APPENDIX G –
CCR MATERIAL INVESTIGATIONS

APPENDIX G.1

TECHNICAL EVALUATION OF GEOTECHNICAL AND CCR MATERIAL CHARACTERISTICS DATA

Appendix G.1 - Technical Evaluation of Geotechnical and CCR Material Characteristics Data

TDEC Commissioner's Order:
Environmental Assessment Report
Kingston Fossil Plant
Harriman, Tennessee

March 12, 2024

Prepared for:

Tennessee Valley Authority
Chattanooga, Tennessee

Prepared by:

Stantec Consulting Services Inc.
Lexington, Kentucky

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Sign-off Sheet

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Prepared by _____

Jeffrey S. Dingrando, Principal, Senior Geotechnical Engineer

Reviewed by _____

Hugo Aparicio, Vice President

Approved by _____

Will Mattingly, PE, Senior Principal

Table of Contents

ABBREVIATIONS ..... **III**

1.0 INTRODUCTION **1**

2.0 GEOTECHNICAL INVESTIGATION **2**
2.1 EXPLORATORY DRILLING 2
2.1.1 Previous Representative Studies and Assessments 2
2.1.2 TDEC Order Environmental Investigation Activities 3
2.1.3 Results 4
2.1.4 Discussion 5
2.2 SLOPE STABILITY 6
2.2.1 Previous Representative Studies and Assessments 6
2.2.2 TDEC Order Environmental Investigation Activities 8
2.2.3 Results 9
2.2.4 Discussion 11
2.3 STRUCTURAL INTEGRITY 12
2.3.1 Previous Representative Studies and Assessments 12
2.3.2 Discussion 18
2.4 STRUCTURAL STABILITY (BEDROCK) 19
2.4.1 Previous Representative Studies and Assessments 19
2.4.2 TDEC Order Environmental Investigation Activities 22
2.4.3 Results 22
2.4.4 Discussion 22

3.0 CCR MATERIAL CHARACTERISTICS **23**
3.1.1 Physical Properties 24
3.1.2 Pore Water Field Parameters 25
3.1.3 Analytical Results 25
3.1.4 Phreatic Surface Levels 27
3.1.5 Pore Water Quality Evaluation 28
3.1.6 Summary 30

4.0 REFERENCES **32**

LIST OF TABLES

Table G.1-1 Long-Term, Static Stability Results at KIF Plant 9
Table G.1-2 Seismic Stability Results at KIF Plant 10
Table G.1-3 Pore Water Analytical Results
Table G.1-4 CCR Material Analytical Results for the Stilling Pond
Table G.1-5 Pore Water Level Measurements, Groundwater Sampling Event #3 (August 19, 2019)

LIST OF EXHIBITS

Exhibit G.1-1 Historical Boring Locations
Exhibit G.1-2 Phase 1 Boring Location Map
Exhibit G.1-3 Phase 2 Boring Location Map
Exhibit G.1-4 Completed Stability Analyses
Exhibit G.1-5 Boring and Well Location Map
Exhibit G.1-6 Pore Water Elevation Contour Map, Event #3 (August 19, 2019)

LIST OF ATTACHMENTS

Attachment G.1-A Pore Water Concentrations Over Time

Abbreviations

CARA	Corrective Action/Risk Assessment
CCR	Coal Combustion Residuals
CCR Rule	Title 40, Code of Federal Regulations, Part 257
CFR	Code of Federal Regulations
CL	Lean Clay
cm/sec	Centimeters per Second
CPT	Cone Penetration Test
DO	Dissolved Oxygen
EAR	Environmental Assessment Report
EI	Environmental Investigation
EIP	Environmental Investigation Plan
EXD	Exploratory Drilling
FS	Factor of Safety
GSL	Groundwater Screening Level
HGI	Hydrogeological Investigation
KIF Plant	Kingston Fossil Plant
KRP	Kingston Recovery Project
mg/L	Milligrams per Liter
ML	Silt
NTU	Nephelometric Turbidity Unit
ORP	Oxidation / Reduction Potential
%	Percent
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
RQD	Rock Quality Designation
SAP	Sampling and Analysis Plan
SAR	Sampling and Analysis Report
SM	Silty Sand
SPLP	Synthetic Precipitation Leaching Procedure
Stantec	Stantec Consulting Services Inc.
TDEC	Tennessee Department of Environment and Conservation
TDEC Order	Commissioner's Order No. OGC15-0177
TDS	Total Dissolved Solids
TOC	Total Organic Carbon
TVA	Tennessee Valley Authority
VWP	Vibrating Wire Piezometer
µS/cm	Microsiemens per Centimeter

APPENDIX G.1 – TECHNICAL EVALUATION OF GEOTECHNICAL AND CCR MATERIAL CHARACTERISTICS DATA

Introduction
March 12, 2024

1.0 INTRODUCTION

Stantec Consulting Services Inc. (Stantec), on behalf of the Tennessee Valley Authority (TVA), has prepared this technical evaluation appendix to summarize applicable historical and recent geotechnical information and coal combustion residuals (CCR) material characteristics data at TVA's Kingston Fossil Plant (KIF Plant) in Harriman, Tennessee. This appendix provides a detailed evaluation of these data to support information provided in the Environmental Assessment Report (EAR) to fulfil the requirements for the Tennessee Department of Environment and Conservation (TDEC) Commissioner's Order OGC15-0177 (TDEC Order) Program (TDEC 2015).

2.0 GEOTECHNICAL INVESTIGATION

The purpose of the geotechnical investigation was to further characterize and evaluate subsurface conditions for the three TDEC Order CCR management units[1] at the KIF Plant, which include the Stilling Pond, Interim Ash Staging Area, and Sluice Trench and Area East of Sluice Trench. For this investigation, TVA reviewed information from previous representative studies and assessments, completed an exploratory drilling (EXD) field program, and conducted evaluations for slope stability, structural integrity, and structural stability (bedrock) as part of the TDEC Order Environmental Investigation (EI).

The following sections summarize the previous studies and present overall geotechnical investigation and evaluation findings based on data obtained during previous studies and the EI for the KIF Plant TDEC Order CCR management units. Elevations reported herein are referenced to the National Geodetic Vertical Datum of 1929 (NGVD29).

2.1 EXPLORATORY DRILLING

2.1.1 Previous Representative Studies and Assessments

Through the various information requests, as well as TDEC comments on the *Environmental Investigation Plan* (EIP) (TVA 2018), a need was identified for an evaluation of existing geotechnical data (borings, piezometric data, laboratory data, material parameters, analyses, etc.). The Evaluation of Existing Geotechnical Data (Appendix L of the EIP) was prepared to review the existing (at the time the EIP was written) data and evaluate its adequacy for responding to the various information requests. Evaluating the adequacy of existing data, in accordance with the *Quality Assurance Project Plan (QAPP)* (Environmental Standards Inc. [EnvStds] 2018), depends on both the type of data and its intended use. Where applicable, existing geotechnical data were used to support the subjects addressed throughout the EAR.

Stilling Pond

From 1975 to 2019, several geotechnical explorations were performed at the Stilling Pond for various objectives. Over 80 borings were performed, some of which included rock coring, monitoring well installation, or piezometer installation. Geotechnical laboratory testing was often performed on recovered soil samples. Cone penetration tests (CPTs) were also performed along portions of the unit perimeter. As would be expected for an impoundment, most of the previous boring locations were focused on the perimeter of the unit (particularly adjacent to Kingston Recovery Project (KRP) Ash Landfill) because they were often related to perimeter dike and/or the KRP Ash Landfill slope design, construction, seepage assessment, slope stability assessment, and/or performance monitoring. Boring locations are shown on Exhibit G.1-1. Refer to the Evaluation of Existing Geotechnical Data (Appendix L in the EIP; Stantec 2018a) for more detailed descriptions of the individual explorations, including evaluations of their adequacy for responding to the various information requests.

[1] The term “CCR management unit” is used in this document generally and is not intended to be a designation under federal or state regulations.

Interim Ash Staging Area

From 2009 to 2016, several geotechnical explorations were performed at the Interim Ash Staging Area for various objectives. Over 50 borings were performed, some of which included rock coring, monitoring well installation, or piezometer installation. Geotechnical laboratory testing was often performed on recovered soil samples. CPTs were also performed within the interior of the unit and along portions of the unit perimeter. Most of the previous boring locations were focused on the perimeter of the unit, particularly adjacent to the KRP Ash Landfill (related to perimeter dike and/or the landfill slope design and construction) and within the footprint of the Bottom Ash Dewatering Facility (related to structure foundation design). Boring locations are shown on Exhibit G.1-1. Refer to the Evaluation of Existing Geotechnical Data (Appendix L in the EIP; Stantec 2018a) for more detailed descriptions of the individual explorations, including evaluations of their adequacy for responding to the various information requests.

Sluice Trench and Area East of Sluice Trench

Between 2009 and 2015, several geotechnical explorations were performed at the Sluice Trench and Area East of Sluice Trench for various objectives. Approximately 20 borings were performed, some of which included rock coring or piezometer installation. Geotechnical laboratory testing was often performed on recovered soil samples. CPTs were also performed within the interior of the unit and along portions of the unit perimeter. As would be expected for a unit that was originally part of an impoundment, most of the previous boring locations were focused on the perimeter of the unit, particularly adjacent to the Intake Channel, because they were often related to perimeter dike and/or the slope design, construction, seepage assessment, slope stability assessment, and/or performance monitoring. Boring locations are shown on Exhibit G.1-1. Refer to the Evaluation of Existing Geotechnical Data (Appendix L in the EIP; Stantec 2018a) for more detailed descriptions of the individual explorations, including evaluations of their adequacy for responding to the various information requests.

2.1.2 TDEC Order Environmental Investigation Activities

Objectives and Scope

EXD field work was conducted in two phases (Phase 1 and Phase 2) and consisted of three primary activities – drilling and sampling, installing temporary wells, and installing piezometers. The primary objective of the Phase 1 EXD, conducted pursuant to the *EXD Sampling and Analysis Plan* (SAP) (Stantec 2018b), was to perform borings and install temporary wells to further characterize subsurface conditions at the KIF Plant, in response to the TDEC Order. The EXD SAP included activities at two CCR units: Interim Ash Staging Area and Sluice Trench and Area East of Sluice Trench. The primary objective of the Phase 2 EXD, conducted pursuant to the *Addendum to Exploratory Drilling SAP* (EXD SAP Addendum) (Stantec 2020a), was to perform borings and install vibrating wire piezometers to further characterize subsurface conditions at the KIF Plant, in response to the TDEC Order. The EXD SAP Addendum included activities at one CCR unit: Sluice Trench and Area East of Sluice Trench.

EI field activities were performed in general accordance with the EXD SAP, EXD SAP Addendum, and the *QAPP,* including TVA- and TDEC-approved programmatic and project-specific changes made after approval of the EIP. Exploration location selection, collection methodology, analyses, and quality assurance/quality control completed for the investigation are provided in the *EXD Sampling and Analysis Report* (SAR) included in Appendix G.2.

The scope of work of the Phase 1 EXD consisted of the following tasks:

- Drilling borings
- Collecting disturbed and undisturbed soil samples for lithologic information
- Installing temporary wells, constructing surface protections, and developing the wells
- Conducting slug tests in temporary wells
- Performing geotechnical laboratory testing
- Surveying boring and temporary well locations.

The scope of work of the Phase 2 EXD consisted of the following tasks:

- Drilling borings
- Collecting disturbed and undisturbed soil samples for lithologic information
- Installing vibrating wire piezometers (VWPs)
- Performing geotechnical laboratory testing
- Surveying boring locations.

Boring locations are shown on Exhibits G.1-2 and G.1-3. For additional details on the objectives and scope, refer to the EXD SAR provided as Appendix G.2.

2.1.3 Results

Stilling Pond

No Phase 1 or Phase 2 EXD borings were performed at the Stilling Pond.

Interim Ash Staging Area

During the Phase 1 EXD, five temporary well borings and six direct push borings were drilled in the interior of the Interim Ash Staging Area. Temporary wells were installed above the base of CCR materials in three of the temporary well borings. After the completion of drilling and laboratory testing of samples from the temporary well borings, review of the data showed that three of these borings were inadvertently terminated within CCR material. Therefore, the supplemental direct push borings were added to extend the material profiles into the foundation soils and obtain the deeper samples adjacent to the installed temporary wells. Two direct push borings were advanced adjacent to each temporary well. The uppermost foundation soil was lean clay (CL) in four of the direct push borings and silty sand (SM) in the remaining two direct push borings.

No Phase 2 EXD borings were performed at the Interim Ash Staging Area.

Sluice Trench and Area East of Sluice Trench

During the Phase 1 EXD, two temporary well borings and one direct push boring were drilled within the interior of the Sluice Trench and Area East of Sluice Trench. Temporary wells were installed above the base of CCR materials in each temporary well boring. After the completion of drilling and laboratory testing of samples from the temporary well borings, review of the data showed that one of these borings was inadvertently terminated within CCR material. Therefore, a supplemental direct push boring was added to extend the material profile into the foundation soils and obtain the deeper samples adjacent to the installed temporary well. The uppermost foundation soil was CL in the two borings.

During the Phase 2 EXD, 12 geotechnical borings, including three with VWPs were performed at the Sluice Trench and Area East of Sluice Trench. The borings were drilled to collect geotechnical data and to support seismic stability analysis (Exhibit G.1-3). Three borings were located along the crest of the East Dike. The remaining nine borings were located along or near the outboard toe of the East Dike. The uppermost foundation soil was CL in five borings and silt (ML) in the remaining seven borings.

2.1.4 Discussion

Stantec completed the EXD at the KIF Plant in accordance with the EXD SAP and EXD SAP Addendum as documented in the EXD SAR. The data collected during the EXD are usable for reporting and evaluation in the EAR and meet the objectives of the TDEC Order EIP.

At each boring location, the uppermost foundation soil was predominantly lean clay (11 occurrences), with lesser occurrences of silt (seven occurrences) or silty sand (two occurrences). This is generally consistent with historical borings across the TDEC Order CCR management units. For more information on CCR management unit performance, refer to Section 2.2 regarding slope stability, Section 3.1.4 and Appendix H.1 regarding groundwater and pore water flow, and EAR Chapter 4.3 for material quantity modeling.

2.2 SLOPE STABILITY

The load cases evaluated in the stability analyses are based on conventional practice and appropriate industry standards for landfills and surface impoundments, as applicable. The load cases are as follows:

- Static, long-term (i.e., normal operation conditions) global stability
- Static, long-term veneer (i.e., final cover) stability
- Seismic, pseudostatic global stability
- Seismic, pseudostatic veneer stability
- Seismic, post-earthquake global stability (includes a preceding liquefaction triggering assessment).

As described in the EIP, including the Evaluation of Existing Geotechnical Data (Appendix L of the EIP; Stantec 2018a), the existing data are sufficient to establish appropriate shear strengths and stability results for certain static and seismic load cases. Supplemental geotechnical data were collected, per the EXD SAP (Stantec 2018b), to support the new or updated stability analyses described in the EIP and the Stability SAP (Stantec 2018c). The new or updated stability analyses also utilize the existing data noted above. The summaries of existing geotechnical data demonstrate that those data are representative and suitable to support the new or updated stability analyses. For the KIF Plant, the Stability SAP (with scope updates as documented in the *Static Stability SAR* and *Seismic Stability SAR*) was necessary to address:

1) the Sluice Trench and Area East of Sluice Trench static global, static veneer, seismic global, and seismic veneer slope stability analyses for the current, closed geometry.

2.2.1 Previous Representative Studies and Assessments

Through the various information requests, as well as TDEC comments on the EIP, a need was identified for an evaluation of existing slope stability analyses (geometry, pore water pressures, material parameters, seismic inputs, analysis methods, results, etc.). As an appendix of the EIP (Appendix L), the Evaluation of Existing Geotechnical Data (Stantec 2018a) was prepared to review the existing analyses and evaluate their adequacy with respect to responding to the various information requests. Evaluating the adequacy of existing data depends on both the type of data and its use. Where applicable, existing geotechnical data were used to support the subjects addressed throughout the EAR. For a summary of historical slope stability analyses utilized to address the required load cases, see Tables G.1-1 and G.1-2 in Section 2.2.3.

As described in the Evaluation of Existing Geotechnical Data (Appendix L of the EIP; Stantec 2018a), existing data (if available) that were considered for evaluating stability of the waste fill and side-slope berms included:

- Slope stability analyses of existing conditions

- Slope stability analyses of future (i.e., permitted, “build-out”, or closed) conditions
- Structural stability assessments performed for CCR Rule compliance.

For stability of the waste fill and side-slope berms, the basis for evaluating the adequacy of each type of data listed above was similar:

- Representative coverage with stability analysis cross sections
- Representative cross section geometry and subsurface characterization
- Representative material parameters and phreatic conditions
- Representative loads (static loads, seismic loads, etc.)
- Appropriate stability analysis methods
- Potential for relevant changes in conditions since analyses were performed.

For evaluating CCR and soil material parameters, including shear strengths, existing data (if available) that were considered included:

- Parameters based on *in situ* testing
- Parameters based on laboratory testing
- Parameters based on published values for similar materials.

For evaluating CCR and soil material parameters, the basis for evaluating the adequacy of each type of data listed above was similar:

- Locations of *in situ* tests and/or samples for each material
- Suitability of methods used to perform *in situ* testing, to collect samples, and to perform laboratory testing. Suitability is judged qualitatively, based on how well the methods obtain the necessary data and compare to the current standard of practice.
- Potential for relevant changes in subsurface conditions since *in situ* testing and/or sampling were performed.

Stilling Pond

TVA performed a static, global safety factor assessment (Stantec 2017a) for the Stilling Pond. Based on recent geotechnical explorations and topographic survey data, two critical cross sections (Station 119+69 and 132+37) were developed for slope stability analysis. Static, global slope stability was analyzed for long-term, drained conditions (normal pool). The assessment also evaluated shallow, translational (veneer-type) stability of the final cover system for static drained and seismic loading conditions. The global slope stability analyses were focused on the potential for outslope failures of significant mass,

which could directly influence potential release of CCR materials from the Stilling Pond. Based upon these analysis results, the closed impoundment meets the minimum Factor of Safety (FS) required for static global stability, static veneer stability, and seismic pseudostatic veneer stability.

TVA performed a seismic, global safety factor assessment (Stantec 2020b) for the Stilling Pond. One critical cross section (Station 132+37) was developed for slope stability analysis. This cross section had been developed previously based on a subsurface exploration and laboratory testing by Stantec (2017a) and was updated based on subsequent geotechnical explorations and laboratory testing. Seismic, global slope stability was analyzed for long-term, drained conditions (normal pool). The seismic analyses included the seismic FS (i.e., pseudostatic slope stability) and liquefaction FS (i.e., post-earthquake slope stability, considering liquefaction). To develop the seismic loading, a site-specific seismic study was conducted based upon the design response spectra developed for the KRP Ash Landfill design. The minimum FS correspond to slip surfaces that could potentially result in the release of CCR materials from within the impoundment. Based upon the analysis performed for the Stilling Pond, the closed impoundment meets the FS criteria for both seismic FS and liquefaction FS.

Interim Ash Staging Area

The closure design of the Interim Ash Staging Area (AECOM 2016a and 2016b) generally leveled the site to conform to the surrounding grades, with gentle slopes (3 percent [%] maximum) and small perimeter ditches to promote surface drainage. Due to the higher surrounding grade, flat closure grading, and containment toward the east by the Polishing Pond, the closure documents demonstrate adequate performance of the CCR containment area without the need for static or seismic slope stability calculations. This rationale was presented in the EIP and Stability SAP and was accepted by TDEC.

Sluice Trench and Area East of Sluice Trench

No previous representative studies or assessments were available for Sluice Trench and Area East of Sluice Trench static and seismic slope stability analyses for the current, closed geometry.

2.2.2 TDEC Order Environmental Investigation Activities

Objectives and Scope

The primary objective of the static and seismic stability work, conducted pursuant to the Stability SAP (Stantec 2018c), was to develop slope stability models, including material parameters, and perform stability analyses for select CCR management units at the KIF Plant, in response to the TDEC Order.

Regarding static stability, the Stability SAP included slope stability models and static, global analyses at the Sluice Trench and Area East of Sluice Trench. The Stability SAP also included static, veneer stability analyses at the Sluice Trench and Area East of Sluice Trench. The Stability SAP did not require static stability analyses at the Stilling Pond or Interim Ash Staging Area.

Regarding seismic stability, the Stability SAP included slope stability models and seismic, global analyses (pseudostatic and post-earthquake) at the Sluice Trench and Area East of Sluice Trench. The Stability

SAP also included seismic, veneer stability analyses (pseudostatic) at a typical cross section at the Sluice Trench and Area East of Sluice Trench. The Stability SAP did not require seismic stability analyses at the Stilling Pond or Interim Ash Staging Area.

For additional details on the objectives and scope, refer to the *Static Stability SAR* and *Seismic Stability SAR* provided as Appendix G.3 and G.4, respectively.

2.2.3 Results

The global stability results presented (and compared to the acceptance criteria) are those in which the critical failure surface intercepts the contained CCR materials within the CCR management unit (unless otherwise noted). The global stability analysis models and critical failure surfaces are shown in the referenced historical documents, *Static Stability SAR* or *Seismic Stability SAR* (as applicable). Likewise, calculations for the veneer stability results presented below are included in the referenced historical documents, *Static Stability SAR* or *Seismic Stability SAR* (as applicable).

Static Stability

The static, long-term, global stability was analyzed for each cross section listed in Table G.1-1. The cross section locations for these global stability analyses are shown on Exhibit G.1-4. The static, long-term, veneer stability was analyzed for the typical geometry of the cover system (unless otherwise noted). The results of the static stability analyses, with the minimum required FS, are summarized in Table G.1-1. The static, long-term, global stability for the cross sections and the static, long-term, veneer stability for the typical sections meets the established FS criteria for the static load cases.

Table G.1-1 Long-Term, Static Stability Results at KIF Plant

TDEC Order CCR Management Unit	Analysis Type	Cross Section	FS Required	FS Sliding	Reference
Interim Ash Staging Area (Closed Condition)	Global	N/A	N/A	N/A	See discussion below
	Veneer	N/A	N/A	N/A	See discussion below
Sluice Trench and Area East of Sluice Trench (Closed Condition)	Global	A-A'	≥ 1.5	1.9	Stantec (2023a)
		Polishing Pond	≥ 1.5	2.4	Stantec (2023a)
	Veneer	Typ.	≥ 1.5	1.8	Stantec (2023a)
Stilling Pond (Closed Condition)	Global	Station 119+69	≥ 1.5	2.0	Stantec (2017a)
		Station 132+37	≥ 1.5	2.6	Stantec (2017a)
	Veneer	Typ.	≥ 1.5	1.5	Stantec (2017a)

Table G.1-1 notes that static, long-term global and veneer analyses were not applicable for the TDEC Order CCR management units. The rationale for this is as follows:

- The closure design of the Interim Ash Staging Area (AECOM 2016a and 2016b) generally leveled the site to conform to the surrounding grades, with gentle slopes (3% maximum) and small perimeter ditches to promote surface drainage. Due to the higher surrounding grade, flat closure

grading, and containment toward the east by the Polishing Pond, the closure documents demonstrate adequate performance of the CCR containment area without the need for static or seismic slope stability calculations. This rationale was presented in the EIP and Stability SAP and was accepted by TDEC.

One of the FS Sliding results presented in Table G.1-1 is for a critical failure surface that does not intercept the contained CCR materials within the CCR management unit. The static, long-term global results for cross section Station 119+69 at the Stilling Pond represents a critical failure surface in the outslope of the lower starter dike and/or rockfill buttress. Due to the geometry and material properties, the FS Sliding results for failure surfaces intercepting the contained CCR materials within the Stilling Pond would be higher (i.e., less critical) than those presented. Thus, the static, long-term, global stability for the Stilling Pond cross sections meets the established FS criteria for the static load case.

Seismic Stability

The pseudostatic, global stability and post-earthquake, global stability were analyzed for each cross section listed in Table G.1-2. The cross section locations for these global stability analyses are shown on Exhibit G.1-4. The pseudostatic, veneer stability was analyzed for the typical geometry of the cover system (unless otherwise noted). The results of the seismic stability analyses, with the minimum required FS for each case, are summarized in Table G.1-2. Seismic global and veneer analyses were not applicable for the Interim Ash Staging Area, as noted below. The pseudostatic veneer stability for the typical sections at the Sluice Trench and Area East of Sluice Trench and at the Stilling Pond meet the established FS criteria for the seismic load cases. The pseudostatic and post-earthquake, global stability for the cross sections at the Sluice Trench and Area East of Sluice Trench (both cross sections for pseudostatic, one cross section for post-earthquake) do not meet the established FS criteria for the seismic load cases and are discussed further below. The pseudostatic and post-earthquake, global stability for the cross section at the Stilling Pond meet the established FS criteria for the seismic load cases.

Table G.1-2 Seismic Stability Results at KIF Plant

TDEC Order CCR Management Unit	Analysis Type	Cross Section	FS Required	FS Sliding	Reference
Interim Ash Staging Area (Closed Condition)	Pseudostatic, Global	N/A	N/A	N/A	See discussion below
	Post-Earthquake Global	N/A	N/A	N/A	See discussion below
	Pseudostatic, Veneer	N/A	N/A	N/A	See discussion below
Sluice Trench and Area East of Sluice Trench (Closed Condition)	Pseudostatic, Global	A-A’	≥ 1.0	< 1.0 (See discussion below)	Stantec (2023b)
		Polishing Pond	≥ 1.0	< 1.0 (See discussion below)	Stantec (2023b)
	Post-Earthquake Global	A-A’	≥ 1.0	1.0	Stantec (2023b)
		Polishing Pond	≥ 1.0	0.8 (See discussion below)	Stantec (2023b)
	Pseudostatic, Veneer	Typ.	≥ 1.0	1.0	Stantec (2023b)

TDEC Order CCR Management Unit	Analysis Type	Cross Section	FS Required	FS Sliding	Reference
Stilling Pond (Closed Condition)	Pseudostatic, Global	Station 132+37	≥ 1.0	> 1.0 (See discussion below)	Stantec (2020b)
	Post-Earthquake Global	Station 132+37	≥ 1.0	1.1	Stantec (2020b)
	Pseudostatic, Veneer	Typical	≥ 1.0	1.0	Stantec (2017a)

Table G.1-2 notes that seismic global and veneer analysis were not applicable for certain CCR management units. The rationale for this is as follows:

- The closure design of the Interim Ash Staging Area (AECOM 2016a and 2016b) generally leveled the site to conform to the surrounding grades, with gentle slopes (3% maximum) and small perimeter ditches to promote surface drainage. Due to the higher surrounding grade, flat closure grading, and containment toward the east by the Polishing Pond, the closure documents demonstrate adequate performance of the CCR containment area without the need for static or seismic slope stability calculations.

The pseudostatic, global stability for the cross section at the Stilling Pond was evaluated by Stantec (2020b) using a seismic displacement analysis (i.e., Newmark analysis). The displacements due to the design earthquake were less than the tolerable displacement of three feet, and thus correlate to a FS Sliding greater than one (as defined in the Seismic Stability SAR [EAR Appendix G.4] and the Stability SAP). This meets the established FS criteria for the pseudostatic, global load case.

Instead of pursuing (per the phased approach outlined in the Stability SAP) the Phases 3 and 4 of analysis of the existing conditions, TVA has elected to pursue seismic mitigation of the Sluice Trench and Area East of Sluice Trench. TVA is currently evaluating mitigation alternatives that would be designed to meet the seismic stability acceptance criteria as defined in the Stability SAP. It is anticipated that the mitigation design process will commence in parallel with the Corrective Action/Risk Assessment (CARA) phase of the TDEC Order program.

2.2.4 Discussion

The static and seismic stability results for the KIF Plant are summarized and compared to criteria in Table G.1-1 and Table G.1-2, respectively. The global stability and the veneer stability for each analyzed section meet the established FS criteria for the static load cases. The pseudostatic veneer stability for the typical sections meet the established FS criteria for the seismic load cases. The pseudostatic and post-earthquake, global stability for the cross section at the Stilling Pond meet the established FS criteria for the seismic load cases.

The pseudostatic and post-earthquake, global stability for the cross sections at the Sluice Trench and Area East of Sluice Trench (both cross sections for pseudostatic, one cross section for post-earthquake) do not meet the established FS criteria for the seismic load cases. TVA is currently evaluating mitigation alternatives for the Sluice Trench and Area East of Sluice Trench that would be designed to meet the

seismic stability acceptance criteria as defined in the Stability SAP. It is anticipated that the mitigation design process will commence in parallel with the CARA phase of the TDEC Order program.

2.3 STRUCTURAL INTEGRITY

Per the KIF EIP, TDEC requested that TVA discuss how the structural integrity of the entire area of CCR materials disposal (surface impoundment[s], landfill(s) and non-registered sites) will be determined. Further, TVA included the methods and models in the EIP that it will use to evaluate structural integrity as discussed in 40 Code of Federal Regulations (CFR) Part 257.73(d) and (e).

For purposes of this section of the EAR, “structural integrity” considers structural potential failure modes that could lead to a release of CCR materials, other than slope stability (addressed in Section 2.2) and structural stability of bedrock (addressed in Section 2.4).

For the KIF Plant TDEC Order CCR management units, the EIP summarized historical reports that could be leveraged to address structural integrity. There was no SAR specifically required under the TDEC Order program to address this subject.

2.3.1 Previous Representative Studies and Assessments

The KIF Stilling Pond and Sluice Trench and Area East of Sluice Trench CCR management units are subject to the CCR Rule requirements for active or inactive units. While the Interim Ash Staging Area is not subject to 40 CFR Part 257.73(d) or (e), closure documents for this CCR management unit addressed many aspects of structural integrity listed in the CCR Rule 40 CFR Part 257.73(d) such as settlement, erosion protection, vegetative cover, and structural integrity of underlying hydraulic structures (AECOM 2016a). A summary of the above-mentioned studies is provided below.

TVA promotes structural integrity of the CCR management units by performing routine inspections and by evaluating proper abandonment of hydraulic structures and pipe penetrations through the unit perimeter. A summary of the structural evaluations is provided below.

Stilling Pond

The Stilling Pond is closed under a National Pollutant Discharge Elimination System (NPDES) permit and includes a final cap system of soil and geosynthetics. Final closure design of the Stilling Pond (Stantec 2017a) considered the following general design and operation issues: pool drawdown, spillway abandonment, fill placement, stormwater management system construction, final cap system installation (including establishment of vegetation cover), and access road construction.

In accordance with the CCR Rule, the Stilling Pond was closed and is monitored and maintained in accordance with a *Closure and Post-Closure Plan* (Stantec 2017c). With respect to closure, the plan summarized control of infiltration and releases, prevention of future impoundment of water, sediment, or slurry, slope stability measures, CCR management unit maintenance, drainage and stabilization of surface impoundments, and final cover system design. With respect to post-closure, the plan summarized monitoring and maintenance activities for the final cover system and groundwater monitoring system.

APPENDIX G.1 – TECHNICAL EVALUATION OF GEOTECHNICAL AND CCR MATERIAL CHARACTERISTICS DATA

Geotechnical Investigation
March 12, 2024

While closure construction was ongoing, TVA performed a structural stability assessment as required by 40 CFR Part 257.73(d) for the KIF Plant Stilling Pond surface impoundment (Stantec 2018d). The scope of work for this assessment is provided below. TVA further promotes structural integrity of the CCR management units by performing routine inspections and by evaluating proper abandonment of hydraulic structures and pipe penetrations through the unit perimeter. A summary of the structural evaluations is also provided below. Additionally, the stability program described in Section 2.2 considers the safety factor aspects of the CCR Rule, 40 CFR Part 257.73(e), such as static and seismic stability.

As part of TVA's ongoing efforts to comply with the CCR Rule, a structural stability assessment was performed for the Stilling Pond (Stantec 2018d). Within this document, "Dike C" refers to the east and southeast perimeter dike system along the Emory River and the intake channel. The "Divider Dike" refers to the dike separating the Stilling Pond from the KRP Ash Landfill. With respect to stability of the waste fill and side slope berms, this assessment considered the following aspects:

- Foundation and abutment conditions (cracking, settlement, deformation, erosion, heave due to seepage): No indications of foundation issues (i.e., cracking, settlement, depressions, and/or deformation) have been noted on historic inspection reports. Recent inspections of Dike C, performed in 2010, 2012, and 2014 note no significant signs of tension cracking, settlement, deformations or similar instabilities. In 2009 and 2010, a rock buttress consisting of filter layers and riprap armor was built on the outboard slopes along the length of Dike C. This buttress was constructed for seepage control and to improve stability of the perimeter dike system. The original spillway structure was abandoned by removing exposed piping and grouting buried piping in 2017 as part of closure construction (Stantec 2018d).

- Slope protection: The exterior slope of Dike C was armored with a riprap buttress between 2009 and 2011. The riprap buttress was inspected annually prior to the start of the closure construction, with no reported deficiencies (Stantec 2018d).

- Embankment dike compaction: Construction records related to the starter dike (built in the 1950s) and raised dike (built in the 1970s) were not available. However, TVA design drawings 31N202, 10N400, 10N420, and 10W421 provide documentation of placement and compaction requirements related to the construction of the perimeter dike. Later subsurface explorations confirm that the earth fill used for the raised portion of Dike C was appropriately compacted and that portions of the earth fill used for the original portion (starter dike) of Dike C were soft or loose. Construction criteria related to dike embankment materials and dike compaction as noted on these drawings include:

    - Portions of the starter dike embankments were placed below water. Fill was placed to the angle of repose

    - Starter dike embankments were constructed of unclassified excavation

    - Raised dike embankments were to be constructed from earth fill from approved borrow sources in accordance with standard TVA construction specifications

  - Raised dike embankments were to be compacted with sheepsfoot rollers. Connections to the starter dike were made by stripping, scarifying, and benching the surface, to provide a good bond between soil lifts.
  - For the raised dike embankments, the earth fill moisture content was to be within 3% of optimum moisture content and uniformly compacted to a minimum 95% of Standard Proctor maximum density
  - The Divider Dike was constructed of bottom ash, and the submerged portion was placed by end dumping. The above water portion was placed in lifts and was well compacted with rubber-tired hauling equipment.

- Spillway condition and capacity: The Stilling Pond closure included installation of a drainage system consisting of ditches and flumes to convey runoff to four culverts through Dike C and ultimately to the Emory River. The Inflow Design Flood Control System Plan (Stantec 2017b) documents the assessment of the Stilling Pond related to the capacity requirements outlined in §257.73(d)(1)(v) of the CCR Rule. The assessment demonstrates that the culverts located on the east perimeter of the Stilling Pond meet the capacity requirements (Stantec 2018d).
- Sudden drawdown assessment (slope stability): The exterior slope of Dike C was assessed for sudden drawdown (i.e., sudden decrease in the Emory River pool elevation) for slope failures of significant mass, which could directly impact potential release of water and CCR materials from the Stilling Pond. Based on the assessment of the sudden drawdown for Dike C, the CCR Rule-related criteria have been met.

In 2020, an annual inspection of the KIF Plant CCR Facilities was performed (TVA 2021). For the Stilling Pond, the inspection report included a general overview of site conditions, summary of areas of interest, and review of instrumentation data. The report also documented a field inspection, which included observations (as applicable) of cover soil, vegetation, drainage ditches, pipes and culverts, pumps, manholes, topography, and access roads. There were no observed deficiencies identified at the Stilling Pond during inspection that required immediate attention, monitoring, or maintenance.

In 2021, Stantec performed a cover system integrity study for the Stilling Pond, as part of CCR Rule compliance activities (Stantec 2021). The study included field inspection, document review, and instrumentation data review. The inspection included the crest of the facility, outer slopes, access roads, ditches, inlets and outlets for surface drainage, and instrumentation associated with the facilities. The inspection team did not observe any critical deficiencies or potential weaknesses in the cover system for the Stilling Pond. No depressed or unstable areas were observed. The field inspection observed and noted minor maintenance items to be addressed for the cover system.

Interim Ash Staging Area

The Interim Ash Staging Area is closed and includes a final cap system of soil, with select areas capped with soil and geosynthetics. Final closure design of the Interim Ash Staging Area (AECOM 2016a and 2016c) considered the following general design and operation issues: final cap system installation (including establishment of vegetation cover), drainage and flow management updates, and construction of the Polishing Pond (a portion of which is within the Interim Ash Staging Area footprint).

As part of closure, the Interim Ash Staging Area was generally leveled to conform to the surrounding grades, with gentle slopes (3% maximum) and small perimeter ditches to promote surface drainage. The higher surrounding grade, flat closure grading, and containment toward the east by the Polishing Pond demonstrated in the closure documents promote the overall structural integrity of the CCR containment area.

While this unit is not subject to 40 CFR Part 257.73(d) or (e), closure documents for the Interim Ash Staging Area addressed many aspects of structural integrity listed in the CCR Rule 40 CFR Part 257.73(d) such as settlement, erosion protection, vegetative cover, and structural integrity of underlying hydraulic structures (AECOM 2016a). Prior to closure, TVA performed a geotechnical exploration and analysis to evaluate how final closure of the Interim Ash Staging Area and construction of the Polishing Pond may impact the structural stability of the adjacent dike systems (AECOM 2016a). The scope of work for this assessment is provided below. A summary of the structural evaluations is also provided below. With respect to stability of the waste fill, the assessments considered the following aspects:

- Foundation and abutment conditions (cracking, settlement, deformation, erosion, heave due to seepage): Based on existing analytical data and results, the existing foundations are performing acceptably in comparison to current criteria. As part of the KRP, the area within the Interim Ash Staging Area was prepared as an “Ash Recovery Area” to allow temporary placement of ash while the KRP Ash Landfill was constructed. To prepare the area for the recovered ash processing, prefabricated vertical drains (i.e., PVDs or wick drains) were installed across the Interim Ash Staging Area footprint to expedite consolidation of the existing underlying CCR materials and foundation soils (TVA 2009a, 2009c). Prior to wick drain installation, the footprint was surfaced with a demarcation layer of crushed stone and filter fabric (TVA 2009b) to delineate pre-existing ash (below the stone layer) from temporarily stacked ash from the KRP effort. Prior to closure of the Interim Ash Staging Area and construction of the Polishing Pond, bearing capacity analyses were performed to assess the ability for potential shallow foundations to support the proposed flow management structures (e.g., pipe rack support, junction chamber). Potential consolidation settlement and deformation were also evaluated in the structural support areas. The Polishing Pond was designed and constructed with a liner system consisting of layers of clay, geomembrane, geotextile, and protecting cover such that water within the facility would remain impounded and not affect seepage conditions (AECOM 2016a).

- Slope protection: The Interim Ash Staging Area was generally leveled to conform to the surrounding grades, with gentle slopes (3% maximum) and small perimeter ditches. Site inspection reports generally indicate appropriate maintenance of slope protection features of the

perimeter ditches (TVA 2022), in accordance with the procedures outlined in the *TVA Operations Support Document* (TVA 2011).

- Embankment dike compaction: The Interim Ash Staging Area does not have above grade embankment dikes. The Initial Ash Disposal Area, which was filled in 1967, was located in the footprint of the Interim Ash Staging Area. The Initial Ash Disposal Area was bounded by the North and East Dikes. The North Dike is now below grade, near the boundary of the Interim Ash Staging Area and the KRP Ash Landfill. The East Dike is part of the Sluice Trench and Area East of Sluice Trench. The final soil cover for the Interim Ash Staging Area and the fill materials (CCR material and soil) for the Polishing Pond perimeter berm were subject to compaction requirements (density and moisture) and quality control testing to achieve the specified hydraulic conductivity and/or strength parameters (AECOM 2016d).

- Vegetation of slopes: The Interim Ash Staging Area has a final cap system of soil, with select areas capped with soil and geosynthetics. The closure documents specified the protective cover soil layer to provide protection for geosynthetics, serve as a barrier layer above the geosynthetics, and to support the establishment of vegetation (AECOM 2016d). QA/QC activities included material source verification and inspection during placement and grading. Annual site inspections were conducted and documented regularly following construction of the final cap. The vegetation along the final cap of the Interim Ash Staging Area was found to be adequate, and any deficiencies were identified for repair (TVA 2022).

- Spillway condition and capacity: The Interim Ash Staging Area does not have any spillway features

- Structural integrity of hydraulic structures underlying the base of the CCR unit: As part of the KRP, the area within the Interim Ash Staging Area was prepared as an “Ash Recovery Area.” To prepare the area for the recovered CCR processing, two existing metal cleaning ponds were decommissioned. The clay lined metal cleaning ponds were dewatered, backfilled with layers of shot rock, crushed stone, and compacted fill, and capped with a demarcation layer of crushed stone and filter fabric (TVA 2009b).

TVA further promotes structural integrity of the CCR management units by performing routine inspections. In 2021, an annual inspection of the Interim Ash Staging Area was performed (TVA 2022). The inspection report included a general overview of site conditions and summary of areas of interest. The report also documented a field inspection, which included observations (as applicable) of cover soil, vegetation, drainage ditches, pipes and culverts, pumps, manholes, topography, and access roads. There were no observed deficiencies identified at the Interim Ash Staging Area during inspection that required immediate attention, monitoring, or maintenance.

Sluice Trench and Area East of Sluice Trench

The Sluice Trench and Area East of Sluice Trench is closed and includes a final cap system of soil in some portions and soil plus geosynthetics in other portions. Final closure design of the Sluice Trench and Area East of Sluice Trench was performed as part of three projects: the Drainage and Flow Management

project (AECOM 2016b), the East Dike Seepage Mitigation project (AECOM 2018a), and the East Dike Area Closure project (AECOM 2019). The elements related to closure considered the following general design and operation issues: fill placement, stormwater management system construction, final cap system installation (including establishment of vegetation cover), and access road construction.

In accordance with the CCR Rule, the Sluice Trench and Area East of Sluice Trench was closed and is monitored and maintained in accordance with a *Closure and Post-Closure Plan* (AECOM 2018b). With respect to closure, the plan summarized control of infiltration and releases, prevention of future impoundment of water, sediment, or slurry, slope stability measures, CCR management unit maintenance, drainage and stabilization of surface impoundments, and final cover system design. With respect to post-closure, the plan summarized monitoring and maintenance activities for the final cover system and groundwater monitoring system.

While closure construction was ongoing, TVA performed a structural stability assessment as required by 40 CFR Part 257.73(d) for the KIF Plant Sluice Trench and Area East of Sluice Trench surface impoundment (AECOM 2018c). The scope of work for this assessment is provided below. TVA further promotes structural integrity of the CCR management units by performing routine inspections and by evaluating proper abandonment of hydraulic structures and pipe penetrations through the unit perimeter. A summary of the structural evaluations is also provided below. Additionally, the stability program described in Section 2.2 considers the safety factor aspects of the CCR Rule, 40 CFR Part 257.73(e), such as static and seismic stability.

As part of TVA's ongoing efforts to comply with the CCR Rule, a structural stability assessment was performed for the Sluice Trench and Area East of Sluice Trench (AECOM 2018c). Within this document, "East Dike" refers to the southeast perimeter dike system along the intake channel. The "Non-CCR Process Water Basin" refers to the Polishing Pond that is located partially within the footprint of this CCR management unit. With respect to stability of the waste fill and side slope berms, this assessment considered the following aspects:

- Foundation and abutment conditions (cracking, settlement, deformation, erosion, heave due to seepage): Based on existing analytical data and results, the existing foundations are performing acceptably in comparison to current criteria. Further, no physical or visual evidence of heave or uplift has been observed. Visual inspections of the perimeter road where pipes pass through do not show any signs of deformation. The pipes have been evaluated for buckling stability for two different limit states: usual loading conditions associated with regularly occurring pool levels and unusual loading conditions associated with the design flood event (AECOM 2018c).

- Slope protection: Site inspection reports generally indicate appropriate maintenance of slope protection features of the perimeter dike, in accordance with the procedures outlined in the *TVA Operations Support Document* (TVA 2011)

- Embankment dike compaction: Construction records related to the East Dike (built in the 1950s) were not available. However, TVA design drawing 10N400 provides documentation of placement and compaction requirements related to the construction of the perimeter dike. Later subsurface

explorations confirm that the earth fill used for the East Dike is generally consistent with well compacted fill. Construction criteria related to dike embankment materials and dike compaction as noted on these drawings include:

  - Portions of the dike embankments were placed below water. Fill was placed to the angle of repose
  - Dike embankments were constructed of unclassified excavation
  - For a length of the East Dike closest to the intake, a note on the drawing states “Special care is to be taken to select firm shale material to be placed below the water level, at the location indicated, so that slope will not extend into the area of the intake channel”.

- Spillway condition and capacity: The Sluice Trench and Area East of Sluice Trench does not have any spillway features
- Sudden drawdown assessment (slope stability): The exterior slope of the Non-CCR Process Water Basin was assessed for sudden drawdown (i.e., sudden decrease in the Emory River pool elevation) for slope failures of significant mass, which could directly impact potential release of water and CCR materials from the basin. Based on the assessment of the sudden drawdown for basin, the CCR Rule-related criteria have been met.

In 2020, an annual inspection of the KIF Plant CCR Facilities was performed (TVA 2021). For the Sluice Trench and Area East of Sluice Trench, the inspection report included a general overview of site conditions, summary of areas of interest, and review of instrumentation data. The report also documented a field inspection, which included observations (as applicable) of cover soil, vegetation, drainage ditches, pipes and culverts, pumps, manholes, topography, and access roads. There were no observed deficiencies identified at the Sluice Trench and Area East of Sluice Trench during inspection that required immediate attention, monitoring, or maintenance.

2.3.2 Discussion

For purposes of this section of the EAR, “structural integrity” considers structural potential failure modes that could lead to a release of CCR materials, other than slope stability (addressed in Section 2.1.4) and structural stability of bedrock (addressed in Section 2.4).

For the KIF Plant TDEC Order CCR management units, historical reports were leveraged to address structural integrity. No significant deficiencies were identified with respect to structural integrity of the KIF Plant TDEC Order CCR management units. TVA promotes structural integrity of the units by performing routine inspections and other compliance activities, in accordance with TVA policies, state regulations, and federal regulations.

2.4 STRUCTURAL STABILITY (BEDROCK)

Per the EIP, TDEC requested that TVA discuss the ability of the local geology to provide sufficient structural stability for the existing surface impoundments, landfills, and/or non-registered disposal areas at the KIF Plant as well as any disposal area considered for closure in place.

For purposes of this section of the EAR, "structural stability (bedrock)" considers stability of bedrock below fill areas. That is, the bedrock was evaluated with respect to voids/cavities and faults/joints of significant lateral or vertical extent that could be large enough to lead to loss of structural support and potential release of the overlying CCR materials.

For the KIF Plant TDEC Order CCR management units, the Evaluation of Existing Geotechnical Data (Appendix L of the EIP; Stantec 2018a) summarized historical reports that could be leveraged to address structural stability of the bedrock.

2.4.1 Previous Representative Studies and Assessments

Evaluating the adequacy of existing data depends on the type of data, its quality, and its intended use. For evaluating the stability of bedrock below fill areas, existing data that were considered included:

- Geotechnical data from borings that included rock coring
- Routine visual observations of CCR management units, with respect to indicators of structural distress
- Geologic mapping and characterization of the site, including descriptions of the shallow rock formations.

For this subject, the basis for evaluating the adequacy of each type of data listed above were similar:

- Spatial coverage of borings and visual observations
- Suitability of methods used to perform rock coring and visual observations, and of the associated documentation. Suitability is evaluated qualitatively, based on how well the methods obtained the necessary data and how the methods compared to the current standard of practice.
- Potential for relevant changes in subsurface conditions since borings, surveys, or observations were performed.

General

According to the United States Geological Survey Geologic Map of the Harriman Quadrangle (Moore, Finlayson, and Milici 1993), the plant is underlain by Lower Ordovician and Cambrian age limestone and shale bedrock formations. The majority of the plant, including the Interim Ash Staging Area, Stilling Pond, and Sluice Trench and Area East of Sluice Trench, is underlain by the Conasauga Shale Formation,

which consists of an argillaceous to silty shale with zones of shaley limestone scattered throughout. The geologic mapping indicates this formation is contorted, brecciated, and sheared throughout.

Stilling Pond

In 2009, Stantec performed four borings at the Stilling Pond that included rock coring at depths up to about 20 feet into the bedrock (Stantec 2009). The rock was described as shale interbedded with limestone. The shale was described as gray to dark gray, fine grained, very soft, thin bedded, argillaceous to calcareous with thin limestone partings throughout. The limestone was described as light gray, fine to medium grained, hard, and thin bedded. Core recovery ranged from 0 to 100%, and rock quality designation (RQD) ranged from 0 to 13%. No voids were noted.

In 2010, S&ME performed two borings at the Stilling Pond that included rock coring at depths up to about 20 feet into the bedrock (S&ME 2010). The rock was described as shale interbedded with limestone. The shale was described as dark gray to gray, very fine grained, very soft to soft. The limestone was described as blue-gray, fine to coarse grained, hard, partially crystalline. Core recovery ranged from 0 to 61%, and RQD ranged from 0 to 12%. Intervals were noted to be highly fractured. No voids were noted.

In 2011, S&ME performed 15 borings at the Stilling Pond that included rock coring at depths up to about 10 feet into the bedrock (S&ME 2011). The rock was described as shale interbedded with siltstone and/or limestone. The shale was described as gray to dark gray, fine to medium grained, soft, thin bedded. The siltstone was described as gray to green, hard, and calcareous with white and pink calcite veining. The limestone was described as gray, fine grained, hard. Core recovery ranged from 0 to 100%, and RQD ranged from 0 to 35%. Intervals were noted to be highly fractured. No voids were noted.

In 2014, S&ME performed one boring at the Stilling Pond that included rock coring at a depth of about 25 feet into the bedrock (TVA 2015). The rock was described as siltstone interbedded with limestone, transitioning to siltstone interbedded with shale. The siltstone was described as dark gray to greenish gray, fine grained, soft to medium hard with calcite veining. The limestone was described as gray, hard. The shale was described as dark gray, very fine grained, medium hard. Core recovery ranged from 73 to 100%, and RQD ranged from 0 to 18%. Intervals were noted to be highly fractured. No voids were noted.

Interim Ash Staging Area

In 2011, S&ME performed three borings at the Interim Ash Staging Area that included rock coring at depths up to about 10 feet into the bedrock (S&ME 2011). The rock was described as shale interbedded with siltstone. The shale was described as maroonish gray, very fine grained, very soft, slightly weathered. The siltstone was described as grayish green and gray, soft to moderately hard. Core recovery ranged from 2 to 70%, and RQD was 0%. Intervals were noted to be highly fractured. No voids were noted.

In 2012, AMEC performed two borings at the Interim Ash Staging Area that included rock coring at depths up to about five feet into the bedrock (AMEC 2012). The rock was described as shale with some limestone stringers. The shale was described as gray, soft to moderately hard. Core recovery ranged from 44 to 100%, and RQD ranged from 0 to 35%. No voids were noted.

In 2012, Stantec performed five borings at the Interim Ash Staging Area that included rock coring at depths up to about 14 feet into the bedrock (Stantec 2012a, Stantec 2012b). The rock was described as shale interbedded with siltstone and limestone. The shale was described as dark gray with dull purple gray, soft to moderately hard, thinly bedded. The siltstone is described as light to medium gray, moderately hard, thin to thick bedded. The limestone was described as light gray. Core recovery ranged from 27 to 100%, and RQD ranged from 0 to 14%. Intervals were noted to be highly fractured. No voids were noted.

In 2015, Amec Foster Wheeler performed two borings at the Interim Ash Staging Area that included rock coring at depths up to about 10 feet into the bedrock (Amec Foster Wheeler 2015). The rock was described as shale and some shale interbedded with limestone. The shale was described as very dark greenish gray, very thinly bedded, slightly weathered. The limestone was described as black, to very dark gray, very thinly bedded. Core recovery ranged from 95 to 100%, and RQD ranged from zero to 75%. Intervals were noted to be highly fractured. No voids were noted.

In 2015, URS performed one boring at the Interim Ash Staging Area that included rock coring at depths of about four feet into the bedrock (AECOM 2016a). The rock was described as shale, gray, hard, laminated to thinly bedded, slightly weathered. Core recovery ranged from 22 to 75%, and RQD ranged from 0 to 33%. Intervals were noted to be highly fractured. No voids were noted.

Sluice Trench and Area East of Sluice Trench

In 2010, S&ME performed one boring at the Sluice Trench and Area East of Sluice Trench that included rock coring at a depth of about 20 feet into the bedrock (S&ME 2010). The rock was described as shale with some siltstone. The shale was described as gray to maroon gray and greenish-gray, fine grained, very soft to soft, slightly weathered. The siltstone was described as calcareous. Core recovery ranged from 40 to 76%, and RQD ranged from 0 to 32%. Intervals were noted to be highly fractured. No voids were noted.

In 2011, S&ME performed four borings at the Sluice Trench and Area East of Sluice Trench that included rock coring at depths up to about 17 feet into the bedrock (S&ME 2011). The rock was described as shale, limestone, and shale interbedded with siltstone. The shale was described as dark gray and maroonish gray, very fine grained, soft, slightly weathered. The siltstone was described as gray, moderately hard, slightly weathered. The limestone was described as black and medium gray, fine to medium grained, hard, slightly weathered with large calcite inclusions. Core recovery ranged from 18 to 88%, and RQD ranged from 0 to 8%. No voids were noted.

In 2015, URS performed three borings at the Interim Ash Staging Area that included rock coring at depths up to about nine feet into the bedrock (AECOM 2016a). The rock was described as shale, limestone, and shale interbedded with limestone. The shale was described as light gray to gray, hard, thinly bedded, moderately weathered. The limestone was described as light gray, hard, thinly bedded. Core recovery ranged from 24 to 81%, and RQD ranged from 0 to 58%. No voids were noted.

2.4.2 TDEC Order Environmental Investigation Activities

Per the KIF Plant EXD SAP and Hydrogeological Investigation (HGI) SAP, no rock coring was required to achieve the SAP objectives.

2.4.3 Results

Stilling Pond

No rock coring was performed at the Stilling Pond during the EXD or HGI field activities.

Interim Ash Staging Area

No rock coring was performed at the Interim Ash Staging Area during the EXD or HGI field activities.

Sluice Trench and Area East of Sluice Trench

No rock coring was performed at the Sluice Trench and Area East of Sluice Trench during the EXD or HGI field activities.

2.4.4 Discussion

For purposes of this section of the EAR, “structural stability (bedrock)” considers stability of bedrock below fill areas. That is, the bedrock was evaluated with respect to voids/cavities and faults/joints of significant lateral or vertical extent that could be large enough to lead to loss of structural support and potential release of the overlying CCR materials.

The KIF Plant TDEC Order CCR management units are underlain by the Conasauga Shale formation. Locally, the Conasauga formation shows little variation in composition and condition and is primarily shale interbedded with limestone and siltstone. Based upon the site-specific geologic mapping, rock core borings, and CCR management unit operational performance, there is no evidence of large voids/cavities that could lead to loss of structural support and potential release of the overlying CCR materials.

3.0 CCR MATERIAL CHARACTERISTICS

The objective of the CCR material characterization was to assess the presence of constituents in and their susceptibility to leach from CCR material. The CCR materials at the KIF Plant were evaluated during the EI as well as during an earlier investigation that occurred while the Stilling Pond closure activities were underway and before the EIP was finalized. The activities associated with the two programs are described separately below.

Environmental Investigation

Borings were advanced into two KIF Plant TDEC Order CCR management units (the Sluice Trench and Area East of Sluice Trench and Interim Ash Staging Area) for the collection and analysis of CCR solid matrix samples for total metals and synthetic precipitation leaching procedure (SPLP) metals, installation of temporary wells, and collection of pore water samples. Pore water is subsurface water that occurs in pore spaces in CCR material. TVA visually characterized the CCR material present at each of the boring locations using the Unified Soil Classification System, which classifies material by grain size distribution followed by the material's textural properties. Additional CCR material characterization completed during the investigation included hydraulic conductivity testing of the CCR material at the screened interval of five temporary wells. Exhibit G.1-5 shows the boring and temporary well locations.

TVA performed investigation sample and data collection activities in accordance with the EIP, *CCR Material Characteristics SAP* (Stantec 2018e), *QAPP* and TVA's Environmental Technical Instructions. Sample location selection, collection methodology, analyses, and Quality Assurance/Quality Control (QA/QC) completed for the investigation are provided in the *CCR Material Characteristics Investigation SAR* included in Appendix G.5.

As reported in the *CCR Material Characteristics Investigation SAR*, the data collected during these investigations were deemed usable for reporting and evaluation in this EAR because they met the objectives of the *EIP*.

The scope of work of the CCR material characteristics investigation consisted of the following tasks:

- Collecting CCR material samples and associated QC samples at multiple depths from the boring locations for laboratory analysis of CCR-related constituents listed in Appendices III and IV of the CCR Rule. In addition, five inorganic constituents listed in Appendix I of Tennessee Rule 0400-11-01-.04 and not included in the 40 CFR 257 Appendices III and IV were analyzed to maintain continuity with the TDEC compliance programs. These additional TDEC Appendix I constituents included copper, nickel, silver, vanadium, and zinc. The combined federal CCR Appendices III and IV constituents and TDEC Appendix I inorganic constituents are hereafter referred to as CCR Parameters. In addition, total organic carbon (TOC), iron, and manganese were added as specific parameters of interest to be analyzed per the *CCR Material Characteristics SAP*. SPLP analyses were performed for metals and radiological parameters.

- Identifying the interface between CCR material and underlying foundation soils
- Recording field measurements of CCR material pH
- Collecting pore water level measurements
- Collecting pore water samples and associated QC samples from the temporary wells for analysis of CCR Parameters, TOC, iron, manganese, and field water quality parameters per the *CCR Material Characteristics SAP*.

The boring and temporary well locations are shown on Exhibit G.1-5.

Temporary monitoring wells were installed and completed above the foundation soils at five locations. Following installation of the temporary wells, seven additional borings (KIF-B01a, KIF-B01b, KIF-B02a, KIF-B02b, KIF-B03a, KIF-B03b, and KIF-B04a) were advanced and sampled to fulfill the scope for both the exploratory drilling and CCR material characteristics investigations. Following well installation and development, the horizontal hydraulic conductivity of the CCR material interval intersected by the well screen was estimated by conducting slug tests. The calculated hydraulic conductivities of the CCR material ranged from 9.61×10^{-4} centimeters per second (cm/sec) at KIF-TW01 to 1.43×10^{-2} cm/sec at KIF-TW04. Temporary well construction details and hydraulic conductivity testing data are included in the *Exploratory Drilling SAR* (Appendix G.2).

Tabulated laboratory analytical data for the CCR material and SPLP samples are provided in the *CCR Material Characteristics Investigation SAR* (Appendix G.5) and Table G.1-3 for pore water.

2017 Stilling Pond Investigation

Pore water and CCR material were collected from the Stilling Pond in November 2017 while the Stilling Pond closure activities were underway and before the EIP was finalized in 2018. One pore water sample was collected from each of the three temporary wells shown in Exhibit G.1-5 and analyzed for CCR Parameters (except chloride, fluoride, and sulfate due to a laboratory error), TOC, iron and manganese. CCR material samples were collected from each of the borings and analyzed for CCR Parameters, TOC, iron, and manganese. The CCR material samples were additionally subjected to SPLP testing, similar to the samples collected under the EI. Pore water results from the Stilling Pond investigation are summarized in Table G.1-3, and the CCR material solids and SPLP data are summarized in Table G.1-4.

3.1.1 Physical Properties

Encountered CCR material predominantly consisted of silt to sand to gravel-sized materials. Minor gradational changes, such as silty sand grading to sandy silt, were common throughout the vertical profile of each CCR management unit. The CCR material in each of the units typically was gray in color, but black, blue, brown, yellow, red, and green shades were also described.

Lithologic descriptions of the encountered CCR material are provided in the temporary well boring logs provided in Appendix B.3.

3.1.2 Pore Water Field Parameters

TVA measured field water quality parameters, including pH, specific conductance, dissolved oxygen (DO), temperature, oxidation reduction potential (ORP), and turbidity during the collection of pore water samples at each temporary well. Measured pore water field parameter results are summarized in Table B.7 of the *CCR Material Characteristics Investigation SAR* (Appendix G.5) and Table G.1-3.

An evaluation of the field parameters showed that the general pore water quality conditions within the various CCR management units were similar, including the Stilling Pond data from the 2017 Stilling Pond Investigation. Pore water pH ranged from neutral to alkaline, ranging from 6.53 to 8.86. DO concentrations ranged from 0.36 milligrams per liter (mg/L) to 6.84 mg/L, and ORP results suggested that pore water was under reducing conditions based on negative ORP measurements, ranging from –168.4 to -33.0 millivolts. Measured pore water specific conductance values, which correlate with total dissolved solids (TDS) concentrations, were generally similar or higher in the Interim Ash Staging Area (1,119 microsiemens per centimeter [µS/cm] to 2,832 µS/cm) than in the Sluice Trench and Area East of Sluice Trench (892 µS/cm to 1,979 µS/cm). Conductivity[2] measured in the Stilling Pond was low in comparison and ranged from 0.447 µS/cm to 1.264 µS/cm. Measured pore water turbidities for the Sluice Trench and Area East of Sluice Trench and Interim Ash Staging Area were between 3.2 nephelometric turbidity units (NTUs) and 36.1 NTUs.

The maximum turbidity measured was 616.3 NTUs from GP-17-102. This result was higher than other turbidity measurements collected in the Stilling Pond, the Sluice Trench and Area East of Sluice Trench, and the Interim Ash Staging Area. Using statistical evaluation methods described in Appendix E.2, the turbidity measurement collected from GP-17-102 was determined to be a statistical outlier. Because of the high turbidity result and the affect that turbidity can have on analytical results for CCR constituents, analytical results for the pore water sample collected from GP-17-102 were excluded from further statistical analysis.

3.1.3 Analytical Results

TDEC requested that total metals and SPLP analyses be conducted to evaluate CCR material leaching potential. A summary of the findings from the CCR material analytical results is provided in the following subsections.

CCR Material Total Metals and SPLP Analyses

TVA collected and analyzed approximately 54 CCR material grab samples from discrete depth intervals at 12 boring locations from the surface to the base of the Interim Ash Staging Area and Sluice Trench and Area East of Sluice Trench. The resultant analytical dataset represents a vertical profile of total and SPLP concentrations at each boring location. Laboratory analytical data for the CCR material samples are

[2] Conductivity and specific conductance are functionally equivalent measurements; however, specific conductance takes into account the temperature of the sample and conductivity does not. This difference can result in slight variations in the reported values between the two methods.

tabulated in the *CCR Material Characteristics Investigation SAR* (Appendix G.5). Three additional CCR material grab samples were collected from the three borings installed in the Stilling Pond.

Descriptive statistics of the CCR material analytical results were developed and are provided in Appendix E.2. The statistical summaries are provided for each by CCR Parameter and for each CCR management unit. A graphical comparison of the representative concentration ranges at each boring are presented as side-by-side concentration box plots.

A similar descriptive statistics summary of the SPLP results for each CCR material sample is provided in Appendix E.2. For each CCR material sample, statistical analyses were conducted on data where CCR Parameters were detected in greater than 50 percent (%) of the samples in both the SPLP and CCR material datasets. The purpose of the analysis was to evaluate whether the total concentrations of metals in CCR material could be used as a reliable predictor of potential leachable concentrations as represented by SPLP results. Scatter plots with best fit regression lines and Pearson's correlation coefficients were constructed to compare SPLP to total metal concentrations.

The statistical relationships between SPLP concentrations and CCR material concentrations were inconsistent and highly variable. One would expect SPLP concentrations to increase with increasing CCR constituent concentrations in CCR material (i.e., exhibit a regression line with a positive slope). However, this relationship was inconsistent between different CCR constituents and between KIF Plant TDEC Order CCR management units. In some cases, even when there was a statistically significant correlation (e.g., boron), the correlation was inconsistent between the different CCR management units.

For the Stilling Pond, there was insufficient data to evaluate the relationship between concentrations of CCR material and SPLP results.

Pore Water/SPLP Comparison

In November 2017, one pore water sample was collected from each temporary well installed in the Stilling Pond for CCR Parameters (with the exception of chloride, fluoride, and sulfate), iron, manganese, and TOC analysis following well installation and development, to complete the scope of the EI. In addition, these samples were analyzed for aluminum, magnesium, potassium, sodium, strontium, TSS, and speciated arsenic. In April 2019, one pore water sample was collected at each of the five temporary wells installed in the Interim Ash Staging Area and the Sluice Trench and Area East of Sluice Trench for CCR Parameters, iron, manganese, and TOC analysis following well installation and development, to complete the scope of the EI. Samples were collected for analysis of dissolved and total metals. The samples collected for dissolved metals were filtered to remove suspended solids prior to laboratory analysis. The samples collected for total metals were not filtered prior to laboratory analysis. Comparison of the reported concentrations of dissolved and total metals provides an indication of the effect that suspended solids included in the sample may have had on the reported concentrations for total metals analyses. Pore water analytical data are tabulated in Table G.1-3. Descriptive statistics of the pore water analytical results were developed and are provided in Appendix E.2. Two other pore water sampling events were conducted as part of other investigations. The analytical results of those sampling events are included in the discussion of pore water quality below.

TVA compared pore water analytical results to SPLP results for the CCR material to evaluate whether the SPLP methodology could be used to predict pore water concentrations (see Appendix E.2) for CCR constituents. In general, the CCR constituent concentrations using SPLP methodology underestimated CCR constituent concentrations observed in pore water. For CCR Rule Appendix IV CCR constituents (some of which are also TDEC Appendix I constituents) that have been detected in groundwater samples at concentrations above groundwater screening levels (GSLs), the general findings were:

- The range of cobalt concentrations for SPLP results was greater than the range for pore water. The mean concentration for SPLP results was greater than the mean for pore water for the Sluice Trench and Area East of Sluice Trench, but the mean concentrations were similar for the Interim Ash Storage Area.

The results indicate that direct measurement of pore water concentrations is the most accurate way of characterizing potential leachability of CCR constituents from CCR material, but geochemical modeling is needed to predict the concentrations of constituents in groundwater.

In addition to total metals concentrations for pore water, descriptive statistics were also produced for dissolved metals concentrations for pore water (see Appendix E.2). The detected minimum and maximum concentrations, and mean concentrations were similar for cobalt. The results indicated that the amount of turbidity above 5 NTUs only had a small effect on the pore water analytical results, except for the sample collected from GP-17-102 which is considered an outlier because of the high turbidity.

3.1.4 Phreatic Surface Levels

TVA measured pore water levels within the temporary wells monthly for six months. In addition, the wells were gauged during bi-monthly groundwater sampling events. This information was combined with available information from other instruments to develop maps of the phreatic surfaces for each CCR management unit at the time of gauging. The phreatic surface is the surface of pore water at which pressure is atmospheric and below which CCR material may be saturated with pore water. The use of the term “saturated” or references to the moisture content of CCR material does not imply that the pore water is readily separable from the CCR material. Saturated CCR material can have a range of moisture contents based on the characteristics of the material. Pore water levels were not available for the temporary wells installed in the Stilling Pond due to the wells being abandoned for cap system placement over the Stilling Pond CCR management unit. Pore water levels were available from piezometers installed in the Stilling Pond; however, the dataset was not of sufficient density for pore water elevation contours to be drawn for this CCR management unit. Exhibit G.1-6 provides a representative phreatic surface elevation contour map for Event #3 conducted in August 2019 for the Interim Ash Staging Area and Sluice Trench and Area East of Sluice Trench. Table G.1-5 provides a summary of the pore water gauging data for the August 2019 sampling event. The data for other gauging events can be found in Table 4.1 of the EAR and Appendices H.3, H.4, H.6, H.7, and H.8.

Each of the TDEC Order CCR management units was previously closed in accordance with applicable regulations in effect at the time of closure. The pore water levels reported herein may not represent steady-state conditions.

3.1.5 Pore Water Quality Evaluation

This section provides a discussion of the analytical results for pore water samples collected from temporary wells installed as part of the EI. Pore water samples were collected from the temporary wells during four sampling events. The second sampling event was conducted as part of the EI. The first, third, and fourth sampling events were conducted as part of activities associated with other investigations at the KIF Plant.

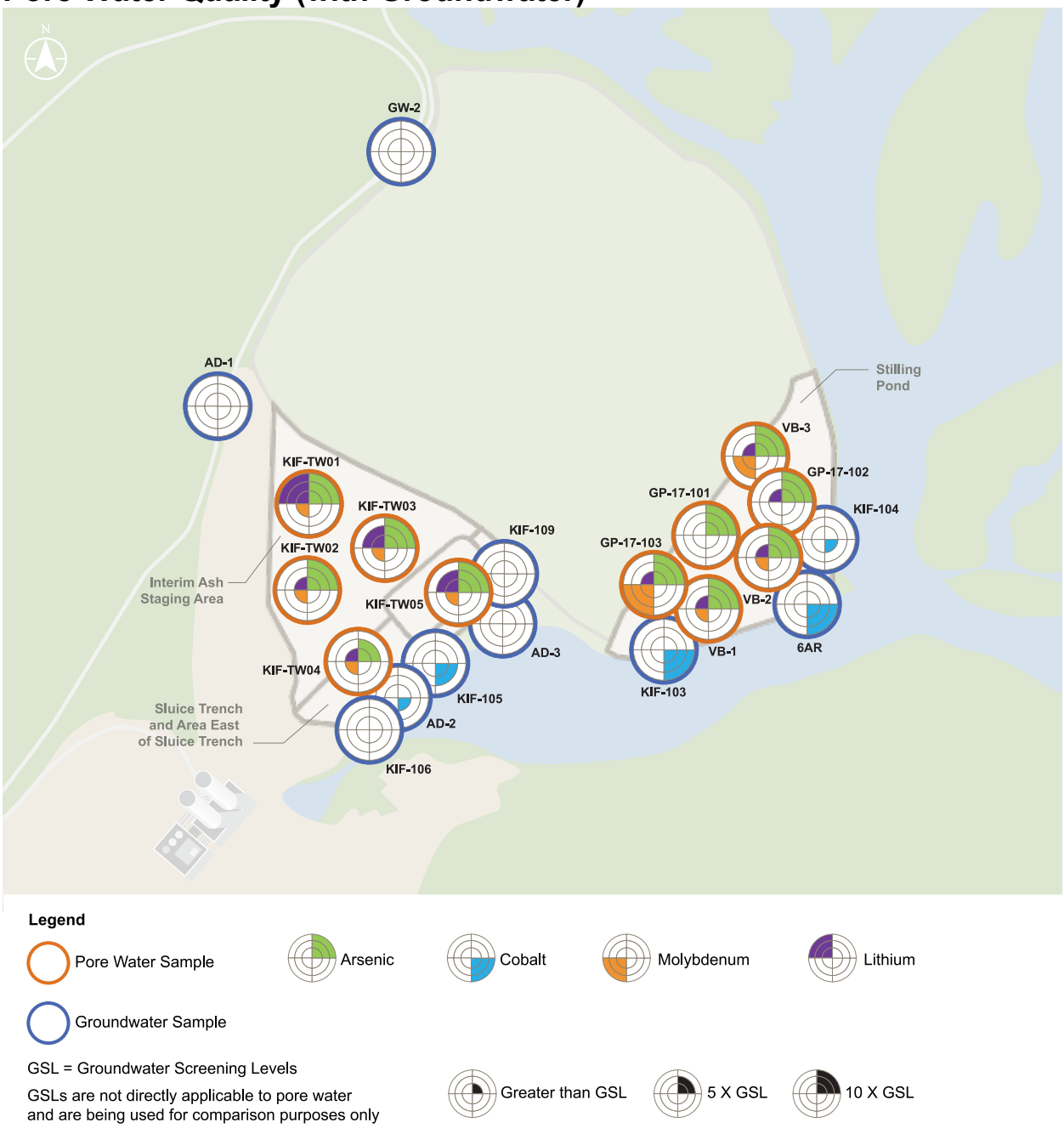
Table G.1-3 provides a summary of pore water analytical results from the following sampling events.

- November 2017 (GP-17-101, GP-17-102, GP-17-103)
- April 2019 (KIF-TW01, KIF-TW02, KIF-TW03, KIF-TW04, KIF-TW05)
- March 2021 (KIF-TW01, KIF-TW02, KIF-TW03, KIF-TW04, KIF-TW05, VB-1, VB-2, VB-3)
- April 2021 (KIF-TW01, KIF-TW02, KIF-TW03, KIF-TW04, KIF-TW05, VB-1, VB-2, VB-3)

The pore water characterization evaluation is based on a comparison of pore water concentrations to groundwater concentrations and GSLs across the KIF Plant. GSLs are not directly applicable to pore water. Comparing pore water concentrations to GSLs is used to identify CCR constituents that have some potential to impact groundwater downgradient of CCR management units. Pore water concentrations were compared to GSLs for constituents listed in Appendix I of TDEC Rule 0400-11-01-.04 (TDEC Appendix I) and in Appendix IV of the CCR Rule because these constituents are subject to potential corrective measures.

Three TDEC Appendix I or CCR Rule Appendix IV constituents (arsenic, lithium, and molybdenum) had reported concentrations in one or more pore water samples above a GSL. None of these, constituents had statistically significant concentrations in groundwater above a GSL. Cobalt is the only constituent with a statistically significant concentration in groundwater above a GSL. The figure below summarizes reported pore water and groundwater analytical results and their comparisons to GSLs. The locations of temporary pore water wells are shown as symbols with an orange outer ring; groundwater well symbols have a blue outer ring. The colored slices in each symbol indicate CCR constituents detected above a GSL in each temporary pore water well. The number of colored sections within each slice represents the magnitude of the reported concentrations relative to the GSL. The legend provides further explanation of the colors and rings.

Pore Water Quality (with Groundwater)



There is a distinct difference between pore water and groundwater quality. As these figures illustrate, many constituents detected above a GSL in pore water samples were below the applicable GSLs in groundwater samples from the same areas.

For the one constituent detected in groundwater above a GSL, the sample had turbidity of 616.3 NTUs. The generally high concentrations of CCR constituents reported in this sample are interpreted to be a result of the high turbidity.

In addition, Attachment G.1-A provides graphs that show the results of the pore water samples over time for constituent-well pairs with one or more reported concentrations above a GSL. Analytical results for total and dissolved fractions of samples are plotted adjacent to one another for each sampling event. The difference between total and dissolved metals results provides an indication of whether suspended solids materially affect the reported concentrations in the total metals analyses. In addition, the GSL was added to the graphs to illustrate the differences between pore water and the GSL. Observations about the graphs follow:

- Except for the April samples collected from KIF-TW05, concentrations generally showed little variation over time as demonstrated by the predominantly horizontal graphs.
- Certain constituents in the samples collected from KIF-TW05, for example arsenic and molybdenum, had lower reported results for the last sampling event.
- The difference between the concentrations of total and dissolved constituents for samples collected from GP-17-102 (including the detection of additional constituents not shown in the graphs) is interpreted to be due to the high turbidity readings during sample collection. The sample had turbidity readings of 616 NTUs. This turbidity reading indicates a potential for suspended solids to affect analytical results for the sample.
- Constituents detected in pore water samples above a GSL were not detected in groundwater samples at statistically significant concentrations above a GSL.

In summary, there is a distinct difference between pore water and groundwater quality. Three CCR Rule Appendix IV or TDEC Appendix I constituents had reported concentrations in pore water above a GSL. None of these constituents had statistically significant concentrations in groundwater above a GSL. Generally, pore water concentrations were stable over the sampling period, and suspended solids did not materially affect reported concentrations for total metal analyses.

3.1.6 Summary

The objective of the CCR material characterization was to assess both the presence of CCR constituents within CCR material and their potential to leach from CCR material. TVA evaluated the usefulness of total metals and SPLP analyses as a predictor of CCR constituent concentrations in pore water. In addition, TVA compared the SPLP analytical results to the pore water sample results. The evaluations found that total concentrations of metals in CCR material are not a reliable predictor of the magnitude of the potentially leached concentrations using SPLP, and SPLP analysis of CCR material does not reliably predict pore water concentrations. The results indicated that direct measurement of pore water concentrations is the most accurate way of characterizing potential leachability of CCR constituents from CCR material, but geochemical modeling is needed to predict the concentrations of constituents in groundwater.

APPENDIX G.1 – TECHNICAL EVALUATION OF GEOTECHNICAL AND CCR MATERIAL CHARACTERISTICS DATA

CCR Material Characteristics
March 12, 2024

TVA evaluated analytical results for pore water based on data collected under the EI and for other investigations. In summary, there is a distinct difference between pore water and groundwater quality. Three CCR Rule Appendix IV or TDEC Appendix I constituents had reported concentrations in pore water above a GSL. None of these constituents had statistically significant concentrations in groundwater above a GSL. Generally, pore water concentrations were stable over the sampling period, and suspended solids did not materially affect reported concentrations for total metal analyses.

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APPENDIX G.1 – TECHNICAL EVALUATION OF GEOTECHNICAL AND CCR MATERIAL CHARACTERISTICS DATA

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TABLES

Table G.1-3 - Pore Water Analytical Results
Kingston Fossil Plant

Sample Location		GP-17-101	GP-17-102			GP-17-103				KIF-TW01		
Sample Date		16-Nov-17	15-Nov-17	15-Nov-17	16-Nov-17	14-Nov-17	14-Nov-17	14-Nov-17	14-Nov-17	12-Apr-19	10-Mar-21	13-Apr-21
Sample ID		KIF-PW-GP17101-17-20171116	KIF-PW-GP17102-18-20171115	KIF-PW-GP17102-FLT-18-2017115	KIF-PW-GP17101-FLT-17-20171116	KIF-PW-GP17103-22-20171114	KIF-PW-DUP01-20171114 KIF-PW-GP17103-22-20171114	KIF-PW-GP17103-FLT-22-20171114	KIF-PW-DUP01-FLT-20171114 KIF-PW-GP17103-FLT-22-20171114	KIF-PW-TW01-35.5-20190412	KIF-PW-TW01-03102021	KIF-PW-TW01-04132021
Parent Sample ID												
Sample Depth		17 ft	18 ft	18 ft	17 ft	22 ft	22 ft	22 ft	22 ft	35.5 ft	31.5 ft	31.5 ft
Sample Type	Units	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Total Metals												
Aluminum	ug/L	1,190 J	43,700 J	-	-	4,170 J	4,290 J	-	-	-	16.5 J	<12.5
Antimony	ug/L	4.25 U*	12.9	-	-	2.1 U*	1.71 U*	-	-	<0.378	<0.378	<0.378
Arsenic	ug/L	676	774	-	-	1,770	1,850	-	-	301	671	602
Barium	ug/L	216	601	-	-	265	265	-	-	39.1	29.4	29.1
Beryllium	ug/L	<0.131	3.45 J	-	-	0.346 J	0.379 J	-	-	<0.155	<0.182	<0.182
Boron	ug/L	1,080	1,580	-	-	11,000	11,500	-	-	3,310	3,100 J	2,900
Cadmium	ug/L	<0.0781	0.87 J	-	-	0.589 J	0.594 J	-	-	0.127 J	<0.217	<0.217
Calcium	ug/L	85,700	68,000	-	-	189,000	189,000	-	-	521,000	588,000	611,000
Chromium	ug/L	2.05 U*	54.9	-	-	4.73 U*	5.21 U*	-	-	2.79 U*	<1.53	<1.53
Cobalt	ug/L	1.39 J	20.7	-	-	2.19	2.22	-	-	3.10	0.957	0.636
Copper	ug/L	3.45 U*	74.8	-	-	8.49	8.89	-	-	1.05 J	<0.627	<0.627
Iron	ug/L	2,370 J	39,300	-	-	5,410	5,770	-	-	73,300	91,900	90,800
Lead	ug/L	1.21 J	44.5	-	-	4.51	4.66	-	-	<0.128	0.159 J	<0.128
Lithium	ug/L	14.5 U*	91.7 J	-	-	159 J	176 J	-	-	528	548	538
Magnesium	ug/L	22,200	22,000	-	-	54,000	54,900	-	-	-	75,600	72,200
Manganese	ug/L	851	789	-	-	322	310	-	-	5,820	5,170	4,710
Mercury	ug/L	<0.0653	0.132 J	-	-	<0.0653	<0.0653	-	-	<0.101	<0.130	<0.130
Molybdenum	ug/L	74.2	70.5	-	-	3,310	3,450	-	-	391	257	243
Nickel	ug/L	2.66 J	41.2	-	-	6.46	6.59	-	-	3.91	2.30	1.82
Potassium	ug/L	7,610	12,800	-	-	19,800	20,300	-	-	-	53,400	51,300
Selenium	ug/L	<1.27	6.67 J	-	-	1.38 J	<1.27	-	-	<2.62	<1.51	<1.51
Silicon	ug/L	-	-	-	-	-	-	-	-	-	10,200	9,960
Silver	ug/L	<0.2	<1	-	-	<0.2	<0.2	-	-	<0.121	<0.177	<0.177
Sodium	ug/L	5,270	5,350	-	-	2,300	2,400	-	-	-	45,700	38,300
Strontium	ug/L	1,950	2,340	-	-	5,120	5,310	-	-	-	-	-
Thallium	ug/L	0.198 J	3.07 J	-	-	0.768 J	0.731 J	-	-	0.491 J	0.327 J	<0.148
Vanadium	ug/L	6.03 J	114	-	-	14.8	16	-	-	1.73 U*	<0.991	<0.991
Zinc	ug/L	5.37	84	-	-	12.1	10.6	-	-	10.3	6.12	5.12
Total Radiological Parameters												
Radium-226	pCi/L	0.211 +/-(0.26)U	1.54 +/-(0.51)	-	-	0.682 +/-(0.43)	0.396 +/-(0.31)U	-	-	0.127 +/-(0.0712)J	0.653 +/-(0.535)U	0.0789 +/-(0.206)U
Radium-228	pCi/L	0.810 +/-(0.46)U*	0.876 +/-(0.75)U	-	-	0.987 +/-(0.71)U	1.80 +/-(0.83)U*	-	-	0.233 +/-(0.241)U	1.17 +/-(0.586)U*	0.240 +/-(0.380)U
Radium-226+228	pCi/L	1.02 +/-(0.53)U*	2.42 +/-(0.91)U*	-	-	1.67 +/-(0.83)U*	2.20 +/-(0.89)U*	-	-	0.359 +/-(0.251)J	1.83 +/-(0.794)U*	0.319 +/-(0.433)U
Total Arsenic Speciation												
Arsenic (V)	ug/L	46.8	129 J	-	-	257	215 J	-	-	-	-	-
Arsenic III	ug/L	657 J	515 J	-	-	1,640	1,670	-	-	-	-	-
Dissolved Metals												
Aluminum	ug/L	-	-	44.2	4,230 J	-	-	36	36.2	-	<12.5	<12.5
Antimony	ug/L	-	-	1.88 U*	4.05	-	-	1.84 U*	1.24 U*	<0.378	<0.378	<0.378
Arsenic	ug/L	-	-	568	598	-	-	1,820	1,770	288	666	585
Barium	ug/L	-	-	88.6	231	-	-	219	213	37.3	30.0	27.7
Beryllium	ug/L	-	-	<0.131	0.391 J	-	-	<0.131	<0.131	<0.155	<0.182	<0.182
Boron	ug/L	-	-	1,360	1,170	-	-	10,000	11,500	3,290	3,070 J	2,840
Cadmium	ug/L	-	-	<0.0781	0.171 J	-	-	0.566 J	0.521 J	<0.125	<0.217	<0.217
Calcium	ug/L	-	-	52,200 J	75,300 J	-	-	185,000 J	184,000 J	517,000	597,000	587,000
Chromium	ug/L	-	-	0.768 U*	5.76 J	-	-	0.85 U*	0.78 U*	2.24 U*	<1.53	<1.53
Cobalt	ug/L	-	-	1.23	2.79 J	-	-	0.658	0.392 J	2.88	0.999	0.673
Copper	ug/L	-	-	<1.04	10.1 J	-	-	<1.04	<1.04	0.905 J	<0.627	<0.627
Iron	ug/L	-	-	4,800 J	3,190 J	-	-	3,370 J	3,180 J	73,300	91,700	89,300
Lead	ug/L	-	-	<0.318	4.6 J	-	-	<0.318	<0.318	<0.128	0.223 J	<0.128
Lithium	ug/L	-	-	12.1 J	19.7 J	-	-	173 J	171 J	555	563	533
Magnesium	ug/L	-	-	16,800	20,200	-	-	55,000	53,300	-	77,700	71,100
Manganese	ug/L	-	-	542	748	-	-	272	259	5,770	5,290	4,580
Mercury	ug/L	-	-	<0.0653	<0.0653	-	-	<0.0653	<0.0653	<0.101	<0.130	<0.130
Molybdenum	ug/L	-	-	60.1	67.5	-	-	3,520	3,450	385	259	235
Nickel	ug/L	-	-	0.402 J	6.1 J	-	-	1.89	1.71	3.96	2.41	1.84
Potassium	ug/L	-	-	5,510	8,200	-	-	20,100	19,400	-	54,100	50,000
Selenium	ug/L	-	-	<1.27	<1.27	-	-	<1.27	<1.27	<2.62	<1.51	<1.51
Silicon	ug/L	-	-	-	-	-	-	-	-	-	10,900	9,820
Silver	ug/L	-	-	<0.2	<0.2	-	-	<0.2	<0.2	<0.121	<0.177	<0.177
Sodium	ug/L	-	-	3,770	5,360	-	-	2,330	2,160	-	47,100	37,700
Strontium	ug/L	-	-	1,550	1,860	-	-	5,270	5,120	-	-	-
Thallium	ug/L	-	-	<0.0531	0.425 J	-	-	0.399 J	0.337 J	0.442 J	0.432 J	<0.148
Vanadium	ug/L	-	-	0.586 U*	16.6 J	-	-	4.45 U*	4.36 U*	1.40 U*	<0.991	<0.991
Zinc	ug/L	-	-	<2.65	9.86	-	-	<2.65	<2.65	9.65	5.46	5.88

See notes on last page.

Table G.1-3 - Pore Water Analytical Results
Kingston Fossil Plant

Sample Location		GP-17-101		GP-17-102		GP-17-103				KIF-TW01		
Sample Date		16-Nov-17	15-Nov-17	15-Nov-17	16-Nov-17	14-Nov-17	14-Nov-17	14-Nov-17	14-Nov-17	12-Apr-19	10-Mar-21	13-Apr-21
Sample ID		KIF-PW-GP17101-17-20171116	KIF-PW-GP17102-18-20171115	KIF-PW-GP17102-FLT-18-2017115	KIF-PW-GP17101-FLT-17-20171116	KIF-PW-GP17103-22-20171114	KIF-PW-DUP01-20171114 KIF-PW-GP17103-22-20171114	KIF-PW-GP17103-FLT-22-20171114	KIF-PW-DUP01-FLT-20171114 KIF-PW-GP17103-FLT-22-20171114	KIF-PW-TW01-35.5-20190412	KIF-PW-TW01-03102021	KIF-PW-TW01-04132021
Parent Sample ID												
Sample Depth		17 ft	18 ft	18 ft	17 ft	22 ft	22 ft	22 ft	22 ft	35.5 ft	31.5 ft	31.5 ft
Sample Type	Units	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Dissolved Radiological Parameters												
Radium-226	pCi/L	-	-	0.277 +/-(0.34)U	0.531 +/-(0.37)J	-	-	0.389 +/-(0.32)U	0.243 +/-(0.33)U	-	-	-
Radium-228	pCi/L	-	-	0.618 +/-(0.64)U	0.774 +/-(0.92)U	-	-	0.911 +/-(0.56)U*	1.15 +/-(0.60)U*	-	-	-
Radium-226+228	pCi/L	-	-	0.895 +/-(0.73)U	1.31 +/-(0.99)U*	-	-	1.30 +/-(0.64)U*	1.39 +/-(0.69)U*	-	-	-
Dissolved Arsenic Speciation												
Arsenic (V)	ug/L	-	-	22.3 J	13.1	-	-	265	281 J	-	-	-
Arsenic III	ug/L	-	-	546	635 J	-	-	1,550	1,530	-	-	-
Gases												
Ethane	ug/L	-	-	-	-	-	-	-	-	-	<0.291	0.399 J
Methane	ug/L	-	-	-	-	-	-	-	-	-	20.2	23.6
Propane	ug/L	-	-	-	-	-	-	-	-	-	<0.380	<0.380
Anions												
Chloride	mg/L	-	-	-	-	-	-	-	-	12.9	17.5	18.3
Fluoride	mg/L	-	-	-	-	-	-	-	-	0.463 J	0.533	0.464
Sulfate	mg/L	-	-	-	-	-	-	-	-	1,420	1,900	1,630
General Chemistry												
Alkalinity, Bicarbonate	mg/L	-	-	-	-	-	-	-	-	-	96.8 J	84.4
Alkalinity, Carbonate	mg/L	-	-	-	-	-	-	-	-	-	5.00 UJ	<5.00
Alkalinity, Total as CaCO3	mg/L	-	-	-	-	-	-	-	-	-	96.8 J	84.4
Ammonia Nitrogren	mg/L	-	-	-	-	-	-	-	-	-	1.16	1.23
Carbon, dissolved organic	mg/L	-	-	-	-	-	-	-	-	-	1.84	1.83
Nitrate-Nitrite	mg/L	-	-	-	-	-	-	-	-	-	<0.0650	1.08
Sulfide	mg/L	-	-	-	-	-	-	-	-	-	<1.34	<1.34
Total Dissolved Solids	mg/L	345	218	-	-	882	880	-	-	2,580	2,490	1,560
Total Suspended Solids	mg/L	31.5	918	-	-	122 J	75.4 J	-	-	-	-	-
Total Organic Carbon	mg/L	2.07	1.65	1.65	1.98	3.81	3.71	2.35	2.89	0.996 J	1.75	1.59
Field Parameters												
Depth to Water	ft	-	-	-	-	-	-	-	-	19.02	19.81	19.38
Dissolved Oxygen	%	-	-	-	-	-	-	-	-	5.4	4.0	4.0
Dissolved Oxygen	mg/L	2.04	0.4	0.4	2.04	0.36	-	0.36	0.36	0.51	0.39	0.38
Ferrous Iron - Field	mg/L	-	-	-	-	-	-	-	-	-	3.0	-
Flow Rate	mL/min	-	-	-	-	-	-	-	-	-	150	150
ORP	MV	-65.8	-168.4	-168.4	-65.8	-65.1	-	-65.1	-65.1	-73.1	-133.9	-138.9
pH (field)	pH units	7.16	7.46	7.46	7.16	6.73	-	6.73	6.73	6.85	6.70	6.74
Specific Cond. (Field)	uS/cm	0.592	0.447	0.447	0.592	1.264	-	1.264	1.264	2,832	2,569	2,831
Temperature, Water (C)	SU	17.73	19.08	19.08	17.73	18.87	-	18.87	18.87	17.5	16.5	15.5
Turbidity, field	NTU	99	616.3	616.3	99	16.6	-	16.6	16.6	9.89	4.07	3.67

See notes on last page.

Table G.1-3 - Pore Water Analytical Results
Kingston Fossil Plant

Sample Location		KIF-TW02			KIF-TW03			KIF-TW04				
Sample Date		9-Apr-19	8-Mar-21	13-Apr-21	9-Apr-19	10-Mar-21	13-Apr-21	11-Apr-19	9-Mar-21	9-Mar-21	15-Apr-21	15-Apr-21
Sample ID		KIF-PW-TW02-38-20190409	KIF-PW-TW02-03082021	KIF-PW-TW02-04132021	KIF-PW-TW03-42-20190409	KIF-PW-TW03-03102021	KIF-PW-TW03-04132021	KIF-PW-TW04-35.9-20190411	KIF-PW-TW04-03092021	KIF-PW-FD-03092021	KIF-PW-TW04-04152021	KIF-PW-FD-04152021
Parent Sample ID										KIF-PW-TW04-03092021		KIF-PW-TW04-04152021
Sample Depth		38 ft	35 ft	35 ft	42 ft	38.5 ft	38.5 ft	35.9 ft	31 ft	31 ft	31 ft	31 ft
Sample Type	Units	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Field Duplicate Sample
Total Metals												
Aluminum	ug/L	-	12.8 U*	13.4 J	-	<12.5	<12.5	-	210	200	765	766
Antimony	ug/L	<0.378	<0.378	<0.378	<0.378	<0.378	<0.378	0.707 J	<0.378	<0.378	<0.378	<0.378
Arsenic	ug/L	229	274	316	382	421	407	79.4	58.4	56.2	60.7	60.6
Barium	ug/L	76.2	37.8	31.9	36.2	25.3	24.6	242	177	178	144	145
Beryllium	ug/L	<0.155	<0.182	0.311 J	<0.155	<0.182	<0.182	<0.155	<0.182	<0.182	<0.182	<0.182
Boron	ug/L	797	819	873	3,830	3,830 J	3,680	2,160	2,130	2,040	3,450	3,540
Cadmium	ug/L	<0.125	0.957 J	<0.217	<0.125	<0.217	<0.217	<0.125	<0.217	<0.217	<0.217	<0.217
Calcium	ug/L	174,000	195,000	218,000	354,000	442,000	459,000	136,000	160,000	156,000	132,000	133,000
Chromium	ug/L	4.74 U*	<1.53	<1.53	4.13 U*	<1.53	<1.53	1.96 U*	<1.53	<1.53	<1.53	<1.53
Cobalt	ug/L	0.673	0.144 J	0.153 J	0.393 J	<0.134	<0.134	0.257 J	<0.134	<0.134	<0.134	<0.134
Copper	ug/L	1.60 J	<0.627	<0.627	0.758 J	<0.627	<0.627	0.667 J	<0.627	<0.627	<0.627	<0.627
Iron	ug/L	36,700	38,400	41,500	43,500	52,200	53,400	608	1,250	1,320	218	220
Lead	ug/L	0.671 J	<0.128	<0.128	<0.128	<0.128	<0.128	<0.128	<0.128	<0.128	<0.128	<0.128
Lithium	ug/L	192	166	184	287	322	316	47.8	91.9	92.2	37.6	37.9
Magnesium	ug/L	-	22,500	21,500	-	57,100	57,900	-	24,500	24,400	16,500	16,400
Manganese	ug/L	1,750	2,200	1,750	3,040	3,770	3,700	151	326	333	127	128
Mercury	ug/L	<0.101	<0.130	<0.130	<0.101	<0.130	<0.130	<0.101	<0.130	<0.130	<0.130	<0.130
Molybdenum	ug/L	120	109	113	450	440	469	193	212	203	396	394
Nickel	ug/L	2.42	0.879 J	0.360 J	0.998 J	0.469 J	0.356 J	0.866 J	<0.336	<0.336	0.818 J	0.830 J
Potassium	ug/L	-	14,000	15,600	-	31,900	31,500	-	10,900	10,700	11,300	11,400
Selenium	ug/L	<2.62	<1.51	<1.51	<2.62	<1.51	<1.51	<2.62	<1.51	<1.51	<1.51	<1.51
Silicon	ug/L	-	10,100	10,200	-	10,200	9,680	-	3,390	3,340	1,750	1,770
Silver	ug/L	<0.121	<0.177	<0.177	<0.121	<0.177	<0.177	<0.121	<0.177	<0.177	<0.177	<0.177
Sodium	ug/L	-	11,400 J	11,300	-	17,300	17,100	-	14,100 J	13,800 J	15,800	15,800
Strontium	ug/L	-	-	-	-	-	-	-	-	-	-	-
Thallium	ug/L	0.149 J	0.342 U*	0.395 J	<0.128	<0.148	<0.148	<0.128	0.156 U*	<0.148	<0.148	<0.148
Vanadium	ug/L	3.90 U*	<0.991	<0.991	2.59 U*	<0.991	<0.991	13.4 U*	1.95	1.86	1.67	1.59
Zinc	ug/L	5.41	18.7 J	3.93 J	6.51	4.87 J	3.70 J	<3.22	3.22 UJ	18.1 J	<3.22	<3.22
Total Radiological Parameters												
Radium-226	pCi/L	0.140 +/-(0.0726)	-0.0126 +/-(0.289)U	0.166 +/-(0.321)U	0.0112 +/-(0.0563)U	0.310 +/-(0.510)U	0.308 +/-(0.392)U	0.126 +/-(0.0735)J	0.241 +/-(0.357)U	0.278 +/-(0.425)U	0.419 +/-(0.519)U	0.134 +/-(0.440)U
Radium-228	pCi/L	0.480 +/-(0.281)U*	0.617 +/-(0.549)U	0.446 +/-(0.523)U	0.223 +/-(0.297)U	0.546 +/-(0.453)U	0.515 +/-(0.334)	0.131 +/-(0.241)U	1.33 +/-(0.693)U*	0.492 +/-(0.586)U	0.00371 +/-(0.336)U	0.275 +/-(0.249)U
Radium-226+228	pCi/L	0.620 +/-(0.290)J	0.617 +/-(0.620)U	0.612 +/-(0.614)U	0.234 +/-(0.302)U	0.856 +/-(0.682)U	0.824 +/-(0.515)J	0.257 +/-(0.252)J	1.57 +/-(0.779)U*	0.771 +/-(0.724)U	0.422 +/-(0.619)U	0.409 +/-(0.505)U
Total Arsenic Speciation												
Arsenic (V)	ug/L	-	-	-	-	-	-	-	-	-	-	-
Arsenic III	ug/L	-	-	-	-	-	-	-	-	-	-	-
Dissolved Metals												
Aluminum	ug/L	-	<12.5	<12.5	-	<12.5	<12.5	-	152	170	702	709
Antimony	ug/L	<0.378	<0.378	<0.378	<0.378	<0.378	<0.378	0.681 J	<0.378	<0.378	<0.378	<0.378
Arsenic	ug/L	180	86.5	311	372	430	411	78.4	41.7	41.2	55.2	54.9
Barium	ug/L	60.5	34.8	31.3	34.4	26.0	24.8	240	176	179	143	145
Beryllium	ug/L	<0.155	0.305 U*	<0.182	<0.155	<0.182	<0.182	<0.155	<0.182	<0.182	<0.182	<0.182
Boron	ug/L	762	765	829	3,550	3,970 J	3,620	2,080	2,080	2,160	3,790	3,710
Cadmium	ug/L	<0.125	1.64	<0.217	<0.125	<0.217	<0.217	<0.125	<0.217	<0.217	<0.217	<0.217
Calcium	ug/L	163,000	168,000	219,000	350,000	439,000	438,000	134,000	156,000	159,000	144,000	144,000
Chromium	ug/L	3.13 U*	<1.53	<1.53	3.53 U*	<1.53	<1.53	<1.53	<1.53	<1.53	<1.53	<1.53
Cobalt	ug/L	0.436 J	0.177 J	<0.134	0.369 J	<0.134	<0.134	0.243 J	<0.134	<0.134	<0.134	<0.134
Copper	ug/L	<0.627	<0.627	<0.627	<0.627	<0.627	<0.627	<0.627	<0.627	<0.627	<0.627	0.795 U*
Iron	ug/L	31,900	18,900	41,800	42,800	53,000	52,400	188	973	815	65.6	67.9
Lead	ug/L	<0.128	<0.128	<0.128	<0.128	<0.128	<0.128	<0.128	<0.128	<0.128	<0.128	<0.128
Lithium	ug/L	181	149	172	280	329	328	48.6	91.1	90.2	38.3	36.4
Magnesium	ug/L	-	20,300	21,600	-	57,100	55,700	-	24,000	24,300	16,100	16,000
Manganese	ug/L	1,680	1,690	1,770	2,970	3,820	3,580	155	327	313	122	120
Mercury	ug/L	<0.101	<0.130	<0.130	<0.101	<0.130	<0.130	<0.101	<0.130	<0.130	<0.130	<0.130
Molybdenum	ug/L	115	81.7	113	443	445	448	195	207	216	402	402
Nickel	ug/L	1.68 U*	1.06	<0.336	0.809 U*	0.494 J	0.359 J	0.912 U*	<0.336	<0.336	0.794 J	0.783 J
Potassium	ug/L	-	12,500	15,600	-	32,400	30,200	-	10,700	10,800	11,300	11,300
Selenium	ug/L	<2.62	<1.51	<1.51	<2.62	<1.51	<1.51	<2.62	<1.51	<1.51	<1.51	<1.51
Silicon	ug/L	-	8,200	10,600	-	10,200	9,470	-	3,350	3,430	1,750	1,810
Silver	ug/L	<0.121	<0.177	<0.177	<0.121	<0.177	<0.177	<0.121	<0.177	<0.177	<0.177	<0.177
Sodium	ug/L	-	10,500 J	11,500	-	17,500	16,400	-	13,600 J	14,200 J	16,100	15,700
Strontium	ug/L	-	-	-	-	-	-	-	-	-	-	-
Thallium	ug/L	<0.128	0.498 U*	<0.148	<0.128	<0.148	<0.148	<0.128	<0.148	<0.148	<0.148	<0.148
Vanadium	ug/L	1.87 U*	<0.991	<0.991	2.12 U*	<0.991	<0.991	11.3	1.68	1.83	1.50	1.46
Zinc	ug/L	4.41 J	44.4 J	3.67 J	5.97	4.83 J	3.57 J	<3.22	<3.22	<3.22	<3.22	<3.22

See notes on last page.

Table G.1-3 - Pore Water Analytical Results
Kingston Fossil Plant

Sample Location		KIF-TW02			KIF-TW03			KIF-TW04				
Sample Date		9-Apr-19	8-Mar-21	13-Apr-21	9-Apr-19	10-Mar-21	13-Apr-21	11-Apr-19	9-Mar-21	9-Mar-21	15-Apr-21	15-Apr-21
Sample ID		KIF-PW-TW02-38-20190409	KIF-PW-TW02-03082021	KIF-PW-TW02-04132021	KIF-PW-TW03-42-20190409	KIF-PW-TW03-03102021	KIF-PW-TW03-04132021	KIF-PW-TW04-35.9-20190411	KIF-PW-TW04-03092021	KIF-PW-FD-03092021	KIF-PW-TW04-04152021	KIF-PW-FD-04152021
Parent Sample ID										KIF-PW-TW04-03092021		KIF-PW-TW04-04152021
Sample Depth		38 ft	35 ft	35 ft	42 ft	38.5 ft	38.5 ft	35.9 ft	31 ft	31 ft	31 ft	31 ft
Sample Type	Units	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Field Duplicate Sample
Dissolved Radiological Parameters												
Radium-226	pCi/L	-	-	-	-	-	-	-	-	-	-	-
Radium-228	pCi/L	-	-	-	-	-	-	-	-	-	-	-
Radium-226+228	pCi/L	-	-	-	-	-	-	-	-	-	-	-
Dissolved Arsenic Speciation												
Arsenic (V)	ug/L	-	-	-	-	-	-	-	-	-	-	-
Arsenic III	ug/L	-	-	-	-	-	-	-	-	-	-	-
Gases												
Ethane	ug/L	-	<0.291	<0.291	-	<0.291	<0.291	-	0.514 J	0.468 J	0.768 J	0.795 J
Methane	ug/L	-	11.8	13.5	-	101	117	-	50.7	49.6	68.3	70.8
Propane	ug/L	-	<0.380	<0.380	-	<0.380	<0.380	-	<0.380	<0.380	<0.380	<0.380
Anions												
Chloride	mg/L	34.2	19.6	18.6	9.40	13.7	14.3	12.2	15.8	16.1	7.45	7.36
Fluoride	mg/L	0.268	0.195	0.174	0.322	0.220	0.219 J	0.192	0.206	0.191	0.229	0.230
Sulfate	mg/L	376	420	415	866	1,110	1,100	300	363	337	314	315
General Chemistry												
Alkalinity, Bicarbonate	mg/L	-	178	181	-	140 J	157	-	149	149	105	103
Alkalinity, Carbonate	mg/L	-	<5.00	<5.00	-	5.00 UJ	<5.00	-	<5.00	<5.00	<5.00	<5.00
Alkalinity, Total as CaCO3	mg/L	-	178	181	-	140 J	157	-	149	149	105	103
Ammonia Nitrogren	mg/L	-	0.385	0.354	-	0.933	0.927	-	0.724	0.725	1.51	1.51
Carbon, dissolved organic	mg/L	-	<0.508	0.414 J	-	0.540 J	0.675 J	-	0.704 J	0.630 J	1.35	1.45
Nitrate-Nitrite	mg/L	-	<0.0650	<0.650	-	<0.0650	<0.0650	-	0.364 J	0.361 J	0.172 J	0.148 J
Sulfide	mg/L	-	<1.34	<1.34	-	<1.34	<1.34	-	<1.34	1.39 J	<1.34	<1.34
Total Dissolved Solids	mg/L	850	907	893	1,680	1,900	1,860	659	710	703	596	580
Total Suspended Solids	mg/L	-	-	-	-	-	-	-	-	-	-	-
Total Organic Carbon	mg/L	2.12	<0.508	0.411 J	0.916 J	0.640 J	0.600 J	4.29	0.661 J	0.609 J	1.27	1.22
Field Parameters												
Depth to Water	ft	18.55	19.21	18.76	23.27	24.11	23.65	14.35	14.88	-	14.46	-
Dissolved Oxygen	%	71.6	51.5	2.1	16.2	3.0	2.6	4.6	3.0	-	4.4	-
Dissolved Oxygen	mg/L	6.84	5.04	0.21	1.58	0.28	0.25	0.43	0.28	-	0.42	-
Ferrous Iron - Field	mg/L	-	3.0	1.5	-	3.0	-	-	1.0	-	-	-
Flow Rate	mL/min	-	150	150	-	350	350	-	200	-	200	-
ORP	MV	-33.0	125.5	-102.9	-71.8	-119.6	-112.8	-38.9	-145.8	-	64.4	-
pH (field)	pH units	6.84	6.76	6.56	6.93	6.62	6.67	8.86	7.64	-	8.33	-
Specific Cond. (Field)	uS/cm	1,119	757	1,152	1,964	1,952	1,979	892	928	-	781	-
Temperature, Water (C)	SU	18.8	17.0	16.9	17.4	17.1	16.9	19.6	18.2	-	17.7	-
Turbidity, field	NTU	36.1	4.32	4.07	3.24	1.87	1.17	3.31	4.11	-	3.60	-

See notes on last page.

Table G.1-3 - Pore Water Analytical Results
Kingston Fossil Plant

Sample Location		KIF-TW05				VB-1		VB-2		VB-3	
Sample Date		10-Apr-19	10-Apr-19	11-Mar-21	14-Apr-21	9-Mar-21	15-Apr-21	9-Mar-21	14-Apr-21	9-Mar-21	14-Apr-21
Sample ID		KIF-PW-TW05-36.5-20190410	KIF-PW-DUP01-20190410	KIF-PW-TW05-03112021	KIF-PW-TW05-04142021	KIF-PW-VB1-03092021	KIF-PW-VB1-04152021	KIF-PW-VB2-03092021	KIF-PW-VB2-04142021	KIF-PW-VB3-03092021	KIF-PW-VB3-04142021
Parent Sample ID			KIF-PW-TW05-36.5-20190410								
Sample Depth		36.5 ft	36.5 ft	31.5 ft	31.5 ft	21.8 ft	21.8 ft	22.3 ft	22.3 ft	27.3 ft	27.3 ft
Sample Type	Units	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Total Metals											
Aluminum	ug/L	-	-	43.5	<12.5	63.3 U*	62.5	50.1 U*	43.6	77.5 U*	38.7
Antimony	ug/L	<0.378	<0.378	<0.378	0.865 J	<0.378	<0.378	<0.378	<0.378	<0.378	<0.378
Arsenic	ug/L	365	371	331	3.41 U*	3,610	3,550	4,540	4,800	1,260	1,180
Barium	ug/L	32.0	31.1	27.7	18.9	159	144	147	151	154	141
Beryllium	ug/L	<0.155	<0.155	<0.182	<0.182	<0.182	<0.182	<0.182	<0.182	<0.182	<0.182
Boron	ug/L	2,600	2,560	2,680	1,400	1,620	1,490	1,190	1,240	1,720	1,550
Cadmium	ug/L	<0.125	<0.125	<0.217	<0.217	<0.217	<0.217	<0.217	<0.217	<0.217	<0.217
Calcium	ug/L	288,000	294,000	268,000	161,000	72,900	72,500 J	75,600	87,600	97,100	128,000
Chromium	ug/L	3.72 U*	3.14 U*	<1.53	<1.53	1.53 UJ	<1.53	<1.53	<1.53	<1.53	<1.53
Cobalt	ug/L	0.350 J	0.349 J	0.264 J	<0.134	0.178 J	0.234 J	0.136 J	<0.134	0.162 J	0.155 J
Copper	ug/L	<0.627	0.660 J	<0.627	0.653 J	<0.627	0.700 J	<0.627	<0.627	<0.627	<0.627
Iron	ug/L	108,000	110,000	58,900	99.9 U*	60.1 U*	66.0	<19.5	<19.5	111 U*	26.3 U*
Lead	ug/L	0.135 J	0.138 J	<0.128	<0.128	<0.128	<0.128	<0.128	<0.128	<0.128	<0.128
Lithium	ug/L	308	313	242	141	126	121	194	213	161	152
Magnesium	ug/L	-	-	51,400	26,300	12,600	13,300	14,500	14,300	19,100	22,200
Manganese	ug/L	2,410	2,430	1,900	15.1	95.4	106	119	147	128	92.7
Mercury	ug/L	<0.101	<0.101	<0.130	<0.130	<0.130	<0.130	<0.130	<0.130	<0.130	<0.130
Molybdenum	ug/L	195	199	192	40.2	311	294	295	305	577	569
Nickel	ug/L	1.94	1.94	1.85	0.605 J	0.581 J	0.916 J	1.24	1.51	1.72	2.35
Potassium	ug/L	-	-	22,700	13,200	8,850	9,450	10,400	11,100	11,400	11,700
Selenium	ug/L	<2.62	<2.62	<1.51	<1.51	<1.51	<1.51	<1.51	<1.51	<1.51	1.97 J
Silicon	ug/L	-	-	13,700	6,200	2,880	3,050	3,240	3,280	3,270	3,650
Silver	ug/L	<0.121	<0.121	<0.177	<0.177	<0.177	<0.177	<0.177	<0.177	<0.177	<0.177
Sodium	ug/L	-	-	11,500	26,000	5,930 J	5,980	48,700 J	51,800	14,300 J	24,900
Strontium	ug/L	-	-	-	-	-	-	-	-	-	-
Thallium	ug/L	<0.128	<0.128	<0.148	<0.148	<0.148	<0.148	0.168 U*	<0.148	0.235 U*	0.370 J
Vanadium	ug/L	2.37 U*	1.88 U*	<0.991	<0.991	<0.991	4.88	1.31	<0.991	<0.991	3.17
Zinc	ug/L	45.3	46.3	26.6	14.4	<3.22	<3.22	<3.22	<3.22	<3.22	<3.22
Total Radiological Parameters											
Radium-226	pCi/L	0.0971 +/-(0.0577)	0.140 +/-(0.0713)	0.00215 +/-(0.296)U	0.397 +/-(0.383)U	0.406 +/-(0.433)U	0.741 +/-(0.660)U	0.733 +/-(0.587)U	0.331 +/-(0.392)U	0.566 +/-(0.426)	0.256 +/-(0.434)U
Radium-228	pCi/L	0.447 +/-(0.236)U*	0.413 +/-(0.242)U*	0.969 +/-(0.627)U*	-0.574 +/-(0.381)U	0.621 +/-(0.484)U	0.576 +/-(0.346)	0.702 +/-(0.421)U*	0.446 +/-(0.402)U	0.753 +/-(0.537)U	-0.604 +/-(0.463)U
Radium-226+228	pCi/L	0.544 +/-(0.243)J	0.554 +/-(0.252)J	0.971 +/-(0.693)U*	0.397 +/-(0.540)U	1.03 +/-(0.649)U	1.32 +/-(0.745)J	1.44 +/-(0.722)U*	0.777 +/-(0.561)U	1.32 +/-(0.685)J	0.256 +/-(0.635)U
Total Arsenic Speciation											
Arsenic (V)	ug/L	-	-	-	-	-	-	-	-	-	-
Arsenic III	ug/L	-	-	-	-	-	-	-	-	-	-
Dissolved Metals											
Aluminum	ug/L	-	-	19.9 J	<12.5	67.9	57.0	41.4 U*	45.2	38.0 U*	25.8 J
Antimony	ug/L	<0.378	<0.378	<0.378	0.764 J	0.427 J	<0.378	<0.378	<0.378	<0.378	<0.378
Arsenic	ug/L	349	347	314	2.38 U*	3,470	3,580	4,730	4,870	1,280	1,110
Barium	ug/L	31.1	29.5	27.5	18.3	155	149	145	151	154	137
Beryllium	ug/L	<0.155	<0.155	<0.182	<0.182	0.197 J	<0.182	<0.182	<0.182	<0.182	<0.182
Boron	ug/L	2,610	2,550	2,480	1,380	1,600	1,610	1,190	1,230	1,790	1,670
Cadmium	ug/L	<0.125	<0.125	<0.217	<0.217	<0.217	<0.217	<0.217	<0.217	<0.217	<0.217
Calcium	ug/L	298,000	288,000	264,000	161,000	72,400	83,800 J	75,700	88,000	103,000	121,000
Chromium	ug/L	2.96 U*	3.42 U*	<1.53	<1.53	7.04 J	<1.53	<1.53	<1.53	<1.53	<1.53
Cobalt	ug/L	0.313 J	0.318 J	0.287 J	<0.134	0.286 J	0.233 J	0.151 J	0.152 J	<0.134	0.161 J
Copper	ug/L	<0.627	<0.627	<0.627	2.33 U*	<0.627	<0.627	<0.627	<0.627	<0.627	<0.627
Iron	ug/L	107,000	107,000	59,100	<19.5	100	55.5	<19.5	<19.5	27.3 U*	<19.5
Lead	ug/L	<0.128	<0.128	<0.128	<0.128	0.293 J	<0.128	<0.128	<0.128	<0.128	<0.128
Lithium	ug/L	317	314	238	137	118	127	195	206	164	156
Magnesium	ug/L	-	-	50,400	26,700	12,200	13,300	14,600	14,400	20,100	21,500
Manganese	ug/L	2,430	2,340	1,860	10.0	98.1	105	122	146	92.8	93.7
Mercury	ug/L	<0.101	<0.101	<0.130	<0.130	<0.130	<0.130	<0.130	<0.130	<0.130	<0.130
Molybdenum	ug/L	196	197	182	40.6	303	305	300	310	619	553
Nickel	ug/L	1.90	1.86	1.91	0.609 J	1.16	1.00	1.24	1.60	2.09	2.24
Potassium	ug/L	-	-	22,400	13,300	9,120	9,450	10,200	11,300	11,600	11,400
Selenium	ug/L	<2.62	<2.62	<1.51	<1.51	<1.51	<1.51	<1.51	<1.51	<1.51	1.81 J
Silicon	ug/L	-	-	13,800	6,190	2,910	3,200	3,270	3,310	3,310	3,680
Silver	ug/L	<0.121	<0.121	<0.177	<0.177	<0.177	<0.177	<0.177	<0.177	<0.177	<0.177
Sodium	ug/L	-	-	11,300	26,500	5,790	6,510	51,900 J	51,400	15,600 J	23,900
Strontium	ug/L	-	-	-	-	-	-	-	-	-	-
Thallium	ug/L	<0.128	<0.128	<0.148	<0.148	0.441 J	0.189 J	0.169 U*	<0.148	0.222 U*	0.313 J
Vanadium	ug/L	1.64 U*	1.75 U*	<0.991	<0.991	1.57	4.40	1.46	<0.991	1.24	3.38
Zinc	ug/L	44.7	50.2	25.4	15.7	<3.22	<3.22	<3.22	<3.22	<3.22	<3.22

See notes on last page.

Table G.1-3 - Pore Water Analytical Results
Kingston Fossil Plant

Sample Location		KIF-TW05				VB-1		VB-2		VB-3	
Sample Date		10-Apr-19	10-Apr-19	11-Mar-21	14-Apr-21	9-Mar-21	15-Apr-21	9-Mar-21	14-Apr-21	9-Mar-21	14-Apr-21
Sample ID		KIF-PW-TW05-36.5-20190410	KIF-PW-DUP01-20190410	KIF-PW-TW05-03112021	KIF-PW-TW05-04142021	KIF-PW-VB1-03092021	KIF-PW-VB1-04152021	KIF-PW-VB2-03092021	KIF-PW-VB2-04142021	KIF-PW-VB3-03092021	KIF-PW-VB3-04142021
Parent Sample ID			KIF-PW-TW05-36.5-20190410								
Sample Depth		36.5 ft	36.5 ft	31.5 ft	31.5 ft	21.8 ft	21.8 ft	22.3 ft	22.3 ft	27.3 ft	27.3 ft
Sample Type	Units	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Dissolved Radiological Parameters											
Radium-226	pCi/L	-	-	-	-	-	-	-	-	-	-
Radium-228	pCi/L	-	-	-	-	-	-	-	-	-	-
Radium-226+228	pCi/L	-	-	-	-	-	-	-	-	-	-
Dissolved Arsenic Speciation											
Arsenic (V)	ug/L	-	-	-	-	-	-	-	-	-	-
Arsenic III	ug/L	-	-	-	-	-	-	-	-	-	-
Gases											
Ethane	ug/L	-	-	<0.291	<0.291	<0.291	<0.291	<0.291	<0.291	<0.291	<0.291
Methane	ug/L	-	-	23.7	<0.174	462	499	344	119	243	168
Propane	ug/L	-	-	<0.380	<0.380	<0.380	<0.380	<0.380	<0.380	<0.380	<0.380
Anions											
Chloride	mg/L	6.99	6.73	9.60	12.1	7.67	7.64	9.20	9.40	8.09	9.91
Fluoride	mg/L	0.325	0.324	0.375	0.413	1.47	1.46	2.00	2.16	2.06	2.00
Sulfate	mg/L	902	839	847	505	10.2	8.95	22.0	20.0	37.0	74.5
General Chemistry											
Alkalinity, Bicarbonate	mg/L	-	-	61.0 J	104	221	224	315	306	314	293
Alkalinity, Carbonate	mg/L	-	-	5.00 UJ	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00
Alkalinity, Total as CaCO3	mg/L	-	-	61.0 J	104	221	224	315	309	314	293
Ammonia Nitrogren	mg/L	-	-	0.914	0.105	2.00	2.19	1.58	0.727	1.04	0.826
Carbon, dissolved organic	mg/L	-	-	0.521 J	1.04	1.26	1.65	4.18	5.21	1.55	1.85
Nitrate-Nitrite	mg/L	-	-	<0.0650	<0.0650	0.325 J	<0.0650	0.503 J	<0.0650	0.0750 J	0.116
Sulfide	mg/L	-	-	<1.34	<1.34	<1.34	<1.34	<1.34	<1.34	<1.34	<1.34
Total Dissolved Solids	mg/L	1,670	1,670	1,360	908	259	248	385	391	384	454
Total Suspended Solids	mg/L	-	-	-	-	-	-	-	-	-	-
Total Organic Carbon	mg/L	1.19	1.23	<0.508	0.985 J	1.31	1.42	4.41	5.14	1.53	1.90
Field Parameters											
Depth to Water	ft	20.11	-	21.06	20.41	-	-	17.65	16.01	22.27	22.15
Dissolved Oxygen	%	5.2	-	4.3	62.1	8.8	4.7	4.3	5.4	23.9	9.0
Dissolved Oxygen	mg/L	0.47	-	0.42	5.73	0.81	0.44	0.41	0.54	2.39	0.88
Ferrous Iron - Field	mg/L	-	-	3.0	1.0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Flow Rate	mL/min	-	-	100	100	100	100	100	100	100	100
ORP	MV	-54.9	-	-81.2	106.5	37.1	-62.8	-10.3	83.4	42.0	72.1
pH (field)	pH units	6.53	-	6.30	6.74	7.91	8.05	7.83	7.49	7.44	7.00
Specific Cond. (Field)	uS/cm	1,979	-	1,546	956	449.5	448.6	622.0	635	685	782
Temperature, Water (C)	SU	19.9	-	17.0	18.6	18.8	16.6	14.8	17.5	15.5	17.3
Turbidity, field	NTU	16.7	-	4.67	1.74	0.77	0.83	0.88	0.69	2.84	1.55

Notes:

Please note that units have been converted automatically in this table, and significant figures may not have been maintained.

15.2	measured concentration did not exceed the indicated standard
<0.03	analyte was not detected at a concentration greater than the Method Detection Limit
-	Parameter not analyzed / not available.
%	percent
DEG C	Degrees Celsius
ft	feet
ID	Identification
J	quantitation is approximate due to limitations identified during data validation
mg/L	milligrams per Liter
mL/min	milliliters per minute
MV	millivolts
NTU	Nephelometric Turbidity Unit
pCi/L	picocuries per Liter
SU	Standard Units
U*	result should be considered “not detected” because it was detected in an associated field or laboratory blank at a similar level
ug/L	micrograms per Liter
UJ	This compound was not detected, but the reporting or detection limit should be considered estimated due to a bias identified during data validation.
uS/cm	microSiemens per centimeter

Table G.1-4 - CCR Material Analytical Results for the Stilling Pond
Kingston Fossil Plant
November 2017

Sample Location		GP-17-101	GP-17-102		GP-17-103
Sample Date		9-Nov-17	8-Nov-17	8-Nov-17	6-Nov-17
Sample ID		KIF-CCR-GP17101-17.0/22.0-20171109	KIF-CCR-DUP01-20171108	KIF-CCR-GP17102-16.8/21.8-20171108	KIF-CCR-GP17103-18.6/23.6-20171106
Parent Sample ID			KIF-CCR-GP17102-16.8/21.8-20171108		
Sample Depth		17.0 - 22.0 ft	16.8 - 21.8 ft	16.8 - 21.8 ft	18.6 - 23.6 ft
Sample Type		Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	Recovery Project	Recovery Project	Recovery Project	Recovery Project
Metals - SPLP					
Antimony	ug/L	4.56	12.2	12.6	5.34
Arsenic	ug/L	93.9 J	101 J	90.4 J	190 J
Barium	ug/L	160	305	327	181
Beryllium	ug/L	<0.131	<0.131	<0.131	<0.131
Boron	ug/L	360	448	466	598
Cadmium	ug/L	<0.0781	0.0900 J	0.0890 J	0.0860 J
Calcium	ug/L	10,800	19,900	21,700	8,000
Chromium	ug/L	1.17 U*	2.59 U*	2.46 U*	2.90 U*
Cobalt	ug/L	0.116 J	0.608	0.513	0.223 J
Copper	ug/L	<1.04	2.29	2.69	2.61
Iron	ug/L	107	531	606	382
Lead	ug/L	<0.318	0.754 J	1.17	0.964 J
Lithium	ug/L	5.60	5.72	4.95 J	7.70
Manganese	ug/L	7.45	21.1	20.2	4.62 J
Mercury	ug/L	<0.0653	<0.0653	<0.0653	0.0653 UJ
Molybdenum	ug/L	25.3	92.9	88.0	69.3
Nickel	ug/L	0.643 J	2.31	2.35	0.941 J
Selenium	ug/L	13.0 J	20.0 J	18.9 J	32.2 J
Silver	ug/L	<0.200	<0.200	<0.200	<0.200
Thallium	ug/L	<0.0531	0.0740 J	<0.0531	0.0900 J
Vanadium	ug/L	48.0	65.4	63.0	96.3
Zinc	ug/L	49.6	127	137	73.0
Total Metals					
Antimony	mg/kg	0.432	1.06	0.924	0.926
Arsenic	mg/kg	32.6	87.3	68.1	80.8
Barium	mg/kg	137 J	277 J	225 J	193 J
Beryllium	mg/kg	1.28 J	3.15 J	2.44 J	1.84 J
Boron	mg/kg	28.3 J	39.9 J	31.0 J	58.7 J
Cadmium	mg/kg	0.246	0.758	0.571	0.423
Calcium	mg/kg	2,250	9,120	6,400	2,610
Chromium	mg/kg	13.5 J	24.7 J	19.8 J	20.3 J
Cobalt	mg/kg	4.42	10.0	7.97	5.90
Copper	mg/kg	19.3 J	43.1 J	36.9 J	28.4 J
Iron	mg/kg	10,400 J	14,000 J	11,500 J	14,000 J
Lead	mg/kg	11.6	20.6	17.6	19.9
Lithium	mg/kg	15.4 J	26.4 J	19.7 J	25.2 J
Manganese	mg/kg	51.4 J	143 J	153 J	39.9 J
Mercury	mg/kg	0.0584	0.0905	0.101	0.0451
Molybdenum	mg/kg	1.88	6.80	6.26	16.0
Nickel	mg/kg	11.1 J	23.2 J	18.3 J	15.2 J
Selenium	mg/kg	1.91 J	4.97 J	4.21 J	3.98 J
Silver	mg/kg	0.0447 J	0.0816 J	0.0663 J	0.0662 J
Thallium	mg/kg	1.05	1.37	1.16	1.51
Vanadium	mg/kg	25.1 J	57.5 J	46.1 J	40.0 J
Zinc	mg/kg	18.1 J	42.6 J	37.0 J	26.9 J
Radiological Parameters - SPLP					
Radium-226	pCi/L	+/-(0.46)U	+/-(0.44)U	+/-(0.32)U	+/-(0.32)U
Radium-228	pCi/L	0.532 +/-(0.31)U*	+/-(0.19)UJ	1.18 +/-(0.43)U*	0.659 +/-(0.35)U*
Radium-226+228	pCi/L	+/-(0.55)U*	+/-(0.48)UJ	+/-(0.54)U*	+/-(0.48)U*
Radiological Parameters					
Radium-226	pCi/g	4.21 +/-(0.30)	3.94 +/-(0.31)	4.00 +/-(0.32)	4.88 +/-(0.35)
Radium-228	pCi/g	2.78 +/-(0.23)	2.57 +/-(0.22)	2.57 +/-(0.23)	2.90 +/-(0.24)
Radium-226+228	pCi/g	6.99 +/-(0.38)U	6.51 +/-(0.38)U	6.57 +/-(0.39)U	7.79 +/-(0.43)U
Anions - SPLP					
Chloride	mg/L	0.846 J	0.866 J	0.779 J	0.755 J
Fluoride	mg/L	0.330 U*	0.293 U*	0.280 U*	0.601
Sulfate	mg/L	6.65 U*	17.8	17.8	9.63 U*
Anions					
Chloride	mg/kg	4.36 J	5.92 J	<3.79	<3.86
Fluoride	mg/kg	1.15	4.61	3.03	6.13
Sulfate	mg/kg	31.9	44.0 J	69.8 J	93.8
General Chemistry					
pH (lab)	SU	7.8	8.0	7.9	8.0
Total Organic Carbon	mg/kg	19,700	20,900 J	19,800	17,900

Notes:

<0.03	analyte was not detected at a concentration greater than the Method Detection Limit
ft	feet below ground surface
ID	Identification
J	quantitation is approximate due to limitations identified during data validation
mg/kg	milligrams per kilogram
mg/L	milligrams per Liter
pCi/g	picocuries per gram
pCi/L	picocuries per Liter
SPLP	Synthetic Precipitation Leaching Procedure
SU	Standard Units
U	not detected
U*	result should be considered "not detected" because it was detected in an associated field or laboratory blank at a similar level
ug/L	micrograms per Liter
UJ	this compound was not detected, but the reporting or detection limit should be considered estimated due to a bias identified during data validation.

1. Units have been converted automatically in this table; therefore, significant figures may not have been maintained.

2. Analytical results were obtained from the Stantec report *Ash & Porewater Sampling Stilling Pond, Kingston Fossil Plant, Harriman, Roane County, Tennessee* , dated March 7, 2018.

Table G.1-5 – Pore Water Level Measurements, Groundwater Sampling Event #3 (August 19, 2019)
Kingston Fossil Plant

Well / Piezometer ID	Date Measured	Depth to Pore Water	Top of Casing Elevation	Pore Water Elevation	Piezometer Ground Surface Elevation	Piezometer Sensor Elevation	Piezometer Sensor Depth	Screened Interval	Screened / Piezometer Sensor Formation
		ft btoc	ft msl	ft msl	ft msl	ft msl	ft bgs	ft bgs	
Temporary Wells									
KIF-TW01	19-Aug-19	19.74	775.36	755.62	n/a	n/a	n/a	26.5-36.5	CCR Material
KIF-TW02	19-Aug-19	19.46	774.73	755.27	n/a	n/a	n/a	30.0-40.0	CCR Material
KIF-TW03	19-Aug-19	24.02	778.90	754.88	n/a	n/a	n/a	33.5-53.5	CCR Material
KIF-TW04	19-Aug-19	14.89	769.60	754.71	n/a	n/a	n/a	26.0-36.0	CCR Material
KIF-TW05	19-Aug-19	20.52	773.59	753.07	n/a	n/a	n/a	26.5-36.1	CCR Material
Piezometers									
KIF-17-02-1	19-Aug-19	n/a	n/a	742.9	754.3	733.3	21.0	n/a	CCR Material
KIF-17-03-1	19-Aug-19	n/a	n/a	NM	749.0	737.0	12.0	n/a	CCR Material
PZ-A1*	19-Aug-19	11.0	764.43	753.4	757.0	732.2	24.8	n/a	CCR Material
PZ-B1*	19-Aug-19	14.2	766.69	752.5	759.3	734.1	25.2	n/a	CCR Material

Notes:

*	Piezometer is manually gauged. Groundwater elevation is calculated to nearest 0.01 from surveyed top of casing
bgs	below ground surface
btoc	below top of casing
CCR	coal combustion residuals
ft	feet
ID	identification
msl	mean sea level
n/a	not applicable
NM	not measured

1. Top of casing elevations, screen intervals, and screened formations were obtained from boring logs, well detail and well survey data.
2. For piezometers, ground surface elevation, pore water elevations, and piezometer data obtained from geotechnical instrumentation database. Vibrating wire sensor formation information were obtained from boring logs. Data from automated piezometers are averaged for the measurement date.
3. Pore water elevations in piezometers are calculated values. Accuracy of piezometer data is to 0.1 ft.
4. Screen interval shown for temporary wells is below ground surface when drilled.
5. In select piezometers noted as "NM" above, pore water elevation data were not available for this event.

EXHIBITS

Exhibit No.

G.1-1

Title

Historical Boring Locations

Client/Project

Tennessee Valley Authority
Kingston Fossil Plant (KIF) TDEC Order

Project Location

Roane County, Tennessee

175668043

Prepared by DMB on 2022-06-22
Technical Review by RAA on 2022-06-22

0 200 400 600 800 Feet

1:2,400 (At original document size of 22x34)

Legend

- Existing Boring
- Existing CPT
- Perimeter Containment Alignment (Approximate)
- CCR Unit Area (Approximate)
- Engineered Wetlands (Approximate)
- Polishing Pond (Approximate)

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Imagery provided by Esri World Imagery from February 2020
3. During the construction of the Perimeter Containment Soil-Cement Stabilization, top of rock elevations were determined by a combination of predrilling (S&ME 2011) and trench excavations. This top of rock information is available for the entirety of the Stabilization alignment and the spacing between top of rock observations range from approximately 15 feet to 20 feet.

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TVA

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Exhibit No.

G.1-2

Title

Phase 1 Boring Location Map

Client/Project

Tennessee Valley Authority
Kingston Fossil Plant (KIF) TDEC Order

Project Location

Roane County, Tennessee

175668043
Prepared by DMB on 2022-06-22
Technical Review by TG on 2022-06-22

0 300 600 900 1,200 Feet

1:3,600 (At original document size of 22x34)

Legend

- Geotechnical Boring
- Temporary Well (Screened Interval)
- CCR Unit Area (Approximate)
- Engineered Wetlands (Approximate)
- Polishing Pond (Approximate)

KRP Ash Landfill
Emory River
Dike C
KIF-TW01 (Sluiced Ash)
KIF-B01a
KIF-B01b
KIF-TW03a
KIF-TW03b (See Note 4)
KIF-B03a
KIF-B03b
Interim Ash Staging Area
KIF-TW02 (Sluiced Ash)
KIF-B02a
KIF-B02b
KIF-TW03 (Sluiced Ash) (See Note 5)
KIF-TW05 (Sluiced Ash)
Polishing Pond
Engineered Wetlands
Stilling Pond
Skimmer Wall
Sluice Trench and Area East of Sluice Trench
KIF-B04a
KIF-TW04 (Sluiced Ash)
East Dike
Plant Intake Channel

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Imagery provided by Esri World Imagery from February 2020
4. KIF-TW03a and KIF-TW03b were attempted at the KIF-TW03 location referenced in EIP Rev. 4. However, the temporary well could not be installed at this location.
5. KIF-TW03 was drilled at the KIF-TW03Alt location referenced in EIP Rev. 4.
6. Boring locations for KIF-TW01, KIF-TW02, KIF-TW03, KIF-TW04, KIF-TW05 surveyed by the R.L.S. Group on May 2, 2019. Boring locations for KIF-TW03a and KIF-TW03b based on handheld GPS coordinates at the time of drilling.
7. Borings locations for KIF-B01a, KIF-B01b, KIF-B02a, KIF-B02b, KIF-B03a, KIF-B03b, and KIF-B04a surveyed by TVA on January 9, 2020.

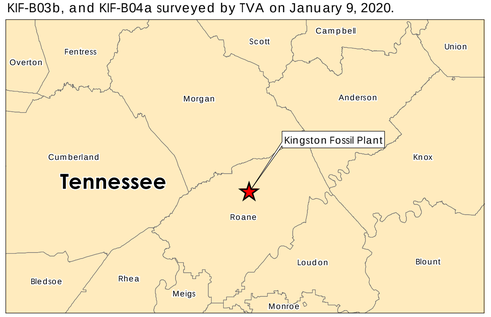

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Exhibit No.

G.1-3

Title

Phase 2 Boring Location Map

Client/Project

Tennessee Valley Authority
Kingston Fossil Plant (KIF) TDEC Order

Project Location

Roane County, Tennessee

175668043
Prepared by DMB on 2022-06-22
Technical Review by DW on 2022-06-22

0 300 600 900 1,200 Feet

1:3,600 (At original document size of 22x34)

Legend

- Geotechnical Boring
- Boring with Vibrating Wire Piezometer
- CCR Unit Area (Approximate)
- Engineered Wetlands (Approximate)
- Polishing Pond (Approximate)

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Imagery provided by Esri World Imagery from February 2020
4. Boring locations for KIF-B05, KIF-B09, and KIF-B13 surveyed by TVA on March 4, 2021.
5. Borings KIF-B06 through KIF-B08, KIF-B10 through KIF-B12, and KIF-B14 through KIF-B16 were drilled from a barge. For each boring, the top of temporary casing location was surveyed by Stantec prior to moving to the next boring location.

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Exhibit No.

G.1-4

Title

Completed Stability Analyses

Client/Project

Tennessee Valley Authority
Kingston Fossil Plant (KIF) TDEC Order

Project Location

Roane County, Tennessee

175668043

Prepared by DMB on 2022-06-22
Technical Review by RAA on 2022-06-22

0 200 400 600 800 Feet

1:2,400 (At original document size of 22x34)

Legend

- Stability Cross Section
- CCR Unit Area (Approximate)
- Engineered Wetlands (Approximate)
- Polishing Pond (Approximate)

KRP Ash Landfill
Emory River
Dike C
STA. 132+37
Interim Ash Staging Area
Stilling Pond
Polishing Pond
Engineered Wetlands
STA. 119+69
Skimmer Wall
Polishing Pond
Sluice Trench and Area East of Sluice Trench
Dike C
East Dike
A-A'
Plant Intake Channel

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Imagery provided by Esri World Imagery from February 2020

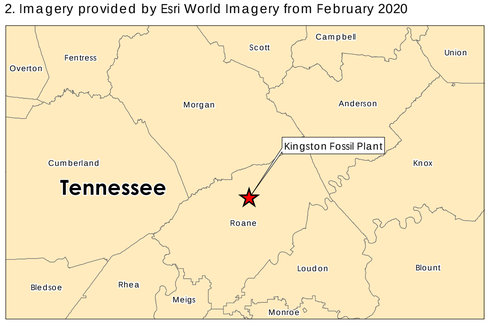

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Exhibit No.

G.1-5

Title

Boring and Well Location Map

Client/Project

Tennessee Valley Authority
Kingston Fossil (KIF) Plant TDEC Order

Project Location

Roane County, Tennessee

175668043

Prepared by DMB on 2023-03-09
Technical Review by RN on 2023-03-09

0 200 400 600 800 Feet

1:2,400 (At original document size of 22x34)

Legend

- Boring
- Drilled and Abandoned Borehole
- Vacatur Bedrock Boring
- Temporary Well in CCR Material
- Abandoned Temporary Well in CCR Material
- Pore Water Well
- Subsurface Wall
- CCR Unit Area (Approximate)
- Engineered Wetlands (Approximate)
- Polishing Pond (Approximate)

CCR: Coal combustion residuals

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Imagery provided by Esri World Imagery
3. Temporary Well locations shown correspond to survey data provided by the RLS Group on May 15, 2019.
4. Borings surveyed by TVA on January 9, 2020.
5. As-drilled boring location not surveyed. Horizontal coordinates based on proposed boring location.
6. Adjacent boring locations shown as single boring symbol due to close proximity.

Stantec TVA

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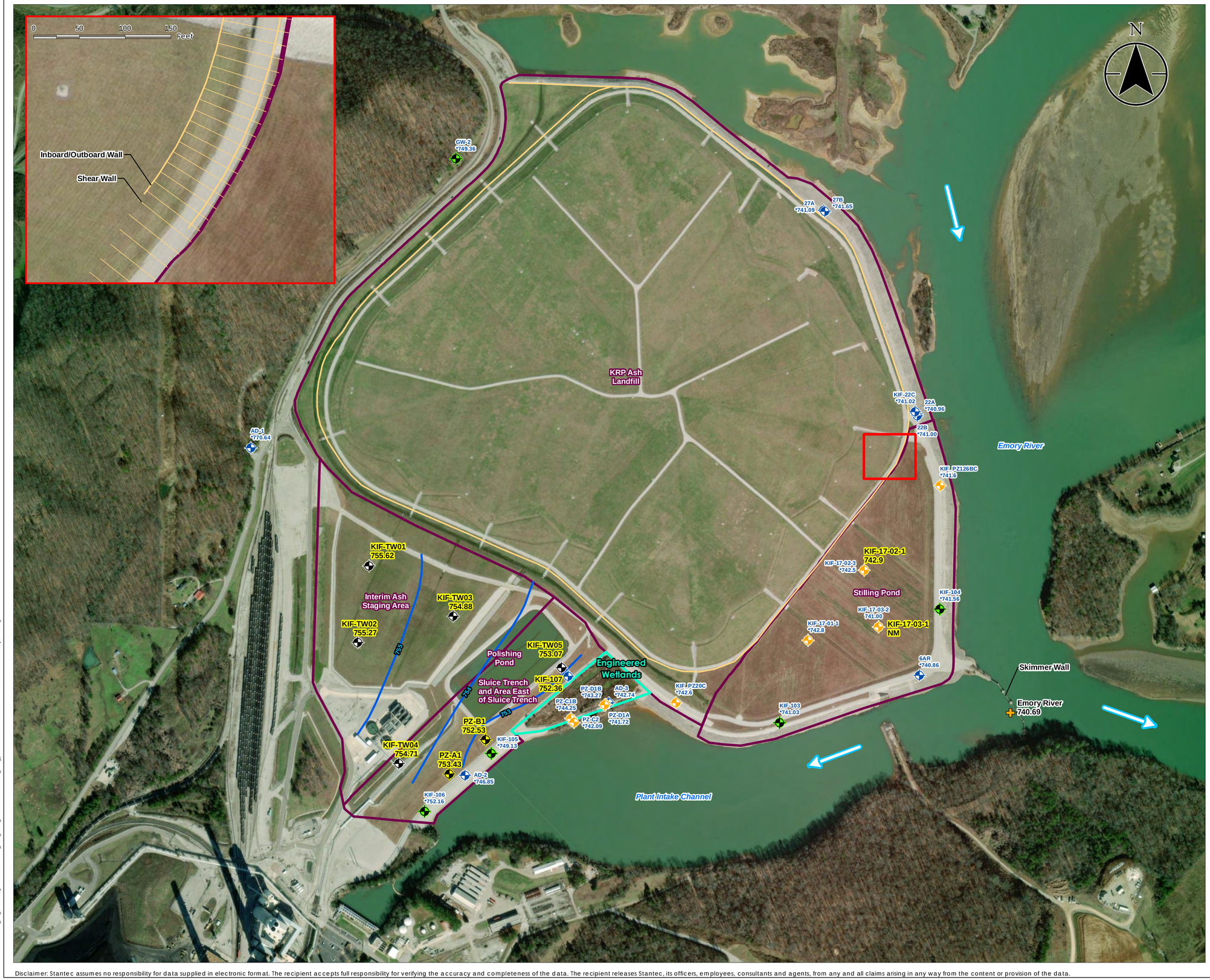

Exhibit No.

G.1-6

Title

Pore Water Elevation Contour Map, Event #3 (August 19, 2019)

Client/Project

Tennessee Valley Authority
Kingston Fossil (KIF) Plant TDEC Order

Project Location

Roane County, Tennessee

175668043

Prepared by DMB on 2023-10-12
Technical Review by MD on 2023-10-12

0 300 600 900 1,200 Feet

1:3,600 (At original document size of 22x34)

Legend

- Groundwater Investigation Monitoring Well
  groundwater elevation in feet above mean sea level (ft amsl); value not used for contouring
- Other Monitoring Well
  groundwater elevation in ft amsl; value not used for contouring
- Piezometer
  groundwater elevation in ft amsl;value not used for contouring
- Piezometer in CCR Material
  pore water elevation in ft amsl
- Temporary well in CCR Material
  pore water elevation in ft amsl
- Emory River Gauging Station
  surface water elevation in ft amsl
- Pore water Contour (1 ft interval; elevations are in ft amsl)
- Subsurface Wall (Approximate)
- Surface Stream Flow
- CCR Unit Management Area (Approximate)
- Engineered Wetlands Area (Approximate)

Perimeter Containment Wall (As Shown in Inset)

- Inboard/Outboard Wall
- Shear Wall

CCR: Coal combustion residuals

*Groundwater elevation displayed but not used as input for contouring

NM: Not measured; data not available

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Imagery provided by Esri World Imagery
3. Pore water contours were created with manual adjustment using Surfer Version 16.1.350 (December 13, 2018)

Stantec TVA

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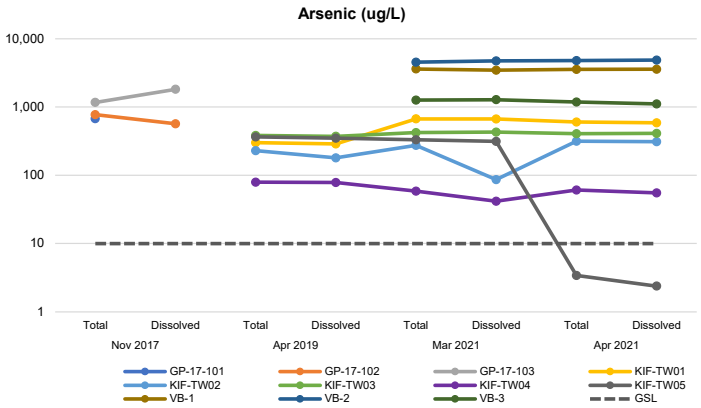
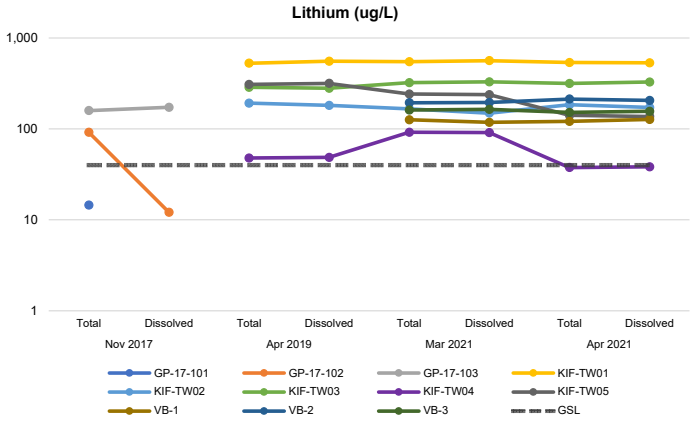
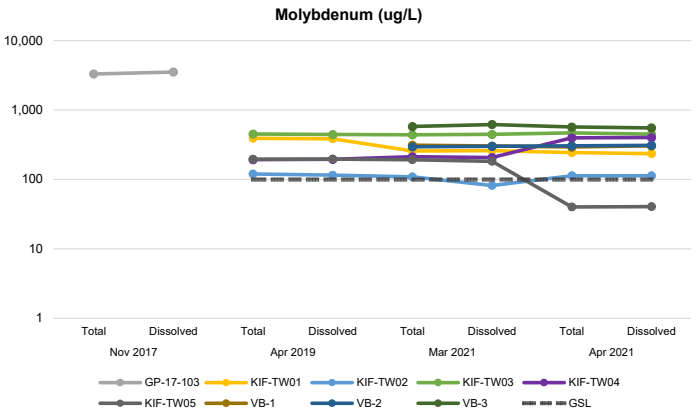
ATTACHMENT G.1-A
PORE WATER CONCENTRATIONS OVER TIME

Attachment G.1-A - Pore Water Concentrations over Time
CCR Rule Parameters
Kingston Fossil Plant







GSL - Groundwater Screening Levels
GSLs are not directly applicable to pore water and are being used for comparison purposes only

APPENDIX G.2

EXPLORATORY DRILLING SAMPLING AND ANALYSIS REPORT

Kingston Fossil Plant
Exploratory Drilling
Sampling and Analysis Report

TDEC Commissioner's Order:
Environmental Investigation Plan
Kingston Fossil Plant
Harriman, Tennessee

January 10, 2022

Prepared for:

Tennessee Valley Authority
Chattanooga, Tennessee

Prepared by:

Stantec Consulting Services Inc.
Lexington, Kentucky

Revision Record

Revision	Description	Date
0	Submittal to TDEC	July 31, 2020
1	Submittal to TDEC; updated to document Phase 2 EXD activities	October 1, 2021
2	Addresses November 9, 2021 TDEC Review Comments and Issued for TDEC	December 3, 2021
3	Addresses January 5, 2022 TDEC Review Comments and Issued for TDEC	January 10, 2022

Sign-off Sheet

This document entitled Kingston Fossil Plant Exploratory Drilling Sampling and Analysis Report was prepared by Stantec Consulting Services Inc. (“Stantec”) for the account of Tennessee Valley Authority (the “Client”). Any reliance on this document by any third party is strictly prohibited. The material in it reflects Stantec’s professional judgment in light of the scope, schedule, and other limitations stated in the document and in the contract between Stantec and the Client. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. In preparing the document, Stantec did not verify information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions taken based on this document.

Prepared by _____

David Webb, Engineer-in-Training

Reviewed by _____

Stan Harris, Senior Principal Engineer

Approved by _____

Rebekah Brooks, Principal Hydrogeologist

Table of Contents

ABBREVIATIONS IV

1.0 INTRODUCTION 1

2.0 OBJECTIVE AND SCOPE 3
2.1 PHASE 1 EXPLORATORY DRILLING 3
2.2 PHASE 2 EXPLORATORY DRILLING 4

3.0 FIELD ACTIVITIES 5
3.1 PHASE 1 ACTIVITIES 5
3.2 PHASE 2 ACTIVITIES 6
3.3 WORK LOCATIONS 6
3.3.1 Phase 1 Work Locations 6
3.3.2 Phase 2 Work Locations 8
3.4 DOCUMENTATION 10
3.4.1 Field Forms 10
3.4.2 Equipment Calibration 12
3.4.3 Photographs 12
3.5 DRILLING AND SAMPLING 12
3.5.1 Drilling 12
3.5.2 Soil Sampling 13
3.5.3 Sample Shipment 14
3.6 TEMPORARY WELL INSTALLATION 14
3.6.1 Temporary Well Installation 14
3.6.2 Temporary Well Development 16
3.6.3 Hydraulic Conductivity (Slug) Testing 16
3.7 INSTRUMENTATION INSTALLATION 17
3.8 INVESTIGATION DERIVED WASTE 18
3.9 BORING AND TEMPORARY WELL SURVEYS 18
3.10 BATHYMETRIC SURVEY 19
3.11 VARIATIONS 19
3.11.1 Variations in Scope 19
3.11.2 Variations in Procedures 20
3.12 LIMITATIONS 20

4.0 SUMMARY 21
4.1 PHASE 1 EXPLORATORY DRILLING 21
4.2 PHASE 2 EXPLORATORY DRILLING 22
4.3 CLOSING 22

5.0 REFERENCES 23

LIST OF TABLES

Table 1. Phase 1 Exploratory Drilling Performed in Each CCR Unit....7
Table 2. Summary of Phase 1 EXD Borings....7
Table 3. Phase 2 Exploratory Drilling Performed in Each CCR Unit....8
Table 4. Summary of Phase 2 EXD Borings....9

LIST OF APPENDICES

APPENDIX A – EXHIBITS

Exhibit A.1 Site Location Map
Exhibit A.2 Phase 1 Boring Location Map
Exhibit A.3 Phase 2 Boring Location Map
Exhibit A.4 Phase 2 Instrumentation Location Map

APPENDIX B – TABLES

Table B.1 Summary of Phase 1 Borings
Table B.2 Summary of Phase 1 Soil and Rock Samples
Table B.3 Summary of Temporary Well Installation
Table B.4 Summary of Well Development Data
Table B.5 Summary of Hydraulic Conductivity (Slug) Testing Results
Table B.6 Summary of Phase 1 Boring and Temporary Well Survey Data
Table B.7 Summary of Phase 2 Borings
Table B.8 Summary of Phase 2 Soil and Rock Samples
Table B.9 Summary of Vibrating Wire Piezometer Installations
Table B.10 Summary of Phase 2 Boring Survey Data

APPENDIX C – SUBSURFACE LOGS, TEMPORARY WELL INSTALLATION DETAILS, AND VIBRATING WIRE PIEZOMETER INSTALLATION DETAILS

Attachment C.1 Phase 1 Subsurface Logs
Attachment C.2 Temporary Well Installation Details
Attachment C.3 Phase 2 Subsurface Logs
Attachment C.4 Vibrating Wire Piezometer Installation Details

APPENDIX D – PHOTOGRAPHS OF BORINGS AND TEMPORARY WELLS

Attachment D.1 Photographic Log of Phase 1 Soil Samples
Attachment D.2 Photographic Log of Phase 1 Site Conditions and Temporary Wells
Attachment D.3 Photographic Log of Phase 2 Soil Samples
Attachment D.4 Photographic Log of Phase 2 Site Conditions and Vibrating Wire Piezometers

APPENDIX E – IN-SITU TESTING RESULTS

Attachment E.1 Hydraulic Conductivity (Slug) Testing Results
Attachment E.2 Automatic Hammer Energy Verification Report

APPENDIX F – GEOTECHNICAL LABORATORY TESTING RESULTS

Attachment F.1 Summary Tables of Phase 1 Geotechnical Laboratory Testing Results
Attachment F.2 Phase 1 Natural Moisture Content Testing Results
Attachment F.3 Phase 1 Soil Classification Testing Results
Attachment F.4 Phase 1 Shear Strength Testing Results
Attachment F.5 Phase 1 Hydraulic Conductivity Testing Results
Attachment F.6 Summary Tables of Phase 2 Geotechnical Laboratory Testing Results
Attachment F.7 Phase 2 Natural Moisture Content Testing Results
Attachment F.8 Phase 2 Soil Classification Testing Results

APPENDIX G – BATHYMETRIC SURVEY RESULTS

Exhibit G.1 Bathymetric Contour Map of the Intake Channel

Abbreviations

ASTM	American Society for Testing and Materials
CCR	Coal Combustion Residuals
COC	Chain-Of-Custody
DPT	Direct Push Technology
EAR	Environmental Assessment Report
EIP	Environmental Investigation Plan
ENV	Environmental
EnvStds	Environmental Standards, Inc.
EXD	Exploratory Drilling
FSP	Field Sampling Personnel
GPS	Global Positioning System
ID	Identification
IDW	Investigation Derived Waste
KIF Plant	Kingston Fossil Plant
PE	Professional Engineer
PG	Professional Geologist
PPE	Personal Protective Equipment
PVC	Polyvinyl Chloride
QAPP	Quality Assurance Project Plan
SAP	Sampling and Analysis Plan
SAR	Sampling and Analysis Report
SS	Split-spoon
ST	Undisturbed (Shelby) Tube sample
Stantec	Stantec Consulting Services Inc.
TDEC	Tennessee Department of Environment and Conservation
TDEC Order	Commissioner’s Order No. OGC15-0177
TI	Technical Instruction
TVA	Tennessee Valley Authority
VWPs	Vibrating Wire Piezometers

1.0 INTRODUCTION

Stantec Consulting Services Inc. (Stantec) has prepared this sampling and analysis report (SAR), on behalf of the Tennessee Valley Authority (TVA), to document activities related to exploratory drilling (EXD) at TVA's Kingston Fossil (KIF) Plant located in Roane County, Tennessee.

The purpose of the EXD was to drill borings, install temporary wells, and install piezometers to evaluate subsurface conditions at the KIF Plant, in support of fulfilling the requirements for the Tennessee Department of Environment and Conservation (TDEC) issued Commissioner's Order No. OGC15-0177 (TDEC Order) to TVA (TDEC 2015). The TDEC Order sets forth a "process for the investigation, assessment, and remediation of unacceptable risks" at TVA's coal ash disposal sites in Tennessee.

The purpose of this SAR is to summarize activities completed to meet the objectives of the EXD Sampling and Analysis Plan (SAP) (Stantec 2018a) and the Addendum to Exploratory Drilling SAP (EXD SAP Addendum) (Stantec 2020). This SAR is not intended to provide conclusions or evaluations of results. The scope of the EXD activities represented herein was conducted pursuant to the EXD SAP and SAP Addendum and is part of a larger environmental investigation at the KIF Plant. The evaluation of the results will consider other aspects of the environmental investigation at the KIF Plant, including data collected under other State and/or coal combustion residuals (CCR) programs and will be presented in the Environmental Assessment Report (EAR).

The EXD activities were performed in conjunction with CCR materials characterization and material quantity investigations in general accordance with the following documents developed by TVA to support fulfilling the requirements of the TDEC Order:

- *Exploratory Drilling SAP* (Stantec 2018a)
- *Addendum to Exploratory Drilling SAP* (Stantec 2020)
- *Environmental Investigation Plan* (Stantec 2018b)
- *CCR Material Characteristics SAP* (Stantec 2018c)
- *Material Quantity SAP* (Stantec 2018d)
- *Groundwater Investigation SAP* (Stantec 2018e)
- *Quality Assurance Project Plan (QAPP)* (Environmental Standards, Inc. 2018).

The exploratory drilling was implemented in accordance with TVA and TDEC-approved Programmatic- and Project-specific changes. Minor variations in scope and procedures from those outlined in the KIF Plant EXD SAP and SAP Addendum occurred during field activities due to field conditions and programmatic updates and are referenced in Section 3.11.

EXD field work was conducted in two phases (Phase 1 and Phase 2) and consisted of three primary activities – drilling and sampling, installing temporary wells, and installing piezometers. Quality Assurance oversight of field data acquisition protocols, sampling practices, and field data review were performed by Environmental Standards, Inc. (EnvStds) under direct contract to TVA. Geotechnical laboratory testing and data review was performed by Stantec.

2.0 OBJECTIVE AND SCOPE

2.1 PHASE 1 EXPLORATORY DRILLING

The primary objective of the Phase 1 EXD, conducted pursuant to the EXD SAP, was to perform borings and install temporary wells to further characterize subsurface conditions at the KIF Plant, in response to the TDEC Order. The EXD SAP included activities at two CCR units: the Interim Ash Staging Area and the Sluice Trench and Ballfield East of Sluice Trench.

The activities conducted during Phase 1 EXD support data collection for the CCR material characteristics and material quantity investigations at the KIF Plant, including pore water level measurements and soil sample collection for analysis of CCR-related constituents.

The approach for Phase 1 EXD was to:

- Perform soil borings and geotechnical laboratory testing to refine subsurface characterization and material quantity estimates
- Install temporary wells to allow for pore water sampling and measuring piezometric (i.e., pore water) levels within CCR units
- Use either hollow-stem auger or direct-push technology (DPT) drilling techniques to collect soil samples at staked boring locations approved by TDEC and considered suitable for the drill rig to safely access
- Complete temporary well development, hydraulic conductivity (slug) testing, and survey activities.

The scope of work of the Phase 1 EXD consisted of the following tasks:

- Drilling borings
- Collecting disturbed and undisturbed soil samples for lithologic information
- Installing temporary wells, constructing surface protections, and developing the wells
- Conducting slug tests in temporary wells
- Performing geotechnical laboratory testing
- Surveying boring and temporary well locations.

Details on each Phase 1 EXD activity are presented in the sections below. These activities were carried out concurrently with CCR material sampling and pore water monitoring and sampling, which were performed in accordance with the CCR Material Characteristics and Material Quantity SAPs. Refer to the CCR Material Characterization and Material Quantity SARs for information from those concurrent activities.

2.2 PHASE 2 EXPLORATORY DRILLING

The primary objective of the Phase 2 EXD, conducted pursuant to the EXD SAP Addendum, was to perform borings and install piezometers to further characterize subsurface conditions at the KIF Plant, in response to the TDEC Order. The EXD SAP Addendum included activities at one CCR unit: the Sluice Trench and Ballfield East of Sluice Trench.

The approach for the Phase 2 EXD was to:

- Perform a bathymetric survey within the Intake Channel adjacent to the East Dike
- Perform soil borings and geotechnical laboratory testing to refine subsurface characterization
- Install vibrating wire piezometers (VWPs) to allow water level (i.e., pore water pressure) readings in various materials
- Use mud rotary techniques to collect soil samples at staked boring locations approved by TDEC and considered suitable for the drill rig to safely access.

The scope of work of the Phase 2 EXD consisted of the following tasks:

- Drilling borings
- Collecting disturbed and undisturbed soil samples for lithologic information
- Installing VWPs
- Performing geotechnical laboratory testing
- Surveying boring locations.

Details on each Phase 2 EXD activity are presented in the sections below.

3.0 FIELD ACTIVITIES

Stantec performed Phase 1 and Phase 2 EXD field activities based on guidance and specifications listed in TVA's Environmental (ENV) Technical Instructions (TIs), the SAPs, and the QAPP, except as noted in the Variations section of this report. As part of TVA's commitment to generate representative and reliable data, oversight of select field activities, field documentation and centralized data management were performed by EnvStds under direct contract with TVA. EnvStds also conducted audits of field activities and provided quality reviews of field documentation.

3.1 PHASE 1 ACTIVITIES

EXD field activities were conducted in several separate intervals. The first two intervals were conducted between November 12 and 15, 2018 and January 22 and February 28, 2019, and consisted of hollow-stem auger drilling and temporary well installation. Temporary well development was conducted between April 2 and 8, 2019. Temporary well slug testing was conducted between June 18 and 20, 2019. Supplemental drilling was conducted between December 2 and 6, 2019, and consisted of DPT drilling. Prior to initiating field activities, TVA conducted environmental reviews, obtained permits, and performed utility clearances as necessary to complete the field work.

During the Phase 1 EXD, Stantec conducted the following field activities:

- Confirmed drilling locations for planned boring locations
- Drilled an initial seven borings within the Interim Ash Staging Area and the Sluice Trench and Ballfield East of Sluice Trench, under the direction of a Stantec Professional Geologist (PG) licensed in the State of Tennessee
- Collected soil samples to develop a continuous subsurface log/soil profile for each boring, with select soil samples subjected to geotechnical laboratory testing
- Installed temporary wells in five of the borings, under the direction of a Stantec PG licensed in the State of Tennessee
- Developed each temporary well and conducted slug tests to estimate hydraulic conductivity
- Drilled seven supplemental borings, for additional sampling needs, adjacent to select temporary well locations.

Following temporary well installation and supplemental drilling, temporary well surface protections were constructed, and each boring location was surveyed.

Appendix A provides a site location map and a Phase 1 EXD boring (and temporary well) location map. Appendix B provides summary tables of information collected during the Phase 1 EXD. Appendix C includes subsurface logs and temporary well installation details. Appendix D includes photographs related

to the borings and temporary wells. Appendix E includes in-situ testing results and Appendix F includes geotechnical laboratory testing results.

3.2 PHASE 2 ACTIVITIES

TVA performed the bathymetric survey within the Intake Channel on December 3, 2020. Phase 2 EXD field activities were conducted by Stantec between January 25 and February 26, 2021 and consisted of geotechnical borings. Prior to initiating field activities, TVA conducted environmental reviews, obtained permits, and performed utility clearances as necessary to complete the field work.

During the Phase 2 EXD, Stantec conducted the following field activities:

- Confirmed drilling locations for planned boring locations
- Drilled 12 borings within the Sluice Trench and Ballfield East of Sluice Trench, under the direction of a Stantec Professional Engineer (PE) licensed in the State of Tennessee
- Collected soil samples to develop a subsurface log/soil profile for each boring, with select soil samples subjected to geotechnical laboratory testing
- Installed six VWPs in three geotechnical borings

Following completion of the Phase 2 borings, each boring location was surveyed.

Appendix A provides a Phase 2 EXD boring location map and an instrument location map. Appendix B provides summary tables of information collected during the Phase 2 EXD. Appendix C includes subsurface logs and instrument installation details. Appendix D includes photographs related to the borings and instruments. Appendix E includes in-situ testing results and Appendix F includes geotechnical laboratory testing results. Appendix G includes a contour map for the top of sediment/soil within the limits of the bathymetric survey.

3.3 WORK LOCATIONS

3.3.1 Phase 1 Work Locations

The Phase 1 boring locations were selected to address data gaps and supplement existing data at the KIF Plant as described in the EXD SAP. Rationale for individual boring locations is discussed below. A site location map and boring locations map are provided as Exhibits A.1 and A.2, respectively, in Appendix A.

In order to provide data regarding CCR material quantity, pore water levels, CCR material characteristics, and subsurface characterization, borings were drilled, and temporary wells installed at locations shown on Exhibit A.2. A total of 14 borings, five of which include temporary well installations, were completed. Table 1 provides the number of borings completed (including temporary well installations) in each CCR unit. Table 2 lists the borings and more detail about the purpose for each.

Table 1. Phase 1 Exploratory Drilling Performed in Each CCR Unit

CCR Unit	No. of Borings without Temporary Wells	No. of Borings with Temporary Wells Installed
Interim Ash Staging Area	8	3
Sluice Trench and Ballfield East of Sluice Trench	1	2
Total	**9**	**5**

Table 2. Summary of Phase 1 EXD Borings

Boring No.	CCR Unit	Borehole Termination Criteria	Temporary Well Screen Location	Boring Purpose
KIF-TW01	Interim Ash Staging Area	Sample Uppermost Foundation Soil	Sluiced Ash	PZ, PW, Geo
KIF-TW02	Interim Ash Staging Area	Sample Uppermost Foundation Soil	Sluiced Ash	PZ, PW, Geo
KIF-TW03a	Interim Ash Staging Area	Sample Uppermost Foundation Soil	Not Installed	Geo
KIF-TW03b	Interim Ash Staging Area	Sample Uppermost Foundation Soil	Not Installed	Geo
KIF-TW03	Interim Ash Staging Area	Sample Uppermost Foundation Soil	Sluiced Ash	PZ, PW, Geo
KIF-TW04	Sluice Trench and Ballfield East of Sluice Trench	Sample Uppermost Foundation Soil	Sluiced Ash	PZ, PW, Geo
KIF-TW05	Sluice Trench and Ballfield East of Sluice Trench	Sample Uppermost Foundation Soil	Sluiced Ash	PZ, PW, Geo
KIF-B01a	Interim Ash Staging Area	Sample Uppermost Foundation Soil	N/A	Geo
KIF-B01b	Interim Ash Staging Area	Sample Uppermost Foundation Soil	N/A	Geo
KIF-B02a	Interim Ash Staging Area	Sample Uppermost Foundation Soil	N/A	Geo
KIF-B02b	Interim Ash Staging Area	Sample Uppermost Foundation Soil	N/A	Geo
KIF-B03a	Interim Ash Staging Area	Sample Uppermost Foundation Soil	N/A	Geo
KIF-B03b	Interim Ash Staging Area	Sample Uppermost Foundation Soil	N/A	Geo
KIF-B04a	Sluice Trench and Ballfield East of Sluice Trench	Sample Uppermost Foundation Soil	N/A	Geo

Notes:
PZ = Piezometric (Pore Water) Levels in CCR;
PW = Pore Water Sampling;
Geo = Geotechnical Data
N/A = Not Applicable
KIF-TW03a and KIF-TW03b encountered obstructions prior to reaching the planned termination depth. Borings did not reach the uppermost foundation soil. See Section 3.10.

As shown on Exhibit A.2 in Appendix A, a total of 14 borings, including five borings with temporary wells (labeled KIF-TW01 through KIF-TW05), were drilled within the footprints of the Interim Ash Staging Area (three temporary wells) and Sluice Trench and Ballfield East of Sluice Trench (two temporary wells). The

borings are located in accessible areas of the unit interiors to improve spatial coverage for CCR material thickness and pore water levels, and to facilitate CCR material characterization and pore water sampling. The temporary wells were screened near the bottom of the CCR in the units, after the portion of the borehole was sealed that penetrated the foundation soils.

The supplemental borings were located within a 25-foot radius of the associated temporary well (e.g., KIF-B01a and KIF-B01b were associated with KIF-TW01). Typically, two supplemental borings were performed at each proposed location within approximately five feet of each other. Pairs of borings were typically necessary to generate adequate sample volume for various laboratory testing needs. However, only one supplemental boring (KIF-B04a) was necessary adjacent to temporary well KIF-TW04. No supplemental borings were necessary adjacent to temporary well KIF-TW05.

3.3.2 Phase 2 Work Locations

The Phase 2 boring locations were selected to address data gaps and supplement existing data at the KIF Plant as described in the EXD SAP Addendum. Rationale for individual boring locations is discussed below. A Phase 2 boring location map and an instrument location map are provided as Exhibits A.3 and A.4, respectively, in Appendix A.

In order to provide data regarding pore water levels, CCR material characteristics, and subsurface characterization, borings were drilled and VWPs installed at locations shown on Exhibits A.3 and A.4. A total of 12 borings were completed. Table 3 provides the number of borings completed (including VWP installations) in each CCR unit. Table 4 lists the borings and more detail about the purpose for each.

Table 3. Phase 2 Exploratory Drilling Performed in Each CCR Unit

CCR Unit	No. of Borings without VWPs	No. of Borings with VWPs Installed
Sluice Trench and Ballfield East of Sluice Trench	9	3
Total	**9**	**3**

Notes:
CCR = Coal Combustion Residuals
VWP = Vibrating Wire Piezometer

Table 4. Summary of Phase 2 EXD Borings

Boring No.	CCR Unit	Borehole Termination Criteria	VWP Tip Location(s)	Boring Purpose
KIF-B05	Sluice Trench and Ballfield East of Sluice Trench	Refusal	Foundation Soils	PZ, Geo
KIF-B06	Sluice Trench and Ballfield East of Sluice Trench	Refusal[1]	--	Geo
KIF-B07	Sluice Trench and Ballfield East of Sluice Trench	Refusal[1]	--	Geo
KIF-B08	Sluice Trench and Ballfield East of Sluice Trench	Refusal	--	Geo
KIF-B09	Sluice Trench and Ballfield East of Sluice Trench	Refusal	Foundation Soils	PZ, Geo
KIF-B10	Sluice Trench and Ballfield East of Sluice Trench	Refusal	--	Geo
KIF-B11	Sluice Trench and Ballfield East of Sluice Trench	Refusal	--	Geo
KIF-B12	Sluice Trench and Ballfield East of Sluice Trench	Refusal[1]	--	Geo
KIF-B13	Sluice Trench and Ballfield East of Sluice Trench	Refusal[1]	Foundation Soils	Geo, PZ
KIF-B14	Sluice Trench and Ballfield East of Sluice Trench	Refusal	--	Geo
KIF-B15	Sluice Trench and Ballfield East of Sluice Trench	Refusal	--	Geo
KIF-B16	Sluice Trench and Ballfield East of Sluice Trench	Refusal[1]	--	Geo

Notes:
CCR = Coal Combustion Residuals;
PZ = Piezometric (Pore Water) Levels;
Geo = Geotechnical Data;
No. = Number;
PZ = Piezometric (Pore Water) Levels;
VWP = Vibrating Wire Piezometer
Refusal = indicates rock-like resistance to borehole advancement. This may indicate the beginning of weathered bedrock, boulders, rock remnants, cemented materials, or other hard/dense layers that prevent hole advancement.
[1] Borings KIF-B06, KIF-B07, KIF-B12, KIF-B13, and KIF-B16 were terminated based on field observations by the Stantec PE, without achieving the planned refusal. However, these borings reached weathered rock, which was sufficient to achieve the technical objectives for these borings.

As shown on Exhibit A.3 in Appendix A, a total of 12 borings, including three borings with VWPs, were drilled within or adjacent to the footprint of the Sluice Trench and Ballfield East of Sluice Trench. Borings KIF-B05, KIF-B09 and KIF-B13 each included VWPs and are located along the crest of the East Dike to facilitate material characterization stability analyses. To better characterize the pore water pressures along the dike alignment, six VWPs were installed in these three borings (Exhibit A.4).

The remaining nine borings are located along or near the outboard toe of the East Dike, and were accessed via a barge (i.e., floating plant) to improve spatial coverage for material characterization and to facilitate stability analyses.

3.4 DOCUMENTATION

Stantec maintained EXD field documentation in general accordance with ENV-TI-05.80.03, *Field Record Keeping*, the EXD SAP, and the QAPP. Field documentation for environmental soil sampling activities is described in the CCR Material Characteristics SAR. Health and safety forms were completed in accordance with TVA and Stantec health and safety requirements. Field activities and data were primarily recorded on program-specific field forms. Additional information regarding EXD field documentation is provided below.

3.4.1 Field Forms

Stantec used program-specific field forms to record field observations and data for specific activities. Field forms used during the EXD included:

- *Daily Field Activity Log*
- *Subsurface Log*
- *Chain-of Custody (COC)*
- *Monitoring Well Installation Field Log*
- *Well Development Form*
- *Equipment Calibration Form*
- *Slug Test Data Form*
- *Vibrating Wire Piezometer Installation Notes and Details.*

3.4.1.1 Daily Field Activity Log

Stantec field sampling personnel (FSP) recorded field activities, observations, and data on a *Daily Field Activity Log* to chronologically document the field program. Deviations from the SAP, TIs or QAPP were documented on *the Daily Field Activity Log*.

3.4.1.2 Subsurface Log

A Stantec PG or PE licensed in the State of Tennessee prepared a *Subsurface Log* for each boring. The log documented time, boring location, drilling personnel, tooling/equipment used, depth to pore water, sample number, sample recovery, soil/rock lithology, and other relevant observations. Soil color was logged per the appropriate Munsell Soil Color Chart (Munsell Color 2009). Information from these logs was used to construct the subsurface logs provided in Attachment C.1 in Appendix C.

3.4.1.3 Chain-of-Custody

Stantec FSP completed geotechnical COC documentation for each soil sample collected during the EXD. The sample identification (ID), sample location, sample depth, type of sample, sampling date, and sample custody record were recorded on the COCs. The Field Team Leader reviewed the COCs for completeness, and the FSP conducted a QC check of samples in each shipment compared to sample IDs on the corresponding COC prior to submittal to the laboratory. COCs were completed in general accordance with *ENV-TI-05.80.02: Sample Labeling and Custody*.

3.4.1.4 Monitoring Well Installation Field Log

A Stantec PG licensed in the State of Tennessee prepared a *Monitoring Well installation Field Log* for each temporary well. The log documented the well location, well installation date(s), well installation materials, well depth, screened interval, depth interval for each backfill material, and surface completion details. Information from these logs was used to construct the temporary well installation details provided in Attachment C.2 in Appendix C.

3.4.1.5 Well Development Form

Stantec FSP completed a *Well Development Form* for each temporary well. The form documented well location, well development date(s), elapsed time since development started, depth to pore water, purge rate, cumulative purge volume, and pore water quality parameter measurements throughout and at completion of the development process.

3.4.1.6 Equipment Calibration Form

Stantec FSP performed daily equipment calibrations of the water quality meter and documented the results on an *Equipment Calibration Form*. The form documented the calibration test results for temperature, turbidity, specific conductance, pH, and verified that the field instruments' sensors were operating within acceptable criteria. Refer to Section 3.4.2 for additional details on equipment calibration procedures.

3.4.1.7 Slug Test Data Form

Stantec FSP completed a *Slug Test Data Form* for the hydraulic conductivity tests performed at each temporary well. The form primarily documented well location, slug test date(s), and initial and final pore water level measurements before and after each slug test attempt. The pore water level measurements during the tests were recorded by an automated pressure transducer and data recorder and subsequently downloaded.

3.4.1.8 Vibrating Wire Piezometer Installation Notes and Details

A Stantec PG or PE licensed in the State of Tennessee prepared a *Vibrating Wire Piezometer Installation Notes and Details* log for each boring containing VWPs. The log documented the piezometer location, piezometer installation date(s), borehole depth, piezometer installation materials, transducer calibration

data, quality checks of the transducer(s), transducer depth(s), installation notes, and surface completion details (protective casing, concrete pad, bollards, etc.). Information from these logs was used to construct the piezometer installation details provided in Attachment C.4 in Appendix C.

3.4.2 Equipment Calibration

Field instruments used to collect, generate, or measure water quality parameters data were calibrated each day prior to sampling as specified by the SAP, QAPP, and ENV-TI-05.80.46, *Field Measurement Using a Multi-Parameter Sonde*. Afternoon calibration verifications were performed to evaluate if instruments remained within acceptable criteria during sampling. Temperature and barometric pressure were recorded using a calibrated NIST traceable thermometer and the National Weather Service (via mesowest.utah.edu) barometric pressure readings for Oak Ridge National Laboratory (KOQT), Oak Ridge, Tennessee, respectively. Additional details regarding equipment calibration were recorded on the *Equipment Calibration Form*, as described in Section 3.4.1.6.

3.4.3 Photographs

In addition to documentation of field activities described above, photographs were taken to document the field investigation. Photographic logs of soil samples recovered from Phase 1 borings and site condition photographs including the surface completion of installed temporary wells are provided in Attachments D.1 and D.2, respectively, in Appendix D. Photographic logs of soil samples recovered from Phase 2 borings and site condition photographs including surface completion of installed VWPs are provided in Attachments D.3 and D.4, respectively, in Appendix D.

3.5 DRILLING AND SAMPLING

The following sections present drilling and soil sampling procedures used during the EXD. Drilling and sampling activities were performed under the direction of a Stantec PG or PE licensed in the State of Tennessee.

3.5.1 Drilling

Drilling, sampling, temporary well installation and VWP installation was performed by Stantec drillers licensed in Tennessee, using Stantec equipment. Supplemental drilling and sampling, utilizing direct push technology, was performed by Hawkston Drilling, LLC, licensed in Tennessee and under subcontract to Stantec, with field oversight and logging by Stantec. Borings were drilled in areas with drive-on access; no special site preparations were necessary to facilitate access.

Hollow stem auger borings were advanced by means of continuous split-spoon (SS) sampling to recover soil for lithologic description, photographic documentation, and sample collection. Each run was then overdrilled using 4.25-inch hollow stem augers. After reaching the bottom of borehole, the 4.25-inch hollow stem augers were withdrawn. The upper portion of the borehole was overdrilled with 8.25-inch (inside diameter) hollow-stem augers to ream the borehole to a larger diameter, to facilitate subsequent installation of the temporary well. Hollow stem augers were decontaminated using a high-pressure steam cleaner and potable water after use at each boring. At each direct push boring location, the boring was

advanced by means of a dual tube sampling system with a closed point tip (i.e., drilling without sampling) to approximately five feet above the termination depth of the adjacent temporary well location. The closed point tip was removed through the casing and a DT37 lined sampler was used to begin continuously sampling the CCR until encountering approximately five feet of the uppermost foundation soils. Direct push borings were advanced in either 2.5- or five-foot runs to recover soil for lithologic description, photographic documentation, and sample collection. Supplemental borings KIF-B01a, KIF-B01b, KIF-B02a, KIF-B02b, KIF-B03a and KIF-B03b penetrated the engineered soil cap of the Interim Ash Staging Area. Boring KIF-B04a penetrated the engineered soil cap of the Sluice Trench area. After the DPT borings were performed, they were backfilled to approximately two feet below the ground surface with 30% solids bentonite grout. The upper 2 feet of the borings were backfilled with clayey soil from an onsite source.

Phase 2 EXD geotechnical borings were advanced by a combination of hollow-stem auger and mud rotary drilling techniques. Mud rotary drilling was conducted in general accordance with American Society for Testing and Materials (ASTM) D5783. The borings were advanced by means of SS and/or undisturbed (Shelby) tube (ST) sampling to recover soil for lithologic description, photographic documentation, and sample collection. Each run was then overdrilled using a mud rotary updraft roller bit.

To support seismic analyses, the automatic hammer used for Standard Penetration Testing during the Phase 2 EXD was subjected to energy verification testing per ASTM D4633. Energy verification testing was performed in boring KIF-B05. A summary of the test data and results of the automatic hammer energy verification is presented in Attachment E.2 in Appendix E.

A summary of the as-drilled boring depths, elevations, and types of sampling or testing is presented in Tables B.1 and B.7 in Appendix B. Boring locations are included on Exhibits A.2 and A.3 in Appendix A.

3.5.2 Soil Sampling

During advancement of each boring, the Stantec PG or PE prepared field subsurface logs using a mobile data collection platform. Inputs included a description of subsurface lithology, sample recovery, color using the Munsell Soil Color Chart, and other relevant parameters as required by the SAPs and TIs. Subsurface logs for the KIF Plant EXD are presented in Attachments C.1 (for Phase 1) and C.3 (for Phase 2) in Appendix C.

Soil samples were collected from each boring to provide lithologic information for a continuous subsurface log/soil profile for the proposed temporary wells. Temporary well borings (including KIF-TW03a and KIF-TW03b) were advanced using a conventional rotary drill rig with SS and ST sampling. Two-inch and/or three-inch diameter split-spoons were used to collect disturbed SS soil samples. SS and ST samples were collected for general soil and CCR characterization and potential laboratory testing. Three-inch diameter tubes were used to collect undisturbed ST soil samples. During Phase 1 EXD, the tubes were advanced using a standard ST sampler or a fixed piston sampler. Supplemental borings were advanced using a DPT drill rig. Dual tube soil samples were collected for general soil and CCR characterization along with potential laboratory testing. During Phase 2 EXD, the tubes were advanced using a fixed piston sampler or a hydraulic fixed piston sampler (i.e., Osterberg sampler). SS and ST samples were

collected for general soil and CCR characterization and potential laboratory testing. Each drill rig employed for in-situ penetration testing utilized an automatic hammer. The hammer weight and/or drop height may vary based on the drill rig, sampler size, and the sampling objectives of each boring.

Tables B.2 and B.8 in Appendix B summarize the soil samples collected in each boring along with sampler and hammer information. No rock coring or downhole testing in rock were performed for the units at the KIF Plant as part of the EXD. The subsurface logs in Attachments C.1 and C.3 record the depths of the recovered samples along with the results of the in-situ penetration testing program, including field blow counts.

For the Phase 1 and 2 work, select soil samples collected during the EXD were subjected to geotechnical laboratory testing. Select SS and ST samples were subjected to Unified Soil Classification System classification and index testing including natural moisture content, gradation, Atterberg limits, and specific gravity tests. Additionally, select ST samples from the Phase 1 drilling were subjected to triaxial compression and hydraulic conductivity tests. Not all test types were performed on all encountered materials. Tests were assigned based on material recovery, availability, and subsurface characterization needs. Appendix F presents the Phase 1 and 2 geotechnical laboratory testing results for select soil samples. Attachment F.1 (Tables F.1-1 through F.1-7) in Appendix F presents summaries of the Phase 1 geotechnical laboratory testing results for select soil samples. Attachment F.6 (Tables F.6-1 through F.6-4) in Appendix F presents summaries of the Phase 2 geotechnical laboratory testing results for select soil samples. The laboratory data sheets for each specific test are provided in Attachments F.2 through F.5 for Phase 1, and Attachments F.6 through F.8 for Phase 2.

3.5.3 Sample Shipment

At appropriate intervals, assigned personnel transported the geotechnical samples to the testing laboratory or designated storage facility. A geotechnical *COC* accompanied the samples throughout the shipping process.

SS and DPT samples are disturbed samples and were treated as Group B samples as discussed in ASTM D4220. The Shelby tubes were stored vertically in padded racks constructed in accordance with ASTM D4220. Based on anticipated weather conditions during sampling operations, care was taken in the storage of the samples to guard against the samples being exposed to extreme heat or cold. Prior to transport, the tubes were transferred to a custom box built in accordance with ASTM D4220 guidelines for transporting Group D type soil samples.

3.6 TEMPORARY WELL INSTALLATION

3.6.1 Temporary Well Installation

Temporary wells were installed in the borings by qualified drill crews working under the direction of a Stantec PG and a licensed Tennessee driller. Temporary well installation was carried out in general accordance with ENV-TI-05.80.25, *Monitoring Well and Piezometer Installation and Development*.

Temporary well construction details are documented on the Well Installation Detail sheets provided in Attachment C.2 in Appendix C.

The lowest portions of the borings were backfilled with bentonite pellets, then generally topped with a layer of sand filter pack (20/40 mesh). The temporary well was installed above the backfilled portion. Temporary wells consisted of a four-inch diameter Schedule 40 polyvinyl chloride (PVC) pre-packed well screen (0.010-inch slots) and riser. The screen and riser consisted of flush-joint, threaded PVC pipe. The screen length was nominally 10 feet. The PVC riser extended a minimum of 2.5 feet above the ground surface and was capped with a temporary plug or slip cap. The annular space was backfilled with a sand filter pack extending approximately two feet above and six inches below the screen. A bentonite pellet seal approximately two feet thick was placed on top of the sand filter pack. The sand filter pack and bentonite pellets were either placed by tremie method or poured slowly into the annular space of the drill tooling to prevent bridging.

After the bentonite pellet seal had sufficiently hydrated for a duration equal to or greater than the minimum recommended by the manufacturer (a minimum of four hours), the remaining annular space was backfilled with a 30% solids bentonite grout. The grout was placed by tremie method through one-inch or 1.5-inch diameter PVC pipe using pumps gauged to allow the installation crew to monitor pressures during the grouting process.

Borings KIF-TW01, KIF-TW02 and KIF-TW03 (including KIF-TW03a, KIF-TW03b and KIF-TW03ALT, see Section 3.11) penetrated the engineered soil cap of the Interim Ash Staging Area. Boring KIF-TW04 penetrated the engineered soil cap of the Sluice Trench area. Borings KIF-TW03a and KIF-TW03b encountered obstructions, did not have a temporary well installed, and were backfilled using 30% solids bentonite grout to within two feet of the ground surface. The uppermost two feet of Borings KIF-TW03a and KIF-TW03b were backfilled with clayey soil from an onsite source. After temporary wells KIF-TW01 through KIF-TW04 were installed, the annular space of the uppermost portion of each boring was backfilled using 30% solids bentonite grout.

Boring KIF-TW05 was performed in an area of the Sluice Trench and Ballfield East of Sluice Trench that was in the process of being capped and closed as part of a separate TVA project. The final cap included geosynthetics and soil components. TVA coordinated the drilling and closure activities such that the temporary well was installed, and the closure contractor followed by attaching the geomembrane to the KIF-TW05 riser pipe using a temporary pipe boot and placing the final cover soil. If/when it is decided to abandon the temporary well in the future (per the EIP), TVA will coordinate removal of the boot and repair of the final cap.

As allowed in the EXD SAP, TVA elected to modify the surface protection for each of the five temporary well installations. Instead of installing a concrete well pad and steel protective cover, TVA installed temporary fence posts and plastic fencing around each riser pipe. Fence posts were not driven deep enough to fully penetrate the final caps. A summary of temporary well installations is presented in Table B.3 in Appendix B. Construction details are presented in the Temporary Well Installation Details provided in Attachment C.2 in Appendix C.

3.6.2 Temporary Well Development

Each new temporary monitoring well was developed in accordance with ENV-TI-05.80.25, *Monitoring Well and Piezometer Installation and Development* by a combination of bailing, surging, and pumping after a minimum of 24 hours following temporary well installation. First, a three-inch diameter PVC bailer was lowered and raised within the screened intervals to create a slight surging action to dislodge particles within the temporary wells and sand filter packs. Then the bailer was used to remove turbid pore water from the temporary well. Baseline readings of turbidity, pH, temperature, and specific conductance were measured using a calibrated YSI Pro Plus water quality meter and a calibrated Hach 2100Q turbidity meter. This process of alternately surging and bailing was repeated several times to decrease the pore water turbidity within the temporary wells. Lastly, a submersible pump was employed to further develop the temporary wells until stabilization criteria for turbidity (≤10 Nephelometric Turbidity Units), pH (±0.1 Standard Unit), temperature (±10%), and specific conductance (±10%) were achieved. The target turbidity value was based on well purging criteria specified in ENV-TI-05.80.42, *Groundwater Sampling* at the time of development. Temporary well development details were recorded on the *Well Development Form.*

Typically, development continued over a span of two to six hours, although development of two temporary wells continued into a second day. Recharge rates observed within the temporary wells near the conclusion of development ranged from 1.7 gallons per hour (gal/hr) at temporary well KIF-TW02 to 6.2 gal/hr at temporary well KIF-TW01. Stabilization criteria were achieved for turbidity, specific conductance, pH, and temperature in each temporary well at completion of development. A summary of initial and final pore water quality measurements is presented in Table B.4 in Appendix B.

3.6.3 Hydraulic Conductivity (Slug) Testing

After development, Stantec performed slug tests in the five temporary wells to estimate hydraulic conductivity. The slug tests were performed in accordance with the ASTM D4044: *Standard Test Method for (Field Procedure) for Instantaneous Change in Head (Slug) Tests for Determining Hydraulic Properties of Aquifers*. A pressure transducer with a data recorder was used to collect pore water level information from the temporary wells.

Three to four rising-head and three to four falling-head slug tests were performed at each temporary well, as shown on Table B.5 in Appendix B. Each temporary well was tested by taking an initial measurement of the static pore water level followed by the insertion of the pressure transducer into the temporary well. After the transducer had been installed, a falling-head slug test was conducted by introducing a solid slug (e.g., PVC pipe filled with sand) into the temporary well to cause a nearly instantaneous rise in the pore water level. The pore water levels were then recorded at regular intervals until reaching near initial static levels. After the first test concluded, a rising-head slug test was conducted by removing the slug to cause a nearly instantaneous drop in the pore water level. Pore water levels were recorded until initial static pore water levels were reached again. The procedure of alternating a falling-head and a rising-head slug test was conducted at least three times at each temporary well. The data were recorded electronically by the transducer and downloaded into a data collector. Raw data were checked in the field for discrepancies prior to demobilizing from the KIF Plant.

The field data were analyzed using AQTESOLV™ Version 4.50 Professional software to estimate the hydraulic conductivity of the saturated soils in the screened interval. Calculated hydraulic conductivities are summarized in Table B.5 in Appendix B, and the full software output package is provided in Appendix E.

Specific to the KIF Plant temporary wells, analysis for each was completed using the Bouwer-Rice method. The solution was matched to the normalized plotted recovery data between 70-80% recovery.

3.7 INSTRUMENTATION INSTALLATION

VWPs were installed in the borings by qualified drill crews working under the direction of a Stantec PG or PE. VWP construction details are documented on the Piezometer Installation Detail sheets provided in Attachment C.4 in Appendix C.

After completion of the boring, the number of VWP transducers and installation depths were selected based on observed subsurface conditions and EXD objectives. Each VWP transducer was checked and prepared per the manufacturer recommendations, prior to installation. Hollow-stem augers were left in place to keep the borehole open and the depth to the bottom of the borehole was measured. A sacrificial tape was then affixed to a sacrificial Schedule 40 PVC pipe in order to attach the VWPs and lower to the desired depth(s) in the borehole. The hollow-stem augers were removed as the borehole was backfilled with 30% solids bentonite grout through the sacrificial pipe. At the surface, excess cable from each VWP was coiled and placed in a five-gallon bucket for protection.

The VWPs installed in borings KIF-B05 and KIF-B09 are located in proximity to existing monitoring wells KIF-106 and AD-2, respectively. From one hour before to one hour after grouting of KIF-B05 and KIF-B09, the groundwater levels were monitored in KIF-106 and AD-2 (respectively) to evaluate possible grout-related influence on the water levels. In both cases, the fluctuations in groundwater levels were less than ±0.02 feet, and were considered negligible. Three weeks following the completion of grouting activities in both borings, groundwater field parameters (water level, temperature, pH, specific conductance, dissolved oxygen, oxidation reduction potential, and turbidity) were recorded in the two monitoring wells to evaluate possible grout-related impacts to the groundwater quality. The field parameters were collected every three to five minutes, until the stabilization criteria were met. The procedures followed applicable portions of Section 5.2 of the *Groundwater Investigation SAP* (Stantec 2018e). Available field parameter data from previous groundwater sampling events at KIF-106 and AD-2 were used to represent the existing conditions prior to grouting. Compared to the pre-grouting data, the post-grouting field parameters were within range of the natural system variability observed for each of the two wells. Therefore, no grout-related impacts were apparent.

As allowed in the EXD SAP, TVA elected to modify the surface protection for each of the VWP installations. Instead of installing a concrete pad and steel protective cover, Stantec installed temporary surface protection (fence posts and plastic fencing) around each riser pipe.

A map showing piezometer locations and the material(s) monitored is provided on Exhibit A.4 in Appendix A. A summary of VWP installations is presented in Table B.9 in Appendix B. Construction details are presented in the Piezometer Installation Details provided in Attachment C.4 in Appendix C.

3.8 INVESTIGATION DERIVED WASTE

Investigation derived waste (IDW) generated during EXD included:

- Soil cuttings
- Used calibration solutions
- Temporary well development water
- Decontamination fluids
- Personal protective equipment (PPE)
- General trash.

IDW was handled in general accordance with ENV-TI-05.80.05, *Field Sampling Equipment Cleaning and Decontamination*; ENV-TI-05.80.25, *Monitoring Well and Piezometer Installation and Development*; the EXD SAP; the KIF Plant-specific waste management plan; and local, state, and federal regulations. Transportation and disposal of IDW were coordinated with the KIF Plant facility management. Soil cuttings, decontamination fluids, and temporary well development water were managed as authorized by the KIF Plant facility management and in accordance with the EXD SAP. Used disposable PPE (e.g., nitrile gloves) and general trash were placed in garbage bags and disposed of in a municipal waste dumpster onsite.

3.9 BORING AND TEMPORARY WELL SURVEYS

After the temporary wells were installed, they were professionally surveyed by The RLS Group, LLC, on May 2, 2019 under subcontract to Stantec. Boring locations for KIF-TW03a and KIF-TW03b are based on handheld global positioning system (GPS) coordinates at the time of drilling. After the supplemental borings were performed, they were professionally surveyed by TVA on January 9, 2020. Measurements were calculated relative to the coordinate systems used by the KIF Plant. Phase 1 temporary well and boring survey information is provided in Table B.6 in Appendix B.

For each Phase 2 boring drilled from the barge, the top of temporary casing location was surveyed by Stantec prior to moving to the next boring location. The horizontal coordinates were acquired using a handheld GPS with sub-meter accuracy. The vertical coordinates were acquired using differential leveling techniques, relative to a temporary benchmark on the East Dike. Phase 2 borings drilled on the land were professionally surveyed by TVA on March 4, 2021. Measurements were calculated relative to the coordinate systems used by the KIF Plant. Phase 2 boring survey information is provided in Table B.10 in Appendix B.

3.10 BATHYMETRIC SURVEY

A bathymetric survey was performed by TVA within the Intake Channel adjacent to East Dike. The bathymetric survey was conducted to identify the top of sediment/soil beneath the water, within the specified horizontal extents of the survey. Methods included sonar and physical soundings (rod, weighted tape, etc.). Horizontal and vertical coordinates of the survey data were referenced to the horizontal and vertical datums used by the KIF Plant. Appendix G includes a contour map for elevations of the top of sediment/soil within the limits of the bathymetric survey.

3.11 VARIATIONS

The proposed scope and procedures for the EXD were outlined in the SAP, QAPP, applicable TVA TIs, and ASTM standards, as detailed in the sections above. Variations in scope or procedures discussed with TDEC and/or TVA, changes based on field conditions, or additional field sampling performed to complete the scope of work in the SAP are described in the following sections. As discussed below, these variations do not impact the overall usability and representativeness of the dataset provided in this SAR for the EXD activities at the KIF Plant.

3.11.1 Variations in Scope

Variations in scope are provided below.

- During the EXD, the crew relocated KIF-TW03 (following TDEC approval) after encountering rock fill within the footprint of a decommissioned chemical treatment pond that was within the larger footprint of the Interim Ash Staging Area. The initial location (later designated KIF-TW03a) was sampled and drilled to a depth of 15.3 feet, at which point the boring was terminated and backfilled due to encountering rock fill. An offset boring (KIF-TW03b) was attempted 20 feet to the west of KIF-TW03a. Again, refusal was encountered in the rock fill at a depth of 13.5 feet and the boring was terminated and backfilled. After additional review of historical documents, the final location for KIF-TW03 (drilled at the KIF-TW03ALT location) was selected outside of the former chemical treatment pond footprint. TDEC approval was obtained for the final location, the boring was successfully completed, and temporary well KIF-TW03 was installed.

- After the completion of drilling and laboratory testing of samples from the temporary well borings, review of the data showed that borings KIF-TW01 through KIF-TW04 did not reach the foundation soils as originally logged in the field. These borings were inadvertently terminated within the CCR. Therefore, the supplemental direct push borings were added to extend the material profiles into the foundation soils and obtain the deeper samples adjacent to temporary wells KIF-TW01 through KIF-TW04. During the supplemental drilling, boring KIF-B04b was determined not to be necessary since adequate information and sample volume were obtained from boring KIF-B04a.

- Borings KIF-B06, KIF-B07, KIF-B12, KIF-B13 and KIF-B16 were terminated based on field observations by the Stantec PE, without achieving the planned refusal. However, these borings

reached weathered rock, which was sufficient to achieve the technical objectives for these borings.

- Groundwater field parameters were not monitored in KIF-106 and AD-2 during grouting of KIF-B05 and KIF-B09 (respectively) because purging of the wells would have interfered with a scheduled groundwater sampling event. Instead, TDEC and TVA agreed that it would be adequate to only monitor water levels in the wells during grouting. The post-grouting field parameter monitoring was performed three weeks after grouting, instead of the planned seven to ten days, to avoid interfering with the scheduled groundwater sampling event.

3.11.2 Variations in Procedures

Variations in procedures occurring in the field are provided below.

- During installation of temporary well KIF-TW05, well seal and grouting procedures differed from those described in the SAP, with bentonite pellets used for the well seal hydrated for two hours prior to placing bentonite grout in the annular space above the seal. Although the manufacturer's specifications suggest a minimum pellet hydration time of four hours, an appropriate well seal and grouting was achieved at temporary well KIF-TW05.

- Well seal type and grouting procedures used during temporary well installation were modified to allow for the use of a bentonite grout and to account for manufacturer's specifications. Revised procedures were approved by TDEC and appropriate well seals and grouting were achieved at each temporary well.

- Photographs of soil samples from borings KIF-TW03a and KIF-TW03b were taken in the field. However, the digital photographs were lost prior to file storage. Soil lithologies were described in subsurface logs as provided in Appendix C.

3.12 LIMITATIONS

The methods and locations of the subsurface exploration considered objectives of the EIP, available historical data, and input from TVA and TDEC. The subsurface exploration was developed to address specific data gaps, as outlined in the EIP. The methods used in this field exploration include inherent limitations as described below.

- The information presented herein was gathered from the borings advanced during this exploration using that degree of care and skill ordinarily exercised under similar circumstances by competent members of the engineering profession. However, no warranties can be made regarding the continuity of conditions between borings.

- The subsurface logs describe subsurface conditions at the specific locations at the time of drilling. Pore water levels may fluctuate over time with adjacent reservoir water level, weather conditions, and/or other influences.

4.0 SUMMARY

The data presented in this report are from the Phase 1 and Phase 2 EXD activities at the KIF Plant.

4.1 PHASE 1 EXPLORATORY DRILLING

The Phase 1 EXD included a total of seven auger borings and seven direct push borings. Five of the auger borings included temporary well installations. The borings were implemented to improve spatial coverage for CCR thickness, uppermost foundation soil type, and pore water levels within the CCR units at the time of drilling. The scope of work for Phase 1 EXD included:

- Drilled five auger borings and six direct push borings within the Interim Ash Staging Area
- Drilled two auger borings and one direct push boring within the Sluice Trench and Ballfield East of Sluice Trench
- Collected soil samples to develop a continuous subsurface log/soil profile for each boring, with select soil samples subjected to geotechnical laboratory testing
- Installed temporary wells in five of the auger borings (three in the Interim Ash Staging Area, two in the Sluice Trench and Ballfield East of Sluice Trench) and constructed surface protections
- Developed each temporary well and conducted slug testing to estimate hydraulic conductivity
- Surveyed each new boring and temporary well.

A summary of the Phase 1 EXD performed in each CCR unit is presented in Table 1. A summary of the Phase 1 EXD borings, including CCR unit and borehole termination criteria, are presented in Table 2. Phase 1 boring summary, soil and rock sample summary, temporary well construction details, temporary well development, hydraulic slug testing results, and survey information are presented in Tables B.1 through B.6, respectively. Phase 1 subsurface logs and temporary well installation details are located in Attachment C.1 and Attachment C.2, respectively. Phase 1 geotechnical laboratory testing results for select soil samples are presented in Attachments F.1 through F.5.

Phase 1 EXD activities were carried out concurrently with CCR material sampling and pore water monitoring and sampling, which were performed in accordance with the CCR Material Characteristics and Material Quantity SAPs. Refer to the CCR Material Characterization and Material Quantity SARs for information from those concurrent activities.

4.2 PHASE 2 EXPLORATORY DRILLING

The Phase 2 EXD included a total of 12 geotechnical borings. Three of the borings included VWP installations. The borings were implemented to improve subsurface characterization in support of upcoming stability analyses. The scope of work for Phase 2 EXD included:

- Performed a bathymetric survey within the Intake Channel adjacent to the East Dike
- Drilled 12 borings within the Sluice Trench and Ballfield East of Sluice Trench
- Collected soil samples to develop a subsurface log/soil profile for each boring, with select soil samples subjected to geotechnical laboratory testing
- Installed VWPs in three of the borings and constructed surface protections
- Surveyed each new boring location.

A summary of the Phase 2 EXD performed in each CCR unit is presented in Table 3. A summary of the Phase 2 EXD borings, including CCR unit and borehole termination criteria, are presented in Table 4. Phase 2 boring summary, soil and rock sample summary, VWP construction details, and survey information are presented in Tables B.7 through B.10, respectively. Phase 2 subsurface logs and VWP installation details are located in Attachment C.3 and Attachment C.4, respectively. Phase 2 geotechnical laboratory testing results for select soil samples are presented in Attachments F.6 through F.8. A contour map for the top of sediment/soil within the limits of the bathymetric survey is presented in Appendix G.

4.3 CLOSING

Stantec has completed the EXD at the KIF Plant in Roane County, Tennessee, in accordance with the EXD SAP and EXD SAP Addendum as documented herein. The data collected during the EXD are usable for reporting and evaluation in the EAR and meet the objectives of the TDEC Order EIP. EXD boring, temporary well installation, and VWP installation data will be evaluated along with data collected under other SAPs, including but not limited to, the CCR materials characteristics and CCR material quantity investigations. This evaluation will be provided in the EAR.

5.0 REFERENCES

American Society for Testing and Materials (ASTM). D4044: *Standard Test Method for (Field Procedure) for Instantaneous Change in Head (Slug) Tests for Determining Hydraulic Properties of Aquifers.*

ASTM. D4220: *Standard Practices for Preserving and Transporting Soil Samples.*

ASTM. D4633: *Standard Test Method for Energy Measurement for Dynamic Penetrometers.*

ASTM. D5783: *Standard Guide for Use of Direct Rotary Drilling with Water-Based Drilling Fluid for Geoenvironmental Exploration and the Installation of Subsurface Water-Quality Monitoring Devices.*

Environmental Standards, Inc. 2018. *Quality Assurance Project Plan for the Tennessee Valley Authority Kingston Fossil Plant Environmental Investigation. Revision 3.* Prepared for Tennessee Valley Authority. November 2018.

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Stantec Consulting Services Inc. (Stantec). 2018a. *Exploratory Drilling Sampling and Analysis Plan, Kingston Fossil Plant. Revision 4.* Prepared for Tennessee Valley Authority. November 9, 2018.

Stantec. 2018b. *Environmental Investigation Plan, Kingston Fossil Plant. Revision 4.* Prepared for Tennessee Valley Authority. November 9, 2018

Stantec. 2018c. *CCR Material Characteristics Sampling and Analysis Plan, Kingston Fossil Plant. Revision 4.* Prepared for Tennessee Valley Authority. November 9, 2018.

Stantec. 2018d. *Material Quantity Sampling and Analysis Plan, Kingston Fossil Plant. Revision 4.* Prepared for Tennessee Valley Authority. November 9, 2018.

Stantec. 2018e. *Groundwater Investigation Sampling and Analysis Plan, Kingston Fossil Plant. Revision 4.* Prepared for Tennessee Valley Authority. November 9, 2018.

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Tennessee Department of Environment and Conservation. 2015. *Commissioner's Order No. OGC15-0177.*

Tennessee Valley Authority (TVA). ENV-TI-05.80.02, *Sample Labeling and Custody*.

TVA. ENV-TI-05.80.03, *Field Record Keeping.*

TVA. ENV-TI-05.80.05, *Field Sampling Equipment Cleaning and Decontamination*.

TVA. ENV-TI-05.80.25, *Monitoring Well and Piezometer Installation and Development*.

TVA. ENV-TI-05.80.42, *Groundwater Sampling.*

TVA. ENV-TI-05.80.46, *Field Measurement Using a Multiparameter Sonde.*

APPENDIX A - EXHIBITS

Exhibit No.

A.1

Title

Site Location Map

Client/Project

Tennessee Valley Authority
Kingston Fossil (KIF) Plant TDEC Order

Project Location

Roane County, Tennessee

175668043
Prepared by MB on 2020-05-19
Technical Review by AB on 2020-05-19

0 1,000 2,000 3,000 4,000 Feet

1:12,000 (At original document size of 22x34)

Legend

- CCR Unit Area (Approximate)
- Engineered Wetlands (Approximate)
- Polishing Pond (Approximate)

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Topographic mapping corresponds to the Harriman Quadrangle (Edition of 2019, Scale 1:24,000) and the Elverton Quadrangle (Edition of 2019, Scale 1:24,000)

Stantec TVA

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Exhibit No.

A.2

Title

Phase 1 Boring Location Map

Client/Project

Tennessee Valley Authority
Kingston Fossil Plant (KIF) TDEC Order

Project Location

Roane County, Tennessee

175668043
Prepared by DMB on 2021-07-20
Technical Review by TG on 2021-07-20

0 300 600 900 1,200 Feet

1:3,600 (At original document size of 22x34)

Legend

- Geotechnical Boring
- Temporary Well (Screened Interval)
- 2018 Imagery Boundary
- CCR Unit Area (Approximate)
- Engineered Wetlands (Approximate)
- Polishing Pond (Approximate)

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Imagery provided by TVA and flown by Tuck Mapping on March 16, 2017.
3. Imagery for the KRP Ash Landfill and Stilling Pond provided by TVA from September 12, 2018.
4. KIF-TW03a and KIF-TW03b were attempted at the KIF-TW03 location referenced in EIP Rev. 4. However, the temporary well could not be installed at this location.
5. KIF-TW03 was drilled at the KIF-TW03Alt location referenced in EIP Rev. 4.
6. Boring locations for KIF-TW01, KIF-TW02, KIF-TW03, KIF-TW04, KIF-TW05 surveyed by the R.L.S. Group on May 2, 2019. Boring locations for KIF-TW03a and KIF-TW03b based on handheld GPS coordinates at the time of drilling.
7. Borings locations for KIF-B01a, KIF-B01b, KIF-B02a, KIF-B02b, KIF-B03a, KIF-B03b, and KIF-B04a surveyed by TVA on January 9, 2020.

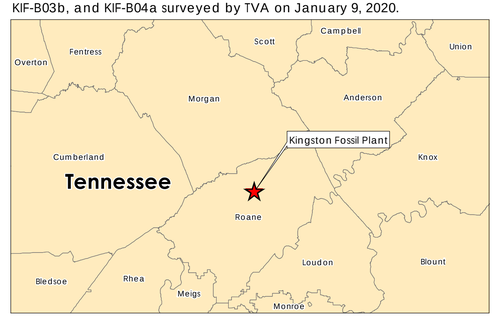

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Exhibit No.

A.3

Title

Phase 2 Boring Location Map

Client/Project

Tennessee Valley Authority
Kingston Fossil Plant (KIF) TDEC Order

Project Location

Roane County, Tennessee

175668043
Prepared by DMB on 2021-08-05
Technical Review by DW on 2021-08-05

0 300 600 900 1,200 Feet

1:3,600 (At original document size of 22x34)

Legend

- Geotechnical Boring
- Boring with Vibrating Wire Piezometer
- 2018 Imagery Boundary
- CCR Unit Area (Approximate)
- Engineered Wetlands (Approximate)
- Polishing Pond (Approximate)

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Imagery provided by TVA and flown by Tuck Mapping on March 16, 2017.
3. Imagery for the KRP Ash Landfill and Stilling Pond provided by TVA from September 12, 2018.
4. Boring locations for KIF-B05, KIF-B09, and KIF-B13 surveyed by TVA on March 4, 2021.
5. Borings KIF-B06 through KIF-B08, KIF-B10 through KIF-B12, and KIF-B14 through KIF-B16 were drilled from a barge. For each boring, the top of temporary casing location was surveyed by Stantec prior to moving to the next boring location.

Stantec

TVA

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Exhibit No.

A.4

Title

Phase 2 Instrument Location Map

Client/Project

Tennessee Valley Authority
Kingston Fossil Plant (KIF) TDEC Order

Project Location

Roane County, Tennessee

175668043
Prepared by DMB on 2021-08-05
Technical Review by DW on 2021-08-05

0 300 600 900 1,200 Feet

1:3,600 (At original document size of 22x34)

Legend

- Vibrating Wire Piezometer (Tip Interval)
- 2018 Imagery Boundary
- CCR Unit Area (Approximate)
- Engineered Wetlands (Approximate)
- Polishing Pond (Approximate)

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Imagery provided by TVA and flown by Tuck Mapping on March 16, 2017.
3. Imagery for the KRP Ash Landfill and Stilling Pond provided by TVA from September 12, 2018.

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APPENDIX B - TABLES

Table B.1 - Summary of Phase 1 Borings
Kingston Fossil Plant
November 2018-January 2020

Boring ID	Ground Surface Elev.	Bottom of CCR Elev.	Refusal Elev.	Bottom of Hole Elev.	Total Hole Depth	Total Overburden Footage	Sample / Test Type
	ft NGVD29	ft NGVD29	ft NGVD29	ft NGVD29	ft bgs	ft	
KIF-TW01	771.8	N/A	NR	727.8	44.0	44.0	SS, ST
KIF-TW02	771.9	N/A	NR	726.4	45.5	45.5	SS, ST
KIF-TW03a	771.4	N/A	756.1	756.1	15.3	15.3	SS
KIF-TW03b	771.9	N/A	758.4	758.4	13.5	13.5	SS
KIF-TW03	776.0	N/A	NR	728.5	47.5	47.5	SS, ST
KIF-TW04	765.2	N/A	NR	724.2	41.0	41.0	SS, ST
KIF-TW05	770.5	732.5	NR	729.5	41.0	41.0	SS, ST
KIF-B01a	771.3	721.5	NR	716.3	55.0	55.0	DP
KIF-B01b	771.3	719.9	NR	716.3	55.0	55.0	DP
KIF-B02a	772.3	719.6	NR	714.8	57.5	57.5	DP
KIF-B02b	772.5	720.2	NR	715.0	57.5	57.5	DP
KIF-B03a	776.3	721.8	NR	716.3	60.0	60.0	DP
KIF-B03b	776.5	722.0	NR	716.5	60.0	60.0	DP
KIF-B04a	765.5	721.5	NR	715.5	50.0	50.0	DP

Notes:

bgs	below ground surface	N/A	Not Applicable
CCR	coal combustion residuals	NGVD29	National Geodetic Vertical Datum of 1929
Elev.	elevation	NR	No Refusal
DP	direct push (2” diameter)	SS	split-spoon (2” or 3”, refer to boring log for sampler size)
ft	feet	ST	undisturbed thin-walled Shelby tube
ID	identification		

1. Ground surface elevations listed are as-drilled elevations.
2. Refusal indicates rock-like resistance to boring advancement. This may indicate the beginning of weathered bedrock, boulders, rock remnants, cemented materials, or other hard/dense layers that prevent hole advancement.
3. KIF-TW03a and KIF-TW03b were attempted at the KIF-TW03 location referenced in EIP Rev. 4. However, the temporary well could not be installed at this location.
4. KIF-TW03 was drilled at the KIF-TW03ALT location referenced in EIP Rev. 4.

Stantec

Table B.2 - Summary of Phase 1 Soil and Rock Samples
Kingston Fossil Plant
November 2018-January 2020

Boring ID	No. 2" SS Samplers Driven	No. 3" SS Samplers Driven	No. ST Samplers Pushed	No. DP Samplers Advanced	Rock Core (Y/N)	Drill Rig ID	Split-Spoon Sampler Size	Hammer Weight (lbs)	Hammer Drop Height (inches)
KIF-TW01	--	26	3	--	N	CME 55T#1, #709	3-inch	140	30
KIF-TW02	--	28	2	--	N	CME 55T#1, #709	3-inch	140	30
KIF-TW03a	--	9	--	--	N	CME 55T#1, #709	3-inch	140	30
KIF-TW03b	--	9	--	--	N	CME 55T#1, #709	3-inch	140	30
KIF-TW03	--	29	2	--	N	CME 55T#1, #709	3-inch	140	30
KIF-TW04	--	25	2	--	N	CME 55T#1, #709	3-inch	140	30
KIF-TW05	--	26	1	--	N	CME 850XR, #953	3-inch	140	30
KIF-B01a	--	--	--	4	N	Geoprobe 3230DT	--	--	--
KIF-B01b	--	--	--	5	N	Geoprobe 3230DT	--	--	--
KIF-B02a	--	--	--	5	N	Geoprobe 3230DT	--	--	--
KIF-B02b	--	--	--	7	N	Geoprobe 3230DT	--	--	--
KIF-B03a	--	--	--	5	N	Geoprobe 3230DT	--	--	--
KIF-B03b	--	--	--	5	N	Geoprobe 3230DT	--	--	--
KIF-B04a	--	--	--	4	N	Geoprobe 3230DT	--	--	--
Total	**--**	**152**	**10**	**35**	**--**	--	--	--	--

Notes:

CME	Central Mining Equipment
DP	direct push
ID	identification
lbs	pounds
SS	split-spoon
ST	undisturbed thin-walled Shelby tube
Y/N	Yes/No

1. Number of samplers driven/pushed/advanced includes attempts that had zero recovery.

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Table B.3 - Summary of Temporary Well Installation
Kingston Fossil Plant
November 2018-January 2020

	Bottom of Well		Screened Interval		Bottom of CCR Interface	
Well ID	**Depth**	**Elevation**	**Depth**	**Elevation**	**Depth**	**Elevation**
	ft bgs	ft NGVD29	ft bgs	ft NGVD29	ft bgs	ft NGVD29
KIF-TW01	37.0	734.8	26.5 - 36.5	745.3 - 735.3	51.1	720.7
KIF-TW02	40.5	731.4	30.0 - 40.0	741.9 - 731.9	52.0	719.9
KIF-TW03	44.0	732.0	33.5 - 43.5	742.5 - 732.5	54.1	721.9
KIF-TW04	36.5	728.7	26.0 - 36.0	739.2 - 729.2	43.7	721.5
KIF-TW05	36.5	734.0	26.5 - 36.1	744.0 - 734.4	38.0	732.5

Notes:

bgs	below ground surface
CCR	coal combustion residuals
ft	feet
ID	identification
NGVD29	National Geodetic Vertical Datum of 1929

1. Measurement data are from Well Installation Details (Attachment C.2).
2. Wells were surveyed on 5/2/2019.
3. Bottom of CCR interface is approximated based on adjacent direct push borings (except KIF-TW05)

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Table B.4 - Summary of Well Development Data
Kingston Fossil Plant
November 2018-January 2020

Well ID	pH		Turbidity		Specific Conductance		Temperature	
	Initial	Final	Initial	Final	Initial	Final	Initial	Final
			NTU	NTU	uS/cm	uS/cm	DEG C	DEG C
KIF-TW01	6.74	6.78	69.5	8.92	2,255	2,725	18.2	17.4
KIF-TW02	6.90	6.88	50.5	9.26	1,200	1,321	15.3	16.4
KIF-TW03	6.97	6.94	34.3	9.64	1,507	1,822	15.9	16.9
KIF-TW04	8.82	8.77	127	9.52	875	909	20.4	18.7
KIF-TW05	6.41	6.53	323	9.06	1,993	1,826	16.9	17.8

Notes:

DEG C	degrees Celsius
ID	identification
NTU	Nephelometric Turbidity Unit
uS/cm	microSiemens per centimeter

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Table B.5 - Summary of Hydraulic Conductivity (Slug) Testing Results
Kingston Fossil Plant
November 2018 - January 2020

Well ID	Saturated Thickness	Number of Tests		Average Hydraulic Conductivity	Average Hydraulic Conductivity
		Falling Head	Rising Head		
	ft			ft/day	cm/s
KIF-TW01	20.9	3	3	2.72	9.61E-04
KIF-TW02	23.9	3	3	20.21	7.13E-03
KIF-TW03	23.1	4	4	15.89	5.60E-03
KIF-TW04	26.0	3	3	40.59	1.43E-02
KIF-TW05	21.9	3	3	4.68	1.65E-03

Notes:

cm/s	centimeters per second
ft	feet
ft/day	feet per day
ID	identification

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Table B.6 - Summary of Phase 1 Boring and Temporary Well Survey Data
Kingston Fossil Plant
November 2018-January 2020

Temporary Well ID	TN State Plane Northing	TN State Plane Easting	Latitude	Longitude	Ground Surface Elevation	Top of Casing Elevation	Remarks
	ft NAD83	ft NAD83	DMS NAD83	DMS NAD83	ft NGVD29	ft NGVD29	
KIF-TW01	576,050.03	2,407,660.06	35°54'24.21"	-84°31'01.27"	771.8	775.36	
KIF-TW02	575,548.50	2,407,585.76	35°54'19.26"	-84°31'02.27"	771.9	774.73	
KIF-TW03a	575,741.10	2,407,987.60	N/A	N/A	771.4	--	Temporary well not installed
KIF-TW03b	575,741.10	2,407,967.60	N/A	N/A	771.9	--	Temporary well not installed
KIF-TW03	575,720.53	2,408,211.78	35°54'20.87"	-84°30'54.63"	776.0	778.90	Temporary well installed in boring KIF-TW03ALT
KIF-TW04	574,754.11	2,407,855.14	35°54'11.36"	-84°30'59.14"	765.2	769.60	
KIF-TW05	575,382.75	2,408,921.34	35°54'17.42"	-84°30'46.07"	770.5	773.59	
KIF-B01a	576,069.92	2,407,677.68	35°54'24.40"	-84°31'01.06"	771.3	--	
KIF-B01b	576,072.41	2,407,677.12	35°54'24.42"	-84°31'01.06"	771.3	--	
KIF-B02a	575,556.85	2,407,609.96	35°54'19.34"	-84°31'01.97"	772.3	--	
KIF-B02b	575,555.09	2,407,613.60	35°54'19.32"	-84°31'01.93"	772.5	--	
KIF-B03a	575,720.46	2,408,236.12	35°54'20.86"	-84°30'54.33"	776.3	--	
KIF-B03b	575,718.86	2,408,238.19	35°54'20.84"	-84°30'54.31"	776.5	--	
KIF-B04a	574,774.09	2,407,874.27	35°54'11.56"	-84°30'58.91"	765.5	--	

Notes:

ALT	Alternate	NAD83	North American Datum of 1983
DMS	Degrees, Minutes, Seconds	NGVD29	National Geodetic Vertical Datum of 1929
ft	feet	TN	Tennessee
ID	identification	N/A	Not Applicable

1. Temporary wells were surveyed on 5/2/2019 and borings were surveyed on 1/9/2020. State Plane coordinates rounded to the nearest 0.01 feet. Latitude and Longitude rounded to the nearest 0.01 second. Ground surface elevations rounded to the nearest 0.1 feet.

2. Top of casing elevations only apply to temporary wells.

3. Boring locations for KIF-TW03a and KIF-TW03b are based on handheld global positioning system coordinates at the time of drilling.

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Table B.7 - Summary of Phase 2 Borings
Kingston Fossil Plant
January 2021-February 2021

Boring ID	Ground Surface Elev.	Bottom of CCR Elev.	Refusal Elev.	Bottom of Hole Elev.	Total Hole Depth	Total Overburden Footage	Sample / Test Type
	ft NGVD29	ft NGVD29	ft NGVD29	ft NGVD29	ft bgs	ft	
KIF-B05	756.5	751.0	707.5	707.5	49.0	48.6	SS, ST
KIF-B06	739.6	N/A	NR[3]	704.9	34.7	33.7	SS
KIF-B07	739.9	N/A	NR[3]	704.9	35.0	34.0	SS, ST
KIF-B08	739.3	N/A	704.0	704.0	35.3	34.0	SS, ST
KIF-B09	754.5	751.6	702.7	702.7	51.8	50.7	SS, ST
KIF-B10	739.0	N/A	701.8	701.8	37.2	36.5	SS
KIF-B11	739.2	N/A	703.4	703.4	35.8	34.6	SS, ST
KIF-B12	739.2	N/A	NR[3]	702.9	36.3	35.3	SS, ST
KIF-B13	753.2	N/A	NR[3]	702.9	50.3	48.8	SS, ST
KIF-B14	738.4	N/A	702.4	702.4	36.0	35.5	SS
KIF-B15	739.1	N/A	708.0	708.0	31.1	30.5	SS, ST
KIF-B16	738.5	N/A	NR[3]	709.2	29.3	29.0	SS, ST

Notes:

bgs	below ground surface	N/A	Not Applicable
CCR	coal combustion residuals	NGVD29	National Geodetic Vertical Datum of 1929
Elev.	elevation	NR	No Refusal
ft	feet	SS	split-spoon (2” diameter)
ID	identification	ST	undisturbed thin-walled Shelby tube

1. Ground surface elevations listed are as-drilled elevations.

2. Refusal indicates rock-like resistance to boring advancement. This may indicate the beginning of weathered bedrock, boulders, rock remnants, cemented materials, or other hard/dense layers that prevent hole advancement.

3. Borings KIF-B06, KIF-B07, KIF-B12, KIF-B13, and KIF-B16 were terminated based on field observations by the Stantec PE, without achieving the planned refusal. However, these borings reached weathered rock, which was sufficient to achieve the technical objectives for these borings.

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Table B.8 - Summary of Phase 2 Soil and Rock Samples
Kingston Fossil Plant
January 2021-February 2021

Boring ID	No. 2" SS Samplers Driven	No. 3" SS Samplers Driven	No. ST Samplers Pushed	Rock Core (Y/N)	Drill Rig ID	Split-Spoon Sampler Size	Hammer Weight (lbs)	Hammer Drop Height (inches)
KIF-B05	20	--	1	N	CME 55T#1, #709	2"	140	30
KIF-B06	12	--	--	N	CME 55T#1, #709	2"	140	30
KIF-B07	10	--	1	N	CME 55T#1, #709	2"	140	30
KIF-B08	10	--	2	N	CME 55T#1, #709	2"	140	30
KIF-B09	20	--	2	N	CME 55T#1, #709	2"	140	30
KIF-B10	13	--	--	N	CME 55T#1, #709	2"	140	30
KIF-B11	9	--	2	N	CME 55T#1, #709	2"	140	30
KIF-B12	7	--	3	N	CME 55T#1, #709	2"	140	30
KIF-B13	20	--	1	N	CME 55T#1, #709	2"	140	30
KIF-B14	12	--	--	N	CME 55T#1, #709	2"	140	30
KIF-B15	7	--	1	N	CME 55T#1, #709	2"	140	30
KIF-B16	7	--	1	N	CME 55T#1, #709	2"	140	30
Total	**147**	**--**	**14**	**--**	--	--	--	--

Notes:

CME	Central Mining Equipment
ID	identification
lbs	pounds
SS	split-spoon
ST	undisturbed thin-walled Shelby tube
Y/N	Yes/No

1. Number of samplers driven/pushed/advanced includes attempts that had zero recovery.

Table B.9 - Summary of Vibrating Wire Piezometer Installation
Kingston Fossil Plant
January 2021-February 2021

Boring ID	VWP ID	Ground Surface Elev.	VWP Sensor		
			Installed Depth	Tip Elev.	Material
		ft NGVD29	ft bgs	ft NGVD29	
KIF-B05	KIF-B05A	756.5	35.0	721.5	Foundation Soil
	KIF-B05B	756.5	45.0	711.5	Foundation Soil
KIF-B09	KIF-B09A	754.5	35.0	719.5	Foundation Soil
	KIF-B09B	754.5	50.0	704.5	Foundation Soil
KIF-B13	KIF-B13A	753.2	23.0	730.2	Foundation Soil
	KIF-B13B	753.2	43.0	710.2	Foundation Soil

Notes:

bgs	below ground surface	ID	identification
CCR	coal combustion residuals	NGVD29	National Geodetic Vertical Datum of 1929
Elev.	elevation	VWP	vibrating wire piezometer
ft	feet		

1. Ground surface elevations listed are as-drilled elevations.
2. Measurement data are from VWP Installation Details (Attachment C.4).

Table B.10 - Summary of Phase 2 Boring Survey Data
Kingston Fossil Plant
January 2021-February 2021

Boring ID	TN State Plane Northing	TN State Plane Easting	Latitude	Longitude	Ground Surface Elevation	Top of Casing Elevation	Remarks
	ft NAD83	ft NAD83	DMS NAD83	DMS NAD83	ft NGVD29	ft NGVD29	
KIF-B05	574,498.86	2,408,062.70	35˚54'08.80"	-84˚30'56.70"	756.5	--	
KIF-B06	574,420.30	2,408,131.50	35˚54'08.02"	-84˚30'55.84"	--	739.6	Drilled from barge
KIF-B07	574,401.90	2,408,144.80	35˚54'07.84"	-84˚30'55.69"	--	739.9	Drilled from barge
KIF-B08	574,378.30	2,408,167.50	35˚54'07.60"	-84˚30'55.41"	--	739.3	Drilled from barge
KIF-B09	574,620.91	2,408,217.76	35˚54'10.00"	-84˚30'54.80"	754.5	--	
KIF-B10	574,552.60	2,408,280.40	35˚54'09.31"	-84˚30'54.01"	--	739.0	Drilled from barge
KIF-B11	574,534.20	2,408,302.40	35˚54'09.12"	-84˚30'53.75"	--	739.2	Drilled from barge
KIF-B12	574,522.10	2,408,318.70	35˚54'09.00"	-84˚30'53.55"	--	739.2	Drilled from barge
KIF-B13	574,919.10	2,408,553.07	35˚54'50.60"	-84˚30'50.60"	753.2	--	
KIF-B14	574,839.50	2,408,620.30	35˚54'12.09"	-84˚30'49.83"	--	738.4	Drilled from barge
KIF-B15	574,817.30	2,408,631.80	35˚54'11.87"	-84˚30'49.69"	--	739.1	Drilled from barge
KIF-B16	574,797.40	2,408,648.30	35˚54'11.67"	-84˚30'49.49"	--	738.5	Drilled from barge

Notes:

DMS	Degrees, Minutes, Seconds	NGVD29	National Geodetic Vertical Datum of 1929
ft	feet	TN	Tennessee
ID	identification	N/A	Not Applicable
NAD83	North American Datum of 1983		

1. Borings KIF-B05, KIF-B09, and KIF-B13 were surveyed by TVA on 3/4/2021. For borings KIF-B06 through KIF-B08, KIF-B10 through KIF-B12, and KIF-B14 through KIF-B16, the top of temporary casing location was surveyed by Stantec prior to moving to the next boring location. State Plane coordinates rounded to the nearest 0.01 feet. Latitude and Longitude rounded to the nearest 0.01 second. Ground surface elevations rounded to the nearest 0.1 feet.

2. Horizontal coordinates surveyed by Stantec were acquired using a handheld global positioning system with sub-meter accuracy. The vertical coordinates were acquired using differential leveling techniques, relative to a temporary benchmark on the East Dike.

3. Top of casing elevations correlate to a depth of zero on the boring logs, for borings drilled from the barge.

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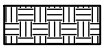
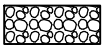
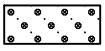
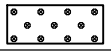
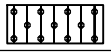
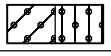
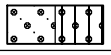
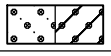
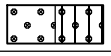
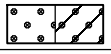
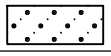
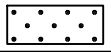
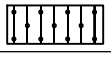
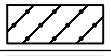
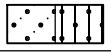
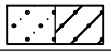
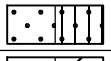
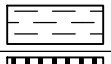
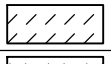
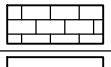
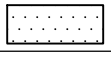
APPENDIX C – SUBSURFACE LOGS, TEMPORARY WELL INSTALLATION DETAILS, AND VIBRATING WIRE PIEZOMETER INSTALLATION DETAILS

ATTACHMENT C.1

Phase 1 Subsurface Logs

Subsurface Boring Legend

Lithology Graphics

Symbol	Lithology
	Fill
	Top Soil
	Gravel
	Well Graded Gravel (GW)
	Poorly Graded Gravel (GP)
	Silty Gravel (GM)
	Silty, Clayey Gravel (GC-GM)
	Clayey Gravel (GC)
	Well Graded Gravel with Silt (GW-GM)
	Well Graded Gravel with Clay (GW-GC)
	Poorly Graded Gravel with Silt (GP-GM)
	Poorly Graded Gravel with Clay (GP-GC)
	Well Graded Sand (SW)
	Poorly Graded Sand (SP)
	Silty Sand (SM)
	Silty, Clayey Sand (SC-SM)
	Clayey Sand (SC)
	Well Graded Sand with Silt (SW-SM)
	Well Graded Sand with Clay (SW-SC)
	Poorly Graded Sand with Silt (SP-SM)
	Poorly Graded Sand with Clay (SP-SC)
	Silt (ML)
	Silty Clay (CL-ML)
	Lean Clay (CL)
	Organic Silt (OL)
	Elastic Silt (MH)
	Fat Clay (CH)
	Organic Clay (OH)
	Non-Durable Shale
	Durable Shale
	Coal
	Limestone
	Sandstone

Lithology Graphics are based on TVA drafting standards.

Other Graphics

Symbol	Description
	Denotes environmental analytical sample interval
	Denotes SS sample interval
	Denotes ST sample interval
	Denotes DP sample interval
	Denotes RS sample interval
	Denotes RC sample interval
	First water level reading
	Second water level reading

Common Abbreviations

Abbreviation	Definition
DP	Direct Push
HA	Hand Auger
HSA	Hollow Stem Auger
N/A	Not Applicable
NR	Not Recorded
RC	Rock Core
RQD	Rock Quality Designation
RS	Rotary Sonic
SS	Split Spoon
ST	Shelby Tube
WH	Weight of Hammer
WR	Weight of Rod

General Notes

The boring logs include sample numbering used during drilling. For assigned Environmental Analytical Sample ID numbers, see relevant Environmental Chain-of- Custody forms from the drilling date range listed on each log.

For pH readings and additional field data, see applicable field documentation (e.g., Soil pH Data Form) from the drilling date range listed on each log.

SUBSURFACE LOG

Client Borehole ID	N/A	Stantec Boring No.	**KIF-TW01**
Client	Tennessee Valley Authority	Boring Location	576,050.03 N; 2,407,660.05 E NAD83
Project Number	175668043	Surface Elevation	771.8 ft
Elevation Datum	NGVD29		
Project Name	KIF TDEC Order	Date Started	1/24/19
Completed	1/28/19		
Project Location	Harriman, Tennessee	Depth to Water	15.5 ft
Date/Time	1/25/19 09:05		
Inspector	J. Andrew	Logger	D. Mihalek
Depth to Water	N/A	Date/Time	N/A
Drilling Contractor	Stantec Consulting Services Inc.	Drill Rig Type and ID	CME 55T#1, #709
Overburden Drilling and Sampling Tools (Type and Size)	4-1/4" HSA, 3" SS w/o liners, 3" Shelby Tubes		
Rock Drilling and Sampling Tools (Type and Size)	N/A		
Overdrill Tooling (Type and Size)	8-1/4" HSA overdrill of boring	Overdrill Depth	44.0 ft
Sampler Hammer Type	Automatic	Weight	140
Drop	30	Efficiency	N/A
Borehole Azimuth	N/A (Vertical)	Borehole Inclination (from Vertical)	N/A
Reviewed By	E. Smith	Approved By	L. Price

Lithology Depth Ft[3]	Elevation	Graphic	Description	Overburden: / Rock Core:	Sample[1,2]	Depth Ft[3]	Rec. Ft	Blows/PSI
					RQD %	Run Ft	Rec. Ft	Rec. %
0.0	771.8		Top of Hole					
0.3	771.5		Top Soil, [FILL]					
			FAT CLAY, CH, 5YR 4/6 (yellowish red), high plasticity, firm, with sand and interbedded chert pebbles, [FILL]		SS01G	0.0 - 1.5	1.2	2-3-8
1.9	769.9				SS02aG	1.5 - 1.9		
			SANDY SILT, ML, 5Y 4/1 (dark gray), non-plastic, firm, dry, [CCR]	2.0/4.0-20190124	SS02b	1.9 - 2.0	1.5	9-16-19
					SS02cE	2.0 - 3.0		
					SS03aE	3.0 - 4.0	1.5	11-15-18
					SS03bG	4.0 - 4.5		
5.5	766.3				SS04aG	4.5 - 5.5	1.3	19-42-17
6.0	765.8		WELL GRADED GRAVEL, GW, 10YR 6/1 (gray), dense, riprap, limestone, [FILL]		SS04bG	5.5 - 6.0		
6.5	765.3				SS05aG	6.0 - 6.5		
7.0	764.8		SILT, ML, 5Y 4/1 (dark gray), low plasticity, firm, dry, [CCR]	7.0/9.0-20190124	SS05bG	6.5 - 7.0	1.5	5-6-31
					SS05cE	7.0 - 7.5		
			FAT CLAY, CH, 7.5YR 4/4 (brown), high plasticity, firm, moist, [FILL]		SS06E	7.5 - 9.0	1.5	23-32-35
			SILT, ML, 5Y 4/1 (dark gray), low plasticity, hard, dry, [CCR]		SS07aG	9.0 - 9.5		
					SS07bG	9.5 - 10.0	1.5	7-25-48
					SS07cG	10.0 - 10.5		
					SS08aG	10.5 - 11.5	1.5	17-24-19
11.8	760.0				SS08bE	11.5 - 12.0		
12.0	759.8		FAT CLAY, CH, 7.5YR 4/4 (brown), high plasticity, firm, moist, [FILL]	11.5/13.5-20190124	SS09E	12.0 - 13.5	1.5	8-11-14
13.5	758.3		SILT, ML, 5Y 4/1 (dark gray), low plasticity, firm, dry, [CCR]		SS10G	13.5 - 15.0	1.5	12-11-11
			SILTY SAND, SM, 10YR 3/1 (very dark gray), medium dense, moist, [CCR]		SS11G	15.0 - 16.5	1.5	9-9-6
			Wet at 15.5'					
			Very loose at 16.5'	16.5/18.5-20190125	SS12E	16.5 - 18.0	1.5	3-2-3

TVA EIP BORING LOG_175668043_TVA_KIF_TDEC.GPJ_TDEC SUBSURF DT 20190530.GDT 4/9/20

SUBSURFACE LOG

Client Borehole ID: N/A
Stantec Boring No.: **KIF-TW01**
Client: Tennessee Valley Authority
Boring Location: 576,050.03 N; 2,407,660.05 E NAD83
Project Number: 175668043
Surface Elevation: 771.8 ft
Elevation Datum: NGVD29

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]		Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft		Rec. Ft	Rec. %
18			SILTY SAND, SM, 10YR 3/1 (very dark gray), medium dense, moist, [CCR] *(Continued)*		SS13aE	18.0 - 18.5	18.0 - 19.5	1.5	2-1-2
19					SS13bG	18.5 - 19.5			
20					ST01G	19.5 - 21.5	19.5 - 21.5	0.0	NR
21									
22				21.5/23.5-20190128	SS15E	21.5 - 22.5	21.5 - 22.5	1.0	3-3
23					SS16aE	22.5 - 23.5	22.5 - 24.0	1.5	2-2-3
24					SS16bG	23.5 - 24.0			
25					ST02G	24.0 - 26.0	24.0 - 26.0	0.0	NR
26	26.0	745.8			SS18a	26.0 - 26.5	26.0 - 27.0	0.7	WH-2-4
27			SILTY SAND WITH GRAVEL, SM, 5YR 2.5/1 (black), coarse, very loose, wet, [CCR]		SS18bE	26.5 - 27.0			
28				26.5/28.5-20190128	SS19E	27.0 - 28.5	27.0 - 28.5	1.5	2-5-7
29					SS20G	28.5 - 30.0	28.5 - 30.0	1.5	5-5-5
30					SS21aG	30.0 - 30.5			
31	31.0	740.8			SS21b	30.5 - 31.0	30.0 - 31.5	1.2	4-4-4
32	32.0	739.8	SILTY SAND, SM, 5YR 2.5/1 (black), fine to medium, loose, wet, [CCR]		SS21cG	31.0 - 31.5			
33	33.0	738.8	WELL GRADED SAND, SW, 5YR 2.5/1 (black), coarse, very loose, wet, [CCR]	31.5/33.5-20190128	SS22E	31.5 - 33.0	31.5 - 33.0	1.5	3-3-6
34			SILTY SAND, SM, 5YR 2.5/1 (black), fine to medium, very loose, wet, [CCR]		SS23aE	33.0 - 33.5	33.0 - 34.5	1.5	3-5-5
35					SS23bG	33.5 - 34.5			
36					SS24G	34.5 - 36.0	34.5 - 36.0	1.5	1-3-5
37					SS25aG	36.0 - 36.5	36.0 - 37.5	1.5	2-4-9
38				36.5/38.5-20190128	SS25bE	36.5 - 37.5			
39	38.8	733.0			SS26aE	37.5 - 38.5	37.5 - 39.0	1.5	10-7-8
40	40.5	731.3	SILT, ML, 7.5YR 3/1 (very dark gray), non-plastic, very loose, wet, [CCR]		SS26bG	38.5 - 39.0			
41	41.5	730.3	SILTY SAND, SM, 5YR 3/1 (very dark gray), very loose, wet, [CCR]		SS27G	39.0 - 40.5	39.0 - 40.5	1.5	1-1-1
42					SS28G	40.5 - 42.0	40.5 - 42.0	1.5	1-2-1

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 4/9/20

SUBSURFACE LOG

Client Borehole ID N/A
Stantec Boring No. **KIF-TW01**
Client Tennessee Valley Authority
Boring Location 576,050.03 N; 2,407,660.05 E NAD83
Project Number 175668043
Surface Elevation 771.8 ft
Elevation Datum NGVD29

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]		Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft		Rec. Ft	Rec. %
43			SILT, ML, 5YR 3/1 (very dark gray), non-plastic, very loose, wet, [CCR] *(Continued)*		ST03G	42.0 - 44.0	42.0 - 44.0	1.2	NR
44	44.0	727.8							

No Refusal /
Bottom of Hole at 44.0 Ft.

Temporary well installed. See well installation log for backfill details

1: E = Environmental Sample Custody (two Split Spoons may be required to obtain sufficient sample)
G = Geotechnical Sample Custody
2: a,b,c denote Split Spoon divided between Environmental and Geotechnical Samples
3: Depths are reported in feet below ground surface

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 4/9/20

SUBSURFACE LOG

Client Borehole ID	N/A	Stantec Boring No.	**KIF-TW02**
Client	Tennessee Valley Authority	Boring Location	575,548.50 N; 2,407,585.76 E NAD83
Project Number	175668043	Surface Elevation	771.9 ft
		Elevation Datum	NGVD29
Project Name	KIF TDEC Order	Date Started	2/5/19
		Completed	2/5/19
Project Location	Harriman, Tennessee	Depth to Water	18.3 ft
		Date/Time	
Inspector	J. Andrew	Logger	D. Mihalek
Depth to Water	N/A	Date/Time	N/A
Drilling Contractor	Stantec Consulting Services Inc.	Drill Rig Type and ID	CME 55T#1, #709
Overburden Drilling and Sampling Tools (Type and Size)	4-1/4" HSA, 3" SS w/o liners, 3" Shelby Tubes		
Rock Drilling and Sampling Tools (Type and Size)	N/A		
Overdrill Tooling (Type and Size)	8-1/4" HSA overdrill of boring	Overdrill Depth	44.5 ft
Sampler Hammer Type	Automatic	Weight	140
		Drop	30
		Efficiency	N/A
Borehole Azimuth	N/A (Vertical)	Borehole Inclination (from Vertical)	N/A
Reviewed By	E. Smith	Approved By	L. Price

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]		Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft		Rec. Ft	Rec. %
0.0	771.9		Top of Hole						
0.8	771.1		ORGANIC SILT, OL, 7.5YR 4/3 (brown), low plasticity, stiff, moist, with organic matter, [FILL]		SS01G	0.0 - 1.5	0.0 - 1.5	1.3	1-4-5
2.3	769.6		FAT CLAY WITH SAND, CH, 7.5 4/3 (brown), high plasticity, soft, moist, some limestone cobbles interbedded, [FILL]		SS02aG	1.5 - 2.25	1.5 - 3.0	1.5	4-6-8
				2.25/4.0-20190205	SS02bE	2.25 - 3.0			
3.5	768.4		SILTY SAND, SM, 2.5Y 4/1 (dark gray), very loose, moist, [CCR]		SS03aE	3.0 - 4.0	3.0 - 4.5	1.3	1-16-23
			SILTY GRAVEL WITH SAND, GM, 2.5Y 4/1 (dark gray), medium dense, dry, [CCR]		SS03bG	4.0 - 4.5			
5.5	766.4				SS04aG	4.5 - 5.5	4.5 - 6.0	1.5	18-21-50
			SILTY SAND, SM, 2.5Y 4/2 (dark grayish brown), medium dense to dense, dry to moist, [CCR] Geofabric at 5.5'		SS04bG	5.5 - 6.0			
					SS05aG	6.0 - 6.5			
				6.5/8.5-20190205	SS05bE	6.5 - 7.5	6.0 - 7.5	1.5	23-44-46
					SS06aE	7.5 - 8.5	7.5 - 9.0	1.4	13-29-30
					SS06bG	8.5 - 9.0			
					SS07G	9.0 - 10.5	9.0 - 10.5	1.5	6-18-22
					SS08aG	10.5 - 11.5	10.5 - 12.0	1.5	12-28-32
				11.5/13.5-20190205	SS08bE	11.5 - 12.0			
					SS09E	12.0 - 13.5	12.0 - 13.5	1.5	21-20-20
			Loose at 13.5'		SS10G	13.5 - 15.0	13.5 - 15.0	1.5	8-12-13
15.5	756.4								
			SILTY SAND, SM, 2.5Y 4/2 (dark grayish brown), loose, wet, [CCR]		SS11G	15.0 - 16.5	15.0 - 16.5	1.5	6-9-9
			Organic material (twigs) at 16.5'	16.5/18.5-20190205					
					SS12E	16.5 - 18.0	16.5 - 18.0	1.5	2-6-3

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 3/23/20

SUBSURFACE LOG

Client Borehole ID: N/A
Stantec Boring No.: **KIF-TW02**
Client: Tennessee Valley Authority
Boring Location: 575,548.50 N; 2,407,585.76 E NAD83
Project Number: 175668043
Surface Elevation: 771.9 ft
Elevation Datum: NGVD29

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]		Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft		Rec. Ft	Rec. %
18			SILTY SAND, SM, 2.5Y 4/2 (dark grayish brown), loose, wet, [CCR] *(Continued)*		SS13aE	18.0 - 18.5	18.0 - 19.5	1.5	11-12-10
19					SS13bG	18.5 - 19.5			
20					SS14G	19.5 - 21.0	19.5 - 21.0	1.5	1-4-6
21									
22					ST01G	21.0 - 23.0	21.0 - 23.0	1.8	NR
23	23.5	748.4							
			SILTY SAND WITH GRAVEL, SM, 5Y 3/1 (very dark gray), very loose, wet, [CCR]		SS16G	23.0 - 24.0	23.0 - 24.0	1.0	6-10
24							24.0 - 25.5		
25					SS17G	24.0 - 25.5		1.5	2-3-11
26					SS18aG	25.5 - 26.5	25.5 - 27.0	1.5	6-6-7
27				26.5/28.5-20190205	SS18bE	26.5 - 27.0			
28					SS19E	27.0 - 28.5	27.0 - 28.5	1.5	4-6-6
29					SS20G	28.5 - 30.0	28.5 - 30.0	1.5	5-6-2
30									
31	31.0	740.9			SS21aG	30.0 - 31.0	30.0 - 31.5	1.5	1-1-1
	31.5	740.4	CLAYEY SILT, ML, 5Y 4/1 (dark gray), medium plasticity, very soft, wet, [CCR]		SS21bG	31.0 - 31.5			
32			SILTY SAND, SM, 5Y 2.5/1 (black), very loose, wet, [CCR]	31.5/33.5-20190205	SS22E	31.5 - 33.0	31.5 - 33.0	1.5	1-2-2
33					SS23aE	33.0 - 33.5	33.0 - 34.5	1.5	1-2-2
34					SS23bG	33.5 - 34.5			
35					SS24G	34.5 - 36.0	34.5 - 36.0	1.5	2-2-3
36					SS25aG	36.0 - 36.5	36.0 - 37.5	1.5	1-2-3
37				36.5/38.5-20190205	SS25bE	36.5 - 37.5			
38	38.5	733.4			SS26aE	37.5 - 38.5	37.5 - 39.0	1.5	2-2-3
			SILT WITH SAND, ML, 5Y 2.5/1 (black) to 5Y 4/1 (dark gray), non-plastic, soft, wet, [CCR]		SS26bG	38.5 - 39.0			
39							39.0 - 40.5		
40					SS27G	39.0 - 40.5		1.5	2-3-3
41					SS28aG	40.5 - 41.5	40.5 - 42.0	1.5	1-1-1
42					SS28b	41.5 - 42.0			

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 3/23/20

SUBSURFACE LOG

Client Borehole ID N/A
Stantec Boring No. **KIF-TW02**
Client Tennessee Valley Authority
Boring Location 575,548.50 N; 2,407,585.76 E NAD83
Project Number 175668043
Surface Elevation 771.9 ft
Elevation Datum NGVD29

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]		Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft		Rec. Ft	Rec. %
43			SILT WITH SAND, ML, 5Y 2.5/1 (black) to 5Y 4/1 (dark gray), non-plastic, soft, wet, [CCR] *(Continued)*		SS29aG	42.0 - 42.5	42.0 - 43.5	1.5	WH-WH-1
					SS29bG	42.5 - 43.5			
44									
					ST02G	43.5 - 45.5	43.5 - 45.5	1.9	1540
45	45.5	726.4							

No Refusal /
Bottom of Hole at 45.5 Ft.

Temporary well installed. See well installation log for backfill details

1: E = Environmental Sample Custody (two Split Spoons may be required to obtain sufficient sample)
G = Geotechnical Sample Custody
2: a,b,c denote Split Spoon divided between Environmental and Geotechnical Samples
3: Depths are reported in feet below ground surface

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 3/23/20

SUBSURFACE LOG

Client Borehole ID	N/A	Stantec Boring No.	**KIF-TW03**
Client	Tennessee Valley Authority	Boring Location	575,720.53 N; 2,408,211.78 E NAD83
Project Number	175668043	Surface Elevation	776.0 ft
		Elevation Datum	NGVD29
Project Name	KIF TDEC Order	Date Started	2/25/19
		Completed	2/26/19
Project Location	Harriman, Tennessee	Depth to Water	19.3 ft
		Date/Time	2/25/19
Inspector	J. Andrew	Logger	D. Mihalek
Depth to Water	N/A	Date/Time	N/A
Drilling Contractor	Stantec Consulting Services Inc.	Drill Rig Type and ID	CME 55T#1, #709
Overburden Drilling and Sampling Tools (Type and Size)	4-1/4" HSA, 3" SS w/o liners, 3" Shelby Tubes		
Rock Drilling and Sampling Tools (Type and Size)	N/A		
Overdrill Tooling (Type and Size)	8-1/4" HSA overdrill of boring	Overdrill Depth	44.5 ft
Sampler Hammer Type	Automatic	Weight	140
Drop	30	Efficiency	N/A
Borehole Azimuth	N/A (Vertical)	Borehole Inclination (from Vertical)	N/A
Reviewed By	E. Smith	Approved By	L. Price

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]		Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft		Rec. Ft	Rec. %
0.0	776.0		Top of Hole						
0.8	775.2		FAT CLAY, CH, 10YR 3/4 (dark yellowish brown), high plasticity, very soft, moist, with organic matter, [FILL]		SS01G	0.0 - 1.5	0.0 - 1.5	1.5	1-1-6
2.5	773.5		LEAN CLAY, CL, 5YR 5/6 (yellowish red), medium plasticity, firm, moist, [FILL]	1.5/3.5-20190225	SS02E	1.5 - 3.0	1.5 - 3.0	1.5	4-7-9
			SANDY SILT WITH GRAVEL, ML, 7.5YR 3/1 (very dark gray), fine, loose, moist, [CCR]		SS03aE	3.0 - 3.5	3.0 - 4.5	1.3	5-9-14
					SS03bG	3.5 - 4.5			
					SS04G	4.5 - 6.0	4.5 - 6.0	1.4	4-10-16
6.0	770.0								
			SILTY GRAVEL, GM, 7.5YR 3/1 (very dark gray), very fine to coarse, dense, dry, [CCR]		SS05aG	6.0 - 6.5	6.0 - 7.5	1.5	24-20-19
7.5	768.5			6.5/8.5-20190225	SS05bE	6.5 - 7.5			
			SILTY SAND, SM, 7.5YR 3/1 (very dark gray), fine, very dense, dry, [CCR]		SS06aE	7.5 - 8.5	7.5 - 9.0	1.5	15-32-50
9.3	766.7				SS06bG	8.5 - 9.0			
			WELL GRADED GRAVEL, GW, 10YR 5/1 (gray), medium to coarse, very dense, dry, [FILL]		SS07aG	9.0 - 10.0	9.0 - 10.5	1.5	41-44-23
10.3	765.7				SS07bG	10.0 - 10.5			
10.5	765.5		SILTY SAND, SM, 7.5YR 3/1 (very dark gray), medium dense, dry, [CCR]		SS08aG	10.5 - 11.5	10.5 - 12.0	1.5	8-19-49
11.5	764.5			11.5/13.5-20190225	SS08bE	11.5 - 12.0			
			SILT, ML, 5YR 5/6 (yellowish red), low plasticity, firm to hard, dry, [FILL]		SS09E	12.0 - 13.5	12.0 - 13.5	1.5	25-24-23
			SILTY SAND WITH GRAVEL, SM, 5YR 5/6 (yellowish red), fine to medium, very dense, dry, [CCR]		SS10G	13.5 - 15.0	13.5 - 15.0	1.5	10-15-19
15.0	761.0								
			POORLY GRADED SAND, SP, 5YR 5/6 (yellowish red), fine to medium, loose, dry, [CCR]		SS11G	15.0 - 16.5	15.0 - 16.5	1.5	7-9-10
16.5	759.5			16.5/18.5-20190225					
			SANDY SILT, ML, 5YR 5/6 (yellowish red), fine to medium, loose, moist, [CCR]		SS12E	16.5 - 18.0	16.5 - 18.0	1.5	4-5-6

TVA EIP BORING LOG_175668043_TVA_KIF_TDEC.GPJ_TDEC SUBSURF DT 20190530.GDT 1/28/20

SUBSURFACE LOG

Client Borehole ID: N/A
Stantec Boring No.: **KIF-TW03**
Client: Tennessee Valley Authority
Boring Location: 575,720.53 N; 2,408,211.78 E NAD83
Project Number: 175668043
Surface Elevation: 776.0 ft
Elevation Datum: NGVD29

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]		Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft		Rec. Ft	Rec. %
18			SANDY SILT, ML, 5YR 5/6 (yellowish red), fine to medium, loose, moist, [CCR] *(Continued)*		SS13aE	18.0 - 18.5	18.0 - 19.5	1.4	4-6-7
19 ▽			Wet at 19.3'		SS13bG	18.5 - 19.5			
20					SS14G	19.5 - 21.0	19.5 - 21.0	1.5	3-2-6
21									
22					ST01G	21.0 - 23.0	21.0 - 23.0	1.0	NR
23	23.0	753.0							
24			SILT, ML, 5YR 5/6 (yellowish red), very loose, wet, [CCR]	23.0/26.0-20190226	SS15E	23.0 - 24.5	23.0 - 24.5	1.5	3-5-6
25					SS16E	24.5 - 26.0	24.5 - 26.0	1.5	4-5-3
26									
27					SS17G	26.0 - 27.5	26.0 - 27.5	1.5	4-5-5
28					SS18G	27.5 - 29.0	27.5 - 29.0	1.5	2-2-3
29									
30	30.0	746.0			SS19G	29.0 - 30.5	29.0 - 30.5	1.5	3-7-6
31			SILTY SAND WITH GRAVEL, SM, 10YR 2/1 (black), very loose to loose, wet, [CCR]		SS20a	30.5 - 31.5	30.5 - 32.0	1.0	2-4-5
32				31.5/33.5-20190226	SS20bE	31.5 - 32.0			
33					SS21E	32.0 - 33.5	32.0 - 33.5	1.0	4-7-6
34					SS22G	33.5 - 35.0	33.5 - 35.0	1.5	4-4-4
35	35.5	740.5							
36			SILT WITH SAND, ML, 5YR 5/6 (yellowish red), very loose, wet, [CCR]		SS23G	35.0 - 36.5	35.0 - 36.5	1.5	3-4-4
37				36.5/38.5-20190226	SS24E	36.5 - 38.0	36.5 - 38.0	1.5	2-2-4
38					SS25aE	38.0 - 38.5	38.0 - 39.5	1.5	2-2-5
39					SS25bG	38.5 - 39.5			
40					SS26G	39.5 - 41.0	39.5 - 41.0	1.5	2-2-4
41					SS27aG	41.0 - 41.5	41.0 - 42.5		2-3-4
42					SS27bE	41.5 - 42.5			

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 1/28/20

SUBSURFACE LOG

Client Borehole ID N/A
Stantec Boring No. **KIF-TW03**
Client Tennessee Valley Authority
Boring Location 575,720.53 N; 2,408,211.78 E NAD83
Project Number 175668043
Surface Elevation 776.0 ft
Elevation Datum NGVD29

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]		Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft		Rec. Ft	Rec. %
43			SILT WITH SAND, ML, 5YR 5/6 (yellowish red), very loose, wet, [CCR] *(Continued)*		SS28aE	42.5 - 43.5	42.5 - 44.0	1.5	1-1-3
44					SS28bG	43.5 - 44.0			
	45.0	731.0			SS29aG	44.0 - 45.0	44.0 - 45.5	1.5	1-2-3
45					SS29bG	45.0 - 45.5			
46			SILT, ML, 10YR 3/1 (very dark gray), non-plastic, soft, wet, [CCR]		ST02G	45.5 - 47.5	45.5 - 47.5	2.0	NR
47	47.5	728.5							

41.5/43.5-20190226

No Refusal /
Bottom of Hole at 47.5 Ft.

Temporary well installed. See well installation log for backfill details

1: E = Environmental Sample Custody (two Split Spoons may be required to obtain sufficient sample)
G = Geotechnical Sample Custody
2: a,b,c denote Split Spoon divided between Environmental and Geotechnical Samples
3: Depths are reported in feet below ground surface

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 1/28/20

SUBSURFACE LOG

Client Borehole ID	N/A	Stantec Boring No.	**KIF-TW03a**
Client	Tennessee Valley Authority	Boring Location	575,741.10 N; 2,407,987.58 E NAD83
Project Number	175668043	Surface Elevation	771.4 ft
		Elevation Datum	NGVD29
Project Name	KIF TDEC Order	Date Started	1/31/19
		Completed	1/31/19
Project Location	Harriman, Tennessee	Depth to Water	15.0 ft
		Date/Time	1/31/19
Inspector	J. Andrew	Logger	D. Mihalek
Depth to Water	N/A	Date/Time	N/A
Drilling Contractor	Stantec Consulting Services Inc.	Drill Rig Type and ID	CME 55T#1, #709
Overburden Drilling and Sampling Tools (Type and Size)	4-1/4" HSA, 3" SS w/o liners		
Rock Drilling and Sampling Tools (Type and Size)	N/A		
Overdrill Tooling (Type and Size)	N/A	Overdrill Depth	N/A
Sampler Hammer Type	Automatic	Weight	140
Drop	30	Efficiency	N/A
Borehole Azimuth	N/A (Vertical)	Borehole Inclination (from Vertical)	N/A
Reviewed By	E. Smith	Approved By	L. Price

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]		Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft		Rec. Ft	Rec. %
0.0	771.4		Top of Hole						
0.5	770.9		ORGANIC SILT, OL, 7.5YR 6/4 (light brown), low plasticity, moist, top soil, [FILL]		SS01G	0.0 - 1.5	0.0 - 1.5	1.5	2-6-8
2.0	769.4		FAT CLAY, CH, 7.5YR 5/6 (strong brown), high plasticity, soft, moist, [FILL]		SS02aG	1.5 - 2.0	1.5 - 3.0	1.5	4-14-17
			SANDY SILT WITH GRAVEL, ML, 10YR 4/1 (dark gray), loose, dry, [CCR]		SS02b	2.0 - 3.0			
4.0	767.4				SS03a	3.0 - 4.0	3.0 - 4.5	1.4	18-22-18
			WELL GRADED GRAVEL, GW, 10YR 7/1 (light gray), medium dense, [FILL]		SS03bG	4.0 - 4.5			
6.0	765.4				SS04G	4.5 - 6.0	4.5 - 6.0	1.4	16-29-32
			Encountered geofabric at 6.0'						
			SILTY SAND, SM, 10YR 5/1 (gray), medium dense, dry, [CCR]		SS05	6.0 - 7.5	6.0 - 7.5	1.5	17-21-23
					SS06	7.5 - 9.0	7.5 - 9.0	1.5	5-5-4
9.5	761.9		Moist at 8.75'		SS07aG	9.0 - 9.5	9.0 - 10.5	1.5	5-14-46
			POORLY GRADED GRAVEL, GP, 10YR 5/1 (gray), dense, dry, [CCR]		SS07bG	9.5 - 10.5			
			Augured to 15.0'		SS08G	10.5 - 10.6	10.5 - 10.6	0.1	50+/1"

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 1/28/20

SUBSURFACE LOG

Client Borehole ID N/A
Stantec Boring No. **KIF-TW03a**
Client Tennessee Valley Authority
Boring Location 575,741.10 N; 2,407,987.58 E NAD83
Project Number 175668043
Surface Elevation 771.4 ft
Elevation Datum NGVD29

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]	Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft	Rec. Ft	Rec. %
13			POORLY GRADED GRAVEL, GP, 10YR 5/1 (gray), dense, dry, [CCR] *(Continued)*					
14								
15 ▽ 15.3	756.1		Wet at 15.0'		SS09	15.0 - 15.3	0.0	36/4"
			Refusal / Bottom of Hole at 15.3 Ft.					

15.0 - 15.3

Encountered obstruction at 15.3 feet, boring terminated and backfilled in accordance with Exploratory Drilling SAP

Since boring was terminated, all Environmental Samples were disposed of as investigative derived waste.

As-drilled boring location not surveyed. Horizontal coordinates based on proposed boring location. Vertical coordinates based on 2017 LIDAR surfaces.

1: E = Environmental Sample Custody (two Split Spoons may be required to obtain sufficient sample)
G = Geotechnical Sample Custody
2: a,b,c denote Split Spoon divided between Environmental and Geotechnical Samples
3: Depths are reported in feet below ground surface

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 1/28/20

SUBSURFACE LOG

Client Borehole ID	N/A	Stantec Boring No.	**KIF-TW03b**
Client	Tennessee Valley Authority	Boring Location	575,741.10 N; 2,407,967.58 E NAD83
Project Number	175668043	Surface Elevation	771.9 ft
Project Name	KIF TDEC Order	Date Started	1/31/19
Project Location	Harriman, Tennessee	Depth to Water	9.7 ft
Inspector	J. Andrew	Logger	D. Mihalek
Drilling Contractor	Stantec Consulting Services Inc.	Drill Rig Type and ID	CME 55T#1, #709
Overburden Drilling and Sampling Tools (Type and Size)	4-1/4" HSA, 3" SS w/o liners		
Rock Drilling and Sampling Tools (Type and Size)	N/A		
Overdrill Tooling (Type and Size)	N/A	Overdrill Depth	N/A
Sampler Hammer Type	Automatic	Weight	140
Drop	30	Efficiency	N/A
Borehole Azimuth	N/A (Vertical)	Borehole Inclination (from Vertical)	N/A
Reviewed By	E. Smith	Approved By	L. Price

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]		Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft		Rec. Ft	Rec. %
0.0	771.9		Top of Hole						
0.7	771.2		ORGANIC SILT, OL, 10YR 4/4 (dark yellowish brown), firm, moist, [FILL]		SS01G	0.0 - 1.5	0.0 - 1.5	1.2	4-7-9
2.0	769.9		FAT CLAY, CH, 7.5YR 4/6 (strong brown), high plasticity, firm, moist, [FILL]		SS02aG	1.5 - 2.5	1.5 - 3.0	1.5	9-12-19
3.0	768.9		SILTY SAND WITH GRAVEL, SM, 10YR 3/1 (very dark gray), fine to coarse, loose, [CCR]		SS02b	2.5 - 3.0			
4.5	767.4		SILTY SAND, SM, 10YR 3/1 (very dark gray), fine to medium, medium dense, dry, [CCR]		SS03a	3.0 - 3.5	3.0 - 4.5	1.5	17-21-22
					SS03bG	3.5 - 4.5			
6.0	765.9		SILTY SAND WITH GRAVEL, SM, 7.5Y 6/1 (very dark gray), fine to coarse, dense, dry, [CCR]		SS04G	4.5 - 6.0	4.5 - 6.0	1.4	10-21-42
7.5	764.4		SILTY SAND, SM, 10YR 3/1 (very dark gray), fine to medium, dense, dry, [CCR] Geofabric encountered at 6.5' and 7.5'		SS05	6.0 - 7.5	6.0 - 7.5	1.5	17-21-22
9.0	762.9		SILT WITH SAND, ML, 10YR 5/1 (gray), soft, moist, [CCR]		SS06	7.5 - 9.0	7.5 - 9.0	1.5	5-7-6
▽ 9.8	762.1		SILTY SAND, SM, 10YR 4/1 (dark gray), medium dense, moist to wet, [CCR] Wet at 9.7'		SS07aG	9.0 - 10.0	9.0 - 10.5	1.5	5-9-11
10.5	761.4		SILT WITH SAND AND GRAVEL, ML, 7.5Y 6/1 (dark gray), fine to coarse, medium dense, moist, [CCR] Geofabric encountered in sample		SS07bG	10.0 - 10.5			
11.5	760.4		SILT, ML, 10YR 5/1 (gray), soft, wet, with limestone cobbles, [CCR]		SS08aG	10.5 - 11.0	10.5 - 12.0	1.2	17-22-40
					SS08b	11.0 - 12.0			
			GRAVEL WITH SAND, GW, 5Y 6/2 (light olive gray), medium to coarse, dense, moist, [FILL]		SS09a	12.0 - 13.5	12.0 - 13.5	1.5	22-16-30

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 1/28/20

SUBSURFACE LOG

Client Borehole ID N/A
Stantec Boring No. **KIF-TW03b**
Client Tennessee Valley Authority
Boring Location 575,741.10 N; 2,407,967.58 E NAD83
Project Number 175668043
Surface Elevation 771.9 ft
Elevation Datum NGVD29

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]	Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft	Rec. Ft	Rec. %
13 – 13.5	758.4		Geofabric encountered in sample		SS09b	13.0 - 13.5		

Refusal /
Bottom of Hole at 13.5 Ft.

Encountered obstruction at 13.5 feet, boring terminated and backfilled in accordance with Exploratory Drilling SAP

Since boring was terminated, all Environmental Samples were disposed of as investigative derived waste.

As-drilled boring location not surveyed. Horizontal coordinates based on proposed boring location. Vertical coordinates based on 2017 LIDAR surfaces.

1: E = Environmental Sample Custody (two Split Spoons may be required to obtain sufficient sample)
G = Geotechnical Sample Custody
2: a,b,c denote Split Spoon divided between Environmental and Geotechnical Samples
3: Depths are reported in feet below ground surface

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 1/28/20

SUBSURFACE LOG

Client Borehole ID	N/A	Stantec Boring No.	**KIF-TW04**
Client	Tennessee Valley Authority	Boring Location	574,754.11 N; 2,407,855.14 E NAD83
Project Number	175668043	Surface Elevation	765.2 ft
Elevation Datum	NGVD29		
Project Name	KIF TDEC Order	Date Started	2/8/19
Completed	2/13/19		
Project Location	Harriman, Tennessee	Depth to Water	21.5 ft
Date/Time	2/11/19 14:25		
Inspector	J. Andrew	Logger	M. Edmunds, D. Mihalek
Depth to Water	N/A	Date/Time	N/A
Drilling Contractor	Stantec Consulting Services Inc.	Drill Rig Type and ID	CME 55T#1, #709
Overburden Drilling and Sampling Tools (Type and Size)	4-1/4" HSA, 3" SS w/o liners, 3" Shelby Tubes		
Rock Drilling and Sampling Tools (Type and Size)	N/A		
Overdrill Tooling (Type and Size)	8-1/4" HSA overdrill of boring	Overdrill Depth	37.0 ft
Sampler Hammer Type	Automatic	Weight	140
Drop	30	Efficiency	N/A
Borehole Azimuth	N/A (Vertical)	Borehole Inclination (from Vertical)	N/A
Reviewed By	E. Smith	Approved By	L. Price

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]		Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft		Rec. Ft	Rec. %
0.0	765.2		Top of Hole						
0			SANDY LEAN CLAY, CL, 10YR 3/6 (dark yellowish brown), low plasticity, firm, moist, with silt, sand, and gravel, [FILL]		SS01G	0.0 - 1.5	0.0 - 1.5	0.9	1-5-4
2.0	763.2				SS02aG	1.5 - 2.0	1.5 - 3.0	1.5	5-3-5
2			FAT CLAY, CH, 2.5YR 6/4 (light reddish brown), medium plasticity, firm, moist, [FILL]		SS02bG	2.0 - 3.0			
3.5	761.7				SS03aG	3.0 - 3.5	3.0 - 4.5	1.5	6-4-2
4			SILT WITH SAND, ML, 5YR 3/1 (very dark gray), non-plastic to low plasticity, very soft to firm, moist, [CCR]	3.5/5.5-20190208	SS03bE	3.5 - 4.5			
5					SS04aE	4.5 - 5.5	4.5 - 6.0	1.5	1-1-1
6					SS04bG	5.5 - 6.0			
7				6.5/8.5-20190208	SS05aG	6.0 - 6.5	6.0 - 7.5	1.5	WH-1-1
8					SS05bE	6.5 - 7.5			
9					SS06aE	7.5 - 8.5	7.5 - 9.0	1.5	1-0-1
10.0	755.2				SS06bG	8.5 - 9.0			
10					SS07G	9.0 - 10.5	9.0 - 10.5	1.5	1-WR-WR
11			SILTY SAND, SM, 10YR 4/1 (dark gray), fine, very loose, moist, [CCR]		SS08aG	10.5 - 11.5	10.5 - 12.0	1.5	1-1-2
12.0	753.2			11.5/13.5-20190211	SS08bE	11.5 - 12.0			
12			SILT, ML, 10YR 4/1 (dark gray), very soft to firm, moist, [CCR]		SS09E	12.0 - 13.5	12.0 - 13.5	1.5	WH-WH-WH
13					SS10G	13.5 - 15.0	13.5 - 15.0	1.5	1-3-5
14					SS11G	15.0 - 16.5	15.0 - 16.5	1.5	1-1-3
15									
16									
17									

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 8/26/20

SUBSURFACE LOG

Client Borehole ID: N/A
Stantec Boring No.: **KIF-TW04**
Client: Tennessee Valley Authority
Boring Location: 574,754.11 N; 2,407,855.14 E NAD83
Project Number: 175668043
Surface Elevation: 765.2 ft
Elevation Datum: NGVD29

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]		Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft		Rec. Ft	Rec. %
17			SILT, ML, 10YR 4/1 (dark gray), very soft to firm, moist, [CCR] *(Continued)*		SS12E	16.5 - 18.0	16.5 - 18.0	1.5	2-4-5
18					SS13aE	18.0 - 18.5	18.0 - 19.5	1.5	2-2-2
19					SS13bG	18.5 - 19.5			
	19.5	745.7							
20			SILTY SAND, SM, 10YR 4/1 (dark gray), very loose, wet, [CCR]		SS14G	19.5 - 21.0	19.5 - 21.0	1.5	1-1-1
21					SS15a	21.0 - 21.5	21.0 - 22.5	1.5	WH-1-1
22					SS15bE	21.5 - 22.5			
23					SS16aE	22.5 - 23.5	22.5 - 24.0	1.5	1-3-6
24					SS16b	23.5 - 24.0			
25					ST01G	24.0 - 26.0	24.0 - 26.0	1.9	NR
	26.0	739.2							
26			SILTY GRAVEL, GM, 5Y 2.5/1 (black), very loose, wet, [CCR]		SS17aG	26.0 - 26.5	26.0 - 27.0	1.0	5-5
27					SS17bE	26.5 - 27.0			
28					SS18E	27.0 - 28.5	27.0 - 28.5	1.2	1-2-2
29					SS19G	28.5 - 30.0	28.5 - 30.0	1.5	2-2-3
	30.0	735.2							
30			SILTY SAND, SM, 5Y 2.5/1 (black), very loose, wet, [CCR]		SS20G	30.0 - 31.5	30.0 - 31.5	1.5	1-2-3
31					SS21E	31.5 - 33.0	31.5 - 33.0	1.5	3-2-3
32					SS22aE	33.0 - 33.5	33.0 - 34.5	1.3	1-3-2
33					SS22bG	33.5 - 34.5			
34					SS23G	34.5 - 36.0	34.5 - 36.0	1.5	1-2-3
35									
	36.0	729.2							
36			CLAYEY SAND, SC, 5Y 2.5/1 (black), low plasticity, very loose, wet, [CCR]		SS24aG	36.0 - 36.5	36.0 - 37.5	1.5	1-1-2
37					SS24bE	36.5 - 37.5			
	37.5	727.7							
38			SILTY, ML, 10Y 3/1 (very dark greenish gray), non-plastic, firm, wet, [CCR]		SS25aE	37.5 - 38.5	37.5 - 39.0	1.5	2-2-3
39					SS25bG	38.5 - 39.0			

16.5/18.5-20190211
21.5/23.5-20190211
26.5/28.5-20190211
31.5/33.5-20190213
36.5/38.5-20190213

TVA EIP BORING LOG_175668043_TVA_KIF_TDEC.GPJ_TDEC SUBSURF DT 20190530.GDT 8/26/20

SUBSURFACE LOG

Client Borehole ID N/A
Stantec Boring No. **KIF-TW04**
Client Tennessee Valley Authority
Boring Location 574,754.11 N; 2,407,855.14 E NAD83
Project Number 175668043
Surface Elevation 765.2 ft
Elevation Datum NGVD29

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]		Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft		Rec. Ft	Rec. %
40			SILT, ML, 10Y 3/1 (very dark greenish gray), non-plastic, firm, wet, [CCR] *(Continued)*		ST02G	39.0 - 41.0	39.0 - 41.0	1.7	NR
41 41.0	724.2		No Refusal / Bottom of Hole at 41.0 Ft.						

Temporary well installed. See well installation log for backfill details

1: E = Environmental Sample Custody (two Split Spoons may be required to obtain sufficient sample)
G = Geotechnical Sample Custody
2: a,b,c denote Split Spoon divided between Environmental and Geotechnical Samples
3: Depths are reported in feet below ground surface

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 8/26/20

SUBSURFACE LOG

Client Borehole ID	N/A	Stantec Boring No.	**KIF-TW05**
Client	Tennessee Valley Authority	Boring Location	575,382.75 N; 2,408,921.34 E NAD83
Project Number	175668043	Surface Elevation	770.5 ft
		Elevation Datum	NGVD29
Project Name	KIF TDEC Order	Date Started	11/13/18
		Completed	11/14/18
Project Location	Harriman, Tennessee	Depth to Water	16.5 ft
		Date/Time	11/13/18
Inspector	B. Lucente	Logger	G. Budd
Depth to Water	N/A	Date/Time	N/A
Drilling Contractor	Stantec Consulting Services Inc.	Drill Rig Type and ID	CME 850XR, #953
Overburden Drilling and Sampling Tools (Type and Size)	4-1/4" HSA, 3" SS w/o liners, 3" Shelby Tubes		
Rock Drilling and Sampling Tools (Type and Size)	N/A		
Overdrill Tooling (Type and Size)	8-1/4" HSA overdrill of boring	Overdrill Depth	39.0 ft
Sampler Hammer Type	Automatic	Weight	140
Drop	30	Efficiency	N/A
Borehole Azimuth	N/A (Vertical)	Borehole Inclination (from Vertical)	N/A
Reviewed By	E. Smith	Approved By	L. Price

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]		Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft		Rec. Ft	Rec. %
0.0	770.5		Top of Hole						
			SILTY SAND WITH GRAVEL, SM, 10YR 3/1 (very dark gray), loose to dense, dry to moist, placed fill material, [CCR]		SS01G	0.0 - 1.5	0.0 - 1.5	1.3	4-8-6
				1.5/3.5-20181113	SS02E	1.5 - 3.0	1.5 - 3.0	1.5	5-6-4
					SS03aE	3.0 - 3.5	3.0 - 4.5	1.5	4-2-2
					SS03b	3.5 - 4.5			
5.2	765.3				SS04G	4.5 - 6.0	4.5 - 6.0	1.2	5-3-6
			LEAN CLAY, CL, 5YR 4/4 (reddish brown), firm, dry to moist, with fragments of chert, [FILL]		SS05a	6.0 - 6.5	6.0 - 7.5	1.5	11-17-20
6.5	764.0			6.5/8.5-20181113	SS05bE	6.5 - 7.5			
7.5	763.0		POORLY GRADED GRAVEL, GP, 10YR 3/1 (very dark gray), fine to coarse, dense, dry, fill material, [CCR]		SS06aE	7.5 - 8.5	7.5 - 9.0	1.5	24-35-50+
			SILTY SAND WITH GRAVEL, SM, 10YR 3/1 (very dark gray) and 10YR 5/6 (yellowish brown), dense to very dense, dry, [CCR]		SS06b	8.5 - 9.0			
					SS07G	9.0 - 10.5	9.0 - 10.5	1.5	39-62-106
					SS08a	10.5 - 11.5	10.5 - 12.0	1.5	45-56-55
12.0	758.5			11.5/13.5-20181113	SS08bE	11.5 - 12.0			
			WELL GRADED SAND, SW, 10YR 3/1 (very dark gray), medium dense to dense, dry to moist, [CCR]		SS09E	12.0 - 13.5	12.0 - 13.5	1.5	27-30-34
					SS10G	13.5 - 15.0	13.5 - 15.0	1.5	25-30-25
15.0	755.5								
			WELL GRADED SAND WITH SILT AND GRAVEL, SW-SM, 10YR 2/1 (black), medium dense, moist to wet, [CCR]		SS11G	15.0 - 16.5	15.0 - 16.5	1.5	19-15-17

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 1/28/20

SUBSURFACE LOG

Client Borehole ID: N/A
Stantec Boring No.: **KIF-TW05**
Client: Tennessee Valley Authority
Boring Location: 575,382.75 N; 2,408,921.34 E NAD83
Project Number: 175668043
Surface Elevation: 770.5 ft
Elevation Datum: NGVD29

Depth Ft[3]	Elevation	Graphic	Description	Sample[1,2]	Depth Ft[3]	Rec. Ft	Blows/PSI
			Overburden: / Rock Core:	RQD %	Run Ft	Rec. Ft	Rec. %
17			WELL GRADED SAND WITH SILT AND GRAVEL, SW-SM, 10YR 2/1 (black), medium dense, moist to wet, [CCR] *(Continued)*	SS12E	16.5 - 18.0	1.5	13-11-10
18				SS13aE	18.0 - 18.5		
19				SS13b	18.5 - 19.5	1.5	17-22-19
20				SS14G	19.5 - 21.0	1.5	11-17-13
21							
22				SS15G	21.0 - 22.5	1.5	11-11-11
23	23.3	747.2		SS16E	22.5 - 24.0	1.5	14-26-30
24			SILTY SAND, SM, 10YR 4/1 (dark gray), very fine to fine, loose to medium dense, moist to wet, [CCR]	SS17aE	24.0 - 24.5		
25				SS17b	24.5 - 25.5	0.6	11-21-17
26	25.8	744.7		SS18a	25.5 - 26.5	1.5	5-6-6
27			WELL GRADED SAND, SW, 10YR 2/1 (black), fine to coarse, loose, wet, [CCR]	SS18bE	26.5 - 27.0		
28	27.7	742.8		SS19E	27.0 - 28.5	1.5	9-9-10
29			SILT WITH SAND, ML, 10YR 4/1 (dark gray), very fine to fine, very loose to loose, wet, [CCR]	SS20G	28.5 - 30.0	1.5	4-3-6
30							
31				SS21G	30.0 - 31.5	1.5	2-3-4
32				SS22E	31.5 - 33.0	1.5	4-7-9
33				SS23aE	33.0 - 33.5		
34				SS23bG	33.5 - 34.5	1.5	3-5-8
35				SS24G	34.5 - 36.0	1.5	2-2-2
36							
37				SS25	36.0 - 37.5	1.5	WR-WR-WR
38	38.0	732.5		SS26	37.5 - 39.0	1.5	1-2-2
39			LEAN CLAY WITH SAND, CL, 10YR 5/1 (gray) and 10YR 4/6 (dark yellowish brown), medium plasticity, moist to wet, with organics				

16.5/19.5-20181113
22.5/24.5-20181113
26.5/28.5-20181113
31.5/33.5-20181113

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 1/28/20

SUBSURFACE LOG

Client Borehole ID N/A
Stantec Boring No. **KIF-TW05**
Client Tennessee Valley Authority
Boring Location 575,382.75 N; 2,408,921.34 E NAD83
Project Number 175668043
Surface Elevation 770.5 ft
Elevation Datum NGVD29

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]		Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft		Rec. Ft	Rec. %
40					ST01G	39.0 - 41.0	39.0 - 41.0	1.8	400
41	41.0	729.5							
			No Refusal / Bottom of Hole at 41.0 Ft.						

Temporary well installed. See well installation log for backfill details

1: E = Environmental Sample Custody (two Split Spoons may be required to obtain sufficient sample)
G = Geotechnical Sample Custody
2: a,b,c denote Split Spoon divided between Environmental and Geotechnical Samples
3: Depths are reported in feet below ground surface

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 1/28/20

SUBSURFACE LOG

Client Borehole ID	N/A	Stantec Boring No.	**KIF-B01a**
Client	Tennessee Valley Authority	Boring Location	576,069.92 N; 2,407,677.68 E NAD83
Project Number	175668043	Surface Elevation	771.3 ft
		Elevation Datum	NGVD29
Project Name	KIF TDEC Order	Date Started	12/2/19
		Completed	12/2/19
Project Location	Harriman, Tennessee	Depth to Water	N/A
		Date/Time	N/A
Inspector	E. Smith	Logger	E. Smith
Depth to Water	N/A	Date/Time	N/A
Drilling Contractor	Hawkston	Drill Rig Type and ID	Geoprobe 3230DT
Overburden Drilling and Sampling Tools (Type and Size)	DT37 Dual Tube Soil Sampling System with 60" PVC Liners		
Rock Drilling and Sampling Tools (Type and Size)	No Coring		
Overdrill Tooling (Type and Size)	NA	Overdrill Depth	N/A
Sampler Hammer Type	No SPT	Weight	N/A
Drop	N/A	Efficiency	N/A
Borehole Azimuth	N/A	Borehole Inclination (from Vertical)	N/A
Reviewed By	J. Musselman	Approved By	M. Aplin

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]	Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft	Rec. Ft	Rec. %
0.0	771.3		Top of Hole					
			No sampling conducted from 0.0' to 35.0', boring advanced through this interval using DPT with closed tip. Refer to boring log for KIF-TW01 for 0.0' through 35.0'.					

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 3/18/20

SUBSURFACE LOG

Client Borehole ID: N/A
Stantec Boring No.: **KIF-B01a**
Client: Tennessee Valley Authority
Boring Location: 576,069.92 N; 2,407,677.68 E NAD83
Project Number: 175668043
Surface Elevation: 771.3 ft
Elevation Datum: NGVD29

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]	Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft	Rec. Ft	Rec. %
18			No sampling conducted from 0.0' to 35.0', boring advanced through this interval using DPT with closed tip. Refer to boring log for KIF-TW01 for 0.0' through 35.0'. *(Continued)*					
19								
20								
21								
22								
23								
24								
25								
26								
27								
28								
29								
30								
31								
32								
33								
34								
35.0	736.3		SILT, ML, 5Y 4/1 (dark gray) to 5Y 3/1 (very dark gray), non-plastic, soft to very soft, moist to wet, no odor, no staining, [CCR]		DP01aG	35.0 - 36.5		
36								
37				36.5/38.5-20191203	DP01bE	36.5 - 38.5	5.0	N/A
38								
39					DP01cG	38.5 - 40.0		
40								
41					DP02aG	40.0 - 41.5		
42								

35.0 - 40.0

TVA EIP BORING LOG_175668043_TVA_KIF_TDEC.GPJ_TDEC SUBSURF DT 20190530.GDT 3/18/20

SUBSURFACE LOG

Client Borehole ID: N/A
Stantec Boring No.: **KIF-B01a**
Client: Tennessee Valley Authority
Boring Location: 576,069.92 N; 2,407,677.68 E NAD83
Project Number: 175668043
Surface Elevation: 771.3 ft
Elevation Datum: NGVD29

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]		Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft		Rec. Ft	Rec. %
43			SILT, ML, 5Y 4/1 (dark gray) to 5Y 3/1 (very dark gray), non-plastic, soft to very soft, moist to wet, no odor, no staining, [CCR] *(Continued)*	41.5/43.5-20191203	DP02bE	41.5 - 43.5	40.0 - 45.0	5.0	N/A
44					DP02cG	43.5 - 45.0			
45					DP03a	45.0 - 46.5			
46				46.5/48.5-20191203					
47					DP03bE	46.5 - 48.5	45.0 - 50.0	5.0	N/A
48									
49					DP03c	48.5 - 49.8			
	49.8	721.5			DP03dG	49.8 - 50.0			
50			LEAN CLAY, CL, 5Y 3/1 (very dark gray), medium plasticity, firm to soft, moist to wet, moderate organic odor, no staining		DP04aG	50.0 - 51.3			
51	51.3	720.0							
52			SANDY SILT, ML, 5Y 5/1 (gray), low plasticity, soft, moist to wet, moderate organic odor, sand increases with depth, clay decreases with depth		DP04bG	51.3 - 53.0	50.0 - 55.0	5.0	N/A
	53.0	718.3							
53	53.7	717.6	WELL GRADED SAND, SW, 5Y 3/1 (very dark gray), very fine to medium, loose, moist to wet, moderate organic odor		DP04cG	53.0 - 53.7			
54					DP04dG	53.7 - 55.0			
	55.0	716.3	LEAN CLAY, CL, 7.5YR 6/4 (light brown) to 7.5YR 6/1 (gray), medium plasticity, firm, dry to moist, mottled gray						
55			No Refusal / Bottom of Hole at 55.0 Ft.						

1: E = Environmental Sample Custody (two Split Spoons may be required to obtain sufficient sample)
G = Geotechnical Sample Custody
2: a,b,c denote Split Spoon divided between Environmental and Geotechnical Samples
3: Depths are reported in feet below ground surface

TVA EIP BORING LOG_175668043_TVA_KIF_TDEC.GPJ_TDEC SUBSURF DT 20190530.GDT 3/18/20

SUBSURFACE LOG

Client Borehole ID	N/A	Stantec Boring No.	**KIF-B01b**
Client	Tennessee Valley Authority	Boring Location	576,072.41 N; 2,407,677.12 E NAD83
Project Number	175668043	Surface Elevation	771.3 ft
Elevation Datum	NGVD29		
Project Name	KIF TDEC Order	Date Started	12/3/19
Completed	12/3/19		
Project Location	Harriman, Tennessee	Depth to Water	N/A
Date/Time	N/A		
Inspector	E. Smith	Logger	E. Smith
Depth to Water	N/A	Date/Time	N/A
Drilling Contractor	Hawkston	Drill Rig Type and ID	Geoprobe 3230DT
Overburden Drilling and Sampling Tools (Type and Size)	DT37 Dual Tube Soil Sampling System with 60" PVC Liners		
Rock Drilling and Sampling Tools (Type and Size)	No Coring		
Overdrill Tooling (Type and Size)	NA	Overdrill Depth	N/A
Sampler Hammer Type	No SPT	Weight	N/A
Drop	N/A	Efficiency	N/A
Borehole Azimuth	N/A	Borehole Inclination (from Vertical)	N/A
Reviewed By	J. Musselman	Approved By	M. Aplin

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]	Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft	Rec. Ft	Rec. %
0.0	771.3		Top of Hole					
			No sampling conducted from 0.0' to 35.0', boring advanced through this interval using DPT with closed tip. Refer to boring log for KIF-TW01 for 0.0' through 35.0'.					

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 3/18/20

SUBSURFACE LOG

Client Borehole ID N/A
Stantec Boring No. **KIF-B01b**
Client Tennessee Valley Authority
Boring Location 576,072.41 N; 2,407,677.12 E NAD83
Project Number 175668043
Surface Elevation 771.3 ft
Elevation Datum NGVD29

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]	Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft	Rec. Ft	Rec. %
			No sampling conducted from 0.0' to 35.0', boring advanced through this interval using DPT with closed tip. Refer to boring log for KIF-TW01 for 0.0' through 35.0'. *(Continued)*					
35.0	736.3		SILT, ML, 5Y 4/1 (dark gray) to 5Y 3/1 (very dark gray), non-plastic, soft to very soft, moist to wet, no odor, no staining, [CCR]		DP01a	35.0 - 36.5		
					DP01bE	36.5 - 38.5	5.0	N/A
					DP01c	38.5 - 40.0		
					DP02a	40.0 - 41.5		

36.5/38.5-20191203

35.0 - 40.0

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 3/18/20

SUBSURFACE LOG

Client Borehole ID: N/A
Stantec Boring No.: **KIF-B01b**
Client: Tennessee Valley Authority
Boring Location: 576,072.41 N; 2,407,677.12 E NAD83
Project Number: 175668043
Surface Elevation: 771.3 ft
Elevation Datum: NGVD29

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]		Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft		Rec. Ft	Rec. %
43			SILT, ML, 5Y 4/1 (dark gray) to 5Y 3/1 (very dark gray), non-plastic, soft to very soft, moist to wet, no odor, no staining, [CCR] *(Continued)*	41.5/43.5-20191203	DP02bE	41.5 - 43.5	40.0 - 45.0	5.0	N/A
44					DP02c	43.5 - 45.0			
45					DP03a	45.0 - 46.5			
46									
47				46.5/48.5-20191203	DP03bE	46.5 - 48.5	45.0 - 50.0	5.0	N/A
48									
49					DP03c	48.5 - 49.8			
50					DP03d	49.8 - 50.0			
51	51.4	719.9			DP04aG	50.0 - 51.4	50.0 - 52.5	2.5	N/A
52	52.3	719.0	LEAN CLAY, CL, 5Y 3/1 (very dark gray), medium plasticity, firm to soft, moist to wet, moderate organic odor, no staining, weak cementation		DP04b	51.4 - 52.5			
53	52.5	718.8	SANDY SILT, ML, 5Y 5/1 (gray), low plasticity, soft, moist to wet, moderate organic odor		DP05a	52.5 - 54.2	52.5 - 55.0	2.5	N/A
54	54.2	717.1	WELL GRADED SAND, SW, 5Y 3/1 (very dark gray), very fine to coarse, loose, moist to wet, moderate organic odor						
55	55.0	716.3	LEAN CLAY, CL, 7.5YR 6/4 (light brown) to 7.5YR 6/1 (gray), medium plasticity, firm, dry to moist, mottled gray, expanding clay		DP05b	54.2 - 55.0			
			No Refusal / Bottom of Hole at 55.0 Ft.						

1: E = Environmental Sample Custody (two Split Spoons may be required to obtain sufficient sample)
G = Geotechnical Sample Custody
2: a,b,c denote Split Spoon divided between Environmental and Geotechnical Samples
3: Depths are reported in feet below ground surface

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 3/18/20

SUBSURFACE LOG

Client Borehole ID	N/A	Stantec Boring No.	**KIF-B02a**
Client	Tennessee Valley Authority	Boring Location	575,556.85 N; 2,407,609.96 E NAD83
Project Number	175668043	Surface Elevation	772.3 ft
		Elevation Datum	NGVD29
Project Name	KIF TDEC Order	Date Started	12/3/19
		Completed	12/4/19
Project Location	Harriman, Tennessee	Depth to Water	N/A
		Date/Time	N/A
Inspector	E. Smith	Logger	E. Smith
Depth to Water	N/A	Date/Time	N/A
Drilling Contractor	Hawkston	Drill Rig Type and ID	Geoprobe 3230DT
Overburden Drilling and Sampling Tools (Type and Size)	DT37 Dual Tube Soil Sampling System with 60" PVC Liners		
Rock Drilling and Sampling Tools (Type and Size)	No Coring		
Overdrill Tooling (Type and Size)	NA	Overdrill Depth	N/A
Sampler Hammer Type	No SPT	Weight	N/A
Drop	N/A	Efficiency	N/A
Borehole Azimuth	N/A	Borehole Inclination (from Vertical)	N/A
Reviewed By	J. Musselman	Approved By	M. Aplin

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]	Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft	Rec. Ft	Rec. %
0.0	772.3		Top of Hole					
			No sampling conducted from 0.0 to 35.0', boring advanced through this interval using DPT with closed tip. Refer to boring log KIF-TW02 for 0.0 - 35.0' details.					

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 3/18/20

SUBSURFACE LOG

Client Borehole ID: N/A
Stantec Boring No.: **KIF-B02a**
Client: Tennessee Valley Authority
Boring Location: 575,556.85 N; 2,407,609.96 E NAD83
Project Number: 175668043
Surface Elevation: 772.3 ft
Elevation Datum: NGVD29

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]	Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft	Rec. Ft	Rec. %
18			No sampling conducted from 0.0 to 35.0', boring advanced through this interval using DPT with closed tip. Refer to boring log KIF-TW02 for 0.0 - 35.0' details. *(Continued)*					
19								
20								
21								
22								
23								
24								
25								
26								
27								
28								
29								
30								
31								
32								
33								
34								
35.0	737.3							
35			SILTY POORLY GRADED SAND WITH GRAVEL, SP, 5Y 2.5/1 (black), very fine, medium dense to dense, moist to wet, no odor, no staining, [CCR]		DP01G	35.0 - 40.0	5.0	N/A
36								
37								
38								
39								
40.0	732.3							
40			GRAVELLY POORLY GRADED SAND, SP, 5Y 3/1 (very dark gray), very fine to fine, loose to medium dense, moist to wet, [CCR]		DP02aG	40.0 - 41.0		
41								
42								

35.0 - 40.0

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 3/18/20

SUBSURFACE LOG

Client Borehole ID: N/A
Stantec Boring No.: **KIF-B02a**
Client: Tennessee Valley Authority
Boring Location: 575,556.85 N; 2,407,609.96 E NAD83
Project Number: 175668043
Surface Elevation: 772.3 ft
Elevation Datum: NGVD29

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]		Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft		Rec. Ft	Rec. %
43.0	729.3				DP02bE	41.0 - 44.0	40.0 - 45.0	5.0	N/A
			SILT WITH SAND, ML, 5Y 3/1 (very dark gray), non-plastic, firm to hard, wet, [CCR]		DP02cG	44.0 - 45.0			
					DP03aG	45.0 - 46.5			
					DP03bE	46.5 - 48.5	45.0 - 50.0	5.0	N/A
					DP03cG	48.5 - 50.0			
					DP04a	50.0 - 50.7			
					DP04bE	50.7 - 52.3			
52.7	719.6				DP04c	52.3 - 52.7	50.0 - 55.0	5.0	N/A
			LEAN CLAY, CL, 10GY 5/1 (greenish gray) and 2.5Y 3/1 (very dark gray), low to medium plasticity, firm to hard, moist to dry, moderate organic odor		DP04dG	52.7 - 55.0			
			Color grades to 10Y 5/1 (greenish gray) mottled with 2.5Y 5/4 (light olive brown) by 55.0'		DP05G	55.0 - 57.5	55.0 - 57.5	2.5	N/A
57.5	714.8								

41.0/44.0-20191204
46.5/48.5-20191204
50.7/52.3-20191204

No Refusal /
Bottom of Hole at 57.5 Ft.

1: E = Environmental Sample Custody (two Split Spoons may be required to obtain sufficient sample)
G = Geotechnical Sample Custody
2: a,b,c denote Split Spoon divided between Environmental and Geotechnical Samples
3: Depths are reported in feet below ground surface

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 3/18/20

SUBSURFACE LOG

Client Borehole ID	N/A	Stantec Boring No.	**KIF-B02b**
Client	Tennessee Valley Authority	Boring Location	575,555.09 N; 2,407,613.60 E NAD83
Project Number	175668043	Surface Elevation	772.5 ft
		Elevation Datum	NGVD29
Project Name	KIF TDEC Order	Date Started	12/4/19
		Completed	12/4/19
Project Location	Harriman, Tennessee	Depth to Water	N/A
		Date/Time	N/A
Inspector	E. Smith	Logger	E. Smith
Depth to Water	N/A	Date/Time	N/A
Drilling Contractor	Hawkston	Drill Rig Type and ID	Geoprobe 3230DT
Overburden Drilling and Sampling Tools (Type and Size)	DT37 Dual Tube Soil Sampling System with 60" PVC Liners		
Rock Drilling and Sampling Tools (Type and Size)	No Coring		
Overdrill Tooling (Type and Size)	NA	Overdrill Depth	N/A
Sampler Hammer Type	No SPT	Weight	N/A
Drop	N/A	Efficiency	N/A
Borehole Azimuth	N/A	Borehole Inclination (from Vertical)	N/A
Reviewed By	J. Musselman	Approved By	M. Aplin

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]	Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft	Rec. Ft	Rec. %
0.0	772.5		Top of Hole					
			No sampling conducted from 0.0 to 35.0', boring advanced through this interval using DPT with closed tip. Refer to boring log KIF-TW02 for 0.0 - 35.0' details.					

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 3/18/20

SUBSURFACE LOG

Client Borehole ID: N/A
Stantec Boring No.: **KIF-B02b**
Client: Tennessee Valley Authority
Boring Location: 575,555.09 N; 2,407,613.60 E NAD83
Project Number: 175668043
Surface Elevation: 772.5 ft
Elevation Datum: NGVD29

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]	Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft	Rec. Ft	Rec. %
			No sampling conducted from 0.0 to 35.0', boring advanced through this interval using DPT with closed tip. Refer to boring log KIF-TW02 for 0.0 - 35.0' details. *(Continued)*					
35.0	737.5							
			POORLY GRADED SAND WITH GRAVEL, SP, 5Y 2.5/1 (black), fine to medium, medium dense to dense, moist to wet, no odor, no staining, [CCR]		DP01aG	35.0 - 36.0	2.5	N/A
					DP01bE	36.0 - 37.5		
37.5	735.0							
			POORLY GRADED SAND, SP, 5Y 3/1 (very dark gray), very fine to fine, moist to wet, [CCR]		DP02aE	37.5 - 39.0	2.5	N/A
					DP02bG	39.0 - 40.0		
					DP03aG	40.0 - 41.0		

36.0/39.0-20191204

35.0 - 37.5

37.5 - 40.0

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 3/18/20

SUBSURFACE LOG

Client Borehole ID: N/A
Stantec Boring No.: **KIF-B02b**
Client: Tennessee Valley Authority
Boring Location: 575,555.09 N; 2,407,613.60 E NAD83
Project Number: 175668043
Surface Elevation: 772.5 ft
Elevation Datum: NGVD29

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]		Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft		Rec. Ft	Rec. %
43.0	729.5				DP03bE	41.0 - 44.0	40.0 - 45.0	5.0	N/A
			SILT WITH SAND, ML, 5Y 3/1 (very dark gray), non-plastic, firm to hard, wet, [CCR]	41.0/44.0-20191204	DP03cG	44.0 - 45.0			
					DP04aG	45.0 - 46.5			
				46.5/48.5-20191204	DP04bE	46.5 - 48.5	45.0 - 50.0	5.0	N/A
					DP04cG	48.5 - 50.0			
					DP05a	50.0 - 50.7			
				50.7/52.3-20191204	DP05bE	50.7 - 52.3	50.0 - 52.5	2.5	N/A
52.3	720.2				DP05cG	52.3 - 52.5			
			LEAN CLAY, CL, 10GY 5/1 (greenish gray) and 2.5Y 3/1 (very dark gray), low to medium plasticity, firm to hard, moist to dry, moderate organic odor		DP06G	52.5 - 55.0	52.5 - 55.0	2.5	N/A
			Color grades to 10Y 5/1 (greenish gray) mottled with 2.5Y 5/4 (light olive brown) by 55.0'		DP07G	55.0 - 57.5	55.0 - 57.5	2.5	N/A
57.5	715.0								
			No Refusal / Bottom of Hole at 57.5 Ft.						

1: E = Environmental Sample Custody (two Split Spoons may be required to obtain sufficient sample)
G = Geotechnical Sample Custody
2: a,b,c denote Split Spoon divided between Environmental and Geotechnical Samples
3: Depths are reported in feet below ground surface

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 3/18/20

SUBSURFACE LOG

Client Borehole ID	N/A	Stantec Boring No.	**KIF-B03a**
Client	Tennessee Valley Authority	Boring Location	575,720.46 N; 2,408,236.12 E NAD83
Project Number	175668043	Surface Elevation	776.3 ft
Elevation Datum	NGVD29		
Project Name	KIF TDEC Order	Date Started	12/5/19
Completed	12/5/19		
Project Location	Harriman, Tennessee	Depth to Water	N/A
Date/Time	N/A		
Inspector	E. Smith	Logger	E. Smith
Depth to Water	N/A	Date/Time	N/A
Drilling Contractor	Hawkston	Drill Rig Type and ID	Geoprobe 3230DT
Overburden Drilling and Sampling Tools (Type and Size)	DT37 Dual Tube Soil Sampling System with 60" PVC Liners		
Rock Drilling and Sampling Tools (Type and Size)	No Coring		
Overdrill Tooling (Type and Size)	NA	Overdrill Depth	N/A
Sampler Hammer Type	No SPT	Weight	N/A
Drop	N/A	Efficiency	N/A
Borehole Azimuth	N/A	Borehole Inclination (from Vertical)	N/A
Reviewed By	J. Musselman	Approved By	M. Aplin

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]	Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft	Rec. Ft	Rec. %
0.0	776.3		Top of Hole					
			No sampling conducted from 0.0 to 40.0', boring advanced through this interval using DPT with closed tip. Refer to boring log KIF-TW03 for 0.0 - 40.0' details.					

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19

TVA EIP BORING LOG_175668043_TVA_KIF_TDEC.GPJ_TDEC SUBSURF DT 20190530.GDT 3/18/20

SUBSURFACE LOG

Client Borehole ID: N/A
Stantec Boring No.: **KIF-B03a**
Client: Tennessee Valley Authority
Boring Location: 575,720.46 N; 2,408,236.12 E NAD83
Project Number: 175668043
Surface Elevation: 776.3 ft
Elevation Datum: NGVD29

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]	Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft	Rec. Ft	Rec. %
19–39			No sampling conducted from 0.0 to 40.0', boring advanced through this interval using DPT with closed tip. Refer to boring log KIF-TW03 for 0.0 - 40.0' details. *(Continued)*					
40.0	736.3		SILT, ML, 5Y 2.5/1 (black), non-plastic, hard to very hard, moist to wet, [CCR]		DP01aG	40.0 - 41.5		
				41.5/43.5-20191205	DP01bE	41.5 - 43.5	5.0	N/A
					DP01cG	43.5 - 45.0		

40.0 - 45.0

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 3/18/20

SUBSURFACE LOG

Client Borehole ID: N/A
Stantec Boring No.: **KIF-B03a**
Client: Tennessee Valley Authority
Boring Location: 575,720.46 N; 2,408,236.12 E NAD83
Project Number: 175668043
Surface Elevation: 776.3 ft
Elevation Datum: NGVD29

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]	Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft	Rec. Ft	Rec. %
45			SILT, ML, 5Y 2.5/1 (black), non-plastic, hard to very hard, moist to wet, [CCR] *(Continued)*		DP02aG	45.0 - 46.5		
46								
47				46.5/48.5-20191205	DP02bE	46.5 - 48.5	5.0	N/A
48								
49					DP02cG	48.5 - 50.0		
50					DP03aG	50.0 - 51.5		
51								
52				51.5/53.5-20191205	DP03bE	51.5 - 53.5	5.0	N/A
53								
54	54.5	721.8			DP03cG	53.5 - 54.5		
					DP03dG	54.5 - 55.0		
55			SANDY SILT, ML, 10Y 3/2 (very dark grayish olive) to N 7/ (light gray), low plasticity, hard to very hard, moist, slight organic odor					
56					DP04G	55.0 - 57.5	2.5	N/A
57								
58	58.2	718.1			DP05aG	57.5 - 58.2		
			POORLY GRADED SAND, SP, 5Y 7/1 (light gray), very fine, very loose, wet		DP05bG	58.2 - 59.2	2.5	N/A
59	59.2	717.1						
60	60.0	716.3	CLAYEY SAND, SC, 2.5Y 8/1 (white) with 2.5Y 5/4 (light olive brown), very fine to fine, very dense to medium dense, moist		DP05cG	59.2 - 60.0		
			No Refusal / Bottom of Hole at 60.0 Ft.					

45.0 - 50.0
50.0 - 55.0
55.0 - 57.5
57.5 - 60.0

1: E = Environmental Sample Custody (two Split Spoons may be required to obtain sufficient sample)
G = Geotechnical Sample Custody
2: a,b,c denote Split Spoon divided between Environmental and Geotechnical Samples
3: Depths are reported in feet below ground surface

TVA EIP BORING LOG_175668043_TVA_KIF_TDEC.GPJ_TDEC SUBSURF DT 20190530.GDT 3/18/20

SUBSURFACE LOG

Client Borehole ID	N/A	Stantec Boring No.	**KIF-B03b**
Client	Tennessee Valley Authority	Boring Location	575,718.86 N; 2,408,238.19 E NAD83
Project Number	175668043	Surface Elevation	776.5 ft
		Elevation Datum	NGVD29
Project Name	KIF TDEC Order	Date Started	12/5/19
		Completed	12/5/19
Project Location	Harriman, Tennessee	Depth to Water	N/A
		Date/Time	N/A
Inspector	E. Smith	Logger	E. Smith
Depth to Water	N/A	Date/Time	N/A
Drilling Contractor	Hawkston	Drill Rig Type and ID	Geoprobe 3230DT
Overburden Drilling and Sampling Tools (Type and Size)	DT37 Dual Tube Soil Sampling System with 60" PVC Liners		
Rock Drilling and Sampling Tools (Type and Size)	No Coring		
Overdrill Tooling (Type and Size)	NA	Overdrill Depth	N/A
Sampler Hammer Type	No SPT	Weight	N/A
Drop	N/A	Efficiency	N/A
Borehole Azimuth	N/A	Borehole Inclination (from Vertical)	N/A
Reviewed By	J. Musselman	Approved By	M. Aplin

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]	Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft	Rec. Ft	Rec. %
0.0	776.5		Top of Hole					
			No sampling conducted from 0.0 to 40.0', boring advanced through this interval using DPT with closed tip. Refer to boring log KIF-TW03 for 0.0 - 40.0' details.					

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19

TVA EIP BORING LOG_175668043_TVA_KIF_TDEC.GPJ_TDEC SUBSURF DT 20190530.GDT 3/18/20

SUBSURFACE LOG

Client Borehole ID N/A
Stantec Boring No. **KIF-B03b**
Client Tennessee Valley Authority
Boring Location 575,718.86 N; 2,408,238.19 E NAD83
Project Number 175668043
Surface Elevation 776.5 ft
Elevation Datum NGVD29

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]	Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft	Rec. Ft	Rec. %
19			No sampling conducted from 0.0 to 40.0', boring advanced through this interval using DPT with closed tip. Refer to boring log KIF-TW03 for 0.0 - 40.0' details. *(Continued)*					
20								
21								
22								
23								
24								
25								
26								
27								
28								
29								
30								
31								
32								
33								
34								
35								
36								
37								
38								
39								
40	40.0	736.5						
41			SILT, ML, 5Y 2.5/1 (black), non-plastic, hard to very hard, moist to wet, no odor, grain size decreases with depth, [CCR]		DP01aG	40.0 - 41.5		
42				41.5/43.5-20191205				
43					DP01bE	41.5 - 43.5	5.0	N/A
44					DP01cG	43.5 - 45.0		

40.0 - 45.0

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 3/18/20

SUBSURFACE LOG

Client Borehole ID: N/A
Stantec Boring No.: **KIF-B03b**
Client: Tennessee Valley Authority
Boring Location: 575,718.86 N; 2,408,238.19 E NAD83
Project Number: 175668043
Surface Elevation: 776.5 ft
Elevation Datum: NGVD29

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]	Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft	Rec. Ft	Rec. %
45			SILT, ML, 5Y 2.5/1 (black), non-plastic, hard to very hard, moist to wet, no odor, grain size decreases with depth, [CCR] *(Continued)*		DP02aG	45.0 - 46.5		
46								
47				46.5/48.5-20191205	DP02bE	46.5 - 48.5	5.0	N/A
48								
49					DP02cG	48.5 - 50.0		
50					DP03aG	50.0 - 51.5		
51								
52				51.5/53.5-20191205	DP03bE	51.5 - 53.5	5.0	N/A
53								
54	54.5	722.0			DP03cG	53.5 - 54.5		
					DP03dG	54.5 - 55.0		
55			SANDY SILT, ML, 10Y 3/2 (very dark grayish olive) to N 7/ (light gray), low plasticity, hard to very hard, moist, slight organic odor					
56					DP04G	55.0 - 57.5	2.5	N/A
57								
58								
59					DP05G	57.5 - 60.0	2.5	N/A
60	60.0	716.5	Heavily iron stained 10YR 4/4 (dark yellowish brown) from 59.6' to 60.0'.					
			No Refusal / Bottom of Hole at 60.0 Ft.					

45.0 - 50.0
50.0 - 55.0
55.0 - 57.5
57.5 - 60.0

1: E = Environmental Sample Custody (two Split Spoons may be required to obtain sufficient sample)
G = Geotechnical Sample Custody
2: a,b,c denote Split Spoon divided between Environmental and Geotechnical Samples
3: Depths are reported in feet below ground surface

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 3/18/20

SUBSURFACE LOG

Client Borehole ID	N/A	Stantec Boring No.	**KIF-B04a**
Client	Tennessee Valley Authority	Boring Location	574,774.09 N; 2,407,874.27 E NAD83
Project Number	175668043	Surface Elevation	765.5 ft
Elevation Datum	NGVD29		
Project Name	KIF TDEC Order	Date Started	12/5/19
Completed	12/5/19		
Project Location	Harriman, Tennessee	Depth to Water	N/A
Date/Time	N/A		
Inspector	E. Smith	Logger	E. Smith
Depth to Water	N/A	Date/Time	N/A
Drilling Contractor	Hawkston	Drill Rig Type and ID	Geoprobe 3230DT
Overburden Drilling and Sampling Tools (Type and Size)	DT37 Dual Tube Soil Sampling System with 60" PVC Liners		
Rock Drilling and Sampling Tools (Type and Size)	No Coring		
Overdrill Tooling (Type and Size)	NA	Overdrill Depth	N/A
Sampler Hammer Type	No SPT	Weight	N/A
Drop	N/A	Efficiency	N/A
Borehole Azimuth	N/A	Borehole Inclination (from Vertical)	N/A
Reviewed By	J. Musselman	Approved By	M. Aplin

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]	Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft	Rec. Ft	Rec. %
0.0	765.5		Top of Hole					
			No sampling conducted from 0.0 to 35.0', boring advanced through this interval using DPT with closed tip. Refer to boring log KIF-TW04 for 0.0 - 35.0' details.					

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 3/18/20

SUBSURFACE LOG

Client Borehole ID N/A
Stantec Boring No. **KIF-B04a**
Client Tennessee Valley Authority
Boring Location 574,774.09 N; 2,407,874.27 E NAD83
Project Number 175668043
Surface Elevation 765.5 ft
Elevation Datum NGVD29

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]	Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft	Rec. Ft	Rec. %
			No sampling conducted from 0.0 to 35.0', boring advanced through this interval using DPT with closed tip. Refer to boring log KIF-TW04 for 0.0 - 35.0' details. *(Continued)*					
35.0	730.5							
			POORLY GRADED SAND, SP, 10B 2.5/1 (bluish black), very fine, very loose, wet, poorly graded, [CCR]		DP01aG	35.0 - 36.5		
					DP01bE	36.5 - 38.5	5.0	N/A
					DP01cG	38.5 - 40.0		
40.0	725.5							
			SILT, ML, 10B 2.5/1 (bluish black), non-plastic, firm, wet, poorly graded, [CCR]		DP02aG	40.0 - 41.5		

36.5/38.5-20191205

35.0 - 40.0

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 3/18/20

SUBSURFACE LOG

Client Borehole ID N/A
Stantec Boring No. **KIF-B04a**
Client Tennessee Valley Authority
Boring Location 574,774.09 N; 2,407,874.27 E NAD83
Project Number 175668043
Surface Elevation 765.5 ft
Elevation Datum NGVD29

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]	Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft	Rec. Ft	Rec. %
43			Minimal coarse angular gravel at 42.0' SILT, ML, 10B 2.5/1 (bluish black), non-plastic, firm, wet, poorly graded, [CCR] *(Continued)*		DP02bE	41.5 - 43.5	5.0	N/A
44	44.0	721.5			DP02cG	43.5 - 44.0		
	45.0	720.5	LEAN CLAY, CL, 10B 2.5/1 (bluish black), very soft, wet, moderate organic odor		DP02dG	44.0 - 45.0		
45								
46			LEAN CLAY, CL, 5Y 6/2 (light olive gray) to 5Y 5/2 (olive gray), firm to hard, moist to wet, moderate organic odor, iron oxide staining, color and moisture content change with depth, mottled 7.5YR 4/4 (brown)		DP03G	45.0 - 47.5	2.5	N/A
47								
48								
49					DP04G	47.5 - 50.0	2.5	N/A
50	50.0	715.5						
			No Refusal / Bottom of Hole at 50.0 Ft.					

41.5/43.5-20191205

40.0 - 45.0

45.0 - 47.5

47.5 - 50.0

1: E = Environmental Sample Custody (two Split Spoons may be required to obtain sufficient sample)
G = Geotechnical Sample Custody
2: a,b,c denote Split Spoon divided between Environmental and Geotechnical Samples
3: Depths are reported in feet below ground surface

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 3/18/20

ATTACHMENT C.2

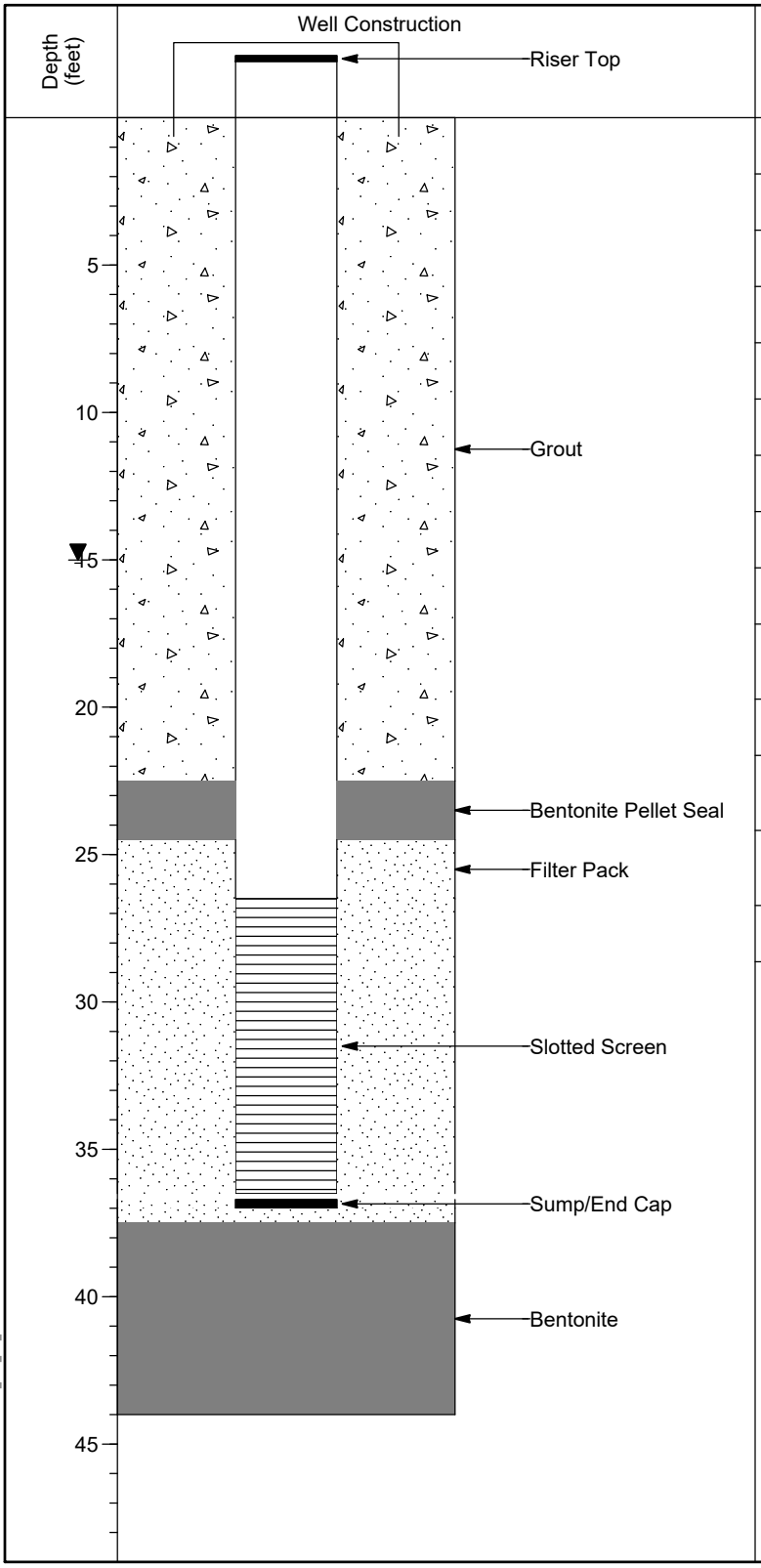
Temporary Well Installation Details

WELL INSTALLATION DETAIL

WELL / PROBEHOLE / BOREHOLE NO: **KIF-TW01** (Boring KIF-TW01)

PROJECT: **KIF TDEC Order**
PROJECT NUMBER: **175668043**
DRILLING COMPANY: **Stantec Consulting Services Inc.**
DRILLING EQUIPMENT: **CME 55T#1, #709**
DRILLING METHOD: **8-1/4" HSA overdrill of boring**
SAMPLING METHOD: **4-1/4" HSA, 3" SS w/o liners, 3" Shelby Tubes**
OBSERVED BY: **D. Mihalek**
REVIEWED BY: **P. Dunne**
APPROVED BY: **L. Price**

INSTALLATION: STARTED: **1/29/19** COMPLETED: **1/30/19**
LOCATION: **576,050.03 N; 2,407,660.05 E** DATUM: **NAD83**
LOC. DESCRIP:
LATITUDE: **35° 54' 24.21"** LONGITUDE: **-84° 31' 1.27"**
GROUND ELEV (ft): **771.8** TOC ELEV (ft): **775.4**
ELEVATION DATUM: **NGVD29**
BOREHOLE DEPTH (ft): **44.0** WELL DEPTH (ft, bgs): **37.0**
DTW AT COMPLETION (ft, bgs): **15.0**
BOREHOLE DIA. (in): **8.0** WELL DIA. (in): **4.0**



Materials Inventory

RISER TYPE: **4" Sch 40 PVC Riser**

RISER: TOP (AGS): **3.5 ft** BOTTOM (BGS): **26.5 ft**

SCREEN TYPE: **5"ID x 4"ID U-Pack**

SCREEN SLOT SIZE (in): **0.010**

SCREEN: TOP (BGS): **26.5 ft** BOTTOM (BGS): **36.5 ft**

END CAP: TOP (BGS): **36.5 ft** BOTTOM (BGS): **37.0 ft**

GROUT QUANTITY: **112 gal**

GROUT TYPE: **30% Solids Bentonite Grout**

GROUT: TOP (BGS): **0.0 ft** BOTTOM (BGS): **22.5 ft**

GROUT DENSITY:
INITIAL (lbs/gal): **10** RETURN (lbs/gal): **10**

BENTONITE TYPE: **3/8" PDS TR30 pellets**

BENTONITE SEAL:
TOP (BGS): **22.5 ft** BOTTOM (BGS): **24.5 ft**

FILTER PACK - PRE-PACK AND ANNULAR SPACE:
TYPE: **20/40 Mesh (Global #7)**

FILTER PACK: TOP (BGS): **24.5 ft** BOTTOM (BGS): **37.5 ft**

NOTES:
Depths shown are in ft bgs at the time of temporary well installation. Surveyed stick-up length (3.6') is 0.1' longer than stick-up reported during installation. Field measured total well depth following well development is 36.9 ft bgs.

WELL CONSTRUCTION 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 3/11/20

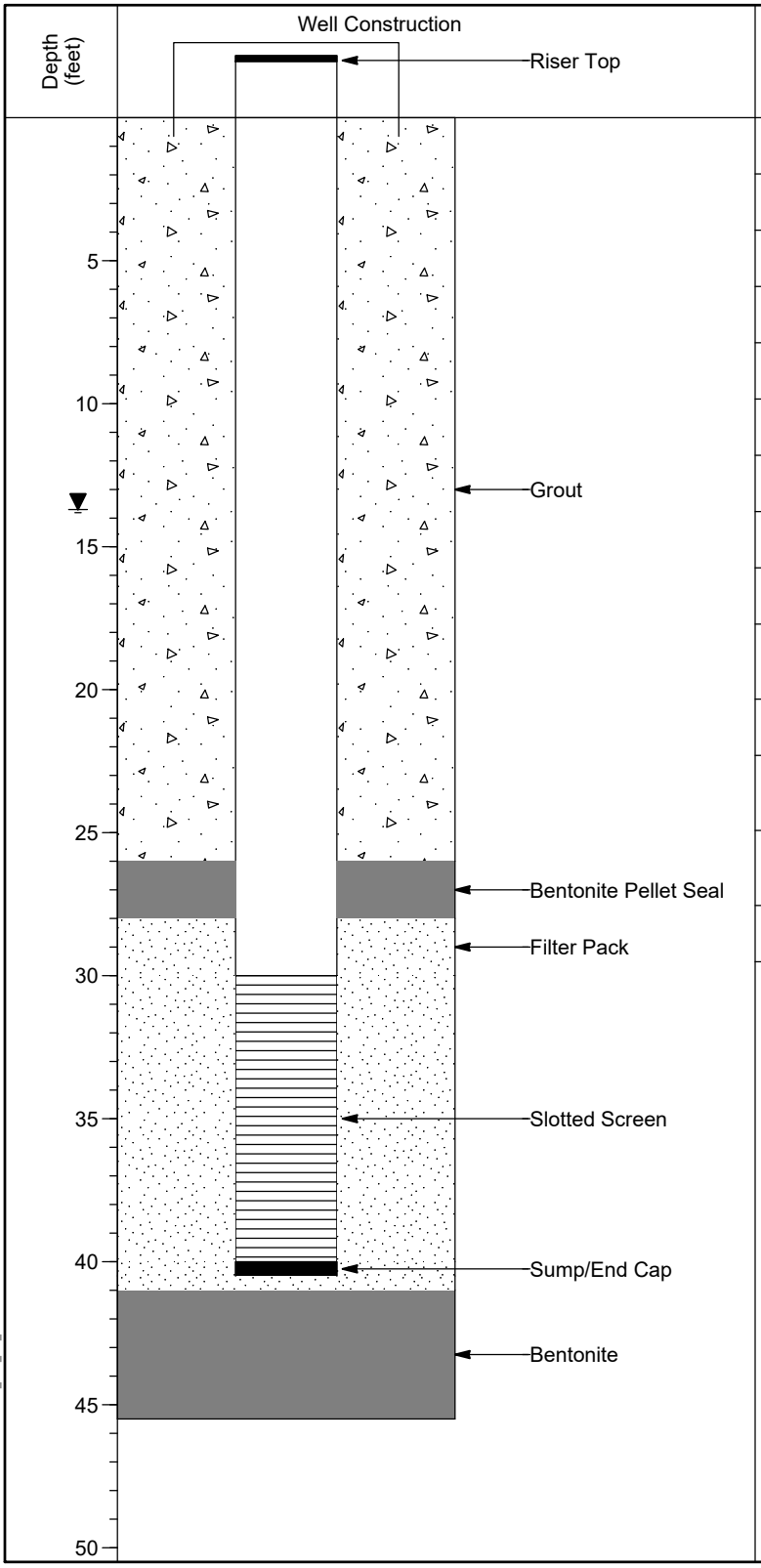
VERTICAL SCALE: AS SHOWN. HORIZONTAL SCALE: NOT TO SCALE (EXAGGERATED TO SHOW DETAIL)

WELL INSTALLATION DETAIL

WELL / PROBEHOLE / BOREHOLE NO: **KIF-TW02** (Boring KIF-TW02) PAGE 1 OF 1

PROJECT: **KIF TDEC Order**
PROJECT NUMBER: **175668043**
DRILLING COMPANY: **Stantec Consulting Services Inc.**
DRILLING EQUIPMENT: **CME 55T#1, #709**
DRILLING METHOD: **8-1/4" HSA overdrill of boring**
SAMPLING METHOD: **4-1/4" HSA, 3" SS w/o liners, 3" Shelby Tubes**
OBSERVED BY: **D. Mihalek**
REVIEWED BY: **P. Dunne**
APPROVED BY: **L. Price**

INSTALLATION: STARTED: **2/6/19** COMPLETED: **2/7/19**
LOCATION: **575,548.50 N; 2,407,585.76 E** DATUM: **NAD83**
LOC. DESCRIP:
LATITUDE: **35° 54' 19.26"** LONGITUDE: **-84° 31' 2.27"**
GROUND ELEV (ft): **771.9** TOC ELEV (ft): **774.7**
ELEVATION DATUM: **NGVD29**
BOREHOLE DEPTH (ft): **45.5** WELL DEPTH (ft, bgs): **40.5**
DTW AT COMPLETION (ft, bgs): **13.7**
BOREHOLE DIA. (in): **8.0** WELL DIA. (in): **4.0**



Materials Inventory

RISER TYPE: **4" Sch 40 PVC Riser**

RISER: TOP (AGS): **2.5 ft** BOTTOM (BGS): **30.0 ft**

SCREEN TYPE: **5"ID x 4"ID U-Pack**

SCREEN SLOT SIZE (in): **0.010**

SCREEN: TOP (BGS): **30.0 ft** BOTTOM (BGS): **40.0 ft**

END CAP: TOP (BGS): **40.0 ft** BOTTOM (BGS): **40.5 ft**

GROUT QUANTITY: **120 gal**

GROUT TYPE: **30% Solids Bentonite Grout**

GROUT: TOP (BGS): **0.0 ft** BOTTOM (BGS): **26.0 ft**

GROUT DENSITY:
INITIAL (lbs/gal): **10** RETURN (lbs/gal): **10**

BENTONITE TYPE: **3/8" PDS TR30 pellets**

BENTONITE SEAL:
TOP (BGS): **26.0 ft** BOTTOM (BGS): **28.0 ft**

FILTER PACK - PRE-PACK AND ANNULAR SPACE:
TYPE: **20/40 Mesh (Global #7)**

FILTER PACK: TOP (BGS): **28.0 ft** BOTTOM (BGS): **41.0 ft**

NOTES:
Depths shown are in ft bgs at the time of temporary well installation. Surveyed stick-up length (2.9') is 0.4' longer than stick-up reported during installation. Field measured total well depth following well development is 40.0 ft bgs.

WELL CONSTRUCTION 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 3/11/20

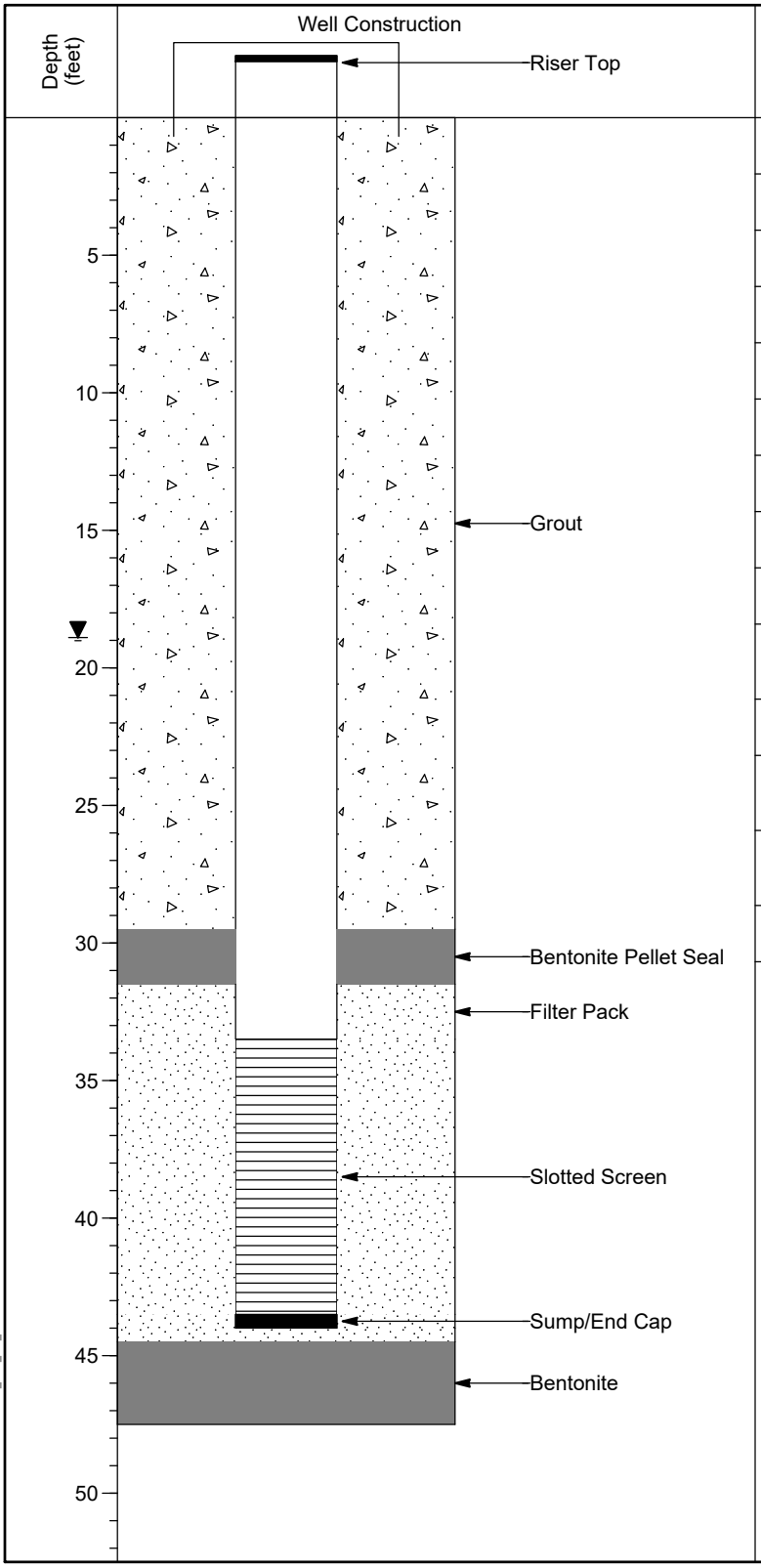
VERTICAL SCALE: AS SHOWN. HORIZONTAL SCALE: NOT TO SCALE (EXAGGERATED TO SHOW DETAIL)

WELL INSTALLATION DETAIL

WELL / PROBEHOLE / BOREHOLE NO: **KIF-TW03** (Boring KIF-TW03)

PROJECT: **KIF TDEC Order**
PROJECT NUMBER: **175668043**
DRILLING COMPANY: **Stantec Consulting Services Inc.**
DRILLING EQUIPMENT: **CME 55T#1, #709**
DRILLING METHOD: **8-1/4" HSA overdrill of boring**
SAMPLING METHOD: **4-1/4" HSA, 3" SS w/o liners, 3" Shelby Tubes**
OBSERVED BY: **D. Mihalek**
REVIEWED BY: **P. Dunne**
APPROVED BY: **L. Price**

INSTALLATION: STARTED: **2/26/19** COMPLETED: **2/27/19**
LOCATION: **575,720.53 N; 2,408,211.78 E** DATUM: **NAD83**
LOC. DESCRIP:
LATITUDE: **35° 54' 20.87"** LONGITUDE: **-84° 30' 54.63"**
GROUND ELEV (ft): **776.0** TOC ELEV (ft): **778.9**
ELEVATION DATUM: **NGVD29**
BOREHOLE DEPTH (ft): **47.5** WELL DEPTH (ft, bgs): **44.0**
DTW AT COMPLETION (ft, bgs): **18.9**
BOREHOLE DIA. (in): **8.0** WELL DIA. (in): **4.0**



Materials Inventory

RISER TYPE: **4" Sch 40 PVC Riser**

RISER: TOP (AGS): **3.0 ft** BOTTOM (BGS): **33.5 ft**

SCREEN TYPE: **5"ID x 4"ID U-Pack**

SCREEN SLOT SIZE (in): **0.010**

SCREEN: TOP (BGS): **33.5 ft** BOTTOM (BGS): **43.5 ft**

END CAP: TOP (BGS): **43.5 ft** BOTTOM (BGS): **44.0 ft**

GROUT QUANTITY: **80 gal**

GROUT TYPE: **30% Solids Bentonite Grout**

GROUT: TOP (BGS): **0.0 ft** BOTTOM (BGS): **29.5 ft**

GROUT DENSITY:
INITIAL (lbs/gal): **10** RETURN (lbs/gal): **10**

BENTONITE TYPE: **3/8" PDS TR30 pellets**

BENTONITE SEAL:
TOP (BGS): **29.5 ft** BOTTOM (BGS): **31.5 ft**

FILTER PACK - PRE-PACK AND ANNULAR SPACE:
TYPE: **20/40 Mesh (Global #7)**

FILTER PACK: TOP (BGS): **31.5 ft** BOTTOM (BGS): **44.5 ft**

NOTES:
Depths shown are in ft bgs at the time of temporary well installation. Surveyed stick-up length (3.0') is the same as the stick-up reported during installation. Field measured total well depth following well development is 43.9 ft bgs.

WELL CONSTRUCTION 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 3/11/20

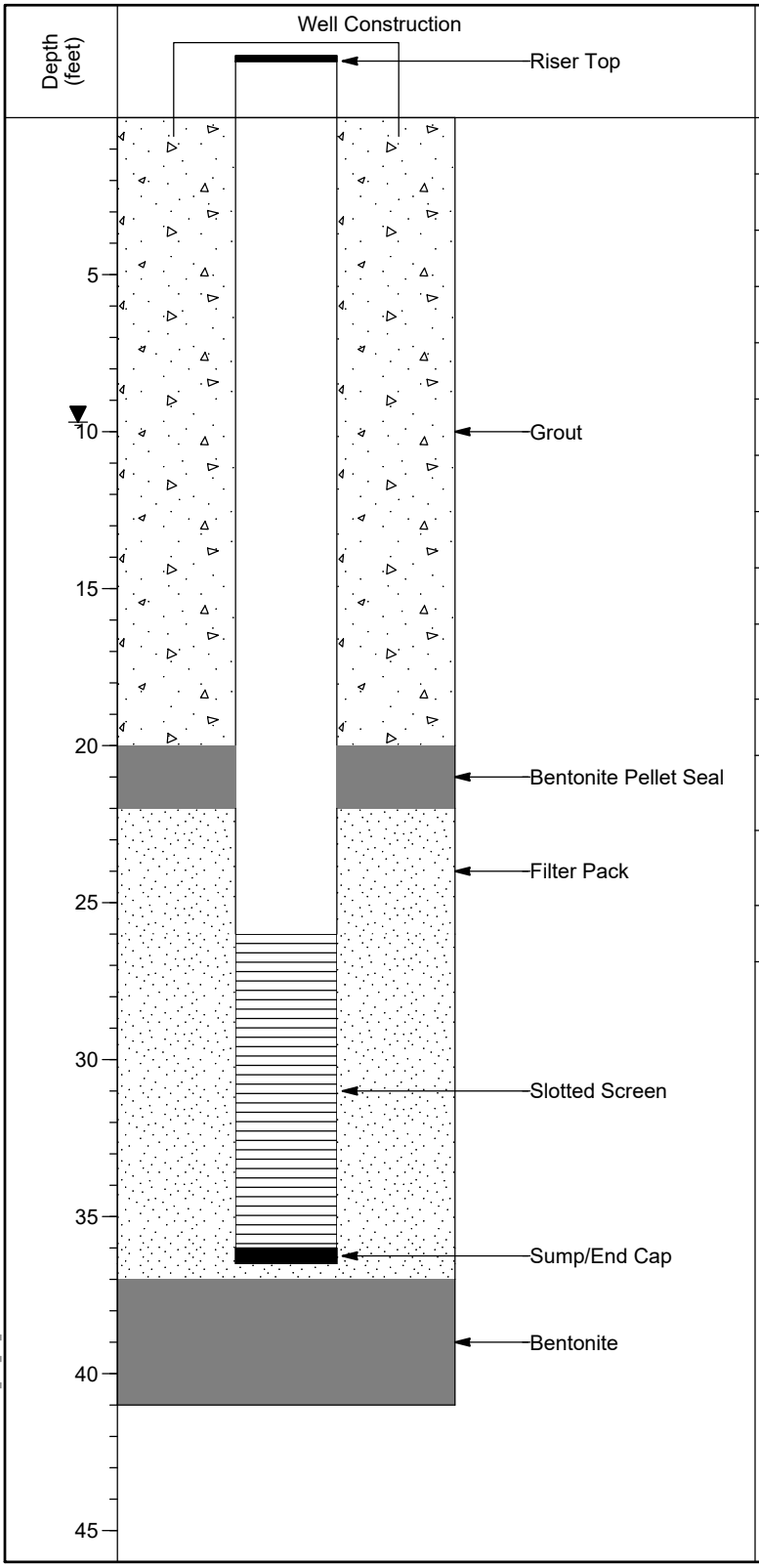
VERTICAL SCALE: AS SHOWN. HORIZONTAL SCALE: NOT TO SCALE (EXAGGERATED TO SHOW DETAIL)

WELL INSTALLATION DETAIL

WELL / PROBEHOLE / BOREHOLE NO: **KIF-TW04** (Boring KIF-TW04) PAGE 1 OF 1

PROJECT: **KIF TDEC Order**
PROJECT NUMBER: **175668043**
DRILLING COMPANY: **Stantec Consulting Services Inc.**
DRILLING EQUIPMENT: **CME 55T#1, #709**
DRILLING METHOD: **8-1/4" HSA overdrill of boring**
SAMPLING METHOD: **4-1/4" HSA, 3" SS w/o liners, 3" Shelby Tubes**
OBSERVED BY: **M. Edmunds**
REVIEWED BY: **P. Dunne**
APPROVED BY: **L. Price**

INSTALLATION: STARTED: **2/13/19** COMPLETED: **2/14/19**
LOCATION: **574,754.11 N; 2,407,855.14 E** DATUM: **NAD83**
LOC. DESCRIP:
LATITUDE: **35° 54' 11.36"** LONGITUDE: **-84° 30' 59.14"**
GROUND ELEV (ft): **765.2** TOC ELEV (ft): **769.6**
ELEVATION DATUM: **NGVD29**
BOREHOLE DEPTH (ft): **41.0** WELL DEPTH (ft, bgs): **36.5**
DTW AT COMPLETION (ft, bgs): **9.7**
BOREHOLE DIA. (in): **8.0** WELL DIA. (in): **4.0**



Materials Inventory

RISER TYPE: **4" Sch 40 PVC Riser**

RISER: TOP (AGS): **4.4 ft** BOTTOM (BGS): **26.0 ft**

SCREEN TYPE: **5"ID x 4"ID U-Pack**

SCREEN SLOT SIZE (in): **0.010**

SCREEN: TOP (BGS): **26.0 ft** BOTTOM (BGS): **36.0 ft**

END CAP: TOP (BGS): **36.0 ft** BOTTOM (BGS): **36.5 ft**

GROUT QUANTITY: **84 gal**

GROUT TYPE: **30% Solids Bentonite Grout**

GROUT: TOP (BGS): **0.0 ft** BOTTOM (BGS): **20.0 ft**

GROUT DENSITY:
INITIAL (lbs/gal): **10** RETURN (lbs/gal): **10**

BENTONITE TYPE: **3/8" PDS TR30 pellets**

BENTONITE SEAL:
TOP (BGS): **20.0 ft** BOTTOM (BGS): **22.0 ft**

FILTER PACK - PRE-PACK AND ANNULAR SPACE:
TYPE: **20/40 Mesh (Global #7)**

FILTER PACK: TOP (BGS): **22.0 ft** BOTTOM (BGS): **37.0 ft**

NOTES:
Depths shown are in ft bgs at the time of temporary well installation. Surveyed stick-up length (4.4') is the same as the stick-up reported during installation. Field measured total well depth following well development is 36.1 ft bgs.

WELL CONSTRUCTION 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 3/11/20

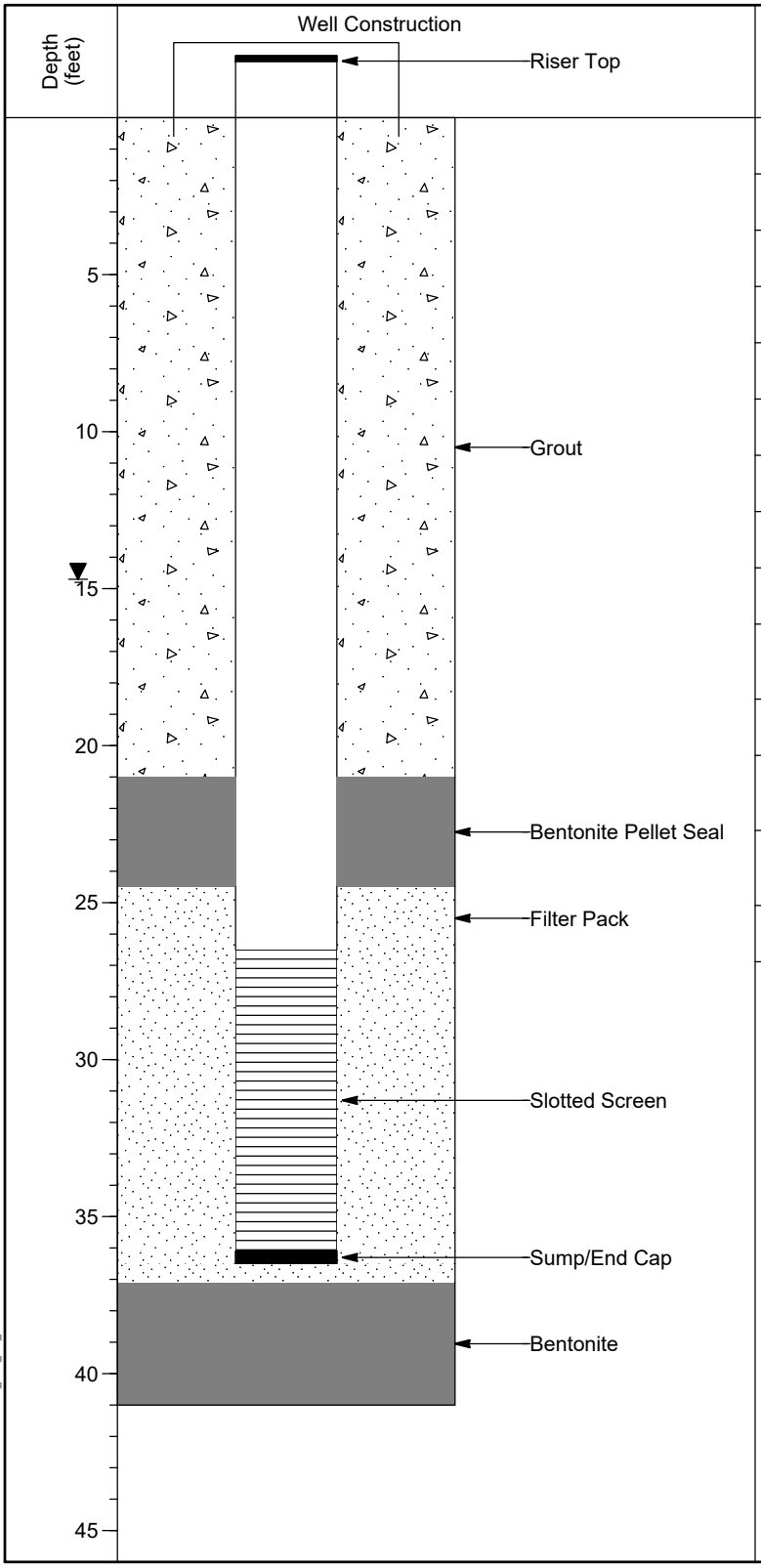
VERTICAL SCALE: AS SHOWN. HORIZONTAL SCALE: NOT TO SCALE (EXAGGERATED TO SHOW DETAIL)

WELL INSTALLATION DETAIL

WELL / PROBEHOLE / BOREHOLE NO: **KIF-TW05** (Boring KIF-TW05)

PROJECT: **KIF TDEC Order**
PROJECT NUMBER: **175668043**
DRILLING COMPANY: **Stantec Consulting Services Inc.**
DRILLING EQUIPMENT: **CME 850XR, #953**
DRILLING METHOD: **8-1/4" HSA overdrill of boring**
SAMPLING METHOD: **4-1/4" HSA, 3" SS w/o liners, 3" Shelby Tubes**
OBSERVED BY: **G. Budd**
REVIEWED BY: **P. Dunne**
APPROVED BY: **L. Price**

INSTALLATION: STARTED: **11/13/18** COMPLETED: **11/14/18**
LOCATION: **575,382.75 N; 2,408,921.34 E** DATUM: **NAD83**
LOC. DESCRIP:
LATITUDE: **35° 54' 17.42"** LONGITUDE: **-84° 30' 46.07"**
GROUND ELEV (ft): **770.5** TOC ELEV (ft): **773.6**
ELEVATION DATUM: **NGVD29**
BOREHOLE DEPTH (ft): **41.0** WELL DEPTH (ft, bgs): **36.5**
DTW AT COMPLETION (ft, bgs): **14.7**
BOREHOLE DIA. (in): **13.0** WELL DIA. (in): **4.0**



Materials Inventory

RISER TYPE: **4" Sch 40 PVC Riser**

RISER: TOP (AGS): **5.0 ft** BOTTOM (BGS): **26.5 ft**

SCREEN TYPE: **5"ID x 4"ID U-Pack**

SCREEN SLOT SIZE (in): **0.010**

SCREEN: TOP (BGS): **26.5 ft** BOTTOM (BGS): **36.1 ft**

END CAP: TOP (BGS): **36.1 ft** BOTTOM (BGS): **36.5 ft**

GROUT QUANTITY: **180 gal**

GROUT TYPE: **30% Solids Bentonite Grout**

GROUT: TOP (BGS): **0.5 ft** BOTTOM (BGS): **21.0 ft**

GROUT DENSITY:
INITIAL (lbs/gal): **N/A** RETURN (lbs/gal): **N/A**

BENTONITE TYPE: **3/8" PDS TR30 pellets**

BENTONITE SEAL:
TOP (BGS): **21.0 ft** BOTTOM (BGS): **24.5 ft**

FILTER PACK - PRE-PACK AND ANNULAR SPACE:
TYPE: **20/40 Mesh (Global #7)**

FILTER PACK: TOP (BGS): **24.5 ft** BOTTOM (BGS): **37.1 ft**

NOTES:
Depths shown are in ft bgs at the time of temporary well installation. Reported surveyed stick-up length (3.1') is 2.1' shorter than stick-up reported during installation.

Overdrill depth was 39.0 ft bgs.

WELL CONSTRUCTION 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 3/11/20

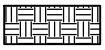
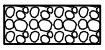
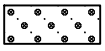
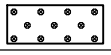
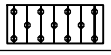
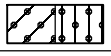
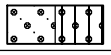
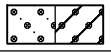
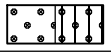
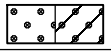
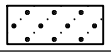
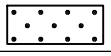
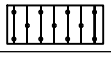
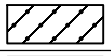
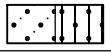
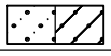
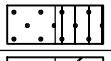
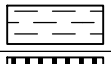
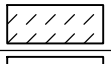
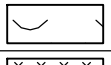
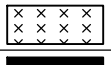
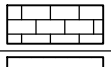
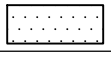
VERTICAL SCALE: AS SHOWN. HORIZONTAL SCALE: NOT TO SCALE (EXAGGERATED TO SHOW DETAIL)

ATTACHMENT C.3

Phase 2 Subsurface Logs

Subsurface Boring Legend

Lithology Graphics

Symbol	Lithology
	Fill
	Top Soil
	Gravel
	Well Graded Gravel (GW)
	Poorly Graded Gravel (GP)
	Silty Gravel (GM)
	Silty, Clayey Gravel (GC-GM)
	Clayey Gravel (GC)
	Well Graded Gravel with Silt (GW-GM)
	Well Graded Gravel with Clay (GW-GC)
	Poorly Graded Gravel with Silt (GP-GM)
	Poorly Graded Gravel with Clay (GP-GC)
	Well Graded Sand (SW)
	Poorly Graded Sand (SP)
	Silty Sand (SM)
	Silty, Clayey Sand (SC-SM)
	Clayey Sand (SC)
	Well Graded Sand with Silt (SW-SM)
	Well Graded Sand with Clay (SW-SC)
	Poorly Graded Sand with Silt (SP-SM)
	Poorly Graded Sand with Clay (SP-SC)
	Silt (ML)
	Silty Clay (CL-ML)
	Lean Clay (CL)
	Organic Silt (OL)
	Elastic Silt (MH)
	Fat Clay (CH)
	Organic Clay (OH)
	Shale
	Siltstone
	Coal
	Limestone
	Sandstone

Lithology Graphics are based on TVA drafting standards.

Other Graphics

Symbol	Description
	Denotes environmental analytical sample interval
	Denotes SS sample interval
	Denotes ST sample interval
	Denotes DP sample interval
	Denotes RS sample interval
	Denotes RC sample interval
	First water level reading
	Second water level reading

Common Abbreviations

Abbreviation	Definition
DP	Direct Push
HA	Hand Auger
HSA	Hollow Stem Auger
N/A	Not Applicable
NR	Not Recorded
RC	Rock Core
RQD	Rock Quality Designation
RS	Rotary Sonic
SS	Split Spoon
ST	Shelby Tube
WH	Weight of Hammer
WR	Weight of Rod

General Notes

The boring logs include sample numbering used during drilling. For assigned Environmental Analytical Sample ID numbers, see relevant Environmental Chain-of- Custody forms from the drilling date range listed on each log.

For pH readings and additional field data, see applicable field documentation (e.g., Soil pH Data Form) from the drilling date range listed on each log.

SUBSURFACE LOG

Client Borehole ID	N/A	Stantec Boring No.	**KIF-B05**
Client	Tennessee Valley Authority	Boring Location	574,498.86 N; 2,408,062.70 E NAD83
Project Number	175668043	Surface Elevation	756.5 ft
Elevation Datum	NGVD29		
Project Name	KIF TDEC Order	Date Started	2/22/21
Completed	2/23/21		
Project Location	Harriman, Tennessee	Depth to Water	N/A
Date/Time	N/A		
Inspector	T. Greenwell	Logger	T. Greenwell
Depth to Water	N/A	Date/Time	N/A
Drilling Contractor	Stantec Consulting Services Inc.	Drill Rig Type and ID	CME 55T#1, #709
Overburden Drilling and Sampling Tools (Type and Size)	4-5/8" 3-Wing Updraft Bit, 2" SS w/o liners, 3" ST		
Rock Drilling and Sampling Tools (Type and Size)	N/A		
Overdrill Tooling (Type and Size)	N/A	Overdrill Depth	N/A
Sampler Hammer Type	Automatic	Weight	140 lb
Drop	30"	Efficiency	89.8%
Borehole Azimuth	N/A	Borehole Inclination (from Vertical)	N/A
Reviewed By	J. Musselman	Approved By	A. Welshans

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]		Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft		Rec. Ft	Rec. %
0.0	756.5		Top of Hole						
0			Crushed stone		SS01G	0.0 - 1.5	0.0 - 1.5	1.3	11-10-15
1			Trace clay below 1.0 feet, dry						
2									
3.0	753.5				SS02aG	2.5 - 3.0	2.5 - 4.0	1.5	9-10-8
3			SILTY SAND TRACE GRAVEL, SM, 2.5Y 2.5/1 (black) to 2.5Y 5/4 (light olive brown), very fine to medium, medium dense, dry to moist, slight organic odor, iron oxide staining, minor lean clay intermixed, [CCR]		SS02bG	3.0 - 4.0			
4									
5.5	751.0				SS03aG	5.0 - 5.5	5.0 - 6.5	1.3	1-2-1
5			SANDY LEAN CLAY, CL, 7.5YR 5/4 (brown) to 7.5YR 3/1 (very dark gray), low to medium plasticity, soft to hard, moist, fine to medium sand, trace black gravelly sand ccr layers intermixed (<5" thick), [FILL]		SS03bG	5.5 - 6.5			
6									
7									
8					SS04G	7.5 - 9.0	7.5 - 9.0	1.4	1-5-9
9.5	747.0								
9			CLAYEY SAND, SC, 7.5YR 5/4 (brown) to 7.5YR 3/1 (very dark gray), fine to coarse, low plasticity, loose to dense, moist, iron oxide staining, [FILL]		SS05G	10.0 - 11.5	10.0 - 11.5	1.4	1-2-6
10									
11									
12									
13					SS06G	12.5 - 14.0	12.5 - 14.0	1.1	8-15-16
14									
15									
16					SS07G	15.0 - 16.5	15.0 - 16.5	0.7	2-3-16
17									
18									

TVA EIP BORING LOG_175668043_TVA_KIF_TDEC.GPJ_TDEC SUBSURF DT 20190530.GDT 8/4/21

SUBSURFACE LOG

Client Borehole ID: N/A
Stantec Boring No.: **KIF-B05**
Client: Tennessee Valley Authority
Boring Location: 574,498.86 N; 2,408,062.70 E NAD83
Project Number: 175668043
Surface Elevation: 756.5 ft
Elevation Datum: NGVD29

Depth Ft[3]	Elevation	Graphic	Description	Sample[1,2]	Depth Ft[3] Run Ft	Rec. Ft	Blows/PSI Rec. %
			Overburden: / Rock Core:	RQD %			
18			CLAYEY SAND, SC, 7.5YR 5/4 (brown) to 7.5YR 3/1 (very dark gray), fine to coarse, low plasticity, loose to dense, moist, iron oxide staining, [FILL] *(Continued)*	SS08	17.5 - 19.0	0.9	5-6-7
19							
20				SS09	19.0 - 20.5	1.1	WH-2-4
21				SS10	20.5 - 22.0	1.0	2-3-4
22	22.5	734.0					
23			SILTY SAND, SM, 7.5YR 5/4 (brown) to 7.5YR 4/1 (dark gray), low to medium plasticity, very loose, moist to wet, iron oxide staining, fine to medium sand, [FILL]	SS11G	23.0 - 24.5	0.5	WH-WH-2
24							
25							
26				SS12G	25.5 - 27.0	0.7	WH-WH-WH
27							
28							
29				SS13G	28.0 - 29.5	0.9	1-1-2
30							
31				SS14G	30.5 - 32.0	1.3	1-2-3
32	32.5	724.0					
33			SANDY LEAN CLAY, CL, 10YR 3/2 (very dark grayish brown), medium plasticity, very soft, wet, slight organic odor, fine to medium sand, trace weathered shale fragments	SS15G	33.0 - 34.5	0.7	WH-WH-WH
34	34.5	722.0					
35			LEAN CLAY, CL, 7.5YR 5/6 (strong brown) to 7.5YR 6/2 (pinkish gray), very fine to fine, low to medium plasticity, hard to soft, moist				
36				ST01G	35.5 - 37.2	1.6	NR
37							
38				SS16aG	38.0 - 38.5	1.5	4-5-9
39				SS16b	38.5 - 39.5		
40							
41				SS17a	40.5 - 41.5	1.3	WH-WH-4
42				SS17bG	41.5 - 42.0		

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 8/4/21

SUBSURFACE LOG

Client Borehole ID N/A | Stantec Boring No. **KIF-B05**

Client Tennessee Valley Authority | Boring Location 574,498.86 N; 2,408,062.70 E NAD83

Project Number 175668043 | Surface Elevation 756.5 ft | Elevation Datum NGVD29

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]		Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft		Rec. Ft	Rec. %
43			LEAN CLAY, CL, 7.5YR 5/6 (strong brown) to 7.5YR 6/2 (pinkish gray), very fine to fine, low to medium plasticity, hard to soft, moist *(Continued)*						
44			Color change to 7.5YR 6/8 (reddish yellow) to 7.5YR 6/1 (gray), increased sand content at 42.5'		SS18G	43.0 - 44.5	43.0 - 44.5	1.4	5-7-8
45									
46					SS19aG	45.5 - 46.0	45.5 - 47.0	1.5	WH-WH-5
			Color change to 10YR 4/2 (dark grayish brown) to 7.5YR 3/1 (very dark gray) at 46.0'		SS19bG	46.0 - 47.0			
47									
48	48.6	707.9			SS20G	48.0 - 48.7	48.0 - 48.7	0.6	WH-50/2"
49	49.0	707.5	Weathered sandstone						

Refusal /
Bottom of Hole at 49.0 Ft.

Top of Rock = 48.6 Ft.
Top of Rock Elevation = 707.9 Ft.

Mud rotary began at 12.0' bgs.

Vibrating wire piezometer installed. See KIF-B05 installation detail for backfill information.

Overburden Drilling and Sampling Tools (Type and Size): 4-1/4" HSA (from 0.0' to 12.0' bgs), 3-Wing Updraft Bit (from 12.0' bgs), 2" SS w/o liners, 3" Shelby Tubes.

1: E = Environmental Sample Custody (two Split Spoons may be required to obtain sufficient sample)
G = Geotechnical Sample Custody
2: a,b,c denote Split Spoon divided between Environmental and Geotechnical Samples
3: Depths are reported in feet below ground surface

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 8/4/21

SUBSURFACE LOG

Client Borehole ID	N/A	Stantec Boring No.	**KIF-B06**
Client	Tennessee Valley Authority	Boring Location	574,420.30 N; 2,408,131.50 E NAD83
Project Number	175668043	Surface Elevation	739.6 ft
		Elevation Datum	NGVD29
Project Name	KIF TDEC Order	Date Started	2/8/21
		Completed	2/8/21
Project Location	Harriman, Tennessee	Depth to Water	N/A
		Date/Time	N/A
Inspector	T. Greenwell	Logger	T. Greenwell
Depth to Water	N/A	Date/Time	N/A
Drilling Contractor	Stantec Consulting Services Inc.	Drill Rig Type and ID	CME 55T#1, #709
Overburden Drilling and Sampling Tools (Type and Size)	4-5/8" 3-Wing Updraft Bit, 2" SS w/o liners		
Rock Drilling and Sampling Tools (Type and Size)	N/A		
Overdrill Tooling (Type and Size)	N/A	Overdrill Depth	N/A
Sampler Hammer Type	Automatic	Weight	140 lb
Drop	30"	Efficiency	89.8%
Borehole Azimuth	N/A	Borehole Inclination (from Vertical)	N/A
Reviewed By	J. Musselman	Approved By	A. Welshans

Lithology Depth Ft[3]	Elevation	Graphic	Description	Overburden: / Rock Core:	Sample[1,2] / RQD %	Depth Ft[3] / Run Ft	Rec. Ft / Rec. Ft	Blows/PSI / Rec. %
0.0	739.6		Top of Hole					
			Casing stickup					
2.9	736.7		Water					
5.7	733.9		No recovery, likely sediment		SS01	5.7 - 7.2	0.0	WR-WR-WR
					SS02	8.2 - 9.7	0.0	WR-WH-WH
					SS03	10.7 - 12.2	0.0	WR-WR-WR
13.2	726.4		SILTY SAND, SM, 7.5YR 4/3 (brown), low to medium plasticity, loose, wet, fine to medium sand, trace coarse sand and gravel, [FILL]		SS04G	13.2 - 14.7	0.4	WR-WH-WH
					SS05	15.7 - 17.2	0.0	WR-WR-WR
17.7	721.9							

TVA EIP BORING LOG_175668043_TVA_KIF_TDEC.GPJ_TDEC SUBSURF DT 20190530.GDT 9/29/21

SUBSURFACE LOG

Client Borehole ID: N/A
Stantec Boring No.: **KIF-B06**
Client: Tennessee Valley Authority
Boring Location: 574,420.30 N; 2,408,131.50 E NAD83
Project Number: 175668043
Surface Elevation: 739.6 ft
Elevation Datum: NGVD29

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]		Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft		Rec. Ft	Rec. %
19									
20	719.4		LEAN CLAY, CL, 7.5YR 3/2 (dark brown), non-plastic to medium plasticity, very soft, wet, moderate organic odor, trace roots *(Continued)*		SS06G	18.2 - 19.7	18.2 - 19.7	0.9	WH-WH-WH
21			SANDY LEAN CLAY TRACE GRAVEL, CL, 10YR 5/2 (grayish brown), very fine to fine, low plasticity, very soft, moist, slight organic odor		SS07G	20.7 - 22.2	20.7 - 22.2	1.3	WH-WH-WH
22	716.9								
23			SANDY LEAN CLAY, CL, 7.5YR 5/1 (gray) with 7.5YR 6/8 (reddish yellow), low plasticity, soft, moist to wet, fine to medium sand		SS08G	23.2 - 24.7	23.2 - 24.7	1.4	1-1-2
24									
25									
26					SS09G	25.7 - 27.2	25.7 - 27.2	1.4	2-2-3
27	711.9								
28			SANDY SILT, ML, 7.5YR 5/1 (gray), fine to medium, non-plastic to low plasticity, very loose, moist		SS10G	28.2 - 29.7	28.2 - 29.7	1.4	1-1-1
29									
30									
31	708.2		Trace fine gravel below 30.7'		SS11aG	30.7 - 31.4	30.7 - 32.2	1.3	WH-2-2
32			LEAN CLAY WITH SAND, CL, 5YR 3/1 (very dark gray), medium plasticity, soft to very soft, wet, fine sand		SS11bG	31.4 - 32.2			
33	705.9				SS12aG	33.2 - 33.7	33.2 - 34.7	1.4	WH-10-34
34	704.9		Shale, dark gray to gray, very soft to soft, highly weathered, damp, 45° bedding angle		SS12bG	33.7 - 34.7			

No Refusal /
Bottom of Hole at 34.7 Ft.

Top of Rock = 33.7 Ft.
Top of Rock Elevation = 705.9 Ft.

Horizontal coordinates collected at time of drilling using Trimble Geo7x handheld unit. Surface elevation shown reflects the top of steel casing. Top of casing elevation was measured using automatic level and level rod referenced from temporary benchmark established by TVA. The temporary benchmark referenced for KIF-B06 was set at the SW corner of the KIF-106 concrete pad.

1: E = Environmental Sample Custody (two Split Spoons may be required to obtain sufficient sample)
G = Geotechnical Sample Custody
2: a,b,c denote Split Spoon divided between Environmental and Geotechnical Samples
3: Depths are reported in feet below ground surface

TVA EIP BORING LOG_175668043_TVA_KIF_TDEC.GPJ_TDEC SUBSURF DT 20190530.GDT 9/29/21

SUBSURFACE LOG

Client Borehole ID	N/A	Stantec Boring No.	**KIF-B07**
Client	Tennessee Valley Authority	Boring Location	574,401.90 N; 2,408,144.80 E NAD83
Project Number	175668043	Surface Elevation	739.9 ft
Elevation Datum	NGVD29		
Project Name	KIF TDEC Order	Date Started	2/9/21
Completed	2/9/21		
Project Location	Harriman, Tennessee	Depth to Water	N/A
Date/Time	N/A		
Inspector	T. Greenwell	Logger	T. Greenwell
Depth to Water	N/A	Date/Time	N/A
Drilling Contractor	Stantec Consulting Services Inc.	Drill Rig Type and ID	CME 55T#1, #709
Overburden Drilling and Sampling Tools (Type and Size)	4-5/8" 3-Wing Updraft Bit, 2" SS w/o liners, 3" Shelby Tubes		
Rock Drilling and Sampling Tools (Type and Size)	N/A		
Overdrill Tooling (Type and Size)	N/A	Overdrill Depth	N/A
Sampler Hammer Type	Automatic	Weight	140 lb
Drop	30"	Efficiency	89.8%
Borehole Azimuth	N/A	Borehole Inclination (from Vertical)	N/A
Reviewed By	J. Musselman	Approved By	A. Welshans

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]		Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft		Rec. Ft	Rec. %
0.0	739.9		Top of Hole						
			Steel Casing						
3.0	736.9								
			Water						
8.3	731.6								
			SANDY LEAN CLAY WITH GRAVEL, CL, 7.5YR 5/1 (gray) to 7.5YR 4/2 (brown), non-plastic to medium plasticity, very soft, wet, fine to medium sand, fine to coarse gravel		SS01	8.3 - 9.8	8.3 - 9.8	0.0	WR-WH-WH
					SS02G	11.0 - 12.5	11.0 - 12.5	0.4	WH-WH-WH
					SS03G	13.5 - 15.5	13.5 - 15.5	0.4	WR-WR-WR
					SS04	16.5 - 18.0	16.5 - 18.0	0.0	WR-WR-WH
18.5	721.4								

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 8/4/21

SUBSURFACE LOG

Client Borehole ID: N/A
Stantec Boring No.: **KIF-B07**
Client: Tennessee Valley Authority
Boring Location: 574,401.90 N; 2,408,144.80 E NAD83
Project Number: 175668043
Surface Elevation: 739.9 ft
Elevation Datum: NGVD29

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]		Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft		Rec. Ft	Rec. %
19			SILTY CLAY WITH SAND, CL-ML, 10YR 5/2 (grayish brown), low plasticity, very soft to soft, wet to moist, fine sand *(Continued)*		SS05G	19.0 - 20.5	19.0 - 20.5	1.1	WH-WH-2
20									
21	21.0	718.9							
21			LEAN CLAY WITH SAND, CL, 7.5YR 5/1 (gray) with 7.5YR 6/8 (reddish yellow), low plasticity, firm, moist, fine sand		SS06G	21.5 - 23.0	21.5 - 23.0	1.5	3-3-4
22									
23									
24					ST01G	24.0 - 26.0	24.0 - 26.0	1.5	NR
25									
26					SS07G	26.0 - 27.5	26.0 - 27.5	1.5	4-4-4
27									
28	28.0	711.9							
28			SILTY CLAYEY SAND, SC-SM, 7.5YR 5/1 (gray), fine to medium, low plasticity, loose, moist, trace fine gravel		SS08G	28.5 - 30.0	28.5 - 30.0	1.2	1-2-2
29									
30									
31					SS09aG	31.0 - 31.9	31.0 - 32.5	1.5	6-7-7
31	31.9	708.0							
32			SANDY SILTY CLAY, CL-ML, 5YR 3/1 (very dark gray), low plasticity, hard, moist		SS09bG	31.9 - 32.5			
33									
34	34.0	705.9			SS10aG	33.5 - 34.0	33.5 - 35.0	1.5	6-11-41
34			Shale, dark gray to gray, very soft to soft, highly weathered, damp, 45° bedding angle		SS10bG	34.0 - 35.0			
35	35.0	704.9							

No Refusal /
Bottom of Hole at 35.0 Ft.

Top of Rock = 34.0 Ft.
Top of Rock Elevation = 705.9 Ft.

Horizontal coordinates collected at time of drilling using Trimble Geo7x handheld unit. Surface elevation shown reflects the top of steel casing. Top of casing elevation was measured using automatic level and level rod referenced from temporary benchmark established by TVA. The temporary benchmark referenced for KIF-B07 was set at the SW corner of the KIF-106 concrete pad.

1: E = Environmental Sample Custody (two Split Spoons may be required to obtain sufficient sample)
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3: Depths are reported in feet below ground surface

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 8/4/21

SUBSURFACE LOG

Client Borehole ID	N/A	Stantec Boring No.	**KIF-B08**
Client	Tennessee Valley Authority	Boring Location	574,378.30 N; 2,408,167.50 E NAD83
Project Number	175668043	Surface Elevation	739.3 ft
Elevation Datum	NGVD29		
Project Name	KIF TDEC Order	Date Started	2/10/21
Completed	2/10/21		
Project Location	Harriman, Tennessee	Depth to Water	N/A
Date/Time	N/A		
Inspector	T. Greenwell	Logger	T. Greenwell
Depth to Water	N/A	Date/Time	N/A
Drilling Contractor	Stantec Consulting Services Inc.	Drill Rig Type and ID	CME 55T#1, #709
Overburden Drilling and Sampling Tools (Type and Size)	4-5/8" 3-Wing Updraft Bit, 2" SS w/o liners, 3" Shelby Tubes		
Rock Drilling and Sampling Tools (Type and Size)	N/A		
Overdrill Tooling (Type and Size)	N/A	Overdrill Depth	N/A
Sampler Hammer Type	Automatic	Weight	140 lb
Drop	30"	Efficiency	89.8%
Borehole Azimuth	N/A	Borehole Inclination (from Vertical)	N/A
Reviewed By	J. Musselman	Approved By	A. Welshans

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]		Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft		Rec. Ft	Rec. %
0.0	739.3		Top of Hole						
			Steel casing						
3.0	736.3								
			Water						
8.5	730.8								
			CLAYEY SILT WITH GRAVEL, ML, 7.5YR 5/1 (gray), non-plastic to medium plasticity, very soft, wet		SS01	8.5 - 10.0	8.5 - 10.0	0.0	WR-WR-WR
					SS02G	11.0 - 12.5	11.0 - 12.5	0.3	1-1-1
					SS03G	13.5 - 15.5	13.5 - 15.5	0.2	1-1-1
					SS04	16.5 - 18.0	16.5 - 18.0	0.0	WH-WH-WH

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 8/4/21

SUBSURFACE LOG

Client Borehole ID: N/A
Stantec Boring No.: **KIF-B08**
Client: Tennessee Valley Authority
Boring Location: 574,378.30 N; 2,408,167.50 E NAD83
Project Number: 175668043
Surface Elevation: 739.3 ft
Elevation Datum: NGVD29

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]		Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft		Rec. Ft	Rec. %
19			CLAYEY SILT WITH GRAVEL, ML, 7.5YR 5/1 (gray), non-plastic to medium plasticity, very soft, wet *(Continued)*		SS05	19.0 - 20.5	19.0 - 20.5	0.0	WH-WH-WH
20									
21.0	718.3		SILTY SAND WITH GRAVEL, SM, 7.5YR 5/1 (gray), fine to medium, low plasticity, loose, moist		ST01G	21.5 - 22.0	21.5 - 22.0	0.4	NR
22									
23					ST02G	22.5 - 24.5	22.5 - 24.5	1.9	NR
24									
25.0	714.3		SILTY CLAY WITH SAND, CL-ML, 7.5YR 5/1 (gray) with 7.5YR 6/8 (reddish yellow), fine, non-plastic to low plasticity, firm, moist, iron oxide staining		SS06aG	24.5 - 25.0	24.5 - 26.0	1.2	2-6-8
25					SS06bG	25.0 - 26.0			
26									
27					SS07aG	27.0 - 27.7	27.0 - 28.5	1.2	2-1-1
28			Color change to 7.5YR 6/2 (pinkish gray) at 27.7'		SS07bG	27.7 - 28.5			
29									
30					SS08aG	29.5 - 30.3	29.5 - 31.0	1.5	WH-WH-5
30.3	709.0		SILTY SAND, SM, 7.5YR 5/1 (gray) to 5GY 4/2 (dark grayish green), fine to medium, loose, moist, Trace fine gravel		SS08bG	30.3 - 31.0			
31									
32					SS09aG	32.0 - 32.6	32.0 - 33.5	1.0	4-5-8
32.6	706.7		SILTY SAND WITH GRAVEL, SM, 5YR 3/1 (very dark gray), non-plastic, medium dense, moist, medium grained sandstone fragments		SS09bG	32.6 - 33.5			
33									
34.0	705.3		Shale, dark gray to gray, very soft to soft, highly weathered, damp, 45° bedding angle						
34									
35.3	704.0				SS10G	34.5 - 35.3	34.5 - 35.3	0.7	33-50/4"
35									

Refusal /
Bottom of Hole at 35.3 Ft.

Top of Rock = 34.0 Ft.
Top of Rock Elevation = 705.3 Ft.

Horizontal coordinates collected at time of drilling using Trimble Geo7x handheld unit. Surface elevation shown reflects the top of steel casing. Top of casing elevation was measured using automatic level and level rod referenced from temporary benchmark established by TVA. The temporary benchmark referenced for KIF-B08 was set at the SW corner of the KIF-106 concrete pad.

1: E = Environmental Sample Custody (two Split Spoons may be required to obtain sufficient sample)
G = Geotechnical Sample Custody
2: a,b,c denote Split Spoon divided between Environmental and Geotechnical Samples
3: Depths are reported in feet below ground surface

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 8/4/21

SUBSURFACE LOG

Client Borehole ID	N/A	Stantec Boring No.	**KIF-B09**
Client	Tennessee Valley Authority	Boring Location	574,620.91 N; 2,408,217.76 E NAD83
Project Number	175668043	Surface Elevation	754.5 ft
		Elevation Datum	NGVD29
Project Name	KIF TDEC Order	Date Started	2/24/21
		Completed	2/25/21
Project Location	Harriman, Tennessee	Depth to Water	N/A
		Date/Time	N/A
Inspector	T. Greenwell	Logger	T. Greenwell
Depth to Water	N/A	Date/Time	N/A
Drilling Contractor	Stantec Consulting Services Inc.	Drill Rig Type and ID	CME 55T#1, #709
Overburden Drilling and Sampling Tools (Type and Size)	4-5/8" 3-Wing Updraft Bit, 2" SS w/o liners, 3" ST		
Rock Drilling and Sampling Tools (Type and Size)	N/A		
Overdrill Tooling (Type and Size)	N/A	Overdrill Depth	N/A
Sampler Hammer Type	Automatic	Weight	140 lb
Drop	30"	Efficiency	89.8%
Borehole Azimuth	N/A	Borehole Inclination (from Vertical)	N/A
Reviewed By	J. Musselman	Approved By	A. Welshans

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]		Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft		Rec. Ft	Rec. %
0.0	754.5		Top of Hole						
			Crushed stone, trace clay		SS01G	0.0 - 1.5	0.0 - 1.5	1.0	4-4-13
2.0	752.5								
			SILTY SAND, SM, 7.5YR 2.5/1 (black), fine to medium, medium dense, dry, [CCR]		SS02aG	2.5 - 2.9	2.5 - 4.0	1.5	8-17-9
2.9	751.6				SS02bG	2.9 - 4.0			
			SILTY SAND WITH GRAVEL, SM, 7.5YR 7/2 (pinkish gray) to 7.5YR 4/4 (brown), fine to medium, low plasticity, hard to very hard, dry, with poorly graded gravel layers (<4" thick) throughout, [FILL] Increased sand content at 5.0'		SS03G	5.0 - 6.5	5.0 - 6.5	0.9	4-14-8
					SS04G	7.5 - 9.0	7.5 - 9.0	0.8	6-7-4
9.5	745.0								
			SILTY GRAVEL WITH SAND, GM, 2.5Y 7/1 (light gray), fine to coarse, dense, dry, [FILL]		SS05G	10.0 - 11.5	10.0 - 11.5	0.8	23-24-13
12.0	742.5								
			LEAN CLAY WITH GRAVEL, CL, 7.5YR 7/1 (light gray) and 7.5YR 4/4 (brown), coarse, low plasticity, hard to very hard, dry, with poorly graded gravel layers (<4" thick), [FILL]		SS06G	12.5 - 14.0	12.5 - 14.0	0.8	13-16-17
15.5	739.0								
			CLAYEY SAND, SC, 7.5YR 4/4 (brown), fine to coarse, medium plasticity, medium dense, dry, [FILL]		SS07G	15.0 - 16.5	15.0 - 16.5	1.4	7-8-9
17.0	737.5								

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 8/4/21

SUBSURFACE LOG

Client Borehole ID: N/A
Stantec Boring No.: **KIF-B09**
Client: Tennessee Valley Authority
Boring Location: 574,620.91 N; 2,408,217.76 E NAD83
Project Number: 175668043
Surface Elevation: 754.5 ft
Elevation Datum: NGVD29

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]		Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft		Rec. Ft	Rec. %
18			SANDY SILT, ML, 7.5YR 5/4 (brown) to 7.5YR 3/2 (dark brown), low to medium plasticity, very soft, moist to wet, iron oxide staining, with shale and sandstone fragments, [FILL] *(Continued)*		SS08G	17.5 - 19.0	17.5 - 19.0	0.5	WH-WH-WH
19									
20					SS09aG	20.0 - 20.5	20.0 - 21.5	1.1	WH-WH-WH
21					SS09b	20.5 - 21.5			
22									
23					SS10	22.5 - 24.0	22.5 - 24.0	1.5	WH-WH-WH
24									
25					SS11a	25.0 - 25.5	25.0 - 26.5	0.8	WH-WH-WH
26					SS11bG	25.5 - 26.5			
27									
28					SS12G	27.5 - 29.0	27.5 - 29.0	1.1	WH-WH-WH
29									
30									
31					SS13G	30.0 - 31.5	30.0 - 31.5	0.6	WH-WH-1
32	32.0	722.5							
33			SILT, ML, 10YR 3/1 (very dark gray), non-plastic to low plasticity, very soft, wet		SS14aG	32.5 - 33.0	32.5 - 34.0	1.3	WH-WH-WH
34	34.5	720.0			SS14b	33.0 - 34.0			
35			LEAN CLAY, CL, 7.5YR 5/1 (gray) to 7.5YR 4/6 (strong brown), low to medium plasticity, hard, moist, trace fine sand, trace black iron oxide staining						
36					SS15	35.0 - 36.5	35.0 - 36.5	1.5	WH-WH-WH
37									
38					ST01G	37.5 - 39.5	37.5 - 39.5	1.7	NR
39									
40			Increased sand content from 39.5' to 41.0'		SS16G	39.5 - 41.0	39.5 - 41.0	1.3	5-7-9
41									
42									

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 8/4/21

SUBSURFACE LOG

Client Borehole ID N/A | Stantec Boring No. **KIF-B09**

Client Tennessee Valley Authority | Boring Location 574,620.91 N; 2,408,217.76 E NAD83

Project Number 175668043 | Surface Elevation 754.5 ft | Elevation Datum NGVD29

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]		Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft		Rec. Ft	Rec. %
43			LEAN CLAY, CL, 7.5YR 5/1 (gray) to 7.5YR 4/6 (strong brown), low to medium plasticity, hard, moist, trace fine sand, trace black iron oxide staining *(Continued)*		ST02G	42.0 - 44.0	42.0 - 44.0	1.9	NR
44					SS17aG	44.0 - 44.5	44.0 - 45.5	1.5	4-5-3
	44.7	709.8							
45			SILT WITH SAND, ML, 7.5YR 4/1 (dark gray), very fine to fine, non-plastic to low plasticity, soft, moist to wet, decreasing clay content with depth		SS17bG	44.5 - 45.5			
46									
47					SS18	46.5 - 48.0	46.5 - 48.0	1.5	WH-1-1
48									
	48.5	706.0							
49			POORLY GRADED SAND WITH SILT, SP-SM, 7.5YR 4/1 (dark gray), very fine to medium, medium dense, wet		SS19a	49.0 - 50.0	49.0 - 50.5	1.2	3-6-12
50					SS19bG	50.0 - 50.5			
	50.7	703.8							
51			Sandstone, dark gray to tan, medium grained, soft, completely weathered to highly weathered, friable		SS20G	51.2 - 51.8	51.2 - 51.8	0.6	20-50/1"
	51.8	702.7							

Refusal /
Bottom of Hole at 51.8 Ft.

Top of Rock = 50.7 Ft.
Top of Rock Elevation = 703.8 Ft.

Mud Rotary began at 17.0' bgs.

Vibrating wire piezometer installed. See KIF-B09 installation detail for backfill information.

Overburden Drilling and Sampling Tools (Type and Size): 4-1/4" HSA (from 0.0' to 17.0' bgs), 4-5/8" 3-Wing Updraft Bit (from 17.0' bgs), 2" SS w/o liners, 3" Shelby Tubes.

1: E = Environmental Sample Custody (two Split Spoons may be required to obtain sufficient sample)
G = Geotechnical Sample Custody
2: a,b,c denote Split Spoon divided between Environmental and Geotechnical Samples
3: Depths are reported in feet below ground surface

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 8/4/21

SUBSURFACE LOG

Client Borehole ID	N/A	Stantec Boring No.	**KIF-B10**
Client	Tennessee Valley Authority	Boring Location	574,552.60 N; 2,408,280.40 E NAD83
Project Number	175668043	Surface Elevation	739.0 ft
Elevation Datum	NGVD29		
Project Name	KIF TDEC Order	Date Started	1/31/21
Completed	2/1/21		
Project Location	Harriman, Tennessee	Depth to Water	N/A
Date/Time	N/A		
Inspector	T. Greenwell	Logger	T. Greenwell
Depth to Water	N/A	Date/Time	N/A
Drilling Contractor	Stantec Consulting Services Inc.	Drill Rig Type and ID	CME 55T#1, #709
Overburden Drilling and Sampling Tools (Type and Size)	3-7/8" 3-wing Updraft Bit, 2" SS w/o liners		
Rock Drilling and Sampling Tools (Type and Size)	N/A		
Overdrill Tooling (Type and Size)	N/A	Overdrill Depth	N/A
Sampler Hammer Type	Automatic	Weight	140 lb
Drop	30"	Efficiency	89.8%
Borehole Azimuth	N/A	Borehole Inclination (from Vertical)	N/A
Reviewed By	J. Musselman	Approved By	A. Welshans

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]		Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft		Rec. Ft	Rec. %
0.0	739.0		Top of Hole						
			Steel casing						
2.8	736.2		Water						
7.0	732.0		No recovery		SS01	7.0 - 8.5	7.0 - 8.5	0.0	WR-1-2
					SS02	9.5 - 11.0	9.5 - 11.0	0.0	WH-WH-WH
					SS03	12.0 - 13.5	12.0 - 13.5	0.0	WR-WR-WH
14.0	725.0		SILT, ML, 10YR 4/2 (dark grayish brown), non-plastic to low plasticity, very soft, wet		SS04G	14.5 - 16.0	14.5 - 16.0	0.8	WH-WH-WH
16.5	722.5		SILT WITH SAND, ML, 5YR 6/6 (reddish yellow) to 5YR 6/1 (gray), fine, non-plastic to low plasticity, very loose to loose, moist		SS05G	17.0 - 18.5	17.0 - 18.5	0.5	WH-WH-WH

TVA EIP BORING LOG_175668043_TVA_KIF_TDEC.GPJ_TDEC SUBSURF DT 20190530.GDT 8/4/21

SUBSURFACE LOG

Client Borehole ID: N/A
Stantec Boring No.: **KIF-B10**
Client: Tennessee Valley Authority
Boring Location: 574,552.60 N; 2,408,280.40 E NAD83
Project Number: 175668043
Surface Elevation: 739.0 ft
Elevation Datum: NGVD29

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]		Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft		Rec. Ft	Rec. %
20					SS06G	19.5 - 21.0	19.5 - 21.0	0.4	WH-4-4
21									
21.5	717.5								
22			LEAN CLAY, CL, 7.5YR 5/1 (gray) to 7.5YR 4/6 (strong brown), medium plasticity, firm to hard, moist, trace fine sand		SS07G	22.0 - 23.5	22.0 - 23.5	1.3	3-4-7
23									
24									
25					SS08G	24.5 - 26.0	24.5 - 26.0	1.3	3-3-5
26									
26.5	712.5								
27			CLAYEY SILTY SAND, SM, 7.5YR 4/1 (dark gray), very fine to fine, non-plastic to low plasticity, very loose, moist to wet, decreasing clay content with depth		SS09G	27.0 - 28.5	27.0 - 28.5	1.3	WH-WH-WH
28									
29									
30					SS10aG	29.5 - 30.0	29.5 - 31.0	1.4	WH-WH-WH
					SS10bG	30.0 - 31.0			
31									
31.5	707.5								
32			POORLY GRADED SAND WITH SILT, SP-SM, 7.5YR 4/1 (dark gray), very fine to medium, very loose, wet		SS11G	32.0 - 33.5	32.0 - 33.5	0.8	WH-WH-1
33									
34									
35					SS12a	34.5 - 35.0	34.5 - 36.0	1.2	10-15-24
					SS12bG	35.0 - 36.0			
36									
36.5	702.5		Sandstone, dark gray to tan, medium grained, soft, completely weathered to highly weathered						
37									
37.2	701.8		Shale, dark brown to gray, very soft, highly weathered		SS13G	37.0 - 37.2	37.0 - 37.2	0.2	50/2"

Refusal /
Bottom of Hole at 37.2 Ft.

Top of Rock = 35.0 Ft.
Top of Rock Elevation = 704.0 Ft.

Horizontal coordinates collected at time of drilling using Trimble Geo7x handheld unit. Surface elevation shown reflects the top of steel casing. Top of casing elevation was measured using automatic level and level rod referenced from temporary benchmark established by TVA. The temporary benchmark referenced for KIF-B10 was set at the SW corner of the KIF-AD-2 concrete pad.

1: E = Environmental Sample Custody (two Split Spoons may be required to obtain sufficient sample)
G = Geotechnical Sample Custody
2: a,b,c denote Split Spoon divided between Environmental and Geotechnical Samples
3: Depths are reported in feet below ground surface

SUBSURFACE LOG

Client Borehole ID	N/A	Stantec Boring No.	**KIF-B11**
Client	Tennessee Valley Authority	Boring Location	574,534.20 N; 2,408,302.40 E NAD83
Project Number	175668043	Surface Elevation	739.2 ft
Elevation Datum	NGVD29		
Project Name	KIF TDEC Order	Date Started	2/1/21
Completed	2/2/21		
Project Location	Harriman, Tennessee	Depth to Water	N/A
Date/Time	N/A		
Inspector	T. Greenwell	Logger	T. Greenwell
Depth to Water	N/A	Date/Time	N/A
Drilling Contractor	Stantec Consulting Services Inc.	Drill Rig Type and ID	CME 55T#1, #709
Overburden Drilling and Sampling Tools (Type and Size)	5-7/8" 3-Wing Updraft Bit, 2" SS w/o liners, 3" ST		
Rock Drilling and Sampling Tools (Type and Size)	N/A		
Overdrill Tooling (Type and Size)	N/A	Overdrill Depth	N/A
Sampler Hammer Type	Automatic	Weight	140 lb
Drop	30"	Efficiency	89.8%
Borehole Azimuth	N/A	Borehole Inclination (from Vertical)	N/A
Reviewed By	J. Musselman	Approved By	A. Welshans

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]		Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft		Rec. Ft	Rec. %
0.0	739.2		Top of Hole						
			Steel casing						
2.8	736.4		Water						
11.9	727.3		SILT WITH SAND, ML, 10YR 4/2 (dark grayish brown), non-plastic, very soft, wet		SS01G	11.9 - 13.4	11.9 - 13.4	0.2	WR-WR-WR
13.9	725.3		LEAN CLAY, CL, 10YR 4/2 (dark grayish brown), low to medium plasticity, very soft, wet		SS02G	14.5 - 16.0	14.5 - 16.0	1.1	WH-WH-WH
16.5	722.7		LEAN CLAY, CL, 5YR 6/6 (reddish yellow) to 5YR 6/1 (gray), low to medium plasticity, very soft to firm, moist		SS03G	17.0 - 18.5	17.0 - 18.5	0.7	WH-1-2

TVA EIP BORING LOG_175668043_TVA_KIF_TDEC.GPJ_TDEC SUBSURF DT 20190530.GDT 8/4/21

SUBSURFACE LOG

Client Borehole ID: N/A
Stantec Boring No.: **KIF-B11**
Client: Tennessee Valley Authority
Boring Location: 574,534.20 N; 2,408,302.40 E NAD83
Project Number: 175668043
Surface Elevation: 739.2 ft
Elevation Datum: NGVD29

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]		Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft		Rec. Ft	Rec. %
20			LEAN CLAY, CL, 5YR 6/6 (reddish yellow) to 5YR 6/1 (gray), low to medium plasticity, very soft to firm, moist *(Continued)*		ST01G	19.5 - 21.5	19.5 - 21.5	1.2	NR
21									
22	22.5	716.7			ST02G	21.5 - 23.5	21.5 - 23.5	0.9	NR
23			LEAN CLAY WITH SAND, CL, 7.5YR 5/1 (gray) to 7.5YR 4/6 (strong brown), medium plasticity, firm, moist						
24					SS04G	23.5 - 25.0	23.5 - 25.0	1.5	5-5-6
25	25.5	713.7							
26			SANDY LEAN CLAY, CL, 7.5YR 4/1 (dark gray), fine, low plasticity, very soft, moist to wet, decreasing clay content with depth		SS05G	26.0 - 27.5	26.0 - 27.5	1.5	WH-WH-WH
27									
28									
29					SS06G	28.5 - 30.0	28.5 - 30.0	1.5	WR-WR-WH
30									
31									
32					SS07G	31.0 - 32.5	31.0 - 32.5	0.9	WR-WH-1
33									
34	34.6	704.6	Color change to 2.5 Y 6/2 (light brownish gray) at 33.5'		SS08aG	33.5 - 34.6	33.5 - 35.0	1.2	1-4-13
35					SS08bG	34.6 - 35.0			
	35.8	703.4	Sandstone, dark gray to tan, medium grained, soft, completely weathered to highly weathered		SS09G	35.0 - 35.8	35.0 - 35.8	0.5	19-50/4"

Refusal /
Bottom of Hole at 35.8 Ft.

Top of Rock = 34.6 Ft.
Top of Rock Elevation = 704.6 Ft.

Overburden Drilling and Sampling Tools (Type and Size): 3-7/8" (to 21.5' below top of casing) and 5-7/8" Mud Rotary, 2" SS w/o liners, 3" Shelby Tubes.

Horizontal coordinates collected at time of drilling using Trimble Geo7x handheld unit. Surface elevation shown reflects the top of steel casing. Top of casing elevation was measured using automatic level and level rod referenced from temporary benchmark established by TVA. The temporary benchmark referenced for KIF-B11 was set at the SW corner of the KIF-AD-2 concrete pad.

1: E = Environmental Sample Custody (two Split Spoons may be required to obtain sufficient sample)
G = Geotechnical Sample Custody
2: a,b,c denote Split Spoon divided between Environmental and Geotechnical Samples
3: Depths are reported in feet below ground surface

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 8/4/21

SUBSURFACE LOG

Client Borehole ID	N/A	Stantec Boring No.	**KIF-B12**
Client	Tennessee Valley Authority	Boring Location	574,522.10 N; 2,408,318.70 E NAD83
Project Number	175668043	Surface Elevation	739.2 ft
Elevation Datum	NGVD29		
Project Name	KIF TDEC Order	Date Started	2/2/21
Completed	2/3/21		
Project Location	Harriman, Tennessee	Depth to Water	N/A
Date/Time	N/A		
Inspector	T. Greenwell	Logger	T. Greenwell
Depth to Water	N/A	Date/Time	N/A
Drilling Contractor	Stantec Consulting Services Inc.	Drill Rig Type and ID	CME 55T#1, #709
Overburden Drilling and Sampling Tools (Type and Size)	3-7/8" 3-Wing Updraft Bit, 2" SS w/o liners, 3" Shelby Tubes		
Rock Drilling and Sampling Tools (Type and Size)	N/A		
Overdrill Tooling (Type and Size)	N/A	Overdrill Depth	N/A
Sampler Hammer Type	Automatic	Weight	140 lb
Drop	30"	Efficiency	89.8%
Borehole Azimuth	N/A	Borehole Inclination (from Vertical)	N/A
Reviewed By	J. Musselman	Approved By	A. Welshans

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]		Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft		Rec. Ft	Rec. %
0.0	739.2		Top of Hole						
			Steel casing						
2.8	736.4		Water						
13.6	725.6								
14.5	724.7		SANDY SILT, ML, 7.5YR 3/2 (dark brown), non-plastic, very soft, wet, sediment		SS01aG	13.6 - 14.6	13.6 - 15.1	0.9	WR-WR-WH
					SS01bG	14.6 - 15.1			
16.5	722.7		LEAN CLAY, CL, 10YR 4/2 (dark grayish brown), low to medium plasticity, very soft, wet						
			SANDY LEAN CLAY TRACE GRAVEL, CL, 5YR 6/6 (reddish yellow) to 5YR 6/1 (gray), very fine to fine, low to medium plasticity, very soft to firm, moist		SS02G	16.0 - 17.5	16.0 - 17.5	0.3	WH-WH-WH
					ST01G	18.3 - 20.3	18.3 - 20.3	1.9	NR

TVA EIP BORING LOG_175668043_TVA_KIF_TDEC.GPJ_TDEC SUBSURF DT 20190530.GDT 8/4/21

SUBSURFACE LOG

Client Borehole ID N/A | Stantec Boring No. **KIF-B12**

Client Tennessee Valley Authority | Boring Location 574,522.10 N; 2,408,318.70 E NAD83

Project Number 175668043 | Surface Elevation 739.2 ft | Elevation Datum NGVD29

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]		Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft		Rec. Ft	Rec. %
20			SANDY LEAN CLAY TRACE GRAVEL, CL, 5YR 6/6 (reddish yellow) to 5YR 6/1 (gray), very fine to fine, low to medium plasticity, very soft to firm, moist *(Continued)*						
21									
22	22.5	716.7			ST02G	21.3 - 23.3	21.3 - 23.3	0.9	NR
23			LEAN CLAY WITH SAND, CH, 7.5YR 4/6 (strong brown) with 7.5YR 5/1 (gray), medium plasticity, hard, moist, fine sand						
24					SS03G	23.3 - 24.8	23.3 - 24.8	1.2	8-6-6
25	25.3	713.9							
26			CLAYEY SILTY SAND, SM, 7.5YR 4/1 (dark gray), very fine to fine, non-plastic to low plasticity, very loose, moist to wet, decreasing clay content with depth						
27					ST03G	25.8 - 27.8	25.8 - 27.8	1.9	NR
28									
29	29.3	709.9			SS04G	27.8 - 29.3	27.8 - 29.3	1.5	WR-WR-WR
30			SILTY SAND, SM, 7.5YR 4/1 (dark gray), very fine to fine, very loose, wet						
31					SS05G	30.3 - 31.8	30.3 - 31.8	1.2	WR-WH-WH
32	32.3	706.9							
33			POORLY GRADED SAND WITH SILT, SP-SM, 2.5Y 6/2 (light brownish gray), very fine to medium, medium dense, wet						
34					SS06G	32.8 - 34.3	32.8 - 34.3	1.0	1-4-22
35	35.3	703.9	Auger refusal at 34.8'		SS07aG	34.8 - 35.3	34.8 - 36.3	1.2	4-15-38
	35.6	703.6			SS07bG	35.3 - 35.6			
36	36.3	702.9	Sandstone, dark gray to blue green, medium grained, soft, completely weathered		SS07cG	35.6 - 36.3			

Shale, dark brown to dark gray, very fine grained, very soft, highly weathered, 45° bedding angle

No Refusal /
Bottom of Hole at 36.3 Ft.

Top of Rock = 35.3 Ft.
Top of Rock Elevation = 703.9 Ft.

Horizontal coordinates collected at time of drilling using Trimble Geo7x handheld unit. Surface elevation shown reflects the top of steel casing. Top of casing elevation was measured using automatic level and level rod referenced from temporary benchmark established by TVA. The temporary benchmark referenced for KIF-B12 was set at the SW corner of the KIF-AD-2 concrete pad.

1: E = Environmental Sample Custody (two Split Spoons may be required to obtain sufficient sample)
G = Geotechnical Sample Custody
2: a,b,c denote Split Spoon divided between Environmental and Geotechnical Samples
3: Depths are reported in feet below ground surface

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 8/4/21

SUBSURFACE LOG

Client Borehole ID	N/A	Stantec Boring No.	**KIF-B13**
Client	Tennessee Valley Authority	Boring Location	574,919.10 N; 2,408,553.07 E NAD83
Project Number	175668043	Surface Elevation	753.2 ft
Elevation Datum	NGVD29		
Project Name	KIF TDEC Order	Date Started	2/13/21
Completed	2/14/21		
Project Location	Harriman, Tennessee	Depth to Water	N/A
Date/Time	N/A		
Inspector	T. Greenwell	Logger	T. Greenwell
Depth to Water	N/A	Date/Time	N/A
Drilling Contractor	Stantec Consulting Services Inc.	Drill Rig Type and ID	CME 55T#1, #709
Overburden Drilling and Sampling Tools (Type and Size)	4-5/8" 3-Wing Updraft Bit, 2" SS w/o liners, 3" ST		
Rock Drilling and Sampling Tools (Type and Size)	N/A		
Overdrill Tooling (Type and Size)	N/A	Overdrill Depth	N/A
Sampler Hammer Type	Automatic	Weight	140 lb
Drop	30"	Efficiency	89.8%
Borehole Azimuth	N/A	Borehole Inclination (from Vertical)	N/A
Reviewed By	J. Musselman	Approved By	A. Welshans

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]		Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft		Rec. Ft	Rec. %
0.0	753.2		Top of Hole						
0			Crushed stone		SS01G	0.0 - 1.5	0.0 - 1.5	1.5	8-16-23
2.9	750.3				SS02aG	2.5 - 2.9	2.5 - 4.0	1.5	12-10-14
			CLAYEY SAND, SC, 2.5YR 3/6 (dark red) to 2.5YR 2.5/1 (reddish black), low to medium plasticity, medium dense to dense, moist, moderate organic odor, [FILL] trace bottom ash layers intermixed below 3.6'		SS02bG	2.9 - 4.0			
					SS03G	5.0 - 6.5	5.0 - 6.5	0.8	6-5-8
7.5	745.7		GRAVELLY LEAN CLAY, CL, 7.5YR 5/4 (brown) to 7.5YR 3/1 (very dark gray), low plasticity, very hard, moist, weathered shale fill, [FILL]		SS04G	7.5 - 9.0	7.5 - 9.0	1.1	18-13-19
9.5	743.7		CLAYEY SAND WITH GRAVEL, SC, 7.5YR 5/4 (brown) to 7.5YR 3/2 (dark brown), low plasticity, very loose to loose, moist to wet, slight organic odor, iron oxide staining, fine to coarse sand, fine gravel, layers of silty to clayey medium-grained gravel up to 6" thick, [FILL]		SS05G	10.0 - 11.5	10.0 - 11.5	1.2	3-3-4
					SS06G	12.5 - 14.0	12.5 - 14.0	0.9	8-7-15
					SS07	15.0 - 16.5	15.0 - 16.5	1.4	1-1-5

TVA EIP BORING LOG_175668043_TVA_KIF_TDEC.GPJ_TDEC SUBSURF DT 20190530.GDT 8/4/21

SUBSURFACE LOG

Client Borehole ID: N/A
Stantec Boring No.: **KIF-B13**
Client: Tennessee Valley Authority
Boring Location: 574,919.10 N; 2,408,553.07 E NAD83
Project Number: 175668043
Surface Elevation: 753.2 ft
Elevation Datum: NGVD29

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]		Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft		Rec. Ft	Rec. %
18			CLAYEY SAND WITH GRAVEL, SC, 7.5YR 5/4 (brown) to 7.5YR 3/2 (dark brown), low plasticity, very loose to loose, moist to wet, slight organic odor, iron oxide staining, fine to coarse sand, fine gravel, layers of silty to clayey medium-grained gravel up to 6" thick, [FILL] *(Continued)*		SS08G	17.5 - 19.0	17.5 - 19.0	0.2	10-2-3
19									
20									
21					SS09G	20.0 - 21.5	20.0 - 21.5	0.5	2-1-1
22	22.0	731.2							
23			SANDY LEAN CLAY, CL, 7.5YR 4/1 (dark gray) to 7.5YR 5/6 (strong brown), medium plasticity, very soft, moist, slight organic odor		SS10	22.5 - 24.0	22.5 - 24.0	1.3	1-1-1
24	24.0	729.2							
25			SANDY LEAN CLAY, CL, 7.5YR 5/6 (strong brown), low to medium plasticity, very soft, moist						
26					SS11a SS11bG	25.0 - 26.0 26.0 - 26.5	25.0 - 26.5	1.4	1-1-2
27	27.0	726.2							
28			SILTY SAND, SM, 7.5YR 4/4 (brown) to 7.5YR 6/3 (light brown), fine to medium, very loose to loose, moist		SS12G	27.5 - 29.0	27.5 - 29.0	1.5	WH-1-2
29									
30									
31					ST01G	30.0 - 32.0	30.0 - 32.0	2.0	NR
32									
33					SS13	32.0 - 33.5	32.0 - 33.5	0.0	2-3-4
34									
35					SS14G	34.5 - 36.0	34.5 - 36.0	1.5	2-3-3
36	36.5	716.7							
37			SILTY SAND, SM, 5YR 5/8 (yellowish red) to 5YR 4/2 (dark reddish gray), fine, loose, moist						
38					SS15G	37.0 - 38.5	37.0 - 38.5	1.4	2-2-3
39	39.0	714.2							
40			SILTY SAND, SM, 7.5YR 4/4 (brown), fine to medium, very loose to loose, moist, trace fine black shale fragments		SS16aG SS16b	39.5 - 39.7 39.7 - 41.0	39.5 - 41.0	1.5	3-2-1
41									
42									

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 8/4/21

SUBSURFACE LOG

Client Borehole ID N/A
Stantec Boring No. **KIF-B13**
Client Tennessee Valley Authority
Boring Location 574,919.10 N; 2,408,553.07 E NAD83
Project Number 175668043
Surface Elevation 753.2 ft
Elevation Datum NGVD29

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]		Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft		Rec. Ft	Rec. %
43			SILTY SAND, SM, 7.5YR 4/4 (brown), fine to medium, very loose to loose, moist, trace fine black shale fragments *(Continued)*		SS17	42.0 - 43.5	42.0 - 43.5	1.1	3-4-4
44	44.0	709.2							
44			SILTY GRAVEL WITH SAND, GM, 7.5YR 6/3 (light brown), medium dense, wet, fine to coarse sand, fine to coarse gravel		SS18	44.5 - 46.0	44.5 - 46.0	0.0	21-9-10
45									
46									
47					SS19G	47.0 - 48.5	47.0 - 48.5	0.9	12-9-11
48	48.8	704.4							
49	49.3	703.9	Sandstone, light tan to orange, medium grained, moderately hard, highly weathered		SS20G	48.8 - 50.3	48.8 - 50.3	0.9	17-18-21
50	50.3	702.9	Shale, dark brown to gray, very soft, very thin bedded, highly weathered, 60° bedding angle						

No Refusal /
Bottom of Hole at 50.3 Ft.

Top of Rock = 48.8 Ft.
Top of Rock Elevation = 704.4 Ft.

Mud Rotary began at 17.0' bgs.

Overburden Drilling and Sampling Tools (Type and Size): 4-1/4" HSA (from 0.0' to 17.0' bgs), 4-5/8" 3-Wing Updraft Bit (from 17.0' bgs), 2" SS w/o liners, 3" Shelby Tubes.

Vibrating wire piezometer installed. See KIF-B13 installation detail for backfill information.

1: E = Environmental Sample Custody (two Split Spoons may be required to obtain sufficient sample)
G = Geotechnical Sample Custody
2: a,b,c denote Split Spoon divided between Environmental and Geotechnical Samples
3: Depths are reported in feet below ground surface

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 8/4/21

SUBSURFACE LOG

Client Borehole ID	N/A	Stantec Boring No.	**KIF-B14**
Client	Tennessee Valley Authority	Boring Location	574,839.50 N; 2,408,620.30 E NAD83
Project Number	175668043	Surface Elevation	738.4 ft
Elevation Datum	NGVD29		
Project Name	KIF TDEC Order	Date Started	1/28/21
Completed	1/29/21		
Project Location	Harriman, Tennessee	Depth to Water	N/A
Date/Time	N/A		
Inspector	T. Greenwell	Logger	T. Greenwell
Depth to Water	N/A	Date/Time	N/A
Drilling Contractor	Stantec Consulting Services Inc.	Drill Rig Type and ID	CME 55T#1, #709
Overburden Drilling and Sampling Tools (Type and Size)	3-7/8" 3-wing Updraft Bit, 2" SS w/o liners		
Rock Drilling and Sampling Tools (Type and Size)	N/A		
Overdrill Tooling (Type and Size)	N/A	Overdrill Depth	N/A
Sampler Hammer Type	Automatic	Weight	140 lb
Drop	30"	Efficiency	89.8%
Borehole Azimuth	N/A	Borehole Inclination (from Vertical)	N/A
Reviewed By	J. Musselman	Approved By	A. Welshans

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]		Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft		Rec. Ft	Rec. %
0.0	738.4		Top of Hole						
			Top of casing stickup						
3.0	735.4								
			Water						
7.4	731.0								
			SANDY SILT, ML, 7.5YR 4/1 (dark gray) to 7.5YR 4/6 (strong brown), non-plastic to low plasticity, very soft, wet		SS01	7.5 - 9.0	7.5 - 9.2	0.0	WR-WR-WR
9.9	728.5				SS02aG	9.5 - 10.0			
10.7	727.7		POORLY GRADED SAND WITH SILT, SP-SM, 10YR 5/2 (grayish brown), fine to medium, very loose, wet		SS02bG	10.0 - 10.8	9.5 - 11.8	1.5	1-1-1
					SS02cG	10.8 - 11.8			
			SILTY SAND, SM, 7.5YR 4/4 (brown), fine to medium, very loose to loose, moist, poorly graded		SS03G	12.0 - 13.5	12.0 - 13.5	0.9	2-1-1
					SS04G	14.5 - 16.0	14.5 - 16.0	1.5	3-2-4
16.4	722.0								
			SILTY SAND, SM, 10YR 7/2 (light gray) and 5YR 4/6 (yellowish red), fine to medium, medium dense, moist		SS05G	17.0 - 18.5	17.0 - 18.5	1.1	4-7-7
18.9	719.5								

TVA EIP BORING LOG_175668043_TVA_KIF_TDEC.GPJ_TDEC SUBSURF DT 20190530.GDT 8/4/21

SUBSURFACE LOG

Client Borehole ID: N/A
Stantec Boring No.: **KIF-B14**
Client: Tennessee Valley Authority
Boring Location: 574,839.50 N; 2,408,620.30 E NAD83
Project Number: 175668043
Surface Elevation: 738.4 ft
Elevation Datum: NGVD29

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]		Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft		Rec. Ft	Rec. %
19			CLAYEY SILTY SAND, SM, 7.5YR 4/4 (brown), fine to medium, very loose, moist *(Continued)*						
20					SS06G	19.5 - 21.0	19.5 - 21.0	1.5	1-1-1
21									
22									
22.9	715.5				SS07	22.0 - 23.5	22.0 - 23.5	0.0	1-1-2
23			SILTY SAND TRACE GRAVEL, SM, 7.5YR 5/8 (strong brown), fine, very loose to loose, wet						
24									
25					SS08G	24.5 - 26.0	24.5 - 26.0	1.3	1-2-2
26									
27									
28					SS09G	27.0 - 28.5	27.0 - 28.5	0.8	11-4-3
29									
29.8	708.6				SS10aG	29.5 - 29.8			
30			SILTY SAND WITH GRAVEL, SM, 7.5YR 6/3 (light brown), medium to coarse, dense to very dense, wet, fine to coarse sand, fine to coarse gravel		SS10bG	29.8 - 31.0	29.5 - 31.0	1.3	13-13-32
31									
32									
33					SS11G	32.0 - 33.5	32.0 - 33.5	1.2	26-40-31
34									
35					SS12aG	34.5 - 35.5	34.5 - 36.0	1.5	16-24-50
35.5	702.9								
36.0	702.4		Shale, dark brown to gray, very soft, very thin bedded, highly weathered		SS12bG	35.5 - 36.0			

Refusal /
Bottom of Hole at 36.0 Ft.

Top of Rock = 35.5 Ft.
Top of Rock Elevation = 702.9 Ft.

Horizontal coordinates collected at time of drilling using Trimble Geo7x handheld unit. Surface elevation shown reflects the top of steel casing. Top of casing elevation was measured using automatic level and level rod referenced from temporary benchmark established by TVA. The temporary benchmark referenced for KIF-B14 was set at the NE corner of the KIF-105 concrete pad.

1: E = Environmental Sample Custody (two Split Spoons may be required to obtain sufficient sample)
G = Geotechnical Sample Custody
2: a,b,c denote Split Spoon divided between Environmental and Geotechnical Samples
3: Depths are reported in feet below ground surface

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 8/4/21

SUBSURFACE LOG

Client Borehole ID	N/A	Stantec Boring No.	**KIF-B15**
Client	Tennessee Valley Authority	Boring Location	574,817.30 N; 2,408,631.80 E NAD83
Project Number	175668043	Surface Elevation	739.1 ft
Elevation Datum	NGVD29		
Project Name	KIF TDEC Order	Date Started	1/29/21
Completed	1/30/21		
Project Location	Harriman, Tennessee	Depth to Water	N/A
Date/Time	N/A		
Inspector	T. Greenwell	Logger	T. Greenwell
Depth to Water	N/A	Date/Time	N/A
Drilling Contractor	Stantec Consulting Services Inc.	Drill Rig Type and ID	CME 55T#1, #709
Overburden Drilling and Sampling Tools (Type and Size)	3-7/8" 3-Wing Updraft Bit, 2" SS w/o liners, 3" Shelby Tubes		
Rock Drilling and Sampling Tools (Type and Size)	N/A		
Overdrill Tooling (Type and Size)	N/A	Overdrill Depth	N/A
Sampler Hammer Type	Automatic	Weight	140 lb
Drop	30"	Efficiency	89.8%
Borehole Azimuth	N/A	Borehole Inclination (from Vertical)	N/A
Reviewed By	J. Musselman	Approved By	A. Welshans

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]		Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft		Rec. Ft	Rec. %
0.0	739.1		Top of Hole						
			Steel casing						
2.9	736.2		Water						
11.5	727.6								
12.1	727.0		SILT WITH SAND, ML, 10YR 4/2 (dark grayish brown), non-plastic, very soft, wet		SS01aG	11.5 - 12.1	11.5 - 13.5	1.2	WR-WR-WH
			SANDY LEAN CLAY, CL, 2.5Y 4/4 (olive brown), low plasticity, very soft, wet		SS01bG	12.1 - 13.5			
14.5	724.6		CLAYEY SAND, SC, 5YR 6/6 (reddish yellow) to 5YR 6/1 (gray), very fine to fine, low plasticity, loose, moist		ST01G	14.5 - 16.5	14.5 - 16.5	1.9	150
16.5	722.6		SILTY SAND TRACE CLAY, SM, 7.5YR 6/4 (light brown), very fine to fine, loose, moist		SS02G	16.5 - 18.0	16.5 - 18.0	1.2	1-3-3

TVA EIP BORING LOG_175668043_TVA_KIF_TDEC.GPJ_TDEC SUBSURF.DT.20190530.GDT 8/4/21

SUBSURFACE LOG

Client Borehole ID: N/A
Stantec Boring No.: **KIF-B15**
Client: Tennessee Valley Authority
Boring Location: 574,817.30 N; 2,408,631.80 E NAD83
Project Number: 175668043
Surface Elevation: 739.1 ft
Elevation Datum: NGVD29

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]		Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft		Rec. Ft	Rec. %
18			SILTY SAND TRACE CLAY, SM, 7.5YR 6/4 (light brown), very fine to fine, loose, moist *(Continued)*						
19									
20					SS03G	19.0 - 20.5	19.0 - 20.5	1.0	3-4-3
21	21.0	718.1							
	21.8	717.3	SANDY LEAN CLAY, CL, 7.5YR 4/4 (brown), low plasticity, very soft, moist		SS04aG	21.5 - 21.8	21.5 - 23.0	1.1	WR-1-1
22			SILTY SAND, SM, 7.5YR 5/1 (gray), very fine to medium, very loose, moist		SS04bG	21.8 - 23.0			
23									
24									
25					SS05G	24.0 - 25.5	24.0 - 25.5	1.4	1-1-1
26	26.0	713.1							
27			SILTY SAND TRACE GRAVEL, SM, 7.5YR 5/8 (strong brown), fine to medium, loose, wet		SS06G	26.5 - 28.0	26.5 - 28.0	0.9	3-1-4
28									
29									
	29.8	709.3			SS07aG	29.0 - 29.8	29.0 - 30.5	1.2	8-29-19
30	30.5	708.6	SANDY POORLY GRADED GRAVEL TRACE SILT, GP, 7.5YR 6/3 (light brown), coarse, dense, wet		SS07bG	29.8 - 30.5			
31	31.1	708.0	Sandstone, moderately hard, highly weathered						

Refusal /
Bottom of Hole at 31.1 Ft.

Top of Rock = 30.5 Ft.
Top of Rock Elevation = 708.6 Ft.

Mud-rotary refusal at 30.5 feet btoc. Boring advanced using a 3-7/8 inch roller bit.

Horizontal coordinates collected at time of drilling using Trimble Geo7x handheld unit. Surface elevation shown reflects the top of steel casing. Top of casing elevation was measured using automatic level and level rod referenced from temporary benchmark established by TVA. The temporary benchmark referenced for KIF-B15 was set at the NE corner of the KIF-105 concrete pad.

1: E = Environmental Sample Custody (two Split Spoons may be required to obtain sufficient sample)
G = Geotechnical Sample Custody
2: a,b,c denote Split Spoon divided between Environmental and Geotechnical Samples
3: Depths are reported in feet below ground surface

TVA EIP BORING LOG_175668043_TVA_KIF_TDEC.GPJ_TDEC SUBSURF DT 20190530.GDT 8/4/21

SUBSURFACE LOG

Client Borehole ID	N/A	Stantec Boring No.	**KIF-B16**
Client	Tennessee Valley Authority	Boring Location	574,797.40 N; 2,408,648.30 E NAD83
Project Number	175668043	Surface Elevation	738.5 ft
Elevation Datum	NGVD29		
Project Name	KIF TDEC Order	Date Started	1/31/21
Completed	1/31/21		
Project Location	Harriman, Tennessee	Depth to Water	N/A
Date/Time	N/A		
Inspector	T. Greenwell	Logger	T. Greenwell
Depth to Water	N/A	Date/Time	N/A
Drilling Contractor	Stantec Consulting Services Inc.	Drill Rig Type and ID	CME 55T#1, #709
Overburden Drilling and Sampling Tools (Type and Size)	3-7/8" 3-Wing Updraft Bit, 2" SS w/o liners, 3" Shelby Tubes		
Rock Drilling and Sampling Tools (Type and Size)	N/A		
Overdrill Tooling (Type and Size)	N/A	Overdrill Depth	N/A
Sampler Hammer Type	Automatic	Weight	140 lb
Drop	30"	Efficiency	89.8%
Borehole Azimuth	N/A	Borehole Inclination (from Vertical)	N/A
Reviewed By	J. Musselman	Approved By	A. Welshans

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]		Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft		Rec. Ft	Rec. %
0.0	738.5		Top of Hole						
			Casing Stickup						
2.9	735.6		Water						
12.0	726.5								
12.5	726.0		SILT WITH SAND, ML, 10YR 4/2 (dark grayish brown), non-plastic, very soft, wet		SS01aG	12.0 - 12.5	12.0 - 13.5	0.9	WR-WR-WH
					SS01bG	12.5 - 13.5			
			SANDY LEAN CLAY, CL, 2.5Y 3/3 (dark olive brown), low to medium plasticity, very soft, wet						
15.5	723.0						14.5 - 16.5		
			SILTY SAND, SM, 5YR 6/6 (reddish yellow) to 5YR 6/1 (gray), very fine to fine, low plasticity, very loose, moist		ST01G	14.5 - 16.5		1.9	150
					SS02G	16.5 - 18.0	16.5 - 18.0	1.1	WR-1-2

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 8/4/21

SUBSURFACE LOG

Client Borehole ID: N/A
Stantec Boring No.: **KIF-B16**
Client: Tennessee Valley Authority
Boring Location: 574,797.40 N; 2,408,648.30 E NAD83
Project Number: 175668043
Surface Elevation: 738.5 ft
Elevation Datum: NGVD29

Lithology									
Depth Ft[3]	Elevation	Graphic	Description	Overburden: / Rock Core:	Sample[1,2] / RQD %	Depth Ft[3] / Run Ft		Rec. Ft / Rec. %	Blows/PSI
18									
18.5	720.0								
19			SILTY SAND TRACE CLAY, SM, 7.5YR 6/4 (light brown), very fine to fine, loose, moist		SS03G	19.0 - 20.5	19.0 - 20.5	1.1	1-3-4
20									
21									
22					SS04aG	21.5 - 22.3	21.5 - 23.0	1.4	1-1-1
22.3	716.2								
23			SILTY SAND, SM, 7.5YR 5/1 (gray), very fine to medium, very loose, moist		SS04bG	22.3 - 23.0			
24									
25					SS05G	24.0 - 25.5	24.0 - 25.5	1.0	WH-WH-4
26.0	712.5								
26			SILTY SAND WITH GRAVEL, SM, 7.5YR 5/4 (brown), fine to medium, loose, wet						
27					SS06G	26.5 - 28.0	26.5 - 28.0	0.9	1-3-1
28									
29.0	709.5								
29					SS07G	29.0 - 29.3	29.0 - 29.3	0.3	50/4"
29.3	709.2		Sandstone, light tan to orange, medium grained, moderately hard, highly weathered						

No Refusal /
Bottom of Hole at 29.3 Ft.

Horizontal coordinates collected at time of drilling using Trimble Geo7x handheld unit. Surface elevation shown reflects the top of steel casing. Top of casing elevation was measured using automatic level and level rod referenced from temporary benchmark established by TVA. The temporary benchmark referenced for KIF-B16 was set at the NE corner of the KIF-105 concrete pad.

1: E = Environmental Sample Custody (two Split Spoons may be required to obtain sufficient sample)
G = Geotechnical Sample Custody
2: a,b,c denote Split Spoon divided between Environmental and Geotechnical Samples
3: Depths are reported in feet below ground surface

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 8/4/21

ATTACHMENT C.4

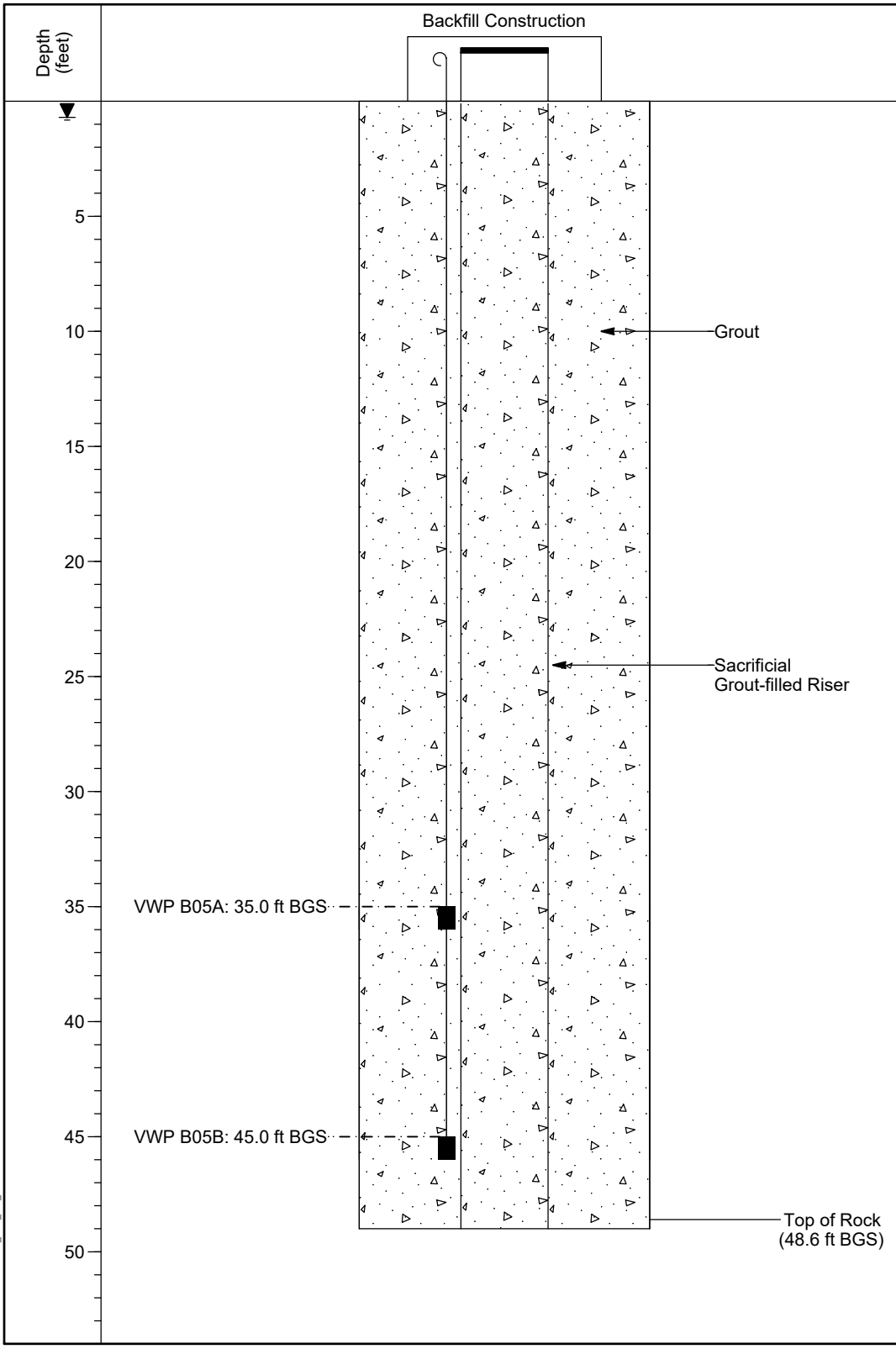
Vibrating Wire Piezometer Installation Details

PIEZOMETER INSTALLATION DETAIL

WELL / PROBEHOLE / BOREHOLE NO: **KIF-B05** (Boring KIF-B05)

PROJECT: **KIF TDEC Order**
PROJECT NUMBER: **175668043**
DRILLING COMPANY: **Stantec Consulting Services Inc.**
DRILLING EQUIPMENT: **CME 55T#1, #709**
DRILLING METHOD: **4-5/8" 3-Wing Updraft Bit, 2" SS w/o liners, 3" ST**
SAMPLING METHOD: **4-5/8" 3-Wing Updraft Bit, 2" SS w/o liners, 3" ST**
OBSERVED BY: **T. Greenwell**
REVIEWED BY: **J. Musselman**
APPROVED BY: **A. Welshans**

INSTALLATION: STARTED: **2/24/21** COMPLETED: **2/24/21**
LOCATION: **574,498.86 N; 2,408,062.70 E** DATUM: **NAD83**
LOC. DESCRIPTION: **East Dike perimeter road**
LATITUDE: **35° 54' 8.8"** LONGITUDE: **-84° 30' 56.7"**
GROUND ELEV (ft): **756.5** TOC ELEV (ft): **N/A**
ELEVATION DATUM: **NGVD29**
BOREHOLE DEPTH (ft): **49.0** RISER DEPTH (ft): **49.0**
DTW AT COMPLETION (ft, bgs): **0.7**
BOREHOLE DIA. (in): **8.0** RISER DIA. (in): **1.0**



Materials Inventory

RISER TYPE:
1" Sch 40 PVC Riser

SCREEN TYPE:
N/A

SCREEN SLOT SIZE (in):
N/A

GROUT QUANTITY (gal):
66

GROUT TYPE:
30% Solids Bentonite Grout

GROUT INITIAL DENSITY (lbs/gal):
10.2

GROUT RETURN DENSITY (lbs/gal)
10.2

GROUT TOP (ft BGS):
0.0

GROUT BOTTOM (ft BGS):
49.0

FILTER PACK TYPE:
N/A

NOTES:
TOC elevation is not applicable for grouted VWPs; instrument reference datum is ground surface elevation.

Refer to the boring log for additional details.

PZ DETAILS 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 8/13/21

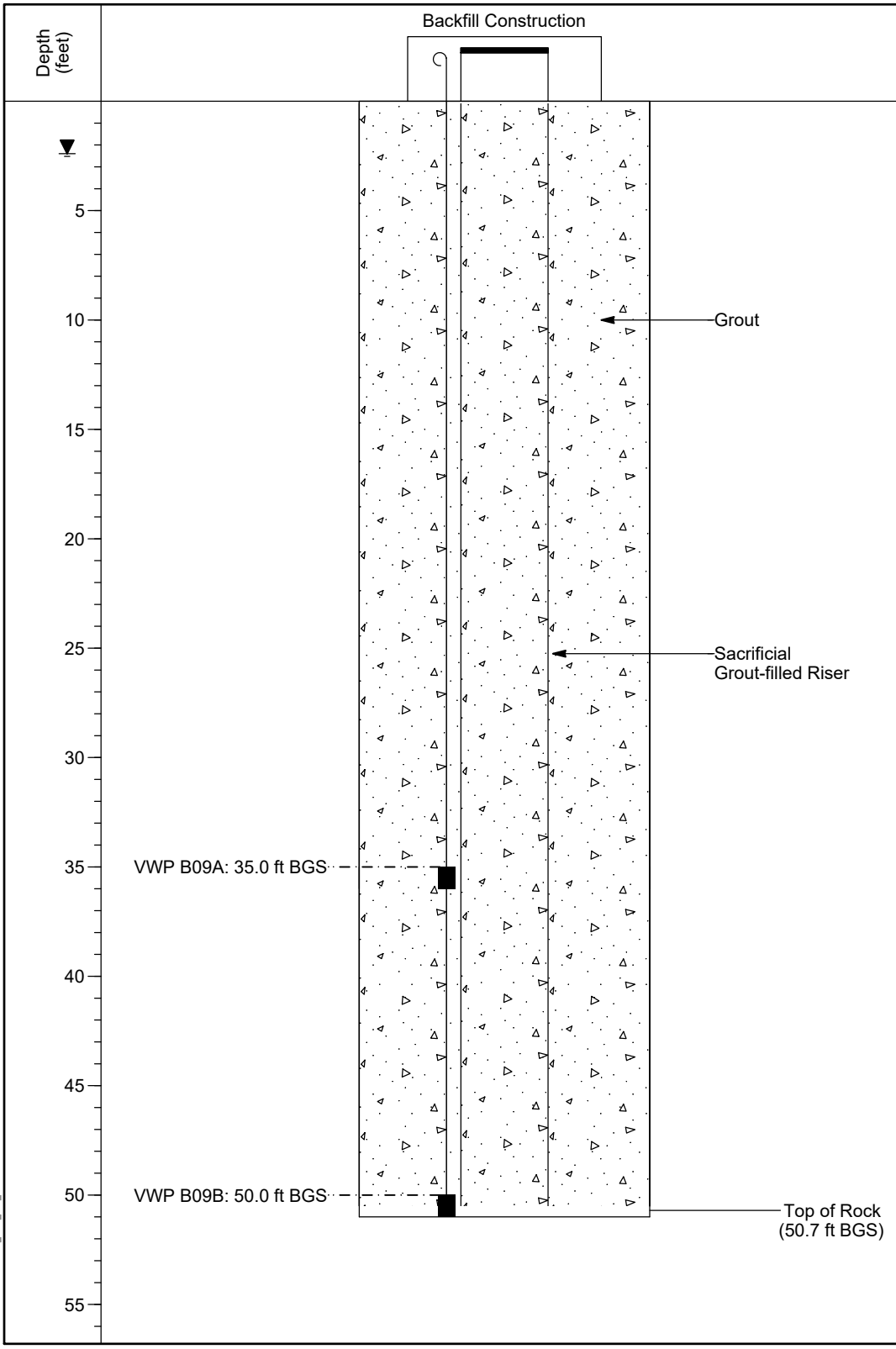
VERTICAL SCALE: AS SHOWN. HORIZONTAL SCALE: NOT TO SCALE (EXAGGERATED TO SHOW DETAIL)

PIEZOMETER INSTALLATION DETAIL

WELL / PROBEHOLE / BOREHOLE NO: **KIF-B09** (Boring KIF-B09) PAGE 1 OF 1

PROJECT: **KIF TDEC Order**
PROJECT NUMBER: **175668043**
DRILLING COMPANY: **Stantec Consulting Services Inc.**
DRILLING EQUIPMENT: **CME 55T#1, #709**
DRILLING METHOD: **4-5/8" 3-Wing Updraft Bit, 2" SS w/o liners, 3" ST**
SAMPLING METHOD: **4-5/8" 3-Wing Updraft Bit, 2" SS w/o liners, 3" ST**
OBSERVED BY: **T. Greenwell**
REVIEWED BY: **J. Musselman**
APPROVED BY: **A. Welshans**

INSTALLATION: STARTED: **2/25/21** COMPLETED: **2/25/21**
LOCATION: **574,620.91 N; 2,408,217.76 E** DATUM: **NAD83**
LOC. DESCRIPTION: **East Dike perimeter road**
LATITUDE: **35° 54' 10.0"** LONGITUDE: **-84° 30' 54.8"**
GROUND ELEV (ft): **754.5** TOC ELEV (ft): **N/A**
ELEVATION DATUM: **NGVD29**
BOREHOLE DEPTH (ft): **51.8** RISER DEPTH (ft): **50.5**
DTW AT COMPLETION (ft, bgs): **2.4**
BOREHOLE DIA. (in): **8.0** RISER DIA. (in): **1.0**



Materials Inventory

RISER TYPE:
1" Sch 40 PVC Riser

SCREEN TYPE:
N/A

SCREEN SLOT SIZE (in):
N/A

GROUT QUANTITY (gal):
61

GROUT TYPE:
30% Solids Bentonite Grout

GROUT INITIAL DENSITY (lbs/gal):
9.5

GROUT RETURN DENSITY (lbs/gal)
10.0

GROUT TOP (ft BGS):
0.0

GROUT BOTTOM (ft BGS):
50.5

FILTER PACK TYPE:
N/A

NOTES:
TOC elevation is not applicable for grouted VWPs; instrument reference datum is ground surface elevation.

Refer to the boring log for additional details.

PZ DETAILS 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 8/13/21

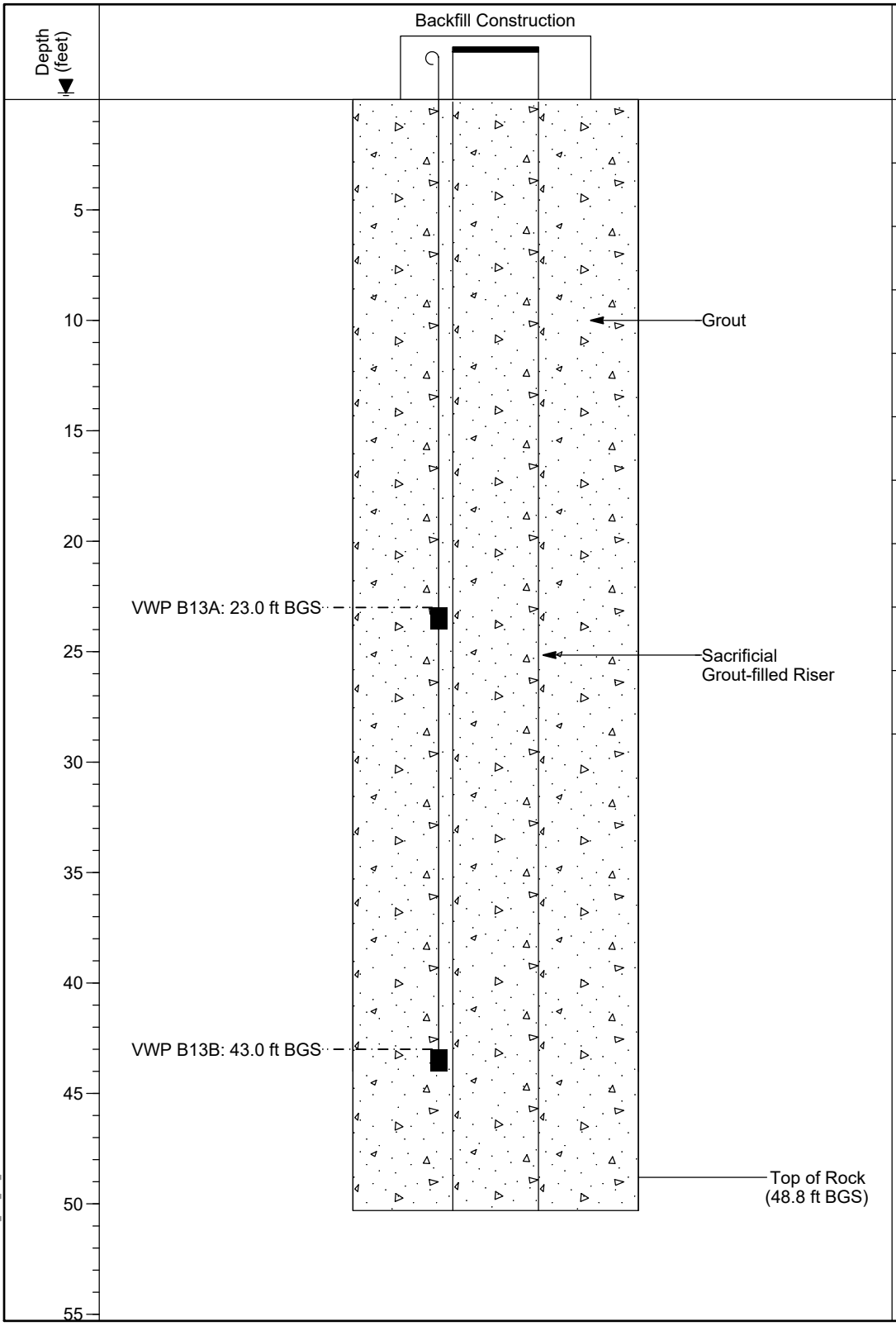
VERTICAL SCALE: AS SHOWN. HORIZONTAL SCALE: NOT TO SCALE (EXAGGERATED TO SHOW DETAIL)

PIEZOMETER INSTALLATION DETAIL

WELL / PROBEHOLE / BOREHOLE NO: **KIF-B13** (Boring KIF-B13)

PROJECT: **KIF TDEC Order**
PROJECT NUMBER: **175668043**
DRILLING COMPANY: **Stantec Consulting Services Inc.**
DRILLING EQUIPMENT: **CME 55T#1, #709**
DRILLING METHOD: **4-5/8" 3-Wing Updraft Bit, 2" SS w/o liners, 3" ST**
SAMPLING METHOD: **4-5/8" 3-Wing Updraft Bit, 2" SS w/o liners, 3" ST**
OBSERVED BY: **T. Greenwell**
REVIEWED BY: **J. Musselman**
APPROVED BY: **A. Welshans**

INSTALLATION: STARTED: **2/14/21** COMPLETED: **2/14/21**
LOCATION: **574,919.10 N; 2,408,553.07 E** DATUM: **NAD83**
LOC. DESCRIPTION: **East Dike perimeter road**
LATITUDE: **35° 54' 50.6"** LONGITUDE: **-84° 30' 50.6"**
GROUND ELEV (ft): **753.2** TOC ELEV (ft): **N/A**
ELEVATION DATUM: **NGVD29**
BOREHOLE DEPTH (ft): **50.3** RISER DEPTH (ft): **50.3**
DTW AT COMPLETION (ft, bgs): **-0.3**
BOREHOLE DIA. (in): **8.0** RISER DIA. (in): **1.0**



Materials Inventory

RISER TYPE:
1" Sch 40 PVC Riser

SCREEN TYPE:
N/A

SCREEN SLOT SIZE (in):
N/A

GROUT QUANTITY (gal):
66

GROUT TYPE:
30% Solids Bentonite Grout

GROUT INITIAL DENSITY (lbs/gal):
9.9

GROUT RETURN DENSITY (lbs/gal)
10.0

GROUT TOP (ft BGS):
0.0

GROUT BOTTOM (ft BGS):
50.3

FILTER PACK TYPE:
N/A

NOTES:
TOC elevation is not applicable for grouted VWPs; instrument reference datum is ground surface elevation.

Refer to the boring log for additional details.

PZ DETAILS 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 8/13/21

VERTICAL SCALE: AS SHOWN. HORIZONTAL SCALE: NOT TO SCALE (EXAGGERATED TO SHOW DETAIL)

APPENDIX D – PHOTOGRAPHS OF BORINGS AND TEMPORARY WELLS

ATTACHMENT D.1

Photographic Log of Phase 1 Soil Samples

Stantec

Photographic Log

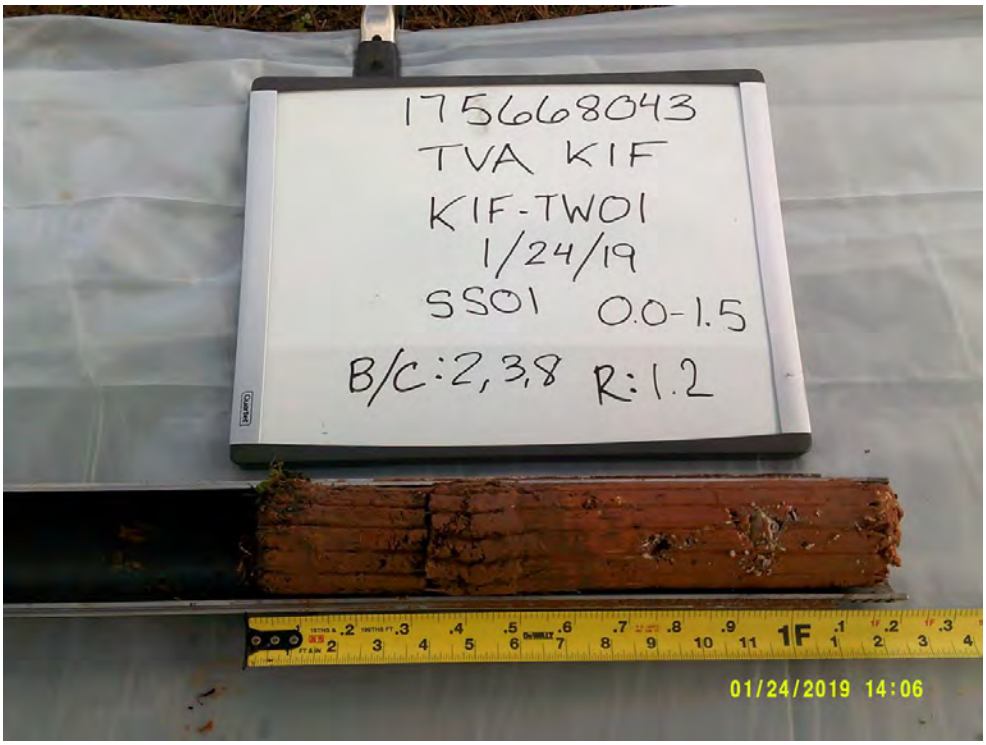
Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 1

Photo Location:
KIF-TW01

Photo Date:
1/24/2019

Comments:
Interval (0.0-1.5 feet)



Photograph ID: 2

Photo Location:
KIF-TW01

Photo Date:
1/24/2019

Comments:
Interval (1.5-3.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 3 **Photo Location:** KIF-TW01 **Photo Date:** 1/24/2019 **Comments:** Interval (3.0-4.5 feet).	
Photograph ID: 4 **Photo Location:** KIF-TW01 **Photo Date:** 1/24/2019 **Comments:** Interval (4.5-6.0 feet).	

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 5

Photo Location:
KIF-TW01

Photo Date:
1/24/2019

Comments:
Interval (6.0-7.5 feet).

Photograph ID: 6

Photo Location:
KIF-TW01

Photo Date:
1/24/2019

Comments:
Interval (7.5-9.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 7 **Photo Location:** KIF-TW01 **Photo Date:** 1/24/2019 **Comments:** Interval (9.0-10.5 feet).	
Photograph ID: 8 **Photo Location:** KIF-TW01 **Photo Date:** 1/24/2019 **Comments:** Interval (10.5-12.0 feet).	

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 9

Photo Location:
KIF-TW01

Photo Date:
1/24/2019

Comments:
Interval (12.0-13.5 feet).

Photograph ID: 10

Photo Location:
KIF-TW01

Photo Date:
1/25/2019

Comments:
Interval (13.5-15.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 11 **Photo Location:** KIF-TW01 **Photo Date:** 1/25/2019 **Comments:** Interval (15.0-16.5 feet).	
Photograph ID: 12 **Photo Location:** KIF-TW01 **Photo Date:** 1/25/2019 **Comments:** Interval (16.5-18.5 feet).	

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 13 **Photo Location:** KIF-TW01 **Photo Date:** 1/25/2019 **Comments:** Interval (18.0-19.5 feet).	
Photograph ID: 14 **Photo Location:** KIF-TW01 **Photo Date:** 12/2/2019 **Comments:** Photo of interval (19.5-21.5 feet) unavailable.	No Photo Applicable

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 15

Photo Location:
KIF-TW01

Photo Date:
1/25/2019

Comments:
Interval (21.5-22.5 feet).

Photograph ID: 16

Photo Location:
KIF-TW01

Photo Date:
1/25/2019

Comments:
Interval (22.5-24.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 17 **Photo Location:** KIF-TW01 **Photo Date:** 1/28/2019 **Comments:** Interval (26.0-27.0 feet).	
Photograph ID: 18 **Photo Location:** KIF-TW01 **Photo Date:** 1/28/2019 **Comments:** Interval (27.0-28.5 feet).	

Client:	Tennessee Valley Authority	Project:	KIF TDEC Order
Site Name:	Kingston Fossil Plant (KIF)	Site Location:	Harriman, Tennessee

Photograph ID: 19 **Photo Location:** KIF-TW01 **Photo Date:** 1/28/2019 **Comments:** Interval (28.5-30.0 feet).	
Photograph ID: 20 **Photo Location:** KIF-TW01 **Photo Date:** 1/28/2019 **Comments:** Interval (30.0-31.5 feet).	

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 21 **Photo Location:** KIF-TW01 **Photo Date:** 1/28/2019 **Comments:** Interval (31.5-33.0 feet).	
Photograph ID: 22 **Photo Location:** KIF-TW01 **Photo Date:** 1/28/2019 **Comments:** Interval (33.0-34.5 feet).	

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 23 **Photo Location:** KIF-TW01 **Photo Date:** 1/28/2019 **Comments:** Interval (34.5-36.0 feet).	
Photograph ID: 24 **Photo Location:** KIF-TW01 **Photo Date:** 1/28/2019 **Comments:** Interval (36.0-37.5 feet).	

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 25 **Photo Location:** KIF-TW01 **Photo Date:** 12/2/2019 **Comments:** Photo of interval (37.5-39.0 feet) unavailable.	No Photo Applicable
Photograph ID: 26 **Photo Location:** KIF-TW01 **Photo Date:** 12/2/2019 **Comments:** Photo of interval (39.0-40.5 feet) unavailable.	No Photo Applicable

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 27

Photo Location:
KIF-TW01

Photo Date:
1/28/2019

Comments:
Interval (40.5-42.0 feet).

Photograph ID: 28

Photo Location:
KIF-TW02

Photo Date:
2/5/2019

Comments:
Interval (0.0-1.5 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 29 **Photo Location:** KIF-TW02 **Photo Date:** 2/5/2019 **Comments:** Photo of interval (1.5-3.0 feet) unavailable.	No Photo Applicable
Photograph ID: 30 **Photo Location:** KIF-TW02 **Photo Date:** 2/5/2019 **Comments:** Photo of interval (3.0-4.5 feet) unavailable.	No Photo Applicable

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 31 **Photo Location:** KIF-TW02 **Photo Date:** 2/5/2019 **Comments:** Photo of interval (4.5-6.0 feet) unavailable.	No Photo Applicable
Photograph ID: 32 **Photo Location:** KIF-TW02 **Photo Date:** 2/5/2019 **Comments:** Interval (6.0-7.5 feet).	

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 33

Photo Location:
KIF-TW02

Photo Date:
2/5/2019

Comments:
Interval (7.5-9.0 feet).

Photograph ID: 34

Photo Location:
KIF-TW02

Photo Date:
2/5/2019

Comments:
Interval (9.0-10.5 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 35

Photo Location:
KIF-TW02

Photo Date:
2/5/2019

Comments:
Interval (10.5-12.0 feet).

Photograph ID: 36

Photo Location:
KIF-TW02

Photo Date:
2/5/2019

Comments:
Interval (12.0-13.5 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 37

Photo Location:
KIF-TW02

Photo Date:
2/5/2019

Comments:
Interval (13.5-15.0 feet).

Photograph ID: 38

Photo Location:
KIF-TW02

Photo Date:
2/5/2019

Comments:
Interval (15.0-16.5 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 39

Photo Location:
KIF-TW02

Photo Date:
2/5/2019

Comments:
Interval (16.5-18.0 feet).

Photograph ID: 40

Photo Location:
KIF-TW02

Photo Date:
2/5/2019

Comments:
Interval (18.0-19.5 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 41 **Photo Location:** KIF-TW02 **Photo Date:** 2/5/2019 **Comments:** Interval (19.5-21.0 feet).	
Photograph ID: 42 **Photo Location:** KIF-TW02 **Photo Date:** 2/5/2019 **Comments:** Interval (23.0-24.0 feet).	

Client:	Tennessee Valley Authority	Project:	KIF TDEC Order
Site Name:	Kingston Fossil Plant (KIF)	Site Location:	Harriman, Tennessee

Photograph ID: 43

Photo Location:
KIF-TW02

Photo Date:
2/5/2019

Comments:
Interval (24.0-25.5 feet).

Photograph ID: 44

Photo Location:
KIF-TW02

Photo Date:
2/5/2019

Comments:
Interval (25.5-27.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 45

Photo Location:
KIF-TW02

Photo Date:
2/5/2019

Comments:
Interval (27.0-28.5 feet).

Photograph ID: 46

Photo Location:
KIF-TW02

Photo Date:
2/5/2019

Comments:
Interval (28.5-30.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 47 **Photo Location:** KIF-TW02 **Photo Date:** 2/5/2019 **Comments:** Interval (30.0-31.5 feet).	
Photograph ID: 48 **Photo Location:** KIF-TW02 **Photo Date:** 2/5/2019 **Comments:** Interval (31.5-33.0 feet).	

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 49

Photo Location:
KIF-TW02

Photo Date:
2/5/2019

Comments:
Interval (33.0-34.5 feet).

Photograph ID: 50

Photo Location:
KIF-TW02

Photo Date:
2/5/2019

Comments:
Interval (34.5-36.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 51

Photo Location:
KIF-TW02

Photo Date:
2/5/2019

Comments:
Interval (36.0-37.5 feet).

Photograph ID: 52

Photo Location:
KIF-TW02

Photo Date:
2/5/2019

Comments:
Interval (37.5-39.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 53

Photo Location:
KIF-TW02

Photo Date:
2/5/2019

Comments:
Interval (39.0-40.5 feet).

Photograph ID: 54

Photo Location:
KIF-TW02

Photo Date:
2/5/2019

Comments:
Interval (40.5-42.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 55

Photo Location:
KIF-TW02

Photo Date:
2/5/2019

Comments:
Interval (42.0-43.5 feet).

Photograph ID: 56

Photo Location:
KIF-TW03

Photo Date:
2/25/2019

Comments:
Interval (0.0-1.5 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 57

Photo Location:
KIF-TW03

Photo Date:
2/25/2019

Comments:
Interval (1.5-3.0 feet).

Photograph ID: 58

Photo Location:
KIF-TW03

Photo Date:
2/25/2019

Comments:
Interval (3.0-4.5 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 59 **Photo Location:** KIF-TW03 **Photo Date:** 2/25/2019 **Comments:** Interval (4.5-6.0 feet).	
Photograph ID: 60 **Photo Location:** KIF-TW03 **Photo Date:** 2/25/2019 **Comments:** Interval (6.0-7.5 feet).	

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 61

Photo Location:
KIF-TW03

Photo Date:
2/25/2019

Comments:
Interval (7.5-9.0 feet).

Photograph ID: 62

Photo Location:
KIF-TW03

Photo Date:
2/25/2019

Comments:
Interval (9.0-10.5 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 63

Photo Location:
KIF-TW03

Photo Date:
2/25/2019

Comments:
Interval (10.5-12.0 feet).

Photograph ID: 64

Photo Location:
KIF-TW03

Photo Date:
2/25/2019

Comments:
Interval (12.0-13.5 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 65

Photo Location:
KIF-TW03

Photo Date:
2/25/2019

Comments:
Interval (13.5-15.0 feet).

Photograph ID: 66

Photo Location:
KIF-TW03

Photo Date:
2/25/2019

Comments:
Interval (15.0-16.5 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 67

Photo Location:
KIF-TW03

Photo Date:
2/25/2019

Comments:
Interval (16.5-18.0 feet).

Photograph ID: 68

Photo Location:
KIF-TW03

Photo Date:
2/25/2019

Comments:
Interval (18.0-19.5 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 69	
Photo Location: KIF-TW03	
Photo Date: 2/25/2019	
Comments: Interval (19.5-21.0 feet).	

Photograph ID: 70	
Photo Location: KIF-TW03	
Photo Date: 2/26/2019	
Comments: Interval (23.0-24.5 feet).	

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 71

Photo Location:
KIF-TW03

Photo Date:
2/26/2019

Comments:
Interval (24.5-26.0 feet).

Photograph ID: 72

Photo Location:
KIF-TW03

Photo Date:
2/26/2019

Comments:
Interval (26.0-27.5 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 73 **Photo Location:** KIF-TW03 **Photo Date:** 2/26/2019 **Comments:** Interval (27.5-29.0 feet).	
Photograph ID: 74 **Photo Location:** KIF-TW03 **Photo Date:** 2/26/2019 **Comments:** Interval (29.0-30.5 feet).	

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 75 **Photo Location:** KIF-TW03 **Photo Date:** 2/26/2019 **Comments:** Interval (30.5-32.0 feet).	
Photograph ID: 76 **Photo Location:** KIF-TW03 **Photo Date:** 2/26/2019 **Comments:** Interval (32.0-33.5 feet).	

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 77 **Photo Location:** KIF-TW03 **Photo Date:** 2/26/2019 **Comments:** Interval (33.5-35.0 feet).	
Photograph ID: 78 **Photo Location:** KIF-TW03 **Photo Date:** 2/26/2019 **Comments:** Interval (35.0-36.5 feet).	

Client:	Tennessee Valley Authority	Project:	KIF TDEC Order
Site Name:	Kingston Fossil Plant (KIF)	Site Location:	Harriman, Tennessee

Photograph ID: 79

Photo Location:
KIF-TW03

Photo Date:
2/26/2019

Comments:
Interval (36.5-38.0 feet).

Photograph ID: 80

Photo Location:
KIF-TW03

Photo Date:
2/26/2019

Comments:
Interval (38.0-39.5 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 81 **Photo Location:** KIF-TW03 **Photo Date:** 2/26/2019 **Comments:** Interval (38.5-41.0 feet).	
Photograph ID: 82 **Photo Location:** KIF-TW03 **Photo Date:** 2/26/2019 **Comments:** Interval (41.0-42.5 feet).	

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 83 **Photo Location:** KIF-TW03 **Photo Date:** 2/26/2019 **Comments:** Interval (42.5-44.0 feet).	
Photograph ID: 84 **Photo Location:** KIF-TW03 **Photo Date:** 2/26/2019 **Comments:** Interval (44.0-45.5 feet).	

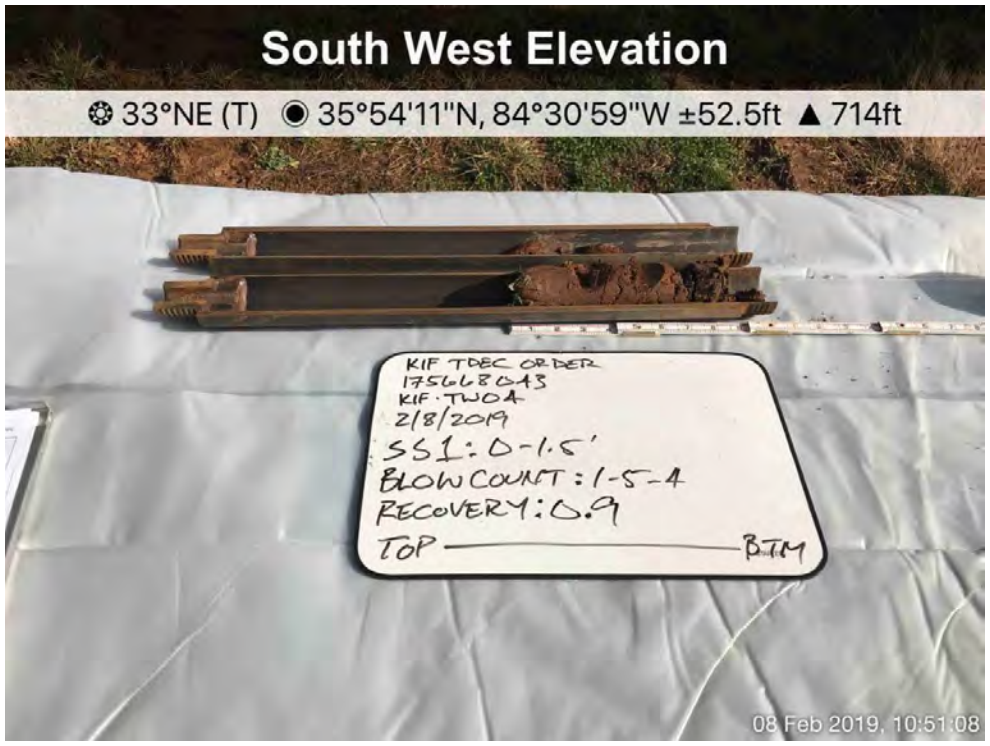
Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 85

Photo Location:
KIF-TW04

Photo Date:
2/8/2019

Comments:
Interval (0.0-1.5 feet).

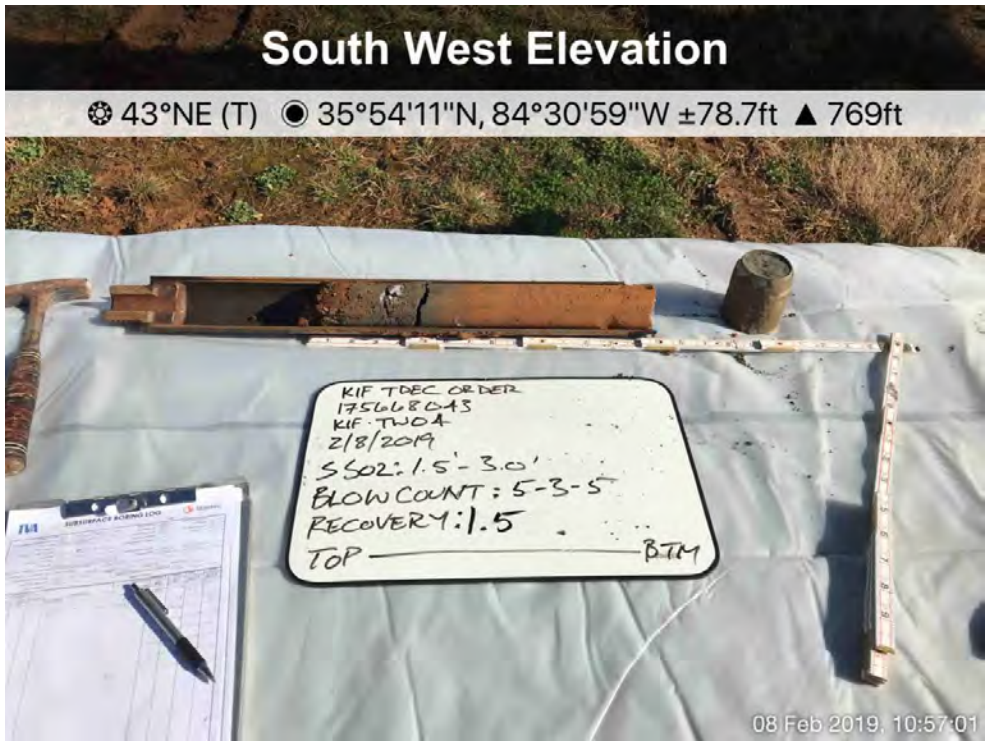


Photograph ID: 86

Photo Location:
KIF-TW04

Photo Date:
2/8/2019

Comments:
Interval (1.5-3.0 feet).



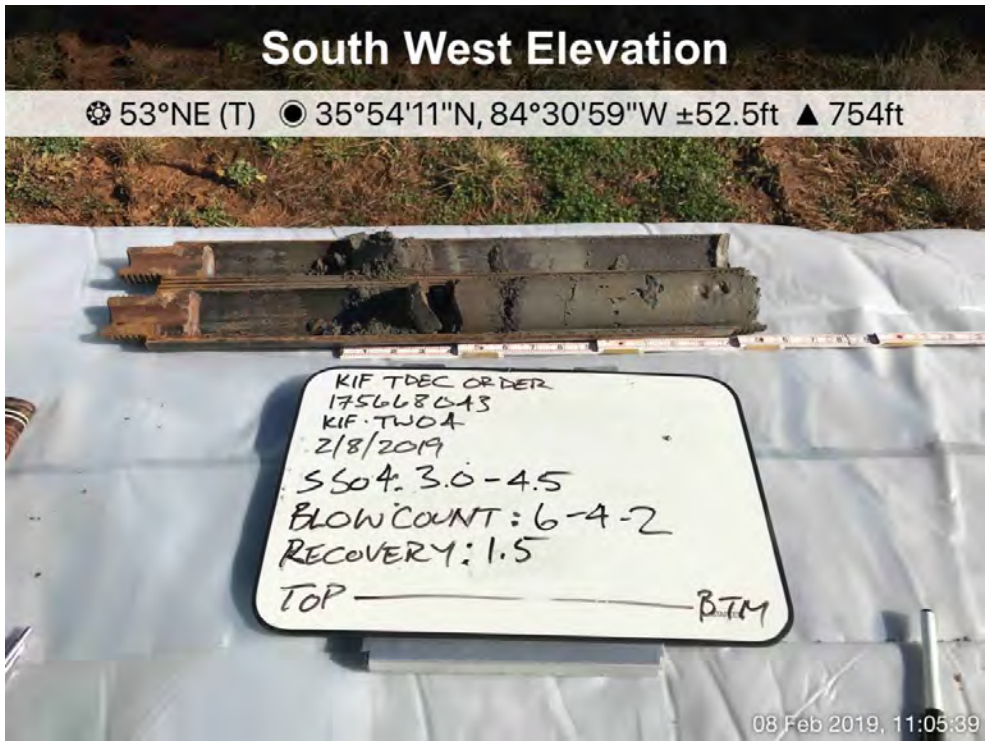
Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 87

Photo Location:
KIF-TW04

Photo Date:
2/8/2019

Comments:
Interval (3.0-4.5 feet).



Photograph ID: 88

Photo Location:
KIF-TW04

Photo Date:
2/8/2019

Comments:
Interval (4.5-6.0 feet).

Client:	Tennessee Valley Authority	Project:	KIF TDEC Order
Site Name:	Kingston Fossil Plant (KIF)	Site Location:	Harriman, Tennessee

Photograph ID: 89

Photo Location:
KIF-TW04

Photo Date:
2/8/2019

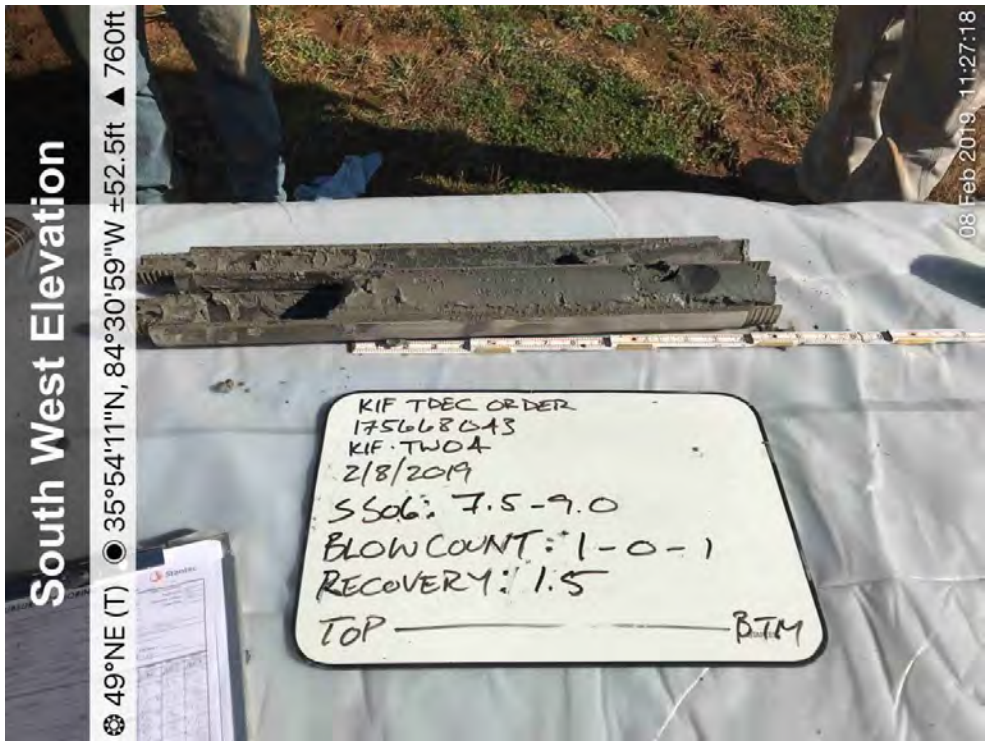
Comments:
Interval (6.0-7.5 feet).

Photograph ID: 90

Photo Location:
KIF-TW04

Photo Date:
2/8/2019

Comments:
Interval (7.5-9.0 feet).



Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 91

Photo Location:
KIF-TW04

Photo Date:
2/8/2019

Comments:
Interval (9.0-10.5 feet).

Photograph ID: 92

Photo Location:
KIF-TW04

Photo Date:
2/11/2019

Comments:
Interval (10.5-12.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 93

Photo Location:
KIF-TW04

Photo Date:
2/11/2019

Comments:
Interval (12.0-13.5 feet).

Photograph ID: 94

Photo Location:
KIF-TW04

Photo Date:
2/11/2019

Comments:
Interval (13.5-15.0 feet).

Client:	Tennessee Valley Authority	Project:	KIF TDEC Order
Site Name:	Kingston Fossil Plant (KIF)	Site Location:	Harriman, Tennessee

Photograph ID: 95

Photo Location:
KIF-TW04

Photo Date:
2/11/2019

Comments:
Interval (15.0-16.5 feet).

Photograph ID: 96

Photo Location:
KIF-TW04

Photo Date:
2/11/2019

Comments:
Interval (16.5-18.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 97

Photo Location:
KIF-TW04

Photo Date:
2/11/2019

Comments:
Interval (18.0-19.5 feet).

Photograph ID: 98

Photo Location:
KIF-TW04

Photo Date:
2/11/2019

Comments:
Interval (19.5-21.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 99

Photo Location:
KIF-TW04

Photo Date:
2/11/2019

Comments:
Interval (21.0-22.5 feet).

Photograph ID: 100

Photo Location:
KIF-TW04

Photo Date:
2/11/2019

Comments:
Interval (22.5-24.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 101 **Photo Location:** KIF-TW04 **Photo Date:** 2/11/2019 **Comments:** Interval (26.0-27.0 feet).	
Photograph ID: 102 **Photo Location:** KIF-TW04 **Photo Date:** 2/11/2019 **Comments:** Interval (27.0-28.5 feet).	

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 103

Photo Location:
KIF-TW04

Photo Date:
2/11/2019

Comments:
Interval (28.5-30.0 feet).

Photograph ID: 104

Photo Location:
KIF-TW04

Photo Date:
2/13/2019

Comments:
Interval (30.0-31.5 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 105 **Photo Location:** KIF-TW04 **Photo Date:** 2/13/2019 **Comments:** Interval (31.5-33.0 feet).	
Photograph ID: 106 **Photo Location:** KIF-TW04 **Photo Date:** 2/13/2019 **Comments:** Interval (33.0-34.5 feet).	

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 107 **Photo Location:** KIF-TW04 **Photo Date:** 2/13/2019 **Comments:** Interval (34.5-36.0 feet).	
Photograph ID: 108 **Photo Location:** KIF-TW04 **Photo Date:** 2/13/2019 **Comments:** Interval (36.0-37.5 feet).	

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 109 **Photo Location:** KIF-TW04 **Photo Date:** 2/13/2019 **Comments:** Interval (37.5-39.0 feet).	
Photograph ID: 110 **Photo Location:** KIF-TW05 **Photo Date:** 11/13/2018 **Comments:** Photo of interval (0.0-1.5 feet) unavailable.	No Photo Applicable

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 111 **Photo Location:** KIF-TW05 **Photo Date:** 11/13/2018 **Comments:** Interval (1.5-3.0 feet).	
Photograph ID: 112 **Photo Location:** KIF-TW05 **Photo Date:** 11/13/2018 **Comments:** Interval (3.0-4.5 feet).	

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 113

Photo Location:
KIF-TW05

Photo Date:
11/13/2018

Comments:
Interval (4.5-6.0 feet).

Photograph ID: 114

Photo Location:
KIF-TW05

Photo Date:
11/13/2018

Comments:
Interval (6.0-7..5 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 115

Photo Location:
KIF-TW05

Photo Date:
11/13/2018

Comments:
Interval (7.5-9.0 feet).

Photograph ID: 116

Photo Location:
KIF-TW05

Photo Date:
11/13/2018

Comments:
Interval (9.0-10.5 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 117 **Photo Location:** KIF-TW05 **Photo Date:** 11/13/2018 **Comments:** Interval (10.5-12.0 feet).	
Photograph ID: 118 **Photo Location:** KIF-TW05 **Photo Date:** 11/13/2018 **Comments:** Interval (12.0-13.5 feet).	

Client:	Tennessee Valley Authority	Project:	KIF TDEC Order
Site Name:	Kingston Fossil Plant (KIF)	Site Location:	Harriman, Tennessee

Photograph ID: 119

Photo Location:
KIF-TW05

Photo Date:
11/13/2018

Comments:
Interval (13.5-15.0 feet).

Photograph ID: 120

Photo Location:
KIF-TW05

Photo Date:
11/13/2018

Comments:
Interval (15.0-16.5 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 121

Photo Location:
KIF-TW05

Photo Date:
11/13/2018

Comments:
Interval (16.5-18.0 feet).

Photograph ID: 122

Photo Location:
KIF-TW05

Photo Date:
11/13/2018

Comments:
Interval (18.0-19.5 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 123

Photo Location:
KIF-TW05

Photo Date:
11/13/2018

Comments:
Interval (19.5-21.0 feet).

Photograph ID: 124

Photo Location:
KIF-TW05

Photo Date:
11/13/2018

Comments:
Interval (21.0-22.5 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 125

Photo Location:
KIF-TW05

Photo Date:
11/13/2018

Comments:
Interval (22.5-24.0 feet).

Photograph ID: 126

Photo Location:
KIF-TW05

Photo Date:
11/13/2018

Comments:
Interval (24.0-25.5 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 127

Photo Location:
KIF-TW05

Photo Date:
11/13/2018

Comments:
Interval (25.5-27.0 feet).

Photograph ID: 128

Photo Location:
KIF-TW05

Photo Date:
11/13/2018

Comments:
Interval (27.0-28.5 feet).

Client:	Tennessee Valley Authority	Project:	KIF TDEC Order
Site Name:	Kingston Fossil Plant (KIF)	Site Location:	Harriman, Tennessee

Photograph ID: 129

Photo Location:
KIF-TW05

Photo Date:
11/13/2018

Comments:
Interval (28.5-30.0 feet).

Photograph ID: 130

Photo Location:
KIF-TW05

Photo Date:
11/13/2018

Comments:
Interval (30.0-31.5 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 131

Photo Location:
KIF-TW05

Photo Date:
11/13/2018

Comments:
Interval (31.5-33.0 feet).

Photograph ID: 132

Photo Location:
KIF-TW05

Photo Date:
11/13/2018

Comments:
Interval (33.0-34.5 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 133

Photo Location:
KIF-TW05

Photo Date:
11/13/2018

Comments:
Interval (34.5-36.0 feet).

Photograph ID: 134

Photo Location:
KIF-TW05

Photo Date:
11/13/2018

Comments:
Interval (36.0-37.5 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 135

Photo Location:
KIF-B01A

Photo Date:
12/2/2019

Comments:
Interval (35.0-40.0 feet).

Photograph ID: 136

Photo Location:
KIF-B01A

Photo Date:
12/2/2019

Comments:
Interval (40.0-45.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 137 **Photo Location:** KIF-B01A **Photo Date:** 12/2/2019 **Comments:** Interval (45.0-50.0 feet).	
Photograph ID: 138 **Photo Location:** KIF-B01A **Photo Date:** 12/2/2019 **Comments:** Photo of interval (50.0-55.0 feet) unavailable.	No Photo Applicable

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 139

Photo Location:
KIF-B01B

Photo Date:
12/3/2019

Comments:
Interval (35.0-40.0 feet).

Photograph ID: 140

Photo Location:
KIF-B01B

Photo Date:
12/3/2019

Comments:
Interval (40.0-45.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 141

Photo Location:
KIF-B01B

Photo Date:
12/3/2019

Comments:
Interval (45.0-50.0 feet).

Photograph ID: 142

Photo Location:
KIF-B01B

Photo Date:
12/3/2019

Comments:
Interval (50.0-52.5 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 143 **Photo Location:** KIF-B01B **Photo Date:** 12/3/2019 **Comments:** Interval (52.5-55.0 feet).	
Photograph ID: 144 **Photo Location:** KIF-B02A **Photo Date:** 12/2/2019 **Comments:** Photo of interval (35.0-40.0 feet) unavailable.	No Photo Applicable

Client:	Tennessee Valley Authority	Project:	KIF TDEC Order
Site Name:	Kingston Fossil Plant (KIF)	Site Location:	Harriman, Tennessee

Photograph ID: 145

Photo Location:
KIF-B02A

Photo Date:
12/4/2019

Comments:
Interval (40.0-45.0 feet).

Photograph ID: 146

Photo Location:
KIF-B02A

Photo Date:
12/4/2019

Comments:
Interval (45.0-50.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 147 **Photo Location:** KIF-B02A **Photo Date:** 12/4/2019 **Comments:** Interval (50.0-55.0 feet).	
Photograph ID: 148 **Photo Location:** KIF-B02A **Photo Date:** 12/4/2019 **Comments:** Interval (55.0-57.75 feet).	

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 149 **Photo Location:** KIF-B02B **Photo Date:** 12/4/2019 **Comments:** Interval (35.0-37.5 feet).	
Photograph ID: 150 **Photo Location:** KIF-B02B **Photo Date:** 12/4/2019 **Comments:** Interval (37.5-40.0 feet).	

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 151

Photo Location:
KIF-B02B

Photo Date:
12/4/2019

Comments:
Interval (40.0-45.0 feet)

Photograph ID: 152

Photo Location:
KIF-B02B

Photo Date:
12/4/2019

Comments:
Interval (45.0-50.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 153

Photo Location:
KIF-B02B

Photo Date:
12/4/2019

Comments:
Interval (50.0-52.5 feet).

Photograph ID: 154

Photo Location:
KIF-B02B

Photo Date:
12/4/2019

Comments:
Interval (50.0-52.5 feet).

Client:	Tennessee Valley Authority	Project:	KIF TDEC Order
Site Name:	Kingston Fossil Plant (KIF)	Site Location:	Harriman, Tennessee

Photograph ID: 155

Photo Location:
KIF-B02B

Photo Date:
12/4/2019

Comments:
Interval (52.5-55.0 feet).

Photograph ID: 156

Photo Location:
KIF-B02B

Photo Date:
12/4/2019

Comments:
Interval (55.0-57.5 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 157

Photo Location:
KIF-B03A

Photo Date:
12/5/2019

Comments:
Interval (40.0-45.0 feet).

Photograph ID: 158

Photo Location:
KIF-B03A

Photo Date:
12/5/2019

Comments:
Interval (45.0-50.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 159

Photo Location:
KIF-B03A

Photo Date:
12/5/2019

Comments:
Interval (50.0-55.0 feet).

Photograph ID: 160

Photo Location:
KIF-B03A

Photo Date:
12/5/2019

Comments:
Interval (50.0-55.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 161

Photo Location:
KIF-B03A

Photo Date:
12/5/2019

Comments:
Interval (55.0-57.5 feet).

Photograph ID: 162

Photo Location:
KIF-B03A

Photo Date:
12/5/2019

Comments:
Interval (57.5-60.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 163

Photo Location:
KIF-B03A

Photo Date:
12/5/2019

Comments:
Interval (57.5-60.0 feet).

Photograph ID: 164

Photo Location:
KIF-B03B

Photo Date:
12/5/2019

Comments:
Interval (40.0-45.0 feet).

Client:	Tennessee Valley Authority	Project:	KIF TDEC Order
Site Name:	Kingston Fossil Plant (KIF)	Site Location:	Harriman, Tennessee

Photograph ID: 165

Photo Location:
KIF-B03B

Photo Date:
12/5/2019

Comments:
Interval (45.0-50.0 feet).

Photograph ID: 166

Photo Location:
KIF-B03B

Photo Date:
12/5/2019

Comments:
Interval (50.0-55.0 feet).

Client:	Tennessee Valley Authority	Project:	KIF TDEC Order
Site Name:	Kingston Fossil Plant (KIF)	Site Location:	Harriman, Tennessee

Photograph ID: 167

Photo Location:
KIF-B03B

Photo Date:
12/5/2019

Comments:
Interval (55.0-57.5 feet).

Photograph ID: 168

Photo Location:
KIF-B03B

Photo Date:
12/5/2019

Comments:
Interval (57.5-60.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 169

Photo Location:
KIF-B04A

Photo Date:
12/5/2019

Comments:
Interval (35.0-40.0 feet).

Photograph ID: 170

Photo Location:
KIF-B04A

Photo Date:
12/5/2019

Comments:
Interval (40.0-45.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 171 **Photo Location:** KIF-B04A **Photo Date:** 12/5/2019 **Comments:** Interval (45.0-47.5 feet).	
Photograph ID: 172 **Photo Location:** KIF-B04A **Photo Date:** 12/5/2019 **Comments:** Interval (47.5-50.0 feet).	

ATTACHMENT D.2

Photographic Log of Phase 1 Site Conditions and Temporary Wells

Stantec

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 1

Photo Location:
TW01

Photo Date:
1/24/2019

Comments:
Example of CCR samples stored in pint-size jars

Photograph ID: 2

Photo Location:
TW01

Photo Date:
1/24/2019

Comments:
Exampling of sampling table setup

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 3 **Photo Location:** TW01 **Photo Date:** 1/24/2019 **Comments:** Split-spoon sampler washing example	
Photograph ID: 4 **Photo Location:** TW01 **Photo Date:** 1/30/2019 **Comments:** TW01 looking south at protective staking and snow fencing	

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 5

Photo Location:
TW01

Photo Date:
9/17/2019

Comments:
TW01 looking south at protective staking and snow fencing

Photograph ID: 6

Photo Location:
TW01

Photo Date:
9/24/2019

Comments:
TW01 surface completion at riser stickup

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 7

Photo Location:
TW01

Photo Date:
9/24/2019

Comments:
TW01 well cover lock

Photograph ID: 8

Photo Location:
TW02

Photo Date:
9/24/2019

Comments:
TW02 surface completion at riser stickup

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 9 **Photo Location:** TW02 **Photo Date:** 9/17/2019 **Comments:** TW02 looking west at protective staking and snow fencing	
Photograph ID: 10 **Photo Location:** TW02 **Photo Date:** 9/24/2019 **Comments:** TW02 well cover lock	

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 11

Photo Location:
TW03

Photo Date:
9/24/2019

Comments:
TW03 surface completion at riser stickup

Photograph ID: 12

Photo Location:
TW03

Photo Date:
9/17/2019

Comments:
TW03 looking south at protective staking and snow fencing

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 13 **Photo Location:** TW04 **Photo Date:** 9/24/2019 **Comments:** TW04 surface completion at riser stickup	
Photograph ID: 14 **Photo Location:** TW04 **Photo Date:** 9/17/2019 **Comments:** TW04 looking south at protective staking and snow fencing	

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 15

Photo Location:
TW04

Photo Date:
9/24/2019

Comments:
TW04 well cover lock

Photograph ID: 16

Photo Location:
TW05

Photo Date:
9/17/2019

Comments:
TW05 surface completion at riser stickup

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 17

Photo Location:
TW05

Photo Date:
9/17/2019

Comments:
TW05 looking south at protective staking and snow fencing

Stantec

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 1

Photo Location:
B01A

Photo Date:
12/6/2019

Comments:
Surface protection for B01A and B01B

Photograph ID: 2

Photo Location:
B01A

Photo Date:
12/3/2019

Comments:
Drill rig set-up at B01A looking East

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 3

Photo Location:
B01A

Photo Date:
12/3/2019

Comments:
Drill rig set-up at B01A looking North

Photograph ID: 4

Photo Location:
B01A

Photo Date:
12/12/2019

Comments:
Surface completion of B01A and B01B

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 5 **Photo Location:** B01A **Photo Date:** 12/12/2019 **Comments:** Surface repair at B01A and B01B	
Photograph ID: 6 **Photo Location:** B02A **Photo Date:** 12/6/2019 **Comments:** Surface protection for B02A and B02B	

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 7 **Photo Location:** B02A **Photo Date:** 12/12/2019 **Comments:** Surface completion of B02A and B02B	
Photograph ID: 8 **Photo Location:** B02A **Photo Date:** 12/12/2019 **Comments:** Surface repair at B02A and B02B	

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 9 **Photo Location:** B03A **Photo Date:** 12/12/2019 **Comments:** Surface completion of B03A and B03B	
Photograph ID: 10 **Photo Location:** B03A **Photo Date:** 12/12/2019 **Comments:** Surface repair at B03A and B03B	

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 11 **Photo Location:** B04A **Photo Date:** 12/12/2019 **Comments:** Surface completion of B04A	
Photograph ID: 12 **Photo Location:** B04A **Photo Date:** 12/12/2019 **Comments:** Surface repair at B04A	

ATTACHMENT D.3

Photographic Log of Phase 2 Soil Samples

Stantec

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil (KIF) Plant**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 1

Photo Location:
KIF-B05

Photo Date:
2/22/2021

Comments:
Interval (0.0-1.5 feet).

Photograph ID: 2

Photo Location:
KIF-B05

Photo Date:
2/22/2021

Comments:
Interval (2.5-4.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil (KIF) Plant**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 3

Photo Location:
KIF-B05

Photo Date:
2/22/2021

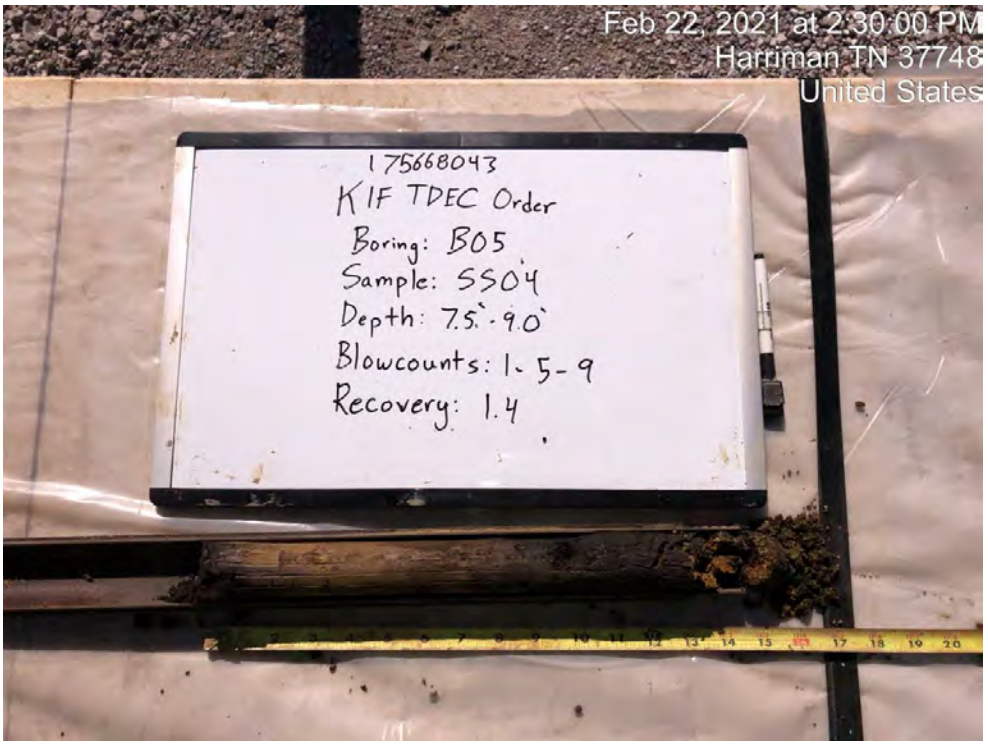
Comments:
Interval (5.0-6.5 feet).

Photograph ID: 4

Photo Location:
KIF-B05

Photo Date:
2/22/2021

Comments:
Interval (7.5-9.0 feet).



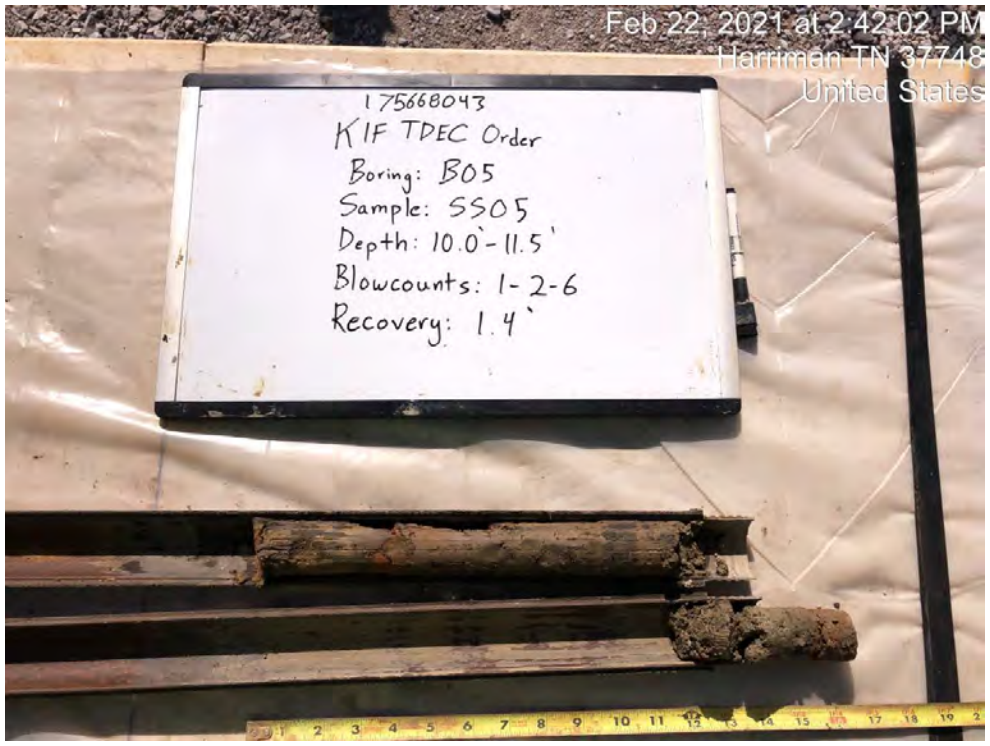
Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil (KIF) Plant**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 5

Photo Location:
KIF-B05

Photo Date:
2/22/2021

Comments:
Interval (10.0-11.5 feet).



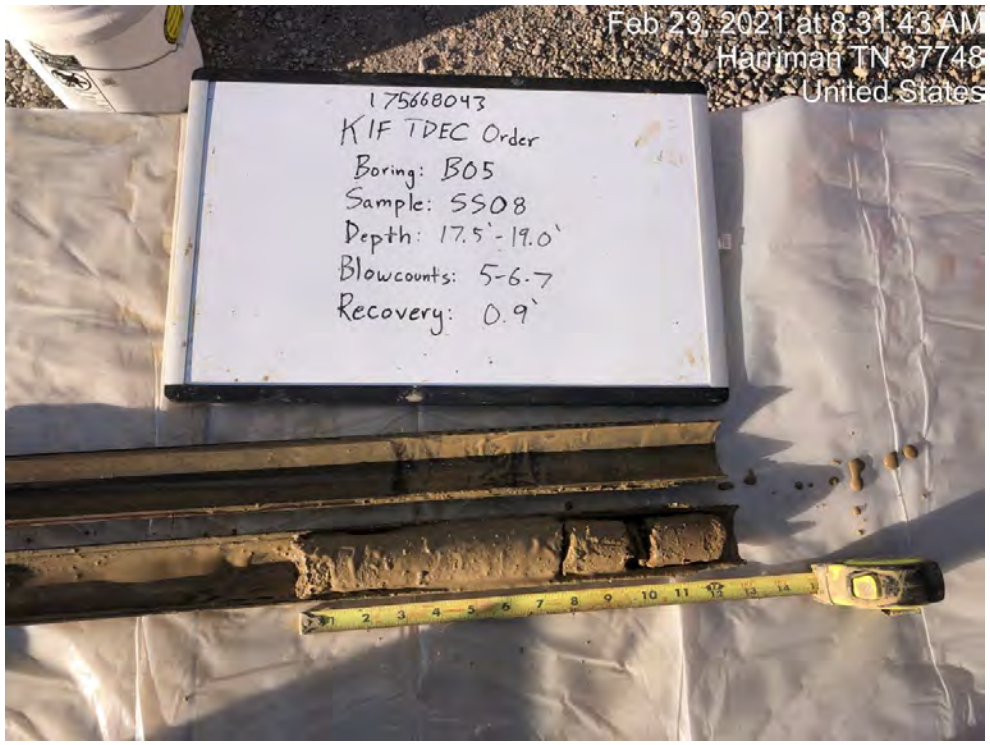
Photograph ID: 6

Photo Location:
KIF-B05

Photo Date:
2/22/2021

Comments:
Interval (12.5-14.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil (KIF) Plant**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 7 **Photo Location:** KIF-B05 **Photo Date:** 2/22/2021 **Comments:** Interval (15.0-16.5 feet).	
Photograph ID: 8 **Photo Location:** KIF-B05 **Photo Date:** 2/23/2021 **Comments:** Interval (17.5-19.0 feet).	

Client:	Tennessee Valley Authority	Project:	KIF TDEC Order
Site Name:	Kingston Fossil (KIF) Plant	Site Location:	Harriman, Tennessee

Photograph ID: 9

Photo Location:
KIF-B05

Photo Date:
2/23/2021

Comments:
Interval (19.0-20.5 feet). WOH on white board is the same as WH on the boring log.

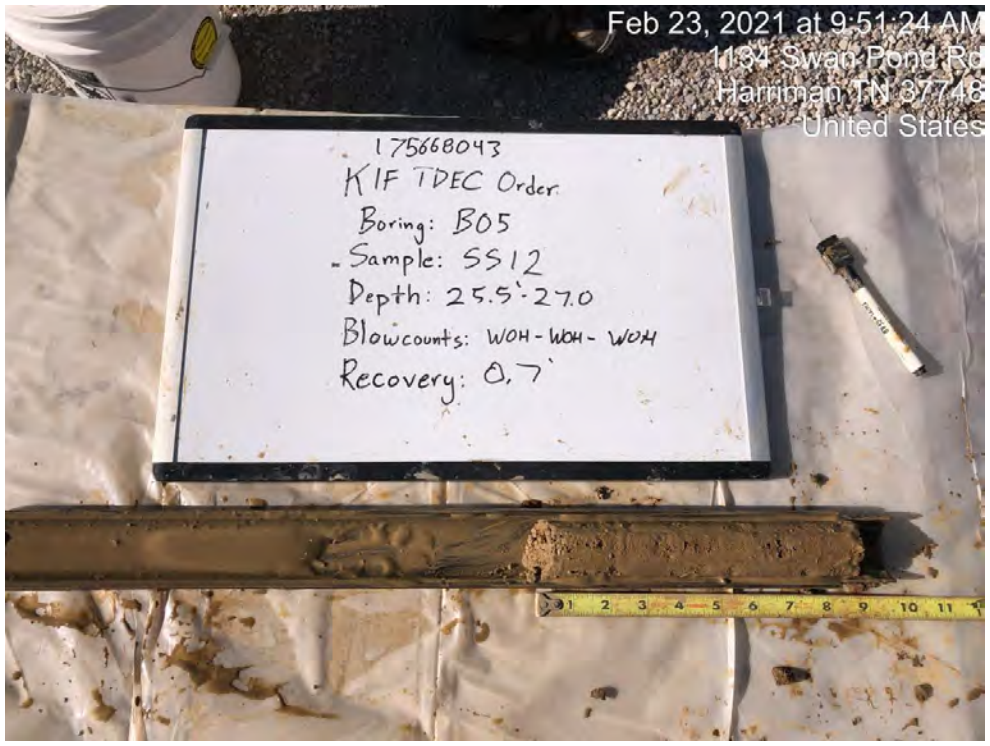
Photograph ID: 10

Photo Location:
KIF-B05

Photo Date:
2/23/2021

Comments:
Interval (20.5-22.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil (KIF) Plant**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 11 **Photo Location:** KIF-B05 **Photo Date:** 2/23/2021 **Comments:** Interval (23.0-24.5 feet). WOH on white board is the same as WH on the boring log.	
Photograph ID: 12 **Photo Location:** KIF-B05 **Photo Date:** 2/23/2021 **Comments:** Interval (25.5-27.0 feet). WOH on white board is the same as WH on the boring log.	

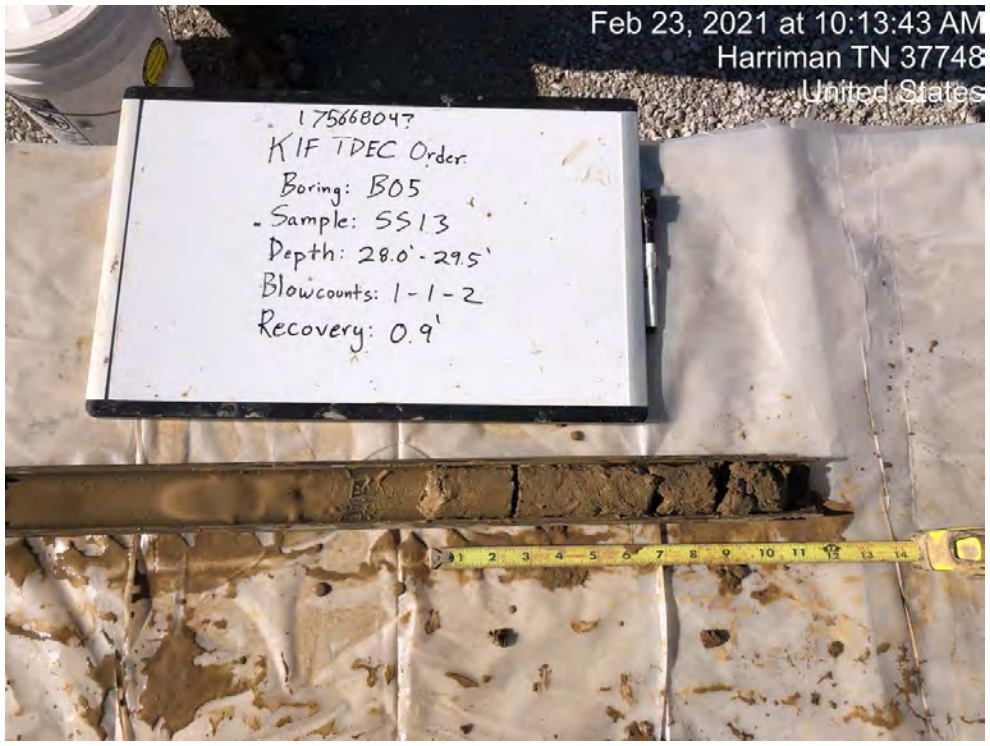
Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil (KIF) Plant**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 13

Photo Location:
KIF-B05

Photo Date:
2/23/2021

Comments:
Interval (28.0-29.5 feet).

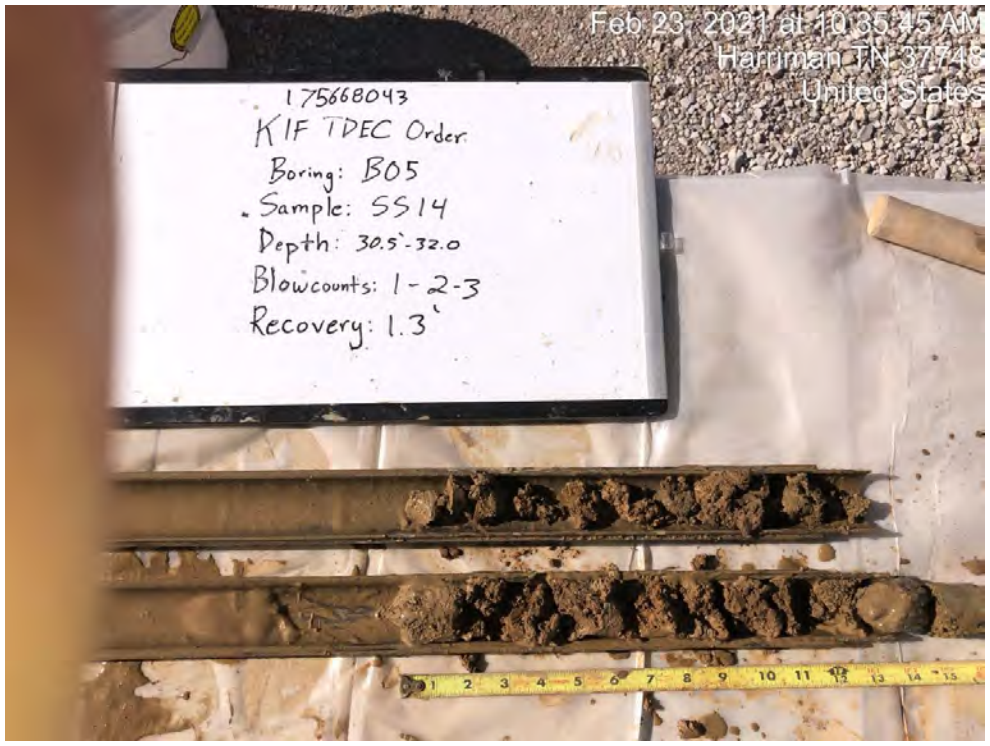


Photograph ID: 14

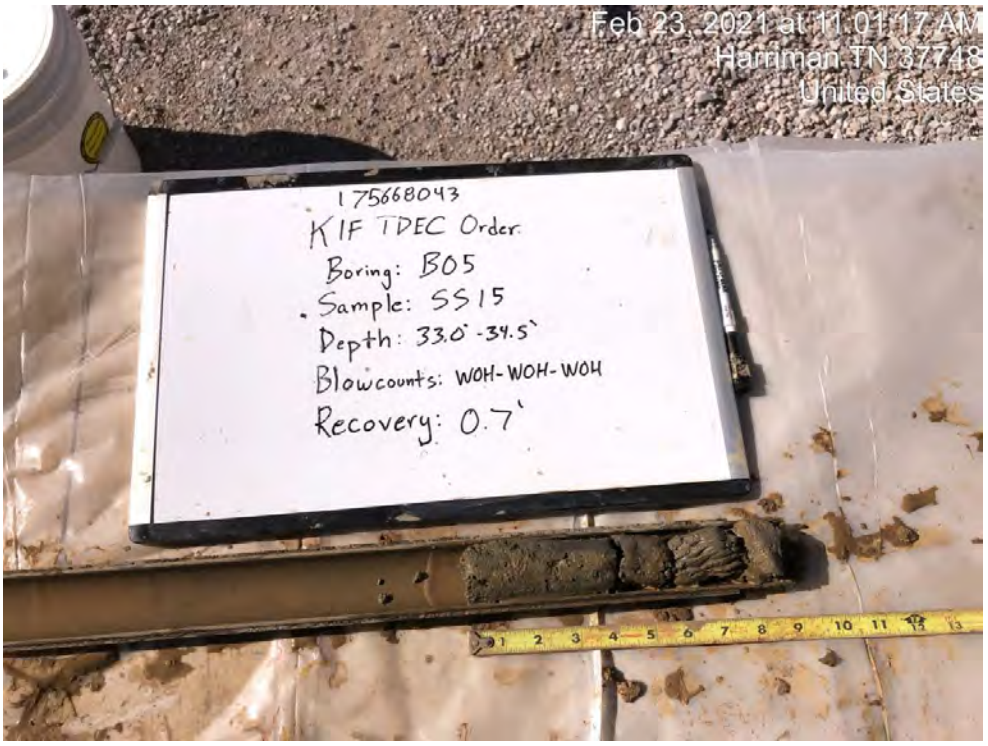
Photo Location:
KIF-B05

Photo Date:
2/23/2021

Comments:
Interval (30.5-32.0 feet).



Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil (KIF) Plant**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 15 **Photo Location:** KIF-B05 **Photo Date:** 2/23/2021 **Comments:** Interval (33.0-34.5 feet). WOH on white board is the same as WH on the boring log.	
Photograph ID: 16 **Photo Location:** KIF-B05 **Photo Date:** 2/23/2021 **Comments:** Photo of interval (35.5-37.2 feet) unavailable because sample collected with shelby tube.	No Photo Applicable

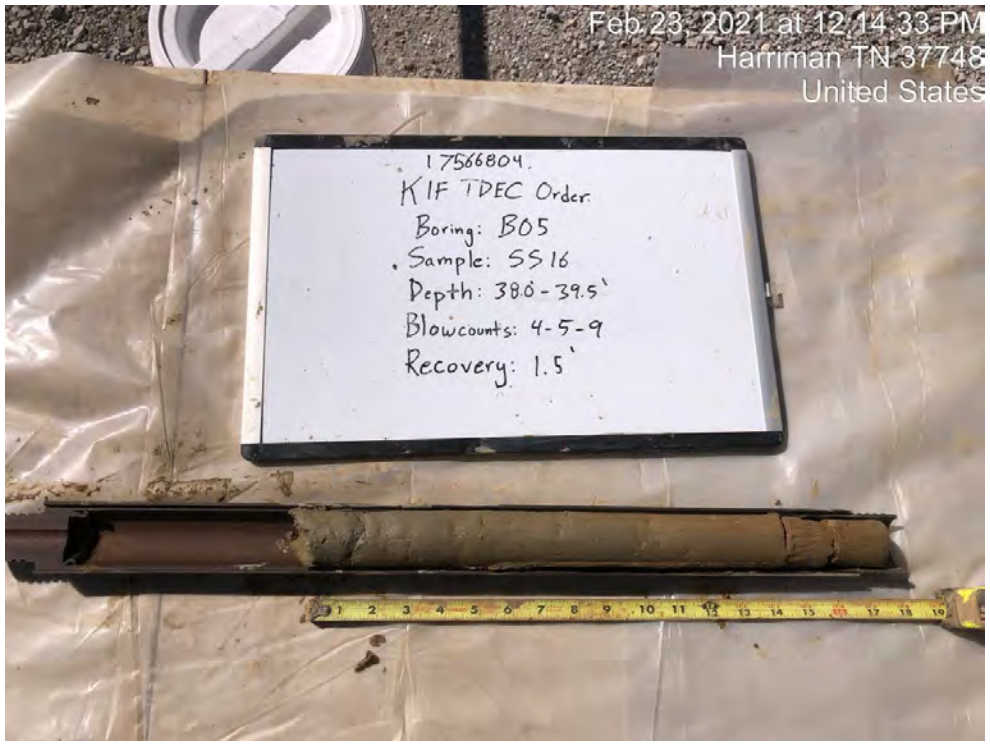
Client:	Tennessee Valley Authority	Project:	KIF TDEC Order
Site Name:	Kingston Fossil (KIF) Plant	Site Location:	Harriman, Tennessee

Photograph ID: 17

Photo Location:
KIF-B05

Photo Date:
2/23/2021

Comments:
Interval (38.0-39.5 feet).

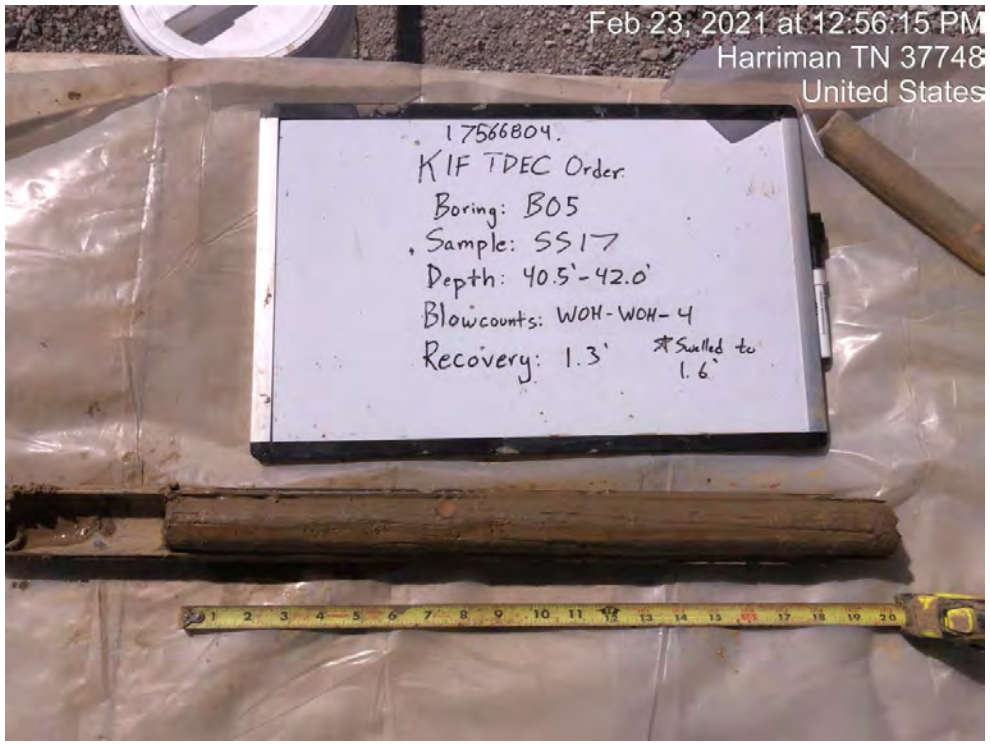


Photograph ID: 18

Photo Location:
KIF-B05

Photo Date:
2/23/2021

Comments:
Interval (40.5-42.0 feet). WOH on white board is the same as WH on the boring log.



Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil (KIF) Plant**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 19

Photo Location:
KIF-B05

Photo Date:
2/23/2021

Comments:
Interval (43.0-44.5 feet).

Photograph ID: 20

Photo Location:
KIF-B05

Photo Date:
2/23/2021

Comments:
Interval (45.5-47.0 feet). WOH on white board is the same as WH on the boring log.

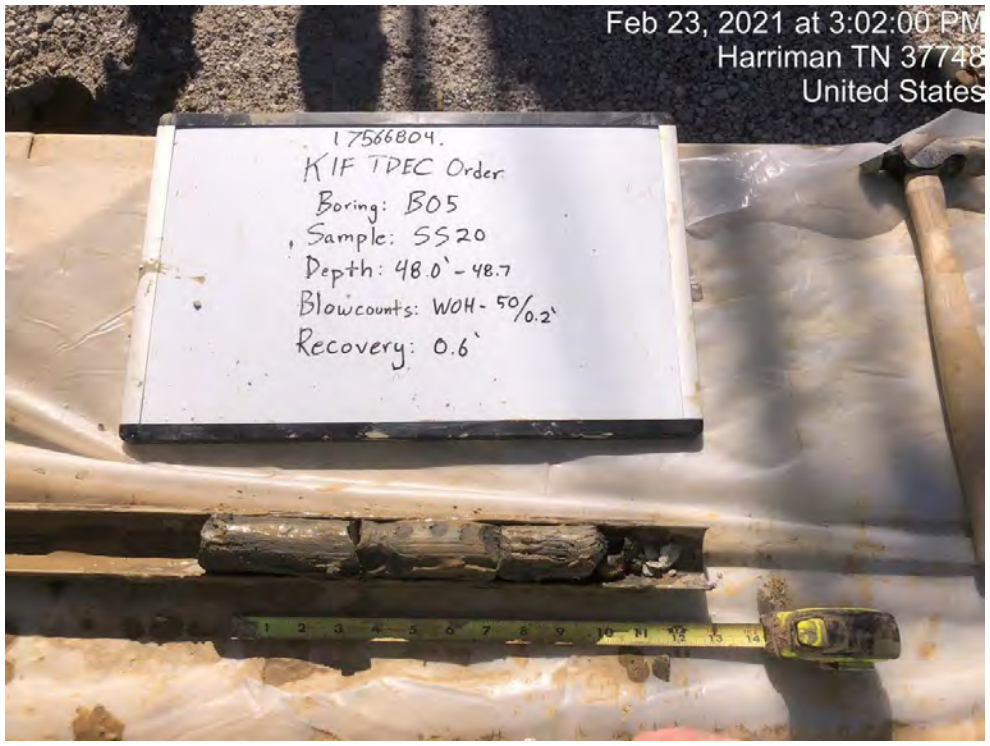
Client:	Tennessee Valley Authority	Project:	KIF TDEC Order
Site Name:	Kingston Fossil (KIF) Plant	Site Location:	Harriman, Tennessee

Photograph ID: 21

Photo Location:
KIF-B05

Photo Date:
2/23/2021

Comments:
Interval (48.0-48.7 feet). WOH on white board is the same as WH on the boring log.

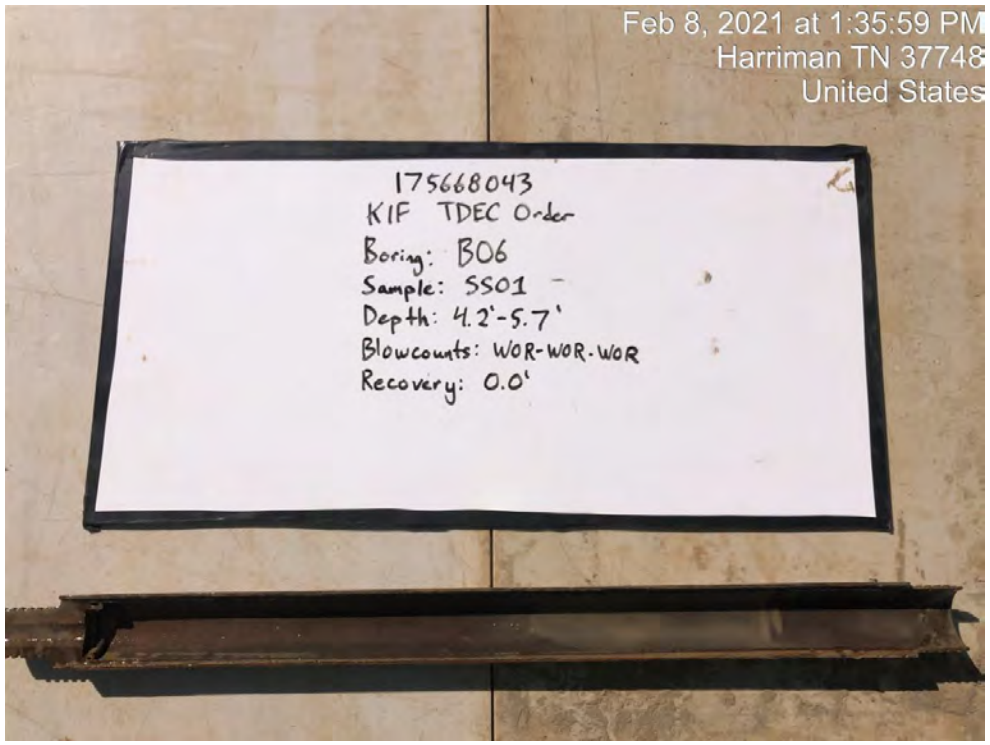


Photograph ID: 22

Photo Location:
KIF-B06

Photo Date:
2/8/2021

Comments:
Interval (5.7-7.2 feet). Interval shown on white board should be 5.7-7.2 feet. WOR on white board is the same as WR on the boring log.



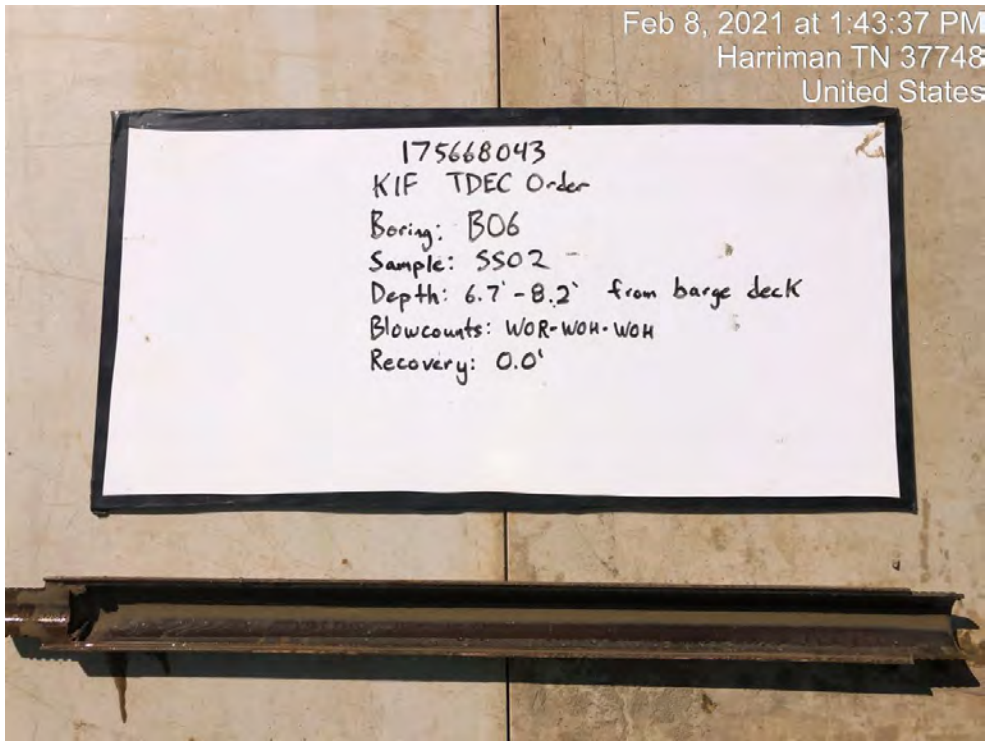
Client:	Tennessee Valley Authority	Project:	KIF TDEC Order
Site Name:	Kingston Fossil (KIF) Plant	Site Location:	Harriman, Tennessee

Photograph ID: 23

Photo Location:
KIF-B06

Photo Date:
2/8/2021

Comments:
Interval (8.2-9.7 feet). Interval shown on white board should be 8.2-9.7 feet. WOR and WOH on white board is the same as WR and WH on the boring log, respectively.

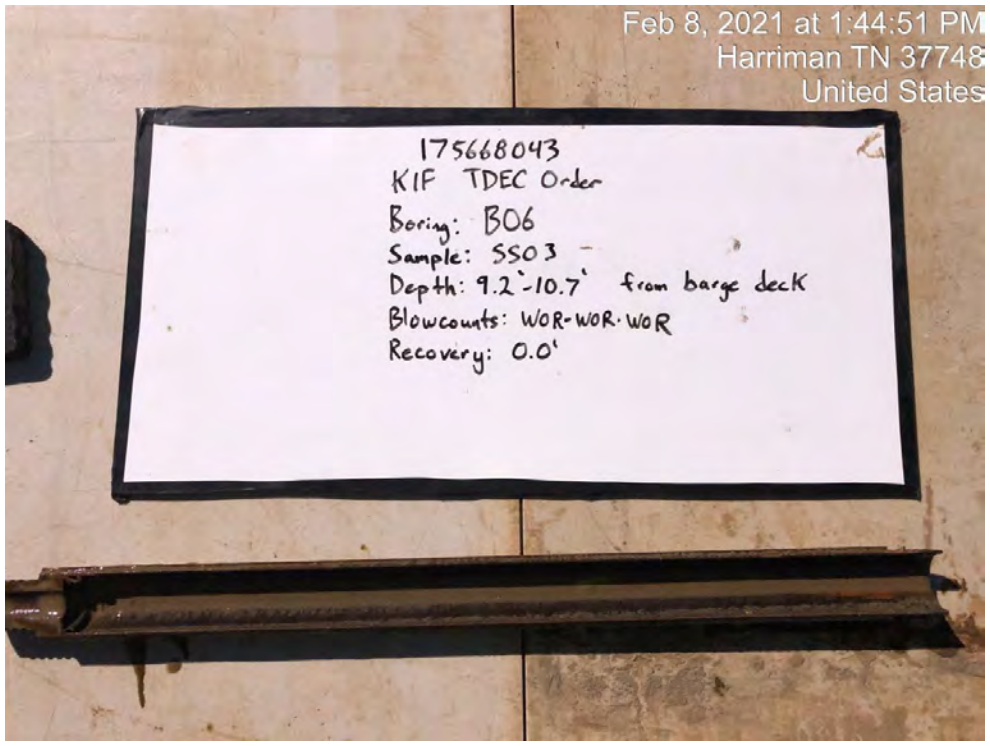


Photograph ID: 24

Photo Location:
KIF-B06

Photo Date:
2/8/2021

Comments:
Interval (10.7-12.2 feet). Interval shown on white board should be 10.7-12.2 feet. WOR on white board is the same as WR on the boring log.



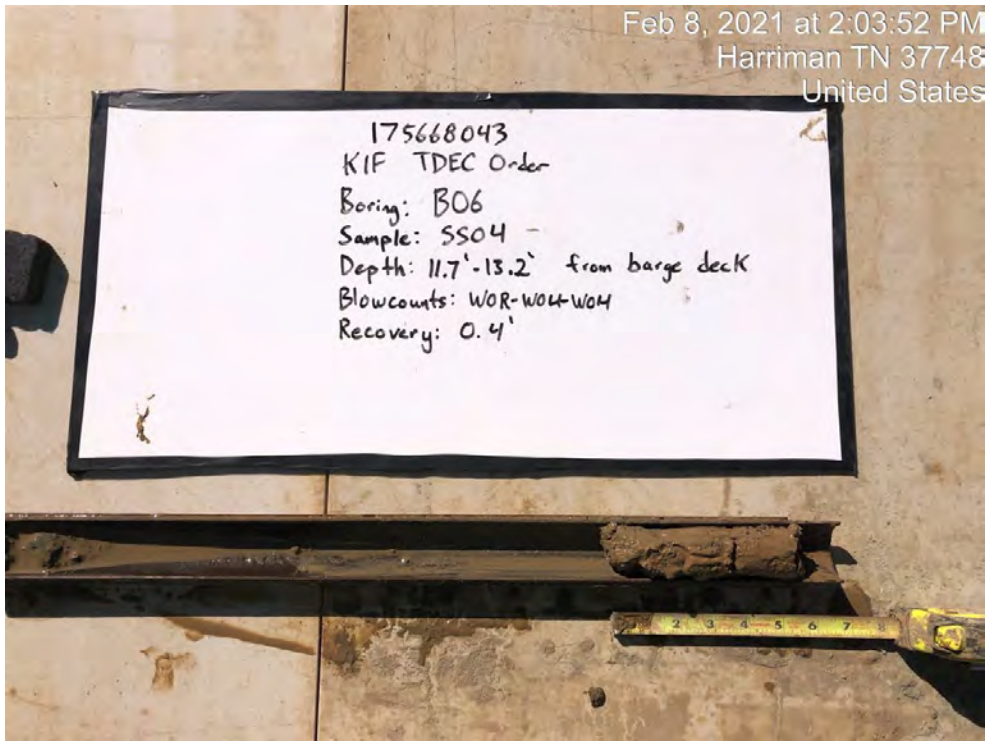
Client:	Tennessee Valley Authority	Project:	KIF TDEC Order
Site Name:	Kingston Fossil (KIF) Plant	Site Location:	Harriman, Tennessee

Photograph ID: 25

Photo Location:
KIF-B06

Photo Date:
2/8/2021

Comments:
Interval (13.2-14.7 feet). Interval shown on white board should be 13.2-14.7 feet. WOR and WOH on white board is the same as WR and WH on the boring log, respectively.

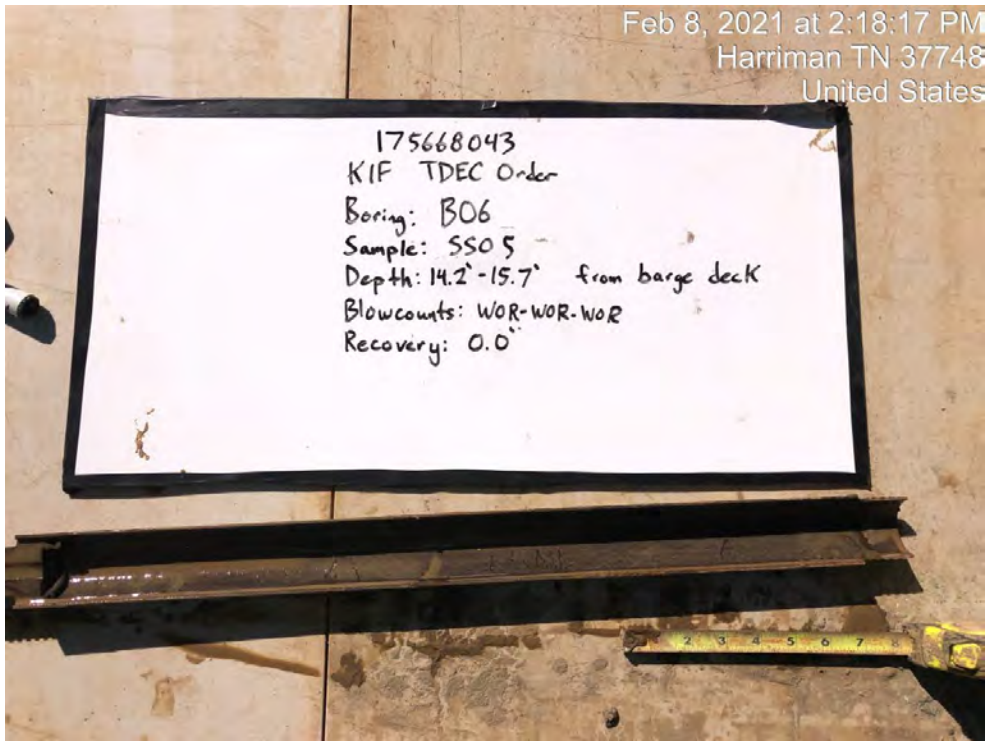


Photograph ID: 26

Photo Location:
KIF-B06

Photo Date:
2/8/2021

Comments:
Interval (15.7-17.2 feet). Interval shown on white board should be 15.7-17.2 feet. WOR on white board is the same as WR on the boring log.



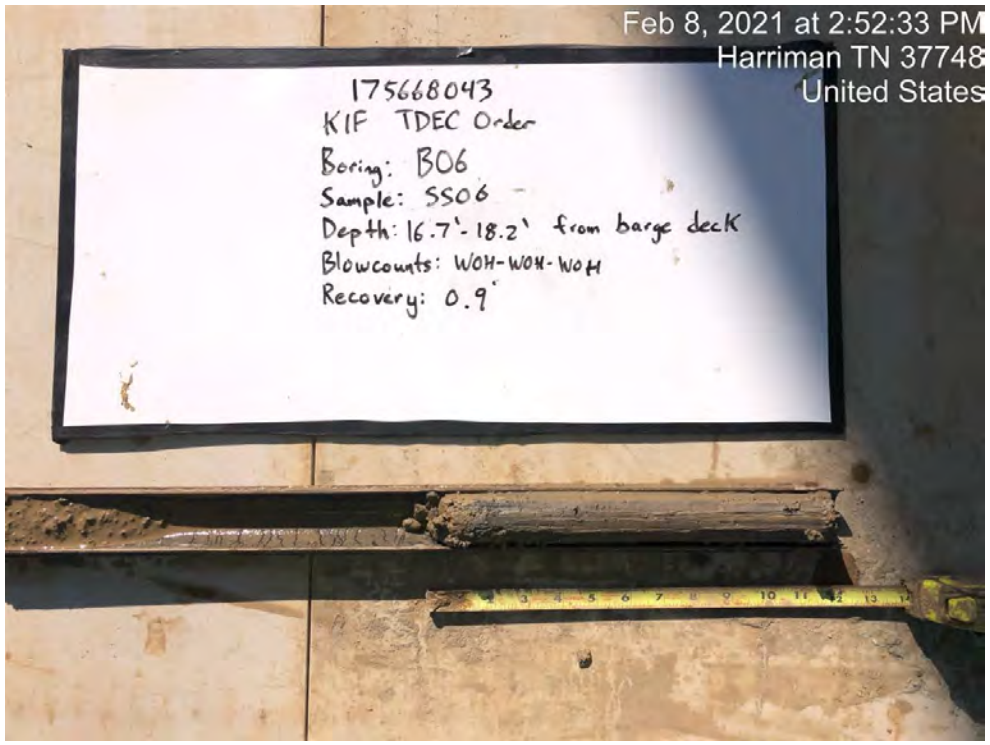
Client:	Tennessee Valley Authority	Project:	KIF TDEC Order
Site Name:	Kingston Fossil (KIF) Plant	Site Location:	Harriman, Tennessee

Photograph ID: 27

Photo Location:
KIF-B06

Photo Date:
2/8/2021

Comments:
Interval (18.2-19.7 feet). Interval shown on white board should be 18.2-19.7 feet. WOH on white board is the same as WH on the boring log.

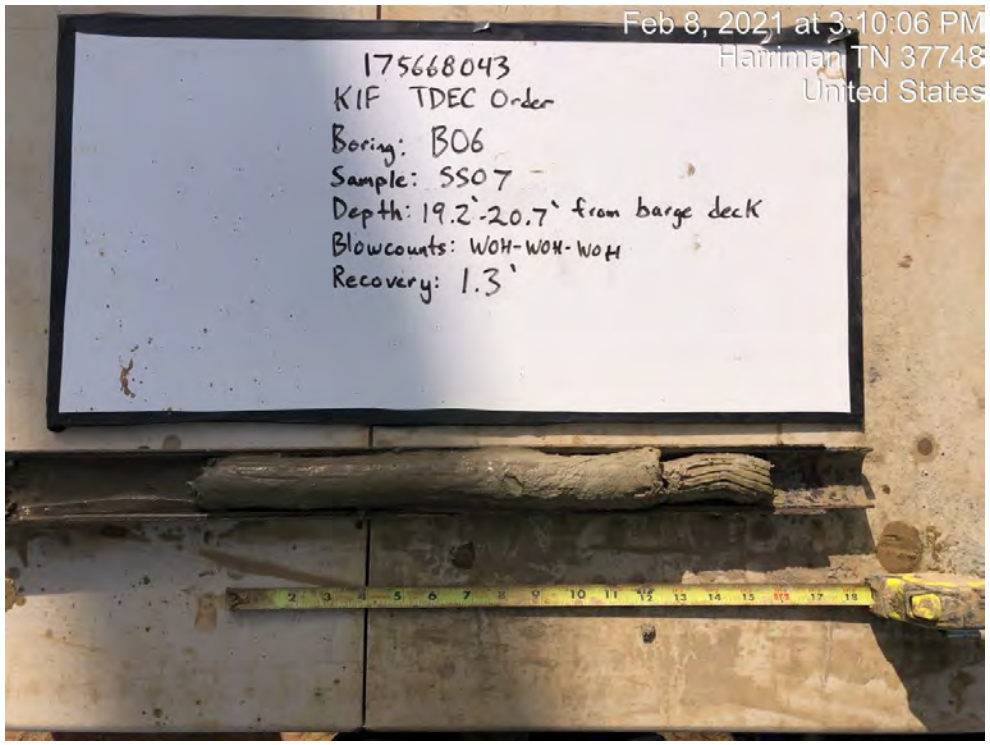


Photograph ID: 28

Photo Location:
KIF-B06

Photo Date:
2/8/2021

Comments:
Interval (20.7-22.2 feet). Interval shown on white board should be 20.7-22.2 feet. WOH on white board is the same as WH on the boring log.



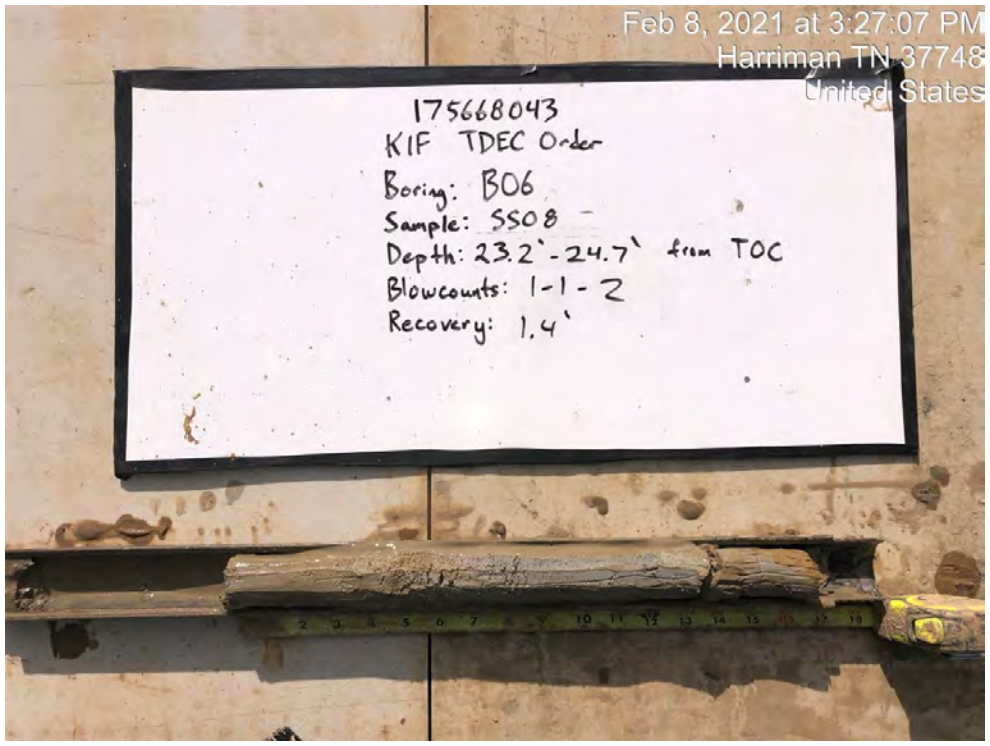
Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil (KIF) Plant**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 29

Photo Location:
KIF-B06

Photo Date:
2/8/2021

Comments:
Interval (23.2-24.7 feet).

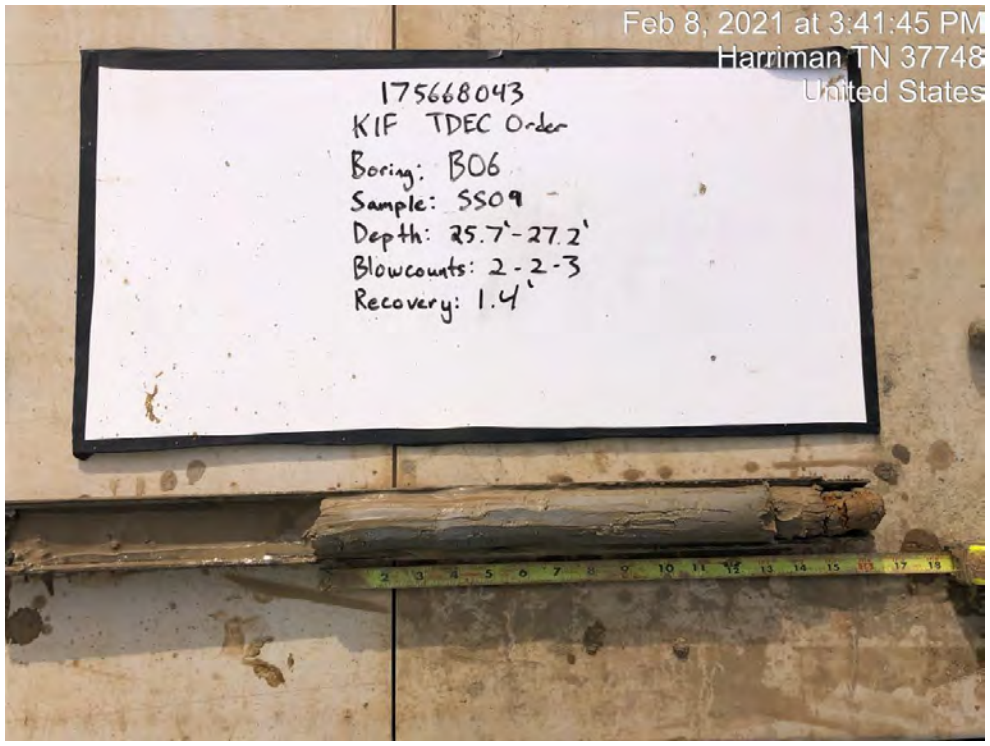


Photograph ID: 30

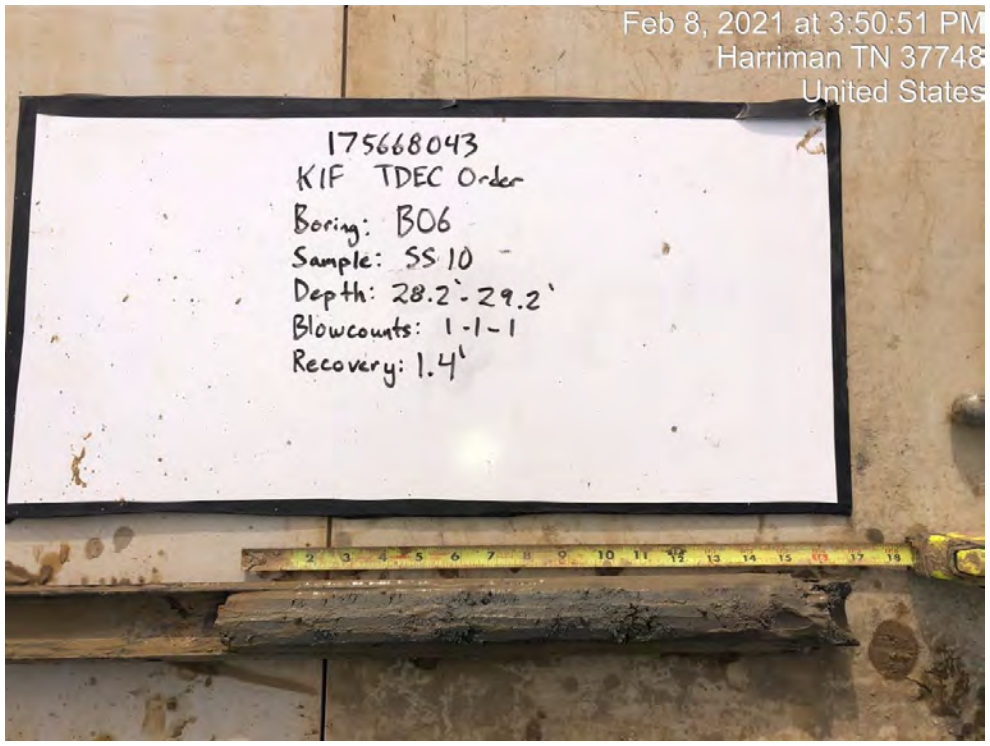
Photo Location:
KIF-B06

Photo Date:
2/8/2021

Comments:
Interval (25.7-27.2 feet).



Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil (KIF) Plant**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 31 **Photo Location:** KIF-B06 **Photo Date:** 2/8/2021 **Comments:** Interval (28.2-29.7 feet). Interval shown on white board should be 28.2-29.7 feet.	
Photograph ID: 32 **Photo Location:** KIF-B06 **Photo Date:** 2/8/2021 **Comments:** Interval (30.7-32.2 feet). WOH on white board is the same as WH on the boring log.	

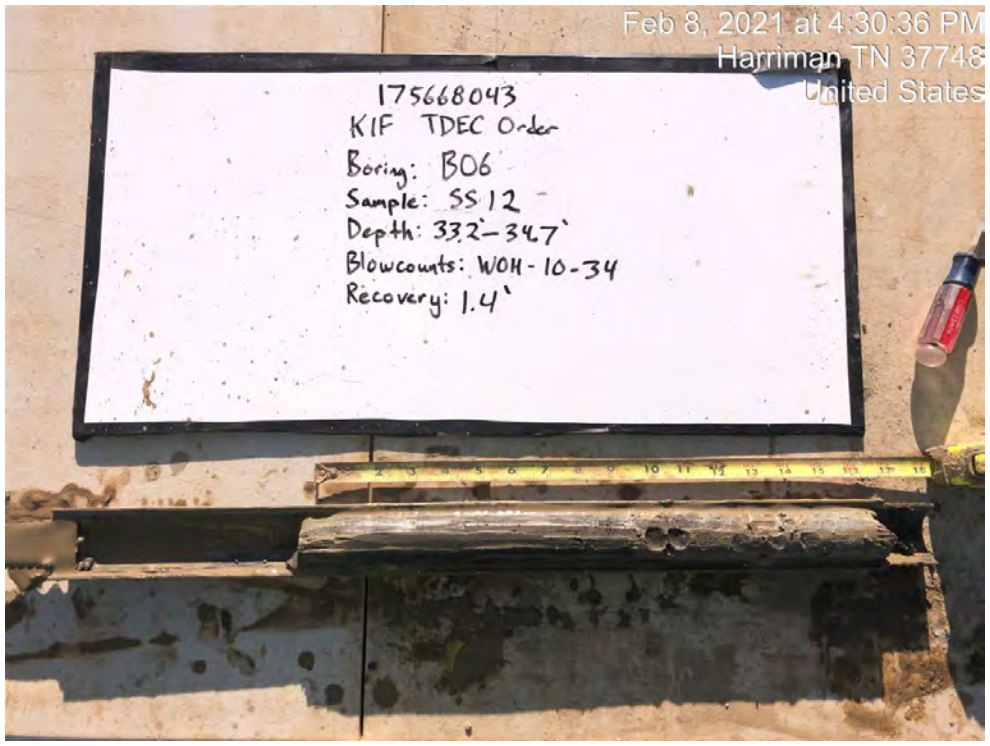
Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil (KIF) Plant**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 33

Photo Location:
KIF-B06

Photo Date:
2/8/2021

Comments:
Interval (33.2-34.7 feet). WOH on white board is the same as WH on the boring log.

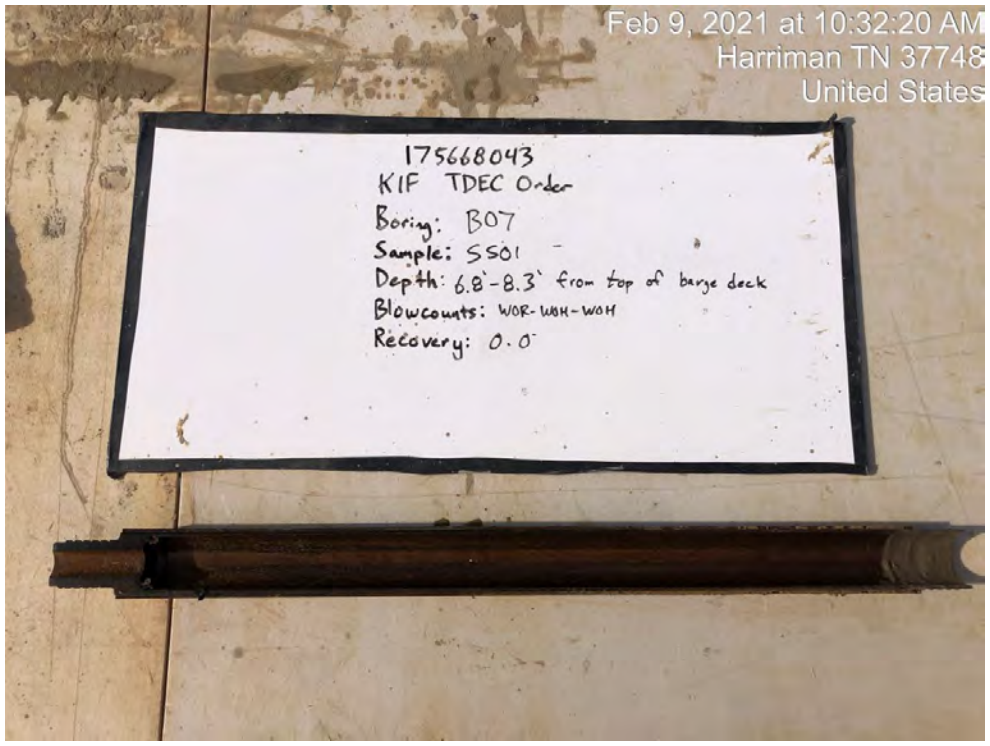


Photograph ID: 34

Photo Location:
KIF-B07

Photo Date:
2/9/2021

Comments:
Interval (8.3-9.8 feet). Interval shown on white board should be 8.3-9.8 feet. WOR and WOH on white board is the same as WR and WH on the boring log, respectively.



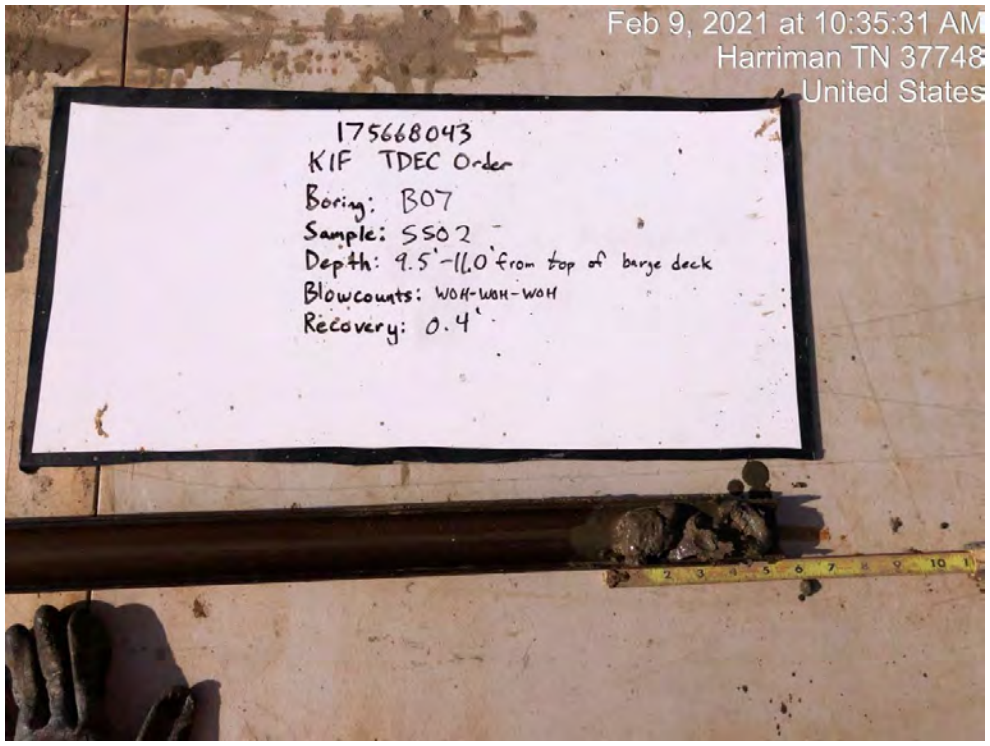
Client:	Tennessee Valley Authority	Project:	KIF TDEC Order
Site Name:	Kingston Fossil (KIF) Plant	Site Location:	Harriman, Tennessee

Photograph ID: 35

Photo Location:
KIF-B07

Photo Date:
2/9/2021

Comments:
Interval (11.0-12.5 feet). Interval shown on white board should be 11.0-12.5 feet. WOH on white board is the same as WH on the boring log.

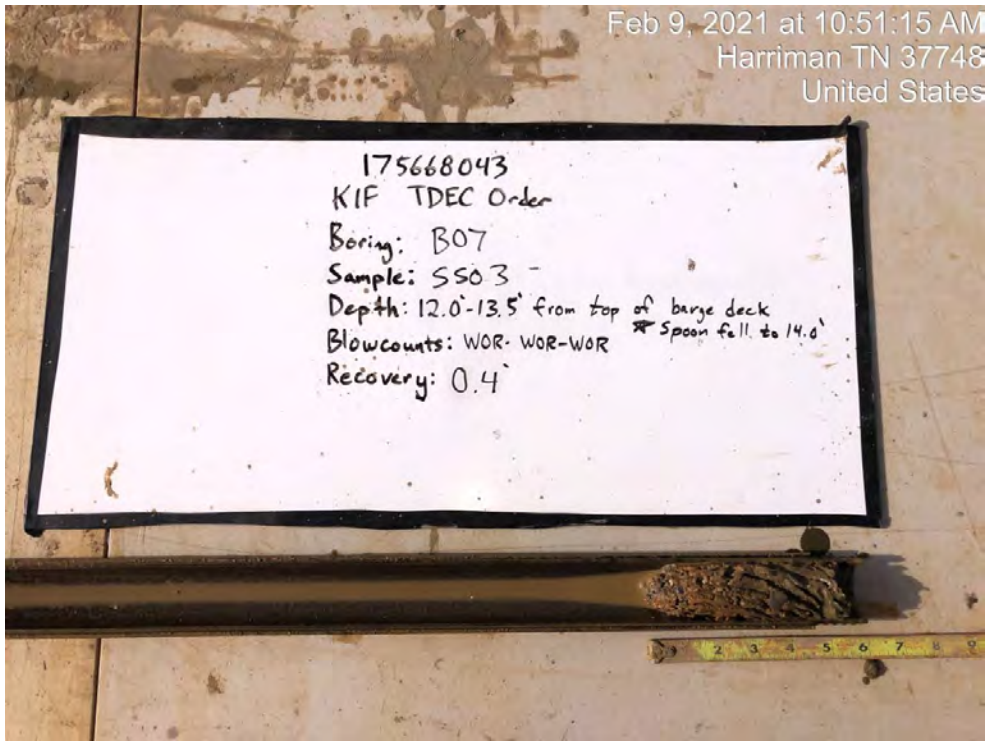


Photograph ID: 36

Photo Location:
KIF-B07

Photo Date:
2/9/2021

Comments:
Interval (13.5-15.5 feet). Interval shown on white board should be 13.5-15.5 feet. WOR on white board is the same as WR on the boring log.



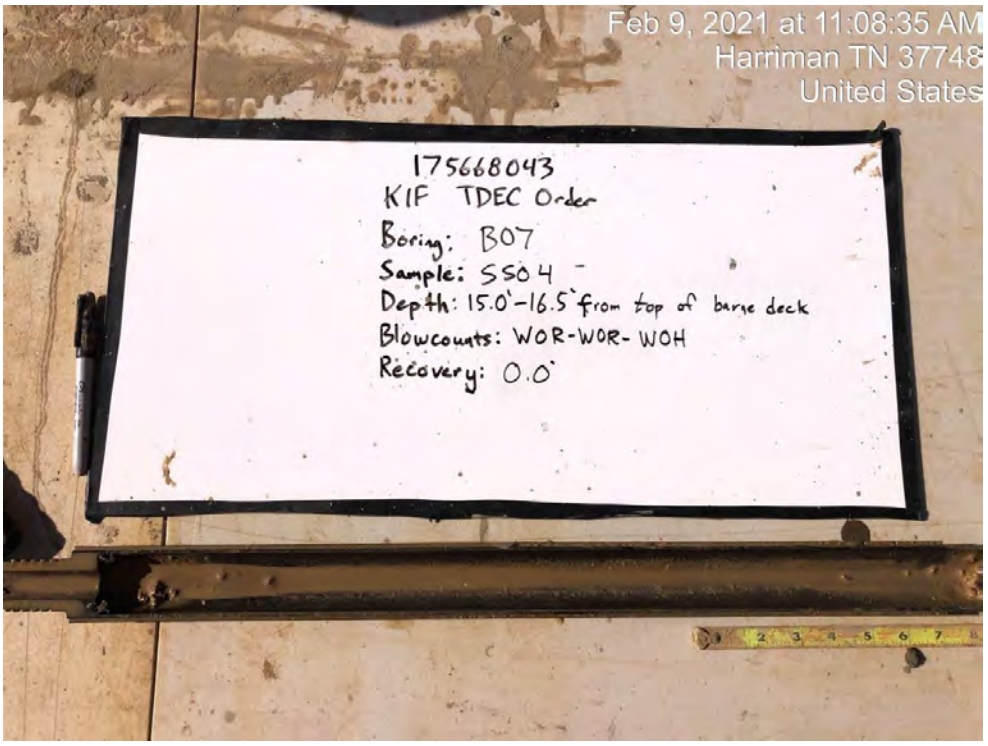
Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil (KIF) Plant**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 37

Photo Location:
KIF-B07

Photo Date:
2/9/2021

Comments:
Interval (16.5-18.0 feet). Interval shown on white board should be 16.5-18.0 feet. WOR and WOH on white board is the same as WR and WH on the boring log, respectively.

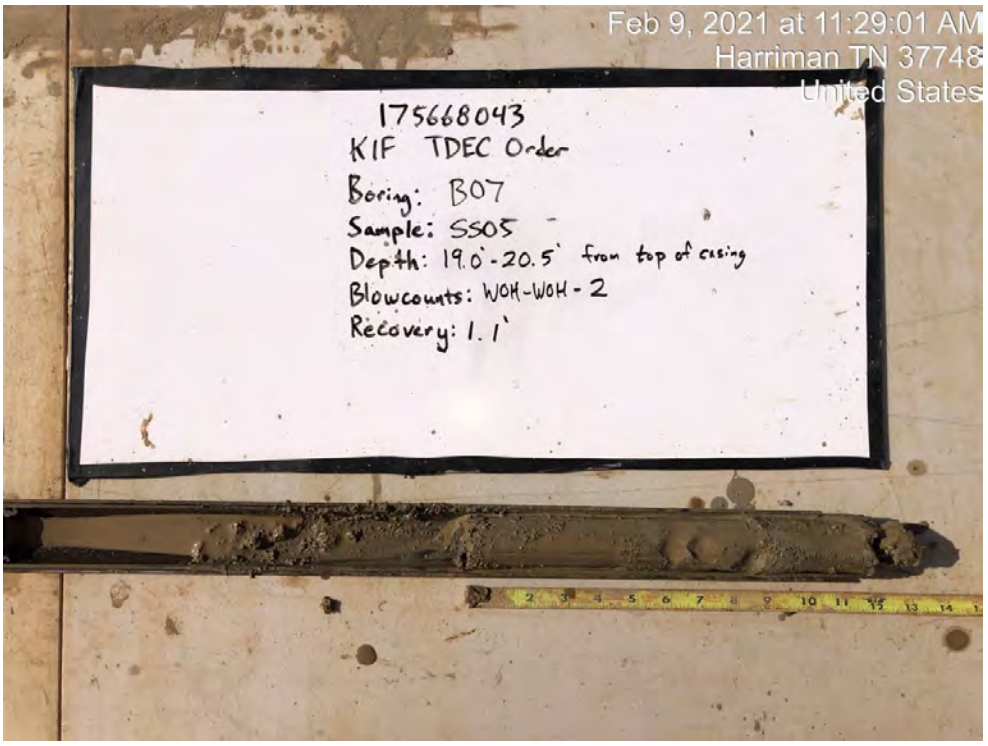


Photograph ID: 38

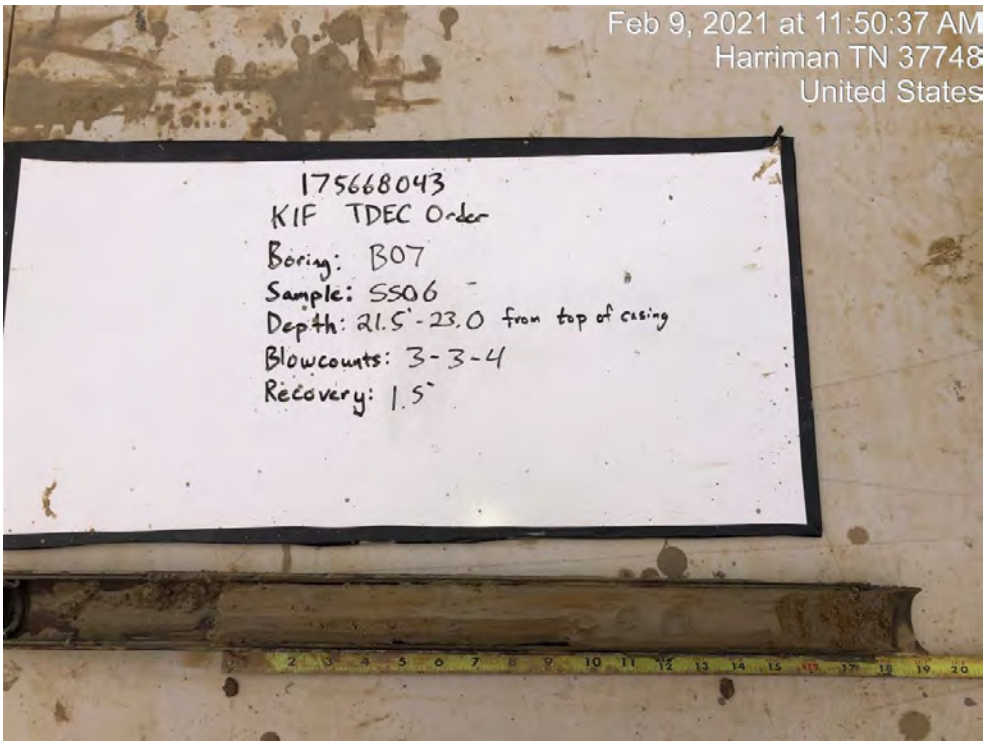
Photo Location:
KIF-B07

Photo Date:
2/9/2021

Comments:
Interval (19.0-20.5 feet). WOH on white board is the same as WH on the boring log.



Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil (KIF) Plant**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 39 **Photo Location:** KIF-B07 **Photo Date:** 2/9/2021 **Comments:** Interval (21.5-23.0 feet).	
Photograph ID: 40 **Photo Location:** KIF-B07 **Photo Date:** 2/9/2021 **Comments:** Photo of interval (24.0-26.0 feet) unavailable because sample collected with shelby tube.	No Photo Applicable

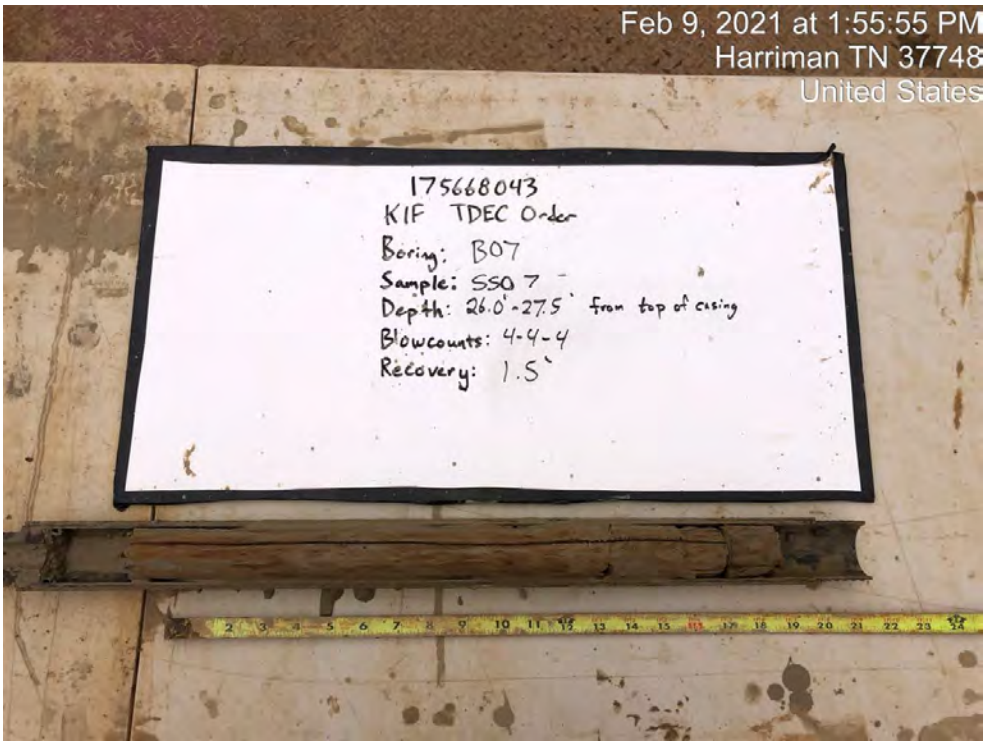
Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil (KIF) Plant**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 41

Photo Location:
KIF-B07

Photo Date:
2/9/2021

Comments:
Interval (26.0-27.5 feet).

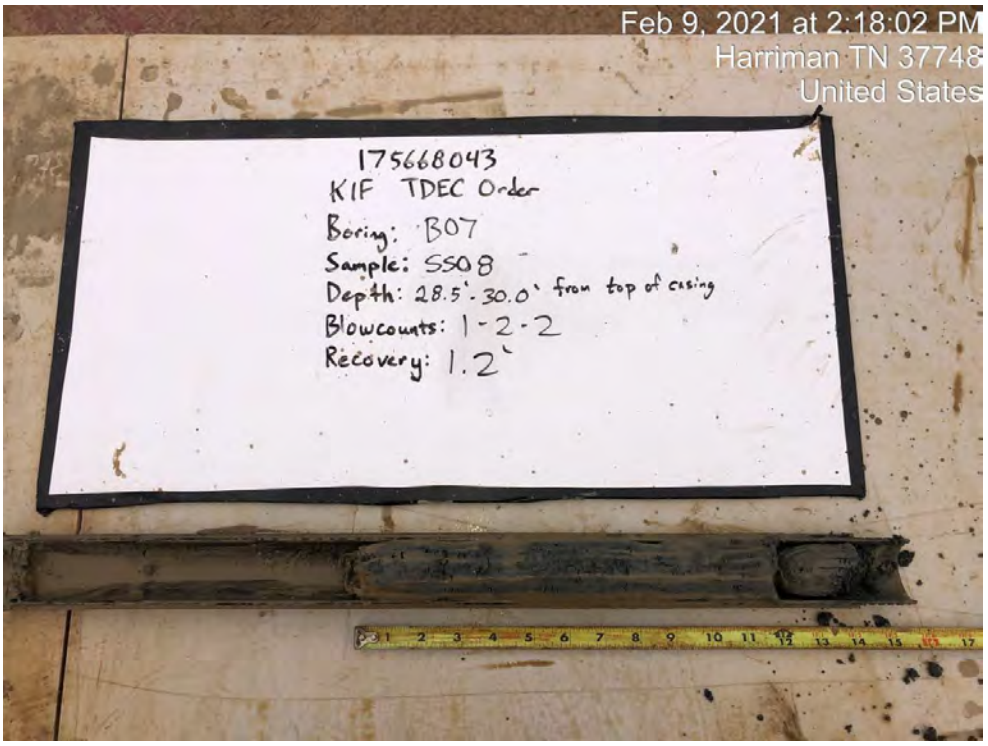


Photograph ID: 42

Photo Location:
KIF-B07

Photo Date:
2/9/2021

Comments:
Interval (28.5-30.0 feet).



Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil (KIF) Plant**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 43 **Photo Location:** KIF-B07 **Photo Date:** 2/9/2021 **Comments:** Photo of interval (31.0-32.5 feet) unavailable.	No Photo Applicable
Photograph ID: 44 **Photo Location:** KIF-B07 **Photo Date:** 2/9/2021 **Comments:** Interval (33.5-35.0 feet).	

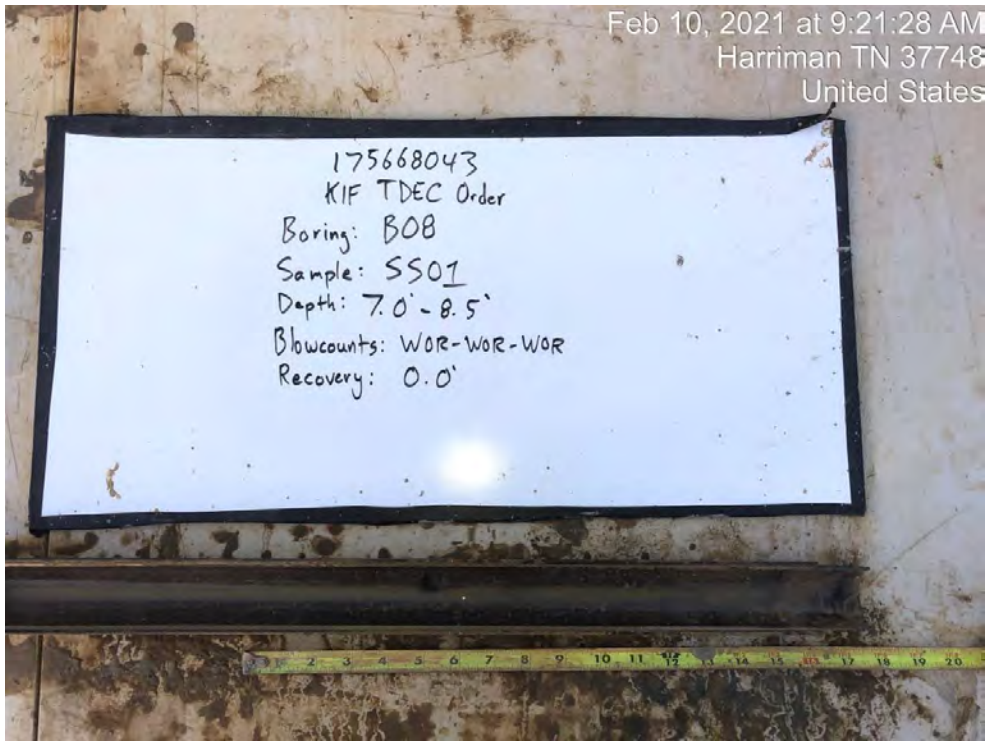
Client:	Tennessee Valley Authority	Project:	KIF TDEC Order
Site Name:	Kingston Fossil (KIF) Plant	Site Location:	Harriman, Tennessee

Photograph ID: 45

Photo Location:
KIF-B08

Photo Date:
2/10/2021

Comments:
Interval (8.5-10.0 feet). Interval shown on white board should be 8.5-10.0 feet. WOR on white board is the same as WR on the boring log.

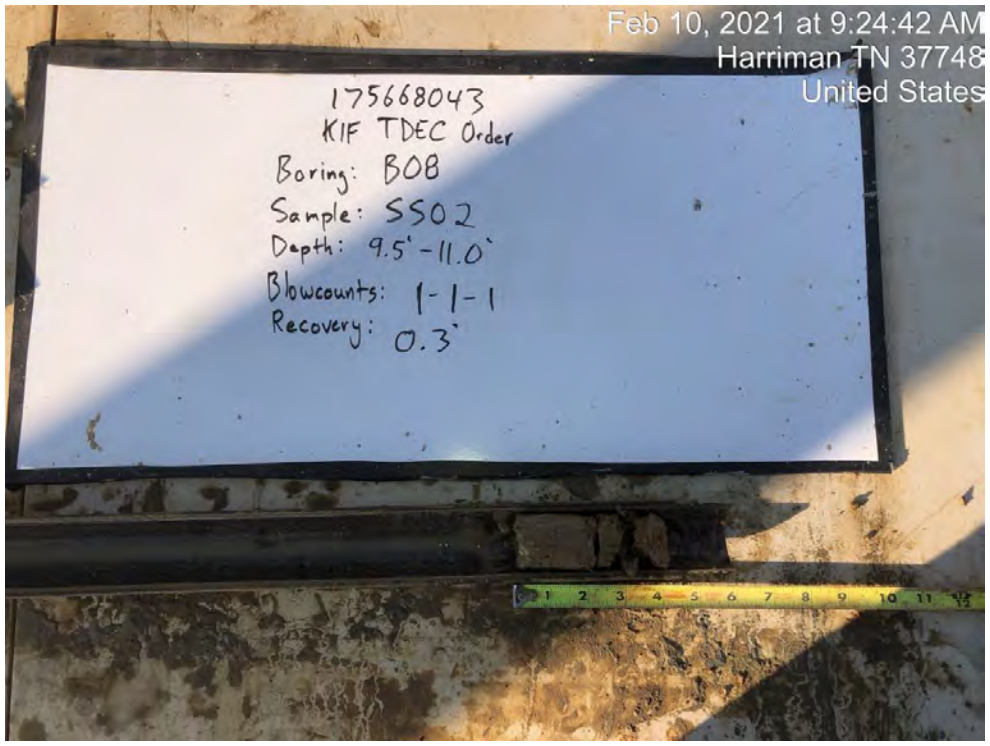


Photograph ID: 46

Photo Location:
KIF-B08

Photo Date:
2/10/2021

Comments:
Interval (11.0-12.5 feet). Interval shown on white board should be 11.0-12.5 feet.



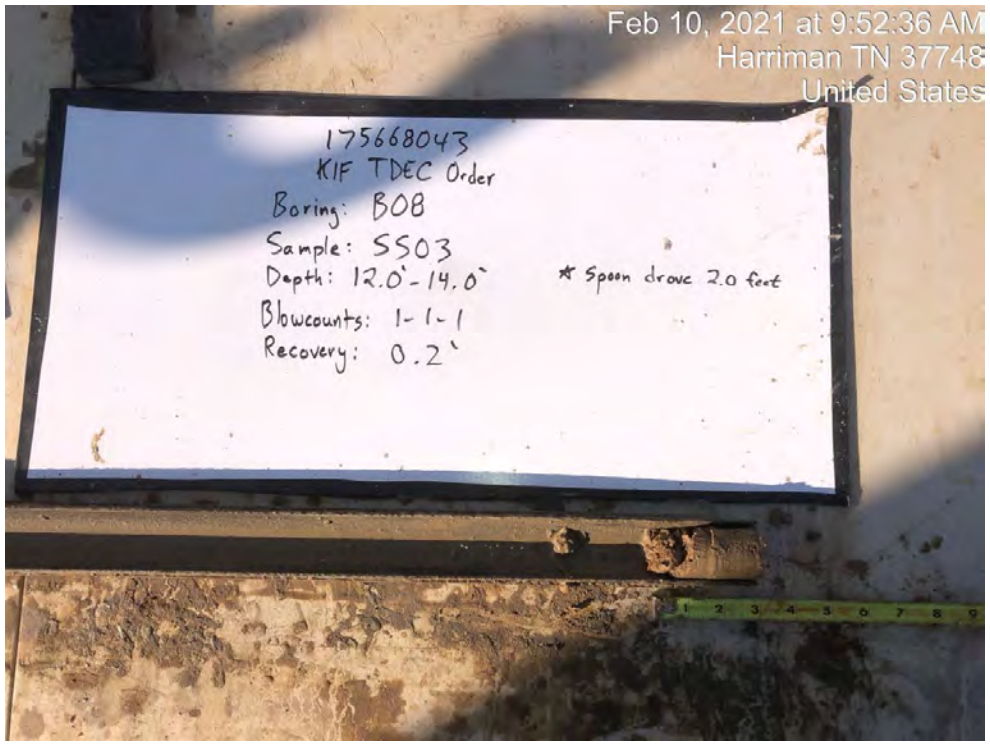
Client:	Tennessee Valley Authority	Project:	KIF TDEC Order
Site Name:	Kingston Fossil (KIF) Plant	Site Location:	Harriman, Tennessee

Photograph ID: 47

Photo Location:
KIF-B08

Photo Date:
2/10/2021

Comments:
Interval (13.5-15.5 feet). Interval shown on white board should be 13.5-15.5 feet.

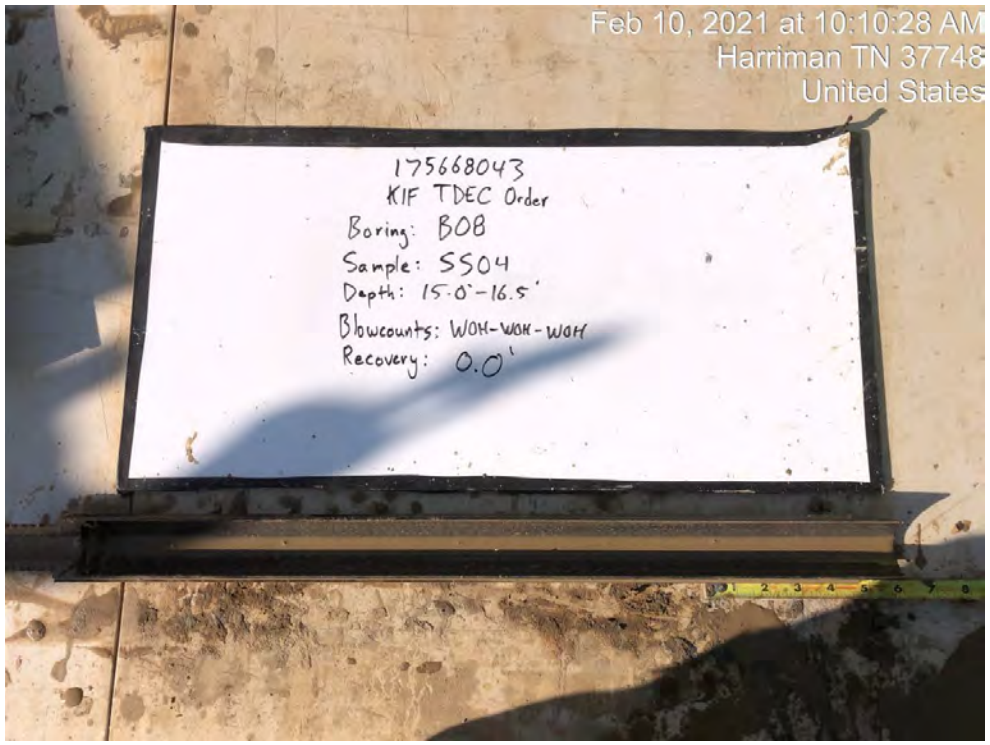


Photograph ID: 48

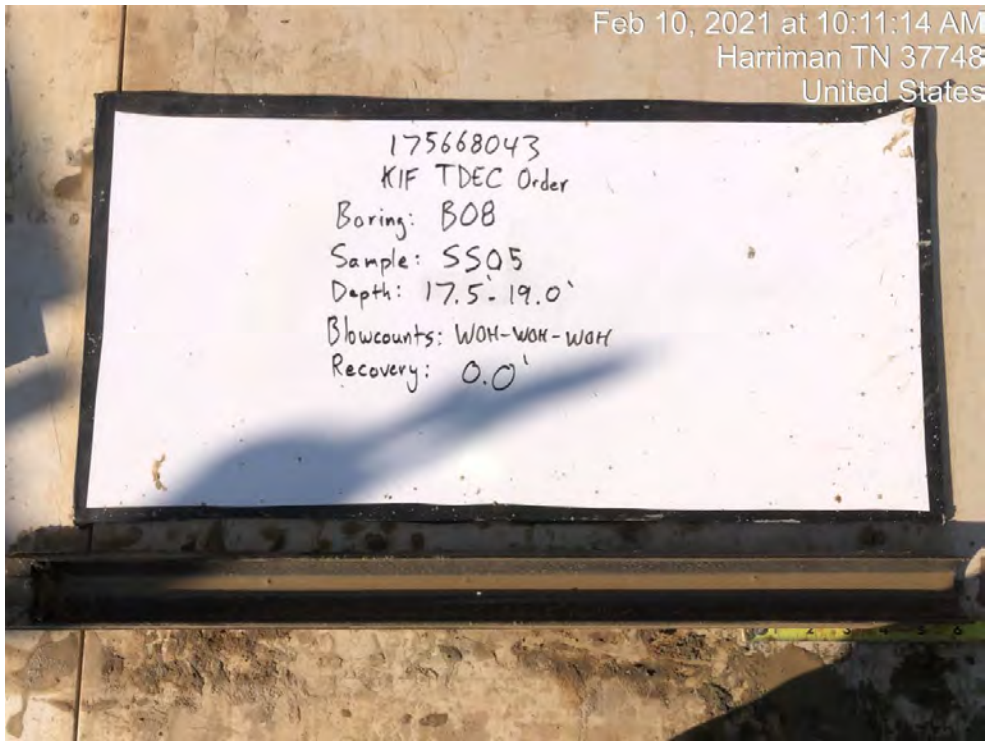
Photo Location:
KIF-B08

Photo Date:
2/10/2021

Comments:
Interval (16.5-18.0 feet). Interval shown on white board should be 16.5-18.0 feet. WOH on whote board is the same as WH on the boring log.



Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil (KIF) Plant**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 49 **Photo Location:** KIF-B08 **Photo Date:** 2/10/2021 **Comments:** Interval (19.0-20.5 feet). Interval shown on white board should be 19.0-20.5 feet. WOH on whote board is the same as WH on the boring log.	
Photograph ID: 50 **Photo Location:** KIF-B08 **Photo Date:** 2/10/2021 **Comments:** Photo of interval (21.5-22.0 feet) unavailable because sample collected with shelby tube.	No Photo Applicable

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil (KIF) Plant**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 51 **Photo Location:** KIF-B08 **Photo Date:** 2/10/2021 **Comments:** Photo of interval (22.5-24.5 feet) unavailable because sample collected with shelby tube.	No Photo Applicable
Photograph ID: 52 **Photo Location:** KIF-B08 **Photo Date:** 2/10/2021 **Comments:** Interval (24.5-26.0 feet).	

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil (KIF) Plant**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 53

Photo Location:
KIF-B08

Photo Date:
2/10/2021

Comments:
Interval (27.0-28.5 feet).

Photograph ID: 54

Photo Location:
KIF-B08

Photo Date:
2/10/2021

Comments:
Interval (29.5-31.0 feet). WOH on whote board is the same as WH on the boring log.

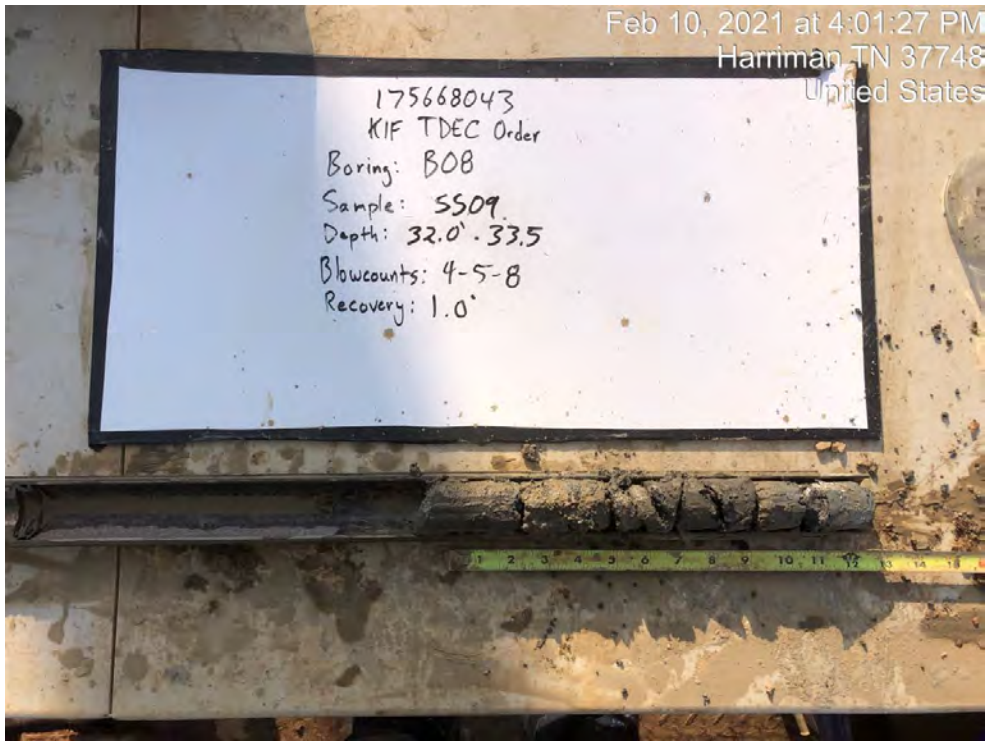
Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil (KIF) Plant**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 55

Photo Location:
KIF-B08

Photo Date:
2/10/2021

Comments:
Interval (32.0-33.5 feet).



Photograph ID: 56

Photo Location:
KIF-B08

Photo Date:
2/10/2021

Comments:
Interval (34.5-35.3 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil (KIF) Plant**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 57

Photo Location:
KIF-B09

Photo Date:
2/24/2021

Comments:
Interval (0.0-1.5 feet).

Photograph ID: 58

Photo Location:
KIF-B09

Photo Date:
2/24/2021

Comments:
Interval (2.5-4.0 feet).
Recovery shown on white board should be 1.5.

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil (KIF) Plant**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 59

Photo Location:
KIF-B09

Photo Date:
2/24/2021

Comments:
Interval (5.0-6.5 feet).

Photograph ID: 60

Photo Location:
KIF-B09

Photo Date:
2/24/2021

Comments:
Interval (7.5-9.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil (KIF) Plant**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 61

Photo Location:
KIF-B09

Photo Date:
2/24/2021

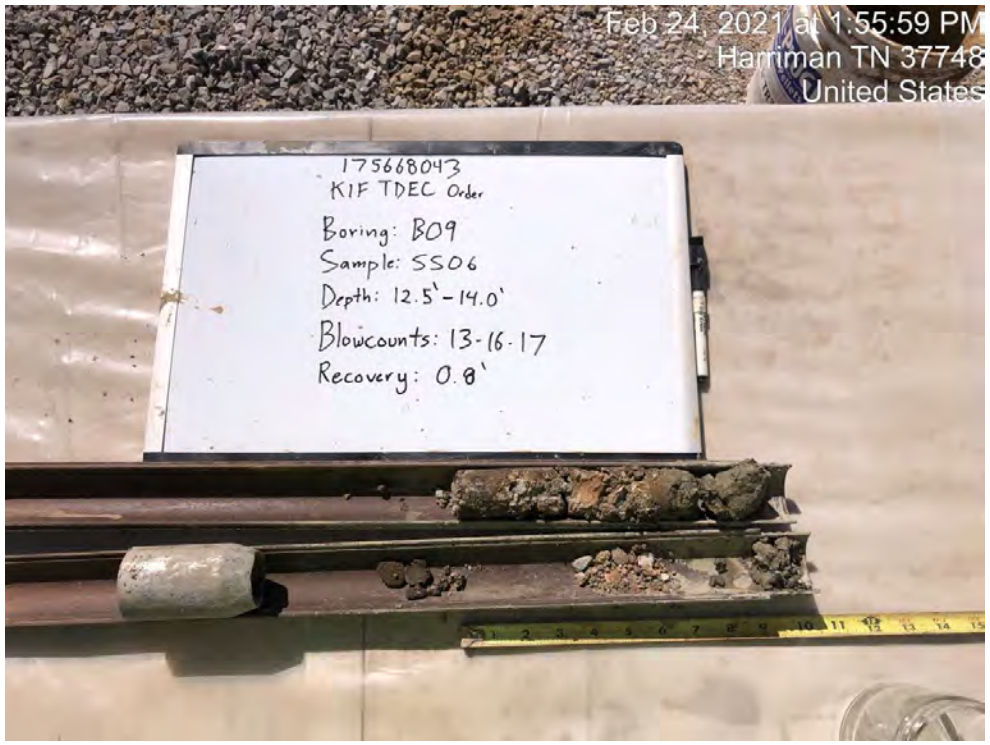
Comments:
Interval (10.0-11.5 feet).

Photograph ID: 62

Photo Location:
KIF-B09

Photo Date:
2/24/2021

Comments:
Interval (12.5-14.0 feet).



Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil (KIF) Plant**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 63

Photo Location:
KIF-B09

Photo Date:
2/24/2021

Comments:
Interval (15.0-16.5 feet).

Photograph ID: 64

Photo Location:
KIF-B09

Photo Date:
2/24/2021

Comments:
Interval (17.5-19.0 feet). WOH on white board is the same as WH on the boring log.

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil (KIF) Plant**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 65

Photo Location:
KIF-B09

Photo Date:
2/24/2021

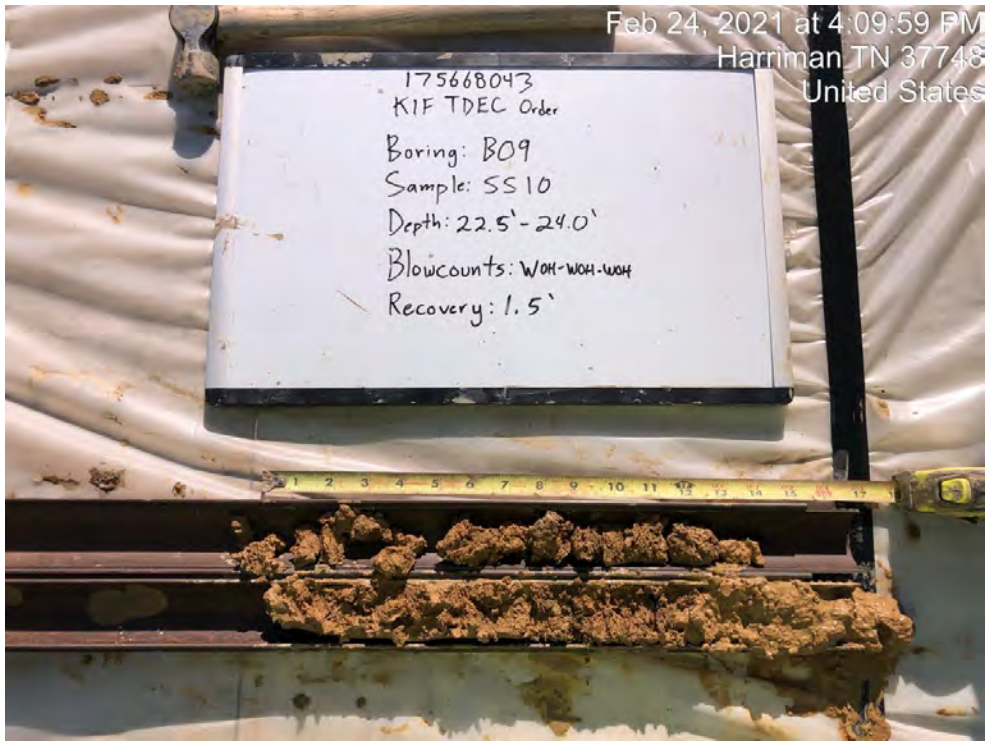
Comments:
Interval (20.0-21.5 feet). WOH on white board is the same as WH on the boring log.

Photograph ID: 66

Photo Location:
KIF-B09

Photo Date:
2/24/2021

Comments:
Interval (22.5-24.0 feet). WOH on white board is the same as WH on the boring log.



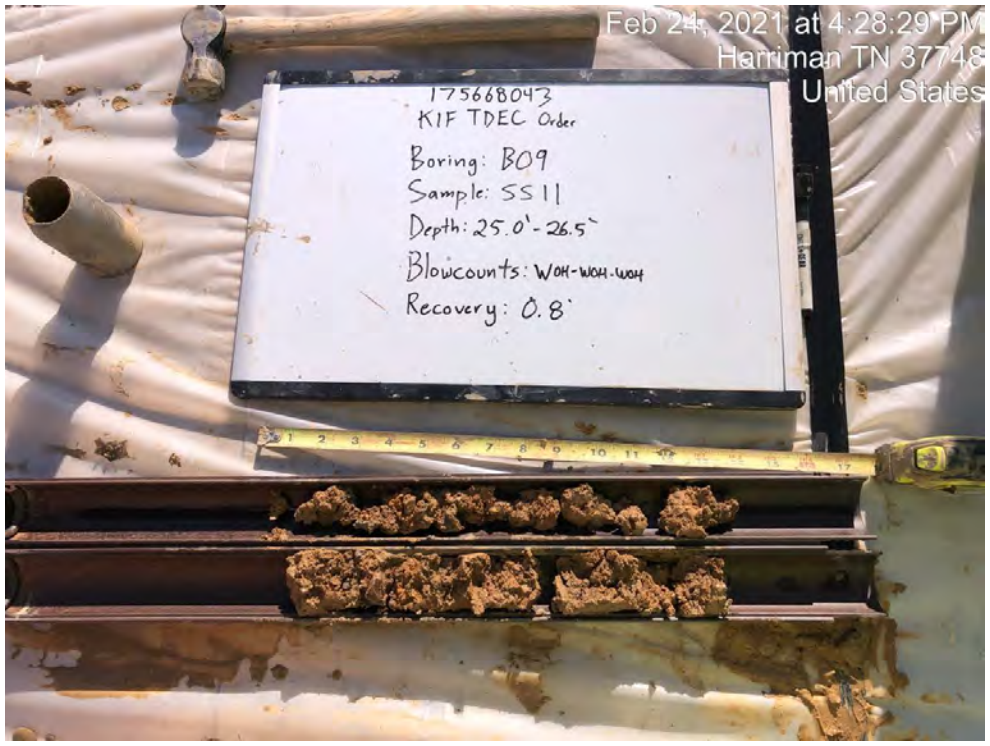
Client:	Tennessee Valley Authority	Project:	KIF TDEC Order
Site Name:	Kingston Fossil (KIF) Plant	Site Location:	Harriman, Tennessee

Photograph ID: 67

Photo Location:
KIF-B09

Photo Date:
2/24/2021

Comments:
Interval (25.0-26.5 feet). WOH on white board is the same as WH on the boring log.



Photograph ID: 68

Photo Location:
KIF-B09

Photo Date:
2/24/2021

Comments:
Interval (27.5-29.0 feet). WOH on white board is the same as WH on the boring log.

Client:	Tennessee Valley Authority	Project:	KIF TDEC Order
Site Name:	Kingston Fossil (KIF) Plant	Site Location:	Harriman, Tennessee

Photograph ID: 69 **Photo Location:** KIF-B09 **Photo Date:** 2/25/2021 **Comments:** Interval (30.0-31.5 feet). WOH on white board is the same as WH on the boring log.	
Photograph ID: 70 **Photo Location:** KIF-B09 **Photo Date:** 2/25/2021 **Comments:** Interval (32.5-34.0 feet). WOH on white board is the same as WH on the boring log.	

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil (KIF) Plant**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 71

Photo Location:
KIF-B09

Photo Date:
2/25/2021

Comments:
Interval (35.0-36.5 feet). WOH on white board is the same as WH on the boring log.

Photograph ID: 72

Photo Location:
KIF-B09

Photo Date:
2/25/2021

Comments:
Photo of interval (37.5-39.5 feet) unavailable because sample collected with shelby tube.

No Photo Applicable

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil (KIF) Plant**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 73 **Photo Location:** KIF-B09 **Photo Date:** 2/25/2021 **Comments:** Interval (39.5-41.0 feet).	
Photograph ID: 74 **Photo Location:** KIF-B09 **Photo Date:** 2/25/2021 **Comments:** Photo of interval (42.0-44.0 feet) unavailable because sample collected with shelby tube.	No Photo Applicable

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil (KIF) Plant**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 75

Photo Location:
KIF-B09

Photo Date:
2/25/2021

Comments:
Interval (44.0-44.5 feet).

Photograph ID: 76

Photo Location:
KIF-B09

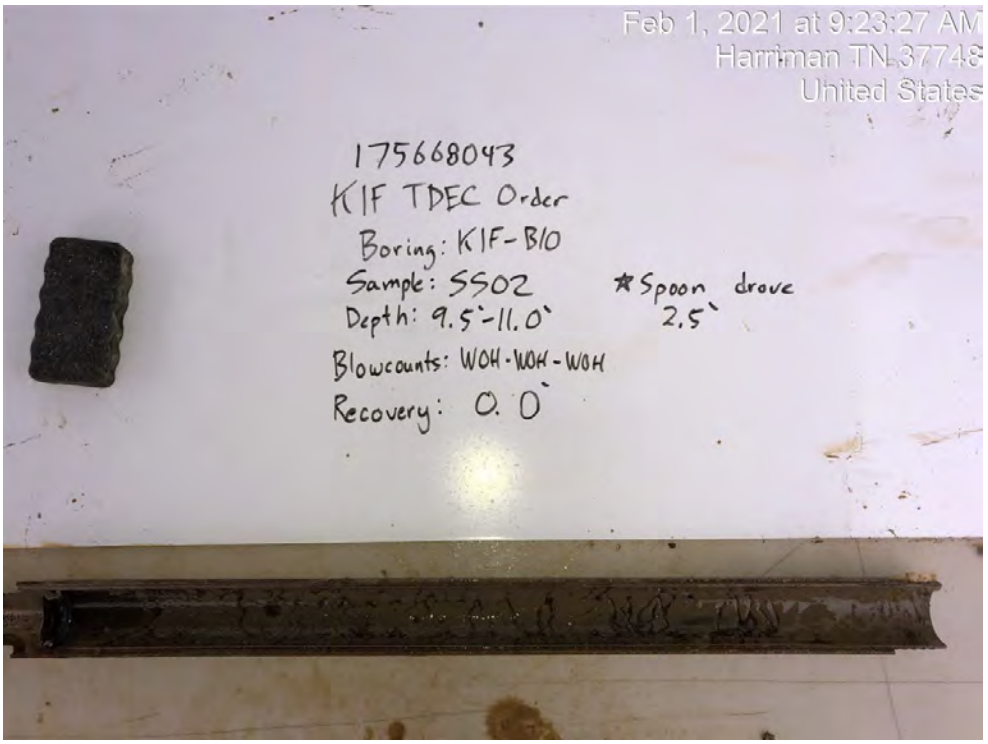
Photo Date:
2/25/2021

Comments:
Interval (46.5-48.0 feet). WOH on white board is the same as WH on the boring log.

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil (KIF) Plant**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 77 **Photo Location:** KIF-B09 **Photo Date:** 2/25/2021 **Comments:** Interval (49.0-50.5 feet).	
Photograph ID: 78 **Photo Location:** KIF-B09 **Photo Date:** 2/25/2021 **Comments:** Interval (51.2-51.8 feet).	

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil (KIF) Plant**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 79 **Photo Location:** KIF-B10 **Photo Date:** 2/1/2021 **Comments:** Photo of interval (7.0-8.5 feet) unavailable.	No Photo Applicable
Photograph ID: 80 **Photo Location:** KIF-B10 **Photo Date:** 2/1/2021 **Comments:** Interval (9.5-11.0 feet). WOH on white board is the same as WH on the boring log.	

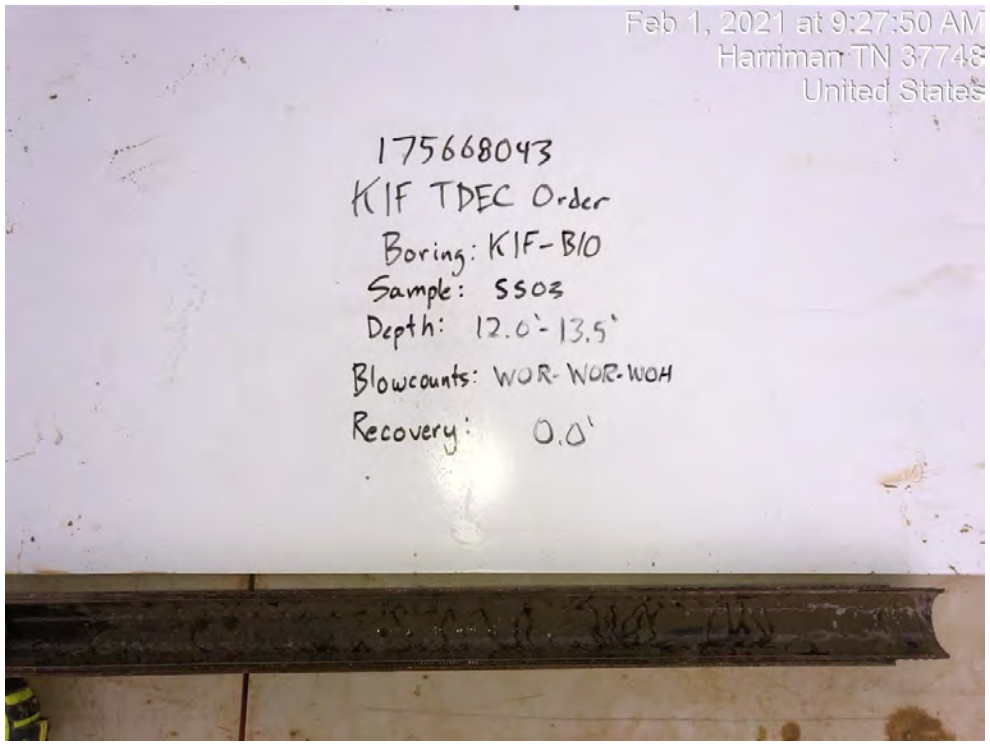
Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil (KIF) Plant**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 81

Photo Location:
KIF-B10

Photo Date:
2/1/2021

Comments:
Interval (12.0-13.5 feet). WOR and WOH on white board is the same as WH and WR on the boring log, respectively.



Photograph ID: 82

Photo Location:
KIF-B10

Photo Date:
2/1/2021

Comments:
Interval (14.5-16.0 feet). WOH on white board is the same as WH on the boring log.

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil (KIF) Plant**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 83 **Photo Location:** KIF-B10 **Photo Date:** 2/1/2021 **Comments:** Interval (17.0-18.5 feet). WOH on white board is the same as WH on the boring log.	
Photograph ID: 84 **Photo Location:** KIF-B10 **Photo Date:** 2/1/2021 **Comments:** Interval (19.5-21.0 feet). WOH on white board is the same as WH on the boring log.	

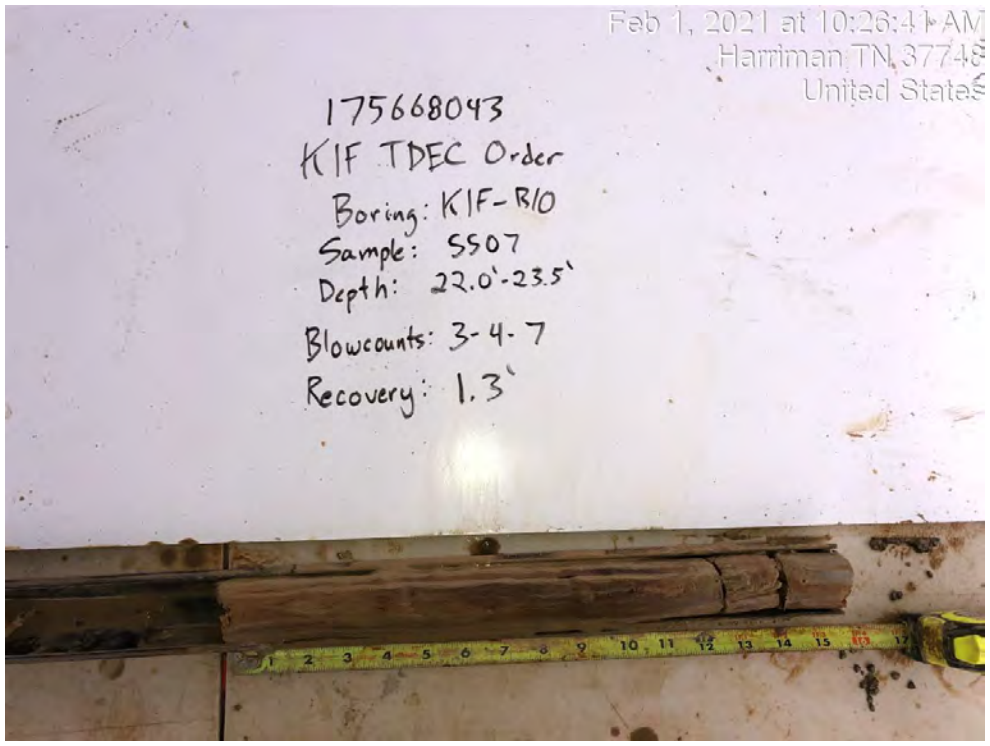
Client:	Tennessee Valley Authority	Project:	KIF TDEC Order
Site Name:	Kingston Fossil (KIF) Plant	Site Location:	Harriman, Tennessee

Photograph ID: 85

Photo Location:
KIF-B10

Photo Date:
2/1/2021

Comments:
Interval (22.0-23.5 feet).

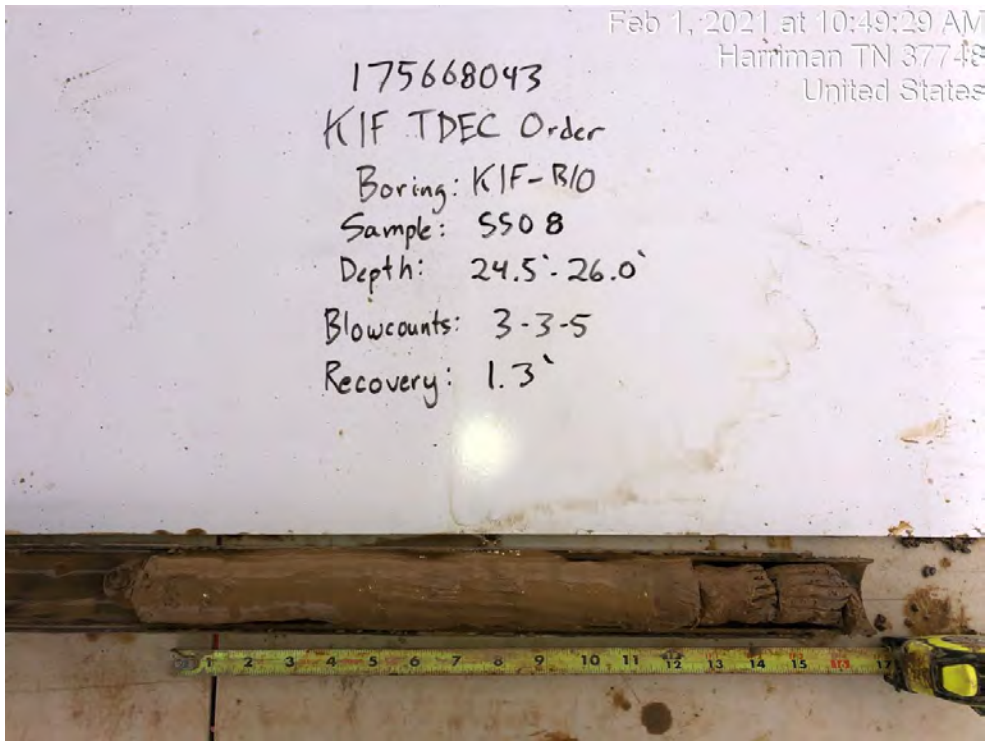


Photograph ID: 86

Photo Location:
KIF-B10

Photo Date:
2/1/2021

Comments:
Interval (24.5-26.0 feet).



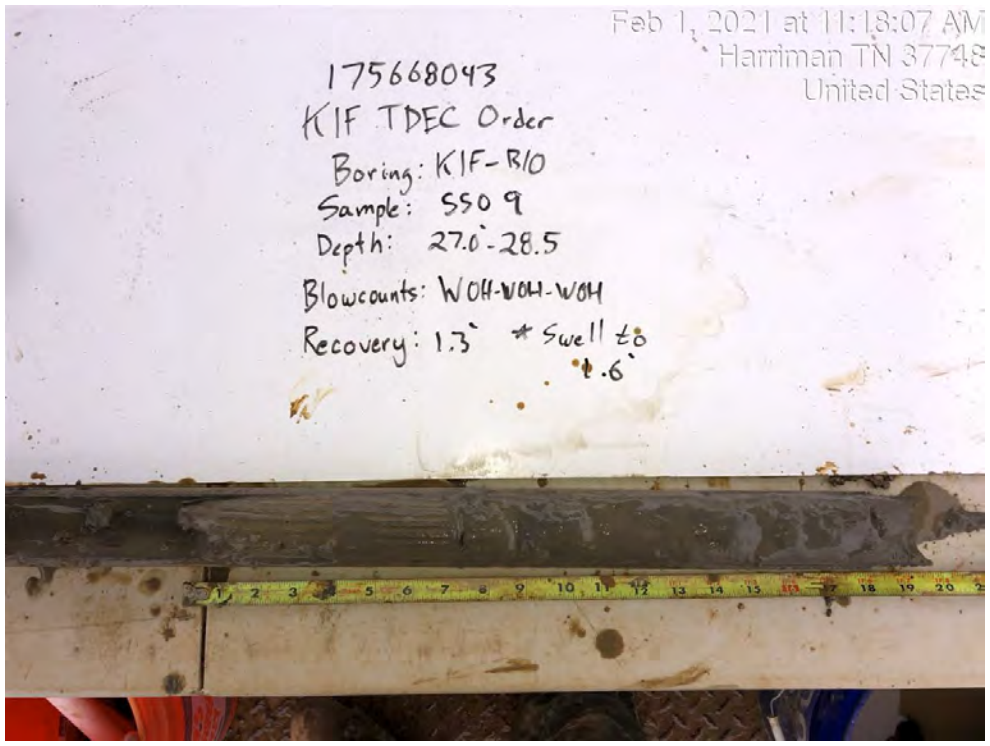
Client:	Tennessee Valley Authority	Project:	KIF TDEC Order
Site Name:	Kingston Fossil (KIF) Plant	Site Location:	Harriman, Tennessee

Photograph ID: 87

Photo Location:
KIF-B10

Photo Date:
2/1/2021

Comments:
Interval (27.0-28.5 feet). WOH on white board is the same as WH on the boring log.

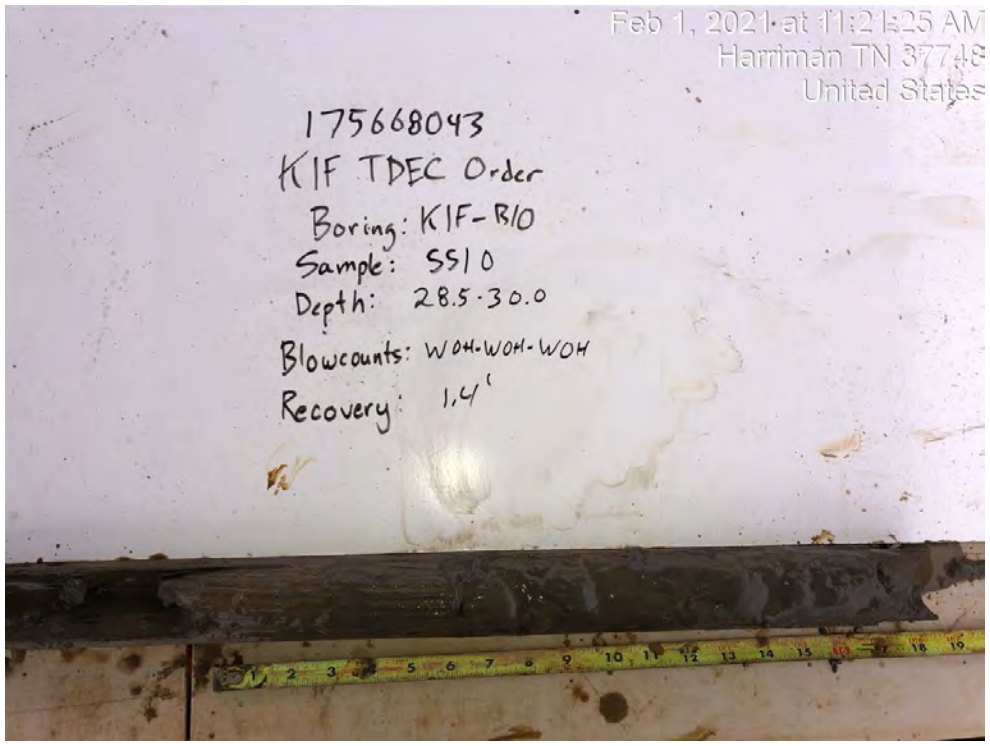


Photograph ID: 88

Photo Location:
KIF-B10

Photo Date:
2/1/2021

Comments:
Interval (29.5-31.0 feet). Interval shown on white board should be 29.5-31.0 feet. WOH on white board is the same as WH on the boring log.



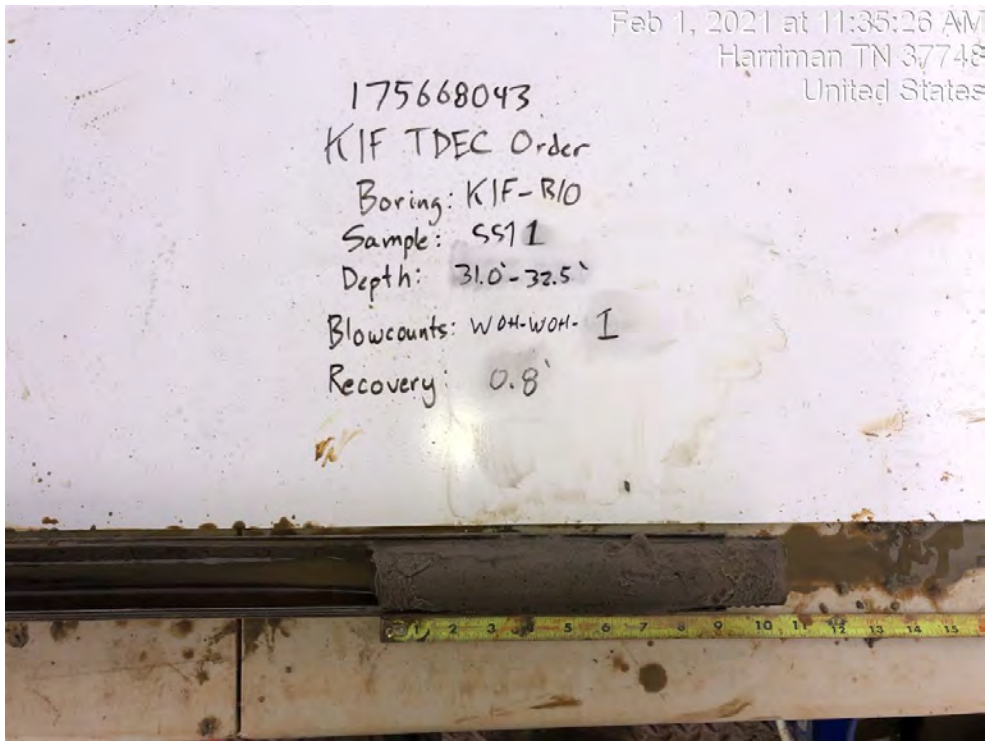
Client:	Tennessee Valley Authority	Project:	KIF TDEC Order
Site Name:	Kingston Fossil (KIF) Plant	Site Location:	Harriman, Tennessee

Photograph ID: 89

Photo Location:
KIF-B10

Photo Date:
2/1/2021

Comments:
Interval (32.0-33.5 feet). Interval shown on white board should be 32.0-33.5 feet. WOH on white board is the same as WH on the boring log.



Photograph ID: 90

Photo Location:
KIF-B10

Photo Date:
2/1/2021

Comments:
Interval (34.5-36.0 feet). Interval shown on white board should be 34.5-36.0 feet.

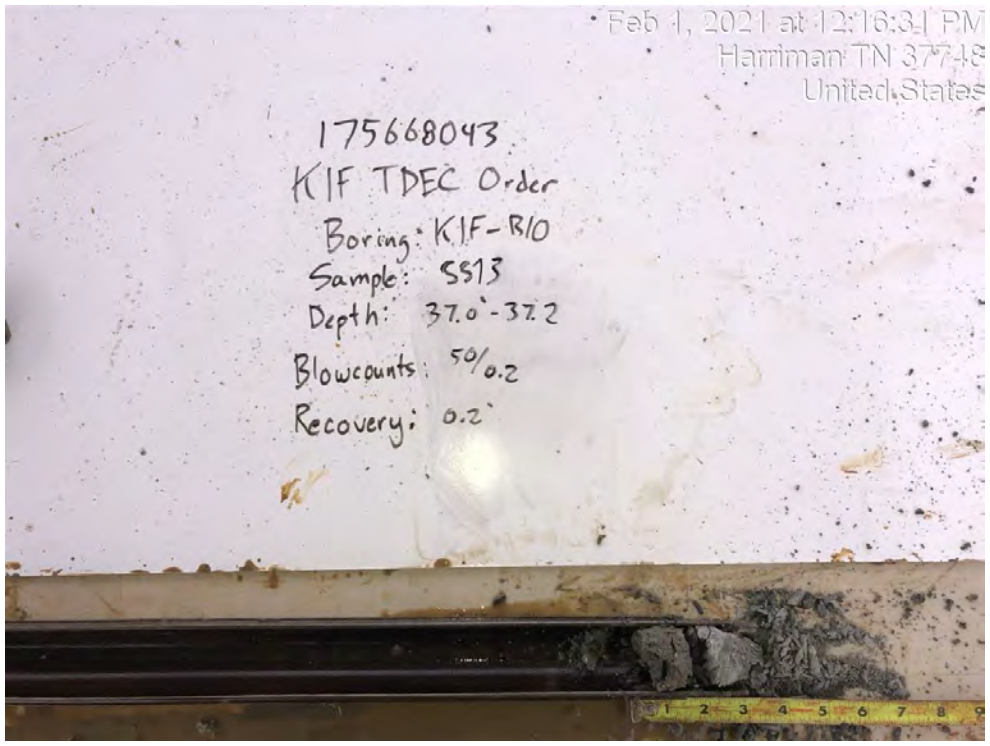
Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil (KIF) Plant**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 91

Photo Location:
KIF-B10

Photo Date:
2/1/2021

Comments:
Interval (37.0-37.2 feet).

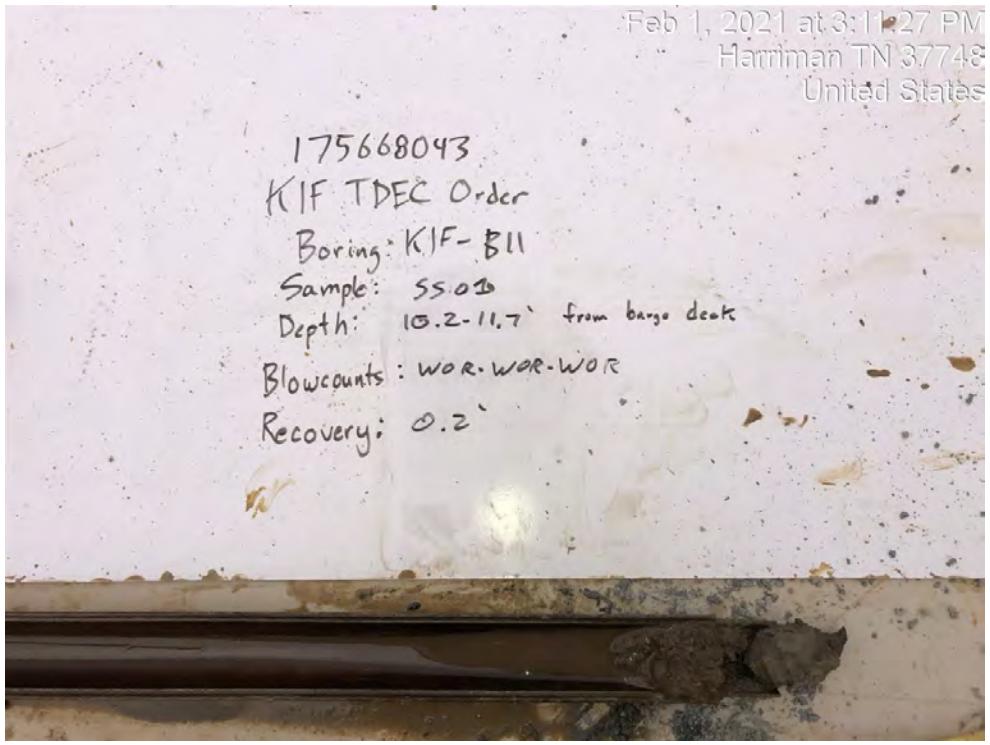


Photograph ID: 92

Photo Location:
KIF-B11

Photo Date:
2/1/2021

Comments:
Interval (11.9-13.4 feet). Interval shown on white board should be 11.9-13.4 feet. WOR on white board is the same as WR on the boring log.



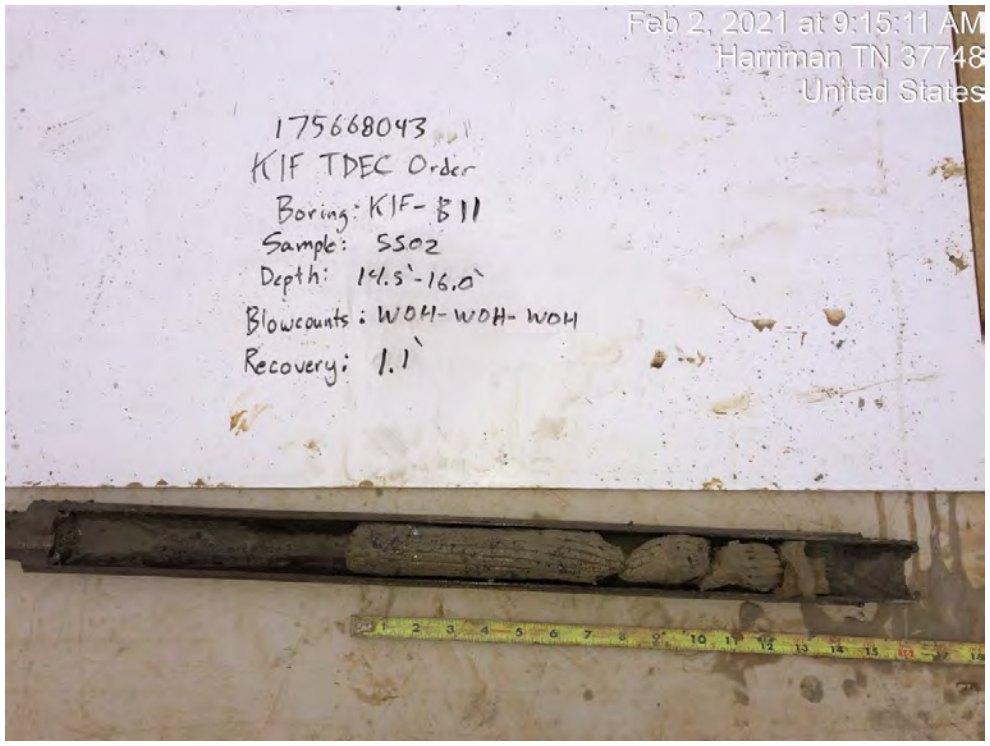
Client:	Tennessee Valley Authority	Project:	KIF TDEC Order
Site Name:	Kingston Fossil (KIF) Plant	Site Location:	Harriman, Tennessee

Photograph ID: 93

Photo Location:
KIF-B11

Photo Date:
2/2/2021

Comments:
Interval (14.5-16.0 feet). WOH on white board is the same as WH on the boring log.

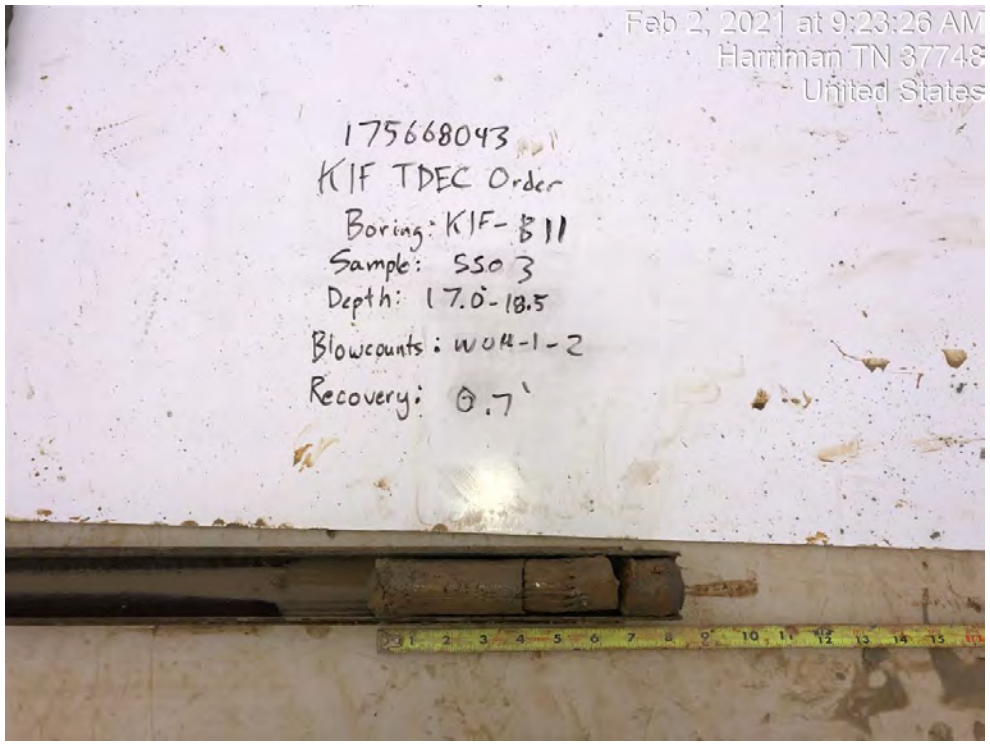


Photograph ID: 94

Photo Location:
KIF-B11

Photo Date:
2/2/2021

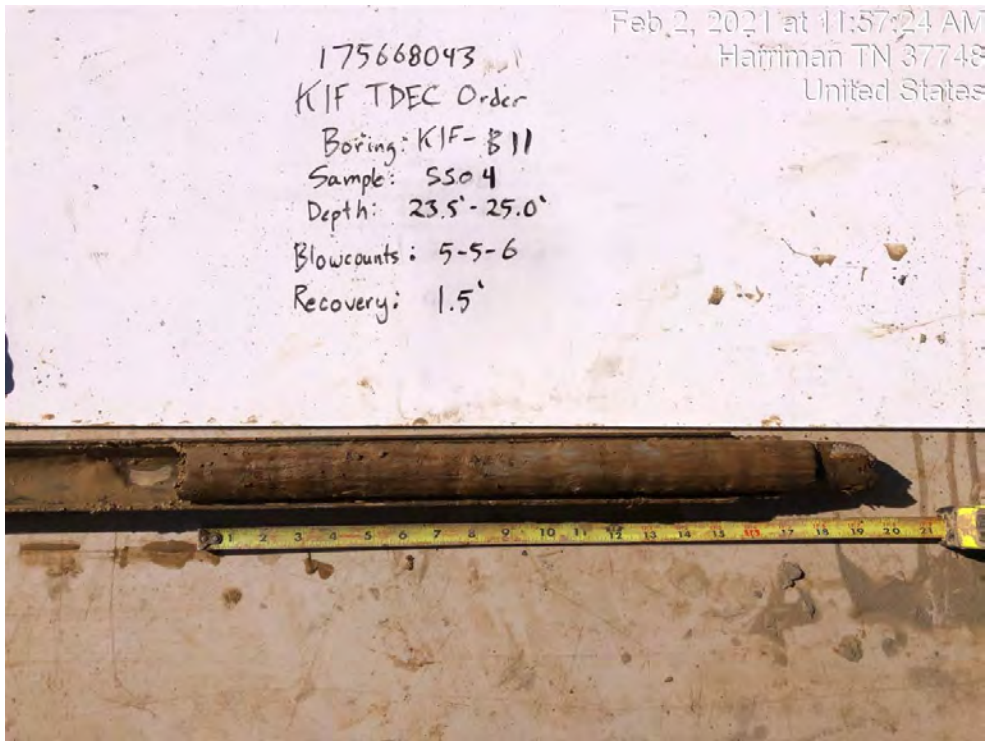
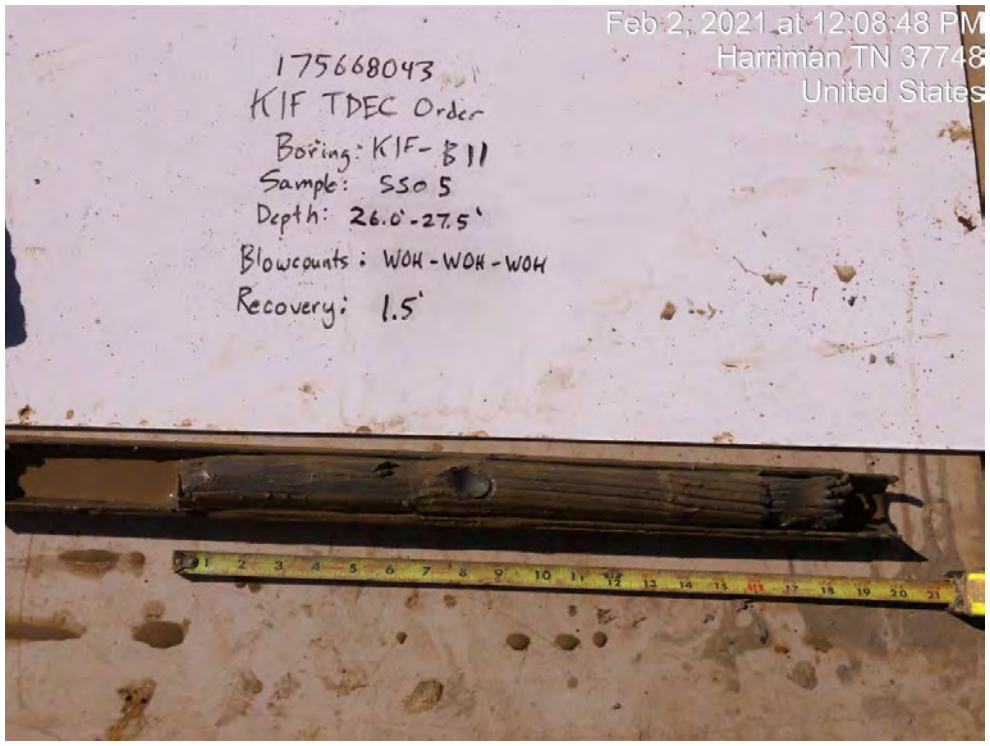
Comments:
Interval (17.0-18.5 feet). WOH on white board is the same as WH on the boring log.



Client:	Tennessee Valley Authority	Project:	KIF TDEC Order
Site Name:	Kingston Fossil (KIF) Plant	Site Location:	Harriman, Tennessee

Photograph ID: 95 **Photo Location:** KIF-B11 **Photo Date:** 2/2/2021 **Comments:** Photo of interval (19.5-21.5 feet) unavailable because sample collected with shelby tube.	No Photo Applicable
Photograph ID: 96 **Photo Location:** KIF-B11 **Photo Date:** 2/2/2021 **Comments:** Photo of interval (21.5-23.5 feet) unavailable because sample collected with shelby tube.	No Photo Applicable

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil (KIF) Plant**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 97 **Photo Location:** KIF-B11 **Photo Date:** 2/2/2021 **Comments:** Interval (23.5-25.0 feet).	
Photograph ID: 98 **Photo Location:** KIF-B11 **Photo Date:** 2/2/2021 **Comments:** Interval (26.0-27.5 feet). WOH on white board is the same as WH on the boring log.	

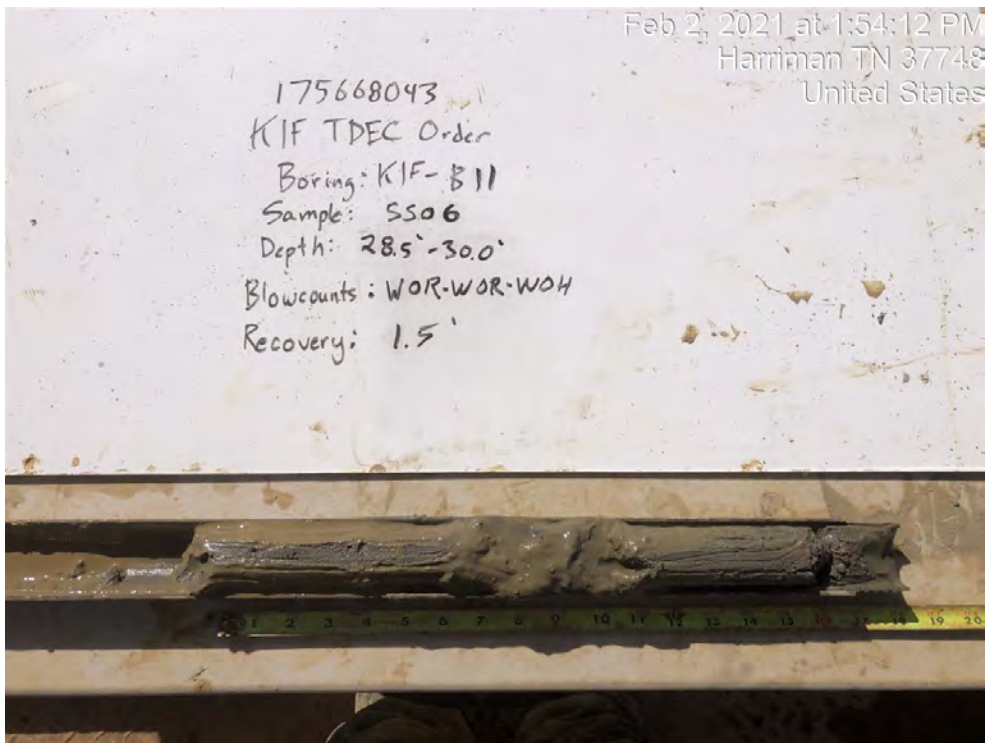
Client:	Tennessee Valley Authority	Project:	KIF TDEC Order
Site Name:	Kingston Fossil (KIF) Plant	Site Location:	Harriman, Tennessee

Photograph ID: 99

Photo Location:
KIF-B11

Photo Date:
2/2/2021

Comments:
Interval (28.5-30.0 feet). WOR and WOH on white board is the same as WR and WH on the boring log, respectively.

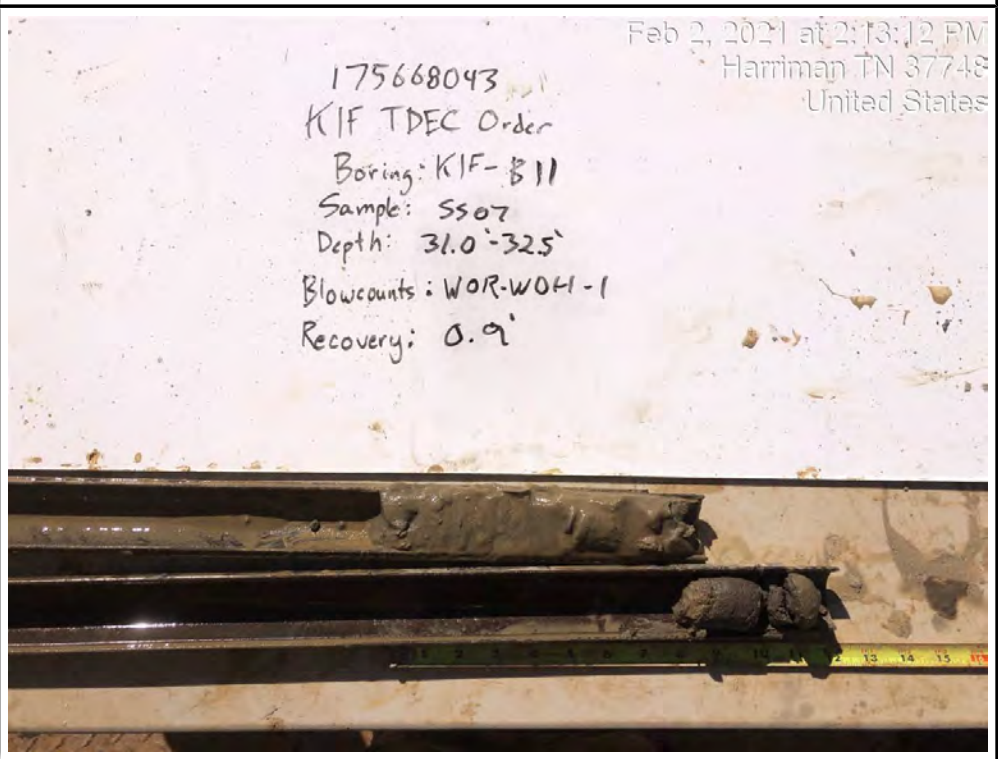


Photograph ID: 100

Photo Location:
KIF-B11

Photo Date:
2/2/2021

Comments:
Interval (31.0-32.5 feet). WOR and WOH on white board is the same as WR and WH on the boring log, respectively.



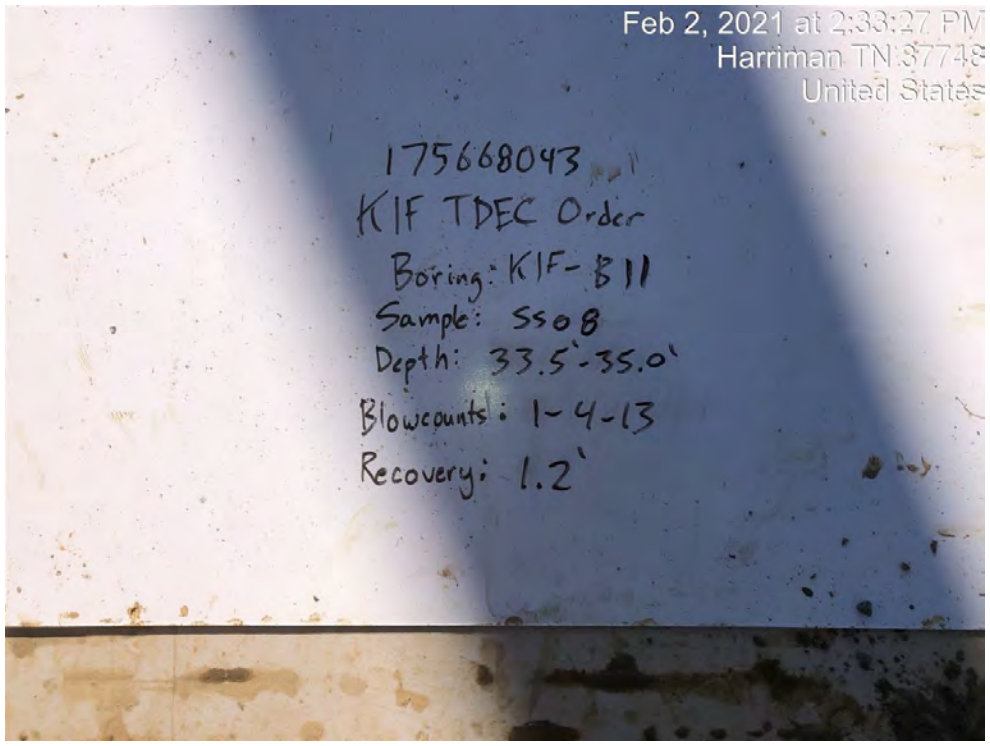
Client:	Tennessee Valley Authority	Project:	KIF TDEC Order
Site Name:	Kingston Fossil (KIF) Plant	Site Location:	Harriman, Tennessee

Photograph ID: 101

Photo Location:
KIF-B11

Photo Date:
2/2/2021

Comments:
Interval (33.5-35.0 feet).

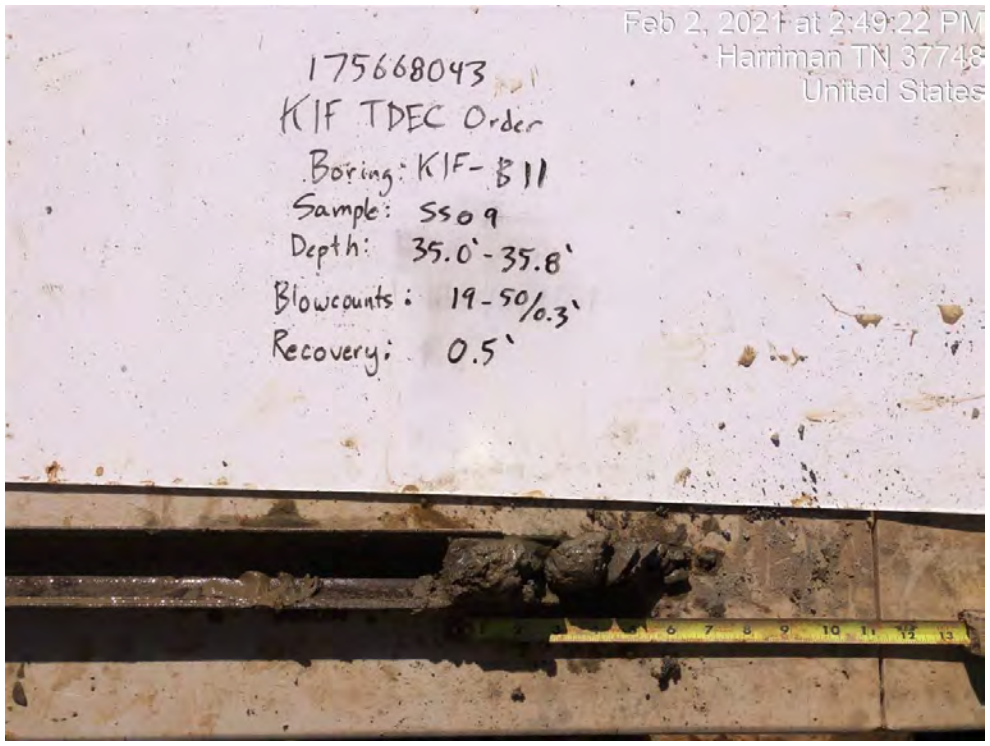


Photograph ID: 102

Photo Location:
KIF-B11

Photo Date:
2/2/2021

Comments:
Interval (35.0-35.8 feet).



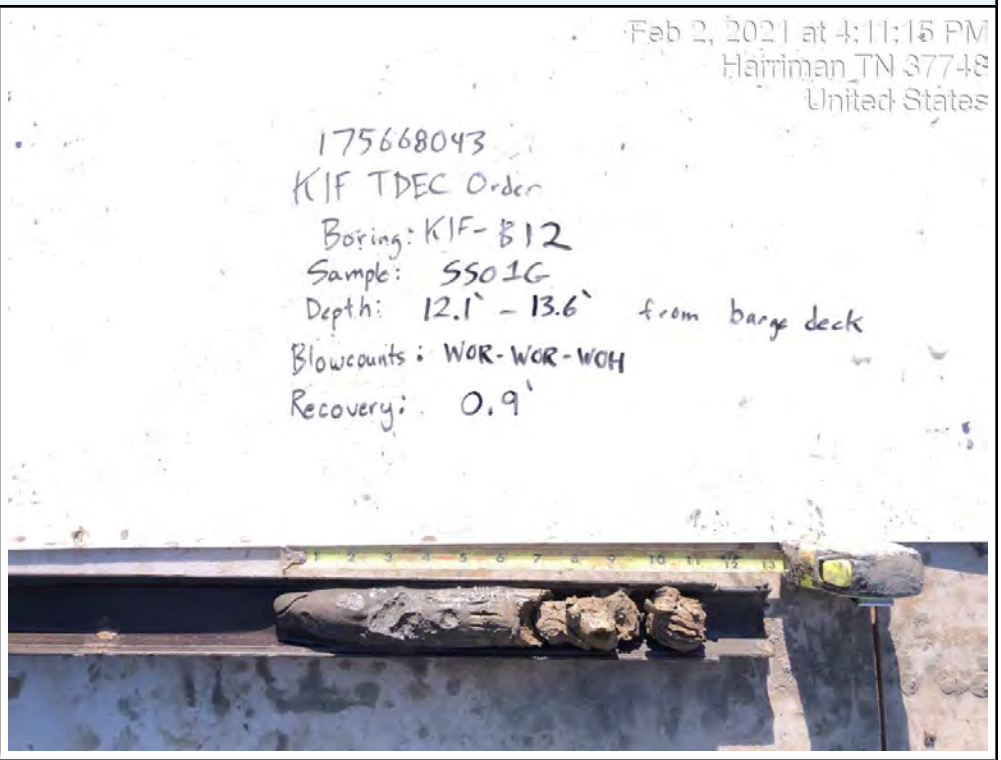
Client:	Tennessee Valley Authority	Project:	KIF TDEC Order
Site Name:	Kingston Fossil (KIF) Plant	Site Location:	Harriman, Tennessee

Photograph ID: 103

Photo Location:
KIF-B12

Photo Date:
2/2/2021

Comments:
Interval (13.6-15.1 feet). Interval shown on white board should be 13.6-15.1 feet. WOR and WOH on white board is the same as WR and WH on the boring log, respectively.

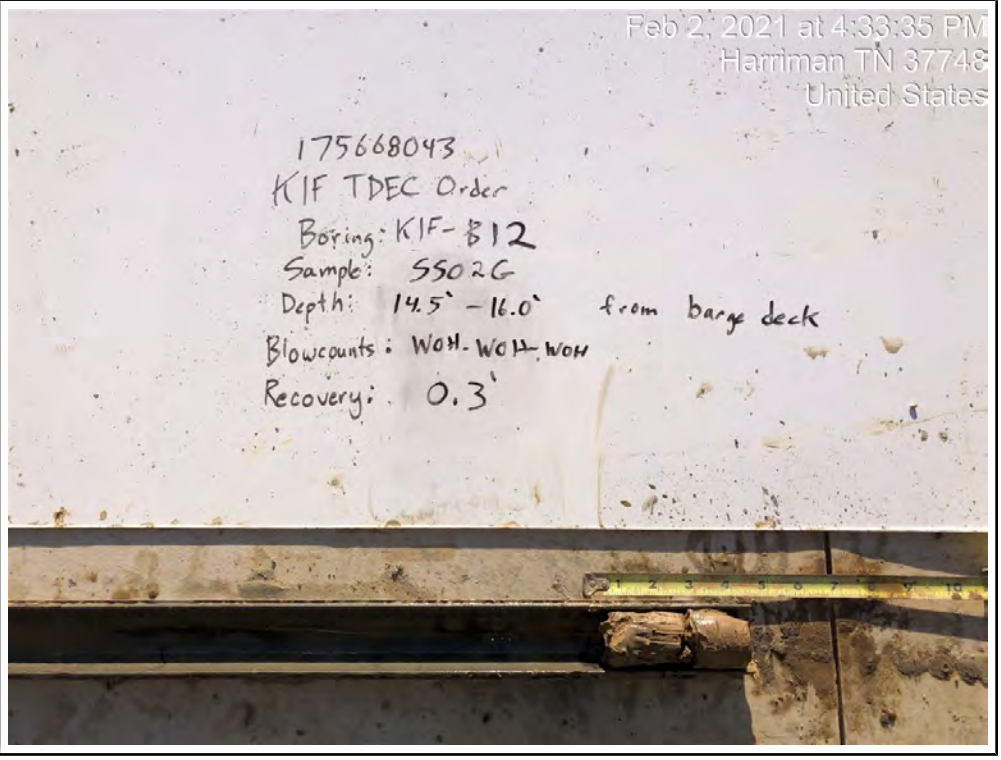


Photograph ID: 104

Photo Location:
KIF-B12

Photo Date:
2/2/2021

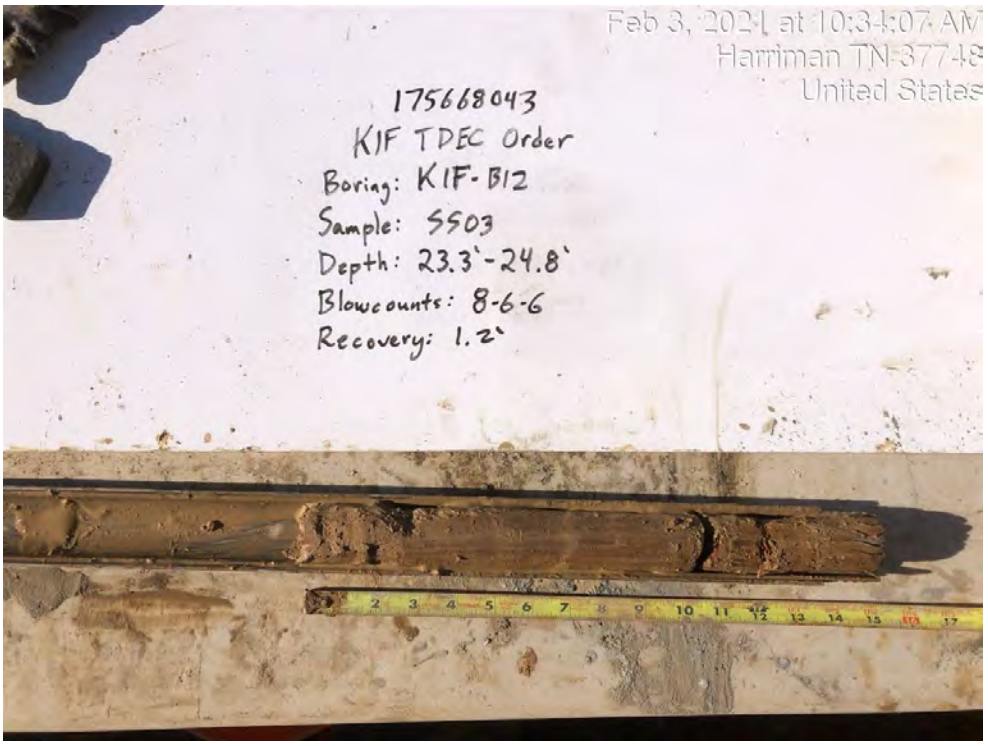
Comments:
Interval (16.0-17.5 feet). Interval shown on white board should be 16.0-17.5 feet. WOH on white board is the same as WH on the boring log.



Client:	Tennessee Valley Authority	Project:	KIF TDEC Order
Site Name:	Kingston Fossil (KIF) Plant	Site Location:	Harriman, Tennessee

Photograph ID: 105 **Photo Location:** KIF-B12 **Photo Date:** 2/3/2021 **Comments:** Photo of interval (18.3-20.3 feet) unavailable because sample collected with shelby tube.	No Photo Applicable
Photograph ID: 106 **Photo Location:** KIF-B12 **Photo Date:** 2/3/2021 **Comments:** Photo of interval (21.3-23.3 feet) unavailable because sample collected with shelby tube.	No Photo Applicable

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil (KIF) Plant**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 107 **Photo Location:** KIF-B12 **Photo Date:** 2/3/2021 **Comments:** Interval (23.3-24.8 feet).	
Photograph ID: 108 **Photo Location:** KIF-B12 **Photo Date:** 2/3/2021 **Comments:** Photo of interval (25.8-27.8 feet) unavailable because sample collected with shelby tube.	No Photo Applicable

Client:	Tennessee Valley Authority	Project:	KIF TDEC Order
Site Name:	Kingston Fossil (KIF) Plant	Site Location:	Harriman, Tennessee

Photograph ID: 109

Photo Location:
KIF-B12

Photo Date:
2/3/2021

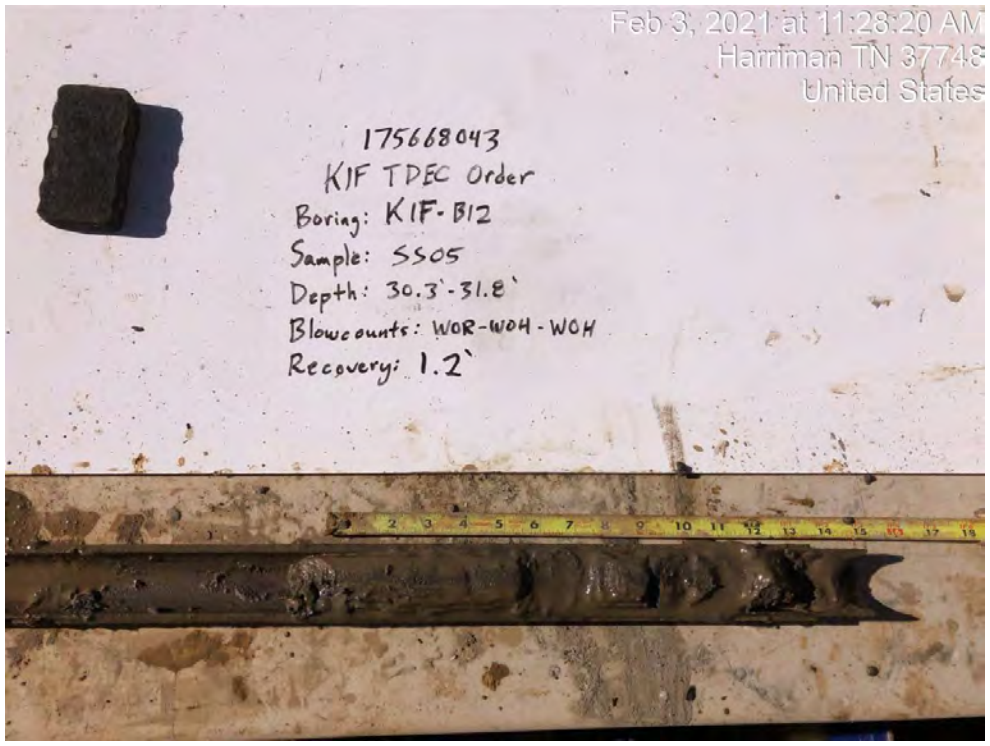
Comments:
Interval (27.8-29.3 feet). WOR on white board is the same as WR on the boring log.

Photograph ID: 110

Photo Location:
KIF-B12

Photo Date:
2/3/2021

Comments:
Interval (30.3-31.8 feet). WOR and WOH on white board is the same as WR and WH on the boring log, respectively.



Client:	Tennessee Valley Authority	Project:	KIF TDEC Order
Site Name:	Kingston Fossil (KIF) Plant	Site Location:	Harriman, Tennessee

Photograph ID: 111 **Photo Location:** KIF-B12 **Photo Date:** 2/3/2021 **Comments:** Interval (32.8-34.3 feet).	
Photograph ID: 112 **Photo Location:** KIF-B12 **Photo Date:** 2/3/2021 **Comments:** Interval (34.8-36.3 feet).	

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil (KIF) Plant**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 113

Photo Location:
KIF-B13

Photo Date:
2/13/2021

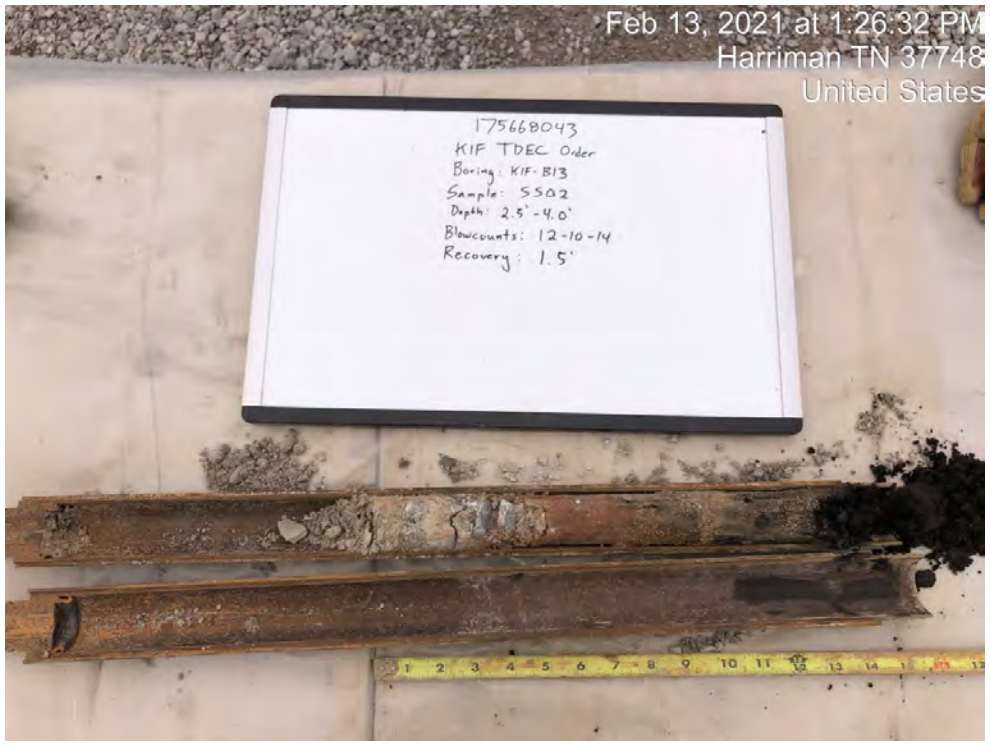
Comments:
Interval (0.0-1.5 feet).

Photograph ID: 114

Photo Location:
KIF-B13

Photo Date:
2/13/2021

Comments:
Interval (2.5-4.0 feet).



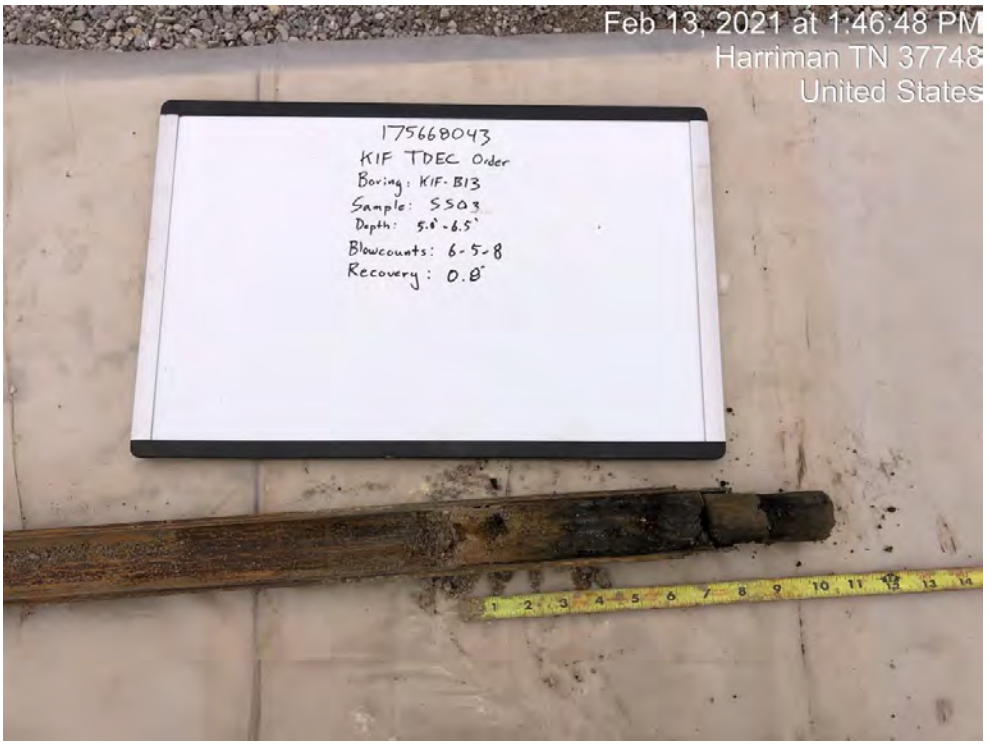
Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil (KIF) Plant**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 115

Photo Location:
KIF-B13

Photo Date:
2/13/2021

Comments:
Interval (5.0-6.5 feet).

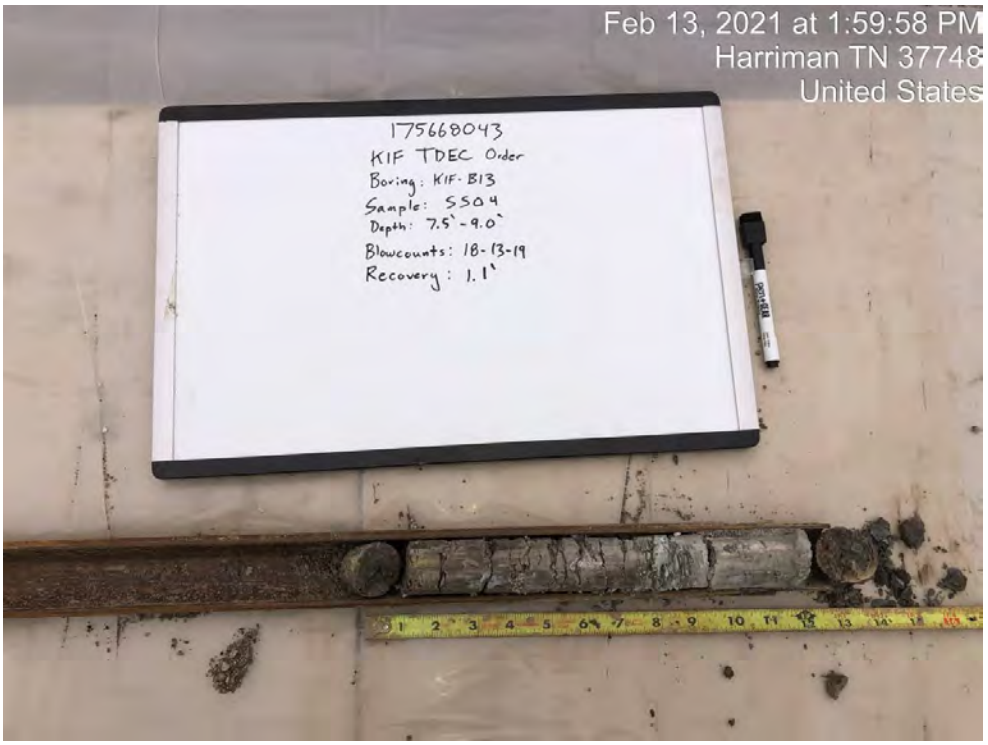


Photograph ID: 116

Photo Location:
KIF-B13

Photo Date:
2/13/2021

Comments:
Interval (7.5-9.0 feet).



Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil (KIF) Plant**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 117

Photo Location:
KIF-B13

Photo Date:
2/13/2021

Comments:
Interval (10.0-11.5 feet).

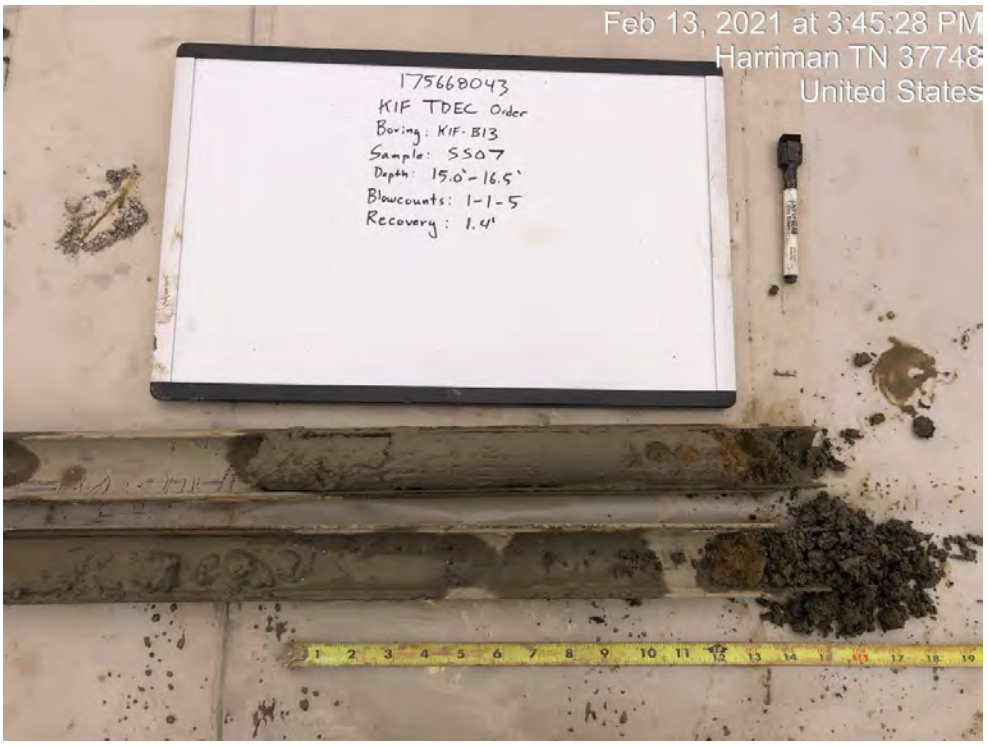
Photograph ID: 118

Photo Location:
KIF-B13

Photo Date:
2/13/2021

Comments:
Interval (12.5-14.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil (KIF) Plant**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 119 **Photo Location:** KIF-B13 **Photo Date:** 2/13/2021 **Comments:** Interval (15.0-16.5 feet).	
Photograph ID: 120 **Photo Location:** KIF-B13 **Photo Date:** 2/13/2021 **Comments:** Photo of interval (17.5-19.0 feet) unavailable.	No Photo Applicable

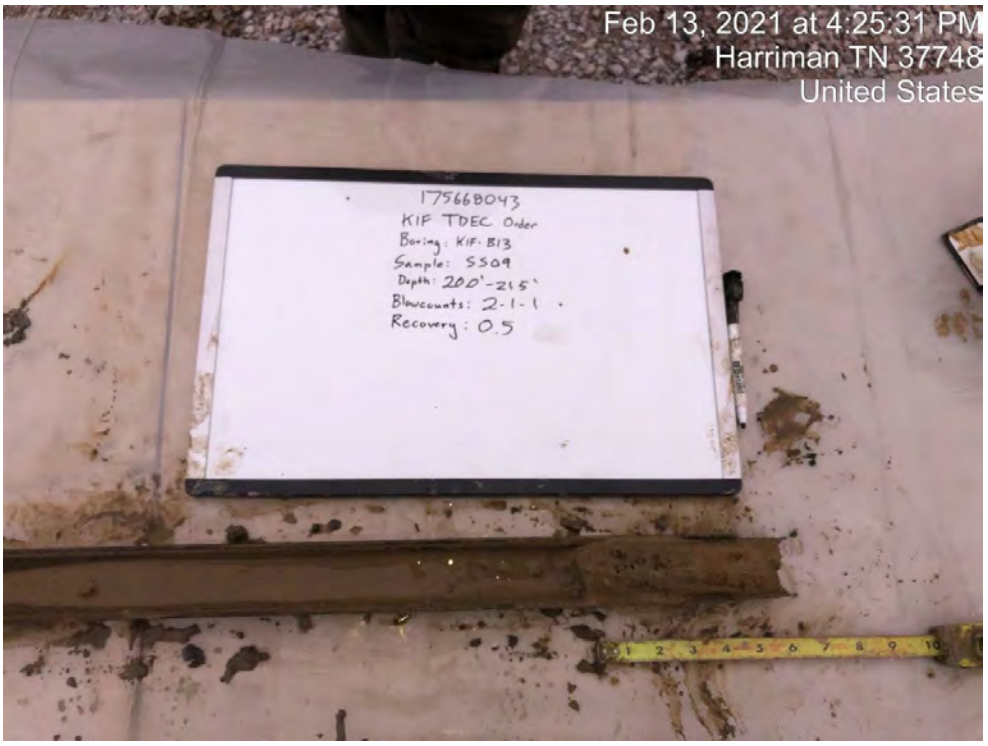
Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil (KIF) Plant**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 121

Photo Location:
KIF-B13

Photo Date:
2/13/2021

Comments:
Interval (20.0-21.5 feet).

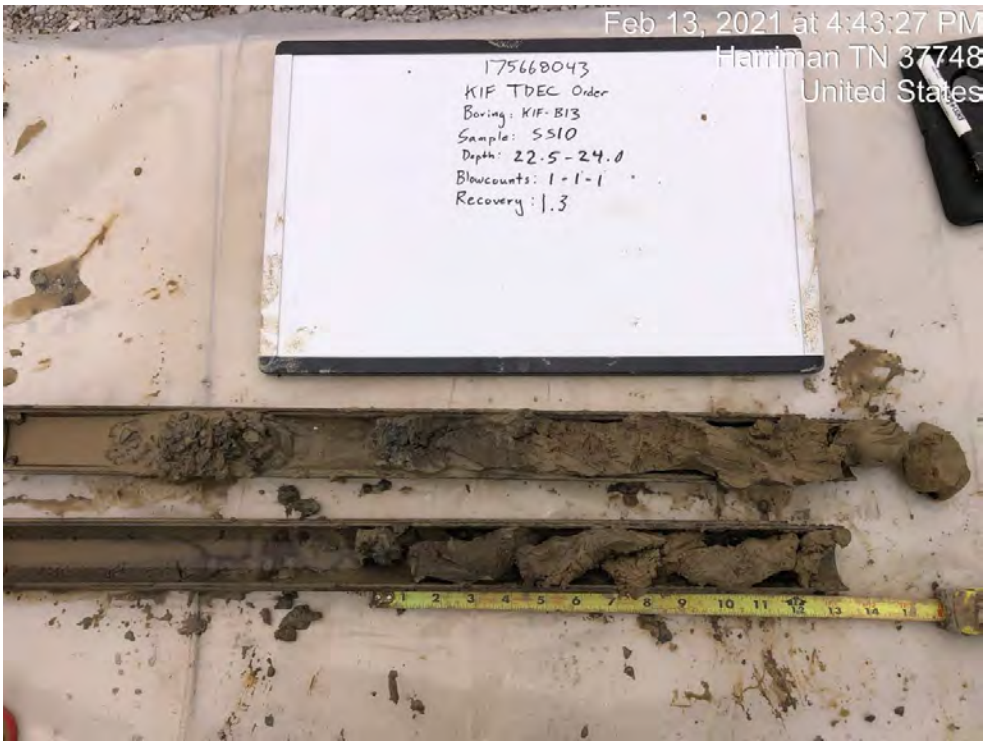


Photograph ID: 122

Photo Location:
KIF-B13

Photo Date:
2/13/2021

Comments:
Interval (22.5-24.0 feet).



Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil (KIF) Plant**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 123

Photo Location:
KIF-B13

Photo Date:
2/14/2021

Comments:
Interval (25.0-26.5 feet).

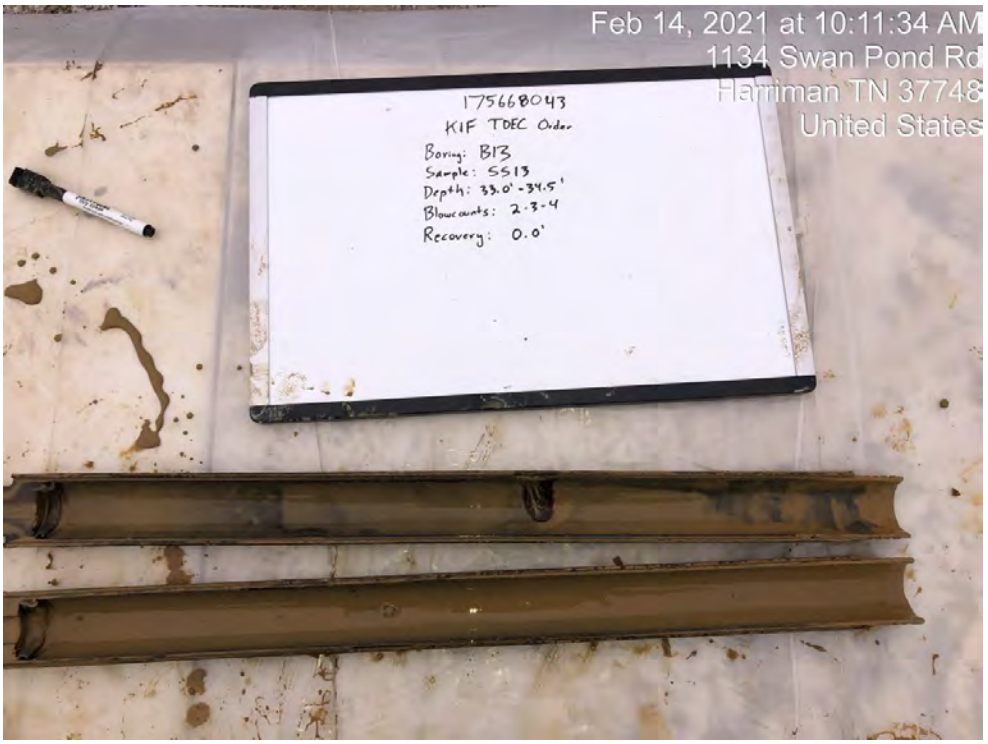
Photograph ID: 124

Photo Location:
KIF-B13

Photo Date:
2/14/2021

Comments:
Interval (27.5-29.0 feet). WOH on white board is the same as WH on the boring log.

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil (KIF) Plant**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 125 **Photo Location:** KIF-B13 **Photo Date:** 2/14/2021 **Comments:** Photo of interval (30.0-32.0 feet) unavailable because sample collected with shelby tube.	No Photo Applicable
Photograph ID: 126 **Photo Location:** KIF-B13 **Photo Date:** 2/14/2021 **Comments:** Interval (32.0-33.5 feet).	

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil (KIF) Plant**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 127 **Photo Location:** KIF-B13 **Photo Date:** 2/14/2021 **Comments:** Interval (34.5-36.0 feet). Sample identifier on the white board should be SS14.	
Photograph ID: 128 **Photo Location:** KIF-B13 **Photo Date:** 2/14/2021 **Comments:** Interval (37.0-38.5 feet). Sample identifier on the white board should be SS15.	

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil (KIF) Plant**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 129

Photo Location:
KIF-B13

Photo Date:
2/14/2021

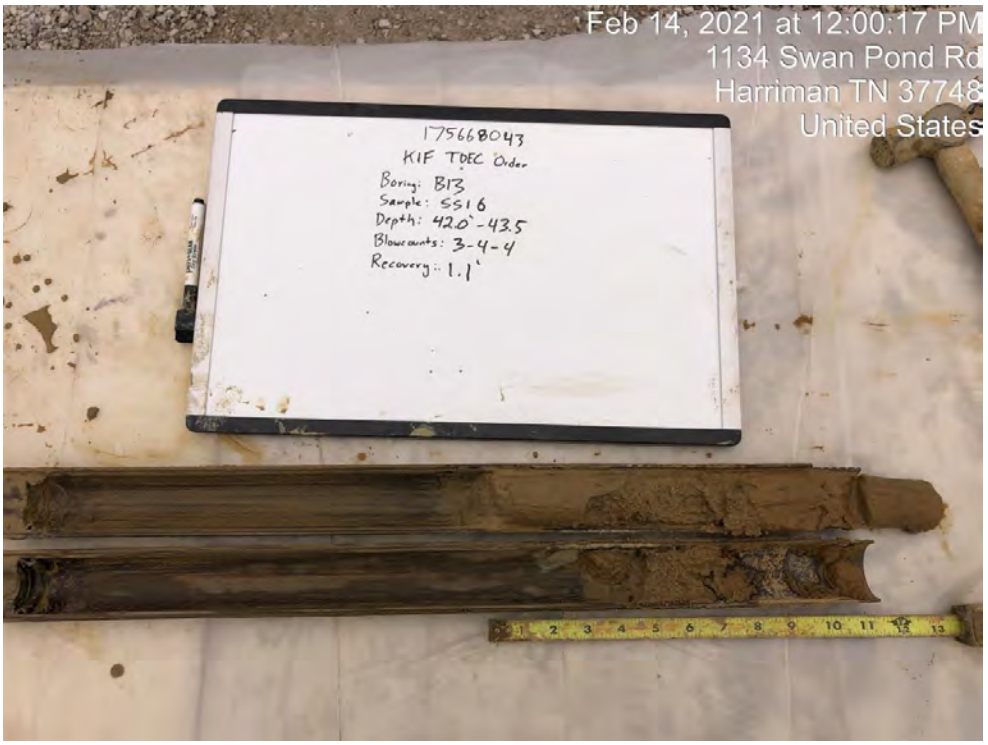
Comments:
Interval (39.5-41.0 feet). Sample identifier on the white board should be SS16.

Photograph ID: 130

Photo Location:
KIF-B13

Photo Date:
2/14/2021

Comments:
Interval (42.0-43.5 feet). Sample identifier on the white board should be SS17.



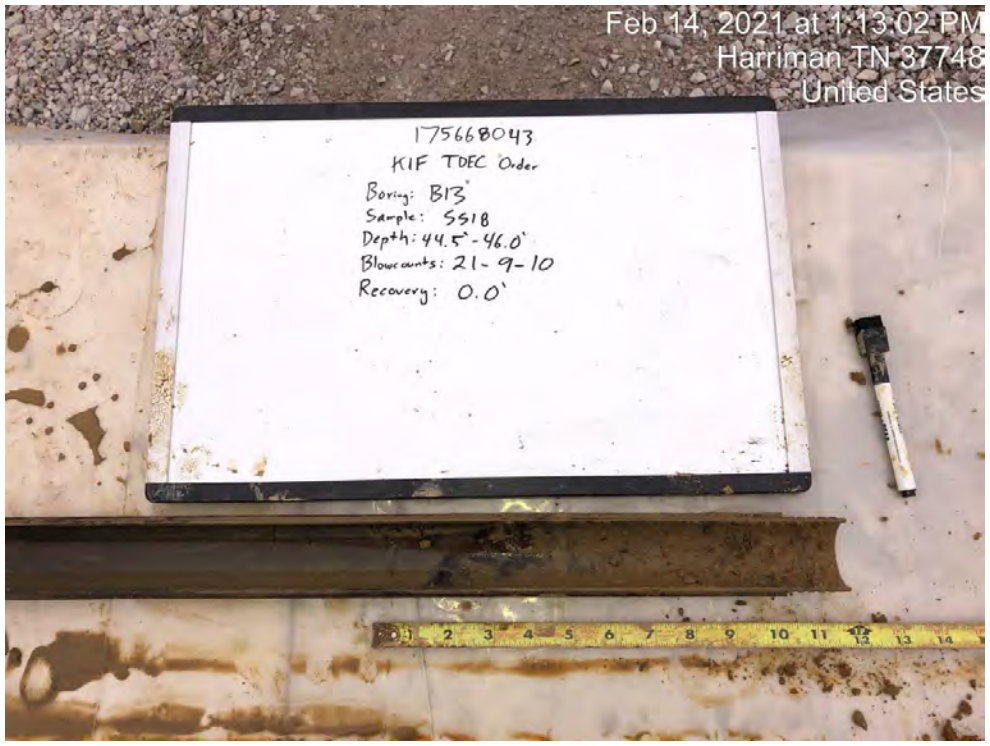
Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil (KIF) Plant**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 131

Photo Location:
KIF-B13

Photo Date:
2/14/2021

Comments:
Interval (44.5-46.0 feet).

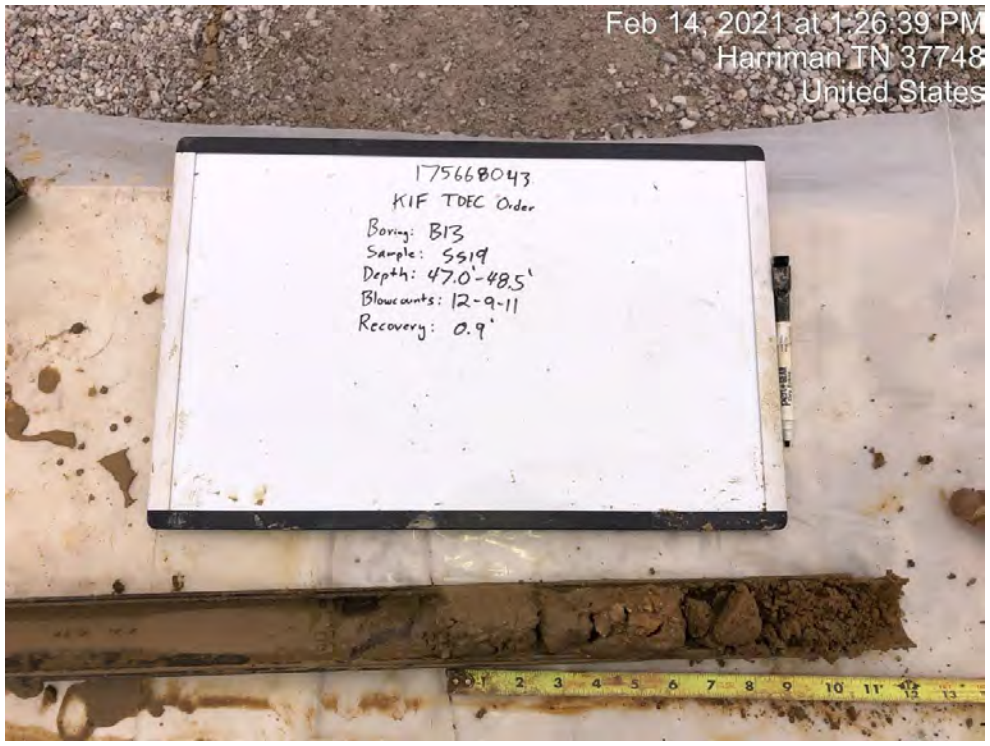


Photograph ID: 132

Photo Location:
KIF-B13

Photo Date:
2/14/2021

Comments:
Interval (47.0-48.5 feet).



Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil (KIF) Plant**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 133

Photo Location:
KIF-B13

Photo Date:
2/14/2021

Comments:
Interval (48.8-50.3 feet).

Photograph ID: 134

Photo Location:
KIF-B14

Photo Date:
1/28/2021

Comments:
Photo of interval (7.5-9.0 feet) unavailable.

No Photo Applicable

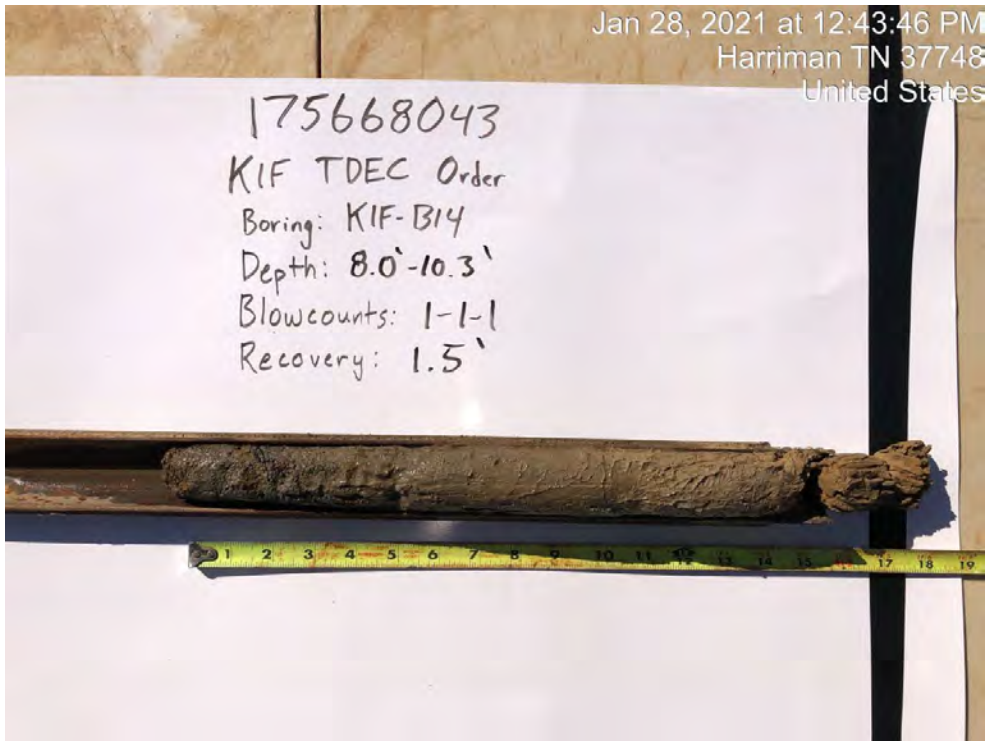
Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil (KIF) Plant**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 135

Photo Location:
KIF-B14

Photo Date:
1/28/2021

Comments:
Interval (9.5-11.8 feet). Interval on white board should be 9.5-11.8 feet.

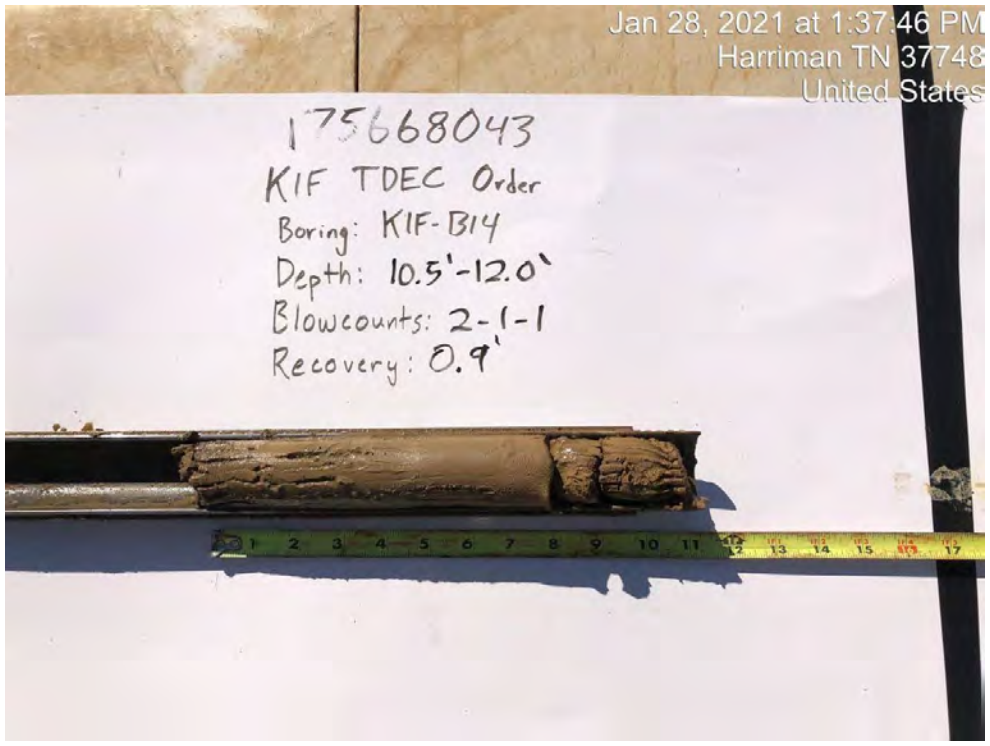


Photograph ID: 136

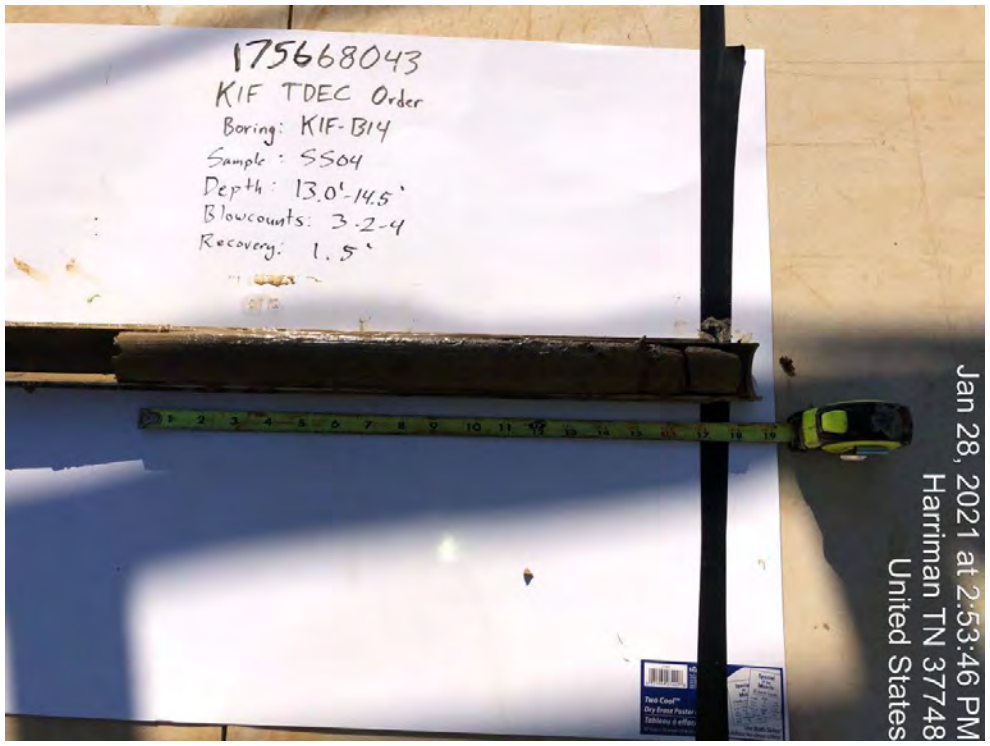
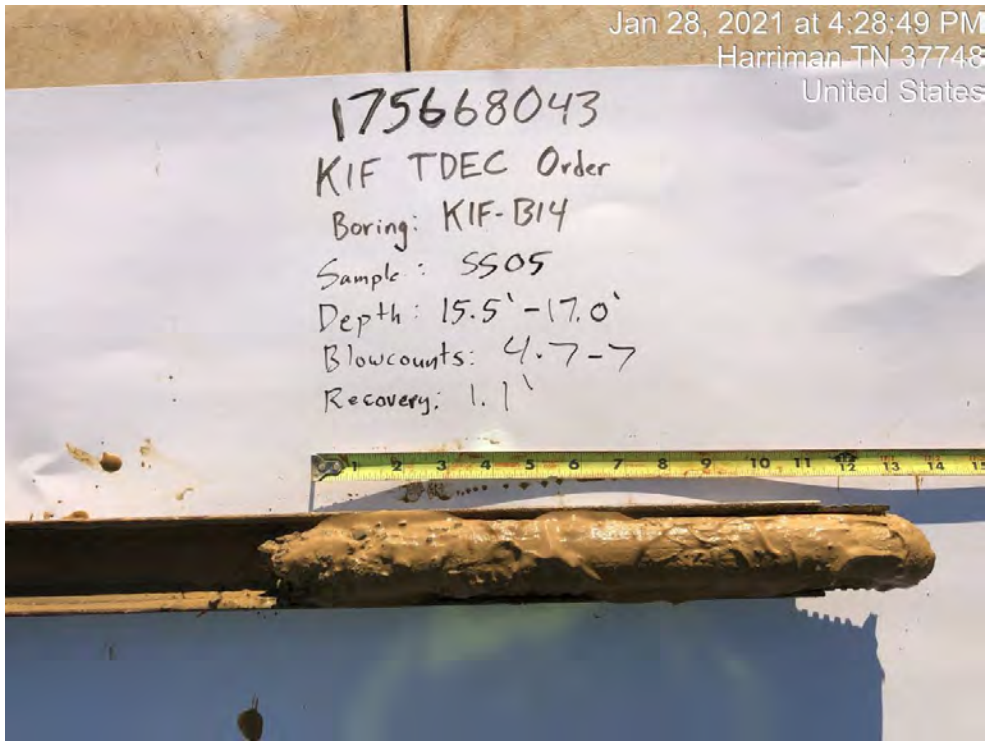
Photo Location:
KIF-B14

Photo Date:
1/28/2021

Comments:
Interval (12.0-13.5 feet). Interval on white board should be 12.0-13.5 feet.



Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil (KIF) Plant**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 137 **Photo Location:** KIF-B14 **Photo Date:** 1/28/2021 **Comments:** Interval (14.5-16.0 feet). Interval on white board should be 14.5-16.0 feet.	
Photograph ID: 138 **Photo Location:** KIF-B14 **Photo Date:** 1/28/2021 **Comments:** Interval (17.0-18.5 feet). Interval on white board should be 17.0-18.5 feet.	

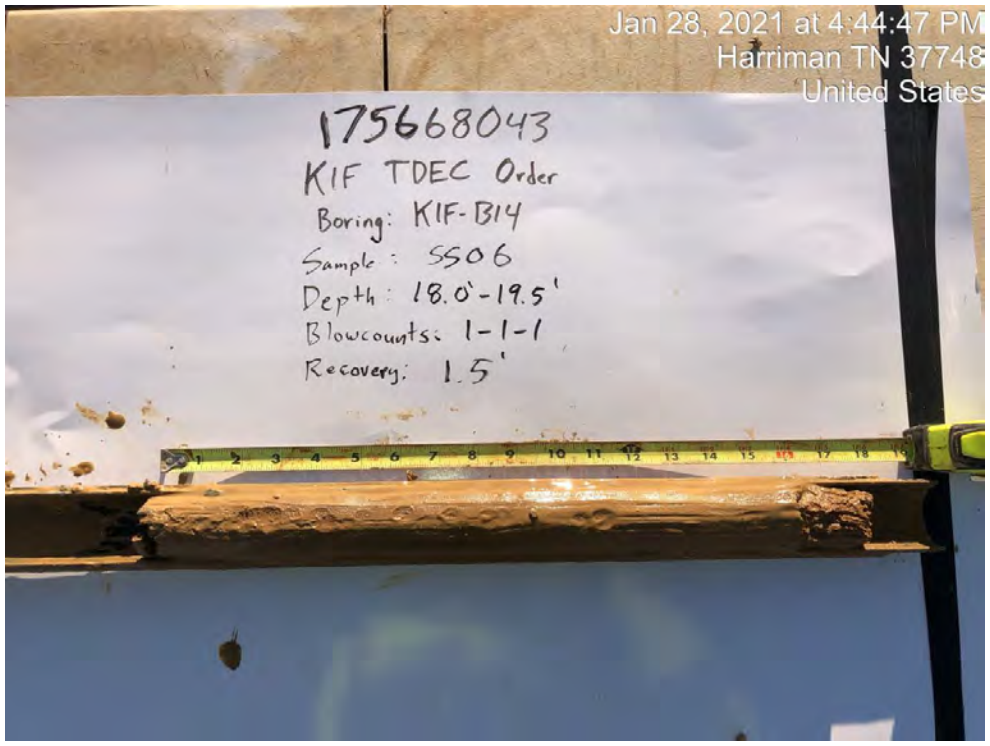
Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil (KIF) Plant**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 139

Photo Location:
KIF-B14

Photo Date:
1/28/2021

Comments:
Interval (19.5-21.0 feet). Interval on white board should be 19.5-21.0 feet.

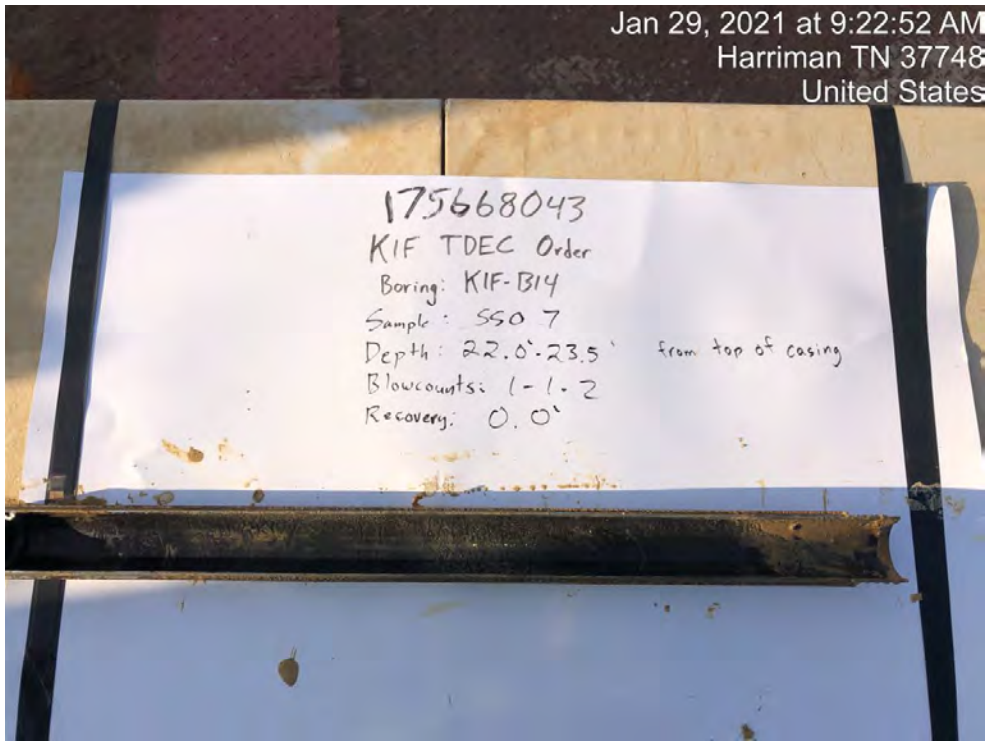


Photograph ID: 140

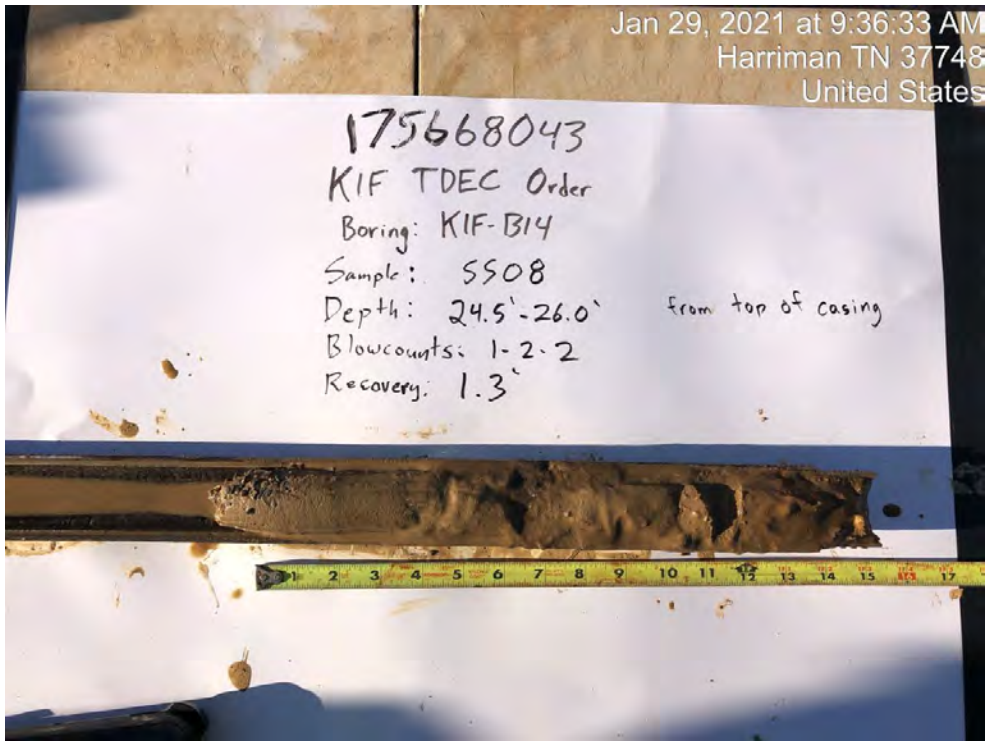
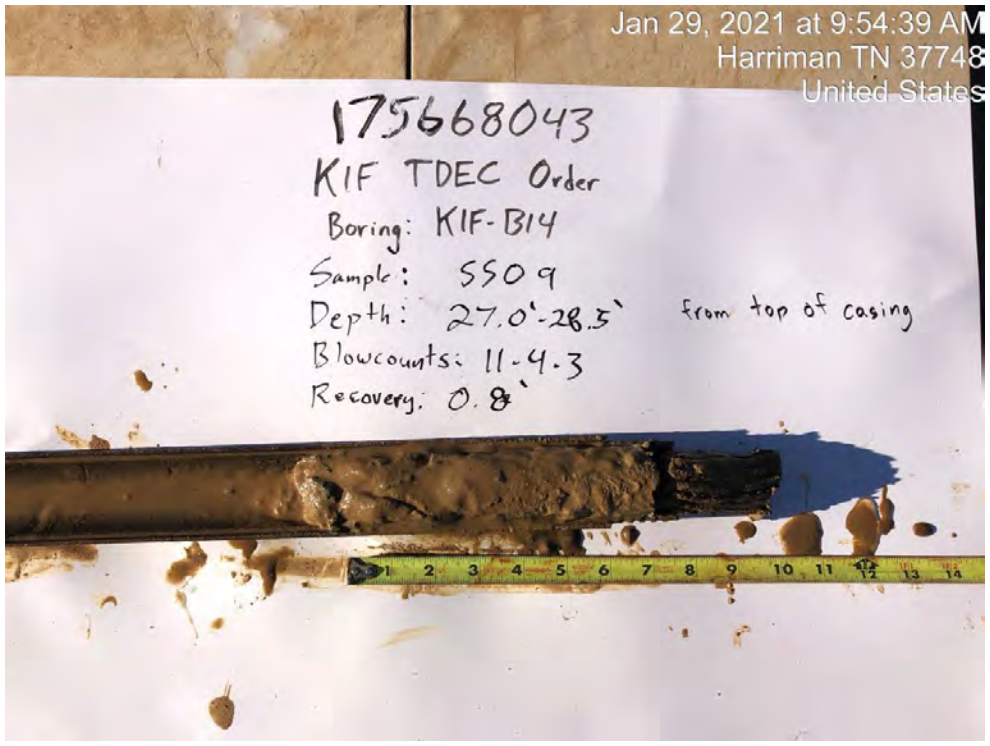
Photo Location:
KIF-B14

Photo Date:
1/29/2021

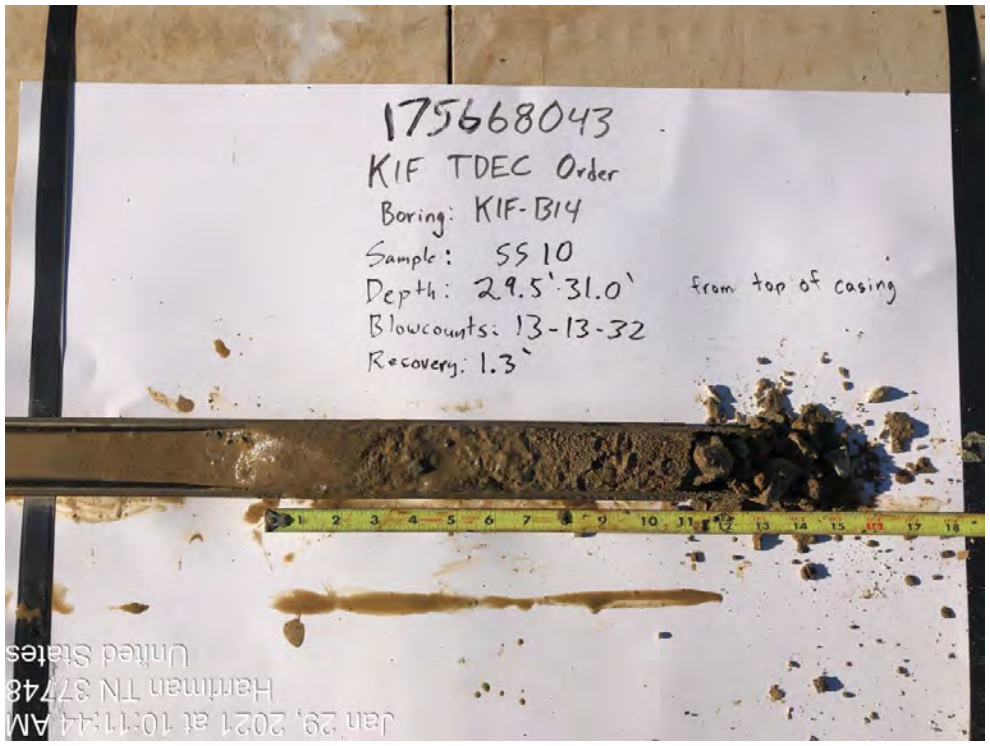
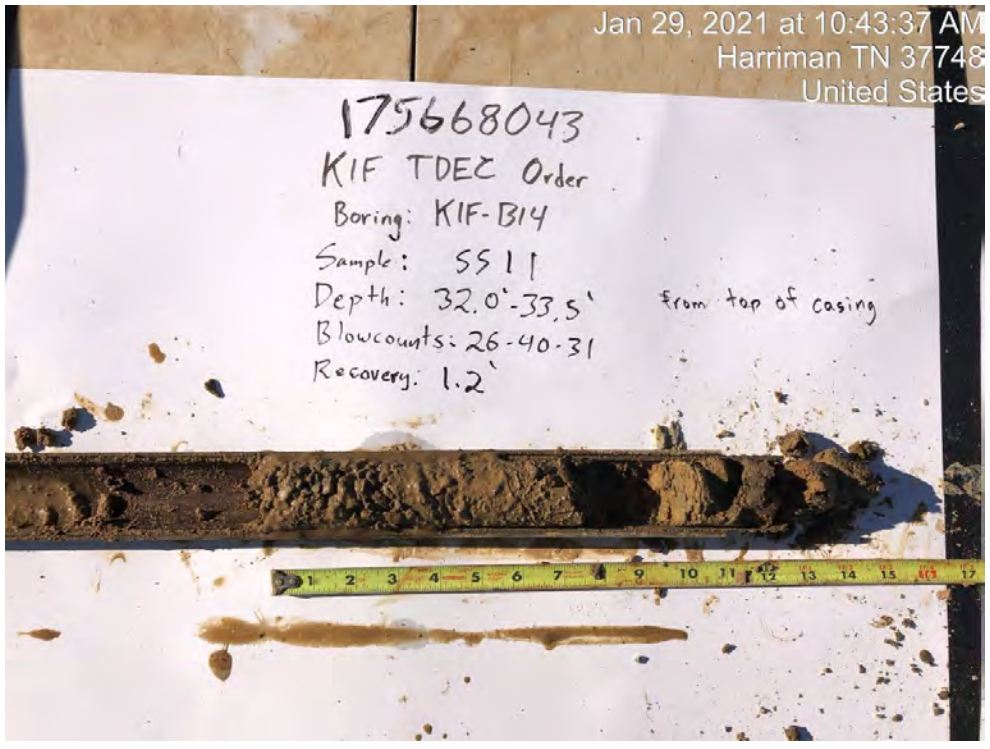
Comments:
Interval (22.0-23.5 feet).



Client:	Tennessee Valley Authority	Project:	KIF TDEC Order
Site Name:	Kingston Fossil (KIF) Plant	Site Location:	Harriman, Tennessee

Photograph ID: 141 **Photo Location:** KIF-B14 **Photo Date:** 1/29/2021 **Comments:** Interval (24.5-26.0 feet).	
Photograph ID: 142 **Photo Location:** KIF-B14 **Photo Date:** 1/29/2021 **Comments:** Interval (27.0-28.5 feet).	

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil (KIF) Plant**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 143 **Photo Location:** KIF-B14 **Photo Date:** 1/29/2021 **Comments:** Interval (29.5-31.0 feet).	
Photograph ID: 144 **Photo Location:** KIF-B14 **Photo Date:** 1/29/2021 **Comments:** Interval (32.0-33.5 feet).	

Client:	Tennessee Valley Authority	Project:	KIF TDEC Order
Site Name:	Kingston Fossil (KIF) Plant	Site Location:	Harriman, Tennessee

Photograph ID: 145

Photo Location:
KIF-B14

Photo Date:
1/29/2021

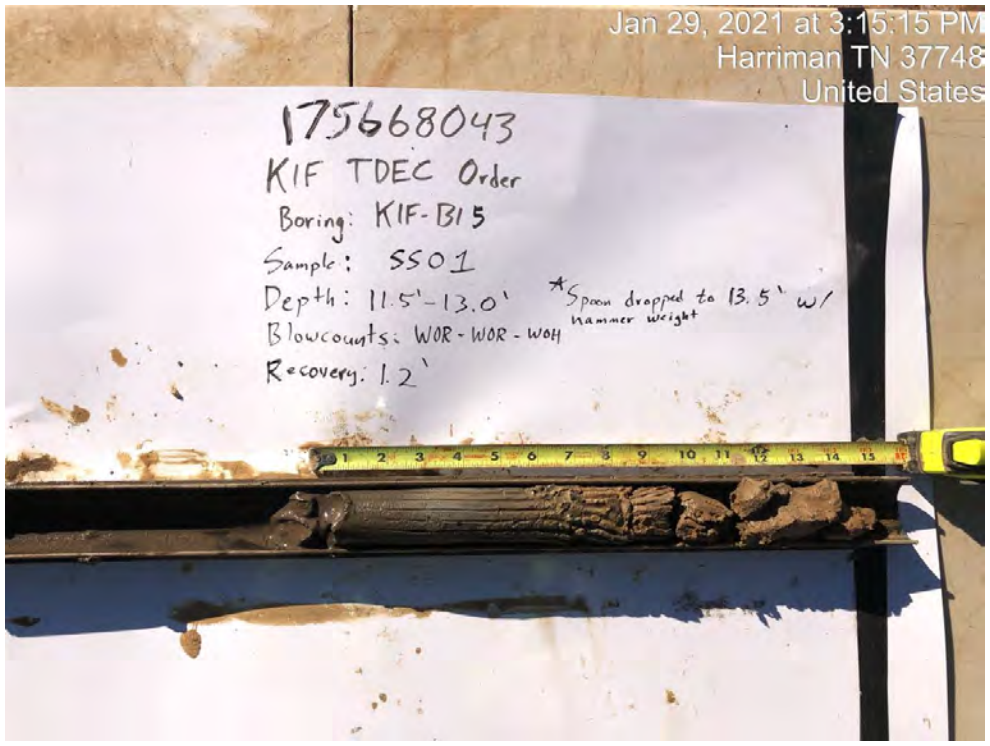
Comments:
Interval (34.5-36.0 feet).

Photograph ID: 146

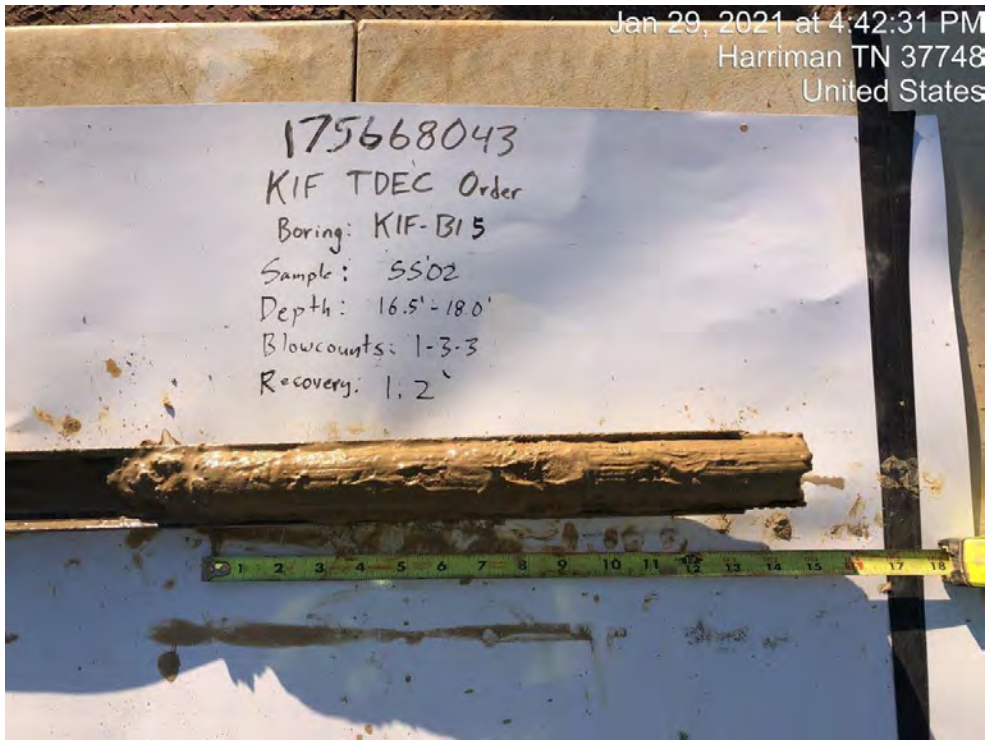
Photo Location:
KIF-B15

Photo Date:
1/29/2021

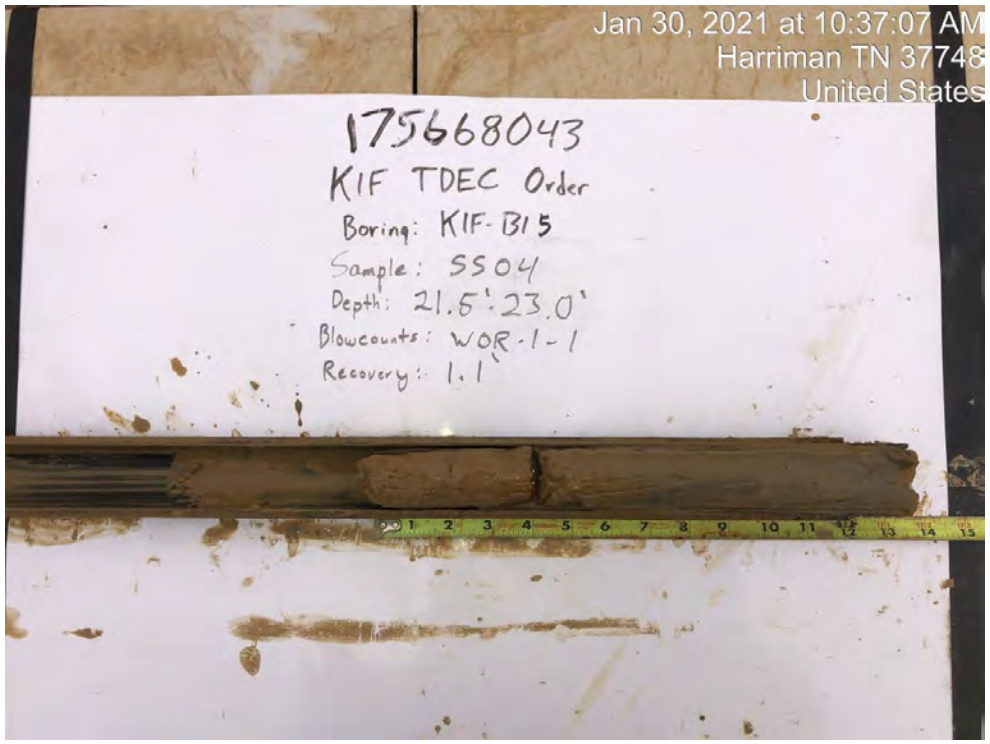
Comments:
Interval (11.5-13.0 feet). WOR and WOH on white board is the same as WR and WH on the boring log, respectively.



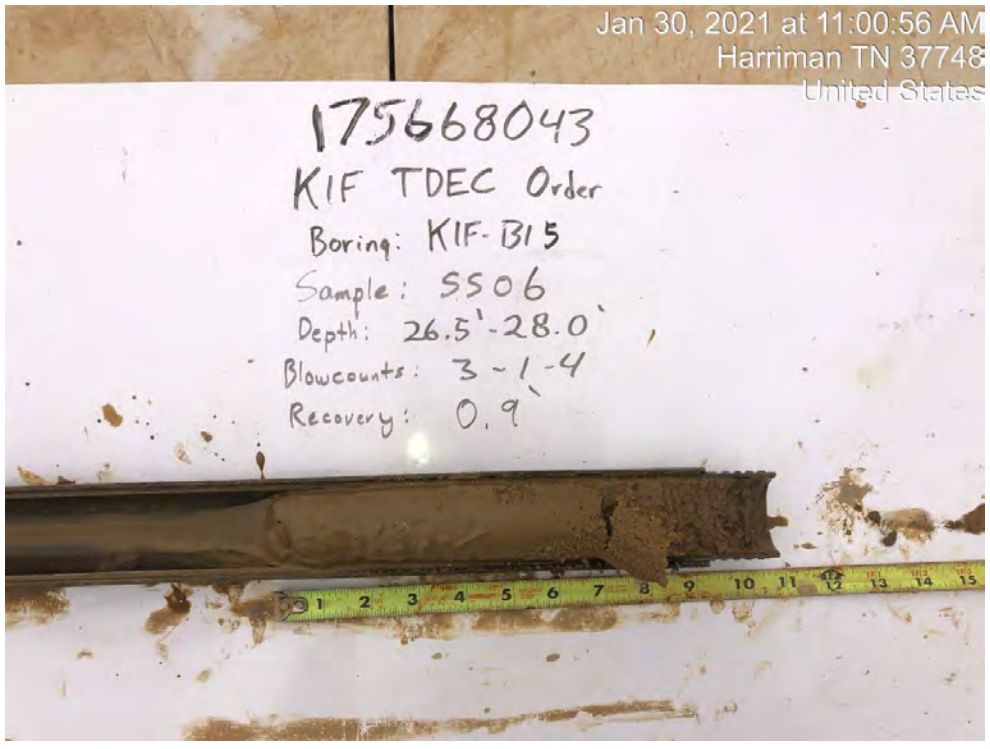
Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil (KIF) Plant**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 147 **Photo Location:** **Photo Date:** **Comments:** Photo of interval (14.5-16.5 feet) unavailable because sample colleted with shelby tube.	No Photo Applicable
Photograph ID: 148 **Photo Location:** KIF-B15 **Photo Date:** 1/29/2021 **Comments:** Interval (16.5-18.0 feet).	

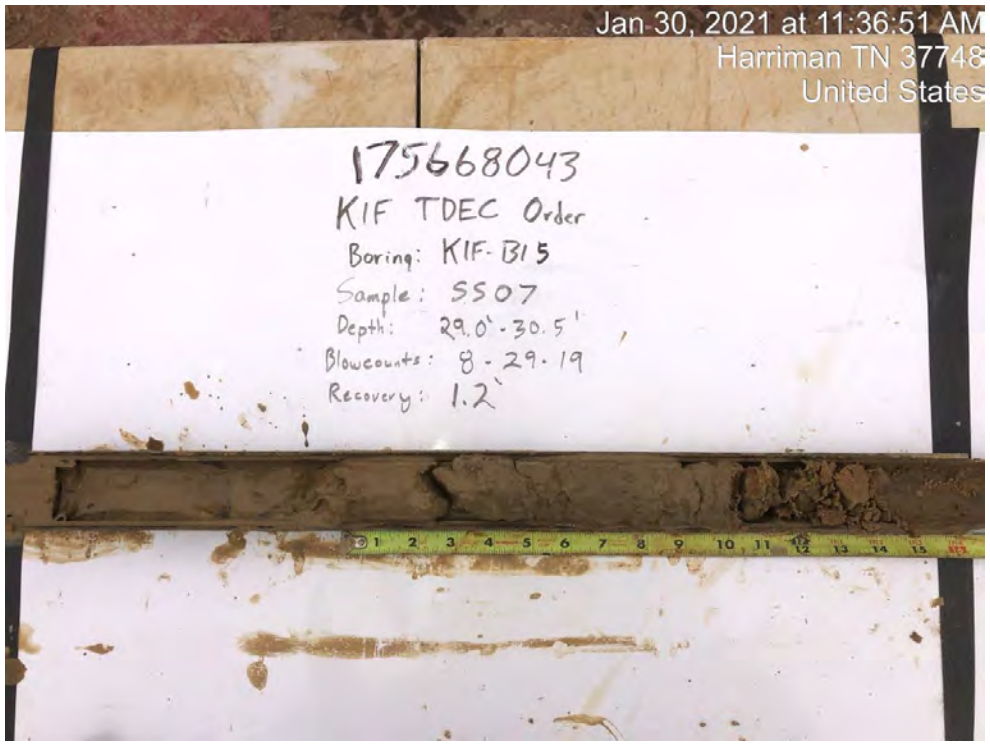
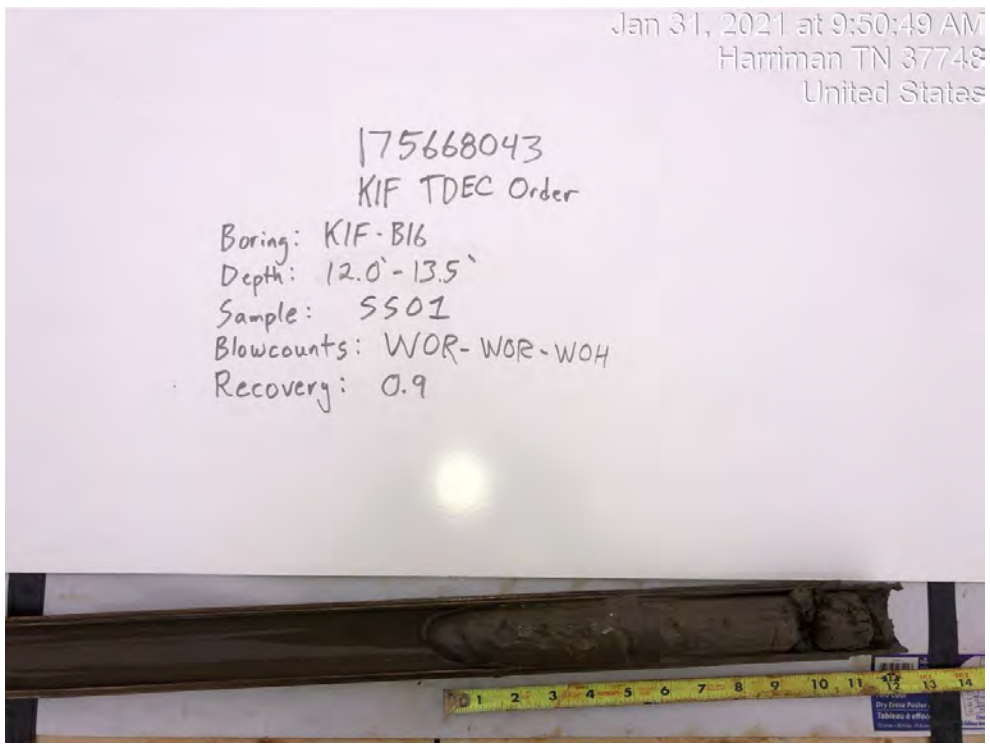
Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil (KIF) Plant**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 149 **Photo Location:** KIF-B15 **Photo Date:** 1/30/2021 **Comments:** Photo of interval (19.0-20.5 feet) unavailable.	No Photo Applicable
Photograph ID: 150 **Photo Location:** KIF-B15 **Photo Date:** 1/30/2021 **Comments:** Interval (21.5-23.0 feet). WOR on white board is the same as WR on the boring log.	

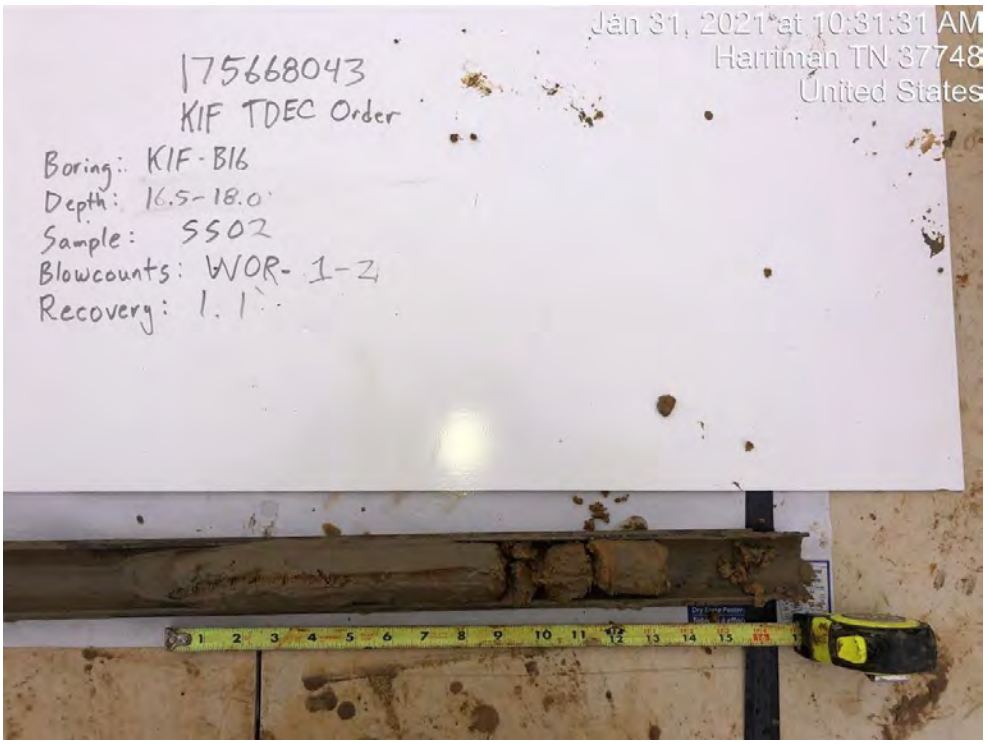
Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil (KIF) Plant**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 151 **Photo Location:** KIF-B15 **Photo Date:** 1/30/2021 **Comments:** Interval (24.0-25.5 feet).	
Photograph ID: 152 **Photo Location:** KIF-B15 **Photo Date:** 1/30/2021 **Comments:** Interval (26.5-28.0 feet).	

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil (KIF) Plant**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 153 **Photo Location:** KIF-B15 **Photo Date:** 1/30/2021 **Comments:** Interval (29.0-30.5 feet).	
Photograph ID: 154 **Photo Location:** KIF-B16 **Photo Date:** 1/31/2021 **Comments:** Interval (12.0-13.5 feet). WOR and WOH on white board is the same as WR and WH on the boring log, respectively.	

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil (KIF) Plant**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 155 **Photo Location:** KIF-B16 **Photo Date:** 1/31/2021 **Comments:** Photo of interval (14.5-16.5 feet) unavailable because sample colleted with shelby tube.	No Photo Applicable
Photograph ID: 156 **Photo Location:** KIF-B16 **Photo Date:** 1/31/2021 **Comments:** Interval (16.5-18.0 feet). WOR on white board is the same as WR on the boring log.	

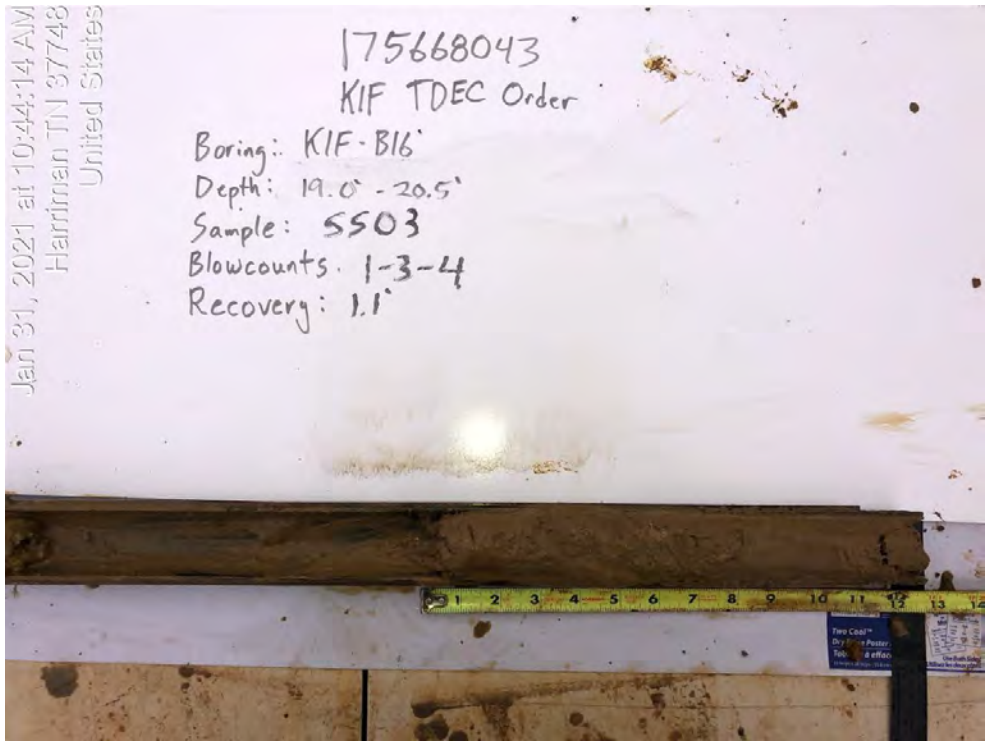
Client:	Tennessee Valley Authority	Project:	KIF TDEC Order
Site Name:	Kingston Fossil (KIF) Plant	Site Location:	Harriman, Tennessee

Photograph ID: 157

Photo Location:
KIF-B16

Photo Date:
1/31/2021

Comments:
Interval (19.0-20.5 feet).

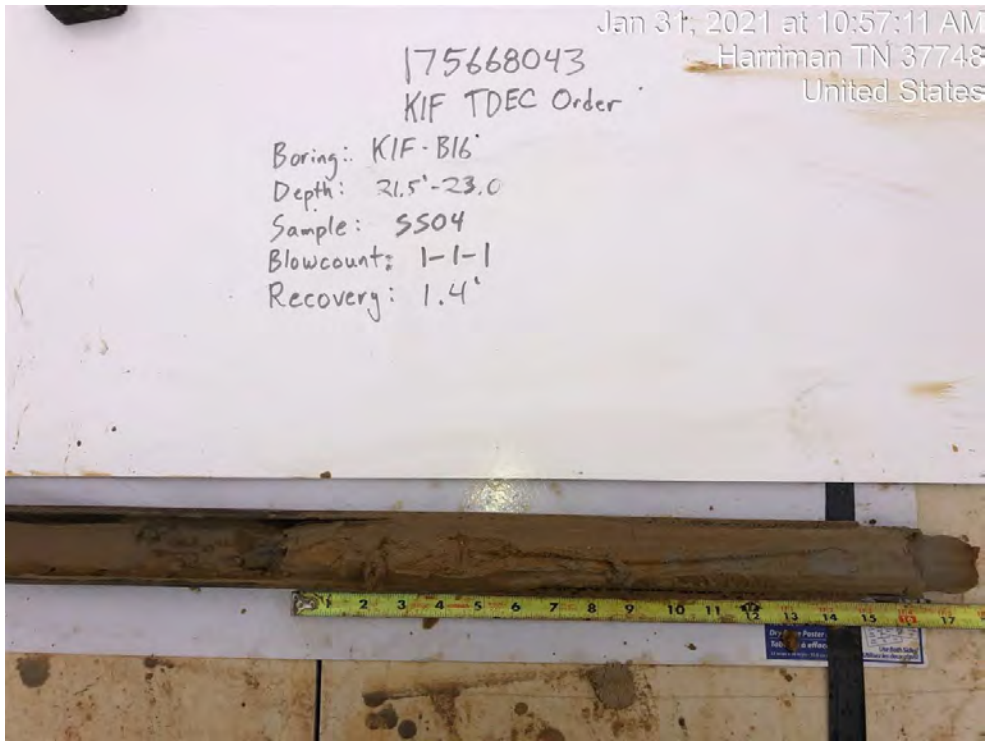


Photograph ID: 158

Photo Location:
KIF-B16

Photo Date:
1/31/2021

Comments:
Interval (21.5-23.0 feet).



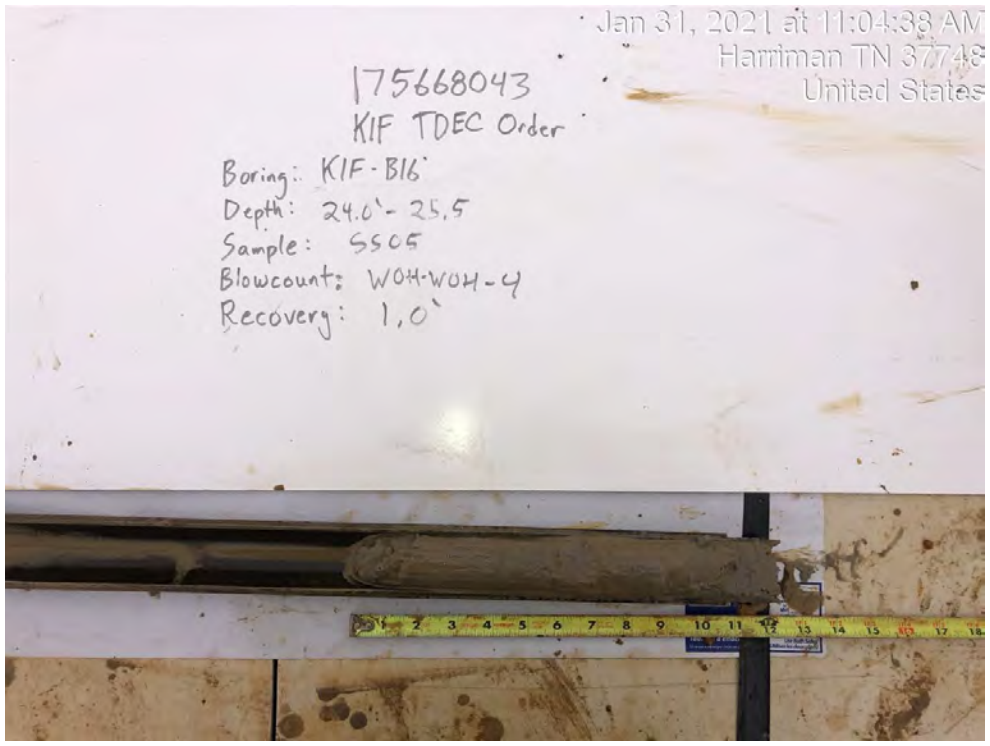
Client:	Tennessee Valley Authority	Project:	KIF TDEC Order
Site Name:	Kingston Fossil (KIF) Plant	Site Location:	Harriman, Tennessee

Photograph ID: 159

Photo Location:
KIF-B16

Photo Date:
1/31/2021

Comments:
Interval (24.0-25.5 feet). WOH on white board is the same as WH on the boring log.

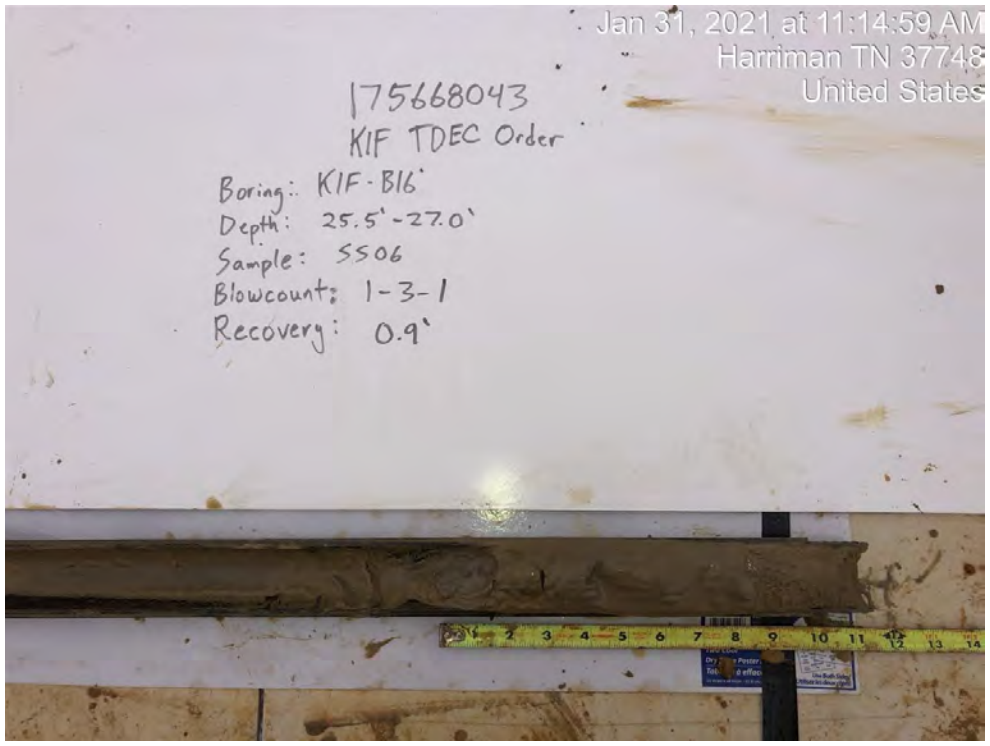


Photograph ID: 160

Photo Location:
KIF-B16

Photo Date:
1/31/2021

Comments:
Interval (26.5-28.0 feet).



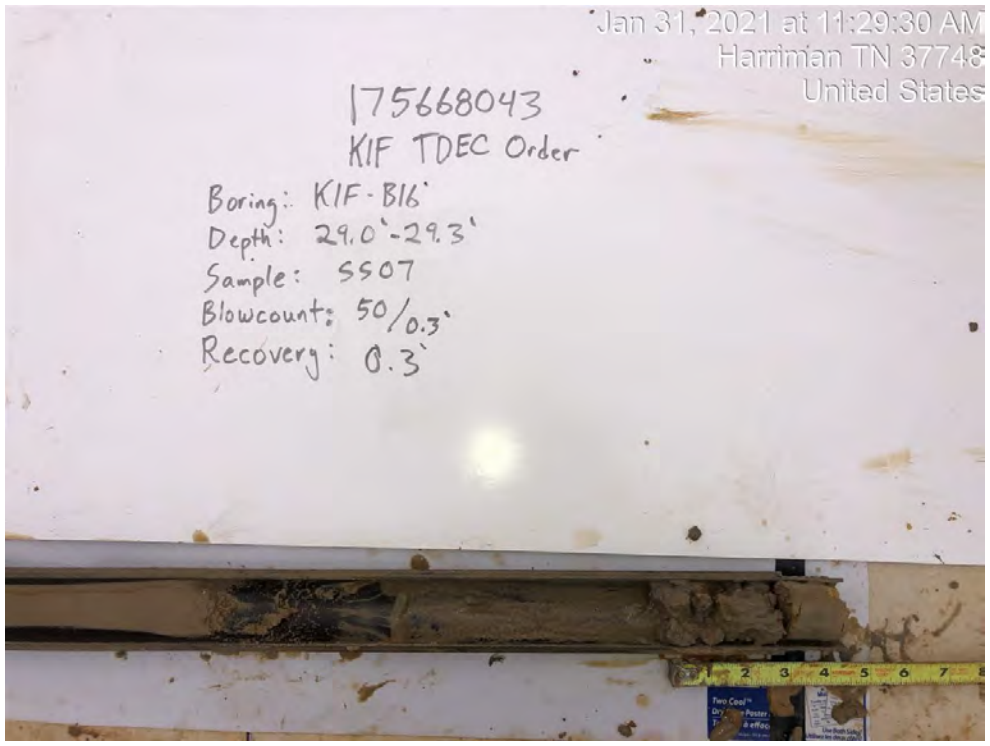
Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil (KIF) Plant**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 161

Photo Location:
KIF-B16

Photo Date:
1/31/2021

Comments:
Interval (29.0-29.3 feet).



ATTACHMENT D.4

Photographic Log of Phase 2 Site Conditions and Vibrating Wire Piezometers

Stantec

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil (KIF) Plant**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 1

Photo Location:
KIF-B05

Photo Date:
2/26/2021

Comments:
Surface completion and protection for the VWP installation at KIF-B05 looking southwest.

Photograph ID: 2

Photo Location:
KIF-B09

Photo Date:
2/26/2021

Comments:
Surface completion and protection for the VWP installation at KIF-B09 looking southwest.

Stantec

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**KIF TDEC Order**
Site Name:	**Kingston Fossil (KIF) Plant**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 3

Photo Location:
KIF-B13

Photo Date:
2/26/2021

Comments:
Surface completion and protection for the VWP installation at KIF-B13 looking southwest.

APPENDIX E – IN-SITU TESTING RESULTS

ATTACHMENT E.1

Hydraulic Conductivity (Slug) Testing Results

Stantec

Table 1
September 2019 Slug Test Summary
TVA-KIF Facility
Kingston, Tennessee
PN: 175668043

September 26, 2019

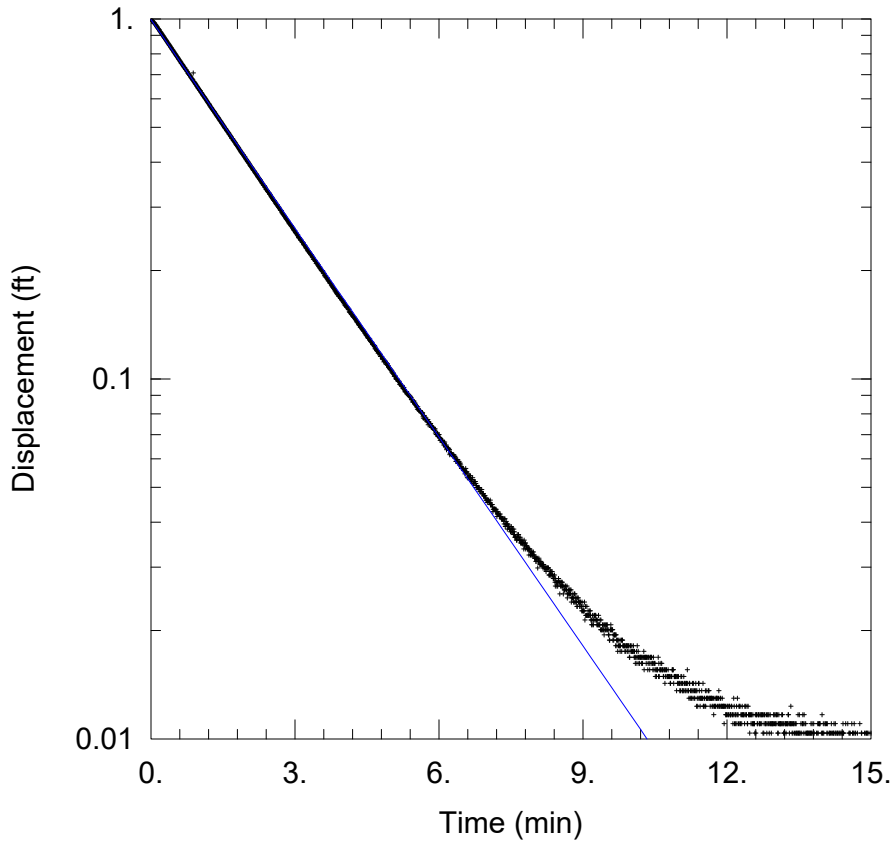
Well ID	Test	Test Date	Bouwer-Rice Hydraulic Conductivity (ft/day)	Bouwer-Rice Hydraulic Conductivity (cm/sec)
TW01	Falling Head 1	6/18/2019	3.35	1.2E-03
	Falling Head 2	6/18/2019	3.18	1.1E-03
	Falling Head 3	6/18/2019	3.45	1.2E-03
	Rising Head 1	6/18/2019	2.11	7.4E-04
	Rising Head 2	6/18/2019	2.09	7.4E-04
	Rising Head 3	6/18/2019	2.17	7.6E-04
TW02	Falling Head 1	6/19/2019	21.82	7.7E-03
	Falling Head 2	6/19/2019	19.15	6.8E-03
	Falling Head 3	6/19/2019	19.22	6.8E-03
	Rising Head 1	6/19/2019	20.74	7.3E-03
	Rising Head 2	6/19/2019	19.79	7.0E-03
	Rising Head 3	6/19/2019	20.52	7.2E-03
TW03	Falling Head 1	6/19/2019	22.60	8.0E-03
	Falling Head 2	6/19/2019	18.69	6.6E-03
	Falling Head 3	6/19/2019	18.32	6.5E-03
	Falling Head 4	6/19/2019	18.46	6.5E-03
	Rising Head 1	6/19/2019	13.26	4.7E-03
	Rising Head 2	6/19/2019	12.02	4.2E-03
	Rising Head 3	6/19/2019	12.21	4.3E-03
	Rising Head 4	6/19/2019	11.54	4.1E-03
TW04	Falling Head 1	6/20/2019	39.16	1.4E-02
	Falling Head 2	6/20/2019	39.22	1.4E-02
	Falling Head 3	6/20/2019	39.06	1.4E-02
	Rising Head 1	6/20/2019	42.79	1.5E-02
	Rising Head 2	6/20/2019	42.11	1.5E-02
	Rising Head 3	6/20/2019	41.17	1.5E-02
TW05	Falling Head 1	6/19/2019	4.86	1.7E-03
	Falling Head 2	6/19/2019	4.50	1.6E-03
	Falling Head 3	6/19/2019	4.54	1.6E-03
	Rising Head 1	6/19/2019	4.80	1.7E-03
	Rising Head 2	6/19/2019	4.66	1.6E-03
	Rising Head 3	6/19/2019	4.71	1.7E-03

Notes

ft/day - feet per day

cm/sec - centimeters per second

Data analysis was completed using AQTESOLV™, Version 4.50 Professional



TW01 FH TEST 1

Data Set: Z:\...\TW01_FH-T1.aqt
Date: 09/26/19 Time: 11:23:52

PROJECT INFORMATION

Company: Stantec
Client: TVA-KIF
Project: 175668043
Location: Kingston Fossil Plant
Test Well: TW01
Test Date: 06/18/19

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 3.353 ft/day
y0 = 0.9959 ft

AQUIFER DATA

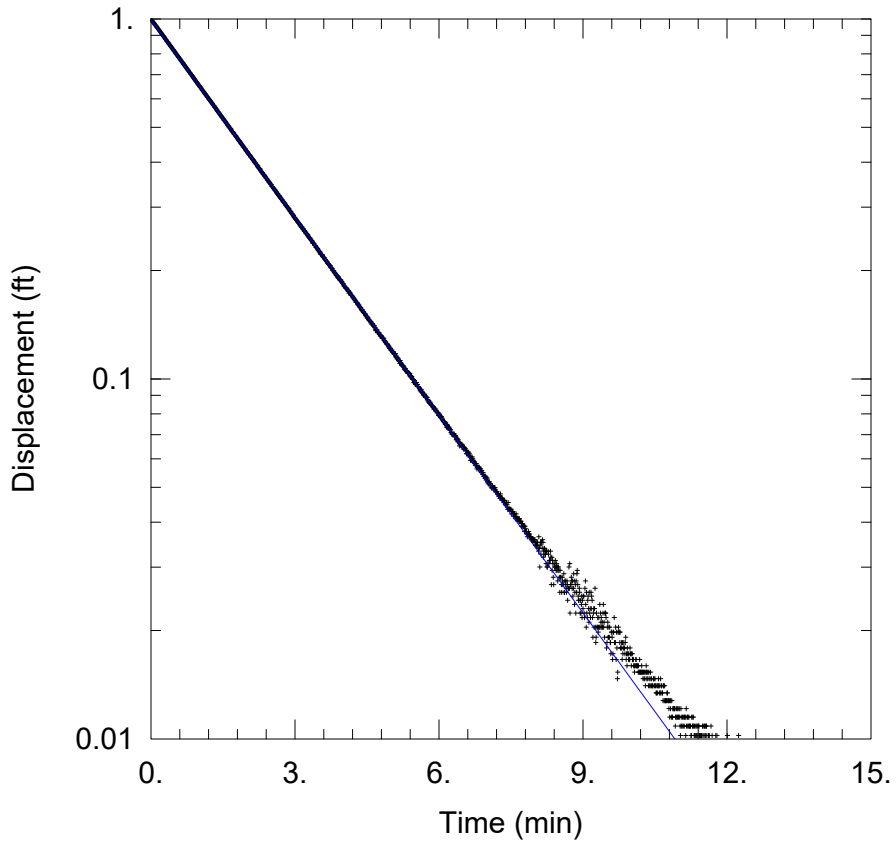
Saturated Thickness: 20.9 ft

Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (TW01)

Initial Displacement: 1. ft
Total Well Penetration Depth: 20.4 ft
Casing Radius: 0.1667 ft

Static Water Column Height: 20.9 ft
Screen Length: 10. ft
Well Radius: 0.333 ft



TW01 FH TEST 2

Data Set: Z:\...\TW01_FH-T2.aqt
Date: 09/26/19 Time: 11:23:12

PROJECT INFORMATION

Company: Stantec
Client: TVA-KIF
Project: 175668043
Location: Kingston Fossil Plant
Test Well: TW01
Test Date: 06/18/19

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 3.175 ft/day
y0 = 0.9946 ft

AQUIFER DATA

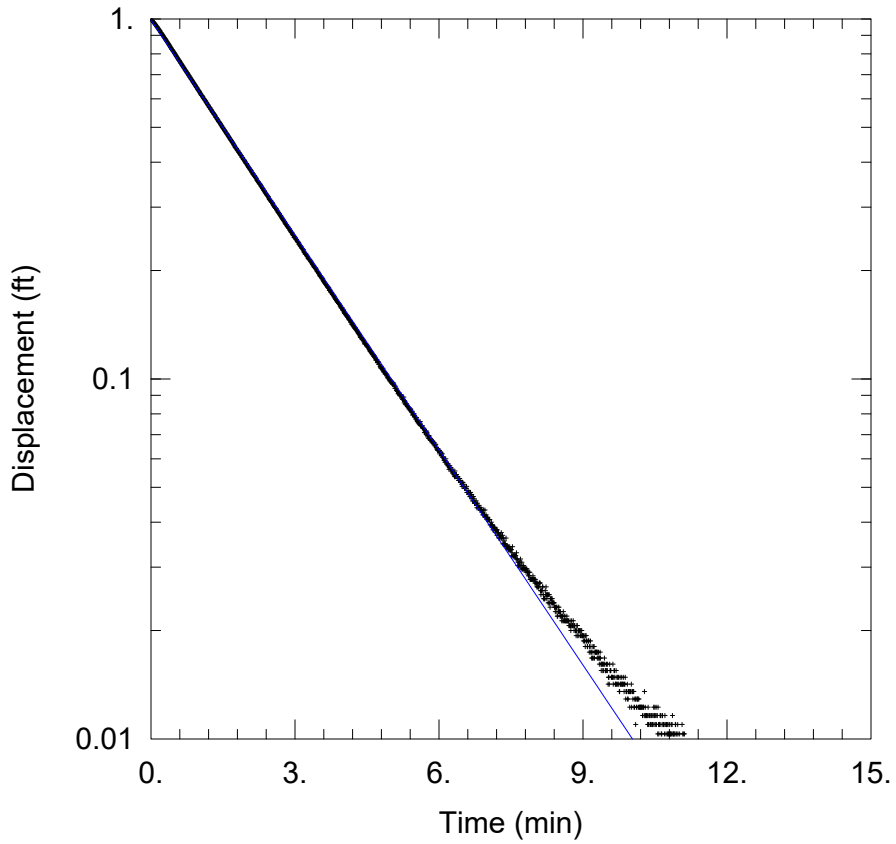
Saturated Thickness: 20.9 ft

Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (TW01)

Initial Displacement: 1. ft
Total Well Penetration Depth: 20.4 ft
Casing Radius: 0.1667 ft

Static Water Column Height: 20.9 ft
Screen Length: 10. ft
Well Radius: 0.333 ft



TW01 FH TEST 3

Data Set: Z:\...\TW01_FH-T3.aqt
Date: 09/26/19 Time: 11:22:08

PROJECT INFORMATION

Company: Stantec
Client: TVA-KIF
Project: 175668043
Location: Kingston Fossil Plant
Test Well: TW01
Test Date: 06/18/19

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

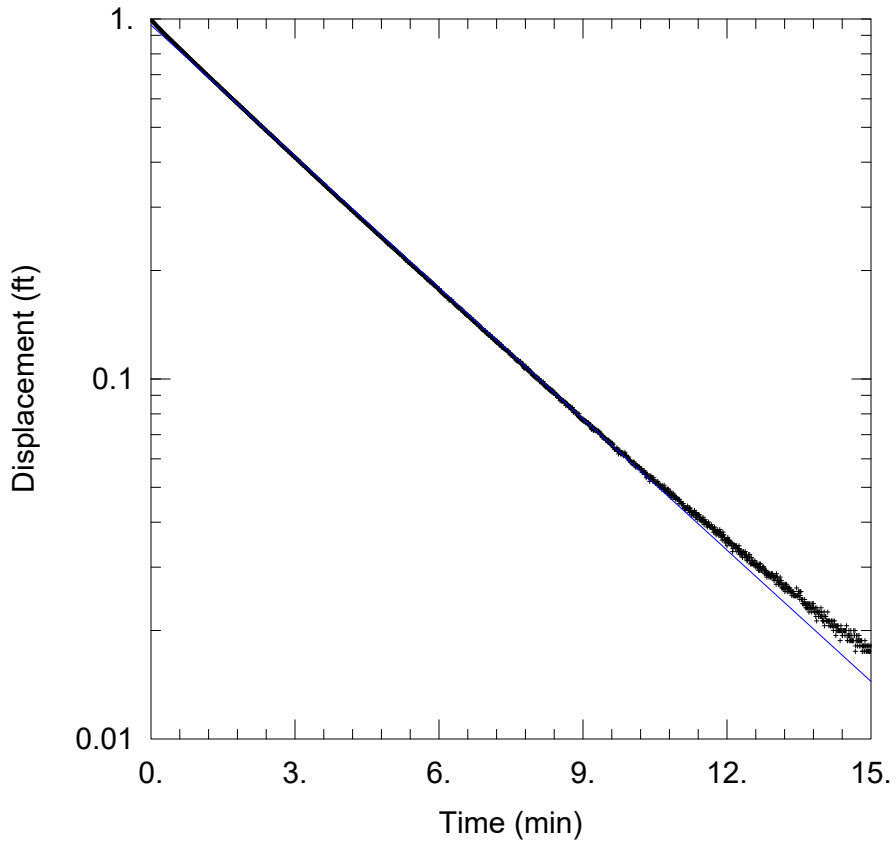
K = 3.453 ft/day
y0 = 0.9927 ft

AQUIFER DATA

Saturated Thickness: 20.9 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (TW01)

Initial Displacement: 1. ft
Total Well Penetration Depth: 20.4 ft
Casing Radius: 0.1667 ft
Static Water Column Height: 20.9 ft
Screen Length: 10. ft
Well Radius: 0.333 ft



TW01 RH TEST 1

Data Set: Z:\...\TW01_RH-T1.aqt
Date: 09/26/19 Time: 11:18:36

PROJECT INFORMATION

Company: Stantec
Client: TVA-KIF
Project: 175668043
Location: Kingston Fossil Plant
Test Well: TW01
Test Date: 06/18/19

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 2.108 ft/day
y0 = 0.9614 ft

AQUIFER DATA

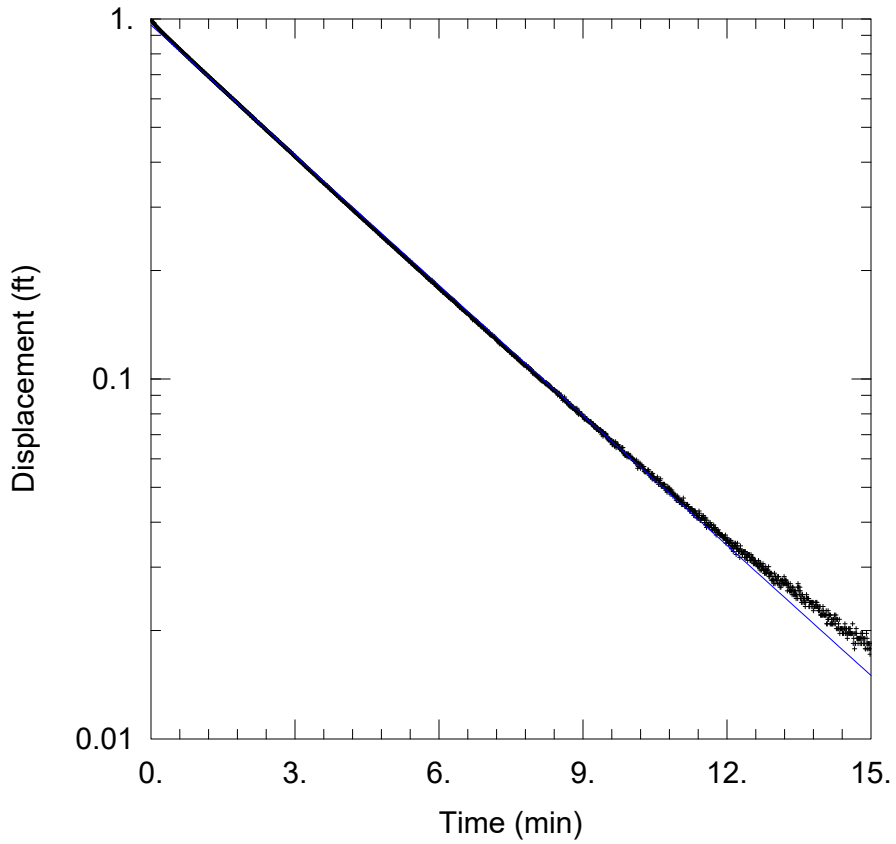
Saturated Thickness: 20.9 ft

Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (TW01)

Initial Displacement: 1. ft
Total Well Penetration Depth: 20.4 ft
Casing Radius: 0.1667 ft

Static Water Column Height: 20.9 ft
Screen Length: 10. ft
Well Radius: 0.333 ft



TW01 RH TEST 2

Data Set: Z:\...\TW01_RH-T2.aqt
Date: 09/26/19 Time: 11:18:00

PROJECT INFORMATION

Company: Stantec
Client: TVA-KIF
Project: 175668043
Location: Kingston Fossil Plant
Test Well: TW01
Test Date: 06/18/19

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

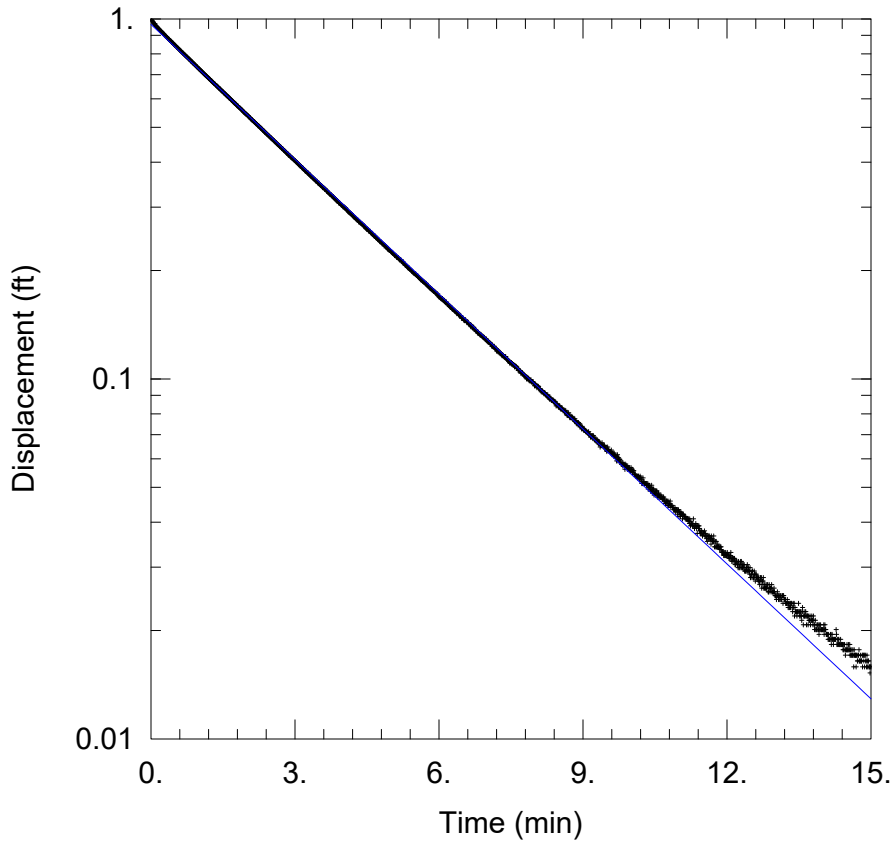
K = 2.089 ft/day
y0 = 0.9612 ft

AQUIFER DATA

Saturated Thickness: 20.9 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (TW01)

Initial Displacement: 1. ft
Total Well Penetration Depth: 20.4 ft
Casing Radius: 0.1667 ft
Static Water Column Height: 20.9 ft
Screen Length: 10. ft
Well Radius: 0.333 ft



TW01 RH TEST 3

Data Set: Z:\...\TW01_RH-T3.aqt
Date: 09/26/19 Time: 11:17:24

PROJECT INFORMATION

Company: Stantec
Client: TVA-KIF
Project: 175668043
Location: Kingston Fossil Plant
Test Well: TW01
Test Date: 06/18/19

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

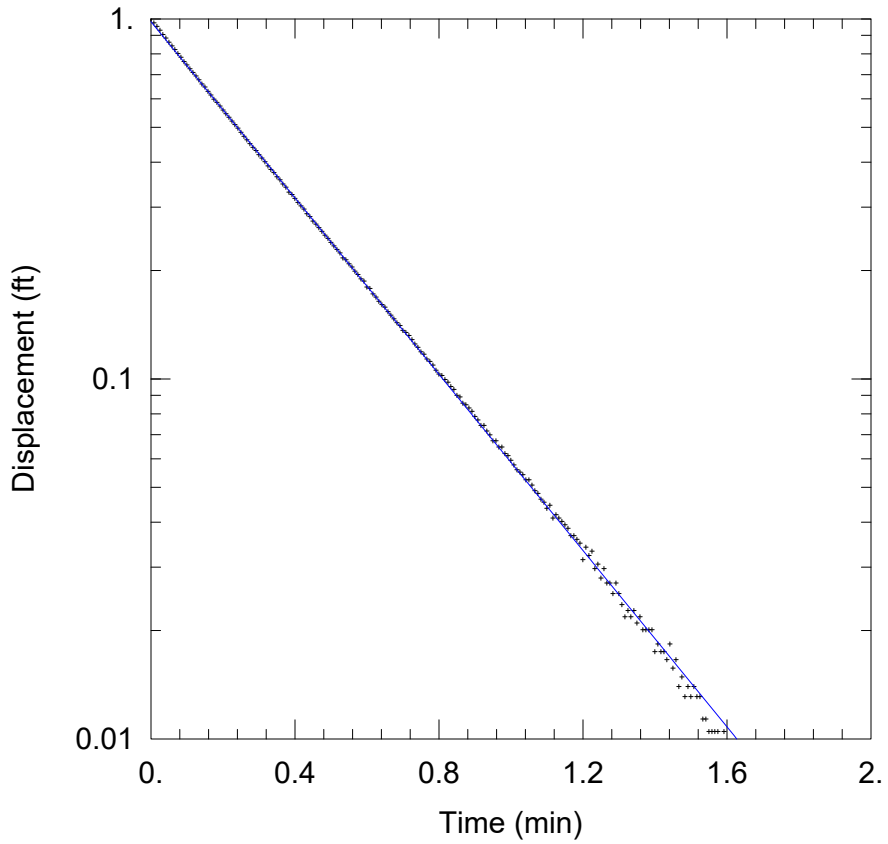
K = 2.166 ft/day
y0 = 0.9653 ft

AQUIFER DATA

Saturated Thickness: 20.9 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (TW01)

Initial Displacement: 1. ft
Total Well Penetration Depth: 20.4 ft
Casing Radius: 0.1667 ft
Static Water Column Height: 20.9 ft
Screen Length: 10. ft
Well Radius: 0.333 ft



TW02 FH TEST 1

Data Set: Z:\...\TW02_FH-T1.aqt
Date: 09/26/19 Time: 11:27:10

PROJECT INFORMATION

Company: Stantec
Client: TVA-KIF
Project: 175668043
Location: Kingston Fossil Plant
Test Well: TW02
Test Date: 06/19/19

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

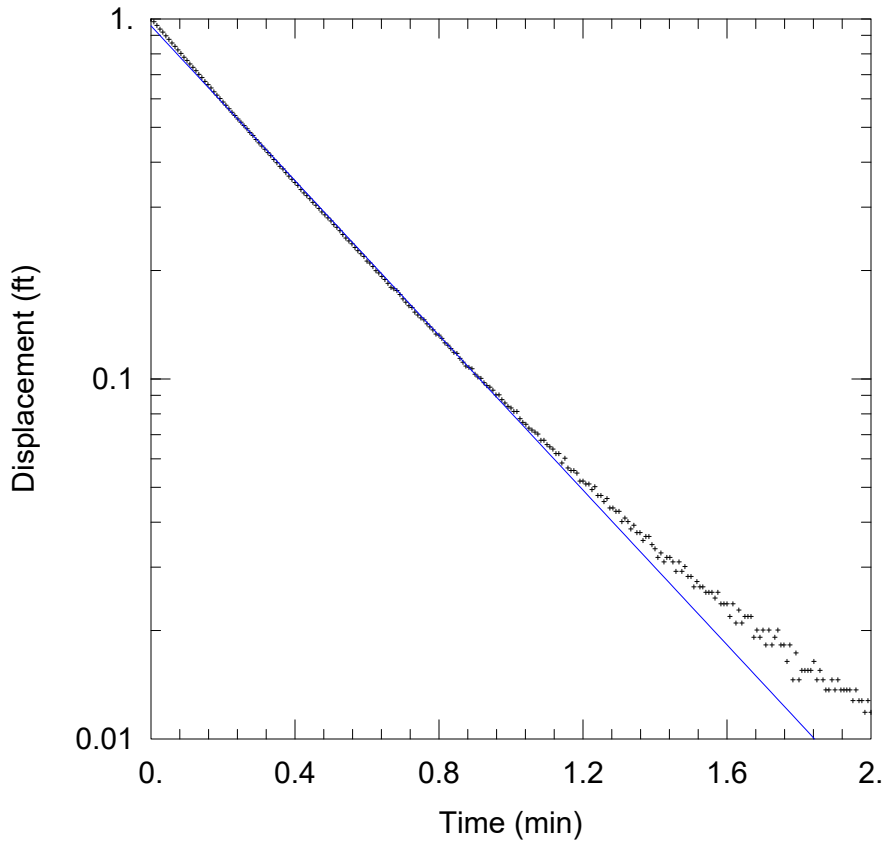
K = 21.82 ft/day
y0 = 0.9823 ft

AQUIFER DATA

Saturated Thickness: 23.9 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (TW02)

Initial Displacement: 1. ft
Total Well Penetration Depth: 23.5 ft
Casing Radius: 0.1667 ft
Static Water Column Height: 23.9 ft
Screen Length: 10. ft
Well Radius: 0.333 ft



TW02 FH TEST 2

Data Set: Z:\...\TW02_FH-T2.aqt
Date: 09/26/19 Time: 11:26:46

PROJECT INFORMATION

Company: Stantec
Client: TVA-KIF
Project: 175668043
Location: Kingston Fossil Plant
Test Well: TW02
Test Date: 06/19/19

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

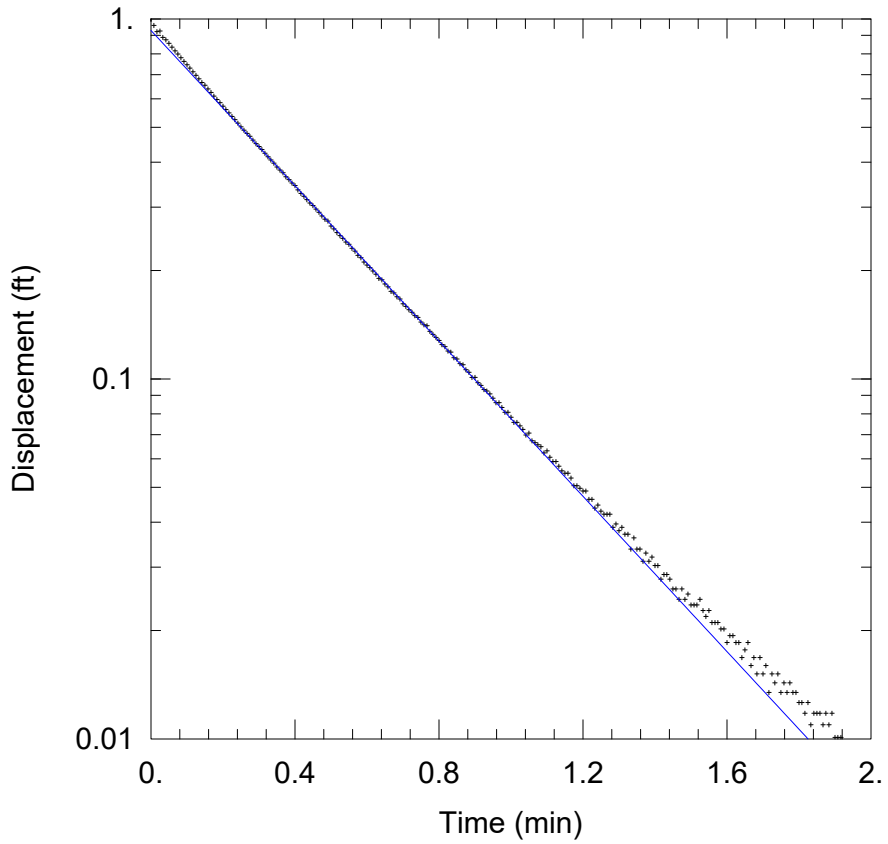
K = 19.15 ft/day
y0 = 0.9563 ft

AQUIFER DATA

Saturated Thickness: 23.9 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (TW02)

Initial Displacement: 1. ft
Total Well Penetration Depth: 23.5 ft
Casing Radius: 0.1667 ft
Static Water Column Height: 23.9 ft
Screen Length: 10. ft
Well Radius: 0.333 ft



TW02 FH TEST 3

Data Set: Z:\...\TW02_FH-T3.aqt
Date: 09/26/19 Time: 11:26:23

PROJECT INFORMATION

Company: Stantec
Client: TVA-KIF
Project: 175668043
Location: Kingston Fossil Plant
Test Well: TW02
Test Date: 06/19/19

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

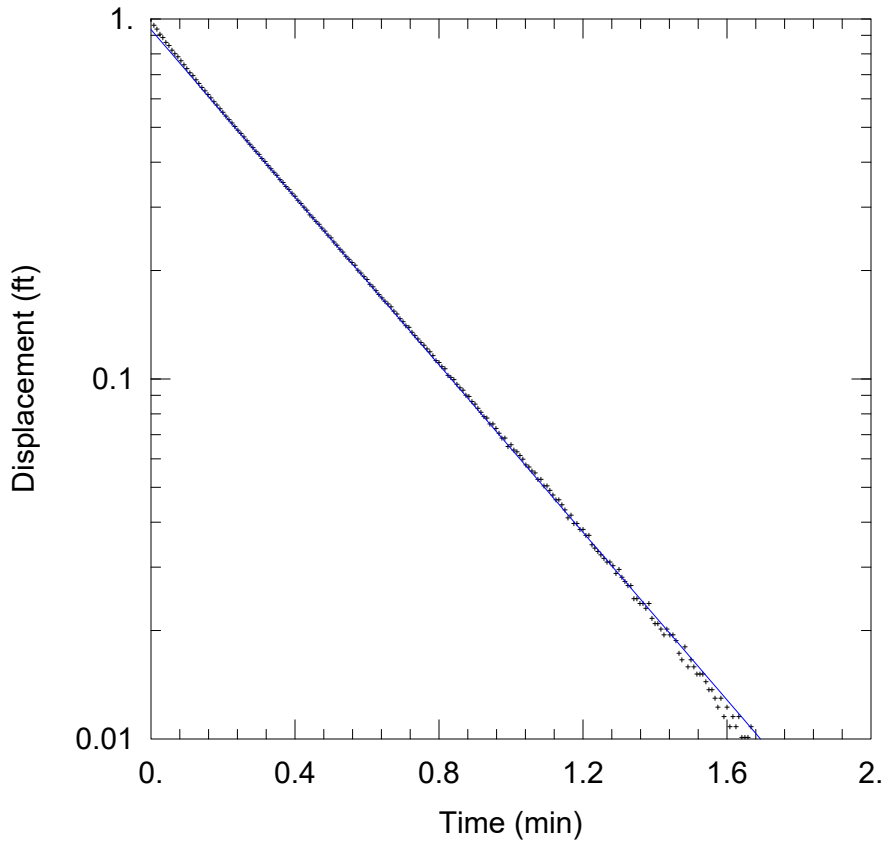
K = 19.22 ft/day
y0 = 0.9287 ft

AQUIFER DATA

Saturated Thickness: 23.9 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (TW02)

Initial Displacement: 1. ft
Total Well Penetration Depth: 23.5 ft
Casing Radius: 0.1667 ft
Static Water Column Height: 23.9 ft
Screen Length: 10. ft
Well Radius: 0.333 ft



TW02 RH TEST 1

Data Set: Z:\...\TW02_RH-T1.aqt
Date: 09/26/19 Time: 11:25:59

PROJECT INFORMATION

Company: Stantec
Client: TVA-KIF
Project: 175668043
Location: Kingston Fossil Plant
Test Well: TW02
Test Date: 06/19/19

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 20.74 ft/day
y0 = 0.934 ft

AQUIFER DATA

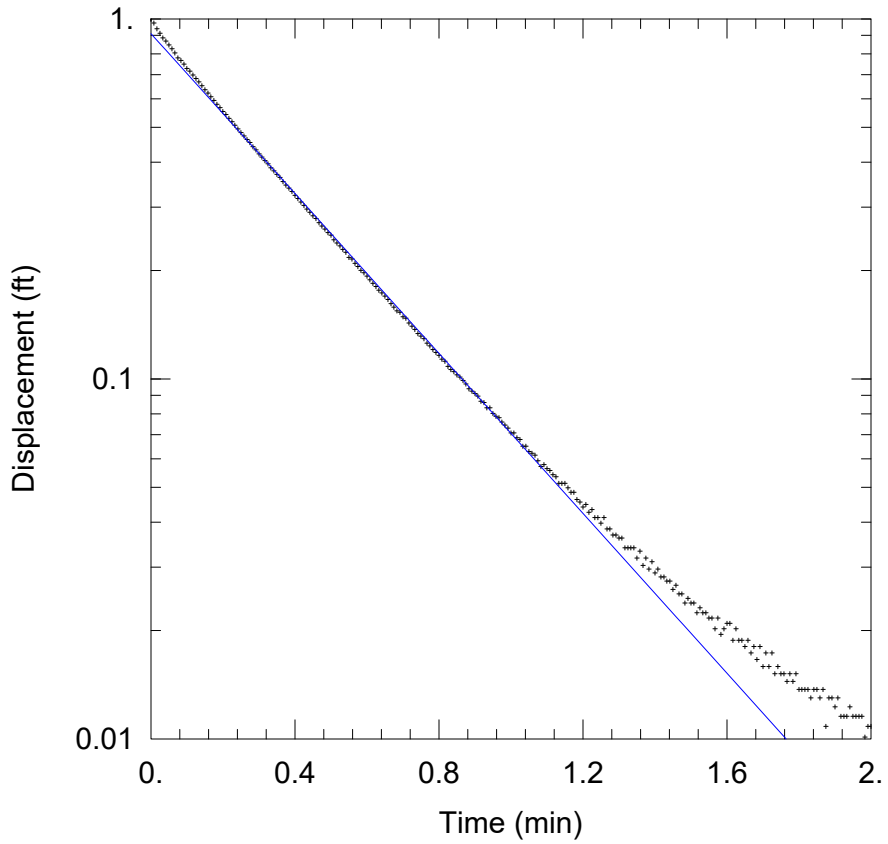
Saturated Thickness: 23.9 ft

Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (TW02)

Initial Displacement: 1. ft
Total Well Penetration Depth: 23.5 ft
Casing Radius: 0.1667 ft

Static Water Column Height: 23.9 ft
Screen Length: 10. ft
Well Radius: 0.333 ft



TW02 RH TEST 2

Data Set: Z:\...\TW02_RH-T2.aqt
Date: 09/26/19 Time: 11:25:37

PROJECT INFORMATION

Company: Stantec
Client: TVA-KIF
Project: 175668043
Location: Kingston Fossil Plant
Test Well: TW02
Test Date: 06/19/19

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

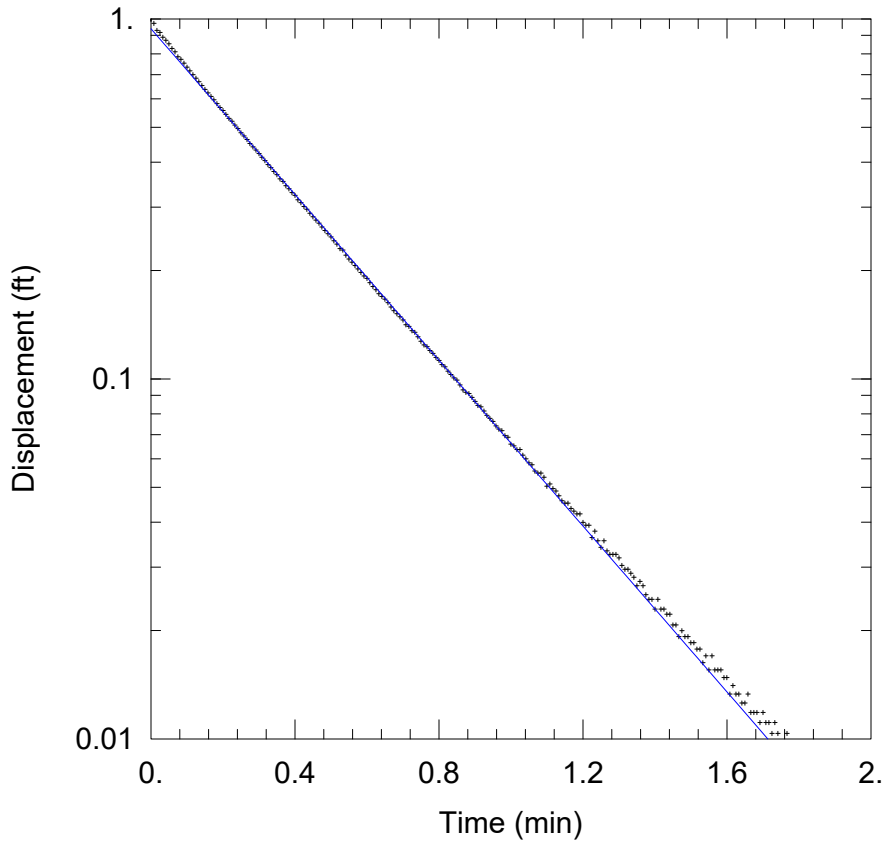
K = 19.79 ft/day
y0 = 0.9101 ft

AQUIFER DATA

Saturated Thickness: 23.9 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (TW02)

Initial Displacement: 1. ft
Total Well Penetration Depth: 23.5 ft
Casing Radius: 0.1667 ft
Static Water Column Height: 23.9 ft
Screen Length: 10. ft
Well Radius: 0.333 ft



TW02 RH TEST 3

Data Set: Z:\...\TW02_RH-T3.aqt
Date: 09/26/19 Time: 11:24:52

PROJECT INFORMATION

Company: Stantec
Client: TVA-KIF
Project: 175668043
Location: Kingston Fossil Plant
Test Well: TW02
Test Date: 06/19/19

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

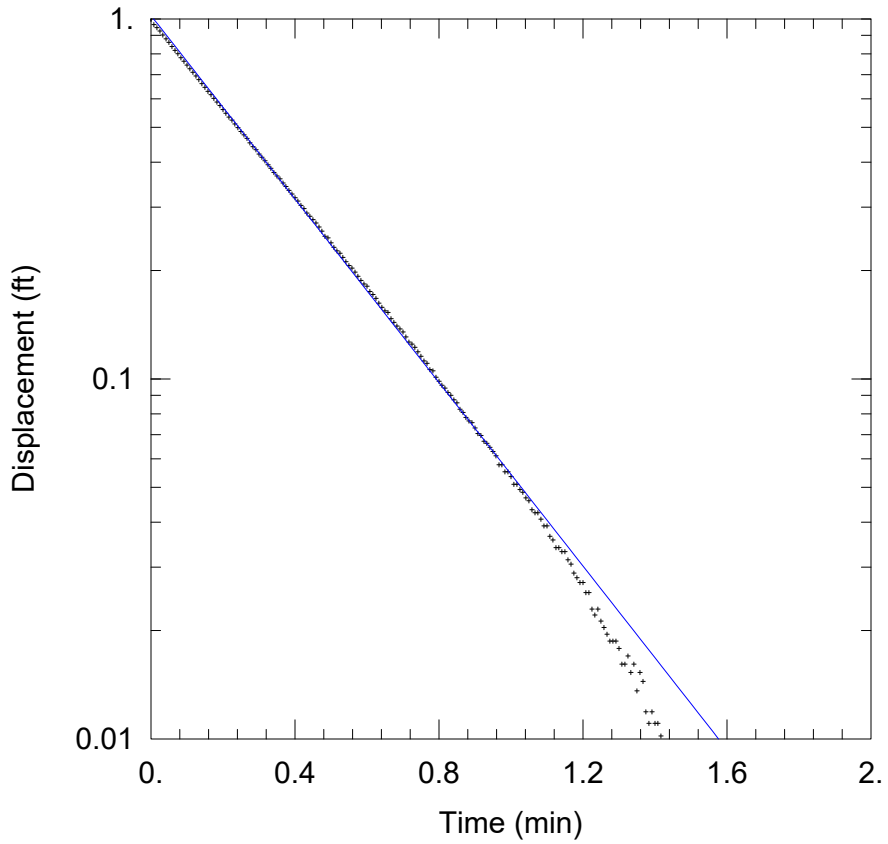
K = 20.52 ft/day
y0 = 0.9389 ft

AQUIFER DATA

Saturated Thickness: 23.9 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (TW02)

Initial Displacement: 1. ft
Total Well Penetration Depth: 23.5 ft
Casing Radius: 0.1667 ft
Static Water Column Height: 23.9 ft
Screen Length: 10. ft
Well Radius: 0.333 ft



TW03 FH TEST 1

Data Set: Z:\...\TW03_FH-T1.aqt
Date: 09/26/19 Time: 11:31:28

PROJECT INFORMATION

Company: Stantec
Client: TVA-KIF
Project: 175668043
Location: Kingston Fossil Plant
Test Well: TW03
Test Date: 06/19/19

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

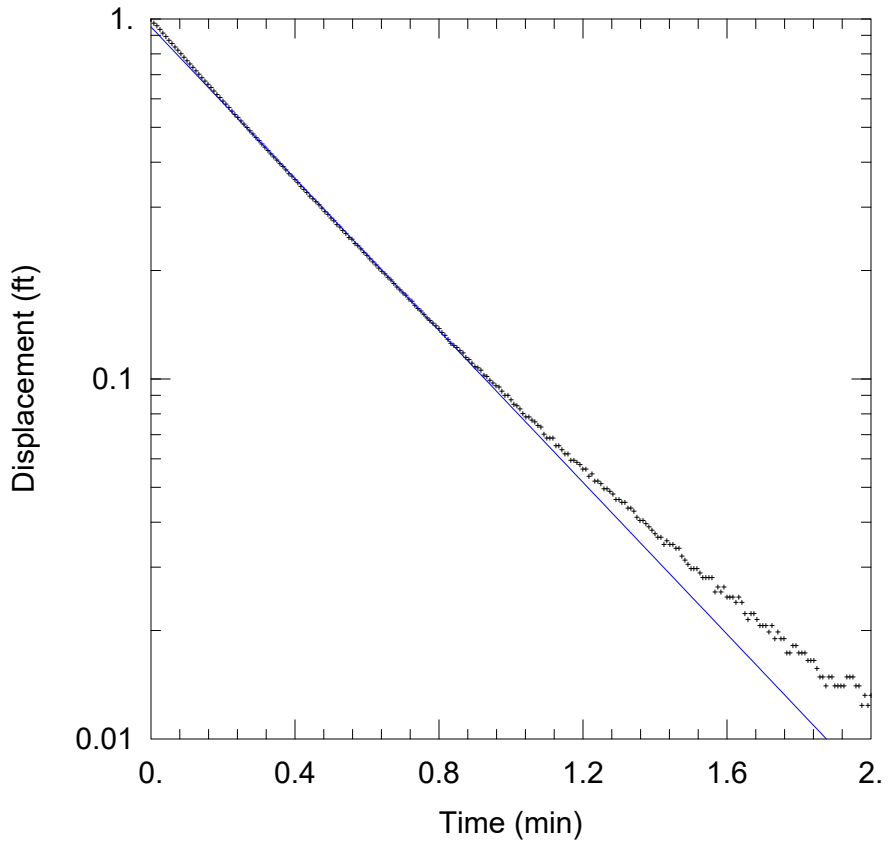
K = 22.6 ft/day
y0 = 1.022 ft

AQUIFER DATA

Saturated Thickness: 23.1 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (TW03)

Initial Displacement: 1. ft
Total Well Penetration Depth: 22.7 ft
Casing Radius: 0.1667 ft
Static Water Column Height: 23.1 ft
Screen Length: 10. ft
Well Radius: 0.333 ft



TW03 FH TEST 2

Data Set: Z:\...\TW03_FH-T2.aqt
Date: 09/26/19 Time: 11:31:10

PROJECT INFORMATION

Company: Stantec
Client: TVA-KIF
Project: 175668043
Location: Kingston Fossil Plant
Test Well: TW03
Test Date: 06/19/19

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

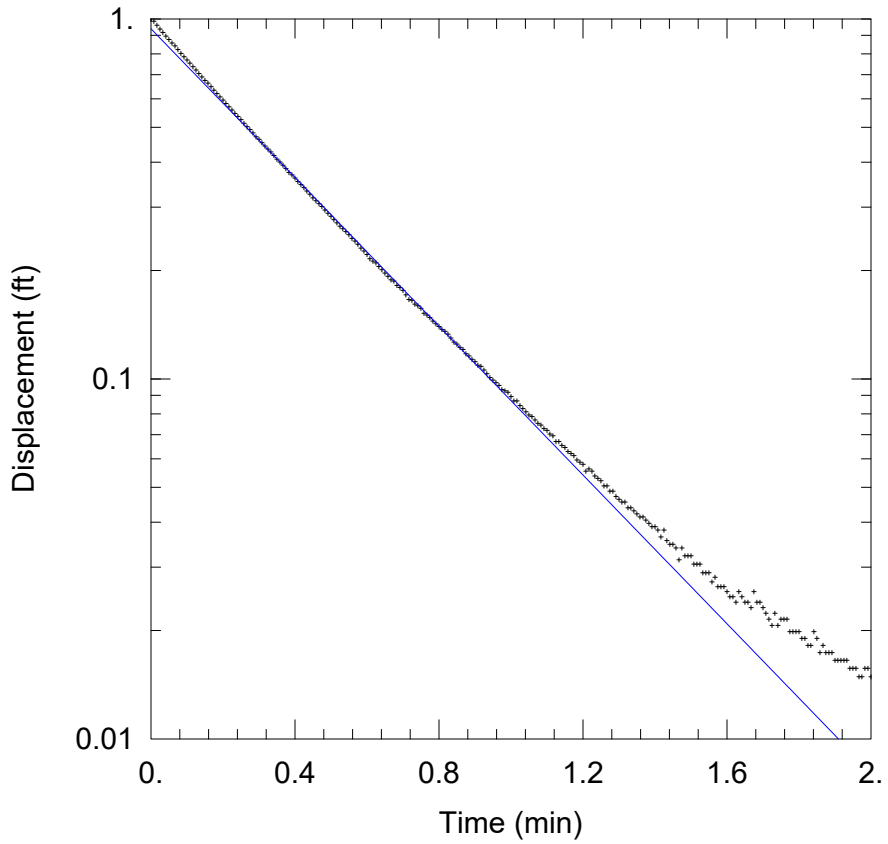
K = 18.69 ft/day
y0 = 0.9496 ft

AQUIFER DATA

Saturated Thickness: 23.1 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (TW03)

Initial Displacement: 1. ft
Total Well Penetration Depth: 22.7 ft
Casing Radius: 0.1667 ft
Static Water Column Height: 23.1 ft
Screen Length: 10. ft
Well Radius: 0.333 ft



TW03 FH TEST 3

Data Set: Z:\...\TW03_FH-T3.aqt
Date: 09/26/19 Time: 11:30:47

PROJECT INFORMATION

Company: Stantec
Client: TVA-KIF
Project: 175668043
Location: Kingston Fossil Plant
Test Well: TW03
Test Date: 06/19/19

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

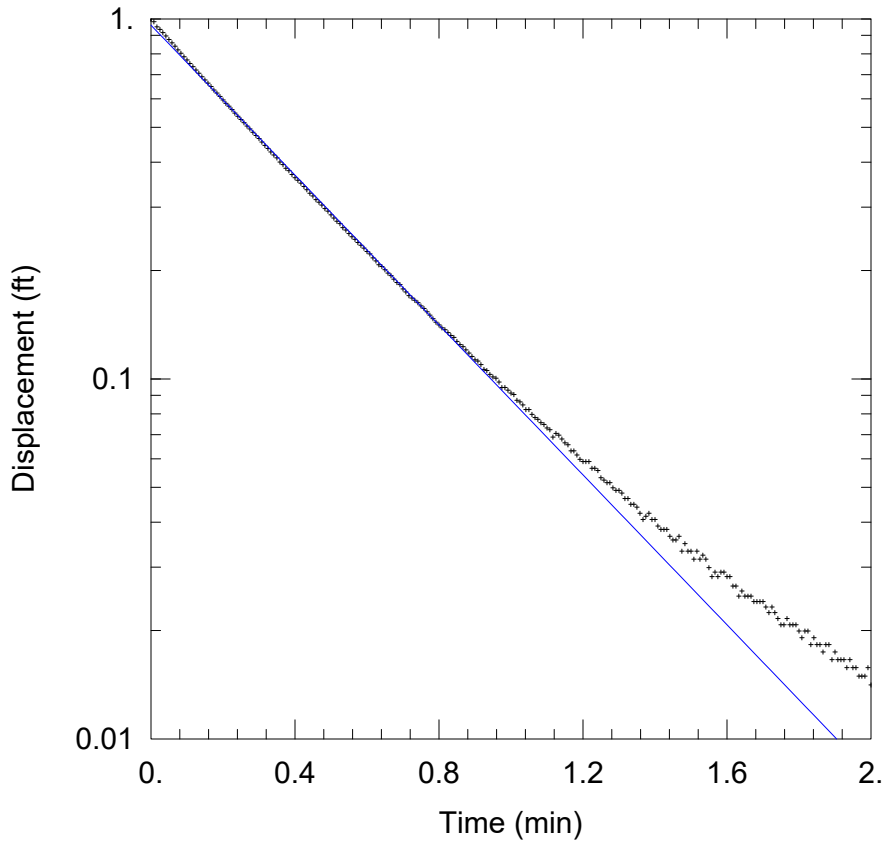
K = 18.32 ft/day
y0 = 0.9388 ft

AQUIFER DATA

Saturated Thickness: 23.1 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (TW03)

Initial Displacement: 1. ft
Total Well Penetration Depth: 22.7 ft
Casing Radius: 0.1667 ft
Static Water Column Height: 23.1 ft
Screen Length: 10. ft
Well Radius: 0.333 ft



TW03 FH TEST 4

Data Set: Z:\...\TW03_FH-T4.aqt
Date: 09/26/19 Time: 11:29:59

PROJECT INFORMATION

Company: Stantec
Client: TVA-KIF
Project: 175668043
Location: Kingston Fossil Plant
Test Well: TW03
Test Date: 06/19/19

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

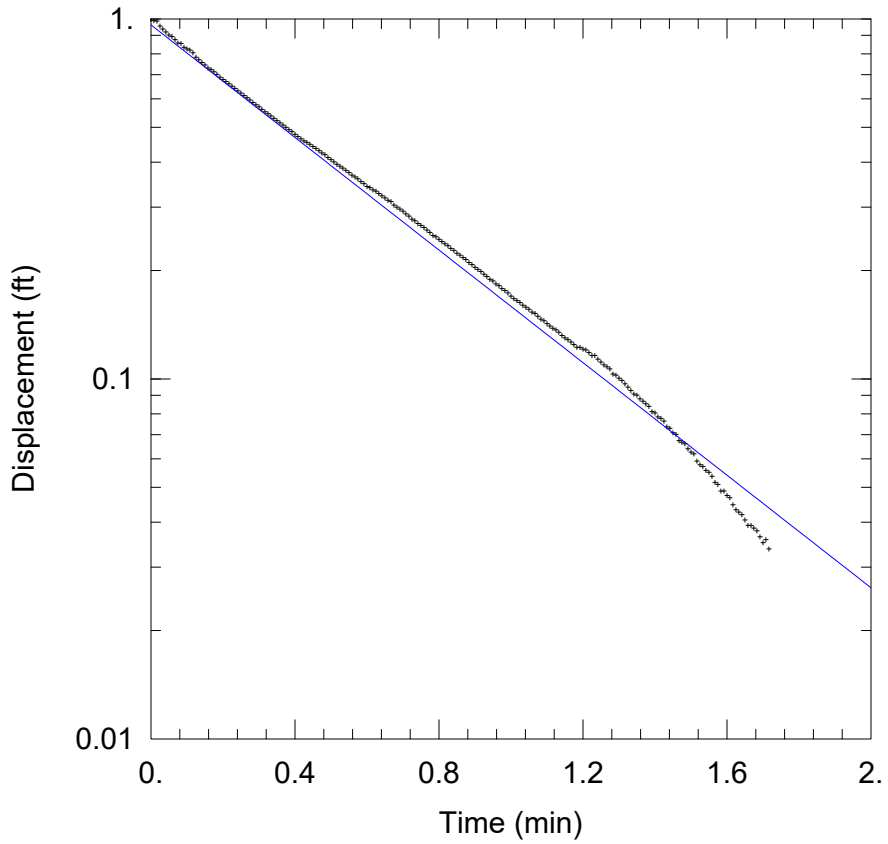
K = 18.46 ft/day
y0 = 0.9607 ft

AQUIFER DATA

Saturated Thickness: 23.1 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (TW03)

Initial Displacement: 1. ft
Total Well Penetration Depth: 22.7 ft
Casing Radius: 0.1667 ft
Static Water Column Height: 23.1 ft
Screen Length: 10. ft
Well Radius: 0.333 ft



TW03 RH TEST 1

Data Set: Z:\...\TW03_RH-T1.aqt
Date: 09/26/19 Time: 11:29:35

PROJECT INFORMATION

Company: Stantec
Client: TVA-KIF
Project: 175668043
Location: Kingston Fossil Plant
Test Well: TW03
Test Date: 06/19/19

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 13.26 ft/day
y0 = 0.9577 ft

AQUIFER DATA

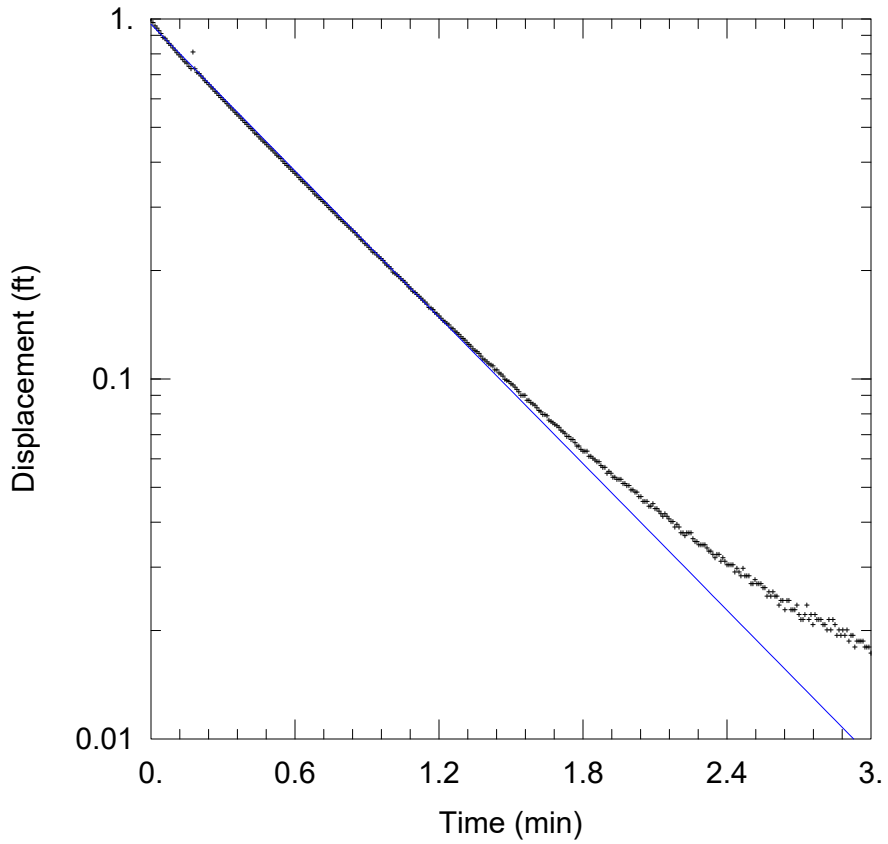
Saturated Thickness: 23.1 ft

Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (TW03)

Initial Displacement: 1. ft
Total Well Penetration Depth: 22.7 ft
Casing Radius: 0.1667 ft

Static Water Column Height: 23.1 ft
Screen Length: 10. ft
Well Radius: 0.333 ft



TW03 RH TEST 2

Data Set: Z:\...\TW03_RH-T2.aqt
Date: 09/26/19 Time: 11:29:16

PROJECT INFORMATION

Company: Stantec
Client: TVA-KIF
Project: 175668043
Location: Kingston Fossil Plant
Test Well: TW03
Test Date: 06/19/19

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 12.02 ft/day
y0 = 0.9659 ft

AQUIFER DATA

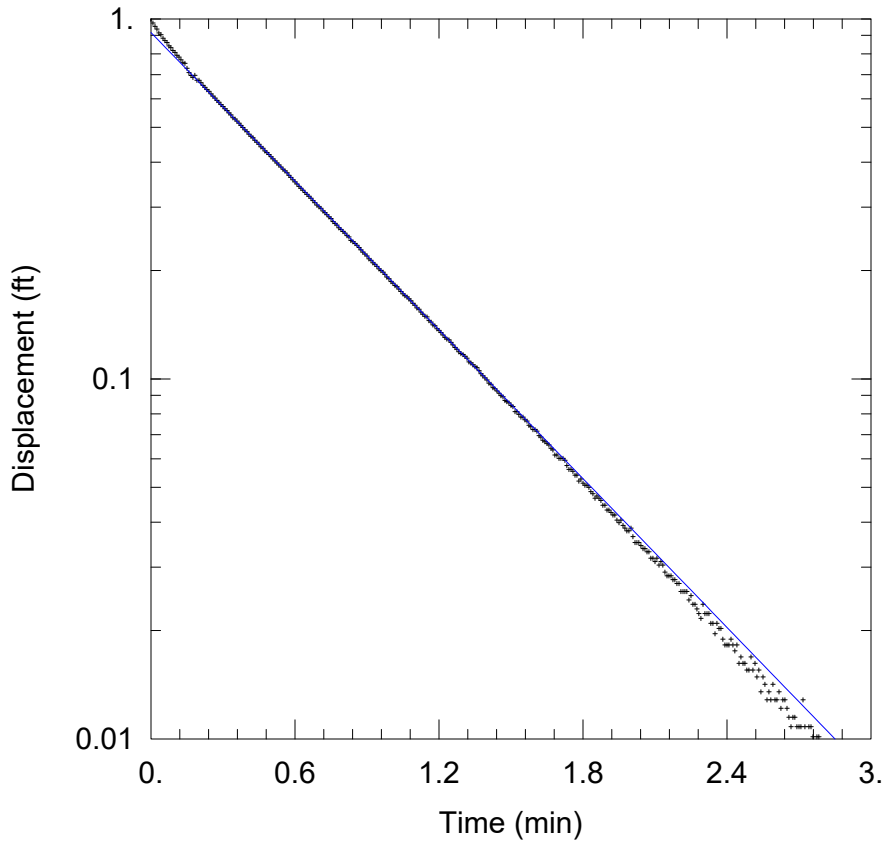
Saturated Thickness: 23.1 ft

Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (TW03)

Initial Displacement: 1. ft
Total Well Penetration Depth: 22.7 ft
Casing Radius: 0.1667 ft

Static Water Column Height: 23.1 ft
Screen Length: 10. ft
Well Radius: 0.333 ft



TW03 RH TEST 3

Data Set: Z:\...\TW03_RH-T3.aqt
Date: 09/26/19 Time: 11:28:52

PROJECT INFORMATION

Company: Stantec
Client: TVA-KIF
Project: 175668043
Location: Kingston Fossil Plant
Test Well: TW03
Test Date: 06/19/19

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 12.21 ft/day
y0 = 0.9166 ft

AQUIFER DATA

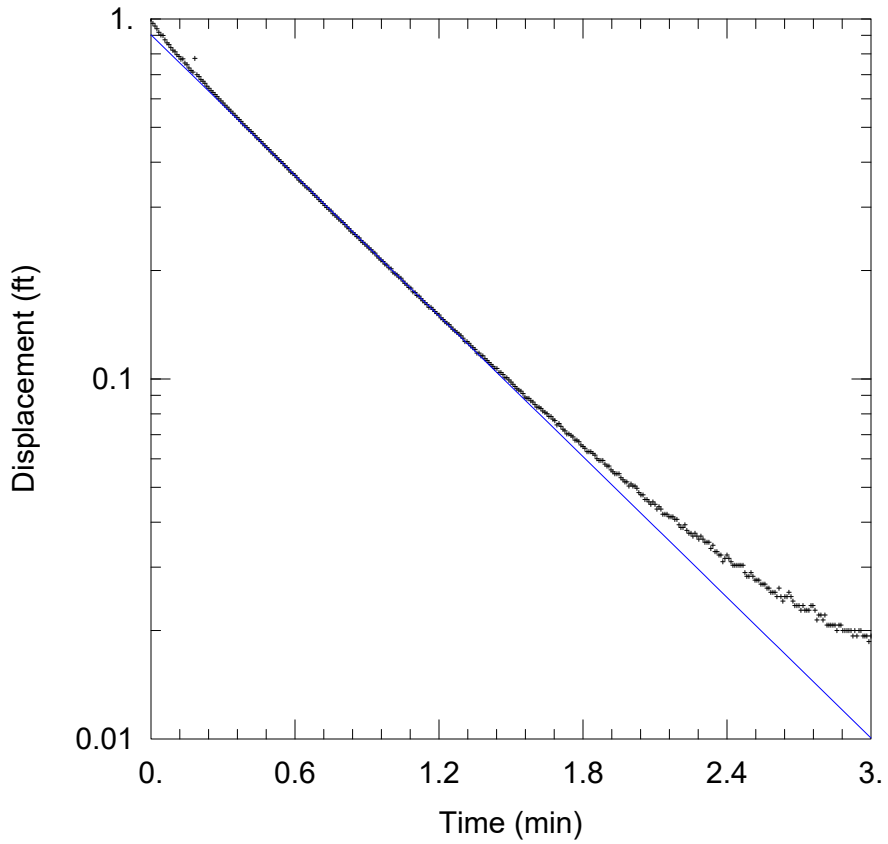
Saturated Thickness: 23.1 ft

Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (TW03)

Initial Displacement: 1. ft
Total Well Penetration Depth: 22.7 ft
Casing Radius: 0.1667 ft

Static Water Column Height: 23.1 ft
Screen Length: 10. ft
Well Radius: 0.333 ft



TW03 RH TEST 4

Data Set: Z:\...\TW03_RH-T4.aqt
Date: 09/26/19 Time: 11:28:24

PROJECT INFORMATION

Company: Stantec
Client: TVA-KIF
Project: 175668043
Location: Kingston Fossil Plant
Test Well: TW03
Test Date: 06/19/19

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

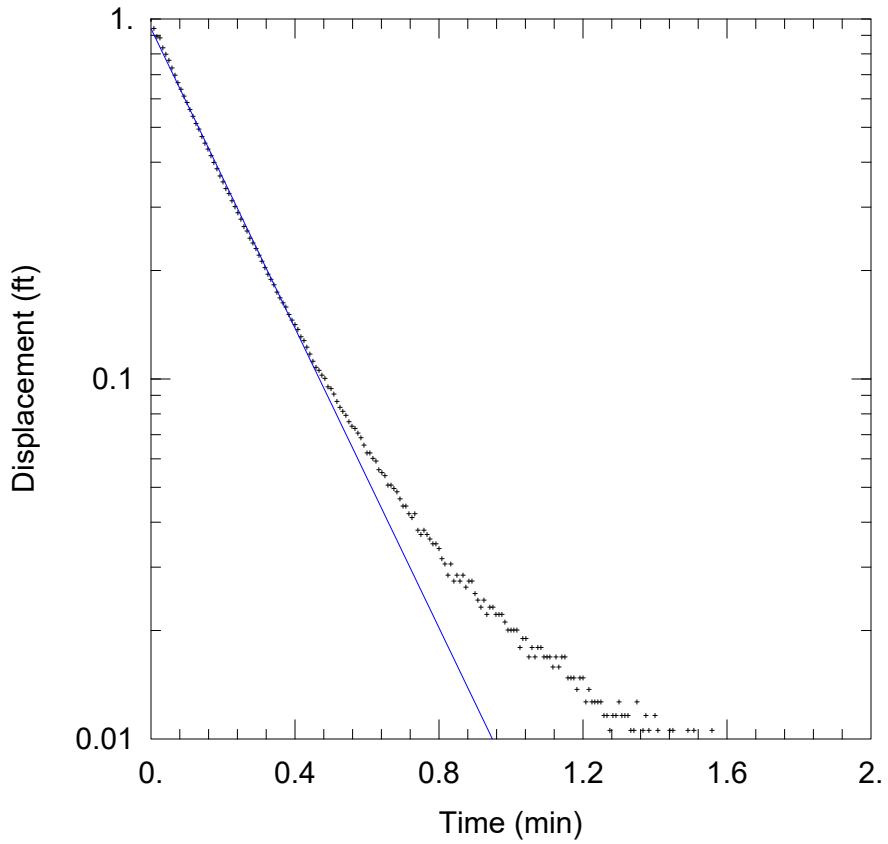
K = 11.54 ft/day
y0 = 0.9034 ft

AQUIFER DATA

Saturated Thickness: 23.1 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (TW03)

Initial Displacement: 1. ft
Total Well Penetration Depth: 22.7 ft
Casing Radius: 0.1667 ft
Static Water Column Height: 23.1 ft
Screen Length: 10. ft
Well Radius: 0.333 ft



TW04 FH TEST 1

Data Set: Z:\...\TW04_FH-T1.aqt
Date: 09/26/19 Time: 11:34:56

PROJECT INFORMATION

Company: Stantec
Client: TVA-KIF
Project: 175668043
Location: Kingston Fossil Plant
Test Well: TW04
Test Date: 06/20/19

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

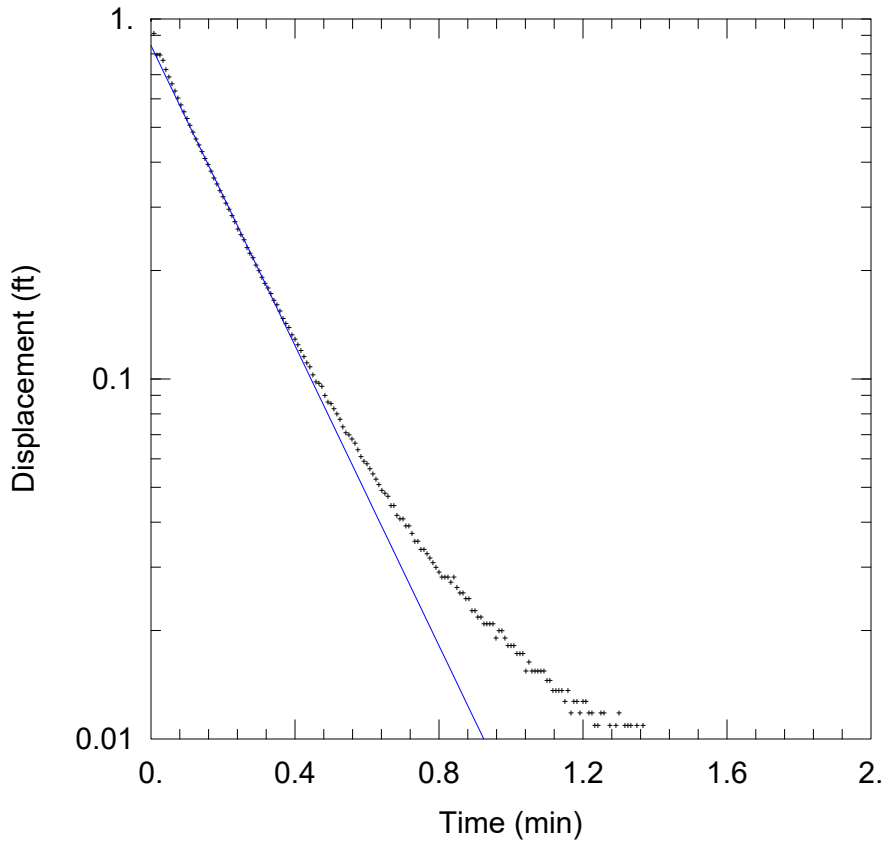
K = 39.16 ft/day
y0 = 0.9404 ft

AQUIFER DATA

Saturated Thickness: 26. ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (TW04)

Initial Displacement: 1. ft
Total Well Penetration Depth: 25.9 ft
Casing Radius: 0.1667 ft
Static Water Column Height: 26. ft
Screen Length: 10. ft
Well Radius: 0.333 ft



TW04 FH TEST 2

Data Set: Z:\...\TW04_FH-T2.aqt
Date: 09/26/19 Time: 11:34:32

PROJECT INFORMATION

Company: Stantec
Client: TVA-KIF
Project: 175668043
Location: Kingston Fossil Plant
Test Well: TW04
Test Date: 06/20/19

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

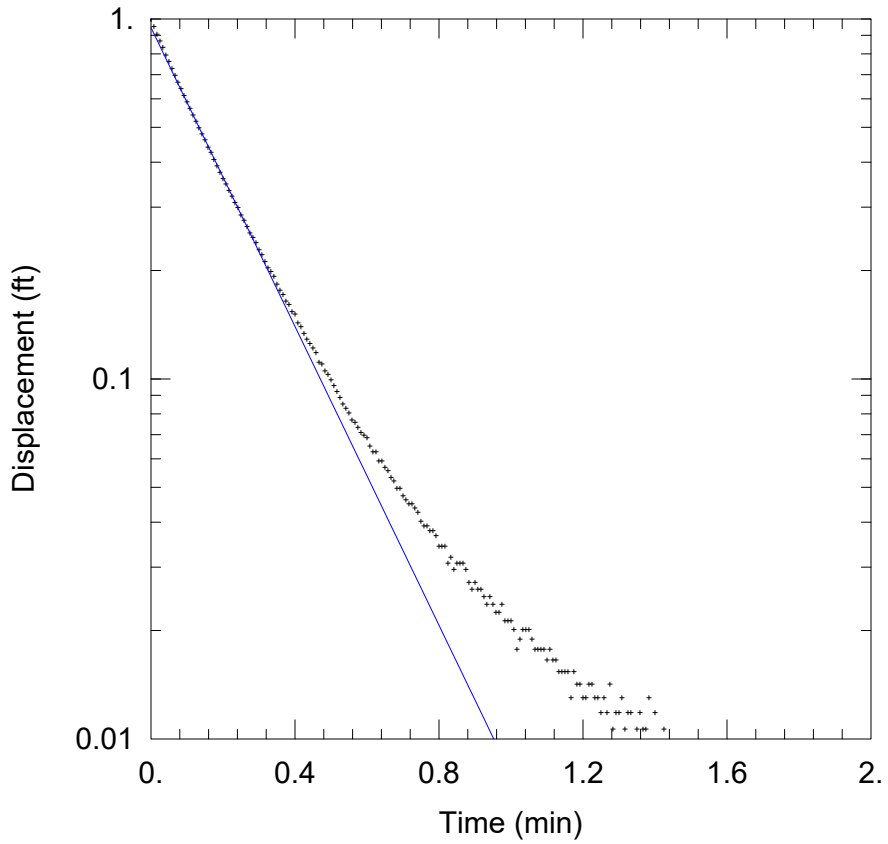
K = 39.22 ft/day
y0 = 0.8433 ft

AQUIFER DATA

Saturated Thickness: 26. ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (TW04)

Initial Displacement: 1. ft
Total Well Penetration Depth: 25.9 ft
Casing Radius: 0.1667 ft
Static Water Column Height: 26. ft
Screen Length: 10. ft
Well Radius: 0.333 ft



TW04 FH TEST 3

Data Set: Z:\...\TW04_FH-T3.aqt
Date: 09/26/19 Time: 11:34:13

PROJECT INFORMATION

Company: Stantec
Client: TVA-KIF
Project: 175668043
Location: Kingston Fossil Plant
Test Well: TW04
Test Date: 06/20/19

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

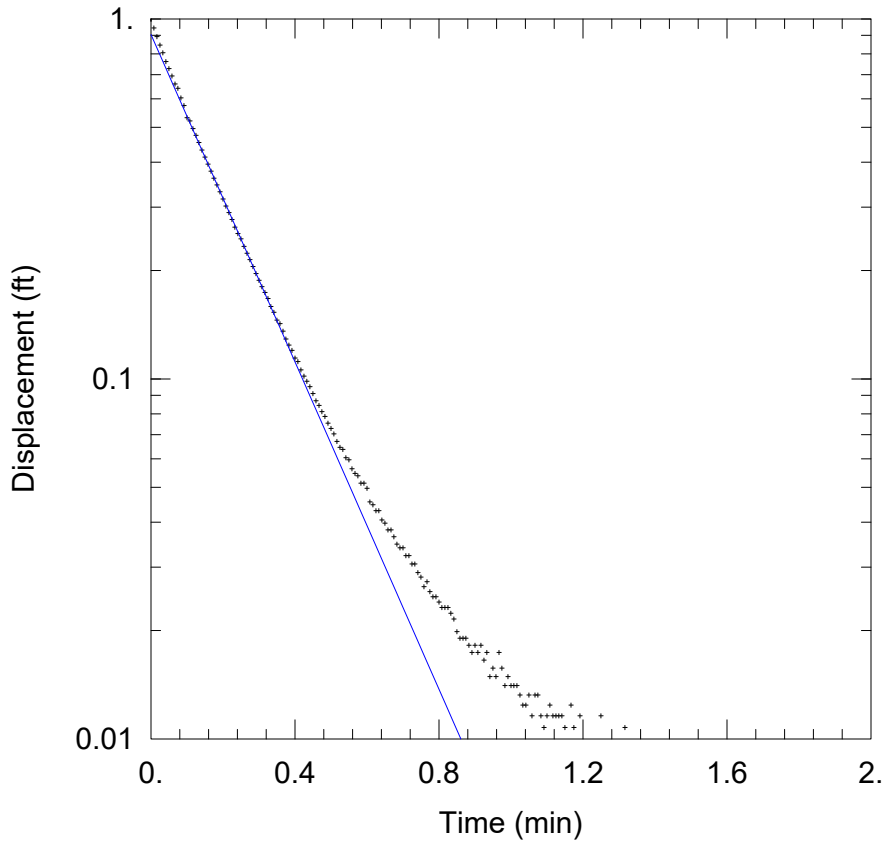
K = 39.06 ft/day
y0 = 0.9457 ft

AQUIFER DATA

Saturated Thickness: 26. ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (TW04)

Initial Displacement: 1. ft
Total Well Penetration Depth: 25.9 ft
Casing Radius: 0.1667 ft
Static Water Column Height: 26. ft
Screen Length: 10. ft
Well Radius: 0.333 ft



TW04 RH TEST 1

Data Set: Z:\...\TW04_RH-T1.aqt
Date: 09/26/19 Time: 11:33:43

PROJECT INFORMATION

Company: Stantec
Client: TVA-KIF
Project: 175668043
Location: Kingston Fossil Plant
Test Well: TW04
Test Date: 06/20/19

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

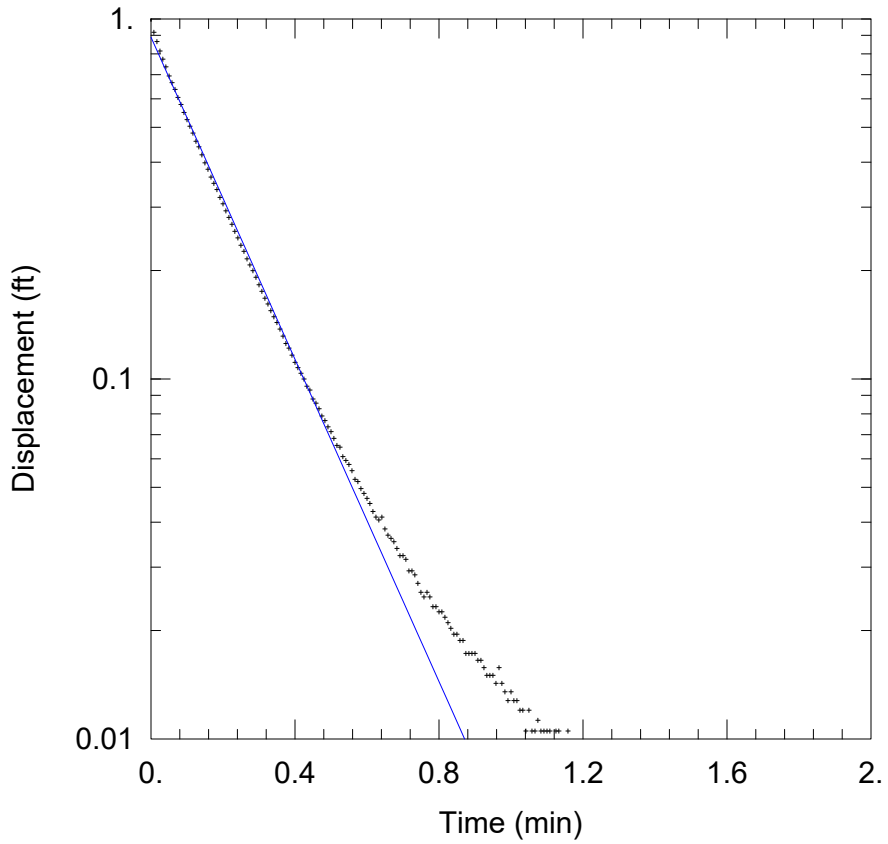
K = 42.79 ft/day
y0 = 0.9054 ft

AQUIFER DATA

Saturated Thickness: 26. ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (TW04)

Initial Displacement: 1. ft
Total Well Penetration Depth: 25.9 ft
Casing Radius: 0.1667 ft
Static Water Column Height: 26. ft
Screen Length: 10. ft
Well Radius: 0.333 ft



TW04 RH TEST 2

Data Set: Z:\...\TW04_RH-T2.aqt
Date: 09/26/19 Time: 11:33:22

PROJECT INFORMATION

Company: Stantec
Client: TVA-KIF
Project: 175668043
Location: Kingston Fossil Plant
Test Well: TW04
Test Date: 06/20/19

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

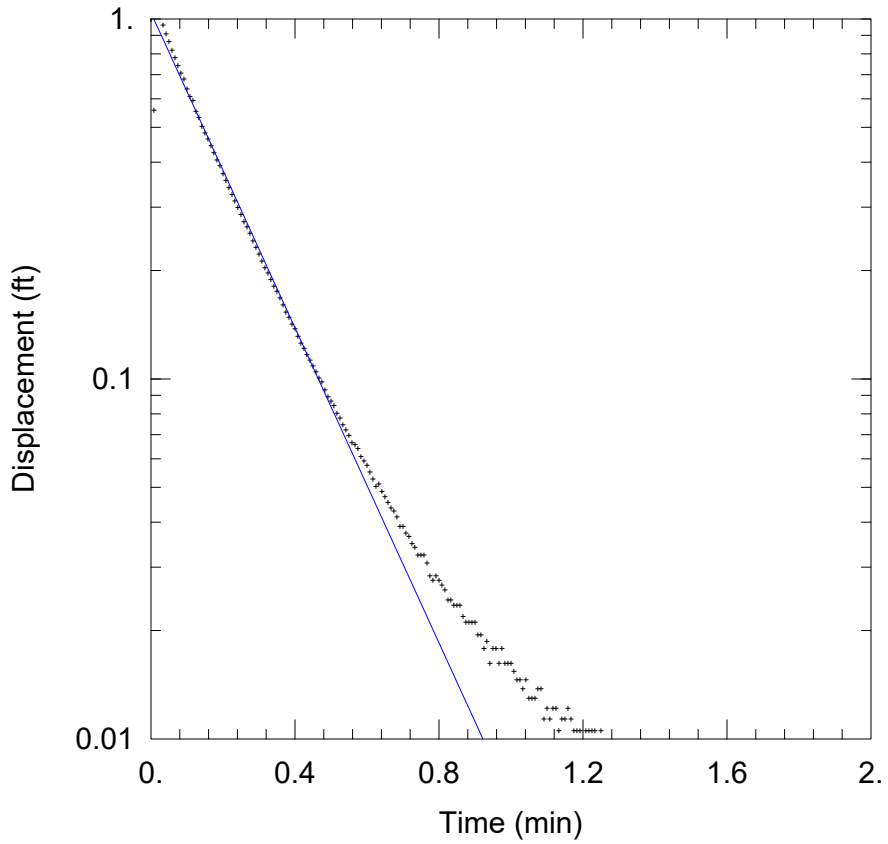
K = 42.11 ft/day
y0 = 0.8898 ft

AQUIFER DATA

Saturated Thickness: 26. ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (TW04)

Initial Displacement: 1. ft
Total Well Penetration Depth: 25.9 ft
Casing Radius: 0.1667 ft
Static Water Column Height: 26. ft
Screen Length: 10. ft
Well Radius: 0.333 ft



TW04 RH TEST 3

Data Set: Z:\...\TW04_RH-T3.aqt
Date: 09/26/19 Time: 11:32:53

PROJECT INFORMATION

Company: Stantec
Client: TVA-KIF
Project: 175668043
Location: Kingston Fossil Plant
Test Well: TW04
Test Date: 06/20/19

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 41.17 ft/day
y0 = 1.04 ft

AQUIFER DATA

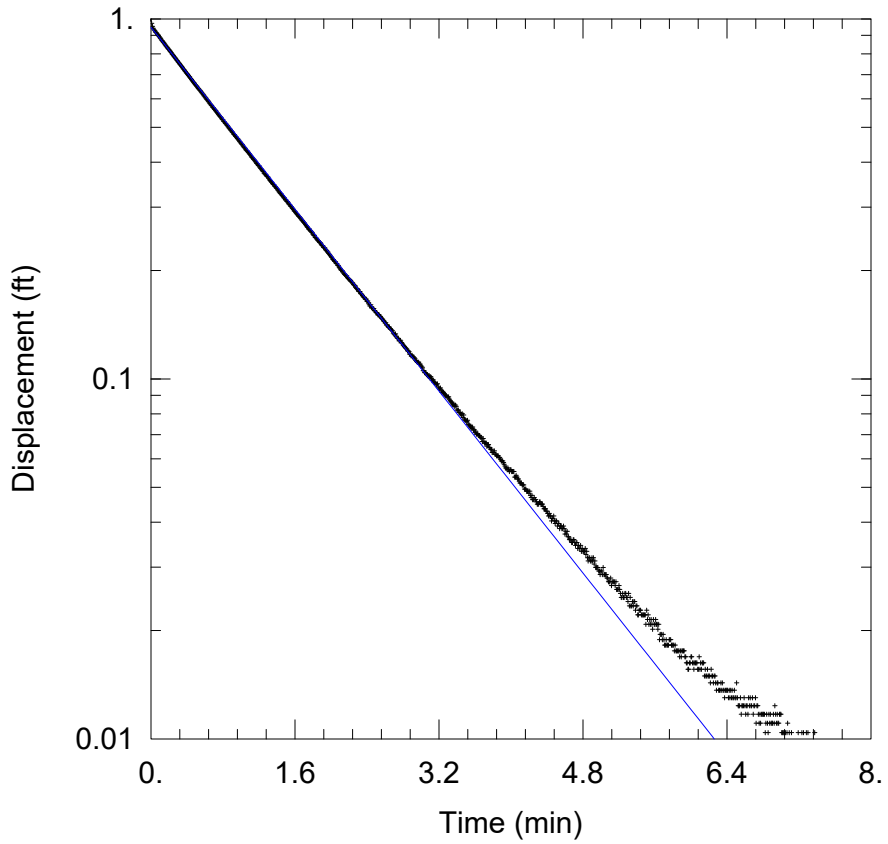
Saturated Thickness: 26. ft

Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (TW04)

Initial Displacement: 1. ft
Total Well Penetration Depth: 25.9 ft
Casing Radius: 0.1667 ft

Static Water Column Height: 26. ft
Screen Length: 10. ft
Well Radius: 0.333 ft



TW05 FH TEST 1

Data Set: Z:\...\TW05_FH-T1.aqt
Date: 09/26/19 Time: 11:37:50

PROJECT INFORMATION

Company: Stantec
Client: TVA-KIF
Project: 175668043
Location: Kingston Fossil Plant
Test Well: TW05
Test Date: 06/19/19

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

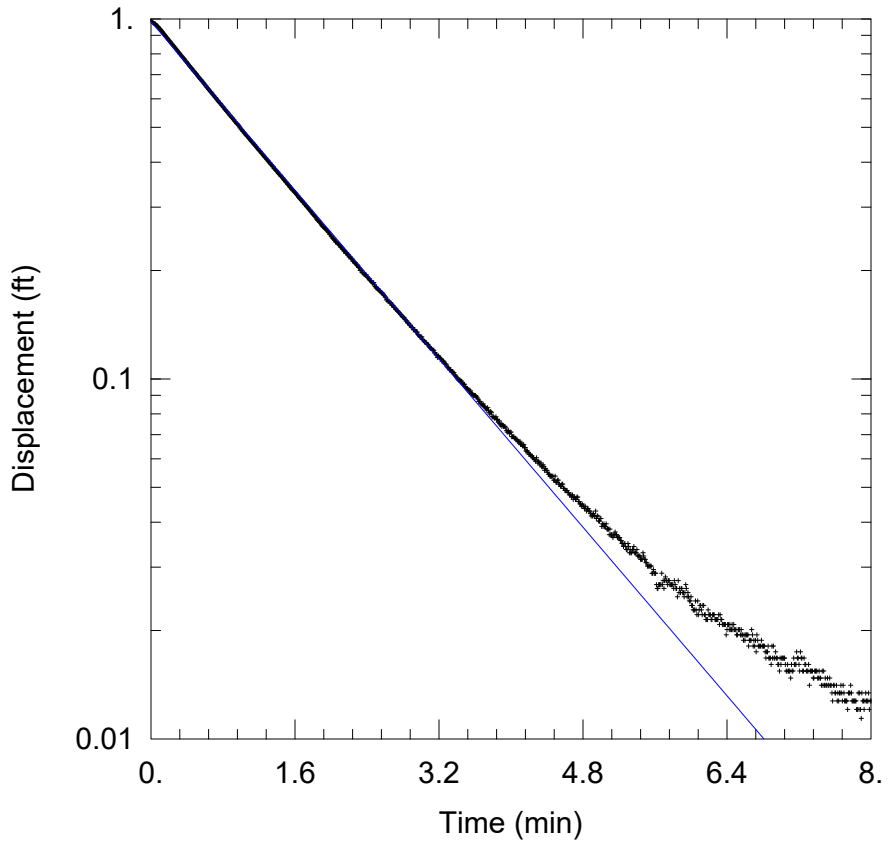
K = 4.856 ft/day
y0 = 0.9481 ft

AQUIFER DATA

Saturated Thickness: 21.9 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (TW05)

Initial Displacement: 1. ft
Total Well Penetration Depth: 21.1 ft
Casing Radius: 0.1667 ft
Static Water Column Height: 21.9 ft
Screen Length: 10. ft
Well Radius: 0.542 ft



TW05 FH TEST 2

Data Set: Z:\...\TW05_FH-T2.aqt
Date: 09/26/19 Time: 11:37:30

PROJECT INFORMATION

Company: Stantec
Client: TVA-KIF
Project: 175668043
Location: Kingston Fossil Plant
Test Well: TW05
Test Date: 06/19/19

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 4.498 ft/day
y0 = 0.9825 ft

AQUIFER DATA

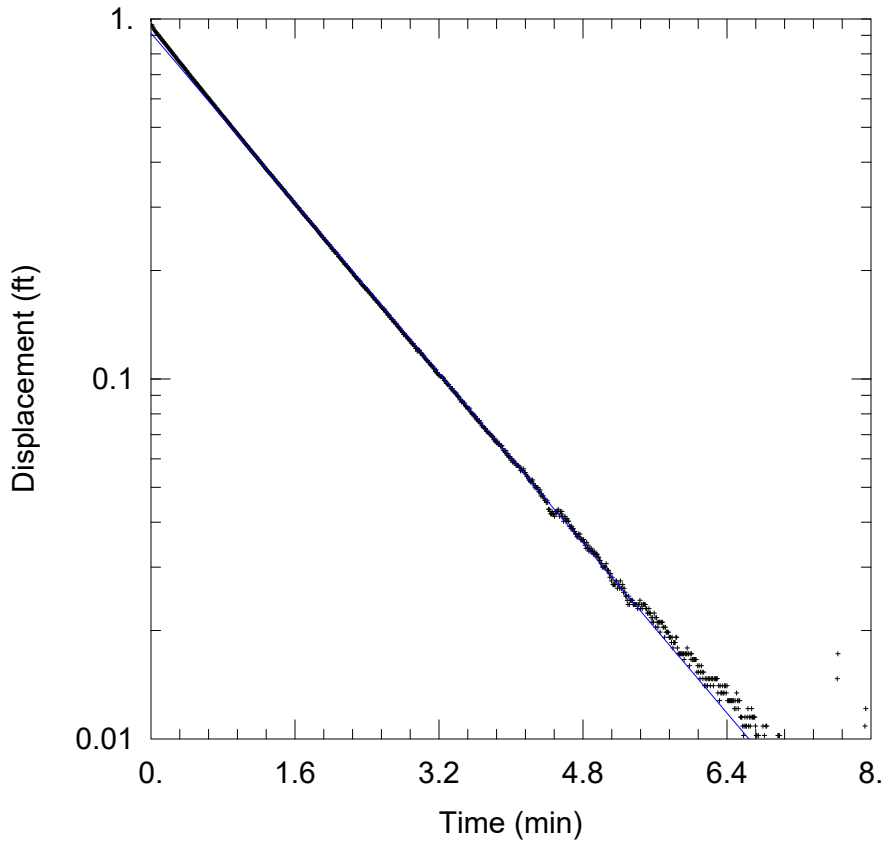
Saturated Thickness: 21.9 ft

Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (TW05)

Initial Displacement: 1. ft
Total Well Penetration Depth: 21.1 ft
Casing Radius: 0.1667 ft

Static Water Column Height: 21.9 ft
Screen Length: 10. ft
Well Radius: 0.542 ft



TW05 FH TEST 3

Data Set: Z:\...\TW05_FH-T3.aqt
Date: 09/26/19 Time: 11:37:04

PROJECT INFORMATION

Company: Stantec
Client: TVA-KIF
Project: 175668043
Location: Kingston Fossil Plant
Test Well: TW05
Test Date: 06/19/19

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

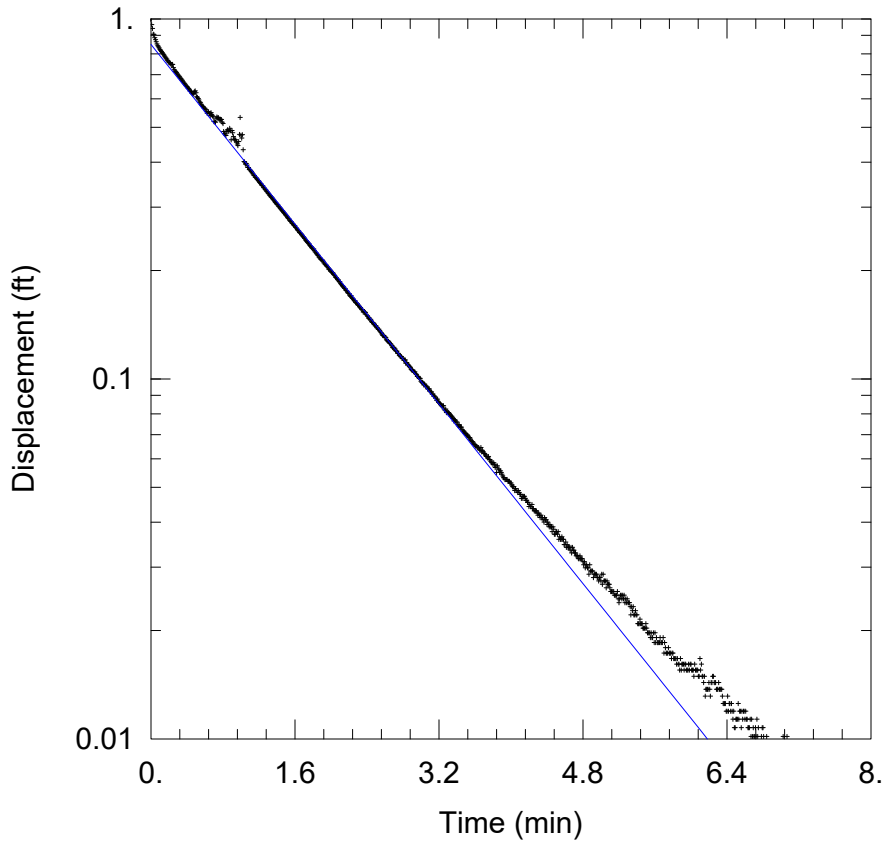
K = 4.538 ft/day
y0 = 0.9134 ft

AQUIFER DATA

Saturated Thickness: 21.9 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (TW05)

Initial Displacement: 1. ft
Total Well Penetration Depth: 21.1 ft
Casing Radius: 0.1667 ft
Static Water Column Height: 21.9 ft
Screen Length: 10. ft
Well Radius: 0.542 ft



TW05 RH TEST 1

Data Set: Z:\...\TW05_RH-T1.aqt
Date: 09/26/19 Time: 11:36:40

PROJECT INFORMATION

Company: Stantec
Client: TVA-KIF
Project: 175668043
Location: Kingston Fossil Plant
Test Well: TW05
Test Date: 06/19/19

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 4.797 ft/day
y0 = 0.849 ft

AQUIFER DATA

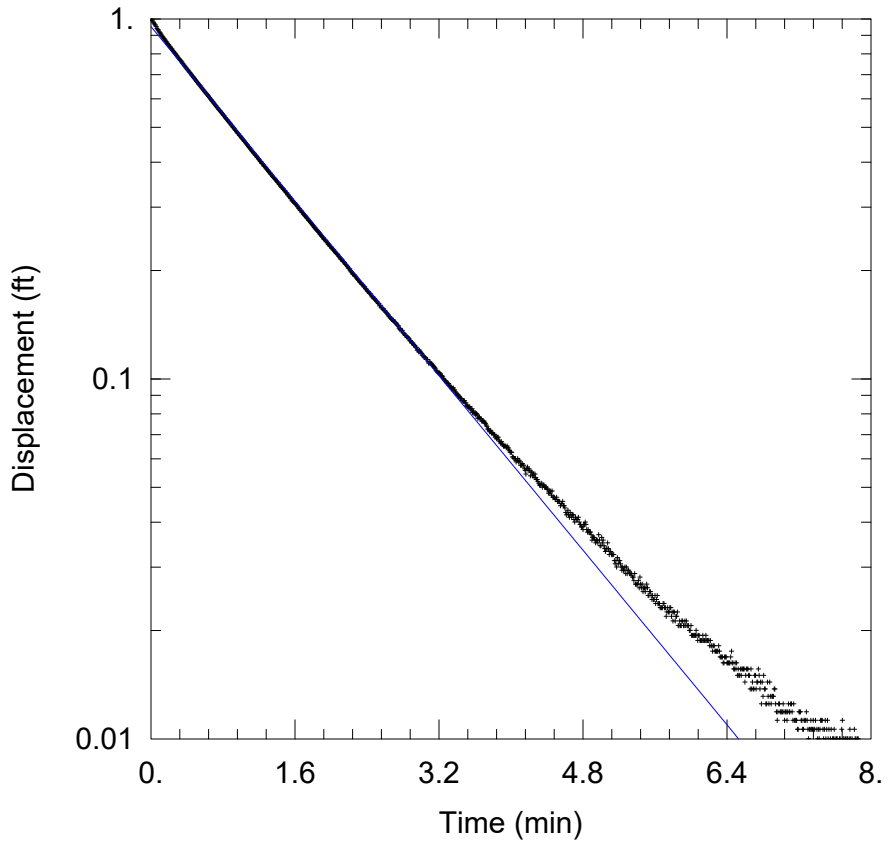
Saturated Thickness: 21.9 ft

Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (TW05)

Initial Displacement: 1. ft
Total Well Penetration Depth: 21.1 ft
Casing Radius: 0.1667 ft

Static Water Column Height: 21.9 ft
Screen Length: 10. ft
Well Radius: 0.542 ft



TW05 RH TEST 2

Data Set: Z:\...\TW05_RH-T2.aqt
Date: 09/26/19 Time: 11:36:13

PROJECT INFORMATION

Company: Stantec
Client: TVA-KIF
Project: 175668043
Location: Kingston Fossil Plant
Test Well: TW05
Test Date: 06/19/19

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

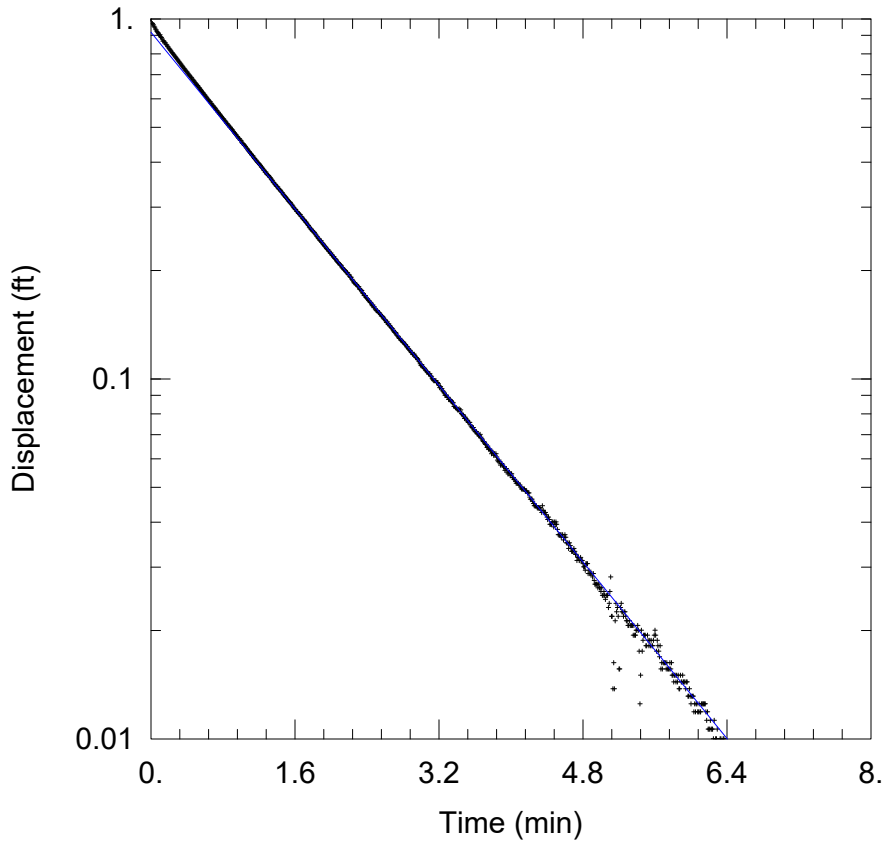
K = 4.659 ft/day
y0 = 0.9518 ft

AQUIFER DATA

Saturated Thickness: 21.9 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (TW05)

Initial Displacement: 1. ft
Total Well Penetration Depth: 21.1 ft
Casing Radius: 0.1667 ft
Static Water Column Height: 21.9 ft
Screen Length: 10. ft
Well Radius: 0.542 ft



TW05 RH TEST 3

Data Set: Z:\...\TW05_RH-T3.aqt
Date: 09/26/19 Time: 11:35:33

PROJECT INFORMATION

Company: Stantec
Client: TVA-KIF
Project: 175668043
Location: Kingston Fossil Plant
Test Well: TW05
Test Date: 06/19/19

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 4.713 ft/day
y0 = 0.9178 ft

AQUIFER DATA

Saturated Thickness: 21.9 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (TW05)

Initial Displacement: 1. ft
Total Well Penetration Depth: 21.1 ft
Casing Radius: 0.1667 ft
Static Water Column Height: 21.9 ft
Screen Length: 10. ft
Well Radius: 0.542 ft

ATTACHMENT E.2

Automatic Hammer Energy Verification Report

Stantec Consulting Services Inc.
3052 Beaumont Centre Circle, Lexington KY 40513-1703

March 7, 2021 175668043

Attention: Mr. Jeff Dingrando
Stantec Consulting Services Inc.
3052 Beaumont Centre Circle
Lexington, Kentucky 40513-1703

Reference: Automatic Hammer Energy Verification – CME 55 #1 (#709) Track Drill Rig SN: 330045

Dear Mr. Dingrando,

Stantec Consulting Services Inc. (Stantec) is pleased to submit this letter regarding the automatic Standard Penetration Test (SPT) hammer energy verification of your 2004 CME 55 Track #1 (#709) SN: 330045. Included within this letter is a summary table followed by a detailed description of the testing equipment used, testing procedures and a summary of the test results.

Summary of Automatic Hammer Energy Verification	
Rig ID:	Stantec CME 55 Track #1 (#709) SN: 330045
Hammer Type:	CME Automatic (140-lb)
Project and Location:	TVA KIF Seismic Borings, Kingston, Tennessee
Test Date and Time:	February 23, 2021 0800 - 1300
Equipment Operator:	Benjamin A. Halada (Stantec)
Drill Operator:	Eddie Caudill (Stantec)
Energy Transfer Ratio (%) [Low-High-**Average**]	84.2% - 95.6% - **89.8%**

Equipment and Procedures

SPT hammer energy verification was performed on Tuesday, February 23, 2021 in Kingston, Tennessee, while the drill was operating on the Tennessee Valley Authority (TVA) Kingston Fossil Plant property. Stantec utilized energy measurement equipment manufactured by Pile Dynamics, Inc. (PDI), of Cleveland, Ohio. Equipment for data acquisition for energy measurements for dynamic penetrometers (per ASTM D 4633) consisted of PDI's Pile Driving Analyzer, Model SPT (SN 4565 TB), an instrumented NW-J rod (SN 393NWJ) with two strain gages (SN 393NWJ-1 and 393NWJ-2) and two piezoresistive accelerometers (SN K3739 and K3740). This system has a sampling frequency of 50 kHz. The instrumented rod measured two-feet in length and was located at the top of the drill string during energy measurement. The strain gages and accelerometers were located one-foot below the top of the instrumented rod. The SPT's were driven per ASTM D 1586.

The above referenced drill rig is equipped with a Central Mine Equipment (CME) automatic SPT hammer that utilizes a hydraulic motor to turn a chain that in turn lifts a 140-lb drive weight and releases the weight for a free fall distance of 30 inches. The drive weight impacts

Reference: Automatic Hammer Energy Verification – CME 55 #1 (#709) Track Drill Rig SN: 330045

a CME anvil (12.75 inches in length and 2.50 inches in diameter) that is threaded into the top of the instrumented rod. During the energy measurements, the hammer was operated in accordance with the manufacturers recommendations, was not lubricated between or during standard penetration tests, the blow rate was approximately 54 blows per minute and the auto hammer / sample rods were kept vertical. At the time of the tests, the weather was 35 to 60° Fahrenheit with sunny skies and little to no wind.

Standard Penetration Testing was performed using a standard two-inch outer diameter split spoon sampler that was driven 1.5 feet. Testing began at a depth of 17.5 feet below the ground surface and was performed intermittently to 38.0 feet below the ground surface. The boring was advanced using a 4 7/8" diameter updraft bit and a bentonite based drilling fluid that had an average density of 9.0 lbs/gal. During the testing, the maximum transferred energy (EMX) was measured by the instrumented rod and compared to the theoretical potential energy (TPE) of the 140-lb drive weight dropping 30 inches. An energy transfer ratio (ETR) was then computed by dividing the EMX by the TPE.

Closing

The ETR for your 2004 CME 55 Track #1 (#709) SN: 330045 ranged from a low of 84.2% to a high of 95.6% with an average of 89.8%. Per ASTM D 4633, this hammer energy verification is valid for one year from the testing date of February 23, 2021. The attached Table 1 presents detailed results of the energy measurement.

Regards,

STANTEC CONSULTING SERVICES INC.

Benjamin A. Halada, PE
Senior Associate
Phone: (859) 422-3070
ben.halada@stantec.com

Attachment: Table 1: Summary of SPT Results – Stantec CME 55 Track #1 (#709)
Test interval summaries
Plots of force and normalized velocity versus time for each test interval
Pile Driving Analyzer, Model SPT Calibration
Rod Calibration
Piezoresistive Accelerometer Calibration

Table 1: Summary of SPT Results - CME 55 Track #1 (#709)

Stantec Consulting Services Inc.
Test Date: 2/23/2021
Drill Rig: CME 55 Track #1 (709) SN: 330045
Rod Size: NW-J
Driller: Eddie Caudill

Project Number: 175668043
Boring ID: KIF-B05
Location: TVA KIF
Hammer: 140 lbs
Drop Height: 30 inches
Theoretical Potential Energy (TPE): 350 lbs-ft

Test Date	Sample ID	Rod Length [1] (feet)	Beginning Depth [2] (feet)	Ending Depth [2] (feet)	Blow Counts (blows/6")	Field N-Value	Hammer Blow Rate (bpm)	Avg. Max Compressive Force (FMX) (kips)	Maximum Velocity (VMX) (ft/sec)	Transferred Energy (EMX) (lbs-ft)	Avg. Energy Transfer Ratio (ETR) [3] (%)
2/23/2021	SS08	23.0	17.5	19.0	**5 - 6 - 7**	**13**	55	39.6	16.3	296.8	84.8
2/23/2021	SS10	25.0	20.5	22.0	**2 - 3 - 4**	**7**	50	39.9	16.2	310.6	88.8
2/23/2021	SS13	34.0	28.0	29.5	**1 - 1 - 2**	**3**	56	39.7	15.9	334.3	95.6
2/23/2021	SS14	36.0	30.5	32.0	**1 2 3**	**5**	56	40.0	14.7	294.6	84.2
2/23/2021	SS16	44.0	38.0	39.5	**4 - 5 - 8**	**13**	54	39.6	16.2	334.7	95.6
							(bpm)	(kips)	(ft/sec)	(lbs-ft)	(%)
					Overall Average Values:		54	39.8	15.9	314.2	89.8
					Standard Deviation:		2.1	0.2	0.6	17.5	5.0

1 - Depth below the location of the gages.
2 - Depth from existing ground surface.
3 - Computed from the (EMX / TPE) * 100%

Test Interval Summaries and Plots of Force and Normalized Velocity

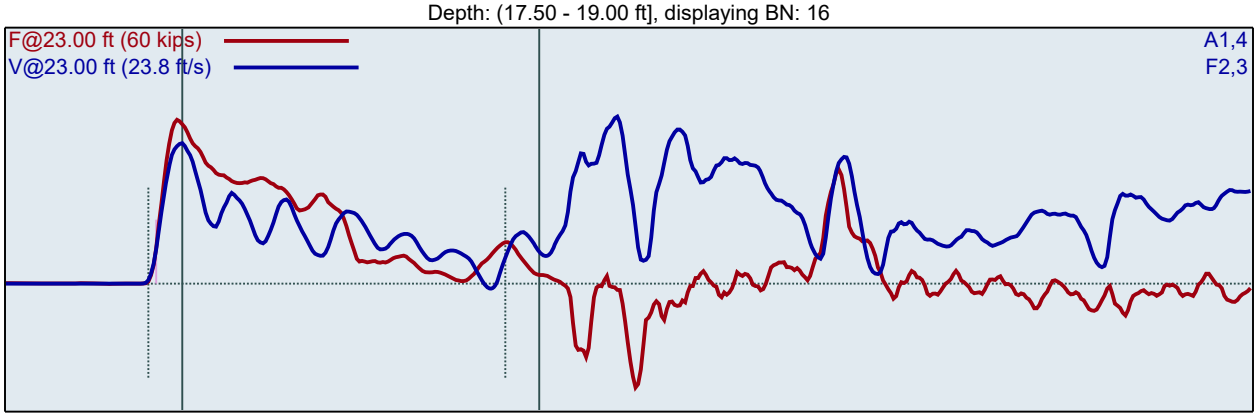
CME 55T#1 (#709) SN 33045
BAH
KIF-B05

SS08 17.5-19.0
Test date: 2/23/2021

AR: 1.41 in^2
LE: 23.00 ft
WS: 16807.9 ft/s

SP: 0.492 k/ft3
EM: 30000 ksi

Depth: (17.50 - 19.00 ft], displaying BN: 16



F2 : [393NWJ1] 209.72 PDICAL (1) FF1
F3 : [393NWJ2] 210.35 PDICAL (1) FF1

A1 (PR): [K3740] 369.779 mv/6.4v/5000g (1) VF1
A4 (PR): [K3739] 309.8 mv/6.4v/5000g (1) VF1

ETR: Energy Transfer Ratio - Rated
CSX: Compression Stress Maximum
CSI: Compression Stress Maximum - Individual Sensor

BPM: Blows/Minute
VMX: Maximum Velocity
FMX: Maximum Force

BL#	BC /6"	LP ft	ETR %	CSX ksi	CSI ksi	BPM bpm	VMX ft/s	FMX kips
1	5	17.60	78.68	26.7	26.8	1.9	15.7	38
2	5	17.70	82.48	27.5	27.6	52.6	16.1	39
3	5	17.80	83.88	27.8	28.0	54.6	15.9	39
4	5	17.90	80.88	28.4	28.4	54.7	16.0	40
5	5	18.00	83.15	28.1	28.2	54.4	16.1	40
6	6	18.08	83.56	28.7	28.7	54.6	15.9	40
7	6	18.17	83.43	28.4	28.5	54.8	15.9	40
8	6	18.25	84.12	28.3	28.4	54.6	15.9	40
9	6	18.33	85.35	28.1	28.2	54.9	16.1	40
10	6	18.42	85.07	27.5	27.5	54.5	15.8	39
11	6	18.50	83.93	28.2	28.2	55.0	16.5	40
12	7	18.57	86.33	28.5	28.7	54.7	16.7	40
13	7	18.64	86.66	28.5	28.5	54.9	17.1	40
14	7	18.71	84.06	28.2	28.3	55.0	16.8	40
15	7	18.79	84.92	28.7	28.8	54.6	17.1	40
16	7	18.86	84.58	27.2	27.4	55.0	15.6	38
17	7	18.93	84.64	27.6	27.9	54.5	16.0	39
18	7	19.00	85.98	27.8	28.2	54.9	16.4	39
		Average	84.82	28.1	28.2	54.8	16.3	40
		Std Dev	0.99	0.4	0.4	0.2	0.5	1
		Maximum	86.66	28.7	28.8	55.0	17.1	40
		Minimum	83.43	27.2	27.4	54.5	15.6	38

N-value: 13

Sample Interval Time: 18.67 seconds.

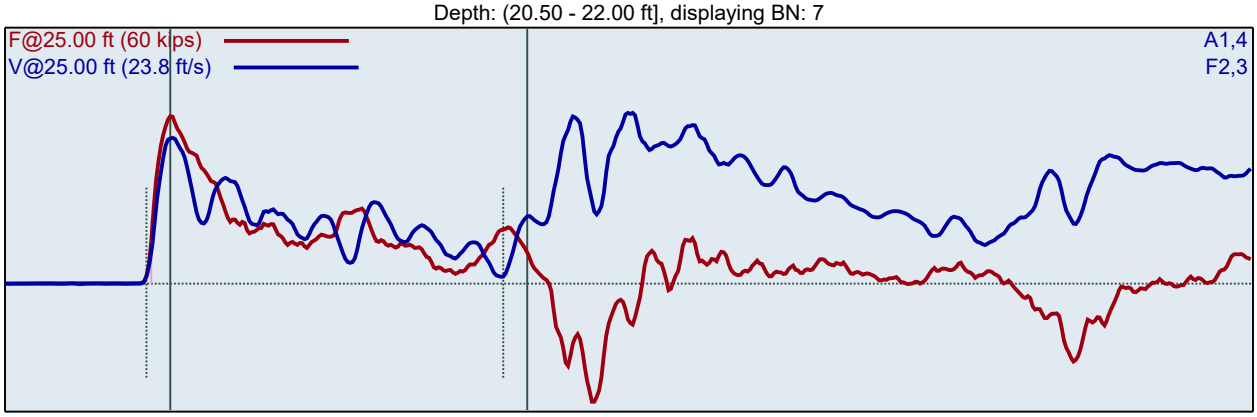
CME 55T#1 (#709) SN 33045
BAH
KIF-B05

SS10 20.5-22.0
Test date: 2/23/2021

AR: 1.41 in^2
LE: 25.00 ft
WS: 16807.9 ft/s

SP: 0.492 k/ft3
EM: 30000 ksi

Depth: (20.50 - 22.00 ft], displaying BN: 7



F2 : [393NWJ1] 209.72 PDICAL (1) FF1
F3 : [393NWJ2] 210.35 PDICAL (1) FF1

A1 (PR): [K3740] 369.779 mv/6.4v/5000g (1) VF1
A4 (PR): [K3739] 309.8 mv/6.4v/5000g (1) VF1

ETR: Energy Transfer Ratio - Rated
CSX: Compression Stress Maximum
CSI: Compression Stress Maximum - Individual Sensor

BPM: Blows/Minute
VMX: Maximum Velocity
FMX: Maximum Force

BL#	BC /6"	LP ft	ETR %	CSX ksi	CSI ksi	BPM bpm	VMX ft/s	FMX kips
1	2	20.75	84.81	27.8	28.1	58.8	15.6	39
2	2	21.00	86.37	28.2	28.5	50.0	16.5	40
3	3	21.17	88.29	28.4	28.9	50.2	16.3	40
4	3	21.33	88.21	28.3	28.9	50.1	16.4	40
5	3	21.50	90.68	28.2	28.7	50.2	17.4	40
6	4	21.63	87.16	28.3	28.8	50.0	16.3	40
7	4	21.75	89.21	27.9	28.3	50.2	15.9	39
8	4	21.88	87.93	28.5	29.1	50.3	15.1	40
9	4	22.00	89.77	28.2	28.8	50.4	15.8	40
		Average	88.75	28.3	28.8	50.2	16.2	40
		Std Dev	1.12	0.2	0.2	0.1	0.7	0
		Maximum	90.68	28.5	29.1	50.4	17.4	40
		Minimum	87.16	27.9	28.3	50.0	15.1	39

N-value: 7

Sample Interval Time: 9.56 seconds.

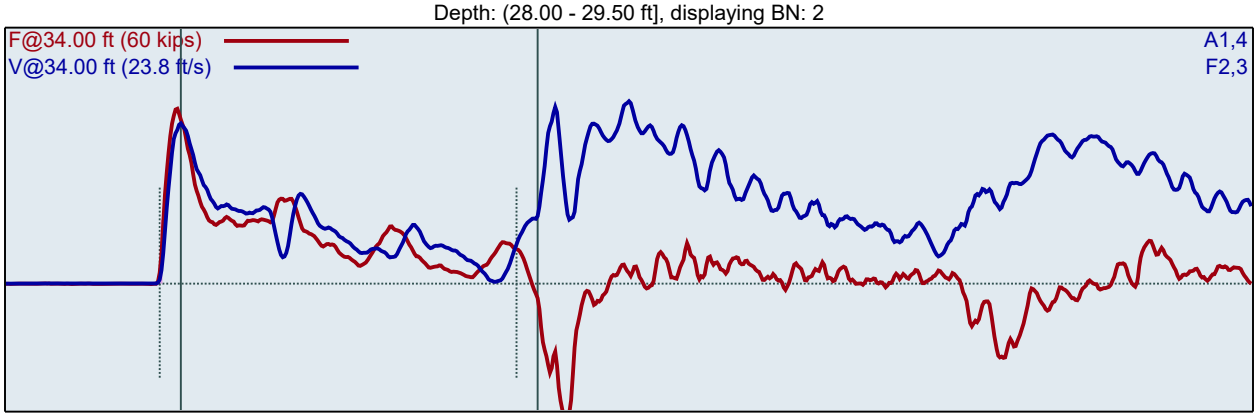
CME 55T#1 (#709) SN 33045
BAH
KIF-B05

SS13 28.0-29.5
Test date: 2/23/2021

AR: 1.41 in^2
LE: 34.00 ft
WS: 16807.9 ft/s

SP: 0.492 k/ft3
EM: 30000 ksi

Depth: (28.00 - 29.50 ft], displaying BN: 2



F2 : [393NWJ1] 209.72 PDICAL (1) FF1
F3 : [393NWJ2] 210.35 PDICAL (1) FF1

A1 (PR): [K3740] 369.779 mv/6.4v/5000g (1) VF1
A4 (PR): [K3739] 309.8 mv/6.4v/5000g (1) VF1

ETR: Energy Transfer Ratio - Rated
CSX: Compression Stress Maximum
CSI: Compression Stress Maximum - Individual Sensor

BPM: Blows/Minute
VMX: Maximum Velocity
FMX: Maximum Force

BL#	BC /6"	LP ft	ETR %	CSX ksi	CSI ksi	BPM bpm	VMX ft/s	FMX kips
1	1	28.50	93.56	27.8	28.3	1.9	16.0	39
2	1	29.00	99.77	29.1	29.7	54.9	17.0	41
3	2	29.25	92.00	27.3	27.6	56.6	15.2	39
4	2	29.50	94.99	27.9	28.5	56.0	15.4	39
		Average	95.59	28.1	28.6	55.8	15.9	40
		Std Dev	3.20	0.7	0.9	0.7	0.8	1
		Maximum	99.77	29.1	29.7	56.6	17.0	41
		Minimum	92.00	27.3	27.6	54.9	15.2	39
				N-value: 3				

Sample Interval Time: 3.23 seconds.

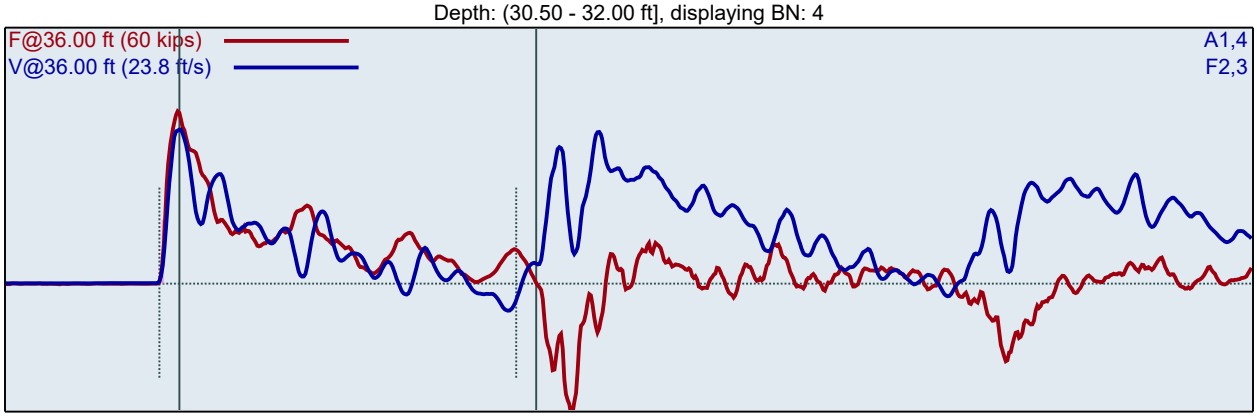
CME 55T#1 (#709) SN 33045
BAH
KIF-B05

SS14 30.5-32.0
Test date: 2/23/2021

AR: 1.41 in^2
LE: 36.00 ft
WS: 16807.9 ft/s

SP: 0.492 k/ft3
EM: 30000 ksi

Depth: (30.50 - 32.00 ft], displaying BN: 4



F2 : [393NWJ1] 209.72 PDICAL (1) FF1
F3 : [393NWJ2] 210.35 PDICAL (1) FF1

A1 (PR): [K3740] 369.779 mv/6.4v/5000g (1) VF1
A4 (PR): [K3739] 309.8 mv/6.4v/5000g (1) VF1

ETR: Energy Transfer Ratio - Rated
CSX: Compression Stress Maximum
CSI: Compression Stress Maximum - Individual Sensor

BPM: Blows/Minute
VMX: Maximum Velocity
FMX: Maximum Force

BL#	BC /6"	LP ft	ETR %	CSX ksi	CSI ksi	BPM bpm	VMX ft/s	FMX kips
1	1	31.00	94.12	28.5	28.8	1.9	17.0	40
2	2	31.25	85.35	28.5	28.8	55.9	15.2	40
3	2	31.50	88.95	28.3	28.8	55.9	15.6	40
4	3	31.67	83.66	28.7	29.2	55.8	14.4	40
5	3	31.83	82.39	28.5	28.8	55.7	14.0	40
6	3	32.00	80.68	28.7	28.8	55.8	14.2	40
		Average	84.21	28.5	28.9	55.8	14.7	40
		Std Dev	2.83	0.1	0.1	0.1	0.6	0
		Maximum	88.95	28.7	29.2	55.9	15.6	40
		Minimum	80.68	28.3	28.8	55.7	14.0	40

N-value: 5

Sample Interval Time: 5.41 seconds.

Pile Dynamics, Inc.
SPT Analyzer Results

PDA-S Ver. 2018.30 - Printed: 3/6/2021

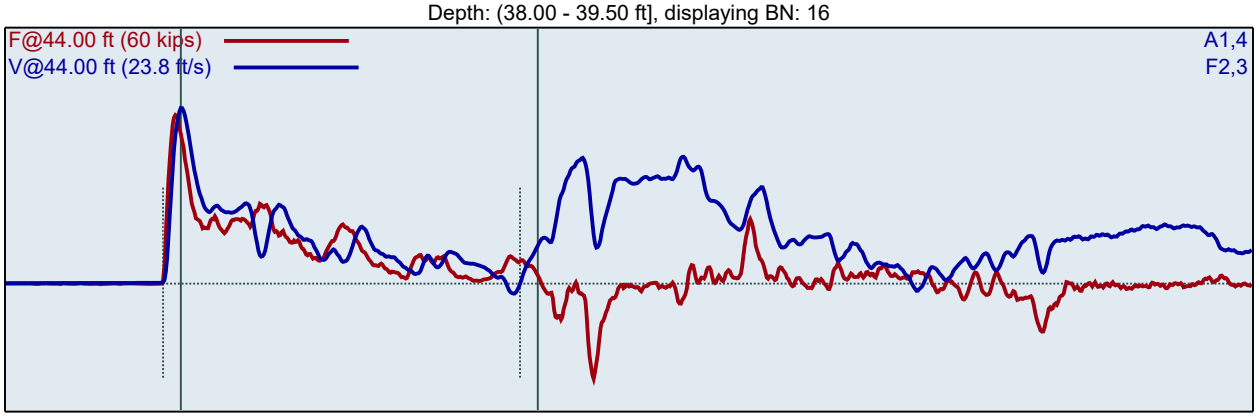
CME 55T#1 (#709) SN 33045
BAH
KIF-B05

SS16 38.0-39.5
Test date: 2/23/2021

AR: 1.41 in^2
LE: 44.00 ft
WS: 16807.9 ft/s

SP: 0.492 k/ft3
EM: 30000 ksi

Depth: (38.00 - 39.50 ft], displaying BN: 16



F2 : [393NWJ1] 209.72 PDICAL (1) FF1
F3 : [393NWJ2] 210.35 PDICAL (1) FF1

A1 (PR): [K3740] 369.779 mv/6.4v/5000g (1) VF1
A4 (PR): [K3739] 309.8 mv/6.4v/5000g (1) VF1

ETR: Energy Transfer Ratio - Rated
CSX: Compression Stress Maximum
CSI: Compression Stress Maximum - Individual Sensor

BPM: Blows/Minute
VMX: Maximum Velocity
FMX: Maximum Force

BL#	BC /6"	LP ft	ETR %	CSX ksi	CSI ksi	BPM bpm	VMX ft/s	FMX kips
1	4	38.13	93.18	27.9	28.3	1.9	15.4	39
2	4	38.25	92.54	27.2	27.9	53.8	15.5	38
3	4	38.38	95.73	27.9	28.5	54.0	16.2	39
4	4	38.50	95.67	27.3	27.7	54.0	15.9	38
5	5	38.60	96.59	27.7	28.1	54.2	16.2	39
6	5	38.70	94.50	28.6	29.0	54.0	16.2	40
7	5	38.80	96.48	28.1	28.7	54.3	16.3	40
8	5	38.90	96.36	27.9	28.5	54.1	16.3	39
9	5	39.00	95.02	28.4	28.8	54.5	16.2	40
10	9	39.06	96.56	28.5	29.1	54.1	16.3	40
11	9	39.11	94.67	28.2	28.6	54.4	16.2	40
12	9	39.17	95.05	28.5	29.1	54.2	16.3	40
13	9	39.22	96.76	28.0	28.7	54.3	16.3	40
14	9	39.28	93.72	28.0	28.7	54.2	16.2	39
15	9	39.33	95.50	27.5	27.8	54.5	16.0	39
16	9	39.39	96.17	28.0	28.5	54.2	16.4	40
17	9	39.44	96.71	27.5	28.2	54.2	16.3	39
18	9	39.50	94.55	27.8	28.3	54.4	16.1	39
		Average	95.62	28.0	28.6	54.3	16.2	40
		Std Dev	0.98	0.4	0.4	0.1	0.1	0
		Maximum	96.76	28.6	29.1	54.5	16.4	40
		Minimum	93.72	27.5	27.8	54.0	16.0	39
			N-value: 14					

Sample Interval Time: 18.80 seconds.

Pile Driving Analyzer, Model SPT Calibration

Certificate of Calibration

Pile Dynamics, Inc. certifies that the

Pile Driving Analyzer®, Model SPT

Serial Number: 4565 TB

was calibrated on 16 Oct 2020

using a PDA Calibration Box whose output was calibrated with test equipment traceable to NIST.

This certificate is valid for 2 years from above date.

Tested by: MO

Pile Dynamics, Inc.
30725 Aurora Road
Cleveland, Ohio 44139 USA

Certificate of Compliance

Pile Dynamics, Inc. certifies that the

Pile Driving Analyzer®, Model SPT

Serial Number: 4565 TB

has been tested and passed all final test procedures on 16 Oct 2023

SEAL

Tested by: MCO

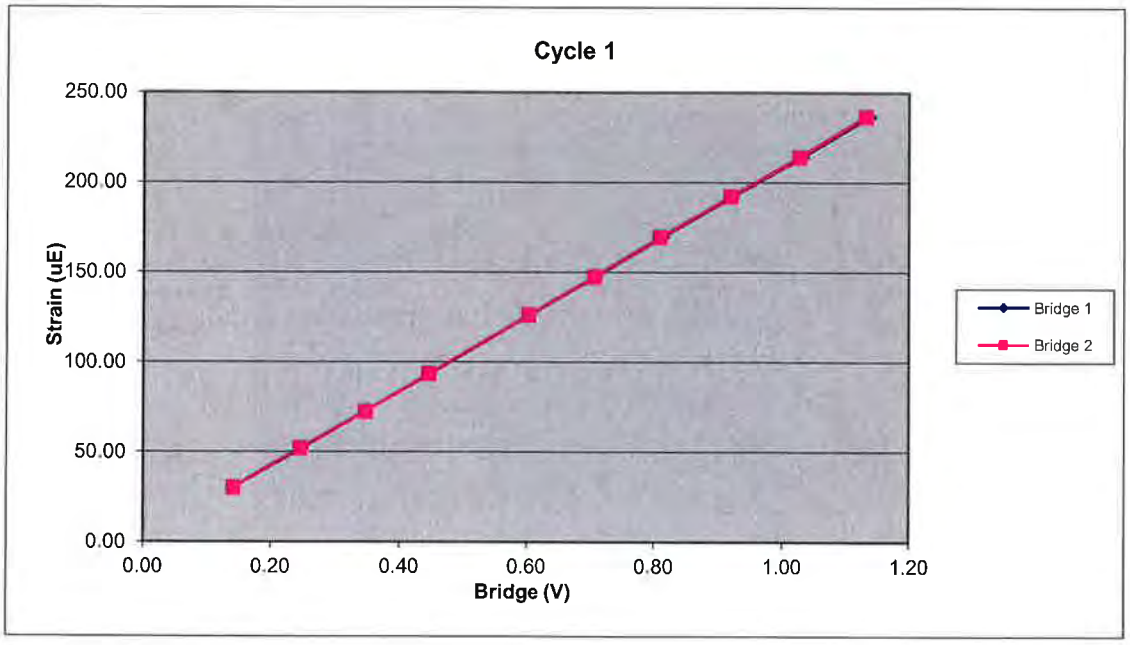
Pile Dynamics, Inc.
30725 Aurora Road
Cleveland, Ohio 44139 USA

NW-J Rod Calibration

393NWJ		Cycle 1		
Sample	**Force (lb)**	**Strain (µE)**	**Bridge 1 (V)**	**Bridge 2 (V)**
1	0.00	0.00	0.00	0.00
2	1256.66	29.87	0.14	0.14
3	2182.58	51.93	0.25	0.25
4	3077.41	72.29	0.35	0.35
5	3958.59	93.22	0.45	0.45
6	5346.46	126.02	0.61	0.60
7	6263.90	147.20	0.71	0.71
8	7185.24	169.35	0.81	0.81
9	8153.08	191.99	0.92	0.92
10	9118.48	213.87	1.03	1.03
11	10058.44	236.37	1.14	1.13

Bridge 1		**Bridge 2**	
Force Calibration (lb/V)	**8852.44**	**Force Calibration (lb/V)**	**8876.59**
Offset	-12.10	Offset	-11.85
Correlation	0.999998	Correlation	0.999998
Strain Calibration (µE/V)	**207.62**	**Strain Calibration (µE/V)**	**208.19**
Offset	0.18	Offset	0.18
Correlation	0.999995	Correlation	0.999990

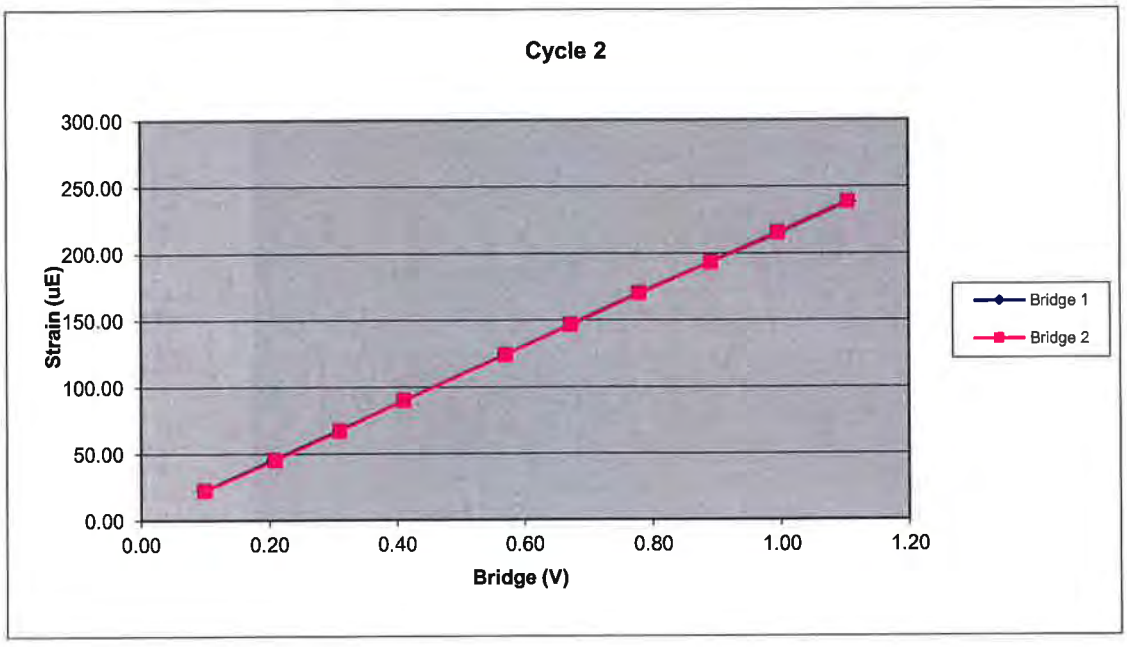
Force Strain Calibration	
EA (Kips)	**42636.94**
Offset	-19.58
Correlation	0.999992



393NWJ		Cycle 2		
Sample	**Force (lb)**	**Strain (µE)**	**Bridge 1 (V)**	**Bridge 2 (V)**
1	0.00	0.00	0.00	0.00
2	891.51	21.98	0.10	0.10
3	1857.21	45.07	0.21	0.21
4	2758.28	67.01	0.31	0.31
5	3650.96	89.73	0.41	0.41
6	5063.00	123.69	0.57	0.57
7	5972.06	146.18	0.67	0.67
8	6915.23	169.67	0.78	0.78
9	7903.84	192.74	0.89	0.89
10	8851.30	214.97	1.00	1.00
11	9814.66	238.41	1.11	1.11

Bridge 1		**Bridge 2**	
Force Calibration (lb/V)	**8842.81**	**Force Calibration (lb/V)**	**8870.66**
Offset	**14.62**	Offset	**-0.53**
Correlation	**0.999999**	Correlation	**0.999999**
Strain Calibration (µE/V)	**214.99**	**Strain Calibration (µE/V)**	**215.66**
Offset	**0.80**	Offset	**0.43**
Correlation	**0.999973**	Correlation	**0.999971**

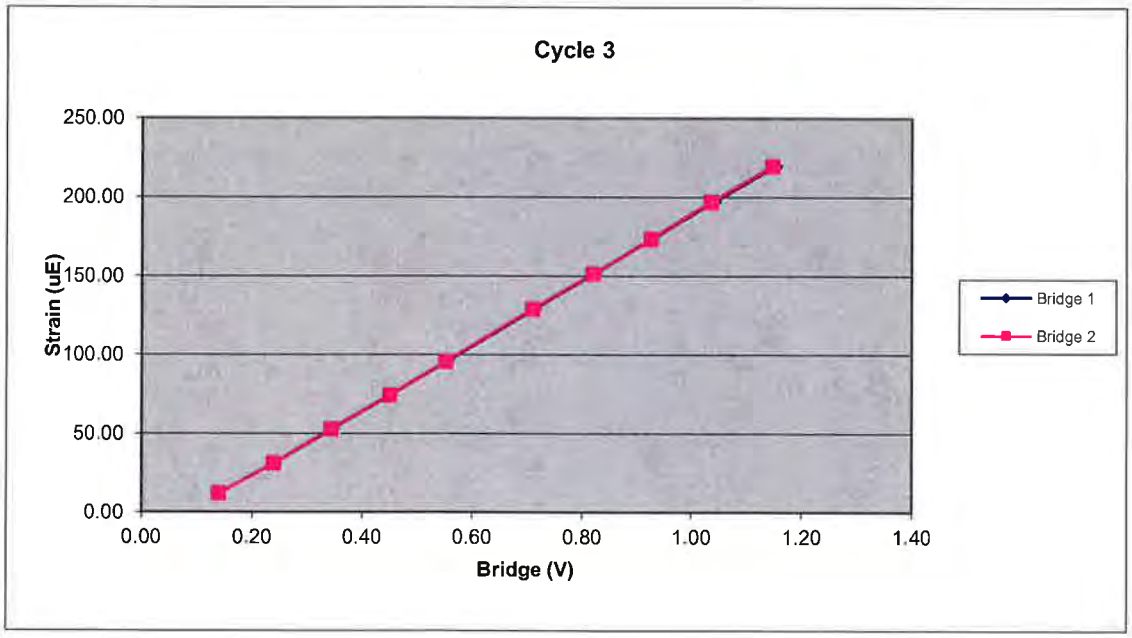
Force Strain Calibration	
EA (Kips)	**41129.20**
Offset	**-17.86**
Correlation	**0.999967**



393NWJ		Cycle 3		
Sample	**Force (lb)**	**Strain (µE)**	**Bridge 1 (V)**	**Bridge 2 (V)**
1	0.00	0.00	0.00	0.00
2	1237.55	11.57	0.14	0.14
3	2124.20	30.83	0.24	0.24
4	3051.97	52.45	0.35	0.34
5	4004.70	74.09	0.45	0.45
6	4916.00	95.54	0.55	0.55
7	6318.58	128.91	0.71	0.71
8	7284.77	151.16	0.82	0.82
9	8219.37	173.23	0.93	0.93
10	9195.20	196.65	1.04	1.04
11	10203.39	219.28	1.15	1.15

Bridge 1		**Bridge 2**	
Force Calibration (lb/V)	**8860.79**	**Force Calibration (lb/V)**	**8887.76**
Offset	**-3.94**	Offset	**-4.95**
Correlation	**0.999997**	Correlation	**0.999999**
Strain Calibration (µE/V)	**206.56**	**Strain Calibration (µE/V)**	**207.19**
Offset	**-18.57**	Offset	**-18.59**
Correlation	**0.999962**	Correlation	**0.999969**

Force Strain Calibration	
EA (Kips)	**42893.26**
Offset	**792.77**
Correlation	**0.999966**



Bridge Excitation (V) 5
Shunt Resitor (ohm) 60.4k

Calibration Factors	393NWJ		
Bridge 1 (µE/V)	209.72	Bridge 2 (µE/V)	210.35
EA Factor (Kips)	42219.80	Area (in^2)	1.41

Calibrated by: _____
Calibrated Date: 11/23/2020

Pile Dynamics Inc
30725 Aurora Rd
Solon, OH 44139

Traceable to N.I.S.T.

Piezoresistive Accelerometer Calibration

Accelerometer Calibration Certificate
Pile Dynamics, Inc.

Calibrated by Pile Dynamics, Inc.
Calibration performed on 28Oct2020

Serial No:	K3739	**Temperature:**	20.0 °C
Model:	PR	**Humidity:**	45%
Calibrated on:	Channel 4 on 8G 5161 LE		

Ref Acc 1:	65538! 1040 g's/volt	**Cal on:**	27Jan2020
Ref Acc 2:	63479! 1080 g's/volt	**Cal on:**	09Sep2020

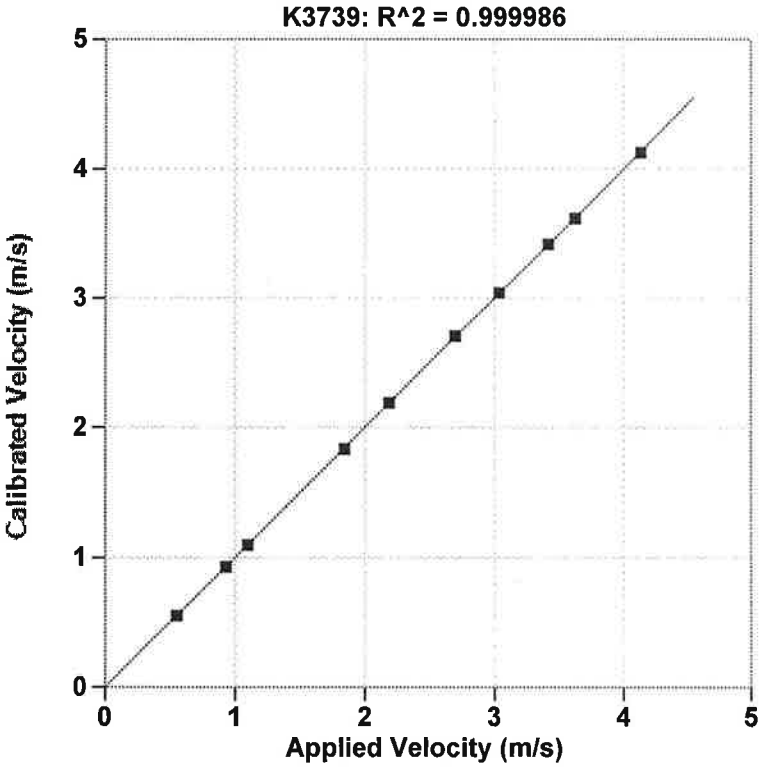
Reference accelerometer calibrations are traceable to the United States National Institute of Standards and Technology (NIST).

PDA CALIBRATION FACTOR

309.8 mv/5000g
(62.0 µv/g)
R^2: 0.999986 [Chip programmed]

Operator: William Johnson

Signed



Reference Velocity	S/N K3739 Velocity
m/s	m/s
0.550	0.549
0.932	0.928
1.096	1.096
1.840	1.833
2.186	2.188
2.702	2.706
3.036	3.041
3.413	3.418
3.621	3.619
4.133	4.127

Maximum Acceleration: 903 g's

Accelerometer Calibration Certificate
Pile Dynamics, Inc.

Calibrated by Pile Dynamics, Inc.
Calibration performed on 28Oct2020

Serial No:	K3740	**Temperature:**	20.0 °C
Model:	PR	**Humidity:**	45%
Calibrated on:	Channel 3 on 8G 5161 LE		

Ref Acc 1:	65538! 1040 g's/volt	**Cal on:**	27Jan2020
Ref Acc 2:	63479! 1080 g's/volt	**Cal on:**	09Sep2020

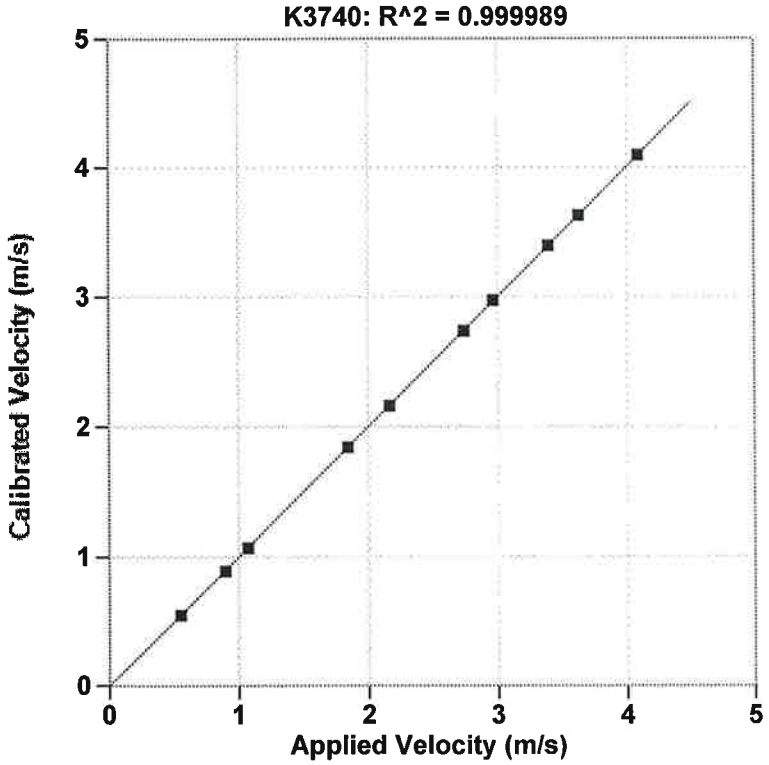
Reference accelerometer calibrations are traceable to the United States National Institute of Standards and Technology (NIST).

PDA CALIBRATION FACTOR

369.8 mv/5000g
(74.0 µv/g)
R^2: 0.999989 [Chip programmed]

Operator: William Johnson

Signed



Reference Velocity	S/N K3740 Velocity
m/s	m/s
0.549	0.549
0.896	0.889
1.073	1.068
1.842	1.839
2.163	2.160
2.739	2.736
2.966	2.973
3.394	3.394
3.629	3.630
4.093	4.094

Maximum Acceleration: 892 g's

APPENDIX F – GEOTECHNICAL LABORATORY TEST RESULTS

ATTACHMENT F.1

Summary Tables of Phase 1 Geotechnical Laboratory Testing Results

Table F.1-1 - Summary of Phase 1 Natural Moisture Content Testing
Kingston Fossil Plant
November 2018-January 2020

Boring ID	Test Interval Depth	Test Interval Elevation	Moisture Content
	ft	ft NGVD29	%
KIF-TW01	1.5 - 1.9	770.3 - 769.9	25
KIF-TW01	4.0 - 4.5	767.8 - 767.3	18
KIF-TW01	9.0 - 9.5	762.8 - 762.3	16
KIF-TW01	13.5 - 15.0	758.3 - 756.8	23
KIF-TW01	18.5 - 19.5	753.3 - 752.3	37
KIF-TW01	24.0 - 26.0	747.8 - 745.8	32
KIF-TW01	28.5 - 30.0	743.3 - 741.8	19
KIF-TW01	31.0 - 31.5	740.8 - 740.3	38
KIF-TW01	33.5 - 34.5	738.3 - 737.3	52
KIF-TW01	36.0 - 36.5	735.8 - 735.3	32
KIF-TW01	39.0 - 40.5	732.8 - 731.3	35
KIF-TW01	42.4 - 42.7	729.4 - 729.1	29
KIF-TW02	42.7 - 43.2	729.1 - 728.6	31
KIF-TW02	1.5 - 2.3	770.4 - 769.6	28
KIF-TW02	5.5 - 6.0	766.4 - 765.9	13
KIF-TW02	8.5 - 9.0	763.4 - 762.9	22
KIF-TW02	10.5 - 11.0	761.4 - 760.9	23
KIF-TW02	15.0 - 16.5	756.9 - 755.4	25
KIF-TW02	21.0 - 23.0	750.9 - 748.9	40
KIF-TW02	25.5 - 26.5	746.4 - 745.4	19
KIF-TW02	28.5 - 30.0	743.4 - 741.9	26
KIF-TW02	33.5 - 34.5	738.4 - 737.4	49
KIF-TW02	36.0 - 36.5	735.9 - 735.4	52
KIF-TW02	38.5 - 39.0	733.4 - 732.9	59
KIF-TW02	39.0 - 40.5	732.9 - 731.4	57
KIF-TW02	43.5 - 45.5	728.4 - 726.4	42
KIF-TW03	0.0 - 1.5	776.0 - 774.5	34
KIF-TW03	4.5 - 6.0	771.5 - 770.0	22

Table F.1-1 - Summary of Phase 1 Natural Moisture Content Testing
Kingston Fossil Plant
November 2018-January 2020

Boring ID	Test Interval Depth	Test Interval Elevation	Moisture Content
	ft	ft NGVD29	%
KIF-TW03	8.5 - 9.0	767.5 - 767.0	19
KIF-TW03	13.5 - 15.0	762.5 - 761.0	15
KIF-TW03	18.5 - 19.5	757.5 - 756.5	22
KIF-TW03	21.0 - 23.0	755.0 - 753.0	34
KIF-TW03	27.5 - 29.0	748.5 - 747.0	41
KIF-TW03	33.5 - 35.0	742.5 - 741.0	45
KIF-TW03	38.5 - 39.5	737.5 - 736.5	59
KIF-TW03	41.0 - 41.5	735.0 - 734.5	45
KIF-TW03	43.5 - 44.0	732.5 - 732.0	58
KIF-TW03	44.0 - 45.0	732.0 - 731.0	48
KIF-TW03	45.5 - 47.5	730.5 - 728.5	57
KIF-TW04	0.0 - 1.5	765.2 - 763.7	25
KIF-TW04	3.0 - 3.5	762.2 - 761.7	29
KIF-TW04	5.5 - 6.0	759.7 - 759.2	50
KIF-TW04	8.5 - 9.0	756.7 - 756.2	51
KIF-TW04	10.5 - 11.5	754.7 - 753.7	45
KIF-TW04	13.5 - 15.0	751.7 - 750.2	41
KIF-TW04	18.5 - 19.5	746.7 - 745.7	61
KIF-TW04	19.5 - 21.0	745.7 - 744.2	54
KIF-TW04	24.0 - 26.0	741.2 - 739.2	49
KIF-TW04	28.5 - 30.0	736.7 - 735.2	39
KIF-TW04	33.5 - 34.5	731.7 - 730.7	58
KIF-TW04	36.0 - 36.5	729.2 - 728.7	52
KIF-TW04	39.0 - 41.0	726.2 - 724.2	34
KIF-TW04	39.9 - 40.5	725.3 - 724.7	40
KIF-TW05	0.0 - 1.5	770.5 - 769.0	18
KIF-TW05	4.5 - 6.0	766.0 - 764.5	23
KIF-TW05	9.0 - 10.5	761.5 - 760.0	13

Table F.1-1 - Summary of Phase 1 Natural Moisture Content Testing
Kingston Fossil Plant
November 2018-January 2020

Boring ID	Test Interval Depth	Test Interval Elevation	Moisture Content
	ft	ft NGVD29	%
KIF-TW05	13.5 - 15.0	757.0 - 755.5	10
KIF-TW05	15.0 - 16.5	755.5 - 754.0	12
KIF-TW05	19.5 - 21.0	751.0 - 749.5	13
KIF-TW05	21.0 - 22.5	749.5 - 748.0	22
KIF-TW05	28.5 - 30.0	742.0 - 740.5	38
KIF-TW05	30.0 - 31.5	740.5 - 739.0	45
KIF-TW05	33.0 - 34.5	737.5 - 736.0	46
KIF-TW05	34.5 - 36.0	736.0 - 734.5	45
KIF-TW05	39.7 - 40.2	730.8 - 730.3	22
KIF-TW05	40.2 - 40.5	730.3 - 730.0	23
KIF-TW05	1.5 - 1.9	770.3 - 769.9	25
KIF-TW05	4.0 - 4.5	767.8 - 767.3	18
KIF-TW05	9.0 - 9.5	762.8 - 762.3	16
KIF-B01A	35.0 - 36.5	736.3 - 734.8	41
KIF-B01A	40.0 - 41.5	731.3 - 729.8	31
KIF-B01A	43.5 - 45.0	727.8 - 726.3	35
KIF-B01A	50.0 - 51.3	721.3 - 720.0	29
KIF-B01A	51.3 - 53.0	720.0 - 718.3	22
KIF-B01A	53.7 - 55.0	717.6 - 716.3	25
KIF-B01B	50.0 - 51.4	721.3 - 719.9	33
KIF-B02A	35.0 - 40.0	737.3 - 732.3	45
KIF-B02A	44.0 - 45.0	728.3 - 727.3	44
KIF-B02A	48.5 - 50.0	723.8 - 722.3	35
KIF-B02A	52.7 - 55.0	719.6 - 717.3	21
KIF-B03A	40.0 - 41.5	736.3 - 734.8	71
KIF-B03A	45.0 - 46.5	731.3 - 729.8	36
KIF-B03A	50.0 - 51.5	726.3 - 724.8	39
KIF-B03A	55.0 - 57.5	721.3 - 718.8	16

Table F.1-1 - Summary of Phase 1 Natural Moisture Content Testing
Kingston Fossil Plant
November 2018-January 2020

Boring ID	Test Interval Depth	Test Interval Elevation	Moisture Content
	ft	ft NGVD29	%
KIF-B03A	59.2 - 60.0	717.1 - 716.3	19
KIF-B04	35.0 - 36.5	730.5 - 729.0	75
KIF-B04	40.0 - 41.5	725.5 - 724.0	40
KIF-B04	43.5 - 44.0	722.0 - 721.5	40
KIF-B04	44.0 - 45.0	721.5 - 720.5	31
KIF-B04	45.0 - 47.5	720.5 - 718.0	25

Notes:

ft	feet
ID	identification
NGVD29	National Geodetic Vertical Datum of 1929

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Table F.1-2 - Summary of Phase 1 Fines Content Testing
Kingston Fossil Plant
November 2018-January 2020

Boring ID	Test Interval Depth	Test Interval Elevation	Percent Passing #200 Sieve
	ft	ft NGVD29	%
KIF-TW01	1.5 - 1.9	770.3 - 769.9	73.1
KIF-TW01	4.0 - 4.5	767.8 - 767.3	69.3
KIF-TW01	13.5 - 15.0	758.3 - 756.8	40.7
KIF-TW01	24.9 - 25.4	746.9 - 746.4	97.5
KIF-TW01	28.5 - 30.0	743.3 - 741.8	16.6
KIF-TW01	36.0 - 36.5	735.8 - 735.3	42.1
KIF-TW01	39.0 - 40.5	732.8 - 731.3	89.6
KIF-TW01	42.7 - 43.2	729.1 - 728.6	93.9
KIF-TW02	1.5 - 2.3	770.4 - 769.6	75.8
KIF-TW02	15.0 - 16.5	756.9 - 755.4	38.1
KIF-TW02	21.0 - 21.5	750.9 - 750.4	92.1
KIF-TW02	28.5 - 30.0	743.4 - 741.9	20.2
KIF-TW02	36.0 - 36.5	735.9 - 735.4	21.4
KIF-TW02	39.0 - 40.5	732.9 - 731.4	75.9
KIF-TW02	44.3 - 44.8	727.6 - 727.1	79.5
KIF-TW03	0.0 - 1.5	771.9 - 770.4	88.0
KIF-TW03	4.5 - 6.0	767.4 - 765.9	60.9
KIF-TW03	13.5 - 15.0	758.4 - 756.9	37.9
KIF-TW03	21.0 - 21.7	750.9 - 750.2	59.0
KIF-TW03	27.5 - 29.0	744.4 - 742.9	92.8
KIF-TW03	33.5 - 35	738.4 - 736.9	22.0
KIF-TW03	38.5 - 39.5	733.4 - 732.4	81.0
KIF-TW03	43.5 - 44.0	728.4 - 727.9	96.4
KIF-TW03	46.6 - 47.1	725.3 - 724.8	86.5
KIF-TW04	0.0 - 1.5	771.9 - 770.4	68.3
KIF-TW04	5.5 - 6.0	766.4 - 765.9	83.1
KIF-TW04	13.5 - 15.0	758.4 - 756.9	94.0
KIF-TW04	24.9 - 25.5	747.0 - 746.4	60.7

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Table F.1-2 - Summary of Phase 1 Fines Content Testing
Kingston Fossil Plant
November 2018-January 2020

Boring ID	Test Interval Depth	Test Interval Elevation	Percent Passing #200 Sieve
	ft	ft NGVD29	%
KIF-TW04	28.5 - 30.0	743.4 - 741.9	37.7
KIF-TW04	33.5 - 34.5	738.4 - 737.4	64.5
KIF-TW04	39.3 - 39.9	732.6 - 732.0	66.0
KIF-TW05	0.0 - 1.5	771.9 - 770.4	32.8
KIF-TW05	9.0 - 10.5	762.9 - 761.4	23.1
KIF-TW05	19.5 - 21.0	752.4 - 750.9	11.1
KIF-TW05	28.5 - 30.0	743.4 - 741.9	62.8
KIF-TW05	34.5 - 36.0	737.4 - 735.9	83.5
KIF-TW05	39.7 - 40.2	732.2 - 731.7	81.3
KIF-B01A	43.5 - 45.0	727.8 - 726.3	86.3
KIF-B01A	50.0 - 51.3	721.3 - 720.0	97.6
KIF-B01A	51.3 - 53.0	720.0 - 718.3	56.4
KIF-B01A	53.7 - 55.0	717.6 - 716.3	97.8
KIF-B01B	50.0 - 51.4	721.3 - 719.9	69.4
KIF-B02A	48.5 - 50.0	723.8 - 722.3	79.6
KIF-B02A	52.7 - 55.0	719.6 - 717.3	96.5
KIF-B03A	50.0 - 51.5	726.3 - 724.8	90.5
KIF-B03A	55.0 - 57.5	721.3 - 718.8	57.7
KIF-B04	43.5 - 44.0	722.0 - 721.5	97.5
KIF-B04	44.0 - 45.0	721.5 - 720.5	97.8
KIF-B04	45.0 - 47.5	720.5 - 718.0	91.4

Notes:

ft	feet
ID	identification
NGVD29	National Geodetic Vertical Datum of 1929

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Table F.1-3 - Summary of Phase 1 Atterberg Limits Testing
Kingston Fossil Plant
November 2018-January 2020

Boring ID	Test Interval Depth	Test Interval Elevation	Liquid Limit (LL)	Plasticity Index (PI)
	ft	ft NGVD29		
KIF-TW01	1.5 - 1.9	770.3 - 769.9	72	47
KIF-TW01	4.0 - 4.5	767.8 - 767.3	NP	NP
KIF-TW01	13.5 - 15.0	758.3 - 756.8	NP	NP
KIF-TW01	24.9 - 25.4	746.9 - 746.4	NP	NP
KIF-TW01	28.5 - 30.0	743.3 - 741.8	NP	NP
KIF-TW01	36.0 - 36.5	735.8 - 735.3	NP	NP
KIF-TW01	39.0 - 40.5	732.8 - 731.3	NP	NP
KIF-TW01	42.7 - 43.2	729.1 - 728.6	NP	NP
KIF-TW02	1.5 - 2.3	770.4 - 769.6	68	43
KIF-TW02	15.0 - 16.5	756.9 - 755.4	NP	NP
KIF-TW02	21.0 - 21.5	750.9 - 750.4	NP	NP
KIF-TW02	28.5 - 30.0	743.4 - 741.9	NP	NP
KIF-TW02	36.0 - 36.5	735.9 - 735.4	NP	NP
KIF-TW02	39.0 - 40.5	732.9 - 731.4	NP	NP
KIF-TW02	44.3 - 44.8	727.6 - 727.1	NP	NP
KIF-TW03	0.0 - 1.5	776.0 - 774.5	67	38
KIF-TW03	4.5 - 6.0	771.5 - 770.0	NP	NP
KIF-TW03	13.5 - 15.0	762.5 - 761.0	NP	NP
KIF-TW03	21.0 - 21.7	755.0 - 754.3	NP	NP
KIF-TW03	27.5 - 29.0	748.5 - 747.0	NP	NP
KIF-TW03	33.5 - 35.0	742.5 - 741.0	NP	NP
KIF-TW03	38.5 - 39.5	737.5 - 736.5	NP	NP
KIF-TW03	43.5 - 44.0	732.5 - 732.0	NP	NP
KIF-TW03	46.6 - 47.1	729.4 - 728.9	NP	NP
KIF-TW04	0.0 - 1.5	765.2 - 763.7	38	17
KIF-TW04	5.5 - 6.0	759.7 - 759.2	NP	NP
KIF-TW04	13.5 - 15.0	751.7 - 750.2	NP	NP
KIF-TW04	24.9 - 25.5	740.3 - 739.7	NP	NP

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Table F.1-3 - Summary of Phase 1 Atterberg Limits Testing
Kingston Fossil Plant
November 2018-January 2020

Boring ID	Test Interval Depth	Test Interval Elevation	Liquid Limit (LL)	Plasticity Index (PI)
	ft	ft NGVD29		
KIF-TW04	28.5 - 30.0	736.7 - 735.2	NP	NP
KIF-TW04	33.5 - 34.5	731.7 - 730.7	NP	NP
KIF-TW04	39.0 - 41.0	726.2 - 724.2	NP	NP
KIF-TW04	39.3 - 39.9	725.9 - 725.3	NP	NP
KIF-TW04	39.9 - 40.5	725.3 - 724.7	NP	NP
KIF-TW05	0.0 - 1.5	770.5 - 769.0	NP	NP
KIF-TW05	9.0 - 10.5	761.5 - 760.0	NP	NP
KIF-TW05	19.5 - 21.0	751.0 - 749.5	NP	NP
KIF-TW05	28.5 - 30.0	742.0 - 740.5	NP	NP
KIF-TW05	34.5 - 36.0	736.0 - 734.5	NP	NP
KIF-TW05	39.0 - 41.0	731.5 - 729.5	26	9
KIF-TW05	39.7 - 40.2	730.8 - 730.3	26	9
KIF-B01A	43.5 - 45.0	727.8 - 726.3	NP	NP
KIF-B01A	50.0 - 51.3	721.3 - 720.0	40	18
KIF-B01A	51.3 - 53.0	720.0 - 718.3	20	2
KIF-B01A	53.7 - 55.0	717.6 - 716.3	43	20
KIF-B01B	50.0 - 51.4	721.3 - 719.9	NP	NP
KIF-B02A	48.5 - 50.0	723.8 - 722.3	NP	NP
KIF-B02A	52.7 - 55.0	719.6 - 717.3	35	15
KIF-B03A	50.0 - 51.5	726.3 - 724.8	NP	NP
KIF-B03A	55.0 - 57.5	721.3 - 718.8	18	2
KIF-B04	43.5 - 44.0	722.0 - 721.5	NP	NP
KIF-B04	44.0 - 45.0	721.5 - 720.5	30	8
KIF-B04	45.0 - 47.5	720.5 - 718.0	36	13

Notes:

ft	feet	NGVD29	National Geodetic Vertical Datum of 1929
ID	identification	NP	non-plastic

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Table F.1-4 - Summary of Phase 1 Specific Gravity Testing
Kingston Fossil Plant
November 2018-January 2020

Boring ID	Test Interval Depth	Test Interval Elevation	Specific Gravity
	ft	ft NGVD29	
KIF-TW01	4.0 - 4.5	767.8 - 767.3	2.44
KIF-TW01	24.6 - 24.9	747.2 - 746.9	2.34
KIF-TW01	24.9 - 25.4	746.9 - 746.4	2.32
KIF-TW01	28.5 - 30.0	743.3 - 741.8	2.63
KIF-TW01	36.0 - 36.5	735.8 - 735.3	2.57
KIF-TW01	42.4 - 42.7	729.4 - 729.1	2.33
KIF-TW01	42.7 - 43.2	729.1 - 728.6	2.35
KIF-TW02	21.0 - 21.5	750.9 - 750.4	2.26
KIF-TW02	21.5 - 21.8	750.4 - 750.1	2.31
KIF-TW02	28.5 - 30.0	743.4 - 741.9	2.70
KIF-TW02	39.0 - 40.5	732.9 - 731.4	2.28
KIF-TW02	44.3 - 44.8	727.6 - 727.1	2.26
KIF-TW02	44.8 - 45.1	727.1 - 726.8	2.32
KIF-TW03	13.5 - 15.0	762.5 - 761.0	2.34
KIF-TW03	21.0 - 21.7	755.0 - 754.3	2.32
KIF-TW03	21.7 - 22.0	754.3 - 754.0	2.21
KIF-TW03	33.5 - 35.0	742.5 - 741.0	2.41
KIF-TW03	46.3 - 46.6	729.7 - 729.4	2.29
KIF-TW03	46.6 - 47.1	729.4 - 728.9	2.26
KIF-TW04	13.5 - 15.0	751.7 - 750.2	2.35
KIF-TW04	24.9 - 25.5	740.3 - 739.7	2.70
KIF-TW04	25.5 - 25.7	739.7 - 739.5	2.40
KIF-TW04	28.5 - 30.0	736.7 - 735.2	2.59
KIF-TW04	39.0 - 41.0	726.2 - 724.2	2.43
KIF-TW04	39.3 - 39.9	725.9 - 725.3	2.41
KIF-TW04	39.9 - 40.5	725.3 - 724.7	2.43
KIF-TW05	9.0 - 10.5	761.5 - 760.0	2.43
KIF-TW05	28.5 - 30.0	742.0 - 740.5	2.49

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Table F.1-4 - Summary of Phase 1 Specific Gravity Testing
Kingston Fossil Plant
November 2018-January 2020

Boring ID	Test Interval Depth	Test Interval Elevation	Specific Gravity
	ft	ft NGVD29	
KIF-TW05	39.0 - 41.0	731.5 - 729.5	2.67
KIF-TW05	40.2 - 40.5	730.3 - 730.0	2.67

Notes:

ft	feet
ID	identification
NGVD29	National Geodetic Vertical Datum of 1929

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Table F.1-5 - Summary of Phase 1 USCS Soil Classification
Kingston Fossil Plant
November 2018-January 2020

Boring ID	Test Interval Depth	Test Interval Elevation	USCS Classification
	ft	ft NGVD29	
KIF-TW01	1.5 - 1.9	770.3 - 769.9	CH
KIF-TW01	4.0 - 4.5	767.8 - 767.3	ML
KIF-TW01	13.5 - 15	758.3 - 756.8	SM
KIF-TW01	24.9 - 25.4	746.9 - 746.4	ML
KIF-TW01	28.5 - 30.0	743.3 - 741.8	SM
KIF-TW01	36.0 - 36.5	735.8 - 735.3	SM
KIF-TW01	39.0 - 40.5	732.8 - 731.3	ML
KIF-TW01	42.7 - 43.2	729.1 - 728.6	ML
KIF-TW02	01.5 - 2.3	770.4 - 769.6	CH
KIF-TW02	15.0 - 16.5	756.9 - 755.4	SM
KIF-TW02	21.0 - 21.5	750.9 - 750.4	ML
KIF-TW02	28.5 - 30.0	743.4 - 741.9	SM
KIF-TW02	36.0 - 36.5	735.9 - 735.4	SM
KIF-TW02	39.0 - 40.5	732.9 - 731.4	ML
KIF-TW02	44.3 - 44.8	727.6 - 727.1	ML
KIF-TW03	0.0 - 1.5	776.0 - 774.5	CH
KIF-TW03	4.5 - 6.0	771.5 - 770.0	ML
KIF-TW03	13.5 - 15.0	762.5 - 761.0	SM
KIF-TW03	21.0 - 21.7	755.0 - 754.3	ML
KIF-TW03	27.5 - 29.0	748.5 - 747.0	ML
KIF-TW03	33.5 - 35.0	742.5 - 741.0	SM
KIF-TW03	38.5 - 39.5	737.5 - 736.5	ML
KIF-TW03	43.5 - 44.0	732.5 - 732.0	ML
KIF-TW03	46.6 - 47.1	729.4 - 728.9	ML
KIF-TW04	0.0 - 1.5	765.2 - 763.7	CL
KIF-TW04	5.5 - 6.0	759.7 - 759.2	ML
KIF-TW04	13.5 - 15.0	751.7 - 750.2	ML
KIF-TW04	24.9 - 25.5	740.3 - 739.7	ML

Table F.1-5 - Summary of Phase 1 USCS Soil Classification
Kingston Fossil Plant
November 2018-January 2020

Boring ID	Test Interval Depth	Test Interval Elevation	USCS Classification
	ft	ft NGVD29	
KIF-TW04	28.5 - 30.0	736.7 - 735.2	SM
KIF-TW04	33.5 - 34.5	731.7 - 730.7	ML
KIF-TW04	39.3 - 39.9	725.9 - 725.3	ML
KIF-TW05	0.0 - 1.5	770.5 - 769.0	SM
KIF-TW05	9.0 - 10.5	761.5 - 760.0	SM
KIF-TW05	19.5 - 21.0	751.0 - 749.5	SW-SM
KIF-TW05	28.5 - 30.0	742.0 - 740.5	ML
KIF-TW05	34.5 - 36.0	736.0 - 734.5	ML
KIF-TW05	39.7 - 40.2	730.8 - 730.3	CL
KIF-B01A	43.5 - 45.0	727.8 - 726.3	ML
KIF-B01A	50.0 - 51.3	721.3 - 720.0	CL
KIF-B01A	51.3 - 53.0	720.0 - 718.3	ML
KIF-B01A	53.7 - 55.0	717.6 - 716.3	CL
KIF-B01B	50.0 - 51.4	721.3 - 719.9	ML
KIF-B02A	48.5 - 50.0	723.8 - 722.3	ML
KIF-B02A	52.7 - 55.0	719.6 - 717.3	CL
KIF-B03A	50.0 - 51.5	726.3 - 724.8	ML
KIF-B03A	55.0 - 57.5	721.3 - 718.8	ML
KIF-B04	43.5 - 44.0	722.0 - 721.5	ML
KIF-B04	44.0 - 45.0	721.5 - 720.5	CL
KIF-B04	45.0 - 47.5	720.5 - 718.0	CL

Notes:

ft	feet
ID	identification
NGVD29	National Geodetic Vertical Datum of 1929
USCS	Unified Soil Classification System

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Table F.1-6 - Summary of Phase 1 Triaxial Compression Testing
Kingston Fossil Plant
November 2018-January 2020

Well ID	Test Interval Depth	Test Interval Elevation	USCS Classification	Confining Stress	Drained Failure		Undrained Failure	
					p'	q	p	q
	ft	ft NGVD29		tsf	tsf	tsf	tsf	tsf
KIF-TW04	24.9 - 25.5	740.3 - 739.7	ML	2.16	2.97	1.76	4.71	2.57
KIF-TW04	39.9 - 40.5	725.3 - 724.7	ML	2.51	5.12	2.91	6.93	4.43
KIF-TW05	39.7 - 40.2	730.8 – 730.3	CL	1.49	2.44	1.43	3.42	1.96

Notes:

ft	feet
ID	identification
NGVD29	National Geodetic Vertical Datum of 1929
tsf	tons per square foot
USCS	Unified Soil Classification System

1. The criterion for drained failure was considered to be the maximum effective principal stress ratio (maximum obliquity).

2. The criterion for undrained failure was considered to be the greater of the maximum deviator stress or the deviator stress at 15 percent axial strain.

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Table F.1-7 - Summary of Phase 1 Vertical Hydraulic Conductivity Testing
Kingston Fossil Plant
November 2018-January 2020

Boring ID	Test Interval Depth	Test Interval Elevation	USCS Classification	Hydraulic Conductivity, Kv
	ft	ft NGVD29		cm/s
KIF-TW01	24.6 - 24.9	747.2 - 746.9	ML	2.3E-05
KIF-TW01	42.4 - 42.7	729.4 - 729.1	ML	7.5E-06
KIF-TW02	21.5 - 21.8	750.4 - 750.1	ML	4.0E-06
KIF-TW02	44.8 - 45.1	727.1 - 726.8	ML	1.2E-05
KIF-TW03	21.7 - 22.0	754.3 - 754.0	ML	6.7E-06
KIF-TW03	46.3 - 46.6	729.7 - 729.4	ML	2.2E-05
KIF-TW04	25.5 - 25.7	739.7 - 739.5	ML	3.7E-05
KIF-TW04	40.5 – 40.7	724.7 - 724.5	ML	1.4E-05
KIF-TW05	40.2 - 40.5	730.3 - 730.0	CL	2.1E-08

Notes:

cm/s	centimeters per second
ft	feet
ID	identification
Kv	Vertical Hydraulic Conductivity
NGVD29	National Geodetic Vertical Datum of 1929
USCS	Unified Soil Classification System

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ATTACHMENT F.2

Phase 1 Natural Moisture Content Testing Results

Stantec

Moisture Content of Soil

ASTM D 2216

Project Name KIF TDEC Order

Project Number 175668043

Tested By DB

Test Method ASTM

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous, Disturbed

Source	Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded Amount	Material Excluded Size	Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
KIF-GT-TW01-SS02a, 1.5'-1.9'	14	4/20/19	Hom	3/4"			No	20.88	58.10	50.65	25.0
KIF-GT-TW01-SS03b, 4.0'-4.5'	15	4/20/19	Len	3/4"			No	20.92	88.00	77.59	18.4
KIF-GT-TW01-SS07a, 9.0'-9.5'	19	4/20/19	Str	3/4"			No	21.15	93.13	83.27	15.9
KIF-GT-TW01-SS10, 13.5'-15.0'	23	4/20/19	Hom	1 1/2"			No	21.12	93.87	80.37	22.8
KIF-GT-TW01-SS13b, 18.5'-19.5'	25	4/20/19	Hom	No. 10			Yes	20.91	125.42	97.34	36.7
KIF-GT-TW01-ST02, 24.0'-26.0'	27	4/20/19	Hom	No. 4			No	30.07	140.62	113.88	31.9
KIF-GT-TW01-SS20, 28.5'-30.0'	29	4/20/19	Len	3/4"			No	21.25	94.74	82.97	19.1
KIF-GT-TW01-SS21b, 31.0'-31.5'	31	4/20/19	Hom	No. 10			Yes	20.67	100.55	78.71	37.6
KIF-GT-TW01-SS23b, 33.5'-34.5'	32	4/20/19	Hom	No. 10			Yes	21.05	110.53	80.07	51.6
KIF-GT-TW01-SS25a, 36.0'-36.5'	34	4/20/19	Hom	3/8"			No	20.93	95.61	77.35	32.4
KIF-GT-TW01-SS27, 39.0'-40.5'	36	4/20/19	Hom	3/8"			No	21.27	111.25	87.89	35.1
KIF-GT-TW01-ST03, 42.0'-44.0'	37	4/20/19	Hom	No. 4			No	30.30	113.79	94.11	30.8
KIF-GT-TW02-SS02a, 1.5'-2.3'	39	4/20/19	Hom	1 1/2"			No	21.27	80.80	67.63	28.4
KIF-GT-TW02-SS04a, 4.5'-5.5' All Rock	41	4/20/19	Hom	3/4"			No	20.93	102.93	101.82	1.4
KIF-GT-TW02-SS04b, 5.5'-6.0'	42	4/20/19	Len	3/4"			No	21.11	91.12	82.98	13.2
KIF-GT-TW02-SS06b, 8.5'-9.0'	44	4/20/19	Hom	No. 4			No	20.73	95.09	81.71	21.9
KIF-GT-TW02-SS08a, 10.5'-11.0'	46	4/20/19	Hom	No. 4			No	21.23	99.96	85.25	23.0
KIF-GT-TW02-SS11, 15.0'-16.5'	48	4/20/19	Hom	3/4"			No	21.00	96.93	81.84	24.8
KIF-GT-TW02-ST01, 21.0'-23.0'	50	4/20/19	Hom	3/8"			No	22.24	94.36	73.78	39.9
KIF-GT-TW02-SS18a, 25.5'-26.5'	53	4/21/19	Hom	3/8"			No	21.19	129.36	112.51	18.5
KIF-GT-TW02-SS20, 28.5'-30.0'	54	4/21/19	Hom	3/4"			No	20.97	96.73	80.97	26.3
KIF-GT-TW02-SS23b, 33.5'-34.5'	57	4/21/19	Hom	3/8"			No	20.96	121.33	88.51	48.6
KIF-GT-TW02-SS25a, 36.0'-36.5'	59	4/21/19	Hom	3/8"			No	21.12	99.01	72.39	51.9
KIF-GT-TW02-SS26b, 38.5'-39.0'	60	4/21/19	Hom	No. 10			Yes	21.17	119.70	83.31	58.6
KIF-GT-TW02-SS27, 39.0'-40.5'	61	4/21/19	Hom	No. 4			No	20.87	116.96	81.99	57.2
KIF-GT-TW02-ST02, 43.5'-45.5'	65	4/20/19	Hom	3/8"			No	29.99	108.00	84.85	42.2
KIF-GT-TW03-SS01, 0.0'-1.5'	66	4/21/19	Len	3/4"			No	20.78	68.46	56.40	33.9
KIF-GT-TW03-SS04, 4.5'-6.0'	68	4/21/19	Hom	3/4"			No	21.36	105.35	90.35	21.7

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Moisture Content of Soil

ASTM D 2216

Project Name KIF TDEC Order

Project Number 175668043

Tested By DB

Test Method ASTM

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous, Disturbed

Source	Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded Amount	Material Excluded Size	Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
KIF-GT-TW03-SS06b, 8.5'-9.0'	70	4/21/19	Hom	No. 10			Yes	21.46	93.48	82.15	18.7
KIF-GT-TW03-SS10, 13.5'-15.0'	74	4/21/19	Hom	1 1/2"			No	22.10	90.97	82.16	14.7
KIF-GT-TW03-SS13b, 18.5'-19.5'	76	4/21/19	Hom	3/8"			No	22.01	111.46	95.38	21.9
KIF-GT-TW03-ST01, 21.0'-23.0'	78	4/20/19	Hom	3/4"			No	30.03	144.31	115.25	34.1
KIF-GT-TW03-SS18, 27.5'-29.0'	80	4/21/19	Hom	No. 4			No	21.16	128.55	97.26	41.1
KIF-GT-TW03-SS22, 33.5'-35.0'	82	4/21/19	Hom	1 1/2"			No	21.27	105.18	79.12	45.0
KIF-GT-TW03-SS25b, 38.5'-39.5'	84	4/21/19	Hom	No. 4			No	21.59	110.52	77.47	59.1
KIF-GT-TW03-SS27a, 41.0'-41.5'	86	4/21/19	Hom	3/8"			No	20.98	121.76	90.53	44.9
KIF-GT-TW03-SS28b, 43.5'-44.0'	87	4/21/19	Hom	3/4"			No	21.05	115.27	80.65	58.1
KIF-GT-TW03-SS29a, 44.0'-45.0'	88	4/21/19	Hom	3/8"			No	21.92	110.27	81.55	48.2
KIF-GT-TW03-ST02, 45.5'-47.5'	90	4/20/19	Hom	No. 4			No	17.23	68.88	50.06	57.3
KIF-GT-TW04-SS01, 0.0'-1.5'	91	4/21/19	Len	3/4"			No	21.59	95.24	80.73	24.5
KIF-GT-TW04-SS03a, 3.0'-3.5'	94	4/21/19	Hom	No. 4			No	19.68	86.58	71.44	29.3
KIF-GT-TW04-SS04b, 5.5'-6.0'	95	4/21/19	Hom	No. 4			No	20.89	114.59	83.29	50.2
KIF-GT-TW04-SS06b, 8.5'-9.0'	97	4/21/19	Hom	No. 10			Yes	20.94	126.10	90.65	50.9
KIF-GT-TW04-SS08a, 10.5'-11.5'	99	4/21/19	Hom	No. 10			Yes	19.91	127.38	94.09	44.9
KIF-GT-TW04-SS010, 13.5'-15.0'	100	4/21/19	Hom	3/8"			No	21.96	94.78	73.66	40.9
KIF-GT-TW04-SS013a, 18.5'-19.5'	102	4/21/19	Hom	No. 4			No	21.06	97.94	68.71	61.3
KIF-GT-TW04-SS014, 19.5'-21.0'	103	4/21/19	Hom	3/8"			No	21.64	106.27	76.66	53.8
KIF-GT-TW04-ST01, 24.0'-26.0'	104	4/20/19	Hom	No. 4			No	31.69	116.44	88.56	49.0
KIF-GT-TW04-SS19, 28.5'-30.0'	106	4/21/19	Hom	3/4"			No	21.53	117.97	90.90	39.0
KIF-GT-TW04-SS22b, 33.5'-34.5'	108	4/21/19	Hom	3/4"			No	21.54	98.25	70.21	57.6
KIF-GT-TW04-SS24a, 36.0'-36.5'	110	4/21/19	Hom	No. 10			Yes	22.36	125.25	90.25	51.6
KIF-GT-TW04-ST02, 39.0'-41.0'	112	4/20/19	Hom	3/4"			No	26.35	102.41	83.01	34.2

Comments

Reviewed By RJ

Stantec

Moisture Content of Soil

ASTM D 2216

Project Name TVA KIF EIP Exploratory Drilling

Project Number 175668043

Tested By KG

Test Method ASTM

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous, Disturbed

Source	Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded Amount	Material Excluded Size	Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
KIF-GT-TW05-SPT01, 0.0'-1.5'	1	12/5/18	Dist	1 1/2"			No	20.68	72.90	64.97	17.9
KIF-GT-TW05-SPT04, 4.5'-6.0'	2	12/5/18	Dist	1 1/2"			No	20.52	86.78	74.22	23.4
KIF-GT-TW05-SPT07, 9.0'-10.5'	3	12/5/18	Dist	3/4"			No	21.35	79.54	72.80	13.1
KIF-GT-TW05-SPT10, 13.5'-15.0'	4	12/5/18	Dist	1 1/2"			No	20.97	101.33	93.86	10.2
KIF-GT-TW05-SPT11, 15.0'-16.5'	5	12/5/18	Dist	1 1/2"			No	22.27	102.87	94.55	11.5
KIF-GT-TW05-SPT14, 19.5'-21.0'	6	12/5/18	Dist	1 1/2"			No	21.84	111.21	101.05	12.8
KIF-GT-TW05-SPT15, 21.0'-22.5'	7	12/5/18	Dist	1 1/2"			No	21.93	112.06	96.03	21.6
KIF-GT-TW05-SPT20, 28.5'-30.0'	8	12/5/18	Dist	3/8"			No	21.08	94.79	74.70	37.5
KIF-GT-TW05-SPT21, 30.0'-31.5'	9	12/5/18	Dist	No. 10			Yes	21.20	88.72	67.65	45.4
KIF-GT-TW05-SPT23, 33.0'-34.5'	10	12/5/18	Dist	No. 10			Yes	21.22	85.39	65.26	45.7
KIF-GT-TW05-SPT24, 34.5'-36.0'	11	12/5/18	Dist	3/8"			No	20.80	99.79	75.33	44.9

Comments

Reviewed By RJ

Stantec

Moisture Content of Soil

ASTM D 2216

Project Name KIF TDEC Order

Project Number 175668043

Tested By DB

Test Method ASTM

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous, Disturbed

Source	Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded Amount	Material Excluded Size	Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
kif-gt-b01a-dp01ag, 35.0'-36.5'	113	12/19/19	Hom	No. 10			Yes	30.40	179.28	135.73	41.3
kif-gt-b01a-dp02ag, 40.0'-41.5'	115	12/19/19	Hom	No. 10			Yes	31.66	180.44	145.71	30.5
kif-gt-b01a-dp02cg, 43.5'-45.0'	116	12/19/19	Hom	No. 4			No	30.09	104.64	85.16	35.4
kif-gt-b01a-dp04ag, 50.0'-51.3'	118	12/19/19	Hom	No. 10			Yes	30.36	126.85	104.97	29.3
kif-gt-b01a-dp04bg, 51.3'-53.0'	119	12/19/19	Dist	No. 4			Yes	31.58	175.94	150.37	21.5
kif-gt-b01a-dp04dg, 53.7'-55.0'	121	12/19/19	Len	No. 10			Yes	31.54	131.13	111.46	24.6
kif-gt-b01b-dp04ag, 50.0'-51.4'	122	12/19/19	Hom	No. 4			No	30.54	153.18	122.51	33.3
kif-gt-b02a-dp01g, 35.0'-40.0'	123	12/19/19	Hom	No. 10			Yes	30.20	167.43	125.07	44.7
kif-gt-b02a-dp02cg, 44.0'-45.0'	125	12/19/19	Hom	No. 10			Yes	30.01	163.91	123.17	43.7
kif-gt-b02a-dp03cg, 48.5'-50.0'	127	12/19/19	Hom	3/8"			No	31.67	130.51	105.02	34.8
kif-gt-b02a-dp04cg, 52.7'-55.0'	128	12/19/19	Len	No. 10			Yes	30.09	90.81	80.13	21.3
kif-gt-b03a-dp01ag, 40.0'-41.5'	139	12/19/19	Hom	3/8"			No	31.60	149.12	100.36	70.9
kif-gt-b03a-dp02ag, 45.0'-46.5'	141	12/19/19	Hom	No. 10			Yes	31.58	208.67	161.38	36.4
kif-gt-b03a-dp03ag, 50.0'-51.5'	143	12/19/19	Hom	No. 4			No	31.35	107.18	85.82	39.2
kif-gt-b03a-dp04g, 55.0'-57.5'	146	12/19/19	Hom	No. 4			Yes	30.07	167.99	148.80	16.2
kif-gt-b03a-dp05cg, 59.2'-60.0'	149	12/19/19	Len	No. 10			Yes	31.67	205.47	178.13	18.7
kif-gt-b04a-dp01ag, 35.0'-36.5'	159	12/19/19	Hom	3/8"			No	31.43	145.86	96.98	74.6
kif-gt-b04a-dp02ag, 40.0'-41.5'	161	12/19/19	Hom	No. 10			Yes	30.02	153.67	118.26	40.1
kif-gt-b04a-dp02cg, 43.5'-44.0'	162	12/19/19	Hom	No. 10			Yes	29.85	98.27	78.68	40.1
kif-gt-b04a-dp02dg, 44.0'-45.0'	163	12/19/19	Dist	No. 10			Yes	30.33	100.99	84.11	31.4
kif-gt-b04a-dp03g, 45.0'-47.5'	164	12/19/19	Len	No. 10			Yes	31.45	142.78	120.76	24.7

ATTACHMENT F.3

Phase 1 Soil Classification Testing Results

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	KIF-GT-TW01-SS02a, 1.5'-1.9'	Lab ID	14
Sample Type	SS	Date Received	3-28-19
		Date Reported	5-21-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 25.0

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
1 1/2"	37.5	100.0
3/4"	19	93.7
3/8"	9.5	89.7
No. 4	4.75	87.4
No. 10	2	84.1
No. 40	0.425	79.4
No. 200	0.075	73.1
	0.02	61.5
	0.005	52.7
	0.002	46.8
estimated	0.001	42.5

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	12.6	15.9
Coarse Sand	3.3	4.7
Medium Sand	4.7	---
Fine Sand	6.3	6.3
Silt	20.4	26.3
Clay	52.7	46.8

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	72
Plastic Limit:	25
Plasticity Index:	47
Activity Index:	1.0

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol:	CH
Group Name:	Fat clay with sand
AASHTO Classification:	A-7-6 (35)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	KIF-GT-TW01-SS02a, 1.5'-1.9'	Lab ID	14

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	DB
Test Date	04-22-2019
Date Received	03-28-2019

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	93.7
3/8"	89.7
No. 4	87.4
No. 10	84.1

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

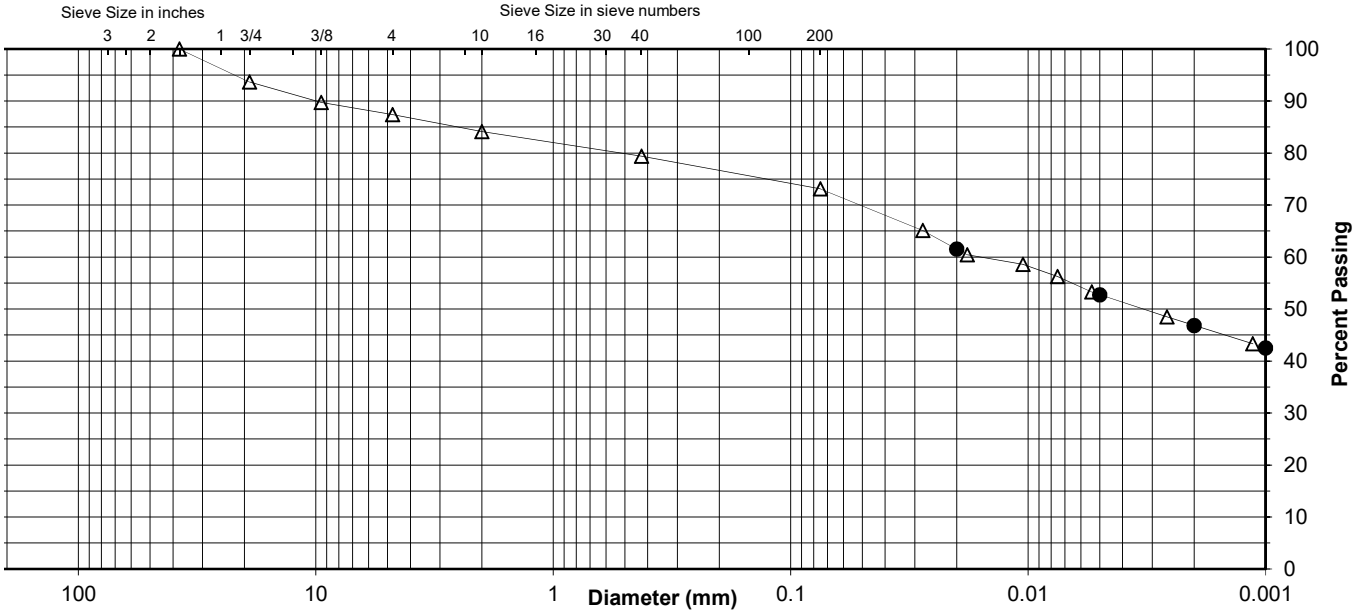
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	79.4
No. 200	73.1
0.02 mm	61.5
0.005 mm	52.7
0.002 mm	46.8
0.001 mm	42.5

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	6.3	6.3	3.3	4.7	6.3	20.4	52.7
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	15.9			4.7	6.3	26.3	46.8



Comments

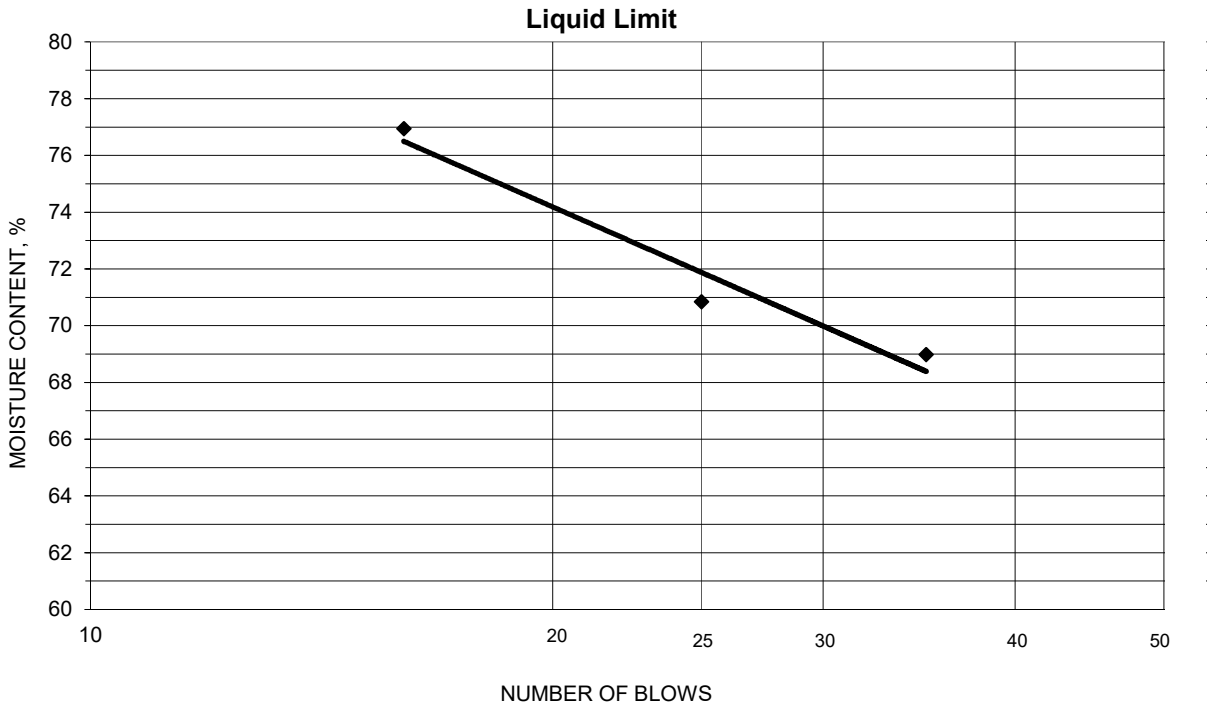
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	KIF-GT-TW01-SS02a, 1.5'-1.9'			Lab ID	14
				% + No. 40	21
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	03-28-2019
Test Date	04-26-2019	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
18.74	15.56	10.95	35	69.0	
18.97	15.69	11.06	25	70.8	
17.90	14.93	11.07	16	76.9	72



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
16.93	15.82	11.37	24.9	25	47
16.35	15.23	10.89	25.8		

Remarks: _____

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	KIF-GT-TW01-SS03b, 4.0'-4.5'	Lab ID	15
Sample Type	SS	Date Received	3-28-19
		Date Reported	5-21-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 18.4

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
3/4"	19	100.0
3/8"	9.5	96.4
No. 4	4.75	93.8
No. 10	2	88.7
No. 40	0.425	84.4
No. 200	0.075	69.3
	0.02	44.0
	0.005	18.9
	0.002	11.5
estimated	0.001	8.5

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	6.2	11.3
Coarse Sand	5.1	4.3
Medium Sand	4.3	---
Fine Sand	15.1	15.1
Silt	50.4	57.8
Clay	18.9	11.5

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	NP
Plastic Limit:	NP
Plasticity Index:	NP
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.44

Classification

Unified Group Symbol: ML

Group Name: Sandy silt

AASHTO Classification: A-4 (0)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	KIF-GT-TW01-SS03b, 4.0'-4.5'	Lab ID	15

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	DB
Test Date	04-22-2019
Date Received	03-28-2019

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	96.4
No. 4	93.8
No. 10	88.7

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity 2.44

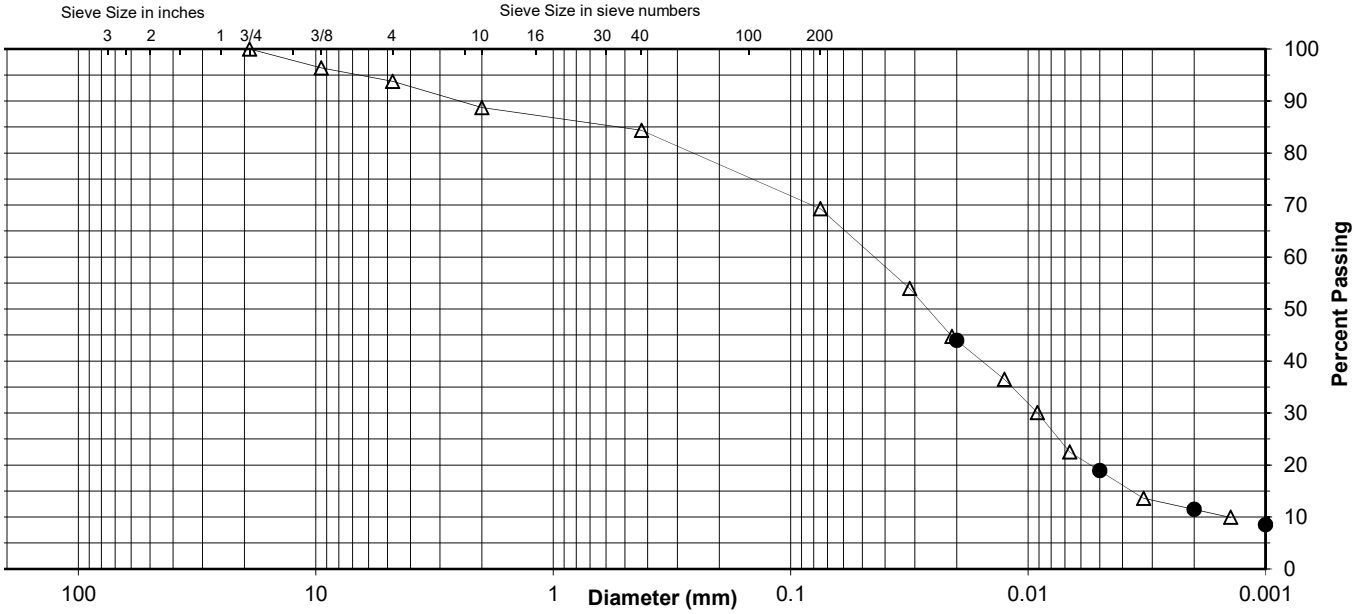
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	84.4
No. 200	69.3
0.02 mm	44.0
0.005 mm	18.9
0.002 mm	11.5
0.001 mm	8.5

Particle Size Distribution

	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
ASTM	0.0	6.2	5.1	4.3	15.1	50.4	18.9

	Gravel	Coarse Sand	Fine Sand	Silt	Clay
AASHTO	11.3	4.3	15.1	57.8	11.5



Comments

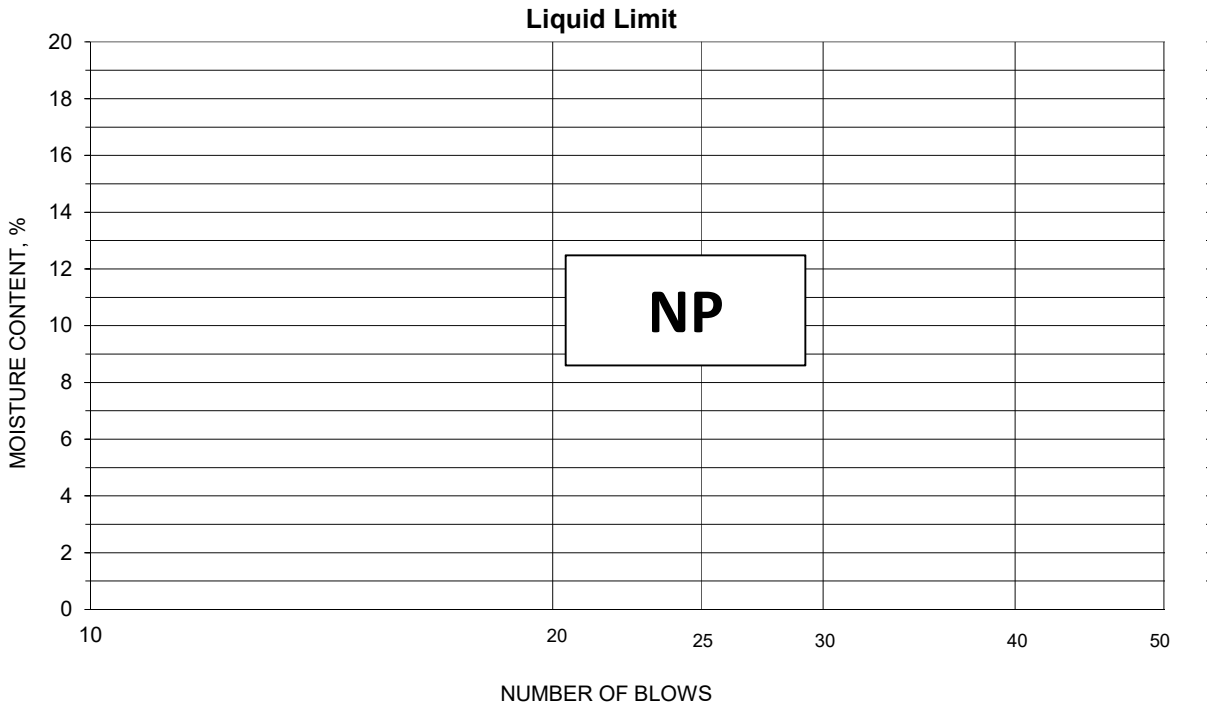
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	KIF-GT-TW01-SS03b, 4.0'-4.5'			Lab ID	15
				% + No. 40	16
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	03-28-2019
Test Date	04-26-2019	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: _____

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	KIF-GT-TW01-SS10, 13.5'-15.0'	Lab ID	23
Sample Type	SS	Date Received	3-28-19
		Date Reported	5-21-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 22.8

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
1 1/2"	37.5	100.0
3/4"	19	93.9
3/8"	9.5	92.1
No. 4	4.75	86.7
No. 10	2	78.4
No. 40	0.425	65.5
No. 200	0.075	40.7
	0.02	14.1
	0.005	4.5
	0.002	1.7
estimated	0.001	0.2

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	13.3	21.6
Coarse Sand	8.3	12.9
Medium Sand	12.9	---
Fine Sand	24.8	24.8
Silt	36.2	39.0
Clay	4.5	1.7

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	NP
Plastic Limit:	NP
Plasticity Index:	NP
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol:	SM
Group Name:	Silty sand
AASHTO Classification:	A-4 (0)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	KIF-GT-TW01-SS10, 13.5'-15.0'	Lab ID	23

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	DB
Test Date	04-22-2019
Date Received	03-28-2019

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	93.9
3/8"	92.1
No. 4	86.7
No. 10	78.4

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

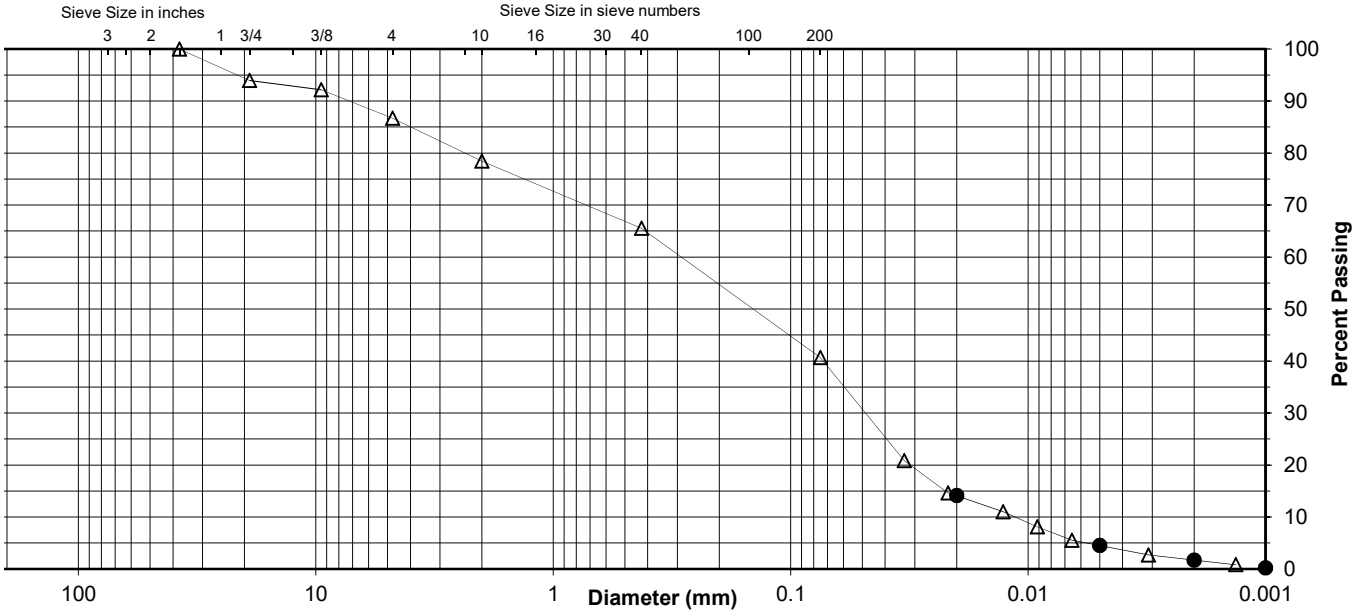
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	65.5
No. 200	40.7
0.02 mm	14.1
0.005 mm	4.5
0.002 mm	1.7
0.001 mm	0.2

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	6.1	7.2	8.3	12.9	24.8	36.2	4.5
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	21.6			12.9	24.8	39.0	1.7



Comments

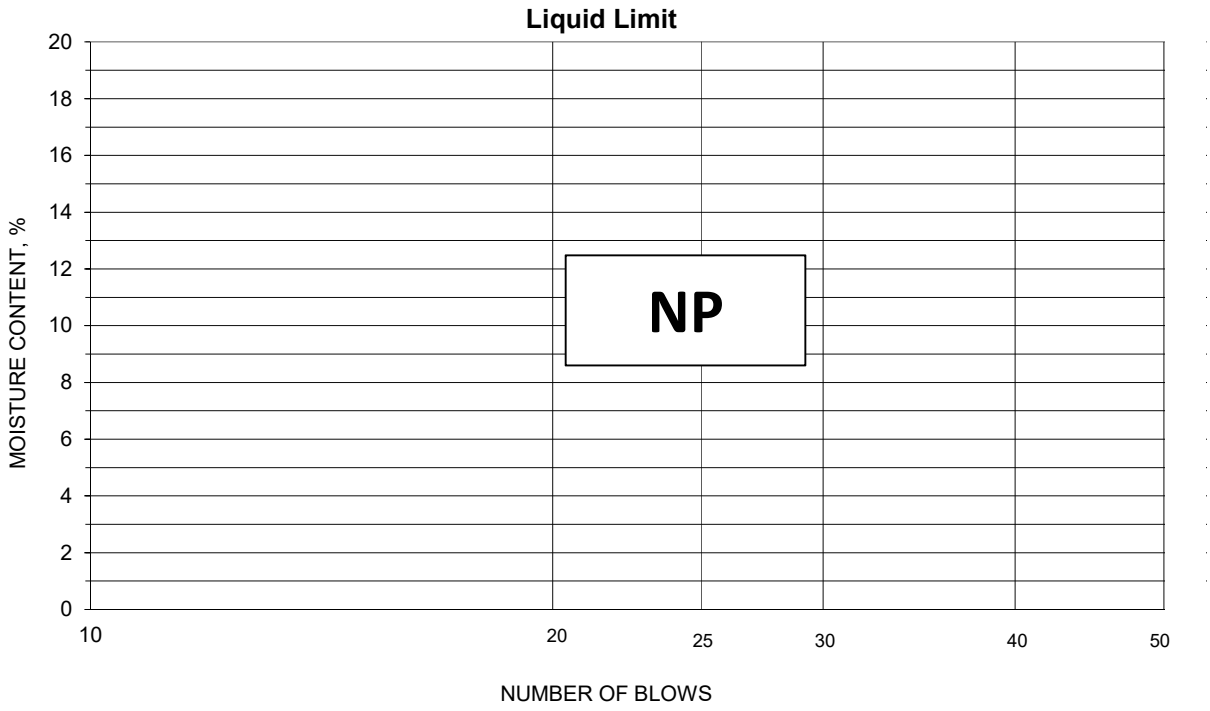
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	KIF-GT-TW01-SS10, 13.5'-15.0'			Lab ID	23
				% + No. 40	35
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	03-28-2019
Test Date	04-23-2019	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: _____

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	KIF-GT-TW01-ST02, 24.9'-25.4'	Lab ID	27
Sample Type	ST	Date Received	3-28-19
		Date Reported	5-22-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 31.9

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 4	4.75	100.0
No. 10	2	99.9
No. 40	0.425	99.4
No. 200	0.075	97.5
	0.02	65.6
	0.005	14.8
	0.002	4.2
estimated	0.001	0.0

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.0	0.1
Coarse Sand	0.1	0.5
Medium Sand	0.5	---
Fine Sand	1.9	1.9
Silt	82.7	93.3
Clay	14.8	4.2

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	NP
Plastic Limit:	NP
Plasticity Index:	NP
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.32

Classification

Unified Group Symbol: ML

Group Name: Silt

AASHTO Classification: A-4 (0)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	KIF-GT-TW01-ST02, 24.9'-25.4'	Lab ID	27

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	DB
Test Date	04-26-2019
Date Received	03-28-2019

Maximum Particle size: No. 4 Sieve

Sieve Size	% Passing
No. 4	100.0
No. 10	99.9

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity 2.32

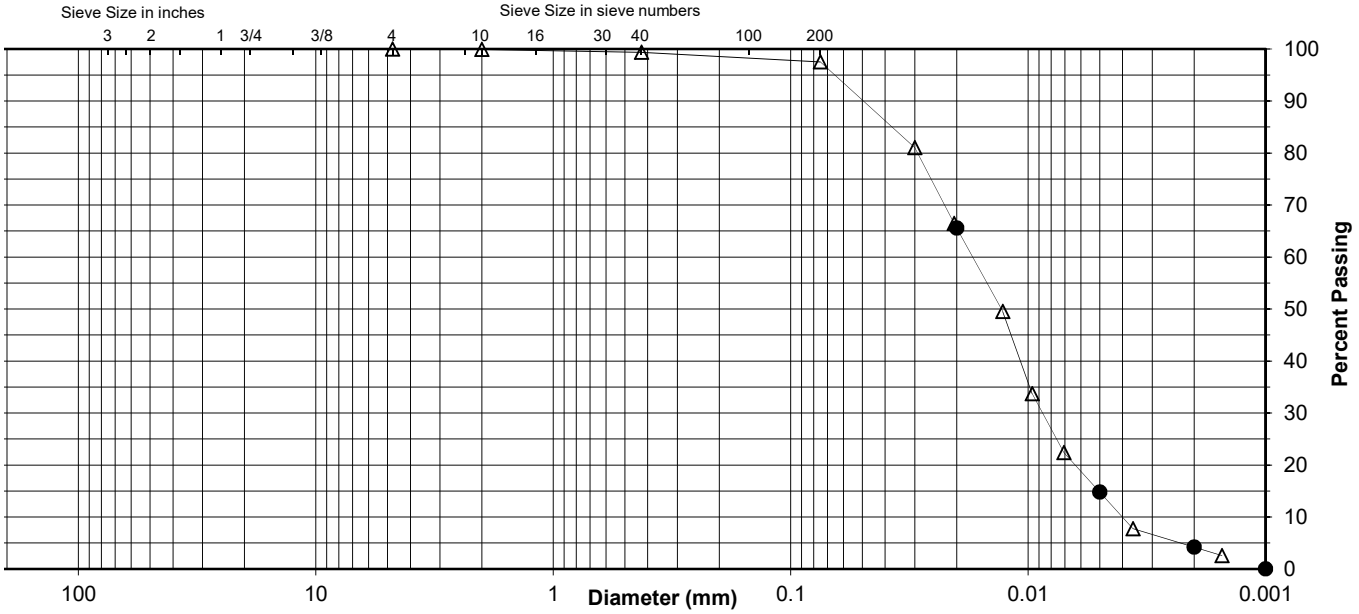
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	99.4
No. 200	97.5
0.02 mm	65.6
0.005 mm	14.8
0.002 mm	4.2
0.001 mm	0.0

Particle Size Distribution

	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
ASTM	0.0	0.0	0.1	0.5	1.9	82.7	14.8

	Gravel	Coarse Sand	Fine Sand	Silt	Clay
AASHTO	0.1	0.5	1.9	93.3	4.2



Comments

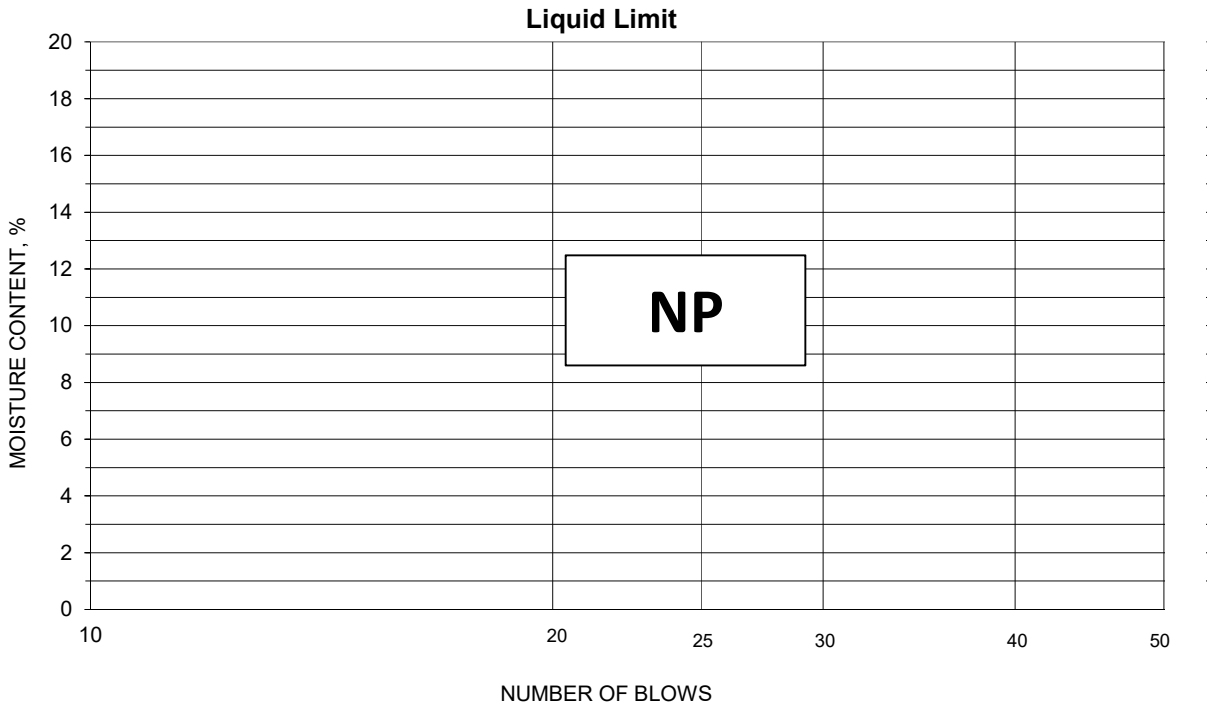
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	KIF-GT-TW01-ST02, 24.9'-25.4'			Lab ID	27
				% + No. 40	1
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	03-28-2019
Test Date	04-26-2019	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: _____

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	KIF-GT-TW01-SS20, 28.5'-30.0'	Lab ID	29
Sample Type	SS	Date Received	3-28-19
		Date Reported	5-22-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 19.1

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
3/4"	19	100.0
3/8"	9.5	92.1
No. 4	4.75	77.9
No. 10	2	54.1
No. 40	0.425	34.0
No. 200	0.075	16.6
	0.02	4.4
	0.005	0.8
	0.002	0.4
estimated	0.001	0.4

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	22.1	45.9
Coarse Sand	23.8	20.1
Medium Sand	20.1	---
Fine Sand	17.4	17.4
Silt	15.8	16.2
Clay	0.8	0.4

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	NP
Plastic Limit:	NP
Plasticity Index:	NP
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.63

Classification

Unified Group Symbol: SM

Group Name: Silty sand with gravel

AASHTO Classification: A-1-b (0)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	KIF-GT-TW01-SS20, 28.5'-30.0'	Lab ID	29

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	DB
Test Date	04-22-2019
Date Received	03-28-2019

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	92.1
No. 4	77.9
No. 10	54.1

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

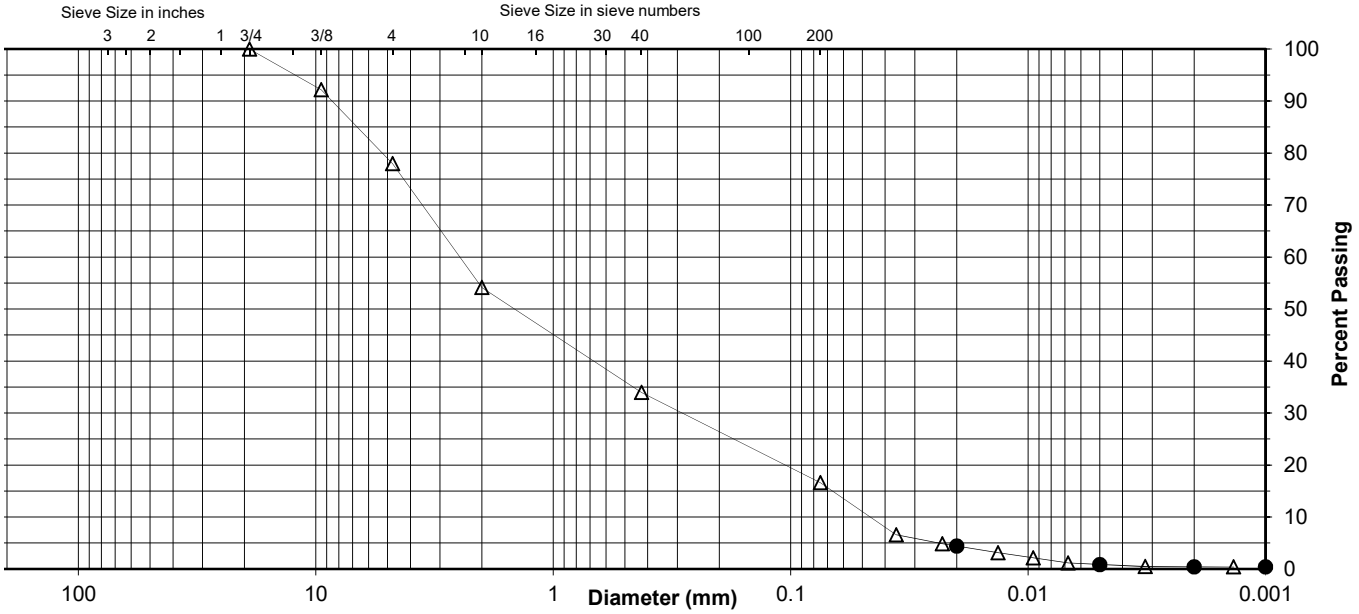
Specific Gravity 2.63

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	34.0
No. 200	16.6
0.02 mm	4.4
0.005 mm	0.8
0.002 mm	0.4
0.001 mm	0.4

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	22.1	23.8	20.1	17.4	15.8	0.8
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	45.9			20.1	17.4	16.2	0.4



Comments

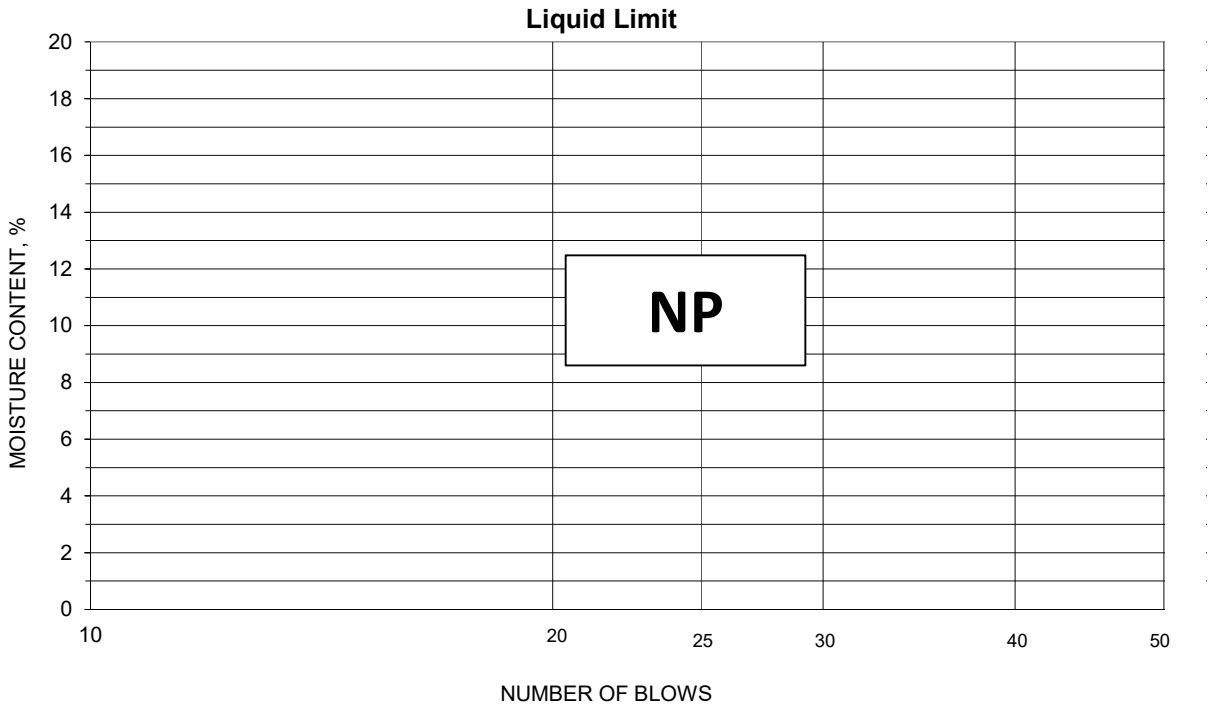
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	KIF-GT-TW01-SS20, 28.5'-30.0'			Lab ID	29
				% + No. 40	66
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	03-28-2019
Test Date	04-23-2019	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: _____

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	KIF-GT-TW01-SS25a, 36.0'-36.5'	Lab ID	34
Sample Type	SS	Date Received	3-28-19
		Date Reported	5-22-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 32.4

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
3/8"	9.5	100.0
No. 4	4.75	99.5
No. 10	2	98.1
No. 40	0.425	73.0
No. 200	0.075	42.1
	0.02	5.4
	0.005	1.2
	0.002	0.4
estimated	0.001	0.4

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.5	1.9
Coarse Sand	1.4	25.1
Medium Sand	25.1	---
Fine Sand	30.9	30.9
Silt	40.9	41.7
Clay	1.2	0.4

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	NP
Plastic Limit:	NP
Plasticity Index:	NP
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.57

Classification

Unified Group Symbol: SM

Group Name: Silty sand

AASHTO Classification: A-4 (0)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	KIF-GT-TW01-SS25a, 36.0'-36.5'	Lab ID	34

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Weathered and Friable
Tested By	DB
Test Date	04-23-2019
Date Received	03-28-2019

Maximum Particle size: 3/8" Sieve

Sieve Size	% Passing
3/8"	100.0
No. 4	99.5
No. 10	98.1

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

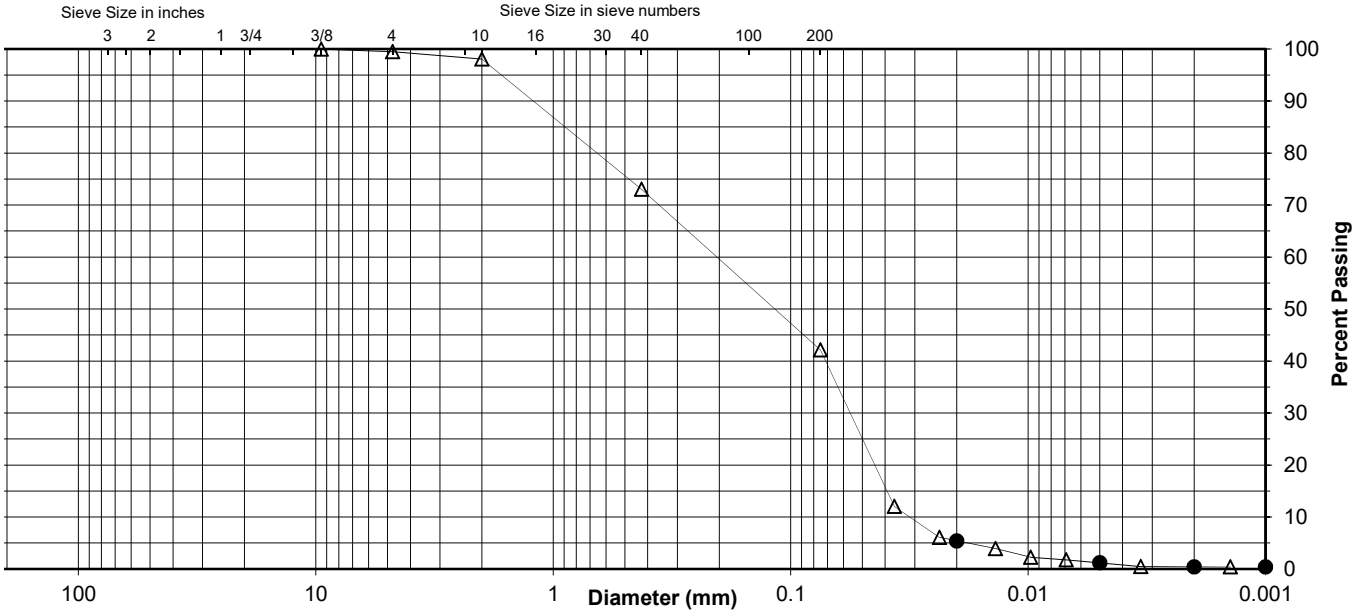
Specific Gravity 2.57

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	73.0
No. 200	42.1
0.02 mm	5.4
0.005 mm	1.2
0.002 mm	0.4
0.001 mm	0.4

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.5	1.4	25.1	30.9	40.9	1.2
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	1.9			25.1	30.9	41.7	0.4



Comments

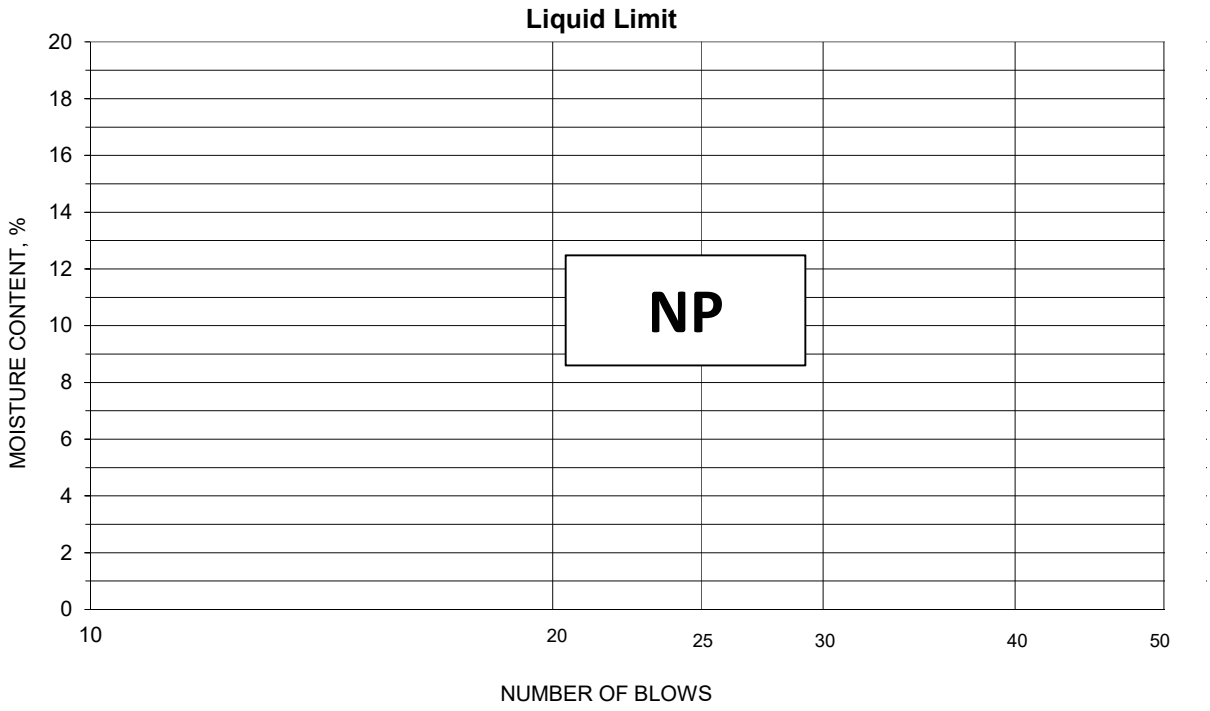
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	KIF-GT-TW01-SS25a, 36.0'-36.5'			Lab ID	34
				% + No. 40	27
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	03-28-2019
Test Date	04-23-2019	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: _____

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	KIF-GT-TW01-SS27, 39.0'-40.5'	Lab ID	36
Sample Type	SS	Date Received	3-28-19
		Date Reported	5-22-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 35.1

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
3/8"	9.5	100.0
No. 4	4.75	99.5
No. 10	2	98.5
No. 40	0.425	96.6
No. 200	0.075	89.6
	0.02	45.8
	0.005	5.8
	0.002	1.4
estimated	0.001	0.7

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.5	1.5
Coarse Sand	1.0	1.9
Medium Sand	1.9	---
Fine Sand	7.0	7.0
Silt	83.8	88.2
Clay	5.8	1.4

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	NP
Plastic Limit:	NP
Plasticity Index:	NP
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol: ML

Group Name: Silt

AASHTO Classification: A-4 (0)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	KIF-GT-TW01-SS27, 39.0'-40.5'	Lab ID	36

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Weathered and Friable
Tested By	DB
Test Date	04-26-2019
Date Received	03-28-2019

Maximum Particle size: 3/8" Sieve

Sieve Size	% Passing
3/8"	100.0
No. 4	99.5
No. 10	98.5

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

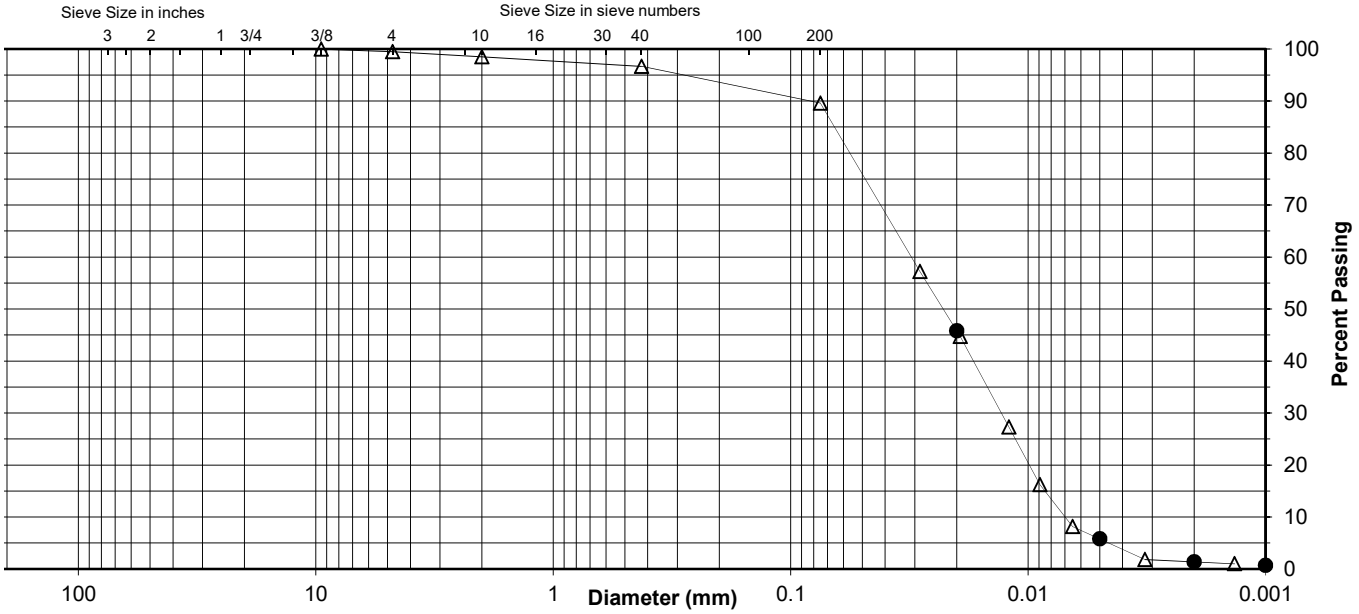
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	96.6
No. 200	89.6
0.02 mm	45.8
0.005 mm	5.8
0.002 mm	1.4
0.001 mm	0.7

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.5	1.0	1.9	7.0	83.8	5.8
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	1.5			1.9	7.0	88.2	1.4



Comments

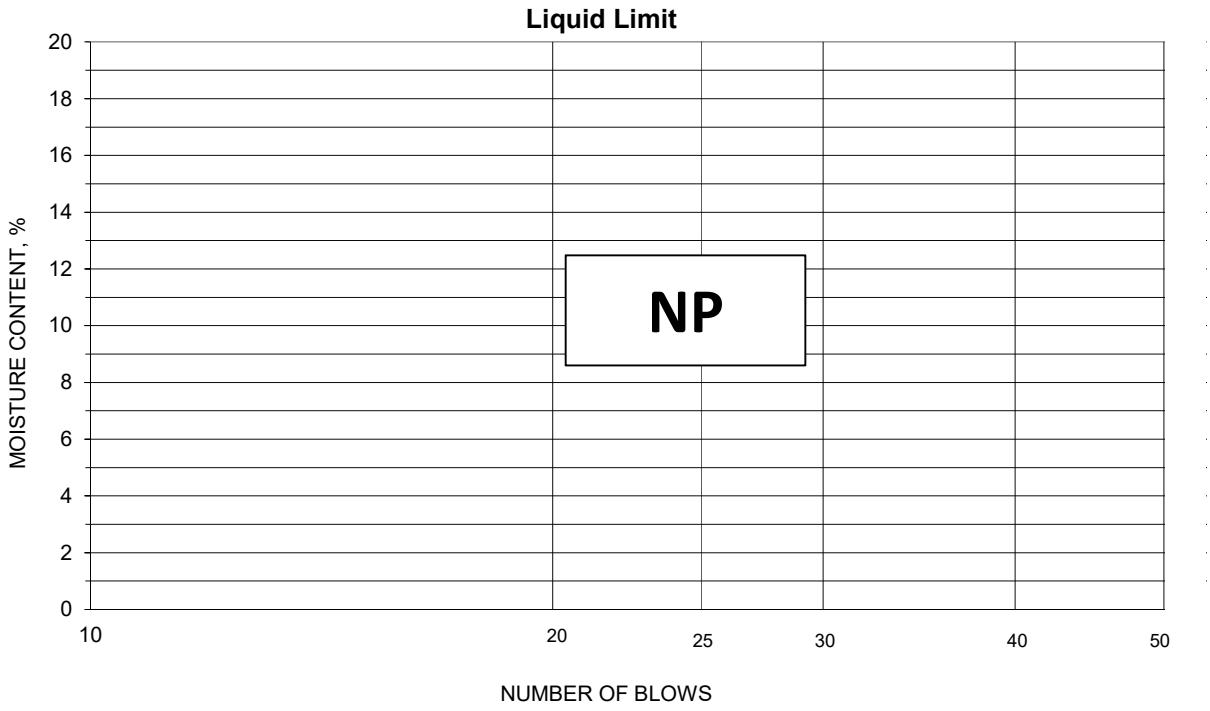
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	KIF-GT-TW01-SS27, 39.0'-40.5'			Lab ID	36
				% + No. 40	3
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	03-28-2019
Test Date	04-23-2019	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: _____

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	KIF-GT-TW01-ST03, 42.7'-43.2'	Lab ID	37
Sample Type	ST	Date Received	3-28-19
		Date Reported	5-22-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 30.8

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 4	4.75	100.0
No. 10	2	100.0
No. 40	0.425	99.4
No. 200	0.075	93.9
	0.02	53.8
	0.005	5.3
	0.002	1.9
estimated	0.001	1.7

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.0	0.0
Coarse Sand	0.0	0.6
Medium Sand	0.6	---
Fine Sand	5.5	5.5
Silt	88.6	92.0
Clay	5.3	1.9

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	NP
Plastic Limit:	NP
Plasticity Index:	NP
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.35

Classification

Unified Group Symbol: ML

Group Name: Silt

AASHTO Classification: A-4 (0)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	KIF-GT-TW01-ST03, 42.7'-43.2'	Lab ID	37

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	DB
Test Date	04-26-2019
Date Received	03-28-2019

Maximum Particle size: No. 4 Sieve

Sieve Size	% Passing
No. 4	100.0
No. 10	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity 2.35

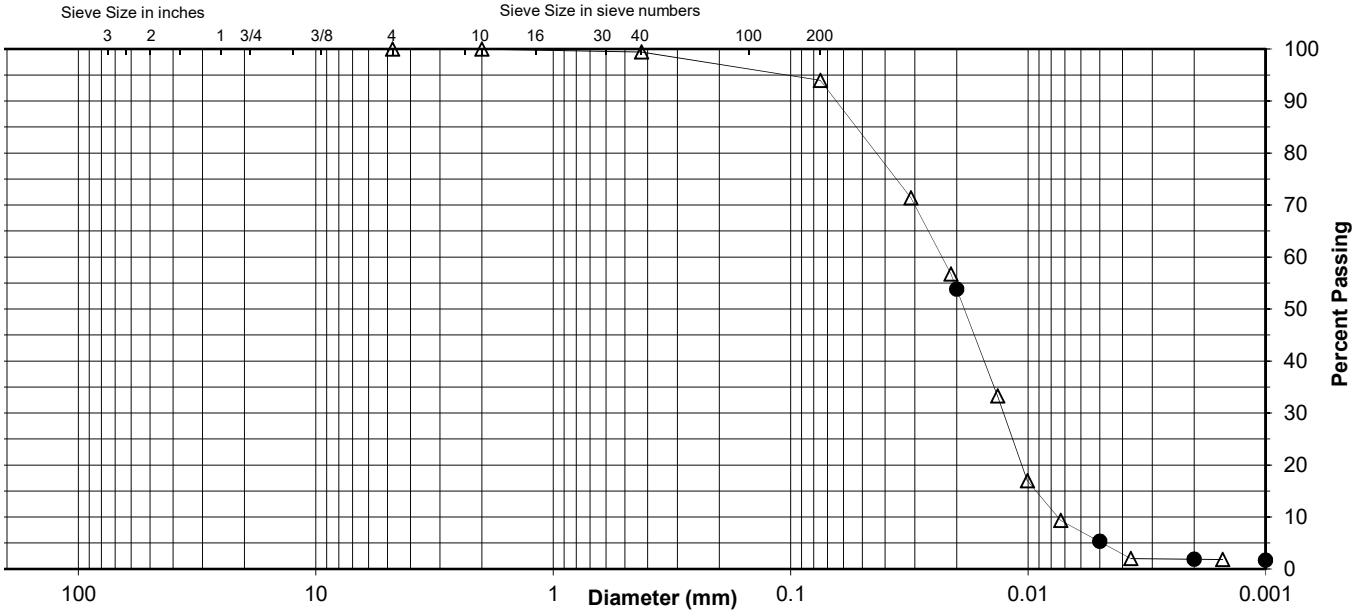
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	99.4
No. 200	93.9
0.02 mm	53.8
0.005 mm	5.3
0.002 mm	1.9
0.001 mm	1.7

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	0.0	0.6	5.5	88.6	5.3

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	0.0	0.6	5.5	92.0	1.9



Comments

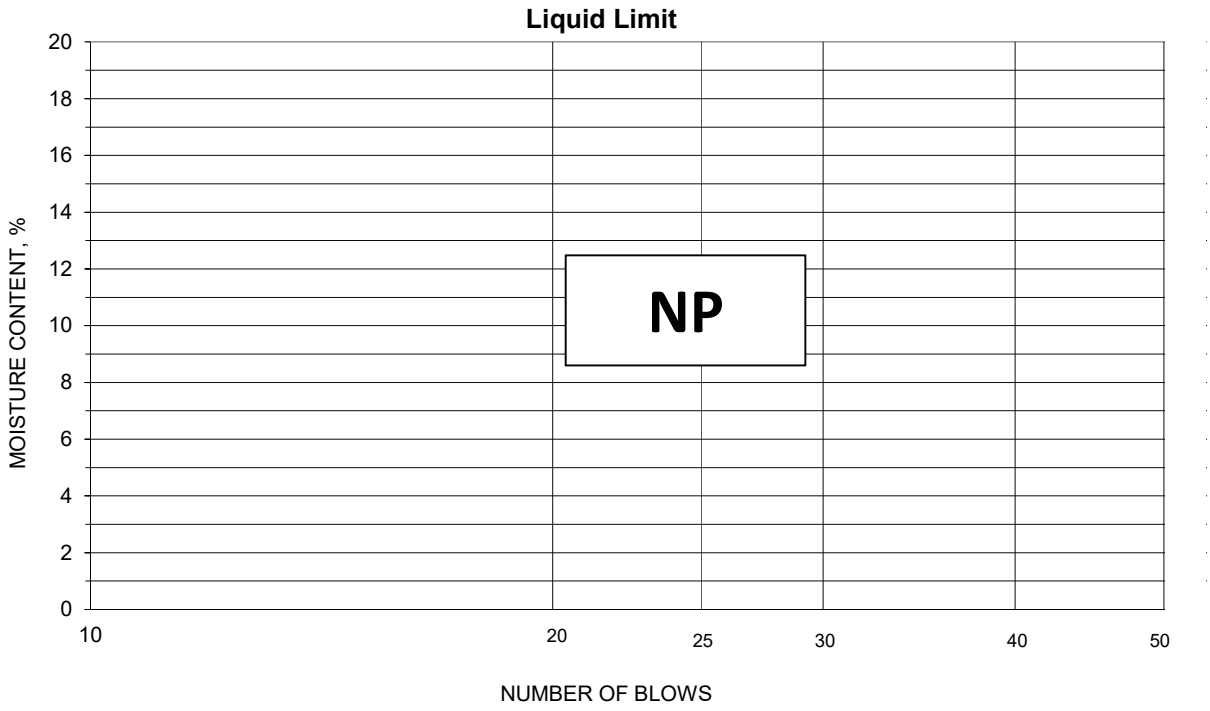
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	KIF-GT-TW01-ST03, 42.7'-43.2'			Lab ID	37
				% + No. 40	1
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	03-28-2019
Test Date	04-26-2019	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: _____

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	KIF-GT-TW02-SS02a, 1.5'-2.3'	Lab ID	39
Sample Type	SS	Date Received	3-28-19
		Date Reported	5-22-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 28.4

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
1 1/2"	37.5	100.0
3/4"	19	94.9
3/8"	9.5	92.9
No. 4	4.75	90.9
No. 10	2	87.0
No. 40	0.425	82.2
No. 200	0.075	75.8
	0.02	61.9
	0.005	53.6
	0.002	47.5
estimated	0.001	43.6

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	9.1	13.0
Coarse Sand	3.9	4.8
Medium Sand	4.8	---
Fine Sand	6.4	6.4
Silt	22.2	28.3
Clay	53.6	47.5

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	68
Plastic Limit:	25
Plasticity Index:	43
Activity Index:	0.9

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol: CH

Group Name: Fat clay with sand

AASHTO Classification: A-7-6 (34)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	KIF-GT-TW02-SS02a, 1.5'-2.3'	Lab ID	39

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	DB
Test Date	04-22-2019
Date Received	03-28-2019

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	94.9
3/8"	92.9
No. 4	90.9
No. 10	87.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

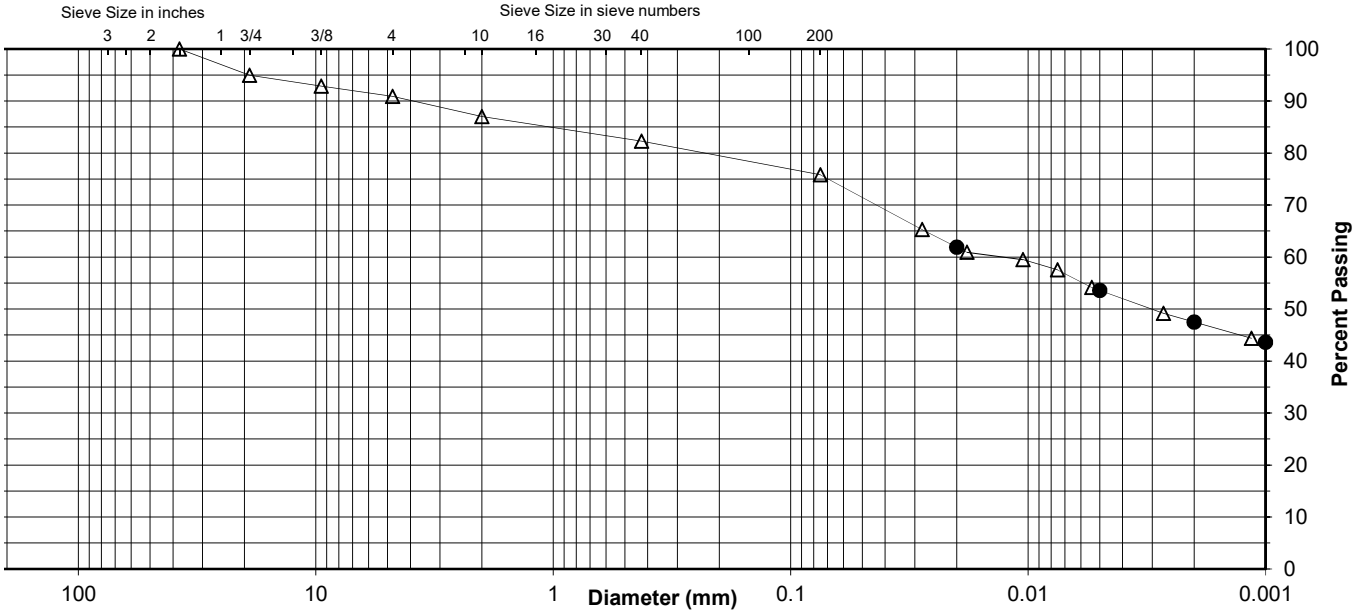
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	82.2
No. 200	75.8
0.02 mm	61.9
0.005 mm	53.6
0.002 mm	47.5
0.001 mm	43.6

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	5.1	4.0	3.9	4.8	6.4	22.2	53.6
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	13.0			4.8	6.4	28.3	47.5



Comments

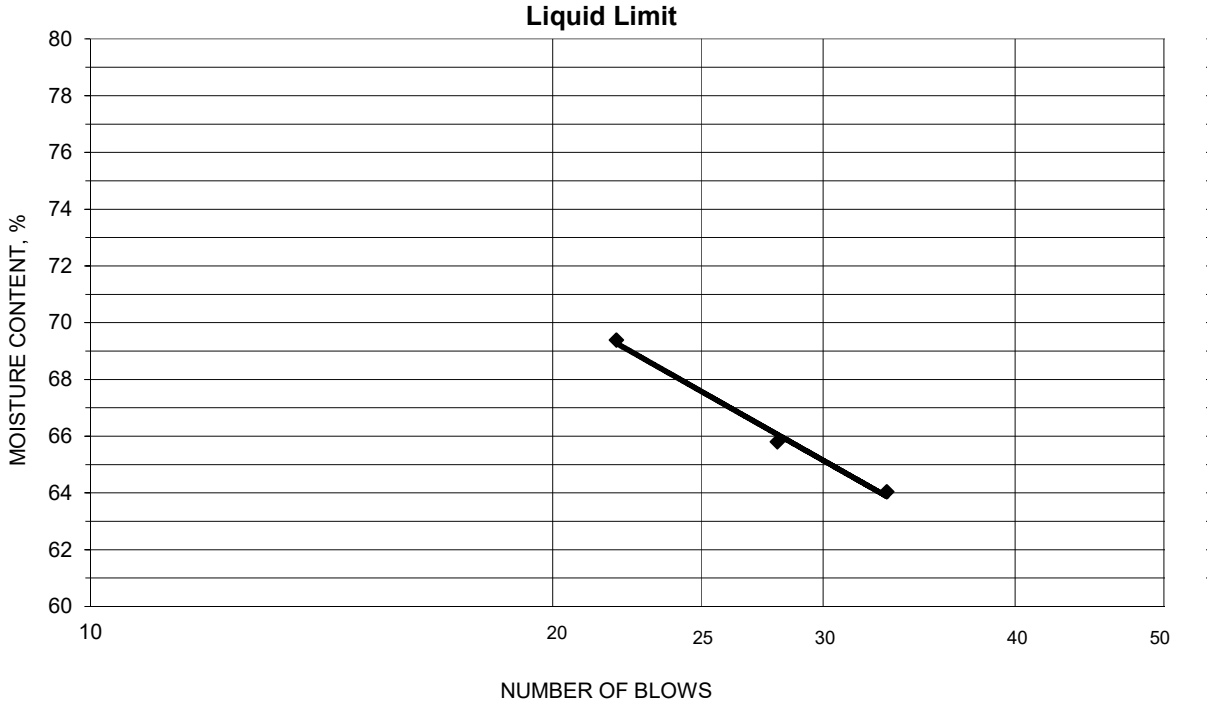
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	KIF-GT-TW02-SS02a, 1.5'-2.3'			Lab ID	39
				% + No. 40	18
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	03-28-2019
Test Date	04-26-2019	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
19.04	16.12	11.56	33	64.0	
17.96	15.42	11.56	28	65.8	
18.35	15.54	11.49	22	69.4	68



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
18.33	16.95	11.60	25.8	25	43
17.69	16.32	10.87	25.1		

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	KIF-GT-TW02-SS11, 15.0'-16.5'	Lab ID	48
Sample Type	SS	Date Received	3-28-19
		Date Reported	5-22-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 24.8

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
3/4"	19	100.0
3/8"	9.5	92.5
No. 4	4.75	86.7
No. 10	2	79.4
No. 40	0.425	65.0
No. 200	0.075	38.1
	0.02	12.5
	0.005	3.2
	0.002	1.0
estimated	0.001	0.4

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	13.3	20.6
Coarse Sand	7.3	14.4
Medium Sand	14.4	---
Fine Sand	26.9	26.9
Silt	34.9	37.1
Clay	3.2	1.0

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	NP
Plastic Limit:	NP
Plasticity Index:	NP
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol:	SM
Group Name:	Silty sand
AASHTO Classification:	A-4 (0)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	KIF-GT-TW02-SS11, 15.0'-16.5'	Lab ID	48

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Weathered and Friable
Tested By	DB
Test Date	04-23-2019
Date Received	03-28-2019

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	92.5
No. 4	86.7
No. 10	79.4

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

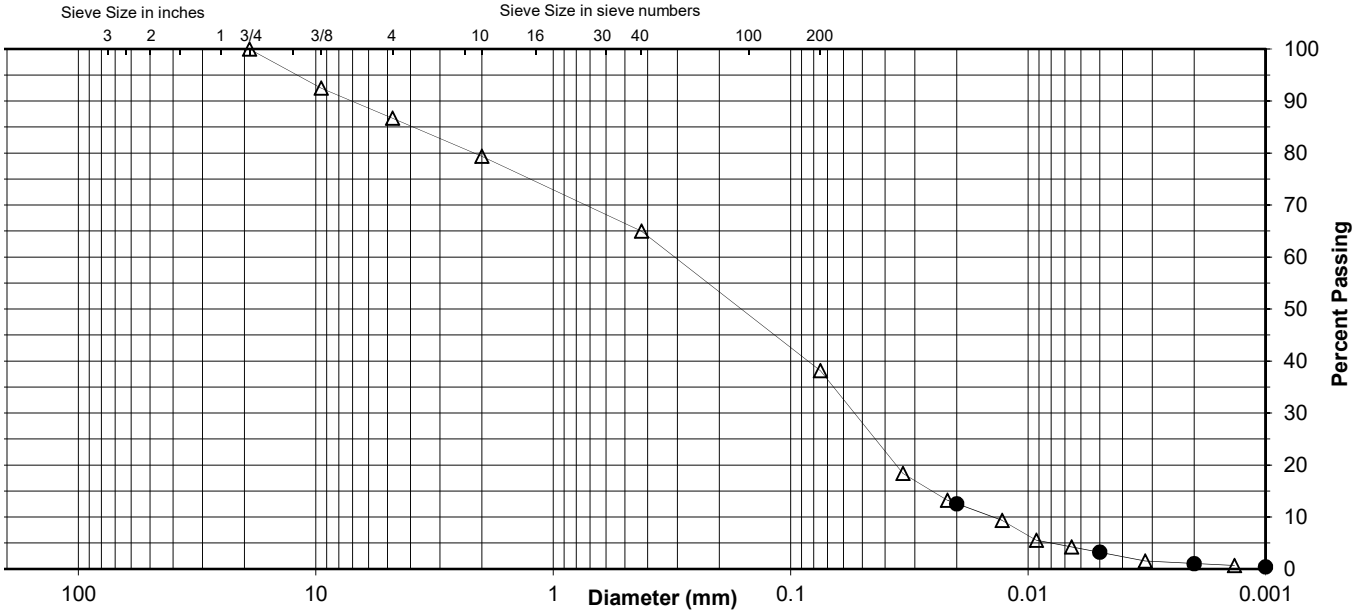
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	65.0
No. 200	38.1
0.02 mm	12.5
0.005 mm	3.2
0.002 mm	1.0
0.001 mm	0.4

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	13.3	7.3	14.4	26.9	34.9	3.2
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	20.6			14.4	26.9	37.1	1.0



Comments

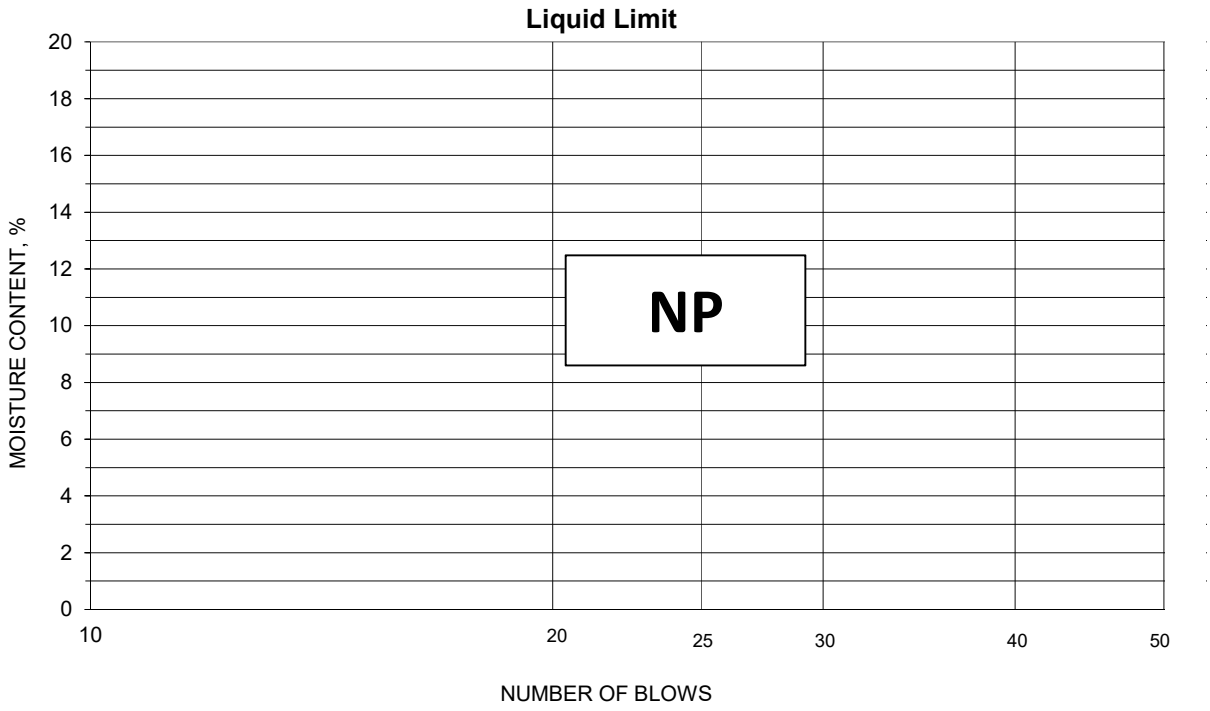
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	KIF-GT-TW02-SS11, 15.0'-16.5'			Lab ID	48
				% + No. 40	35
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	03-28-2019
Test Date	04-23-2019	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: _____

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	KIF-GT-TW02-ST01, 21.0'-21.5'	Lab ID	50
Sample Type	ST	Date Received	3-28-19
		Date Reported	5-22-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 39.9

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
3/8"	9.5	100.0
No. 4	4.75	99.9
No. 10	2	99.9
No. 40	0.425	99.9
No. 200	0.075	92.1
	0.02	49.6
	0.005	6.0
	0.002	1.3
estimated	0.001	0.2

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.1	0.1
Coarse Sand	0.0	0.0
Medium Sand	0.0	---
Fine Sand	7.8	7.8
Silt	86.1	90.8
Clay	6.0	1.3

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	NP
Plastic Limit:	NP
Plasticity Index:	NP
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.26

Classification

Unified Group Symbol: ML

Group Name: Silt

AASHTO Classification: A-4 (0)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	KIF-GT-TW02-ST01, 21.0'-21.5'	Lab ID	50

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	DB
Test Date	04-26-2019
Date Received	03-28-2019

Maximum Particle size: 3/8" Sieve

Sieve Size	% Passing
3/8"	100.0
No. 4	99.9
No. 10	99.9

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

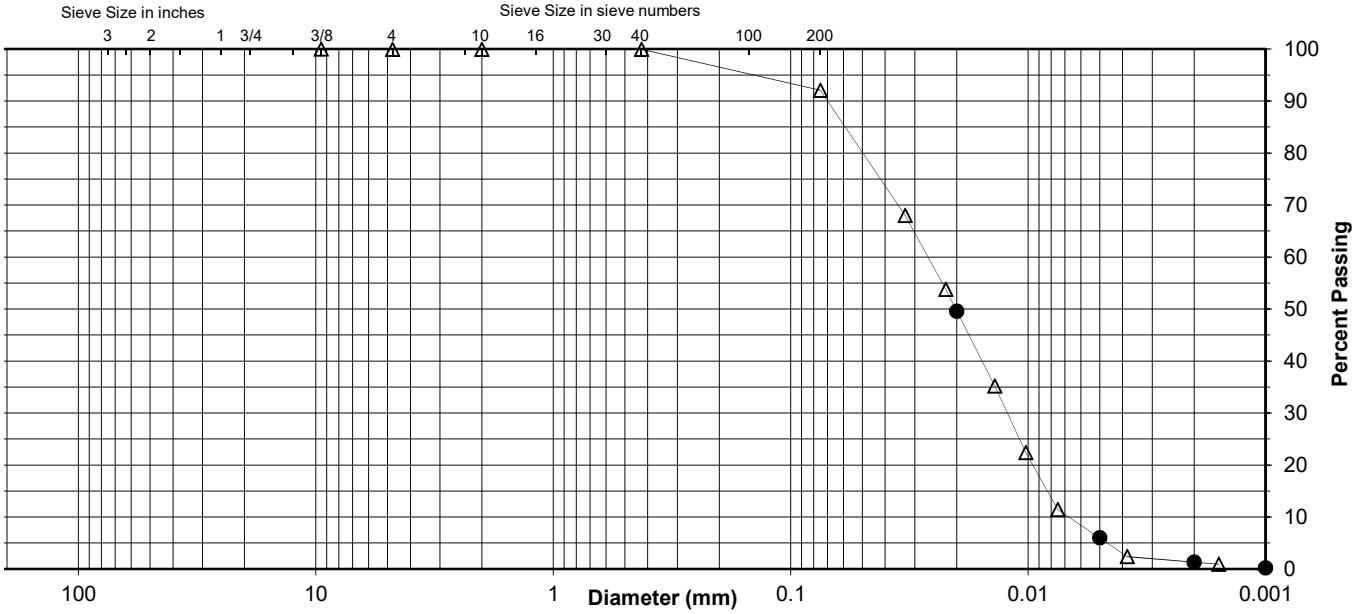
Specific Gravity 2.26

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	99.9
No. 200	92.1
0.02 mm	49.6
0.005 mm	6.0
0.002 mm	1.3
0.001 mm	0.2

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.1	0.0	0.0	7.8	86.1	6.0
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	0.1			0.0	7.8	90.8	1.3



Comments

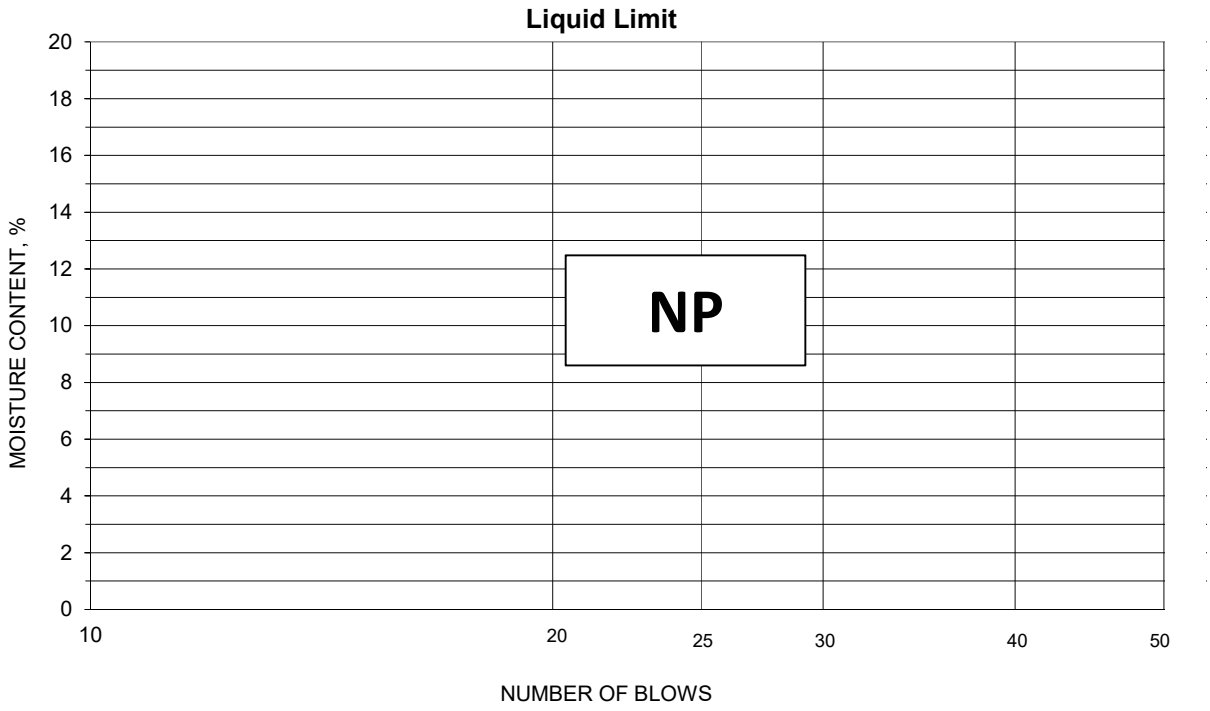
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	KIF-GT-TW02-ST01, 21.0'-21.5'			Lab ID	50
				% + No. 40	0
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	03-28-2019
Test Date	04-26-2019	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: _____

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	KIF-GT-TW02-SS20, 28.5'-30.0'	Lab ID	54
Sample Type	SS	Date Received	3-28-19
		Date Reported	5-22-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 26.3

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
3/4"	19	100.0
3/8"	9.5	93.8
No. 4	4.75	85.0
No. 10	2	65.1
No. 40	0.425	43.3
No. 200	0.075	20.2
	0.02	2.1
	0.005	0.4
	0.002	0.2
estimated	0.001	0.2

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	15.0	34.9
Coarse Sand	19.9	21.8
Medium Sand	21.8	---
Fine Sand	23.1	23.1
Silt	19.8	20.0
Clay	0.4	0.2

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	NP
Plastic Limit:	NP
Plasticity Index:	NP
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol: SM

Group Name: Silty sand

AASHTO Classification: A-1-b (0)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	KIF-GT-TW02-SS20, 28.5'-30.0'	Lab ID	54

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Weathered and Friable
Tested By	DB
Test Date	04-23-2019
Date Received	03-28-2019

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	93.8
No. 4	85.0
No. 10	65.1

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

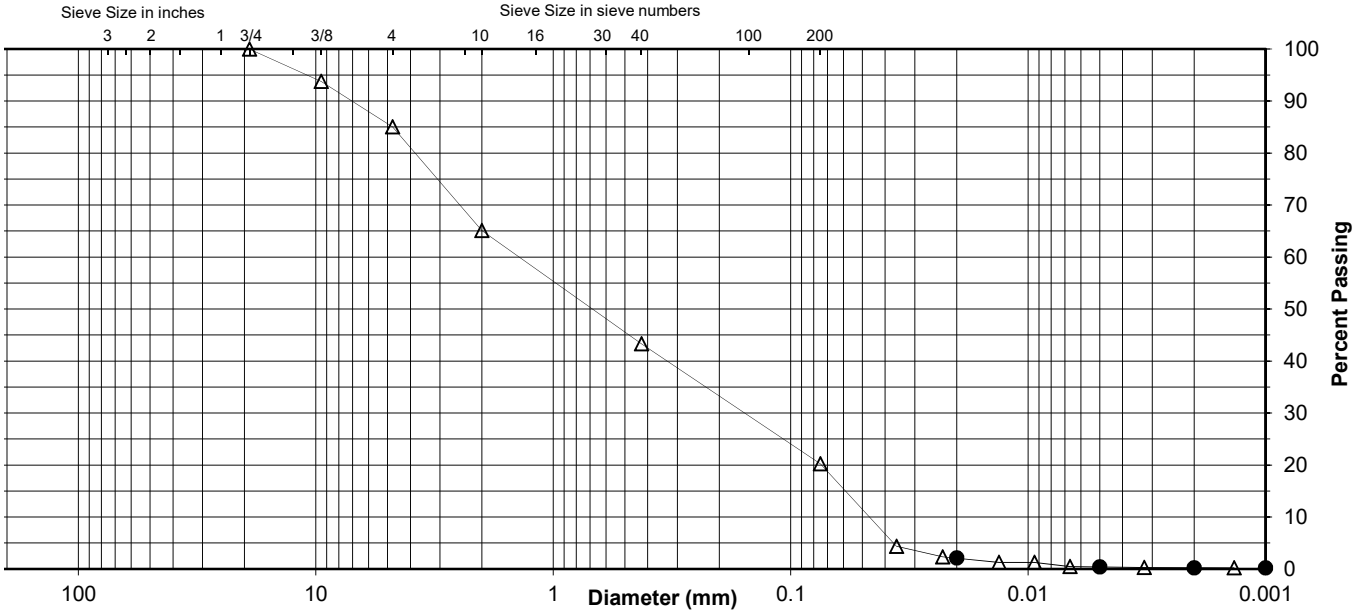
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	43.3
No. 200	20.2
0.02 mm	2.1
0.005 mm	0.4
0.002 mm	0.2
0.001 mm	0.2

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	15.0	19.9	21.8	23.1	19.8	0.4
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	34.9			21.8	23.1	20.0	0.2



Comments

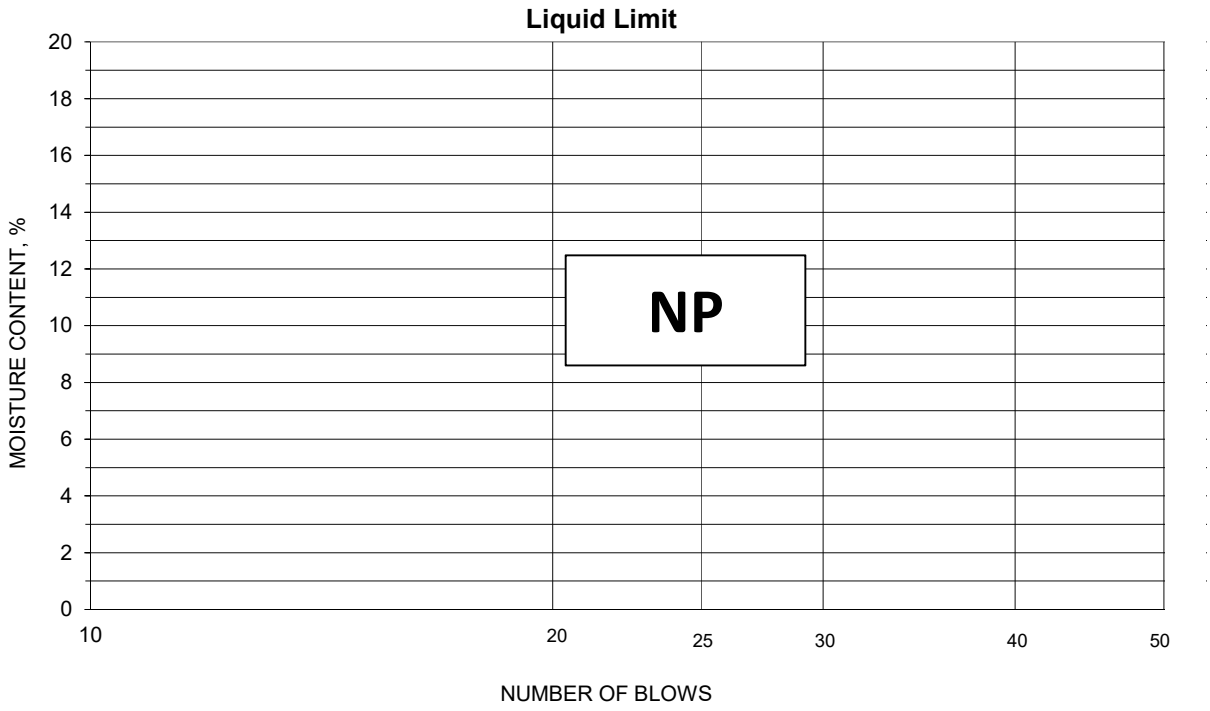
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	KIF-GT-TW02-SS20, 28.5'-30.0'			Lab ID	54
				% + No. 40	57
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	03-28-2019
Test Date	04-23-2019	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	KIF-GT-TW02-SS25a, 36.0'-36.5'	Lab ID	59
Sample Type	SS	Date Received	3-28-19
		Date Reported	5-22-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 51.9

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
3/8"	9.5	100.0
No. 4	4.75	98.8
No. 10	2	93.6
No. 40	0.425	54.4
No. 200	0.075	21.4
	0.02	4.6
	0.005	1.3
	0.002	0.5
estimated	0.001	0.5

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	1.2	6.4
Coarse Sand	5.2	39.2
Medium Sand	39.2	---
Fine Sand	33.0	33.0
Silt	20.1	20.9
Clay	1.3	0.5

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	NP
Plastic Limit:	NP
Plasticity Index:	NP
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol:	SM
Group Name:	Silty sand
AASHTO Classification:	A-2-4 (0)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	KIF-GT-TW02-SS25a, 36.0'-36.5'	Lab ID	59

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Weathered and Friable
Tested By	DB
Test Date	04-23-2019
Date Received	03-28-2019

Maximum Particle size: 3/8" Sieve

Sieve Size	% Passing
3/8"	100.0
No. 4	98.8
No. 10	93.6

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

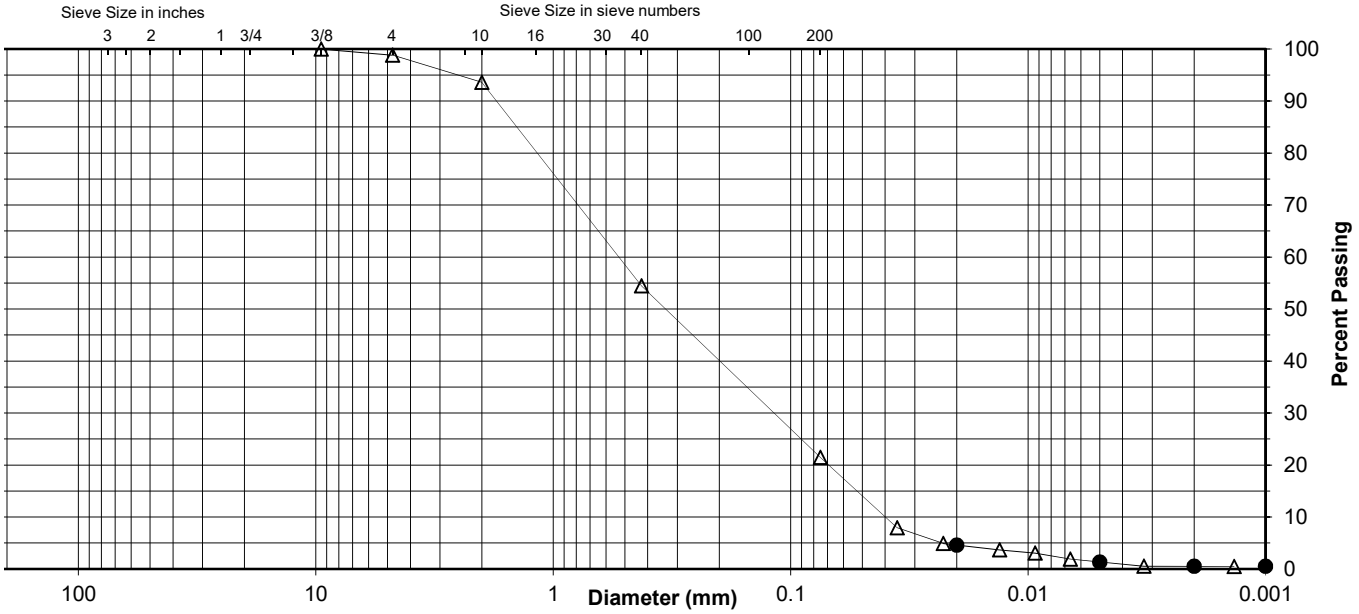
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	54.4
No. 200	21.4
0.02 mm	4.6
0.005 mm	1.3
0.002 mm	0.5
0.001 mm	0.5

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	1.2	5.2	39.2	33.0	20.1	1.3
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	6.4			39.2	33.0	20.9	0.5



Comments

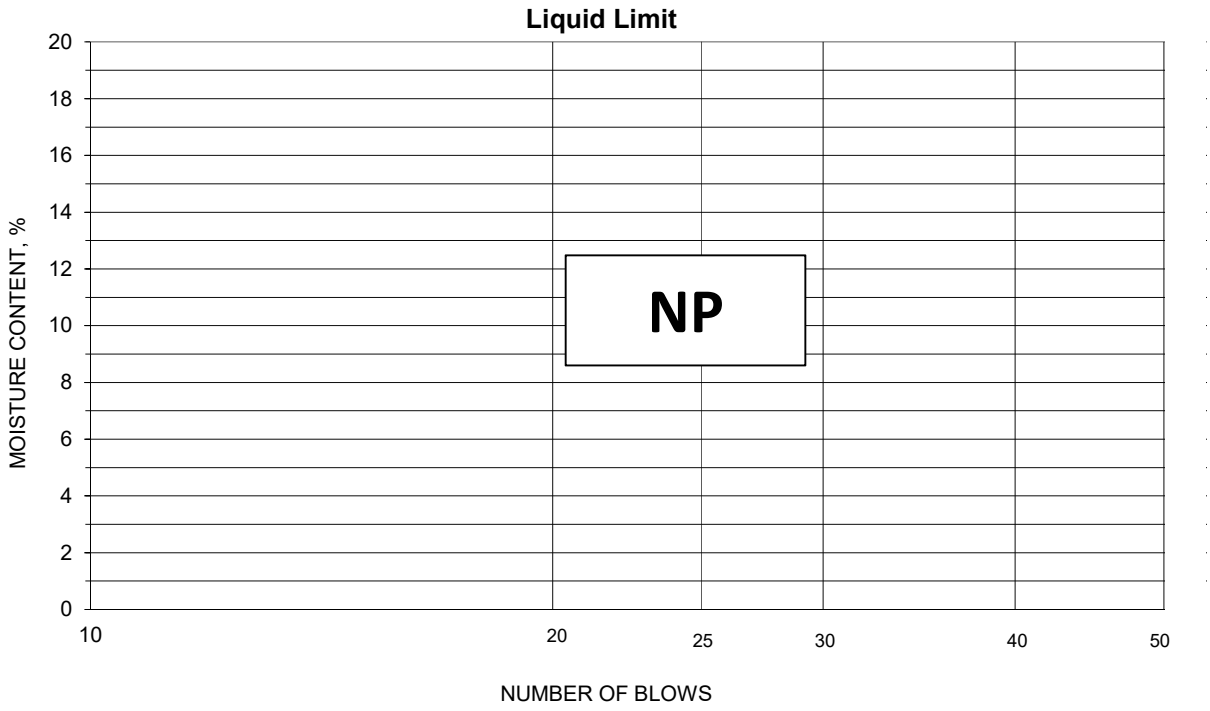
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	KIF-GT-TW02-SS25a, 36.0'-36.5'			Lab ID	59
				% + No. 40	46
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	03-28-2019
Test Date	04-23-2019	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: _____

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	KIF-GT-TW02-SS27, 39.0'-40.5'	Lab ID	61
Sample Type	SS	Date Received	3-28-19
		Date Reported	5-22-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 57.2

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 4	4.75	100.0
No. 10	2	100.0
No. 40	0.425	99.0
No. 200	0.075	75.9
	0.02	21.7
	0.005	2.1
	0.002	0.6
estimated	0.001	0.6

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.0	0.0
Coarse Sand	0.0	1.0
Medium Sand	1.0	---
Fine Sand	23.1	23.1
Silt	73.8	75.3
Clay	2.1	0.6

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	NP
Plastic Limit:	NP
Plasticity Index:	NP
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.28

Classification

Unified Group Symbol: ML

Group Name: Silt with sand

AASHTO Classification: A-4 (0)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	KIF-GT-TW02-SS27, 39.0'-40.5'	Lab ID	61

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Weathered and Friable
Tested By	DB
Test Date	04-23-2019
Date Received	03-28-2019

Maximum Particle size: No. 4 Sieve

Sieve Size	% Passing
No. 4	100.0
No. 10	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

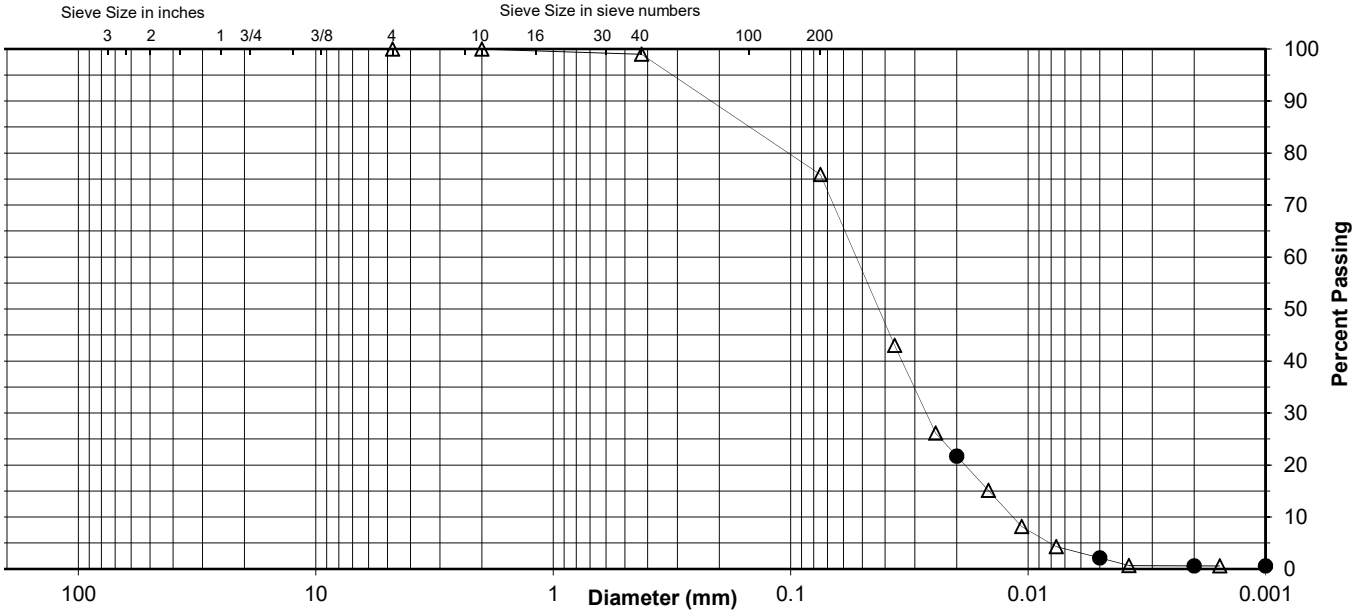
Specific Gravity 2.28

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	99.0
No. 200	75.9
0.02 mm	21.7
0.005 mm	2.1
0.002 mm	0.6
0.001 mm	0.6

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	0.0	1.0	23.1	73.8	2.1
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	0.0			1.0	23.1	75.3	0.6



Comments

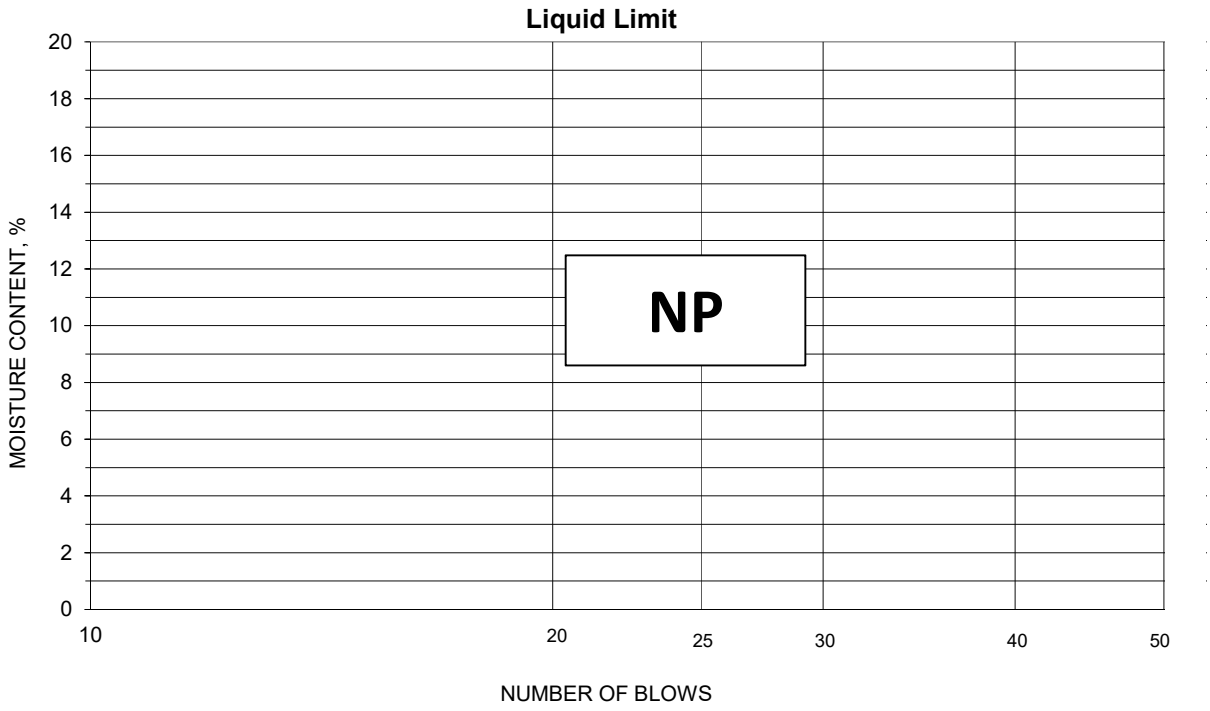
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	KIF-GT-TW02-SS27, 39.0'-40.5'			Lab ID	61
				% + No. 40	1
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	03-28-2019
Test Date	04-23-2019	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: _____

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	KIF-GT-TW02-ST02, 44.3'-44.8'	Lab ID	65
Sample Type	ST	Date Received	3-28-19
		Date Reported	5-22-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 42.2

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
3/8"	9.5	100.0
No. 4	4.75	99.9
No. 10	2	99.7
No. 40	0.425	98.1
No. 200	0.075	79.5
	0.02	29.2
	0.005	3.1
	0.002	1.7
estimated	0.001	1.5

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.1	0.3
Coarse Sand	0.2	1.6
Medium Sand	1.6	---
Fine Sand	18.6	18.6
Silt	76.4	77.8
Clay	3.1	1.7

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	NP
Plastic Limit:	NP
Plasticity Index:	NP
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.26

Classification

Unified Group Symbol:	ML
Group Name:	Silt with sand
AASHTO Classification:	A-4 (0)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	KIF-GT-TW02-ST02, 44.3'-44.8'	Lab ID	65

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Weathered and Friable
Tested By	DB
Test Date	04-26-2019
Date Received	03-28-2019

Maximum Particle size: 3/8" Sieve

Sieve Size	% Passing
3/8"	100.0
No. 4	99.9
No. 10	99.7

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

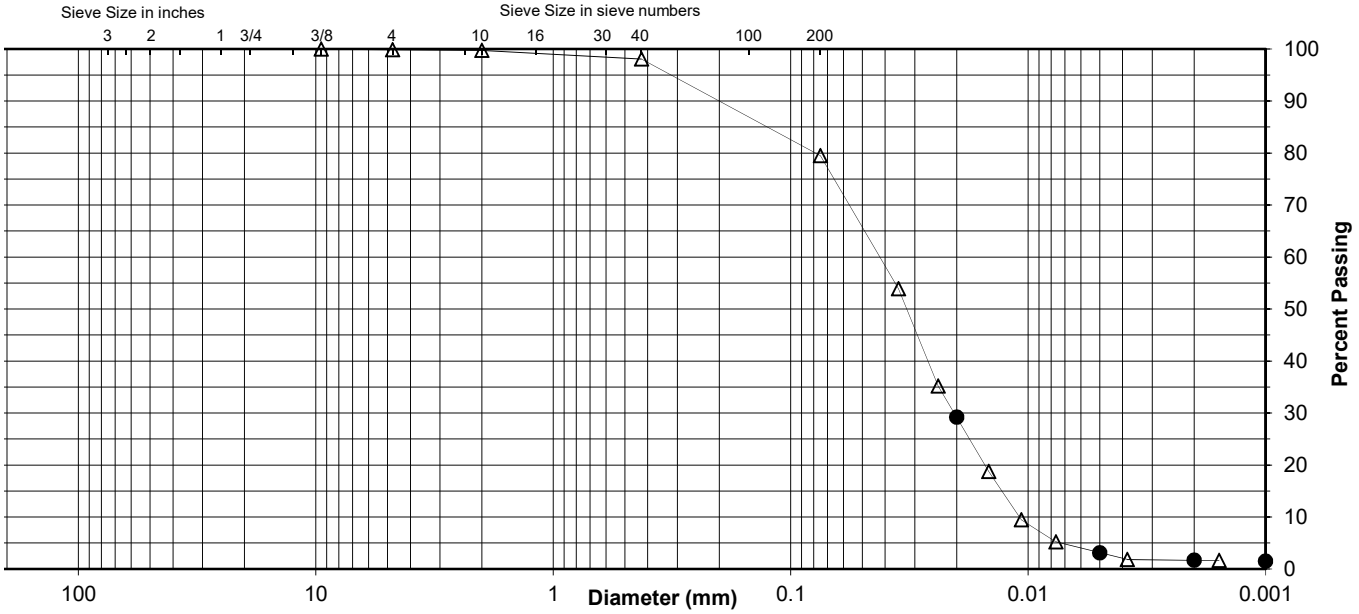
Specific Gravity 2.26

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	98.1
No. 200	79.5
0.02 mm	29.2
0.005 mm	3.1
0.002 mm	1.7
0.001 mm	1.5

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.1	0.2	1.6	18.6	76.4	3.1
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	0.3			1.6	18.6	77.8	1.7



Comments

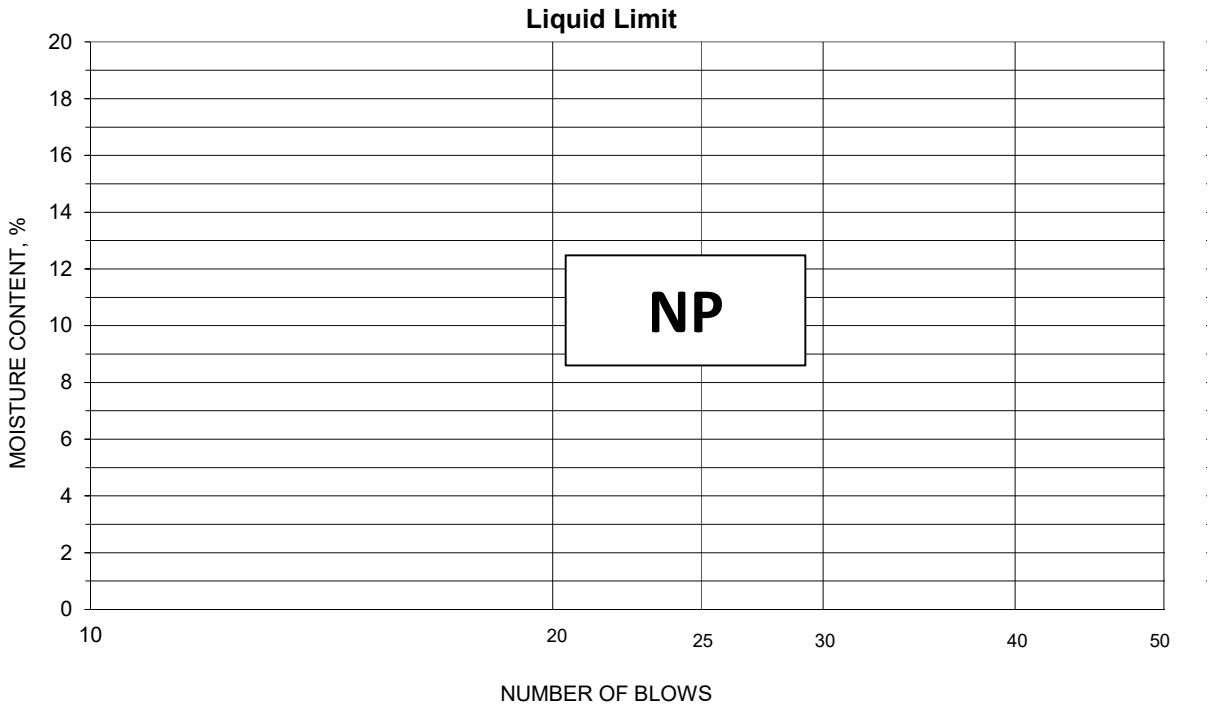
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	KIF-GT-TW02-ST02, 44.3'-44.8'			Lab ID	65
				% + No. 40	2
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	03-28-2019
Test Date	04-26-2019	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: _____

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	KIF-GT-TW03-SS01, 0.0'-1.5'	Lab ID	66
Sample Type	SS	Date Received	3-28-19
		Date Reported	5-22-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 33.9

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
3/4"	19	100.0
3/8"	9.5	98.2
No. 4	4.75	96.6
No. 10	2	94.2
No. 40	0.425	91.2
No. 200	0.075	88.0
	0.02	78.0
	0.005	65.1
	0.002	59.7
estimated	0.001	55.3

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	3.4	5.8
Coarse Sand	2.4	3.0
Medium Sand	3.0	---
Fine Sand	3.2	3.2
Silt	22.9	28.3
Clay	65.1	59.7

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	67
Plastic Limit:	29
Plasticity Index:	38
Activity Index:	0.6

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol:	CH
Group Name:	Fat clay
AASHTO Classification:	A-7-6 (38)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	KIF-GT-TW03-SS01, 0.0'-1.5'	Lab ID	66

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	DB
Test Date	04-22-2019
Date Received	03-28-2019

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	98.2
No. 4	96.6
No. 10	94.2

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity 2.7

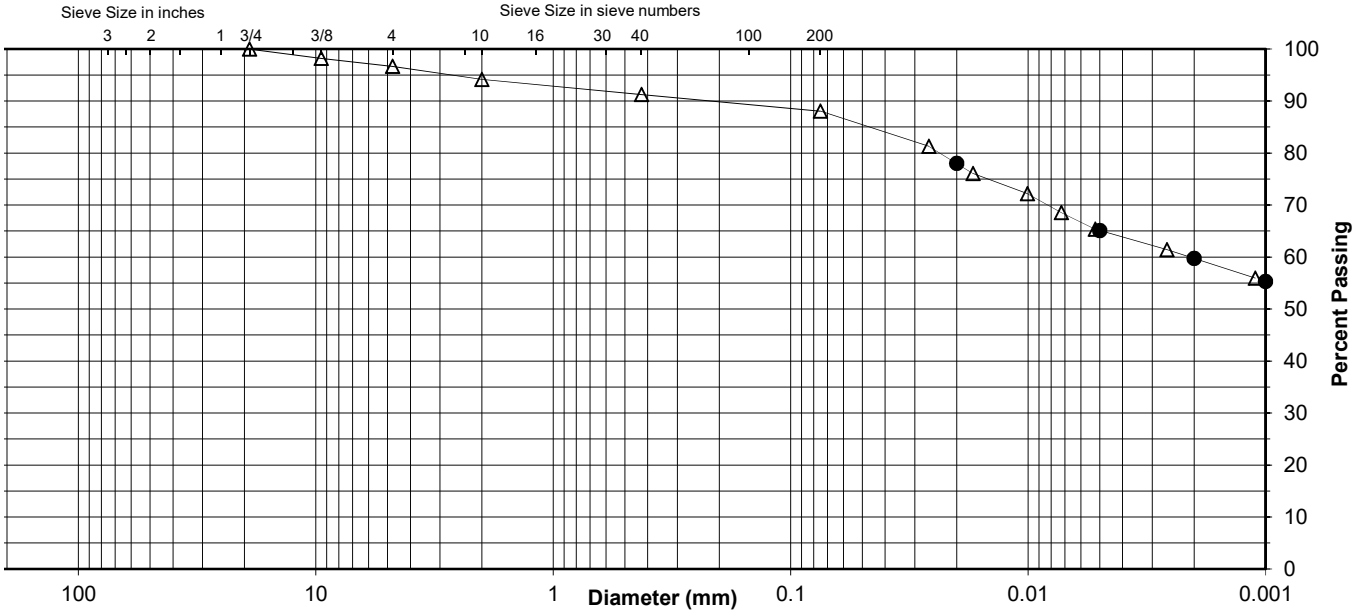
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	91.2
No. 200	88.0
0.02 mm	78.0
0.005 mm	65.1
0.002 mm	59.7
0.001 mm	55.3

Particle Size Distribution

	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
ASTM	0.0	3.4	2.4	3.0	3.2	22.9	65.1

	Gravel	Coarse Sand	Fine Sand	Silt	Clay
AASHTO	5.8	3.0	3.2	28.3	59.7



Comments

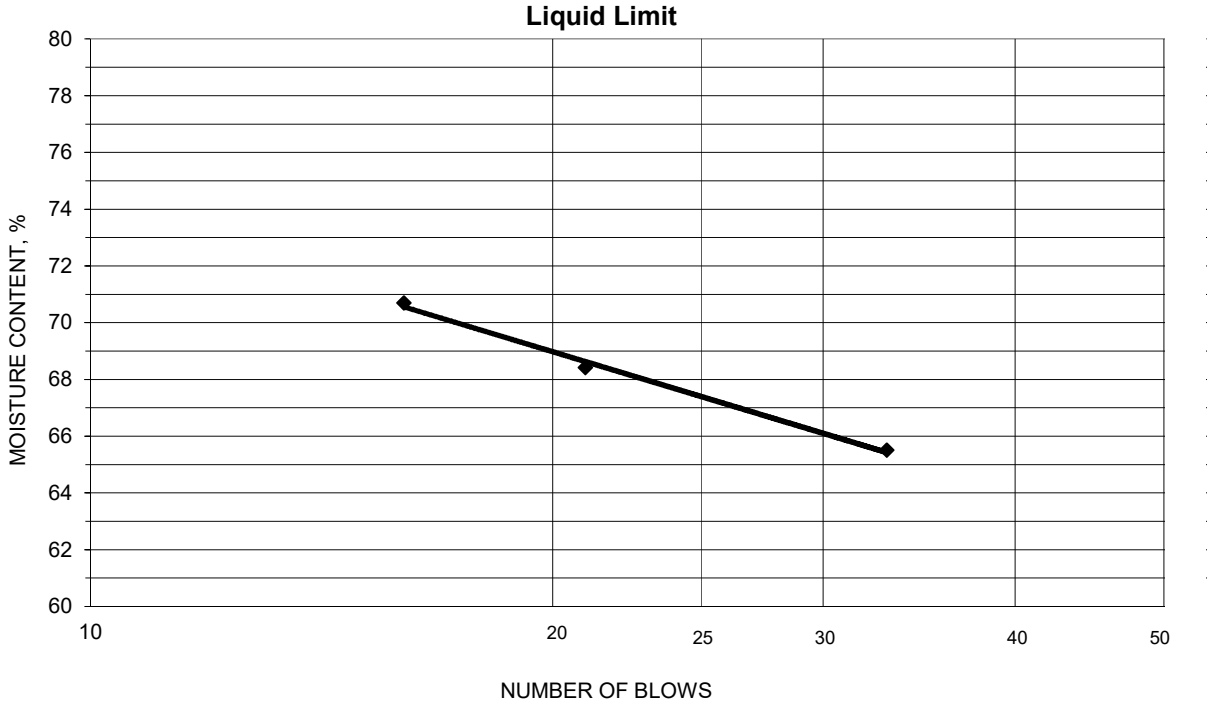
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	KIF-GT-TW03-SS01, 0.0'-1.5'			Lab ID	66
				% + No. 40	9
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	03-28-2019
Test Date	04-30-2019	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
17.85	15.02	10.70	33	65.5	
18.51	15.50	11.10	21	68.4	
18.75	15.71	11.41	16	70.7	67



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
17.88	16.48	11.67	29.1	29	38
16.83	15.46	10.77	29.2		

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	KIF-GT-TW03-SS04, 4.5'-6.0'	Lab ID	68
Sample Type	SS	Date Received	3-28-19
		Date Reported	5-22-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 21.7

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
3/4"	19	100.0
3/8"	9.5	88.0
No. 4	4.75	81.9
No. 10	2	77.7
No. 40	0.425	72.9
No. 200	0.075	60.9
	0.02	37.9
	0.005	15.7
	0.002	6.5
estimated	0.001	2.9

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	18.1	22.3
Coarse Sand	4.2	4.8
Medium Sand	4.8	---
Fine Sand	12.0	12.0
Silt	45.2	54.4
Clay	15.7	6.5

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	NP
Plastic Limit:	NP
Plasticity Index:	NP
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol: ML

Group Name: Sandy silt with gravel

AASHTO Classification: A-4 (0)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	KIF-GT-TW03-SS04, 4.5'-6.0'	Lab ID	68

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Weathered and Friable
Tested By	DB
Test Date	04-23-2019
Date Received	03-28-2019

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	88.0
No. 4	81.9
No. 10	77.7

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

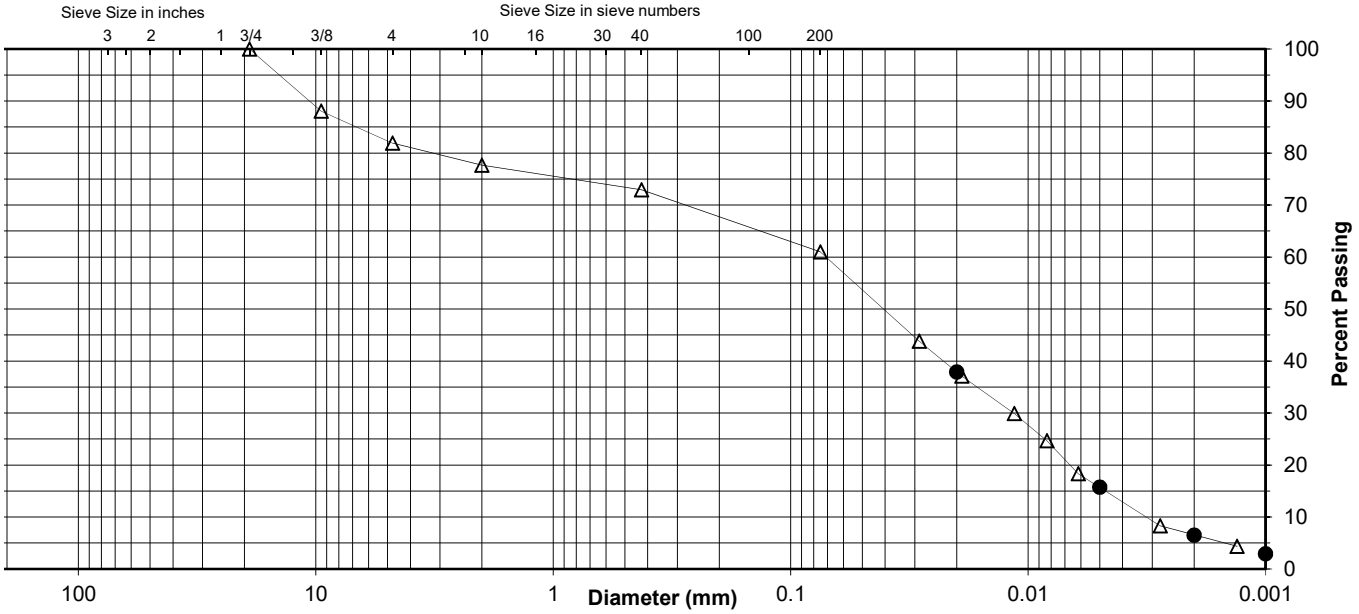
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	72.9
No. 200	60.9
0.02 mm	37.9
0.005 mm	15.7
0.002 mm	6.5
0.001 mm	2.9

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	18.1	4.2	4.8	12.0	45.2	15.7
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	22.3			4.8	12.0	54.4	6.5



Comments

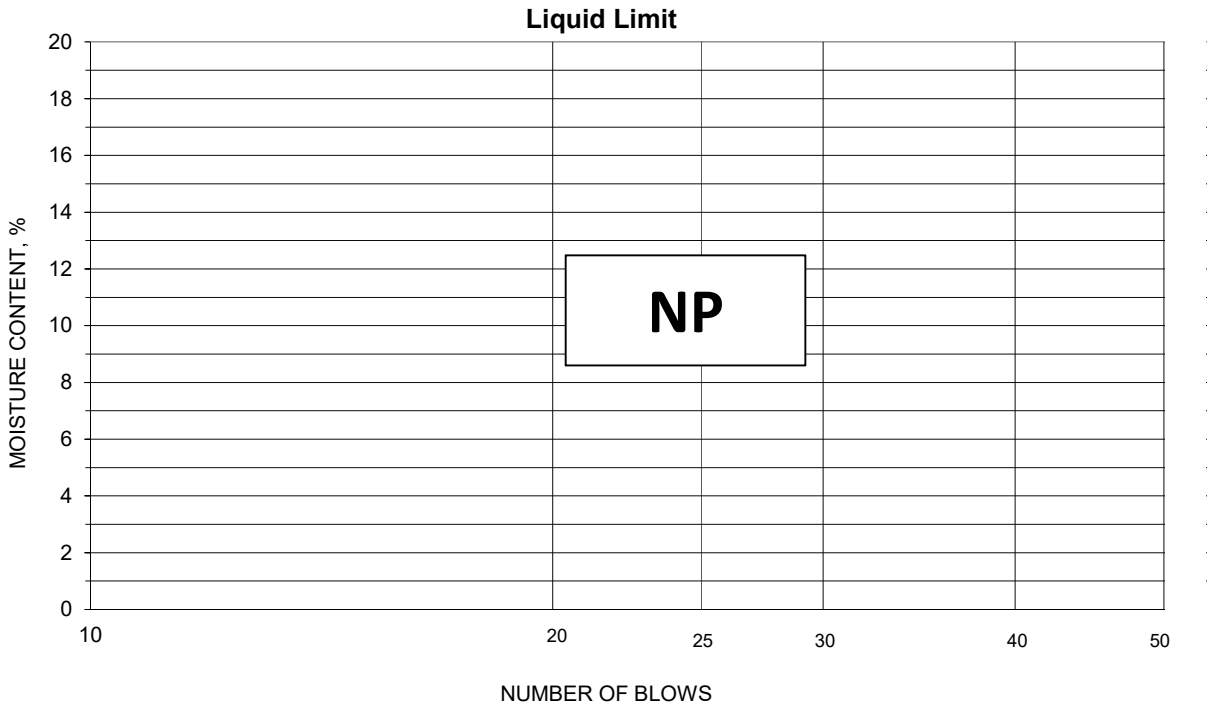
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	KIF-GT-TW03-SS04, 4.5'-6.0'			Lab ID	68
				% + No. 40	27
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	03-28-2019
Test Date	04-23-2019	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: _____

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	KIF-GT-TW03-SS10, 13.5'-15.0'	Lab ID	74
Sample Type	SS	Date Received	3-28-19
		Date Reported	5-22-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 14.7

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
1 1/2"	37.5	100.0
3/4"	19	91.1
3/8"	9.5	87.7
No. 4	4.75	80.1
No. 10	2	72.2
No. 40	0.425	61.8
No. 200	0.075	37.9
	0.02	12.8
	0.005	3.0
	0.002	0.4
estimated	0.001	0.3

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	19.9	27.8
Coarse Sand	7.9	10.4
Medium Sand	10.4	---
Fine Sand	23.9	23.9
Silt	34.9	37.5
Clay	3.0	0.4

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	NP
Plastic Limit:	NP
Plasticity Index:	NP
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.34

Classification

Unified Group Symbol: SM

Group Name: Silty sand with gravel

AASHTO Classification: A-4 (0)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	KIF-GT-TW03-SS10, 13.5'-15.0'	Lab ID	74

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	DB
Test Date	04-23-2019
Date Received	03-28-2019

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	91.1
3/8"	87.7
No. 4	80.1
No. 10	72.2

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity 2.34

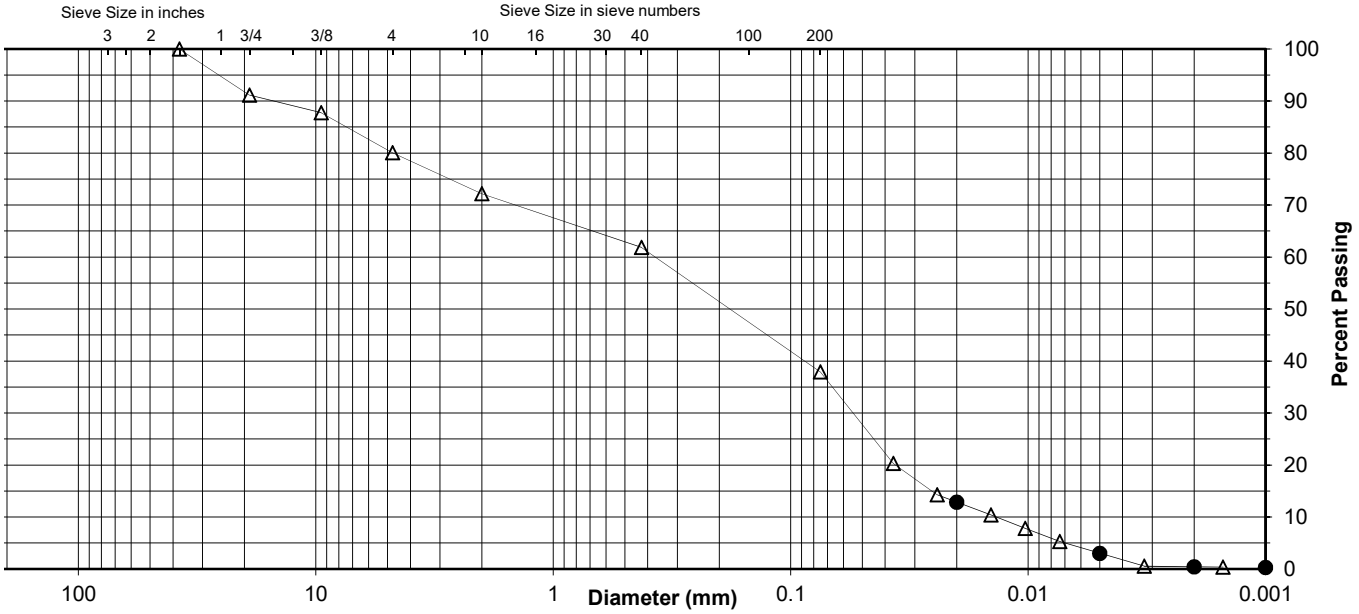
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	61.8
No. 200	37.9
0.02 mm	12.8
0.005 mm	3.0
0.002 mm	0.4
0.001 mm	0.3

Particle Size Distribution

	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
ASTM	8.9	11.0	7.9	10.4	23.9	34.9	3.0

	Gravel	Coarse Sand	Fine Sand	Silt	Clay
AASHTO	27.8	10.4	23.9	37.5	0.4



Comments

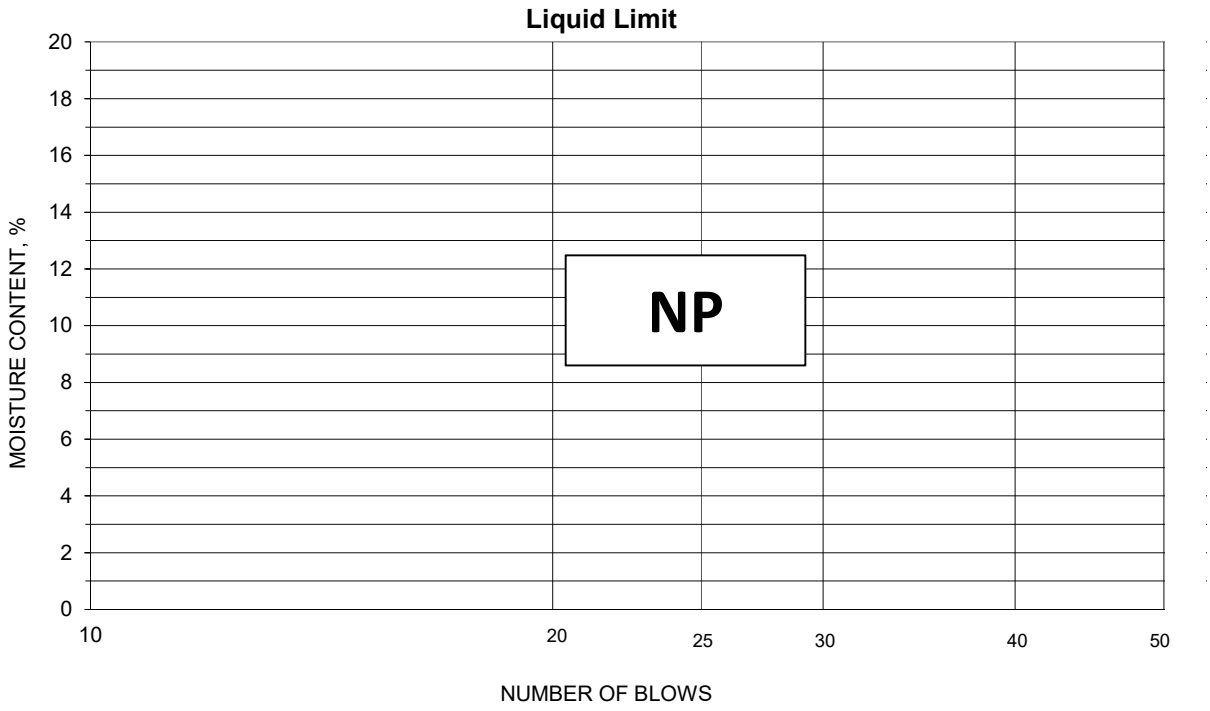
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	KIF-GT-TW03-SS10, 13.5'-15.0'			Lab ID	74
				% + No. 40	38
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	03-28-2019
Test Date	04-23-2019	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: _____

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	KIF-GT-TW03-ST01, 21.0'-21.7'	Lab ID	78
Sample Type	ST	Date Received	3-28-19
		Date Reported	5-21-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 34.1

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
3/4"	19	100.0
3/8"	9.5	98.9
No. 4	4.75	96.9
No. 10	2	94.5
No. 40	0.425	88.7
No. 200	0.075	59.0
	0.02	20.8
	0.005	4.4
	0.002	1.6
estimated	0.001	1.0

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	3.1	5.5
Coarse Sand	2.4	5.8
Medium Sand	5.8	---
Fine Sand	29.7	29.7
Silt	54.6	57.4
Clay	4.4	1.6

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	NP
Plastic Limit:	NP
Plasticity Index:	NP
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.32

Classification

Unified Group Symbol: ML

Group Name: Sandy silt

AASHTO Classification: A-4 (0)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	KIF-GT-TW03-ST01, 21.0'-21.7'	Lab ID	78

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	DB
Test Date	04-26-2019
Date Received	03-28-2019

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	98.9
No. 4	96.9
No. 10	94.5

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity 2.32

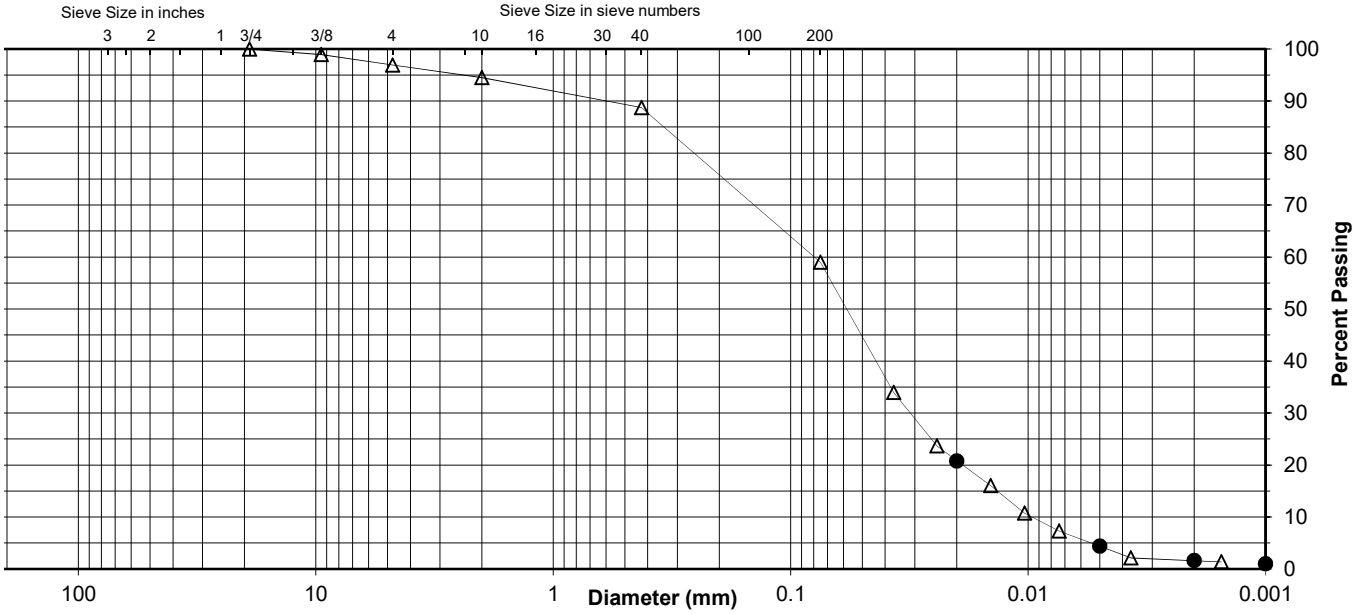
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	88.7
No. 200	59.0
0.02 mm	20.8
0.005 mm	4.4
0.002 mm	1.6
0.001 mm	1.0

Particle Size Distribution

	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
ASTM	0.0	3.1	2.4	5.8	29.7	54.6	4.4

	Gravel	Coarse Sand	Fine Sand	Silt	Clay
AASHTO	5.5	5.8	29.7	57.4	1.6



Comments

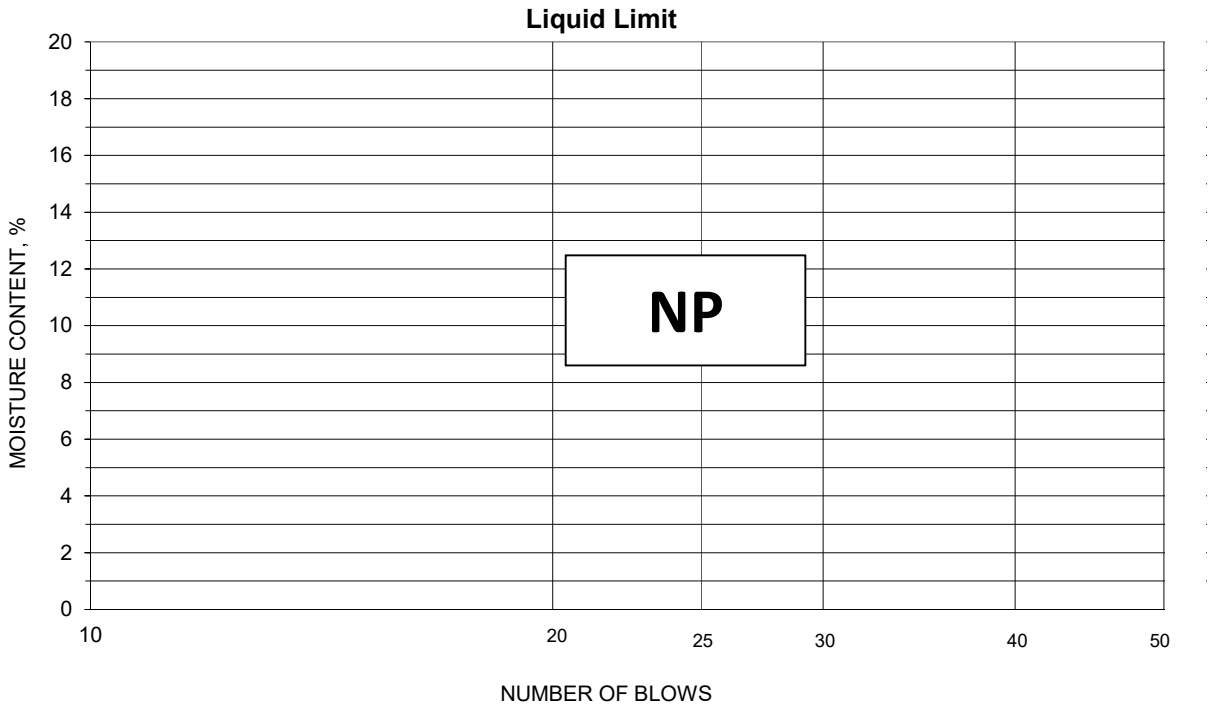
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	KIF-GT-TW03-ST01, 21.0'-21.7'			Lab ID	78
				% + No. 40	11
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	03-28-2019
Test Date	04-23-2019	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: _____

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	KIF-GT-TW03-SS18, 27.5'-29.0'	Lab ID	80
Sample Type	SS	Date Received	3-28-19
		Date Reported	5-22-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 41.1

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 4	4.75	100.0
No. 10	2	100.0
No. 40	0.425	99.9
No. 200	0.075	92.8
	0.02	53.6
	0.005	14.3
	0.002	3.8
estimated	0.001	0.6

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.0	0.0
Coarse Sand	0.0	0.1
Medium Sand	0.1	---
Fine Sand	7.1	7.1
Silt	78.5	89.0
Clay	14.3	3.8

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	NP
Plastic Limit:	NP
Plasticity Index:	NP
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol: ML

Group Name: Silt

AASHTO Classification: A-4 (0)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	KIF-GT-TW03-SS18, 27.5'-29.0'	Lab ID	80

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	DB
Test Date	04-23-2019
Date Received	03-28-2019

Maximum Particle size: No. 4 Sieve

Sieve Size	% Passing
No. 4	100.0
No. 10	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

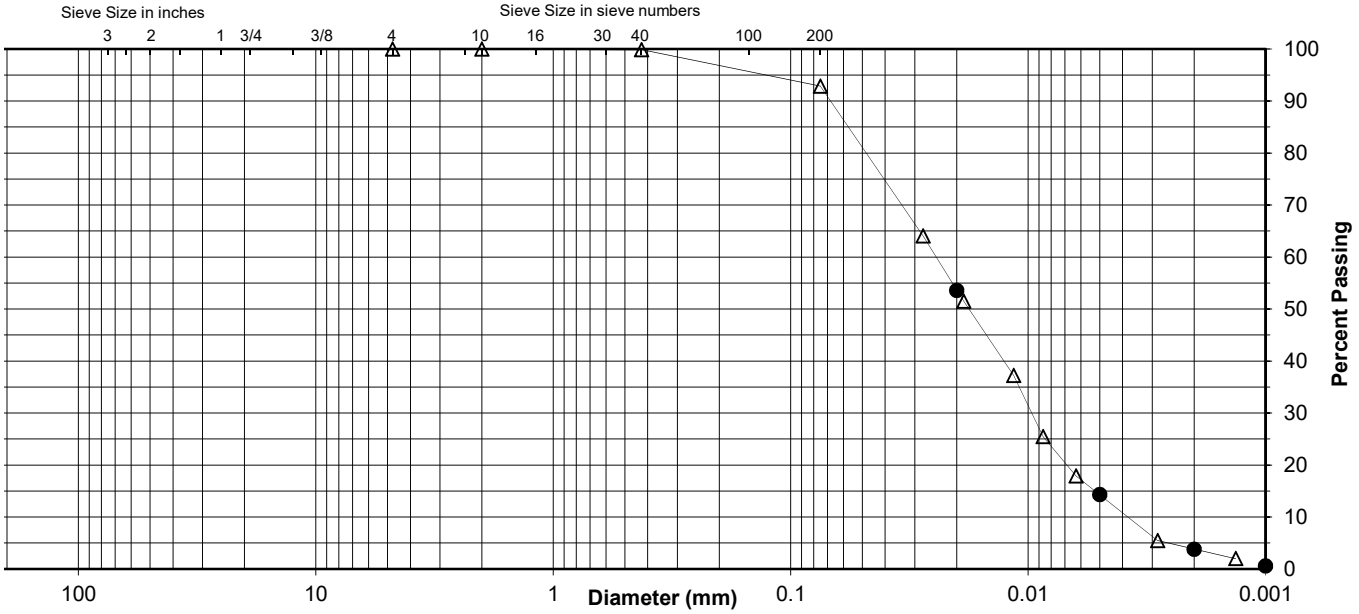
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	99.9
No. 200	92.8
0.02 mm	53.6
0.005 mm	14.3
0.002 mm	3.8
0.001 mm	0.6

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	0.0	0.1	7.1	78.5	14.3
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	0.0			0.1	7.1	89.0	3.8



Comments

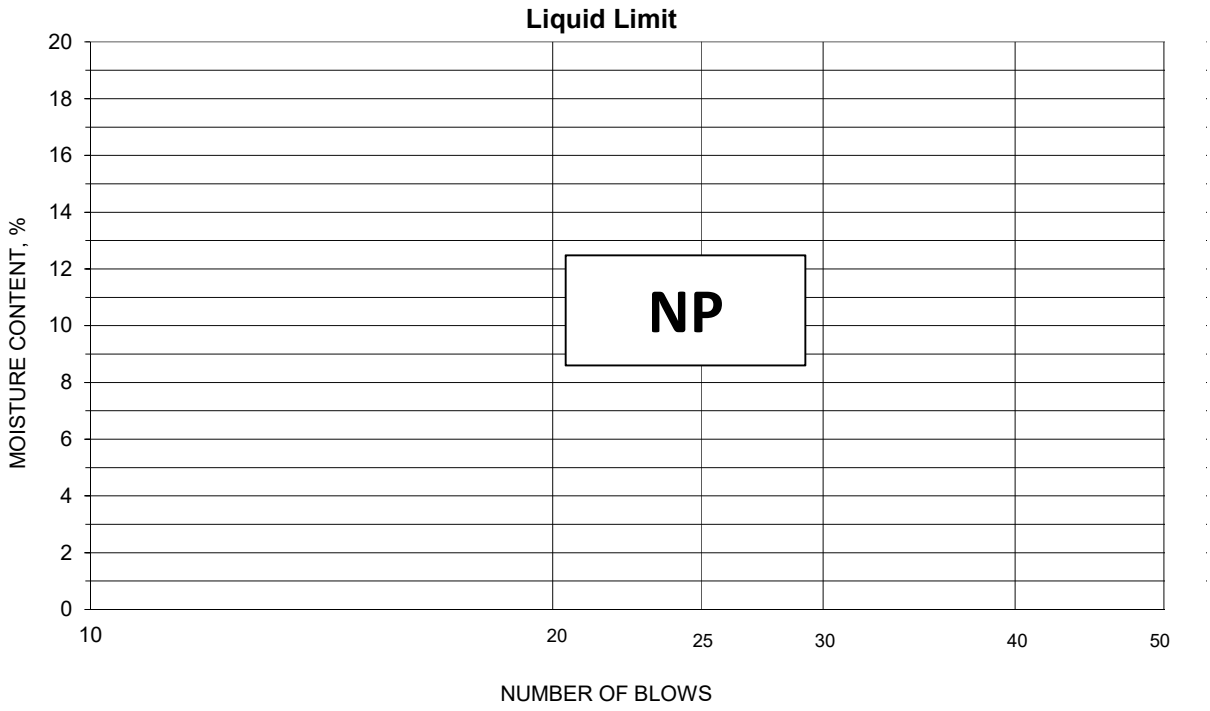
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	KIF-GT-TW03-SS18, 27.5'-29.0'			Lab ID	80
				% + No. 40	0
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	03-28-2019
Test Date	04-23-2019	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: _____

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	KIF-GT-TW03-SS22, 33.5'-35.0'	Lab ID	82
Sample Type	SS	Date Received	3-28-19
		Date Reported	5-22-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 45.0

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
1 1/2"	37.5	100.0
3/4"	19	95.4
3/8"	9.5	93.2
No. 4	4.75	87.7
No. 10	2	75.2
No. 40	0.425	58.3
No. 200	0.075	22.0
	0.02	3.3
	0.005	0.6
	0.002	0.4
estimated	0.001	0.3

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	12.3	24.8
Coarse Sand	12.5	16.9
Medium Sand	16.9	---
Fine Sand	36.3	36.3
Silt	21.4	21.6
Clay	0.6	0.4

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	NP
Plastic Limit:	NP
Plasticity Index:	NP
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.41

Classification

Unified Group Symbol:	SM
Group Name:	Silty sand
AASHTO Classification:	A-2-4 (0)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	KIF-GT-TW03-SS22, 33.5'-35.0'	Lab ID	82

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	DB
Test Date	04-23-2019
Date Received	03-28-2019

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	95.4
3/8"	93.2
No. 4	87.7
No. 10	75.2

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

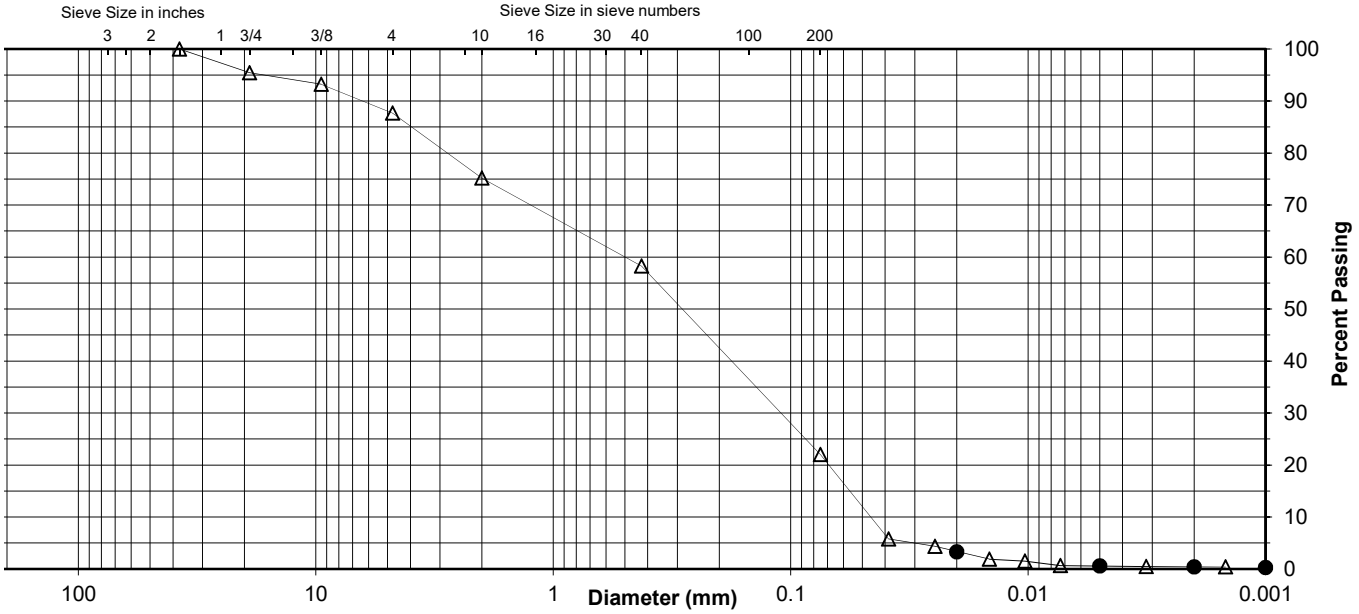
Specific Gravity 2.41

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	58.3
No. 200	22.0
0.02 mm	3.3
0.005 mm	0.6
0.002 mm	0.4
0.001 mm	0.3

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	4.6	7.7	12.5	16.9	36.3	21.4	0.6
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	24.8			16.9	36.3	21.6	0.4



Comments

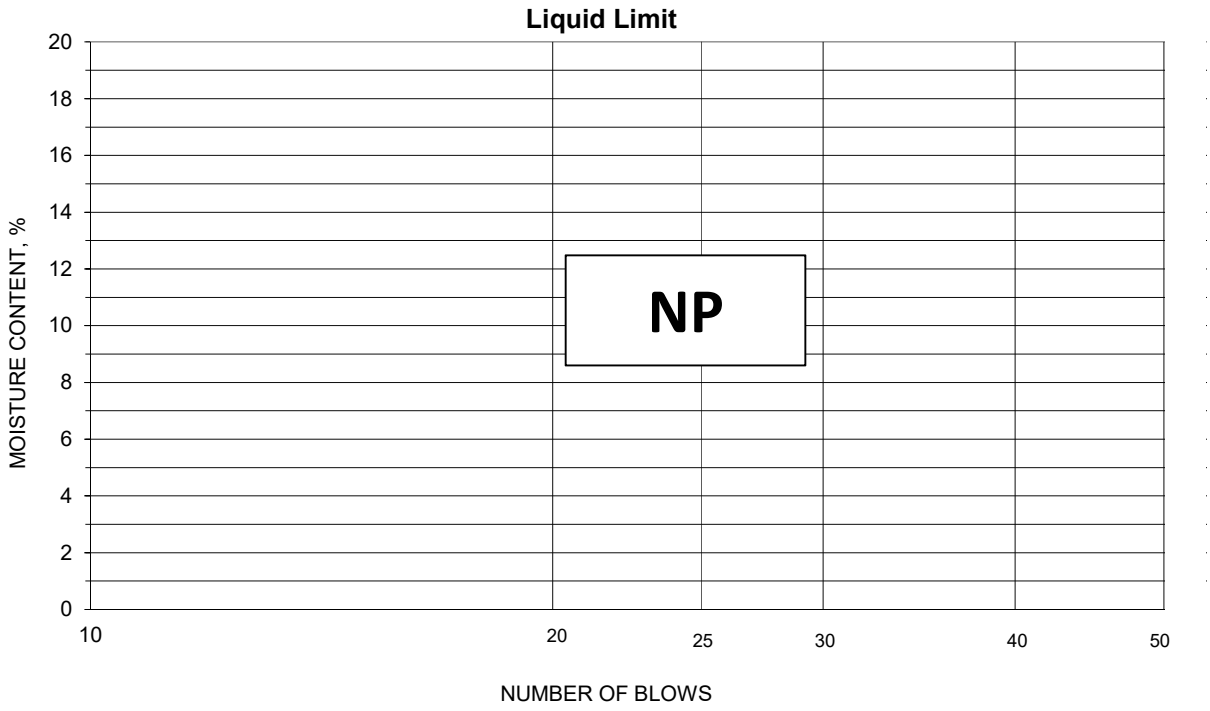
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	KIF-GT-TW03-SS22, 33.5'-35.0'			Lab ID	82
				% + No. 40	42
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	03-28-2019
Test Date	04-23-2019	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	KIF-GT-TW03-SS25b, 38.5'-39.5'	Lab ID	84
Sample Type	SS	Date Received	3-28-19
		Date Reported	5-22-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 59.1

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 4	4.75	100.0
No. 10	2	99.9
No. 40	0.425	98.9
No. 200	0.075	81.0
	0.02	24.6
	0.005	3.2
	0.002	1.3
estimated	0.001	0.1

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.0	0.1
Coarse Sand	0.1	1.0
Medium Sand	1.0	---
Fine Sand	17.9	17.9
Silt	77.8	79.7
Clay	3.2	1.3

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	NP
Plastic Limit:	NP
Plasticity Index:	NP
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol:	ML
Group Name:	Silt with sand
AASHTO Classification:	A-4 (0)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	KIF-GT-TW03-SS25b, 38.5'-39.5'	Lab ID	84

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Weathered and Friable
Tested By	DB
Test Date	04-23-2019
Date Received	03-28-2019

Maximum Particle size: No. 4 Sieve

Sieve Size	% Passing
No. 4	100.0
No. 10	99.9

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

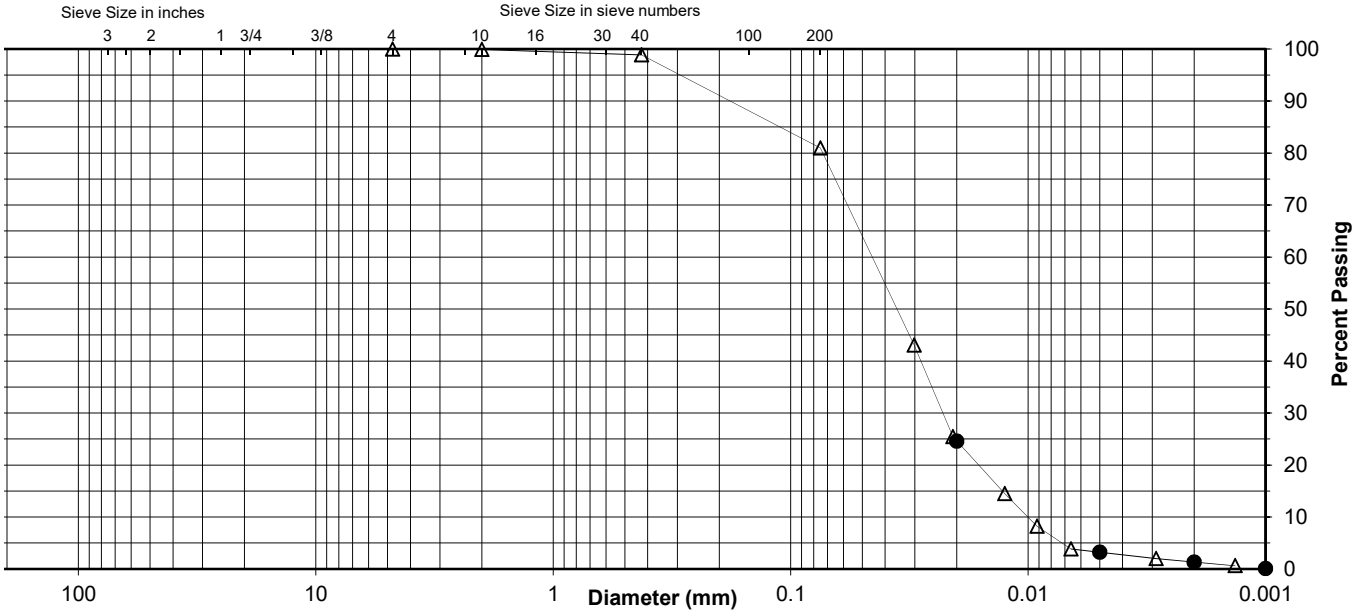
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	98.9
No. 200	81.0
0.02 mm	24.6
0.005 mm	3.2
0.002 mm	1.3
0.001 mm	0.1

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	0.1	1.0	17.9	77.8	3.2
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	0.1			1.0	17.9	79.7	1.3



Comments

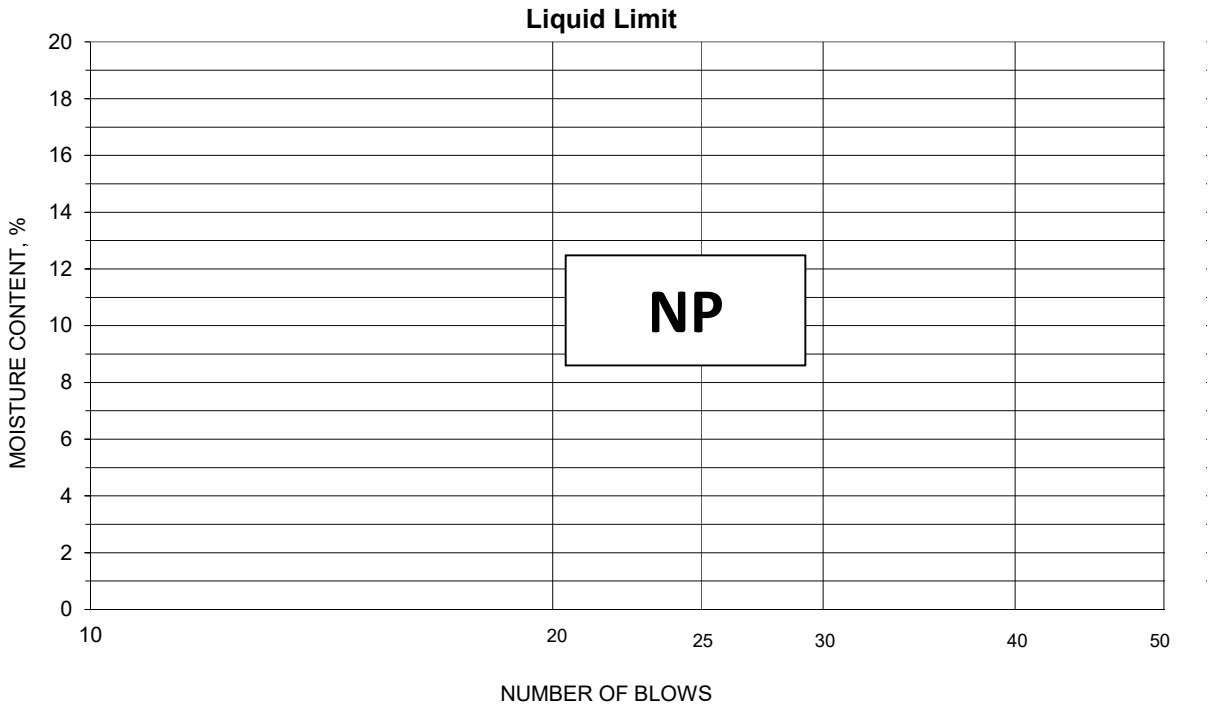
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	KIF-GT-TW03-SS25b, 38.5'-39.5'			Lab ID	84
				% + No. 40	1
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	03-28-2019
Test Date	04-23-2019	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: _____

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	KIF-GT-TW03-SS28b, 43.5'-44.0'	Lab ID	87
Sample Type	SS	Date Received	3-28-19
		Date Reported	5-22-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 58.1

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
3/4"	19	100.0
3/8"	9.5	99.5
No. 4	4.75	99.4
No. 10	2	98.9
No. 40	0.425	97.0
No. 200	0.075	96.4
	0.02	25.8
	0.005	2.8
	0.002	0.8
estimated	0.001	0.2

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.6	1.1
Coarse Sand	0.5	1.9
Medium Sand	1.9	---
Fine Sand	0.6	0.6
Silt	93.6	95.6
Clay	2.8	0.8

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	NP
Plastic Limit:	NP
Plasticity Index:	NP
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol: ML

Group Name: Silt

AASHTO Classification: A-4 (0)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	KIF-GT-TW03-SS28b, 43.5'-44.0'	Lab ID	87

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Weathered and Friable
Tested By	DB
Test Date	04-22-2019
Date Received	03-28-2019

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	99.5
No. 4	99.4
No. 10	98.9

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity 2.7

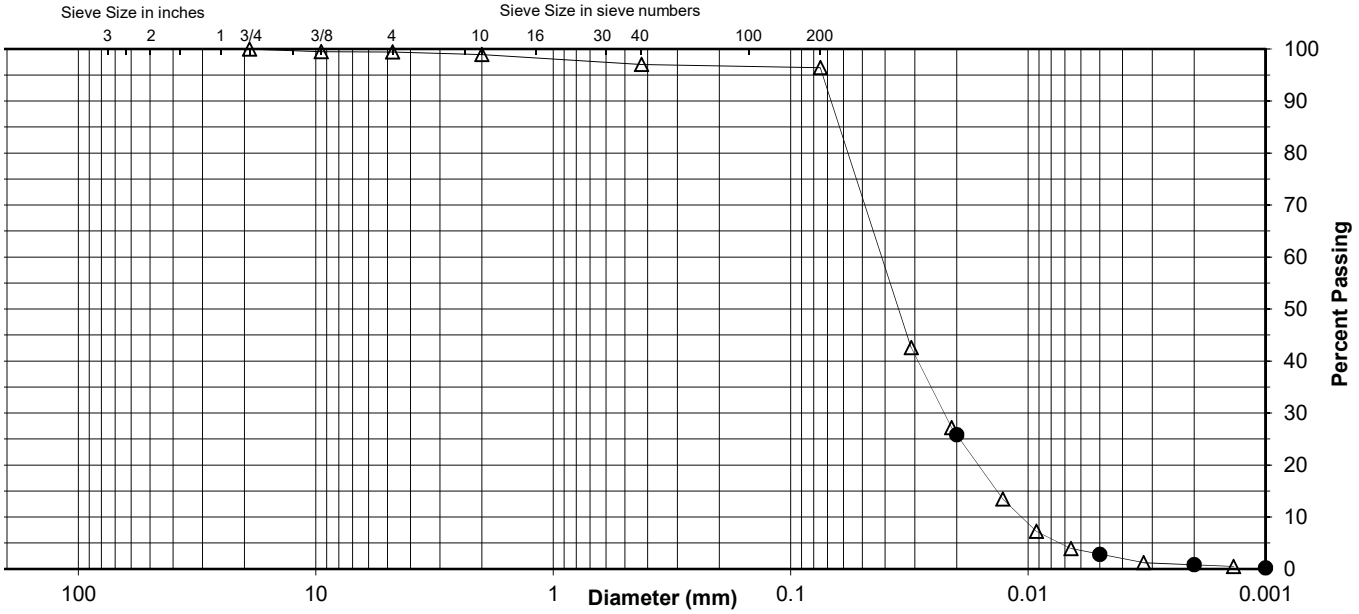
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	97.0
No. 200	96.4
0.02 mm	25.8
0.005 mm	2.8
0.002 mm	0.8
0.001 mm	0.2

Particle Size Distribution

	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
ASTM	0.0	0.6	0.5	1.9	0.6	93.6	2.8

	Gravel	Coarse Sand	Fine Sand	Silt	Clay
AASHTO	1.1	1.9	0.6	95.6	0.8



Comments

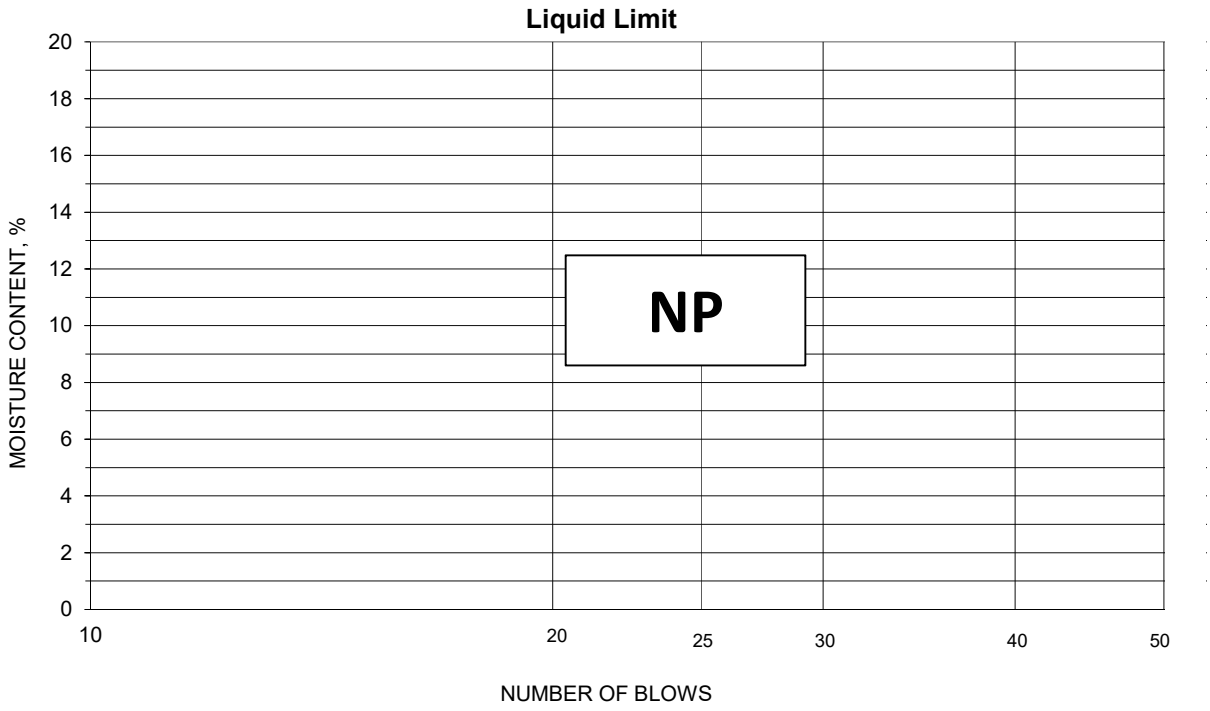
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	KIF-GT-TW03-SS28b, 43.5'-44.0'			Lab ID	87
				% + No. 40	3
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	03-28-2019
Test Date	04-23-2019	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: _____

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	KIF-GT-TW03-ST02, 46.6'-47.1'	Lab ID	90
Sample Type	ST	Date Received	3-28-19
		Date Reported	5-22-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 57.3

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 4	4.75	100.0
No. 10	2	100.0
No. 40	0.425	99.9
No. 200	0.075	86.5
	0.02	21.4
	0.005	2.0
	0.002	0.7
estimated	0.001	0.2

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.0	0.0
Coarse Sand	0.0	0.1
Medium Sand	0.1	---
Fine Sand	13.4	13.4
Silt	84.5	85.8
Clay	2.0	0.7

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	NP
Plastic Limit:	NP
Plasticity Index:	NP
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.26

Classification

Unified Group Symbol: ML

Group Name: Silt

AASHTO Classification: A-4 (0)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	KIF-GT-TW03-ST02, 46.6'-47.1'	Lab ID	90

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Weathered and Friable
Tested By	HE
Test Date	05-10-2019
Date Received	03-28-2019

Maximum Particle size: No. 4 Sieve

Sieve Size	% Passing
No. 4	100.0
No. 10	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity 2.26

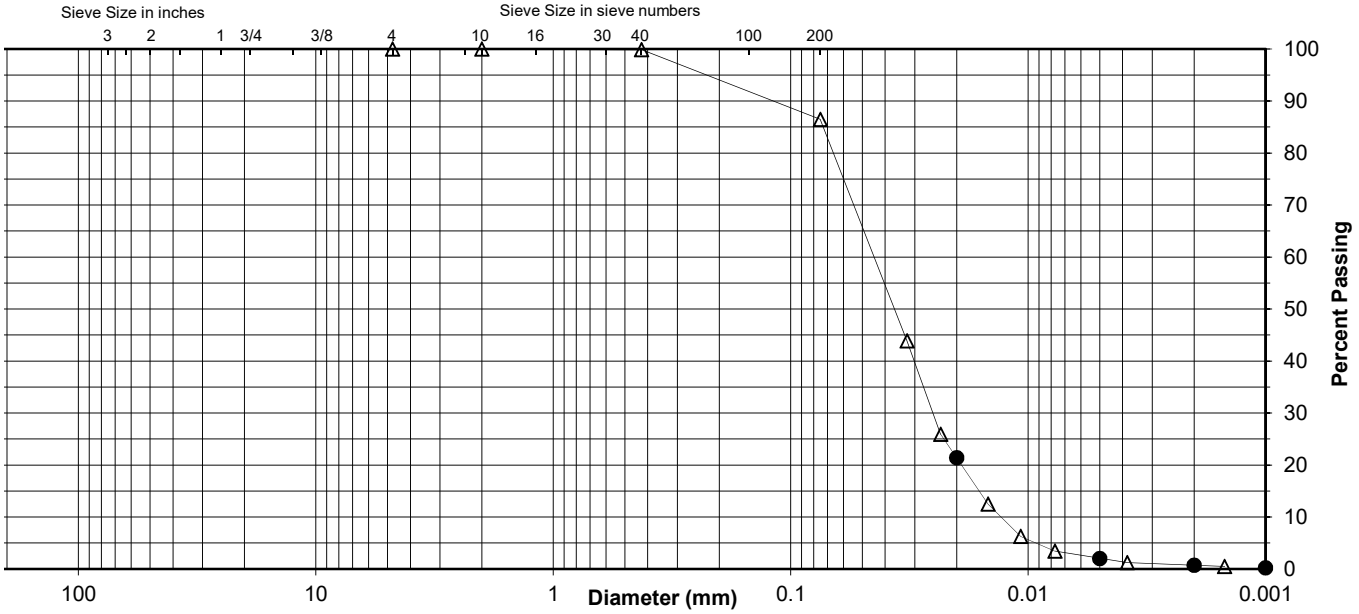
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	99.9
No. 200	86.5
0.02 mm	21.4
0.005 mm	2.0
0.002 mm	0.7
0.001 mm	0.2

Particle Size Distribution

	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
ASTM	0.0	0.0	0.0	0.1	13.4	84.5	2.0

	Gravel	Coarse Sand	Fine Sand	Silt	Clay
AASHTO	0.0	0.1	13.4	85.8	0.7



Comments

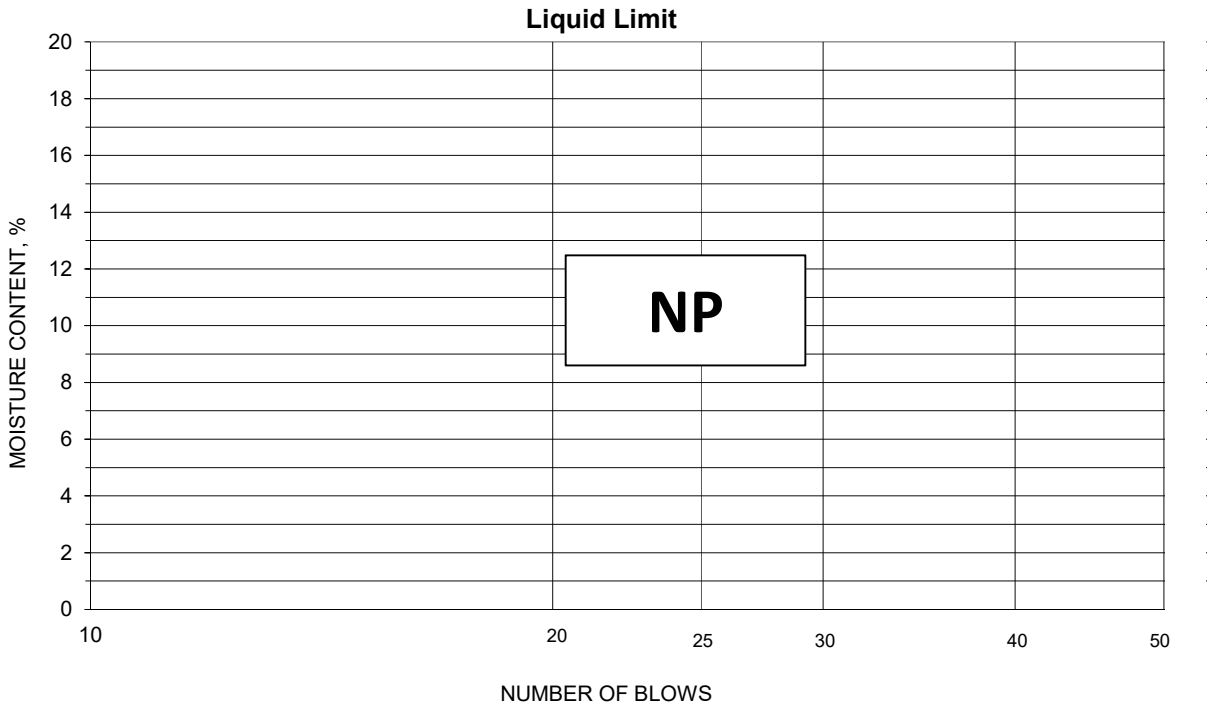
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	KIF-GT-TW03-ST02, 46.6'-47.1'			Lab ID	90
				% + No. 40	0
Tested By	DB	Test Method	ASTM D 4318 Method A	Date Received	03-28-2019
Test Date	05-13-2019	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: _____

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	KIF-GT-TW04-SS01, 0.0'-1.5'	Lab ID	91
Sample Type	SS	Date Received	3-28-19
		Date Reported	5-22-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 24.5

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
3/4"	19	100.0
3/8"	9.5	96.0
No. 4	4.75	94.3
No. 10	2	90.6
No. 40	0.425	83.9
No. 200	0.075	68.3
	0.02	51.4
	0.005	34.5
	0.002	25.8
estimated	0.001	20.0

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	5.7	9.4
Coarse Sand	3.7	6.7
Medium Sand	6.7	---
Fine Sand	15.6	15.6
Silt	33.8	42.5
Clay	34.5	25.8

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	38
Plastic Limit:	21
Plasticity Index:	17
Activity Index:	0.7

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol:	CL
Group Name:	Sandy lean clay
AASHTO Classification:	A-6 (10)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	KIF-GT-TW04-SS01, 0.0'-1.5'	Lab ID	91

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	DB
Test Date	04-22-2019
Date Received	03-28-2019

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	96.0
No. 4	94.3
No. 10	90.6

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

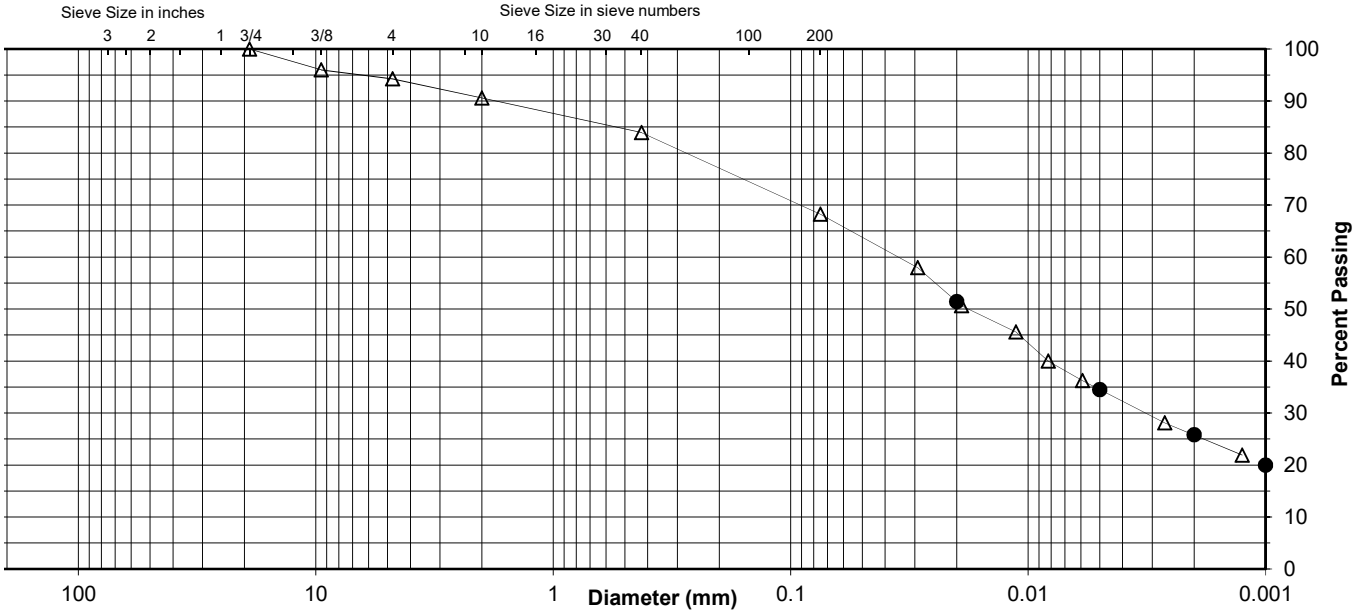
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	83.9
No. 200	68.3
0.02 mm	51.4
0.005 mm	34.5
0.002 mm	25.8
0.001 mm	20.0

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	5.7	3.7	6.7	15.6	33.8	34.5
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	9.4			6.7	15.6	42.5	25.8



Comments

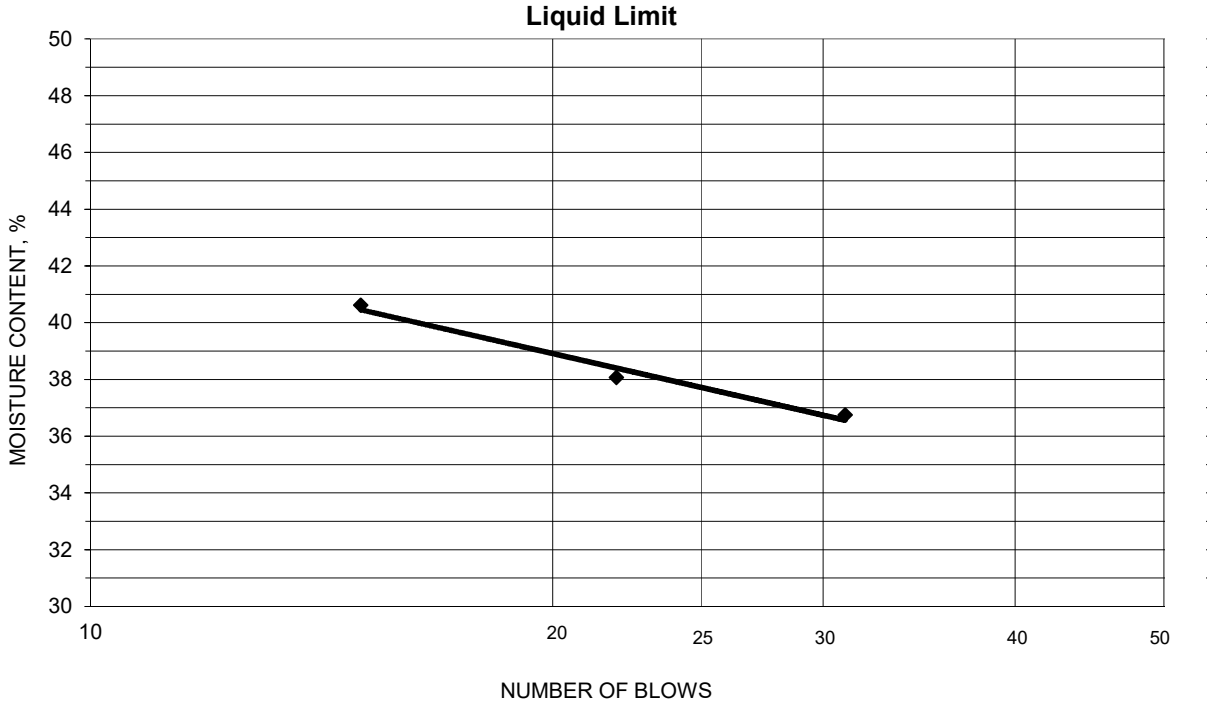
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order	Project No.	175668043
Source	KIF-GT-TW04-SS01, 0.0'-1.5'	Lab ID	91
		% + No. 40	16
Tested By	KWS	Test Method	ASTM D 4318 Method A
Test Date	04-30-2019	Prepared	Dry
		Date Received	03-28-2019

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
19.70	17.40	11.14	31	36.7	
20.00	17.56	11.15	22	38.1	
18.83	16.58	11.04	15	40.6	38



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
17.21	16.09	10.70	20.8	21	17
17.46	16.32	10.99	21.4		

Remarks: _____

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	KIF-GT-TW04-SS04b, 5.5'-6.0'	Lab ID	95
Sample Type	SS	Date Received	3-28-19
		Date Reported	5-22-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 50.2

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 4	4.75	100.0
No. 10	2	100.0
No. 40	0.425	98.9
No. 200	0.075	83.1
	0.02	50.4
	0.005	19.1
	0.002	7.3
estimated	0.001	1.2

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.0	0.0
Coarse Sand	0.0	1.1
Medium Sand	1.1	---
Fine Sand	15.8	15.8
Silt	64.0	75.8
Clay	19.1	7.3

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	NP
Plastic Limit:	NP
Plasticity Index:	NP
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol:	ML
Group Name:	Silt with sand
AASHTO Classification:	A-4 (0)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	KIF-GT-TW04-SS04b, 5.5'-6.0'	Lab ID	95

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	DB
Test Date	04-23-2019
Date Received	03-28-2019

Maximum Particle size: No. 4 Sieve

Sieve Size	% Passing
No. 4	100.0
No. 10	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity 2.7

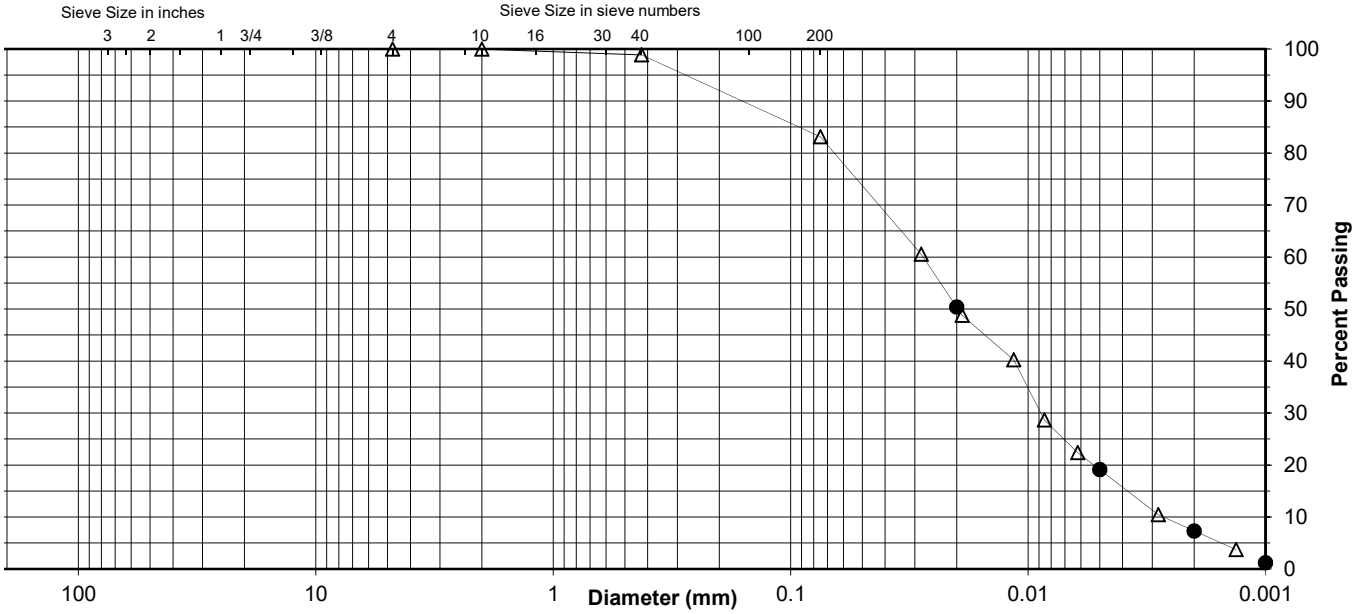
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	98.9
No. 200	83.1
0.02 mm	50.4
0.005 mm	19.1
0.002 mm	7.3
0.001 mm	1.2

Particle Size Distribution

	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
ASTM	0.0	0.0	0.0	1.1	15.8	64.0	19.1

	Gravel	Coarse Sand	Fine Sand	Silt	Clay
AASHTO	0.0	1.1	15.8	75.8	7.3



Comments

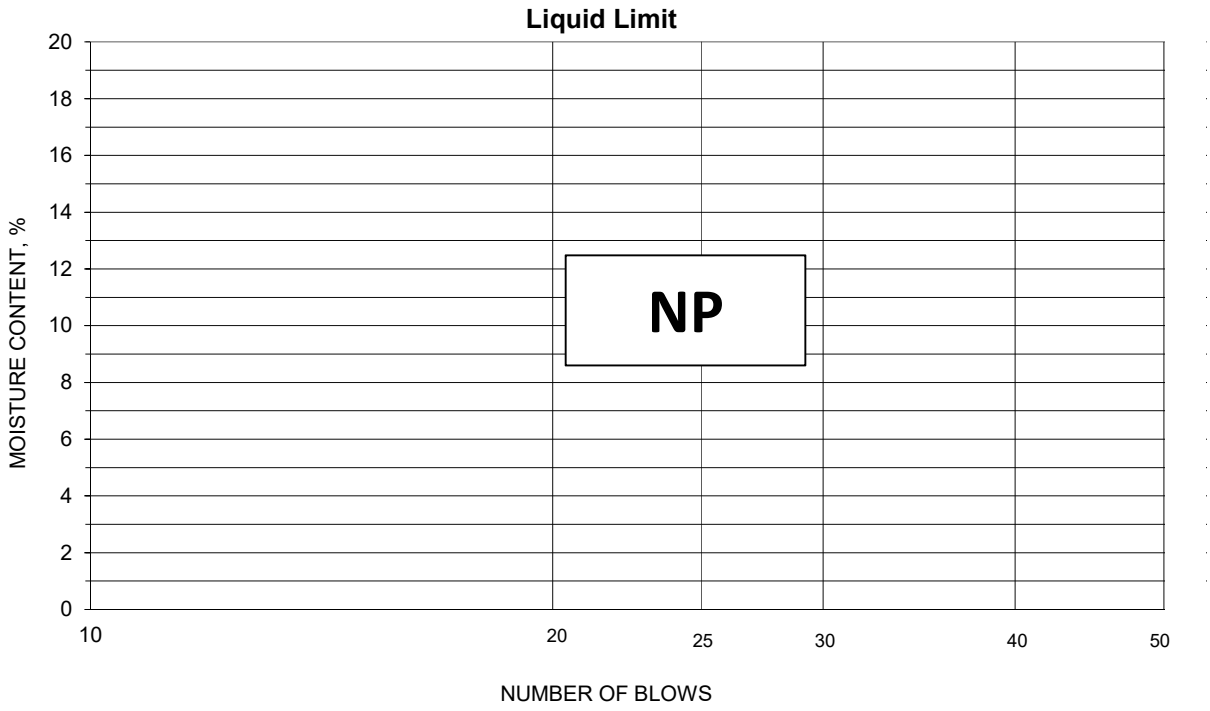
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	KIF-GT-TW04-SS04b, 5.5'-6.0'			Lab ID	95
				% + No. 40	1
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	03-28-2019
Test Date	04-23-2019	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: _____

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	KIF-GT-TW04-SS010, 13.5'-15.0'	Lab ID	100
Sample Type	SS	Date Received	3-28-19
		Date Reported	5-22-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 40.9

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
3/8"	9.5	100.0
No. 4	4.75	99.9
No. 10	2	99.6
No. 40	0.425	99.0
No. 200	0.075	94.0
	0.02	69.9
	0.005	24.1
	0.002	8.0
estimated	0.001	0.0

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.1	0.4
Coarse Sand	0.3	0.6
Medium Sand	0.6	---
Fine Sand	5.0	5.0
Silt	69.9	86.0
Clay	24.1	8.0

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	NP
Plastic Limit:	NP
Plasticity Index:	NP
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.35

Classification

Unified Group Symbol: ML

Group Name: Silt

AASHTO Classification: A-4 (0)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	KIF-GT-TW04-SS010, 13.5'-15.0'	Lab ID	100

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Weathered and Friable
Tested By	DB
Test Date	04-23-2019
Date Received	03-28-2019

Maximum Particle size: 3/8" Sieve

Sieve Size	% Passing
3/8"	100.0
No. 4	99.9
No. 10	99.6

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity 2.35

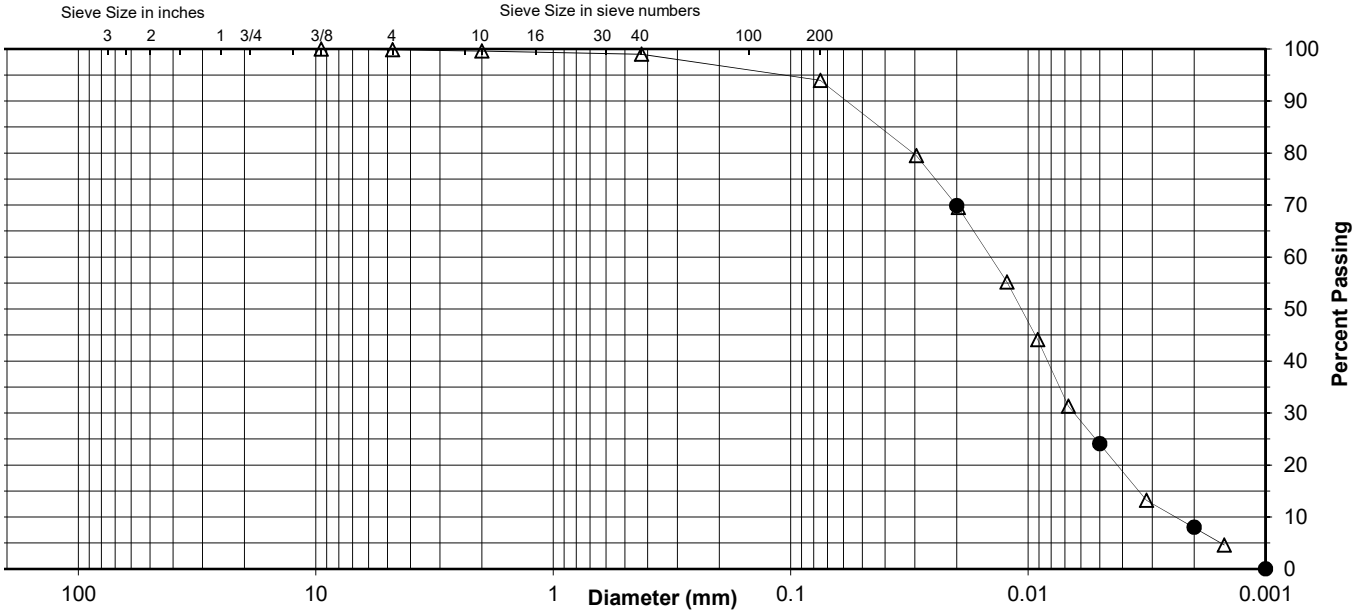
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	99.0
No. 200	94.0
0.02 mm	69.9
0.005 mm	24.1
0.002 mm	8.0
0.001 mm	0.0

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.1	0.3	0.6	5.0	69.9	24.1

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	0.4	0.6	5.0	86.0	8.0



Comments

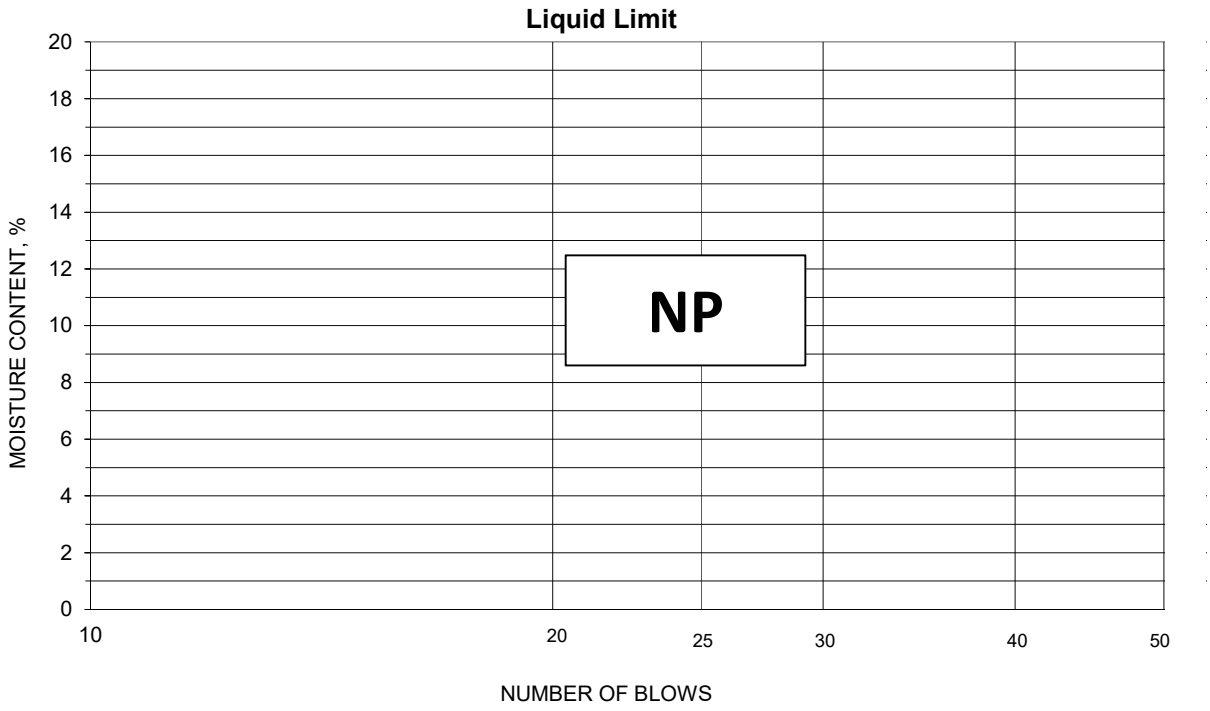
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	KIF-GT-TW04-SS010, 13.5'-15.0'			Lab ID	100
				% + No. 40	1
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	03-28-2019
Test Date	04-23-2019	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: _____

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	KIF-GT-TW04-ST01, 24.9'-25.5'	Lab ID	104
Sample Type	ST	Date Received	3-28-19
		Date Reported	5-22-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 49.0

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 4	4.75	100.0
No. 10	2	98.2
No. 40	0.425	90.9
No. 200	0.075	60.7
	0.02	12.8
	0.005	1.6
	0.002	0.7
estimated	0.001	0.2

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.0	1.8
Coarse Sand	1.8	7.3
Medium Sand	7.3	---
Fine Sand	30.2	30.2
Silt	59.1	60.0
Clay	1.6	0.7

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	NP
Plastic Limit:	NP
Plasticity Index:	NP
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol: ML

Group Name: Sandy silt

AASHTO Classification: A-4 (0)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	KIF-GT-TW04-ST01, 24.9'-25.5'	Lab ID	104

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	HE
Test Date	05-09-2019
Date Received	03-28-2019

Maximum Particle size: No. 4 Sieve

Sieve Size	% Passing
No. 4	100.0
No. 10	98.2

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity 2.7

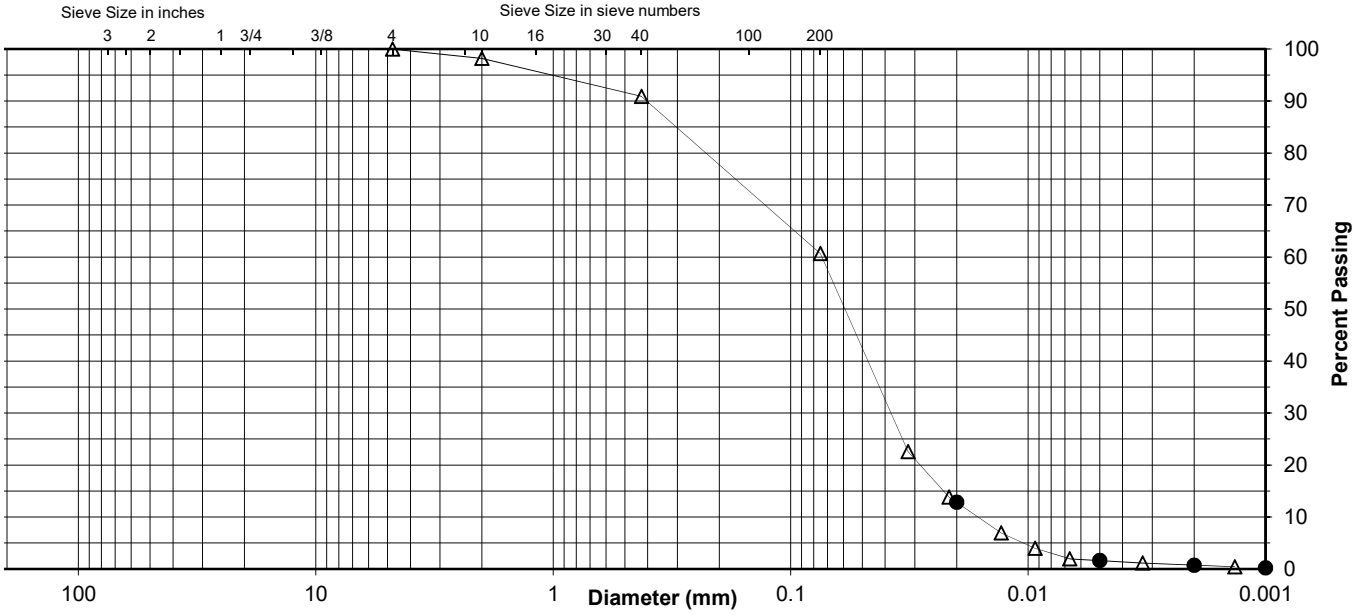
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	90.9
No. 200	60.7
0.02 mm	12.8
0.005 mm	1.6
0.002 mm	0.7
0.001 mm	0.2

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	1.8	7.3	30.2	59.1	1.6

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	1.8	7.3	30.2	60.0	0.7



Comments

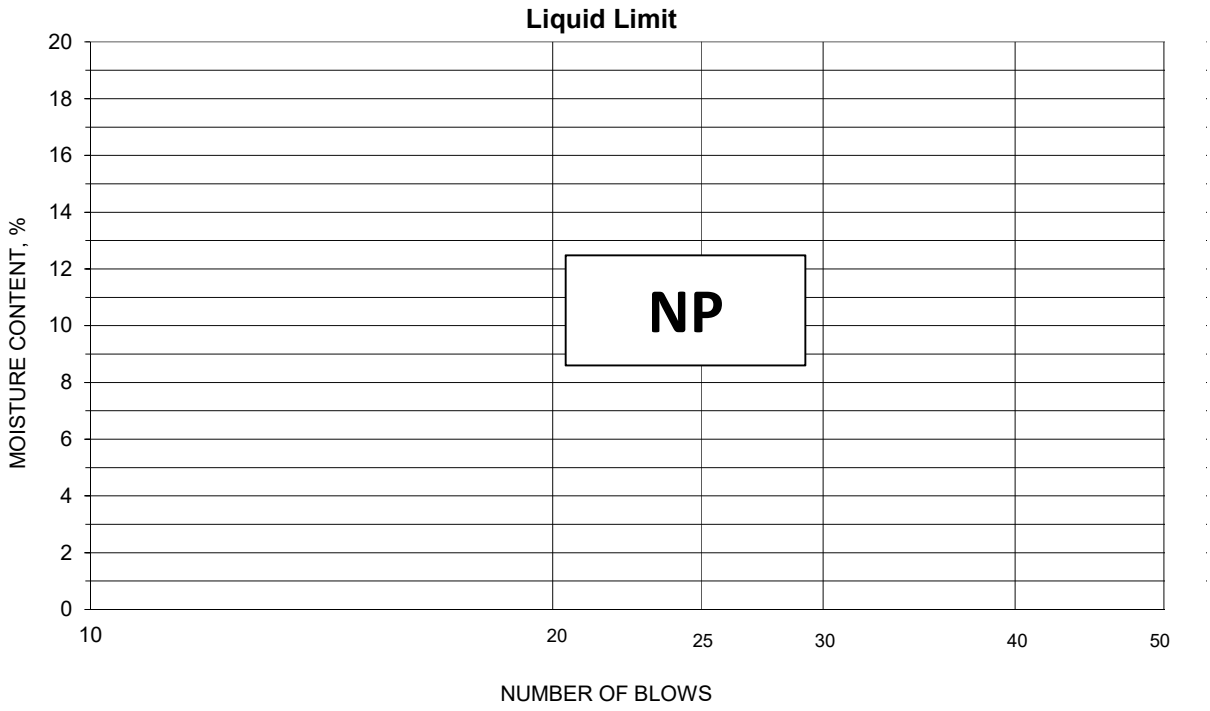
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	KIF-GT-TW04-ST01, 24.9'-25.5'			Lab ID	104
				% + No. 40	9
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	03-28-2019
Test Date	05-10-2019	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: _____

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	KIF-GT-TW04-SS19, 28.5'-30.0'	Lab ID	106
Sample Type	SS	Date Received	3-28-19
		Date Reported	5-23-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 39.0

Particle Size Analysis

Preparation Method: ASTM D 421

Gradation Method: ASTM D 422

Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
3/4"	19	100.0
3/8"	9.5	97.1
No. 4	4.75	92.0
No. 10	2	84.5
No. 40	0.425	70.1
No. 200	0.075	37.7
	0.02	5.3
	0.005	0.7
	0.002	0.5
estimated	0.001	0.3

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	8.0	15.5
Coarse Sand	7.5	14.4
Medium Sand	14.4	---
Fine Sand	32.4	32.4
Silt	37.0	37.2
Clay	0.7	0.5

Atterberg Limits

Test Method: ASTM D 4318 Method A

Prepared: Dry

Liquid Limit:	NP
Plastic Limit:	NP
Plasticity Index:	NP
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Test Method: ASTM D 854

Prepared: Dry

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.59

Classification

Unified Group Symbol: SM

Group Name: Silty sand

AASHTO Classification: A-4 (0)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	KIF-GT-TW04-SS19, 28.5'-30.0'	Lab ID	106

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Weathered and Friable
Tested By	DB
Test Date	04-23-2019
Date Received	03-28-2019

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	97.1
No. 4	92.0
No. 10	84.5

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

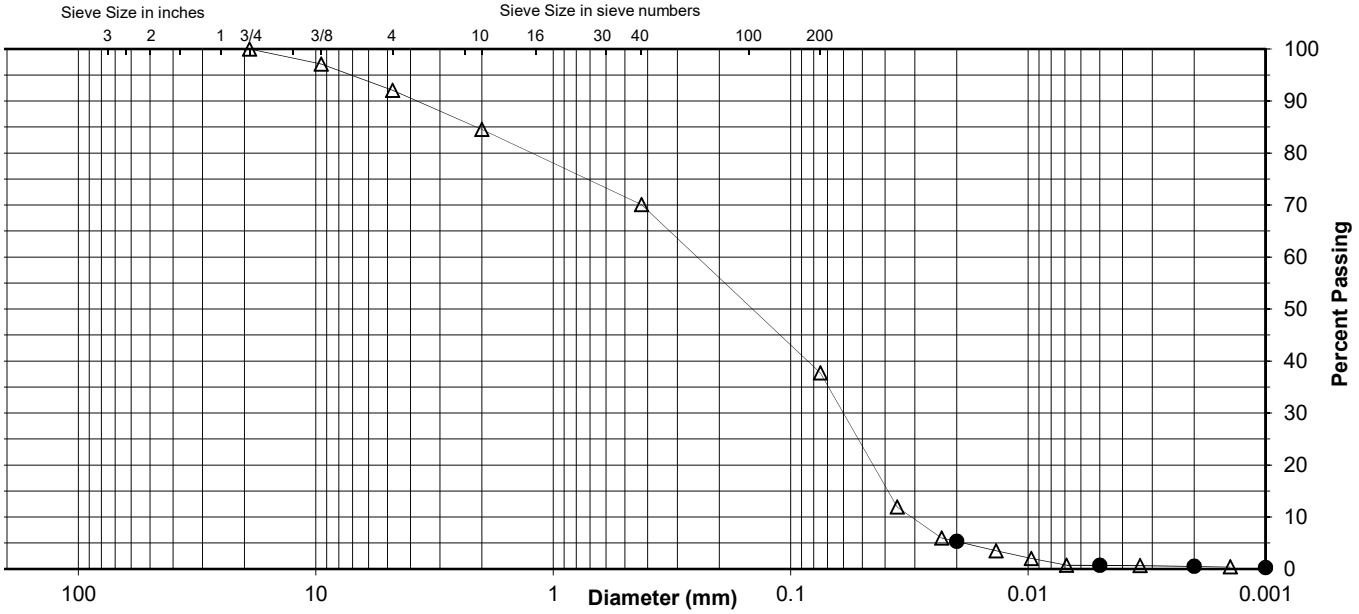
Specific Gravity 2.59

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	70.1
No. 200	37.7
0.02 mm	5.3
0.005 mm	0.7
0.002 mm	0.5
0.001 mm	0.3

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	8.0	7.5	14.4	32.4	37.0	0.7
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	15.5			14.4	32.4	37.2	0.5



Comments

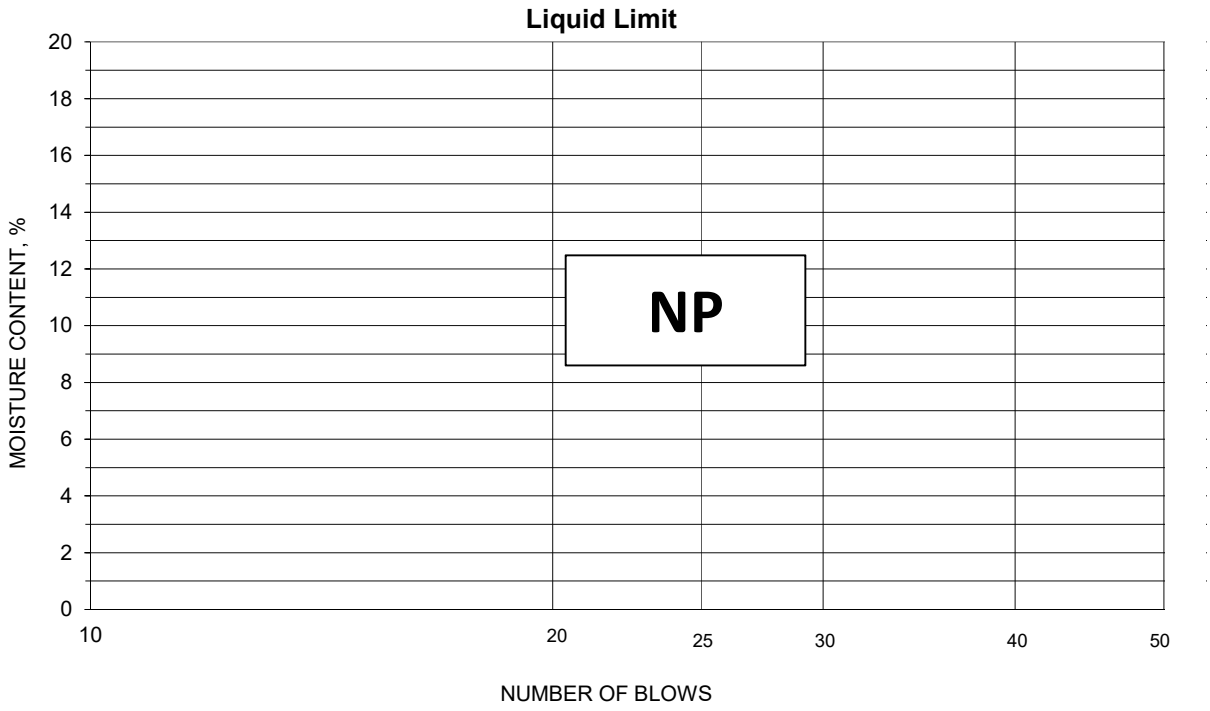
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	KIF-GT-TW04-SS19, 28.5'-30.0'			Lab ID	106
				% + No. 40	30
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	03-28-2019
Test Date	04-23-2019	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	KIF-GT-TW04-SS22b, 33.5'-34.5'	Lab ID	108
Sample Type	SS	Date Received	3-28-19
		Date Reported	5-23-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 57.6

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
3/4"	19	100.0
3/8"	9.5	99.6
No. 4	4.75	98.5
No. 10	2	97.7
No. 40	0.425	95.3
No. 200	0.075	64.5
	0.02	8.6
	0.005	0.8
	0.002	0.5
estimated	0.001	0.4

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	1.5	2.3
Coarse Sand	0.8	2.4
Medium Sand	2.4	---
Fine Sand	30.8	30.8
Silt	63.7	64.0
Clay	0.8	0.5

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	NP
Plastic Limit:	NP
Plasticity Index:	NP
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol: ML

Group Name: Sandy silt

AASHTO Classification: A-4 (0)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	KIF-GT-TW04-SS22b, 33.5'-34.5'	Lab ID	108

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Weathered and Friable
Tested By	DB
Test Date	04-23-2019
Date Received	03-28-2019

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	99.6
No. 4	98.5
No. 10	97.7

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity 2.7

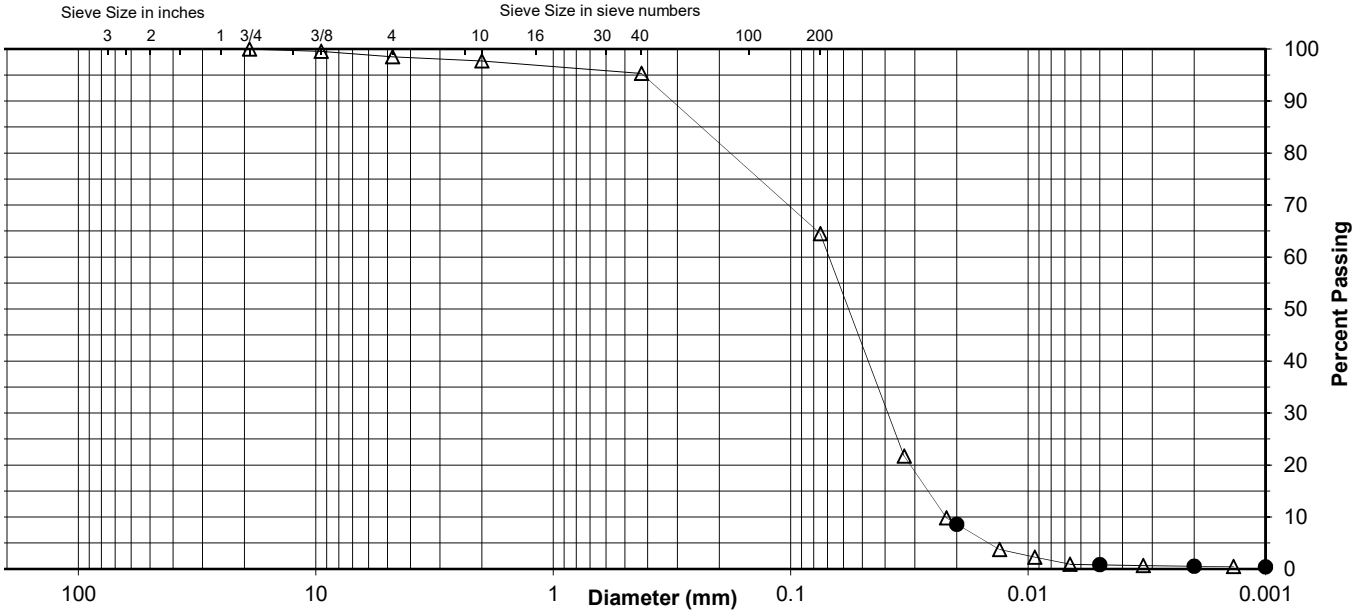
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	95.3
No. 200	64.5
0.02 mm	8.6
0.005 mm	0.8
0.002 mm	0.5
0.001 mm	0.4

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	1.5	0.8	2.4	30.8	63.7	0.8

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	2.3	2.4	30.8	64.0	0.5



Comments

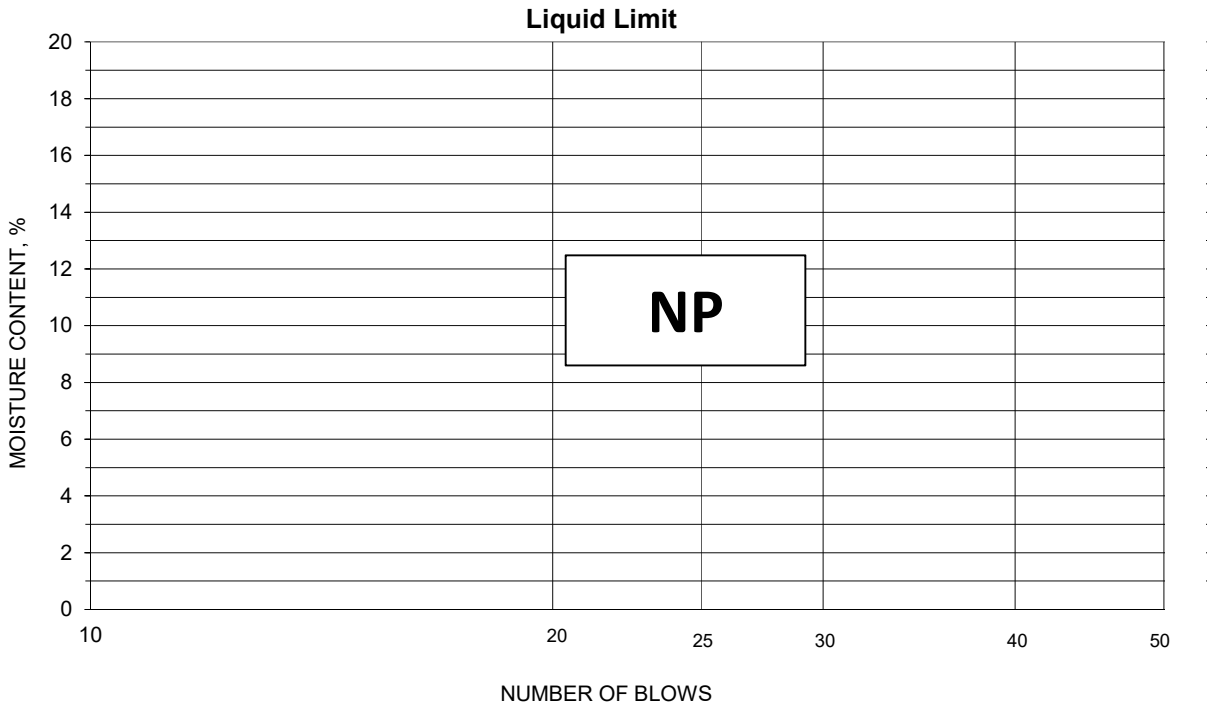
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	KIF-GT-TW04-SS22b, 33.5'-34.5'			Lab ID	108
				% + No. 40	5
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	03-28-2019
Test Date	04-23-2019	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: _____

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	KIF-GT-TW04-ST02, 39.3'-39.9'	Lab ID	112
Sample Type	ST	Date Received	3-28-19
		Date Reported	5-22-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 34.2

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
3/4"	19	100.0
3/8"	9.5	99.1
No. 4	4.75	97.0
No. 10	2	91.9
No. 40	0.425	85.4
No. 200	0.075	66.0
	0.02	21.8
	0.005	2.3
	0.002	0.7
estimated	0.001	0.1

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	3.0	8.1
Coarse Sand	5.1	6.5
Medium Sand	6.5	---
Fine Sand	19.4	19.4
Silt	63.7	65.3
Clay	2.3	0.7

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	NP
Plastic Limit:	NP
Plasticity Index:	NP
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.41

Classification

Unified Group Symbol: ML

Group Name: Sandy silt

AASHTO Classification: A-4 (0)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	KIF-GT-TW04-ST02, 39.3'-39.9'	Lab ID	112

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	HE
Test Date	05-10-2019
Date Received	03-28-2019

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	99.1
No. 4	97.0
No. 10	91.9

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

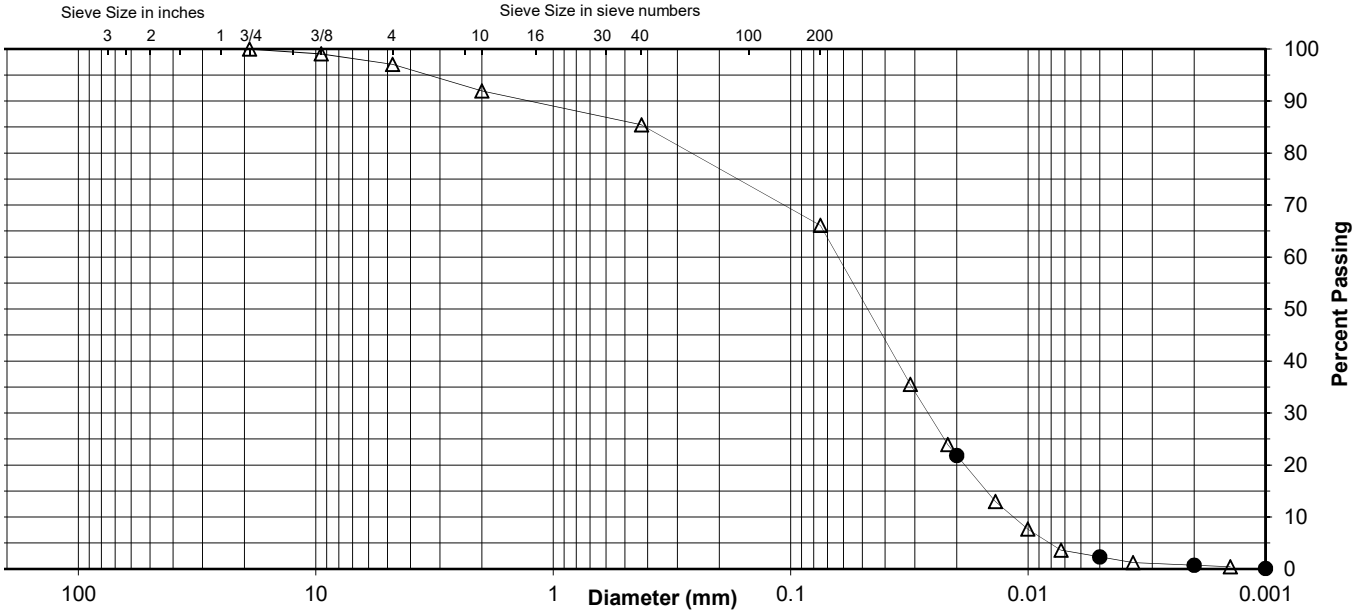
Specific Gravity 2.41

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	85.4
No. 200	66.0
0.02 mm	21.8
0.005 mm	2.3
0.002 mm	0.7
0.001 mm	0.1

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	3.0	5.1	6.5	19.4	63.7	2.3
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	8.1			6.5	19.4	65.3	0.7



Comments

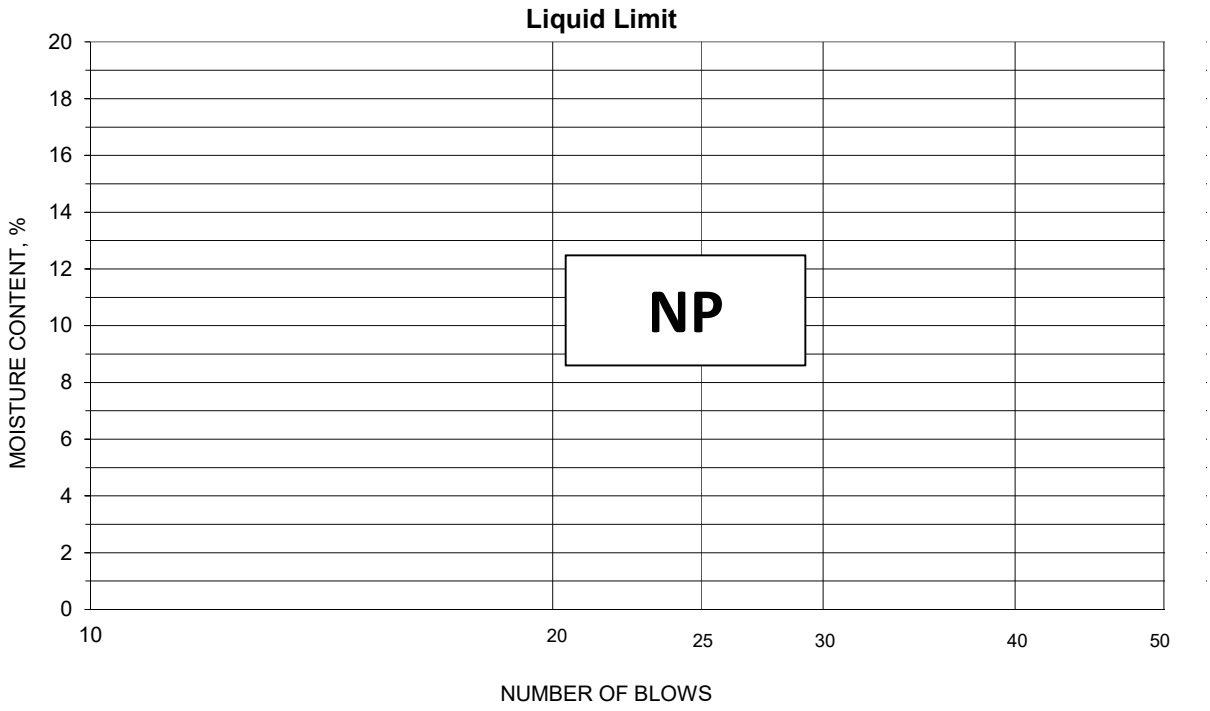
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	KIF-GT-TW04-ST02, 39.3'-39.9'			Lab ID	112
				% + No. 40	15
Tested By	DB	Test Method	ASTM D 4318 Method A	Date Received	03-28-2019
Test Date	05-13-2019	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: _____

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	TVA KIF EIP Exploratory Drilling	Project Number	175668043
Source	KIF-GT-TW05-SPT01, 0.0'-1.5'	Lab ID	1
Sample Type	SPT	Date Received	12-3-18
		Date Reported	12-12-18

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 17.9

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
1 1/2"	37.5	100.0
3/4"	19	96.2
3/8"	9.5	87.8
No. 4	4.75	76.9
No. 10	2	63.0
No. 40	0.425	49.1
No. 200	0.075	32.8
	0.02	17.7
	0.005	5.8
	0.002	1.9
estimated	0.001	0.3

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	23.1	37.0
Coarse Sand	13.9	13.9
Medium Sand	13.9	---
Fine Sand	16.3	16.3
Silt	27.0	30.9
Clay	5.8	1.9

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	NP
Plastic Limit:	NP
Plasticity Index:	NP
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.65

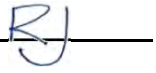
Classification

Unified Group Symbol: SM

Group Name: Silty sand with gravel

AASHTO Classification: A-2-4 (0)

Comments:

Reviewed By 

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	TVA KIF EIP Exploratory Drilling	Project Number	175668043
Source	KIF-GT-TW05-SPT01, 0.0'-1.5'	Lab ID	1

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	RC
Test Date	12-06-2018
Date Received	12-03-2018

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	96.2
3/8"	87.8
No. 4	76.9
No. 10	63.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

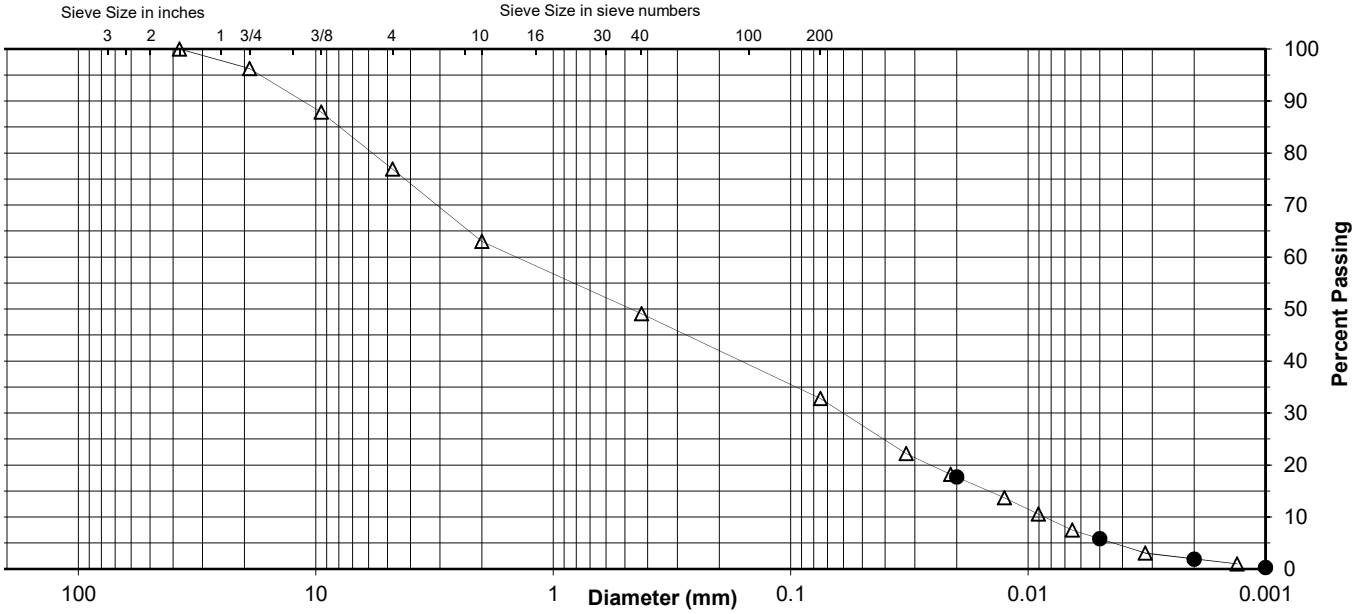
Specific Gravity 2.65

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	49.1
No. 200	32.8
0.02 mm	17.7
0.005 mm	5.8
0.002 mm	1.9
0.001 mm	0.3

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	3.8	19.3	13.9	13.9	16.3	27.0	5.8
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	37.0			13.9	16.3	30.9	1.9



Comments

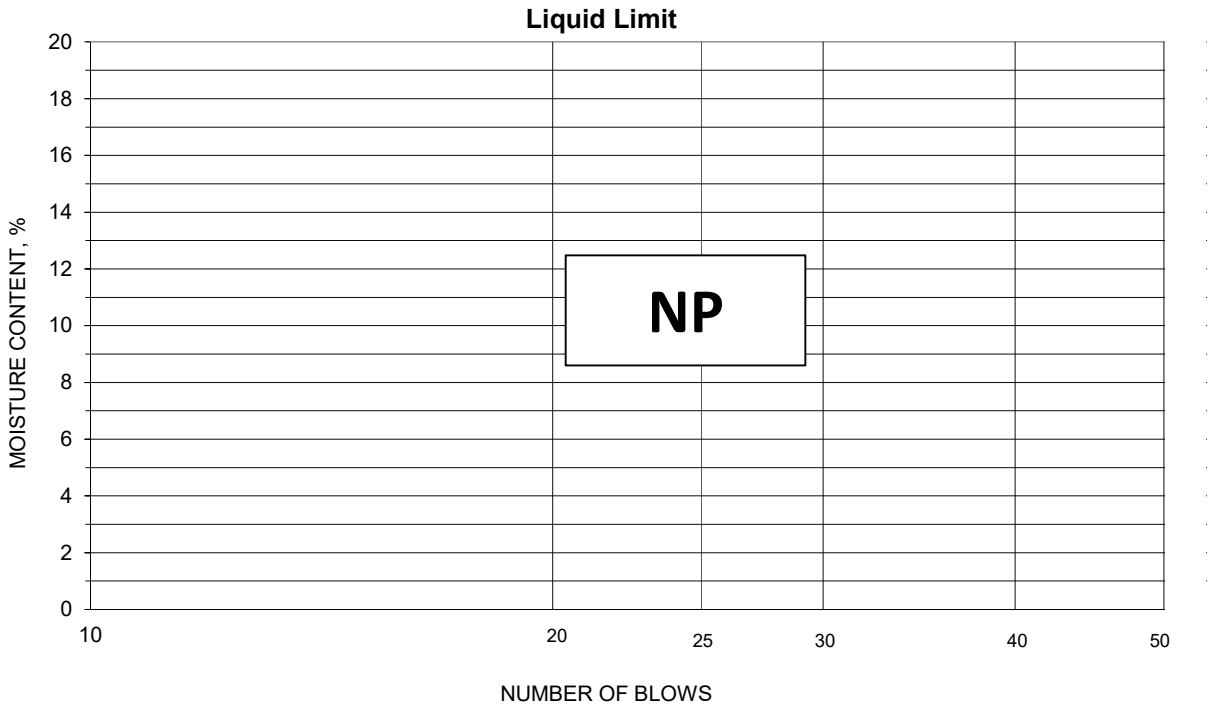
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	TVA KIF EIP Exploratory Drilling			Project No.	175668043
Source	KIF-GT-TW05-SPT01, 0.0'-1.5'			Lab ID	1
				% + No. 40	51
Tested By	KG	Test Method	ASTM D 4318 Method A	Date Received	12-03-2018
Test Date	12-07-2018	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: _____

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	TVA KIF EIP Exploratory Drilling	Project Number	175668043
Source	KIF-GT-TW05-SPT07, 9.0'-10.5'	Lab ID	3
Sample Type	SPT	Date Received	12-3-18
		Date Reported	12-12-18

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 13.1

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
3/4"	19	100.0
3/8"	9.5	94.5
No. 4	4.75	84.7
No. 10	2	70.4
No. 40	0.425	46.8
No. 200	0.075	23.1
	0.02	5.9
	0.005	0.1
	0.002	0.0
estimated	0.001	0.0

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	15.3	29.6
Coarse Sand	14.3	23.6
Medium Sand	23.6	---
Fine Sand	23.7	23.7
Silt	23.0	23.1
Clay	0.1	0.0

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	NP
Plastic Limit:	NP
Plasticity Index:	NP
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.43

Classification

Unified Group Symbol: SM

Group Name: Silty sand with gravel

AASHTO Classification: A-1-b (0)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	TVA KIF EIP Exploratory Drilling	Project Number	175668043
Source	KIF-GT-TW05-SPT07, 9.0'-10.5'	Lab ID	3

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	RC
Test Date	12-06-2018
Date Received	12-03-2018

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	94.5
No. 4	84.7
No. 10	70.4

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity 2.43

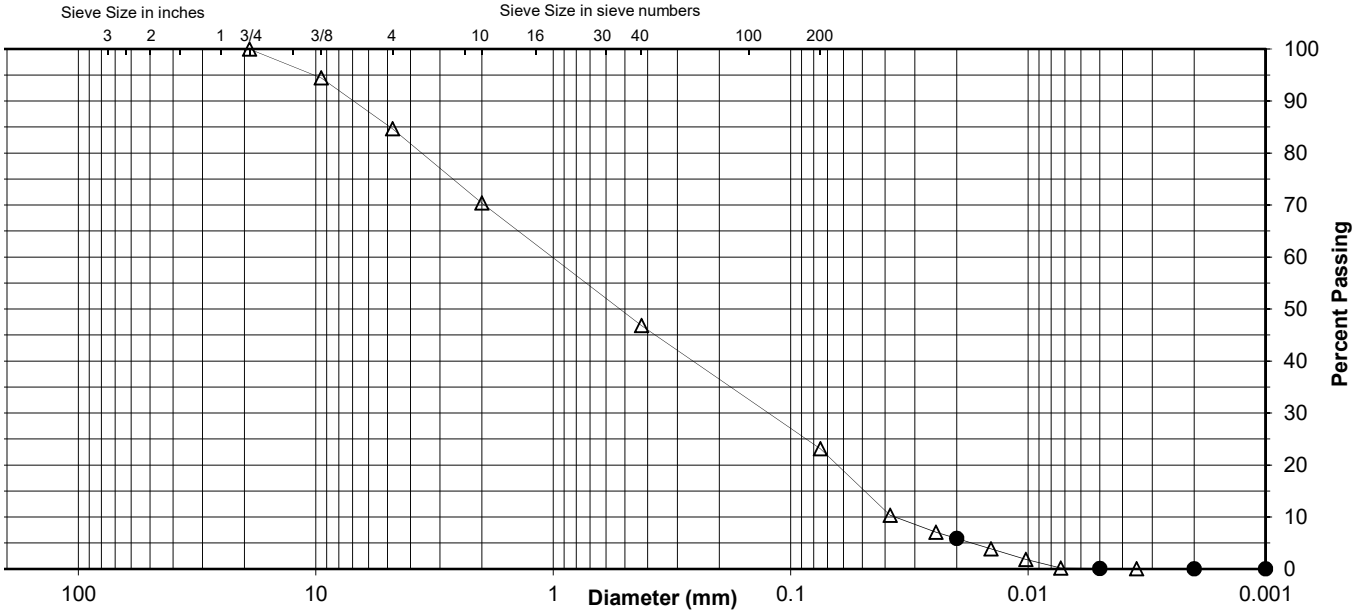
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	46.8
No. 200	23.1
0.02 mm	5.9
0.005 mm	0.1
0.002 mm	0.0
0.001 mm	0.0

Particle Size Distribution

	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
ASTM	0.0	15.3	14.3	23.6	23.7	23.0	0.1

	Gravel	Coarse Sand	Fine Sand	Silt	Clay
AASHTO	29.6	23.6	23.7	23.1	0.0



Comments

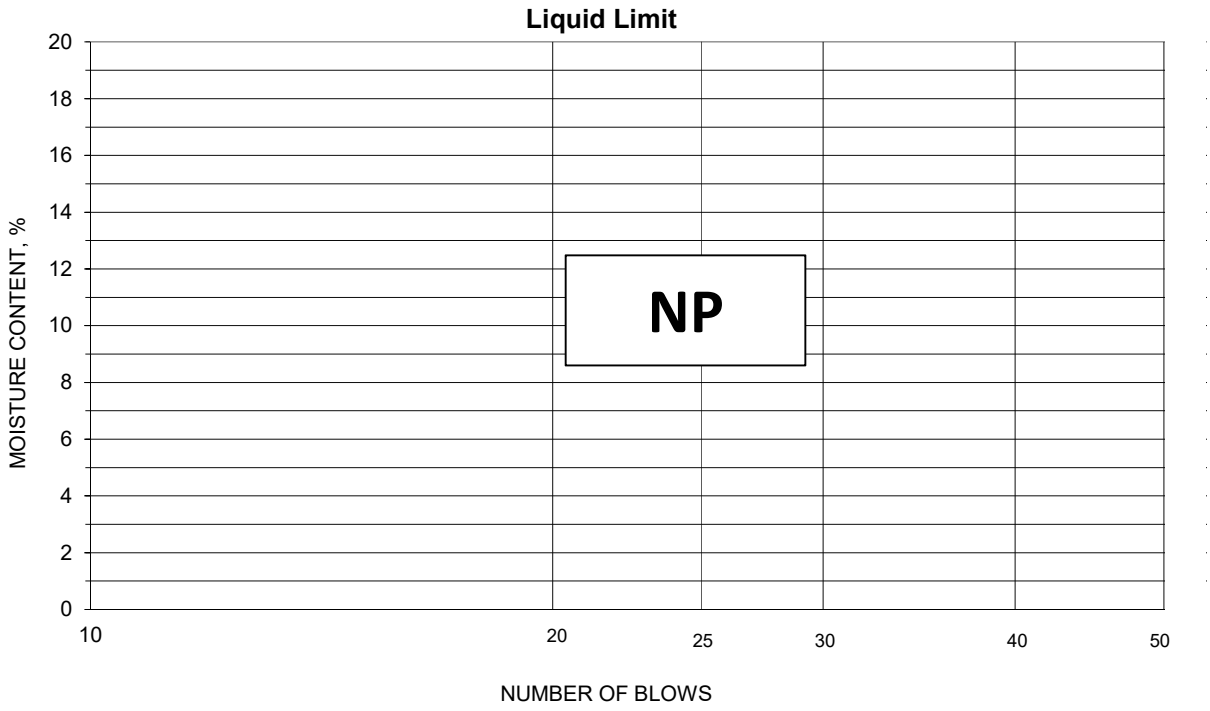
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	TVA KIF EIP Exploratory Drilling			Project No.	175668043
Source	KIF-GT-TW05-SPT07, 9.0'-10.5'			Lab ID	3
				% + No. 40	53
Tested By	KG	Test Method	ASTM D 4318 Method A	Date Received	12-03-2018
Test Date	12-06-2018	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: _____

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	TVA KIF EIP Exploratory Drilling	Project Number	175668043
Source	KIF-GT-TW05-SPT14, 19.5'-21.0'	Lab ID	6
Sample Type	SPT	Date Received	12-3-18
		Date Reported	12-12-18

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 12.8

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
1 1/2"	37.5	100.0
3/4"	19	94.9
3/8"	9.5	77.4
No. 4	4.75	63.0
No. 10	2	45.7
No. 40	0.425	25.1
No. 200	0.075	11.1
	0.02	2.3
	0.005	0.0
	0.002	0.0
estimated	0.001	0.0

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	37.0	54.3
Coarse Sand	17.3	20.6
Medium Sand	20.6	---
Fine Sand	14.0	14.0
Silt	11.1	11.1
Clay	0.0	0.0

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	NP
Plastic Limit:	NP
Plasticity Index:	NP
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.65

Classification

Unified Group Symbol: SW-SM

Group Name: Well-graded sand with silt and gravel

AASHTO Classification: A-1-a (0)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	TVA KIF EIP Exploratory Drilling	Project Number	175668043
Source	KIF-GT-TW05-SPT14, 19.5'-21.0'	Lab ID	6

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	RC
Test Date	12-06-2018
Date Received	12-03-2018

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	94.9
3/8"	77.4
No. 4	63.0
No. 10	45.7

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

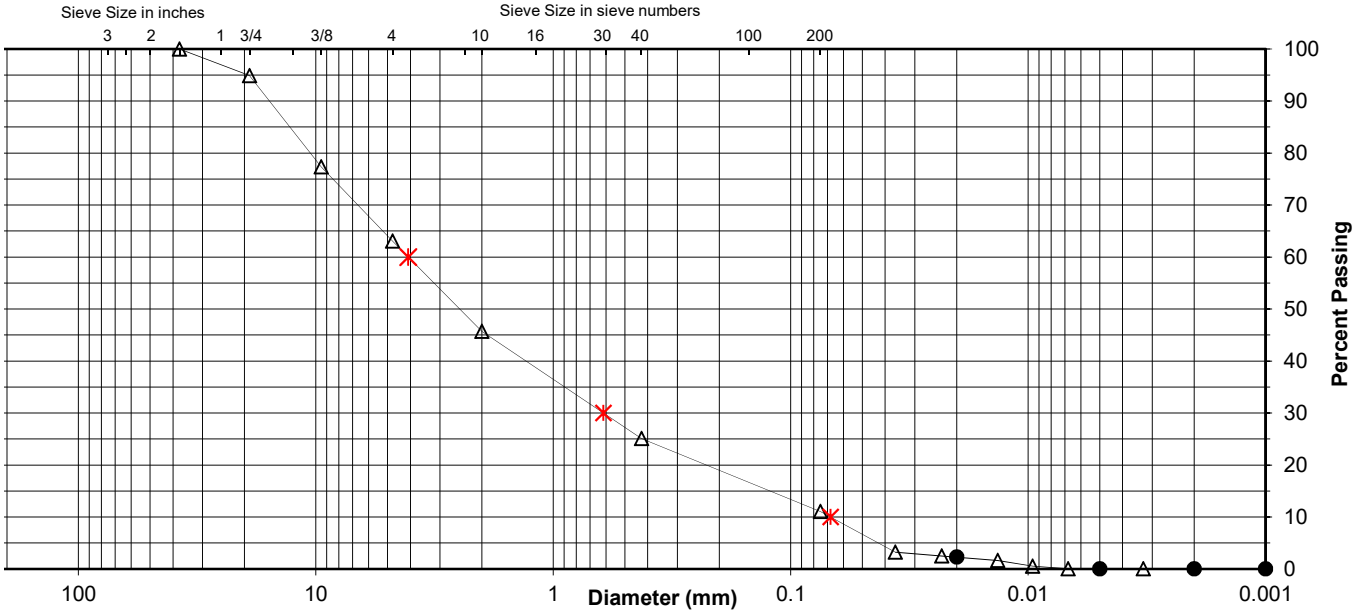
Specific Gravity 2.65

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	25.1
No. 200	11.1
0.02 mm	2.3
0.005 mm	0.0
0.002 mm	0.0
0.001 mm	0.0

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	5.1	31.9	17.3	20.6	14.0	11.1	0.0
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	54.3			20.6	14.0	11.1	0.0



Comments

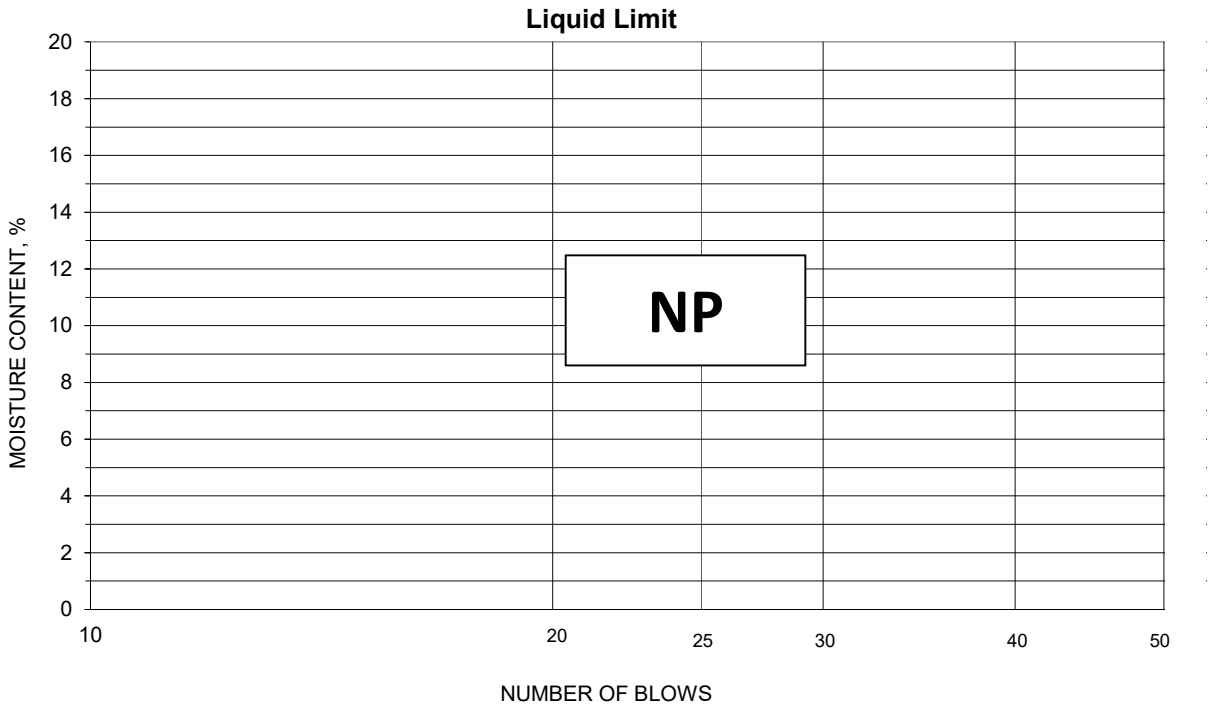
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	TVA KIF EIP Exploratory Drilling			Project No.	175668043
Source	KIF-GT-TW05-SPT14, 19.5'-21.0'			Lab ID	6
				% + No. 40	75
Tested By	KG	Test Method	ASTM D 4318 Method A	Date Received	12-03-2018
Test Date	12-06-2018	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: _____

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	TVA KIF EIP Exploratory Drilling	Project Number	175668043
Source	KIF-GT-TW05-SPT20, 28.5'-30.0'	Lab ID	8
Sample Type	SPT	Date Received	12-3-18
		Date Reported	12-12-18

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 37.5

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
3/8"	9.5	100.0
No. 4	4.75	99.2
No. 10	2	97.2
No. 40	0.425	88.8
No. 200	0.075	62.8
	0.02	19.4
	0.005	0.1
	0.002	0.0
estimated	0.001	0.0

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.8	2.8
Coarse Sand	2.0	8.4
Medium Sand	8.4	---
Fine Sand	26.0	26.0
Silt	62.7	62.8
Clay	0.1	0.0

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	NP
Plastic Limit:	NP
Plasticity Index:	NP
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.49

Classification

Unified Group Symbol: ML

Group Name: Sandy silt

AASHTO Classification: A-4 (0)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	TVA KIF EIP Exploratory Drilling	Project Number	175668043
Source	KIF-GT-TW05-SPT20, 28.5'-30.0'	Lab ID	8

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Soft
Tested By	RC
Test Date	12-06-2018
Date Received	12-03-2018

Maximum Particle size: 3/8" Sieve

Sieve Size	% Passing
3/8"	100.0
No. 4	99.2
No. 10	97.2

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

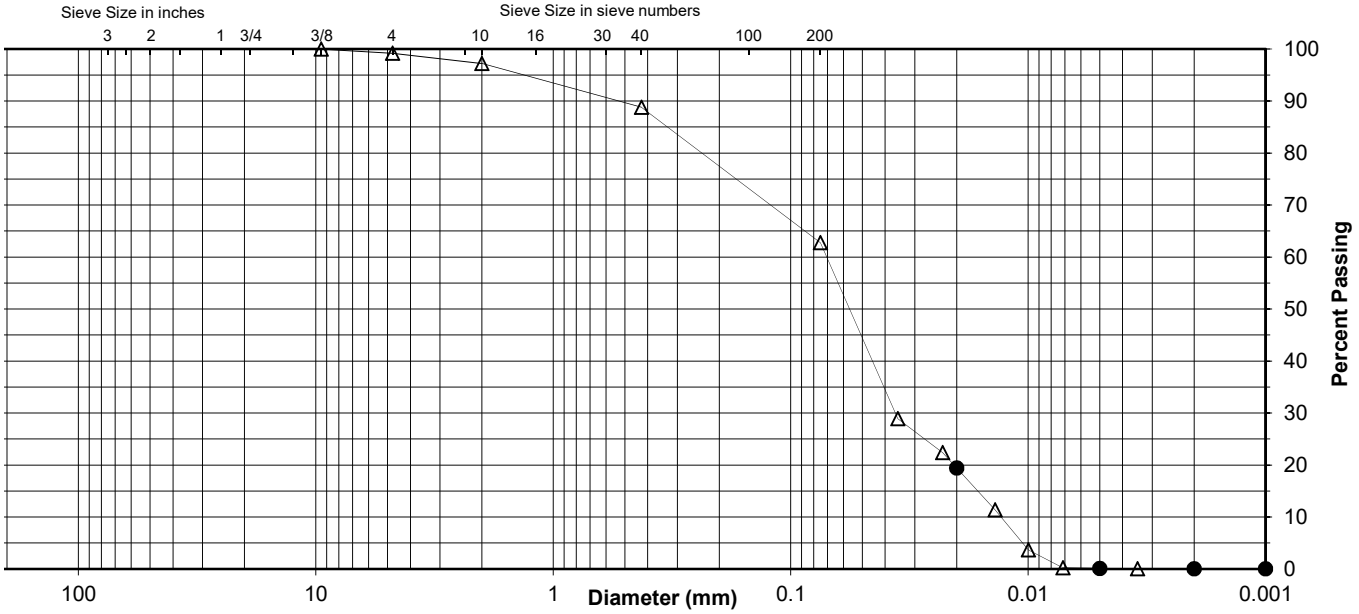
Specific Gravity 2.49

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	88.8
No. 200	62.8
0.02 mm	19.4
0.005 mm	0.1
0.002 mm	0.0
0.001 mm	0.0

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.8	2.0	8.4	26.0	62.7	0.1
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	2.8			8.4	26.0	62.8	0.0



Comments

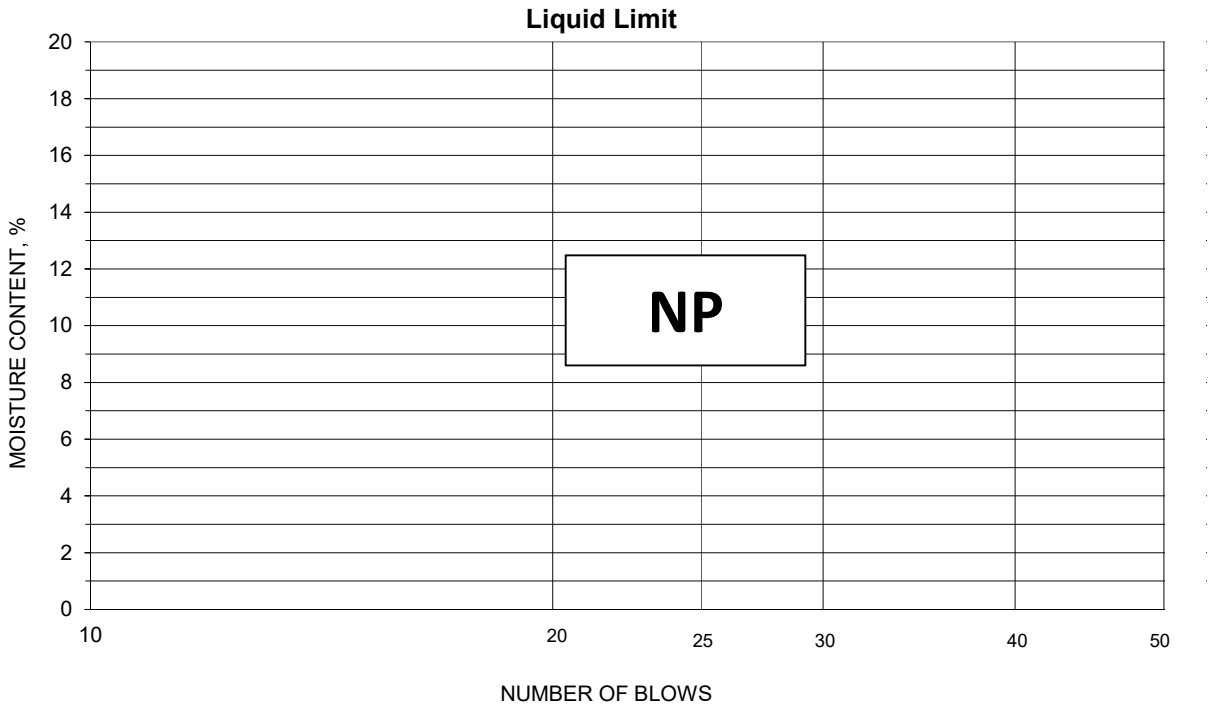
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	TVA KIF EIP Exploratory Drilling			Project No.	175668043
Source	KIF-GT-TW05-SPT20, 28.5'-30.0'			Lab ID	8
				% + No. 40	11
Tested By	KG	Test Method	ASTM D 4318 Method A	Date Received	12-03-2018
Test Date	12-06-2018	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	TVA KIF EIP Exploratory Drilling	Project Number	175668043
Source	KIF-GT-TW05-SPT24, 34.5'-36.0'	Lab ID	11
Sample Type	SPT	Date Received	12-3-18
		Date Reported	12-12-18

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 44.9

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
3/8"	9.5	100.0
No. 4	4.75	99.8
No. 10	2	99.3
No. 40	0.425	98.2
No. 200	0.075	83.5
	0.02	35.6
	0.005	1.8
	0.002	0.0
estimated	0.001	0.0

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.2	0.7
Coarse Sand	0.5	1.1
Medium Sand	1.1	---
Fine Sand	14.7	14.7
Silt	81.7	83.5
Clay	1.8	0.0

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	NP
Plastic Limit:	NP
Plasticity Index:	NP
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.65

Classification

Unified Group Symbol:	ML
Group Name:	Silt with sand
AASHTO Classification:	A-4 (0)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	TVA KIF EIP Exploratory Drilling	Project Number	175668043
Source	KIF-GT-TW05-SPT24, 34.5'-36.0'	Lab ID	11

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Soft
Tested By	RC
Test Date	12-06-2018
Date Received	12-03-2018

Maximum Particle size: 3/8" Sieve

Sieve Size	% Passing
3/8"	100.0
No. 4	99.8
No. 10	99.3

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

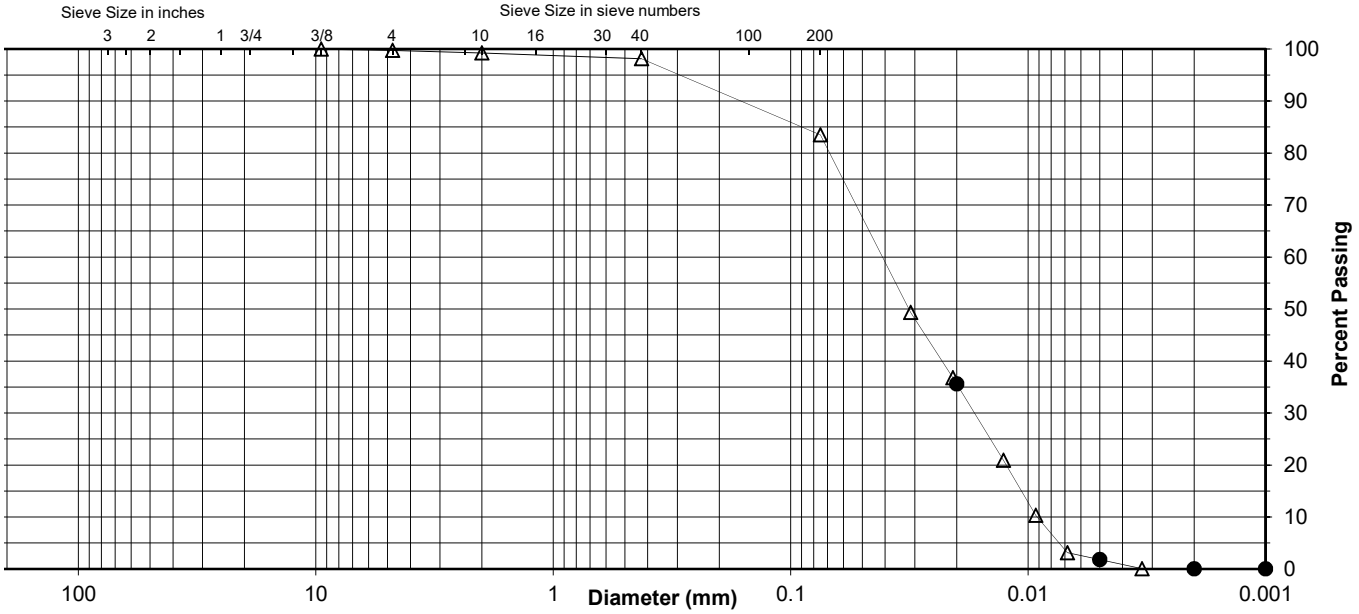
Specific Gravity 2.65

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	98.2
No. 200	83.5
0.02 mm	35.6
0.005 mm	1.8
0.002 mm	0.0
0.001 mm	0.0

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.2	0.5	1.1	14.7	81.7	1.8
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	0.7			1.1	14.7	83.5	0.0



Comments

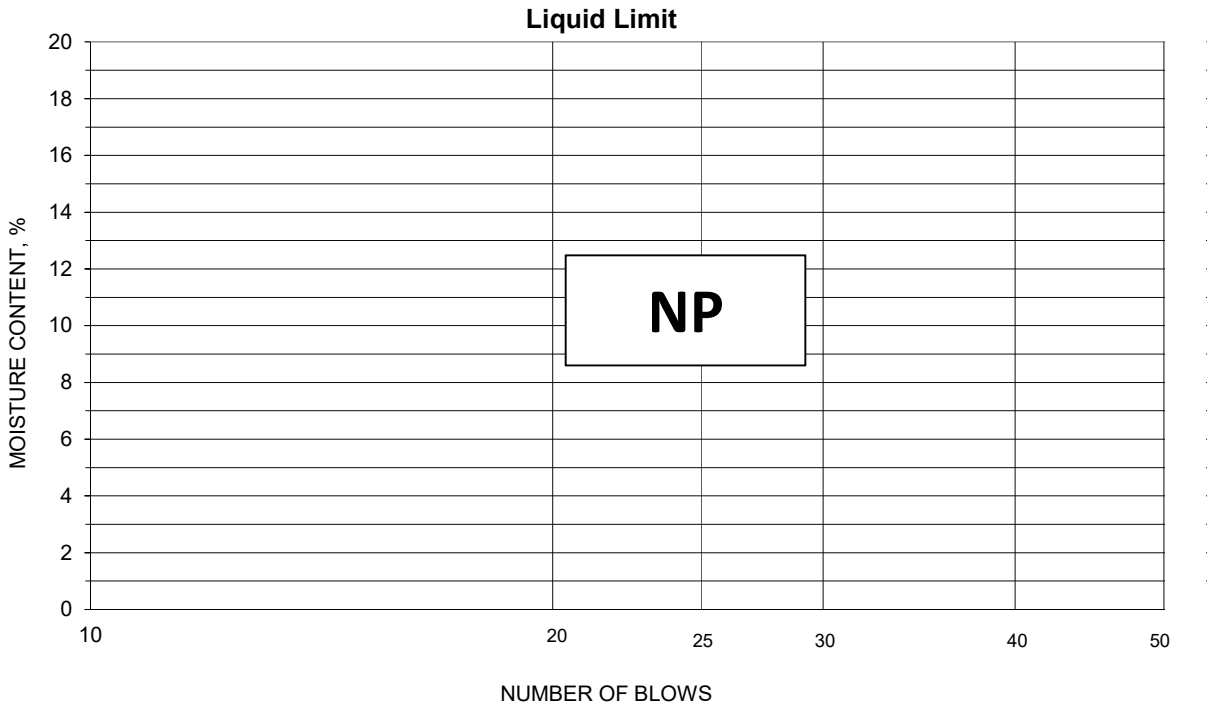
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	TVA KIF EIP Exploratory Drilling			Project No.	175668043
Source	KIF-GT-TW05-SPT24, 34.5'-36.0'			Lab ID	11
				% + No. 40	2
Tested By	KG	Test Method	ASTM D 4318 Method A	Date Received	12-03-2018
Test Date	12-06-2018	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: _____

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	TVA KIF EIP Exploratory Drilling	Project Number	175668043
Source	KIF-GT-TW05-ST01, 39.7'-40.2'	Lab ID	12
Sample Type	ST	Date Received	12-3-18
		Date Reported	12-12-18

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 22.1

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
3/4"	19	100.0
3/8"	9.5	99.8
No. 4	4.75	99.7
No. 10	2	98.1
No. 40	0.425	97.7
No. 200	0.075	81.3
	0.02	50.4
	0.005	22.9
	0.002	14.4
estimated	0.001	10.3

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.3	1.9
Coarse Sand	1.6	0.4
Medium Sand	0.4	---
Fine Sand	16.4	16.4
Silt	58.4	66.9
Clay	22.9	14.4

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	26
Plastic Limit:	17
Plasticity Index:	9
Activity Index:	0.6

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.65

Classification

Unified Group Symbol:	CL
Group Name:	Lean clay with sand
AASHTO Classification:	A-4 (5)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	TVA KIF EIP Exploratory Drilling	Project Number	175668043
Source	KIF-GT-TW05-ST01, 39.7'-40.2'	Lab ID	12

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Soft
Tested By	RC
Test Date	12-06-2018
Date Received	12-03-2018

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	99.8
No. 4	99.7
No. 10	98.1

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

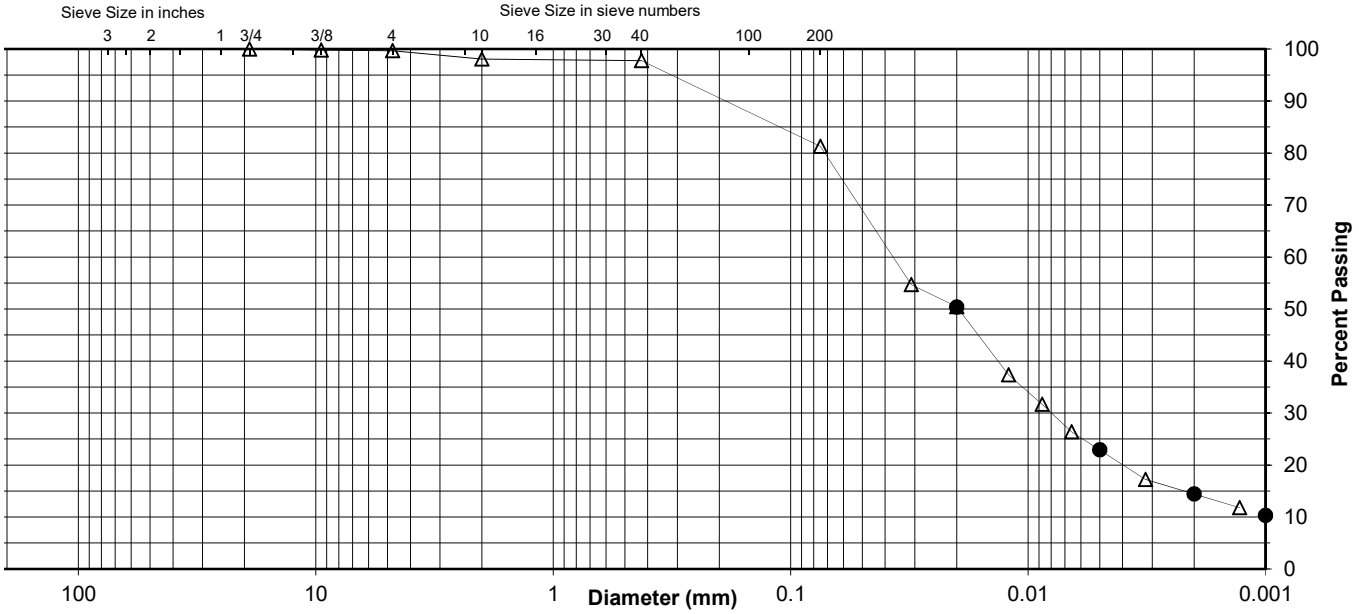
Specific Gravity 2.65

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	97.7
No. 200	81.3
0.02 mm	50.4
0.005 mm	22.9
0.002 mm	14.4
0.001 mm	10.3

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.3	1.6	0.4	16.4	58.4	22.9
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	1.9			0.4	16.4	66.9	14.4



Comments

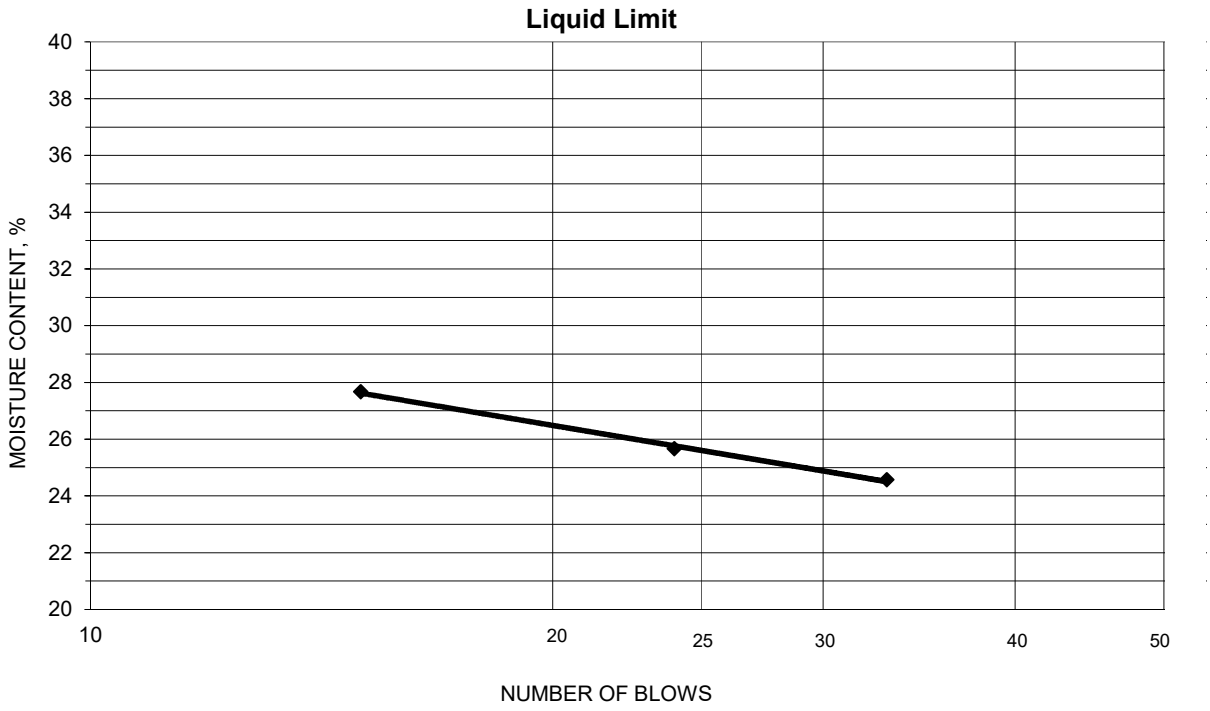
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	TVA KIF EIP Exploratory Drilling			Project No.	175668043
Source	KIF-GT-TW05-ST01, 39.7'-40.2'			Lab ID	12
				% + No. 40	2
Tested By	KG	Test Method	ASTM D 4318 Method A	Date Received	12-03-2018
Test Date	12-07-2018	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
19.11	17.32	10.85	15	27.7	
18.74	17.18	11.10	24	25.7	
19.84	18.13	11.17	33	24.6	26



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
21.00	19.85	13.00	16.8	17	9
18.88	17.99	12.70	16.8		

Remarks: _____

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b01a-dp02cg, 43.5'-45.0'	Lab ID	116
Sample Type	DP	Date Received	12-17-19
		Date Reported	1-15-20

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 35.4

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 4	4.75	100.0
No. 10	2	99.9
No. 40	0.425	99.7
No. 200	0.075	86.3
	0.02	34.0
	0.005	4.3
	0.002	1.6
estimated	0.001	1.3

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.0	0.1
Coarse Sand	0.1	0.2
Medium Sand	0.2	---
Fine Sand	13.4	13.4
Silt	82.0	84.7
Clay	4.3	1.6

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	NP
Plastic Limit:	NP
Plasticity Index:	NP
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol: ML

Group Name: Silt

AASHTO Classification: A-4 (0)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b01a-dp02cg, 43.5'-45.0'	Lab ID	116

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	MW
Test Date	12-20-2019
Date Received	12-17-2019

Maximum Particle size: No. 4 Sieve

Sieve Size	% Passing
No. 4	100.0
No. 10	99.9

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity 2.7

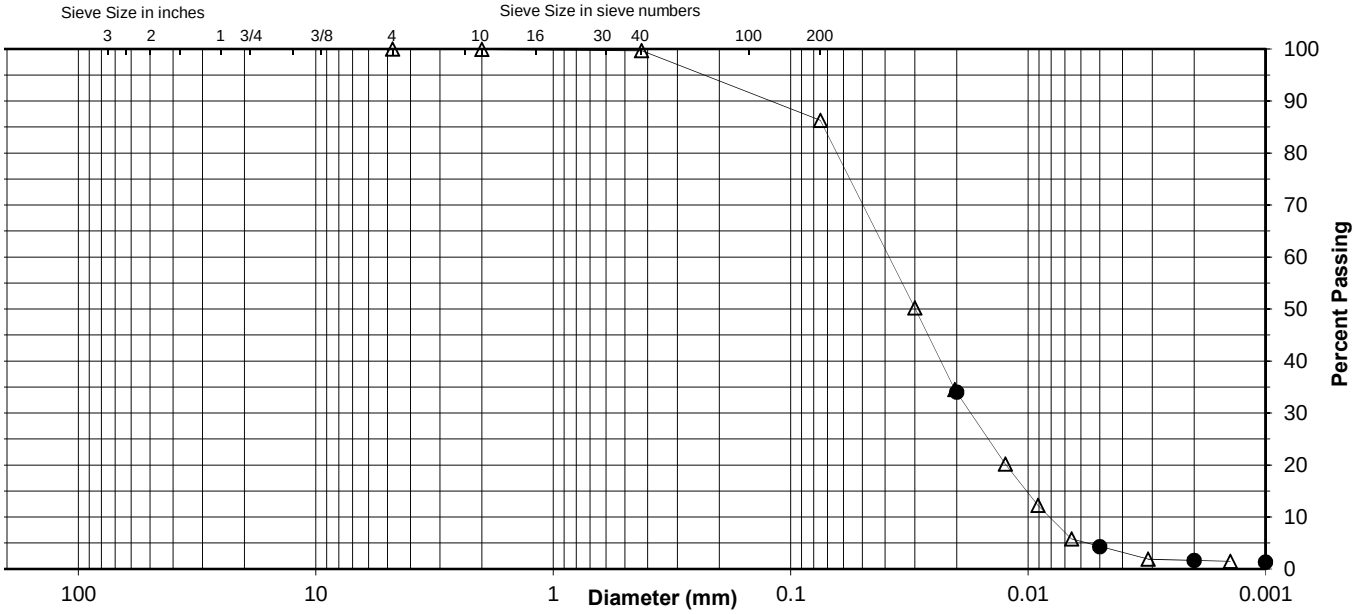
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	99.7
No. 200	86.3
0.02 mm	34.0
0.005 mm	4.3
0.002 mm	1.6
0.001 mm	1.3

Particle Size Distribution

	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
ASTM	0.0	0.0	0.1	0.2	13.4	82.0	4.3

	Gravel	Coarse Sand	Fine Sand	Silt	Clay
AASHTO	0.1	0.2	13.4	84.7	1.6



Comments

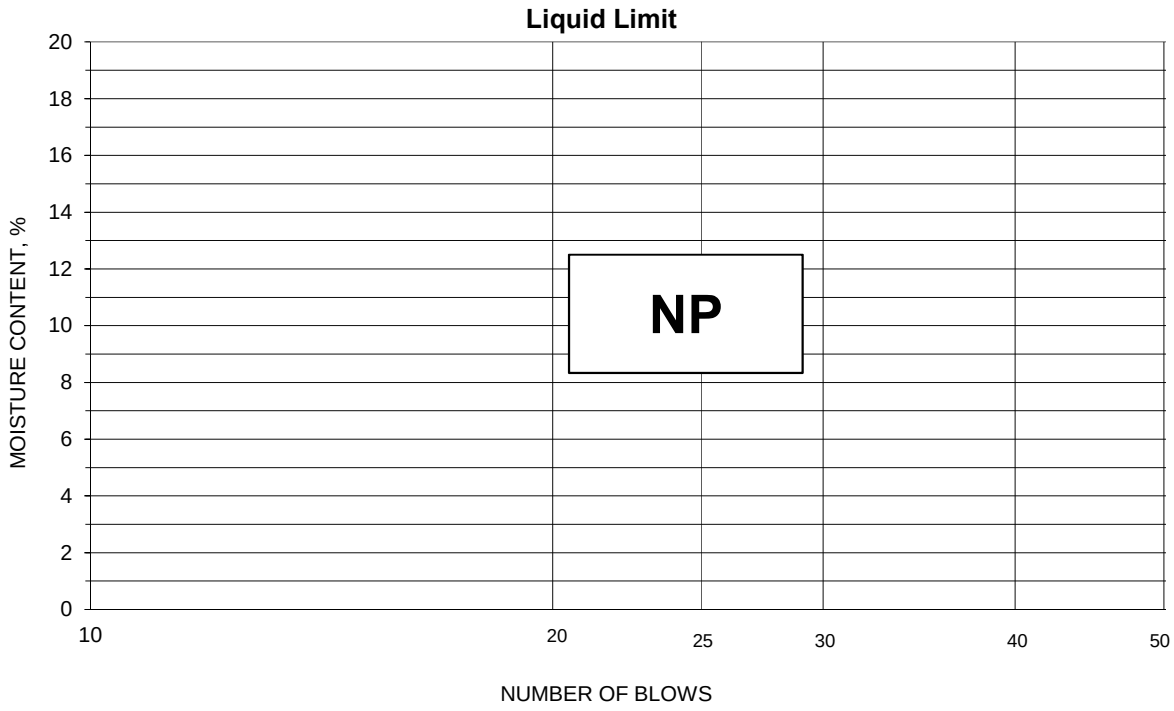
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	kif-gt-b01a-dp02cg, 43.5'-45.0'			Lab ID	116
				% + No. 40	0
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	12-17-2019
Test Date	12-20-2019	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b01a-dp04ag, 50.0'-51.3'	Lab ID	118
Sample Type	DP	Date Received	12-17-19
		Date Reported	1-15-20

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 29.3

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 10	2	100.0
No. 40	0.425	99.7
No. 200	0.075	97.6
	0.02	80.0
	0.005	50.3
	0.002	31.8
estimated	0.001	20.6

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.0	0.0
Coarse Sand	0.0	0.3
Medium Sand	0.3	---
Fine Sand	2.1	2.1
Silt	47.3	65.8
Clay	50.3	31.8

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	40
Plastic Limit:	22
Plasticity Index:	18
Activity Index:	0.6

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol: CL

Group Name: Lean clay

AASHTO Classification: A-6 (19)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b01a-dp04ag, 50.0'-51.3'	Lab ID	118

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	N/A
Particle Hardness:	N/A
Tested By	MW
Test Date	12-20-2019
Date Received	12-17-2019

Maximum Particle size: No. 10 Sieve

Sieve Size	% Passing
No. 10	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

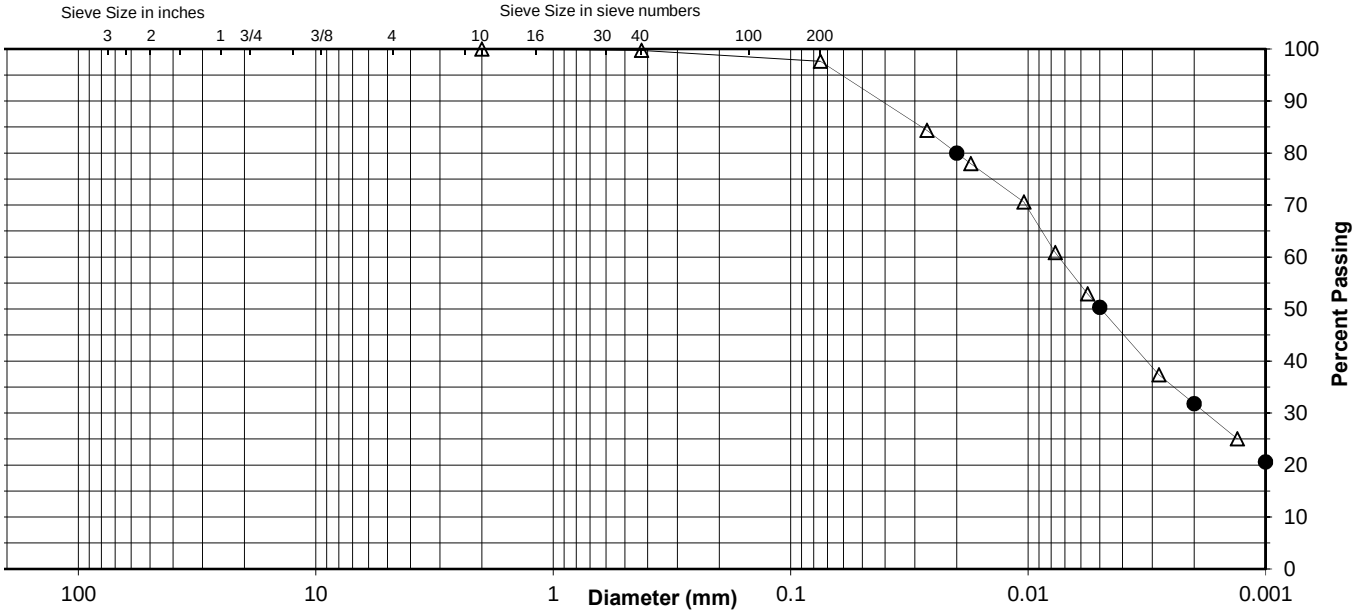
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	99.7
No. 200	97.6
0.02 mm	80.0
0.005 mm	50.3
0.002 mm	31.8
0.001 mm	20.6

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	0.0	0.3	2.1	47.3	50.3
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	0.0			0.3	2.1	65.8	31.8



Comments

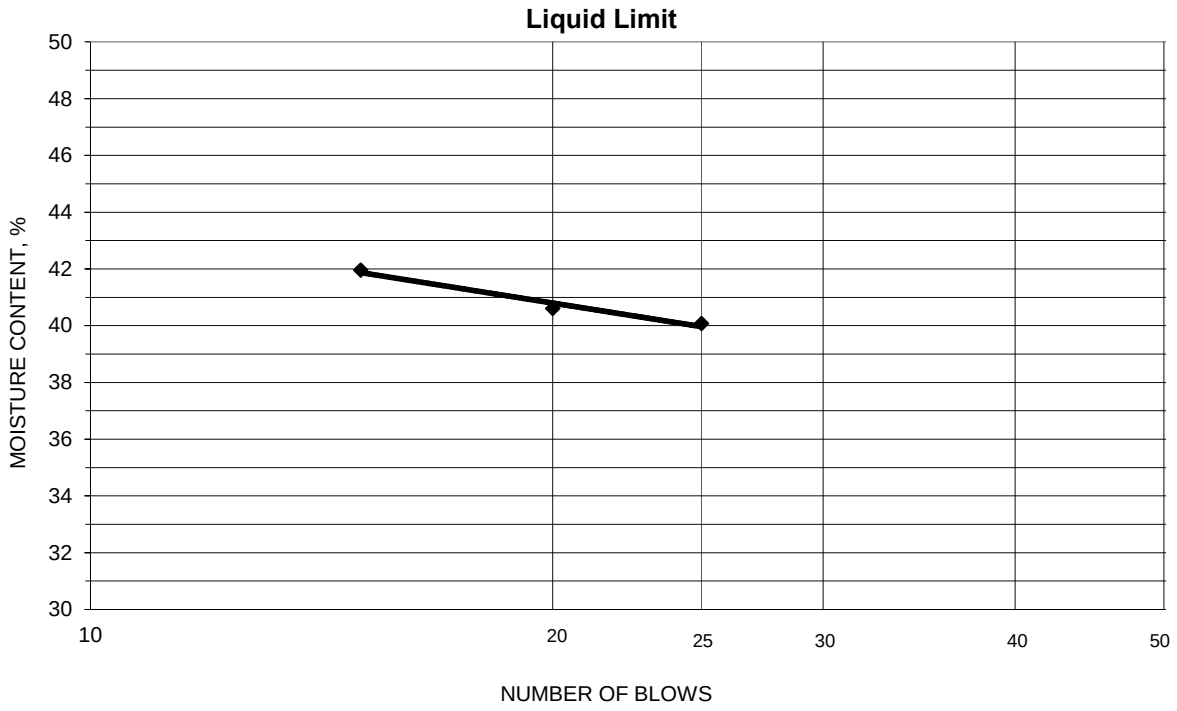
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	kif-gt-b01a-dp04ag, 50.0'-51.3'			Lab ID	118
				% + No. 40	0
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	12-17-2019
Test Date	12-30-2019	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
18.18	16.12	11.21	15	42.0	
19.33	17.06	11.47	20	40.6	
18.75	16.59	11.20	25	40.1	40



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
17.32	16.16	11.04	22.7	22	18
17.14	16.02	10.94	22.0		

Remarks: _____

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b01a-dp04bg, 51.3'-53.0'	Lab ID	119
Sample Type	DP	Date Received	12-17-19
		Date Reported	1-15-20

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 21.5

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 4	4.75	100.0
No. 10	2	100.0
No. 40	0.425	96.8
No. 200	0.075	56.4
	0.02	26.7
	0.005	15.9
	0.002	12.8
estimated	0.001	11.1

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.0	0.0
Coarse Sand	0.0	3.2
Medium Sand	3.2	---
Fine Sand	40.4	40.4
Silt	40.5	43.6
Clay	15.9	12.8

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	20
Plastic Limit:	18
Plasticity Index:	2
Activity Index:	0.2

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol:	ML
Group Name:	Sandy silt
AASHTO Classification:	A-4 (0)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b01a-dp04bg, 51.3'-53.0'	Lab ID	119

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	MW
Test Date	12-20-2019
Date Received	12-17-2019

Maximum Particle size: No. 4 Sieve

Sieve Size	% Passing
No. 4	100.0
No. 10	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

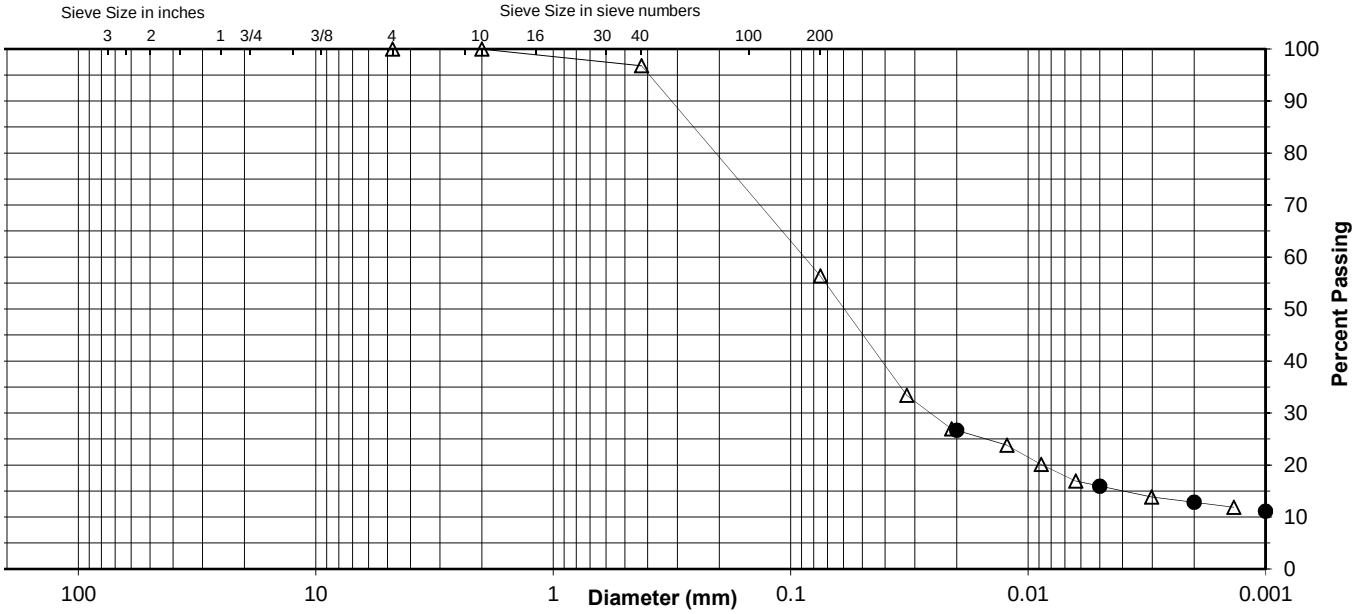
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	96.8
No. 200	56.4
0.02 mm	26.7
0.005 mm	15.9
0.002 mm	12.8
0.001 mm	11.1

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	0.0	3.2	40.4	40.5	15.9
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	0.0			3.2	40.4	43.6	12.8



Comments

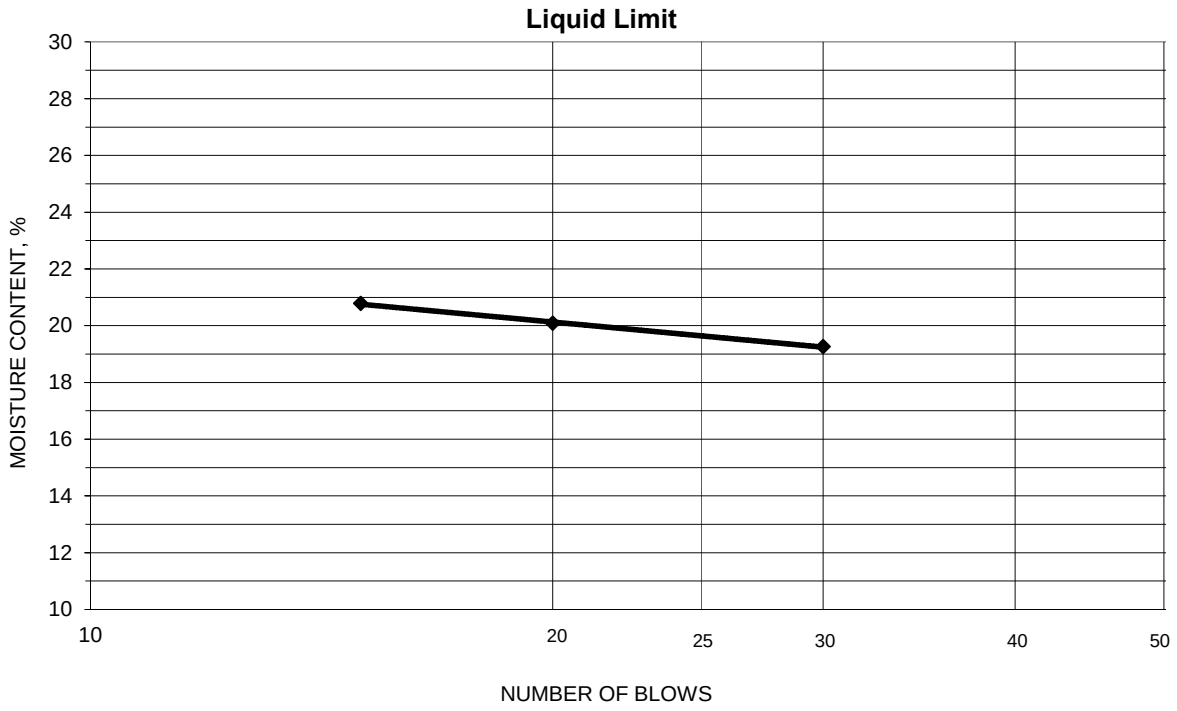
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	kif-gt-b01a-dp04bg, 51.3'-53.0'			Lab ID	119
				% + No. 40	3
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	12-17-2019
Test Date	12-30-2019	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
19.25	17.92	11.52	15	20.8	
19.71	18.35	11.58	20	20.1	
19.13	17.88	11.39	30	19.3	20



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
18.09	17.07	11.36	17.9	18	2
17.38	16.37	10.76	18.0		

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b01a-dp04dg, 53.7'-55.0'	Lab ID	121
Sample Type	DP	Date Received	12-17-19
		Date Reported	1-15-20

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 24.6

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 10	2	100.0
No. 40	0.425	99.9
No. 200	0.075	97.8
	0.02	80.1
	0.005	45.6
	0.002	32.8
estimated	0.001	23.7

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.0	0.0
Coarse Sand	0.0	0.1
Medium Sand	0.1	---
Fine Sand	2.1	2.1
Silt	52.2	65.0
Clay	45.6	32.8

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	43
Plastic Limit:	23
Plasticity Index:	20
Activity Index:	0.6

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol:	CL
Group Name:	Lean clay
AASHTO Classification:	A-7-6 (22)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b01a-dp04dg, 53.7'-55.0'	Lab ID	121

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	N/A
Particle Hardness:	N/A
Tested By	MW
Test Date	12-20-2019
Date Received	12-17-2019

Maximum Particle size: No. 10 Sieve

Sieve Size	% Passing
No. 10	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity 2.7

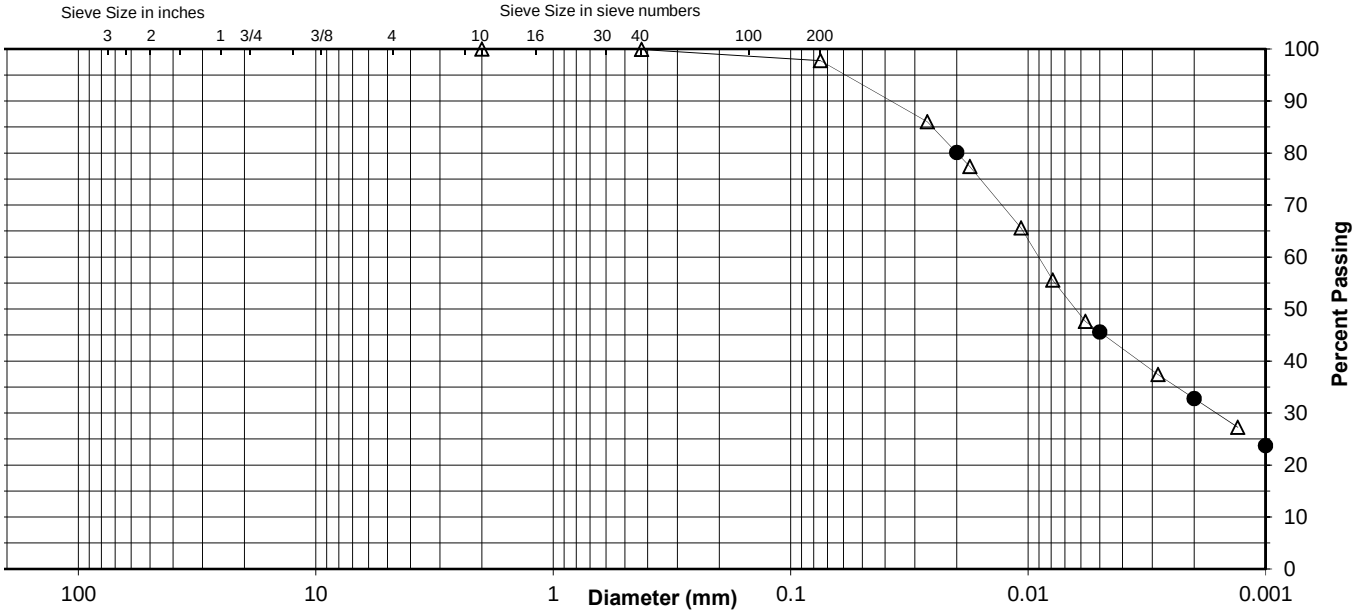
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	99.9
No. 200	97.8
0.02 mm	80.1
0.005 mm	45.6
0.002 mm	32.8
0.001 mm	23.7

Particle Size Distribution

	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
ASTM	0.0	0.0	0.0	0.1	2.1	52.2	45.6

	Gravel	Coarse Sand	Fine Sand	Silt	Clay
AASHTO	0.0	0.1	2.1	65.0	32.8



Comments

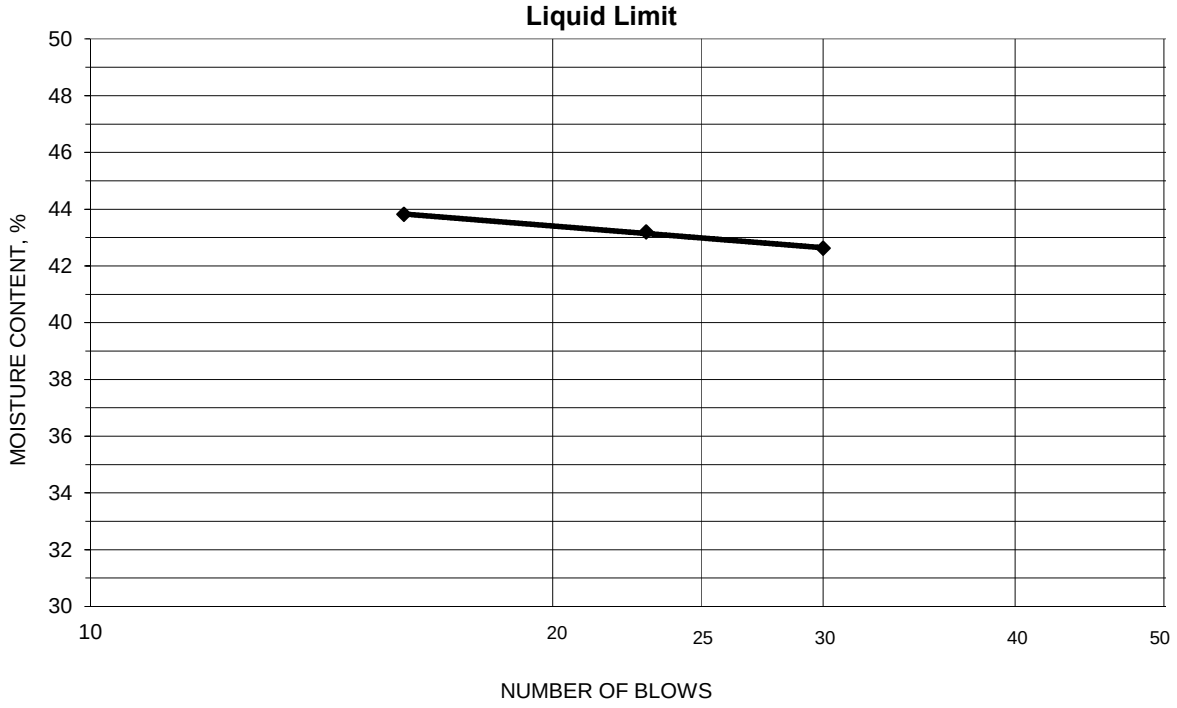
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	kif-gt-b01a-dp04dg, 53.7'-55.0'			Lab ID	121
				% + No. 40	0
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	12-17-2019
Test Date	12-30-2019	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
18.26	16.03	10.94	16	43.8	
17.62	15.59	10.89	23	43.2	
17.85	15.83	11.09	30	42.6	43



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
17.47	16.33	11.45	23.4	23	20
17.76	16.53	11.20	23.1		

Remarks: _____

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b01b-dp04ag, 50.0'-51.4'	Lab ID	122
Sample Type	DP	Date Received	12-17-19
		Date Reported	1-15-20

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 33.3

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 4	4.75	100.0
No. 10	2	99.9
No. 40	0.425	99.1
No. 200	0.075	69.4
	0.02	15.8
	0.005	3.5
	0.002	2.1
estimated	0.001	1.3

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.0	0.1
Coarse Sand	0.1	0.8
Medium Sand	0.8	---
Fine Sand	29.7	29.7
Silt	65.9	67.3
Clay	3.5	2.1

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	NP
Plastic Limit:	NP
Plasticity Index:	NP
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol:	ML
Group Name:	Sandy silt
AASHTO Classification:	A-4 (0)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b01b-dp04ag, 50.0'-51.4'	Lab ID	122

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	MW
Test Date	01-07-2020
Date Received	12-17-2019

Maximum Particle size: No. 4 Sieve

Sieve Size	% Passing
No. 4	100.0
No. 10	99.9

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

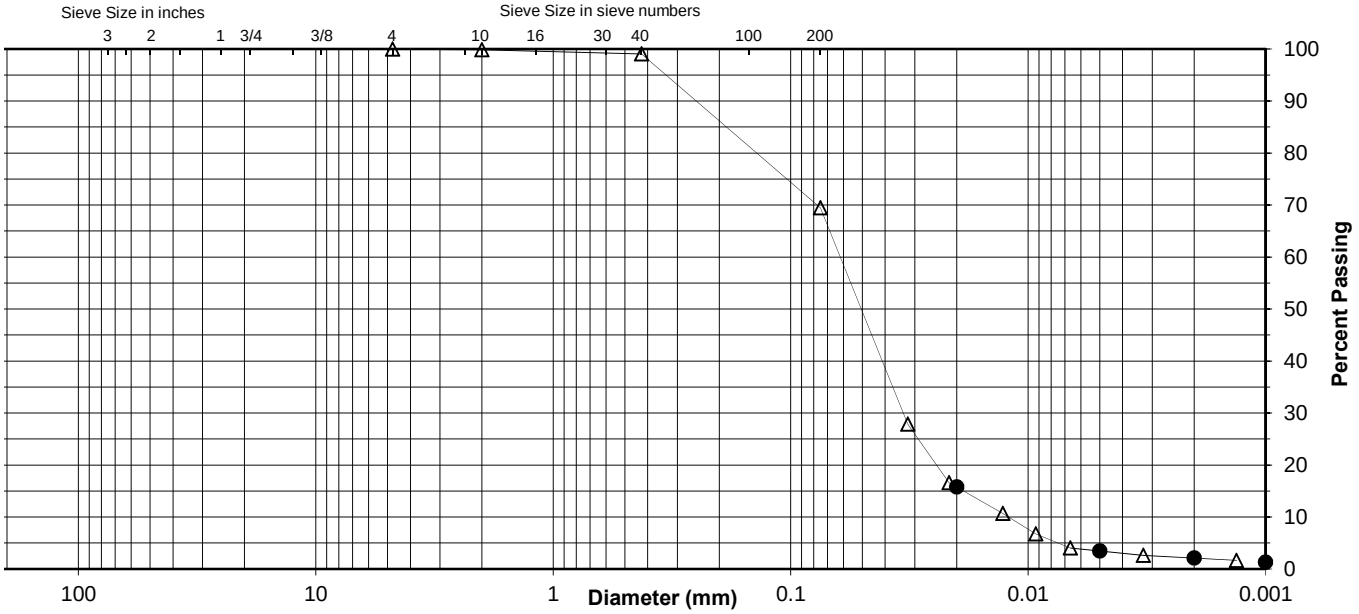
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	99.1
No. 200	69.4
0.02 mm	15.8
0.005 mm	3.5
0.002 mm	2.1
0.001 mm	1.3

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	0.1	0.8	29.7	65.9	3.5
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	0.1			0.8	29.7	67.3	2.1



Comments

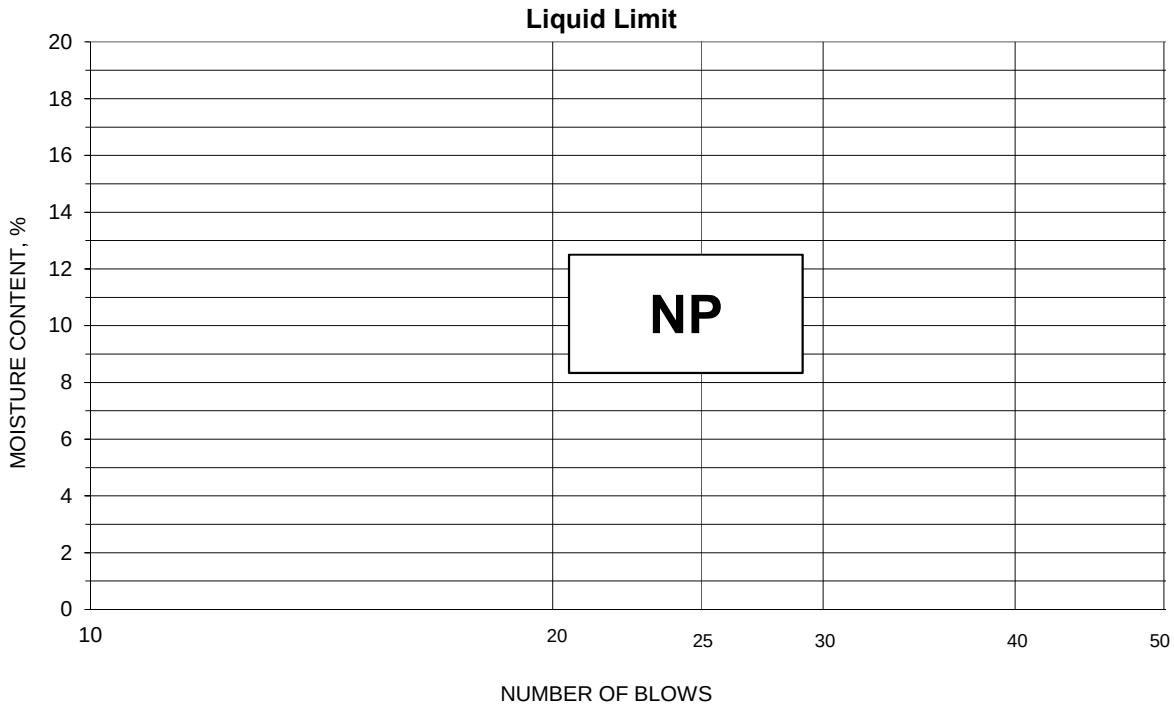
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	kif-gt-b01b-dp04ag, 50.0'-51.4'			Lab ID	122
				% + No. 40	1
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	12-17-2019
Test Date	01-20-2020	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: _____

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b02a-dp03cg, 48.5'-50.0'	Lab ID	127
Sample Type	DP	Date Received	12-17-19
		Date Reported	1-15-20

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 34.8

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
3/8"	9.5	100.0
No. 4	4.75	99.6
No. 10	2	99.3
No. 40	0.425	96.0
No. 200	0.075	79.6
	0.02	27.6
	0.005	3.0
	0.002	1.2
estimated	0.001	1.0

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.4	0.7
Coarse Sand	0.3	3.3
Medium Sand	3.3	---
Fine Sand	16.4	16.4
Silt	76.6	78.4
Clay	3.0	1.2

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	NP
Plastic Limit:	NP
Plasticity Index:	NP
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol:	ML
Group Name:	Silt with sand
AASHTO Classification:	A-4 (0)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b02a-dp03cg, 48.5'-50.0'	Lab ID	127

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	MW
Test Date	01-07-2020
Date Received	12-17-2019

Maximum Particle size: 3/8" Sieve

Sieve Size	% Passing
3/8"	100.0
No. 4	99.6
No. 10	99.3

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

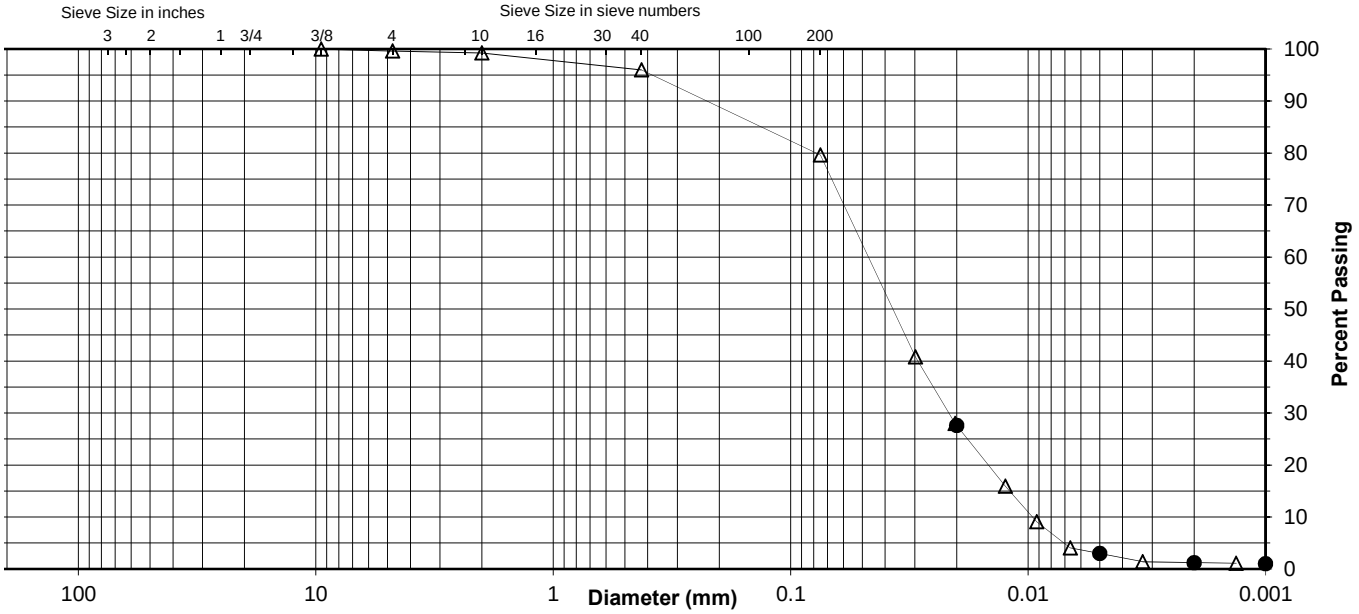
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	96.0
No. 200	79.6
0.02 mm	27.6
0.005 mm	3.0
0.002 mm	1.2
0.001 mm	1.0

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.4	0.3	3.3	16.4	76.6	3.0
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	0.7			3.3	16.4	78.4	1.2



Comments

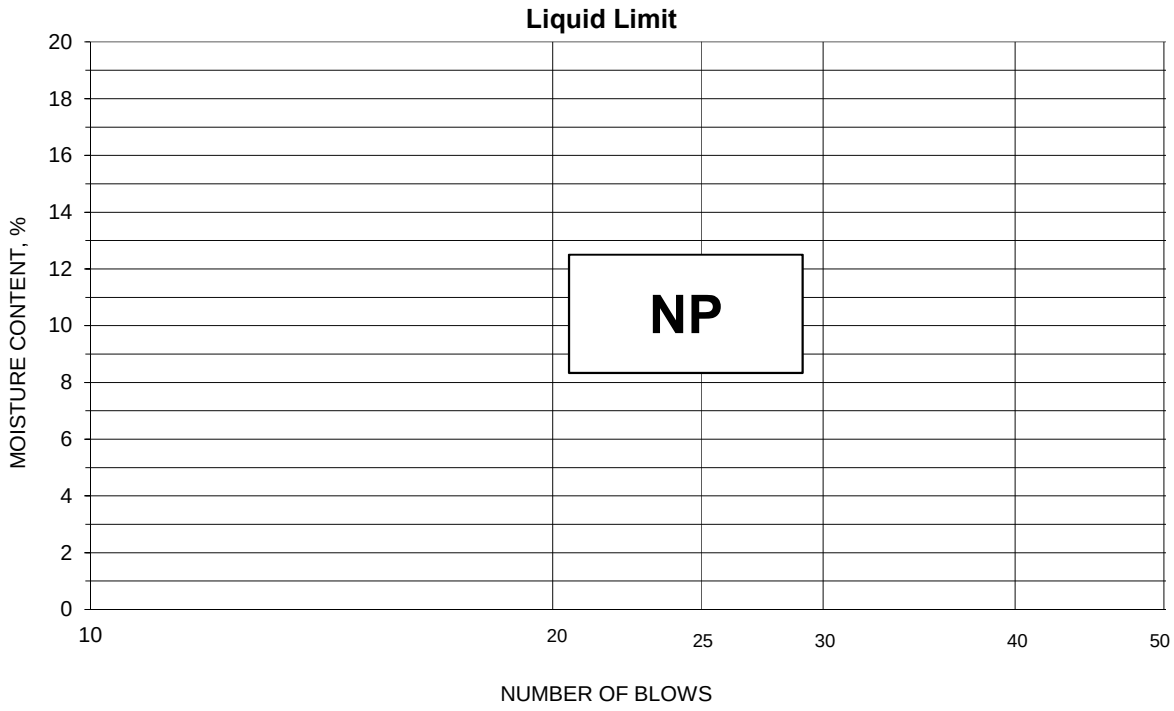
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	kif-gt-b02a-dp03cg, 48.5'-50.0'			Lab ID	127
				% + No. 40	4
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	12-17-2019
Test Date	01-10-2020	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: _____

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b02a-dp04cg, 52.7'-55.0'	Lab ID	128
Sample Type	DP	Date Received	12-17-19
		Date Reported	1-15-20

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 21.3

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 10	2	100.0
No. 40	0.425	99.9
No. 200	0.075	96.5
	0.02	70.1
	0.005	39.5
	0.002	29.4
estimated	0.001	23.8

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.0	0.0
Coarse Sand	0.0	0.1
Medium Sand	0.1	---
Fine Sand	3.4	3.4
Silt	57.0	67.1
Clay	39.5	29.4

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	35
Plastic Limit:	20
Plasticity Index:	15
Activity Index:	0.5

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol:	CL
Group Name:	Lean clay
AASHTO Classification:	A-6 (15)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b02a-dp04cg, 52.7'-55.0'	Lab ID	128

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	N/A
Particle Hardness:	N/A
Tested By	MW
Test Date	01-06-2020
Date Received	12-17-2019

Maximum Particle size: No. 10 Sieve

Sieve Size	% Passing
No. 10	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

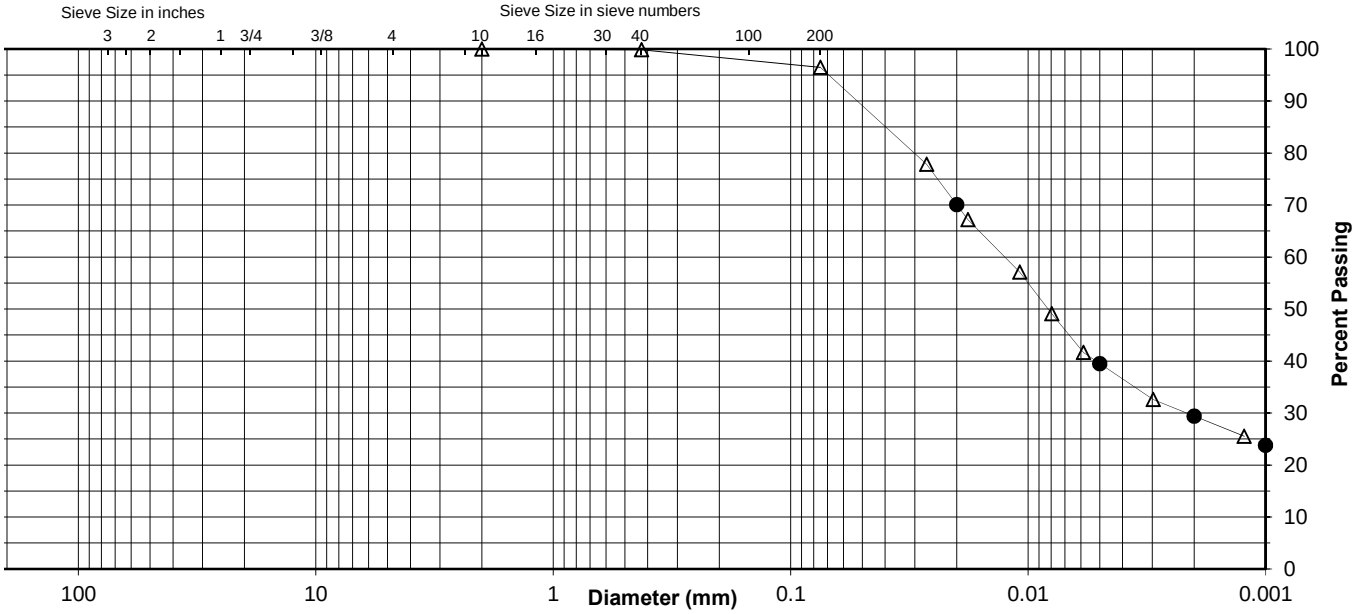
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	99.9
No. 200	96.5
0.02 mm	70.1
0.005 mm	39.5
0.002 mm	29.4
0.001 mm	23.8

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	0.0	0.1	3.4	57.0	39.5
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	0.0			0.1	3.4	67.1	29.4



Comments

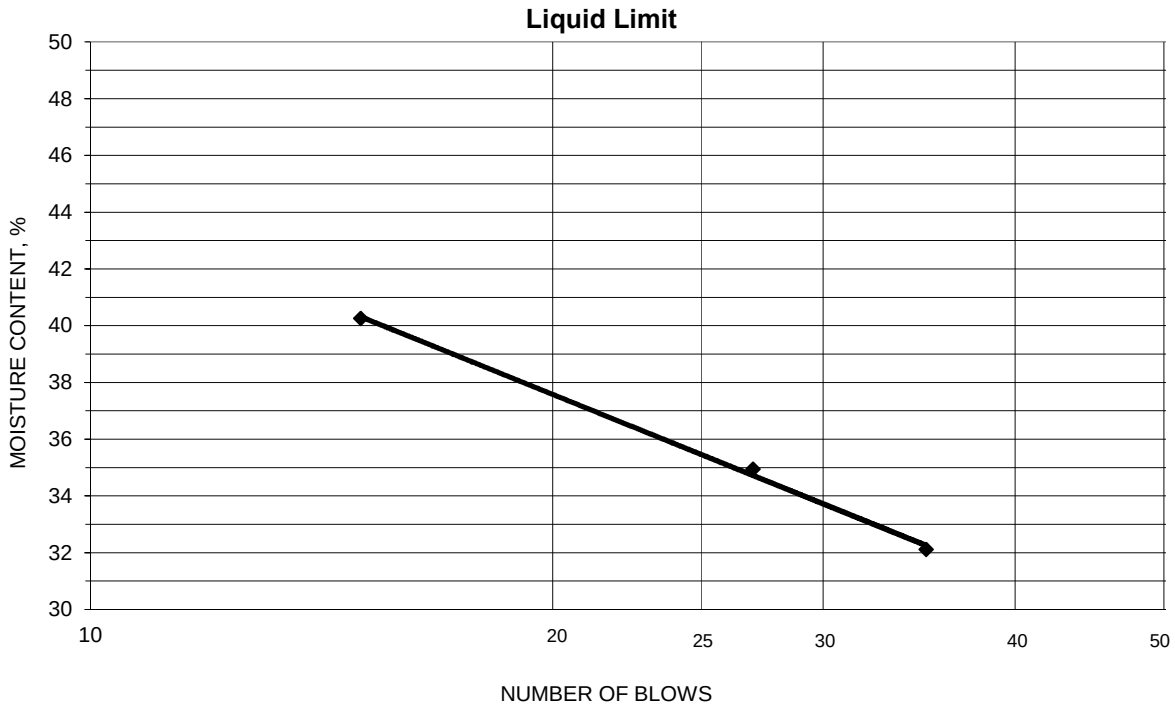
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	kif-gt-b02a-dp04cg, 52.7'-55.0'			Lab ID	128
				% + No. 40	0
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	12-17-2019
Test Date	01-13-2020	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
18.46	16.54	10.56	35	32.1	
18.60	16.64	11.03	27	34.9	
17.61	15.67	10.85	15	40.2	35



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
17.34	16.27	10.93	20.0	20	15
17.51	16.47	11.40	20.5		

Remarks: _____

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b03a-dp03ag, 50.0'-51.5'	Lab ID	143
Sample Type	DP	Date Received	12-17-19
		Date Reported	1-15-20

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 39.2

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 4	4.75	100.0
No. 10	2	99.9
No. 40	0.425	99.7
No. 200	0.075	90.5
	0.02	38.0
	0.005	3.1
	0.002	0.2
estimated	0.001	0.1

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.0	0.1
Coarse Sand	0.1	0.2
Medium Sand	0.2	---
Fine Sand	9.2	9.2
Silt	87.4	90.3
Clay	3.1	0.2

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	NP
Plastic Limit:	NP
Plasticity Index:	NP
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol: ML

Group Name: Silt

AASHTO Classification: A-4 (0)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b03a-dp03ag, 50.0'-51.5'	Lab ID	143

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	MW
Test Date	01-06-2020
Date Received	12-17-2019

Maximum Particle size: No. 4 Sieve

Sieve Size	% Passing
No. 4	100.0
No. 10	99.9

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

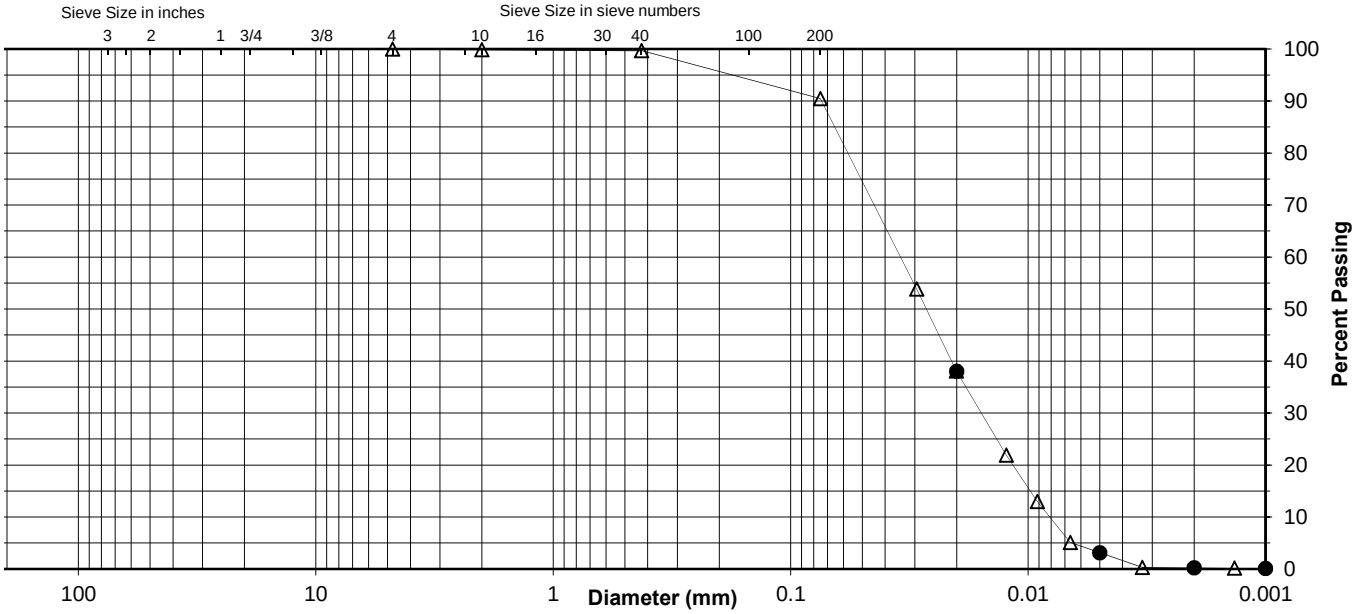
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	99.7
No. 200	90.5
0.02 mm	38.0
0.005 mm	3.1
0.002 mm	0.2
0.001 mm	0.1

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	0.1	0.2	9.2	87.4	3.1
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	0.1			0.2	9.2	90.3	0.2



Comments

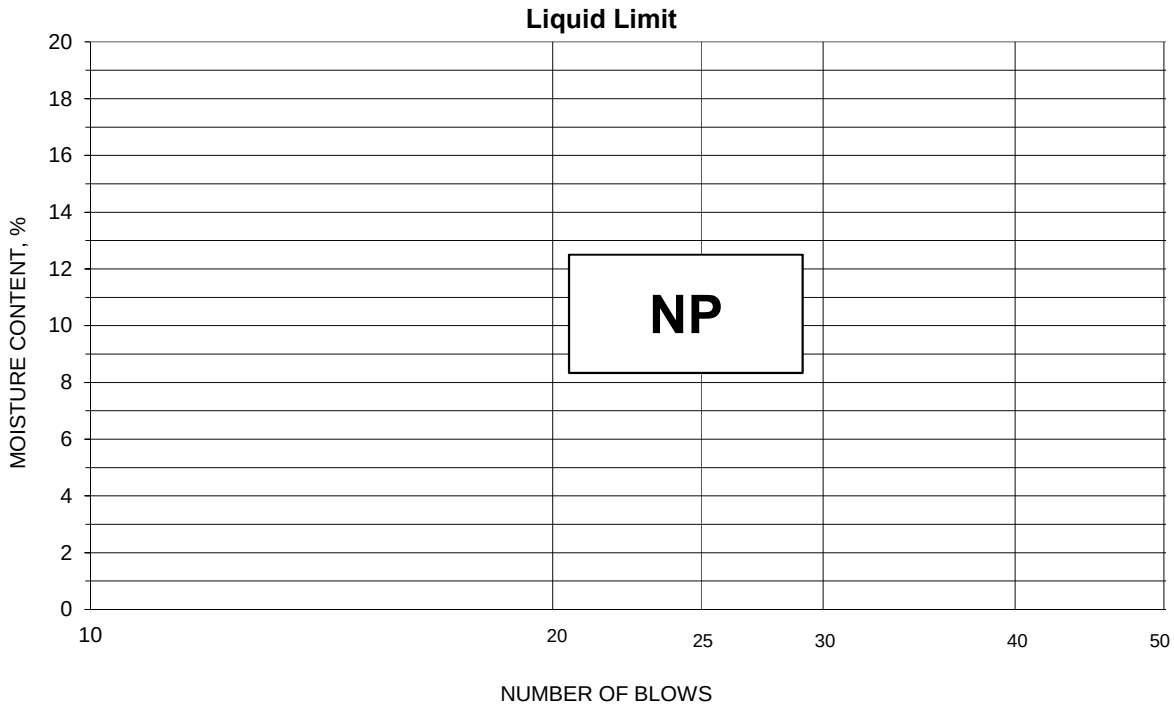
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	kif-gt-b03a-dp03ag, 50.0'-51.5'			Lab ID	143
				% + No. 40	0
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	12-17-2019
Test Date	01-10-2020	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b03a-dp04g, 55.0'-57.5'	Lab ID	146
Sample Type	DP	Date Received	12-17-19
		Date Reported	1-15-20

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 16.2

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 4	4.75	100.0
No. 10	2	100.0
No. 40	0.425	99.2
No. 200	0.075	57.7
	0.02	30.4
	0.005	17.0
	0.002	13.0
estimated	0.001	10.8

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.0	0.0
Coarse Sand	0.0	0.8
Medium Sand	0.8	---
Fine Sand	41.5	41.5
Silt	40.7	44.7
Clay	17.0	13.0

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	18
Plastic Limit:	16
Plasticity Index:	2
Activity Index:	0.2

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol:	ML
Group Name:	Sandy silt
AASHTO Classification:	A-4 (0)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b03a-dp04g, 55.0'-57.5'	Lab ID	146

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	MW
Test Date	01-07-2020
Date Received	12-17-2019

Maximum Particle size: No. 4 Sieve

Sieve Size	% Passing
No. 4	100.0
No. 10	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

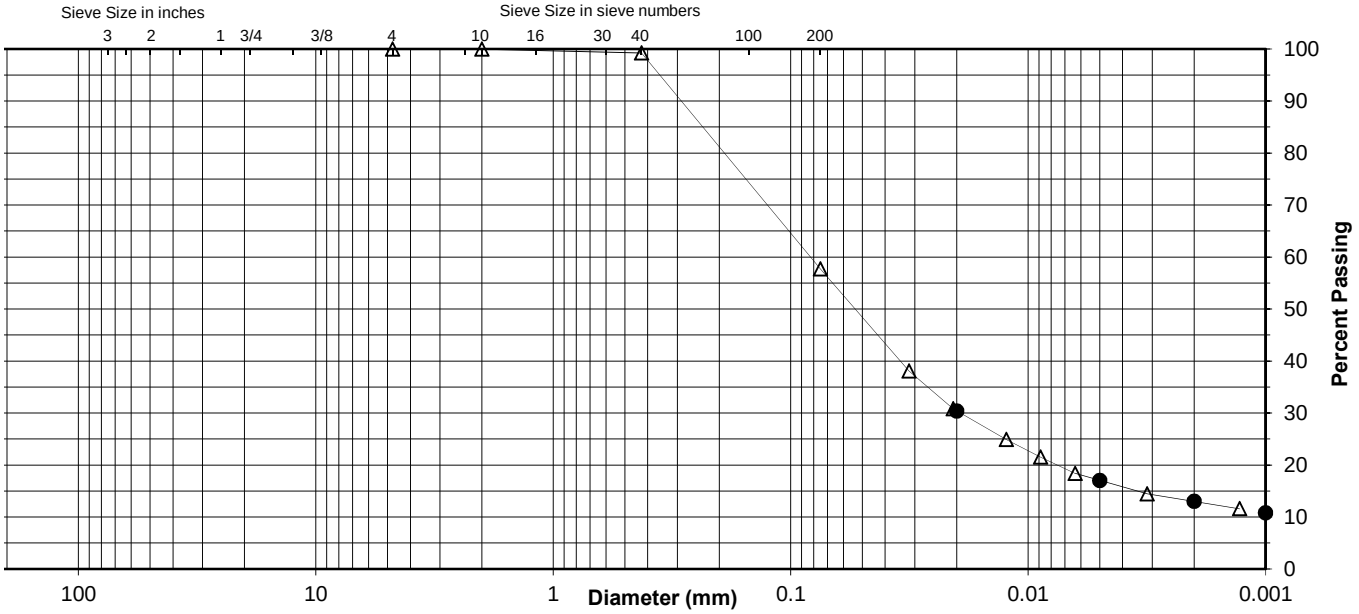
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	99.2
No. 200	57.7
0.02 mm	30.4
0.005 mm	17.0
0.002 mm	13.0
0.001 mm	10.8

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	0.0	0.8	41.5	40.7	17.0
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	0.0			0.8	41.5	44.7	13.0



Comments

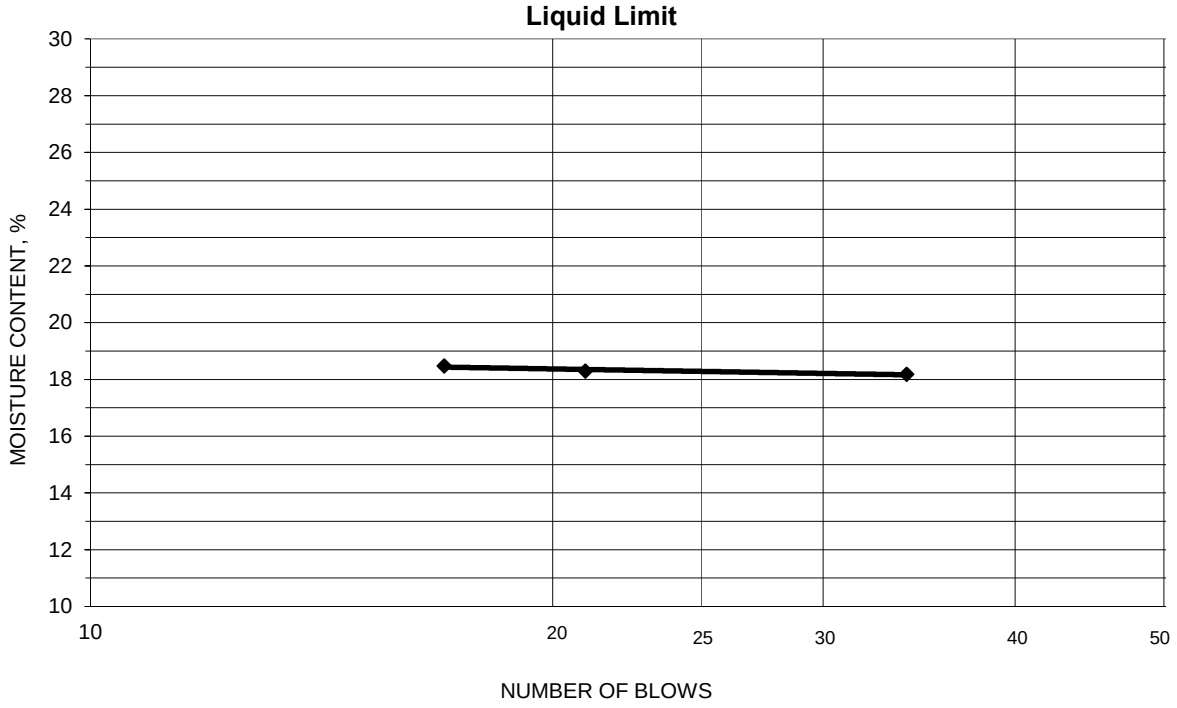
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	kif-gt-b03a-dp04g, 55.0'-57.5'			Lab ID	146
				% + No. 40	1
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	12-17-2019
Test Date	01-13-2020	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
18.01	16.92	11.02	17	18.5	
20.10	18.79	11.63	21	18.3	
18.48	17.30	10.81	34	18.2	18



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
18.45	17.38	10.98	16.7	16	2
18.32	17.29	10.95	16.2		

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b04a-dp02cg, 43.5'-44.0'	Lab ID	162
Sample Type	DP	Date Received	12-17-19
		Date Reported	1-15-20

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 40.1

Particle Size Analysis

Preparation Method: ASTM D 421

Gradation Method: ASTM D 422

Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 10	2	100.0
No. 40	0.425	99.9
No. 200	0.075	97.5
	0.02	58.2
	0.005	7.9
	0.002	4.2
estimated	0.001	3.0

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.0	0.0
Coarse Sand	0.0	0.1
Medium Sand	0.1	---
Fine Sand	2.4	2.4
Silt	89.6	93.3
Clay	7.9	4.2

Atterberg Limits

Test Method: ASTM D 4318 Method A

Prepared: Dry

Liquid Limit:	NP
Plastic Limit:	NP
Plasticity Index:	NP
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol: ML

Group Name: Silt

AASHTO Classification: A-4 (0)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b04a-dp02cg, 43.5'-44.0'	Lab ID	162

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	N/A
Particle Hardness:	N/A
Tested By	MW
Test Date	01-06-2020
Date Received	12-17-2019

Maximum Particle size: No. 10 Sieve

Sieve Size	% Passing
No. 10	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity 2.7

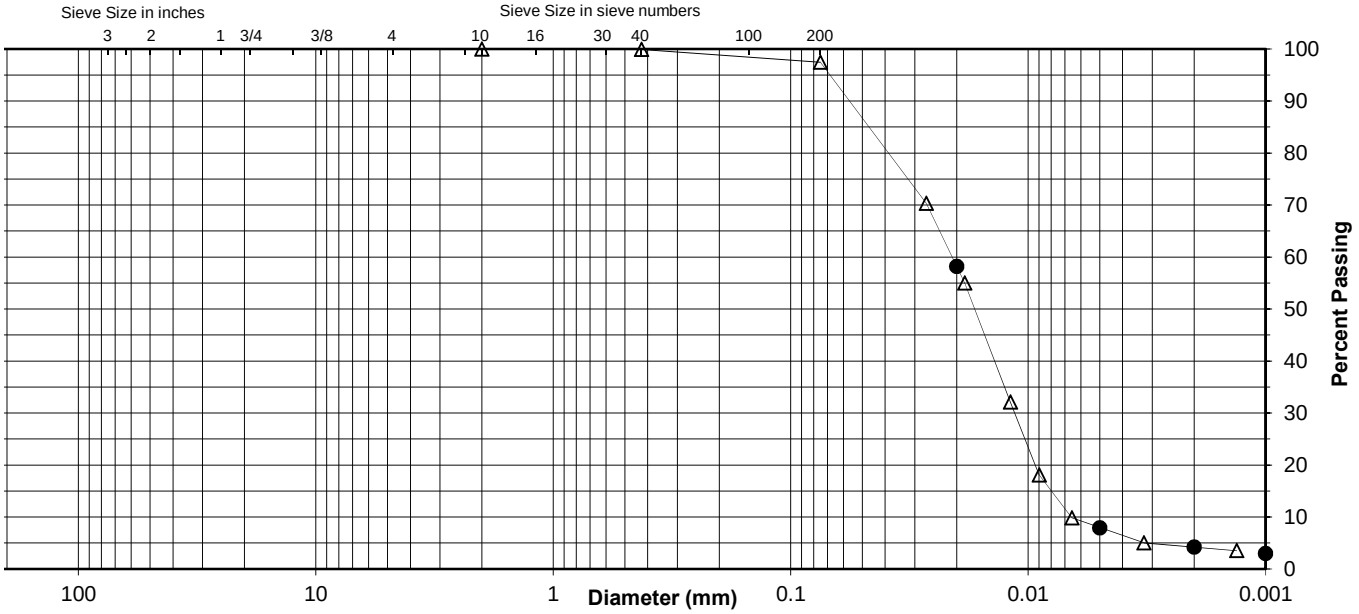
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	99.9
No. 200	97.5
0.02 mm	58.2
0.005 mm	7.9
0.002 mm	4.2
0.001 mm	3.0

Particle Size Distribution

	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
ASTM	0.0	0.0	0.0	0.1	2.4	89.6	7.9

	Gravel	Coarse Sand	Fine Sand	Silt	Clay
AASHTO	0.0	0.1	2.4	93.3	4.2



Comments

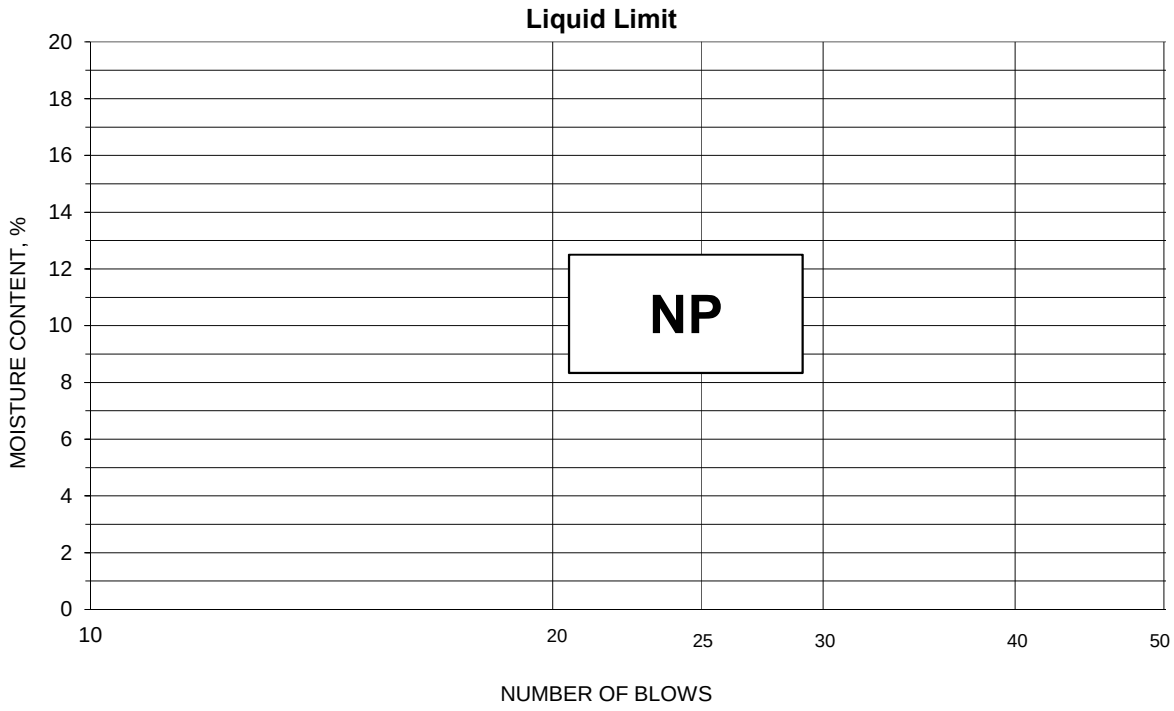
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	kif-gt-b04a-dp02cg, 43.5'-44.0'			Lab ID	162
				% + No. 40	0
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	12-17-2019
Test Date	01-10-2020	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: _____

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b04a-dp02dg, 44.0'-45.0'	Lab ID	163
Sample Type	DP	Date Received	12-17-19
		Date Reported	1-15-20

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 31.4

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 10	2	100.0
No. 40	0.425	99.9
No. 200	0.075	97.8
	0.02	73.5
	0.005	38.9
	0.002	25.4
estimated	0.001	17.7

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.0	0.0
Coarse Sand	0.0	0.1
Medium Sand	0.1	---
Fine Sand	2.1	2.1
Silt	58.9	72.4
Clay	38.9	25.4

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	30
Plastic Limit:	22
Plasticity Index:	8
Activity Index:	0.3

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol:	CL
Group Name:	Lean clay
AASHTO Classification:	A-4 (8)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b04a-dp02dg, 44.0'-45.0'	Lab ID	163

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	N/A
Particle Hardness:	N/A
Tested By	MW
Test Date	01-07-2020
Date Received	12-17-2019

Maximum Particle size: No. 10 Sieve

Sieve Size	% Passing
No. 10	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity 2.7

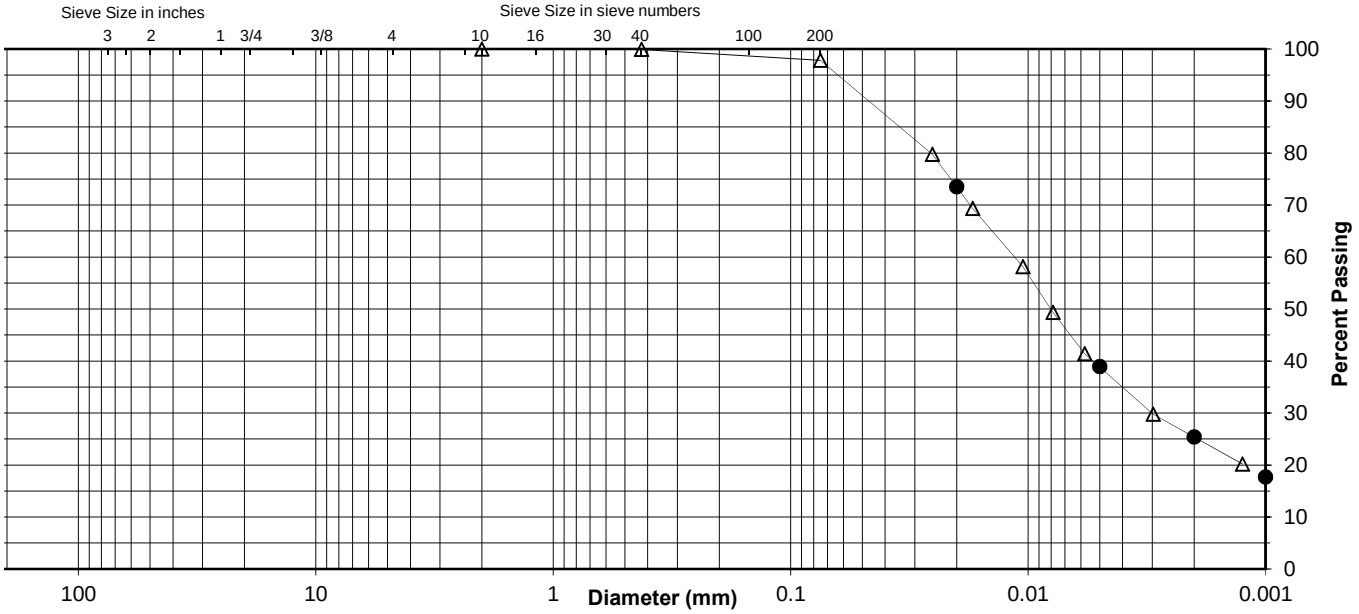
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	99.9
No. 200	97.8
0.02 mm	73.5
0.005 mm	38.9
0.002 mm	25.4
0.001 mm	17.7

Particle Size Distribution

	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
ASTM	0.0	0.0	0.0	0.1	2.1	58.9	38.9

	Gravel	Coarse Sand	Fine Sand	Silt	Clay
AASHTO	0.0	0.1	2.1	72.4	25.4



Comments

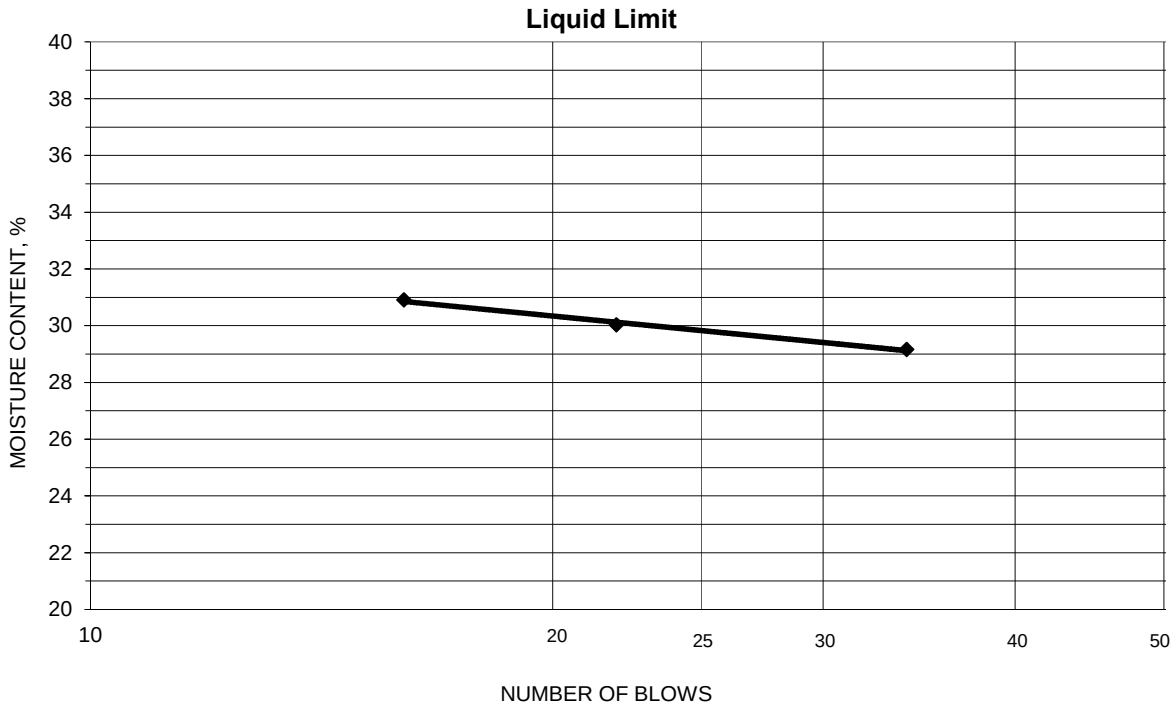
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	kif-gt-b04a-dp02dg, 44.0'-45.0'			Lab ID	163
				% + No. 40	0
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	12-17-2019
Test Date	01-13-2020	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
20.34	18.22	10.95	34	29.2	
20.03	17.88	10.72	22	30.0	
19.43	17.39	10.79	16	30.9	30



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
17.46	16.26	10.89	22.3	22	8
17.24	16.09	10.84	21.9		

Remarks: _____

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b04a-dp03g, 45.0'-47.5'	Lab ID	164
Sample Type	DP	Date Received	12-17-19
		Date Reported	1-15-20

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 24.7

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 10	2	100.0
No. 40	0.425	99.7
No. 200	0.075	91.4
	0.02	70.1
	0.005	39.6
	0.002	28.0
estimated	0.001	22.0

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.0	0.0
Coarse Sand	0.0	0.3
Medium Sand	0.3	---
Fine Sand	8.3	8.3
Silt	51.8	63.4
Clay	39.6	28.0

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	36
Plastic Limit:	23
Plasticity Index:	13
Activity Index:	0.5

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol:	CL
Group Name:	Lean clay
AASHTO Classification:	A-6 (12)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b04a-dp03g, 45.0'-47.5'	Lab ID	164

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	N/A
Particle Hardness:	N/A
Tested By	MW
Test Date	01-07-2020
Date Received	12-17-2019

Maximum Particle size: No. 10 Sieve

Sieve Size	% Passing
No. 10	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

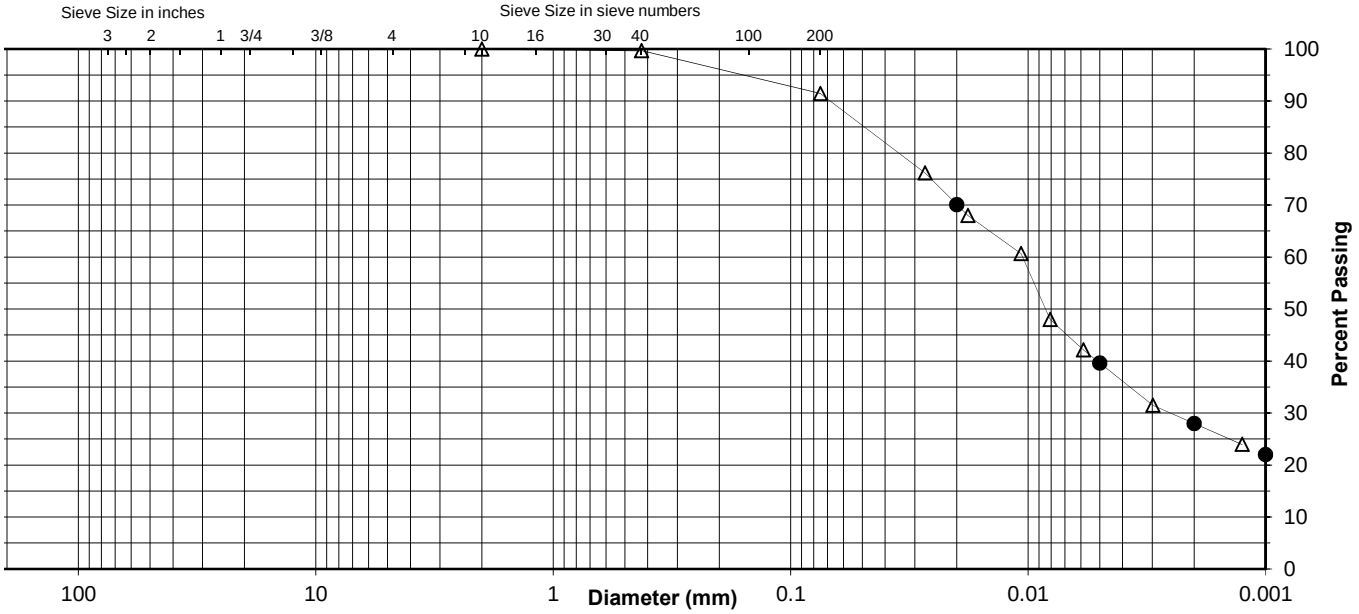
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	99.7
No. 200	91.4
0.02 mm	70.1
0.005 mm	39.6
0.002 mm	28.0
0.001 mm	22.0

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	0.0	0.3	8.3	51.8	39.6
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	0.0			0.3	8.3	63.4	28.0



Comments

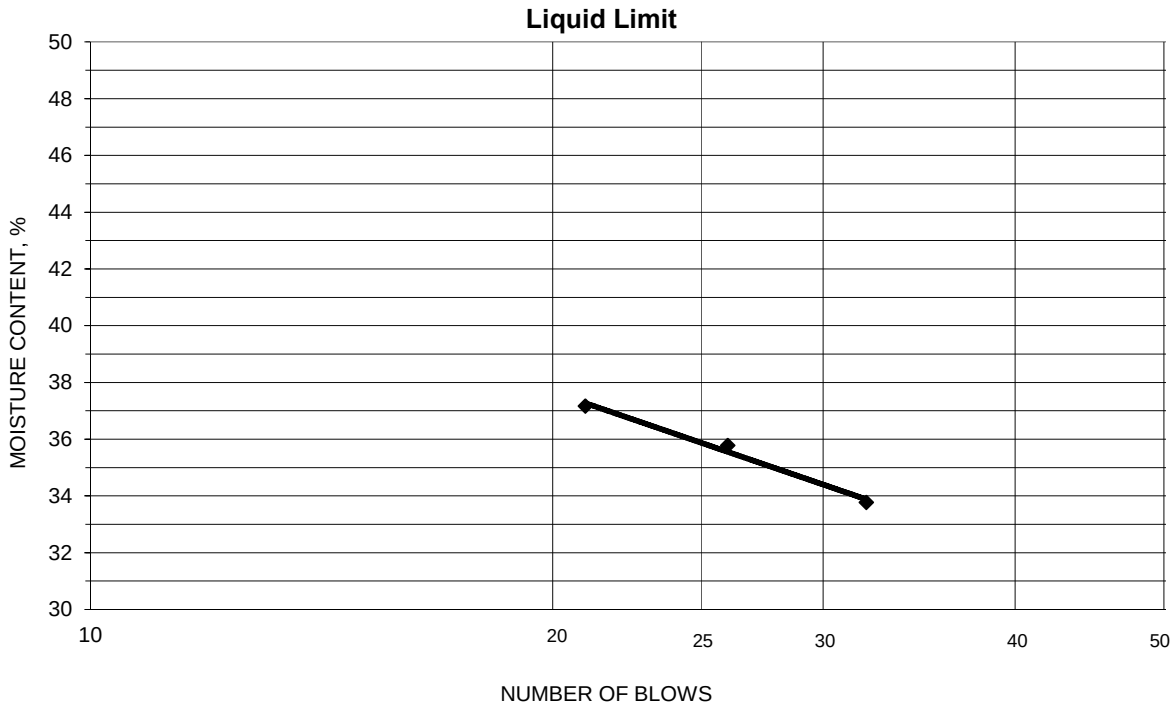
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	kif-gt-b04a-dp03g, 45.0'-47.5'			Lab ID	164
				% + No. 40	0
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	12-17-2019
Test Date	01-13-2020	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
17.95	16.14	10.78	32	33.8	
18.79	16.74	11.01	26	35.8	
18.70	16.63	11.06	21	37.2	36



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
18.40	17.15	11.61	22.6	23	13
17.87	16.64	11.20	22.6		

Remarks: _____

Reviewed By RJ

ATTACHMENT F.4

Phase 1 Shear Strength Testing Results

Stantec

Consolidated Undrained Triaxial Compression

ASTM D 4767

Project Name	KIF TDEC Order	Project No.	175668043
Source	KIF-GT-TW04-ST01, 24.9'-25.5'	Lab ID	104
Description	Sandy Silt (ML), black, moist, firm	Test ID	104-A
Specimen Type	Intact		
Preparation	Wet Mounting	Date Received	03/28/2019
		Date Tested	05/06/2019

Specific Gravity	2.40
ASTM D 854, Dry	
Liquid Limit	NP
Plastic Limit	NP
Plasticity Index	NP
ASTM D 4318	

Target Test Parameters

Nominal Chamber Pressure (psi)	90
Nominal Back Pressure (psi)	60
Nominal Consolidation Pressure (psi)	30

Saturation / Consolidation Results

Pore Pressure Parameter B	0.99
Measured Effective Consol. Stress (tsf)	2.150
Time to 50% Consolidation (min)	0.10
Actual Axial Strain Rate of Test (%/min)	0.100

Consolidated Specimen Conditions

Moist Unit Weight (pcf)	104.0
Moisture Content (%)	45.5
Dry Unit Weight (pcf)	71.5
Void Ratio	1.092
Degree of Saturation (%)	100.0

At Drained Failure

Failure Criterion: Max. Eff. Prin. Stress Ratio

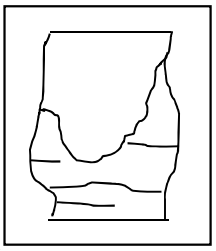
Axial Strain (%)	3.492
Deviator Stress (tsf)	3.517
Induced Pore Pressure (tsf)	0.945
Minor Effective Stress, σ_3' (tsf)	1.207
Major Effective Stress, σ_1' (tsf)	4.724
Eff. Principal Stress Ratio, σ_1'/σ_3'	3.915
p' (tsf)	2.965
q (tsf)	1.759

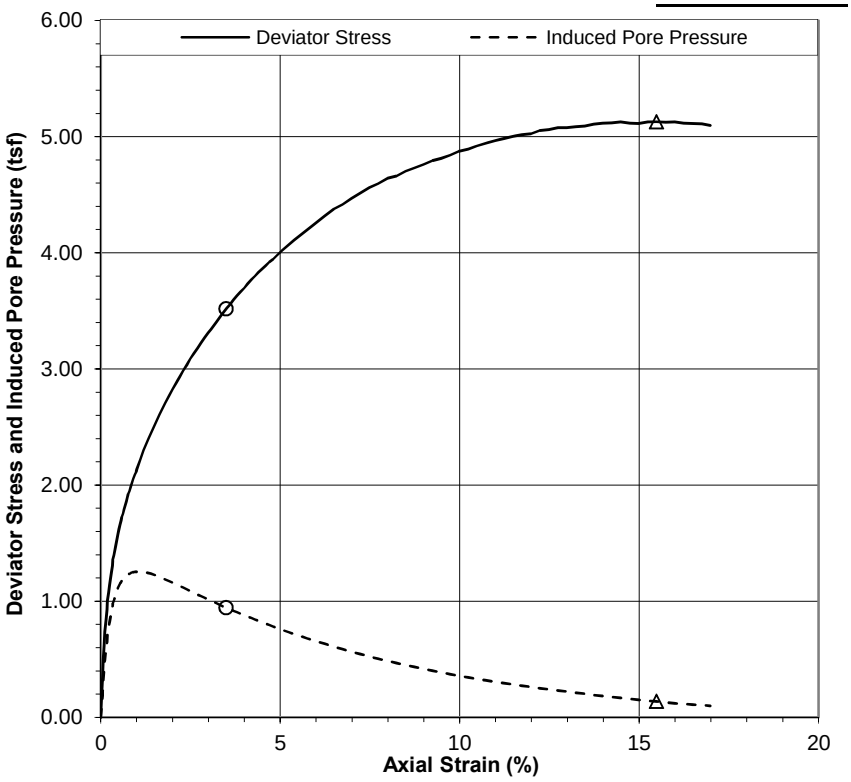
At Consolidated Undrained Failure

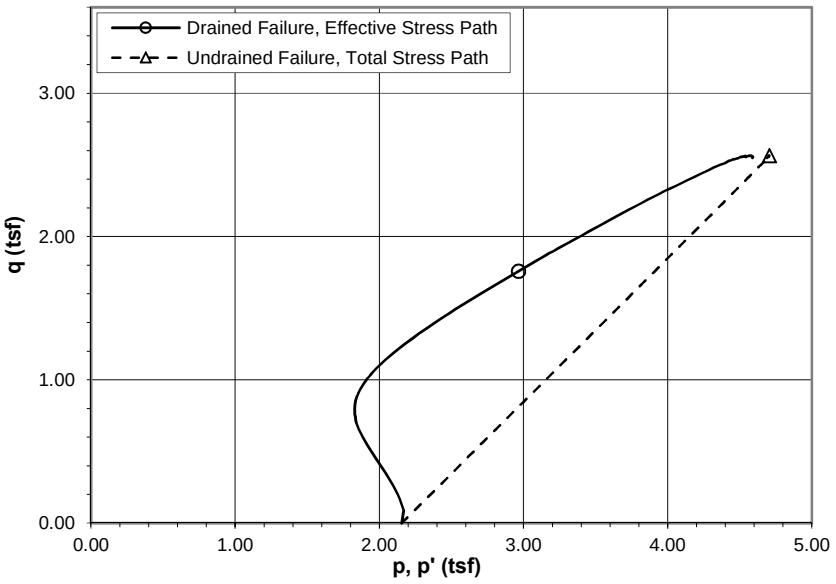
Failure Criterion: 15% Axial Strain

Axial Strain (%)	15.479
Deviator Stress (tsf)	5.128
Minor Principal Stress, σ_3 (tsf)	2.142
Major Principal Stress, σ_1 (tsf)	7.269
p (tsf)	4.705
q (tsf)	2.564

Failure Sketch







Comments

Reviewed KG

Stantec

Consolidated Undrained Triaxial Compression

ASTM D 4767

Project Name KIF TDEC Order
Source KIF-GT-TW04-ST01, 24.9'-25.5'
Description Sandy Silt (ML), black, moist, firm

Project No. 175668043
Lab ID 104
Test ID 104-A

Initial Specimen Conditions		Consolidated Specimen Conditions	
Average Height (in)	6.090	Calculated Height (in)	6.066
Average Diameter (in)	2.899	Calculated Diameter (in)	2.923
Calculated Area (in^2)	6.601	Calculated Area (in^2)	6.709
Moist Weight (lb)	2.304	Moist Weight (lb)	2.450
Moist Unit Weight (pcf)	99.0	Moist Unit Weight (pcf)	104.0
Moisture Content (%)	36.9	Moisture Content (%)	45.5
Dry Weight (lb)	1.683	Dry Weight (lb)	1.683
Dry Unit Weight (pcf)	72.4	Dry Unit Weight (pcf)	71.5
Void Ratio	1.067	Void Ratio	1.092
Degree of Saturation (%)	83.0	Degree of Saturation (%)	100.0

Specific Gravity 2.40
ASTM D 854, Dry

Liquid Limit NP
Plastic Limit NP
Plasticity Index NP
ASTM D 4318

Confining Stress
σ_3 (tsf) 2.155

Effective Consolidation Stress
σ_3' (tsf) 2.155

Moisture contents obtained using partial specimen.
Specimen consolidated cross-sectional area determined using method B.
Membrane corrections have been applied,where Em = 200 lbf/in and t = 0.012 in.
All other tests performed in association with this specimen are reported separately.

Project: 175668043			Source: KIF-GT-TW04-ST01, 24.9'-25.5'								Lab ID: 104		Test ID		
Test Time (min)	Corr. Axial Load (lbf)	Axial Deform. (in)	Axial Strain (%)	Corr. Area (in^2)	Deviator Stress (tsf)	Corr. Deviator Stress (tsf)	Pore Pressure (tsf)	Induced Pore Pressure (tsf)	σ_1 (tsf)	σ_1' (tsf)	σ_3' (tsf)	p (tsf)	p' (tsf)	q (tsf)	Eff. Princ. Stress Ratio σ_1'/σ_3'
0.0	0.0	0.000	0.00	6.709	0.000	0.000	4.327	0.000	2.155	2.155	2.155	2.155	2.155	0.000	1.000
0.3	16.5	0.002	0.03	6.711	0.177	0.177	4.402	0.075	2.332	2.257	2.080	2.243	2.168	0.089	1.085
0.5	32.1	0.003	0.05	6.712	0.345	0.345	4.513	0.186	2.499	2.313	1.968	2.327	2.141	0.172	1.175
0.8	45.9	0.004	0.07	6.714	0.492	0.492	4.623	0.297	2.647	2.350	1.859	2.401	2.104	0.246	1.265
1.0	58.1	0.006	0.09	6.715	0.623	0.622	4.727	0.401	2.777	2.377	1.754	2.466	2.066	0.311	1.355
1.3	68.9	0.007	0.12	6.717	0.738	0.738	4.820	0.493	2.892	2.399	1.661	2.523	2.030	0.369	1.444
1.5	78.5	0.009	0.15	6.719	0.841	0.841	4.903	0.576	2.995	2.419	1.578	2.574	1.998	0.420	1.533
1.8	86.5	0.011	0.17	6.721	0.927	0.927	4.974	0.648	3.080	2.433	1.506	2.617	1.969	0.463	1.615
2.0	93.6	0.011	0.19	6.722	1.003	1.003	5.039	0.712	3.156	2.444	1.442	2.655	1.943	0.501	1.695
2.3	100.4	0.013	0.22	6.724	1.075	1.075	5.098	0.771	3.229	2.458	1.383	2.691	1.920	0.537	1.777
2.5	106.6	0.015	0.25	6.726	1.141	1.141	5.148	0.821	3.294	2.473	1.332	2.724	1.902	0.570	1.857
2.8	112.1	0.016	0.27	6.727	1.200	1.199	5.195	0.869	3.352	2.484	1.285	2.753	1.884	0.600	1.933
3.1	117.2	0.018	0.30	6.729	1.254	1.253	5.236	0.910	3.407	2.497	1.244	2.780	1.870	0.627	2.007
3.3	122.0	0.020	0.32	6.731	1.306	1.305	5.274	0.947	3.458	2.511	1.206	2.806	1.859	0.652	2.082
3.5	126.6	0.021	0.34	6.732	1.354	1.354	5.307	0.980	3.507	2.527	1.173	2.830	1.850	0.677	2.154
3.8	130.7	0.023	0.38	6.734	1.397	1.396	5.337	1.010	3.550	2.540	1.143	2.852	1.841	0.698	2.221
4.0	134.7	0.024	0.40	6.736	1.440	1.439	5.364	1.037	3.592	2.555	1.116	2.872	1.836	0.720	2.290
4.3	138.8	0.025	0.42	6.737	1.483	1.482	5.388	1.062	3.636	2.574	1.092	2.895	1.833	0.741	2.358
4.5	142.3	0.027	0.44	6.739	1.521	1.520	5.411	1.084	3.673	2.590	1.070	2.913	1.830	0.760	2.421
4.8	146.0	0.029	0.47	6.741	1.560	1.558	5.430	1.103	3.712	2.609	1.050	2.933	1.830	0.779	2.484
5.1	149.4	0.030	0.49	6.742	1.596	1.594	5.448	1.122	3.748	2.626	1.032	2.951	1.829	0.797	2.545
5.3	152.7	0.031	0.52	6.744	1.630	1.629	5.465	1.138	3.782	2.644	1.016	2.968	1.830	0.814	2.604
5.6	155.8	0.033	0.54	6.745	1.663	1.662	5.479	1.152	3.815	2.663	1.001	2.984	1.832	0.831	2.660
5.8	158.8	0.034	0.57	6.747	1.695	1.693	5.493	1.166	3.847	2.681	0.988	3.000	1.834	0.847	2.715
6.1	161.7	0.036	0.59	6.749	1.726	1.724	5.504	1.177	3.878	2.701	0.976	3.016	1.838	0.862	2.766
6.3	164.5	0.038	0.62	6.751	1.755	1.753	5.515	1.188	3.907	2.719	0.965	3.030	1.842	0.877	2.816
6.6	167.5	0.039	0.65	6.753	1.786	1.785	5.524	1.198	3.939	2.741	0.956	3.046	1.848	0.892	2.867
6.8	170.2	0.041	0.67	6.754	1.815	1.813	5.533	1.206	3.967	2.761	0.947	3.060	1.854	0.907	2.914
7.1	172.8	0.042	0.70	6.756	1.842	1.840	5.541	1.214	3.993	2.779	0.939	3.073	1.859	0.920	2.958
7.3	175.6	0.044	0.72	6.758	1.871	1.869	5.548	1.221	4.023	2.802	0.933	3.088	1.867	0.934	3.003
7.6	178.1	0.045	0.75	6.759	1.897	1.895	5.554	1.227	4.050	2.823	0.927	3.102	1.875	0.948	3.044
7.9	180.6	0.046	0.77	6.761	1.923	1.922	5.559	1.232	4.076	2.844	0.922	3.115	1.883	0.961	3.084
8.1	183.1	0.049	0.80	6.763	1.949	1.947	5.563	1.236	4.102	2.865	0.918	3.128	1.892	0.974	3.122
8.4	185.4	0.050	0.83	6.765	1.973	1.971	5.567	1.240	4.125	2.885	0.914	3.140	1.899	0.986	3.158
8.6	187.8	0.051	0.85	6.766	1.999	1.997	5.570	1.244	4.150	2.907	0.910	3.152	1.908	0.998	3.194
8.9	190.3	0.053	0.87	6.768	2.024	2.022	5.573	1.246	4.176	2.930	0.908	3.165	1.919	1.011	3.228
9.1	192.6	0.055	0.90	6.770	2.048	2.046	5.576	1.249	4.200	2.951	0.906	3.177	1.928	1.023	3.259
9.4	194.7	0.056	0.93	6.772	2.070	2.068	5.577	1.251	4.222	2.972	0.903	3.188	1.937	1.034	3.289
9.6	197.0	0.058	0.95	6.773	2.094	2.091	5.579	1.252	4.245	2.993	0.902	3.199	1.947	1.046	3.320

Project: 175668043			Source: KIF-GT-TW04-ST01, 24.9'-25.5'								Lab ID: 104		Test ID		
Test Time (min)	Corr. Axial Load (lbf)	Axial Deform. (in)	Axial Strain (%)	Corr. Area (in^2)	Deviator Stress (tsf)	Corr. Deviator Stress (tsf)	Pore Pressure (tsf)	Induced Pore Pressure (tsf)	σ_1 (tsf)	σ_1' (tsf)	σ_3' (tsf)	p (tsf)	p' (tsf)	q (tsf)	Eff. Princ. Stress Ratio σ_1'/σ_3'
9.9	199.2	0.060	0.98	6.776	2.116	2.114	5.580	1.253	4.268	3.015	0.901	3.211	1.958	1.057	3.347
10.1	201.2	0.061	1.01	6.777	2.138	2.135	5.581	1.254	4.289	3.035	0.900	3.221	1.967	1.068	3.374
11.1	209.4	0.067	1.10	6.784	2.223	2.220	5.581	1.255	4.374	3.119	0.899	3.264	2.009	1.110	3.469
12.1	217.1	0.073	1.20	6.790	2.302	2.299	5.577	1.251	4.453	3.202	0.903	3.303	2.052	1.150	3.546
13.1	224.6	0.079	1.30	6.798	2.379	2.376	5.570	1.244	4.529	3.286	0.910	3.342	2.098	1.188	3.611
14.1	231.7	0.085	1.40	6.804	2.451	2.448	5.562	1.235	4.602	3.367	0.918	3.378	2.142	1.224	3.665
15.2	238.6	0.091	1.50	6.811	2.522	2.518	5.552	1.225	4.672	3.447	0.929	3.413	2.188	1.259	3.712
16.1	245.0	0.097	1.60	6.818	2.587	2.584	5.540	1.214	4.738	3.524	0.940	3.446	2.232	1.292	3.747
17.1	251.2	0.103	1.70	6.825	2.650	2.646	5.528	1.201	4.800	3.599	0.953	3.477	2.276	1.323	3.778
18.1	257.4	0.109	1.79	6.832	2.712	2.708	5.514	1.187	4.862	3.675	0.966	3.508	2.320	1.354	3.803
19.2	263.3	0.115	1.90	6.839	2.772	2.767	5.501	1.174	4.921	3.747	0.980	3.537	2.363	1.384	3.825
20.2	269.1	0.122	2.00	6.846	2.830	2.825	5.487	1.160	4.979	3.819	0.994	3.566	2.406	1.413	3.843
21.2	274.4	0.127	2.10	6.853	2.884	2.879	5.472	1.145	5.031	3.886	1.007	3.592	2.447	1.439	3.858
22.2	279.7	0.133	2.20	6.860	2.936	2.931	5.458	1.132	5.084	3.952	1.022	3.618	2.487	1.465	3.869
23.2	285.3	0.139	2.29	6.866	2.992	2.986	5.444	1.117	5.139	4.022	1.036	3.646	2.529	1.493	3.883
24.2	290.4	0.146	2.40	6.874	3.042	3.036	5.429	1.103	5.189	4.087	1.051	3.671	2.569	1.518	3.890
25.2	295.7	0.151	2.50	6.881	3.094	3.088	5.414	1.088	5.241	4.153	1.065	3.697	2.609	1.544	3.898
26.2	300.2	0.157	2.59	6.888	3.139	3.132	5.400	1.073	5.286	4.213	1.081	3.720	2.647	1.566	3.899
27.2	305.0	0.164	2.70	6.895	3.184	3.178	5.384	1.058	5.331	4.273	1.095	3.742	2.684	1.589	3.902
28.2	309.8	0.170	2.80	6.902	3.232	3.225	5.370	1.043	5.378	4.335	1.110	3.765	2.722	1.613	3.907
29.2	314.5	0.176	2.90	6.909	3.278	3.271	5.355	1.028	5.424	4.395	1.125	3.788	2.760	1.635	3.908
30.2	318.8	0.181	2.99	6.916	3.319	3.312	5.341	1.014	5.465	4.451	1.139	3.809	2.795	1.656	3.907
31.2	323.1	0.188	3.09	6.923	3.360	3.353	5.327	1.000	5.505	4.505	1.152	3.828	2.828	1.676	3.910
32.2	327.4	0.194	3.20	6.931	3.401	3.394	5.312	0.986	5.546	4.560	1.166	3.849	2.863	1.697	3.910
33.2	331.7	0.200	3.29	6.937	3.442	3.434	5.299	0.972	5.586	4.614	1.180	3.869	2.897	1.717	3.911
34.2	335.9	0.205	3.38	6.944	3.482	3.474	5.286	0.959	5.627	4.668	1.193	3.890	2.930	1.737	3.912
35.2	340.4	0.212	3.49	6.952	3.525	3.517	5.272	0.945	5.669	4.724	1.207	3.911	2.965	1.759	3.915
36.2	344.3	0.218	3.60	6.959	3.562	3.554	5.259	0.932	5.706	4.774	1.220	3.929	2.997	1.777	3.914
37.2	348.8	0.224	3.70	6.967	3.605	3.596	5.245	0.918	5.748	4.830	1.234	3.950	3.032	1.798	3.913
38.2	352.7	0.230	3.79	6.973	3.641	3.632	5.232	0.906	5.785	4.879	1.247	3.969	3.063	1.816	3.913
39.2	356.2	0.236	3.90	6.981	3.674	3.665	5.220	0.893	5.818	4.925	1.260	3.985	3.092	1.832	3.909
40.2	359.8	0.242	4.00	6.988	3.707	3.698	5.207	0.880	5.849	4.970	1.272	4.000	3.121	1.849	3.907
41.2	363.6	0.248	4.09	6.995	3.742	3.733	5.194	0.867	5.884	5.017	1.284	4.018	3.151	1.866	3.906
42.2	367.4	0.255	4.20	7.003	3.777	3.767	5.182	0.855	5.919	5.063	1.296	4.035	3.180	1.884	3.907
43.2	370.7	0.260	4.29	7.010	3.808	3.798	5.170	0.843	5.949	5.106	1.308	4.050	3.207	1.899	3.904
44.2	374.4	0.267	4.40	7.017	3.841	3.831	5.157	0.830	5.981	5.151	1.320	4.066	3.236	1.915	3.901
45.2	377.7	0.272	4.49	7.024	3.871	3.860	5.145	0.818	6.011	5.193	1.333	4.081	3.263	1.930	3.897
46.2	381.0	0.279	4.60	7.032	3.901	3.890	5.133	0.806	6.041	5.235	1.344	4.096	3.289	1.945	3.894
47.2	384.4	0.285	4.70	7.040	3.931	3.920	5.121	0.795	6.071	5.276	1.356	4.111	3.316	1.960	3.891
48.2	387.2	0.291	4.80	7.047	3.956	3.944	5.110	0.783	6.095	5.312	1.368	4.123	3.340	1.972	3.884
49.2	390.5	0.297	4.90	7.055	3.986	3.974	5.098	0.771	6.125	5.354	1.380	4.138	3.367	1.987	3.880
50.2	393.8	0.303	4.99	7.061	4.016	4.004	5.086	0.760	6.155	5.395	1.391	4.153	3.393	2.002	3.878
52.7	401.6	0.318	5.24	7.080	4.084	4.072	5.059	0.732	6.222	5.490	1.418	4.186	3.454	2.036	3.871
55.2	408.9	0.333	5.49	7.098	4.148	4.135	5.033	0.706	6.285	5.579	1.444	4.218	3.512	2.067	3.863
57.7	416.3	0.349	5.75	7.118	4.211	4.198	5.007	0.680	6.348	5.667	1.470	4.249	3.569	2.099	3.856
60.2	423.3	0.364	5.99	7.137	4.271	4.257	4.983	0.656	6.407	5.750	1.494	4.278	3.622	2.128	3.850
62.7	430.4	0.378	6.24	7.155	4.331	4.316	4.958	0.632	6.466	5.834	1.518	4.308	3.676	2.158	3.844
65.2	437.8	0.394	6.50	7.175	4.394	4.378	4.936	0.609	6.528	5.919	1.540	4.338	3.730	2.189	3.842
67.7	442.8	0.409	6.74	7.194	4.432	4.416	4.914	0.587	6.566	5.979	1.563	4.358	3.771	2.208	3.826
70.2	449.3	0.424	6.99	7.213	4.485	4.468	4.892	0.565	6.617	6.052	1.584	4.383	3.818	2.234	3.821
72.7	455.2	0.439	7.24	7.232	4.531	4.514	4.871	0.544	6.663	6.119	1.605	4.406	3.862	2.257	3.813
75.2	461.2	0.454	7.49	7.252	4.579	4.562	4.851	0.524	6.711	6.187	1.625	4.430	3.906	2.281	3.807
77.7	465.8	0.469	7.73	7.271	4.613	4.595	4.831	0.504	6.743	6.239	1.644	4.446	3.942	2.297	3.794
80.2	472.0	0.485	7.99	7.292	4.660	4.641	4.813	0.486	6.790	6.304	1.663	4.469	3.983	2.321	3.792
82.7	475.4	0.500	8.24	7.312	4.681	4.662	4.795	0.469	6.810	6.341	1.680	4.479	4.011	2.331	3.775
85.2	481.0	0.515	8.49	7.331	4.723	4.703	4.777	0.450	6.852	6.402	1.698	4.500	4.050	2.352	3.769
87.7	485.0	0.530	8.74	7.351	4.750	4.730	4.760	0.434	6.878	6.444	1.714	4.513	4.079	2.365	3.759
90.2	489.6	0.545	8.99	7.372	4.782	4.760	4.744	0.417	6.908	6.491	1.730	4.528	4.111	2.380	3.751
92.7	494.4	0.561	9.25	7.392	4.815	4.793	4.729	0.402	6.941	6.539	1.745	4.544	4.142	2.397	3.746
95.2	497.7	0.575	9.49	7.412	4.835	4.813	4.713	0.387	6.960	6.573	1.761	4.554	4.167	2.406	3.733
97.7	502.1	0.590	9.73	7.432	4.865	4.842	4.699	0.373	6.989	6.616	1.775	4.568	4.196	2.421	3.728
100.2	506.9	0.605	9.98	7.452	4.898	4.874	4.684	0.358	7.021	6.663	1.789	4.584	4.226	2.437	3.724
102.7	510.6	0.621	10.24	7.475	4.918	4.894	4.671	0.345	7.041	6.697	1.802	4.594	4.249	2.447	3.715
105.2	514.9	0.636	10.48	7.495	4.946	4.921	4.657	0.331	7.068	6.737	1.816	4.607	4.277	2.461	3.710
107.7	518.7	0.651	10.74	7.516	4.969	4.944	4.644	0.318	7.091	6.773	1.830	4.619	4.302	2.472	3.702
110.2	522.4	0.666	10.99	7.537	4.990	4.964	4.633	0.306	7.110	6.805	1.840	4.628	4.322	2.482	3.698
112.7	526.0	0.682	11.24	7.558	5.011	4.984	4.620	0.293	7.130	6.837	1.853	4.638	4.345	2.492	3.690
115.2	529.4	0.697	11.49	7.579	5.029	5.002	4.609	0.282	7.148	6.866	1.864	4.647	4.365	2.501	3.684
117.7	532.5	0.712	11.73	7.600	5.045	5.017	4.598	0.271	7.163	6.892	1.874	4.654	4.383	2.509	3.677

Project: 175668043			Source: KIF-GT-TW04-ST01, 24.9'-25.5'								Lab ID: 104		Test ID		
Test Time (min)	Corr. Axial Load (lbf)	Axial Deform. (in)	Axial Strain (%)	Corr. Area (in^2)	Deviator Stress (tsf)	Corr. Deviator Stress (tsf)	Pore Pressure (tsf)	Induced Pore Pressure (tsf)	σ_1 (tsf)	σ_1' (tsf)	σ_3' (tsf)	p (tsf)	p' (tsf)	q (tsf)	Eff. Princ. Stress Ratio σ_1'/σ_3'
120.2	535.1	0.727	11.99	7.623	5.054	5.026	4.589	0.262	7.172	6.910	1.884	4.659	4.397	2.513	3.668
122.7	539.4	0.742	12.23	7.644	5.081	5.052	4.578	0.251	7.197	6.946	1.894	4.671	4.420	2.526	3.667
125.2	542.0	0.758	12.49	7.666	5.091	5.061	4.568	0.241	7.207	6.965	1.904	4.676	4.435	2.530	3.658
127.7	545.4	0.772	12.73	7.688	5.108	5.078	4.558	0.231	7.223	6.992	1.914	4.684	4.453	2.539	3.653
130.2	546.9	0.788	12.99	7.710	5.107	5.077	4.548	0.221	7.221	6.999	1.923	4.683	4.461	2.538	3.640
132.7	549.5	0.803	13.23	7.732	5.117	5.086	4.538	0.212	7.231	7.019	1.933	4.688	4.476	2.543	3.631
135.2	551.8	0.818	13.49	7.755	5.123	5.091	4.529	0.202	7.235	7.033	1.942	4.689	4.487	2.546	3.622
137.7	555.2	0.833	13.74	7.777	5.140	5.108	4.520	0.193	7.251	7.059	1.951	4.698	4.505	2.554	3.618
140.2	557.7	0.848	13.99	7.800	5.148	5.115	4.511	0.184	7.258	7.074	1.959	4.701	4.517	2.558	3.611
142.7	560.0	0.864	14.24	7.823	5.154	5.120	4.502	0.175	7.263	7.088	1.967	4.703	4.528	2.560	3.603
145.2	562.3	0.878	14.48	7.845	5.161	5.127	4.494	0.167	7.268	7.101	1.975	4.705	4.538	2.563	3.596
147.7	562.9	0.894	14.74	7.869	5.150	5.115	4.485	0.158	7.256	7.098	1.982	4.699	4.540	2.558	3.580
150.2	564.3	0.909	14.99	7.892	5.148	5.113	4.477	0.151	7.253	7.103	1.990	4.697	4.546	2.556	3.569
152.8	567.6	0.925	15.24	7.916	5.163	5.127	4.470	0.143	7.267	7.124	1.997	4.704	4.561	2.563	3.567
155.2	569.3	0.939	15.48	7.938	5.164	5.128	4.463	0.136	7.269	7.133	2.005	4.705	4.569	2.564	3.557
157.8	570.9	0.955	15.74	7.962	5.163	5.126	4.456	0.129	7.267	7.138	2.012	4.704	4.575	2.563	3.547
160.3	572.9	0.970	15.99	7.986	5.165	5.127	4.448	0.121	7.267	7.146	2.019	4.704	4.583	2.564	3.539
162.8	573.4	0.985	16.24	8.010	5.154	5.116	4.443	0.116	7.257	7.141	2.025	4.699	4.583	2.558	3.526
165.3	574.8	1.000	16.49	8.033	5.152	5.113	4.437	0.111	7.254	7.144	2.031	4.698	4.587	2.556	3.518
167.8	576.6	1.016	16.75	8.059	5.151	5.112	4.432	0.105	7.253	7.148	2.036	4.697	4.592	2.556	3.511
170.1	576.5	1.030	16.98	8.081	5.136	5.096	4.426	0.099	7.237	7.137	2.041	4.689	4.589	2.548	3.497

Consolidated Undrained Triaxial Compression

ASTM D 4767

Project Name	KIF TDEC Order	Project No.	175668043
Source	KIF-GT-TW04-ST02, 39.9'-40.5'	Lab ID	112
Description	Sandy Silt (ML), gray, wet, soft	Test ID	112-A
Specimen Type	Intact		
Preparation	Wet Mounting	Date Received	03/28/2019
		Date Tested	05/07/2019

Specific Gravity	2.43
ASTM D 854, Dry	
Liquid Limit	NP
Plastic Limit	NP
Plasticity Index	NP
ASTM D 4318	

Target Test Parameters

Nominal Chamber Pressure (psi)	90
Nominal Back Pressure (psi)	55
Nominal Consolidation Pressure (psi)	35

Saturation / Consolidation Results

Pore Pressure Parameter B	0.95
Measured Effective Consol. Stress (tsf)	2.501
Time to 50% Consolidation (min)	0.04
Actual Axial Strain Rate of Test (%/min)	0.100

Consolidated Specimen Conditions

Moist Unit Weight (pcf)	110.2
Moisture Content (%)	35.5
Dry Unit Weight (pcf)	81.3
Void Ratio	0.862
Degree of Saturation (%)	100.0

At Drained Failure

Failure Criterion: Max. Eff. Prin. Stress Ratio

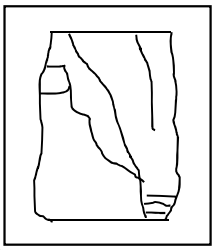
Axial Strain (%)	4.856
Deviator Stress (tsf)	5.811
Induced Pore Pressure (tsf)	0.294
Minor Effective Stress, σ_3' (tsf)	2.213
Major Effective Stress, σ_1' (tsf)	8.024
Eff. Principal Stress Ratio, σ_1'/σ_3'	3.626
p' (tsf)	5.119
q (tsf)	2.906

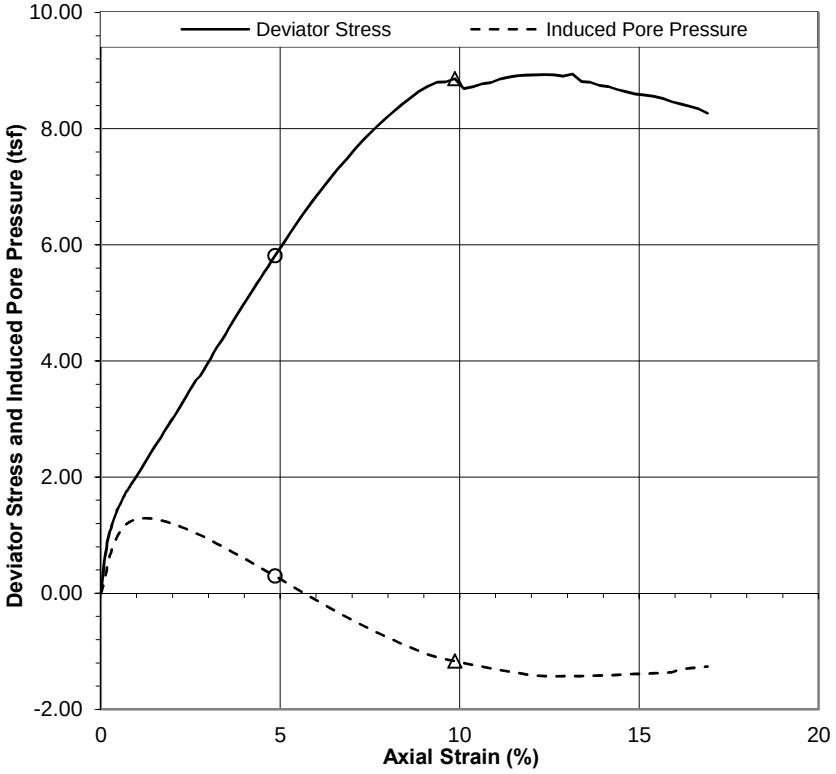
At Consolidated Undrained Failure

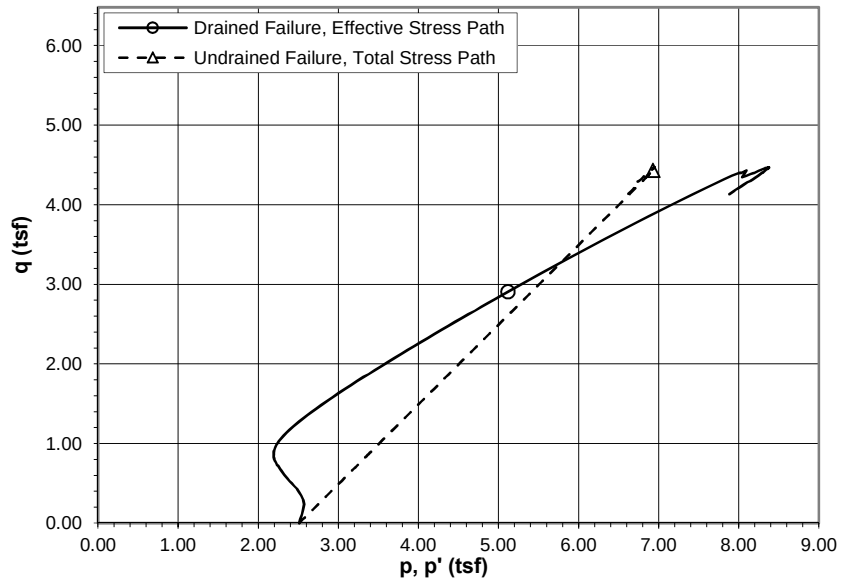
Failure Criterion: Peak Deviator Stress

Axial Strain (%)	9.868
Deviator Stress (tsf)	8.863
Minor Principal Stress, σ_3 (tsf)	2.496
Major Principal Stress, σ_1 (tsf)	11.359
p (tsf)	6.928
q (tsf)	4.431

Failure Sketch







Comments

Reviewed KG

Stantec

Consolidated Undrained Triaxial Compression

ASTM D 4767

Project Name KIF TDEC Order
Source KIF-GT-TW04-ST02, 39.9'-40.5'
Description Sandy Silt (ML), gray, wet, soft

Project No. 175668043
Lab ID 112
Test ID 112-A

Initial Specimen Conditions		Consolidated Specimen Conditions	
Average Height (in)	5.717	Calculated Height (in)	5.678
Average Diameter (in)	2.883	Calculated Diameter (in)	2.753
Calculated Area (in^2)	6.528	Calculated Area (in^2)	5.954
Moist Weight (lb)	2.228	Moist Weight (lb)	2.156
Moist Unit Weight (pcf)	103.1	Moist Unit Weight (pcf)	110.2
Moisture Content (%)	40.0	Moisture Content (%)	35.5
Dry Weight (lb)	1.591	Dry Weight (lb)	1.591
Dry Unit Weight (pcf)	73.7	Dry Unit Weight (pcf)	81.3
Void Ratio	1.055	Void Ratio	0.862
Degree of Saturation (%)	92.1	Degree of Saturation (%)	100.0

Specific Gravity 2.43
ASTM D 854, Dry

Liquid Limit NP
Plastic Limit NP
Plasticity Index NP
ASTM D 4318

Confining Stress
σ_3 (tsf) 2.512

Effective Consolidation Stress
σ_3' (tsf) 2.512

Moisture contents obtained using partial specimen.
Specimen consolidated cross-sectional area determined using method B.
Membrane corrections have been applied,where Em = 200 lbf/in and t = 0.012 in.
All other tests performed in association with this specimen are reported separately.

Project: 175668043			Source: KIF-GT-TW04-ST02, 39.9'-40.5'								Lab ID: 112		Test ID		
Test Time (min)	Corr. Axial Load (lbf)	Axial Deform. (in)	Axial Strain (%)	Corr. Area (in^2)	Deviator Stress (tsf)	Corr. Deviator Stress (tsf)	Pore Pressure (tsf)	Induced Pore Pressure (tsf)	σ_1 (tsf)	σ_1' (tsf)	σ_3' (tsf)	p (tsf)	p' (tsf)	q (tsf)	Eff. Princ. Stress Ratio σ_1'/σ_3'
0.0	0.0	0.000	0.00	5.954	0.000	0.000	3.967	0.000	2.512	2.512	2.512	2.512	2.512	0.000	1.000
0.2	7.8	0.002	0.03	5.955	0.095	0.095	4.001	0.034	2.606	2.572	2.477	2.559	2.525	0.047	1.038
0.5	18.0	0.002	0.04	5.956	0.218	0.218	4.042	0.075	2.729	2.654	2.436	2.620	2.545	0.109	1.089
0.7	28.3	0.004	0.07	5.958	0.342	0.341	4.086	0.119	2.853	2.734	2.392	2.682	2.563	0.171	1.143
1.0	39.1	0.005	0.09	5.959	0.472	0.472	4.143	0.176	2.983	2.807	2.336	2.748	2.572	0.236	1.202
1.2	48.8	0.006	0.11	5.960	0.589	0.589	4.211	0.244	3.101	2.856	2.267	2.806	2.562	0.295	1.260
1.5	57.3	0.008	0.14	5.962	0.692	0.691	4.286	0.319	3.203	2.884	2.193	2.857	2.539	0.346	1.315
1.8	64.7	0.009	0.16	5.964	0.781	0.781	4.359	0.392	3.293	2.901	2.120	2.902	2.510	0.390	1.368
2.0	71.9	0.010	0.18	5.965	0.868	0.868	4.431	0.464	3.379	2.915	2.047	2.945	2.481	0.434	1.424
2.2	77.6	0.012	0.20	5.966	0.937	0.936	4.498	0.531	3.447	2.916	1.980	2.979	2.448	0.468	1.473
2.5	83.1	0.013	0.23	5.968	1.003	1.002	4.561	0.593	3.514	2.921	1.918	3.013	2.419	0.501	1.523
2.7	88.2	0.015	0.26	5.969	1.064	1.063	4.619	0.651	3.575	2.923	1.860	3.043	2.391	0.532	1.572
3.0	92.7	0.016	0.29	5.971	1.118	1.117	4.672	0.705	3.628	2.923	1.806	3.069	2.365	0.558	1.618
3.3	97.3	0.018	0.31	5.972	1.173	1.172	4.722	0.755	3.683	2.928	1.756	3.097	2.342	0.586	1.667
3.5	101.6	0.019	0.34	5.974	1.224	1.223	4.767	0.800	3.734	2.934	1.711	3.122	2.322	0.612	1.715
3.8	105.5	0.020	0.36	5.975	1.272	1.271	4.810	0.843	3.782	2.939	1.668	3.146	2.304	0.635	1.762
4.0	109.4	0.022	0.39	5.977	1.318	1.317	4.848	0.881	3.828	2.947	1.630	3.169	2.289	0.658	1.808
4.3	113.0	0.023	0.41	5.978	1.361	1.360	4.885	0.917	3.870	2.953	1.593	3.191	2.273	0.680	1.853
4.5	116.4	0.025	0.44	5.980	1.401	1.400	4.918	0.951	3.911	2.960	1.560	3.211	2.260	0.700	1.897
4.8	119.8	0.026	0.46	5.982	1.442	1.440	4.949	0.982	3.952	2.970	1.529	3.231	2.250	0.720	1.942
5.0	121.8	0.028	0.49	5.983	1.466	1.465	4.977	1.010	3.976	2.966	1.501	3.243	2.234	0.732	1.976
5.3	124.9	0.029	0.51	5.984	1.503	1.502	5.004	1.036	4.012	2.975	1.474	3.261	2.225	0.751	2.019
5.5	127.5	0.030	0.54	5.986	1.534	1.533	5.028	1.061	4.043	2.983	1.450	3.277	2.216	0.766	2.057
5.8	130.1	0.032	0.56	5.988	1.565	1.563	5.051	1.084	4.074	2.990	1.426	3.292	2.208	0.782	2.096
6.0	132.7	0.033	0.59	5.989	1.595	1.593	5.072	1.105	4.104	2.999	1.406	3.307	2.203	0.797	2.133
6.3	135.2	0.035	0.61	5.990	1.625	1.623	5.091	1.124	4.133	3.010	1.386	3.322	2.198	0.812	2.171
6.6	137.6	0.036	0.63	5.992	1.653	1.652	5.109	1.142	4.162	3.021	1.369	3.336	2.195	0.826	2.207
6.8	140.1	0.037	0.66	5.993	1.683	1.681	5.125	1.158	4.191	3.033	1.352	3.351	2.192	0.841	2.243
7.1	142.7	0.039	0.68	5.995	1.714	1.712	5.140	1.173	4.222	3.050	1.338	3.366	2.194	0.856	2.280
7.3	145.1	0.040	0.70	5.996	1.742	1.740	5.153	1.186	4.250	3.064	1.324	3.380	2.194	0.870	2.314
7.6	147.3	0.042	0.73	5.998	1.768	1.766	5.166	1.198	4.276	3.078	1.312	3.393	2.195	0.883	2.346
7.8	149.0	0.043	0.76	5.999	1.788	1.787	5.177	1.210	4.297	3.087	1.300	3.403	2.193	0.893	2.374
8.1	151.4	0.045	0.78	6.001	1.816	1.814	5.187	1.220	4.325	3.105	1.290	3.417	2.197	0.907	2.406
8.3	153.5	0.046	0.82	6.003	1.841	1.839	5.197	1.229	4.349	3.119	1.280	3.429	2.200	0.919	2.436
8.6	155.7	0.047	0.84	6.004	1.867	1.865	5.205	1.238	4.375	3.137	1.272	3.443	2.204	0.932	2.466
8.8	157.9	0.049	0.86	6.006	1.893	1.891	5.213	1.246	4.401	3.155	1.264	3.456	2.210	0.945	2.496
9.8	165.4	0.055	0.96	6.012	1.981	1.979	5.237	1.269	4.489	3.219	1.241	3.499	2.230	0.989	2.595
10.8	174.1	0.061	1.07	6.018	2.083	2.080	5.251	1.284	4.590	3.306	1.226	3.550	2.266	1.040	2.697
11.8	182.5	0.066	1.17	6.024	2.181	2.178	5.258	1.290	4.688	3.397	1.219	3.599	2.308	1.089	2.786

Project: 175668043			Source: KIF-GT-TW04-ST02, 39.9'-40.5'								Lab ID: 112		Test ID		
Test Time (min)	Corr. Axial Load (lbf)	Axial Deform. (in)	Axial Strain (%)	Corr. Area (in^2)	Deviator Stress (tsf)	Corr. Deviator Stress (tsf)	Pore Pressure (tsf)	Induced Pore Pressure (tsf)	σ_1 (tsf)	σ_1' (tsf)	σ_3' (tsf)	p (tsf)	p' (tsf)	q (tsf)	Eff. Princ. Stress Ratio σ_1'/σ_3'
12.8	190.6	0.071	1.25	6.029	2.276	2.273	5.259	1.292	4.782	3.490	1.218	3.646	2.354	1.136	2.867
13.8	199.8	0.077	1.36	6.036	2.383	2.380	5.256	1.288	4.889	3.601	1.221	3.699	2.411	1.190	2.949
14.8	208.6	0.083	1.46	6.042	2.486	2.482	5.248	1.281	4.992	3.711	1.228	3.750	2.469	1.241	3.021
15.8	217.5	0.089	1.57	6.049	2.589	2.585	5.238	1.271	5.095	3.824	1.239	3.802	2.532	1.293	3.087
16.8	225.5	0.095	1.67	6.055	2.681	2.677	5.225	1.257	5.186	3.928	1.252	3.848	2.590	1.338	3.138
17.8	234.2	0.100	1.77	6.061	2.782	2.778	5.209	1.242	5.287	4.045	1.268	3.898	2.657	1.389	3.191
18.8	242.2	0.106	1.86	6.067	2.874	2.869	5.192	1.224	5.379	4.154	1.285	3.944	2.720	1.435	3.233
19.8	250.3	0.111	1.95	6.073	2.968	2.963	5.172	1.205	5.473	4.267	1.304	3.991	2.786	1.482	3.272
20.8	258.8	0.117	2.06	6.079	3.065	3.060	5.151	1.184	5.569	4.386	1.326	4.039	2.856	1.530	3.308
21.8	267.7	0.123	2.16	6.086	3.168	3.162	5.128	1.161	5.671	4.510	1.348	4.090	2.929	1.581	3.346
22.8	277.0	0.128	2.26	6.092	3.274	3.268	5.104	1.137	5.777	4.640	1.372	4.143	3.006	1.634	3.382
23.9	286.0	0.134	2.36	6.098	3.377	3.371	5.079	1.112	5.879	4.767	1.396	4.194	3.081	1.686	3.415
24.8	294.5	0.140	2.46	6.104	3.474	3.468	5.053	1.086	5.976	4.891	1.422	4.242	3.157	1.734	3.438
25.8	303.5	0.145	2.56	6.110	3.576	3.569	5.026	1.059	6.078	5.019	1.449	4.293	3.234	1.785	3.463
26.9	312.5	0.151	2.66	6.116	3.678	3.672	4.998	1.031	6.181	5.150	1.478	4.345	3.314	1.836	3.484
27.8	318.6	0.157	2.77	6.123	3.746	3.739	4.970	1.002	6.248	5.245	1.506	4.378	3.376	1.869	3.482
28.8	327.5	0.163	2.87	6.130	3.847	3.839	4.941	0.973	6.348	5.375	1.535	4.428	3.455	1.920	3.501
29.8	336.6	0.168	2.97	6.136	3.949	3.942	4.910	0.943	6.450	5.508	1.566	4.479	3.537	1.971	3.518
30.8	345.3	0.174	3.06	6.142	4.047	4.040	4.879	0.912	6.548	5.636	1.596	4.528	3.616	2.020	3.531
31.9	354.8	0.179	3.15	6.148	4.155	4.148	4.847	0.880	6.656	5.776	1.628	4.582	3.702	2.074	3.547
32.9	364.3	0.185	3.26	6.154	4.263	4.254	4.816	0.849	6.762	5.914	1.659	4.635	3.786	2.127	3.564
33.9	372.6	0.191	3.36	6.161	4.354	4.346	4.783	0.816	6.854	6.038	1.693	4.681	3.865	2.173	3.567
34.9	381.6	0.197	3.46	6.167	4.455	4.446	4.750	0.783	6.954	6.171	1.725	4.731	3.948	2.223	3.577
35.9	390.6	0.202	3.56	6.173	4.555	4.547	4.717	0.749	7.054	6.305	1.758	4.781	4.032	2.273	3.586
36.9	399.7	0.207	3.65	6.180	4.657	4.647	4.683	0.716	7.155	6.439	1.791	4.831	4.115	2.324	3.595
37.9	408.9	0.213	3.75	6.186	4.759	4.749	4.649	0.682	7.257	6.575	1.826	4.883	4.200	2.375	3.601
38.9	418.2	0.219	3.85	6.193	4.863	4.853	4.615	0.648	7.361	6.713	1.860	4.935	4.287	2.427	3.609
39.9	427.3	0.225	3.96	6.199	4.963	4.953	4.581	0.614	7.462	6.848	1.895	4.985	4.371	2.476	3.614
40.9	436.5	0.231	4.06	6.206	5.065	5.055	4.546	0.579	7.563	6.984	1.929	5.036	4.457	2.527	3.620
41.9	444.7	0.236	4.16	6.212	5.155	5.144	4.511	0.544	7.652	7.108	1.964	5.080	4.536	2.572	3.620
42.9	454.0	0.242	4.26	6.219	5.257	5.246	4.475	0.508	7.754	7.246	2.000	5.131	4.623	2.623	3.623
43.9	462.1	0.247	4.35	6.225	5.345	5.334	4.440	0.473	7.842	7.369	2.035	5.175	4.702	2.667	3.621
44.9	471.3	0.253	4.46	6.232	5.445	5.434	4.404	0.437	7.942	7.505	2.071	5.225	4.788	2.717	3.624
45.9	479.9	0.259	4.56	6.238	5.539	5.528	4.369	0.402	8.035	7.634	2.106	5.272	4.870	2.764	3.624
46.9	488.3	0.265	4.66	6.245	5.630	5.618	4.332	0.365	8.126	7.761	2.143	5.317	4.952	2.809	3.622
47.9	497.3	0.270	4.75	6.251	5.728	5.716	4.297	0.330	8.224	7.894	2.178	5.366	5.036	2.858	3.624
48.9	506.1	0.276	4.86	6.258	5.823	5.811	4.262	0.294	8.319	8.024	2.213	5.413	5.119	2.906	3.626
51.4	527.9	0.290	5.11	6.275	6.058	6.045	4.171	0.204	8.553	8.349	2.304	5.530	5.326	3.023	3.624
53.9	549.5	0.304	5.35	6.290	6.290	6.276	4.080	0.113	8.783	8.670	2.394	5.645	5.532	3.138	3.622
56.4	570.2	0.318	5.61	6.307	6.508	6.494	3.990	0.023	9.000	8.978	2.483	5.753	5.731	3.247	3.615
58.9	591.2	0.332	5.85	6.324	6.731	6.716	3.901	-0.066	9.223	9.289	2.572	5.864	5.930	3.358	3.611
61.4	610.4	0.347	6.11	6.341	6.931	6.916	3.811	-0.156	9.422	9.578	2.662	5.964	6.120	3.458	3.598
63.9	629.5	0.361	6.36	6.358	7.129	7.113	3.724	-0.243	9.619	9.861	2.748	6.062	6.305	3.557	3.588
66.4	648.3	0.375	6.60	6.375	7.322	7.306	3.638	-0.330	9.811	10.140	2.835	6.158	6.487	3.653	3.577
68.9	666.0	0.390	6.86	6.392	7.502	7.484	3.554	-0.413	9.989	10.402	2.918	6.247	6.660	3.742	3.565
71.4	684.2	0.404	7.11	6.409	7.686	7.669	3.472	-0.495	10.174	10.669	3.000	6.339	6.835	3.834	3.556
73.9	701.3	0.418	7.36	6.427	7.857	7.838	3.392	-0.575	10.342	10.917	3.079	6.423	6.998	3.919	3.546
76.4	716.1	0.432	7.61	6.444	8.001	7.982	3.316	-0.651	10.487	11.138	3.156	6.496	7.147	3.991	3.529
78.9	731.8	0.446	7.86	6.462	8.154	8.135	3.242	-0.725	10.640	11.364	3.230	6.572	7.297	4.067	3.519
81.4	746.1	0.461	8.12	6.480	8.291	8.270	3.170	-0.797	10.775	11.572	3.302	6.640	7.437	4.135	3.505
83.9	759.9	0.475	8.36	6.497	8.422	8.401	3.103	-0.864	10.905	11.769	3.368	6.704	7.569	4.200	3.494
86.4	773.4	0.489	8.62	6.515	8.547	8.525	3.036	-0.931	11.029	11.960	3.434	6.766	7.697	4.263	3.482
88.9	786.1	0.503	8.86	6.533	8.665	8.642	2.972	-0.995	11.145	12.139	3.497	6.823	7.818	4.321	3.471
91.4	796.0	0.517	9.11	6.550	8.750	8.727	2.914	-1.053	11.227	12.280	3.553	6.864	7.916	4.363	3.456
93.9	804.8	0.532	9.36	6.569	8.821	8.798	2.865	-1.102	11.296	12.398	3.600	6.897	7.999	4.399	3.444
96.4	807.5	0.545	9.61	6.587	8.828	8.803	2.831	-1.136	11.301	12.436	3.633	6.899	8.035	4.402	3.423
98.9	815.4	0.560	9.87	6.606	8.887	8.863	2.800	-1.167	11.359	12.526	3.663	6.928	8.094	4.431	3.420
101.4	801.6	0.575	10.12	6.624	8.712	8.687	2.763	-1.204	11.184	12.388	3.701	6.840	8.044	4.343	3.347
103.9	807.2	0.589	10.37	6.643	8.749	8.723	2.733	-1.234	11.219	12.453	3.730	6.858	8.091	4.361	3.339
106.4	814.0	0.603	10.62	6.661	8.799	8.772	2.702	-1.265	11.268	12.533	3.761	6.882	8.147	4.386	3.332
108.9	818.5	0.617	10.87	6.680	8.822	8.794	2.671	-1.297	11.290	12.587	3.792	6.893	8.189	4.397	3.319
111.4	826.4	0.631	11.12	6.699	8.882	8.855	2.643	-1.324	11.350	12.674	3.820	6.923	8.247	4.427	3.318
113.9	831.8	0.646	11.37	6.718	8.915	8.886	2.616	-1.351	11.380	12.731	3.845	6.937	8.288	4.443	3.311
116.4	837.2	0.661	11.64	6.738	8.946	8.917	2.591	-1.376	11.408	12.784	3.868	6.950	8.326	4.458	3.305
118.9	840.1	0.674	11.87	6.756	8.954	8.924	2.568	-1.399	11.412	12.811	3.887	6.950	8.349	4.462	3.296
121.4	843.1	0.689	12.13	6.776	8.958	8.928	2.549	-1.418	11.413	12.831	3.903	6.949	8.367	4.464	3.287
123.9	846.0	0.703	12.38	6.795	8.965	8.934	2.538	-1.429	11.416	12.845	3.911	6.949	8.378	4.467	3.284
126.4	848.0	0.717	12.63	6.815	8.960	8.928	2.534	-1.433	11.408	12.841	3.913	6.944	8.377	4.464	3.282
128.9	848.0	0.731	12.88	6.834	8.934	8.902	2.537	-1.431	11.381	12.811	3.909	6.930	8.360	4.451	3.277

Project: 175668043			Source: KIF-GT-TW04-ST02, 39.9'-40.5'								Lab ID: 112		Test ID		
Test Time (min)	Corr. Axial Load (lbf)	Axial Deform. (in)	Axial Strain (%)	Corr. Area (in^2)	Deviator Stress (tsf)	Corr. Deviator Stress (tsf)	Pore Pressure (tsf)	Induced Pore Pressure (tsf)	σ_1 (tsf)	σ_1' (tsf)	σ_3' (tsf)	p (tsf)	p' (tsf)	q (tsf)	Eff. Princ. Stress Ratio σ_1'/σ_3'
131.4	854.4	0.746	13.13	6.854	8.975	8.942	2.538	-1.429	11.418	12.847	3.905	6.947	8.376	4.471	3.290
133.9	844.7	0.761	13.40	6.875	8.846	8.813	2.540	-1.427	11.286	12.713	3.900	6.880	8.307	4.406	3.259
136.4	846.0	0.774	13.64	6.894	8.836	8.801	2.544	-1.423	11.271	12.694	3.892	6.870	8.293	4.401	3.261
138.9	843.1	0.789	13.90	6.915	8.778	8.744	2.547	-1.420	11.208	12.628	3.884	6.836	8.256	4.372	3.251
141.4	843.5	0.803	14.15	6.935	8.757	8.721	2.551	-1.416	11.182	12.598	3.877	6.822	8.238	4.361	3.249
143.9	841.4	0.818	14.40	6.955	8.710	8.674	2.559	-1.408	11.133	12.541	3.867	6.796	8.204	4.337	3.243
146.4	840.2	0.832	14.66	6.976	8.672	8.635	2.570	-1.397	11.094	12.492	3.857	6.777	8.174	4.318	3.239
148.9	839.1	0.846	14.90	6.997	8.635	8.598	2.575	-1.392	11.050	12.442	3.845	6.751	8.143	4.299	3.236
151.5	839.9	0.861	15.16	7.017	8.617	8.579	2.580	-1.388	11.025	12.412	3.833	6.735	8.123	4.290	3.238
153.9	840.5	0.875	15.41	7.038	8.598	8.559	2.590	-1.378	11.006	12.383	3.824	6.726	8.104	4.280	3.238
156.4	839.3	0.890	15.67	7.060	8.560	8.520	2.596	-1.371	10.964	12.335	3.815	6.703	8.075	4.260	3.234
158.9	836.5	0.904	15.91	7.081	8.506	8.466	2.602	-1.365	10.903	12.268	3.802	6.670	8.035	4.233	3.227
161.5	834.9	0.918	16.16	7.102	8.465	8.424	2.659	-1.308	10.908	12.216	3.792	6.696	8.004	4.212	3.222
164.0	833.4	0.932	16.42	7.123	8.424	8.382	2.675	-1.292	10.868	12.160	3.778	6.676	7.969	4.191	3.219
166.5	831.5	0.946	16.67	7.145	8.380	8.338	2.687	-1.280	10.823	12.103	3.765	6.654	7.934	4.169	3.215
168.8	826.8	0.960	16.91	7.165	8.308	8.266	2.702	-1.265	10.751	12.016	3.750	6.618	7.883	4.133	3.204

Stantec

Consolidated Undrained Triaxial Compression

ASTM D 4767

Project Name	TVA KIF EIP Exploratory Drilling	Project No.	175668043
Source	KIF-GT-TW05-ST01, 39.7'-40.2'	Lab ID	12
Description	Lean Clay with Sand (CL), light brown, moist, soft to firm	Test ID	12-A
Specimen Type	Intact		
Preparation	Wet Mounting	Date Received	12/03/2018
		Date Tested	12/04/2018

Specific Gravity	2.67
ASTM D 854, Dry	
Liquid Limit	26
Plastic Limit	17
Plasticity Index	9
ASTM D 4318	

Target Test Parameters

Nominal Chamber Pressure (psi)	90
Nominal Back Pressure (psi)	65
Nominal Consolidation Pressure (psi)	25

Saturation / Consolidation Results

Pore Pressure Parameter B	0.98
Measured Effective Consol. Stress (tsf)	1.484
Time to 50% Consolidation (min)	18.50
Actual Axial Strain Rate of Test (%/min)	0.016

Consolidated Specimen Conditions

Moist Unit Weight (pcf)	131.6
Moisture Content (%)	18.8
Dry Unit Weight (pcf)	110.8
Void Ratio	0.502
Degree of Saturation (%)	100.0

At Drained Failure

Failure Criterion: Max. Eff. Prin. Stress Ratio

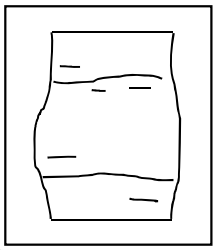
Axial Strain (%)	5.543
Deviator Stress (tsf)	2.855
Induced Pore Pressure (tsf)	0.484
Minor Effective Stress, σ_3' (tsf)	1.008
Major Effective Stress, σ_1' (tsf)	3.863
Eff. Principal Stress Ratio, σ_1'/σ_3'	3.831
p' (tsf)	2.436
q (tsf)	1.427

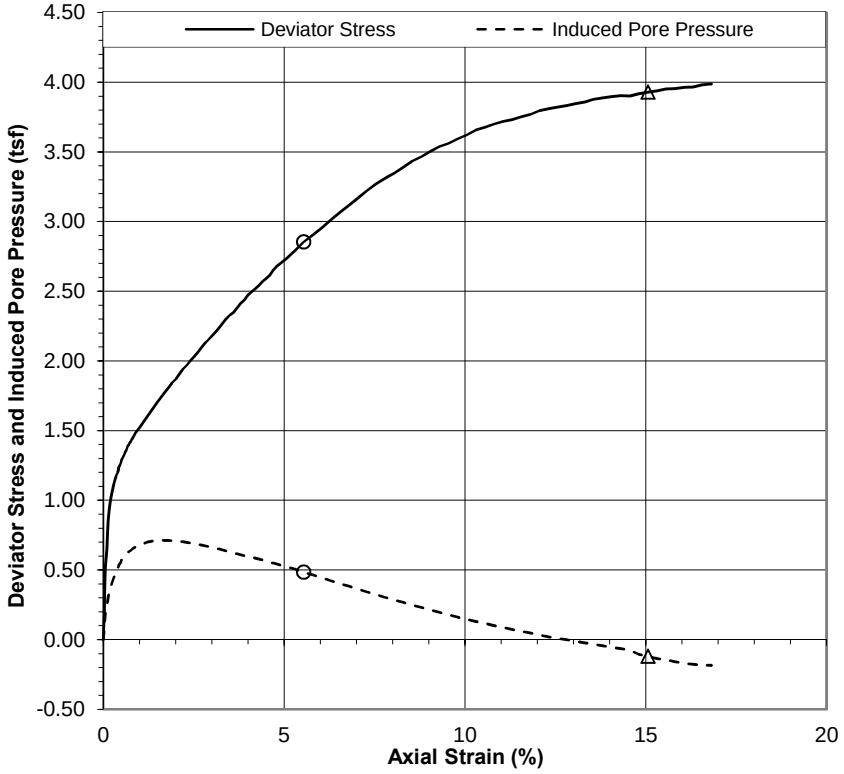
At Consolidated Undrained Failure

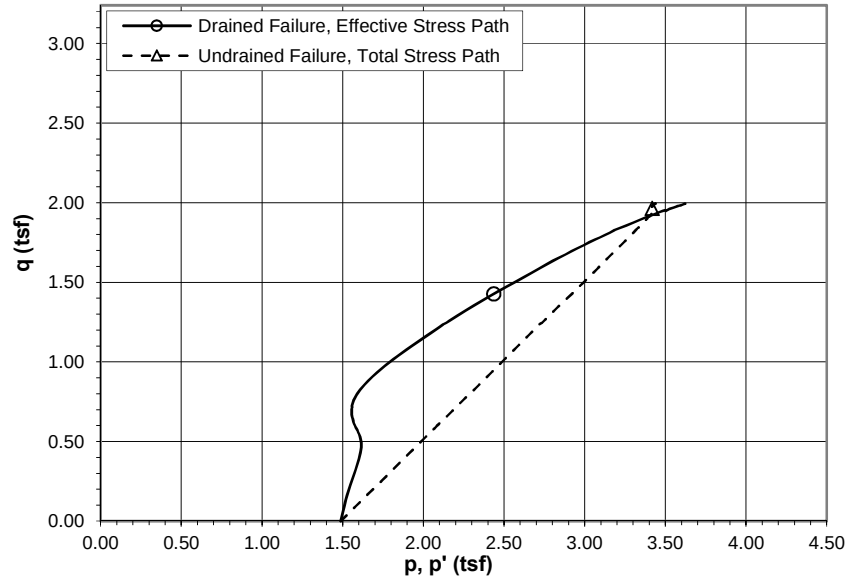
Failure Criterion: 15% Axial Strain

Axial Strain (%)	15.067
Deviator Stress (tsf)	3.928
Minor Principal Stress, σ_3 (tsf)	1.455
Major Principal Stress, σ_1 (tsf)	5.383
p (tsf)	3.419
q (tsf)	1.964

Failure Sketch







Comments

Reviewed KG

Stantec

Consolidated Undrained Triaxial Compression

ASTM D 4767

Project Name: TVA KIF EIP Exploratory Drilling
Source: KIF-GT-TW05-ST01, 39.7'-40.2'
Description: Lean Clay with Sand (CL), light brown, moist, soft to firm

Project No.: 175668043
Lab ID: 12
Test ID: 12-A

Initial Specimen Conditions		Consolidated Specimen Conditions	
Average Height (in)	5.826	Calculated Height (in)	5.808
Average Diameter (in)	2.883	Calculated Diameter (in)	2.788
Calculated Area (in^2)	6.529	Calculated Area (in^2)	6.105
Moist Weight (lb)	2.815	Moist Weight (lb)	2.700
Moist Unit Weight (pcf)	127.9	Moist Unit Weight (pcf)	131.6
Moisture Content (%)	23.9	Moisture Content (%)	18.8
Dry Weight (lb)	2.273	Dry Weight (lb)	2.273
Dry Unit Weight (pcf)	103.3	Dry Unit Weight (pcf)	110.8
Void Ratio	0.611	Void Ratio	0.502
Degree of Saturation (%)	104.2	Degree of Saturation (%)	100.0

Specific Gravity: 2.67
ASTM D 854, Dry

Liquid Limit: 26
Plastic Limit: 17
Plasticity Index: 9
ASTM D 4318

Confining Stress
σ_3 (tsf): 1.489

Effective Consolidation Stress
σ_3' (tsf): 1.489

Moisture contents obtained using partial specimen.
Specimen consolidated cross-sectional area determined using method B.
Membrane corrections have been applied,where Em = 200 lbf/in and t = 0.012 in.
All other tests performed in association with this specimen are reported separately.

Project: 175668043			Source: KIF-GT-TW05-ST01, 39.7'-40.2'								Lab ID: 12		Test ID		
Test Time (min)	Corr. Axial Load (lbf)	Axial Deform. (in)	Axial Strain (%)	Corr. Area (in^2)	Deviator Stress (tsf)	Corr. Deviator Stress (tsf)	Pore Pressure (tsf)	Induced Pore Pressure (tsf)	σ_1 (tsf)	σ_1' (tsf)	σ_3' (tsf)	p (tsf)	p' (tsf)	q (tsf)	Eff. Princ. Stress Ratio σ_1'/σ_3'
0.0	0.0	0.000	0.00	6.105	0.000	0.000	4.993	0.000	1.489	1.489	1.489	1.489	1.489	0.000	1.000
1.5	16.0	0.002	0.03	6.107	0.188	0.188	5.065	0.072	1.676	1.604	1.416	1.582	1.510	0.094	1.133
3.1	30.6	0.002	0.04	6.107	0.361	0.361	5.127	0.134	1.849	1.715	1.354	1.669	1.535	0.180	1.266
4.6	43.8	0.003	0.05	6.108	0.516	0.516	5.180	0.187	2.004	1.817	1.301	1.746	1.559	0.258	1.397
6.2	55.3	0.006	0.10	6.111	0.651	0.651	5.224	0.232	2.139	1.907	1.256	1.813	1.581	0.326	1.519
7.7	65.1	0.007	0.12	6.112	0.766	0.766	5.264	0.271	2.253	1.982	1.216	1.870	1.599	0.383	1.630
9.3	72.7	0.008	0.14	6.113	0.856	0.856	5.297	0.305	2.343	2.038	1.182	1.915	1.610	0.428	1.724
10.8	78.8	0.009	0.16	6.115	0.928	0.928	5.328	0.336	2.415	2.079	1.151	1.951	1.615	0.464	1.806
12.4	83.6	0.011	0.19	6.116	0.984	0.983	5.356	0.364	2.470	2.107	1.123	1.979	1.615	0.492	1.875
13.9	87.1	0.013	0.22	6.118	1.025	1.024	5.380	0.387	2.511	2.124	1.100	1.999	1.612	0.512	1.931
15.5	90.1	0.014	0.24	6.120	1.060	1.060	5.402	0.409	2.546	2.137	1.077	2.017	1.607	0.530	1.984
17.0	92.9	0.015	0.26	6.121	1.092	1.092	5.422	0.430	2.578	2.148	1.057	2.032	1.603	0.546	2.033
18.6	95.0	0.017	0.29	6.123	1.117	1.117	5.441	0.448	2.603	2.155	1.038	2.045	1.597	0.558	2.075
20.1	97.1	0.019	0.32	6.125	1.141	1.140	5.458	0.465	2.626	2.161	1.021	2.056	1.591	0.570	2.117
21.7	98.9	0.020	0.34	6.126	1.163	1.162	5.475	0.482	2.648	2.166	1.004	2.067	1.585	0.581	2.157
23.2	100.7	0.021	0.36	6.127	1.183	1.183	5.490	0.497	2.669	2.171	0.989	2.077	1.580	0.591	2.196
24.7	102.3	0.023	0.40	6.129	1.202	1.201	5.503	0.511	2.686	2.176	0.975	2.086	1.575	0.600	2.231
26.3	103.9	0.024	0.42	6.131	1.220	1.219	5.516	0.524	2.705	2.181	0.962	2.095	1.571	0.610	2.267
27.8	105.4	0.025	0.43	6.131	1.238	1.237	5.528	0.536	2.722	2.187	0.950	2.104	1.568	0.618	2.302
29.4	106.9	0.027	0.46	6.133	1.256	1.254	5.540	0.547	2.740	2.193	0.938	2.113	1.566	0.627	2.337
30.9	108.5	0.028	0.48	6.135	1.273	1.272	5.550	0.558	2.757	2.199	0.928	2.121	1.564	0.636	2.371
32.5	109.9	0.030	0.51	6.136	1.290	1.288	5.564	0.571	2.776	2.205	0.917	2.132	1.561	0.644	2.404
34.0	111.3	0.031	0.53	6.138	1.305	1.304	5.572	0.580	2.792	2.212	0.908	2.140	1.560	0.652	2.437
35.6	112.6	0.032	0.56	6.139	1.320	1.319	5.581	0.589	2.807	2.218	0.899	2.147	1.559	0.659	2.467
37.1	113.7	0.034	0.58	6.141	1.333	1.332	5.589	0.597	2.820	2.223	0.891	2.154	1.557	0.666	2.495
38.7	114.9	0.035	0.60	6.142	1.347	1.346	5.597	0.605	2.834	2.229	0.883	2.161	1.556	0.673	2.524
40.2	116.3	0.037	0.64	6.144	1.362	1.361	5.604	0.612	2.848	2.237	0.876	2.168	1.556	0.680	2.553
41.8	117.5	0.038	0.66	6.145	1.376	1.375	5.611	0.619	2.862	2.244	0.869	2.175	1.557	0.687	2.581
43.3	118.8	0.039	0.68	6.147	1.392	1.390	5.618	0.626	2.877	2.252	0.862	2.182	1.557	0.695	2.613
44.8	119.8	0.041	0.71	6.149	1.403	1.401	5.624	0.631	2.889	2.257	0.856	2.188	1.557	0.701	2.636
46.4	120.7	0.043	0.73	6.150	1.413	1.411	5.629	0.637	2.899	2.262	0.851	2.193	1.556	0.706	2.659
47.9	121.7	0.044	0.76	6.152	1.425	1.423	5.634	0.641	2.910	2.269	0.846	2.199	1.557	0.711	2.682
49.5	122.8	0.045	0.78	6.153	1.437	1.435	5.639	0.646	2.922	2.276	0.841	2.205	1.558	0.717	2.706
51.0	123.7	0.047	0.81	6.155	1.447	1.445	5.644	0.651	2.932	2.281	0.836	2.210	1.559	0.723	2.728
57.2	127.3	0.052	0.90	6.160	1.488	1.486	5.659	0.666	2.972	2.306	0.820	2.230	1.563	0.743	2.812
63.4	130.9	0.059	1.01	6.167	1.528	1.526	5.672	0.679	3.012	2.333	0.808	2.249	1.570	0.763	2.889
69.6	134.4	0.064	1.10	6.173	1.568	1.565	5.681	0.688	3.051	2.363	0.798	2.269	1.580	0.782	2.961
75.8	137.5	0.070	1.21	6.180	1.602	1.599	5.692	0.699	3.089	2.390	0.791	2.290	1.590	0.800	3.023
82.0	140.8	0.076	1.31	6.186	1.639	1.636	5.698	0.705	3.125	2.420	0.785	2.308	1.603	0.818	3.085

Project: 175668043			Source: KIF-GT-TW05-ST01, 39.7'-40.2'								Lab ID: 12		Test ID		
Test Time (min)	Corr. Axial Load (lbf)	Axial Deform. (in)	Axial Strain (%)	Corr. Area (in^2)	Deviator Stress (tsf)	Corr. Deviator Stress (tsf)	Pore Pressure (tsf)	Induced Pore Pressure (tsf)	σ_1 (tsf)	σ_1' (tsf)	σ_3' (tsf)	p (tsf)	p' (tsf)	q (tsf)	Eff. Princ. Stress Ratio σ_1'/σ_3'
88.2	144.2	0.082	1.41	6.192	1.676	1.673	5.701	0.709	3.162	2.454	0.781	2.326	1.617	0.836	3.142
94.4	147.4	0.088	1.51	6.198	1.712	1.709	5.704	0.712	3.198	2.487	0.778	2.344	1.632	0.854	3.196
100.5	150.7	0.093	1.60	6.204	1.749	1.745	5.705	0.712	3.234	2.522	0.777	2.362	1.649	0.872	3.245
106.7	153.3	0.099	1.70	6.211	1.777	1.773	5.705	0.712	3.262	2.549	0.776	2.375	1.663	0.887	3.284
112.9	156.5	0.105	1.81	6.217	1.813	1.808	5.704	0.711	3.297	2.586	0.777	2.393	1.681	0.904	3.327
119.1	159.7	0.111	1.91	6.224	1.848	1.843	5.703	0.710	3.332	2.622	0.778	2.410	1.700	0.922	3.368
125.3	162.3	0.117	2.01	6.230	1.876	1.871	5.701	0.708	3.360	2.651	0.780	2.424	1.716	0.936	3.398
131.5	165.7	0.123	2.11	6.237	1.913	1.908	5.698	0.705	3.396	2.691	0.783	2.442	1.737	0.954	3.437
137.7	168.8	0.128	2.21	6.243	1.947	1.942	5.695	0.702	3.430	2.728	0.786	2.459	1.757	0.971	3.470
143.8	171.5	0.134	2.31	6.249	1.976	1.970	5.691	0.698	3.458	2.760	0.790	2.473	1.775	0.985	3.494
150.0	174.4	0.140	2.41	6.255	2.008	2.002	5.687	0.694	3.489	2.796	0.794	2.489	1.795	1.001	3.522
156.2	177.3	0.146	2.51	6.262	2.039	2.032	5.682	0.689	3.520	2.830	0.798	2.503	1.814	1.016	3.547
162.4	180.1	0.152	2.61	6.269	2.068	2.062	5.677	0.684	3.549	2.865	0.803	2.518	1.834	1.031	3.569
168.6	182.9	0.157	2.70	6.275	2.098	2.092	5.672	0.679	3.579	2.899	0.807	2.533	1.853	1.046	3.591
174.8	185.9	0.162	2.80	6.281	2.131	2.124	5.666	0.674	3.610	2.937	0.813	2.549	1.875	1.062	3.612
181.0	188.3	0.168	2.90	6.287	2.157	2.149	5.661	0.668	3.636	2.967	0.818	2.561	1.893	1.075	3.628
187.1	191.1	0.174	3.00	6.294	2.187	2.179	5.655	0.663	3.665	3.003	0.824	2.576	1.913	1.090	3.646
193.3	194.0	0.180	3.11	6.301	2.216	2.209	5.649	0.656	3.695	3.038	0.830	2.590	1.934	1.104	3.662
199.5	196.9	0.186	3.21	6.307	2.247	2.240	5.643	0.650	3.725	3.075	0.836	2.605	1.955	1.120	3.680
205.7	199.6	0.191	3.29	6.313	2.276	2.268	5.636	0.644	3.753	3.109	0.841	2.619	1.975	1.134	3.696
211.9	202.6	0.197	3.39	6.319	2.308	2.300	5.629	0.636	3.784	3.148	0.848	2.634	1.998	1.150	3.711
218.1	205.3	0.203	3.50	6.326	2.336	2.327	5.623	0.630	3.812	3.182	0.855	2.648	2.018	1.164	3.724
224.3	207.4	0.209	3.60	6.333	2.357	2.348	5.616	0.623	3.833	3.210	0.861	2.659	2.036	1.174	3.726
230.5	210.5	0.215	3.70	6.340	2.391	2.382	5.608	0.616	3.866	3.250	0.868	2.675	2.059	1.191	3.743
236.7	213.4	0.220	3.79	6.346	2.421	2.411	5.602	0.609	3.896	3.287	0.875	2.690	2.081	1.206	3.755
242.8	216.0	0.227	3.90	6.353	2.448	2.439	5.595	0.602	3.923	3.321	0.882	2.704	2.101	1.219	3.764
249.0	219.0	0.232	3.99	6.359	2.480	2.470	5.587	0.595	3.954	3.359	0.889	2.719	2.124	1.235	3.779
255.2	221.3	0.238	4.09	6.365	2.503	2.493	5.586	0.593	3.983	3.389	0.897	2.736	2.143	1.246	3.780
261.4	223.6	0.244	4.20	6.373	2.527	2.516	5.579	0.586	4.006	3.420	0.904	2.748	2.162	1.258	3.785
267.6	226.1	0.250	4.30	6.379	2.551	2.541	5.571	0.578	4.030	3.452	0.911	2.760	2.182	1.270	3.788
273.8	228.9	0.255	4.40	6.386	2.580	2.569	5.564	0.571	4.059	3.487	0.918	2.774	2.203	1.285	3.799
280.0	231.1	0.262	4.50	6.393	2.603	2.592	5.556	0.564	4.081	3.517	0.926	2.786	2.222	1.296	3.799
286.1	233.6	0.267	4.60	6.400	2.628	2.616	5.548	0.556	4.106	3.550	0.933	2.798	2.242	1.308	3.803
292.3	236.9	0.273	4.70	6.406	2.663	2.651	5.542	0.549	4.141	3.592	0.941	2.815	2.266	1.325	3.818
298.5	239.7	0.279	4.80	6.413	2.691	2.679	5.535	0.542	4.169	3.627	0.948	2.830	2.288	1.340	3.827
314.0	245.1	0.293	5.05	6.430	2.744	2.732	5.516	0.524	4.222	3.699	0.967	2.856	2.333	1.366	3.825
329.5	251.2	0.308	5.30	6.447	2.805	2.792	5.497	0.505	4.284	3.779	0.987	2.888	2.383	1.396	3.828
344.9	257.5	0.322	5.54	6.463	2.868	2.855	5.476	0.484	4.347	3.863	1.008	2.920	2.436	1.427	3.831
360.4	262.8	0.337	5.80	6.481	2.920	2.906	5.456	0.464	4.398	3.935	1.029	2.945	2.482	1.453	3.824
375.9	268.3	0.352	6.05	6.498	2.973	2.958	5.435	0.442	4.451	4.008	1.050	2.972	2.529	1.479	3.817
391.3	274.0	0.366	6.29	6.515	3.028	3.012	5.415	0.423	4.505	4.082	1.070	2.999	2.576	1.506	3.815
406.8	279.9	0.381	6.55	6.533	3.084	3.068	5.394	0.402	4.560	4.158	1.091	3.026	2.624	1.534	3.813
422.3	285.0	0.394	6.79	6.550	3.133	3.116	5.375	0.382	4.609	4.226	1.110	3.051	2.668	1.558	3.806
437.7	290.6	0.409	7.05	6.568	3.185	3.168	5.355	0.362	4.661	4.298	1.130	3.077	2.714	1.584	3.803
453.2	296.5	0.424	7.30	6.586	3.242	3.224	5.335	0.342	4.715	4.373	1.149	3.103	2.761	1.612	3.805
468.7	301.7	0.438	7.55	6.603	3.290	3.271	5.315	0.323	4.763	4.440	1.169	3.127	2.804	1.636	3.799
484.1	306.2	0.453	7.80	6.621	3.330	3.310	5.296	0.304	4.802	4.498	1.188	3.147	2.843	1.655	3.787
499.6	310.5	0.468	8.05	6.639	3.367	3.347	5.277	0.285	4.838	4.554	1.207	3.165	2.880	1.674	3.774
515.1	315.6	0.482	8.30	6.658	3.413	3.392	5.259	0.266	4.883	4.617	1.225	3.187	2.921	1.696	3.770
530.5	320.4	0.497	8.55	6.676	3.456	3.435	5.241	0.248	4.926	4.677	1.243	3.209	2.960	1.717	3.764
546.0	324.4	0.511	8.81	6.694	3.489	3.467	5.223	0.230	4.957	4.727	1.260	3.224	2.994	1.733	3.751
561.5	328.8	0.526	9.05	6.712	3.527	3.505	5.205	0.213	4.995	4.783	1.278	3.243	3.030	1.752	3.743
576.9	332.8	0.540	9.29	6.731	3.560	3.537	5.188	0.195	5.028	4.832	1.295	3.259	3.064	1.769	3.731
592.4	336.1	0.555	9.55	6.750	3.585	3.562	5.171	0.178	5.051	4.873	1.311	3.270	3.092	1.781	3.717
607.9	340.1	0.569	9.80	6.768	3.618	3.594	5.154	0.162	5.083	4.921	1.327	3.286	3.124	1.797	3.707
623.3	343.8	0.584	10.05	6.787	3.647	3.622	5.139	0.147	5.112	4.965	1.343	3.300	3.154	1.811	3.697
638.8	348.0	0.598	10.29	6.806	3.682	3.656	5.124	0.131	5.145	5.014	1.358	3.317	3.186	1.828	3.693
654.3	351.0	0.613	10.56	6.825	3.703	3.677	5.109	0.116	5.166	5.050	1.373	3.327	3.211	1.838	3.678
669.7	354.2	0.627	10.80	6.844	3.726	3.699	5.094	0.101	5.188	5.087	1.388	3.339	3.237	1.849	3.665
685.2	357.1	0.642	11.06	6.864	3.746	3.719	5.079	0.087	5.207	5.120	1.402	3.348	3.261	1.859	3.653
700.7	359.4	0.656	11.30	6.883	3.760	3.732	5.066	0.074	5.220	5.146	1.415	3.354	3.280	1.866	3.638
716.1	362.2	0.670	11.54	6.902	3.779	3.750	5.053	0.060	5.238	5.178	1.427	3.363	3.303	1.875	3.627
731.6	365.0	0.686	11.81	6.922	3.797	3.767	5.040	0.047	5.254	5.207	1.440	3.371	3.324	1.884	3.616
747.1	368.8	0.700	12.05	6.942	3.826	3.796	5.027	0.035	5.283	5.248	1.452	3.385	3.350	1.898	3.614
762.5	371.3	0.714	12.30	6.961	3.840	3.810	5.014	0.022	5.296	5.274	1.464	3.391	3.369	1.905	3.602
778.0	373.6	0.729	12.55	6.981	3.853	3.822	5.003	0.010	5.308	5.298	1.476	3.397	3.387	1.911	3.590
793.5	375.7	0.744	12.81	7.002	3.864	3.832	4.992	-0.001	5.317	5.318	1.486	3.401	3.402	1.916	3.578
808.9	378.2	0.758	13.05	7.021	3.878	3.845	4.981	-0.012	5.331	5.343	1.497	3.408	3.420	1.923	3.568
824.4	380.6	0.773	13.31	7.042	3.892	3.859	4.971	-0.022	5.344	5.366	1.507	3.414	3.436	1.929	3.561

Project: 175668043			Source: KIF-GT-TW05-ST01, 39.7'-40.2'								Lab ID: 12		Test ID		
Test Time (min)	Corr. Axial Load (lbf)	Axial Deform. (in)	Axial Strain (%)	Corr. Area (in^2)	Deviator Stress (tsf)	Corr. Deviator Stress (tsf)	Pore Pressure (tsf)	Induced Pore Pressure (tsf)	σ_1 (tsf)	σ_1' (tsf)	σ_3' (tsf)	p (tsf)	p' (tsf)	q (tsf)	Eff. Princ. Stress Ratio σ_1'/σ_3'
839.9	383.4	0.787	13.55	7.062	3.909	3.875	4.960	-0.032	5.360	5.392	1.517	3.422	3.455	1.938	3.555
855.3	385.7	0.802	13.81	7.083	3.921	3.887	4.950	-0.043	5.371	5.414	1.527	3.428	3.470	1.943	3.546
870.8	387.8	0.816	14.06	7.104	3.930	3.896	4.938	-0.054	5.378	5.432	1.536	3.430	3.484	1.948	3.536
886.3	389.7	0.831	14.31	7.124	3.939	3.903	4.927	-0.065	5.384	5.449	1.546	3.432	3.498	1.952	3.524
901.7	390.8	0.846	14.57	7.146	3.937	3.901	4.916	-0.076	5.380	5.456	1.555	3.430	3.506	1.950	3.508
917.2	393.6	0.860	14.80	7.166	3.955	3.918	4.888	-0.105	5.377	5.482	1.564	3.418	3.523	1.959	3.505
932.7	395.9	0.875	15.07	7.188	3.966	3.928	4.874	-0.118	5.383	5.501	1.573	3.419	3.537	1.964	3.498
948.1	398.2	0.889	15.31	7.209	3.977	3.939	4.857	-0.136	5.384	5.520	1.581	3.415	3.551	1.969	3.491
963.6	400.7	0.904	15.56	7.230	3.990	3.952	4.847	-0.145	5.397	5.542	1.590	3.421	3.566	1.976	3.485
979.1	402.2	0.918	15.81	7.251	3.993	3.954	4.834	-0.159	5.393	5.552	1.598	3.416	3.575	1.977	3.475
994.5	404.3	0.933	16.06	7.273	4.002	3.962	4.823	-0.169	5.399	5.568	1.606	3.418	3.587	1.981	3.467
1010.0	406.0	0.947	16.31	7.295	4.007	3.966	4.816	-0.177	5.403	5.580	1.613	3.420	3.597	1.983	3.458
1025.5	408.7	0.962	16.56	7.317	4.022	3.980	4.809	-0.183	5.418	5.601	1.621	3.428	3.611	1.990	3.456
1040.9	410.8	0.977	16.82	7.339	4.030	3.988	4.809	-0.183	5.433	5.617	1.629	3.439	3.623	1.994	3.449
1040.9	410.5	0.977	16.82	7.339	4.028	3.986	4.809	-0.184	5.431	5.615	1.629	3.438	3.622	1.993	3.447

ATTACHMENT F.5

Phase 1 Hydraulic Conductivity Testing Results

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

ASTM D 5084, Method C

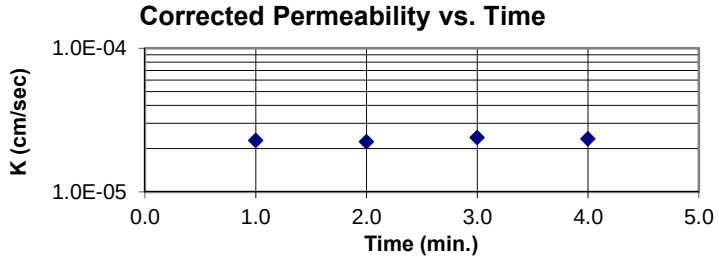
Project Name	KIF TDEC Order			Project No.	175668043
Source	KIF-GT-TW01, ST02, 24.6'-24.9'			Test ID	27
Description	Silt (ML), gray, moist, firm			Prepared By	KG
		Specific Gravity	2.34 ASTM D854, Dry	Date	4-23-19
Specimen	Undisturbed	LL	NP		
Preparation	Trimmed in a trimming ring	PL	NP	Maximum Dry Density (pcf)	
Permeant	De-aired Tap Water	PI	NP	Percent of Maximum	

Specimens (if compacted) were compacted in a Proctor Mold as follows: The Maximum Dry Density was converted to Wet Density, this mass was divided by 4 (layers) and 3 of the 4 layers were compacted into the mold using a Proctor Hammer using 19 blows per layer. The density was varied by reducing the height of the drop by the amount listed beside "Compacted".

The specimen was trimmed from the bottom two layers.

	Initial Specimen Data	After Consolidation Data	After Test Data	Final Pressures (psi)			
Height (in.)	1.4579	1.4593	1.4517	Chamber	35		
Diameter (in.)	2.7975		2.7898	Influent	20.1		
Moisture Content (%)	31.5		31.6	Effluent	20	Applied Head Difference (psi)	0.1
Dry Unit Weight (pcf)	82.6		83.4			Back Pressure Saturated to (psi)	20
Void Ratio	0.769		0.752			Maximum Effective Consolidation Stress (psi)	15
Degree of Saturation (%)	95.7		98.2			Minimum Effective Consolidation Stress (psi)	14.9

						Hydraulic Conductivity			
Date	Clock (24H:M)	Temp. (°F)	Bottom Head (in)	Top Head (in)	Test Time (sec)	k (m/s)	k (cm/s)	k @ 20° C (m/s)	k @ 20° C (cm/s)
4-26-19	13:04	70.0	21.39	3.67	0	---	---	---	---
4-26-19	13:05	70.0	21.15	3.91	6.00E+01	2.3E-07	2.3E-05	2.3E-07	2.3E-05
4-26-19	13:06	70.0	20.92	4.14	6.00E+01	2.3E-07	2.3E-05	2.2E-07	2.2E-05
4-26-19	13:07	70.0	20.68	4.38	6.00E+01	2.4E-07	2.4E-05	2.4E-07	2.4E-05
4-26-19	13:08	70.0	20.45	4.61	6.00E+01	2.4E-07	2.4E-05	2.3E-07	2.3E-05



A gradient of approximately 1.9 was used for this test.

Average Hydraulic Conductivity @ 20° C (last 4 determinations)	m/s	2.31E-07	cm/s	2.31E-05
Average Hydraulic Conductivity @ 20° C (last run)	m/s	2.31E-07	cm/s	2.31E-05

Comments

Reviewed By KG

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

ASTM D 5084, Method C

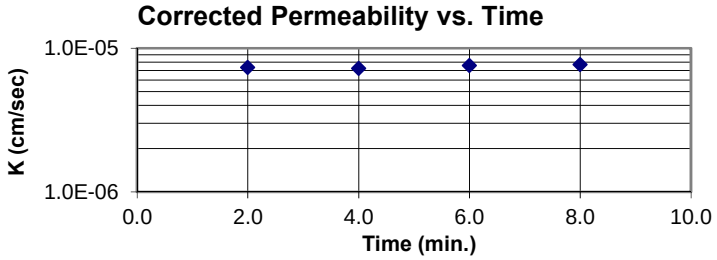
Project Name	KIF TDEC Order			Project No.	175668043
Source	KIF-GT-TW01-ST03, 42.4'-42.7'			Test ID	37
Description	Silt (ML), gray, moist, firm			Prepared By	KG
		Specific Gravity	2.33 ASTM D854, Dry	Date	4-24-19
Specimen	Undisturbed	LL	NP		
Preparation	Trimmed in a trimming ring	PL	NP	Maximum Dry Density (pcf)	
Permeant	De-aired Tap Water	PI	NP	Percent of Maximum	

Specimens (if compacted) were compacted in a Proctor Mold as follows: The Maximum Dry Density was converted to Wet Density, this mass was divided by 4 (layers) and 3 of the 4 layers were compacted into the mold using a Proctor Hammer using 19 blows per layer. The density was varied by reducing the height of the drop by the amount listed beside "Compacted".

The specimen was trimmed from the bottom two layers.

	Initial Specimen Data	After Consolidation Data	After Test Data	Final Pressures (psi)			
Height (in.)	1.4578	1.4382	1.4454	Chamber	40		
Diameter (in.)	2.7975		2.7945	Influent	20.1		
Moisture Content (%)	28.6		27.5	Effluent	20	Applied Head Difference (psi)	0.1
Dry Unit Weight (pcf)	88.5		89.4			Back Pressure Saturated to (psi)	20
Void Ratio	0.645		0.627			Maximum Effective Consolidation Stress (psi)	20
Degree of Saturation (%)	103.4		102.2			Minimum Effective Consolidation Stress (psi)	19.9

						Hydraulic Conductivity			
Date	Clock (24H:M)	Temp. (°F)	Bottom Head (in)	Top Head (in)	Test Time (sec)	k (m/s)	k (cm/s)	k @ 20° C (m/s)	k @ 20° C (cm/s)
4-30-19	13:30	71.0	21.64	3.84	0	---	---	---	---
4-30-19	13:32	71.0	21.49	4.01	1.20E+02	7.6E-08	7.6E-06	7.3E-08	7.3E-06
4-30-19	13:34	71.0	21.34	4.17	1.20E+02	7.5E-08	7.5E-06	7.2E-08	7.2E-06
4-30-19	13:36	71.0	21.18	4.33	1.20E+02	7.9E-08	7.9E-06	7.6E-08	7.6E-06
4-30-19	13:38	71.0	21.02	4.49	1.20E+02	8.0E-08	8.0E-06	7.7E-08	7.7E-06



A gradient of approximately 1.9 was used for this test.

Average Hydraulic Conductivity @ 20° C (last 4 determinations)	m/s	7.45E-08	cm/s	7.45E-06
Average Hydraulic Conductivity @ 20° C (last run)	m/s	7.45E-08	cm/s	7.45E-06

Comments

Reviewed By KG

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

ASTM D 5084, Method C

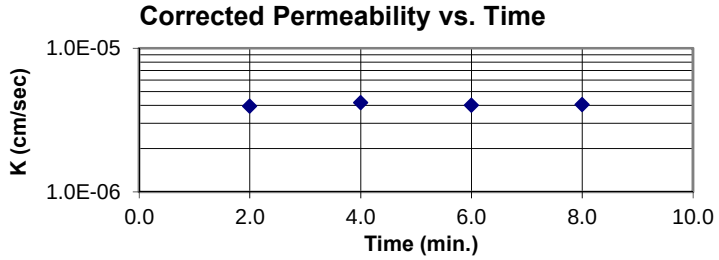
Project Name	KIF TDEC Order			Project No.	175668043
Source	KIF-GT-TW02-ST01, 21.5'-21.8'			Test ID	50
Description	Silt (ML), gray, moist, firm			Prepared By	KG
		Specific Gravity	2.31 ASTM D854, Dry	Date	4-24-19
Specimen	Undisturbed	LL	NP		
Preparation	Trimmed in a trimming ring	PL	NP	Maximum Dry Density (pcf)	
Permeant	De-aired Tap Water	PI	NP	Percent of Maximum	

Specimens (if compacted) were compacted in a Proctor Mold as follows: The Maximum Dry Density was converted to Wet Density, this mass was divided by 4 (layers) and 3 of the 4 layers were compacted into the mold using a Proctor Hammer using 19 blows per layer. The density was varied by reducing the height of the drop by the amount listed beside "Compacted".

The specimen was trimmed from the bottom two layers.

	Initial Specimen Data	After Consolidation Data	After Test Data	Final Pressures (psi)			
Height (in.)	1.4579	1.4382	1.4356	Chamber	40		
Diameter (in.)	2.7975		2.8078	Influent	20.2		
Moisture Content (%)	34.3		32.1	Effluent	20	Applied Head Difference (psi)	0.2
Dry Unit Weight (pcf)	82.0		82.6			Back Pressure Saturated to (psi)	20
Void Ratio	0.759		0.745			Maximum Effective Consolidation Stress (psi)	20
Degree of Saturation (%)	104.4		99.4			Minimum Effective Consolidation Stress (psi)	19.8

						Hydraulic Conductivity			
Date	Clock (24H:M)	Temp. (°F)	Bottom Head (in)	Top Head (in)	Test Time (sec)	k (m/s)	k (cm/s)	k @ 20° C (m/s)	k @ 20° C (cm/s)
4-30-19	12:47	71.0	21.91	3.63	0	---	---	---	---
4-30-19	12:49	71.0	21.81	3.73	1.20E+02	4.1E-08	4.1E-06	3.9E-08	3.9E-06
4-30-19	12:51	71.0	21.71	3.84	1.20E+02	4.4E-08	4.4E-06	4.2E-08	4.2E-06
4-30-19	12:53	71.0	21.61	3.94	1.20E+02	4.2E-08	4.2E-06	4.0E-08	4.0E-06
4-30-19	12:55	71.0	21.51	4.04	1.20E+02	4.2E-08	4.2E-06	4.1E-08	4.1E-06



A gradient of approximately 3.8 was used for this test.

Average Hydraulic Conductivity @ 20° C (last 4 determinations)	m/s	4.05E-08	cm/s	4.05E-06
Average Hydraulic Conductivity @ 20° C (last run)	m/s	4.05E-08	cm/s	4.05E-06

Comments

Reviewed By KG

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

ASTM D 5084, Method C

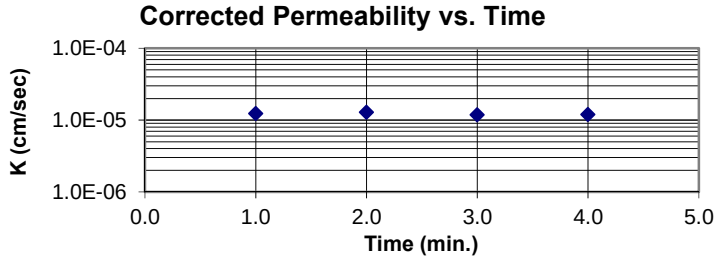
Project Name	KIF TDEC Order			Project No.	175668043
Source	KIF-GT-TW02-ST02, 44.8'-45.1'			Test ID	65
Description	Silt with Sand (ML), gray, moist, firm			Prepared By	KG
		Specific Gravity	2.32 ASTM D854, Dry	Date	4-23-19
Specimen	Undisturbed	LL	NP		
Preparation	Trimmed in a trimming ring	PL	NP	Maximum Dry Density (pcf)	
Permeant	De-aired Tap Water	PI	NP	Percent of Maximum	

Specimens (if compacted) were compacted in a Proctor Mold as follows: The Maximum Dry Density was converted to Wet Density, this mass was divided by 4 (layers) and 3 of the 4 layers were compacted into the mold using a Proctor Hammer using 19 blows per layer. The density was varied by reducing the height of the drop by the amount listed beside "Compacted".

The specimen was trimmed from the bottom two layers.

	Initial Specimen Data	After Consolidation Data	After Test Data	Final Pressures (psi)			
Height (in.)	1.4579	1.4161	1.4198	Chamber	45		
Diameter (in.)	2.7975		2.7993	Influent	20.2		
Moisture Content (%)	39.9		36.6	Effluent	20	Applied Head Difference (psi)	0.2
Dry Unit Weight (pcf)	75.8		77.7			Back Pressure Saturated to (psi)	20
Void Ratio	0.912		0.864			Maximum Effective Consolidation Stress (psi)	25
Degree of Saturation (%)	101.5		98.4			Minimum Effective Consolidation Stress (psi)	24.8

						Hydraulic Conductivity			
Date	Clock (24H:M)	Temp. (°F)	Bottom Head (in)	Top Head (in)	Test Time (sec)	k (m/s)	k (cm/s)	k @ 20° C (m/s)	k @ 20° C (cm/s)
5-1-19	11:04	70.0	21.55	4.15	0	---	---	---	---
5-1-19	11:05	70.0	21.41	4.31	6.00E+01	1.3E-07	1.3E-05	1.2E-07	1.2E-05
5-1-19	11:06	70.0	21.24	4.45	6.00E+01	1.3E-07	1.3E-05	1.3E-07	1.3E-05
5-1-19	11:07	70.0	21.10	4.59	6.00E+01	1.2E-07	1.2E-05	1.2E-07	1.2E-05
5-1-19	11:08	70.0	20.96	4.73	6.00E+01	1.2E-07	1.2E-05	1.2E-07	1.2E-05



A gradient of approximately 3.8 was used for this test.

Average Hydraulic Conductivity @ 20° C (last 4 determinations)	m/s	1.22E-07	cm/s	1.22E-05
Average Hydraulic Conductivity @ 20° C (last run)	m/s	1.22E-07	cm/s	1.22E-05

Comments

Reviewed By KG

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

ASTM D 5084, Method C

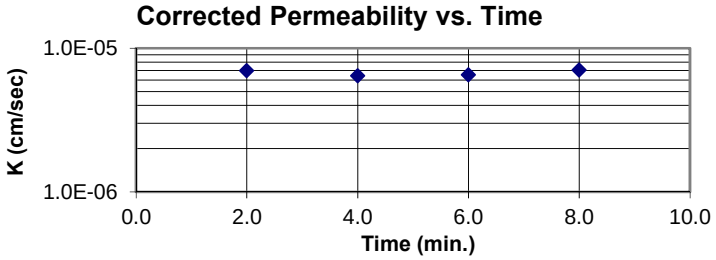
Project Name	KIF TDEC Order			Project No.	175668043
Source	KIF-GT-TW03-ST01, 21.7'-22.0'			Test ID	78
Description	Sandy Silt (ML), gray, moist, firm			Prepared By	KG
		Specific Gravity	2.21 ASTM D854, Dry	Date	4-24-19
Specimen	Undisturbed	LL	NP		
Preparation	Trimmed in a trimming ring	PL	NP	Maximum Dry Density (pcf)	
Permeant	De-aired Tap Water	PI	NP	Percent of Maximum	

Specimens (if compacted) were compacted in a Proctor Mold as follows: The Maximum Dry Density was converted to Wet Density, this mass was divided by 4 (layers) and 3 of the 4 layers were compacted into the mold using a Proctor Hammer using 19 blows per layer. The density was varied by reducing the height of the drop by the amount listed beside "Compacted".

The specimen was trimmed from the bottom two layers.

	Initial Specimen Data	After Consolidation Data	After Test Data	Final Pressures (psi)			
Height (in.)	1.4579	1.4454	1.4460	Chamber	45		
Diameter (in.)	2.7975		2.7891	Influent	20.2		
Moisture Content (%)	30.0		28.7	Effluent	20	Applied Head Difference (psi)	0.2
Dry Unit Weight (pcf)	85.8		87.1			Back Pressure Saturated to (psi)	20
Void Ratio	0.607		0.585			Maximum Effective Consolidation Stress (psi)	25
Degree of Saturation (%)	109.1		108.4			Minimum Effective Consolidation Stress (psi)	24.8

						Hydraulic Conductivity			
Date	Clock (24H:M)	Temp. (°F)	Bottom Head (in)	Top Head (in)	Test Time (sec)	k (m/s)	k (cm/s)	k @ 20° C (m/s)	k @ 20° C (cm/s)
5-1-19	11:22	70.0	21.29	3.97	0	---	---	---	---
5-1-19	11:24	70.0	21.12	4.13	1.20E+02	7.2E-08	7.2E-06	7.0E-08	7.0E-06
5-1-19	11:26	70.0	20.96	4.27	1.20E+02	6.6E-08	6.6E-06	6.4E-08	6.4E-06
5-1-19	11:28	70.0	20.80	4.41	1.20E+02	6.7E-08	6.7E-06	6.5E-08	6.5E-06
5-1-19	11:30	70.0	20.64	4.57	1.20E+02	7.2E-08	7.2E-06	7.0E-08	7.0E-06



A gradient of approximately 3.8 was used for this test.

Average Hydraulic Conductivity @ 20° C (last 4 determinations)	m/s	6.74E-08	cm/s	6.74E-06
Average Hydraulic Conductivity @ 20° C (last run)	m/s	6.74E-08	cm/s	6.74E-06

Comments

Reviewed By KG

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

ASTM D 5084, Method C

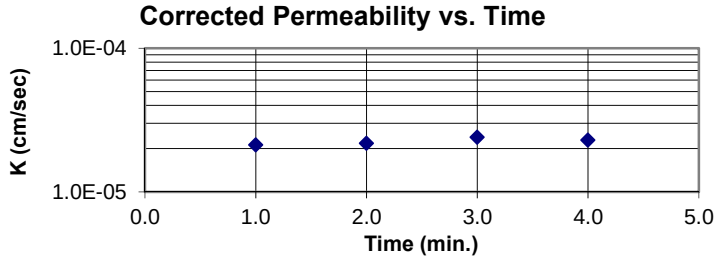
Project Name	KIF TDEC Order			Project No.	175668043
Source	KIF-GT-TW03-ST02, 46.3'-46.6'			Test ID	90
Description	Silt (ML), gray, wet, soft			Prepared By	KG
		Specific Gravity	2.29 ASTM D854, Dry	Date	5-2-19
Specimen	Undisturbed	LL	NP		
Preparation	Trimmed in a trimming ring	PL	NP	Maximum Dry Density (pcf)	
Permeant	De-aired Tap Water	PI	NP	Percent of Maximum	

Specimens (if compacted) were compacted in a Proctor Mold as follows: The Maximum Dry Density was converted to Wet Density, this mass was divided by 4 (layers) and 3 of the 4 layers were compacted into the mold using a Proctor Hammer using 19 blows per layer. The density was varied by reducing the height of the drop by the amount listed beside "Compacted".

The specimen was trimmed from the bottom two layers.

	Initial Specimen Data	After Consolidation Data	After Test Data	Final Pressures (psi)			
Height (in.)	1.4579	1.3747	1.3946	Chamber	50		
Diameter (in.)	2.7975		2.8322	Influent	20.2		
Moisture Content (%)	42.8		39.6	Effluent	20	Applied Head Difference (psi)	0.2
Dry Unit Weight (pcf)	72.1		73.6			Back Pressure Saturated to (psi)	20
Void Ratio	0.982		0.943			Maximum Effective Consolidation Stress (psi)	30
Degree of Saturation (%)	100.0		96.1			Minimum Effective Consolidation Stress (psi)	29.8

						Hydraulic Conductivity			
Date	Clock (24H:M)	Temp. (°F)	Bottom Head (in)	Top Head (in)	Test Time (sec)	k (m/s)	k (cm/s)	k @ 20° C (m/s)	k @ 20° C (cm/s)
5-10-19	15:25	70.0	21.42	4.21	0	---	---	---	---
5-10-19	15:26	70.0	21.16	4.49	6.00E+01	2.2E-07	2.2E-05	2.1E-07	2.1E-05
5-10-19	15:27	70.0	20.87	4.74	6.00E+01	2.2E-07	2.2E-05	2.2E-07	2.2E-05
5-10-19	15:28	70.0	20.60	5.05	6.00E+01	2.5E-07	2.5E-05	2.4E-07	2.4E-05
5-10-19	15:29	70.0	20.32	5.31	6.00E+01	2.4E-07	2.4E-05	2.3E-07	2.3E-05



A gradient of approximately 3.8 was used for this test.

Average Hydraulic Conductivity @ 20° C (last 4 determinations)	m/s	2.25E-07	cm/s	2.25E-05
Average Hydraulic Conductivity @ 20° C (last run)	m/s	2.25E-07	cm/s	2.25E-05

Comments

Reviewed By KG

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

ASTM D 5084, Method C

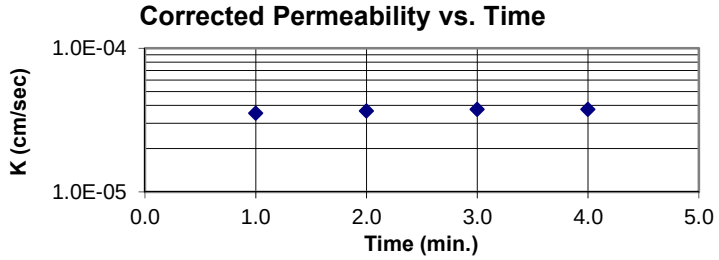
Project Name	KIF TDEC Order			Project No.	175668043
Source	KIF-GT-TW04-ST01, 25.5'-25.7'			Test ID	104
Description	Sandy Silt (ML), black, moist, firm			Prepared By	KG
		Specific Gravity	2.4 ASTM D854, Dry	Date	5-2-19
Specimen	Undisturbed	LL	NP		
Preparation	Trimmed in a trimming ring	PL	NP	Maximum Dry Density (pcf)	
Permeant	De-aired Tap Water	PI	NP	Percent of Maximum	

Specimens (if compacted) were compacted in a Proctor Mold as follows: The Maximum Dry Density was converted to Wet Density, this mass was divided by 4 (layers) and 3 of the 4 layers were compacted into the mold using a Proctor Hammer using 19 blows per layer. The density was varied by reducing the height of the drop by the amount listed beside "Compacted".

The specimen was trimmed from the bottom two layers.

	Initial Specimen Data	After Consolidation Data	After Test Data	Final Pressures (psi)			
Height (in.)	1.4579	1.4117	1.4144	Chamber	50		
Diameter (in.)	2.7975		2.7803	Influent	20.2		
Moisture Content (%)	45.4		55.5	Effluent	20	Applied Head Difference (psi)	0.2
Dry Unit Weight (pcf)	61.7		64.4			Back Pressure Saturated to (psi)	20
Void Ratio	1.427		1.326			Maximum Effective Consolidation Stress (psi)	30
Degree of Saturation (%)	76.4		100.5			Minimum Effective Consolidation Stress (psi)	29.8

						Hydraulic Conductivity			
Date	Clock (24H:M)	Temp. (°F)	Bottom Head (in)	Top Head (in)	Test Time (sec)	k (m/s)	k (cm/s)	k @ 20° C (m/s)	k @ 20° C (cm/s)
5-10-19	15:15	70.0	19.77	5.38	0	---	---	---	---
5-10-19	15:16	70.0	19.41	5.75	6.00E+01	3.6E-07	3.6E-05	3.5E-07	3.5E-05
5-10-19	15:17	70.0	19.04	6.11	6.00E+01	3.8E-07	3.8E-05	3.7E-07	3.7E-05
5-10-19	15:18	70.0	18.68	6.47	6.00E+01	3.9E-07	3.9E-05	3.7E-07	3.7E-05
5-10-19	15:19	70.0	18.34	6.82	6.00E+01	3.8E-07	3.8E-05	3.7E-07	3.7E-05



A gradient of approximately 3.8 was used for this test.

Average Hydraulic Conductivity @ 20° C (last 4 determinations)	m/s	3.67E-07	cm/s	3.67E-05
Average Hydraulic Conductivity @ 20° C (last run)	m/s	3.67E-07	cm/s	3.67E-05

Comments

Reviewed By KG

Stantec

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

ASTM D 5084, Method C

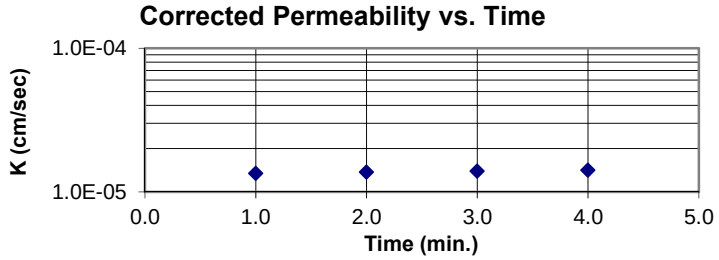
Project Name	KIF TDEC Order			Project No.	175668043
Source	KIF-GT-TW04-ST02, 40.5'-40.7'			Test ID	112
Description	Sandy Silt (ML), black, wet, very soft			Prepared By	KG
		Specific Gravity	2.43 ASTM D854, Dry	Date	5-2-19
Specimen	Undisturbed	LL	NP		
Preparation	Trimmed in a trimming ring	PL	NP	Maximum Dry Density (pcf)	
Permeant	De-aired Tap Water	PI	NP	Percent of Maximum	

Specimens (if compacted) were compacted in a Proctor Mold as follows: The Maximum Dry Density was converted to Wet Density, this mass was divided by 4 (layers) and 3 of the 4 layers were compacted into the mold using a Proctor Hammer using 19 blows per layer. The density was varied by reducing the height of the drop by the amount listed beside "Compacted".

The specimen was trimmed from the bottom two layers.

	Initial Specimen Data	After Consolidation Data	After Test Data	Final Pressures (psi)			
Height (in.)	1.4579	1.2751	1.2722	Chamber	55		
Diameter (in.)	2.7975		2.8560	Influent	20.2		
Moisture Content (%)	33.6		29.0	Effluent	20	Applied Head Difference (psi)	0.2
Dry Unit Weight (pcf)	80.9		89.0			Back Pressure Saturated to (psi)	20
Void Ratio	0.874		0.705			Maximum Effective Consolidation Stress (psi)	35
Degree of Saturation (%)	93.5		100.1			Minimum Effective Consolidation Stress (psi)	34.8

						Hydraulic Conductivity			
Date	Clock (24H:M)	Temp. (°F)	Bottom Head (in)	Top Head (in)	Test Time (sec)	k (m/s)	k (cm/s)	k @ 20° C (m/s)	k @ 20° C (cm/s)
5-13-19	15:24	71.0	21.58	4.26	0	---	---	---	---
5-13-19	15:25	71.0	21.40	4.46	6.00E+01	1.4E-07	1.4E-05	1.3E-07	1.3E-05
5-13-19	15:26	71.0	21.20	4.64	6.00E+01	1.4E-07	1.4E-05	1.4E-07	1.4E-05
5-13-19	15:27	71.0	21.01	4.83	6.00E+01	1.4E-07	1.4E-05	1.4E-07	1.4E-05
5-13-19	15:28	71.0	20.82	5.02	6.00E+01	1.5E-07	1.5E-05	1.4E-07	1.4E-05



A gradient of approximately 3.8 was used for this test.

Average Hydraulic Conductivity @ 20° C (last 4 determinations)	m/s	1.38E-07	cm/s	1.38E-05
Average Hydraulic Conductivity @ 20° C (last run)	m/s	1.38E-07	cm/s	1.38E-05

Comments

Reviewed By KG

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

ASTM D 5084, Method C

Project Name	TVA KIF EIP Exploratory Drilling			Project No.	175668043
Source	KIF-GT-TWO5-ST01, 40.2'-40.5'			Test ID	12
Description	Lean Clay with Sand (CL), gray brown, moist, soft			Prepared By	KG
		Specific Gravity	2.67 ASTM D854, Dry	Date	12-4-18
Specimen	Undisturbed	LL	26		
Preparation		PL	17	Maximum Dry Density (pcf)	
Permeant	De-aired Tap Water	PI	9	Percent of Maximum	

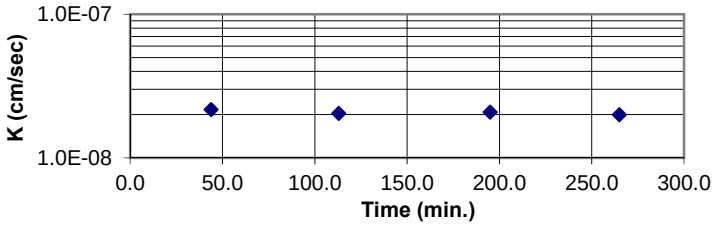
Specimens (if compacted) were compacted in a Proctor Mold as follows: The Maximum Dry Density was converted to Wet Density, this mass was divided by 4 (layers) and 3 of the 4 layers were compacted into the mold using a Proctor Hammer using 19 blows per layer. The density was varied by reducing the height of the drop by the amount listed beside "Compacted".

The specimen was trimmed from the bottom two layers.

	Initial Specimen Data	After Consolidation Data	After Test Data	Final Pressures (psi)			
Height (in.)	1.4813	1.4042	1.3798	Chamber	55		
Diameter (in.)	2.7743		2.7947	Influent	32		
Moisture Content (%)	23.1		19.3	Effluent	30	Applied Head Difference (psi)	2
Dry Unit Weight (pcf)	104.4		110.4			Back Pressure Saturated to (psi)	30
Void Ratio	0.597		0.509			Maximum Effective Consolidation Stress (psi)	25
Degree of Saturation (%)	103.4		101.1			Minimum Effective Consolidation Stress (psi)	23

						Hydraulic Conductivity			
Date	Clock (24H:M)	Temp. (°F)	Bottom Head (in)	Top Head (in)	Test Time (sec)	k (m/s)	k (cm/s)	k @ 20° C (m/s)	k @ 20° C (cm/s)
12-7-18	8:26	71.0	22.30	3.14	0	---	---	---	---
12-7-18	9:10	71.0	22.14	3.28	2.64E+03	2.3E-10	2.3E-08	2.2E-10	2.2E-08
12-7-18	10:19	71.0	21.92	3.50	4.14E+03	2.1E-10	2.1E-08	2.0E-10	2.0E-08
12-7-18	11:41	71.0	21.64	3.75	4.92E+03	2.2E-10	2.2E-08	2.1E-10	2.1E-08
12-7-18	12:51	71.0	21.43	3.97	4.20E+03	2.1E-10	2.1E-08	2.0E-10	2.0E-08

Corrected Permeability vs. Time



A gradient of approximately 37.4 was used for this test.

Average Hydraulic Conductivity @ 20° C (last 4 determinations)	m/s	2.07E-10	cm/s	2.07E-08
Average Hydraulic Conductivity @ 20° C (last run)	m/s	2.07E-10	cm/s	2.07E-08

Comments

Reviewed By KG

ATTACHMENT F.6

Summary Tables of Phase 2 Geotechnical Laboratory Testing Results

Table F.6-1 - Summary of Phase 2 Natural Moisture Content Testing
Kingston Fossil Plant
January 2021-February 2021

Boring ID	Test Interval Depth	Test Interval Elevation	Moisture Content
	ft	ft NGVD29	%
KIF-B05	5.5 - 6.5	751.0 - 750.0	26.4
KIF-B05	10.0 - 11.5	746.5 - 745.0	21.0
KIF-B05	15.0 - 16.5	741.5 - 740.0	20.9
KIF-B05	28.0 - 29.5	728.5 - 727.0	23.5
KIF-B05	33.0 - 34.5	723.5 - 722.0	34.7
KIF-B05	38.0 - 38.5	718.5 - 718.0	24.0
KIF-B05	43.0 - 44.5	713.5 - 712.0	21.6
KIF-B05	46.0 - 47.0	710.5 - 709.5	25.2
KIF-B06	13.2 - 14.7	726.4 - 724.9	30.3
KIF-B06	18.2 - 19.7	721.4 - 719.9	37.6
KIF-B06	23.2 - 24.7	716.4 - 714.9	20.8
KIF-B06	28.2 - 29.7	711.4 - 709.9	24.2
KIF-B06	31.4 - 32.2	708.2 - 707.4	31.9
KIF-B07	11.0 - 12.5	728.9 - 727.4	39.5
KIF-B07	13.5 - 15.0	726.4 - 724.9	43.1
KIF-B07	19.0 - 20.5	720.9 - 719.4	25.2
KIF-B07	26.0 - 27.5	713.9 - 712.4	20.9
KIF-B07	28.5 - 30.0	711.4 - 709.9	23.0
KIF-B07	31.9 - 32.5	708.0 - 707.4	20.1
KIF-B08	25.0 - 26.0	714.3 - 713.3	19.1
KIF-B08	27.7 - 28.5	711.6 - 710.8	24.4
KIF-B08	30.3 - 31.0	709.0 - 708.3	22.0
KIF-B08	32.6 - 33.5	706.7 - 705.8	17.2
KIF-B09	5.0 - 6.5	749.5 - 748.0	24.7
KIF-B09	10.0 - 11.5	744.5 - 743.0	5.5
KIF-B09	15.0 - 16.5	739.5 - 738.0	17.6
KIF-B09	20.0 - 20.5	734.5 - 734.0	32.7
KIF-B09	27.5 - 29.0	727.0 - 725.5	32.6

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Table F.6-1 - Summary of Phase 2 Natural Moisture Content Testing
Kingston Fossil Plant
January 2021-February 2021

Boring ID	Test Interval Depth	Test Interval Elevation	Moisture Content
	ft	ft NGVD29	%
KIF-B09	32.5 - 33.0	722.0 - 721.5	33.5
KIF-B09	39.5 - 41.0	715.0 - 713.5	23.8
KIF-B09	44.5 - 45.5	710.0 - 709.0	23.4
KIF-B10	14.5 - 16.0	724.6 - 723.1	41.4
KIF-B10	17.0 - 18.5	722.1 - 720.6	25.8
KIF-B10	17.0 - 18.5, 19.5 - 21.0	722.1 - 720.6, 719.6 - 718.1	25.8
KIF-B10	24.5 - 26.0	714.6 - 713.1	26.4
KIF-B10	30.0 - 31.0	709.1 - 708.1	32.4
KIF-B10	32.0 - 33.5	707.1 - 705.6	28.0
KIF-B11	14.5 - 16.0	724.8 - 723.3	32.2
KIF-B11	17.0 - 18.5	722.3 - 720.8	26.7
KIF-B11	23.5 - 25.0	715.8 - 714.3	22.3
KIF-B11	26.0 - 27.5	713.3 - 711.8	25.9
KIF-B11	31.0 - 32.5	708.3 - 706.8	30.9
KIF-B11	33.5 - 34.6	705.8 - 704.7	24.8
KIF-B12	23.3 - 24.8	716.0 - 714.5	23.8
KIF-B12	27.8 - 29.3	1.5.0 - 710.0	25.8
KIF-B12	30.3 - 31.8	709.0 - 707.5	31.2
KIF-B12	32.8 - 34.3	706.5 - 705.0	24.6
KIF-B13	2.9 - 4.0	750.1 - 749.0	20.0
KIF-B13	5.0 - 6.5	748.0 - 746.5	16.9
KIF-B13	10.0 - 11.5	743.0 - 741.5	18.4
KIF-B13	17.5 - 19.0	735.5 - 734.0	18.1
KIF-B13	26.0 - 26.5	727.0 - 726.5	20.3
KIF-B13	27.5 - 29.0	725.5 - 724.0	19.8
KIF-B13	34.5 - 36.0	718.5 - 717.0	22.4
KIF-B13	37.0 - 38.5	716.0 - 714.5	18.4

Table F.6-1 - Summary of Phase 2 Natural Moisture Content Testing
Kingston Fossil Plant
January 2021-February 2021

Boring ID	Test Interval Depth	Test Interval Elevation	Moisture Content
	ft	ft NGVD29	%
KIF-B13	47.0 - 48.5	706.0 - 704.5	16.2
KIF-B14	9.5 - 10.0	729.1 - 728.6	27.9
KIF-B14	12.0 - 13.5	726.6 - 725.1	19.4
KIF-B14	17.0 - 18.5	721.6 - 720.1	18.5
KIF-B14	24.5 - 26.0	714.1 - 712.6	27.6
KIF-B14	32.0 - 33.5	706.6 - 705.1	14.6
KIF-B15	12.1 - 13.0	727.2 - 726.3	33.1
KIF-B15	16.5 - 18.0	722.8 - 721.3	21.9
KIF-B15	21.5 - 21.8	717.8 - 717.5	24.8
KIF-B15	24.0 - 25.5	715.3 - 713.8	25.0
KIF-B15	26.5 - 28.0	712.8 - 711.3	27.1
KIF-B16	12.5 - 13.5	726.2 - 725.2	47.4
KIF-B16	16.5 - 18.0	722.2 - 720.7	23.5
KIF-B16	16.5 - 18.5	722.2 - 720.2	23.5
KIF-B16	19.0 - 20.5	719.7 - 718.2	18.8
KIF-B16	22.3 - 23.0	716.4 - 715.7	22.5
KIF-B16	26.5 - 28.0	712.2 - 710.7	22.8

Notes:

ft	feet
ID	identification
NGVD29	National Geodetic Vertical Datum of 1929

1. Where multiple test intervals are reported for a single result, a composite sample for the intervals was tested.

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Table F.6-2 - Summary of Phase 2 Fines Content Testing
Kingston Fossil Plant
January 2021-February 2021

Boring ID	Test Interval Depth	Test Interval Elevation	Percent Passing #200 Sieve
	ft	ft NGVD29	%
KIF-B05	5.5 - 6.5	751.0 - 750.0	51.1
KIF-B05	15.0 - 16.5	741.5 - 740.0	20.2
KIF-B05	28.0 - 29.5	728.5 - 727.0	36.3
KIF-B05	33.0 - 34.5	723.5 - 722.0	60.1
KIF-B05	38.0 - 38.5	718.5 - 718.0	93.3
KIF-B05	43.0 - 44.5	713.5 - 712.0	78.7
KIF-B05	46.0 - 47.0	710.5 - 709.5	84.9
KIF-B06	13.2 - 14.7	726.4 - 724.9	46.0
KIF-B06	18.2 - 19.7	721.4 - 719.9	86.2
KIF-B06	23.2 - 24.7	716.4 - 714.9	68.2
KIF-B06	28.2 - 29.7	711.4 - 709.9	55.6
KIF-B06	31.4 - 32.2	708.2 - 707.4	84.1
KIF-B07	11.0 - 12.5, 13.5 - 15.0	728.9 - 727.4, 726.4 - 724.9	51.6
KIF-B07	19.0 - 20.5	720.9 - 719.4	79.5
KIF-B07	26.0 - 27.5	713.9 - 712.4	79.5
KIF-B07	28.5 - 30.0	711.4 - 709.9	43.7
KIF-B07	31.9 - 32.5	708.0 - 707.4	58.8
KIF-B08	25.0 - 26.0	714.3 - 713.3	72.4
KIF-B08	27.7 - 28.5	711.6 - 710.8	73.6
KIF-B08	30.3 - 31.0	709.0 - 708.3	44.5
KIF-B08	32.6 - 33.5	706.7 - 705.8	30.6
KIF-B09	5.0 - 6.5	749.5 - 748.0	37.9
KIF-B09	10.0 - 11.5	744.5 - 743.0	13.8
KIF-B09	15.0 - 16.5	739.5 - 738.0	48.9
KIF-B09	27.5 - 29.0	727.0 - 725.5	61.4
KIF-B09	32.5 - 33.0	722.0 - 721.5	93.6
KIF-B09	39.5 - 41.0	715.0 - 713.5	89.3

Table F.6-2 - Summary of Phase 2 Fines Content Testing
Kingston Fossil Plant
January 2021-February 2021

Boring ID	Test Interval Depth	Test Interval Elevation	Percent Passing #200 Sieve
	ft	ft NGVD29	%
KIF-B09	44.5 - 45.5	710.0 - 709.0	79.6
KIF-B09	50.0 - 50.5	704.5 - 704.0	11.2
KIF-B10	14.5 - 16.0	724.6 - 723.1	91.0
KIF-B10	17.0 - 18.5, 19.5 - 21.0	722.1 - 720.6, 719.6 - 718.1	80.5
KIF-B10	24.5 - 26.0	714.6 - 713.1	89.5
KIF-B10	30.0 - 31.0	709.1 - 708.1	24.6
KIF-B10	32.0 - 33.5	707.1 - 705.6	10.9
KIF-B11	14.5 - 16.0	724.8 - 723.3	89.9
KIF-B11	17.0 - 18.5	722.3 - 720.8	94.1
KIF-B11	23.5 - 25.0	715.8 - 714.3	86.6
KIF-B11	26.0 - 27.5	713.3 - 711.8	63.8
KIF-B11	31.0 - 32.5	708.3 - 706.8	16.7
KIF-B11	33.5 - 34.6	705.8 - 704.7	15.9
KIF-B12	23.3 - 24.8	716.0 - 714.5	82.8
KIF-B12	27.8 - 29.3	711.5 - 710.0	47.9
KIF-B12	30.3 - 31.8	709.0 - 707.5	28.2
KIF-B12	32.8 - 34.3	706.5 - 705.0	10.5
KIF-B13	2.9 - 4.0	750.1 - 749.0	41.4
KIF-B13	10.0 - 11.5	743.0 - 741.5	29.7
KIF-B13	26.0 - 26.5	727.0 - 726.5	57.1
KIF-B13	27.5 - 29.0	725.5 - 724.0	49.0
KIF-B13	34.5 - 36.0	718.5 - 717.0	23.0
KIF-B13	37.0 - 38.5	716.0 - 714.5	38.4
KIF-B13	39.5 - 39.7	713.5 - 713.3	39.4
KIF-B13	47.0 - 48.5	706.0 - 704.5	15.0
KIF-B14	12.0 - 13.5	726.6 - 725.1	42.1
KIF-B14	17.0 - 18.5	721.6 - 720.1	40.4

Table F.6-2 - Summary of Phase 2 Fines Content Testing
Kingston Fossil Plant
January 2021-February 2021

Boring ID	Test Interval Depth	Test Interval Elevation	Percent Passing #200 Sieve
	ft	ft NGVD29	%
KIF-B14	24.5 - 26.0	714.1 - 712.6	22.1
KIF-B14	32.0 - 33.5	706.6 - 705.1	18.2
KIF-B15	16.5 - 18.0	722.8 - 721.3	32.9
KIF-B15	24.0 - 25.5	715.3 - 713.8	21.3
KIF-B15	26.5 - 28.0	712.8 - 711.3	13.3
KIF-B16	16.5 - 18.0	722.2 - 720.7	39.8
KIF-B16	19.0 - 20.5	719.7 - 718.2	29.2
KIF-B16	22.3 - 23.0	716.4 - 715.7	29.3
KIF-B16	26.5 - 28.0	712.2 - 710.7	17.1

Notes:

ft	feet
ID	identification
NGVD29	National Geodetic Vertical Datum of 1929

1. Where multiple test intervals are reported for a single result, a composite sample for the intervals was tested.

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Table F.6-3 - Summary of Phase 2 Atterberg Limits Testing
Kingston Fossil Plant
January 2021-February 2021

Boring ID	Test Interval Depth	Test Interval Elevation	Liquid Limit (LL)	Plasticity Index (PI)
	ft	ft NGVD29		
KIF-B05	5.5 - 6.5	751.0 - 750.0	42	18
KIF-B05	15.0 - 16.5	741.5 - 740.0	28	11
KIF-B05	28.0 - 29.5	728.5 - 727.0	37	12
KIF-B05	33.0 - 34.5	723.5 - 722.0	36	14
KIF-B05	38.0 - 38.5	718.5 - 718.0	33	13
KIF-B05	43.0 - 44.5	713.5 - 712.0	31	14
KIF-B05	46.0 - 47.0	710.5 - 709.5	35	18
KIF-B06	13.2 - 14.7	726.4 - 724.9	38	13
KIF-B06	18.2 - 19.7	721.4 - 719.9	38	16
KIF-B06	23.2 - 24.7	716.4 - 714.9	25	9
KIF-B06	28.2 - 29.7	711.4 - 709.9	NP	NP
KIF-B06	31.4 - 32.2	708.2 - 707.4	32	12
KIF-B07	11.0 - 12.5, 13.5 - 15.0	728.9 - 727.4, 726.4 - 724.9	36	14
KIF-B07	19.0 - 20.5	720.9 - 719.4	25	7
KIF-B07	26.0 - 27.5	713.9 - 712.4	25	8
KIF-B07	28.5 - 30.0	711.4 - 709.9	24	6
KIF-B07	31.9 - 32.5	708.0 - 707.4	24	6
KIF-B08	11.0 - 12.5, 13.5 - 15.0	728.3 - 726.8, 725.8 - 724.3	35	6
KIF-B08	25.0 - 26.0	714.3 - 713.3	24	7
KIF-B08	27.7 - 28.5	711.6 - 710.8	21	4
KIF-B08	30.3 - 31.0	709.0 - 708.3	NP	NP
KIF-B08	32.6 - 33.5	706.7 - 705.8	NP	NP
KIF-B09	5.0 - 6.5	749.5 - 748.0	42	15
KIF-B09	10.0 - 11.5	744.5 - 743.0	NP	NP
KIF-B09	15.0 - 16.5	739.5 - 738.0	37	14
KIF-B09	27.5 - 29.0	727.0 - 725.5	42	16

Table F.6-3 - Summary of Phase 2 Atterberg Limits Testing
Kingston Fossil Plant
January 2021-February 2021

Boring ID	Test Interval Depth	Test Interval Elevation	Liquid Limit (LL)	Plasticity Index (PI)
	ft	ft NGVD29		
KIF-B09	32.5 - 33.0	722.0 - 721.5	NP	NP
KIF-B09	39.5 - 41.0	715.0 - 713.5	36	15
KIF-B09	44.5 - 45.5	710.0 - 709.0	NP	NP
KIF-B09	50.0 - 50.5	704.5 - 704.0	NP	NP
KIF-B10	14.5 - 16.0	724.6 - 723.1	NP	NP
KIF-B10	17.0 - 18.5, 19.5 - 21.0	722.1 - 720.6, 719.6 - 718.1	NP	NP
KIF-B10	24.5 - 26.0	714.6 - 713.1	40	20
KIF-B10	30.0 - 31.0	709.1 - 708.1	NP	NP
KIF-B10	32.0 - 33.5	707.1 - 705.6	NP	NP
KIF-B11	14.5 - 16.0	724.8 - 723.3	41	19
KIF-B11	17.0 - 18.5	722.3 - 720.8	41	18
KIF-B11	23.5 - 25.0	715.8 - 714.3	35	17
KIF-B11	26.0 - 27.5	713.3 - 711.8	23	8
KIF-B11	31.0 - 32.5	708.3 - 706.8	NP	NP
KIF-B11	33.5 - 34.6	705.8 - 704.7	NP	NP
KIF-B12	14.6 - 15.1	724.7 - 724.2	35	15
KIF-B12	23.3 - 24.8	716.0 - 714.5	33	15
KIF-B12	27.8 - 29.3	711.5 - 710.0	NP	NP
KIF-B12	30.3 - 31.8	709.0 - 707.5	NP	NP
KIF-B12	32.8 - 34.3	706.5 - 705.0	NP	NP
KIF-B13	2.9 - 4.0	750.1 - 749.0	35	13
KIF-B13	10.0 - 11.5	743.0 - 741.5	33	13
KIF-B13	26.0 - 26.5	727.0 - 726.5	23	8
KIF-B13	27.5 - 29.0	725.5 - 724.0	NP	NP
KIF-B13	34.5 - 36.0	718.5 - 717.0	NP	NP
KIF-B13	37.0 - 38.5	716.0 - 714.5	NP	NP
KIF-B13	39.5 - 39.7	713.5 - 713.3	NP	NP

Table F.6-3 - Summary of Phase 2 Atterberg Limits Testing
Kingston Fossil Plant
January 2021-February 2021

Boring ID	Test Interval Depth	Test Interval Elevation	Liquid Limit (LL)	Plasticity Index (PI)
	ft	ft NGVD29		
KIF-B13	47.0 - 48.5	706.0 - 704.5	NP	NP
KIF-B14	9.5 - 10.0	729.1 - 728.6	28	7
KIF-B14	12.0 - 13.5	726.6 - 725.1	NP	NP
KIF-B14	17.0 - 18.5	721.6 - 720.1	NP	NP
KIF-B14	24.5 - 26.0	714.1 - 712.6	NP	NP
KIF-B14	32.0 - 33.5	706.6 - 705.1	NP	NP
KIF-B15	12.1 - 13.0	727.2 - 726.3	37	18
KIF-B15	16.5 - 18.0	722.8 - 721.3	NP	NP
KIF-B15	24.0 - 25.5	715.3 - 713.8	NP	NP
KIF-B15	26.5 - 28.0	712.8 - 711.3	NP	NP
KIF-B16	12.5 - 13.5	726.2 - 725.2	44	16
KIF-B16	16.5 - 18.0	722.2 - 720.7	NP	NP
KIF-B16	19.0 - 20.5	719.7 - 718.2	NP	NP
KIF-B16	22.3 - 23.0	716.4 - 715.7	NP	NP
KIF-B16	26.5 - 28.0	712.2 - 710.7	NP	NP

Notes:

ft	feet	NGVD29	National Geodetic Vertical Datum of 1929
ID	identification	NP	non-plastic

1. Where multiple test intervals are reported for a single result, a composite sample for the intervals was tested.

Table F.6-4 - Summary of Phase 2 USCS Soil Classification
Kingston Fossil Plant
January 2021-February 2021

Boring ID	Test Interval Depth	Test Interval Elevation	USCS Classification
	ft	ft NGVD29	
KIF-B05	5.5 - 6.5	751.0 - 750.0	CL
KIF-B05	15.0 - 16.5	741.5 - 740.0	SC
KIF-B05	28.0 - 29.5	728.5 - 727.0	SM
KIF-B05	33.0 - 34.5	723.5 - 722.0	CL
KIF-B05	38.0 - 38.5	718.5 - 718.0	CL
KIF-B05	43.0 - 44.5	713.5 - 712.0	CL
KIF-B05	46.0 - 47.0	710.5 - 709.5	CL
KIF-B06	13.2 - 14.7	726.4 - 724.9	SM
KIF-B06	18.2 - 19.7	721.4 - 719.9	CL
KIF-B06	23.2 - 24.7	716.4 - 714.9	CL
KIF-B06	28.2 - 29.7	711.4 - 709.9	ML
KIF-B06	31.4 - 32.2	708.2 - 707.4	CL
KIF-B07	11.0 - 12.5, 13.5 - 15.0	728.9 - 727.4, 726.4 - 724.9	CL
KIF-B07	19.0 - 20.5	720.9 - 719.4	CL-ML
KIF-B07	26.0 - 27.5	713.9 - 712.4	CL
KIF-B07	28.5 - 30.0	711.4 - 709.9	SC-SM
KIF-B07	31.9 - 32.5	708.0 - 707.4	CL-ML
KIF-B08	25.0 - 26.0	714.3 - 713.3	CL-ML
KIF-B08	27.7 - 28.5	711.6 - 710.8	CL-ML
KIF-B08	30.3 - 31.0	709.0 - 708.3	SM
KIF-B08	32.6 - 33.5	706.7 - 705.8	SM
KIF-B09	5.0 - 6.5	749.5 - 748.0	SM
KIF-B09	10.0 - 11.5	744.5 - 743.0	GM
KIF-B09	15.0 - 16.5	739.5 - 738.0	SC
KIF-B09	27.5 - 29.0	727.0 - 725.5	ML
KIF-B09	32.5 - 33.0	722.0 - 721.5	ML
KIF-B09	39.5 - 41.0	715.0 - 713.5	CL

Table F.6-4 - Summary of Phase 2 USCS Soil Classification
Kingston Fossil Plant
January 2021-February 2021

Boring ID	Test Interval Depth	Test Interval Elevation	USCS Classification
	ft	ft NGVD29	
KIF-B09	44.5 - 45.5	710.0 - 709.0	ML
KIF-B09	50.0 - 50.5	704.5 - 704.0	SP-SM
KIF-B10	14.5 - 16.0	724.6 - 723.1	ML
KIF-B10	17.0 - 18.5, 19.5 - 21.0	722.1 - 720.6, 719.6 - 718.1	ML
KIF-B10	24.5 - 26.0	714.6 - 713.1	CL
KIF-B10	30.0 - 31.0	709.1 - 708.1	SM
KIF-B10	32.0 - 33.5	707.1 - 705.6	SP-SM
KIF-B11	14.5 - 16.0	724.8 - 723.3	CL
KIF-B11	17.0 - 18.5	722.3 - 720.8	CL
KIF-B11	23.5 - 25.0	715.8 - 714.3	CL
KIF-B11	26.0 - 27.5	713.3 - 711.8	CL
KIF-B11	31.0 - 32.5	708.3 - 706.8	SM
KIF-B11	33.5 - 34.6	705.8 - 704.7	SM
KIF-B12	23.3 - 24.8	716.0 - 714.5	CL
KIF-B12	27.8 - 29.3	711.5 - 710.0	SM
KIF-B12	30.3 - 31.8	709.0 - 707.5	SM
KIF-B12	32.8 - 34.3	706.5 - 705.0	SP-SM
KIF-B13	2.9 - 4.0	750.1 - 749.0	SC
KIF-B13	10.0 - 11.5	743.0 - 741.5	SC
KIF-B13	26.0 - 26.5	727.0 - 726.5	CL
KIF-B13	27.5 - 29.0	725.5 - 724.0	SM
KIF-B13	34.5 - 36.0	718.5 - 717.0	SM
KIF-B13	37.0 - 38.5	716.0 - 714.5	SM
KIF-B13	39.5 - 39.7	713.5 - 713.3	SM
KIF-B13	47.0 - 48.5	706.0 - 704.5	GM
KIF-B14	12.0 - 13.5	726.6 - 725.1	SM
KIF-B14	17.0 - 18.5	721.6 - 720.1	SM

Table F.6-4 - Summary of Phase 2 USCS Soil Classification
Kingston Fossil Plant
January 2021-February 2021

Boring ID	Test Interval Depth	Test Interval Elevation	USCS Classification
	ft	ft NGVD29	
KIF-B14	24.5 - 26.0	714.1 - 712.6	SM
KIF-B14	32.0 - 33.5	706.6 - 705.1	SM
KIF-B15	16.5 - 18.0	722.8 - 721.3	SM
KIF-B15	24.0 - 25.5	715.3 - 713.8	SM
KIF-B15	26.5 - 28.0	712.8 - 711.3	SM
KIF-B16	16.5 - 18.0	722.2 - 720.7	SM
KIF-B16	19.0 - 20.5	719.7 - 718.2	SM
KIF-B16	22.3 - 23.0	716.4 - 715.7	SM
KIF-B16	26.5 - 28.0	712.2 - 710.7	SM

Notes:

ft	feet
ID	identification
NGVD29	National Geodetic Vertical Datum of 1929
USCS	Unified Soil Classification System

1. Where multiple test intervals are reported for a single result, a composite sample for the intervals was tested.

Stantec

ATTACHMENT F.7

Phase 2 Natural Moisture Content Testing Results

Stantec

Moisture Content of Soil

ASTM D 2216

Project Name KIF TDEC Order

Project Number 175668043

Tested By DB

Test Method ASTM

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous, Disturbed

Source	Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded Amount	Material Excluded Size	Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
kif-gt-b05-ss03bG, 5.5'-6.5'	170	3/15/21	Len	1 1/2"	2	1 1/2"	No	30.63	118.18	99.90	26.4
kif-gt-b05-ss05G, 10.0'-11.5'	172	3/15/21	Len	3/4"			No	30.25	217.37	184.90	21.0
kif-gt-b05-ss07G, 15.0'-16.5'	174	3/15/21	Len	3/4"			No	31.39	123.20	107.36	20.9
kif-gt-b05-ss13G, 28.0'-29.5'	177	3/15/21	Len	1 1/2"	2	1 1/2"	No	31.96	109.31	94.57	23.5
kif-gt-b05-ss15G, 33.0'-34.5'	179	3/15/21	Len	3/8"			No	30.75	94.40	77.99	34.7
kif-gt-b05-ss16aG, 38.0'-38.5'	181	3/15/21	Len	No. 10			Yes	31.58	91.36	79.80	24.0
kif-gt-b05-ss18G, 43.0'-44.5'	183	3/15/21	Len	No. 10			Yes	31.00	170.18	145.49	21.6
kif-gt-b05-ss19bG, 46.0'-47.0'	185	3/15/21	Len	No. 10			Yes	31.40	191.73	159.48	25.2
kif-gt-b06-ss04g, 13.2'-14.7'	187	3/15/21	Len	3/4"			No	29.94	53.65	48.14	30.3
kif-gt-b06-ss06G, 18.2'-19.7'	188	3/15/21	Len	1 1/2"	1	1 1/2"	No	30.03	143.57	112.57	37.6
kif-gt-b06-ss08G, 23.2'-24.7'	190	3/15/21	Len	3/8"			No	30.03	141.76	122.55	20.8
kif-gt-b06-ss10G, 28.2'-29.7'	192	3/15/21	Len	3/8"			No	31.39	221.57	184.55	24.2
kif-gt-b06-ss11bG, 31.4'-32.2'	194	3/15/21	Len	No. 10			Yes	30.87	114.85	94.55	31.9
kif-gt-b07-ss02G, 11.0'-12.5'	198	3/15/21	Dist	1 1/2"	1	1 1/2"	No	30.73	51.51	45.63	39.5
kif-gt-b07-ss03G, 13.5'-15.0'	199	3/15/21	Dist	1 1/2"	1	1 1/2"	No	31.84	86.48	70.03	43.1
kif-gt-b07-ss05G, 19.0'-20.5'	200	3/15/21	Dist	No. 10			Yes	31.35	220.34	182.28	25.2
kif-gt-b07-ss07G, 26.0'-27.5'	203	3/15/21	Len	No. 10			Yes	30.19	198.67	169.54	20.9
kif-gt-b07-ss08G, 28.5'-30.0'	204	3/15/21	Len	3/8"			No	29.98	218.10	182.89	23.0
kif-gt-b07-ss09bG, 31.9'-32.5'	206	3/15/21	Len	3/8"			No	31.96	135.45	118.13	20.1
kif-gt-b08-ss06bG, 25.0'-26.0'	214	3/15/21	Len	No. 10			Yes	31.49	164.50	143.15	19.1
kif-gt-b08-ss07bG, 27.7'-28.5'	216	3/15/21	Dist	No. 10			Yes	31.13	111.50	95.74	24.4
kif-gt-b08-ss08bG, 30.3'-31.0'	218	3/15/21	Len	3/8"			No	31.71	133.10	114.79	22.0
kif-gt-b08-ss09bG, 32.5'-33.5'	220	3/15/21	Len	1 1/2"	1	1 1/2"	No	30.92	65.33	60.29	17.2
kif-gt-b09-ss03G, 5.0'-6.5'	225	3/15/21	Len	1 1/2"	2	1 1/2"	No	31.57	90.36	78.71	24.7
kif-gt-b09-ss05G, 10.0'-11.5'	227	3/15/21	Dist	1 1/2"	7	1 1/2"	No	30.50	85.84	82.95	5.5
kif-gt-b09-ss07G, 15.0'-16.5'	229	3/15/21	Len	3/4"			No	30.14	113.41	100.97	17.6
kif-gt-b09-ss09aG, 20.0'-20.5'	231	3/15/21	Dist	3/8"			No	30.85	178.46	142.09	32.7
kif-gt-b09-ss12G, 27.5'-29.0'	233	3/15/21	Len	3/4"			No	30.72	154.85	124.33	32.6

Stantec

Moisture Content of Soil

ASTM D 2216

Project Name KIF TDEC Order

Project Number 175668043

Tested By DB

Test Method ASTM

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous, Disturbed

Source	Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded Amount	Material Excluded Size	Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
kif-gt-b09-ss14aG, 32.5'-33.0'	235	3/15/21	Len	No. 10			Yes	31.55	81.70	69.11	33.5
kif-gt-b09-ss16G, 39.5'-41.0'	237	3/15/21	Len	No. 10			Yes	30.00	133.33	113.46	23.8
kif-gt-b09-ss17bG, 44.5'-45.5'	240	3/15/21	Len	3/8"			No	30.38	158.58	134.25	23.4
kif-gt-b10-ss04G, 14.5'-16.0'	243	3/15/21	Dist	3/4"	1	3/4"	No	32.01	107.21	85.18	41.4
kif-gt-b10-ss06G, 17.0'-18.5' & 19.5'-21.0'	245	3/15/21	Len	3/4"			No	32.07	122.79	104.20	25.8
kif-gt-b10-ss08G, 24.5'-26.0'	247	3/15/21	Len	No. 10			Yes	31.54	135.37	113.71	26.4
kif-gt-b10-ss10bG, 30.0'-31.0'	250	3/15/21	Hom	No. 10			Yes	31.51	186.06	148.28	32.4
kif-gt-b10-ss11G, 32.0'-33.5'	251	3/15/21	Hom	No. 10			Yes	31.74	139.16	115.63	28.0
kif-gt-b11-ss02G, 14.5'-16.0'	255	3/15/21	Dist	No. 10			Yes	30.72	142.98	115.61	32.2
kif-gt-b11-ss03G, 17.0'-18.5'	256	3/15/21	Len	3/8"	1	3/8"	No	31.52	88.06	76.15	26.7
kif-gt-b11-ss04G, 23.5'-25.0'	259	3/15/21	Len	No. 10			Yes	29.94	135.26	116.04	22.3
kif-gt-b11-ss05G, 26.0'-27.5'	260	3/15/21	Dist	No. 10			Yes	32.10	130.82	110.54	25.9
kif-gt-b11-ss07G, 31.0'-32.5'	262	3/15/21	Hom	No. 10			Yes	31.25	155.61	126.26	30.9
kif-gt-b11-ss08aG, 33.5'-34.6'	263	3/15/21	Dist	No. 10			Yes	31.50	137.81	116.69	24.8
kif-gt-b12-ss03G, 23.3'-24.8'	271	3/15/21	Len	No. 10			Yes	30.12	117.00	100.29	23.8
kif-gt-b12-ss04G, 27.8'-29.3'	273	3/15/21	Hom	No. 10			Yes	29.93	217.81	179.33	25.8
kif-gt-b12-ss05G, 30.3'-31.8'	274	3/15/21	Hom	No. 10			Yes	30.14	192.94	154.24	31.2
kif-gt-b12-ss06G, 32.8'-34.3'	275	3/15/21	Hom	1 1/2"	1	1 1/2"	No	31.45	144.01	121.82	24.6
kif-gt-b13-ss02bG, 2.9'-4.0'	281	3/15/21	Len	3/4"			No	31.78	138.29	120.57	20.0
kif-gt-b13-ss03G, 5.0'-6.5'	282	3/15/21	Len	3/4"			No	30.29	197.46	173.30	16.9
kif-gt-b13-ss05G, 10.0'-11.5'	284	3/15/21	Len	3/4"			No	29.80	119.86	105.89	18.4
kif-gt-b13-ss08G, 17.5'-19.0'	286	3/15/21	Dist	3/4"			No	29.67	154.36	135.23	18.1
kif-gt-b13-ss11bG, 26.0'-26.5'	288	3/15/21	Hom	No. 10			Yes	29.68	132.93	115.50	20.3
kif-gt-b13-ss12G, 27.5'-29.0'	289	3/15/21	Len	No. 10			Yes	30.18	202.83	174.28	19.8
kif-gt-b13-ss14G, 34.5'-36.0'	291	3/15/21	Hom	No. 10			Yes	31.48	207.91	175.60	22.4
kif-gt-b13-ss15G, 37.0'-38.5'	292	3/15/21	Dist	No. 10			Yes	31.66	237.73	205.70	18.4
kif-gt-b13-ss19G, 47.0'-48.5'	294	3/15/21	Dist	1 1/2"	2	1 1/2"	No	30.10	118.40	106.11	16.2
kif-gt-b14-ss02aG, 9.5'-10.0'	296	3/15/21	Dist	3/8"			No	30.02	82.26	70.86	27.9

Stantec

Moisture Content of Soil

ASTM D 2216

Project Name KIF TDEC Order

Project Number 175668043

Tested By DB

Test Method ASTM

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous, Disturbed

Source	Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded Amount	Material Excluded Size	Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
kif-gt-b14-ss03G, 12.0'-13.5'	299	3/15/21	Dist	1 1/2"	1	1 1/2"	No	31.00	149.78	130.52	19.4
kif-gt-b14-ss05G, 17.0'-18.5'	301	3/15/21	Len	No. 10			Yes	30.48	163.74	142.97	18.5
kif-gt-b14-ss08G, 24.5'-26.0'	303	3/15/21	Dist	No. 10			Yes	31.69	215.94	176.12	27.6
kif-gt-b14-ss11G, 32.0'-33.5'	307	3/15/21	Dist	1 1/2"	3	1 1/2"	No	31.60	192.51	172.00	14.6
kif-gt-b15-ss01bG, 12.1'-13.0'	311	3/15/21	Dist	No. 10			Yes	30.32	109.19	89.58	33.1
kif-gt-b15-ss02G, 16.5'-18.0'	313	3/15/21	Hom	No. 10			Yes	30.06	244.51	206.05	21.9
kif-gt-b15-ss04aG, 21.5'-21.8'	315	3/15/21	Dist	No. 10			Yes	31.30	175.33	146.72	24.8
kif-gt-b15-ss05G, 24.0'-25.5'	317	3/15/21	Dist	No. 10			Yes	30.08	240.98	198.86	25.0
kif-gt-b15-ss06G, 26.5'-28.0'	318	3/15/21	Hom	No. 10			Yes	30.11	191.70	157.20	27.1
kif-gt-b16-ss01bG, 12.5'-13.5'	322	3/15/21	Dist	No. 10			Yes	31.53	111.28	85.63	47.4
kif-gt-b16-ss02G, 16.5'-18.5'	324	3/15/21	Len	No. 10			Yes	30.60	203.52	170.60	23.5
kif-gt-b16-ss03G, 19.0'-20.5'	325	3/15/21	Dist	No. 10			Yes	31.32	218.36	188.73	18.8
kif-gt-b16-ss04bG, 22.3'-23.0'	327	3/15/21	Dist	No. 10			Yes	31.56	134.83	115.87	22.5
kif-gt-b16-ss06G, 26.5'-28.0'	329	3/15/21	Dist	1 1/2"	2	1 1/2"	No	31.58	127.56	109.72	22.8

Comments

Reviewed By RJ

ATTACHMENT F.8

Phase 2 Soil Classification Testing Results

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b05-ss03bG, 5.5'-6.5'	Lab ID	170
Sample Type	SS	Date Received	3-10-21
		Date Reported	3-26-21

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 26.4

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
1 1/2"	37.5	100.0
3/4"	19	94.8
3/8"	9.5	93.7
No. 4	4.75	92.2
No. 10	2	90.1
No. 40	0.425	65.5
No. 200	0.075	51.1
	0.02	35.4
	0.005	25.3
	0.002	19.1
estimated	0.001	15.4

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	7.8	9.9
Coarse Sand	2.1	24.6
Medium Sand	24.6	---
Fine Sand	14.4	14.4
Silt	25.8	32.0
Clay	25.3	19.1

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	42
Plastic Limit:	24
Plasticity Index:	18
Activity Index:	0.9

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol: CL

Group Name: Sandy lean clay

AASHTO Classification: A-7-6 (6)

Comments:

Reviewed By RHB

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b05-ss03bG, 5.5'-6.5'	Lab ID	170

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	TRH
Test Date	03-18-2021
Date Received	03-10-2021

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	94.8
3/8"	93.7
No. 4	92.2
No. 10	90.1

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

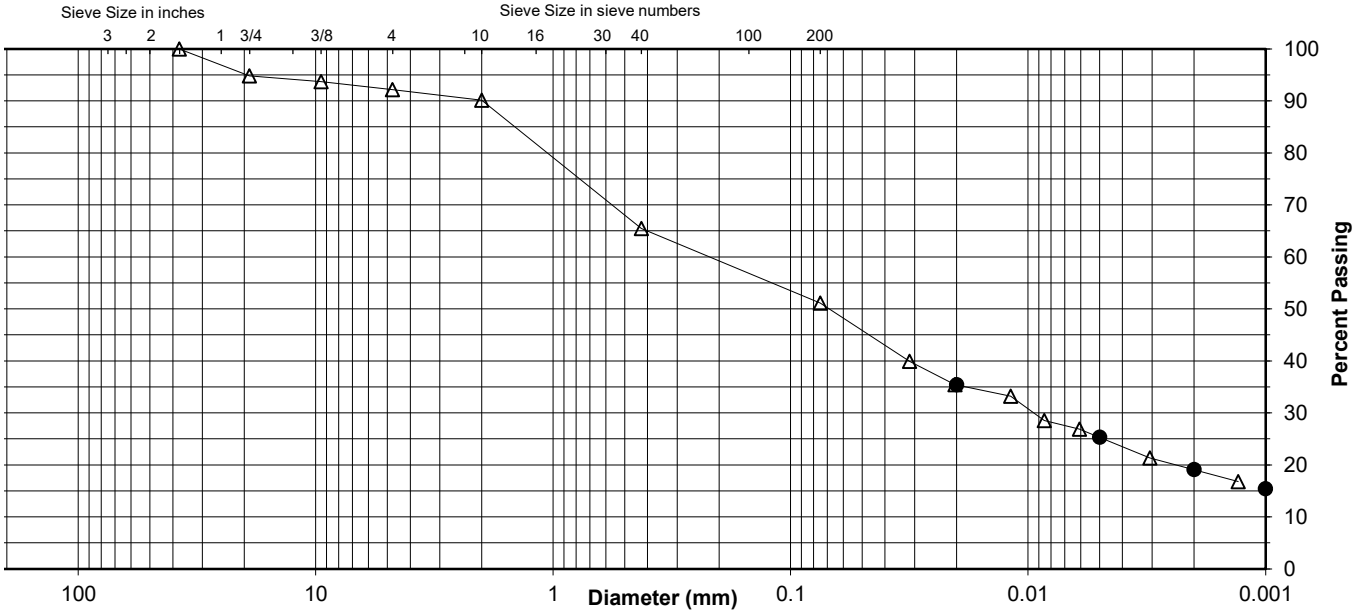
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	65.5
No. 200	51.1
0.02 mm	35.4
0.005 mm	25.3
0.002 mm	19.1
0.001 mm	15.4

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	5.2	2.6	2.1	24.6	14.4	25.8	25.3
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	9.9			24.6	14.4	32.0	19.1



Comments

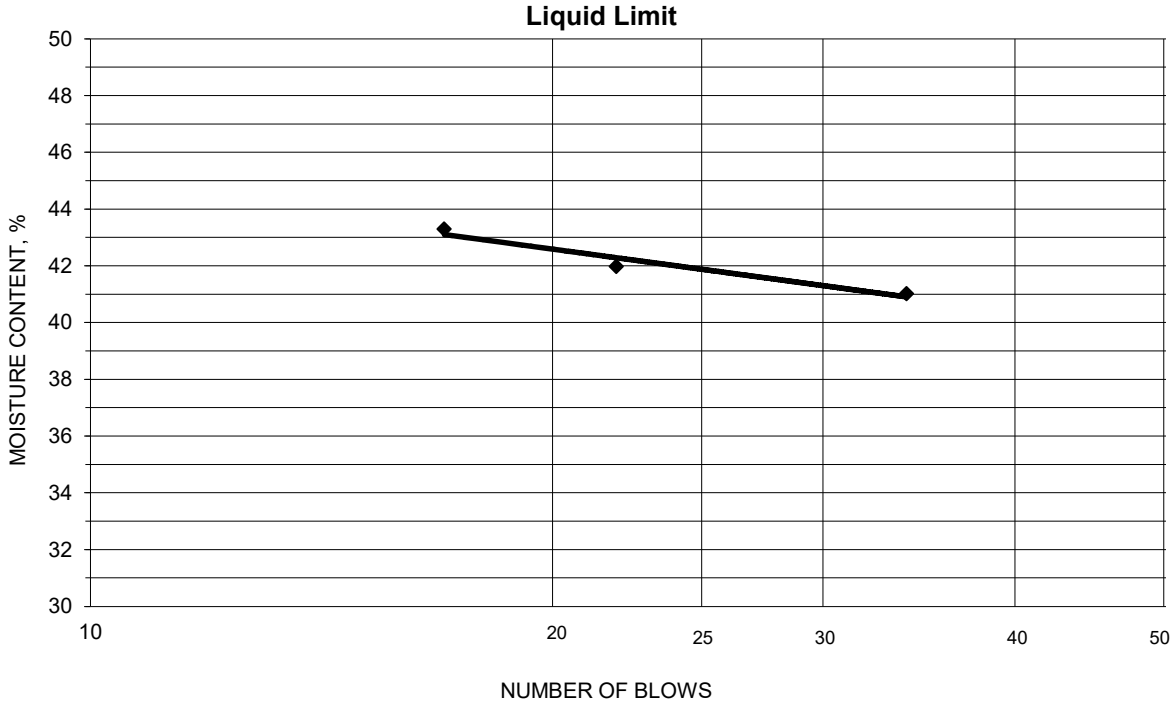
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order	Project No.	175668043
Source	kif-gt-b05-ss03bG, 5.5'-6.5'	Lab ID	170
		% + No. 40	35
Tested By	KWS	Test Method	ASTM D 4318 Method A
Test Date	03-25-2021	Prepared	Dry
		Date Received	03-10-2021

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
18.03	15.93	11.08	17	43.3	
18.96	16.58	10.91	22	42.0	
18.23	16.22	11.32	34	41.0	42



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
17.27	16.06	10.98	23.8	24	18
17.56	16.25	10.79	24.0		

Remarks: _____

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b05-ss07G, 15.0'-16.5'	Lab ID	174
Sample Type	SS	Date Received	3-10-21
		Date Reported	3-29-21

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 20.9

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
3/4"	19	100.0
3/8"	9.5	88.8
No. 4	4.75	85.6
No. 10	2	72.8
No. 40	0.425	31.1
No. 200	0.075	20.2
	0.02	12.4
	0.005	8.0
	0.002	5.8
estimated	0.001	4.4

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	14.4	27.2
Coarse Sand	12.8	41.7
Medium Sand	41.7	---
Fine Sand	10.9	10.9
Silt	12.2	14.4
Clay	8.0	5.8

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	28
Plastic Limit:	17
Plasticity Index:	11
Activity Index:	1.9

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol: SC
Group Name: Clayey sand

AASHTO Classification: A-2-6 (0)

Comments:

Reviewed By RHB

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b05-ss07G, 15.0'-16.5'	Lab ID	174

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	TRH
Test Date	03-16-2021
Date Received	03-10-2021

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	88.8
No. 4	85.6
No. 10	72.8

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

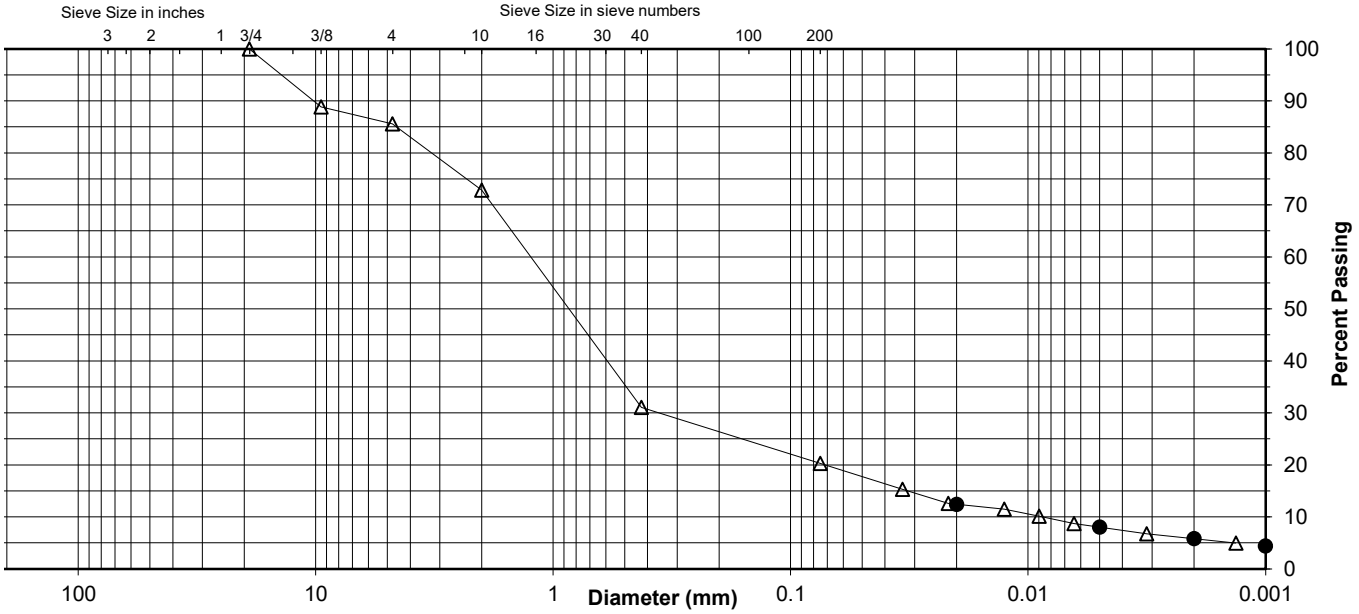
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	31.1
No. 200	20.2
0.02 mm	12.4
0.005 mm	8.0
0.002 mm	5.8
0.001 mm	4.4

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	14.4	12.8	41.7	10.9	12.2	8.0
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	27.2			41.7	10.9	14.4	5.8



Comments

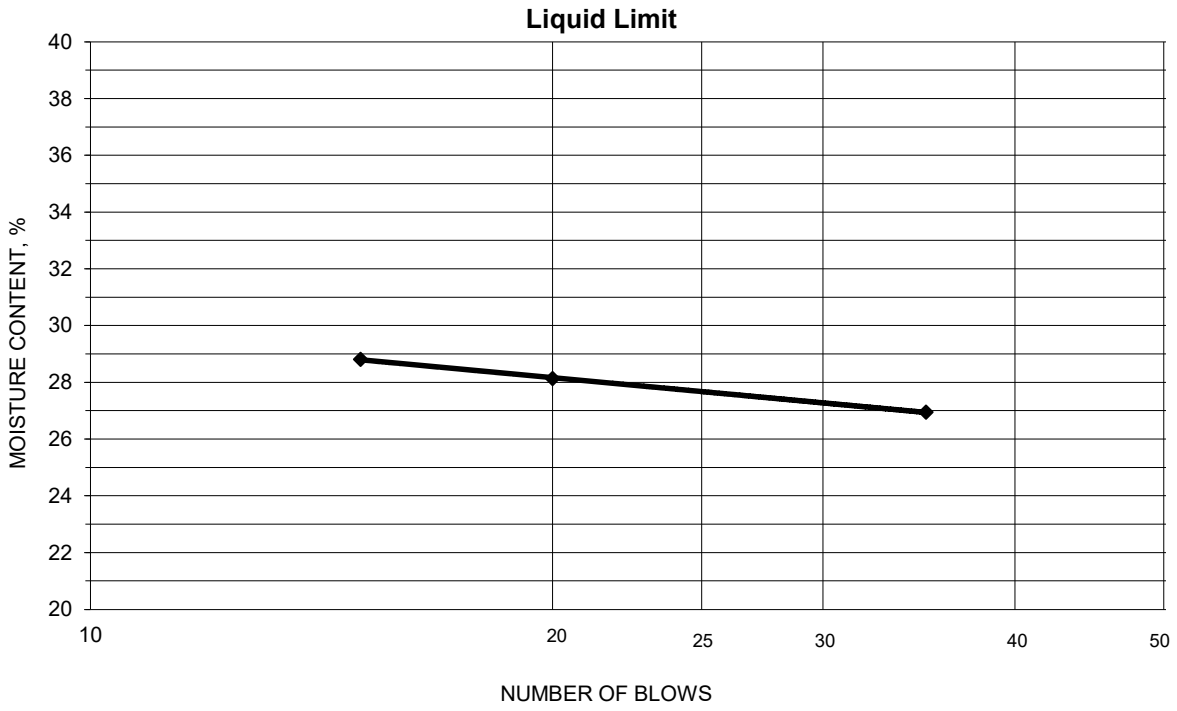
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	kif-gt-b05-ss07G, 15.0'-16.5'			Lab ID	174
				% + No. 40	69
Tested By	JMB	Test Method	ASTM D 4318 Method A	Date Received	03-10-2021
Test Date	03-17-2021	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
12.45	10.72	4.30	35	26.9	
11.92	10.26	4.36	20	28.1	
13.46	11.42	4.34	15	28.8	28



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
11.31	10.29	4.32	17.1	17	11
11.35	10.30	4.32	17.6		

Remarks: _____

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b05-ss13G, 28.0'-29.5'	Lab ID	177
Sample Type	SS	Date Received	3-10-21
		Date Reported	3-26-21

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 23.5

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
1 1/2"	37.5	100.0
3/4"	19	91.1
3/8"	9.5	85.8
No. 4	4.75	85.3
No. 10	2	82.4
No. 40	0.425	50.9
No. 200	0.075	36.3
	0.02	22.7
	0.005	14.0
	0.002	9.8
estimated	0.001	7.7

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	14.7	17.6
Coarse Sand	2.9	31.5
Medium Sand	31.5	---
Fine Sand	14.6	14.6
Silt	22.3	26.5
Clay	14.0	9.8

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	37
Plastic Limit:	25
Plasticity Index:	12
Activity Index:	1.2

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol: SM
Group Name: Silty sand

AASHTO Classification: A-6 (1)

Comments:

Reviewed By RHB

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b05-ss13G, 28.0'-29.5'	Lab ID	177

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	TRH
Test Date	03-18-2021
Date Received	03-10-2021

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	91.1
3/8"	85.8
No. 4	85.3
No. 10	82.4

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

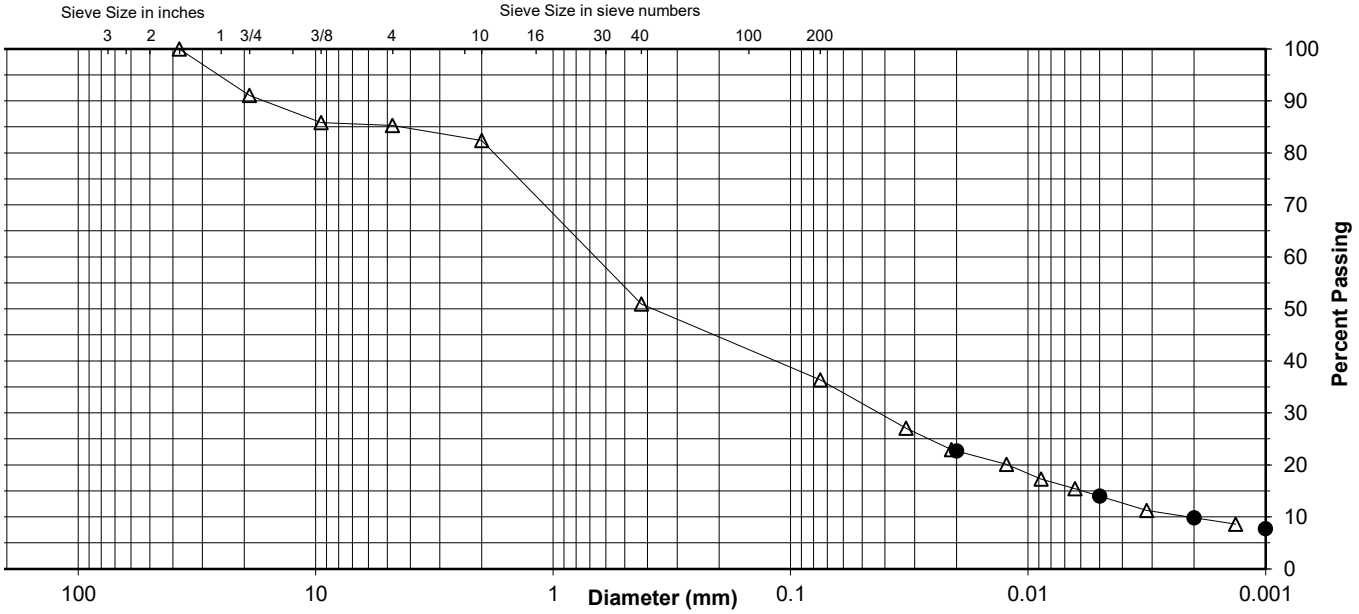
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	50.9
No. 200	36.3
0.02 mm	22.7
0.005 mm	14.0
0.002 mm	9.8
0.001 mm	7.7

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	8.9	5.8	2.9	31.5	14.6	22.3	14.0
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	17.6			31.5	14.6	26.5	9.8



Comments

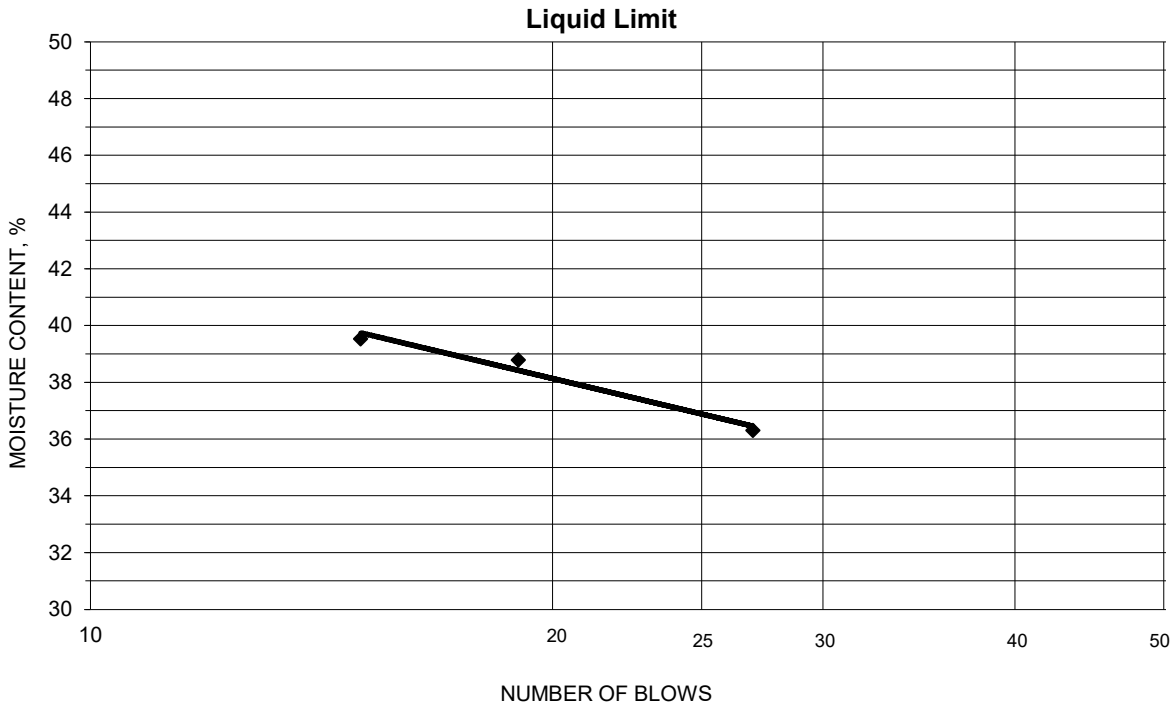
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	kif-gt-b05-ss13G, 28.0'-29.5'			Lab ID	177
				% + No. 40	49
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	03-10-2021
Test Date	03-25-2021	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
17.75	15.96	11.03	27	36.3	
18.98	16.68	10.75	19	38.8	
17.77	15.77	10.71	15	39.5	37



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
17.98	16.72	11.58	24.5	25	12
18.05	16.73	11.49	25.2		

Remarks: _____

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b05-ss15G, 33.0'-34.5'	Lab ID	179
Sample Type	SS	Date Received	3-10-21
		Date Reported	3-29-21

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 34.7

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 10	2	100.0
No. 40	0.425	72.3
No. 200	0.075	60.1
	0.02	40.1
	0.005	24.6
	0.002	17.6
estimated	0.001	13.8

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.0	0.0
Coarse Sand	0.0	27.7
Medium Sand	27.7	---
Fine Sand	12.2	12.2
Silt	35.5	42.5
Clay	24.6	17.6

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	36
Plastic Limit:	22
Plasticity Index:	14
Activity Index:	0.8

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol:	CL
Group Name:	Sandy lean clay
AASHTO Classification:	A-6 (6)

Comments:

Reviewed By RHB

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b05-ss15G, 33.0'-34.5'	Lab ID	179

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	N/A
Particle Hardness:	N/A
Tested By	TRH
Test Date	03-16-2021
Date Received	03-10-2021

Maximum Particle size: No. 10 Sieve

Sieve Size	% Passing
No. 10	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

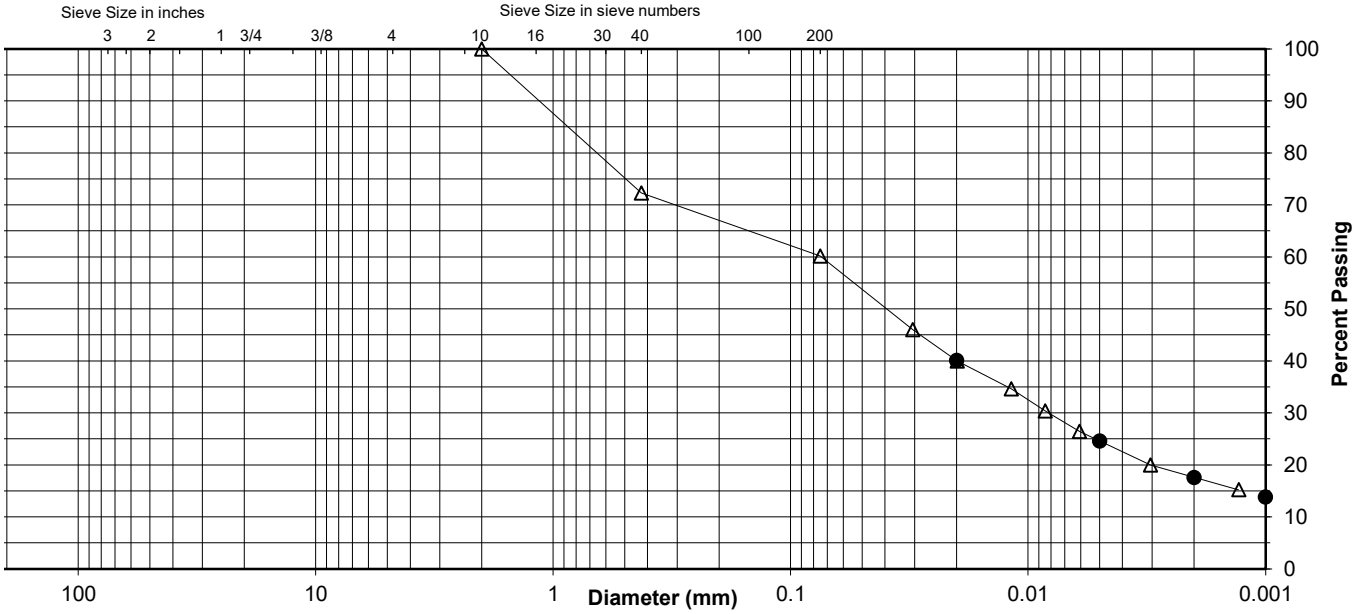
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	72.3
No. 200	60.1
0.02 mm	40.1
0.005 mm	24.6
0.002 mm	17.6
0.001 mm	13.8

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	0.0	27.7	12.2	35.5	24.6
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	0.0			27.7	12.2	42.5	17.6



Comments

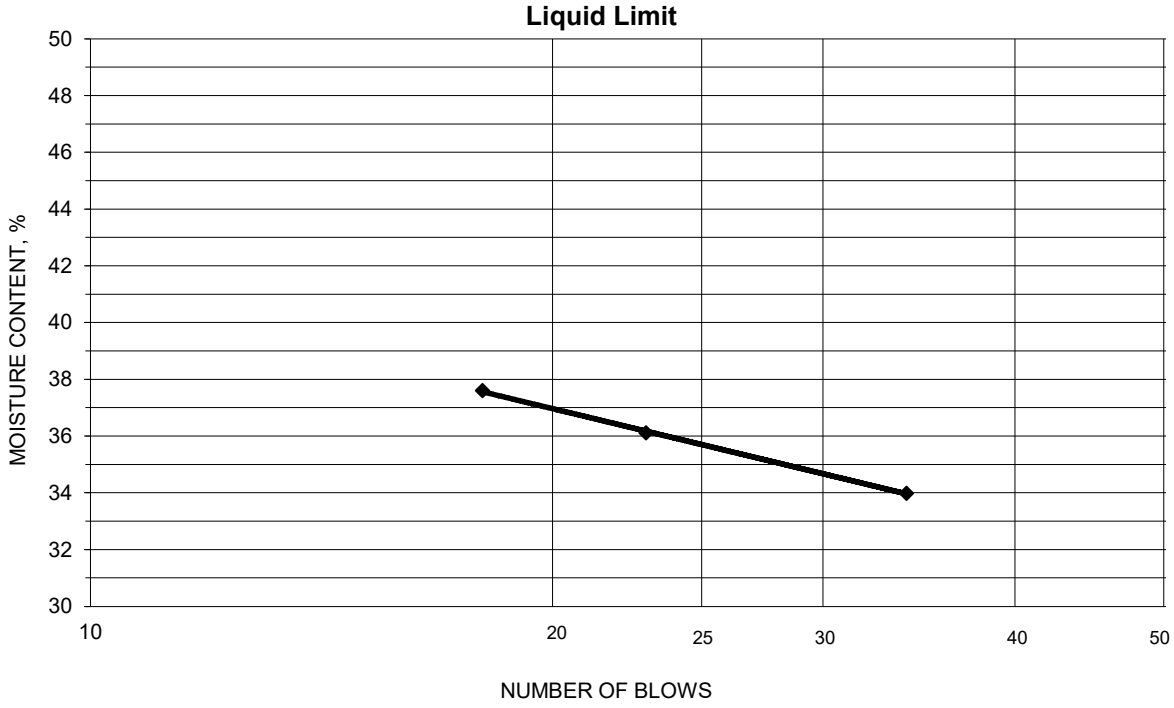
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	kif-gt-b05-ss15G, 33.0'-34.5'			Lab ID	179
				% + No. 40	28
Tested By	JMB	Test Method	ASTM D 4318 Method A	Date Received	03-10-2021
Test Date	03-17-2021	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
17.76	16.02	10.90	34	34.0	
17.74	15.88	10.73	23	36.1	
18.69	16.78	11.70	18	37.6	36



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
17.67	16.48	11.03	21.8	22	14
18.59	17.25	11.18	22.1		

Remarks: _____

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b05-ss16aG, 38.0'-38.5'	Lab ID	181
Sample Type	SS	Date Received	3-10-21
		Date Reported	3-29-21

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 24.0

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
3/8"	9.5	100.0
No. 4	4.75	99.8
No. 10	2	99.5
No. 40	0.425	98.1
No. 200	0.075	93.3
	0.02	61.9
	0.005	36.5
	0.002	27.2
estimated	0.001	21.9

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.2	0.5
Coarse Sand	0.3	1.4
Medium Sand	1.4	---
Fine Sand	4.8	4.8
Silt	56.8	66.1
Clay	36.5	27.2

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	33
Plastic Limit:	20
Plasticity Index:	13
Activity Index:	0.5

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol: CL

Group Name: Lean clay

AASHTO Classification: A-6 (12)

Comments:

Reviewed By RHB

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b05-ss16aG, 38.0'-38.5'	Lab ID	181

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	TRH
Test Date	03-17-2021
Date Received	03-10-2021

Maximum Particle size: 3/8" Sieve

Sieve Size	% Passing
3/8"	100.0
No. 4	99.8
No. 10	99.5

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

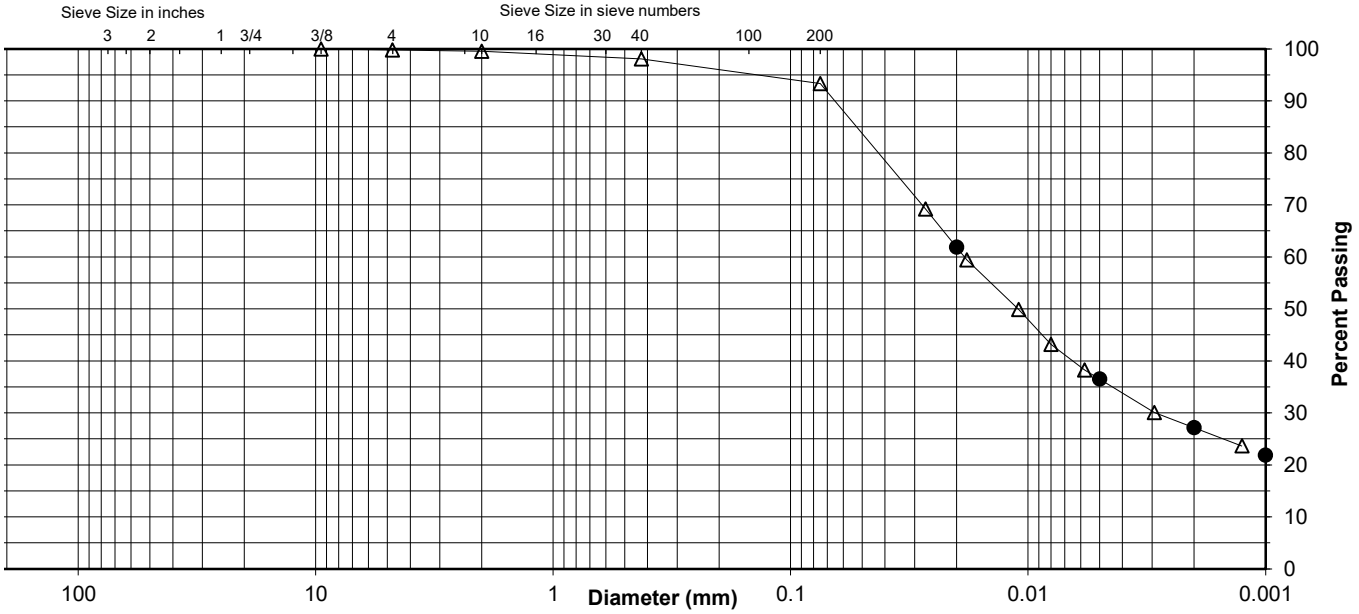
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	98.1
No. 200	93.3
0.02 mm	61.9
0.005 mm	36.5
0.002 mm	27.2
0.001 mm	21.9

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.2	0.3	1.4	4.8	56.8	36.5
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	0.5			1.4	4.8	66.1	27.2



Comments

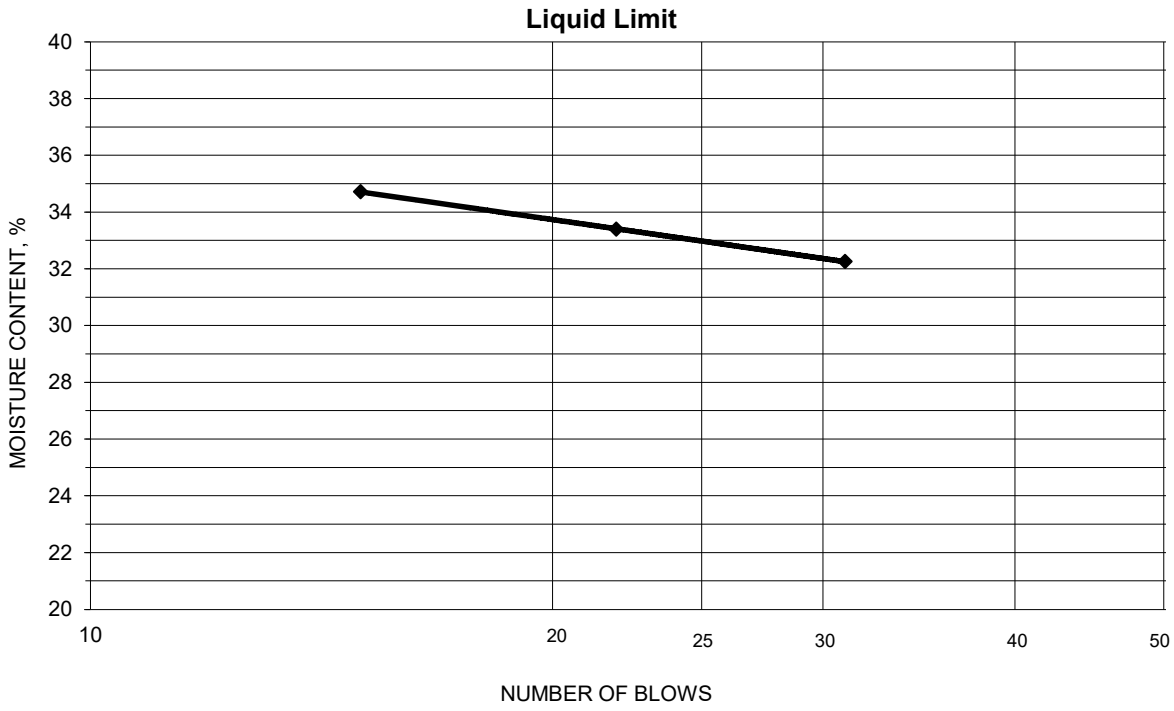
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order	Project No.	175668043
Source	kif-gt-b05-ss16aG, 38.0'-38.5'	Lab ID	181
		% + No. 40	2
Tested By	KWS	Test Method	ASTM D 4318 Method A
Test Date	03-18-2021	Prepared	Dry
		Date Received	03-10-2021

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
17.89	16.13	11.06	15	34.7	
17.44	15.80	10.89	22	33.4	
18.00	16.30	11.03	31	32.3	33



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
18.13	16.97	11.33	20.6	20	13
17.84	16.71	10.95	19.6		

Remarks: _____

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b05-ss18G, 43.0'-44.5'	Lab ID	183
Sample Type	SS	Date Received	3-10-21
		Date Reported	3-29-21

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 21.6

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 10	2	100.0
No. 40	0.425	98.8
No. 200	0.075	78.7
	0.02	50.4
	0.005	28.2
	0.002	20.5
estimated	0.001	15.5

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.0	0.0
Coarse Sand	0.0	1.2
Medium Sand	1.2	---
Fine Sand	20.1	20.1
Silt	50.5	58.2
Clay	28.2	20.5

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	31
Plastic Limit:	17
Plasticity Index:	14
Activity Index:	0.7

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol: CL

Group Name: Lean clay with sand

AASHTO Classification: A-6 (9)

Comments:

Reviewed By RHB

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b05-ss18G, 43.0'-44.5'	Lab ID	183

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	N/A
Particle Hardness:	N/A
Tested By	TRH
Test Date	03-16-2021
Date Received	03-10-2021

Maximum Particle size: No. 10 Sieve

Sieve Size	% Passing
No. 10	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

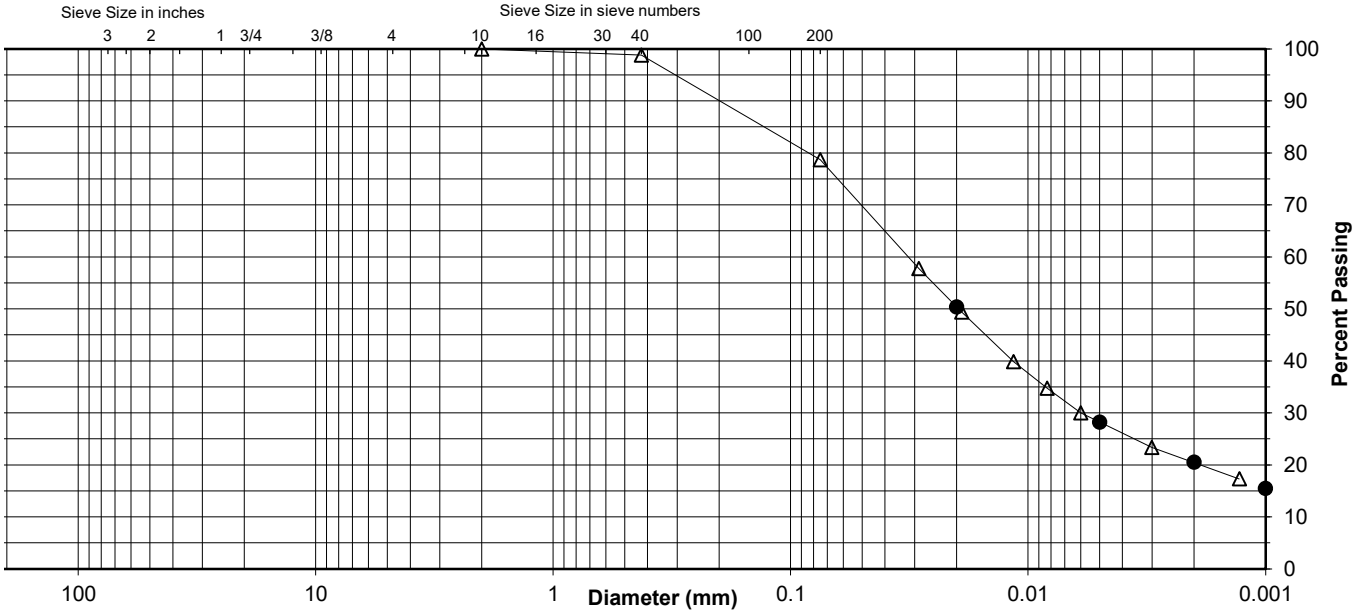
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	98.8
No. 200	78.7
0.02 mm	50.4
0.005 mm	28.2
0.002 mm	20.5
0.001 mm	15.5

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	0.0	1.2	20.1	50.5	28.2
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	0.0			1.2	20.1	58.2	20.5



Comments

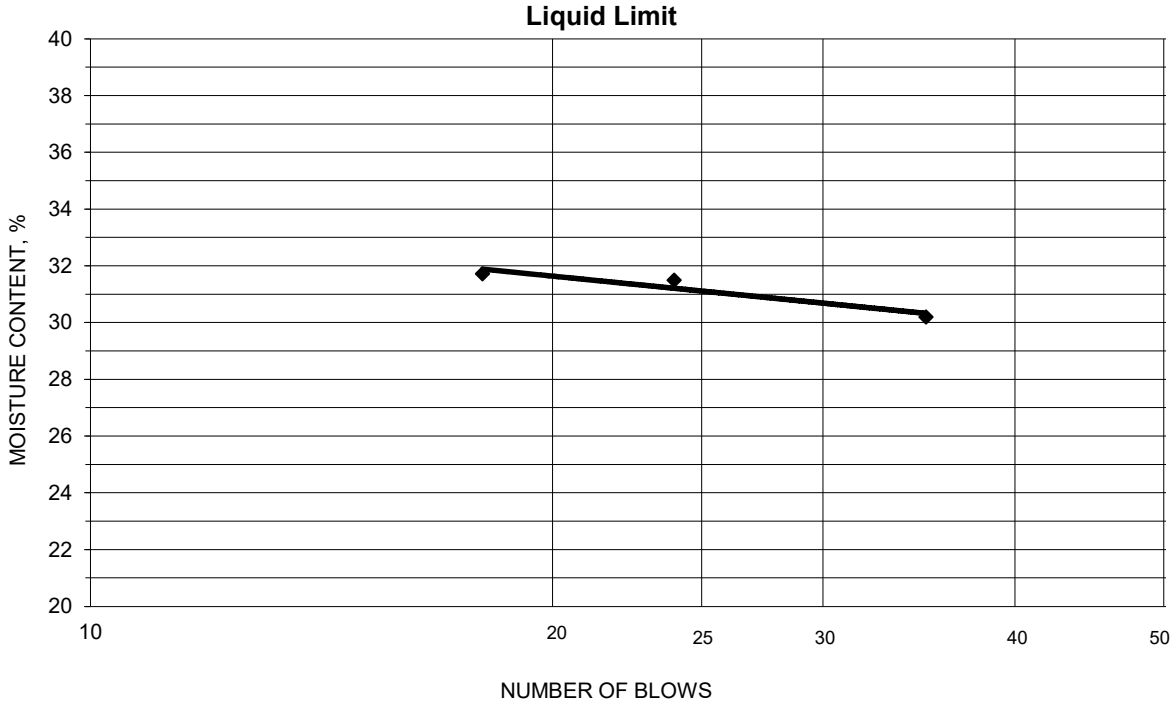
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	kif-gt-b05-ss18G, 43.0'-44.5'			Lab ID	183
				% + No. 40	1
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	03-10-2021
Test Date	03-18-2021	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
17.56	16.05	11.29	18	31.7	
17.26	15.72	10.83	24	31.5	
18.01	16.50	11.50	35	30.2	31



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
18.06	16.98	10.81	17.5	17	14
17.86	16.92	11.52	17.4		

Remarks: _____

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b05-ss19bG, 46.0'-47.0'	Lab ID	185
Sample Type	SS	Date Received	3-10-21
		Date Reported	3-29-21

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 25.2

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 10	2	100.0
No. 40	0.425	99.6
No. 200	0.075	84.9
	0.02	58.9
	0.005	33.3
	0.002	24.3
estimated	0.001	19.1

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.0	0.0
Coarse Sand	0.0	0.4
Medium Sand	0.4	---
Fine Sand	14.7	14.7
Silt	51.6	60.6
Clay	33.3	24.3

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	35
Plastic Limit:	17
Plasticity Index:	18
Activity Index:	0.7

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol:	CL
Group Name:	Lean clay with sand
AASHTO Classification:	A-6 (14)

Comments:

Reviewed By RHB

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b05-ss19bG, 46.0'-47.0'	Lab ID	185

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	N/A
Particle Hardness:	N/A
Tested By	TRH
Test Date	03-17-2021
Date Received	03-10-2021

Maximum Particle size: No. 10 Sieve

Sieve Size	% Passing
No. 10	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

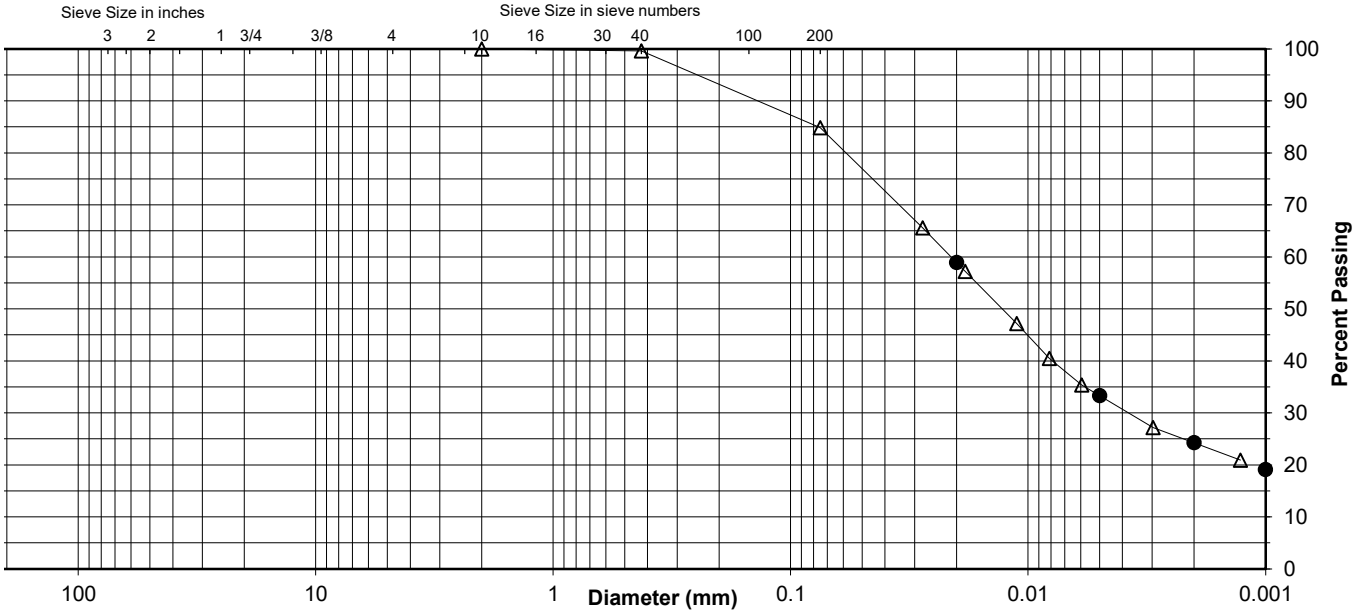
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	99.6
No. 200	84.9
0.02 mm	58.9
0.005 mm	33.3
0.002 mm	24.3
0.001 mm	19.1

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	0.0	0.4	14.7	51.6	33.3
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	0.0			0.4	14.7	60.6	24.3



Comments

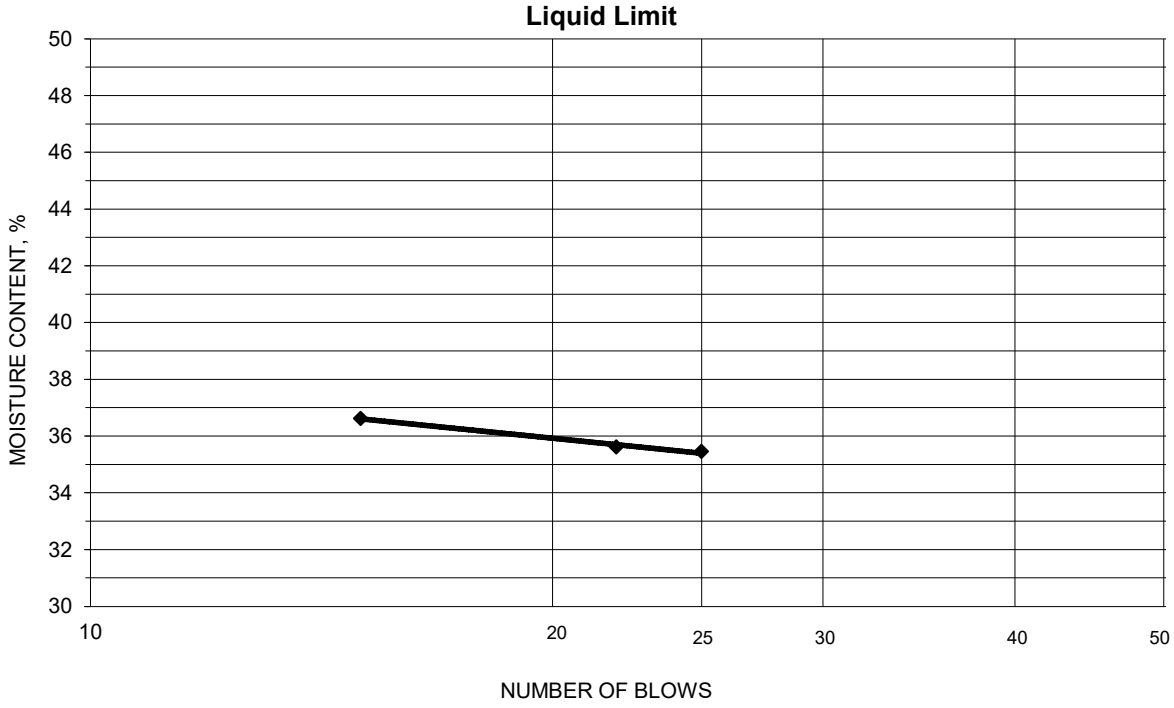
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	kif-gt-b05-ss19bG, 46.0'-47.0'			Lab ID	185
				% + No. 40	0
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	03-10-2021
Test Date	03-18-2021	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
18.95	16.80	10.93	15	36.6	
18.50	16.68	11.57	22	35.6	
17.58	16.02	11.62	25	35.5	35



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
17.13	16.21	10.82	17.1	17	18
17.26	16.31	10.66	16.8		

Remarks: _____

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b06-ss04g, 13.2'-14.7'	Lab ID	187
Sample Type	SS	Date Received	3-10-21
		Date Reported	3-31-21

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 30.3

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
3/4"	19	100.0
3/8"	9.5	97.2
No. 4	4.75	94.3
No. 10	2	88.5
No. 40	0.425	62.6
No. 200	0.075	46.0
	0.02	25.4
	0.005	15.2
	0.002	10.9
estimated	0.001	8.7

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	5.7	11.5
Coarse Sand	5.8	25.9
Medium Sand	25.9	---
Fine Sand	16.6	16.6
Silt	30.8	35.1
Clay	15.2	10.9

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	38
Plastic Limit:	25
Plasticity Index:	13
Activity Index:	1.2

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol: SM

Group Name: Silty sand

AASHTO Classification: A-6 (3)

Comments:

Reviewed By RHB

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b06-ss04g, 13.2'-14.7'	Lab ID	187

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	TRH
Test Date	03-22-2021
Date Received	03-10-2021

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	97.2
No. 4	94.3
No. 10	88.5

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity 2.7

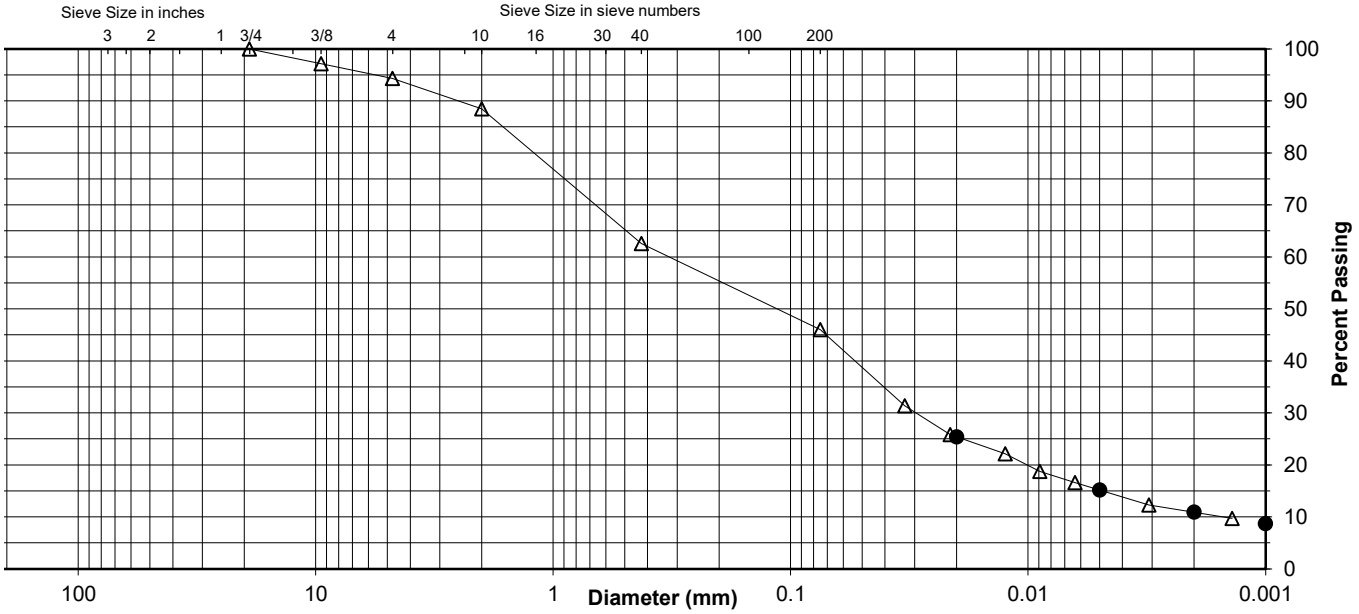
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	62.6
No. 200	46.0
0.02 mm	25.4
0.005 mm	15.2
0.002 mm	10.9
0.001 mm	8.7

Particle Size Distribution

	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
ASTM	0.0	5.7	5.8	25.9	16.6	30.8	15.2

	Gravel	Coarse Sand	Fine Sand	Silt	Clay
AASHTO	11.5	25.9	16.6	35.1	10.9



Comments

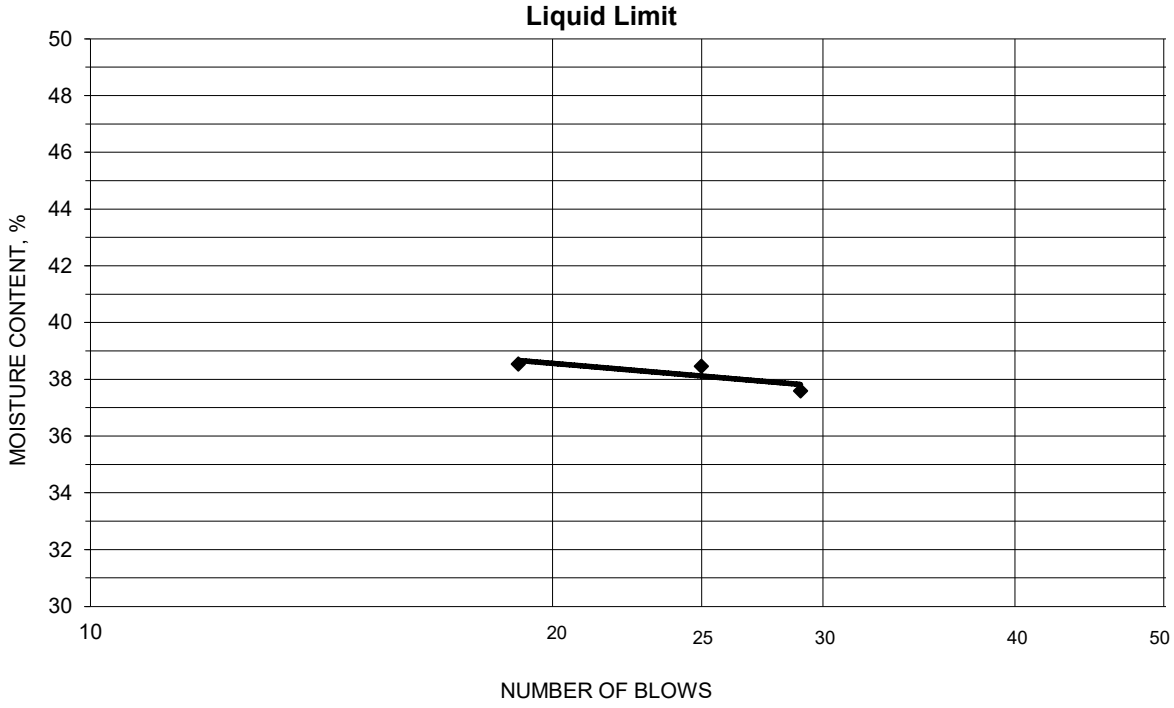
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	kif-gt-b06-ss04g, 13.2'-14.7'			Lab ID	187
				% + No. 40	37
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	03-10-2021
Test Date	03-30-2021	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
17.83	15.86	10.62	29	37.6	
17.41	15.56	10.75	25	38.5	
17.35	15.55	10.88	19	38.5	38



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
17.54	16.28	11.36	25.6	25	13
18.03	16.64	11.14	25.3		

Remarks: _____

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b06-ss06G, 18.2'-19.7'	Lab ID	188
Sample Type	SS	Date Received	3-10-21
		Date Reported	3-29-21

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 37.6

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
3/4"	19	100.0
3/8"	9.5	98.9
No. 4	4.75	98.9
No. 10	2	97.8
No. 40	0.425	91.6
No. 200	0.075	86.2
	0.02	63.5
	0.005	41.7
	0.002	27.5
estimated	0.001	18.1

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	1.1	2.2
Coarse Sand	1.1	6.2
Medium Sand	6.2	---
Fine Sand	5.4	5.4
Silt	44.5	58.7
Clay	41.7	27.5

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	38
Plastic Limit:	22
Plasticity Index:	16
Activity Index:	0.6

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol: CL

Group Name: Lean clay

AASHTO Classification: A-6 (14)

Comments:

Reviewed By RHB

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b06-ss06G, 18.2'-19.7'	Lab ID	188

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	TRH
Test Date	03-16-2021
Date Received	03-10-2021

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	98.9
No. 4	98.9
No. 10	97.8

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

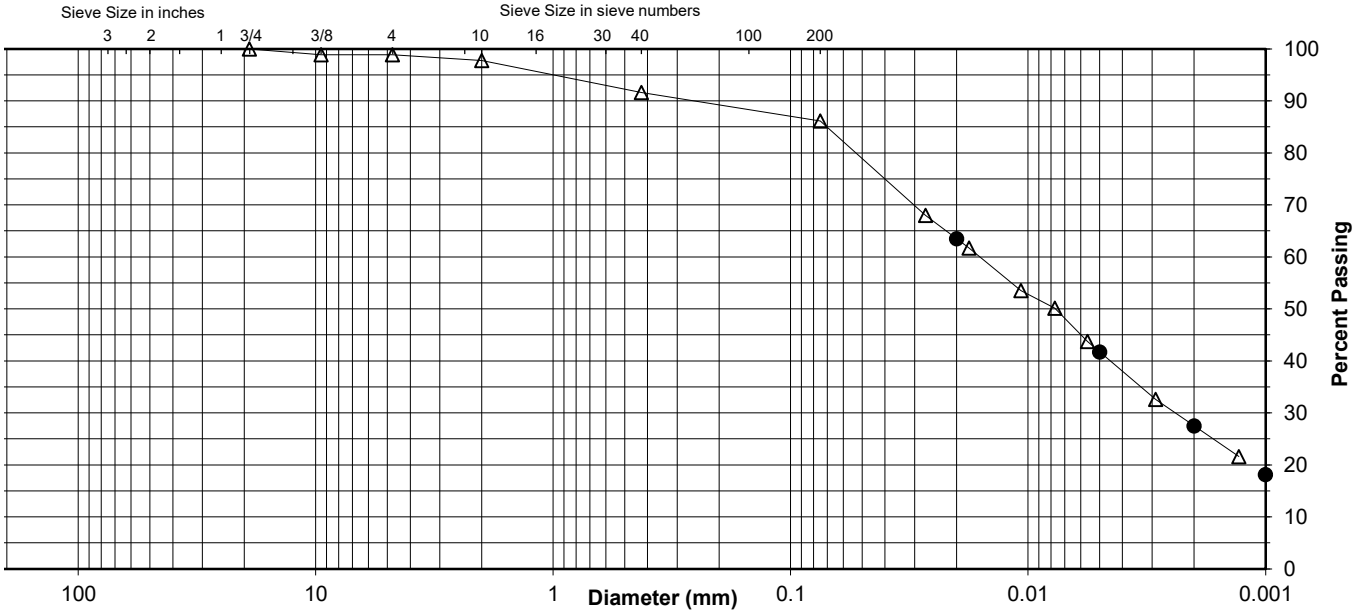
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	91.6
No. 200	86.2
0.02 mm	63.5
0.005 mm	41.7
0.002 mm	27.5
0.001 mm	18.1

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	1.1	1.1	6.2	5.4	44.5	41.7
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	2.2			6.2	5.4	58.7	27.5



Comments

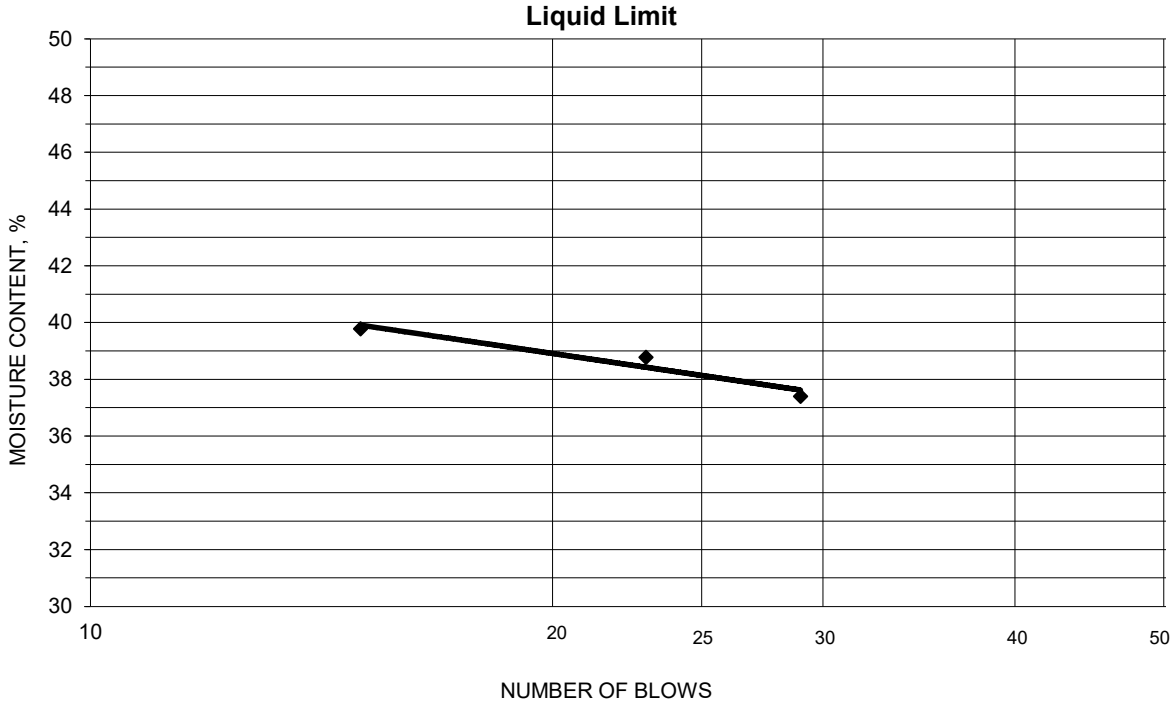
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	kif-gt-b06-ss06G, 18.2'-19.7'			Lab ID	188
				% + No. 40	8
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	03-10-2021
Test Date	03-18-2021	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
16.22	14.74	11.02	15	39.8	
17.61	15.90	11.49	23	38.8	
17.74	15.93	11.09	29	37.4	38



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
17.68	16.52	11.18	21.7	22	16
17.72	16.64	11.65	21.6		

Remarks: _____

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b06-ss08G, 23.2'-24.7'	Lab ID	190
Sample Type	SS	Date Received	3-10-21
		Date Reported	3-29-21

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 20.8

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 4	4.75	100.0
No. 10	2	100.0
No. 40	0.425	94.8
No. 200	0.075	68.2
	0.02	34.9
	0.005	21.4
	0.002	15.3
estimated	0.001	12.6

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.0	0.0
Coarse Sand	0.0	5.2
Medium Sand	5.2	---
Fine Sand	26.6	26.6
Silt	46.8	52.9
Clay	21.4	15.3

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	25
Plastic Limit:	16
Plasticity Index:	9
Activity Index:	0.6

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol:	CL
Group Name:	Sandy lean clay
AASHTO Classification:	A-4 (4)

Comments:

Reviewed By RHB

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b06-ss08G, 23.2'-24.7'	Lab ID	190

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	TRH
Test Date	03-16-2021
Date Received	03-10-2021

Maximum Particle size: No. 4 Sieve

Sieve Size	% Passing
No. 4	100.0
No. 10	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

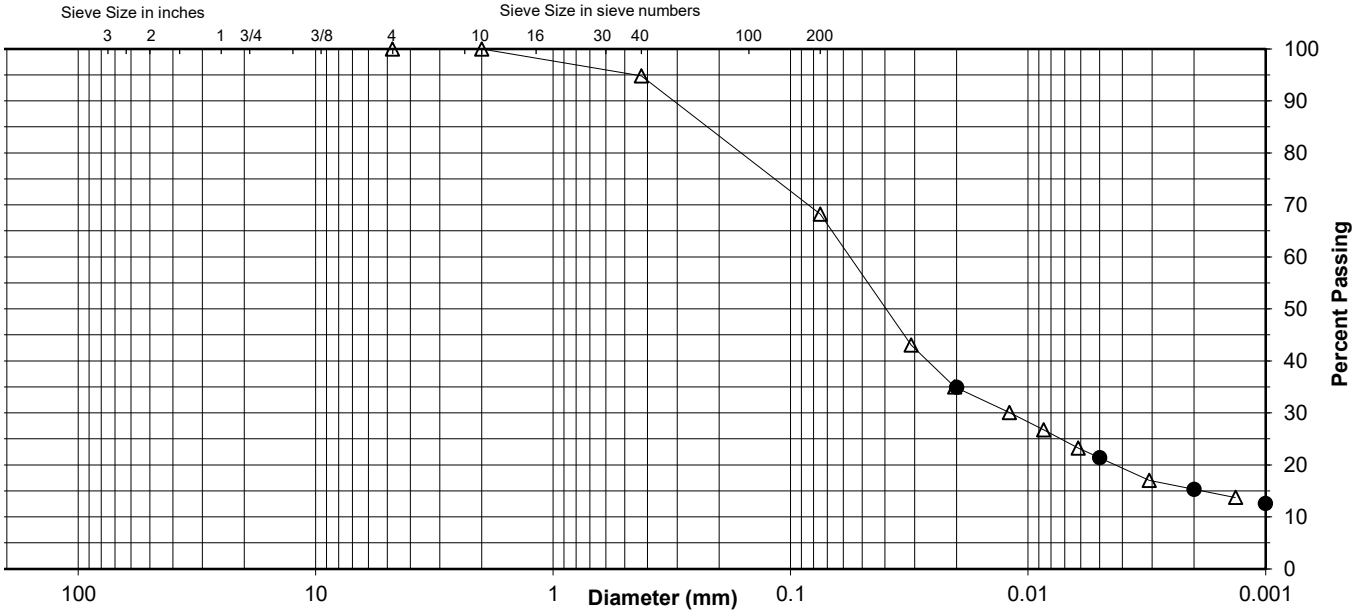
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	94.8
No. 200	68.2
0.02 mm	34.9
0.005 mm	21.4
0.002 mm	15.3
0.001 mm	12.6

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	0.0	5.2	26.6	46.8	21.4
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	0.0			5.2	26.6	52.9	15.3



Comments

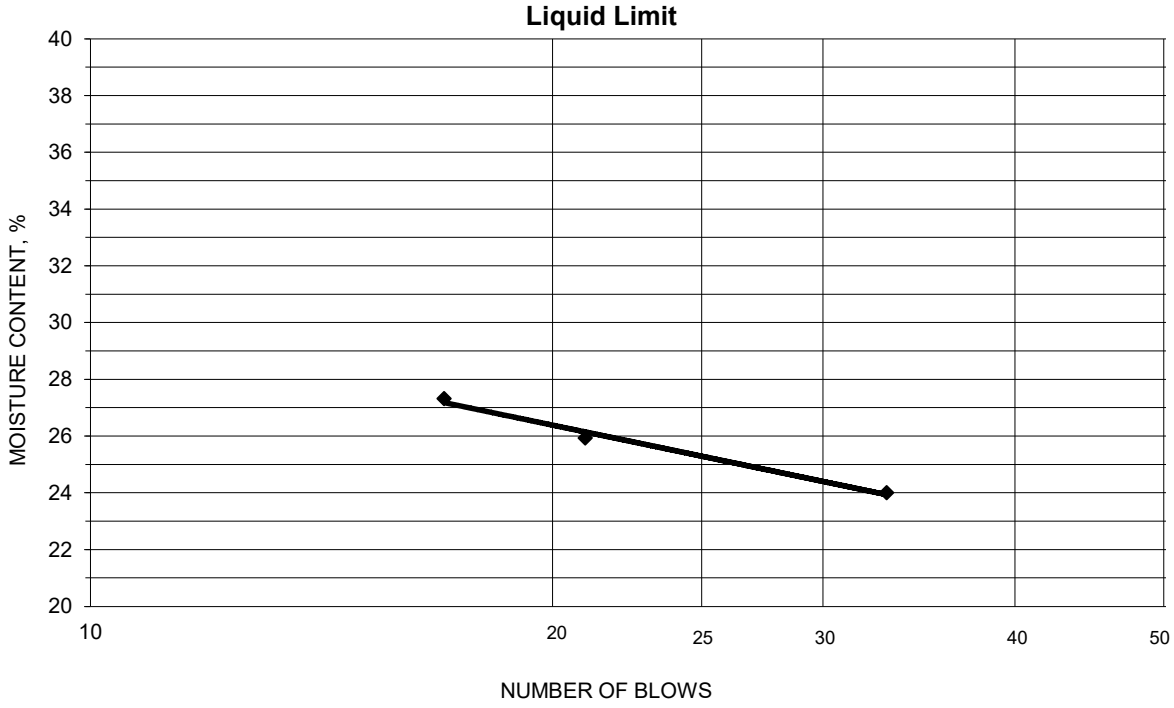
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	kif-gt-b06-ss08G, 23.2'-24.7'			Lab ID	190
				% + No. 40	5
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	03-10-2021
Test Date	03-18-2021	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
19.54	17.80	10.55	33	24.0	
18.56	16.97	10.84	21	25.9	
17.83	16.33	10.84	17	27.3	25



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
17.75	16.88	11.19	15.3	16	9
18.22	17.28	11.31	15.7		

Remarks: _____

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b06-ss10G, 28.2'-29.7'	Lab ID	192
Sample Type	SS	Date Received	3-10-21
		Date Reported	3-30-21

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 24.2

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 4	4.75	100.0
No. 10	2	99.9
No. 40	0.425	97.7
No. 200	0.075	55.6
	0.02	27.4
	0.005	14.7
	0.002	10.0
estimated	0.001	7.7

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.0	0.1
Coarse Sand	0.1	2.2
Medium Sand	2.2	---
Fine Sand	42.1	42.1
Silt	40.9	45.6
Clay	14.7	10.0

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	NP
Plastic Limit:	NP
Plasticity Index:	NP
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol: ML

Group Name: Sandy silt

AASHTO Classification: A-4 (0)

Comments:

Reviewed By RHB

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b06-ss10G, 28.2'-29.7'	Lab ID	192

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	TRH
Test Date	03-16-2021
Date Received	03-10-2021

Maximum Particle size: No. 4 Sieve

Sieve Size	% Passing
No. 4	100.0
No. 10	99.9

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

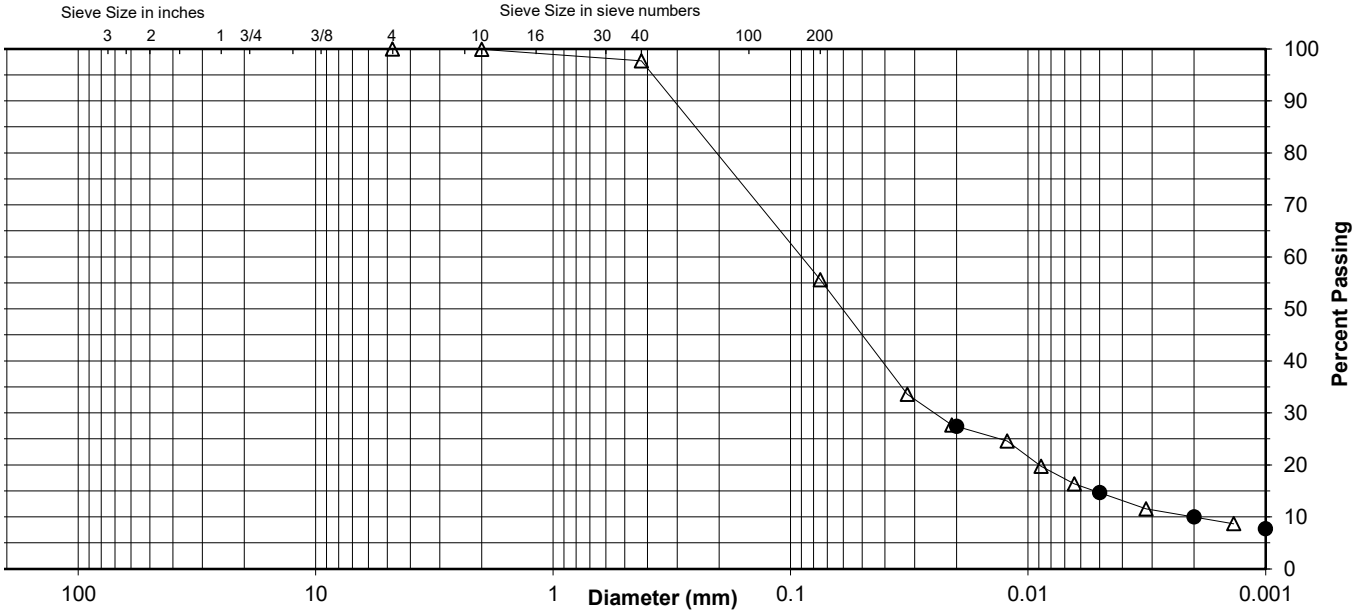
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	97.7
No. 200	55.6
0.02 mm	27.4
0.005 mm	14.7
0.002 mm	10.0
0.001 mm	7.7

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	0.1	2.2	42.1	40.9	14.7
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	0.1			2.2	42.1	45.6	10.0



Comments

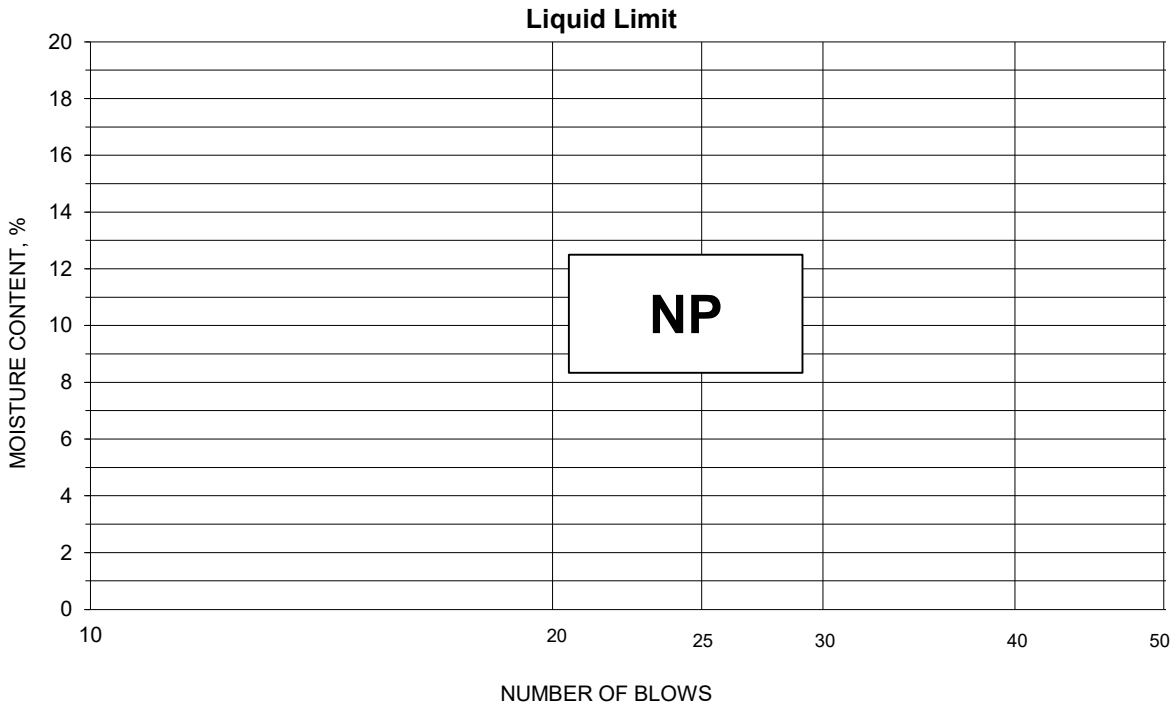
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	kif-gt-b06-ss10G, 28.2'-29.7'			Lab ID	192
				% + No. 40	2
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	03-10-2021
Test Date	03-29-2021	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: _____

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b06-ss11bG, 31.4'-32.2'	Lab ID	194
Sample Type	SS	Date Received	3-10-21
		Date Reported	3-29-21

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 31.9

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 10	2	100.0
No. 40	0.425	99.4
No. 200	0.075	84.1
	0.02	48.8
	0.005	24.8
	0.002	18.6
estimated	0.001	15.7

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.0	0.0
Coarse Sand	0.0	0.6
Medium Sand	0.6	---
Fine Sand	15.3	15.3
Silt	59.3	65.5
Clay	24.8	18.6

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	32
Plastic Limit:	20
Plasticity Index:	12
Activity Index:	0.6

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol:	CL
Group Name:	Lean clay with sand
AASHTO Classification:	A-6 (9)

Comments:

Reviewed By RHB

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b06-ss11bG, 31.4'-32.2'	Lab ID	194

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	N/A
Particle Hardness:	N/A
Tested By	TRH
Test Date	03-16-2021
Date Received	03-10-2021

Maximum Particle size: No. 10 Sieve

Sieve Size	% Passing
No. 10	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity 2.7

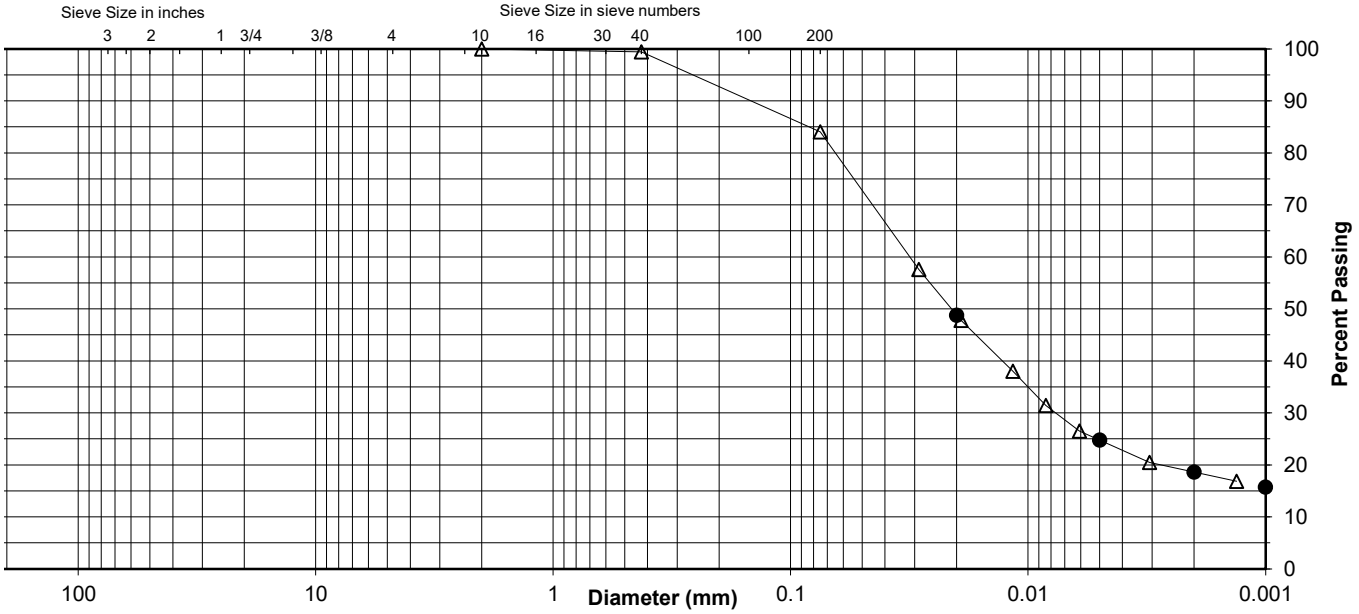
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	99.4
No. 200	84.1
0.02 mm	48.8
0.005 mm	24.8
0.002 mm	18.6
0.001 mm	15.7

Particle Size Distribution

	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
ASTM	0.0	0.0	0.0	0.6	15.3	59.3	24.8

	Gravel	Coarse Sand	Fine Sand	Silt	Clay
AASHTO	0.0	0.6	15.3	65.5	18.6



Comments

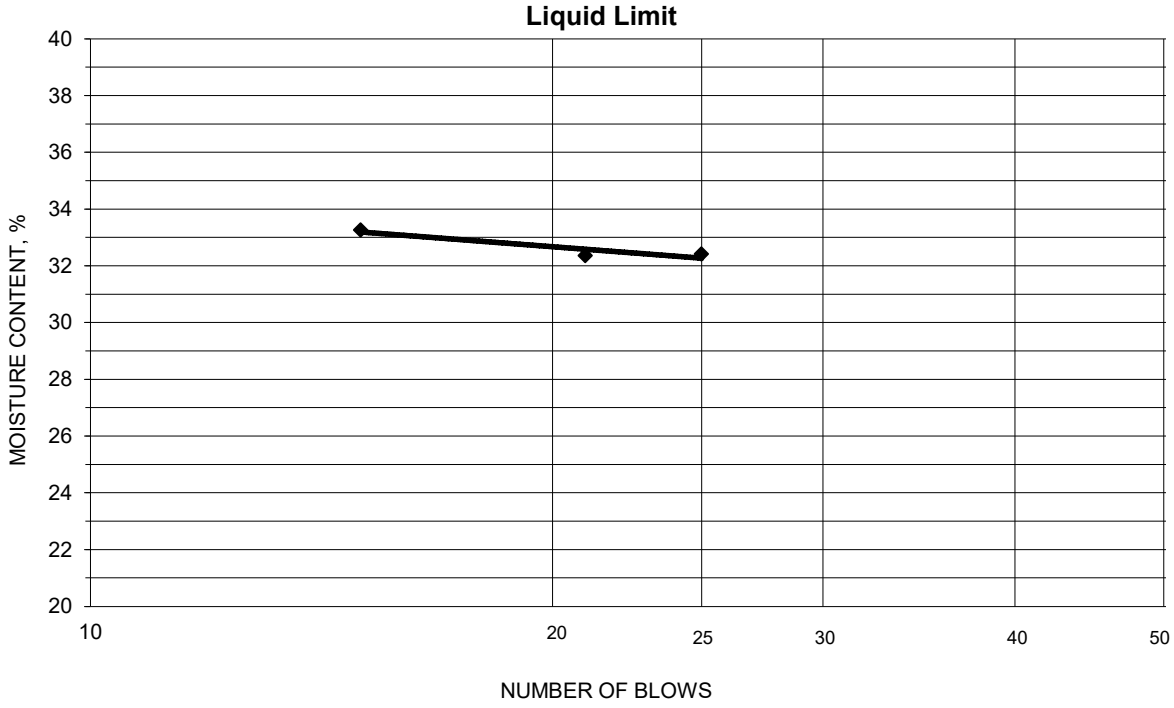
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	kif-gt-b06-ss11bG, 31.4'-32.2'			Lab ID	194
				% + No. 40	1
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	03-10-2021
Test Date	03-18-2021	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
17.90	16.19	11.05	15	33.3	
18.83	16.94	11.10	21	32.4	
17.41	15.88	11.16	25	32.4	32



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
14.63	13.54	8.05	19.9	20	12
17.44	16.35	10.91	20.0		

Remarks: _____

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b07-ss02G, 11.0'-12.5' & kif-gt-b07-ss03G, 13.5'-15.0'	Lab ID	197
Sample Type	SS Composite	Date Received	3-10-21
		Date Reported	3-31-21

Test Results

Natural Moisture Content

Test Not Performed

Moisture Content (%): N/A

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
1 1/2"	37.5	100.0
3/4"	19	89.8
3/8"	9.5	84.8
No. 4	4.75	84.8
No. 10	2	83.7
No. 40	0.425	66.1
No. 200	0.075	51.6
	0.02	30.9
	0.005	17.4
	0.002	12.8
estimated	0.001	10.3

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	15.2	16.3
Coarse Sand	1.1	17.6
Medium Sand	17.6	---
Fine Sand	14.5	14.5
Silt	34.2	38.8
Clay	17.4	12.8

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	36
Plastic Limit:	22
Plasticity Index:	14
Activity Index:	1.1

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol: CL

Group Name: Sandy lean clay with gravel

AASHTO Classification: A-6 (5)

Comments:

Reviewed By RHB

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b07-ss02G, 11.0'-12.5' & kif-gt-b07-ss03G, 13.5'-15.0'	Lab ID	197

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	TRH
Test Date	03-22-2021
Date Received	03-10-2021

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	89.8
3/8"	84.8
No. 4	84.8
No. 10	83.7

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

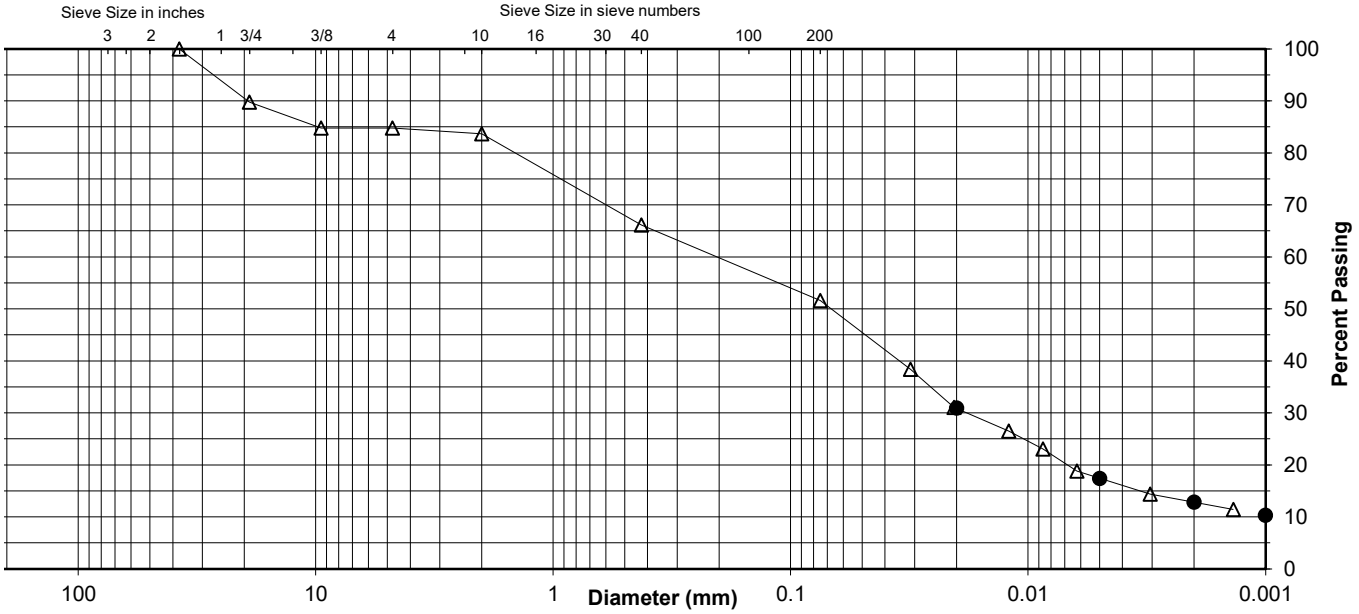
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	66.1
No. 200	51.6
0.02 mm	30.9
0.005 mm	17.4
0.002 mm	12.8
0.001 mm	10.3

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	10.2	5.0	1.1	17.6	14.5	34.2	17.4
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	16.3			17.6	14.5	38.8	12.8



Comments

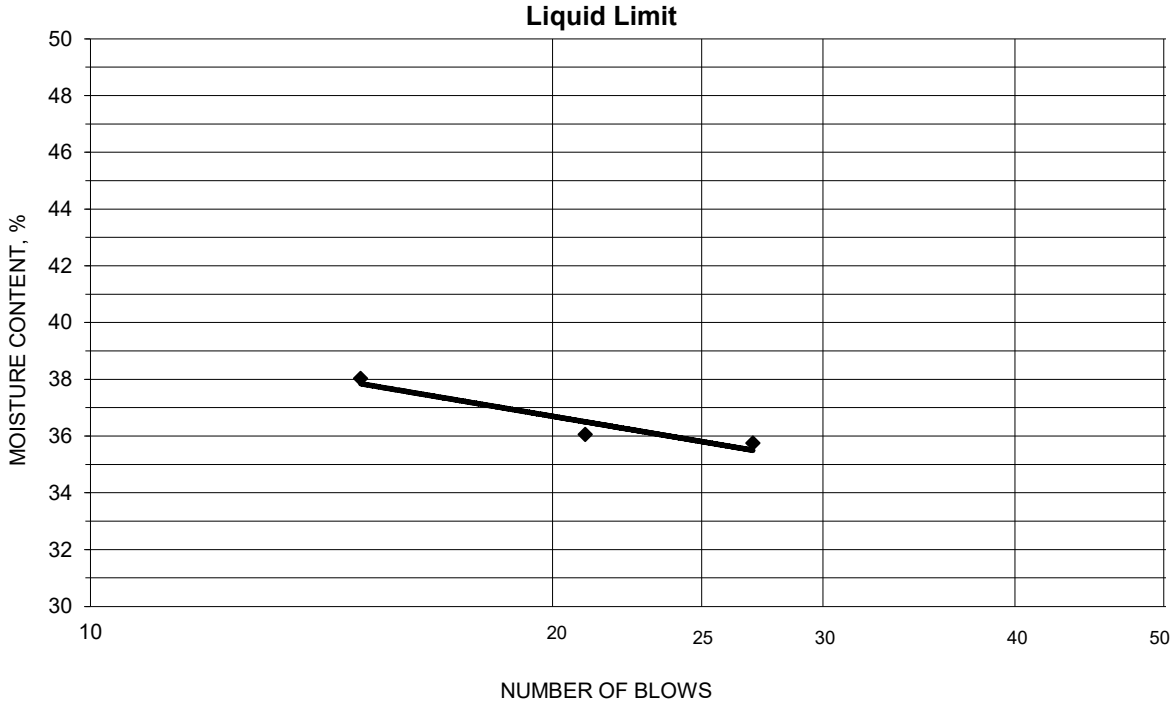
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	kif-gt-b07-ss02G, 11.0'-12.5' & kif-gt-b07-ss03G, 13.5'-15.0'			Lab ID	197
				% + No. 40	34
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	03-10-2021
Test Date	03-29-2021	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
18.36	16.44	11.07	27	35.8	
17.93	16.21	11.44	21	36.1	
19.16	17.11	11.72	15	38.0	36



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
18.20	16.94	11.33	22.5	22	14
17.38	16.20	10.90	22.3		

Remarks: _____

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b07-ss05G, 19.0'-20.5'	Lab ID	200
Sample Type	SS	Date Received	3-10-21
		Date Reported	3-29-21

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 25.2

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 10	2	100.0
No. 40	0.425	99.7
No. 200	0.075	79.5
	0.02	53.8
	0.005	29.2
	0.002	20.1
estimated	0.001	14.9

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.0	0.0
Coarse Sand	0.0	0.3
Medium Sand	0.3	---
Fine Sand	20.2	20.2
Silt	50.3	59.4
Clay	29.2	20.1

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	25
Plastic Limit:	18
Plasticity Index:	7
Activity Index:	0.3

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol: CL-ML

Group Name: Silty clay with sand

AASHTO Classification: A-4 (4)

Comments:

Reviewed By RHB

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b07-ss05G, 19.0'-20.5'	Lab ID	200

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	N/A
Particle Hardness:	N/A
Tested By	TRH
Test Date	03-17-2021
Date Received	03-10-2021

Maximum Particle size: No. 10 Sieve

Sieve Size	% Passing
No. 10	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

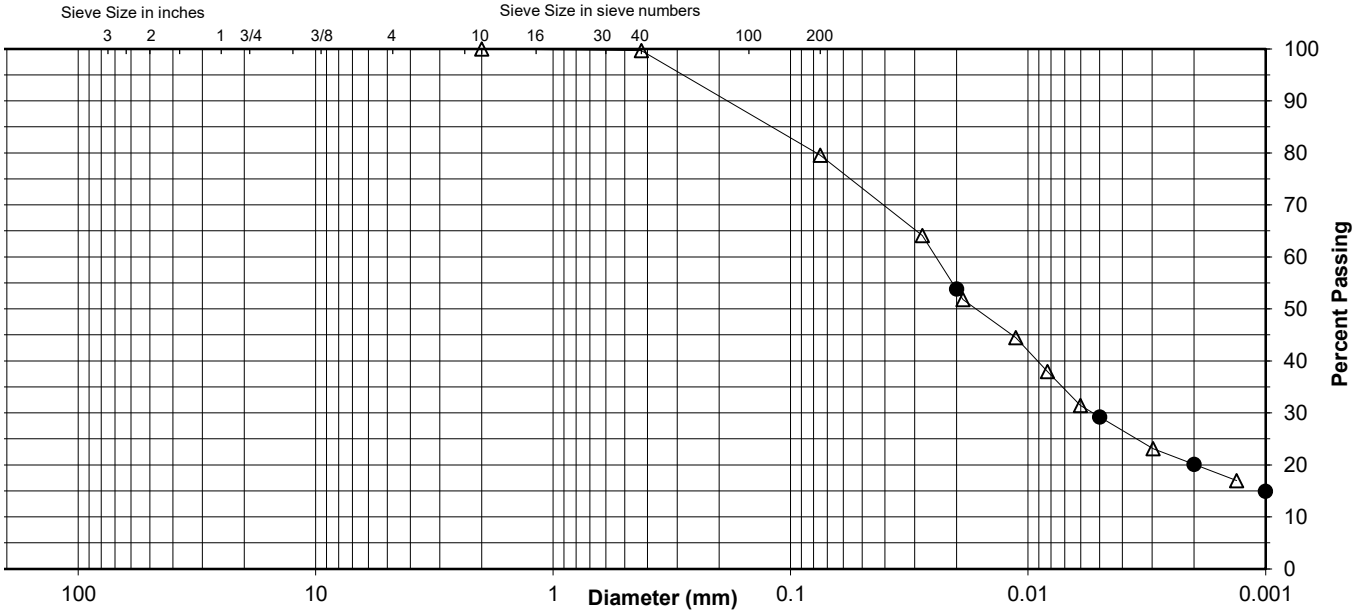
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	99.7
No. 200	79.5
0.02 mm	53.8
0.005 mm	29.2
0.002 mm	20.1
0.001 mm	14.9

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	0.0	0.3	20.2	50.3	29.2
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	0.0			0.3	20.2	59.4	20.1



Comments

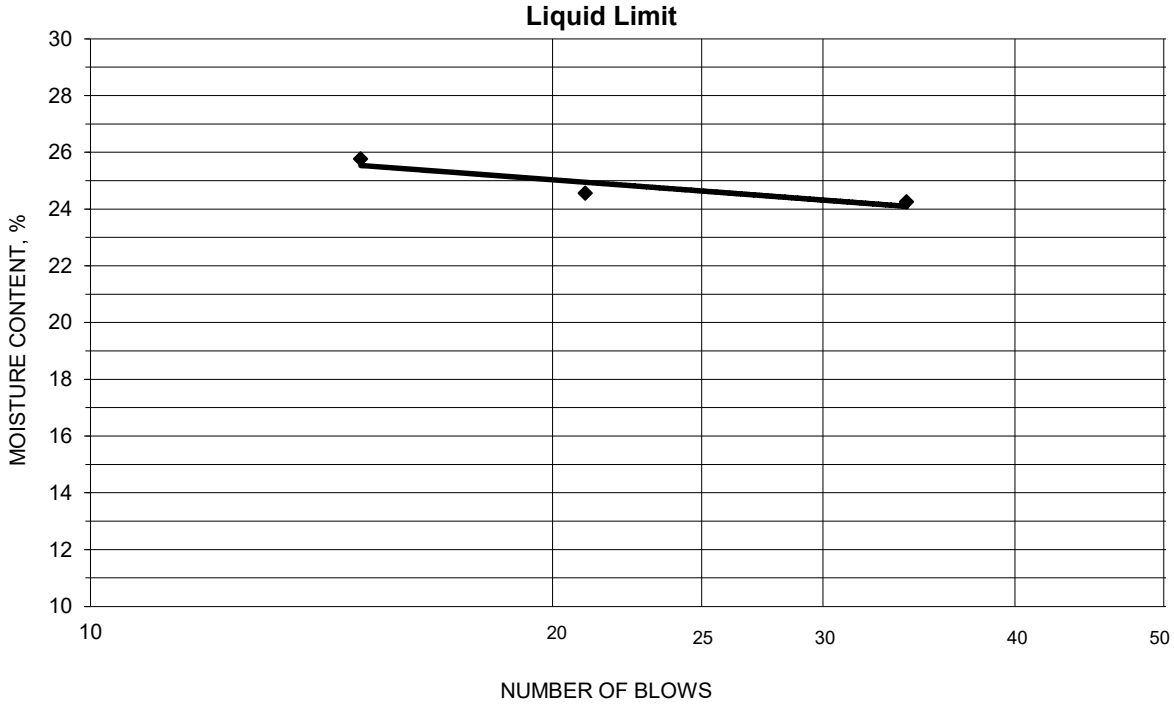
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	kif-gt-b07-ss05G, 19.0'-20.5'			Lab ID	200
				% + No. 40	0
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	03-10-2021
Test Date	03-25-2021	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
18.53	17.01	11.11	15	25.8	
19.23	17.67	11.32	21	24.6	
18.87	17.33	10.98	34	24.3	25



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
17.34	16.33	10.71	18.0	18	7
17.74	16.70	10.74	17.4		

Remarks: _____

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b07-ss07G, 26.0'-27.5'	Lab ID	203
Sample Type	SS	Date Received	3-10-21
		Date Reported	3-29-21

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 20.9

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 4	4.75	100.0
No. 10	2	100.0
No. 40	0.425	99.6
No. 200	0.075	79.5
	0.02	42.4
	0.005	21.5
	0.002	15.4
estimated	0.001	12.5

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.0	0.0
Coarse Sand	0.0	0.4
Medium Sand	0.4	---
Fine Sand	20.1	20.1
Silt	58.0	64.1
Clay	21.5	15.4

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	25
Plastic Limit:	17
Plasticity Index:	8
Activity Index:	0.5

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol: CL

Group Name: Lean clay with sand

AASHTO Classification: A-4 (4)

Comments:

Reviewed By RHB

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b07-ss07G, 26.0'-27.5'	Lab ID	203

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	TRH
Test Date	03-17-2021
Date Received	03-10-2021

Maximum Particle size: No. 4 Sieve

Sieve Size	% Passing
No. 4	100.0
No. 10	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

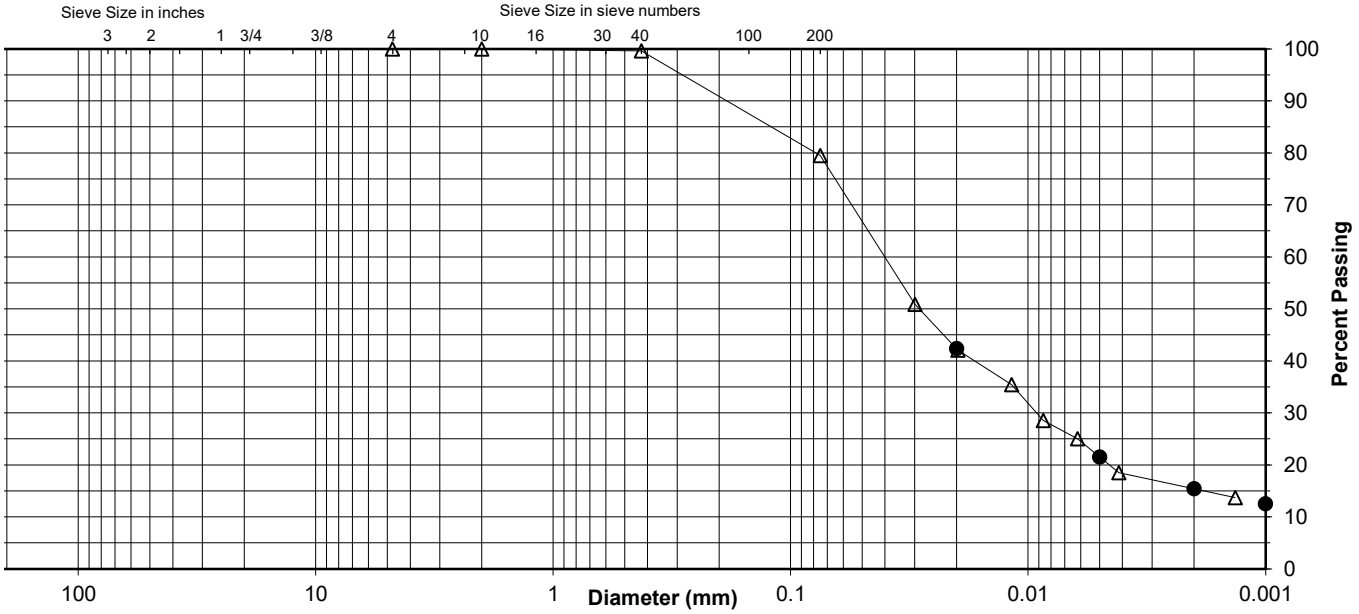
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	99.6
No. 200	79.5
0.02 mm	42.4
0.005 mm	21.5
0.002 mm	15.4
0.001 mm	12.5

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	0.0	0.4	20.1	58.0	21.5
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	0.0			0.4	20.1	64.1	15.4



Comments

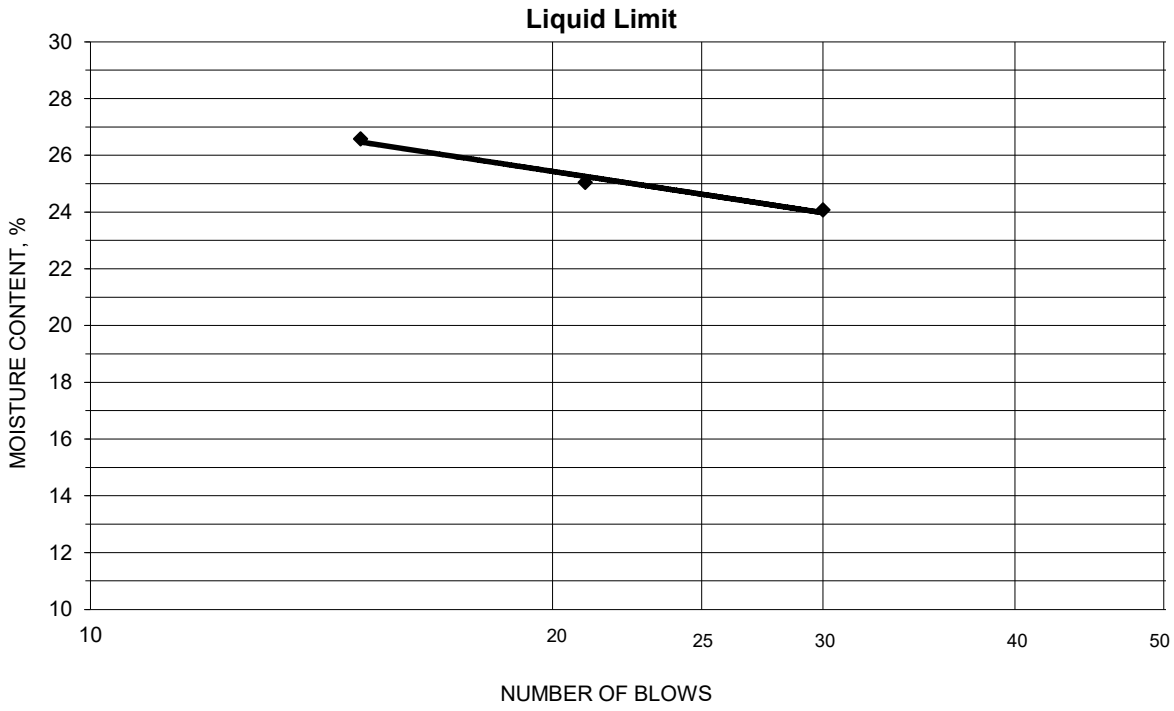
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	kif-gt-b07-ss07G, 26.0'-27.5'			Lab ID	203
				% + No. 40	0
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	03-10-2021
Test Date	03-25-2021	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
18.51	17.07	11.09	30	24.1	
17.95	16.53	10.86	21	25.0	
17.66	16.27	11.04	15	26.6	25



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
17.02	16.16	10.83	16.1	17	8
17.67	16.72	11.10	16.9		

Remarks: _____

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b07-ss08G, 28.5'-30.0'	Lab ID	204
Sample Type	SS	Date Received	3-10-21
		Date Reported	3-29-21

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 23.0

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
3/8"	9.5	100.0
No. 4	4.75	98.6
No. 10	2	96.9
No. 40	0.425	72.9
No. 200	0.075	43.7
	0.02	22.5
	0.005	11.3
	0.002	7.7
estimated	0.001	5.5

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	1.4	3.1
Coarse Sand	1.7	24.0
Medium Sand	24.0	---
Fine Sand	29.2	29.2
Silt	32.4	36.0
Clay	11.3	7.7

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	24
Plastic Limit:	18
Plasticity Index:	6
Activity Index:	0.8

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol: SC-SM

Group Name: Silty, clayey sand

AASHTO Classification: A-4 (0)

Comments:

Reviewed By RHB

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b07-ss08G, 28.5'-30.0'	Lab ID	204

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	TRH
Test Date	03-17-2021
Date Received	03-10-2021

Maximum Particle size: 3/8" Sieve

Sieve Size	% Passing
3/8"	100.0
No. 4	98.6
No. 10	96.9

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

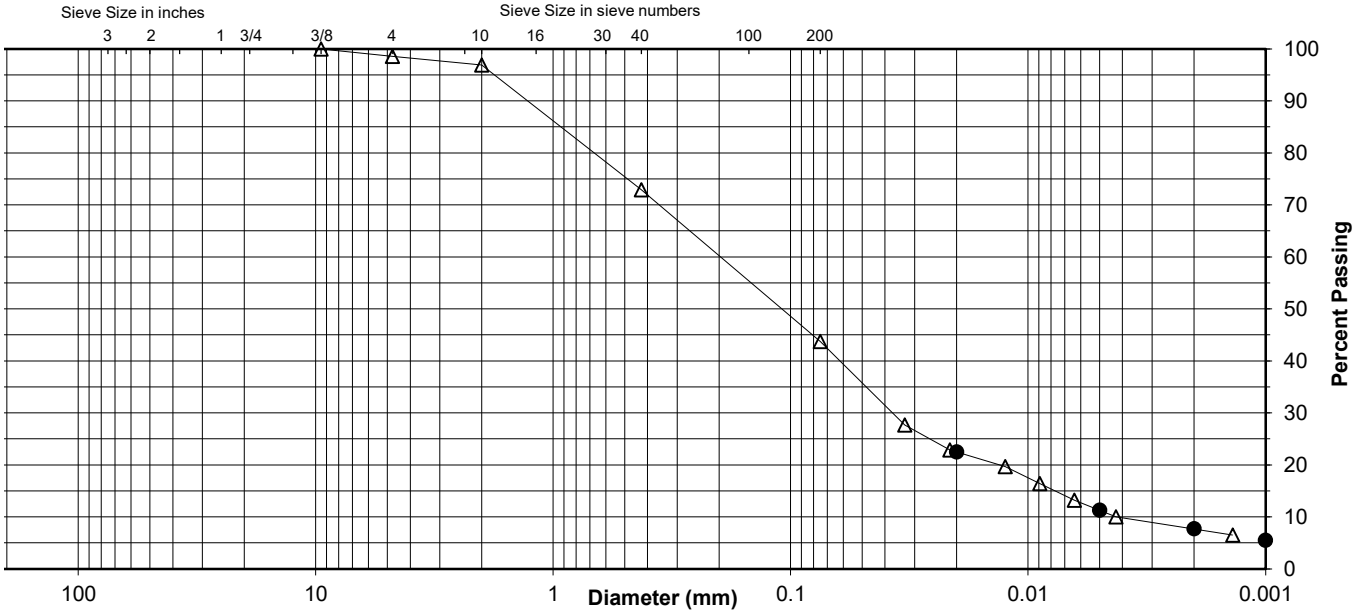
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	72.9
No. 200	43.7
0.02 mm	22.5
0.005 mm	11.3
0.002 mm	7.7
0.001 mm	5.5

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	1.4	1.7	24.0	29.2	32.4	11.3
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	3.1			24.0	29.2	36.0	7.7



Comments

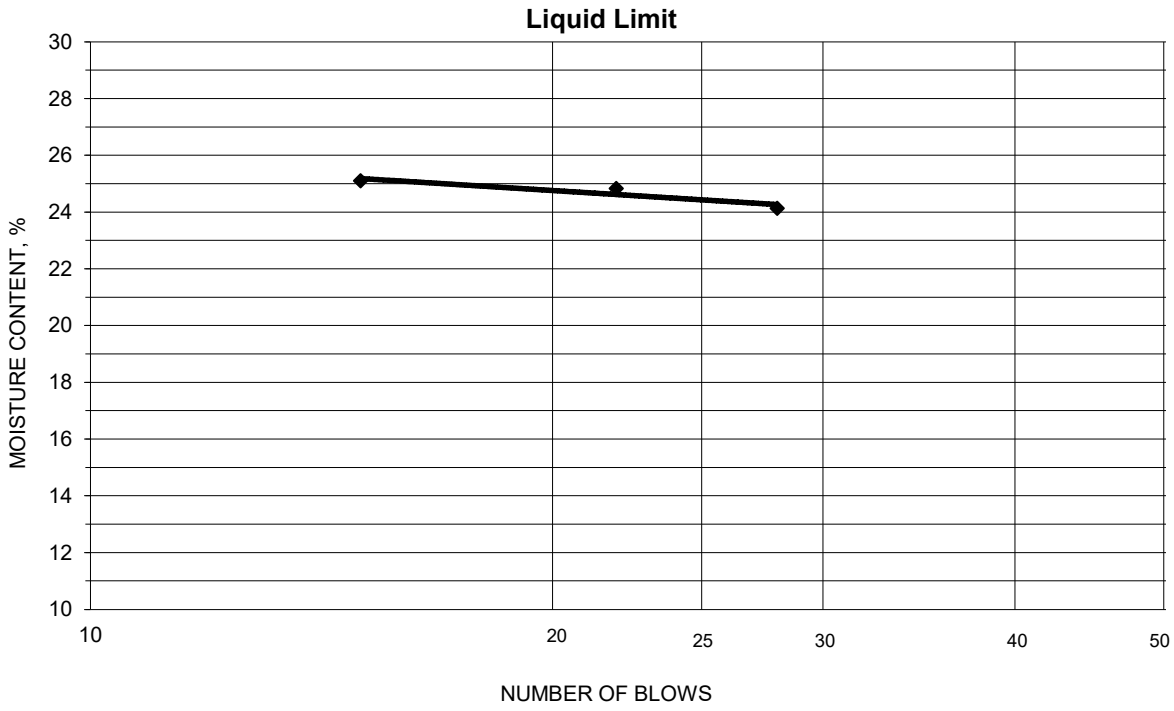
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	kif-gt-b07-ss08G, 28.5'-30.0'			Lab ID	204
				% + No. 40	27
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	03-10-2021
Test Date	03-25-2021	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
16.88	15.66	10.80	15	25.1	
18.59	17.16	11.40	22	24.8	
19.85	18.24	11.57	28	24.1	24



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
17.14	16.19	10.86	17.8	18	6
17.84	16.84	11.15	17.6		

Remarks: _____

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b07-ss09bG, 31.9'-32.5'	Lab ID	206
Sample Type	SS	Date Received	3-10-21
		Date Reported	3-29-21

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 20.1

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
3/8"	9.5	100.0
No. 4	4.75	99.8
No. 10	2	98.6
No. 40	0.425	87.2
No. 200	0.075	58.8
	0.02	32.2
	0.005	15.4
	0.002	11.1
estimated	0.001	9.2

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.2	1.4
Coarse Sand	1.2	11.4
Medium Sand	11.4	---
Fine Sand	28.4	28.4
Silt	43.4	47.7
Clay	15.4	11.1

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	24
Plastic Limit:	18
Plasticity Index:	6
Activity Index:	0.5

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol: CL-ML

Group Name: Sandy silty clay

AASHTO Classification: A-4 (1)

Comments:

Reviewed By RHB

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b07-ss09bG, 31.9'-32.5'	Lab ID	206

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	TRH
Test Date	03-17-2021
Date Received	03-10-2021

Maximum Particle size: 3/8" Sieve

Sieve Size	% Passing
3/8"	100.0
No. 4	99.8
No. 10	98.6

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

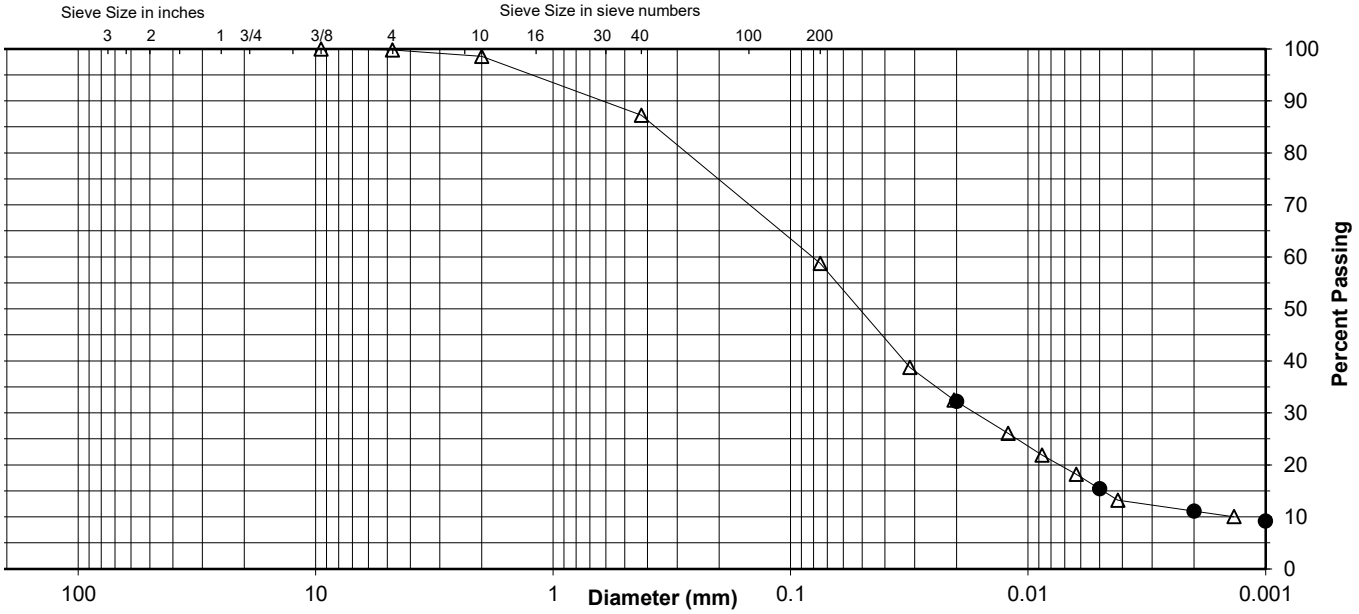
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	87.2
No. 200	58.8
0.02 mm	32.2
0.005 mm	15.4
0.002 mm	11.1
0.001 mm	9.2

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.2	1.2	11.4	28.4	43.4	15.4
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	1.4			11.4	28.4	47.7	11.1



Comments

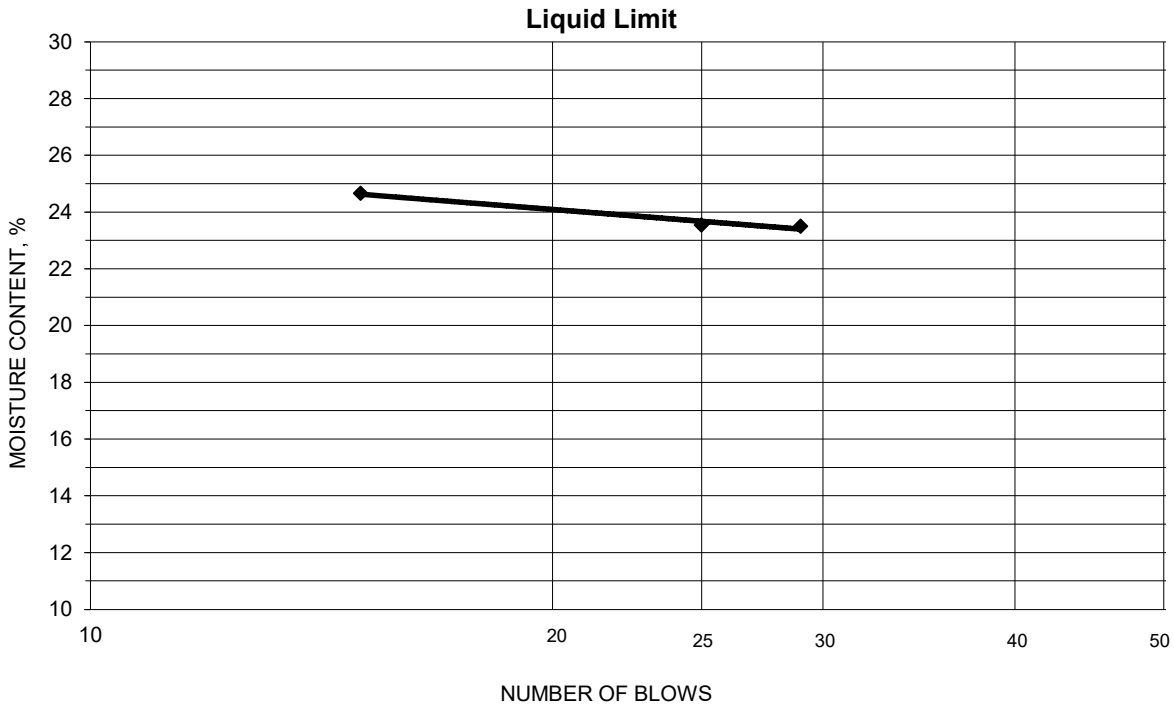
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	kif-gt-b07-ss09bG, 31.9'-32.5'			Lab ID	206
				% + No. 40	13
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	03-10-2021
Test Date	03-25-2021	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
19.25	17.63	11.06	15	24.7	
20.16	18.42	11.03	25	23.5	
18.62	17.17	11.00	29	23.5	24



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
17.64	16.65	11.02	17.6	18	6
17.52	16.54	10.93	17.5		

Remarks: _____

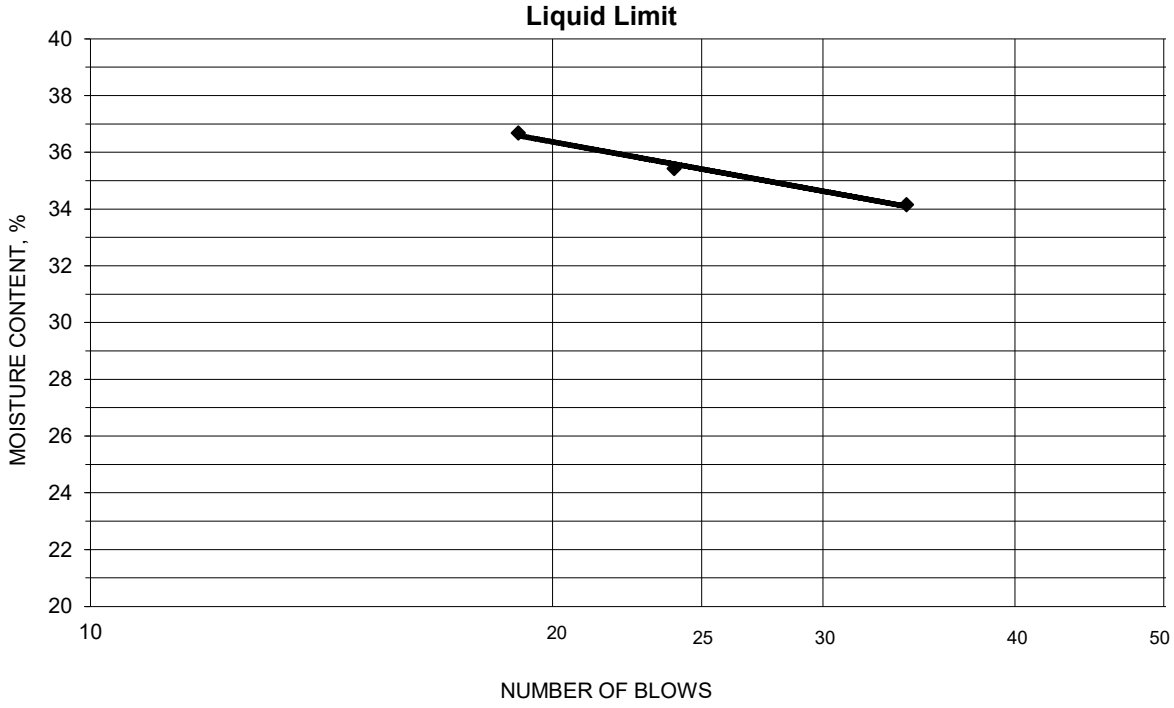
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order	Project No.	175668043
Source	kif-gt-b08-ss02G, 11.0'-12.5' & kif-gt-b08-ss03G, 13.5'-15.0'	Lab ID	209
		% + No. 40	20
Tested By	KWS	Test Method	ASTM D 4318 Method A
Test Date	03-29-2021	Prepared	Dry
		Date Received	03-10-2021

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
18.44	16.51	10.86	34	34.2	
18.36	16.61	11.67	24	35.4	
18.84	16.87	11.50	19	36.7	35



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
17.63	16.30	11.69	28.9	29	6
17.84	16.42	11.39	28.2		

Remarks: _____

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b08-ss06bG, 25.0'-26.0'	Lab ID	214
Sample Type	SS	Date Received	3-10-21
		Date Reported	3-30-21

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 19.1

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 10	2	100.0
No. 40	0.425	99.0
No. 200	0.075	72.4
	0.02	40.2
	0.005	22.8
	0.002	16.9
estimated	0.001	13.8

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.0	0.0
Coarse Sand	0.0	1.0
Medium Sand	1.0	---
Fine Sand	26.6	26.6
Silt	49.6	55.5
Clay	22.8	16.9

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	24
Plastic Limit:	17
Plasticity Index:	7
Activity Index:	0.4

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol: CL-ML

Group Name: Silty clay with sand

AASHTO Classification: A-4 (3)

Comments:

Reviewed By RHB

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b08-ss06bG, 25.0'-26.0'	Lab ID	214

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	N/A
Particle Hardness:	N/A
Tested By	TRH
Test Date	03-17-2021
Date Received	03-10-2021

Maximum Particle size: No. 10 Sieve

Sieve Size	% Passing
No. 10	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

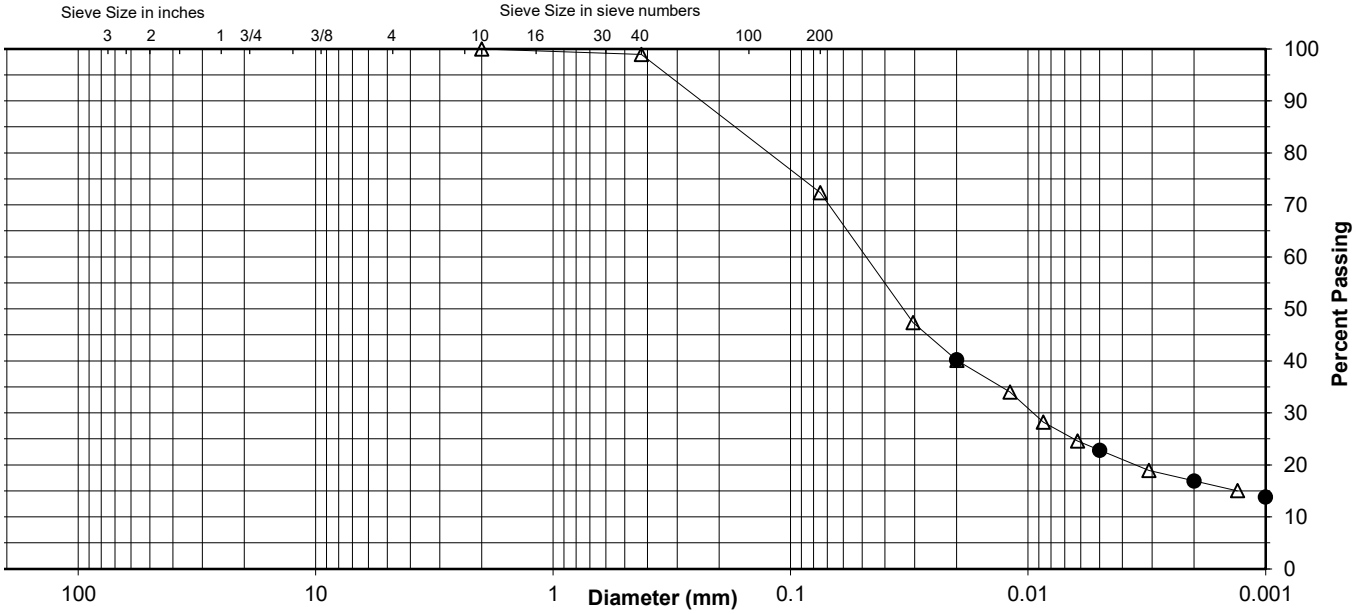
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	99.0
No. 200	72.4
0.02 mm	40.2
0.005 mm	22.8
0.002 mm	16.9
0.001 mm	13.8

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	0.0	1.0	26.6	49.6	22.8
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	0.0			1.0	26.6	55.5	16.9



Comments

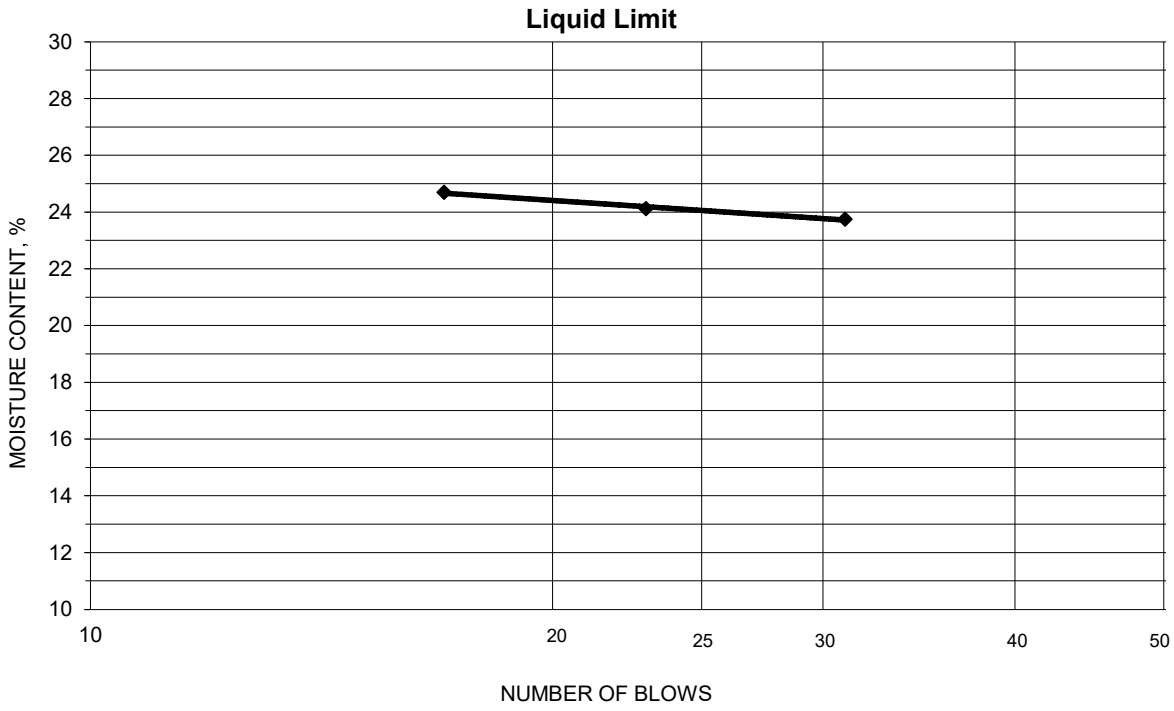
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	kif-gt-b08-ss06bG, 25.0'-26.0'			Lab ID	214
				% + No. 40	1
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	03-10-2021
Test Date	03-29-2021	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
20.69	18.85	11.40	17	24.7	
20.01	18.36	11.52	23	24.1	
18.29	16.91	11.10	31	23.8	24



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
17.36	16.44	10.76	16.2	17	7
17.71	16.72	10.86	16.9		

Remarks: _____

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b08-ss07bG, 27.7'-28.5'	Lab ID	216
Sample Type	SS	Date Received	3-10-21
		Date Reported	3-30-21

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 24.4

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 4	4.75	100.0
No. 10	2	99.9
No. 40	0.425	99.4
No. 200	0.075	73.6
	0.02	34.9
	0.005	18.4
	0.002	14.1
estimated	0.001	12.3

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.0	0.1
Coarse Sand	0.1	0.5
Medium Sand	0.5	---
Fine Sand	25.8	25.8
Silt	55.2	59.5
Clay	18.4	14.1

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	21
Plastic Limit:	17
Plasticity Index:	4
Activity Index:	0.3

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol: CL-ML

Group Name: Silty clay with sand

AASHTO Classification: A-4 (1)

Comments:

Reviewed By RHB

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b08-ss07bG, 27.7'-28.5'	Lab ID	216

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Rounded and Angular
Particle Hardness:	Hard and Durable
Tested By	TRH
Test Date	03-17-2021
Date Received	03-10-2021

Maximum Particle size: No. 4 Sieve

Sieve Size	% Passing
No. 4	100.0
No. 10	99.9

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

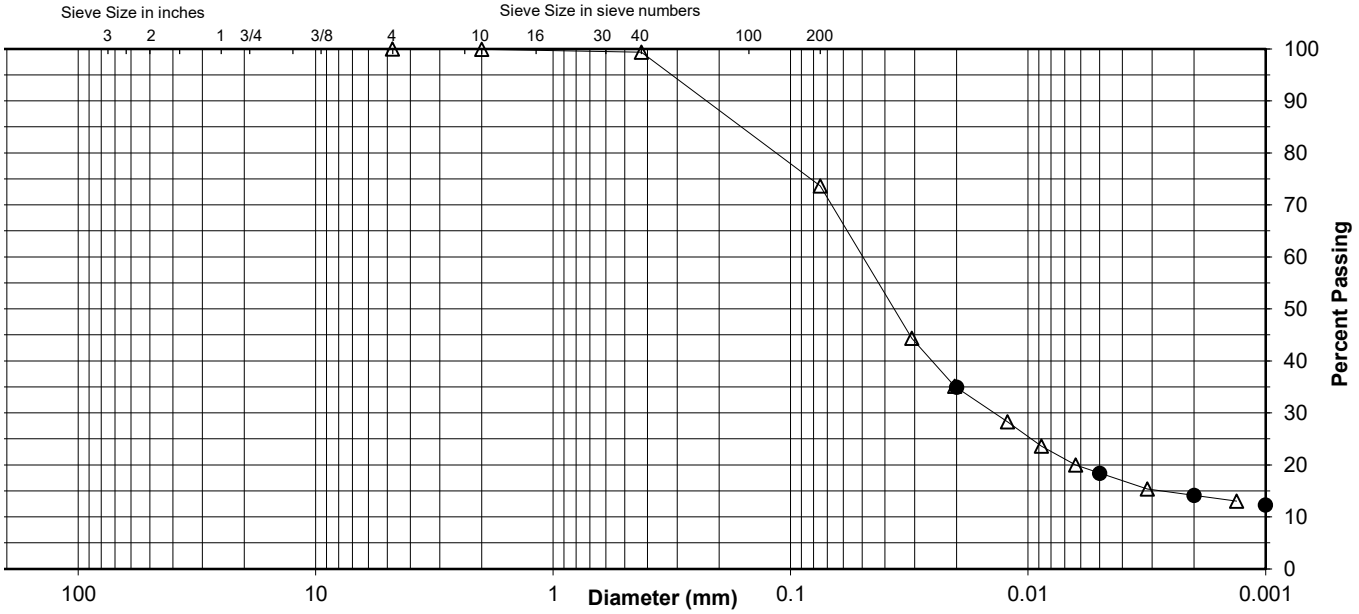
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	99.4
No. 200	73.6
0.02 mm	34.9
0.005 mm	18.4
0.002 mm	14.1
0.001 mm	12.3

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	0.1	0.5	25.8	55.2	18.4
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	0.1			0.5	25.8	59.5	14.1



Comments

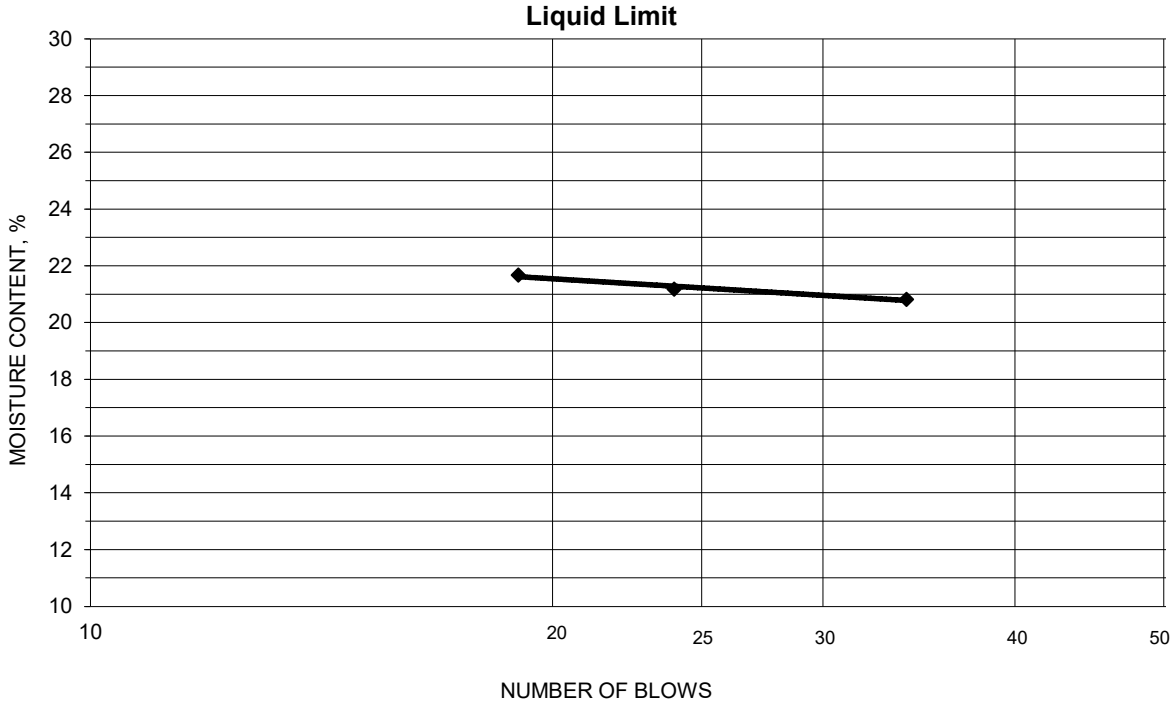
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	kif-gt-b08-ss07bG, 27.7'-28.5'			Lab ID	216
				% + No. 40	1
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	03-10-2021
Test Date	03-29-2021	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
21.53	19.70	10.91	34	20.8	
18.54	17.21	10.93	24	21.2	
20.06	18.51	11.36	19	21.7	21



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
17.57	16.64	11.30	17.4	17	4
17.42	16.46	10.82	17.0		

Remarks: _____

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b08-ss08bG, 30.3'-31.0'	Lab ID	218
Sample Type	SS	Date Received	3-10-21
		Date Reported	3-31-21

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 22.0

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
3/4"	19	100.0
3/8"	9.5	99.0
No. 4	4.75	98.0
No. 10	2	94.0
No. 40	0.425	81.4
No. 200	0.075	44.5
	0.02	23.5
	0.005	11.7
	0.002	8.2
estimated	0.001	5.9

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	2.0	6.0
Coarse Sand	4.0	12.6
Medium Sand	12.6	---
Fine Sand	36.9	36.9
Silt	32.8	36.3
Clay	11.7	8.2

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	NP
Plastic Limit:	NP
Plasticity Index:	NP
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol: SM
Group Name: Silty sand

AASHTO Classification: A-4 (0)

Comments:

Reviewed By RHB

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b08-ss08bG, 30.3'-31.0'	Lab ID	218

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	TRH
Test Date	03-22-2021
Date Received	03-10-2021

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	99.0
No. 4	98.0
No. 10	94.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

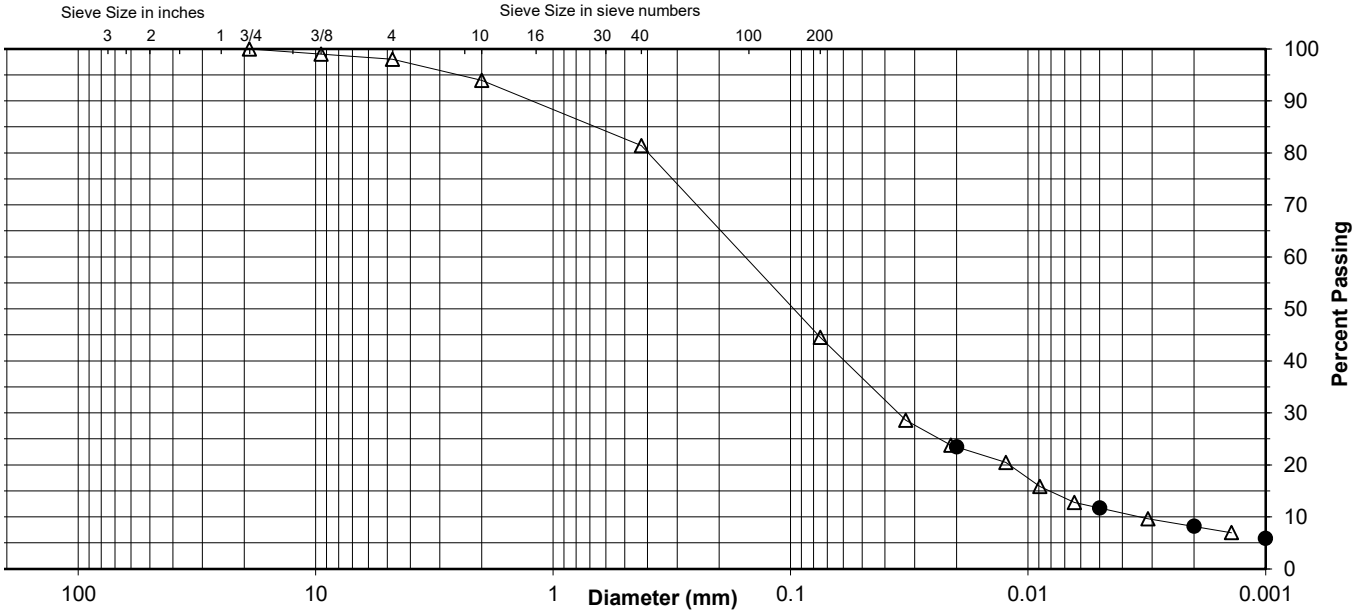
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	81.4
No. 200	44.5
0.02 mm	23.5
0.005 mm	11.7
0.002 mm	8.2
0.001 mm	5.9

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	2.0	4.0	12.6	36.9	32.8	11.7
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	6.0			12.6	36.9	36.3	8.2



Comments

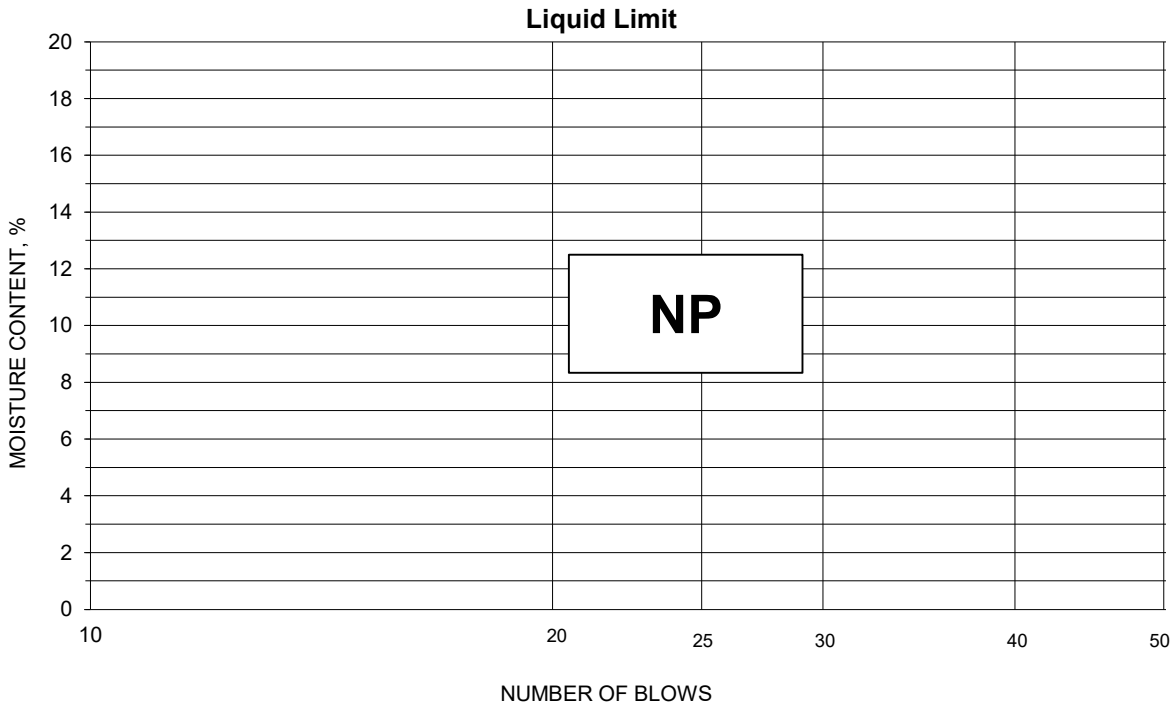
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order	Project No.	175668043
Source	kif-gt-b08-ss08bG, 30.3'-31.0'	Lab ID	218
		% + No. 40	19
Tested By	DB	Test Method	ASTM D 4318 Method A
Test Date	03-26-2021	Prepared	Dry
		Date Received	03-10-2021

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: _____

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b08-ss09bG, 32.5'-33.5'	Lab ID	220
Sample Type	SS	Date Received	3-10-21
		Date Reported	3-31-21

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 17.2

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
1 1/2"	37.5	100.0
3/4"	19	87.1
3/8"	9.5	75.0
No. 4	4.75	70.6
No. 10	2	64.8
No. 40	0.425	46.1
No. 200	0.075	30.6
	0.02	16.9
	0.005	8.6
	0.002	5.9
estimated	0.001	4.7

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	29.4	35.2
Coarse Sand	5.8	18.7
Medium Sand	18.7	---
Fine Sand	15.5	15.5
Silt	22.0	24.7
Clay	8.6	5.9

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	NP
Plastic Limit:	NP
Plasticity Index:	NP
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol: SM

Group Name: Silty sand with gravel

AASHTO Classification: A-2-4 (0)

Comments:

Reviewed By RHB

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b08-ss09bG, 32.5'-33.5'	Lab ID	220

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	TRH
Test Date	03-23-2021
Date Received	03-10-2021

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	87.1
3/8"	75.0
No. 4	70.6
No. 10	64.8

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

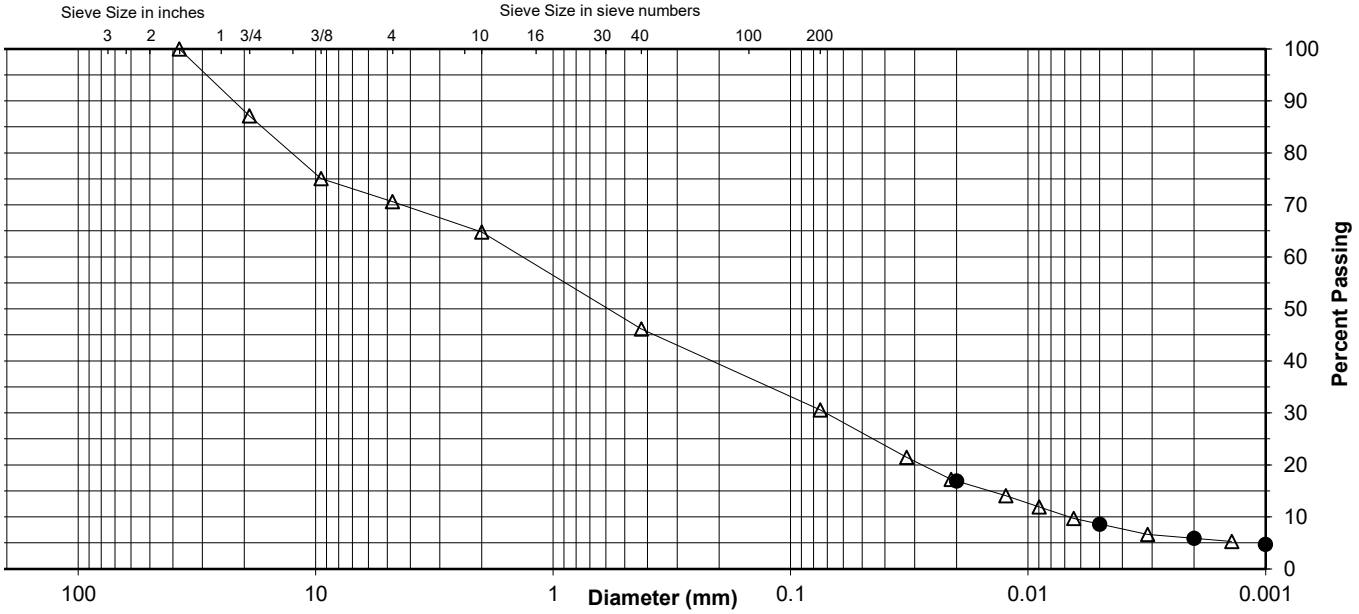
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	46.1
No. 200	30.6
0.02 mm	16.9
0.005 mm	8.6
0.002 mm	5.9
0.001 mm	4.7

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	12.9	16.5	5.8	18.7	15.5	22.0	8.6
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	35.2			18.7	15.5	24.7	5.9



Comments

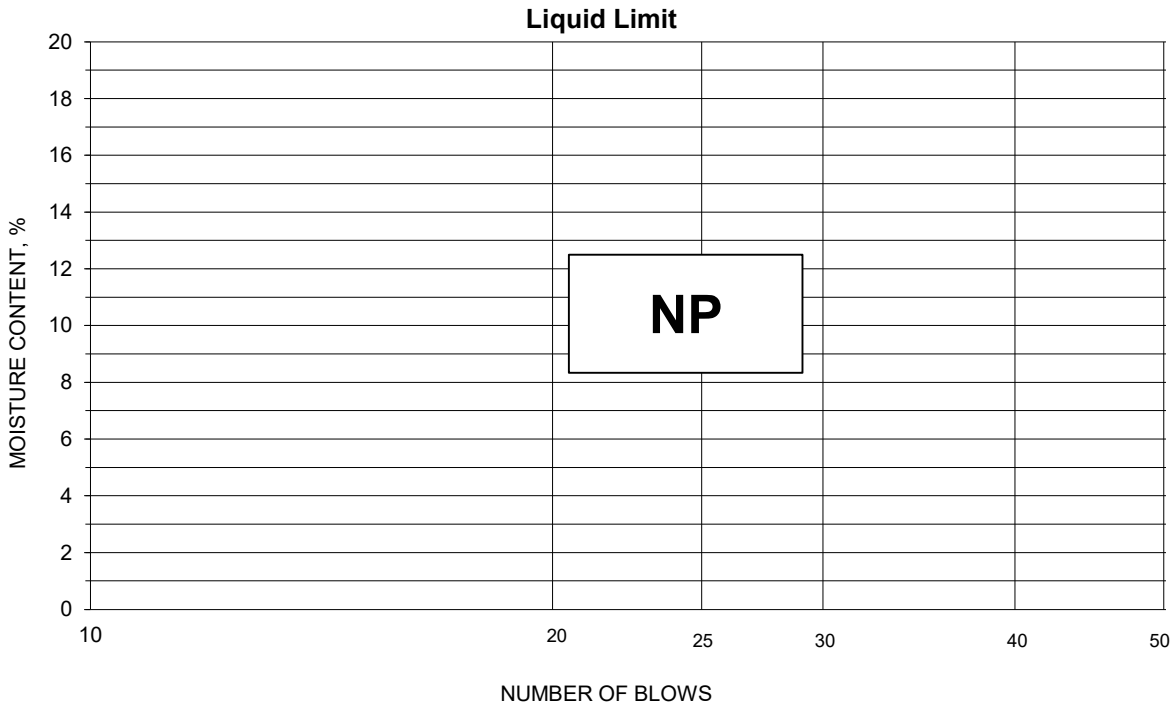
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order	Project No.	175668043
Source	kif-gt-b08-ss09bG, 32.5'-33.5'	Lab ID	220
		% + No. 40	54
Tested By	DB	Test Method	ASTM D 4318 Method A
Test Date	03-26-2021	Prepared	Dry
		Date Received	03-10-2021

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: _____

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b09-ss03G, 5.0'-6.5'	Lab ID	225
Sample Type	SS	Date Received	3-10-21
		Date Reported	3-31-21

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 24.7

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
1 1/2"	37.5	100.0
3/4"	19	83.4
3/8"	9.5	81.6
No. 4	4.75	77.6
No. 10	2	67.7
No. 40	0.425	53.0
No. 200	0.075	37.9
	0.02	25.3
	0.005	10.1
	0.002	3.6
estimated	0.001	1.7

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	22.4	32.3
Coarse Sand	9.9	14.7
Medium Sand	14.7	---
Fine Sand	15.1	15.1
Silt	27.8	34.3
Clay	10.1	3.6

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	42
Plastic Limit:	27
Plasticity Index:	15
Activity Index:	4.2

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol: SM

Group Name: Silty sand with gravel

AASHTO Classification: A-7-6 (2)

Comments:

Reviewed By RHB

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b09-ss03G, 5.0'-6.5'	Lab ID	225

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	TRH
Test Date	03-23-2021
Date Received	03-10-2021

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	83.4
3/8"	81.6
No. 4	77.6
No. 10	67.7

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity 2.7

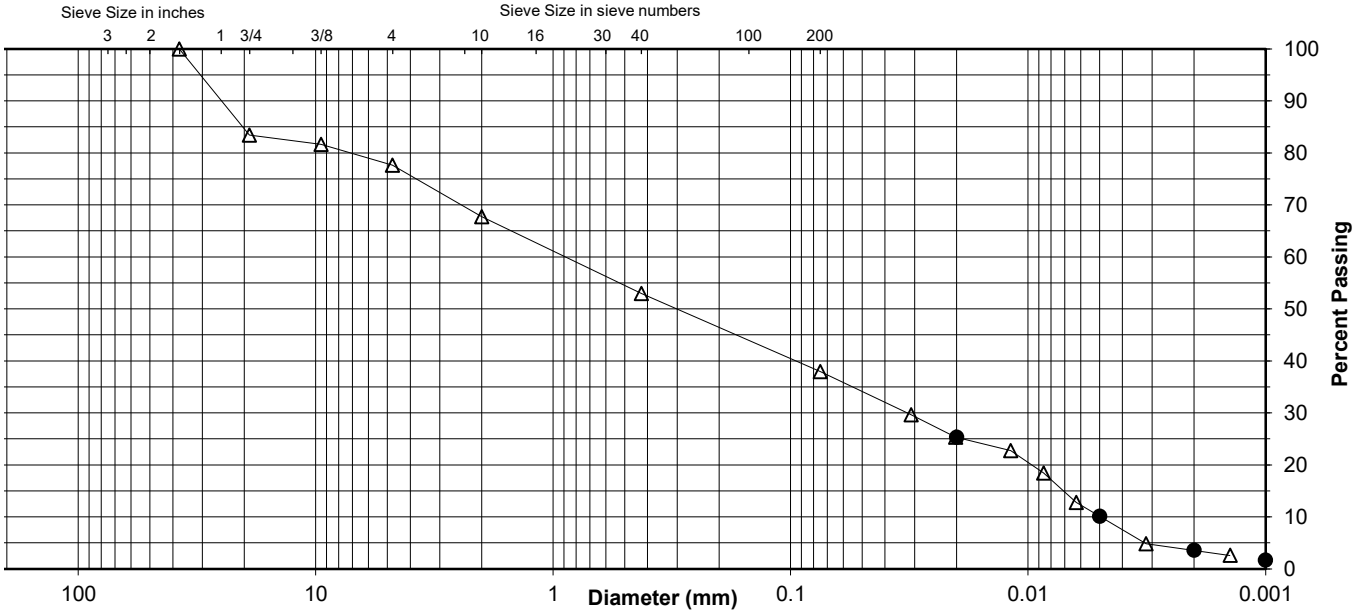
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	53.0
No. 200	37.9
0.02 mm	25.3
0.005 mm	10.1
0.002 mm	3.6
0.001 mm	1.7

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	16.6	5.8	9.9	14.7	15.1	27.8	10.1

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	32.3	14.7	15.1	34.3	3.6



Comments

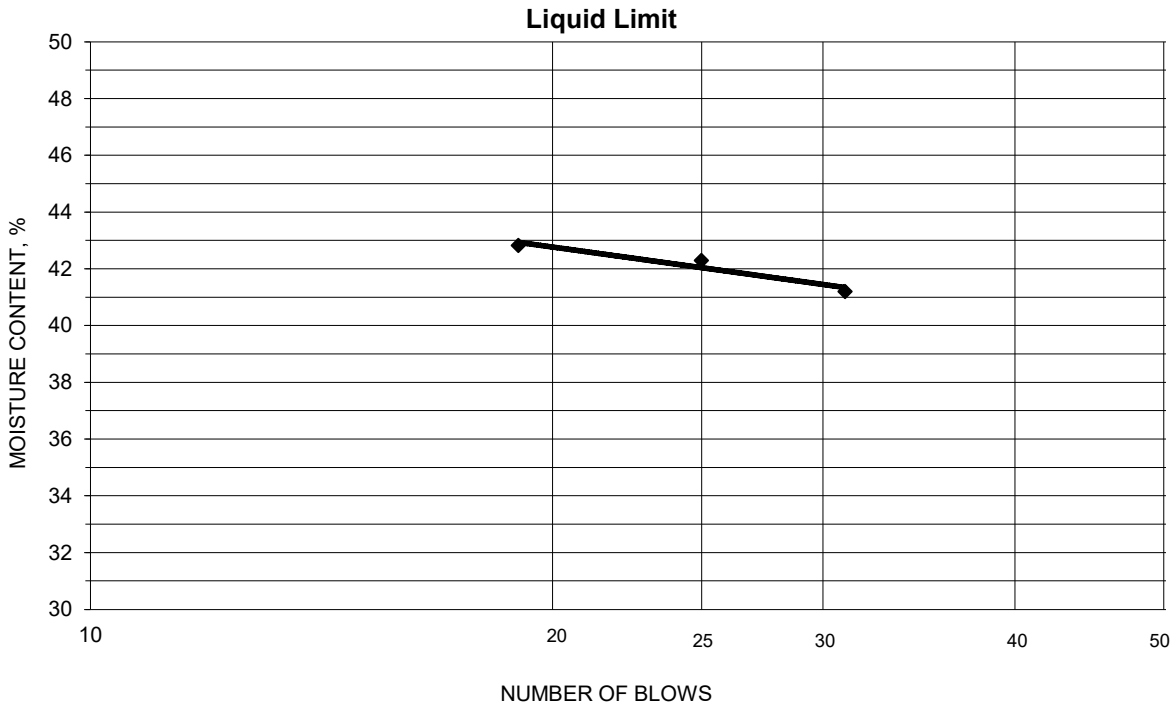
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	kif-gt-b09-ss03G, 5.0'-6.5'			Lab ID	225
				% + No. 40	47
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	03-10-2021
Test Date	03-29-2021	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
19.34	17.42	12.76	31	41.2	
19.00	17.08	12.54	25	42.3	
19.11	17.23	12.84	19	42.8	42



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
19.13	17.73	12.55	27.0	27	15
19.66	18.19	12.83	27.4		

Remarks: _____

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b09-ss05G, 10.0'-11.5'	Lab ID	227
Sample Type	SS	Date Received	3-10-21
		Date Reported	3-26-21

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 5.5

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
1 1/2"	37.5	100.0
3/4"	19	64.8
3/8"	9.5	44.3
No. 4	4.75	38.7
No. 10	2	31.2
No. 40	0.425	19.9
No. 200	0.075	13.8
	0.02	9.0
	0.005	4.8
	0.002	3.4
estimated	0.001	2.5

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	61.3	68.8
Coarse Sand	7.5	11.3
Medium Sand	11.3	---
Fine Sand	6.1	6.1
Silt	9.0	10.4
Clay	4.8	3.4

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	NP
Plastic Limit:	NP
Plasticity Index:	NP
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol: GM

Group Name: Silty gravel with sand

AASHTO Classification: A-1-a (0)

Comments:

Reviewed By RHB

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b09-ss05G, 10.0'-11.5'	Lab ID	227

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	SKS
Test Date	03-19-2021
Date Received	03-10-2021

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	64.8
3/8"	44.3
No. 4	38.7
No. 10	31.2

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

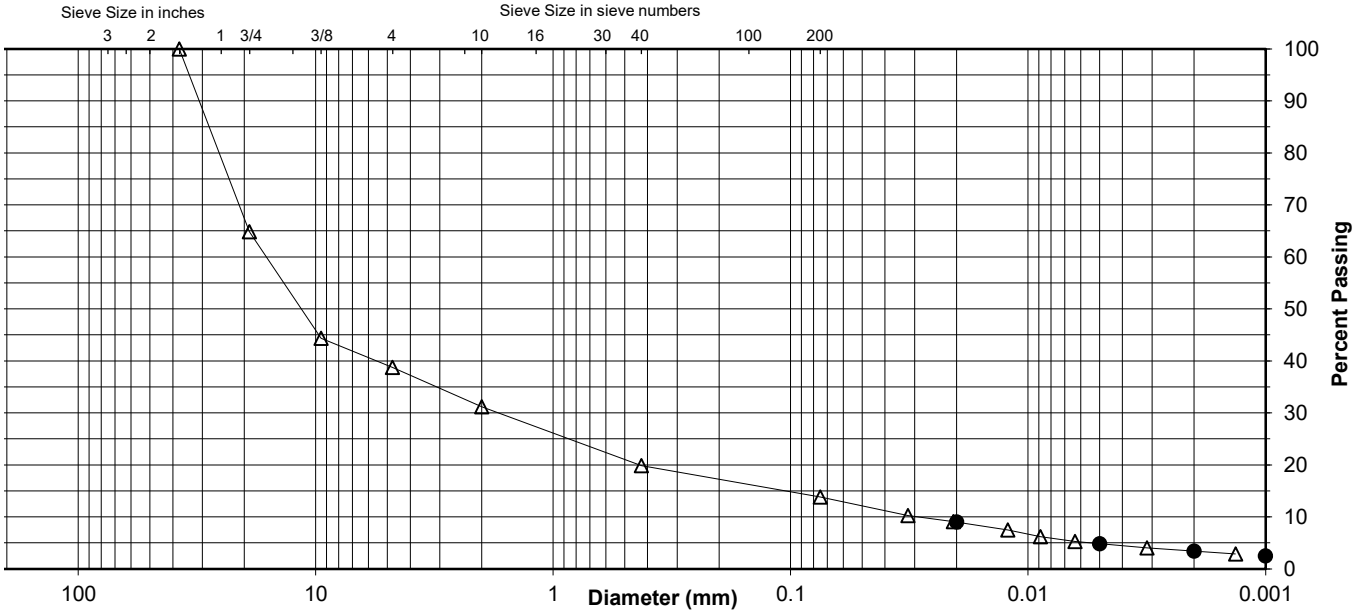
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	19.9
No. 200	13.8
0.02 mm	9.0
0.005 mm	4.8
0.002 mm	3.4
0.001 mm	2.5

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	35.2	26.1	7.5	11.3	6.1	9.0	4.8
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	68.8			11.3	6.1	10.4	3.4



Comments

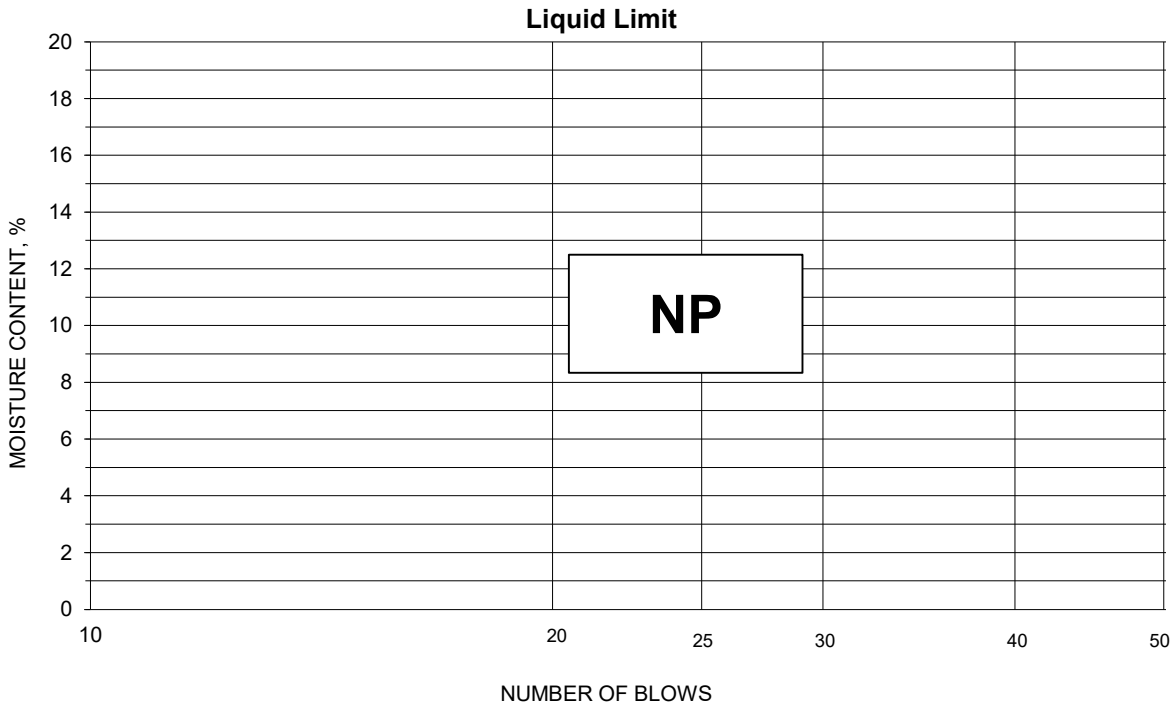
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order	Project No.	175668043
Source	kif-gt-b09-ss05G, 10.0'-11.5'	Lab ID	227
		% + No. 40	80
Tested By	DB	Test Method	ASTM D 4318 Method A
Test Date	03-15-2021	Prepared	Dry
		Date Received	03-10-2021

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: _____

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b09-ss07G, 15.0'-16.5'	Lab ID	229
Sample Type	SS	Date Received	3-10-21
		Date Reported	3-31-21

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 17.6

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
3/4"	19	100.0
3/8"	9.5	93.4
No. 4	4.75	90.2
No. 10	2	85.7
No. 40	0.425	63.2
No. 200	0.075	48.9
	0.02	28.2
	0.005	16.4
	0.002	12.3
estimated	0.001	10.1

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	9.8	14.3
Coarse Sand	4.5	22.5
Medium Sand	22.5	---
Fine Sand	14.3	14.3
Silt	32.5	36.6
Clay	16.4	12.3

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	37
Plastic Limit:	23
Plasticity Index:	14
Activity Index:	1.1

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol:	SC
Group Name:	Clayey sand
AASHTO Classification:	A-6 (4)

Comments:

Reviewed By RHB

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b09-ss07G, 15.0'-16.5'	Lab ID	229

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	TRH
Test Date	03-23-2021
Date Received	03-10-2021

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	93.4
No. 4	90.2
No. 10	85.7

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

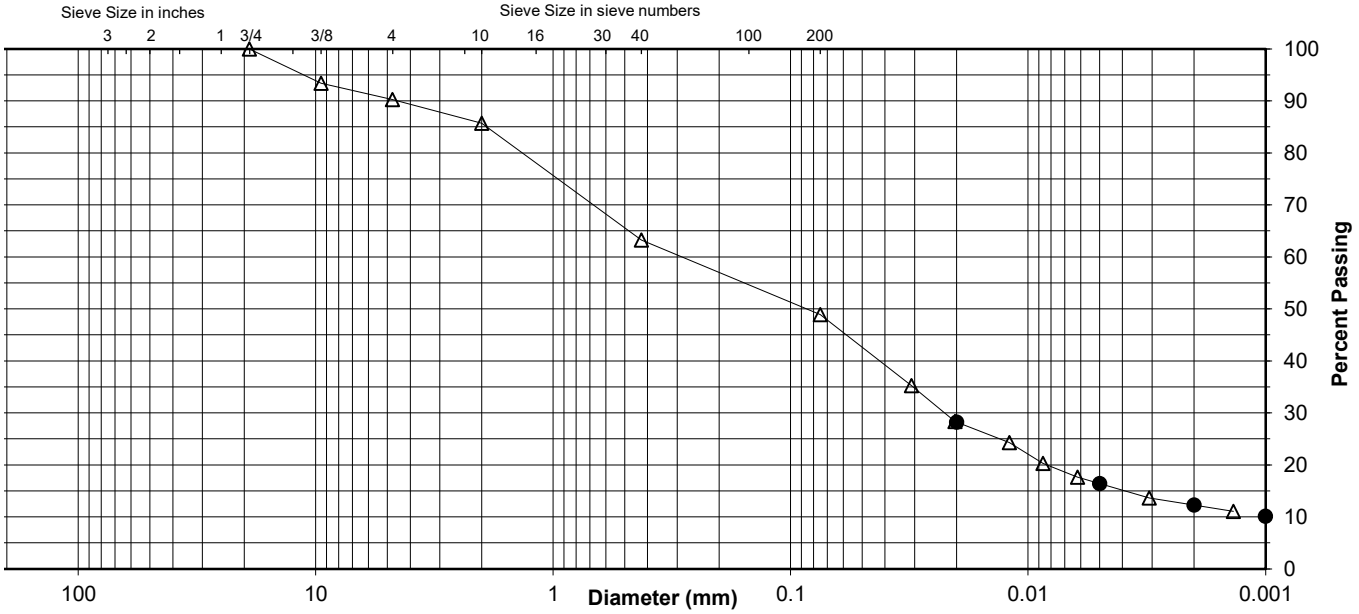
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	63.2
No. 200	48.9
0.02 mm	28.2
0.005 mm	16.4
0.002 mm	12.3
0.001 mm	10.1

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	9.8	4.5	22.5	14.3	32.5	16.4
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	14.3			22.5	14.3	36.6	12.3



Comments

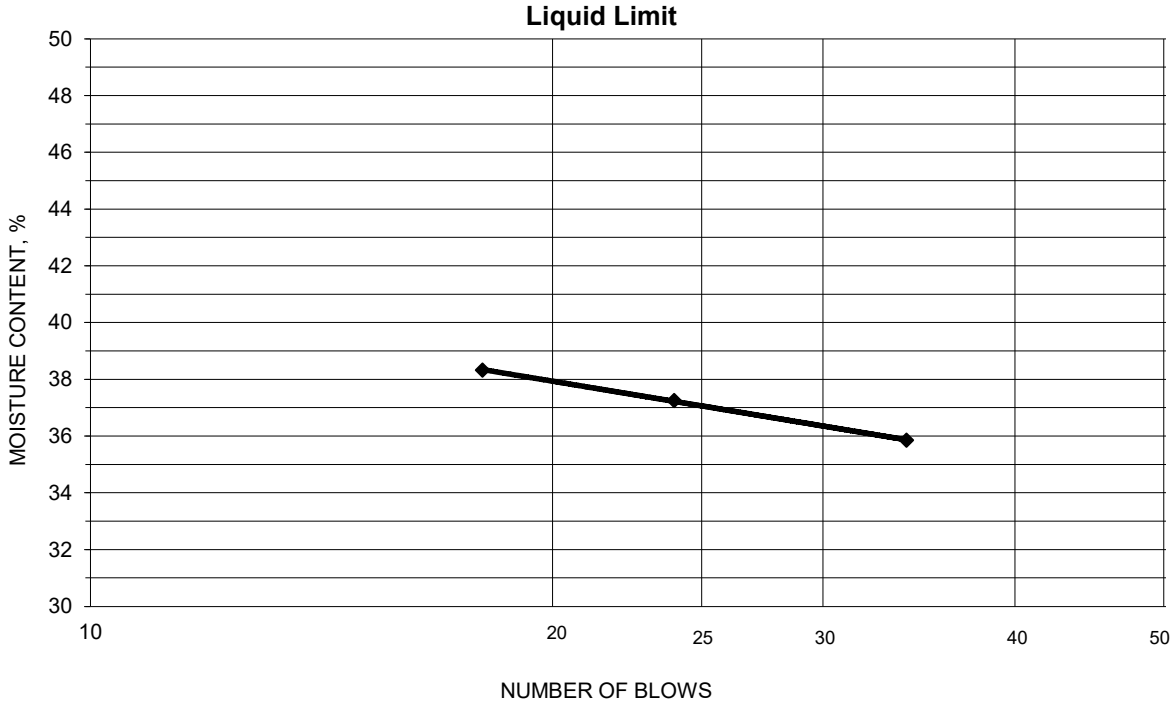
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	kif-gt-b09-ss07G, 15.0'-16.5'			Lab ID	229
				% + No. 40	37
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	03-10-2021
Test Date	03-30-2021	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
19.56	17.33	11.11	34	35.9	
18.47	16.38	10.77	24	37.3	
18.04	16.07	10.93	18	38.3	37



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
17.39	16.16	10.92	23.5	23	14
17.24	16.04	10.92	23.4		

Remarks: _____

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b09-ss12G, 27.5'-29.0'	Lab ID	233
Sample Type	SS	Date Received	3-10-21
		Date Reported	4-5-21

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 32.6

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
3/4"	19	100.0
3/8"	9.5	99.4
No. 4	4.75	97.8
No. 10	2	94.3
No. 40	0.425	80.9
No. 200	0.075	61.4
	0.02	35.0
	0.005	21.9
	0.002	16.0
estimated	0.001	13.0

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	2.2	5.7
Coarse Sand	3.5	13.4
Medium Sand	13.4	---
Fine Sand	19.5	19.5
Silt	39.5	45.4
Clay	21.9	16.0

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	42
Plastic Limit:	26
Plasticity Index:	16
Activity Index:	1.0

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol: ML

Group Name: Sandy silt

AASHTO Classification: A-7-6 (8)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b09-ss12G, 27.5'-29.0'	Lab ID	233

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	TRH
Test Date	03-23-2021
Date Received	03-10-2021

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	99.4
No. 4	97.8
No. 10	94.3

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

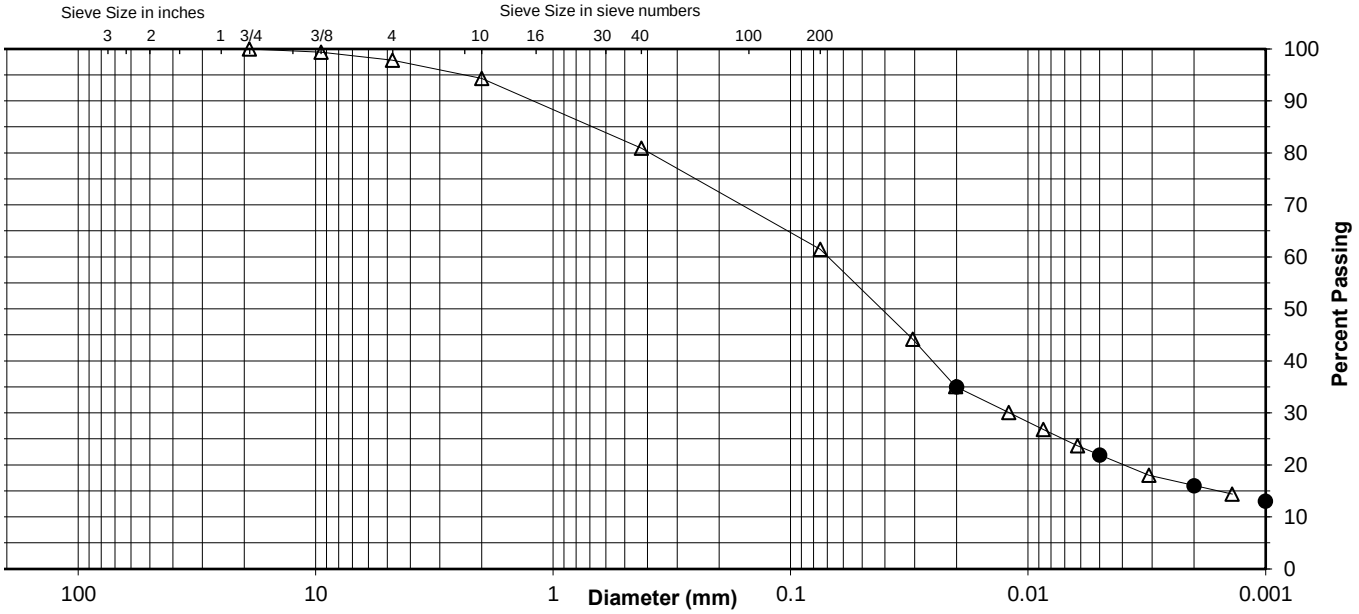
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	80.9
No. 200	61.4
0.02 mm	35.0
0.005 mm	21.9
0.002 mm	16.0
0.001 mm	13.0

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	2.2	3.5	13.4	19.5	39.5	21.9
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	5.7			13.4	19.5	45.4	16.0



Comments

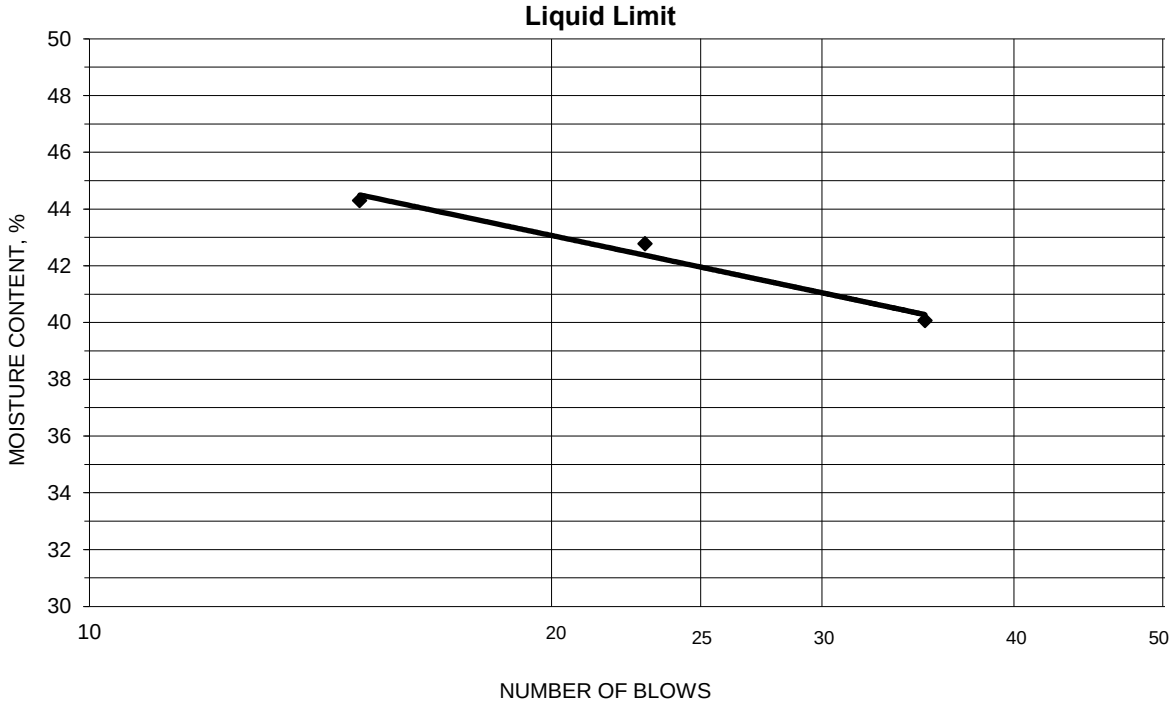
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	kif-gt-b09-ss12G, 27.5'-29.0'			Lab ID	233
				% + No. 40	19
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	03-10-2021
Test Date	03-30-2021	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
18.04	15.96	10.77	35	40.1	
18.61	16.30	10.90	23	42.8	
17.75	15.69	11.04	15	44.3	42



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
17.60	16.35	11.45	25.5	26	16
17.66	16.34	11.17	25.5		

Remarks: _____

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b09-ss14aG, 32.5'-33.0'	Lab ID	235
Sample Type	SS	Date Received	3-10-21
		Date Reported	3-31-21

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 33.5

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
3/4"	19	100.0
3/8"	9.5	99.5
No. 4	4.75	99.4
No. 10	2	99.3
No. 40	0.425	97.5
No. 200	0.075	93.6
	0.02	66.0
	0.005	34.0
	0.002	20.6
estimated	0.001	12.8

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.6	0.7
Coarse Sand	0.1	1.8
Medium Sand	1.8	---
Fine Sand	3.9	3.9
Silt	59.6	73.0
Clay	34.0	20.6

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	NP
Plastic Limit:	NP
Plasticity Index:	NP
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol: ML

Group Name: Silt

AASHTO Classification: A-4 (0)

Comments:

Reviewed By RHB

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b09-ss14aG, 32.5'-33.0'	Lab ID	235

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	TRH
Test Date	03-23-2021
Date Received	03-10-2021

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	99.5
No. 4	99.4
No. 10	99.3

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

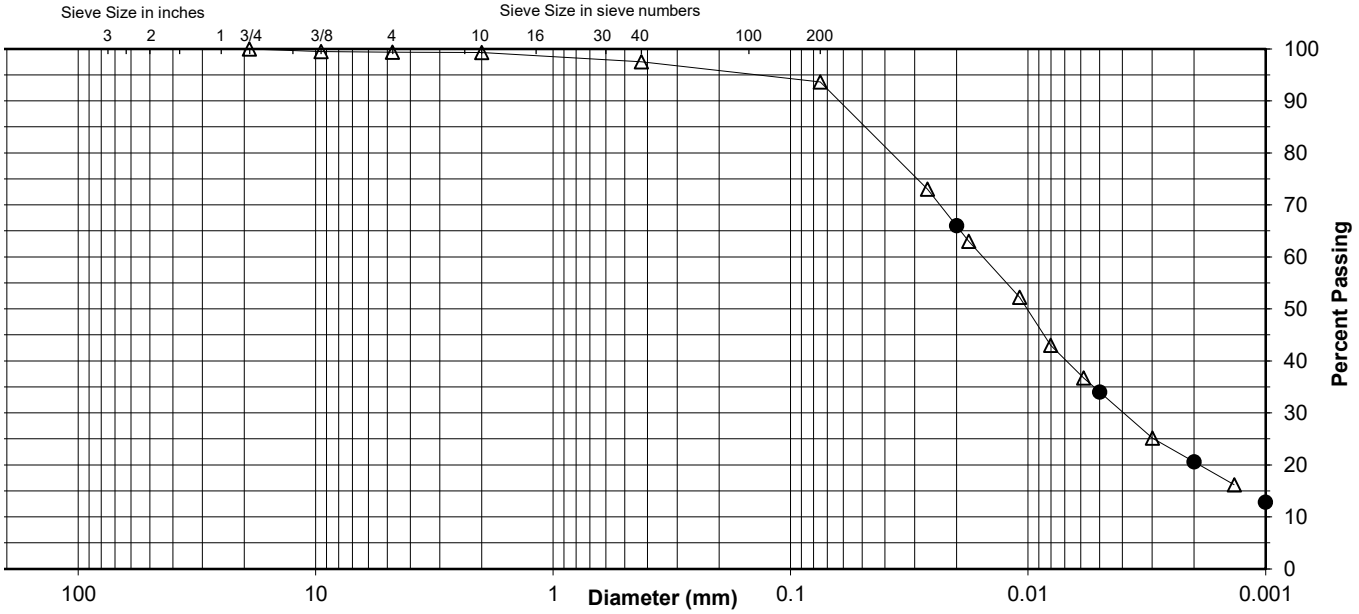
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	97.5
No. 200	93.6
0.02 mm	66.0
0.005 mm	34.0
0.002 mm	20.6
0.001 mm	12.8

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.6	0.1	1.8	3.9	59.6	34.0
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	0.7			1.8	3.9	73.0	20.6



Comments

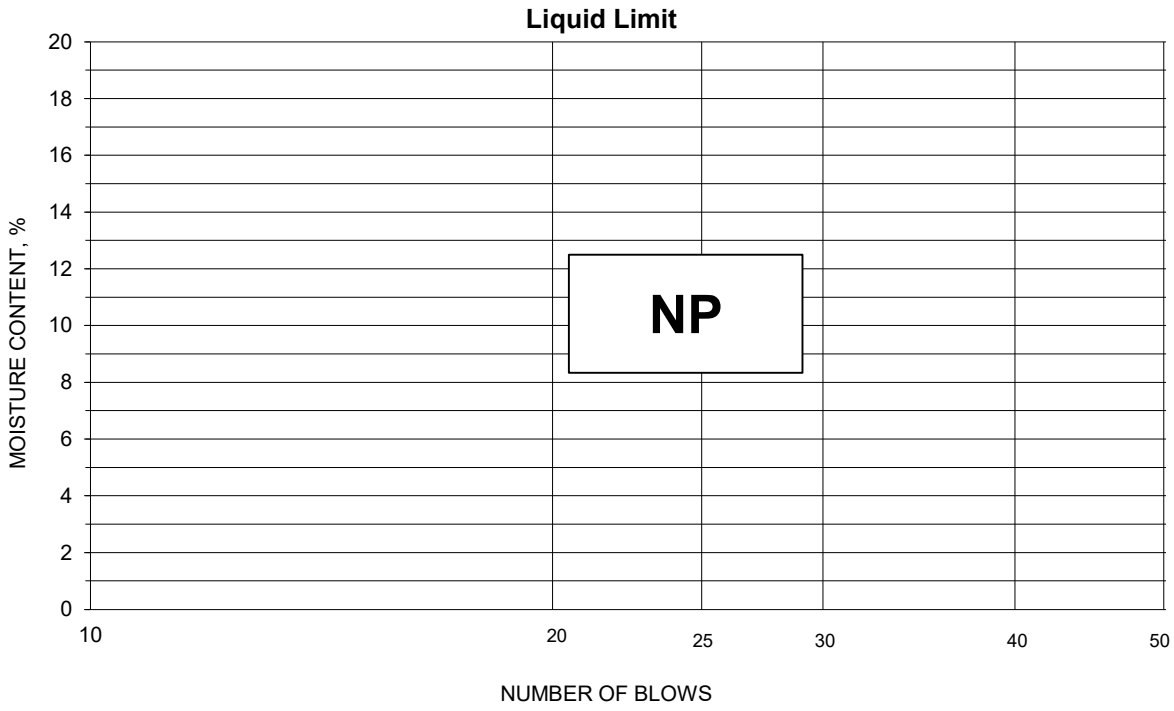
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order	Project No.	175668043
Source	kif-gt-b09-ss14aG, 32.5'-33.0'	Lab ID	235
		% + No. 40	3
Tested By	DB	Test Method	ASTM D 4318 Method A
Test Date	03-26-2021	Prepared	Dry
		Date Received	03-10-2021

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: _____

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b09-ss16G, 39.5'-41.0'	Lab ID	237
Sample Type	SS	Date Received	3-10-21
		Date Reported	3-31-21

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 23.8

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 10	2	100.0
No. 40	0.425	98.4
No. 200	0.075	89.3
	0.02	65.5
	0.005	34.8
	0.002	24.8
estimated	0.001	19.7

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.0	0.0
Coarse Sand	0.0	1.6
Medium Sand	1.6	---
Fine Sand	9.1	9.1
Silt	54.5	64.5
Clay	34.8	24.8

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	36
Plastic Limit:	21
Plasticity Index:	15
Activity Index:	0.6

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol: CL

Group Name: Lean clay

AASHTO Classification: A-6 (13)

Comments:

Reviewed By RHB

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b09-ss16G, 39.5'-41.0'	Lab ID	237

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	N/A
Particle Hardness:	N/A
Tested By	TRH
Test Date	03-22-2021
Date Received	03-10-2021

Maximum Particle size: No. 10 Sieve

Sieve Size	% Passing
No. 10	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

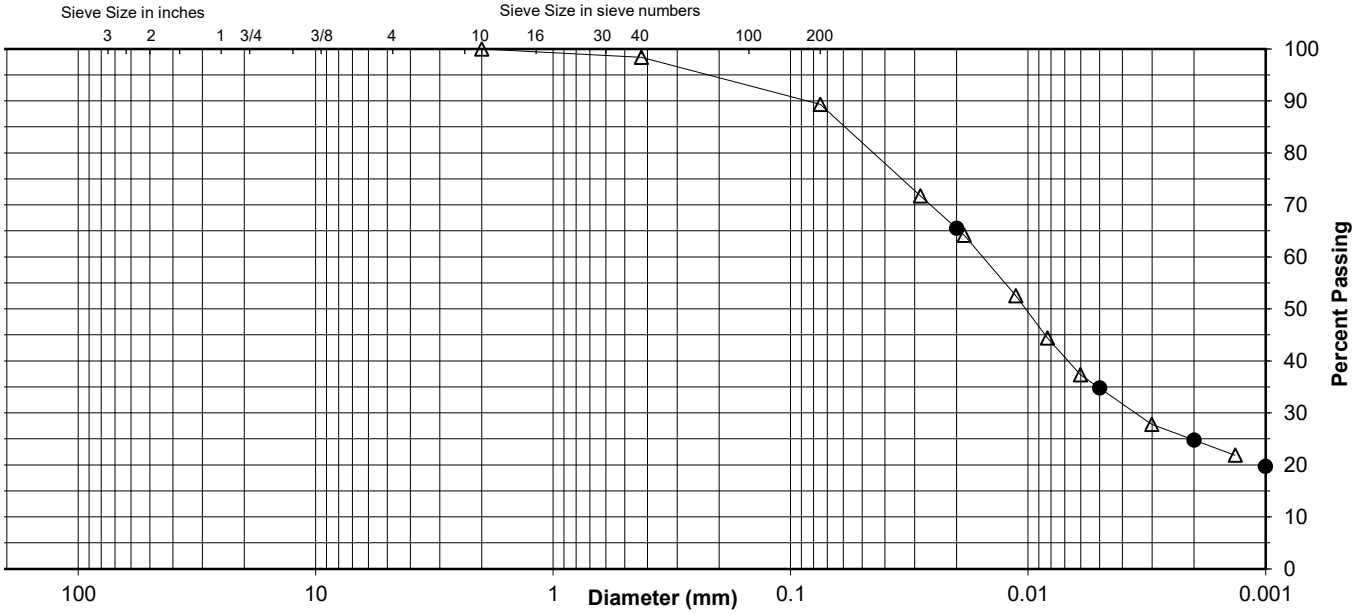
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	98.4
No. 200	89.3
0.02 mm	65.5
0.005 mm	34.8
0.002 mm	24.8
0.001 mm	19.7

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	0.0	1.6	9.1	54.5	34.8
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	0.0			1.6	9.1	64.5	24.8



Comments

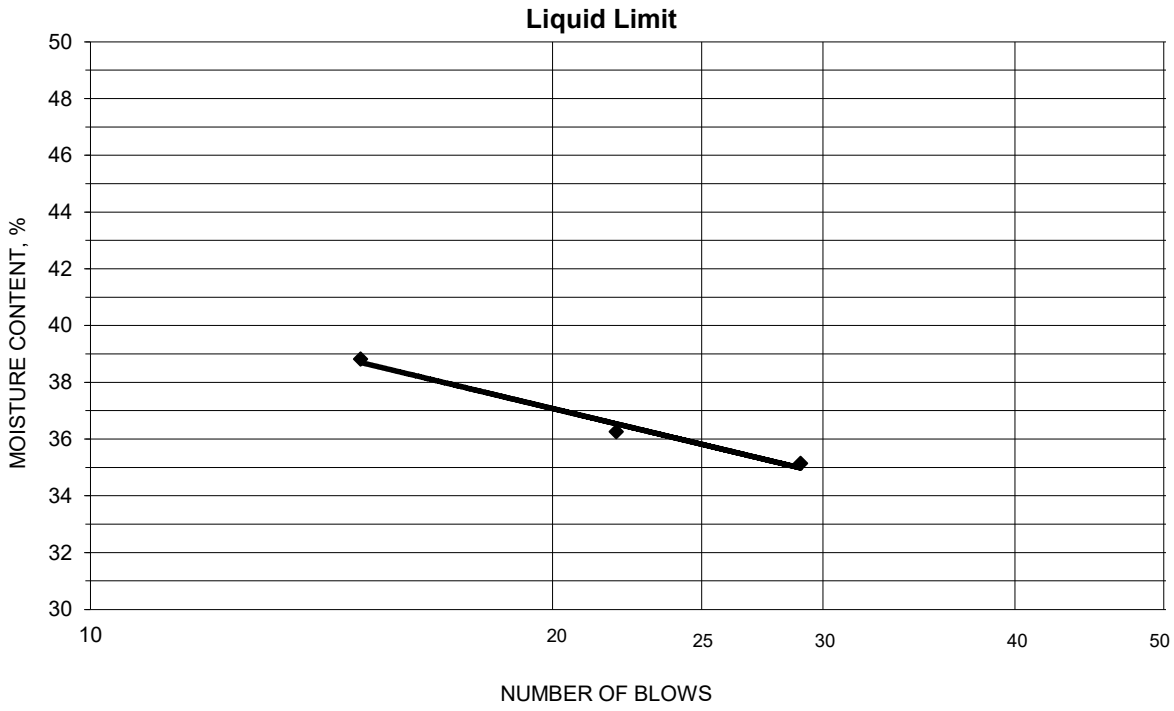
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	kif-gt-b09-ss16G, 39.5'-41.0'			Lab ID	237
				% + No. 40	2
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	03-10-2021
Test Date	03-29-2021	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
18.48	16.54	11.02	29	35.1	
18.01	16.15	11.02	22	36.3	
17.43	15.66	11.10	15	38.8	36



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
17.54	16.39	10.98	21.3	21	15
17.25	16.13	10.91	21.5		

Remarks: _____

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b09-ss17bG, 44.5'-45.5'	Lab ID	240
Sample Type	SS	Date Received	3-10-21
		Date Reported	3-31-21

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 23.4

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 10	2	100.0
No. 40	0.425	99.8
No. 200	0.075	79.6
	0.02	48.8
	0.005	25.3
	0.002	19.2
estimated	0.001	15.3

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.0	0.0
Coarse Sand	0.0	0.2
Medium Sand	0.2	---
Fine Sand	20.2	20.2
Silt	54.3	60.4
Clay	25.3	19.2

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	NP
Plastic Limit:	NP
Plasticity Index:	NP
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol:	ML
Group Name:	Silt with sand
AASHTO Classification:	A-4 (0)

Comments:

Reviewed By RHB

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b09-ss17bG, 44.5'-45.5'	Lab ID	240

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	N/A
Particle Hardness:	N/A
Tested By	TRH
Test Date	03-22-2021
Date Received	03-10-2021

Maximum Particle size: No. 10 Sieve

Sieve Size	% Passing
No. 10	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity 2.7

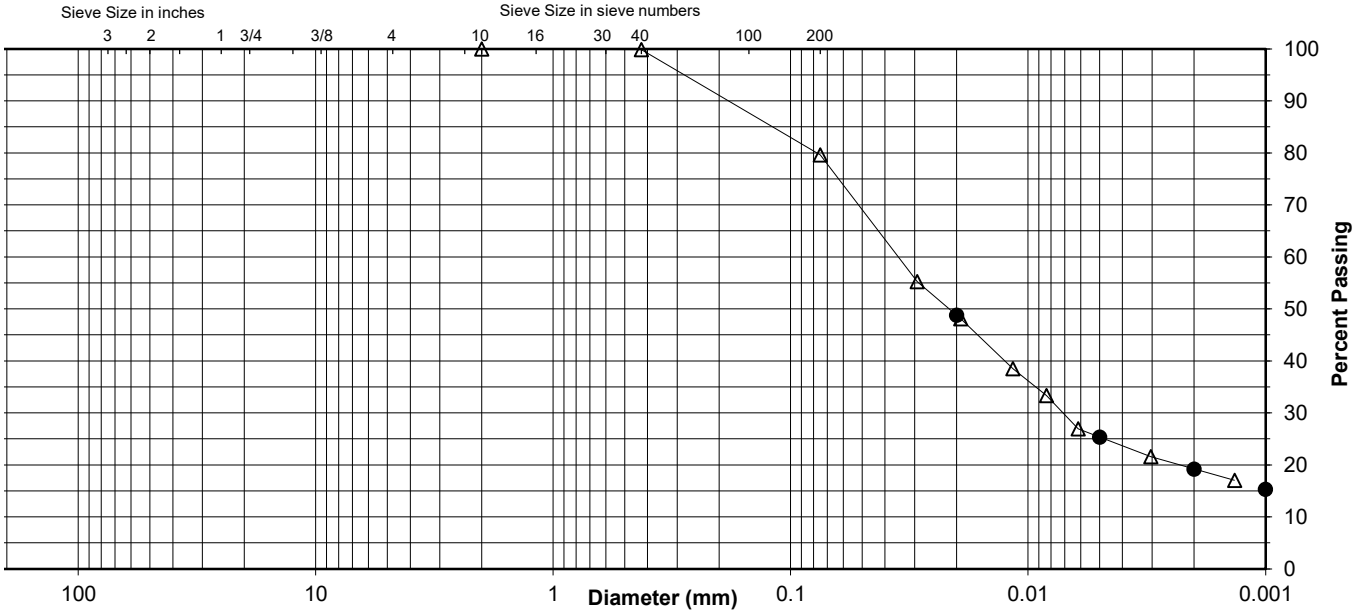
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	99.8
No. 200	79.6
0.02 mm	48.8
0.005 mm	25.3
0.002 mm	19.2
0.001 mm	15.3

Particle Size Distribution

	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
ASTM	0.0	0.0	0.0	0.2	20.2	54.3	25.3

	Gravel	Coarse Sand	Fine Sand	Silt	Clay
AASHTO	0.0	0.2	20.2	60.4	19.2



Comments

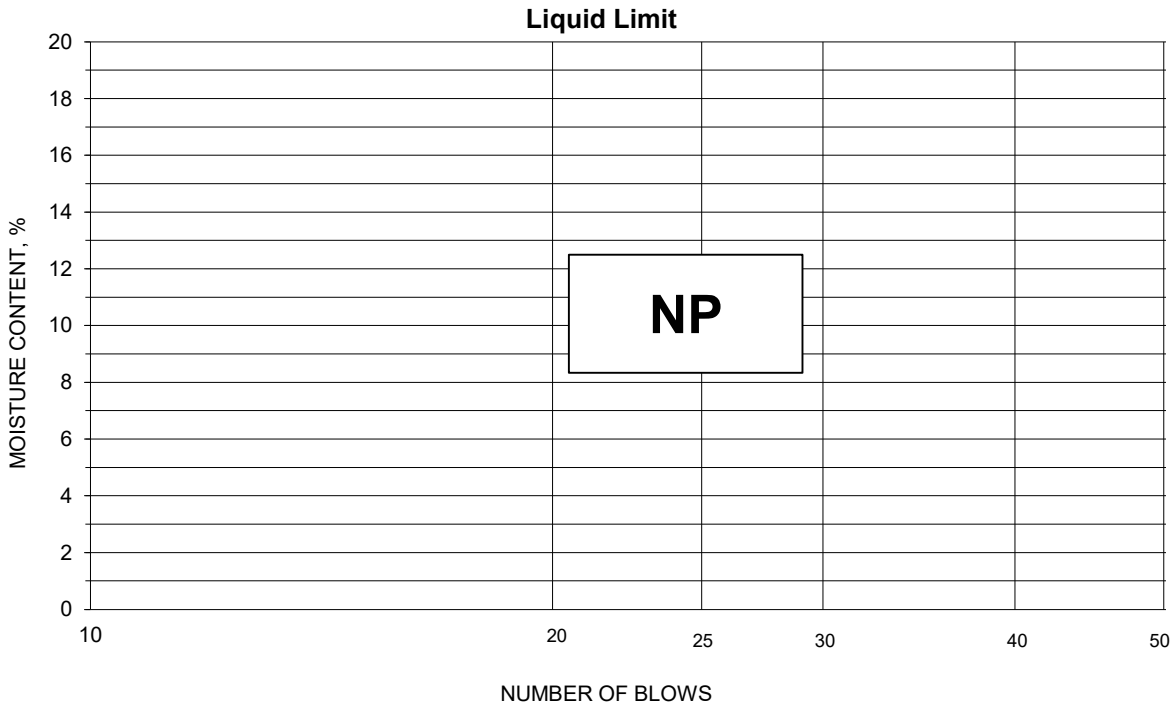
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order	Project No.	175668043
Source	kif-gt-b09-ss17bG, 44.5'-45.5'	Lab ID	240
		% + No. 40	0
Tested By	DB	Test Method	ASTM D 4318 Method A
Test Date	03-26-2021	Prepared	Dry
		Date Received	03-10-2021

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: _____

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b09-ss19bG, 50.0'-50.5'	Lab ID	241
Sample Type	SS	Date Received	3-10-21
		Date Reported	3-31-21

Test Results

Natural Moisture Content

Test Not Performed

Moisture Content (%): N/A

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 10	2	100.0
No. 40	0.425	99.8
No. 200	0.075	11.2
	0.02	5.8
	0.005	3.1
	0.002	2.4
estimated	0.001	2.2

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.0	0.0
Coarse Sand	0.0	0.2
Medium Sand	0.2	---
Fine Sand	88.6	88.6
Silt	8.1	8.8
Clay	3.1	2.4

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	NP
Plastic Limit:	NP
Plasticity Index:	NP
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol: SP-SM
Group Name: Poorly graded sand with silt

AASHTO Classification: A-2-4 (0)

Comments:

Reviewed By RHB

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b09-ss19bG, 50.0'-50.5'	Lab ID	241

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	N/A
Particle Hardness:	N/A
Tested By	TRH
Test Date	03-22-2021
Date Received	03-10-2021

Maximum Particle size: No. 10 Sieve

Sieve Size	% Passing
No. 10	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

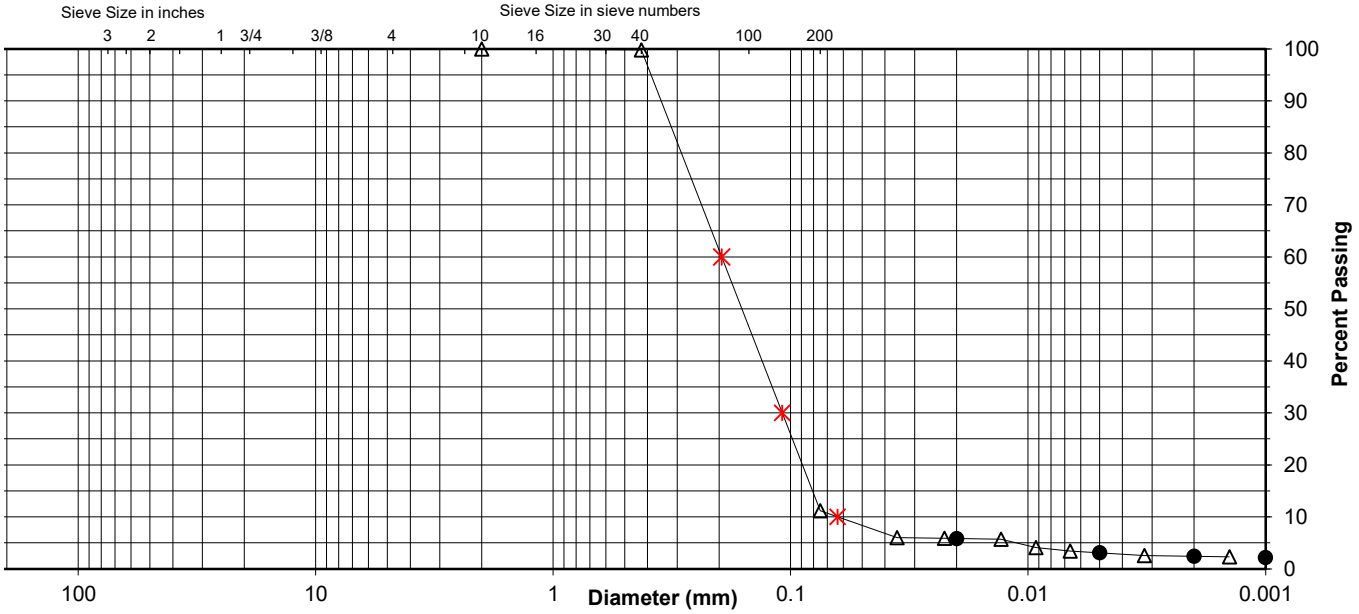
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	99.8
No. 200	11.2
0.02 mm	5.8
0.005 mm	3.1
0.002 mm	2.4
0.001 mm	2.2

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	0.0	0.2	88.6	8.1	3.1
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	0.0			0.2	88.6	8.8	2.4



Comments

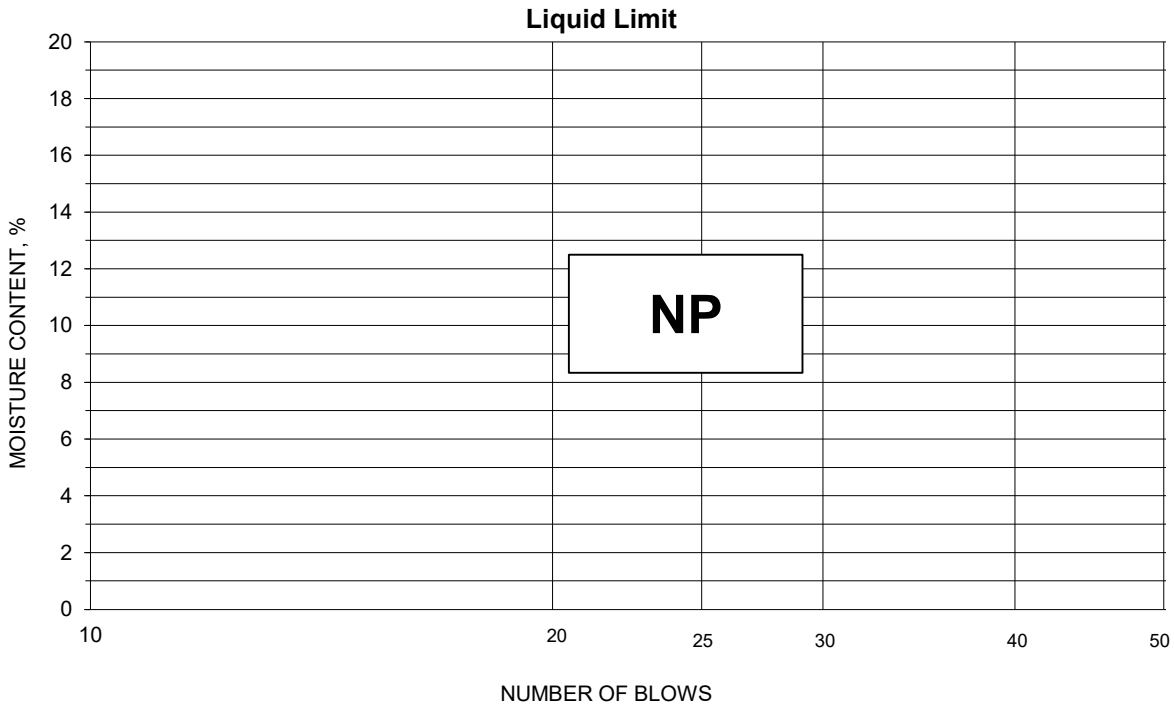
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order	Project No.	175668043
Source	kif-gt-b09-ss19bG, 50.0'-50.5'	Lab ID	241
		% + No. 40	0
Tested By	DB	Test Method	ASTM D 4318 Method A
Test Date	03-15-2021	Prepared	Dry
		Date Received	03-10-2021

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: _____

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b10-ss04G, 14.5'-16.0'	Lab ID	243
Sample Type	SS	Date Received	3-10-21
		Date Reported	3-30-21

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 41.4

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
3/4"	19	100.0
3/8"	9.5	95.7
No. 4	4.75	95.4
No. 10	2	95.1
No. 40	0.425	93.6
No. 200	0.075	91.0
	0.02	68.6
	0.005	36.9
	0.002	23.6
estimated	0.001	16.6

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	4.6	4.9
Coarse Sand	0.3	1.5
Medium Sand	1.5	---
Fine Sand	2.6	2.6
Silt	54.1	67.4
Clay	36.9	23.6

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	NP
Plastic Limit:	NP
Plasticity Index:	NP
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol: ML

Group Name: Silt

AASHTO Classification: A-4 (0)

Comments:

Reviewed By RHB

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b10-ss04G, 14.5'-16.0'	Lab ID	243

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	TRH
Test Date	03-22-2021
Date Received	03-10-2021

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	95.7
No. 4	95.4
No. 10	95.1

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

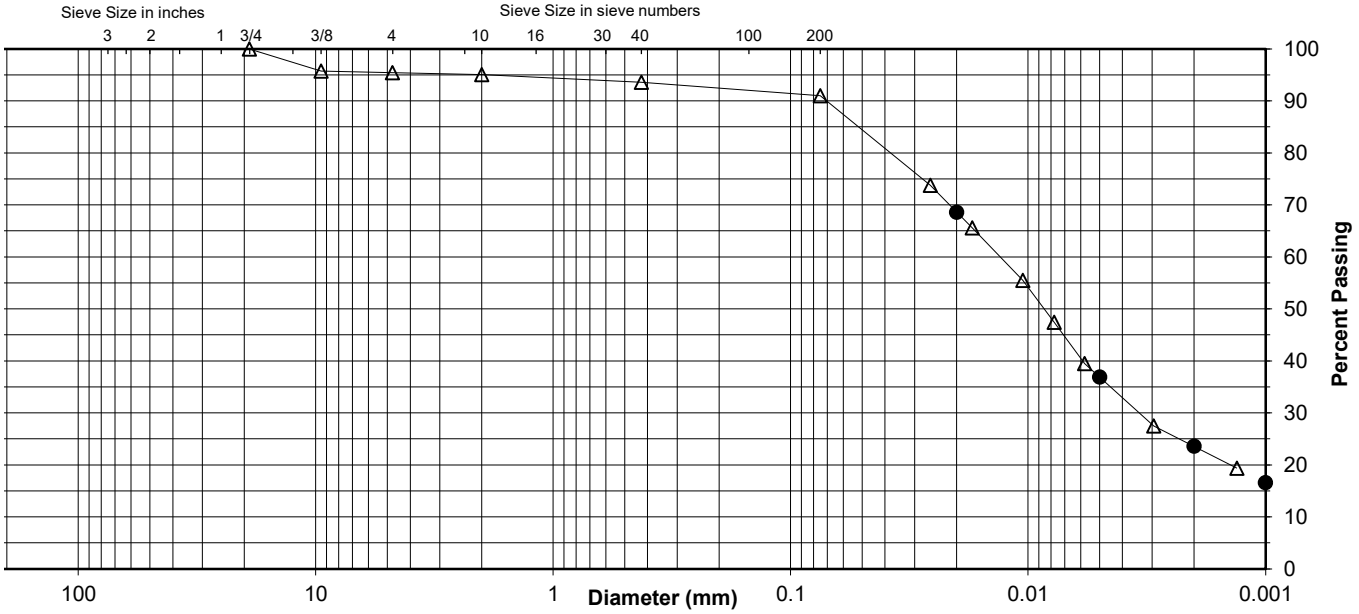
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	93.6
No. 200	91.0
0.02 mm	68.6
0.005 mm	36.9
0.002 mm	23.6
0.001 mm	16.6

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	4.6	0.3	1.5	2.6	54.1	36.9
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	4.9			1.5	2.6	67.4	23.6



Comments

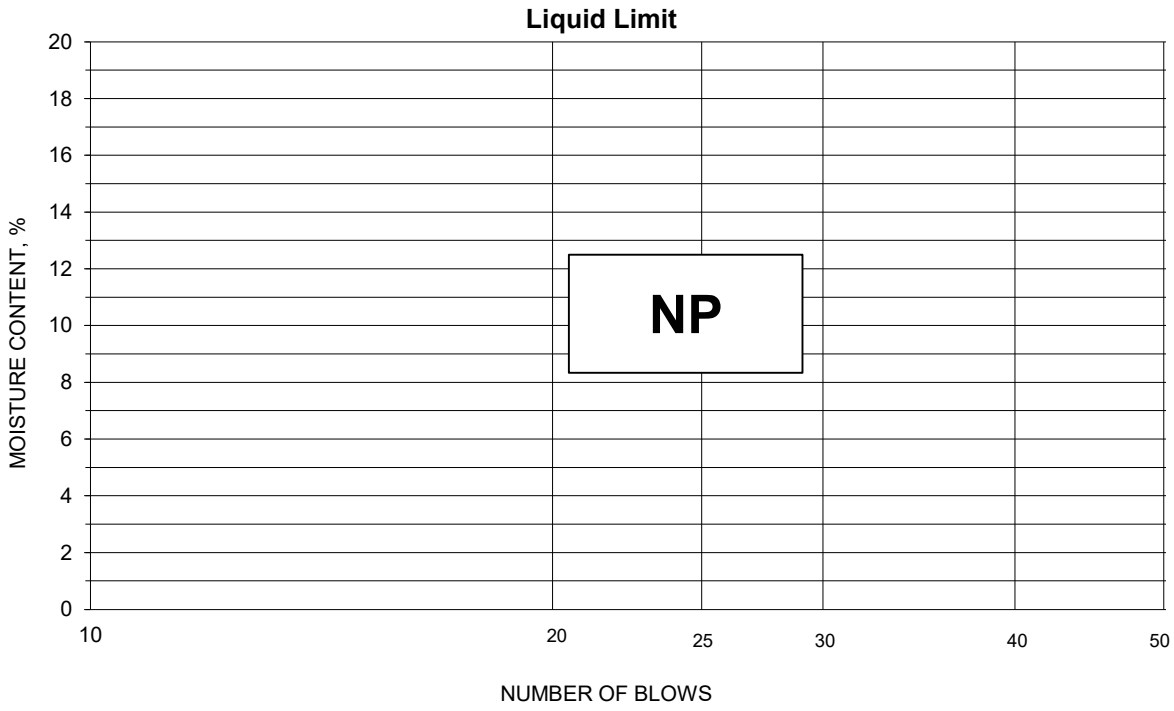
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	kif-gt-b10-ss04G, 14.5'-16.0'			Lab ID	243
				% + No. 40	6
Tested By	DB	Test Method	ASTM D 4318 Method A	Date Received	03-10-2021
Test Date	03-26-2021	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: _____

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b10-ss05G, 17.0'-18.5' & kif-gt-b10-ss06G, 19.5'-21.0'	Lab ID	245
Sample Type	SPT Composite	Date Received	3-10-21
		Date Reported	3-30-21

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 25.8

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
3/4"	19	100.0
3/8"	9.5	95.1
No. 4	4.75	93.2
No. 10	2	91.2
No. 40	0.425	87.4
No. 200	0.075	80.5
	0.02	55.0
	0.005	28.8
	0.002	20.7
estimated	0.001	16.6

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	6.8	8.8
Coarse Sand	2.0	3.8
Medium Sand	3.8	---
Fine Sand	6.9	6.9
Silt	51.7	59.8
Clay	28.8	20.7

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	NP
Plastic Limit:	NP
Plasticity Index:	NP
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol:	ML
Group Name:	Silt with sand
AASHTO Classification:	A-4 (0)

Comments:

Reviewed By RHB

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b10-ss05G, 17.0'-18.5' & kif-gt-b10-ss06G, 19.5'-21.0'	Lab ID	245

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	TRH
Test Date	03-23-2021
Date Received	03-10-2021

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	95.1
No. 4	93.2
No. 10	91.2

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

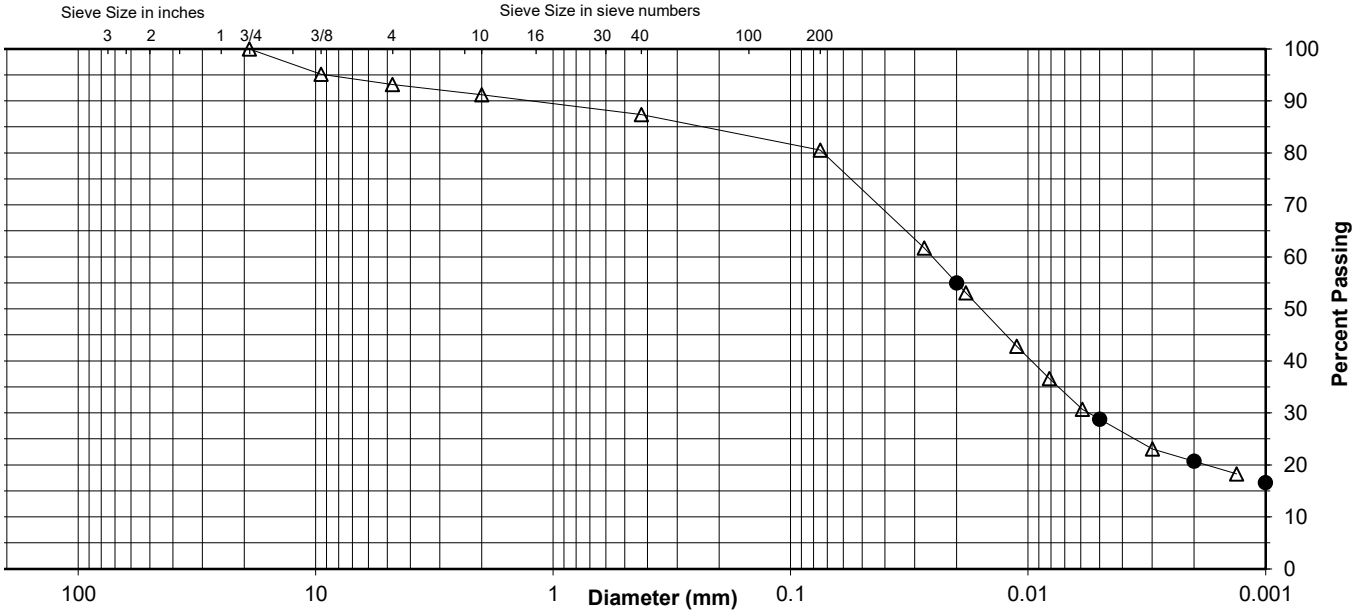
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	87.4
No. 200	80.5
0.02 mm	55.0
0.005 mm	28.8
0.002 mm	20.7
0.001 mm	16.6

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	6.8	2.0	3.8	6.9	51.7	28.8
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	8.8			3.8	6.9	59.8	20.7



Comments

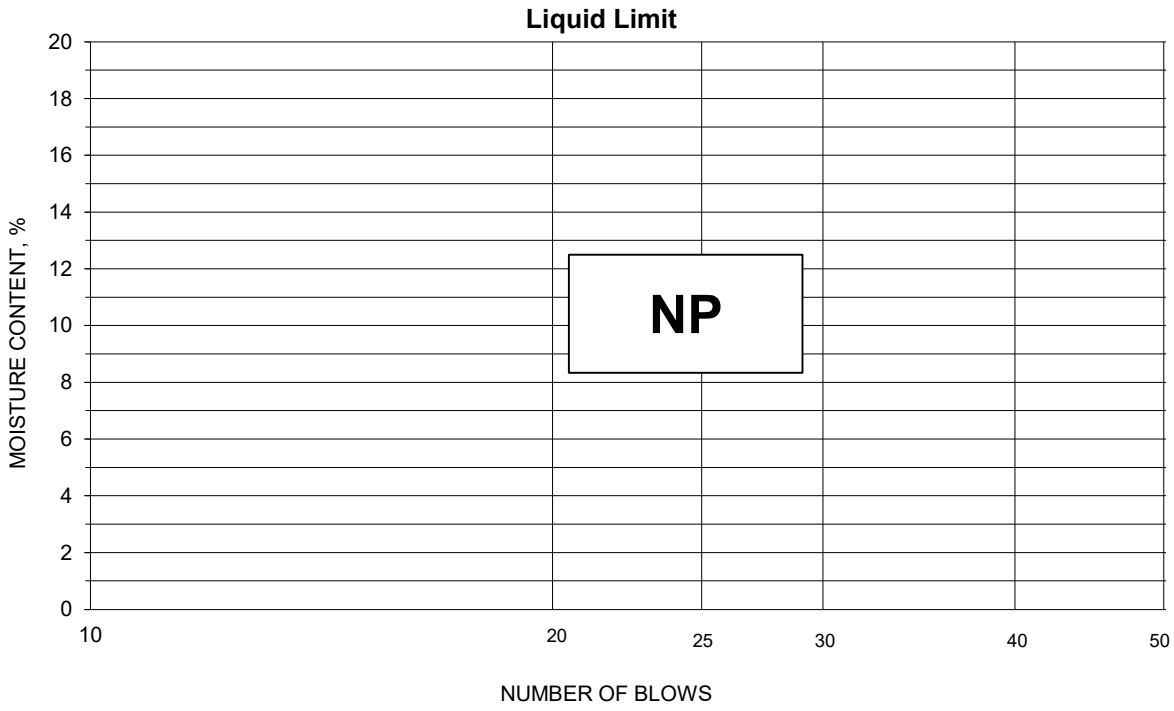
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order	Project No.	175668043
Source	kif-gt-b10-ss05G, 17.0'-18.5' & kif-gt-b10-ss06G, 19.5'-21.0'	Lab ID	245
		% + No. 40	13
Tested By	DB	Test Method	ASTM D 4318 Method A
Test Date	03-26-2021	Prepared	Dry
		Date Received	03-10-2021

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: _____

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b10-ss08G, 24.5'-26.0'	Lab ID	247
Sample Type	SS	Date Received	3-10-21
		Date Reported	4-7-21

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 26.4

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 4	4.75	100.0
No. 10	2	100.0
No. 40	0.425	99.5
No. 200	0.075	89.5
	0.02	60.6
	0.005	34.2
	0.002	26.1
estimated	0.001	21.9

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.0	0.0
Coarse Sand	0.0	0.5
Medium Sand	0.5	---
Fine Sand	10.0	10.0
Silt	55.3	63.4
Clay	34.2	26.1

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	40
Plastic Limit:	20
Plasticity Index:	20
Activity Index:	0.8

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol: CL

Group Name: Lean clay

AASHTO Classification: A-6 (18)

Comments:

Reviewed By RHB

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b10-ss08G, 24.5'-26.0'	Lab ID	247

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	TRH
Test Date	03-22-2021
Date Received	03-10-2021

Maximum Particle size: No. 4 Sieve

Sieve Size	% Passing
No. 4	100.0
No. 10	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

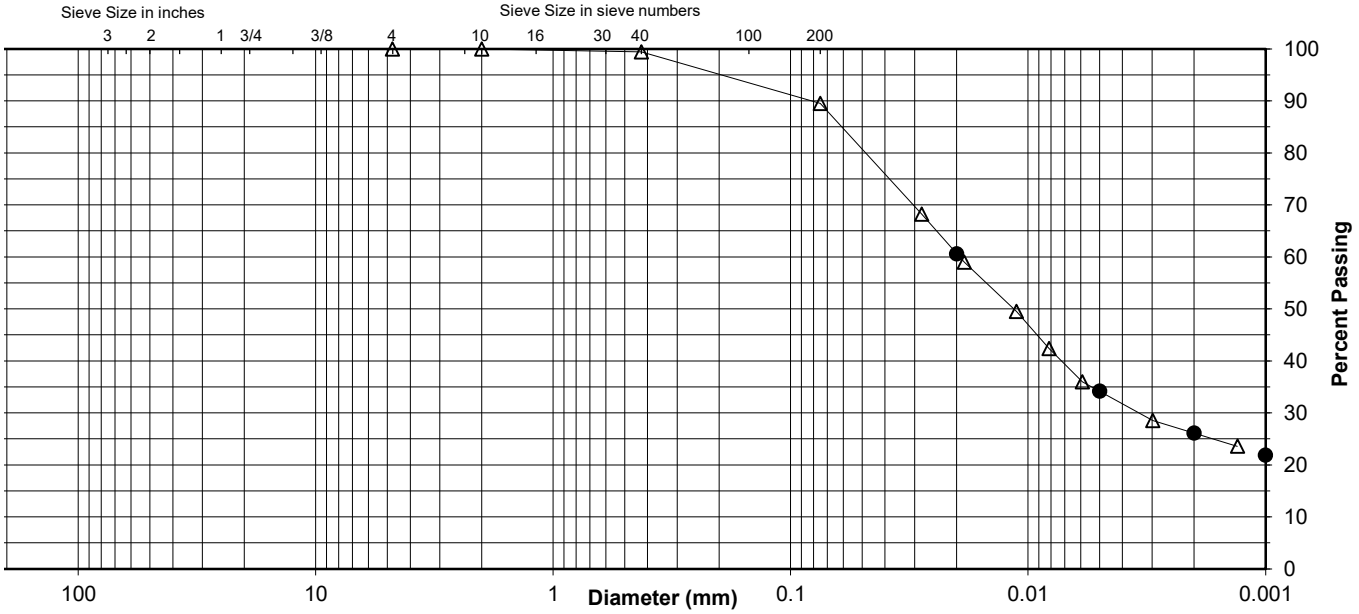
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	99.5
No. 200	89.5
0.02 mm	60.6
0.005 mm	34.2
0.002 mm	26.1
0.001 mm	21.9

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	0.0	0.5	10.0	55.3	34.2
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	0.0			0.5	10.0	63.4	26.1



Comments

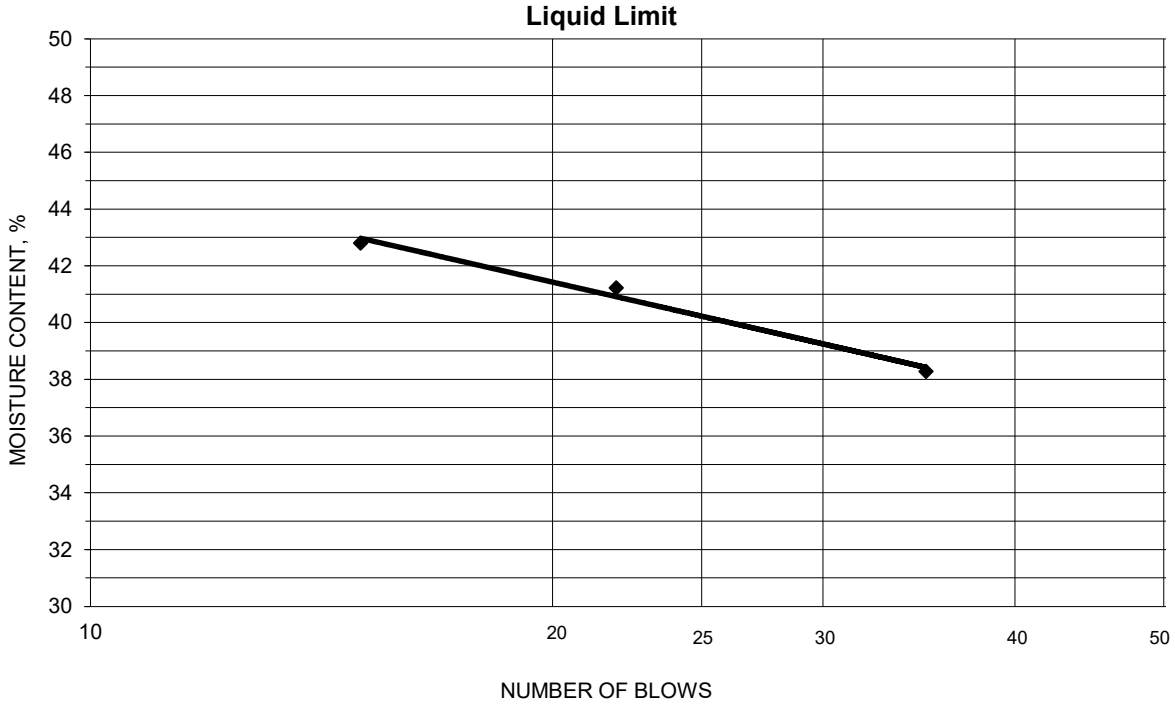
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	kif-gt-b10-ss08G, 24.5'-26.0'			Lab ID	247
				% + No. 40	1
Tested By	JMB	Test Method	ASTM D 4318 Method A	Date Received	03-10-2021
Test Date	04-06-2021	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
13.14	10.69	4.29	35	38.3	
12.17	9.87	4.29	22	41.2	
11.88	9.62	4.34	15	42.8	40



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
11.44	10.27	4.30	19.6	20	20
11.53	10.34	4.35	19.9		

Remarks: _____

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b10-ss10bG, 30.0'-31.0'	Lab ID	250
Sample Type	SS	Date Received	3-10-21
		Date Reported	3-26-21

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 32.4

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 10	2	100.0
No. 40	0.425	99.6
No. 200	0.075	24.6
	0.02	15.4
	0.005	8.8
	0.002	6.8
estimated	0.001	5.4

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.0	0.0
Coarse Sand	0.0	0.4
Medium Sand	0.4	---
Fine Sand	75.0	75.0
Silt	15.8	17.8
Clay	8.8	6.8

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	NP
Plastic Limit:	NP
Plasticity Index:	NP
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol: SM
Group Name: Silty sand

AASHTO Classification: A-2-4 (0)

Comments:

Reviewed By RHB

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b10-ss10bG, 30.0'-31.0'	Lab ID	250

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	N/A
Particle Hardness:	N/A
Tested By	SKS
Test Date	03-19-2021
Date Received	03-10-2021

Maximum Particle size: No. 10 Sieve

Sieve Size	% Passing
No. 10	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity 2.7

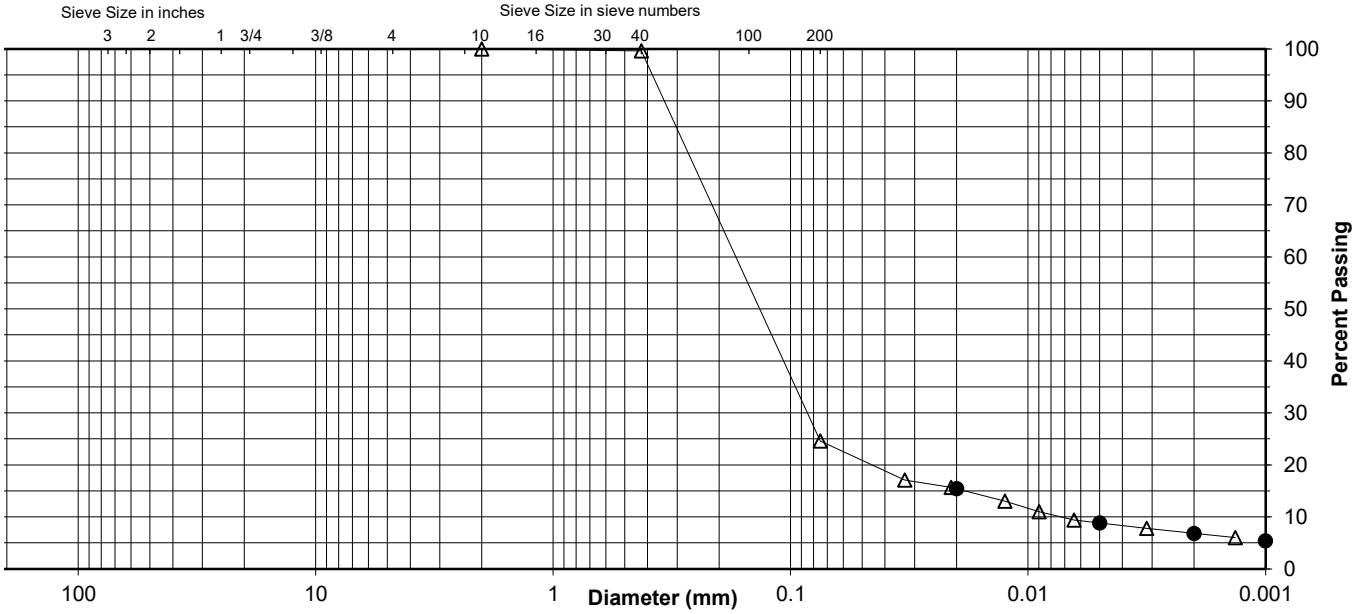
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	99.6
No. 200	24.6
0.02 mm	15.4
0.005 mm	8.8
0.002 mm	6.8
0.001 mm	5.4

Particle Size Distribution

	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
ASTM	0.0	0.0	0.0	0.4	75.0	15.8	8.8

	Gravel	Coarse Sand	Fine Sand	Silt	Clay
AASHTO	0.0	0.4	75.0	17.8	6.8



Comments

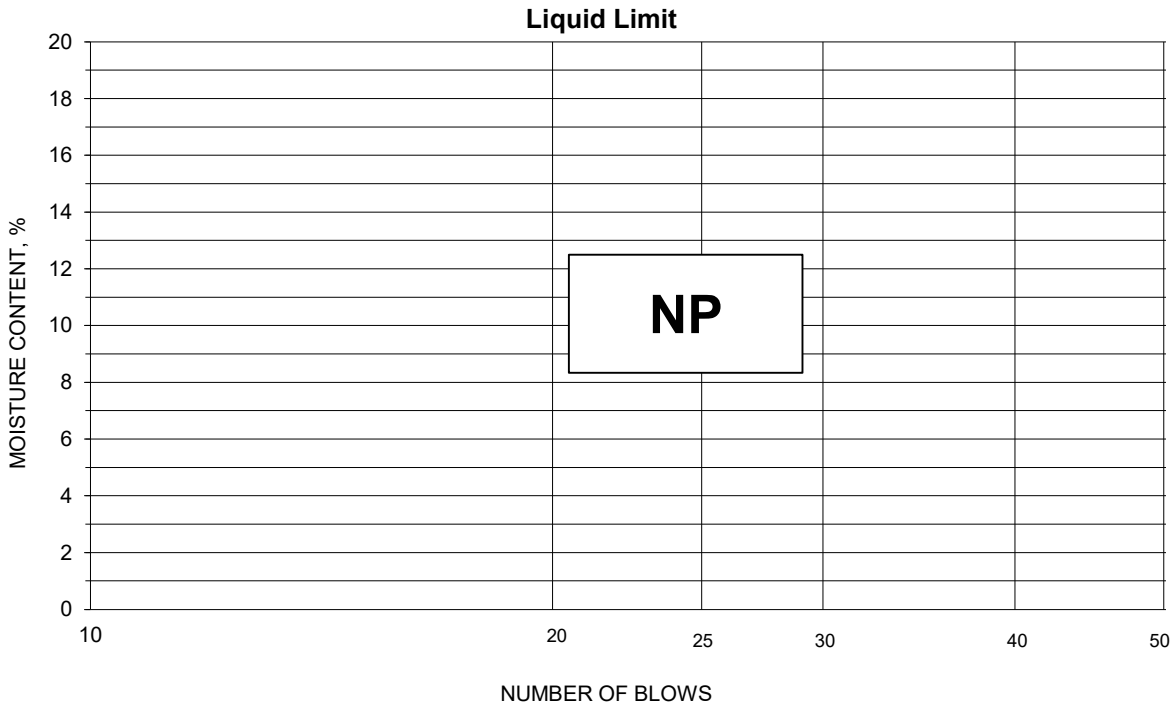
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	kif-gt-b10-ss10bG, 30.0'-31.0'			Lab ID	250
				% + No. 40	0
Tested By	DB	Test Method	ASTM D 4318 Method A	Date Received	03-10-2021
Test Date	03-15-2021	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: _____

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b10-ss11G, 32.0'-33.5'	Lab ID	251
Sample Type	SS	Date Received	3-10-21
		Date Reported	3-26-21

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 28.0

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
3/8"	9.5	100.0
No. 4	4.75	99.9
No. 10	2	99.8
No. 40	0.425	99.4
No. 200	0.075	10.9
	0.02	6.0
	0.005	3.6
	0.002	2.8
estimated	0.001	2.5

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.1	0.2
Coarse Sand	0.1	0.4
Medium Sand	0.4	---
Fine Sand	88.5	88.5
Silt	7.3	8.1
Clay	3.6	2.8

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	NP
Plastic Limit:	NP
Plasticity Index:	NP
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol: SP-SM

Group Name: Poorly graded sand with silt

AASHTO Classification: A-2-4 (0)

Comments:

Reviewed By RHB

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b10-ss11G, 32.0'-33.5'	Lab ID	251

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	TRH
Test Date	03-18-2021
Date Received	03-10-2021

Maximum Particle size: 3/8" Sieve

Sieve Size	% Passing
3/8"	100.0
No. 4	99.9
No. 10	99.8

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

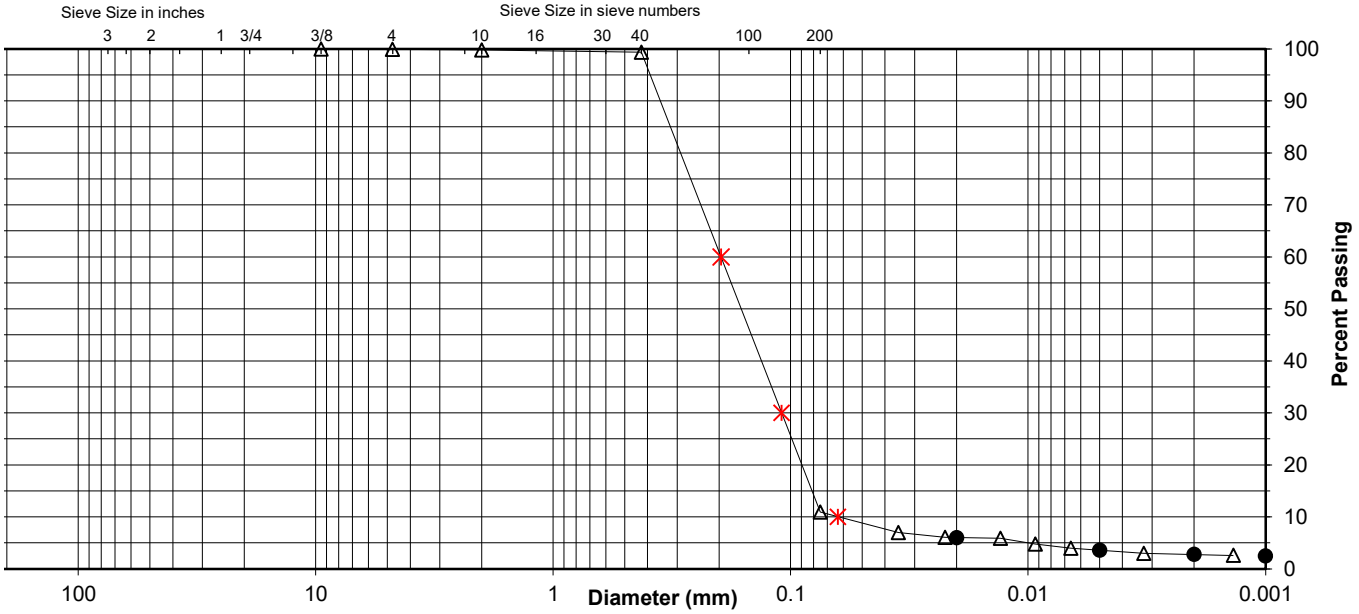
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	99.4
No. 200	10.9
0.02 mm	6.0
0.005 mm	3.6
0.002 mm	2.8
0.001 mm	2.5

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.1	0.1	0.4	88.5	7.3	3.6
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	0.2			0.4	88.5	8.1	2.8



Comments

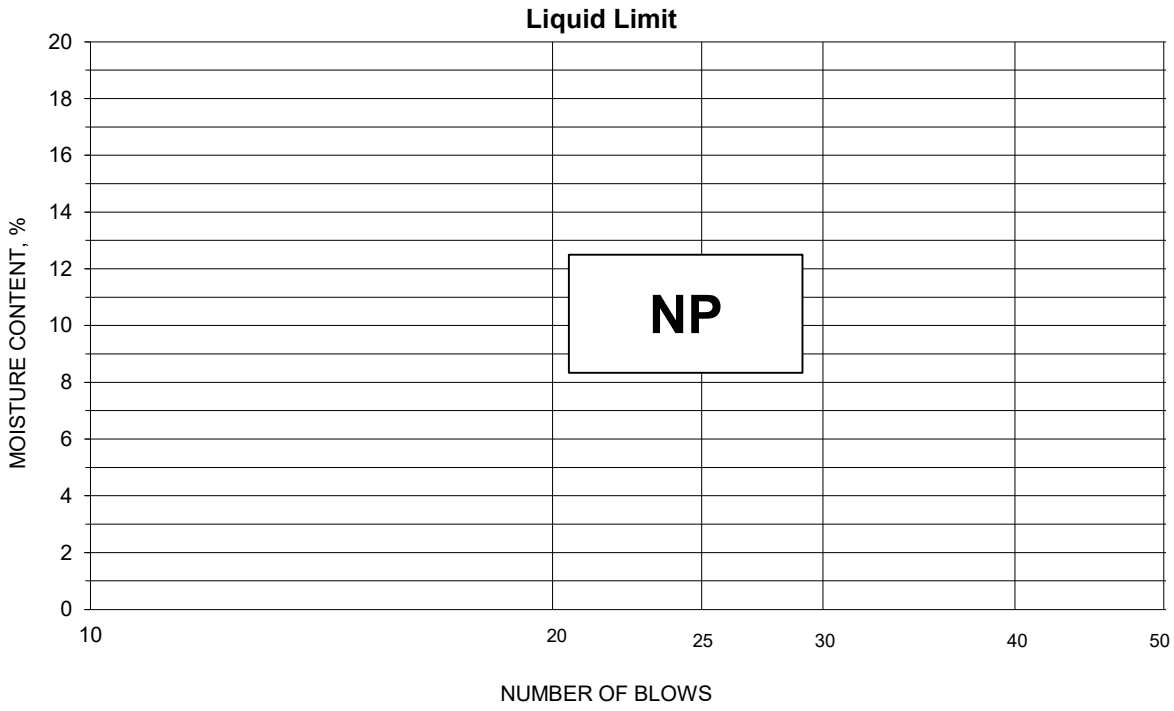
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	kif-gt-b10-ss11G, 32.0'-33.5'			Lab ID	251
				% + No. 40	1
Tested By	DB	Test Method	ASTM D 4318 Method A	Date Received	03-10-2021
Test Date	03-15-2021	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: _____

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b11-ss02G, 14.5'-16.0'	Lab ID	255
Sample Type	SS	Date Received	3-10-21
		Date Reported	3-30-21

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 32.2

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
3/4"	19	100.0
3/8"	9.5	99.6
No. 4	4.75	99.6
No. 10	2	98.8
No. 40	0.425	92.9
No. 200	0.075	89.9
	0.02	70.5
	0.005	42.1
	0.002	30.9
estimated	0.001	25.0

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.4	1.2
Coarse Sand	0.8	5.9
Medium Sand	5.9	---
Fine Sand	3.0	3.0
Silt	47.8	59.0
Clay	42.1	30.9

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	41
Plastic Limit:	22
Plasticity Index:	19
Activity Index:	0.6

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol: CL

Group Name: Lean clay

AASHTO Classification: A-7-6 (18)

Comments:

Reviewed By RHB

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b11-ss02G, 14.5'-16.0'	Lab ID	255

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	TRH
Test Date	03-18-2021
Date Received	03-10-2021

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	99.6
No. 4	99.6
No. 10	98.8

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity 2.7

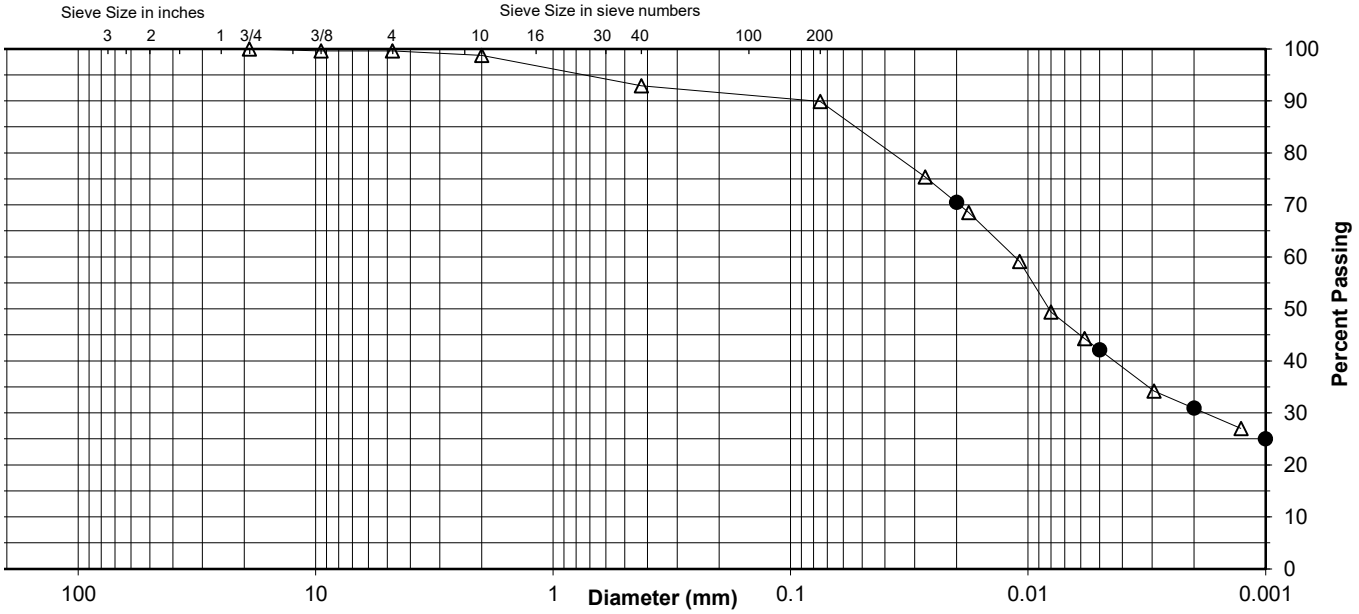
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	92.9
No. 200	89.9
0.02 mm	70.5
0.005 mm	42.1
0.002 mm	30.9
0.001 mm	25.0

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.4	0.8	5.9	3.0	47.8	42.1

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	1.2	5.9	3.0	59.0	30.9



Comments

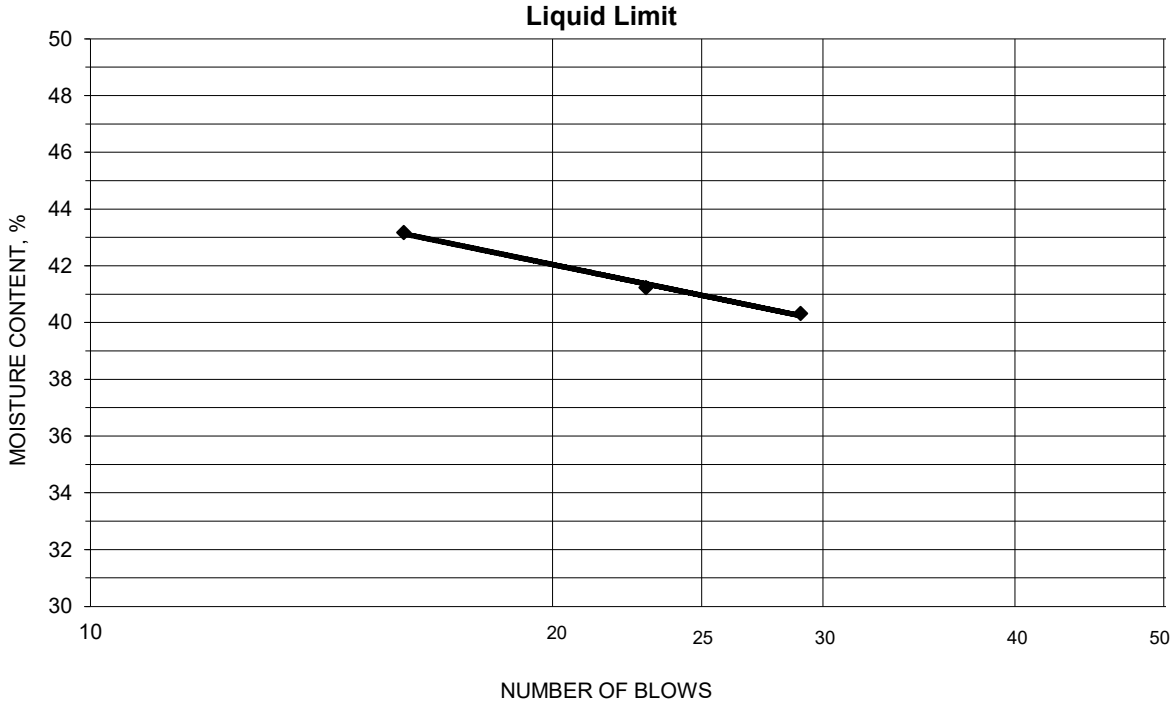
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	kif-gt-b11-ss02G, 14.5'-16.0'			Lab ID	255
				% + No. 40	7
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	03-10-2021
Test Date	03-29-2021	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
18.02	15.90	10.99	16	43.2	
17.46	15.53	10.85	23	41.2	
18.25	16.23	11.22	29	40.3	41



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
17.70	16.56	11.34	21.8	22	19
17.60	16.40	10.93	21.9		

Remarks: _____

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b11-ss03G, 17.0'-18.5'	Lab ID	256
Sample Type	SS	Date Received	3-10-21
		Date Reported	4-7-21

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 26.7

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
3/8"	9.5	100.0
No. 4	4.75	98.6
No. 10	2	98.6
No. 40	0.425	97.6
No. 200	0.075	94.1
	0.02	69.3
	0.005	43.3
	0.002	32.1
estimated	0.001	26.0

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	1.4	1.4
Coarse Sand	0.0	1.0
Medium Sand	1.0	---
Fine Sand	3.5	3.5
Silt	50.8	62.0
Clay	43.3	32.1

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	41
Plastic Limit:	23
Plasticity Index:	18
Activity Index:	0.6

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol: CL

Group Name: Lean clay

AASHTO Classification: A-7-6 (18)

Comments:

Reviewed By RHB

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b11-ss03G, 17.0'-18.5'	Lab ID	256

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	TRH
Test Date	03-18-2021
Date Received	03-10-2021

Maximum Particle size: 3/8" Sieve

Sieve Size	% Passing
3/8"	100.0
No. 4	98.6
No. 10	98.6

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity 2.7

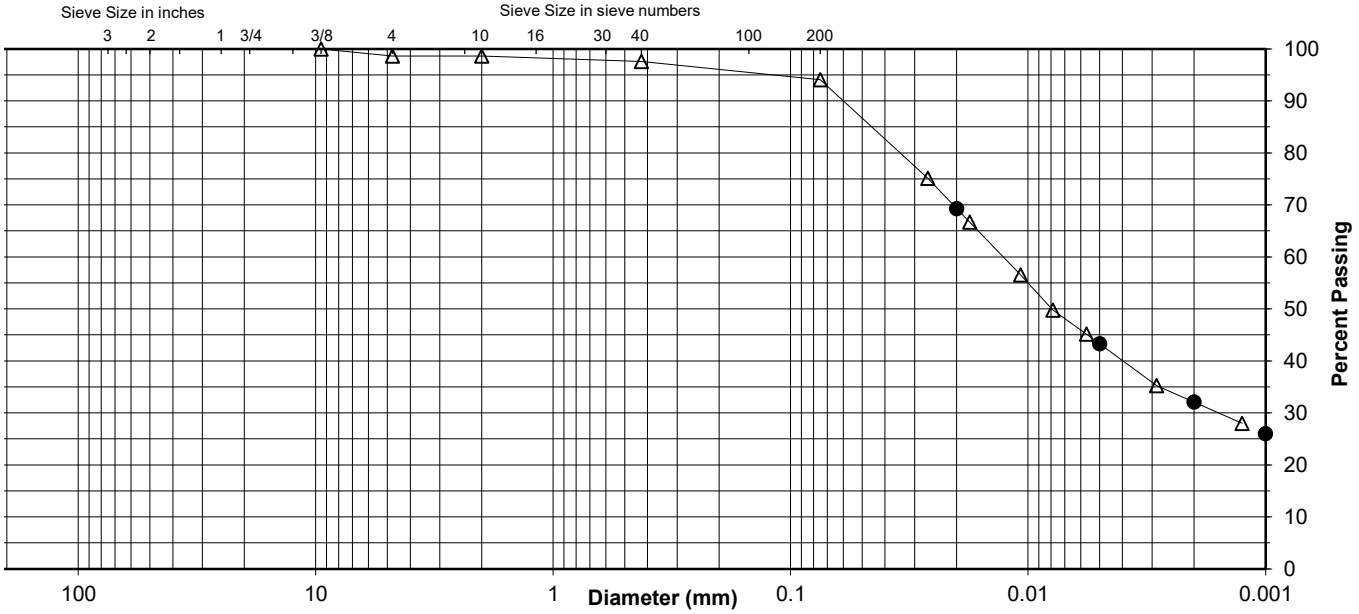
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	97.6
No. 200	94.1
0.02 mm	69.3
0.005 mm	43.3
0.002 mm	32.1
0.001 mm	26.0

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	1.4	0.0	1.0	3.5	50.8	43.3

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	1.4	1.0	3.5	62.0	32.1



Comments

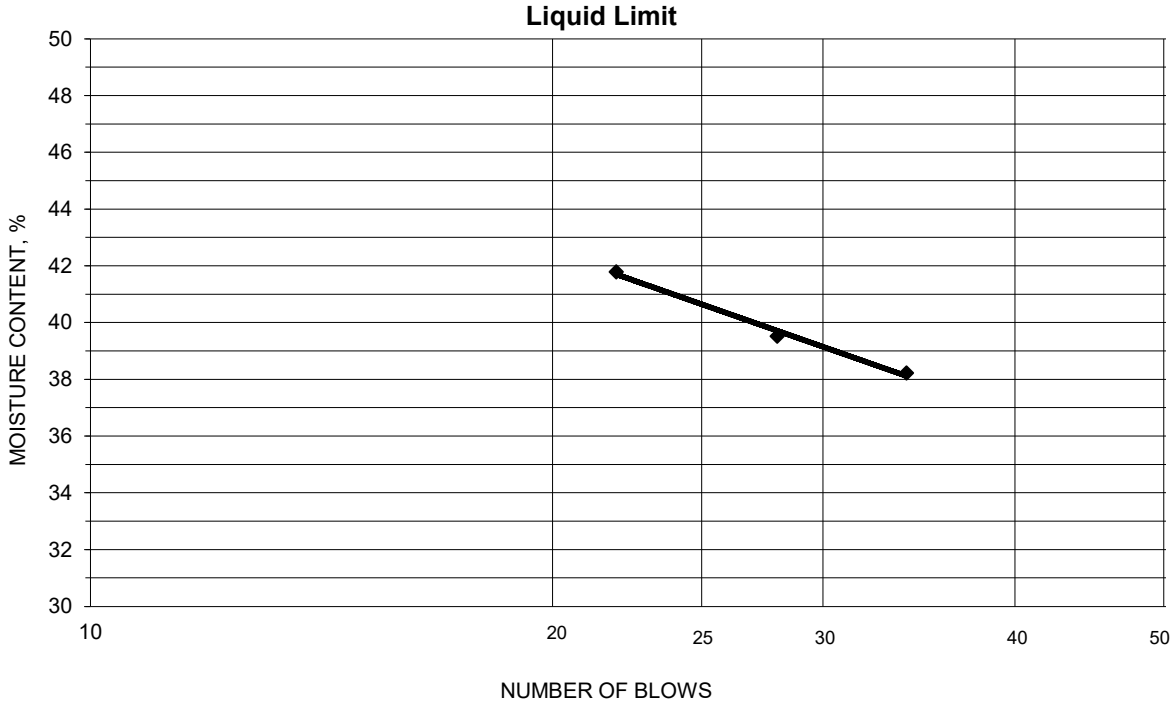
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	kif-gt-b11-ss03G, 17.0'-18.5'			Lab ID	256
				% + No. 40	2
Tested By	JMB	Test Method	ASTM D 4318 Method A	Date Received	03-10-2021
Test Date	04-06-2021	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
10.98	9.13	4.29	34	38.2	
10.71	8.90	4.32	28	39.5	
13.06	10.49	4.34	22	41.8	41



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
11.43	10.10	4.31	23.0	23	18
11.79	10.39	4.32	23.1		

Remarks: _____

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b11-ss04G, 23.5'-25.0'	Lab ID	259
Sample Type	SS	Date Received	3-10-21
		Date Reported	3-31-21

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 22.3

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 10	2	100.0
No. 40	0.425	99.4
No. 200	0.075	86.6
	0.02	60.7
	0.005	33.4
	0.002	24.8
estimated	0.001	20.3

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.0	0.0
Coarse Sand	0.0	0.6
Medium Sand	0.6	---
Fine Sand	12.8	12.8
Silt	53.2	61.8
Clay	33.4	24.8

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	35
Plastic Limit:	18
Plasticity Index:	17
Activity Index:	0.7

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol: CL

Group Name: Lean clay

AASHTO Classification: A-6 (14)

Comments:

Reviewed By RHB

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b11-ss04G, 23.5'-25.0'	Lab ID	259

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	N/A
Particle Hardness:	N/A
Tested By	TRH
Test Date	03-18-2021
Date Received	03-10-2021

Maximum Particle size: No. 10 Sieve

Sieve Size	% Passing
No. 10	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

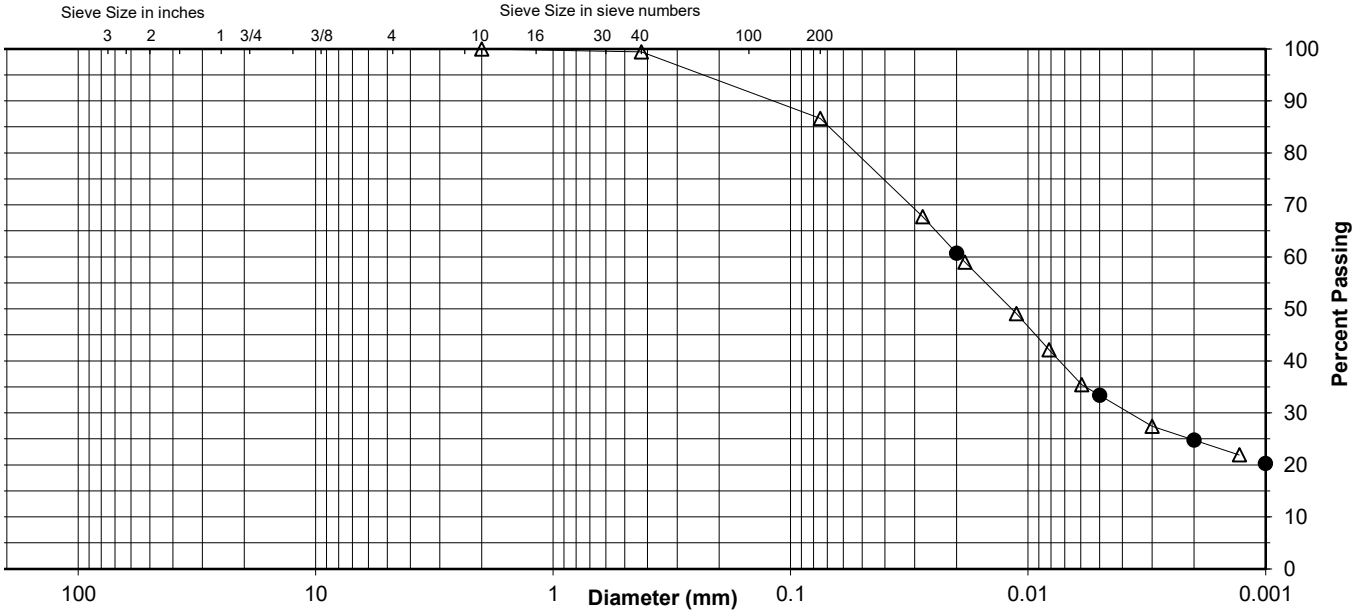
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	99.4
No. 200	86.6
0.02 mm	60.7
0.005 mm	33.4
0.002 mm	24.8
0.001 mm	20.3

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	0.0	0.6	12.8	53.2	33.4
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	0.0			0.6	12.8	61.8	24.8



Comments

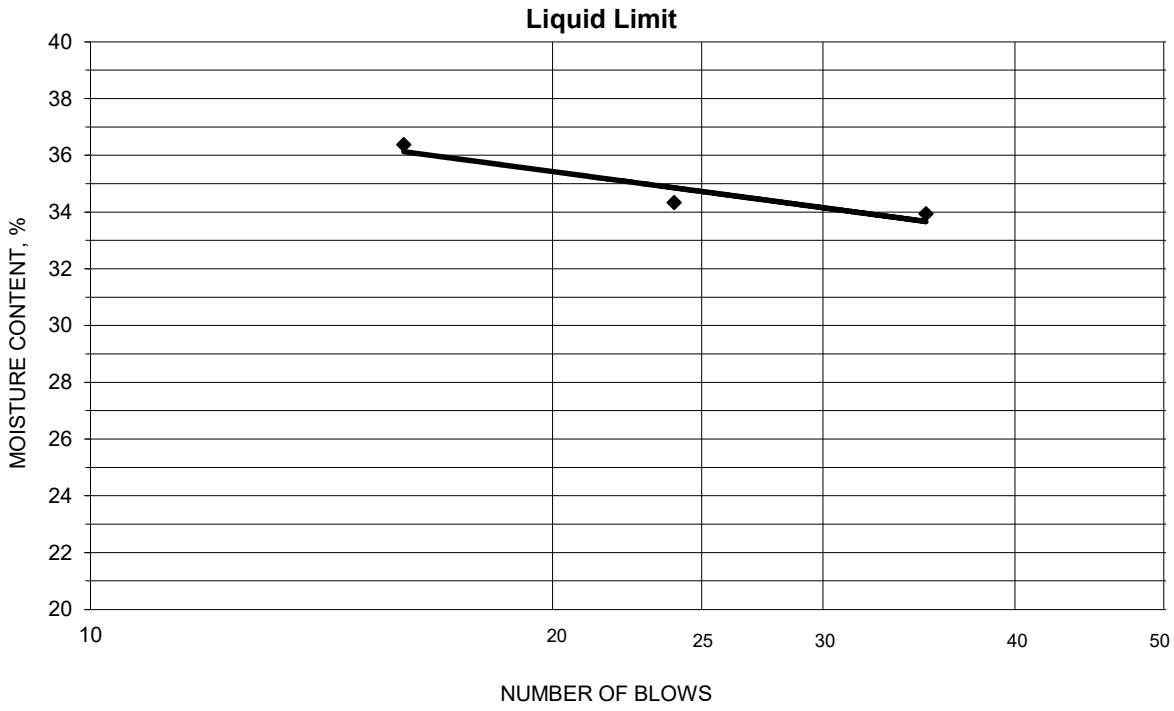
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	kif-gt-b11-ss04G, 23.5'-25.0'			Lab ID	259
				% + No. 40	1
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	03-10-2021
Test Date	03-30-2021	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
18.89	16.78	10.98	16	36.4	
17.71	16.11	11.45	24	34.3	
18.79	16.92	11.41	35	33.9	35



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
17.57	16.57	11.13	18.4	18	17
17.35	16.37	11.07	18.5		

Remarks: _____

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b11-ss05G, 26.0'-27.5'	Lab ID	260
Sample Type	SS	Date Received	3-10-21
		Date Reported	4-7-21

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 25.9

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 10	2	100.0
No. 40	0.425	99.8
No. 200	0.075	63.8
	0.02	37.4
	0.005	21.5
	0.002	16.4
estimated	0.001	13.7

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.0	0.0
Coarse Sand	0.0	0.2
Medium Sand	0.2	---
Fine Sand	36.0	36.0
Silt	42.3	47.4
Clay	21.5	16.4

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	23
Plastic Limit:	15
Plasticity Index:	8
Activity Index:	0.5

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol:	CL
Group Name:	Sandy lean clay
AASHTO Classification:	A-4 (2)

Comments:

Reviewed By RHB

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b11-ss05G, 26.0'-27.5'	Lab ID	260

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	N/A
Particle Hardness:	N/A
Tested By	TRH
Test Date	03-18-2021
Date Received	03-10-2021

Maximum Particle size: No. 10 Sieve

Sieve Size	% Passing
No. 10	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

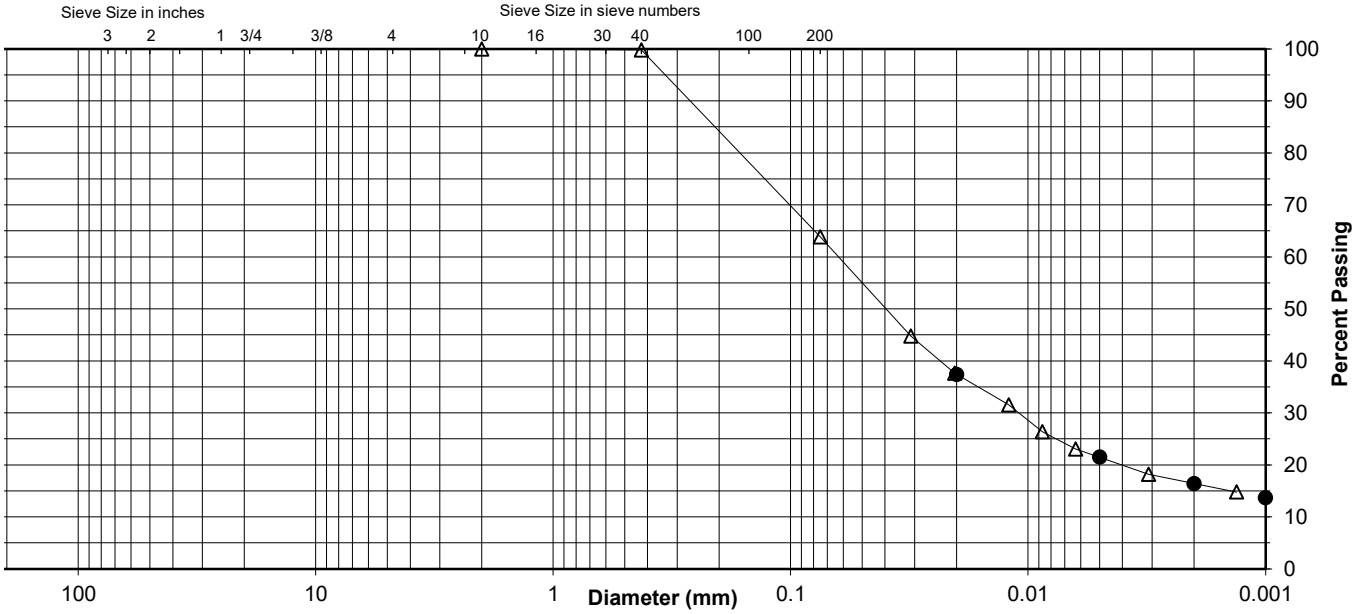
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	99.8
No. 200	63.8
0.02 mm	37.4
0.005 mm	21.5
0.002 mm	16.4
0.001 mm	13.7

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	0.0	0.2	36.0	42.3	21.5
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	0.0			0.2	36.0	47.4	16.4



Comments

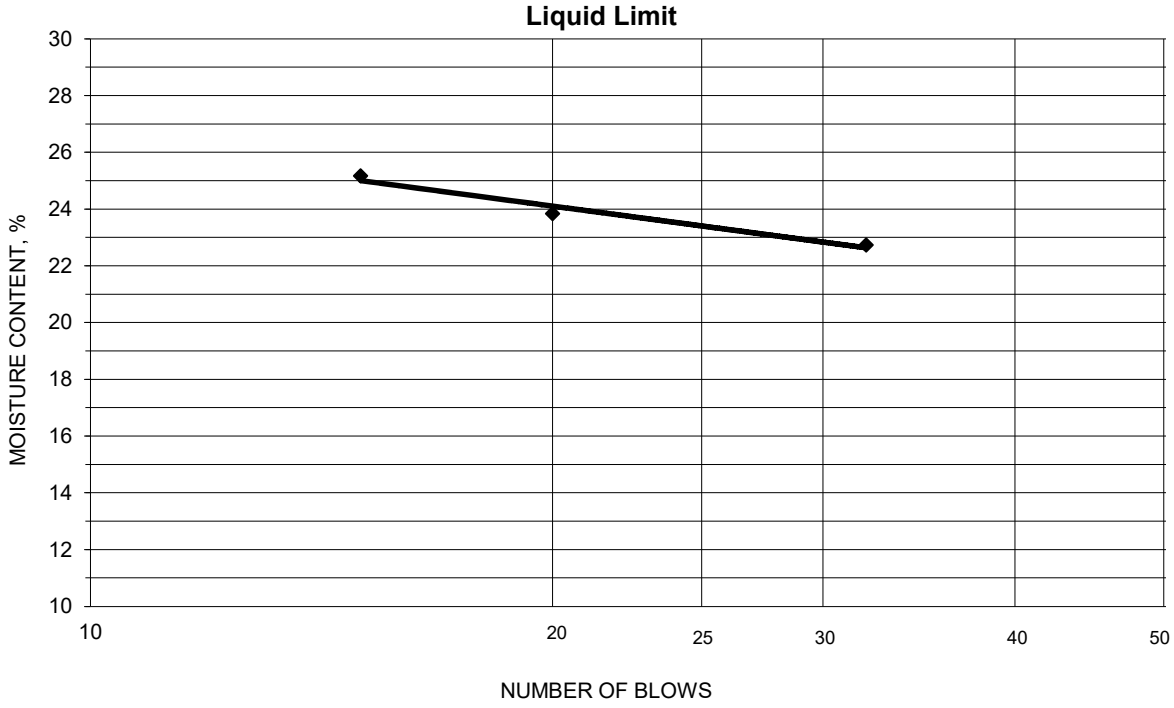
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	kif-gt-b11-ss05G, 26.0'-27.5'			Lab ID	260
				% + No. 40	0
Tested By	JMB	Test Method	ASTM D 4318 Method A	Date Received	03-10-2021
Test Date	04-06-2021	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
12.54	11.01	4.28	32	22.7	
13.12	11.42	4.29	20	23.8	
13.75	11.85	4.30	15	25.2	23



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
11.86	10.88	4.30	14.9	15	8
12.26	11.21	4.28	15.2		

Remarks: _____

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b11-ss07G, 31.0'-32.5'	Lab ID	262
Sample Type	SS	Date Received	3-10-21
		Date Reported	3-26-21

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 30.9

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 10	2	100.0
No. 40	0.425	99.8
No. 200	0.075	16.7
	0.02	9.7
	0.005	6.1
	0.002	4.4
estimated	0.001	3.4

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.0	0.0
Coarse Sand	0.0	0.2
Medium Sand	0.2	---
Fine Sand	83.1	83.1
Silt	10.6	12.3
Clay	6.1	4.4

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	NP
Plastic Limit:	NP
Plasticity Index:	NP
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol: SM
Group Name: Silty sand

AASHTO Classification: A-2-4 (0)

Comments:

Reviewed By RHB

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b11-ss07G, 31.0'-32.5'	Lab ID	262

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	N/A
Particle Hardness:	N/A
Tested By	SKS
Test Date	03-19-2021
Date Received	03-10-2021

Maximum Particle size: No. 10 Sieve

Sieve Size	% Passing
No. 10	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

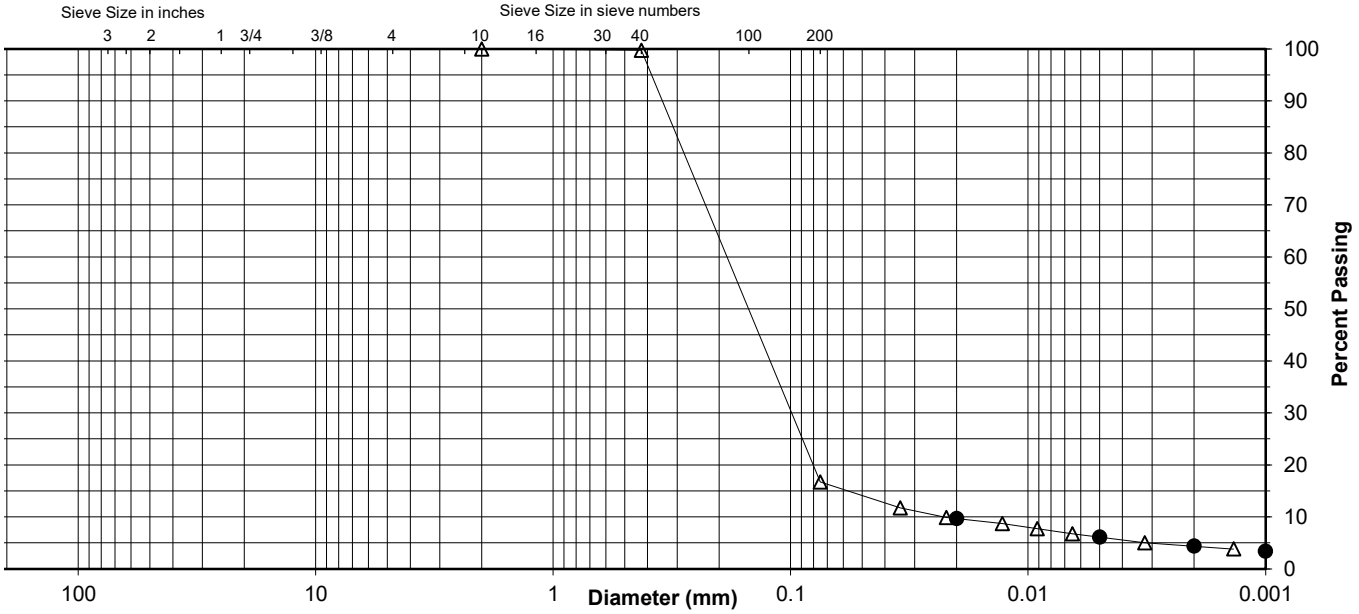
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	99.8
No. 200	16.7
0.02 mm	9.7
0.005 mm	6.1
0.002 mm	4.4
0.001 mm	3.4

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	0.0	0.2	83.1	10.6	6.1
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	0.0			0.2	83.1	12.3	4.4



Comments

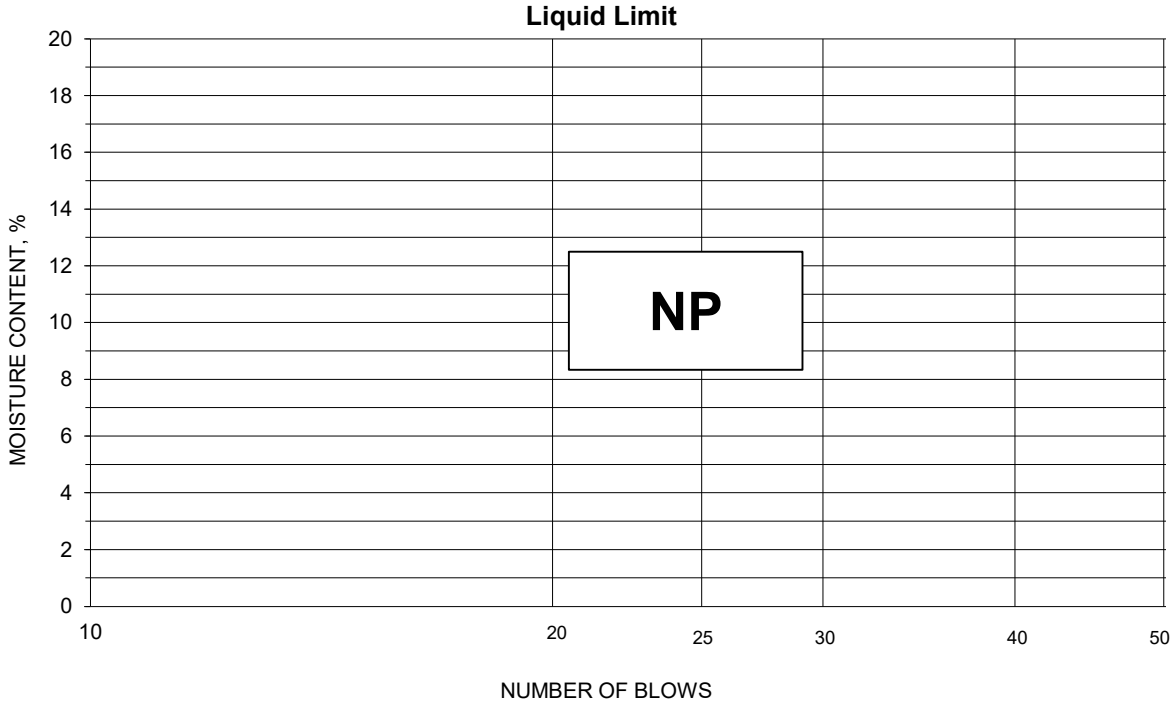
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order	Project No.	175668043
Source	kif-gt-b11-ss07G, 31.0'-32.5'	Lab ID	262
		% + No. 40	0
Tested By	DB	Test Method	ASTM D 4318 Method A
Test Date	03-15-2021	Prepared	Dry
		Date Received	03-10-2021

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: _____

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b11-ss08aG, 33.5'-34.6'	Lab ID	263
Sample Type	SS	Date Received	3-10-21
		Date Reported	3-26-21

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 24.8

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 4	4.75	100.0
No. 10	2	99.8
No. 40	0.425	92.3
No. 200	0.075	15.9
	0.02	9.6
	0.005	5.2
	0.002	4.0
estimated	0.001	3.8

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.0	0.2
Coarse Sand	0.2	7.5
Medium Sand	7.5	---
Fine Sand	76.4	76.4
Silt	10.7	11.9
Clay	5.2	4.0

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	NP
Plastic Limit:	NP
Plasticity Index:	NP
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol: SM

Group Name: Silty sand

AASHTO Classification: A-2-4 (0)

Comments:

Reviewed By RHB

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b11-ss08aG, 33.5'-34.6'	Lab ID	263

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	SKS
Test Date	03-19-2021
Date Received	03-10-2021

Maximum Particle size: No. 4 Sieve

Sieve Size	% Passing
No. 4	100.0
No. 10	99.8

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

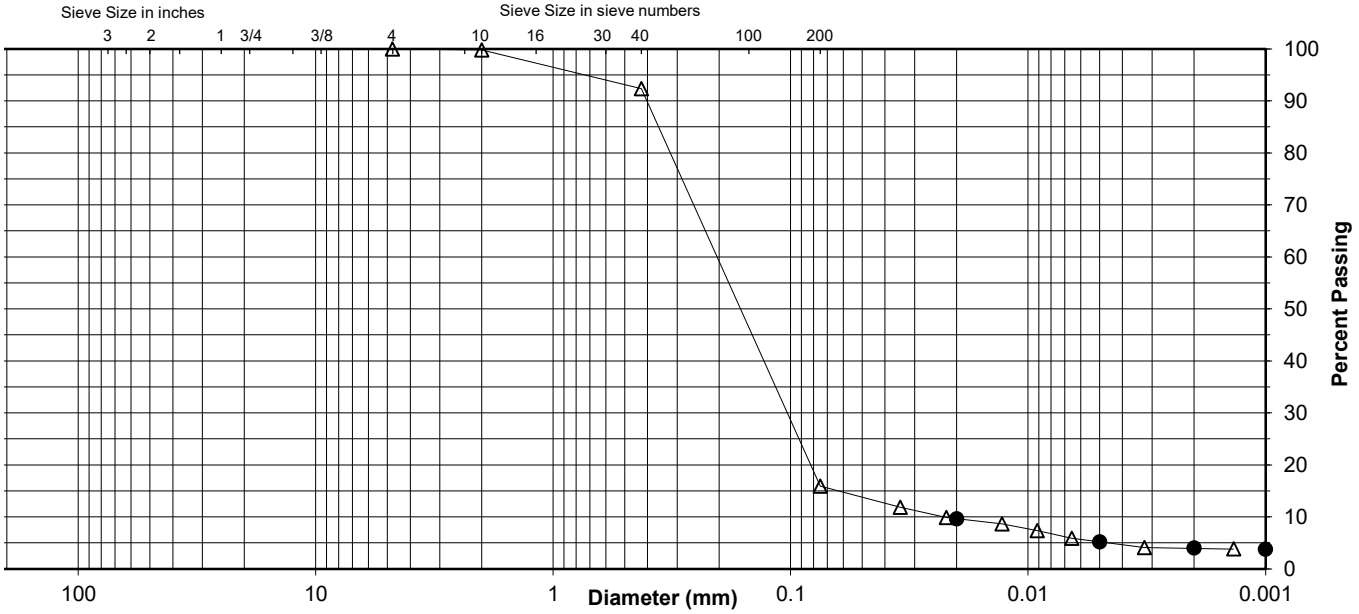
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	92.3
No. 200	15.9
0.02 mm	9.6
0.005 mm	5.2
0.002 mm	4.0
0.001 mm	3.8

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	0.2	7.5	76.4	10.7	5.2
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	0.2			7.5	76.4	11.9	4.0



Comments

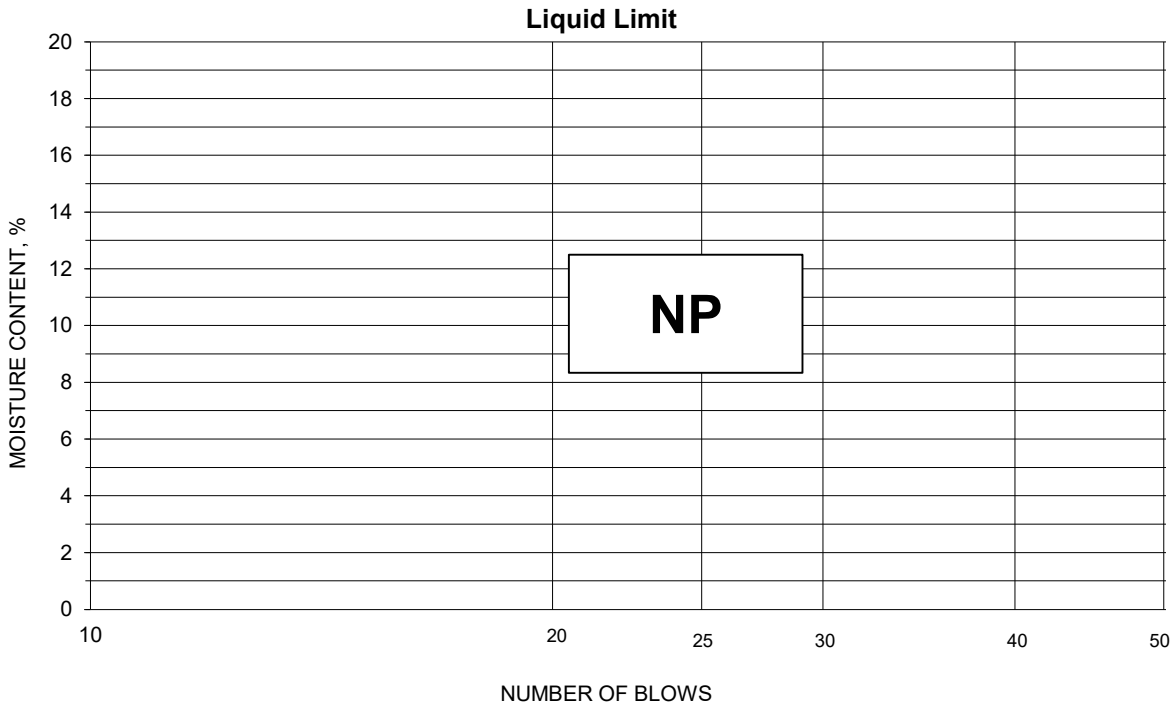
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	kif-gt-b11-ss08aG, 33.5'-34.6'			Lab ID	263
				% + No. 40	8
Tested By	DB	Test Method	ASTM D 4318 Method A	Date Received	03-10-2021
Test Date	03-15-2021	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: _____

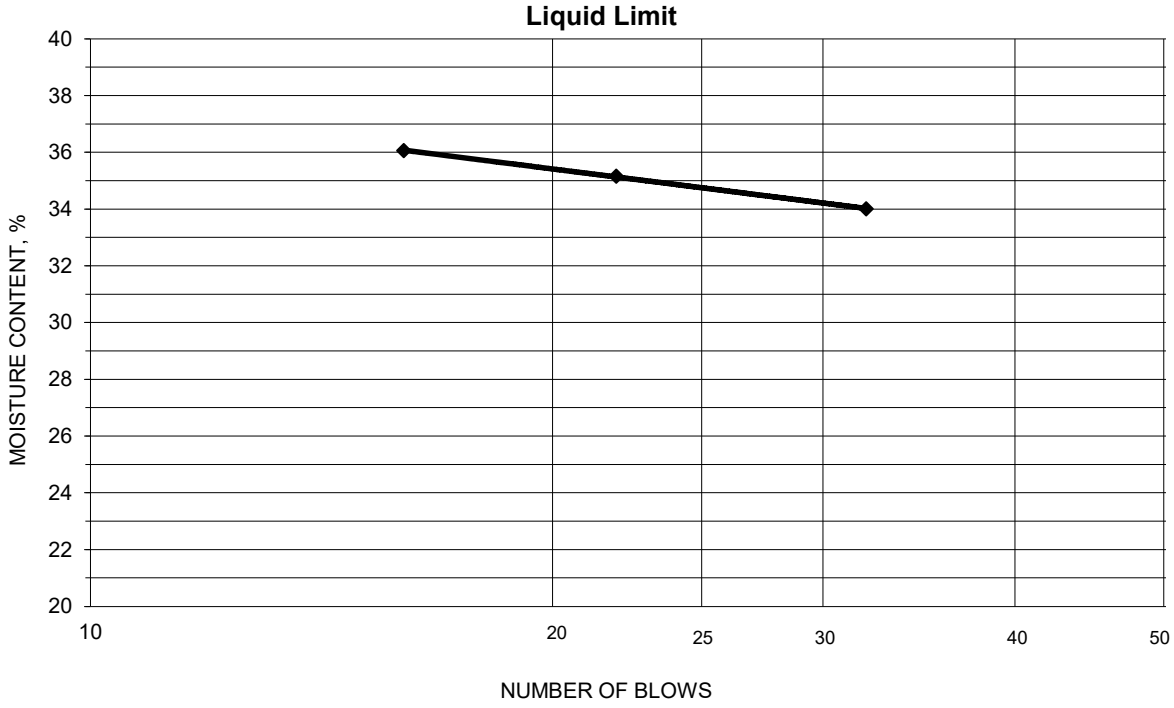
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order	Project No.	175668043
Source	kif-gt-b12-ss01bG, 14.6'-15.1'	Lab ID	267
		% + No. 40	1
Tested By	JMB	Test Method	ASTM D 4318 Method A
Test Date	04-06-2021	Prepared	Dry
		Date Received	03-10-2021

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
10.87	9.20	4.29	32	34.0	
9.98	8.50	4.29	22	35.2	
12.13	10.06	4.32	16	36.1	35



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
12.11	10.82	4.32	19.8	20	15
11.71	10.47	4.31	20.1		

Remarks: _____

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b12-ss03G, 23.3'-24.8'	Lab ID	271
Sample Type	SS	Date Received	3-10-21
		Date Reported	4-7-21

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 23.8

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
3/8"	9.5	100.0
No. 4	4.75	99.8
No. 10	2	99.8
No. 40	0.425	98.7
No. 200	0.075	82.8
	0.02	60.3
	0.005	32.5
	0.002	24.0
estimated	0.001	19.7

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.2	0.2
Coarse Sand	0.0	1.1
Medium Sand	1.1	---
Fine Sand	15.9	15.9
Silt	50.3	58.8
Clay	32.5	24.0

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	33
Plastic Limit:	18
Plasticity Index:	15
Activity Index:	0.6

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol: CL

Group Name: Lean clay with sand

AASHTO Classification: A-6 (11)

Comments:

Reviewed By RHB

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b12-ss03G, 23.3'-24.8'	Lab ID	271

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	TRH
Test Date	03-19-2021
Date Received	03-10-2021

Maximum Particle size: 3/8" Sieve

Sieve Size	% Passing
3/8"	100.0
No. 4	99.8
No. 10	99.8

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity 2.7

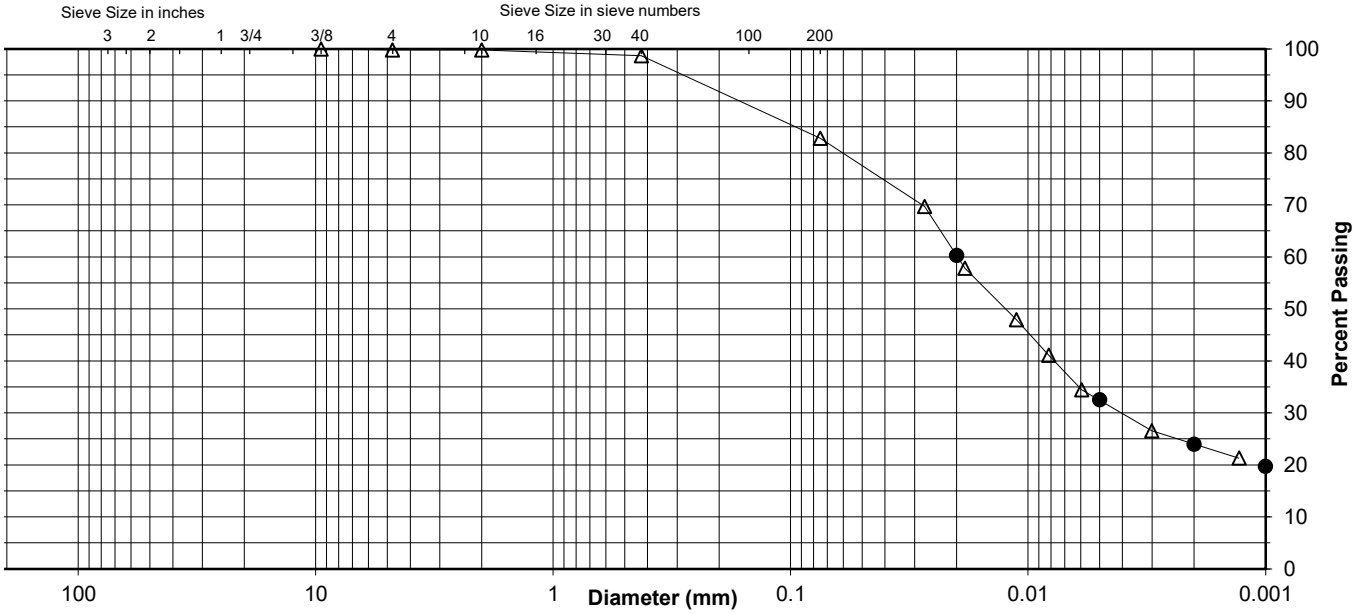
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	98.7
No. 200	82.8
0.02 mm	60.3
0.005 mm	32.5
0.002 mm	24.0
0.001 mm	19.7

Particle Size Distribution

	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
ASTM	0.0	0.2	0.0	1.1	15.9	50.3	32.5

	Gravel	Coarse Sand	Fine Sand	Silt	Clay
AASHTO	0.2	1.1	15.9	58.8	24.0



Comments

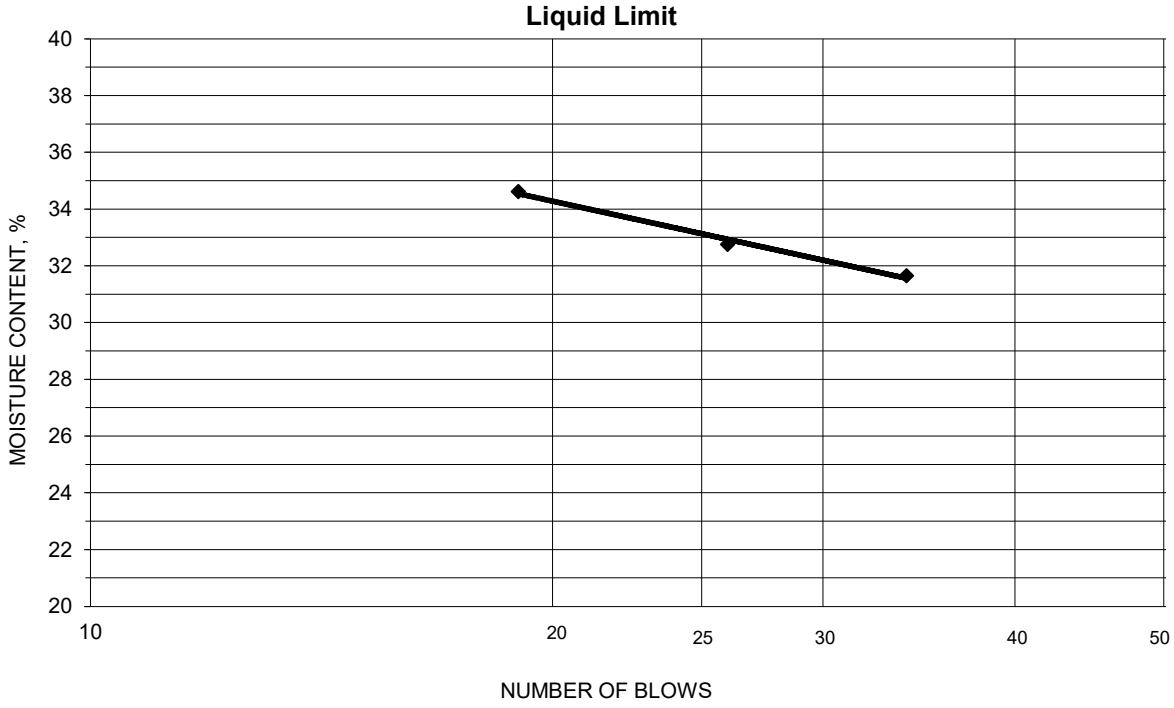
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	kif-gt-b12-ss03G, 23.3'-24.8'			Lab ID	271
				% + No. 40	1
Tested By	JMB	Test Method	ASTM D 4318 Method A	Date Received	03-10-2021
Test Date	04-06-2021	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
10.81	9.24	4.28	34	31.7	
12.76	10.67	4.29	26	32.8	
12.27	10.21	4.26	19	34.6	33



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
11.71	10.58	4.34	18.1	18	15
12.61	11.33	4.36	18.4		

Remarks: _____

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b12-ss04G, 27.8'-29.3'	Lab ID	273
Sample Type	SS	Date Received	3-10-21
		Date Reported	4-2-21

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 25.8

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 4	4.75	100.0
No. 10	2	100.0
No. 40	0.425	99.9
No. 200	0.075	47.9
	0.02	27.6
	0.005	15.8
	0.002	11.8
estimated	0.001	9.5

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.0	0.0
Coarse Sand	0.0	0.1
Medium Sand	0.1	---
Fine Sand	52.0	52.0
Silt	32.1	36.1
Clay	15.8	11.8

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	NP
Plastic Limit:	NP
Plasticity Index:	NP
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol: SM
Group Name: Silty sand

AASHTO Classification: A-4 (0)

Comments:

Reviewed By RHB

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b12-ss04G, 27.8'-29.3'	Lab ID	273

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	TRH
Test Date	03-19-2021
Date Received	03-10-2021

Maximum Particle size: No. 4 Sieve

Sieve Size	% Passing
No. 4	100.0
No. 10	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

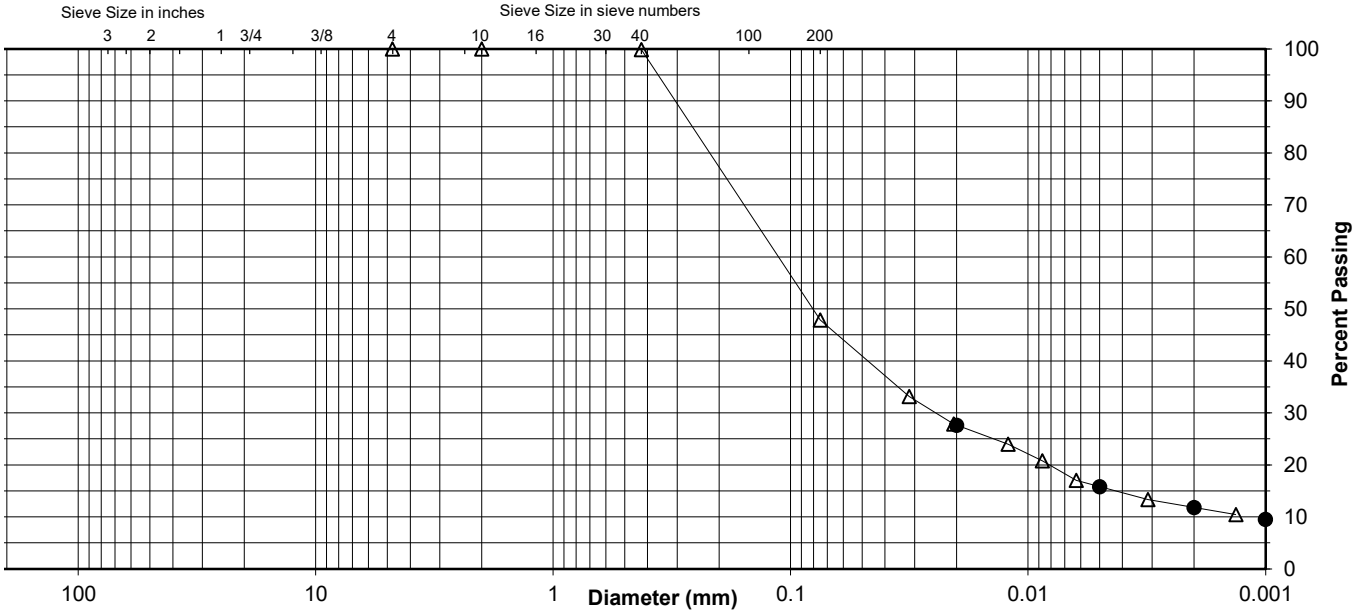
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	99.9
No. 200	47.9
0.02 mm	27.6
0.005 mm	15.8
0.002 mm	11.8
0.001 mm	9.5

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	0.0	0.1	52.0	32.1	15.8
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	0.0			0.1	52.0	36.1	11.8



Comments

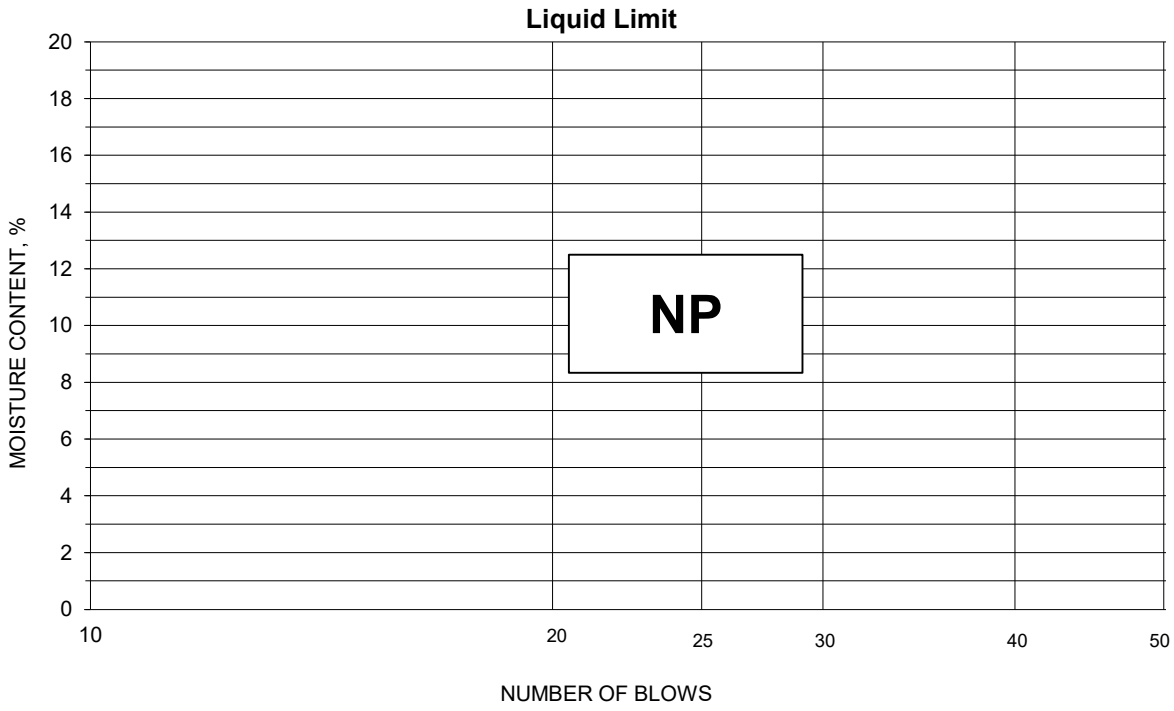
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	kif-gt-b12-ss04G, 27.8'-29.3'			Lab ID	273
				% + No. 40	0
Tested By	DB	Test Method	ASTM D 4318 Method A	Date Received	03-10-2021
Test Date	03-30-2021	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: _____

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b12-ss05G, 30.3'-31.8'	Lab ID	274
Sample Type	SS	Date Received	3-10-21
		Date Reported	3-26-21

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 31.2

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 10	2	100.0
No. 40	0.425	99.9
No. 200	0.075	28.2
	0.02	15.0
	0.005	8.7
	0.002	5.9
estimated	0.001	4.3

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.0	0.0
Coarse Sand	0.0	0.1
Medium Sand	0.1	---
Fine Sand	71.7	71.7
Silt	19.5	22.3
Clay	8.7	5.9

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	NP
Plastic Limit:	NP
Plasticity Index:	NP
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol: SM
Group Name: Silty sand

AASHTO Classification: A-2-4 (0)

Comments:

Reviewed By RHB

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b12-ss05G, 30.3'-31.8'	Lab ID	274

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	N/A
Particle Hardness:	N/A
Tested By	TRH
Test Date	03-19-2021
Date Received	03-10-2021

Maximum Particle size: No. 10 Sieve

Sieve Size	% Passing
No. 10	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

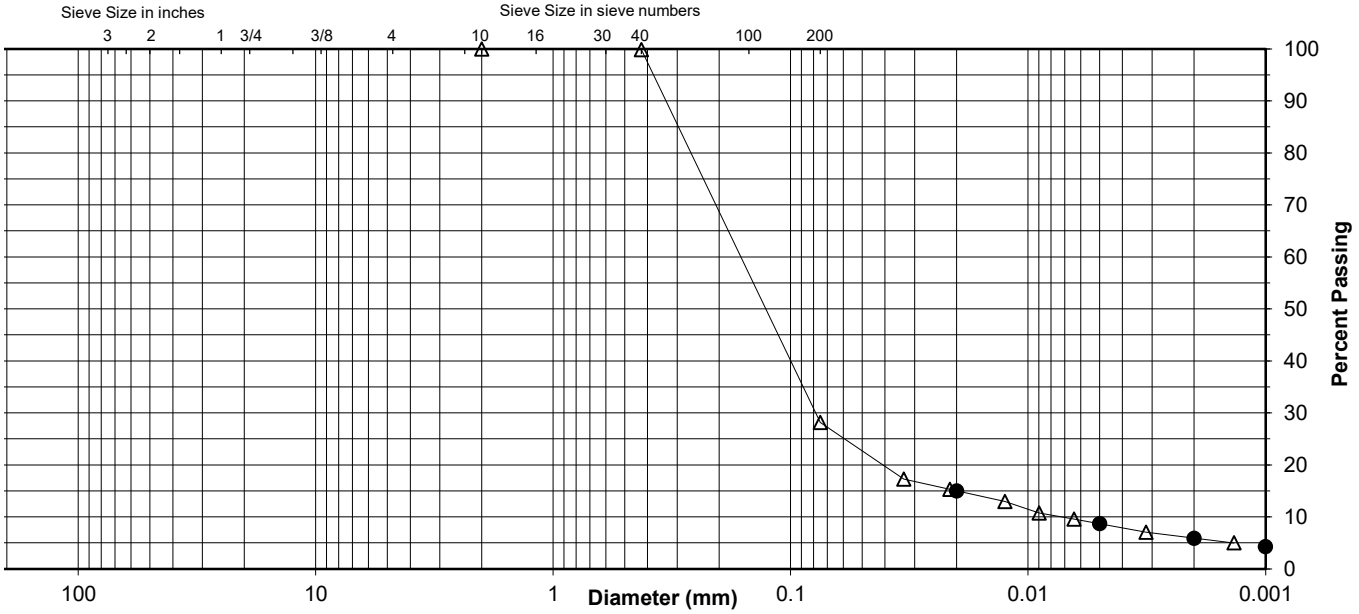
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	99.9
No. 200	28.2
0.02 mm	15.0
0.005 mm	8.7
0.002 mm	5.9
0.001 mm	4.3

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	0.0	0.1	71.7	19.5	8.7
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	0.0			0.1	71.7	22.3	5.9



Comments

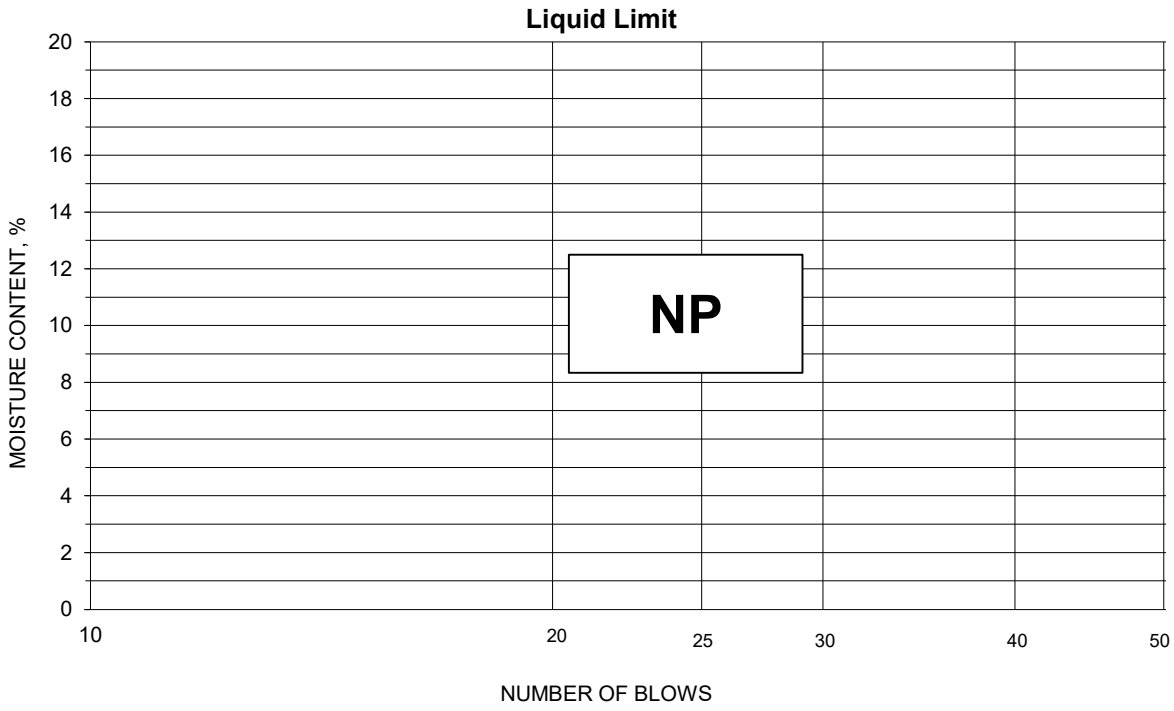
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	kif-gt-b12-ss05G, 30.3'-31.8'			Lab ID	274
				% + No. 40	0
Tested By	DB	Test Method	ASTM D 4318 Method A	Date Received	03-10-2021
Test Date	03-15-2021	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: _____

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b12-ss06G, 32.8'-34.3'	Lab ID	275
Sample Type	SS	Date Received	3-10-21
		Date Reported	3-26-21

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 24.6

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
3/4"	19	100.0
3/8"	9.5	97.8
No. 4	4.75	97.3
No. 10	2	97.1
No. 40	0.425	93.1
No. 200	0.075	10.5
	0.02	2.3
	0.005	0.0
	0.002	0.0
estimated	0.001	0.0

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	2.7	2.9
Coarse Sand	0.2	4.0
Medium Sand	4.0	---
Fine Sand	82.6	82.6
Silt	10.5	10.5
Clay	0.0	0.0

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	NP
Plastic Limit:	NP
Plasticity Index:	NP
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol: SP-SM

Group Name: Poorly graded sand with silt

AASHTO Classification: A-3 (0)

Comments:

Reviewed By RHB

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b12-ss06G, 32.8'-34.3'	Lab ID	275

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	TRH
Test Date	03-19-2021
Date Received	03-10-2021

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	97.8
No. 4	97.3
No. 10	97.1

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity 2.7

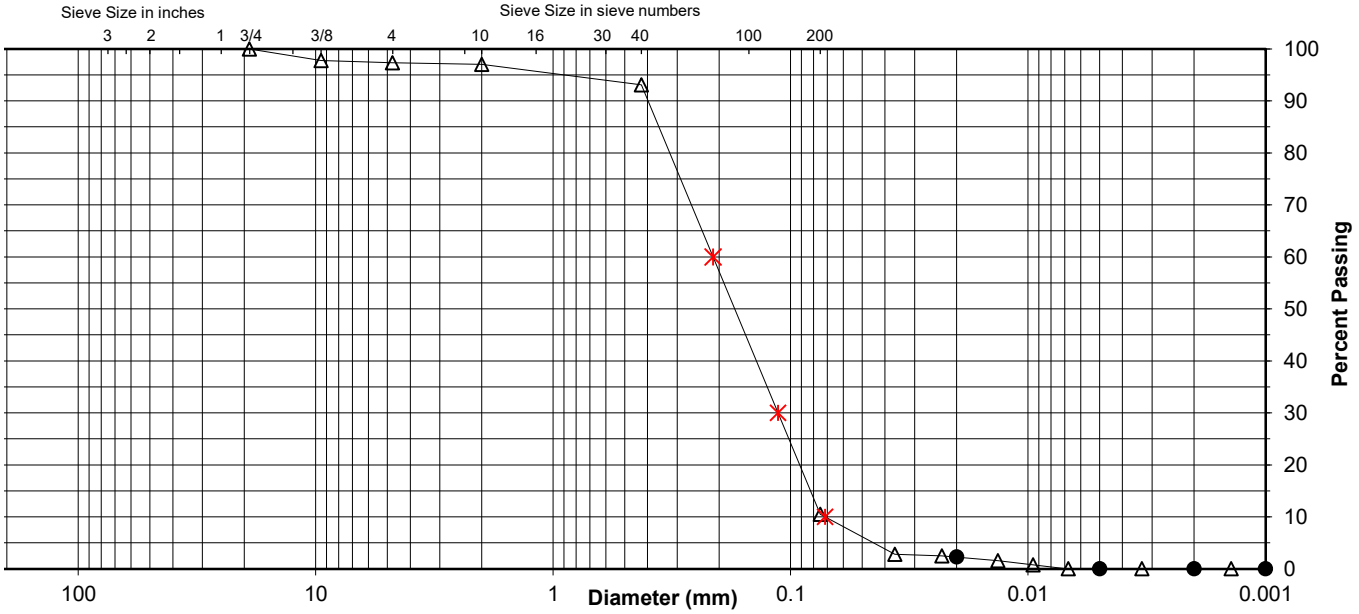
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	93.1
No. 200	10.5
0.02 mm	2.3
0.005 mm	0.0
0.002 mm	0.0
0.001 mm	0.0

Particle Size Distribution

	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
ASTM	0.0	2.7	0.2	4.0	82.6	10.5	0.0

	Gravel	Coarse Sand	Fine Sand	Silt	Clay
AASHTO	2.9	4.0	82.6	10.5	0.0



Comments

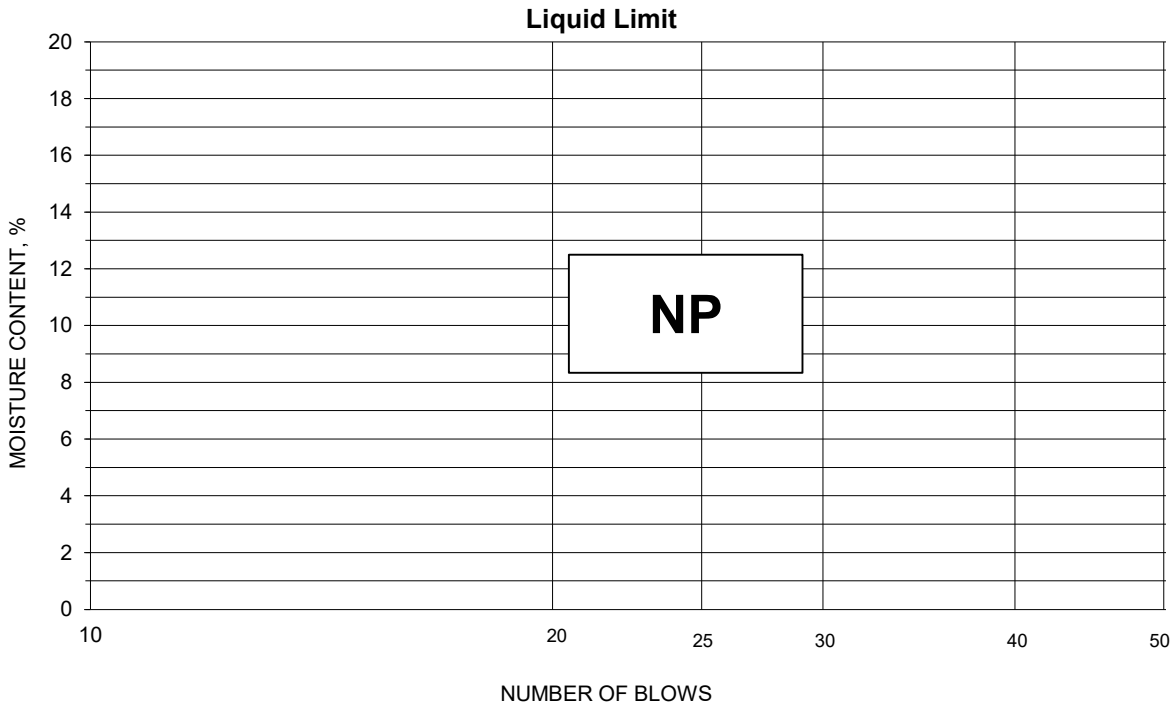
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	kif-gt-b12-ss06G, 32.8'-34.3'			Lab ID	275
				% + No. 40	7
Tested By	DB	Test Method	ASTM D 4318 Method A	Date Received	03-10-2021
Test Date	03-15-2021	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: _____

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b13-ss02bG, 2.9'-4.0'	Lab ID	281
Sample Type	SS	Date Received	3-10-21
		Date Reported	4-7-21

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 20.0

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
3/4"	19	100.0
3/8"	9.5	96.6
No. 4	4.75	93.7
No. 10	2	84.9
No. 40	0.425	62.6
No. 200	0.075	41.4
	0.02	27.6
	0.005	19.3
	0.002	14.0
estimated	0.001	10.2

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	6.3	15.1
Coarse Sand	8.8	22.3
Medium Sand	22.3	---
Fine Sand	21.2	21.2
Silt	22.1	27.4
Clay	19.3	14.0

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	35
Plastic Limit:	22
Plasticity Index:	13
Activity Index:	0.9

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol: SC

Group Name: Clayey sand

AASHTO Classification: A-6 (2)

Comments:

Reviewed By RHB

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b13-ss02bG, 2.9'-4.0'	Lab ID	281

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	TRH
Test Date	03-23-2021
Date Received	03-10-2021

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	96.6
No. 4	93.7
No. 10	84.9

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

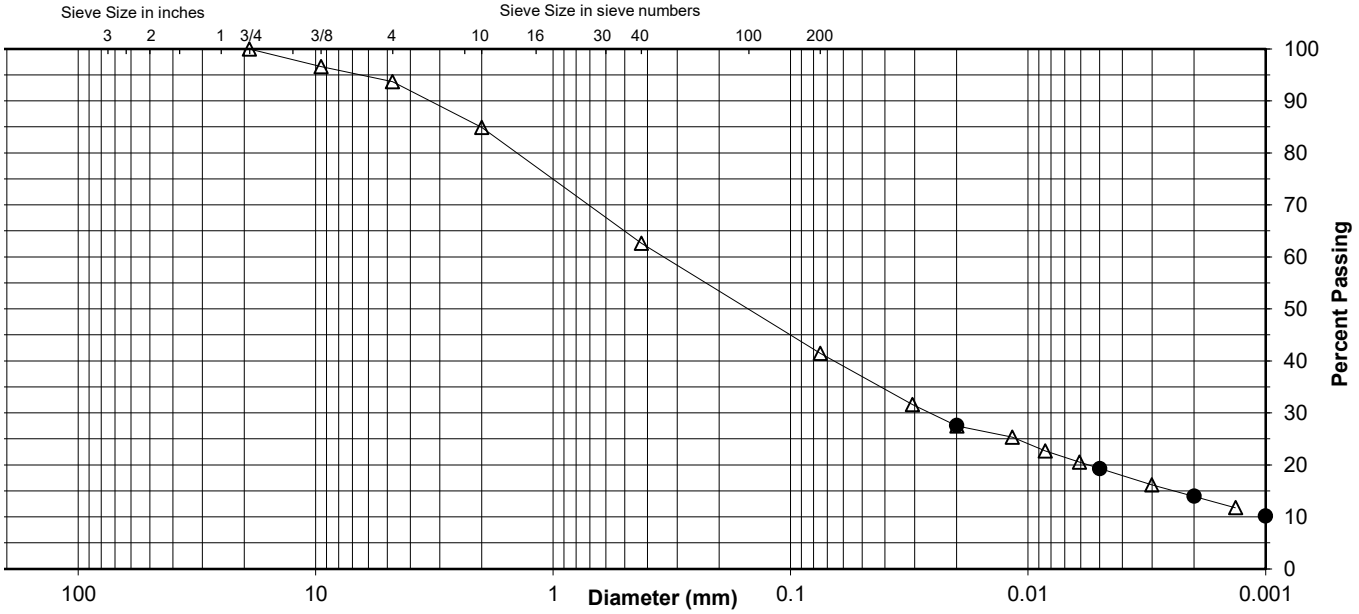
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	62.6
No. 200	41.4
0.02 mm	27.6
0.005 mm	19.3
0.002 mm	14.0
0.001 mm	10.2

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	6.3	8.8	22.3	21.2	22.1	19.3
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	15.1			22.3	21.2	27.4	14.0



Comments

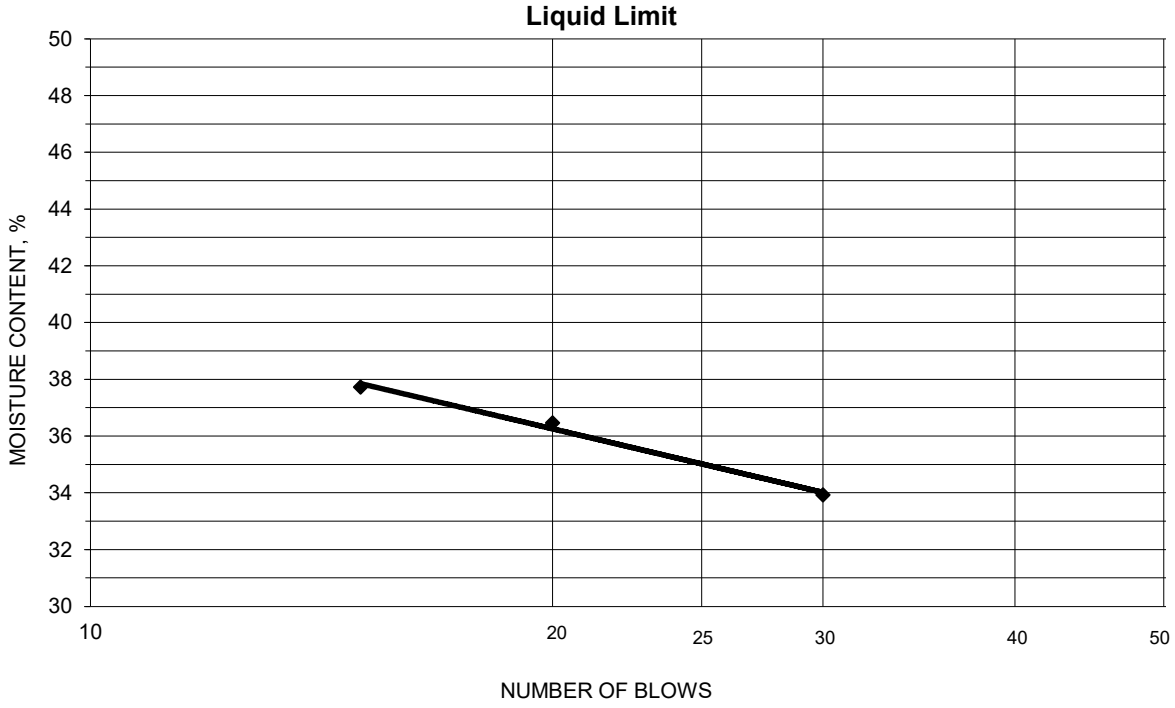
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	kif-gt-b13-ss02bG, 2.9'-4.0'			Lab ID	281
				% + No. 40	37
Tested By	JMB	Test Method	ASTM D 4318 Method A	Date Received	03-10-2021
Test Date	04-06-2021	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
11.87	9.96	4.33	30	33.9	
10.44	8.81	4.34	20	36.5	
12.78	10.46	4.31	15	37.7	35



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
11.48	10.18	4.31	22.1	22	13
11.96	10.55	4.33	22.7		

Remarks: _____

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b13-ss05G, 10.0'-11.5'	Lab ID	284
Sample Type	SS	Date Received	3-10-21
		Date Reported	4-7-21

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 18.4

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
3/4"	19	100.0
3/8"	9.5	88.7
No. 4	4.75	76.8
No. 10	2	63.6
No. 40	0.425	41.2
No. 200	0.075	29.7
	0.02	19.6
	0.005	11.3
	0.002	7.9
estimated	0.001	6.7

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	23.2	36.4
Coarse Sand	13.2	22.4
Medium Sand	22.4	---
Fine Sand	11.5	11.5
Silt	18.4	21.8
Clay	11.3	7.9

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	33
Plastic Limit:	20
Plasticity Index:	13
Activity Index:	1.6

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol: SC

Group Name: Clayey sand with gravel

AASHTO Classification: A-2-6 (0)

Comments:

Reviewed By RHB

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b13-ss05G, 10.0'-11.5'	Lab ID	284

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	TRH
Test Date	03-22-2021
Date Received	03-10-2021

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	88.7
No. 4	76.8
No. 10	63.6

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

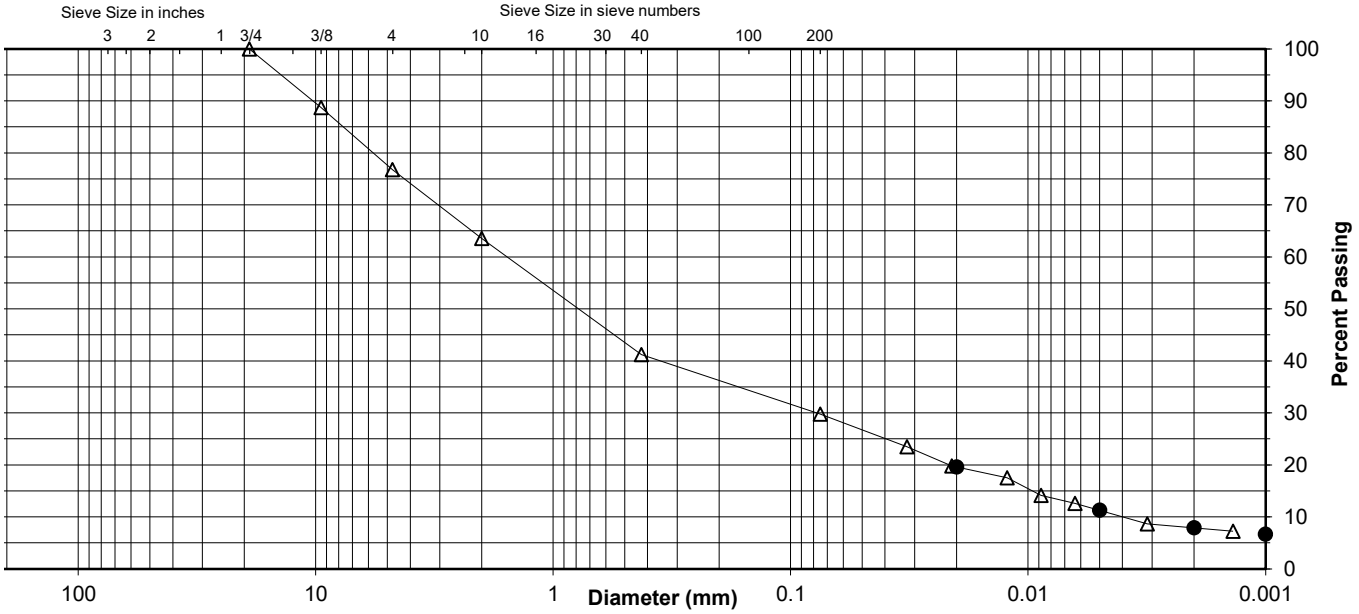
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	41.2
No. 200	29.7
0.02 mm	19.6
0.005 mm	11.3
0.002 mm	7.9
0.001 mm	6.7

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	23.2	13.2	22.4	11.5	18.4	11.3
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	36.4			22.4	11.5	21.8	7.9



Comments

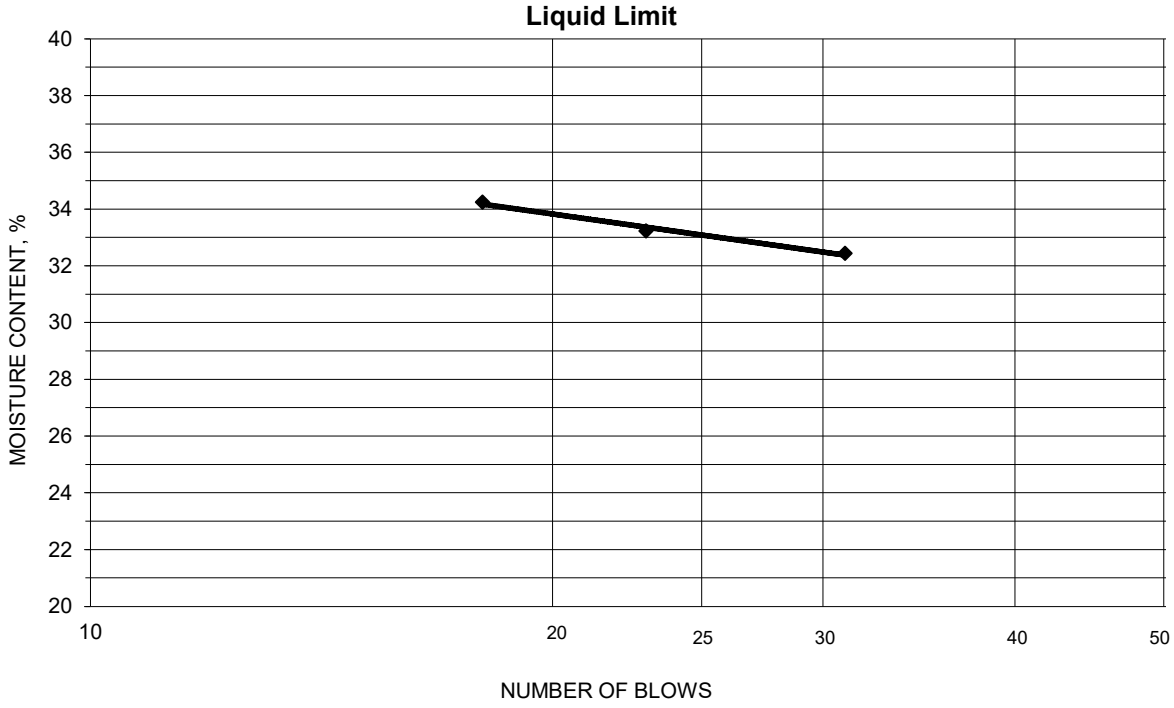
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	kif-gt-b13-ss05G, 10.0'-11.5'			Lab ID	284
				% + No. 40	59
Tested By	JMB	Test Method	ASTM D 4318 Method A	Date Received	03-10-2021
Test Date	04-06-2021	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
12.69	10.64	4.32	31	32.4	
12.95	10.79	4.29	23	33.2	
14.09	11.59	4.29	18	34.2	33



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
11.48	10.30	4.29	19.6	20	13
12.54	11.18	4.31	19.8		

Remarks: _____

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b13-ss11bG, 26.0'-26.5'	Lab ID	288
Sample Type	SS	Date Received	3-10-21
		Date Reported	3-31-21

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 20.3

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 10	2	100.0
No. 40	0.425	98.2
No. 200	0.075	57.1
	0.02	34.2
	0.005	21.6
	0.002	17.3
estimated	0.001	14.4

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.0	0.0
Coarse Sand	0.0	1.8
Medium Sand	1.8	---
Fine Sand	41.1	41.1
Silt	35.5	39.8
Clay	21.6	17.3

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	23
Plastic Limit:	15
Plasticity Index:	8
Activity Index:	0.5

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol:	CL
Group Name:	Sandy lean clay
AASHTO Classification:	A-4 (2)

Comments:

Reviewed By RHB

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b13-ss11bG, 26.0'-26.5'	Lab ID	288

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	N/A
Particle Hardness:	N/A
Tested By	TRH
Test Date	03-18-2021
Date Received	03-10-2021

Maximum Particle size: No. 10 Sieve

Sieve Size	% Passing
No. 10	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

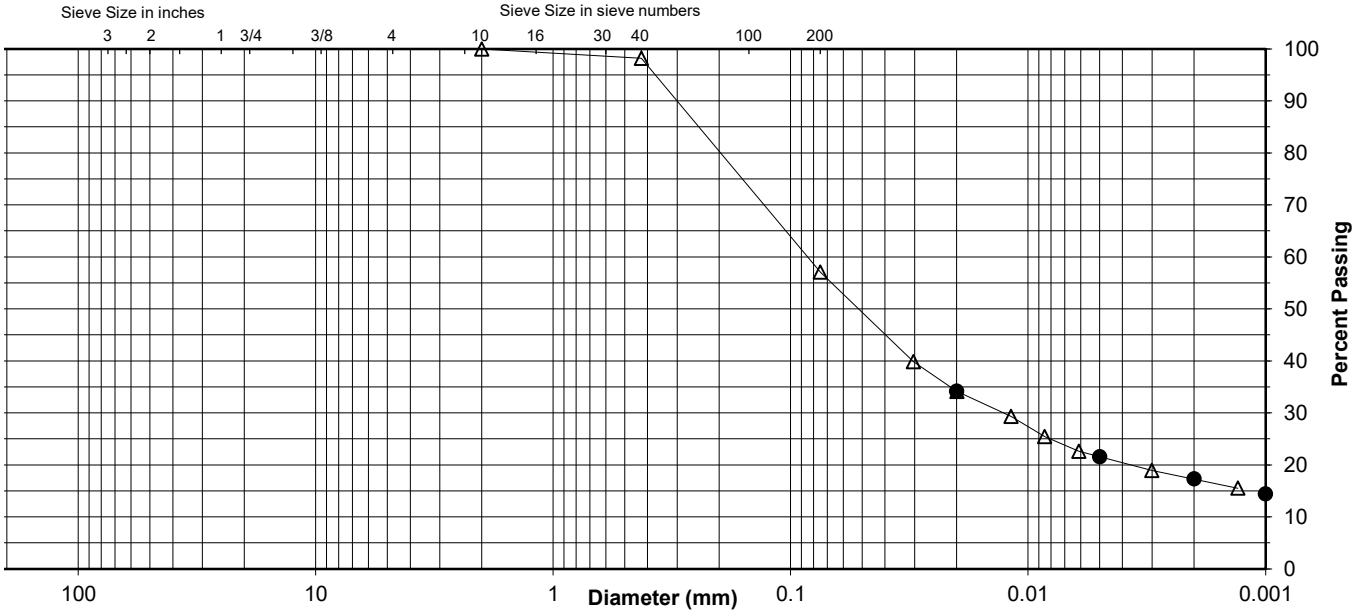
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	98.2
No. 200	57.1
0.02 mm	34.2
0.005 mm	21.6
0.002 mm	17.3
0.001 mm	14.4

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	0.0	1.8	41.1	35.5	21.6
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	0.0			1.8	41.1	39.8	17.3



Comments

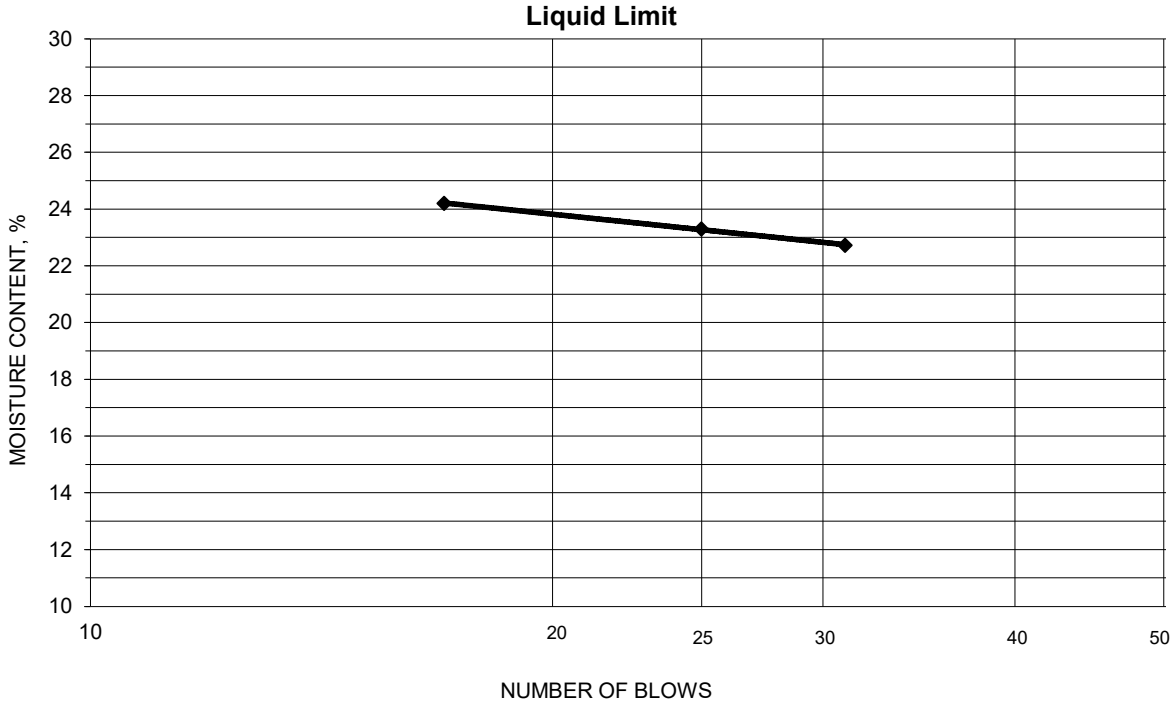
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	kif-gt-b13-ss11bG, 26.0'-26.5'			Lab ID	288
				% + No. 40	2
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	03-10-2021
Test Date	03-30-2021	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
17.72	16.47	10.97	31	22.7	
22.08	20.02	11.18	25	23.3	
19.90	18.15	10.92	17	24.2	23



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
17.29	16.42	10.74	15.3	15	8
18.17	17.21	10.95	15.3		

Remarks: _____

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b13-ss12G, 27.5'-29.0'	Lab ID	289
Sample Type	SS	Date Received	3-10-21
		Date Reported	4-2-21

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 19.8

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 4	4.75	100.0
No. 10	2	99.9
No. 40	0.425	97.5
No. 200	0.075	49.0
	0.02	26.3
	0.005	15.6
	0.002	12.3
estimated	0.001	10.4

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.0	0.1
Coarse Sand	0.1	2.4
Medium Sand	2.4	---
Fine Sand	48.5	48.5
Silt	33.4	36.7
Clay	15.6	12.3

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	NP
Plastic Limit:	NP
Plasticity Index:	NP
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol: SM
Group Name: Silty sand

AASHTO Classification: A-4 (0)

Comments:

Reviewed By RHB

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b13-ss12G, 27.5'-29.0'	Lab ID	289

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	TRH
Test Date	03-22-2021
Date Received	03-10-2021

Maximum Particle size: No. 4 Sieve

Sieve Size	% Passing
No. 4	100.0
No. 10	99.9

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

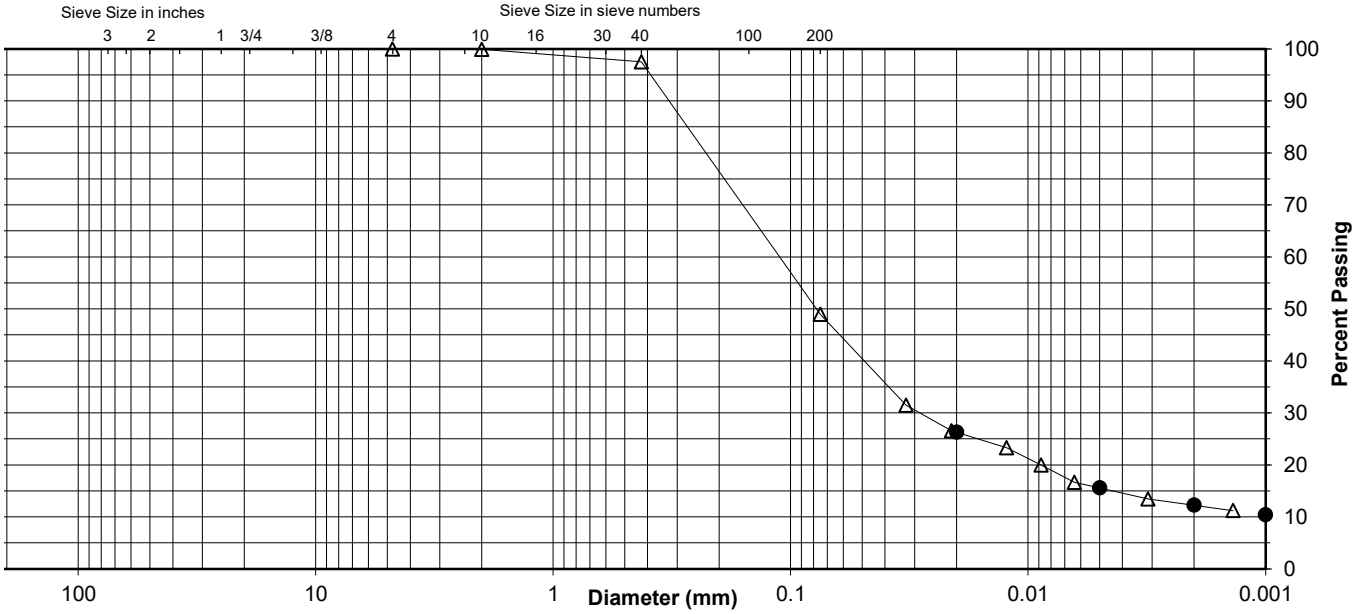
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	97.5
No. 200	49.0
0.02 mm	26.3
0.005 mm	15.6
0.002 mm	12.3
0.001 mm	10.4

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	0.1	2.4	48.5	33.4	15.6
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	0.1			2.4	48.5	36.7	12.3



Comments

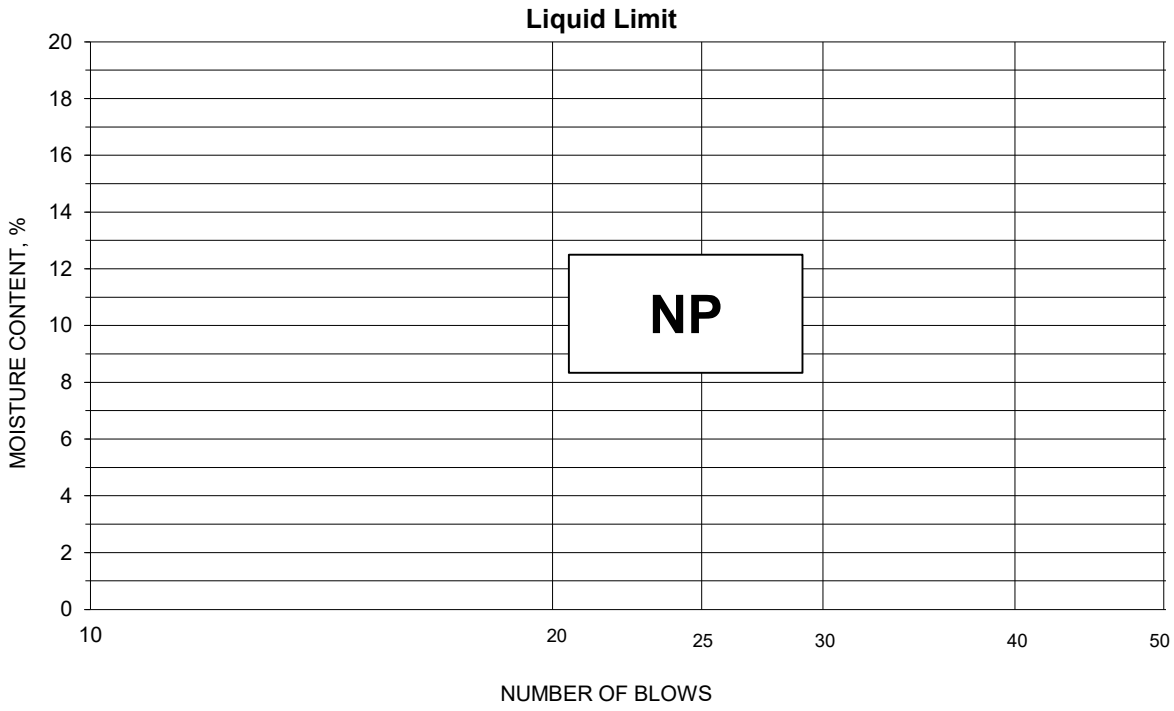
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	kif-gt-b13-ss12G, 27.5'-29.0'			Lab ID	289
				% + No. 40	2
Tested By	DB	Test Method	ASTM D 4318 Method A	Date Received	03-10-2021
Test Date	03-30-2021	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: _____

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b13-ss14G, 34.5'-36.0'	Lab ID	291
Sample Type	SS	Date Received	3-10-21
		Date Reported	3-31-21

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 22.4

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 4	4.75	100.0
No. 10	2	99.8
No. 40	0.425	98.7
No. 200	0.075	23.0
	0.02	12.8
	0.005	8.5
	0.002	6.2
estimated	0.001	4.5

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.0	0.2
Coarse Sand	0.2	1.1
Medium Sand	1.1	---
Fine Sand	75.7	75.7
Silt	14.5	16.8
Clay	8.5	6.2

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	NP
Plastic Limit:	NP
Plasticity Index:	NP
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol: SM
Group Name: Silty sand

AASHTO Classification: A-2-4 (0)

Comments:

Reviewed By RHB

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b13-ss14G, 34.5'-36.0'	Lab ID	291

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	TRH
Test Date	03-18-2021
Date Received	03-10-2021

Maximum Particle size: No. 4 Sieve

Sieve Size	% Passing
No. 4	100.0
No. 10	99.8

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

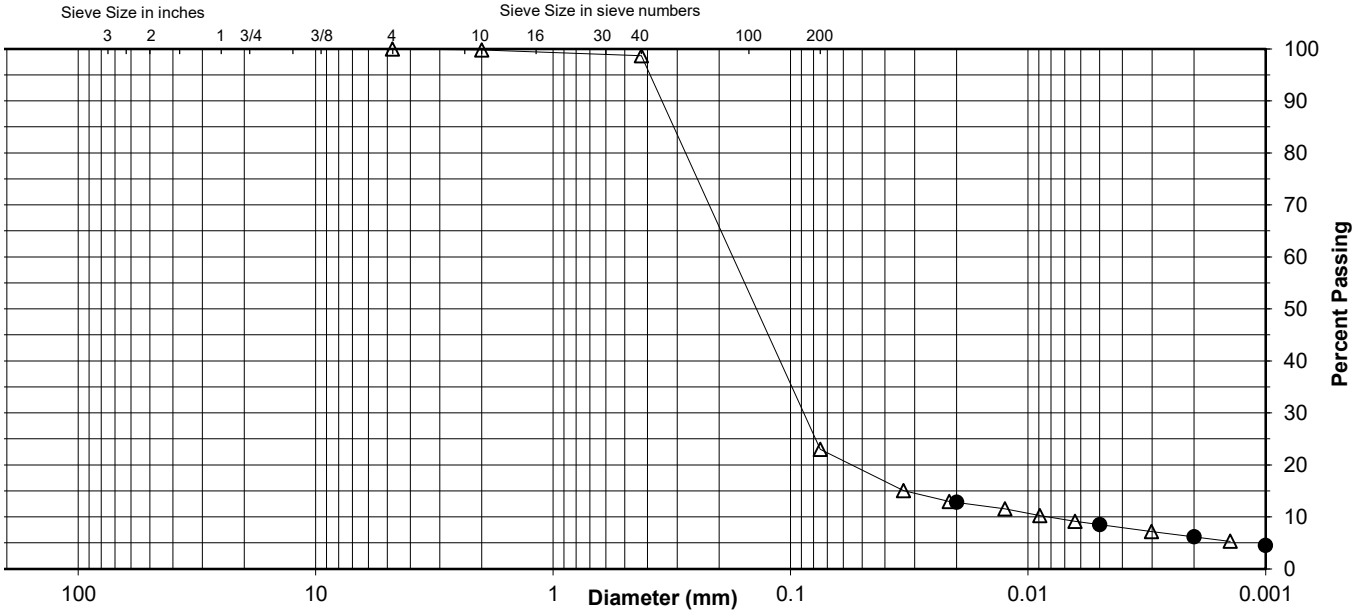
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	98.7
No. 200	23.0
0.02 mm	12.8
0.005 mm	8.5
0.002 mm	6.2
0.001 mm	4.5

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	0.2	1.1	75.7	14.5	8.5
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	0.2			1.1	75.7	16.8	6.2



Comments

Reviewed By RHB

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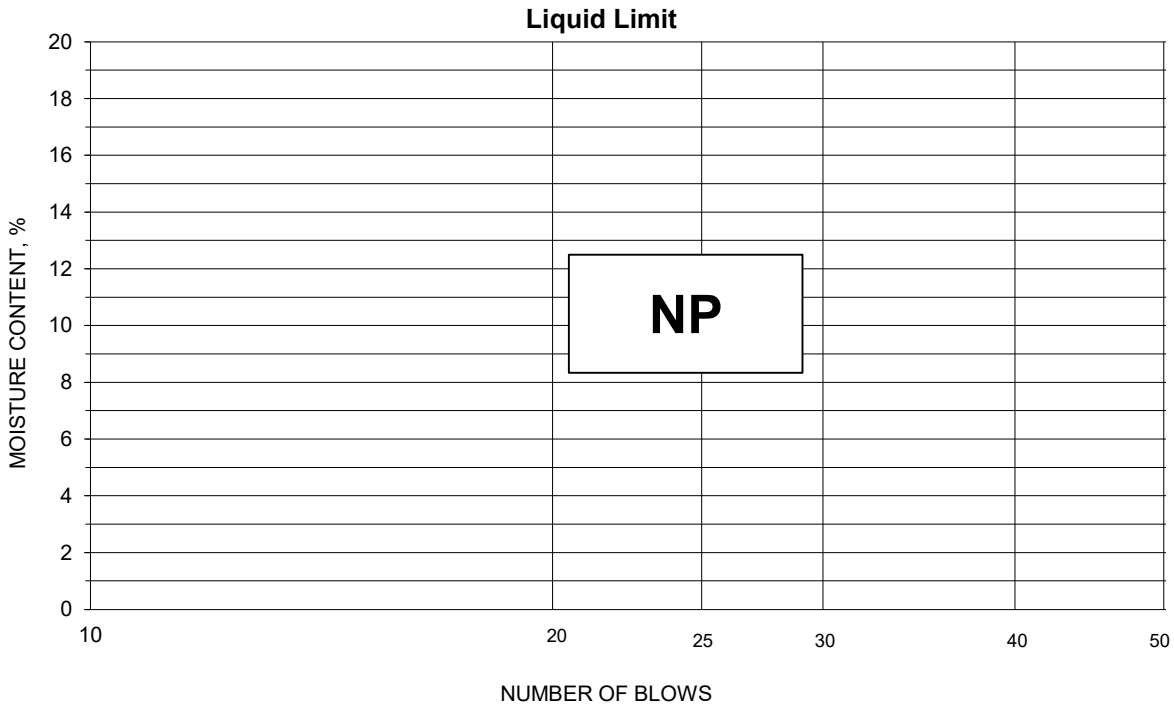
ATTERBERG LIMITS

Project	KIF TDEC Order	Project No.	175668043
Source	kif-gt-b13-ss14G, 34.5'-36.0'	Lab ID	291
		% + No. 40	1
Tested By	DB	Test Method	ASTM D 4318 Method A
Test Date	03-15-2021	Prepared	Dry
		Date Received	03-10-2021

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: _____

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b13-ss15G, 37.0'-38.5'	Lab ID	292
Sample Type	SS	Date Received	3-10-21
		Date Reported	3-30-21

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 18.4

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
3/8"	9.5	100.0
No. 4	4.75	99.9
No. 10	2	99.9
No. 40	0.425	99.1
No. 200	0.075	38.4
	0.02	19.7
	0.005	12.5
	0.002	9.8
estimated	0.001	7.5

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.1	0.1
Coarse Sand	0.0	0.8
Medium Sand	0.8	---
Fine Sand	60.7	60.7
Silt	25.9	28.6
Clay	12.5	9.8

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	NP
Plastic Limit:	NP
Plasticity Index:	NP
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol: SM
Group Name: Silty sand

AASHTO Classification: A-4 (0)

Comments:

Reviewed By RHB

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b13-ss15G, 37.0'-38.5'	Lab ID	292

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	TRH
Test Date	03-22-2021
Date Received	03-10-2021

Maximum Particle size: 3/8" Sieve

Sieve Size	% Passing
3/8"	100.0
No. 4	99.9
No. 10	99.9

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

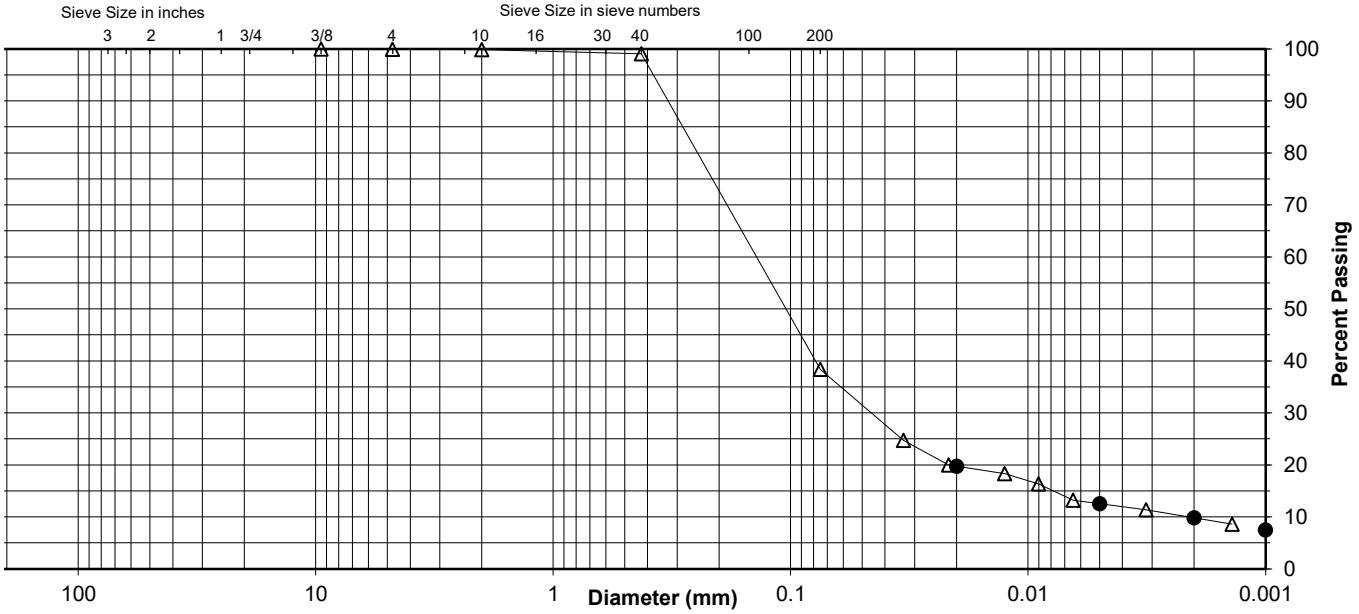
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	99.1
No. 200	38.4
0.02 mm	19.7
0.005 mm	12.5
0.002 mm	9.8
0.001 mm	7.5

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.1	0.0	0.8	60.7	25.9	12.5
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	0.1			0.8	60.7	28.6	9.8



Comments

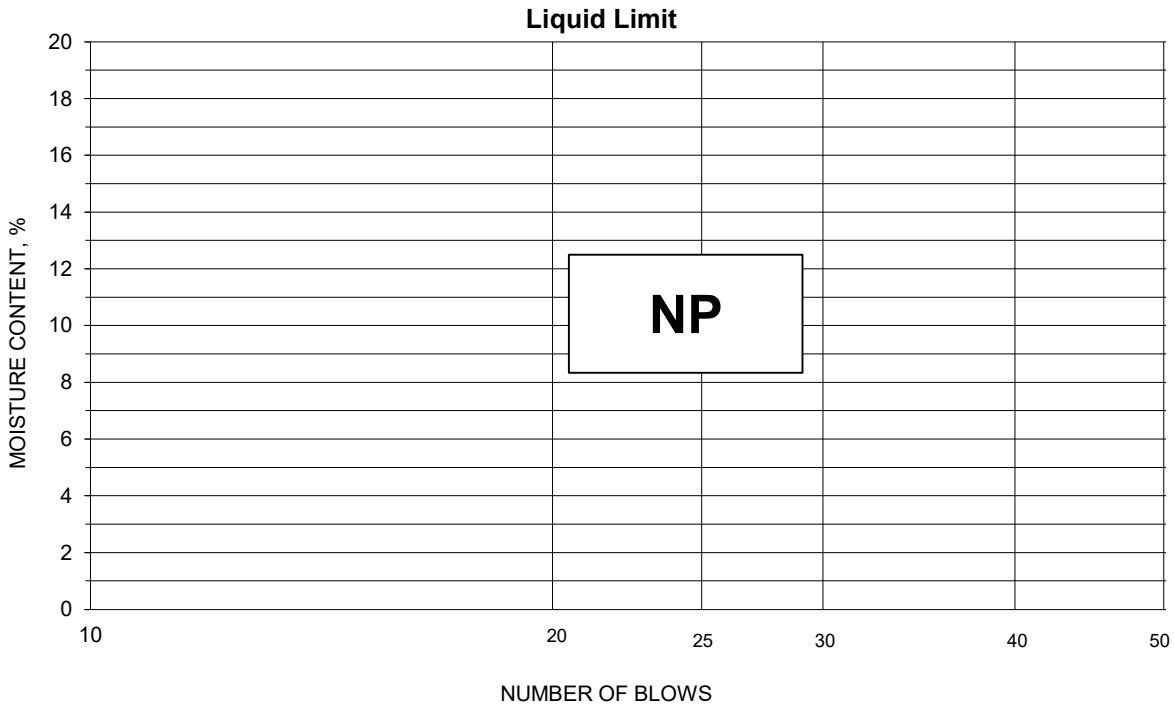
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order	Project No.	175668043
Source	kif-gt-b13-ss15G, 37.0'-38.5'	Lab ID	292
		% + No. 40	1
Tested By	DB	Test Method	ASTM D 4318 Method A
Test Date	03-15-2021	Prepared	Dry
		Date Received	03-10-2021

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: _____

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b13-ss16aG, 39.5'-39.7'	Lab ID	293
Sample Type	SS	Date Received	3-10-21
		Date Reported	3-31-21

Test Results

Natural Moisture Content

Test Not Performed

Moisture Content (%): N/A

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 10	2	100.0
No. 40	0.425	98.4
No. 200	0.075	39.4
	0.02	21.0
	0.005	12.6
	0.002	9.3
estimated	0.001	7.6

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.0	0.0
Coarse Sand	0.0	1.6
Medium Sand	1.6	---
Fine Sand	59.0	59.0
Silt	26.8	30.1
Clay	12.6	9.3

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	NP
Plastic Limit:	NP
Plasticity Index:	NP
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol:	SM
Group Name:	Silty sand
AASHTO Classification:	A-4 (0)

Comments:

Reviewed By RHB

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b13-ss16aG, 39.5'-39.7'	Lab ID	293

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	N/A
Particle Hardness:	N/A
Tested By	TRH
Test Date	03-18-2021
Date Received	03-10-2021

Maximum Particle size: No. 10 Sieve

Sieve Size	% Passing
No. 10	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

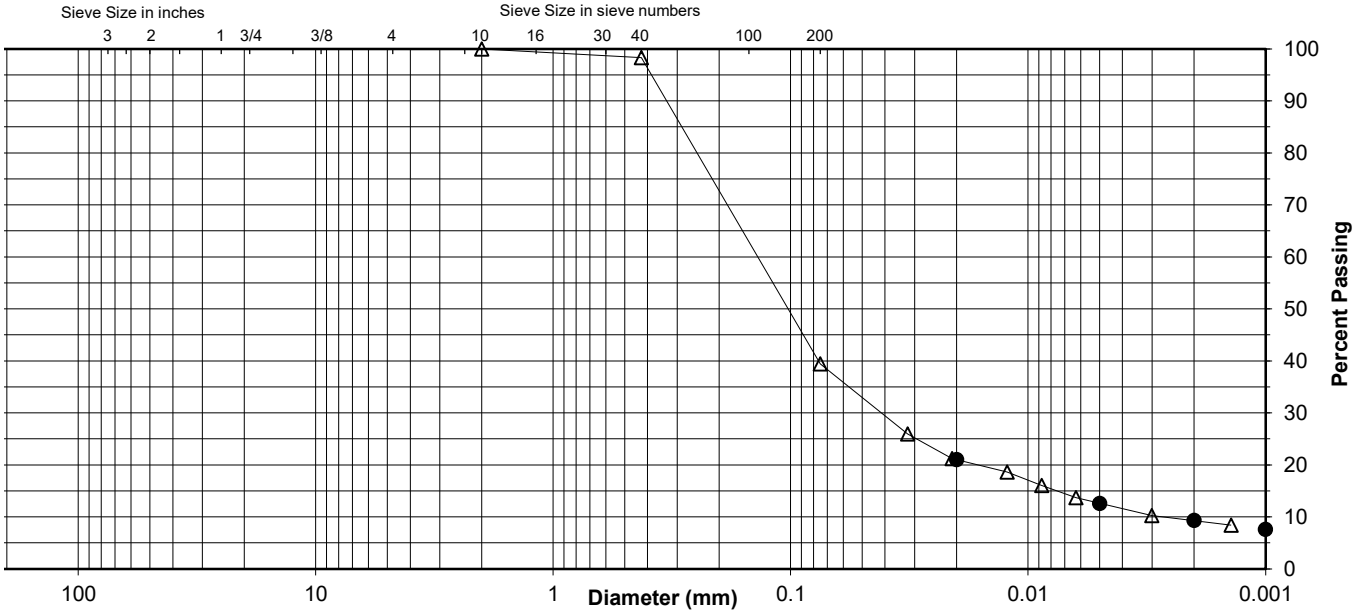
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	98.4
No. 200	39.4
0.02 mm	21.0
0.005 mm	12.6
0.002 mm	9.3
0.001 mm	7.6

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	0.0	1.6	59.0	26.8	12.6
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	0.0			1.6	59.0	30.1	9.3



Comments

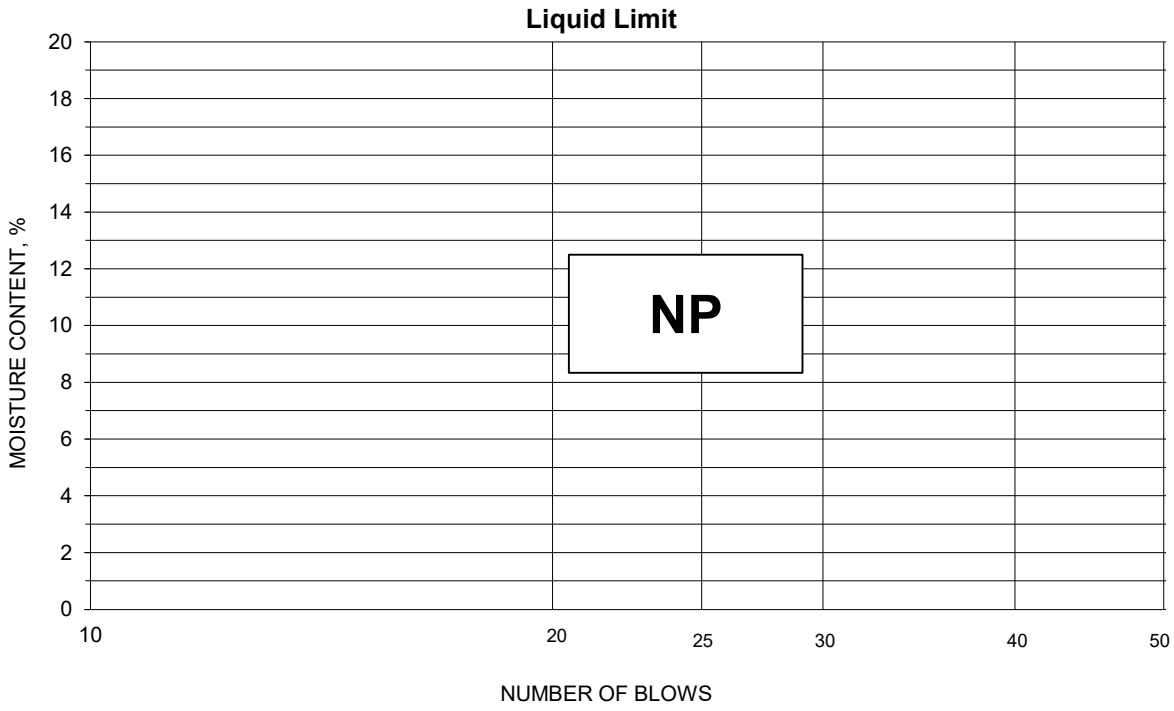
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	kif-gt-b13-ss16aG, 39.5'-39.7'			Lab ID	293
				% + No. 40	2
Tested By	DB	Test Method	ASTM D 4318 Method A	Date Received	03-10-2021
Test Date	03-18-2021	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: _____

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b13-ss19G, 47.0'-48.5'	Lab ID	294
Sample Type	SS	Date Received	3-10-21
		Date Reported	3-31-21

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 16.2

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
1 1/2"	37.5	100.0
3/4"	19	77.5
3/8"	9.5	62.3
No. 4	4.75	51.8
No. 10	2	45.3
No. 40	0.425	31.2
No. 200	0.075	15.0
	0.02	8.8
	0.005	5.2
	0.002	3.6
estimated	0.001	2.6

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	48.2	54.7
Coarse Sand	6.5	14.1
Medium Sand	14.1	---
Fine Sand	16.2	16.2
Silt	9.8	11.4
Clay	5.2	3.6

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	NP
Plastic Limit:	NP
Plasticity Index:	NP
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol: GM

Group Name: Silty gravel with sand

AASHTO Classification: A-1-b (0)

Comments:

Reviewed By RHB

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b13-ss19G, 47.0'-48.5'	Lab ID	294

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	TRH
Test Date	03-19-2021
Date Received	03-10-2021

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	77.5
3/8"	62.3
No. 4	51.8
No. 10	45.3

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

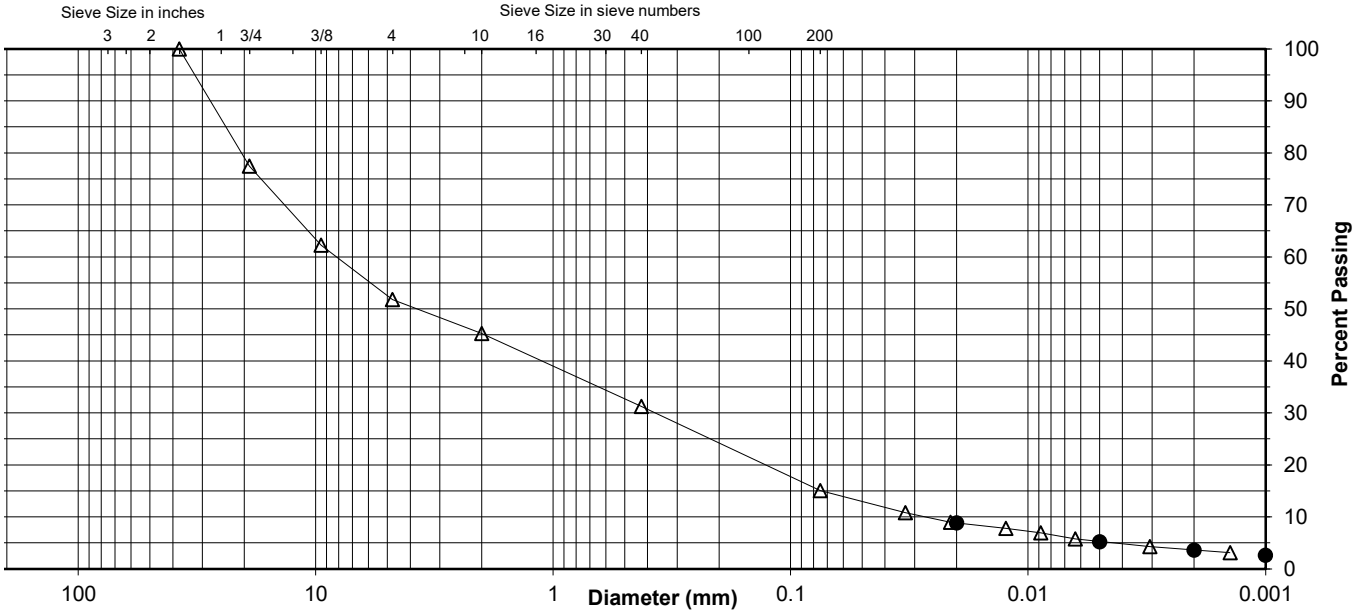
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	31.2
No. 200	15.0
0.02 mm	8.8
0.005 mm	5.2
0.002 mm	3.6
0.001 mm	2.6

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	22.5	25.7	6.5	14.1	16.2	9.8	5.2
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	54.7			14.1	16.2	11.4	3.6



Comments

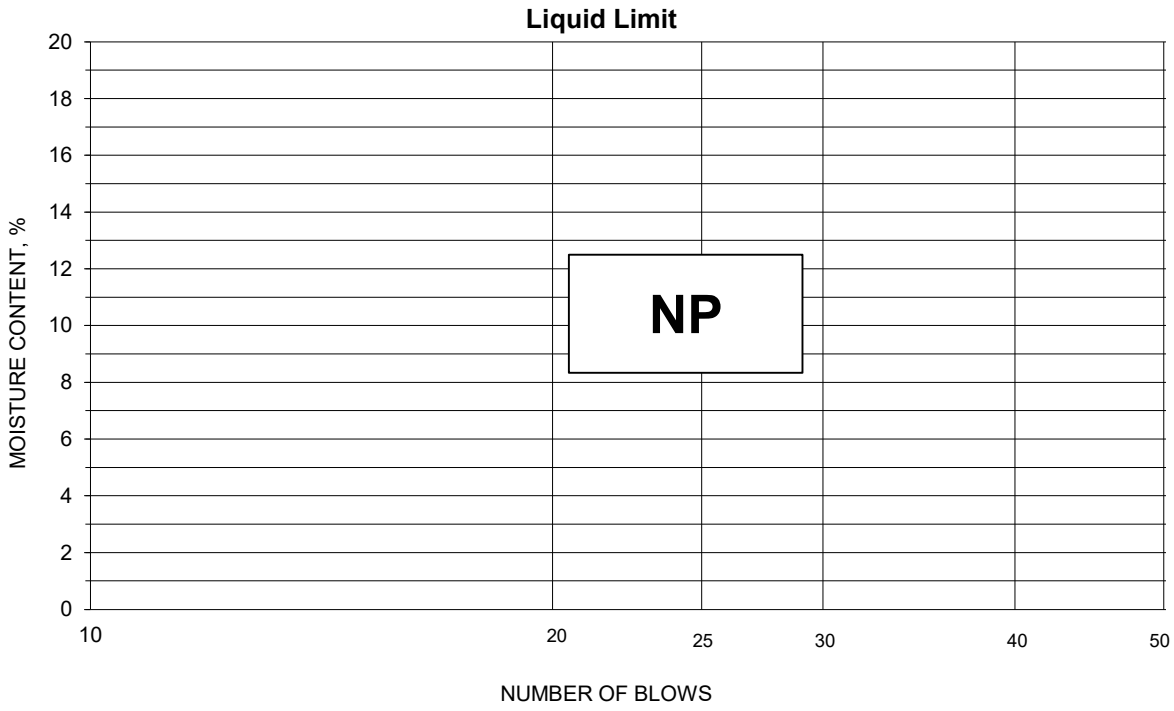
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order	Project No.	175668043
Source	kif-gt-b13-ss19G, 47.0'-48.5'	Lab ID	294
		% + No. 40	69
Tested By	DB	Test Method	ASTM D 4318 Method A
Test Date	03-15-2021	Prepared	Dry
		Date Received	03-10-2021

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: _____

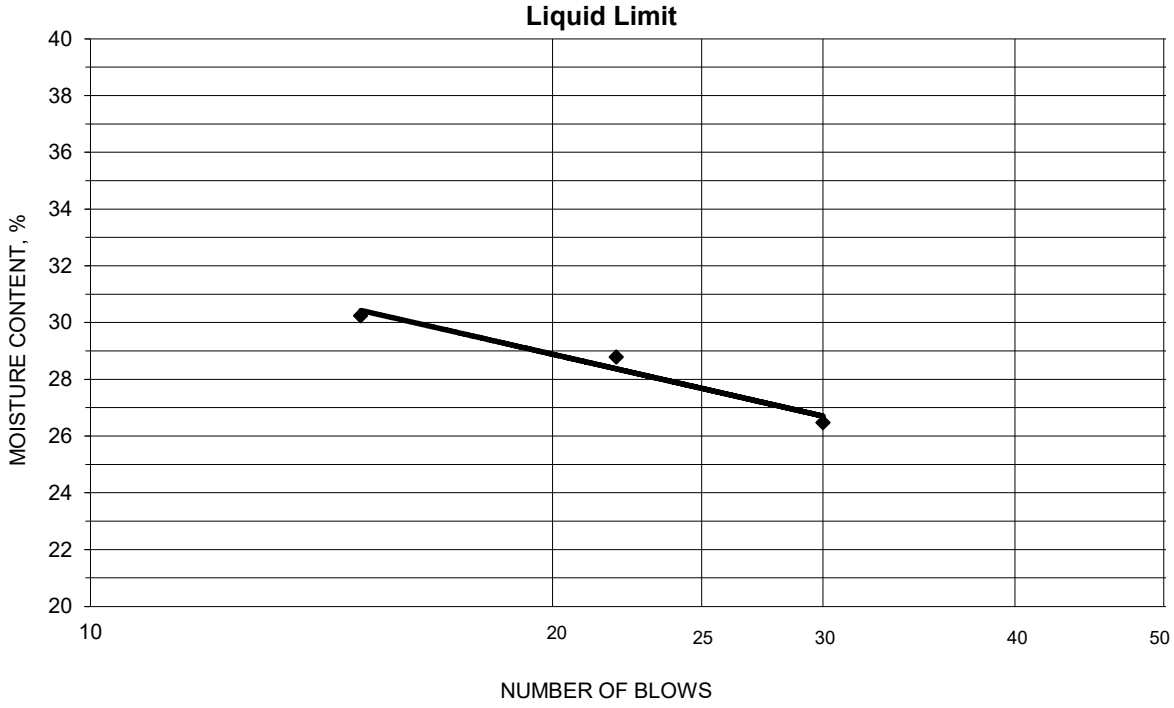
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order	Project No.	175668043
Source	kif-gt-b14-ss02aG, 9.5'-10.0'	Lab ID	296
		% + No. 40	10
Tested By	JMB	Test Method	ASTM D 4318 Method A
Test Date	04-06-2021	Prepared	Dry
		Date Received	03-10-2021

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
15.93	13.50	4.32	30	26.5	
12.75	10.87	4.34	22	28.8	
13.48	11.36	4.35	15	30.2	28



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
10.46	9.40	4.36	21.0	21	7
10.68	9.58	4.38	21.2		

Remarks: _____

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b14-ss03G, 12.0'-13.5'	Lab ID	299
Sample Type	SS	Date Received	3-10-21
		Date Reported	4-2-21

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 19.4

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
1 1/2"	37.5	100.0
3/4"	19	96.9
3/8"	9.5	94.9
No. 4	4.75	94.7
No. 10	2	94.4
No. 40	0.425	93.0
No. 200	0.075	42.1
	0.02	24.7
	0.005	14.3
	0.002	10.9
estimated	0.001	8.7

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	5.3	5.6
Coarse Sand	0.3	1.4
Medium Sand	1.4	---
Fine Sand	50.9	50.9
Silt	27.8	31.2
Clay	14.3	10.9

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	NP
Plastic Limit:	NP
Plasticity Index:	NP
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol: SM

Group Name: Silty sand

AASHTO Classification: A-4 (0)

Comments:

Reviewed By RHB

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b14-ss03G, 12.0'-13.5'	Lab ID	299

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	TRH
Test Date	03-22-2021
Date Received	03-10-2021

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	96.9
3/8"	94.9
No. 4	94.7
No. 10	94.4

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity 2.7

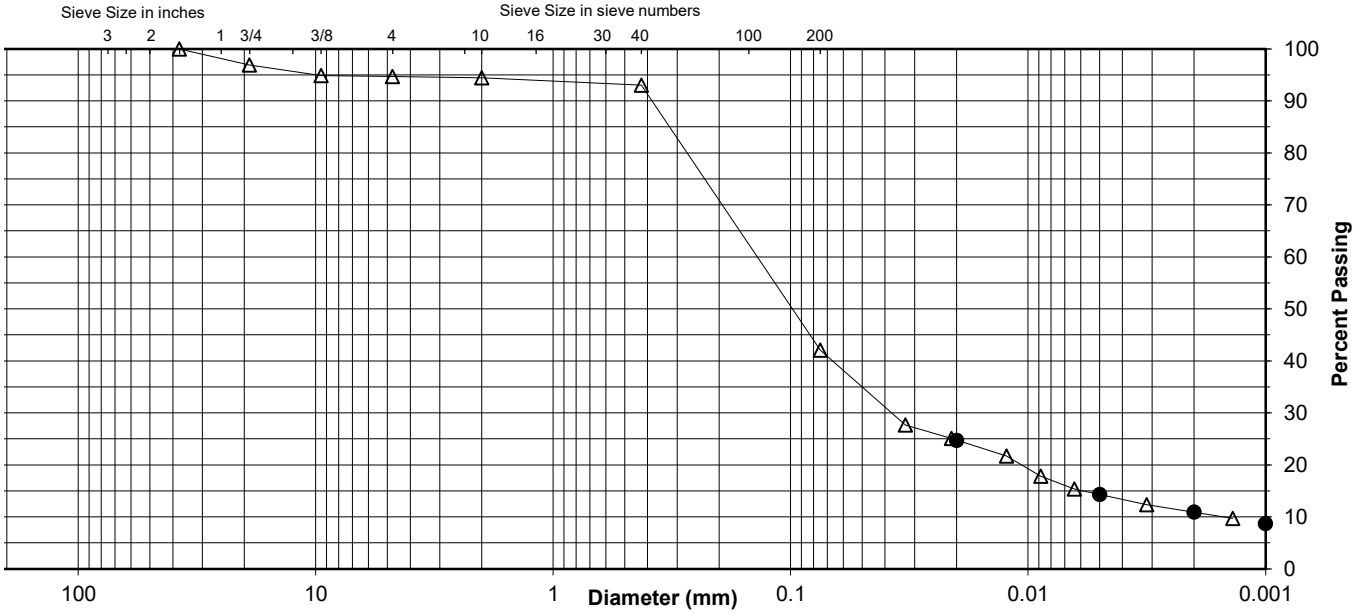
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	93.0
No. 200	42.1
0.02 mm	24.7
0.005 mm	14.3
0.002 mm	10.9
0.001 mm	8.7

Particle Size Distribution

	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
ASTM	3.1	2.2	0.3	1.4	50.9	27.8	14.3

	Gravel	Coarse Sand	Fine Sand	Silt	Clay
AASHTO	5.6	1.4	50.9	31.2	10.9



Comments

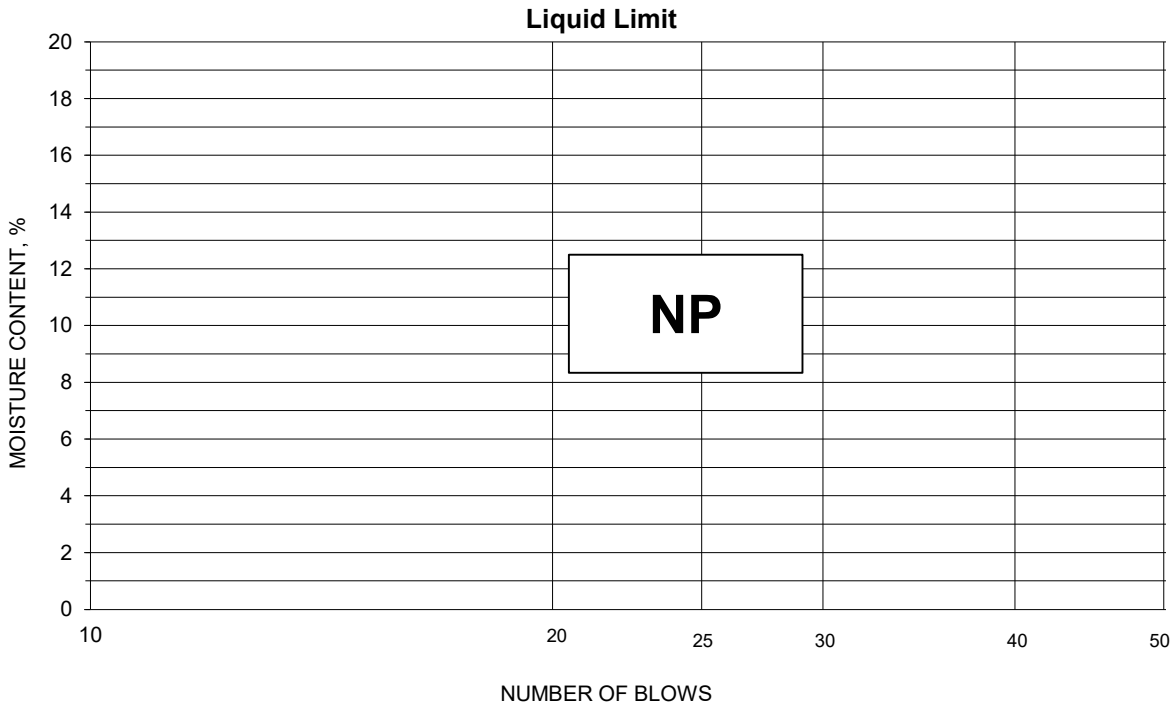
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order	Project No.	175668043
Source	kif-gt-b14-ss03G, 12.0'-13.5'	Lab ID	299
		% + No. 40	7
Tested By	DB	Test Method	ASTM D 4318 Method A
Test Date	03-30-2021	Prepared	Dry
		Date Received	03-10-2021

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: _____

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b14-ss05G, 17.0'-18.5'	Lab ID	301
Sample Type	SS	Date Received	3-10-21
		Date Reported	3-31-21

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 18.5

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 4	4.75	100.0
No. 10	2	99.7
No. 40	0.425	97.2
No. 200	0.075	40.4
	0.02	19.8
	0.005	10.4
	0.002	6.7
estimated	0.001	4.4

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.0	0.3
Coarse Sand	0.3	2.5
Medium Sand	2.5	---
Fine Sand	56.8	56.8
Silt	30.0	33.7
Clay	10.4	6.7

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	NP
Plastic Limit:	NP
Plasticity Index:	NP
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol: SM

Group Name: Silty sand

AASHTO Classification: A-4 (0)

Comments:

Reviewed By RHB

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b14-ss05G, 17.0'-18.5'	Lab ID	301

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	TRH
Test Date	03-19-2021
Date Received	03-10-2021

Maximum Particle size: No. 4 Sieve

Sieve Size	% Passing
No. 4	100.0
No. 10	99.7

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

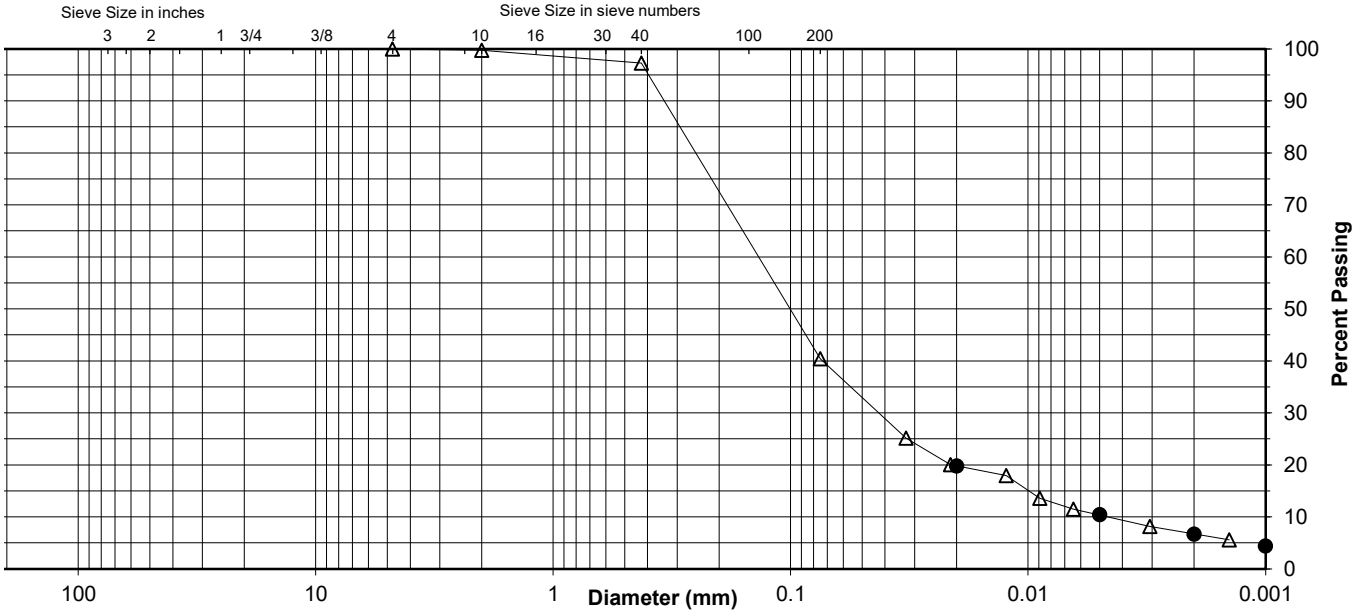
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	97.2
No. 200	40.4
0.02 mm	19.8
0.005 mm	10.4
0.002 mm	6.7
0.001 mm	4.4

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	0.3	2.5	56.8	30.0	10.4
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	0.3			2.5	56.8	33.7	6.7



Comments

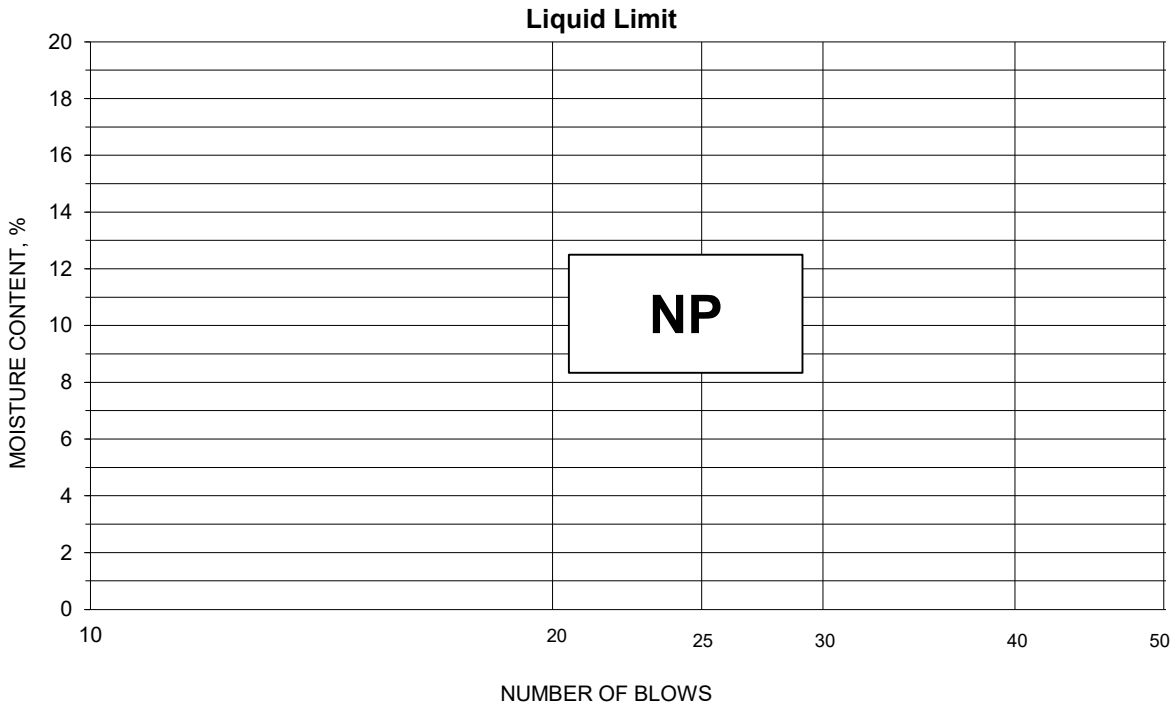
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	kif-gt-b14-ss05G, 17.0'-18.5'			Lab ID	301
				% + No. 40	3
Tested By	DB	Test Method	ASTM D 4318 Method A	Date Received	03-10-2021
Test Date	03-15-2021	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: _____

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b14-ss08G, 24.5'-26.0'	Lab ID	303
Sample Type	SS	Date Received	3-10-21
		Date Reported	3-31-21

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 27.6

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
3/8"	9.5	100.0
No. 4	4.75	99.8
No. 10	2	99.5
No. 40	0.425	98.8
No. 200	0.075	22.1
	0.02	11.8
	0.005	7.8
	0.002	5.7
estimated	0.001	4.6

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.2	0.5
Coarse Sand	0.3	0.7
Medium Sand	0.7	---
Fine Sand	76.7	76.7
Silt	14.3	16.4
Clay	7.8	5.7

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	NP
Plastic Limit:	NP
Plasticity Index:	NP
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol: SM
Group Name: Silty sand

AASHTO Classification: A-2-4 (0)

Comments:

Reviewed By RHB

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b14-ss08G, 24.5'-26.0'	Lab ID	303

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	TRH
Test Date	03-18-2021
Date Received	03-10-2021

Maximum Particle size: 3/8" Sieve

Sieve Size	% Passing
3/8"	100.0
No. 4	99.8
No. 10	99.5

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

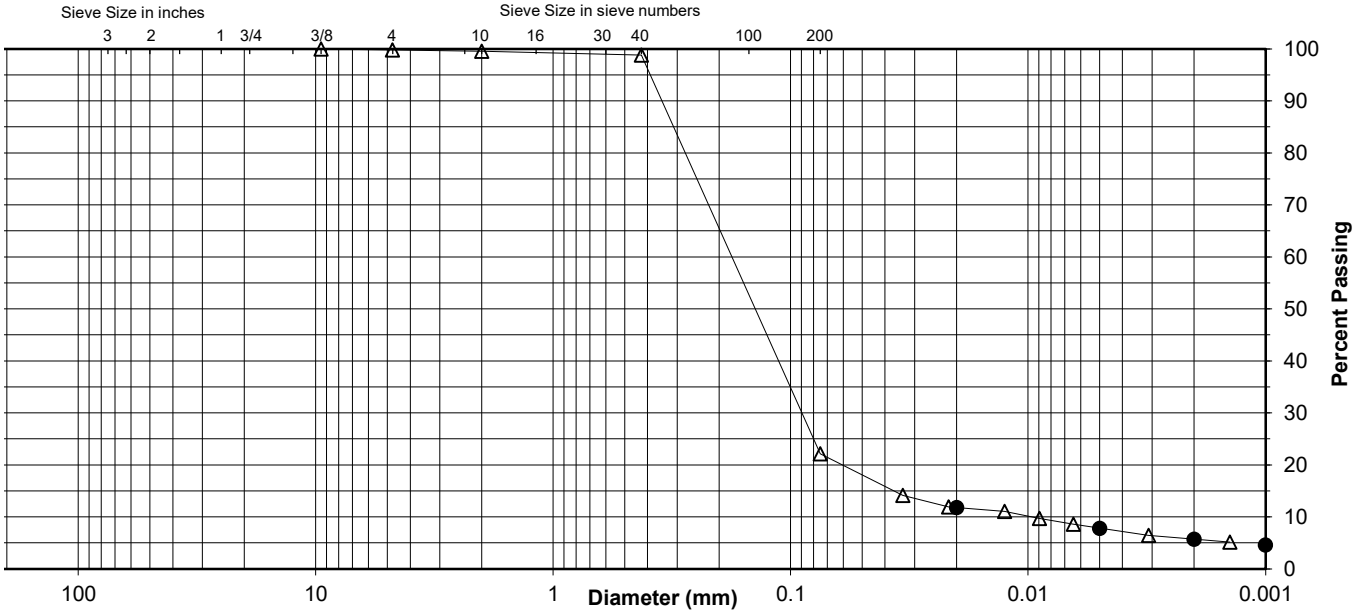
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	98.8
No. 200	22.1
0.02 mm	11.8
0.005 mm	7.8
0.002 mm	5.7
0.001 mm	4.6

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.2	0.3	0.7	76.7	14.3	7.8
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	0.5			0.7	76.7	16.4	5.7



Comments

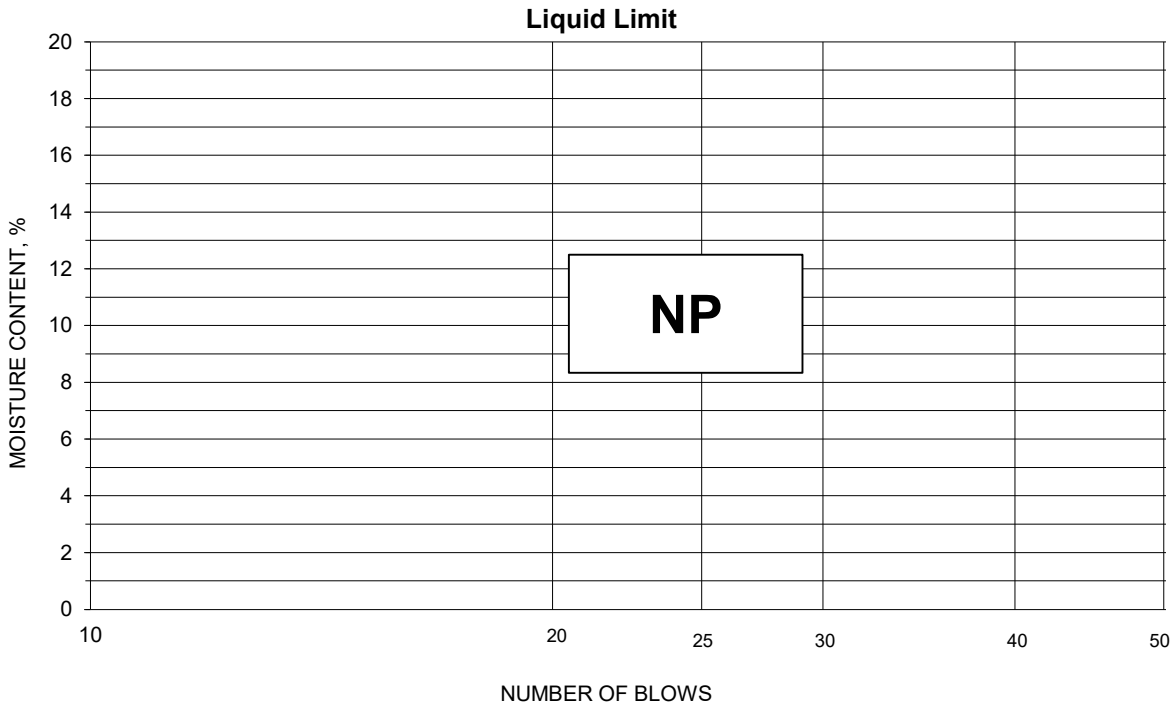
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order	Project No.	175668043
Source	kif-gt-b14-ss08G, 24.5'-26.0'	Lab ID	303
		% + No. 40	1
Tested By	DB	Test Method	ASTM D 4318 Method A
Test Date	03-15-2021	Prepared	Dry
		Date Received	03-10-2021

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: _____

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b14-ss11G, 32.0'-33.5'	Lab ID	307
Sample Type	SS	Date Received	3-10-21
		Date Reported	3-31-21

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 14.6

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
1 1/2"	37.5	100.0
3/4"	19	90.3
3/8"	9.5	74.2
No. 4	4.75	62.9
No. 10	2	52.1
No. 40	0.425	38.9
No. 200	0.075	18.2
	0.02	9.0
	0.005	5.6
	0.002	3.8
estimated	0.001	2.6

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	37.1	47.9
Coarse Sand	10.8	13.2
Medium Sand	13.2	---
Fine Sand	20.7	20.7
Silt	12.6	14.4
Clay	5.6	3.8

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	NP
Plastic Limit:	NP
Plasticity Index:	NP
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol: SM

Group Name: Silty sand with gravel

AASHTO Classification: A-1-b (0)

Comments:

Reviewed By RHB

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b14-ss11G, 32.0'-33.5'	Lab ID	307

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	TRH
Test Date	03-18-2021
Date Received	03-10-2021

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	90.3
3/8"	74.2
No. 4	62.9
No. 10	52.1

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

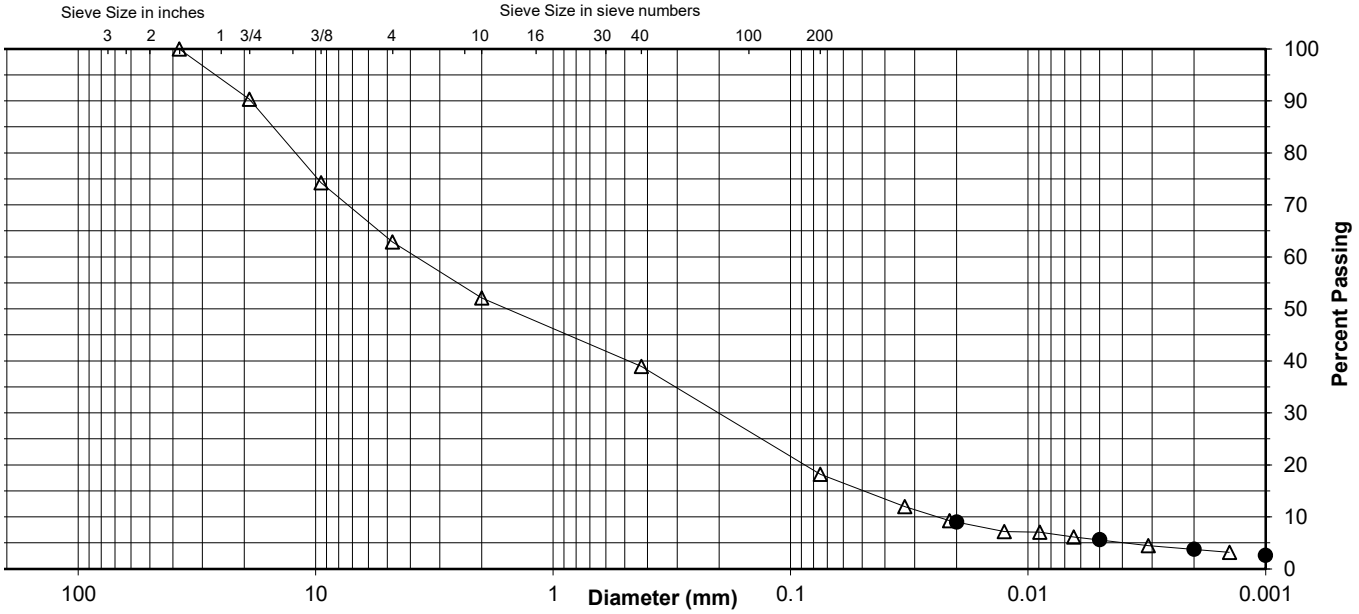
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	38.9
No. 200	18.2
0.02 mm	9.0
0.005 mm	5.6
0.002 mm	3.8
0.001 mm	2.6

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	9.7	27.4	10.8	13.2	20.7	12.6	5.6
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	47.9			13.2	20.7	14.4	3.8



Comments

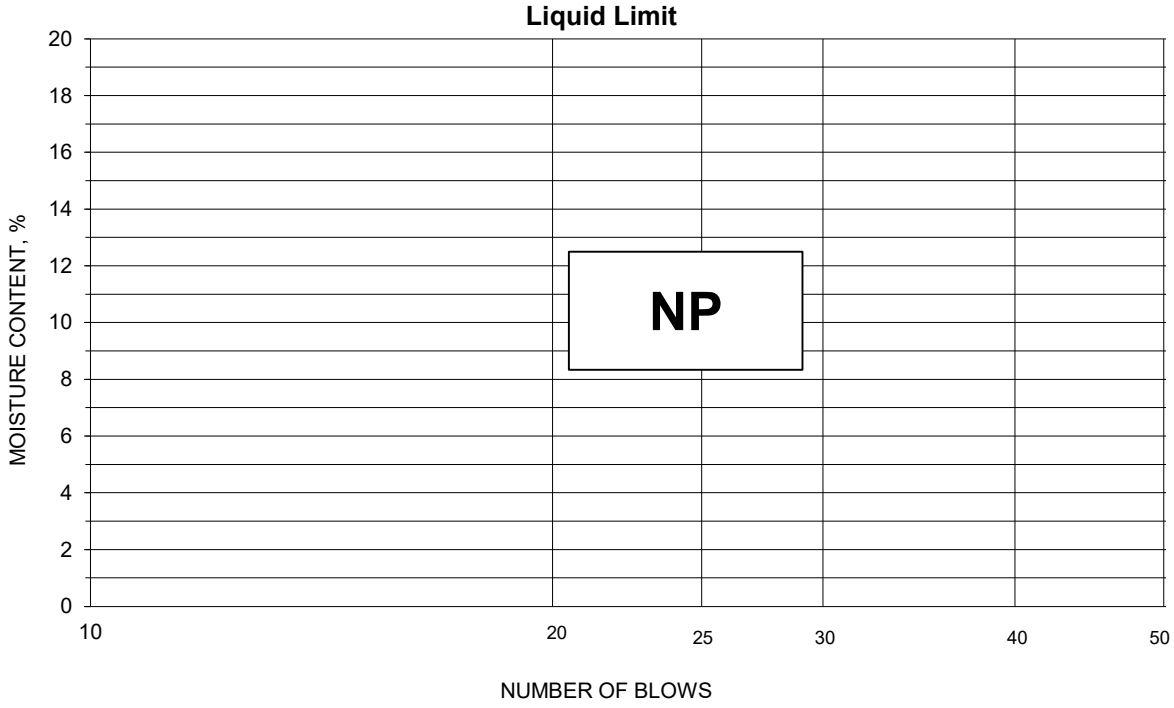
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order	Project No.	175668043
Source	kif-gt-b14-ss11G, 32.0'-33.5'	Lab ID	307
		% + No. 40	61
Tested By	DB	Test Method	ASTM D 4318 Method A
Test Date	03-15-2021	Prepared	Dry
		Date Received	03-10-2021

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: _____

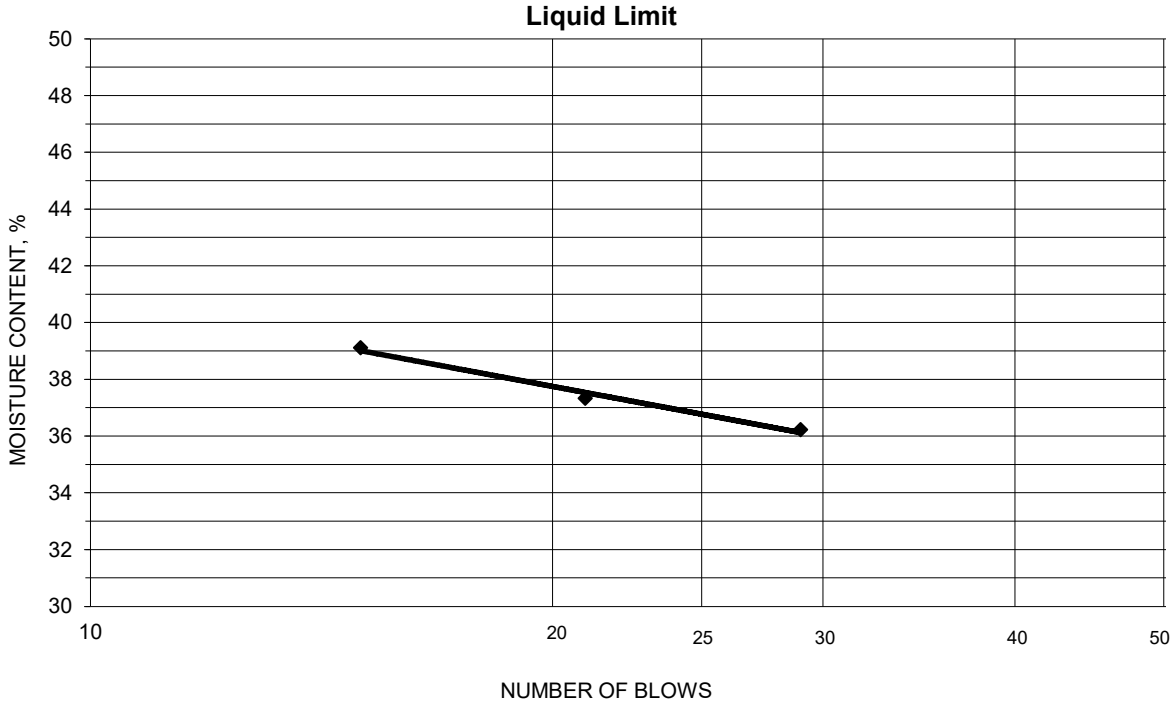
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order	Project No.	175668043
Source	kif-gt-b15-ss01bG, 12.1'-13.0'	Lab ID	311
		% + No. 40	0
Tested By	JMB	Test Method	ASTM D 4318 Method A
Test Date	04-06-2021	Prepared	Dry
		Date Received	03-10-2021

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
11.64	9.68	4.27	29	36.2	
11.30	9.40	4.31	21	37.3	
13.71	11.07	4.32	15	39.1	37



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
11.31	10.19	4.30	19.0	19	18
11.61	10.45	4.29	18.8		

Remarks: _____

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b15-ss02G, 16.5'-18.0'	Lab ID	313
Sample Type	SS	Date Received	3-10-21
		Date Reported	3-31-21

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 21.9

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 10	2	100.0
No. 40	0.425	98.8
No. 200	0.075	32.9
	0.02	16.2
	0.005	10.9
	0.002	8.2
estimated	0.001	6.2

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.0	0.0
Coarse Sand	0.0	1.2
Medium Sand	1.2	---
Fine Sand	65.9	65.9
Silt	22.0	24.7
Clay	10.9	8.2

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	NP
Plastic Limit:	NP
Plasticity Index:	NP
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol: SM
Group Name: Silty sand

AASHTO Classification: A-2-4 (0)

Comments:

Reviewed By RHB

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b15-ss02G, 16.5'-18.0'	Lab ID	313

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	N/A
Particle Hardness:	N/A
Tested By	TRH
Test Date	03-18-2021
Date Received	03-10-2021

Maximum Particle size: No. 10 Sieve

Sieve Size	% Passing
No. 10	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

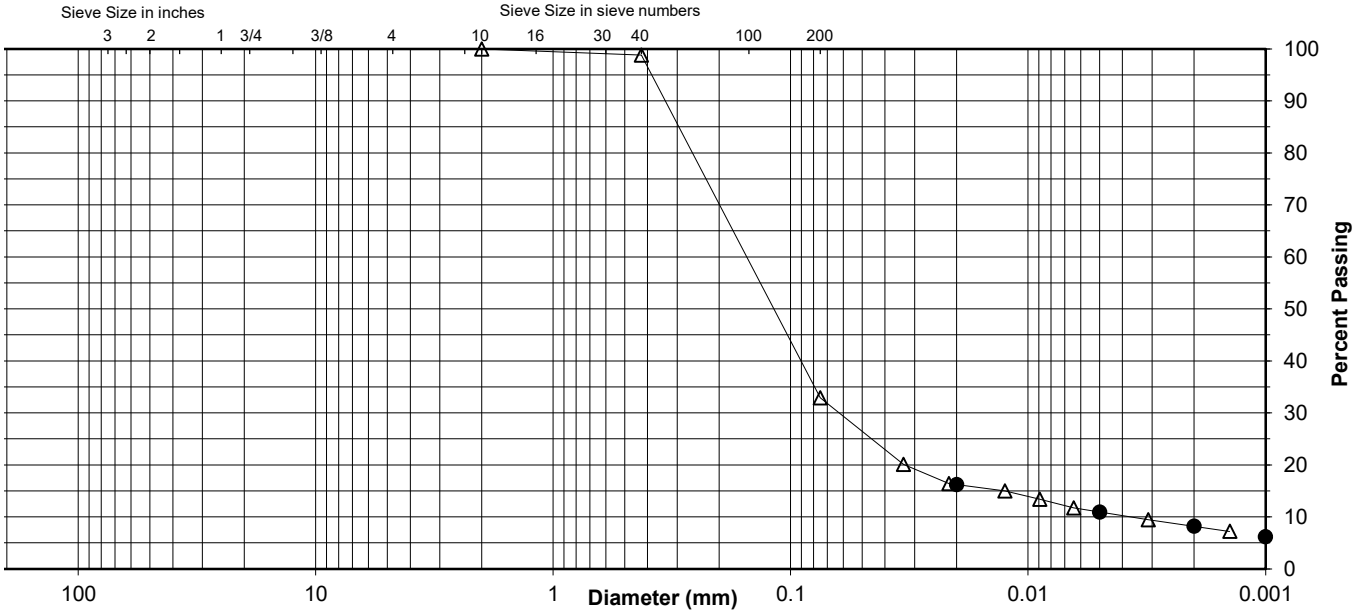
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	98.8
No. 200	32.9
0.02 mm	16.2
0.005 mm	10.9
0.002 mm	8.2
0.001 mm	6.2

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	0.0	1.2	65.9	22.0	10.9
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	0.0			1.2	65.9	24.7	8.2



Comments

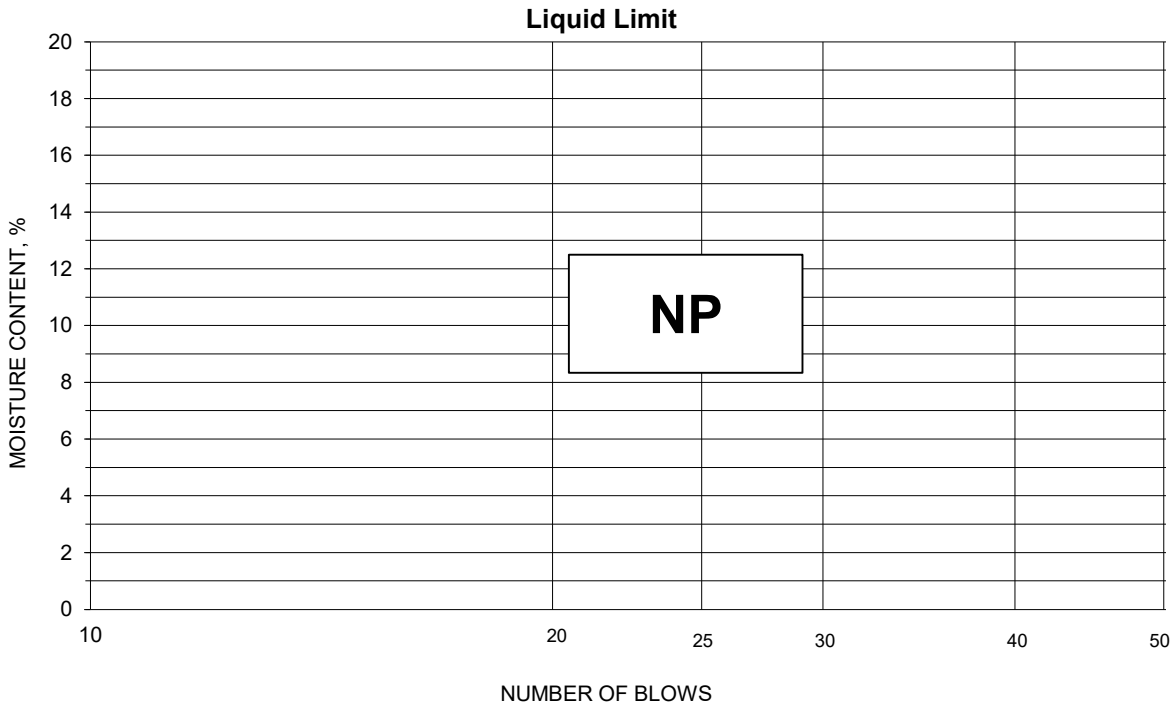
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order	Project No.	175668043
Source	kif-gt-b15-ss02G, 16.5'-18.0'	Lab ID	313
		% + No. 40	1
Tested By	DB	Test Method	ASTM D 4318 Method A
Test Date	03-15-2021	Prepared	Dry
		Date Received	03-10-2021

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: _____

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b15-ss05G, 24.0'-25.5'	Lab ID	317
Sample Type	SS	Date Received	3-10-21
		Date Reported	3-31-21

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 25.0

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 10	2	100.0
No. 40	0.425	99.1
No. 200	0.075	21.3
	0.02	11.9
	0.005	7.2
	0.002	5.0
estimated	0.001	3.4

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.0	0.0
Coarse Sand	0.0	0.9
Medium Sand	0.9	---
Fine Sand	77.8	77.8
Silt	14.1	16.3
Clay	7.2	5.0

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	NP
Plastic Limit:	NP
Plasticity Index:	NP
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol: SM
Group Name: Silty sand

AASHTO Classification: A-2-4 (0)

Comments:

Reviewed By RHB

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b15-ss05G, 24.0'-25.5'	Lab ID	317

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	N/A
Particle Hardness:	N/A
Tested By	TRH
Test Date	03-18-2021
Date Received	03-10-2021

Maximum Particle size: No. 10 Sieve

Sieve Size	% Passing
No. 10	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

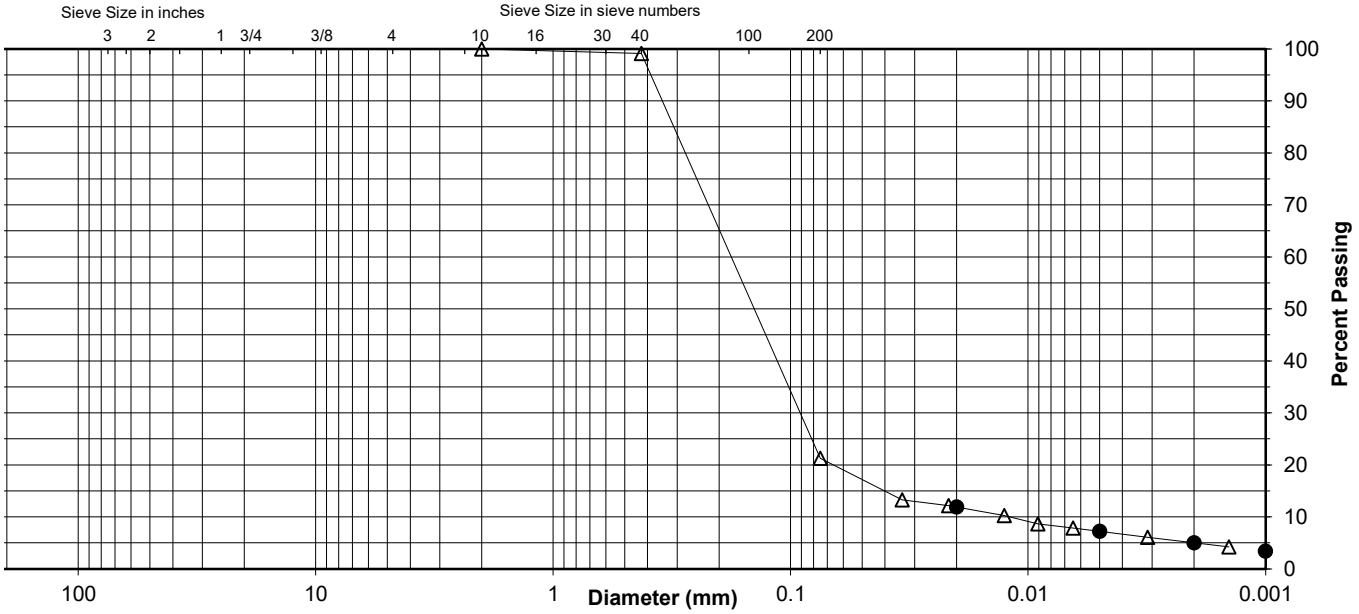
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	99.1
No. 200	21.3
0.02 mm	11.9
0.005 mm	7.2
0.002 mm	5.0
0.001 mm	3.4

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	0.0	0.9	77.8	14.1	7.2
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	0.0			0.9	77.8	16.3	5.0



Comments

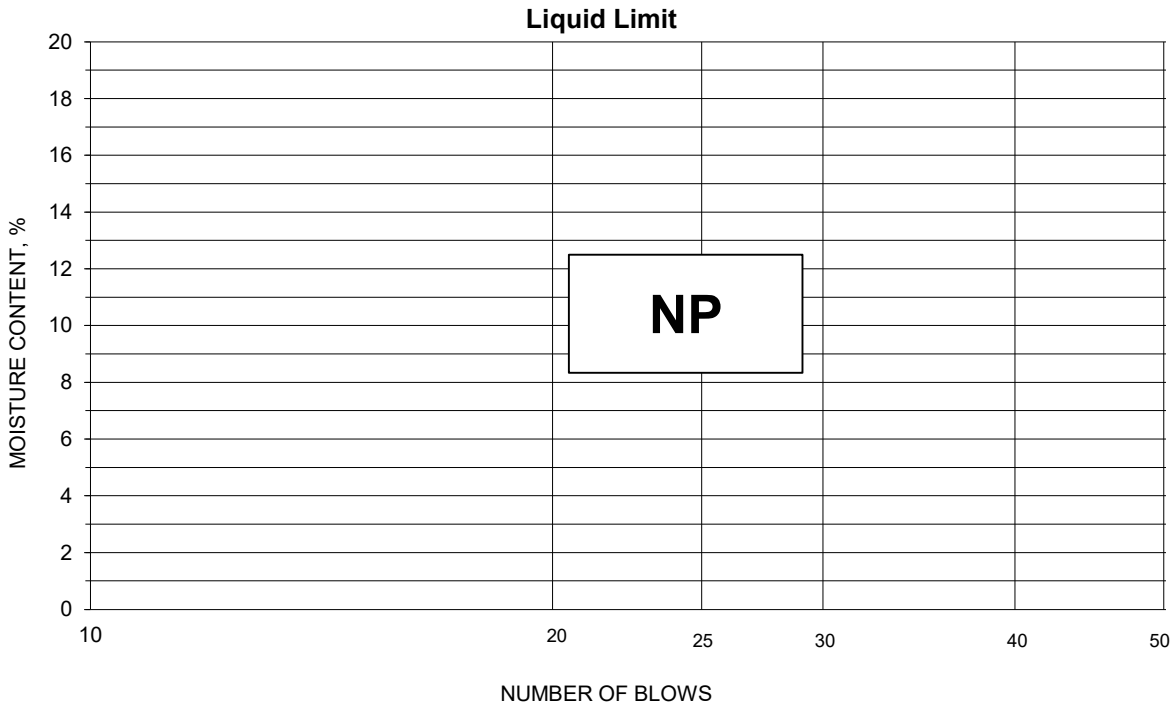
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order	Project No.	175668043
Source	kif-gt-b15-ss05G, 24.0'-25.5'	Lab ID	317
		% + No. 40	1
Tested By	DB	Test Method	ASTM D 4318 Method A
Test Date	03-15-2021	Prepared	Dry
		Date Received	03-10-2021

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: _____

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b15-ss06G, 26.5'-28.0'	Lab ID	318
Sample Type	SS	Date Received	3-10-21
		Date Reported	3-31-21

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 27.1

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 10	2	100.0
No. 40	0.425	99.6
No. 200	0.075	13.3
	0.02	7.5
	0.005	5.4
	0.002	4.3
estimated	0.001	3.6

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.0	0.0
Coarse Sand	0.0	0.4
Medium Sand	0.4	---
Fine Sand	86.3	86.3
Silt	7.9	9.0
Clay	5.4	4.3

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	NP
Plastic Limit:	NP
Plasticity Index:	NP
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol: SM

Group Name: Silty sand

AASHTO Classification: A-2-4 (0)

Comments:

Reviewed By RHB

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b15-ss06G, 26.5'-28.0'	Lab ID	318

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	N/A
Particle Hardness:	N/A
Tested By	TRH
Test Date	03-18-2021
Date Received	03-10-2021

Maximum Particle size: No. 10 Sieve

Sieve Size	% Passing
No. 10	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity 2.7

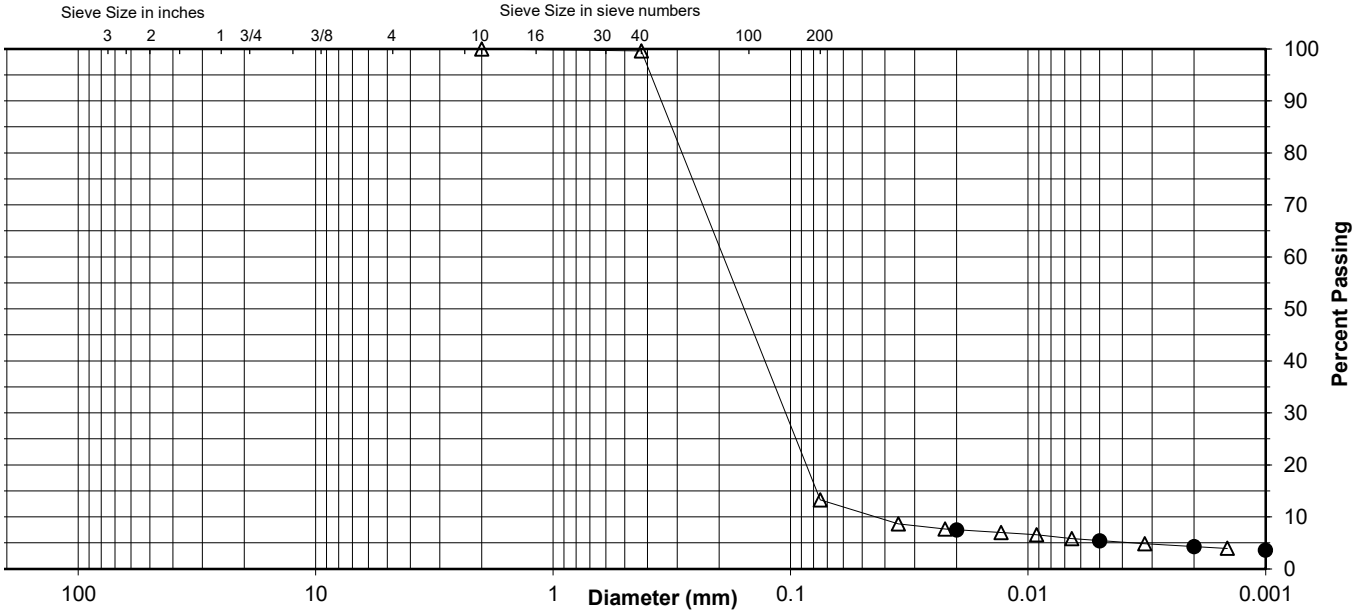
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	99.6
No. 200	13.3
0.02 mm	7.5
0.005 mm	5.4
0.002 mm	4.3
0.001 mm	3.6

Particle Size Distribution

	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
ASTM	0.0	0.0	0.0	0.4	86.3	7.9	5.4

	Gravel	Coarse Sand	Fine Sand	Silt	Clay
AASHTO	0.0	0.4	86.3	9.0	4.3



Comments

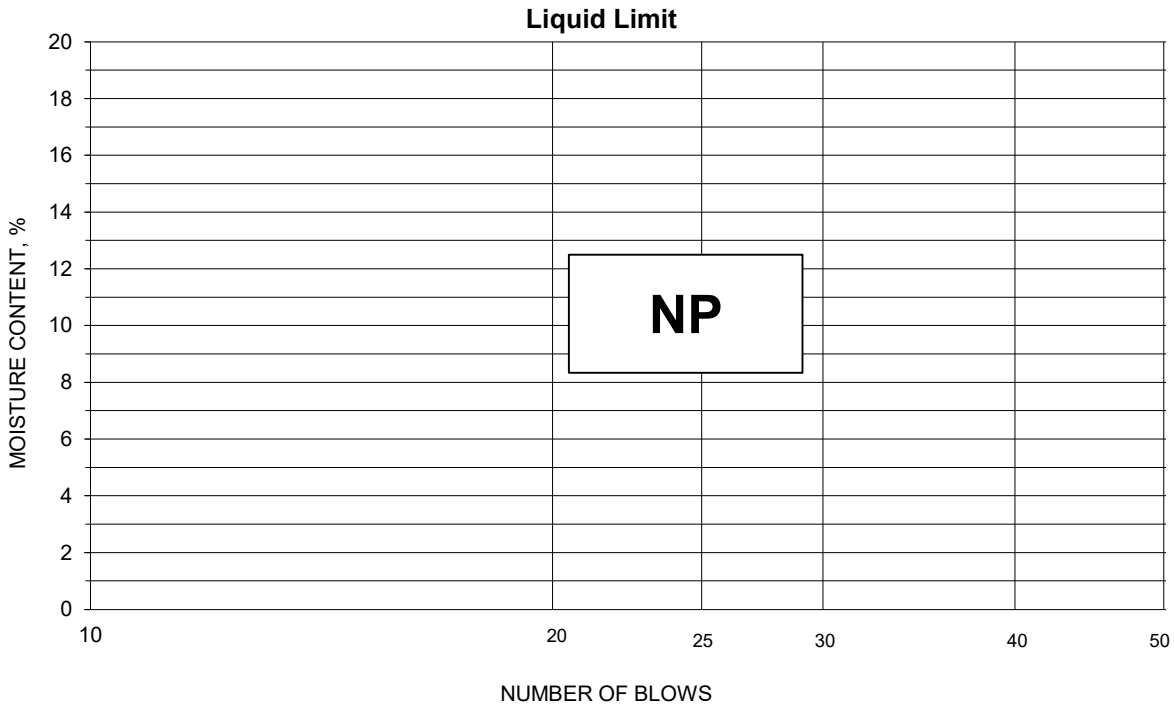
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	kif-gt-b15-ss06G, 26.5'-28.0'			Lab ID	318
				% + No. 40	0
Tested By	DB	Test Method	ASTM D 4318 Method A	Date Received	03-10-2021
Test Date	03-15-2021	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: _____

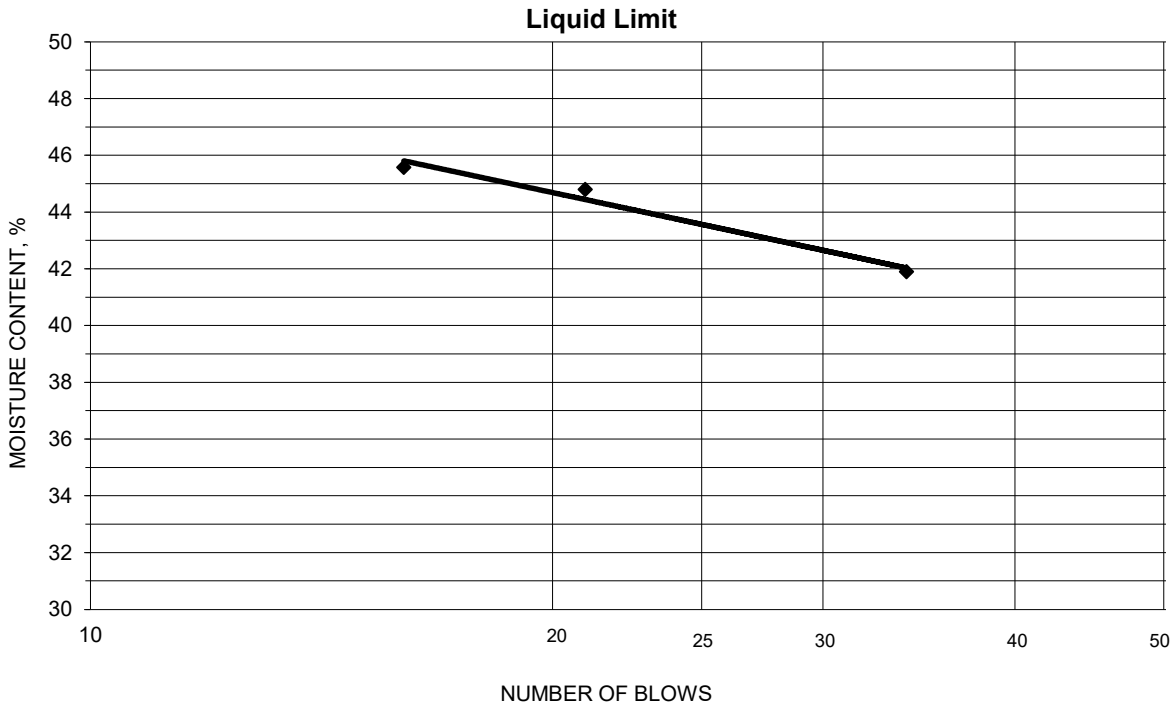
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order	Project No.	175668043
Source	kif-gt-b16-ss01bG, 12.5'-13.5'	Lab ID	322
		% + No. 40	<5
Tested By	JMB	Test Method	ASTM D 4318 Method A
Test Date	04-06-2021	Prepared	Dry
		Date Received	03-10-2021

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
20.16	17.42	10.88	34	41.9	
18.24	16.00	11.00	21	44.8	
20.05	17.37	11.49	16	45.6	44



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
16.88	15.68	11.44	28.3	28	16
18.34	16.83	11.42	27.9		

Remarks: _____

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b16-ss02G, 16.5'-18.0'	Lab ID	324
Sample Type	SS	Date Received	3-10-21
		Date Reported	3-31-21

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 23.5

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 10	2	100.0
No. 40	0.425	97.3
No. 200	0.075	39.8
	0.02	22.8
	0.005	14.4
	0.002	11.8
estimated	0.001	11.0

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.0	0.0
Coarse Sand	0.0	2.7
Medium Sand	2.7	---
Fine Sand	57.5	57.5
Silt	25.4	28.0
Clay	14.4	11.8

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	NP
Plastic Limit:	NP
Plasticity Index:	NP
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol: SM
Group Name: Silty sand

AASHTO Classification: A-4 (0)

Comments:

Reviewed By RHB

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b16-ss02G, 16.5'-18.0'	Lab ID	324

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	N/A
Particle Hardness:	N/A
Tested By	TRH
Test Date	03-18-2021
Date Received	03-10-2021

Maximum Particle size: No. 10 Sieve

Sieve Size	% Passing
No. 10	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

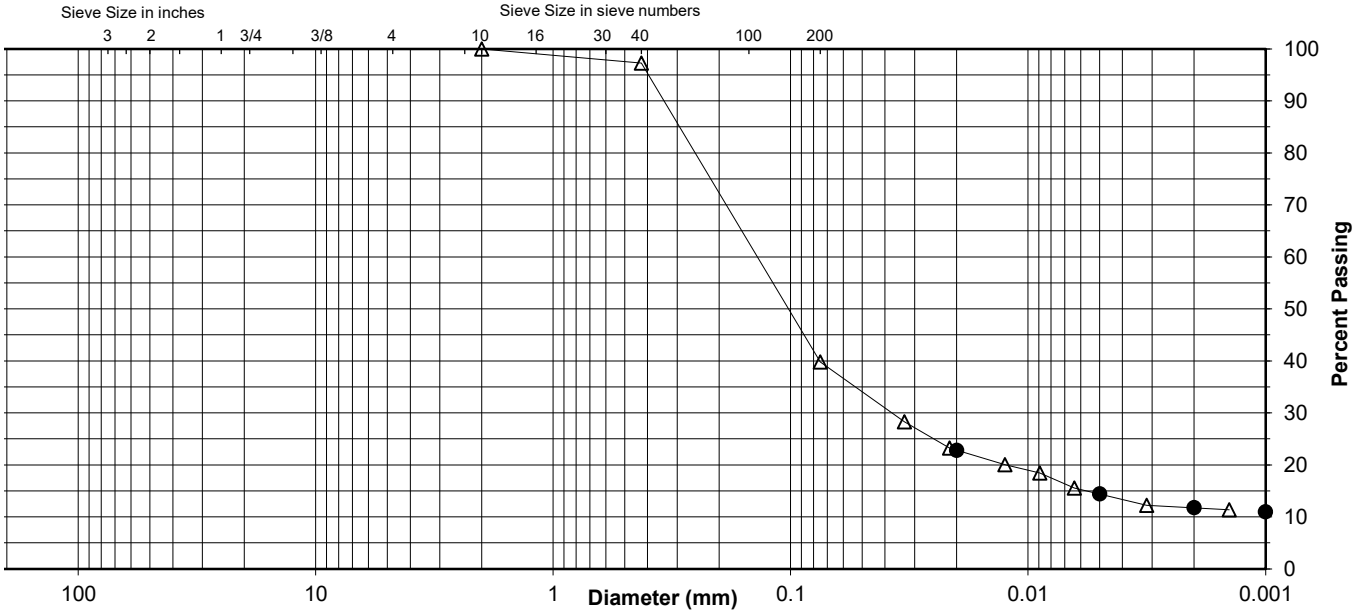
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	97.3
No. 200	39.8
0.02 mm	22.8
0.005 mm	14.4
0.002 mm	11.8
0.001 mm	11.0

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	0.0	2.7	57.5	25.4	14.4
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	0.0			2.7	57.5	28.0	11.8



Comments

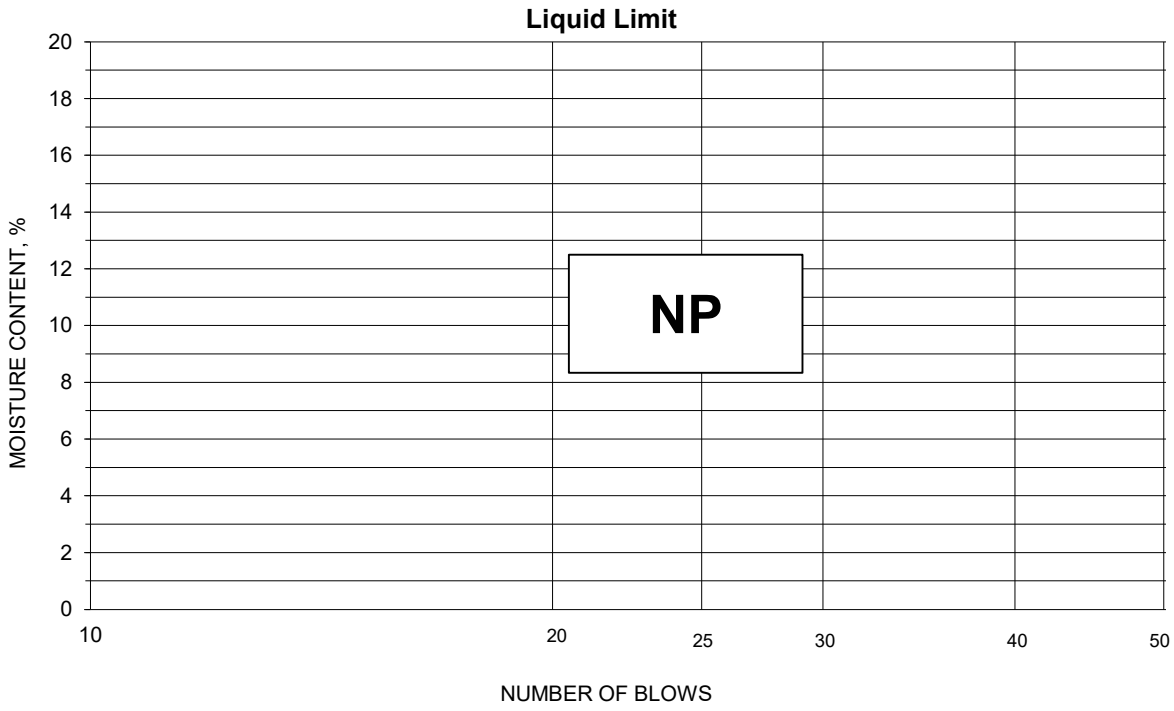
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	kif-gt-b16-ss02G, 16.5'-18.0'			Lab ID	324
				% + No. 40	3
Tested By	DB	Test Method	ASTM D 4318 Method A	Date Received	03-10-2021
Test Date	03-15-2021	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: _____

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b16-ss03G, 19.0'-20.5'	Lab ID	325
Sample Type	SS	Date Received	3-10-21
		Date Reported	3-31-21

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 18.8

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 4	4.75	100.0
No. 10	2	100.0
No. 40	0.425	98.8
No. 200	0.075	29.2
	0.02	14.4
	0.005	7.7
	0.002	5.4
estimated	0.001	4.8

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.0	0.0
Coarse Sand	0.0	1.2
Medium Sand	1.2	---
Fine Sand	69.6	69.6
Silt	21.5	23.8
Clay	7.7	5.4

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	NP
Plastic Limit:	NP
Plasticity Index:	NP
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol: SM

Group Name: Silty sand

AASHTO Classification: A-2-4 (0)

Comments:

Reviewed By RHB

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b16-ss03G, 19.0'-20.5'	Lab ID	325

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	TRH
Test Date	03-19-2021
Date Received	03-10-2021

Maximum Particle size: No. 4 Sieve

Sieve Size	% Passing
No. 4	100.0
No. 10	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

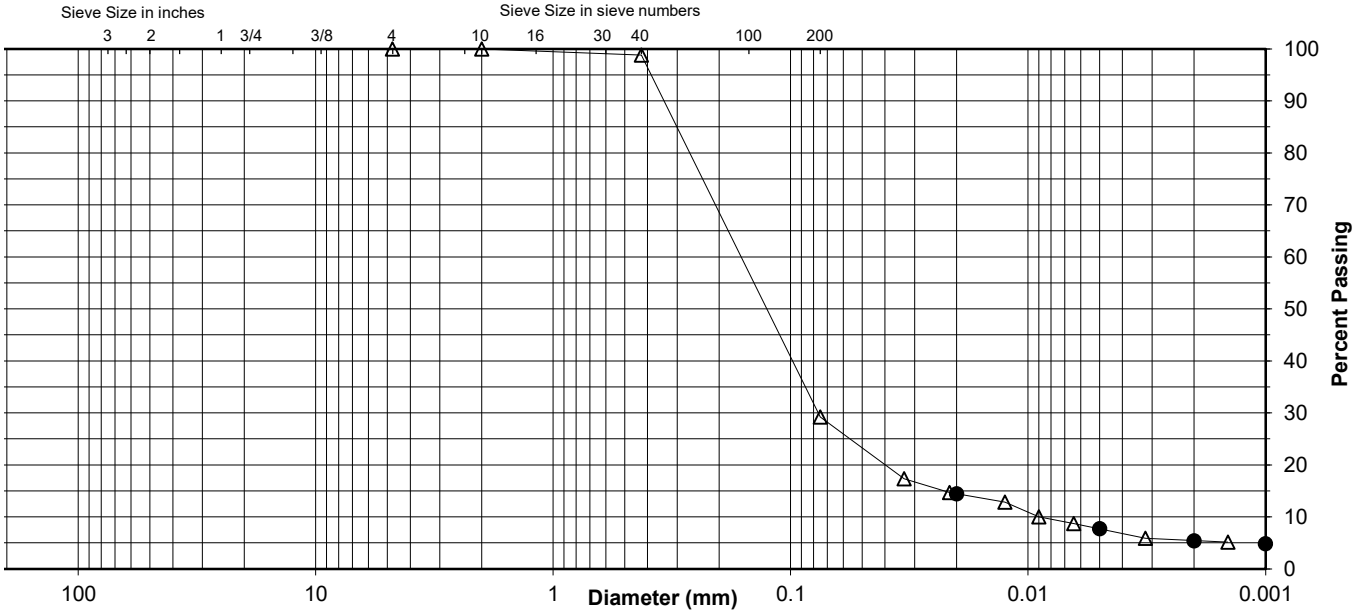
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	98.8
No. 200	29.2
0.02 mm	14.4
0.005 mm	7.7
0.002 mm	5.4
0.001 mm	4.8

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	0.0	1.2	69.6	21.5	7.7
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	0.0			1.2	69.6	23.8	5.4



Comments

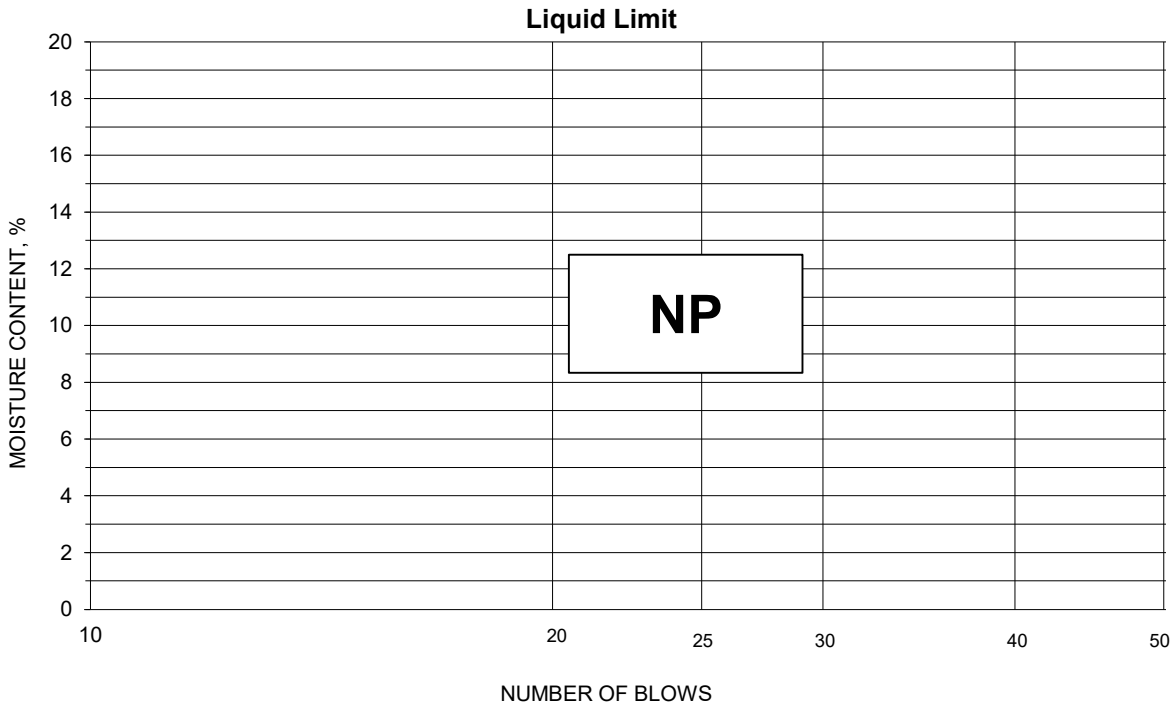
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	kif-gt-b16-ss03G, 19.0'-20.5'			Lab ID	325
				% + No. 40	1
Tested By	DB	Test Method	ASTM D 4318 Method A	Date Received	03-10-2021
Test Date	03-15-2021	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: _____

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b16-ss04bG, 22.3'-23.0'	Lab ID	327
Sample Type	SS	Date Received	3-10-21
		Date Reported	3-31-21

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 22.5

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
3/8"	9.5	100.0
No. 4	4.75	99.9
No. 10	2	99.8
No. 40	0.425	99.1
No. 200	0.075	29.3
	0.02	15.3
	0.005	9.6
	0.002	6.8
estimated	0.001	5.4

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.1	0.2
Coarse Sand	0.1	0.7
Medium Sand	0.7	---
Fine Sand	69.8	69.8
Silt	19.7	22.5
Clay	9.6	6.8

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	NP
Plastic Limit:	NP
Plasticity Index:	NP
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol: SM
Group Name: Silty sand

AASHTO Classification: A-2-4 (0)

Comments:

Reviewed By RHB

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b16-ss04bG, 22.3'-23.0'	Lab ID	327

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	SKS
Test Date	03-19-2021
Date Received	03-10-2021

Maximum Particle size: 3/8" Sieve

Sieve Size	% Passing
3/8"	100.0
No. 4	99.9
No. 10	99.8

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

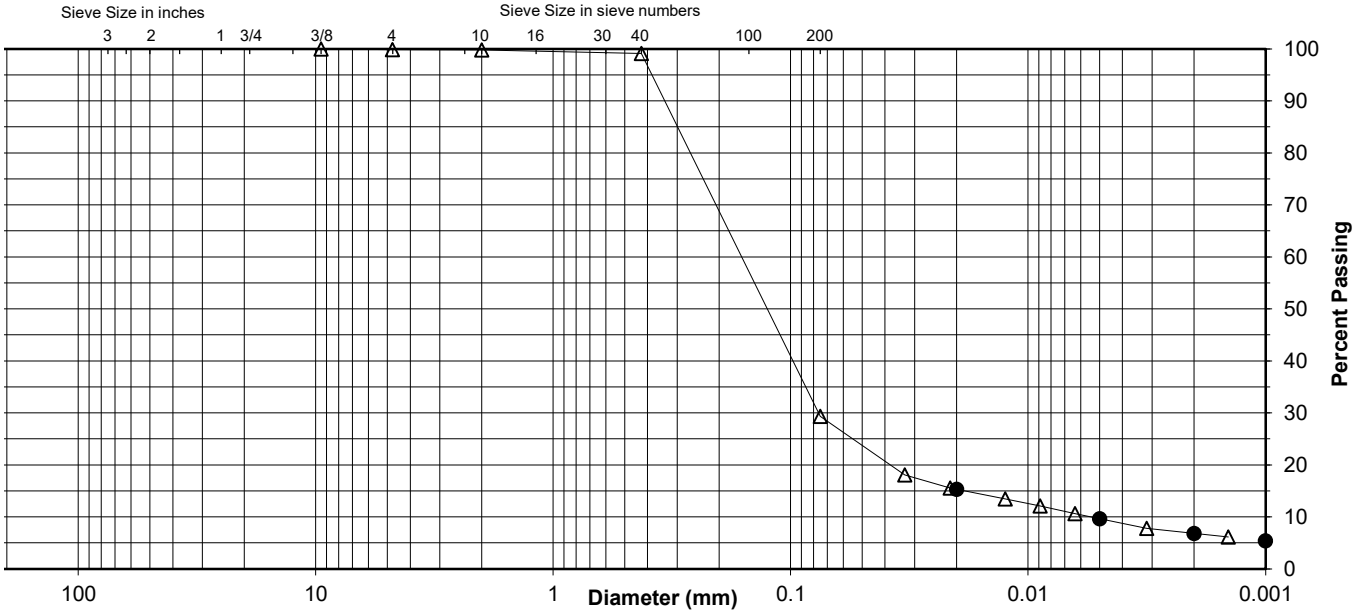
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	99.1
No. 200	29.3
0.02 mm	15.3
0.005 mm	9.6
0.002 mm	6.8
0.001 mm	5.4

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.1	0.1	0.7	69.8	19.7	9.6
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	0.2			0.7	69.8	22.5	6.8



Comments

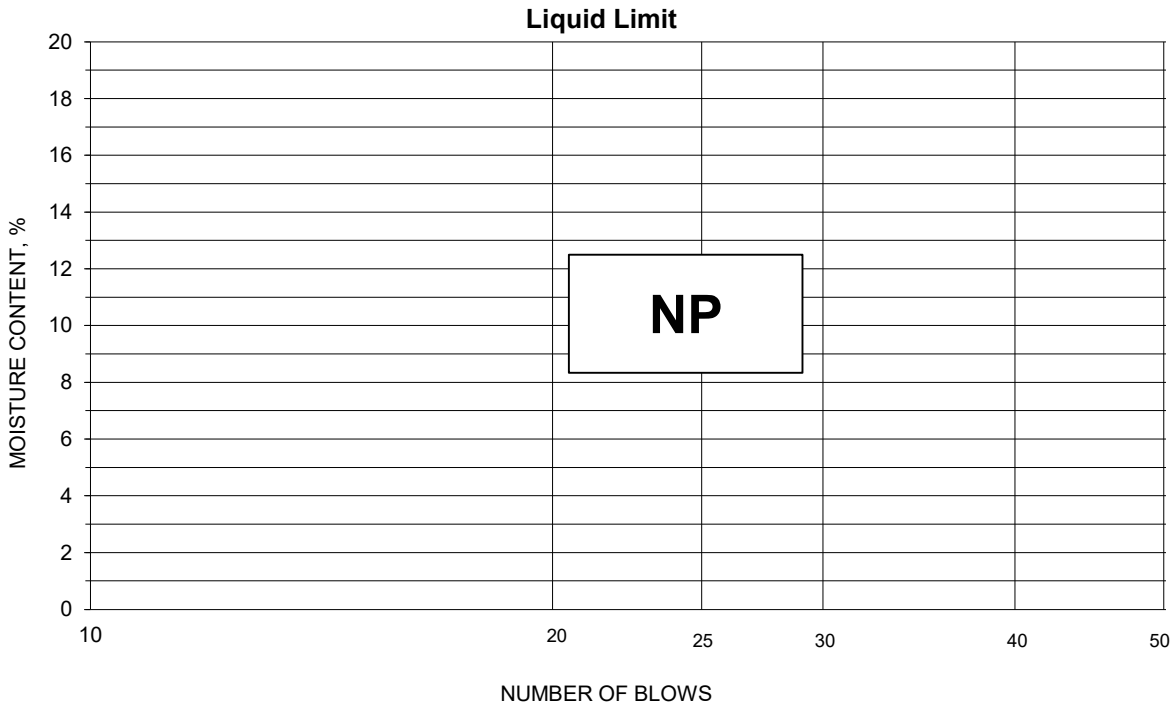
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order	Project No.	175668043
Source	kif-gt-b16-ss04bG, 22.3'-23.0'	Lab ID	327
		% + No. 40	1
Tested By	DB	Test Method	ASTM D 4318 Method A
Test Date	03-15-2021	Prepared	Dry
		Date Received	03-10-2021

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: _____

Reviewed By RHB

Stantec

Summary of Soil Tests

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b16-ss06G, 26.5'-28.0'	Lab ID	329
Sample Type	SS	Date Received	3-10-21
		Date Reported	3-31-21

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 22.8

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
1 1/2"	37.5	100.0
3/4"	19	88.7
3/8"	9.5	85.2
No. 4	4.75	83.4
No. 10	2	82.7
No. 40	0.425	79.9
No. 200	0.075	17.1
	0.02	9.6
	0.005	5.9
	0.002	4.5
estimated	0.001	3.9

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	16.6	17.3
Coarse Sand	0.7	2.8
Medium Sand	2.8	---
Fine Sand	62.8	62.8
Silt	11.2	12.6
Clay	5.9	4.5

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	NP
Plastic Limit:	NP
Plasticity Index:	NP
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol: SM

Group Name: Silty sand with gravel

AASHTO Classification: A-2-4 (0)

Comments:

Reviewed By RHB

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	KIF TDEC Order	Project Number	175668043
Source	kif-gt-b16-ss06G, 26.5'-28.0'	Lab ID	329

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	TRH
Test Date	03-19-2021
Date Received	03-10-2021

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	88.7
3/8"	85.2
No. 4	83.4
No. 10	82.7

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

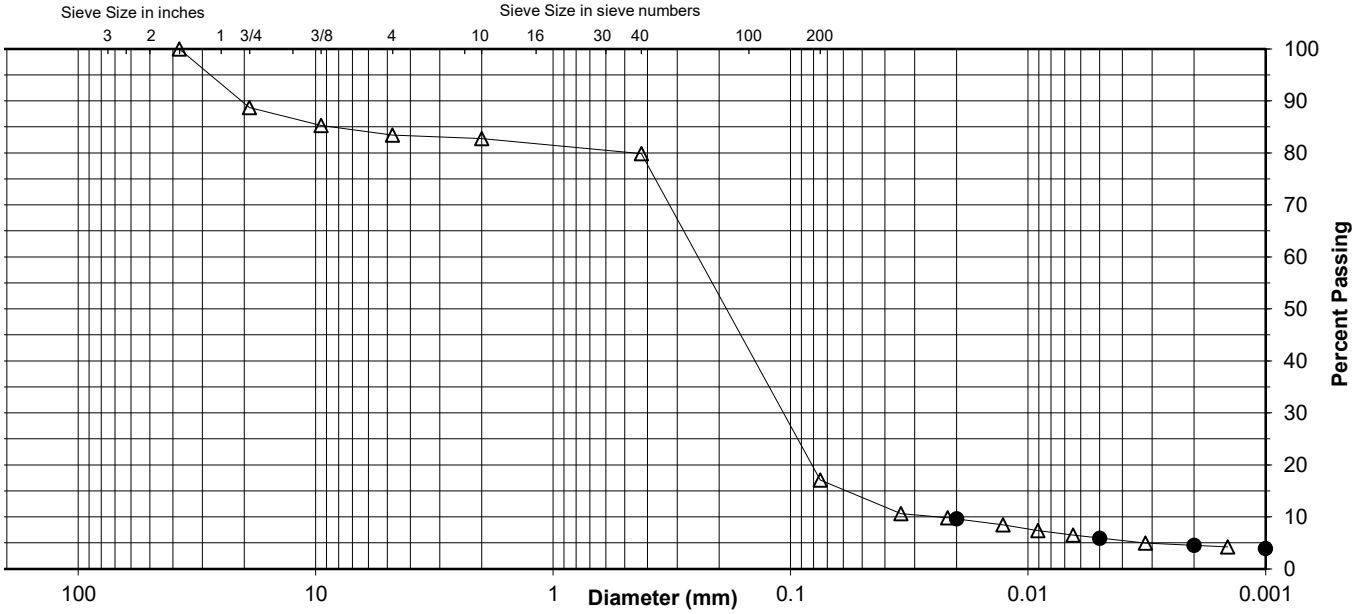
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	79.9
No. 200	17.1
0.02 mm	9.6
0.005 mm	5.9
0.002 mm	4.5
0.001 mm	3.9

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	11.3	5.3	0.7	2.8	62.8	11.2	5.9
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	17.3			2.8	62.8	12.6	4.5



Comments

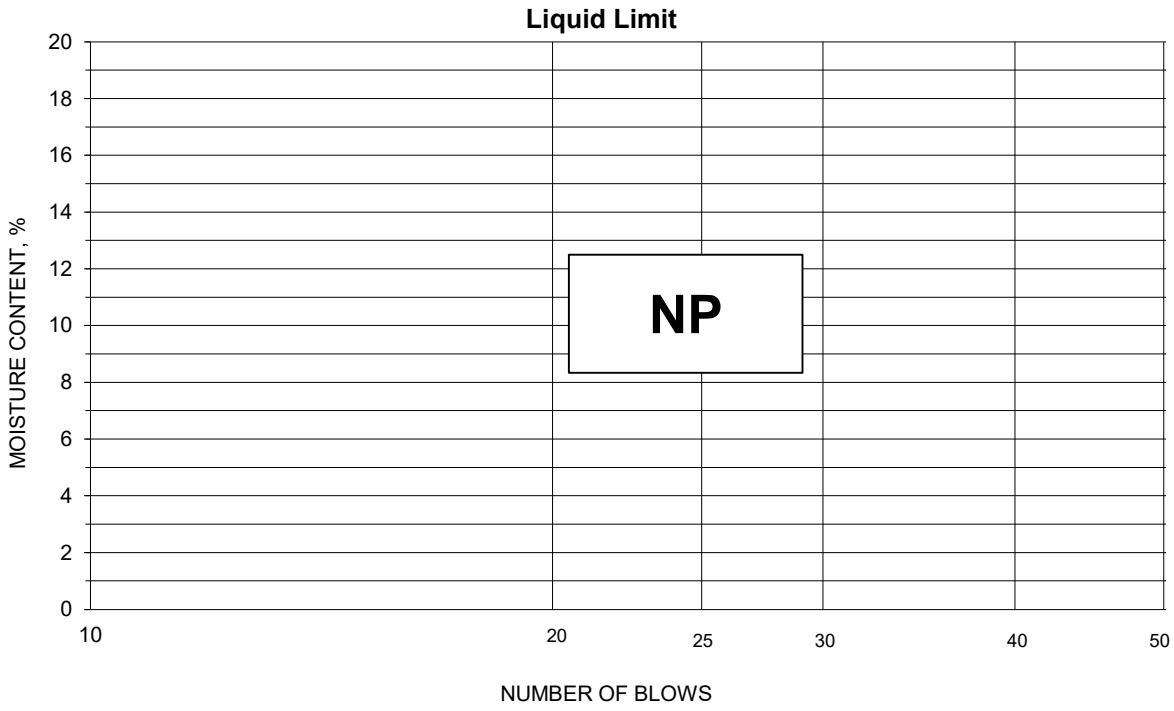
Reviewed By RHB

Stantec

ATTERBERG LIMITS

Project	KIF TDEC Order			Project No.	175668043
Source	kif-gt-b16-ss06G, 26.5'-28.0'			Lab ID	329
				% + No. 40	20
Tested By	DB	Test Method	ASTM D 4318 Method A	Date Received	03-10-2021
Test Date	03-15-2021	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: _____

Reviewed By RHB

APPENDIX G – BATHYMETRIC SURVEY RESULTS

Exhibit No.

G.1

Title

Bathymetric Contour Map of the Intake Channel

Client/Project

Tennessee Valley Authority
Kingston Fossil Plant (KIF) TDEC Order

Project Location

Roane County, Tennessee

175668043

Prepared by DMB on 2022-01-06
Technical Review by JD on 2022-01-06

0 50 100 150 200 Feet

1:600 (At original document size of 22x34)

Legend

- Major Contour (Contour Interval = 5 ft)
- Minor Contour (Contour Interval = 1 ft)
- Edge of Water (December 3, 2020)
- CCR Unit Area (Approximate)
- Engineered Wetlands (Approximate)
- Polishing Pond (Approximate)

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Imagery provided by TVA and flown by Tuck Mapping on March 16, 2017.
3. Bathymetric contours for the Intake Channel were provided by TVA and were surveyed on December 3, 2020 for project KIF202479 and Task Id: TTF685.

Stantec

TVA

Disclaimer: Stantec assumes no responsibility for data supplied in electronic format. The recipient accepts full responsibility for verifying the accuracy and completeness of the data. The recipient releases Stantec, its officers, employees, consultants and agents, from any and all claims arising in any way from the content or provision of the data.

U:\TVA-EIP\175668043_KIF_Phase2\gis\mxd\ExploratoryDrilling_SAR\KIF_ExploratoryDrilling_G-1_BathymetricContourMap\IntakeChannel.mxd Revised: 2022-01-06 By: mbough

APPENDIX G.3

STATIC STABILITY SAMPLING AND ANALYSIS REPORT

Kingston Fossil Plant
Static Stability
Sampling and Analysis Report

TDEC Commissioner's Order:
Environmental Investigation Plan
Kingston Fossil Plant
Harriman, Tennessee

February 7, 2023

Prepared for:

Tennessee Valley Authority
Chattanooga, Tennessee

Prepared by:

Stantec Consulting Services Inc.
Lexington, Kentucky

Revision Record

Revision	Description	Date
0	Submittal to TDEC	April 6, 2021
1	Addresses March 11, 2022 TDEC Review Comments and Issued for TDEC	March 25, 2022
2	Addresses TDEC programmatic review comments; Issued for TDEC	February 7, 2023

Sign-off Sheet

This document entitled Kingston Fossil Plant Static Stability Sampling and Analysis Report was prepared by Stantec Consulting Services Inc. (“Stantec”) for the account of Tennessee Valley Authority (the “Client”). Any reliance on this document by any third party is strictly prohibited. The material in it reflects Stantec’s professional judgment in light of the scope, schedule and other limitations stated in the document and in the contract between Stantec and the Client. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. In preparing the document, Stantec did not verify information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions taken based on this document.

Prepared by
Nick Duda, Geotechnical Engineer in Training

Reviewed by
Jeff Dingrando, PE, Principal

Reviewed by
Stan Harris, PE, Senior Principal

Approved by
James M. Kerr, Jr., Senior Principal Geologist

Table of Contents

ABBREVIATIONS IV

1.0 INTRODUCTION 1

2.0 OBJECTIVE AND SCOPE 2

3.0 PHYSICAL SETTING AND SITE HISTORY 4
3.1 EXISTING CONDITIONS 4
3.2 GEOLOGIC SETTING 5
3.3 SITE HISTORY 5
3.4 PRIOR SUBSURFACE INVESTIGATIONS 6
3.5 PRIOR STABILITY ANALYSES 7

4.0 SUBSURFACE CHARACTERIZATION 8
4.1 MATERIAL PROPERTIES 8
4.1.1 General Description and Geologic Origin 9
4.1.2 Index Properties, Classification, and Density Parameters 11
4.1.3 Drained Strengths for Static, Long-term Conditions 14
4.1.4 Shear Strength of Bedrock 27
4.2 ANALYSIS CROSS SECTIONS 27
4.2.1 Cross Section A-A': Basis for Selection 28
4.2.2 Cross Section "Polishing Pond": Basis for Selection 31
4.2.3 Typical Section for Veneer Stability: Basis for Selection 33

5.0 LOADING CONDITIONS AND ACCEPTANCE CRITERIA 34
5.1 LOAD CASES, PHASED ASSESSMENT, AND ACCEPTANCE CRITERIA 34
5.2 POOL LEVELS AND PORE WATER PRESSURES 36

6.0 METHODOLOGY 38
6.1 GENERAL 38
6.1.1 Software 38
6.1.2 Assumed System(s) of Slice Forces 38
6.1.3 Optimization Scheme to Define Critical Rupture Surface 39
6.1.4 Shapes of Rupture Surfaces Considered 39
6.1.5 Consideration of Shallow Slope Instabilities 39
6.1.6 Exclusion of Retrogressive Slope Failure Mechanisms 40
6.1.7 Tension Cracks 40
6.1.8 Drained versus Undrained Analyses 41
6.1.9 Input Pore Pressures 42
6.1.10 Single-Stage Analyses 43
6.2 STATIC STABILITY 44
6.2.1 Long-Term, Global Stability 44
6.2.2 Long-Term, Veneer Stability 44

7.0 RESULTS 45

7.1 STATIC STABILITY 45
7.1.1 Long-Term, Global and Veneer Stability 45

8.0 VARIATIONS 46
8.1 VARIATIONS IN SCOPE 46
8.2 VARIATIONS IN PROCEDURES 46

9.0 SUMMARY 47

10.0 REFERENCES 48

LIST OF TABLES

Table 1. Stability Analyses Completed for each CCR Unit 3
Table 2. Identification of Subsurface Materials at KIF Plant 8
Table 3. Density Parameters of the Subsurface Materials at KIF Plant 11
Table 4. Drained Shear Strength Parameters for the Analysis of Static, Long-term Conditions, for the Subsurface Materials at KIF Plant 15
Table 5. Analyzed Cross Sections at KIF Plant 27
Table 6. Summary of Load Cases and Acceptance Criteria 35
Table 7. Pool Levels and Phreatic Surfaces at KIF Plant 36
Table 8. Conditions for Drained versus Undrained Analyses 42
Table 9. Long-Term, Static Stability Results at KIF Plant 45

LIST OF FIGURES

Figure 1. Sluice Trench and Ballfield East of Sluice Trench, showing East Dike Location 4
Figure 2. Drained Failure Stresses and Strength Envelope from Triaxial Compression Tests on Embankment Fill 16
Figure 3. Drained Failure Stresses and Strength Envelope from Triaxial Compression Tests on Fly Ash 17
Figure 4. Empirical correlations for the drained friction angle for Fly Ash based on SPT data (left) and CPT data (center). The data is presented together versus elevation (right), with the average drained friction angle of 35 degrees shown. 19
Figure 5. Drained Failure Stresses and Strength Envelope from Triaxial Compression Tests on Bottom Ash 20
Figure 6. Drained Failure Stresses and Strength Envelope from Triaxial Compression Tests on Subunit 1 22
Figure 7. Drained Failure Stresses and Strength Envelope from Triaxial Compression Tests on Subunit 2 23
Figure 8. Empirical correlations for the drained friction angle for Subunit 2 based on SPT data (left) and CPT data (center). The data is presented together versus elevation (right), with the average drained friction angle of 32 degrees shown. 25
Figure 9. Drained Failure Stresses and Strength Envelope from Triaxial Compression Tests on Subunit 3 26
Figure 10. Cross section locations 27

Figure 11. Materials in Stability Analysis Section A-A....30
Figure 12. Materials in Stability Analysis Section “Polishing Pond”....32
Figure 13. Selected geometry for Veneer Stability analyses....33
Figure 14. Phreatic Surface Correction (from GEO-SLOPE 2015)....43
Figure 15. Free body diagram representing veneer stability problem....44

LIST OF APPENDICES

APPENDIX A - EXHIBITS

APPENDIX B – GLOBAL STABILITY ANALYSIS RESULTS

APPENDIX C – VENEER STABILITY ANALYSIS RESULTS

APPENDIX D – A REFERENCE FOR CHARACTERIZING THE ENGINEERING PROPERTIES OF SOILS

Abbreviations

ASTM	American Society for Testing and Materials
c'	drained cohesion
c	undrained cohesion
CCR	Coal Combustion Residuals
CU triaxial test	Consolidated Undrained triaxial test
CH	Unified Soil Classification System abbreviation for Fat Clay
CL	Unified Soil Classification System abbreviation for Lean Clay
CPT	Cone Penetration Test
EAR	Environmental Assessment Report
EIP	Environmental Investigation Plan
deg	degrees
ft	feet
KIF Plant	Kingston Fossil Plant
KRP	Kingston Recovery Project
LLDPE	Linear Low-Density Polyethylene
ML	Unified Soil Classification System abbreviation for Silt
pcf	pounds per cubic foot
S_u	undrained shear strength
SAP	Sampling and Analysis Plan
SAR	Sampling and Analysis Report
SM	Unified Soil Classification System abbreviation for Silty Sand
SPT	Standard Penetration Test
Stantec	Stantec Consulting Services Inc.
Subunit 1	Foundation Soil Subunit 1
Subunit 2	Foundation Soil Subunit 2
Subunit 3	Foundation Soil Subunit 3
TDEC	Tennessee Department of Environment and Conservation
TDEC Order	Commissioner's Order No. OGC15-0177
TDOT	Tennessee Department of Transportation
tsf	tons per square foot
TVA	Tennessee Valley Authority
σ'_{vo}	vertical effective stress
ϕ'	drained friction angle
ϕ	undrained friction angle

1.0 INTRODUCTION

Stantec Consulting Services Inc. (Stantec) has prepared this sampling and analysis report (SAR), on behalf of the Tennessee Valley Authority (TVA), to document activities related to the static stability analyses at TVA's Kingston Fossil (KIF) Plant located in Harriman, Tennessee (see Exhibit A.1 in Appendix A).

The purpose of the Static Stability SAR is to develop slope stability models, including material parameters, and perform slope stability analyses for the selected coal combustion residuals (CCR) units, in support of fulfilling the requirements for the Tennessee Department of Environment and Conservation (TDEC) issued Commissioner's Order No. OGC15-0177 (TDEC Order) to the TVA (TDEC 2015). The TDEC Order set forth a "process for the investigation, assessment, and remediation of unacceptable risks" at TVA's coal ash disposal sites in Tennessee.

The purpose of this Static Stability SAR is to summarize activities completed to meet the objectives of the Stability Sampling and Analysis Plan (SAP) (Stantec 2018a), for applicable static load cases. Seismic load cases (if any) required by the SAP are documented in a separate Seismic Stability SAR. This SAR presents results of static stability analyses (also referred to herein as stability analyses) and compares those results to acceptance criteria defined in the SAP. However, this SAR is not intended to provide conclusions of the stability analysis. The scope of the stability analysis activities represented herein was conducted pursuant to the SAP and is part of a larger environmental investigation at the KIF Plant. The evaluation of the results will consider other aspects of the environmental investigation, as well as data collected under other State and/or CCR programs and will be presented in the Environmental Assessment Report (EAR).

The Static Stability SAR activities were performed in general accordance with the following documents developed by TVA to support fulfilling the requirements of the TDEC Order:

- *Stability SAP* (Stantec 2018a)
- *Environmental Investigation Plan (EIP)* (Stantec 2018b)
- *Quality Assurance Project Plan (QAPP)* (Environmental Standards, Inc. 2018).

2.0 OBJECTIVE AND SCOPE

The primary objective of the Static Stability SAR, conducted pursuant to the Stability SAP, was to develop slope stability models, including material parameters, and perform static stability analyses for select CCR units at the KIF Plant, in response to the TDEC Order. The Stability SAP included slope stability models and static, global analyses at two cross sections at the Sluice Trench and Ballfield East of the Sluice Trench: Section A-A' and the "Polishing Pond" Section. Cross sections are presented in Section 4.2. The Stability SAP also included static, veneer stability analyses at typical cross sections at the Sluice Trench and Ballfield East of the Sluice Trench. The approach for the Static Stability SAR was to:

- Review historical and TDEC Order subsurface explorations of the site to characterize the subsurface conditions
- Review and compile historical and TDEC Order laboratory testing of materials to determine material properties
- Conduct the required global and veneer stability analyses for the various load cases.

The scope of work of the Static Stability SAR consisted of the following tasks:

- Develop material properties and strengths
- Model the subsurface conditions at each cross section, including the phreatic surface
- Conduct global stability analyses for the required load cases (long-term and drained)
- Conduct veneer stability analyses for the required load cases (long-term and drained)
- Compare results against the acceptance criteria defined in the SAP; for cases (if any) not meeting the acceptance criteria, further assessment will be appropriate per the phased approach defined in the Stability SAP.

Table 1 provides the stability analyses (i.e., load cases) conducted for each CCR unit. In cases where new analyses were not performed, existing analyses adequately address the load case(s) for the unit.

Table 1. Stability Analyses Completed for each CCR Unit

CCR[1] Unit and Condition	Static Cases	
	Long-Term, Global	Long-Term, Veneer[2]
Interim Ash Staging Area (Closed Condition)	–[3]	–[3]
Sluice Trench and Ballfield East of Sluice Trench (Closed Condition)	X	X
Stilling Pond (Closed Condition)	–[4]	–[4]

Notes:

1. CCR = coal combustion residuals
2. Veneer stability is the slope stability of the final cover
3. Stability calculations are not required to demonstrate performance of the closed conditions due to the higher surrounding grade, flat closure grading, and containment towards the east by the Polishing Pond
4. The reassessment of the Stilling Pond closure design includes analyses sufficient to address the necessary load cases.

Details of the analyses performed are presented in the sections below. Graphical stability analysis results are included in Appendix B (global stability) and Appendix C (veneer stability). Supplemental information for characterizing soil parameters are included in Appendix D.

3.0 PHYSICAL SETTING AND SITE HISTORY

3.1 EXISTING CONDITIONS

The Sluice Trench and Ballfield East of Sluice Trench (Figure 1) was capped and closed in 2019. The unit is located along the Emory River, near the intake for the plant. The unit includes a clay embankment dike known as the East Dike, the water quality channel, and a portion of the Polishing Pond. The East Dike forms the southeastern perimeter of the unit. The Engineered Wetlands area is outside the limits of the CCR unit. With respect to the stability of this CCR unit, the focus is on slope failures along the East Dike that could result in a release of CCR to the adjacent river/intake channel.

Figure 1. Sluice Trench and Ballfield East of Sluice Trench, showing East Dike Location

3.2 GEOLOGIC SETTING

The plant is situated on the western edge of the Valley and Ridge Physiographic province near the base of the Cumberland Plateau. Numerous faults, trending northeast to southwest as characteristic of the Valley and Ridge Province, are depicted on the geologic mapping. The plant is positioned between the Chattanooga Fault to the north, and the Kingston Fault to the south.

According to the United States Geological Survey Geologic Map of the Harriman Quadrangle (Moore, Finlayson, and Milici 1993), the plant is underlain by Lower Ordovician and Cambrian age limestone and shale bedrock formations. Although not depicted on the geologic mapping, previous drilling programs at the plant indicate that alluvial deposits consisting of fine sands, silty sands, and sandy silts are present at the site, as are commonly found adjacent to rivers.

The majority of the plant, including the Sluice Trench and Ballfield East of Sluice Trench, is underlain by the Conasauga Shale Formation, which consists of an argillaceous to silty shale with zones of shaley limestone scattered throughout. The geologic mapping indicates this formation is contorted, brecciated, and sheared throughout. The geologic mapping indicates Pine Ridge, just north of the plant, and the northern corner of the Kingston Recovery Project (KRP) Ash Landfill are underlain by the Rome Formation, consisting of arenaceous shale interbedded with very thin siltstone layers and thin beds of sandstone.

3.3 SITE HISTORY

TVA constructed the KIF Plant from 1951 to 1954 and commenced operations in 1954. In 1956, the East Dike was constructed as part of the initial ash disposal area, which includes the footprints of the present-day Sluice Trench and Ballfield East of Sluice Trench and the Interim Ash Staging Area. Construction of the perimeter containment dikes around the former main ash pond were completed in 1958.

The sluice trench was constructed in the late 1960s along the east portion of the initial ash disposal area. The sluice trench was used to sluice ash from the plant to the former main ash pond, which is now within the footprint of the KRP Ash Landfill (Calvert 1967 and 1968). Historical annual inspections (Parrish 1970) reported that the ash was generally sluiced quickly enough from the plant to the main ash pond such that there was minimal ash deposition in the sluice trench.

As part of the KRP, CCR was temporarily staged at the Sluice Trench and the Interim Ash Staging Area. The staged ash was removed in 2015, and as part of the closure a low permeability soil cap was constructed. The closure design of the Interim Ash Staging Area (AECOM 2016a, 2016b, and 2016c) generally leveled the site to conform to the higher surrounding grades, with gentle slopes (3 percent [%] maximum) and small perimeter ditches to promote surface drainage.

In 2015, as part of the cap construction for the Sluice Trench unit, the Sluice Trench was filled in and a new Water Quality Channel was constructed to the southeast along a parallel alignment. The Water Quality Channel was lined with a geomembrane and designed to convey process water to the Stilling Pond (TVA 2015). During the subsequent Polishing Pond construction, the Water Quality Channel was rerouted to convey the process water to the Polishing Pond.

The Polishing Pond was constructed in 2017 over a segment of the former Sluice Trench and a portion of the Ballfield East of Sluice Trench. The area was partially excavated and geosynthetic clay liner and a geomembrane were placed over the area within the limits of the Polishing Pond. Outside the limits of the Polishing Pond, a soil cap was constructed over another segment of the former Sluice Trench and another portion of the Ballfield East of Sluice Trench (AECOM 2016b).

CCR excavated during the closure of the Interim Ash Staging Area, Sluice Trench, and construction of the water quality channel and Polishing Pond was placed in the KRP Ash Landfill.

In 2018, a reverse graded filter and seepage collection system was constructed along the outboard face of the East Dike, as part of a seepage mitigation project (AECOM 2018). The filter and collection system were constructed to mitigate concerns from historical seeps observed along the outboard face of the dike.

In 2019, the last remaining uncapped portion of the Ballfield East of Sluice Trench was regraded and capped with a geomembrane and vegetative soil layer. As part of the regrading effort for the area, a heterogenous mix of CCR and soil was placed as structural fill to prepare the subgrade prior to constructing the cover system. This East Dike Area Closure project (AECOM 2019) capped the corridor between the East Dike and the areas that were already capped as part of the Water Quality Channel and Polishing Pond projects.

3.4 PRIOR SUBSURFACE INVESTIGATIONS

Historical boring and geotechnical data was used to supplement data collected during execution of the Exploratory Drilling (Phase 1 only), Hydrogeological Investigation, and Background Soil SAPs.

The prior subsurface investigations used to support the stability analysis of the Sluice Trench and Ballfield East of Sluice Trench include:

- Stantec (2009) – historical boring logs within the Engineered Wetlands adjacent to the Sluice Trench and Ballfield East of Sluice Trench were used to characterize the strengths and index properties of the foundation soil subunits
- MACTEC (2009) – historical boring logs and laboratory testing from borings along the East Dike at the Sluice Trench and Ballfield East of Sluice Trench were used to characterize the strengths and index properties of the CCR and foundation soil subunits
- Geosyntec (2010a) – historical boring logs and laboratory testing from borings along the East Dike at the Sluice Trench and Ballfield East of Sluice Trench were used to characterize the strengths and index properties of the CCR, embankment dike material, and foundation soil subunits. Data from piezometers installed in these borings were used to develop phreatic surfaces for stability analyses.
- Geosyntec (2010b) – historical boring logs and laboratory testing from borings along the East Dike at the Sluice Trench and Ballfield East of Sluice Trench were used to characterize the strengths and index properties of the foundation soil subunits

- Geosyntec (2012) – historical boring logs and laboratory testing from borings along the East Dike at the Sluice Trench and Ballfield East of Sluice Trench were used to characterize the strengths and index properties of the CCR, embankment dike material, and foundation soil subunits
- AECOM (2016a) – historical boring logs and laboratory testing of soils from borings at the Sluice Trench and Ballfield East of Sluice Trench were used to characterize the strengths and index properties of CCR, embankment dike material, and foundation soil subunits
- AECOM (2016b) – historical boring logs, laboratory testing of soils from borings, and cone penetration test (CPT) soundings at the Sluice Trench and Ballfield East of Sluice Trench were used to characterize the strengths and index properties of CCR, embankment dike material, and foundation soil subunits
- Stantec (2017) – historical boring logs and laboratory testing were used to characterize the strengths and index properties of the foundation soil subunits.

3.5 PRIOR STABILITY ANALYSES

Prior stability analyses, which were reviewed when developing/updating stability models, for the Sluice Trench and Ballfield East of Sluice Trench include the following:

- Geosyntec (2010a): Static long-term global slope stability analysis of the East Dike
- Geosyntec (2010b): Static long-term and seismic (pseudostatic) short-term global slope stability analyses of the East Dike
- Geosyntec (2012): Static long-term global slope stability analysis of the East Dike, incorporating results of additional geotechnical exploration
- AECOM (2016b): Static long-term and seismic (pseudostatic and post-earthquake) short-term global stability analyses of the East Dike and Polishing Pond, incorporating results of additional geotechnical exploration.

The historical analyses of the Drainage and Flow Management Project (i.e., Polishing Pond and Water Quality Channel) constructed within the Sluice Trench and Ballfield East of Sluice Trench unit (AECOM 2016a, 2016b) do not include veneer stability analyses for long-term, drained conditions. Further, these available analyses did not include geometry changes from recent construction of a graded filter and seepage collection system along the outboard slope of the East Dike (AECOM 2017). Therefore, new static (global and veneer) analyses for the existing (with graded filter) conditions were performed. These analyses were performed in accordance with the Stability SAP.

4.0 SUBSURFACE CHARACTERIZATION

4.1 MATERIAL PROPERTIES

Subsurface materials are identified based on the project records, subsurface explorations, laboratory testing, and other available information. A material is a region or zone in the analytical model comprised of an idealized grouping of soil or rock sublayers of similar geologic origin or geotechnical behavior, subject to practical considerations in the analysis. A material is not necessarily a single type of soil or rock and may include significant variability. Field information may identify sub-layers or sub-units within a given material. The key materials (i.e., idealized groupings for characterization) for purposes of seepage and/or stability analyses are represented in Table 2, with the CCR units where the material is located and a brief description. Material delineation/zonation considered the potential for weak or otherwise distinct strata that may affect the static stability analyses. Such strata were modeled as separate materials, if/when appropriate. Physical properties of these materials are described in the subsections below. For context, the selected material parameters are compared to those used in historical analyses (where available, and for information only). For the shale bedrock, relevant material properties are described separately in subsection 4.1.4.

Table 2. Identification of Subsurface Materials at KIF Plant

Material Name	CCR Units	Description
Embankment Fill	Sluice Trench and Ballfield East of Sluice Trench	Compacted clay fill including the starter dike
Fly Ash	Sluice Trench and Ballfield East of Sluice Trench	Fly ash sluiced into the initial ash storage area
Bottom Ash	Sluice Trench and Ballfield East of Sluice Trench	Bottom ash sluiced (early operations) or placed and compacted (later operations); sometimes used as structural fill
Cover Material	Sluice Trench and Ballfield East of Sluice Trench	Compacted soil fill at the surface of the capped portions of the unit
Filter Materials	Sluice Trench and Ballfield East of Sluice Trench	American Society for Testing and Materials (ASTM) C33 concrete sand and Tennessee Department of Transportation (TDOT) No. 78 stone; part of 2018 reverse graded filter on East Dike outboard slope
Riprap	Sluice Trench and Ballfield East of Sluice Trench	TDOT A1 Riprap; part of 2018 reverse graded filter on East Dike outboard slope
Foundation Soil - Subunit 1 (Subunit 1)	Sluice Trench and Ballfield East of Sluice Trench	Natural, alluvial deposits of lean clay to silty lean clay soil
Foundation Soil - Subunit 2 (Subunit 2)	Sluice Trench and Ballfield East of Sluice Trench	Natural, alluvial deposits of silty sand to sandy silt, with no less than about 30% fines
Foundation Soil - Subunit 3 (Subunit 3)	Sluice Trench and Ballfield East of Sluice Trench	Natural, alluvial deposits of sand to silty sand, with less than about 30% fines
Shale[1]	Sluice Trench and Ballfield East of Sluice Trench	Weathered shale bedrock, with dipping beds and occasional layers of limestone

Notes:
1. For the shale bedrock, relevant material properties are described separately in subsection 4.1.4.

4.1.1 General Description and Geologic Origin

4.1.1.1 Embankment Fill

The Embankment Fill is generally described as a silty clay material with some shale fragments, as encountered during historical exploration. The Embankment Fill material was placed during the original construction of the East Dike at the perimeter of the initial ash disposal area, along the KIF Plant intake channel. Record drawings specify that the material should “be fine and relatively impervious,” and that “select firm shale material be placed below the water level” for a portion of the East Dike (TVA 1956). The Embankment Fill extends up to 29 feet (ft) in thickness along the crest of the original alignment of the East Dike.

In previous stability analyses (Geosyntec 2010a, 2012) the Embankment Fill was modeled as two zones, an upper and lower dike fill. The delineation of the zones correlates to a decrease in the Standard Penetration Test blowcounts (i.e., N-values). The delineation of the Embankment Fill was reevaluated as part of this study. The higher blowcounts were attributed to suction-induced strength above the phreatic surface. Otherwise, the upper and lower dike fill materials were similar in type and behavior. Therefore, the material was modeled as one material rather than two.

4.1.1.2 Fly Ash

The Fly Ash material is composed primarily of fine-grained CCR that is generally described as a non-plastic, sandy silt. The Fly Ash was sluiced into the initial ash disposal area, during early operations of the plant. The thickness ranges from four ft adjacent to the Embankment Fill to 15 ft in the interior of the Ballfield East of Sluice Trench.

4.1.1.3 Bottom Ash

The Bottom Ash material is composed primarily of coarse-grained CCR that is generally described as a silty sand to sandy silt. The Bottom Ash was placed during operation of the sluice trench in the Ballfield East of Sluice Trench, over the Fly Ash material. Some bottom ash was sluiced, while some was placed and compacted. Bottom Ash was sometimes used as structural fill, such as in the Polishing Pond perimeter dike. In some instances, bottom ash used as structural fill may contain some fraction of random soil fill. The Bottom Ash extends up to 35 ft thick in the interior of the Ballfield East of Sluice Trench.

4.1.1.4 Cover Material

The Cover Material was placed during the closure of the Sluice Trench and Ballfield East of Sluice Trench as part of the engineered soil cap. The soil was sourced from the “I-40 borrow area”, as detailed in the construction certification report for the closure of the unit (AECOM 2019). Per the closure documentation (AECOM 2019), the cap system consists of 24 inches of protective cover soil, overlying a geocomposite drainage layer (geotextile/geonet/geotextile) and geomembrane (textured 60-mil Linear Low-Density Polyethylene (LLDPE), overlying the CCR material. The geosynthetics were characterized using the typical properties from their respective manufacture product sheets (AGRU 2018 and SKAPS 2017) because no project-specific testing was available.

4.1.1.5 Filter Materials

The Filter Materials include ASTM C33 sand and TDOT No. 78 stone used in the reverse-graded filter constructed as part of the Seepage and Drainage repair along the East Dike (AECOM 2017). In this analysis, it was adequate to model the ASTM C33 sand and TDOT No. 78 stone as one material. The Filter Materials were sourced from the Rogers Roane County Quarry in Harriman, Tennessee (AECOM 2018). The thickness of the Filter Materials varies from two ft up to 3.5 ft along the outboard face of the East Dike.

4.1.1.6 Riprap

The Riprap consists of TDOT A1 Riprap placed as part of the Seepage and Drainage repair along the East Dike (AECOM 2017). The Riprap was sourced from the Rogers Roane County Quarry in Harriman, Tennessee (AECOM 2018). The Riprap was placed in a two-ft-thick layer over the Filter Materials along the outboard face of the East Dike.

4.1.1.7 Foundation Soils

The foundation soils underlying the site were generally more fine-grained, and plastic near the original ground surface and transitioned to a sandier, non-plastic material at greater depths, until bedrock was encountered. The transition between the materials was gradual and, although distinct horizon delineations were not noted, the foundation was divided into three subunits using the criteria listed in the subsections below. The varying presence of the uppermost foundation soil (Subunit 1) has been attributed to the alluvial deposition of the foundation soils.

4.1.1.7.1 Subunit 1

Subunit 1 is generally described as an alluvial, silty, lean clay deposit that comprises the upper portions of the alluvial foundation along the Emory River and intake channel, extending into the interior of the Sluice Trench and Ballfield East of Sluice Trench. Based on historical and TDEC Order borings, the presence and thickness of this subunit is highly variable across the site. Subunit 1 was not encountered in the vicinity of the Polishing Pond but was encountered under the East Dike closer to the intake channel. Where encountered, the thickness of Subunit 1 varies between approximately five ft at the interior of the Ballfield East of Sluice Trench and approximately 10 ft extending into the intake channel.

4.1.1.7.2 Subunit 2

Subunit 2 is generally described as a sandy silt to silty sand with no less than about 30% fines, comprising part of the alluvial foundation at the Sluice Trench and Ballfield East of Sluice Trench. Subunit 2 is continuous across the unit footprint and underlies Subunit 1 (where present). Where Subunit 1 is not present (e.g., the Polishing Pond), Subunit 2 is the uppermost foundation material. Subunit 2 varies in thickness from approximately five to 15 ft.

4.1.1.7.3 Subunit 3

Subunit 3 is generally described as an alluvial silty sand with less than about 30% fines and comprises the lower foundation. This subunit overlies the shale bedrock and varies in thickness from approximately five to 10 ft.

4.1.2 Index Properties, Classification, and Density Parameters

The stability analyses require unit weights (densities) for each material or zone that is modeled. Unit weights for each material are summarized in Table 3. These parameters were derived from available laboratory testing results using the methodology outlined in Appendix D.

Table 3. Density Parameters of the Subsurface Materials at KIF Plant

Material Name	G_s	w (%)	e	γ_d (pcf)	γ_m (pcf)	γ_{sat} (pcf)
Embankment Fill	2.70	23	0.61	104	128	128
Fly Ash	2.51	40	0.96	80	112	112
Bottom Ash	2.67	21	0.68	99	119	124
Cover Material	2.72	30	0.83	92	120	121
Filter Materials	2.77	20	0.65	105	126	130
Riprap	2.65	15	0.65	100	115	125
Subunit 1	2.69	24	0.63	103	127	127
Subunit 2	2.68	21	0.62	103	126	127
Subunit 3	2.74	20	0.56	110	131	132

Notes:

G_s	Specific Gravity of the solids	γ_d	dry unit weight
w	natural, gravimetric water content	γ_m	moist unit weight
e	void ratio	γ_{sat}	saturated unit weight
%	percent	pcf	pounds per cubic foot

The following subsections detail the available data and basis for selecting the density parameters for each material.

4.1.2.1 Embankment Fill

Historical index testing (AECOM 2016b, Geosyntec 2010a and 2010b) is available to characterize the Embankment Fill.

The aggregated historical laboratory testing of the Embankment Fill material produced an average moist unit weight of 128 pounds per cubic foot (pcf) which was selected as the representative moist unit weight for the material. A dry unit weight of 104 pcf was calculated based on the average moist unit weight and moisture content values. The Embankment Fill generally classified per ASTM D2487: *Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)* (USCS) as a sandy, lean clay (CL). The averages of the historical laboratory testing results were also used as the

representative void ratio and specific gravity values (0.61 and 2.70, respectively). The median fines content and average moisture content of the Embankment Fill material were 52%and 23%, respectively. The median fines content was selected due to outliers skewing the average fines content of the material.

The selected values are within the expected range for the material. See Appendix D for additional discussion of typical values. The values are also similar to those used in previous analyses. The supplemental assessment by Geosyntec (2012) used moist unit weights of 125 and 120 pcf for the Upper Dike Fill and Lower Dike Fill, respectively. The unit weight used in the historical analysis by AECOM (2016b) is 132 pcf, for their “Fill: Sandy Silt”, which is analogous to the Embankment Fill.

4.1.2.2 Fly Ash

The Fly Ash material was characterized using data from the Exploratory Drilling SAR and historical index testing (Geosyntec 2010a and 2010b, AECOM 2016b, and MACTEC 2009). Generally, average values from the recent and historical laboratory data were selected for use in the analyses. The Fly Ash material generally classified per USCS as a non-plastic, sandy silt (ML) and had an average fines content of 57 percent and average moisture content of 40%.

The average moist unit weight was 112 pcf. A dry unit weight of 80 pcf was calculated based on the average moist unit weight and moisture content values. The average void ratio and specific gravity from current and historical laboratory testing were also selected as the representative values (0.96 and 2.51, respectively).

The total unit weight for the Fly Ash is similar to the unit weight used in the latest stability from the Polishing Pond Report (AECOM 2016b) of 117 pcf. The Polishing Pond Report modeled the Fly Ash and Bottom Ash as a single material, Ash Fill. The average of the Fly Ash and Bottom Ash unit weights selected for this analysis is equal to the value used for the Ash Fill in the Polishing Pond assessment (AECOM 2016b). The Seepage and Stability Study for the East Dike (Geosyntec 2010a) and Supplemental Assessment of Seepage and Slope Stability (Geosyntec 2012) used a total unit weight of 75 pcf based on recommended values from previous analyses completed at the KIF Plant.

4.1.2.3 Bottom Ash

The Bottom Ash material was characterized using data from the Exploratory Drilling SAR and historical index testing (Geosyntec 2010a and 2010b, AECOM 2016b, and MACTEC 2009). Generally, average values from the recent and historical laboratory data were selected for use in the analyses. The Bottom Ash material generally classified per USCS as a silty sand (SM) to sandy silt (ML) and had an average fines content of 32% and average moisture content of 21%. The average moist unit weight was 119 pcf. The representative dry unit weight (99 pcf) was calculated based on the selected moist unit weight and moisture content values. The selected void ratio and specific gravity values for the Bottom Ash were also based on averages from laboratory data (0.68 and 2.67, respectively).

The selected moist unit weight for the Bottom Ash material is similar to the value (117 pcf) used for the “Ash Fill” materials in the Polishing Pond Engineering Report (AECOM 2016b). The Bottom Ash and Fly Ash were modeled as one material (Ash Fill) by AECOM. If the unit weights assigned herein to the Bottom

Ash and the Fly Ash are averaged, the result is equivalent to the unit weight of the previous Ash Fill. Other historical analyses assumed a lower value (100 pcf) based on limited data.

4.1.2.4 Cover Material

The Cover Material is generally classified as a fat clay with sand and was sourced from a borrow area offsite (I-40, Exit 364). Selected parameters for the Cover Material are based on the construction closure record document (AECOM 2019) for the Sluice Trench and Ballfield East of Sluice Trench. The moist unit weight selected was the average from seven proctor tests performed on seven bulk samples from the borrow site. The void ratio and moisture content were selected based on typical values (Appendix D).

4.1.2.5 Filter Materials

The Filter Materials include ASTM C33 sand and TDOT No. 78 stone (AECOM 2017) used to construct the reverse-graded filter along the East Dike. Properties for the Filter Materials in Table 3 were estimated using typical values.

4.1.2.6 Riprap

The Riprap consists of TDOT A1 Riprap (AECOM 2017). Properties for the Riprap in Table 3 were estimated using typical values.

4.1.2.7 Subunit 1

The Subunit 1 material is comprised of alluvial, plastic, fine-grained soil that classifies per USCS laboratory testing as lean clay (CL). The soil was characterized using data from the Exploratory Drilling SAR and historical index testing (Geosyntec 2010a and 2010b). Generally, average values from the recent and historical laboratory data were selected for use in the analyses. The Subunit 1 material had an average fines content of 79 percent and average moisture content of 24%.

The average moist unit weight was 127 pcf. The selected dry unit weight (103 pcf) was calculated using the selected moist unit weight and moisture content values. From the current and historical laboratory testing, the average void ratio and specific gravity were also selected as the representative values (0.63 and 2.69, respectively).

The moist unit weight for Subunit 1 is similar to that used in historical analyses. The Seepage and Stability Study for the East Dike (Geosyntec 2010a) and Supplemental Assessment of Seepage and Slope Stability (Geosyntec 2012) used a value of 125 pcf. The Polishing Pond Analysis, which modeled the foundation soil as a single unit, used a value of 117 pcf (AECOM 2016b). The selected moist unit weight for Subunit 1 is also similar to the value (125 pcf) used in the Stilling Pond Analysis (Stantec 2020).

4.1.2.8 Subunit 2

Subunit 2 consists of alluvial deposits classified per USCS laboratory testing as silty sand (SM) to sandy silt (ML) with fines content no less than about 30 percent. Historical index testing (Geosyntec 2010a and 2010b, MACTEC 2009, and AECOM 2016b) from various analyses and subsurface explorations was

used to characterize the soil. The Subunit 2 material had an average fines content of 47% and average moisture content of 21%.

The average moist unit weight was 126 pcf. The selected dry unit weight (103 pcf) was calculated using the selected moist unit weight and moisture content values. The average void ratio and specific gravity from historical laboratory testing were selected as the representative values (0.62 and 2.68, respectively).

The moist unit weight for Subunit 2 is similar to the unit weights used in historical stability analyses. The Seepage and Stability Study for the East Dike (Geosyntec 2010a) and Supplemental Assessment of Seepage and Slope Stability (Geosyntec 2012) used a value of 125 pcf. The Polishing Pond Analysis, which modeled the foundation soil as a single unit, used a value of 117 pcf (AECOM 2016b). The moist unit weight assigned to Subunit 2 is similar to the value (125 pcf) used in the KIF Plant Stilling Pond Stability Analysis (Stantec 2020).

4.1.2.9 Subunit 3

Subunit 3 consists of alluvial deposits classified per USCS laboratory testing as silty sand (SM) to sandy silt (ML) with fines content of less than about 30 percent. Historical index testing (Geosyntec 2010a and 2010b, AECOM 2016b) from various analyses and subsurface explorations was used to characterize the soil. The Subunit 3 material had an average fines content of 28% and average moisture content of 20%.

The average moist unit weight was 131 pcf. The selected dry unit weight (110 pcf) was calculated using the selected moist unit weight and moisture content values. The average void ratio and specific gravity from historical laboratory testing were selected as the representative values (0.56 and 2.74, respectively).

The selected moist unit weight for Subunit 3 is higher than the unit weights used in historical stability analyses. The Seepage and Stability Study for the East Dike (Geosyntec 2010a) and Supplemental Assessment of Seepage and Slope Stability (Geosyntec 2012) used a value of 120 pcf. The Polishing Pond Analysis, which modeled the foundation soil as a single unit, used a value of 117 pcf (AECOM 2016b). The moist unit weight assigned to Subunit 3 for the KIF Plant Stilling Pond Stability Analysis is 127 pcf (Stantec 2020).

4.1.3 Drained Strengths for Static, Long-term Conditions

Drained strength (effective stress) parameters, defined in terms of drained friction angle (φ') and drained cohesion (c'), for the subsurface materials under static, long-term conditions are summarized in Table 4. Determination of these parameters for each material is described in the subsections below. Background information, typical values, correlations, and measurement methods for characterizing the drained shear strength of soils are discussed in Appendix D. See Section 6.1.8 for discussion on how the drained strengths are applied in the stability model.

Table 4. Drained Shear Strength Parameters for the Analysis of Static, Long-term Conditions, for the Subsurface Materials at KIF Plant

Material Name	ϕ' (deg)	c' (tsf)
Embankment Fill	36	0
Fly Ash	34	0
Bottom Ash	37	0
Cover Material[1]	19	0
Filter Materials	33	0
Riprap	40	0
Subunit 1	32	0
Subunit 2	35	0
Subunit 3	37	0

Notes:

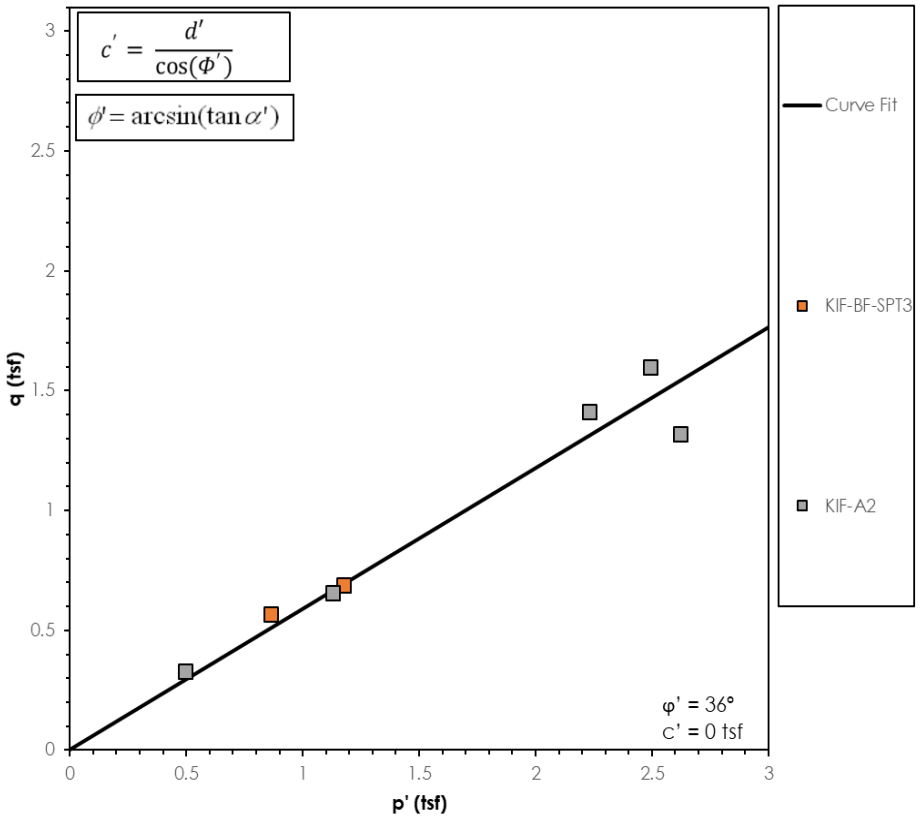
ϕ'	drained friction angle	c'	drained cohesion
deg	degrees	tsf	tons per square foot

1. To account for possible sliding along the geosynthetic interface within the cap system the cover system strength was assumed to be (φ' = 16° and c' = 0) in the global stability analyses.

4.1.3.1 Embankment Fill

Drained strength (effective stress) parameters for the Embankment Fill under static, long-term conditions are presented on Figure 2. Determination of these parameters is described below.

Figure 2. Drained Failure Stresses and Strength Envelope from Triaxial Compression Tests on Embankment Fill



The selected strength envelope (c' = 0 tons per square foot (tsf) and φ' = 36º) is plotted with the isotropically consolidated undrained (CU) triaxial compression data from tests performed on undisturbed samples of the Embankment Fill as part of historical investigations (Geosyntec 2010a and AECOM 2016b). The data was obtained using maximum effective principal stress ratio as the failure criterion. The labels on Figure 2 indicate from which boring the samples were obtained.

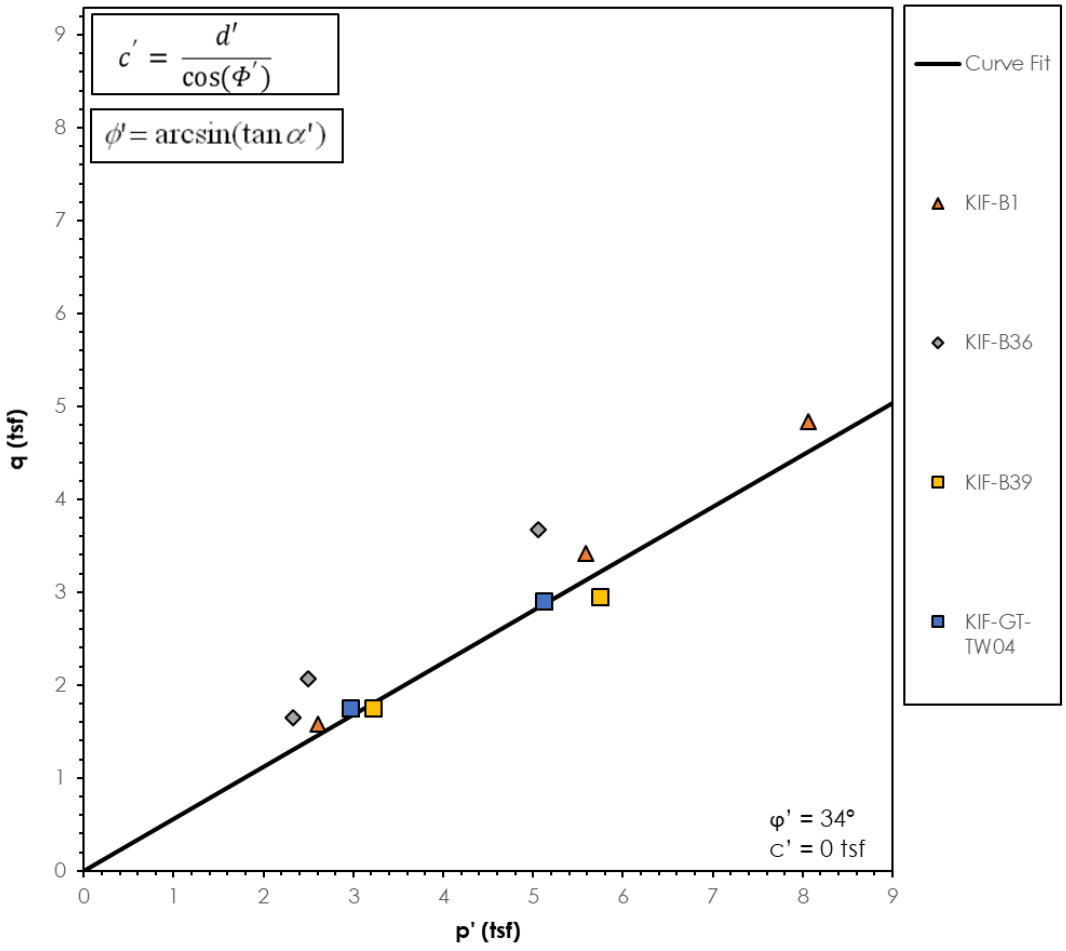
In total, data is available from seven CU triaxial tests. Overall, the data generally plots along a linear trend. The assigned strength parameters were selected by fitting the CU data per the two-thirds best fit rule (Appendix D).

The selected strength parameters (c' = 0 tsf and φ' = 36º) compare well to strengths used in historical analyses. The Supplemental Stability Assessment of the Slope Stability of the East Dike used CPT correlations estimate a friction angle range of 33 to 41 degrees, while conservatively using a 32-degree friction angle in the analysis (Geosyntec 2012). The Polishing Pond stability analysis similarly used a friction angle of 32 degrees based on CU triaxial data collected during the geotechnical exploration of the area (AECOM 2016a).

4.1.3.2 Fly Ash

Drained strength (effective stress) parameters for the Fly Ash under static, long-term conditions are presented on Figure 3. Determination of these parameters is described below.

Figure 3. Drained Failure Stresses and Strength Envelope from Triaxial Compression Tests on Fly Ash



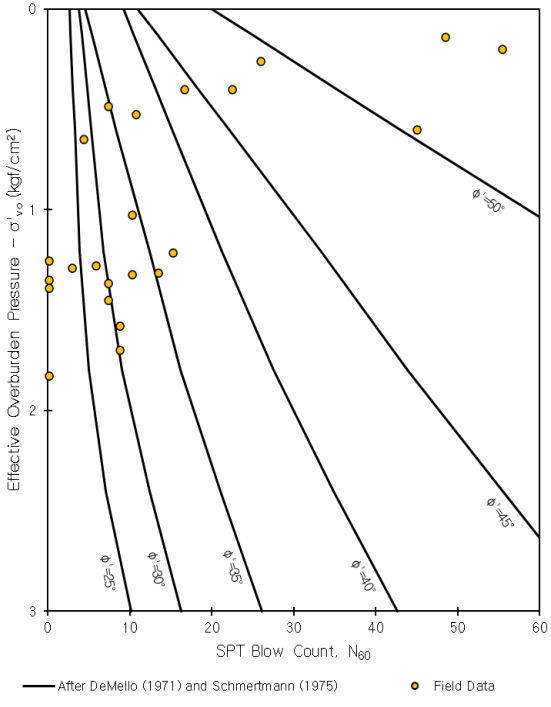
The selected strength envelope (c' = 0 tsf and φ' = 34°) is plotted with the CU data from tests performed on undisturbed samples of the Fly Ash as part of the Exploratory Drilling SAR and historical investigations (MACTEC 2009 and Geosyntec 2010a). The data was obtained using maximum effective principal stress ratio as the failure criterion. The labels on Figure 3 indicate from which boring the samples were obtained.

In total, data is available from 10 CU triaxial compression tests. Overall, the data is grouped along a general linear trend. The assigned strength parameters were selected by fitting the CU data per the two-thirds best fit rule.

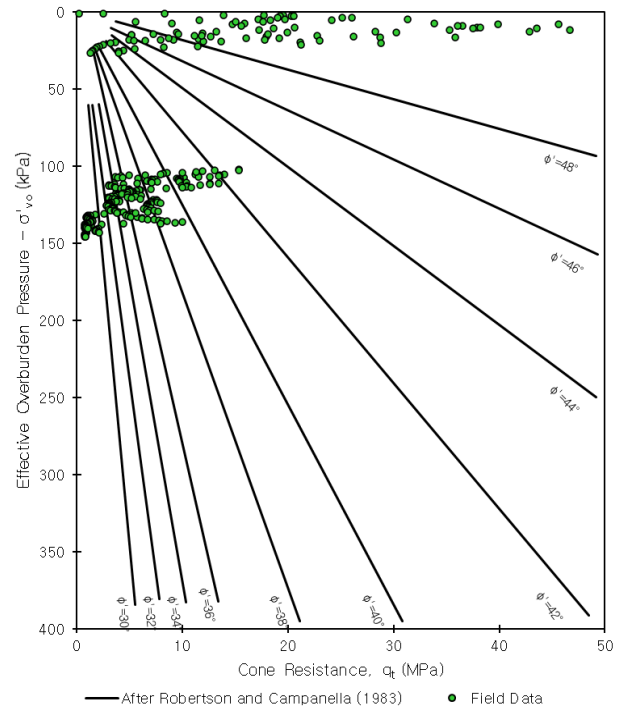
Compared to the strengths used in the historical stability analyses, the assigned strength parameters (c' = 0 tsf and φ' = 34º) in this analysis are slightly higher. The Initial and Supplemental Assessments of the Slope Stability of the East Dike used a friction angle of 25 degrees based on earlier assessments of "Soft Pond Ash", however it is noted that "these values are conservative compared to the laboratory testing results" (Geosyntec 2010a and 2012). In the historical Polishing Pond stability, the Bottom Ash and Fly Ash were modeled as a single material with a friction angle of 32 degrees.

Drained strength parameters were also estimated using empirical correlations for standard penetration test (SPT) (DeMello 1971 and Schmertmann 1975) and CPT (Robertson and Campenella 1983) data. The data, which is from historical field explorations, is shown on Figure 4 with the correlations. While acknowledging the significant data scatter, the data from both correlations was compiled and produced an average drained friction angle of 35 degrees, as shown on Figure 4.

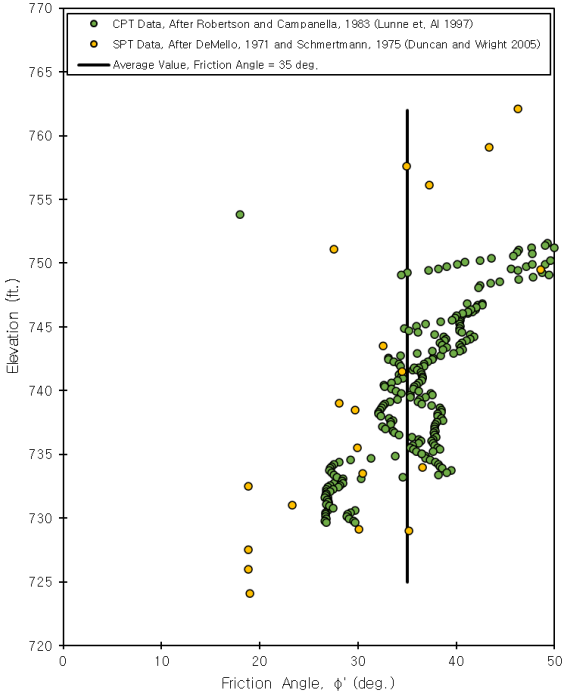
Figure 4. Empirical correlations for the drained friction angle for Fly Ash based on SPT data (left) and CPT data (center). The data is presented together versus elevation (right), with the average drained friction angle of 35 degrees shown.



Duncan, J. M, and Wright, S. G. (2005). Soil Strength and Slope Stability. John Wiley and Sons, Hoboken, New Jersey.



Lunne, T., Robertson, P. K., and Powell, J. J. M. (1997). Cone Penetration Testing in Geotechnical Practice. Spon Press, London.

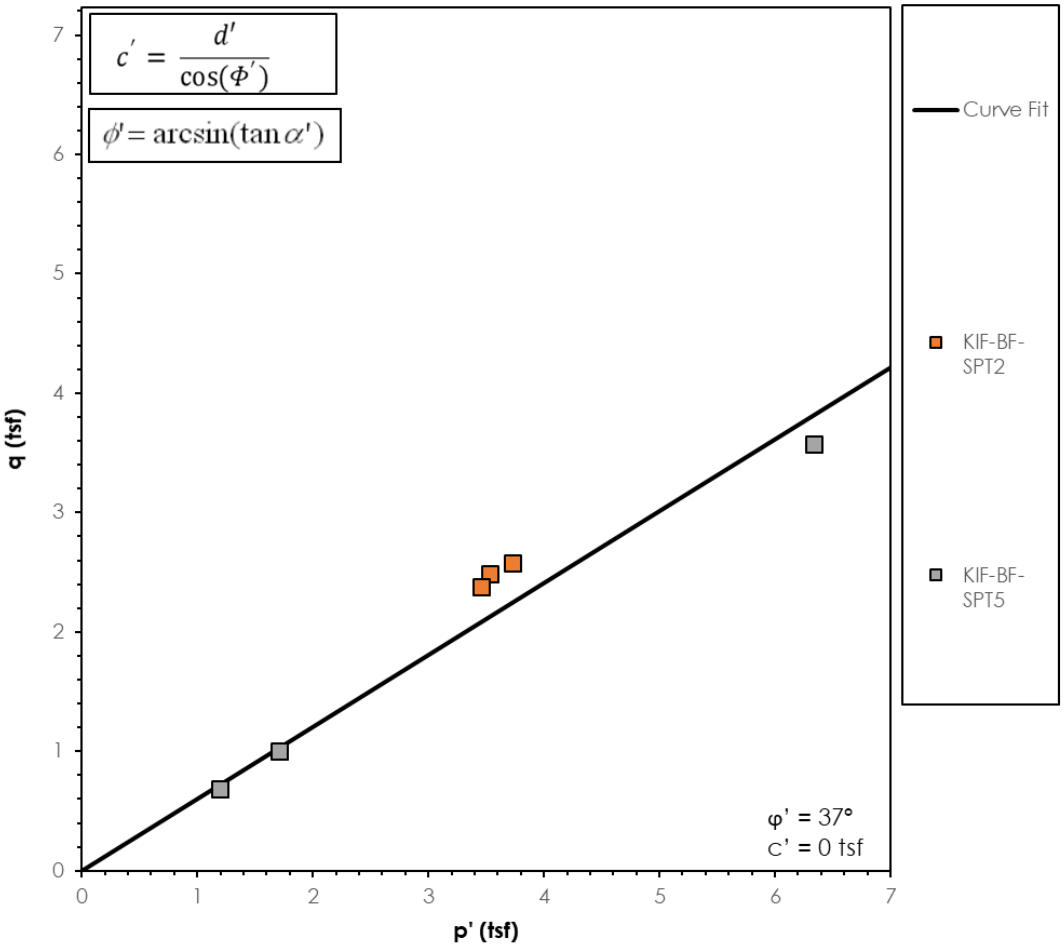


Lunne, T., Robertson, P. K., and Powell, J. J. M. (1997). Cone Penetration Testing in Geotechnical Practice. Spon Press, London.
Duncan, J. M, and Wright, S. G. (2005). Soil Strength and Slope Stability. John Wiley and Sons, Hoboken, New Jersey.

4.1.3.3 Bottom Ash

Drained strength (effective stress) parameters for the Bottom Ash under static, long-term conditions are presented on Figure 5. Determination of these parameters is described below.

Figure 5. Drained Failure Stresses and Strength Envelope from Triaxial Compression Tests on Bottom Ash



The selected strength envelope (c' = 0 tsf and φ' = 37°) is plotted with the CU data from tests performed on undisturbed samples of the Bottom Ash as part of historical investigations (AECOM 2016a). The data was obtained using maximum effective principal stress ratio as the failure criterion. The labels on Figure 5 indicate from which boring the samples were obtained.

In total, data is available from six CU triaxial compression tests. Overall, the data generally plots along a linear trend. Based on the scatter of the CU data and a relatively small data set, an exact two-thirds fit could not be achieved. The assigned strength parameters were selected by approximating a two-thirds fit.

The assigned strength parameters (c' = 0 tsf and φ' = 37º) are higher than what was used in historical stability analyses. The Initial and Supplemental Assessments of the Slope Stability of the East Dike used a friction angle of 30 degrees based on limited data (Geosyntec 2010a and 2012). The historical Polishing Pond stability analysis did not delineate between the Fly Ash and Bottom Ash materials and modeled them as one material with an assigned friction angle of 32 degrees (AECOM 2016b).

4.1.3.4 Cover Material

The Cover Material can generally be classified as a fat clay with sand. The selected strength (φ' = 19º and c'=0) is based on typical values (Figure 3 in Appendix D). The Cover Material is modeled with a lower drained strength (φ' = 16º and c'=0) in the global stability analysis to account for the geosynthetics interface in the cover system.

4.1.3.5 Filter Materials

The Filter material is composed of both ASTM C33 Sand and TDOT No. 78 stone used to create the reverse graded filter. The drained strengths for the material (φ' = 33º and c' = 0) were selected based on typical values and correlations relating classification and dry unit weight to internal friction angle (Naval Facilities Engineering Command 1986), shown in Appendix D.

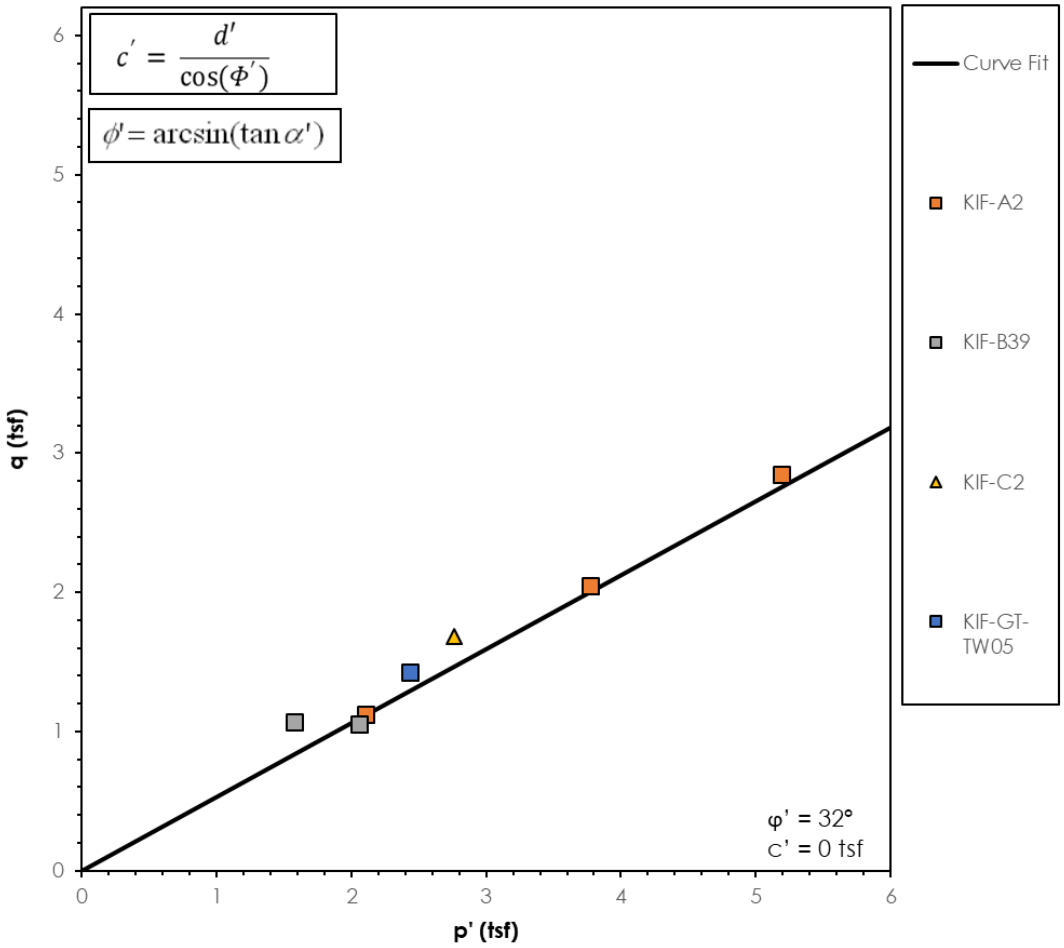
4.1.3.6 Riprap

A drained friction angle of φ' = 40º was selected (with c' = 0) based on typical values (Appendix D).

4.1.3.7 Subunit 1

Drained strength (effective stress) parameters for Subunit 1 under static, long-term conditions are presented on Figure 6. Determination of these parameters is described below.

Figure 6. Drained Failure Stresses and Strength Envelope from Triaxial Compression Tests on Subunit 1



The selected strength envelope (c' = 0 tsf and φ' = 32º) is plotted with the CU data from tests performed on undisturbed samples of Subunit 1 as part of the Exploratory Drilling SAR and historical investigations (MACTEC 2009 and Geosyntec 2010a and 2010b). The data was obtained using maximum effective principal stress ratio as the failure criterion. The labels on Figure 6 indicate from which boring the samples were obtained.

In total, data is available from seven CU triaxial compression tests. Overall, the data is grouped along a linear trend. The assigned strength parameters were selected by fitting the CU data per the two-thirds best fit rule.

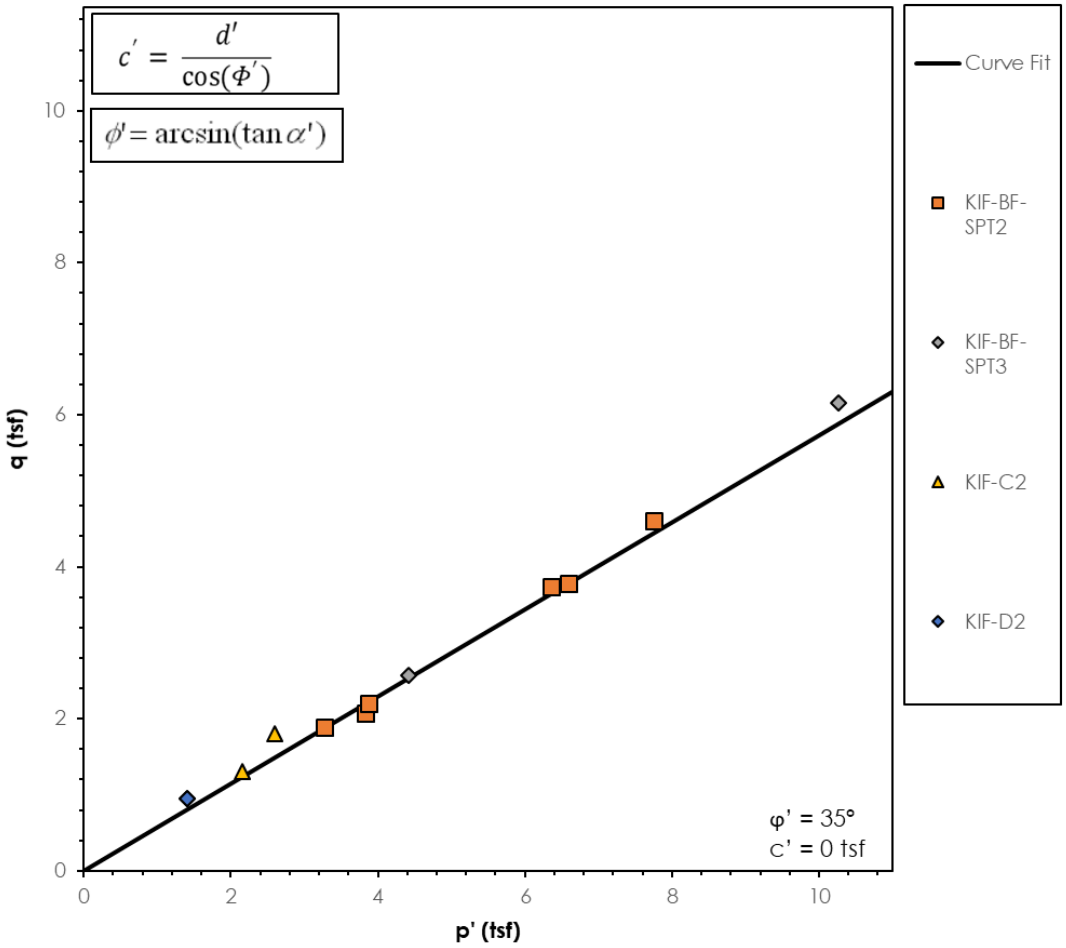
The selected strength parameters (c' = 0 tsf and φ' = 32º) compare well to the strength parameters used in the Polishing Pond Stability Analysis (AECOM 2016a). The report used a drained friction angle of 33 degrees derived from laboratory data; however, the foundation soil was modeled as one material rather than divided into subunits. The Initial Assessment of the Slope Stability of the East Dike (Geosyntec 2010a) used a drained friction angle of 30 degrees based on laboratory data. The Supplemental

Assessment of the Slope Stability of the East Dike (Geosyntec 2012) used only cohesion (0.9 tsf) to represent the strength for Subunit 1; the strength was calculated using correlations for CPT data. The Stilling Pond Updated Seismic Performance (Stantec 2020) assigned a similar drained friction angle of 35 degrees to Subunit 1, based on laboratory data.

4.1.3.8 Subunit 2

Drained strength (effective stress) parameters for Subunit 2 under static, long-term conditions are presented on Figure 7. Determination of these parameters is described below.

Figure 7. Drained Failure Stresses and Strength Envelope from Triaxial Compression Tests on Subunit 2



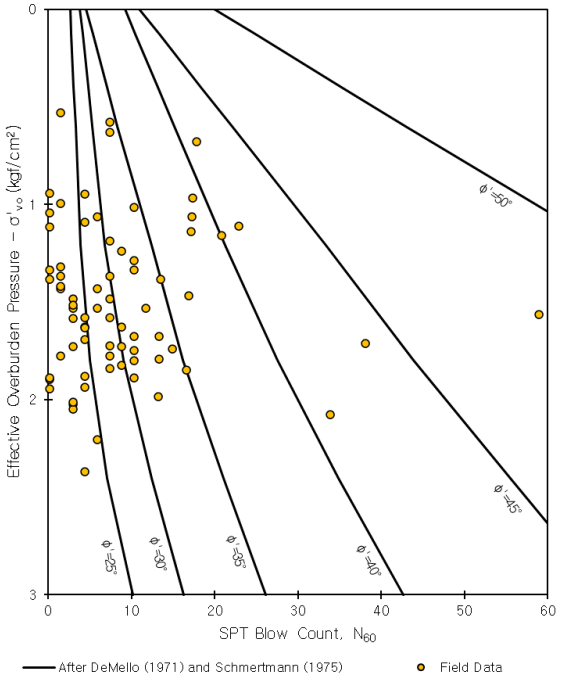
The selected strength envelope (c' = 0 tsf and φ' = 35º) is plotted with the CU data from tests performed on undisturbed samples of Subunit 2 as part of the historical investigations (Geosyntec 2010b and AECOM 2016b). The data was obtained using maximum effective principal stress ratio as the failure criterion. The labels on Figure 7 indicate from which boring the samples were obtained.

In total, data is available from 12 CU triaxial compression tests. Overall, the data is grouped along a linear trend. The assigned strength parameters were selected by fitting the CU data per the two-thirds best fit rule.

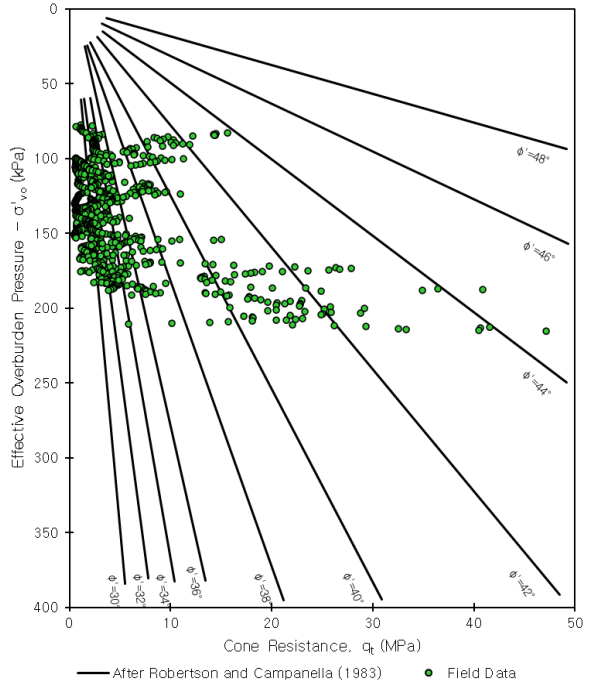
Compared to the strengths used in the historical stability analyses, the assigned strength parameters (c' = 0 tsf and φ' = 35º) in this analysis are slightly higher. The Initial and Supplemental Assessments of the Slope Stability of the East Dike conservatively used a drained friction angle of 30 degrees but reported CPT data that correlated to a friction angle of approximately 35 degrees (Geosyntec 2010a and 2012). In the Polishing Pond Stability Analysis (AECOM 2016a), the foundation soil was modeled as a single material with a drained friction angle of 32 degrees. The Stilling Pond Updated Seismic Performance (Stantec 2020) assigned a drained friction angle of 26 degrees to Subunit 2, based on Figure 3 in Appendix D.

Drained strength parameters were also estimated using empirical correlations for SPT (DeMello 1971 and Schmertmann 1975), and CPT (Robertson and Campenella 1983) data. The data, which is from historical field explorations, is shown on Figure 8. The data from both correlations was compiled and produced an average drained friction angle of 32 degrees, not significantly different from the selected value of 35 degrees that was based on the laboratory CU data. The average of the correlations is also shown on Figure 8.

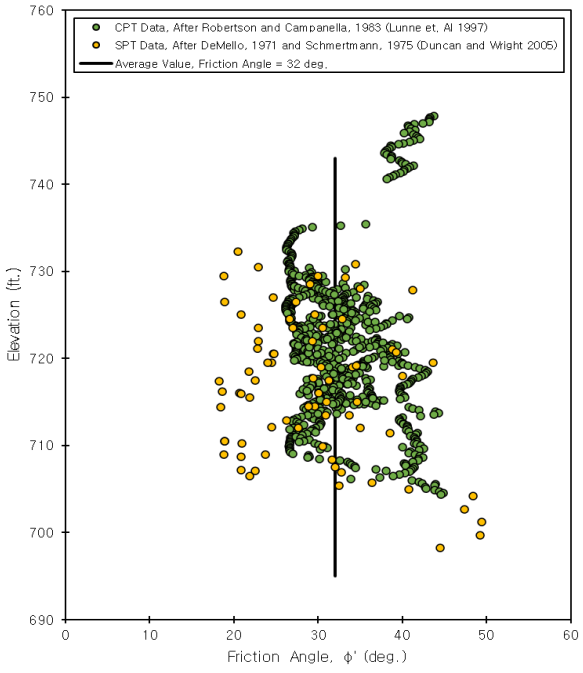
Figure 8. Empirical correlations for the drained friction angle for Subunit 2 based on SPT data (left) and CPT data (center). The data is presented together versus elevation (right), with the average drained friction angle of 32 degrees shown.



Duncan, J. M. and Wright, S. G. (2005). Soil Strength and Slope Stability. John Wiley and Sons, Hoboken, New Jersey.



Lunne, T., Robertson, P. K., and Powell, J. J. M. (1997). Cone Penetration Testing in Geotechnical Practice. Spon Press, London.

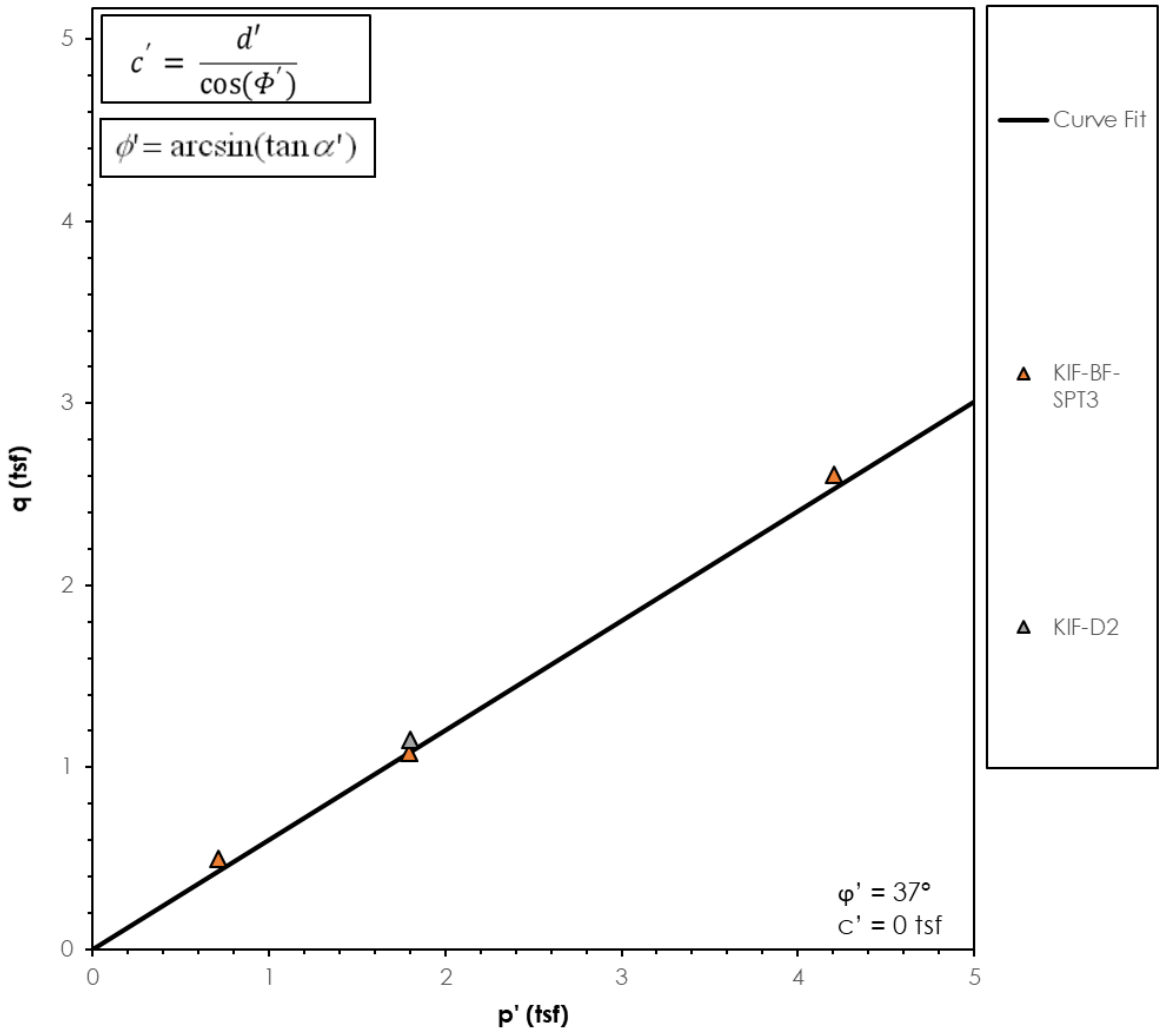


Lunne, T., Robertson, P. K., and Powell, J. J. M. (1997). Cone Penetration Testing in Geotechnical Practice. Spon Press, London.
Duncan, J. M. and Wright, S. G. (2005). Soil Strength and Slope Stability. John Wiley and Sons, Hoboken, New Jersey.

4.1.3.9 Subunit 3

Drained strength (effective stress) parameters for Subunit 3 under static, long-term conditions are presented on Figure 9. Determination of these parameters is described below.

Figure 9. Drained Failure Stresses and Strength Envelope from Triaxial Compression Tests on Subunit 3



The selected strength envelope (c' = 0 tsf and φ' = 37º) is plotted with the CU data from tests performed on undisturbed samples of Subunit 3 as part of the historical investigations (Geosyntec 2010b and AECOM 2016b). The data was obtained using maximum effective principal stress ratio as the failure criterion. The labels on Figure 9 indicate from which boring the samples were obtained.

In total, data is available from four CU triaxial compression tests. Overall, the data generally plots along a linear trend. The assigned strength parameters were selected by fitting the CU data per the two-thirds best fit rule.

The assigned strength parameters (c' = 0 tsf and φ' = 37º) are similar to the historical Initial and Supplemental Assessments of the Slope Stability of the East Dike (Geosyntec 2010a and 2012), which used a drained friction angle of 35 degrees. CPT correlations performed as part of the analysis resulted in a friction angle range of 37 to 43 degrees. In the historical Polishing Pond stability analysis, the foundation soil was modeled as a single material, which had a drained friction angle of 32 degrees (AECOM 2016b). The Stilling Pond Updated Seismic Performance (Stantec 2020) assigned a similar drained friction angle of 34 degrees to Subunit 3, based on SPT and CPT data.

4.1.4 Shear Strength of Bedrock

The dip of the shale bedrock is to the southeast, which is in the outboard direction relative to the East Dike. This orientation of the bedding planes increases the resistance to sliding within the bedrock. Based on the depth to bedrock, bedding plane orientation, and relative material strengths of the overlying soils, the shale bedrock is modeled as impenetrable in these analyses. See Section 6.1.4 for discussion on how impenetrable materials are considered in the global stability models.

4.2 ANALYSIS CROSS SECTIONS

The stability analyses are performed for the specific cross sections listed in Table 5 and shown on Figure 10. Per the Stability SAP, the selected locations represent critical cross sections based on reviews of previous stability analysis results, subsurface stratigraphy, material properties, and structure geometry. If the previously used cross sections were not considered representative for the new analyses, sections were updated or new cross sections were developed using available site-specific data (including data from the Exploratory Drilling SAR). The following subsections present the specific basis for the selection of each section.

Table 5. Analyzed Cross Sections at KIF Plant

CCR Unit	Cross Section	Notes
Sluice Trench and Ballfield East of Sluice Trench	A-A'	Southwest portion of the East Dike near the intake channel at KIF Plant
Sluice Trench and Ballfield East of Sluice Trench	Polishing Pond	Central portion of the East Dike, including the Polishing Pond but excluding the Engineered Wetlands
Sluice Trench and Ballfield East of Sluice Trench	Typical (veneer only)	Representative section for veneer stability analysis; steep portion of the Polishing Pond section.

The previous global slope stability analysis results (Geosyntec 2010a, 2010b, and 2012, AECOM 2016a) for the Sluice Trench and Ballfield East of the Sluice Trench were reviewed to identify the critical cross section(s) for the static, long-term loading condition. Geosyntec (2010a, 2010b, and 2012) included static, long-term global stability analyses for four cross sections (Sections A, B, C, D) at the Sluice Trench and Ballfield East of the Sluice Trench. The lowest factors of safety for global stability (for the existing condition at that time) were reported at Section A (FS=1.7) and Section B (FS=1.6). During the planning and design of the Polishing Pond, AECOM (2016a) analyzed the "Polishing Pond" cross section, which is located near Geosyntec's Section B. For the static long-term global stability, the AECOM (2016a) analysis considered a slip surface intercepting the Polishing Pond pool (FS=3.8) and a slip surface limited to the outboard toe of the East Dike (FS=2.1), so the results are not directly comparable to the slip surface criteria used herein. Since the previous analyses, the Polishing Pond has been constructed and the

Sluice Trench and Ballfield East of Sluice Trench has been regraded (including fill placed between the Polishing Pond and the East Dike) and capped with geosynthetics and cover soil (AECOM 2019). The outboard slope of the East Dike was also modified for seepage mitigation purposes (AECOM 2017). Based on the historical analysis results and the current unit geometry, Section A-A' and the "Polishing Pond" were selected as the critical cross sections to represent the static, long-term global stability for existing conditions at the Sluice Trench and Ballfield East of Sluice Trench.

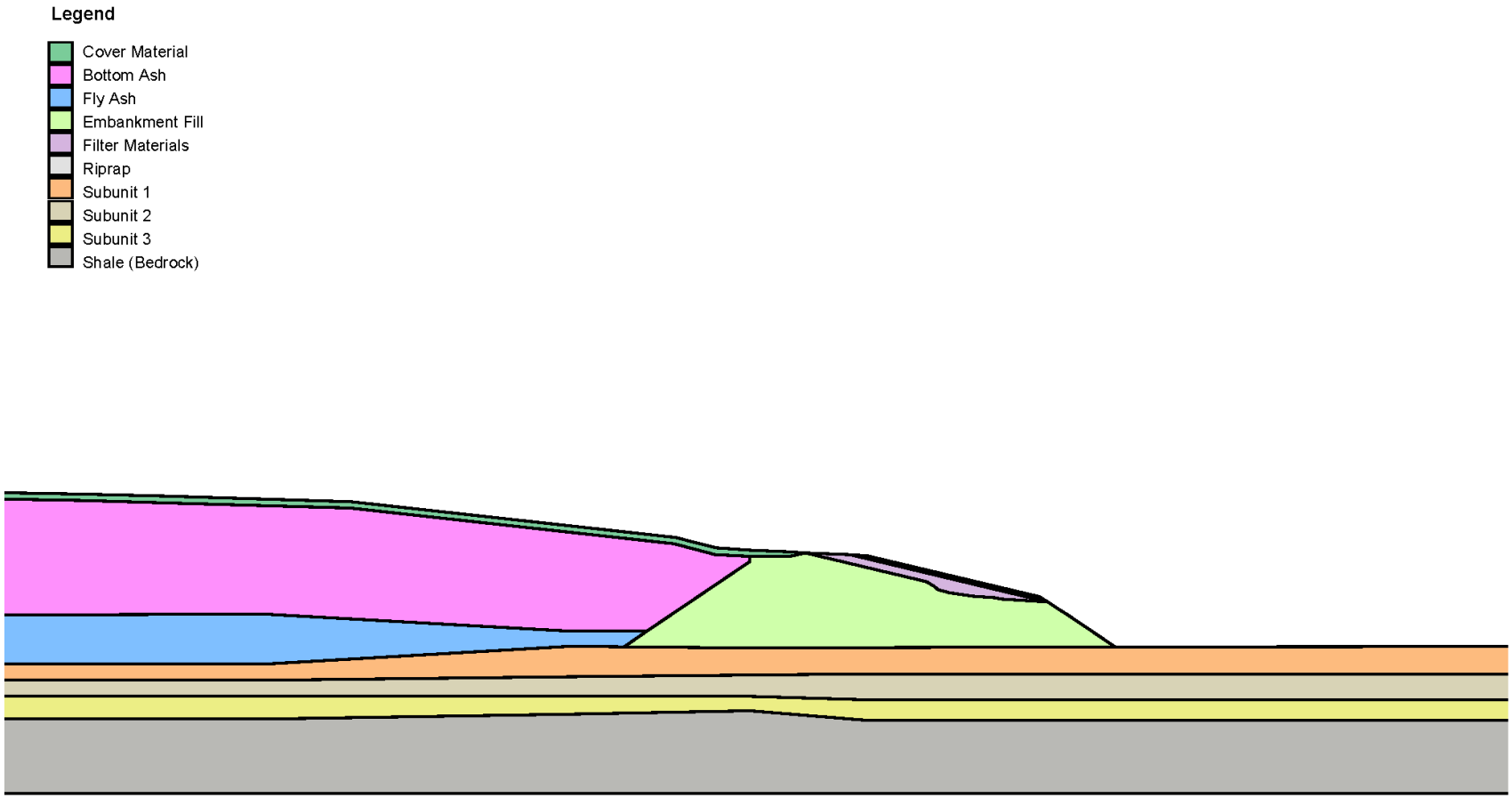
Figure 10. Cross section locations

4.2.1 Cross Section A-A': Basis for Selection

Cross section A-A' was selected to represent the typical slope geometry of the portion of the East Dike near the intake channel. This section was previously analyzed by Geosyntec (2010a and 2012). Since the previous analyses, the Sluice Trench and Ballfield East of Sluice Trench has been regraded and capped with geosynthetics and cover soil (AECOM 2019). The outboard slope of the East Dike was also modified for seepage mitigation purposes (AECOM 2017).

The geometry of the groundline was developed by combining the plant-wide LiDAR survey, completed in 2017, and the top of ground survey (i.e., as-built survey) completed as part of the seepage mitigation construction at the East Dike. The original design drawings depict the geometry and extents of the material used in the construction of the East Dike, which is comprised of lean clay fill, with some shale fragments. The outboard face of the dike has a reverse graded filter, which consists of Filter Materials between the Embankment Fill and Riprap. The Cover Material represents the cap system installed over the Fly Ash and Bottom Ash materials on the inboard side of the East Dike. The section is underlain by alluvial foundation soil, beginning with an alluvial clay (Subunit 1) transitioning to silty sand (Subunits 2 and 3). Figure 11 shows the analysis section with the various materials color-coded for ease of review.

Figure 11. Materials in Stability Analysis Section A-A

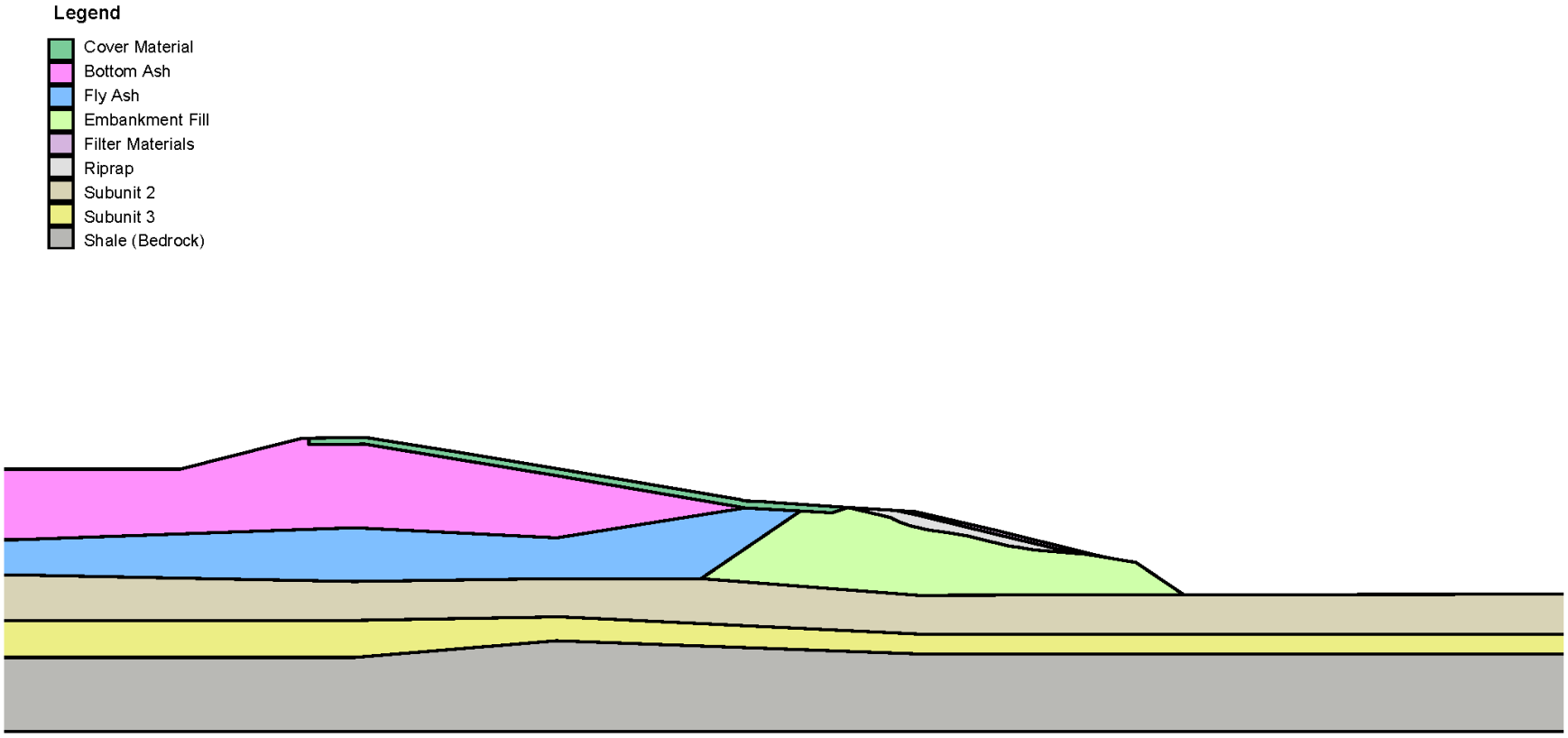


4.2.2 Cross Section “Polishing Pond”: Basis for Selection

Cross section “Polishing Pond” was selected to represent the typical section of the East Dike that includes the Polishing Pond but excludes the buttressing effect of the Engineered Wetlands. This section was previously analyzed by AECOM (2016a) during the planning and design of the Polishing Pond; however, since the previous analyses, the Sluice Trench and Ballfield East of Sluice Trench has been regraded (including fill placed between the Polishing Pond and the East Dike) and capped with geosynthetics and cover soil (AECOM 2019). The outboard slope of the East Dike was also modified for seepage mitigation purposes (AECOM 2017).

Similar to Section A-A’, the geometry was derived from previous surveys of the area and historical design drawings. The previous surveys of the area include the top of subgrade and top of grade completed as part of the seepage mitigation construction of the East Dike, in addition to the LiDAR survey of KIF Plant completed in 2017. Additionally, the record drawings for the newly constructed Polishing Pond were used to update the slope and pond geometry. The outboard face of the dike also has a reverse-graded filter, which consists of Filter Materials placed on the outboard face of the Embankment Fill and covered with Riprap. The Polishing Pond was constructed overtop of the Fly Ash and Bottom Ash, which is retained by the East Dike. The section is underlain by alluvial foundation soil, beginning with alluvial sandy silt (Subunit 2) and transitioning to a silty sand (Subunit 3) above bedrock. As noted in Section 4.1.1.7, Subunit 1 is generally absent in this vicinity and was not modeled. Figure 12 shows the analysis section with the various materials color-coded for ease of review.

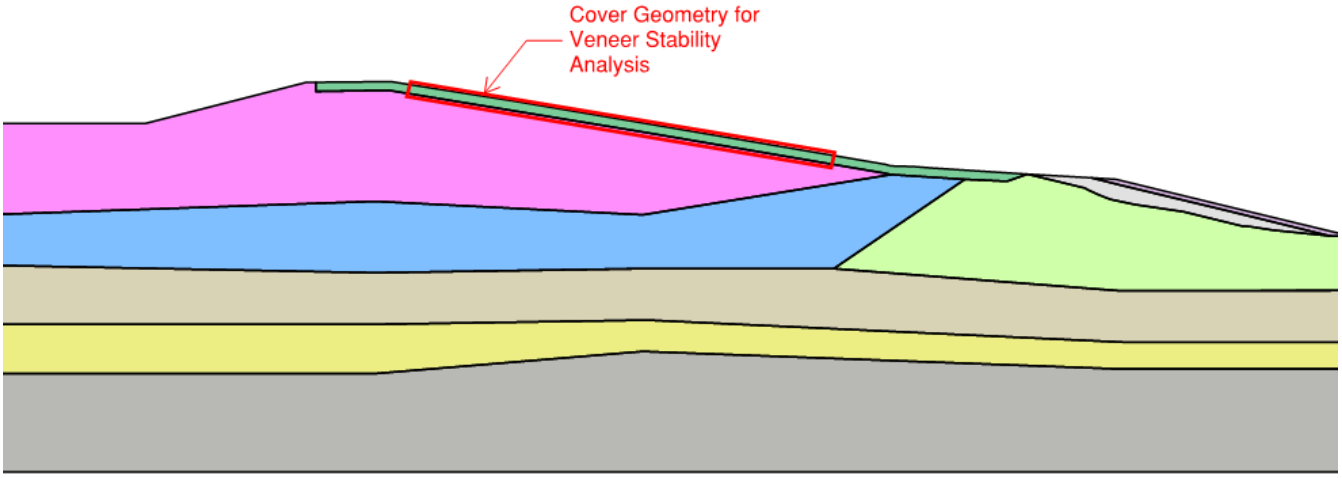
Figure 12. Materials in Stability Analysis Section "Polishing Pond"



4.2.3 Typical Section for Veneer Stability: Basis for Selection

The veneer stability was evaluated at the steepest section within the unit (Figure 13), along the Polishing Pond section, with the 2.0 ft of soil above the geosynthetic components, where the mid-slope angle is 10 degrees and the mid-slope height is 11.2 ft above the access road.

Figure 13. Selected geometry for Veneer Stability analyses



5.0 LOADING CONDITIONS AND ACCEPTANCE CRITERIA

5.1 LOAD CASES, PHASED ASSESSMENT, AND ACCEPTANCE CRITERIA

The load cases, phased assessment, and acceptance criteria presented here were approved in the EIP (Stantec 2018b). The Stability SAP (2018a) contains a detailed explanation of the basis for the load cases and acceptance criteria.

The load cases to be evaluated in the stability analyses are based on conventional practice and appropriate industry standards for landfills and surface impoundments, as applicable.

- Static, long-term (i.e., normal operation conditions) global stability
- Static, long-term veneer (i.e., final cover) stability.

The stability analyses defined in the Stability SAP are performed using a phased assessment process. Initial phases employ available site information, simplified analysis methods, and more conservative acceptance criteria. If acceptable performance is demonstrated, the analyses for the particular load case(s) are then complete. If not, the next phase may include collection of additional site information and/or more advanced analysis methods. Less conservative acceptance criteria may be utilized, commensurate with the improved site characterization. The process may continue through multiple phases, as outlined in the Stability SAP. The use of a phased approach is consistent with industry standard engineering practices.

The load cases and acceptance criteria presented herein (Table 6) apply specifically for the TDEC Order. The same CCR units may also be subject to other requirements (which may be more or less stringent) for compliance with other regulations such as state permitting, CCR Rule, etc. This Stability SAR documents Phase 1 TDEC Order stability assessments as noted in Table 1. The process for a Phase 1 assessment is as follows:

Phase 1 Assessment

- Use available geotechnical data SPT, CPT, laboratory testing, etc.
    - Where geotechnical data is insufficient, collect supplemental data
- Compute static, long-term factor of safety (global, FS_{static} and veneer, $FS_{static\text{-}veneer}$ slope stability)
- Performance is acceptable if the following criteria are met
    - $FS_{static} \geq 1.5$
    - $FS_{static\text{-}veneer} \geq 1.5$
- If any load cases do not meet criteria, go to Phase 2 (refer to Stability SAP).

Refer to the Stability SAP (Stantec 2018a) for discussion of other phases of stability assessment.

Table 6. Summary of Load Cases and Acceptance Criteria

Load Case	Pool Levels	Incipient Motion	Analysis	Soil Strengths	Pore Pressures	Acceptance Criteria
Static, Long-Term, Global and Veneer	Impoundment (where applicable): Normal Operating Pool Adjacent Reservoir: Winter Pool	Inboard (Impoundments Only) and Outboard	Drained	Drained Static	Seepage for Modeled Pool Levels and/or Piezometer Data	FS ≥ 1.5

5.2 POOL LEVELS AND PORE WATER PRESSURES

Table 7 presents the pool levels and the basis of the phreatic surfaces used to predict pore pressures in the slope stability analyses.

For static, long-term load cases, the pool within an impoundment (where applicable) is the normal operating pool. The pool in the adjacent body of water (e.g., river or reservoir) is the normal operating pool (Summer or Winter Pool, whichever is more conservative) for the reservoir.

The slope stability analyses require pore water pressures for computing effective consolidation stresses, as defined for the load conditions. Pore water pressures were estimated by assigning a piezometric line to the cross section, based, in part, on available site-specific piezometer data.

Consideration of both estimated pore water pressures and adjacent reservoir pool levels (where applicable) will generally encompass the phreatic conditions that will be experienced by the unit.

Table 7. Pool Levels and Phreatic Surfaces at KIF Plant

CCR Unit	Pool Levels		Basis of Phreatic Surface
	Impoundment	Adjacent Water Body	
Sluice Trench and Ballfield East of Sluice Trench	N/A	Emory River/Intake Channel	Nearby temporary well and piezometer data. Construction records for seepage mitigation system along East Dike.

The Emory River (including the Intake Channel for the KIF Plant) is adjacent to the East Dike at each cross section. The Emory River joins the Tennessee River just downstream of the site, both of which are then impounded by Watts Bar Dam approximately 38 miles downstream from the KIF Plant. The headwater of Watts Bar Dam varies seasonally per a prescribed operating guide, which includes target elevations for Winter and Summer Pools. The annual operating guide for Watts Bar Dam targets the Winter Pool, which is approximately five feet lower than the targeted Summer Pool, from December 1 to April 1 (TVA 2020). This seasonal change is observed in the Emory River water levels at the KIF Plant, as recorded by an onsite river gauge. The Winter Pool was modeled in the stability analyses because the lower pool (compared to the Summer Pool) provides less resisting force along the outboard slope of the East Dike and thus is more conservative for slope stability analysis. For this analysis, the elevation of the Winter Pool was defined as the median elevation for the two most recent winters of daily readings during the periods of December 1, 2018 to April 1, 2019 and December 1, 2019 to April 1, 2020. This pool elevation was calculated to be 737.4 ft.

The phreatic surfaces for both sections were developed using the calculated onsite Winter Pool and piezometric data collected from temporary wells and piezometers installed at the Sluice Trench and Ballfield East of Sluice Trench. The piezometric data were obtained from TVA's geotechnical instrumentation database. Median values of available piezometric data from the past two years were used. For most instruments, the available data consisted of periodic readings from May to December 2019 and one reading from April 2020. The instruments used to create the phreatic surface for Section A-

A' include temporary well KIF-TW04 and piezometers PZ-A1 and PZ-A2 (Geosyntec 2010a). The instruments used to create the phreatic surface for the Polishing Pond Section include the temporary wells KIF-TW04 and KIF-TW05, and piezometers PZ-B1, PZ-B2, and PZ-B3 (Geosyntec 2010a). The instruments are located between the interior of the adjacent Interim Ash Staging Area and the crest of the East Dike. Generally, the instruments used for the phreatic surface at the Polishing Pond section were southwest of the section. The instruments used for the phreatic surface at Section A-A' generally aligned with the cross section. The piezometric surface at the outboard face of the East Dike was controlled by the invert elevation of the seepage collection pipe at each section, as defined in construction documentation from the KIF East Dike Seepage Mitigation project (AECOM 2017).

It should be noted that the Polishing Pond (Figure 1), located partially within the boundaries of the Sluice Trench and Ballfield East of Sluice Trench CCR unit, is lined with geomembrane. Thus, the water in this pond is hydraulically isolated from the subsurface and does not influence the underlying phreatic surface. However, the weight of the water within the pond was included as a surcharge load in the Polishing Pond analysis section. The surcharge load was modeled for a pond elevation of 769.2 ft, which is the designed normal pool (AECOM 2016b).

6.0 METHODOLOGY

6.1 GENERAL

6.1.1 Software

Slope stability is evaluated using conventional, limit equilibrium methods as implemented in the GeoStudio SLOPE/W 2016 software (GEO-SLOPE 2015). Available from GEO-SLOPE International, Ltd., of Calgary, Alberta, Canada (www.geo-slope.com), SLOPE/W is a special-purpose computer code designed to compute the stability of earth slopes using two-dimensional, limit equilibrium, method of slices analyses. SLOPE/W 2016, version 8.16, is used for the analyses described herein. With SLOPE/W, the distribution of pore water pressures within the earth mass may be mapped directly from the results of a SEEP/W analysis.

6.1.2 Assumed System(s) of Slice Forces

Limit equilibrium methods for evaluating slope stability consider the static equilibrium of a soil mass above a potential failure surface. In conventional, two-dimensional methods of analysis, the slide mass above an assumed failure surface is split into vertical slices. Stresses are evaluated along the sides and base of each slice. The factor of safety against a slope failure (FS_{slope}) is defined as:

$$FS_{slope} = \frac{shear\ strength\ of\ soil}{shear\ stress\ required\ for\ equilibrium} \qquad \textbf{Equation 1}$$

where the strengths and stresses are computed along a defined failure surface, on the base of the vertical slices. The shearing resistance at locations along the potential slip surface is computed, with appropriate Mohr-Coulomb strength parameters, as a function of the total or effective normal stress.

Spencer's solution procedure (Spencer 1967), which satisfies the conditions of equilibrium for each slice, is used in this study. Key assumptions and features of Spencer's method include (United States Army Corps Engineers 2003; Duncan and Wright 2005):

- Interslice forces are assumed to have the same inclination angle with respect to the horizontal. The inclination is computed as part of the solution.
- The normal force on the base of each slice is assumed to act at the center of the base
- A trial and error solution is required, to solve for equilibrium
- Force and moment equilibrium are satisfied for each slice, and the overall slide mass
- Circular and noncircular potential failure surfaces can be evaluated

- The procedure computes FS_{slope} for an assumed failure surface. A search must be made to find the critical slip surface corresponding to the lowest FS_{slope}.

6.1.3 Optimization Scheme to Define Critical Rupture Surface

Once a critical slip surface is identified by the automated search routine, the "optimization" feature in SLOPE/W is used to consider the possible effects of localized changes in the slip surface. The code divides the critical slip circle into linear segments, then moves the end points while searching for a surface that yields a lower FS_{slope}. The optimization routine will sometimes produce a slip surface with reverse curves, or one that is not otherwise kinematically logical. If the inferred, failure mechanism is not a realistic representation of slope movements, the "optimized" result is discarded.

A variety of these methods is used in searching for the critical slip surface. The details of the employed strategy are relatively unimportant, however, as different approaches usually lead to similar answers. The final failure surface, representing the critical slip surface associated with FS_{slope}, is selected by the engineer based on the analytical results, the automated search outcomes, and knowledge of the geotechnical conditions.

6.1.4 Shapes of Rupture Surfaces Considered

SLOPE/W includes several options and trial routines to facilitate the search for the critical failure surface (GEO-SLOPE 2015). In the "grid and radius" search method, a region (divided into a grid) for the circle centers and a range of possible radii are specified for the trial slip circles. The code then automatically evaluates a large number of trial circles within those parameters, searching for one circle having the lowest FS_{slope}. In the "entry and exit" method, the search considers potential slip circles that intersect the ground surface within specified ranges. Where a potential failure circle intersects a much stronger, "impenetrable" layer (such as rock), SLOPE/W automatically evaluates composite slip surface (circles with straight-line portions along the interface). Non-circular slip surfaces are considered using the "block method".

Slip surfaces are evaluated for two conditions in the analyses: failure surfaces that intercept the contained CCR and shallow (D_{min} = 10 ft) failure surfaces. See additional discussion in Section 6.1.5.

6.1.5 Consideration of Shallow Slope Instabilities

When an earth slope is comprised of a cohesionless soil, an infinite slope mechanism will have the least resistance to sliding. An infinite slope failure will result in shallow raveling of the embankment slope. Localized, shallow slips of this type can be repaired to prevent progression to a deeper sliding mechanism, such that infinite slope failures are usually considered as a potential maintenance issue. Moreover, capillary stresses (which are neglected in the analysis) in the near surface soil will create an apparent cohesion that resists shallow sliding.

In a stability analysis where the surficial soil is modeled with a strength envelope having zero cohesion (c = 0), the lowest factor of safety will be computed for shallow sliding parallel to the slope face. The slope stability analyses presented here are focused on the potential for slope failures of significant mass, which

could directly impact the safety of the CCR unit. The search for a critical slip surface in the stability analyses is thus restricted, to consider only potential surfaces where the depth (measured at the base of at least one slice) is more than 10 ft vertically below the ground surface. Shallower slip surfaces at depths less than 10 ft, representing infinite slope failures, are ignored in the analysis.

The minimum specified depth may be increased or decreased as needed to study failure mechanisms for a given slope geometry. Consideration of sliding depths less than 10 ft may be warranted on relatively short structures. Other criteria are appropriate where shallow sliding could initiate a progressive failure that would impact a significant portion of the CCR unit or critical project components. Any history of shallow slides at the CCR unit would be relevant.

In cases where shallow surface sliding is found to give the lowest safety factor, additional analyses are completed to evaluate failure surfaces that would intercept the contained CCR within the unit. The search parameters are set to find a critical slip surface that intercepts CCR within the unit.

This “CCR intercept” stability analysis will indicate a different factor of safety, for a potential failure mode that would more clearly correspond to an unacceptable CCR release condition. In reporting the stability results, the CCR intercept failures are thus given greater emphasis than the failures that do not intercept CCR.

6.1.6 Exclusion of Retrogressive Slope Failure Mechanisms

A retrogressive slope failure (sometimes called a progressive slope failure) develops as a sequence of soil movements, where an initial slide mass triggers additional movement farther up the slope. If not remediated, a retrogressive failure on a CCR unit can eventually progress to the contained CCR and lead to an uncontrolled release.

Retrogressive slope failures are not evaluated herein. If acceptance criteria are met for the load cases under consideration, a retrogressive slope failure will be unlikely. Furthermore, retrogressive failures develop over a period of time and should be identified with sufficient time for intervention to remediate the failure before the contained CCR is impacted.

6.1.7 Tension Cracks

When the soils at the head of a slip surface are assigned cohesive strength ($c > 0$) in a slope stability analysis, tensile stresses are often computed along the base of the slices in that area. In the field, tensile stress results in the opening of a tension crack, reducing the lateral stresses to zero. Because tension results in a stabilizing force at the head of the slide mass, it is unconservative to have tensile stresses between the slices in a slope stability analysis. This problem is discussed by Duncan and Wright (2005).

When tensile stresses are reported in the stability calculation, a vertical tension crack is introduced into the analysis at the ground surface. The crack depth is increased until tensile stresses (negative normal stresses on the base of a slice) are no longer indicated. The depth of the tension crack (d_{crack}) should not exceed this theoretical maximum value:

$$(d_{crack})_{max} = \frac{2\,c_d}{\gamma_m \tan(45 - 0.5\phi_d)}$$ **Equation 2**

Here, γ_m is the moist unit weight, and c_d and ϕ_d are the developed shear strength parameters ($c_d = c / FS_{slope}$, $\tan\phi_d = \tan\phi / FS_{slope}$), for the upper soil layer at the head of the slip surface.

For earthquake load cases, tension cracks are assumed to be dry. For other load cases, an incipient failure may coincide with rain and surface runoff, which would fill a tension crack with water and create an additional lateral force on the slide mass. Tensions cracks are thus assumed to be full of water for these load cases.

6.1.8 Drained versus Undrained Analyses

Conventional, geotechnical stability is evaluated for only two bounding conditions:

- Drained conditions, where the pore pressures are assumed to be unchanged, shear strengths are computed based on the effective stress at failure, and effective stress stability analyses are used
- Undrained conditions, where the final pore pressures (including pore pressures induced by shearing) are unknown, shear strengths are constant or computed based on the effective consolidation stress, and total stress analyses are used.

The inherent assumptions for each condition are summarized in Table 8. The type of analysis to be used for each load case is defined in Section 5.1.

When setting up the slope stability analysis, each material zone is considered individually to determine which strength parameters (drained or undrained) should be assigned for a particular load case. Within an undrained, total stress stability analysis, it may be appropriate to treat some permeable material zones as fully drained (that is, assume no excess pore pressure at failure and assign effective stress strength parameters), while undrained strength parameters are specified in other zones.

The decision to treat a particular material zone as drained or undrained is based on how rapidly the loading condition develops with respect to how quickly pore pressures induced by the loading can dissipate. In most cases, clean, coarse rockfill will be fully drained under the considered loading conditions, even during seismic loading. Most other soils, including sands, will behave undrained during seismic loading. In marginal cases, the time factor (T) can be estimated to judge when a particular soil zone is drained or undrained in a particular load case (see Appendix D).

For either drained or undrained stability analyses, pore pressures are specified for each material zone consistent with how the strength parameters model the shearing resistance in that soil. The input pore pressures are used to compute the effective consolidation stresses along the trial failure surfaces. When “drained” strengths (c’, ϕ’) or “consolidated undrained” (c, ϕ) strengths are used, the shearing resistance is computed from the consolidation stresses normal to the failure surface. When undrained strengths are characterized using c/p (S_u/σ'_{vo}) ratios, the shearing resistance (S_u) is computed based on the vertical effective stress to which the soil has been consolidated at points along the slip surface. Technically, pore

pressures are not needed where "unconsolidated undrained" (S_u, $\phi = 0$) strengths are specified. Because the assigned strength is constant in this case, pore pressures input for $\phi = 0$ soils will have no impact on the slope stability solution.

In practice, it is therefore acceptable to provide steady-state pore pressures for each material for both drained, effective-stress and undrained, total-stress analyses. In each considered load case, pore pressures are computed to represent the steady-state seepage condition, prior to loading to failure (Section 6.1.9).

Table 8. Conditions for Drained versus Undrained Analyses

	Drained Condition	**Undrained Condition**	
Loading Cases (Section 5.1)	Long-Term	Pseudostatic Post-Earthquake	
Type of Stability Analysis	Effective Stress	Total Stress	
Pore Pressures at Failure	Assumed equal to steady state seepage	Unknown, cannot be predicted with confidence	
Characterization of Shear Strength	Drained, effective stress parameters	Undrained strength parameters	
Strength Parameters	c', ϕ'	S_u, $\phi = 0$	c, ϕ or S_u/σ'_{vo}
Pore Pressures used in Stability Analysis	From steady state seepage model	Pore pressures not used	From steady state seepage model

Notes:

ϕ'	drained friction angle	c'	drained cohesion
ϕ	undrained friction angle	c	undrained cohesion
S_u	shearing resistance	σ'_{vo}	vertical effective stress

6.1.9 Input Pore Pressures

The slope stability analyses require pore water pressures for computing effective consolidation stresses, as defined for the specified load conditions (Section 5.1). Pore pressures are predicted based on the depth below the assumed phreatic surface, sometimes called the piezometric line. This line illustrates the locations in the cross section at which the pore pressure is assumed to be zero. The pore pressure increases hydrostatically with distance below this line.

The pore water pressures in some stability analyses must be computed using piezometric lines. Due to software limitations, SLOPE/W cannot use mapped pressures from the SEEP/W solution for certain load cases.

A piezometric line is assumed to correspond to the phreatic line (line of zero pore pressure) predicted by SEEP/W. The phreatic line is manually digitized for input to SLOPE/W, which then computes pore pressures at any point based on the depth below this line. Some of the detailed information from the seepage analysis is thus lost because SLOPE/W cannot interpolate the nodal pore pressures from the finite element solution.

The less rigorous method, using piezometric lines to compute pore pressures, may or may not be conservative, depending on the geometry and details of the seepage problem. Little to no error occurs when seepage passes through a uniform cross section and the phreatic surface is horizontal. Greater

inaccuracies are introduced when pore pressures are computed from more steeply sloping piezometric lines.

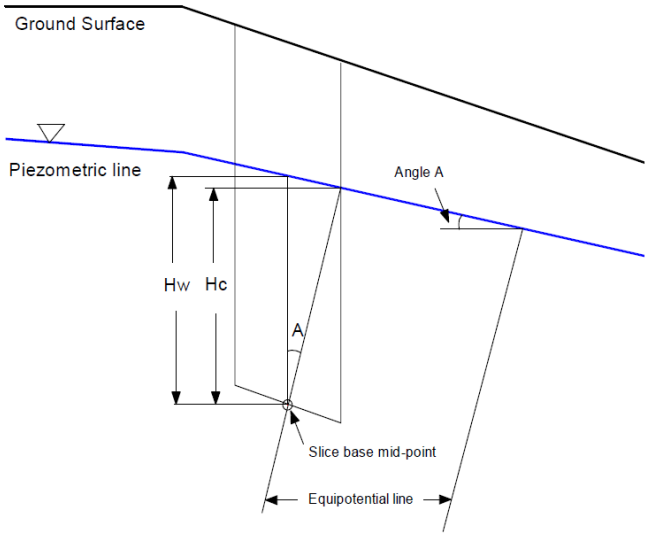
To reduce this error in the undrained analyses that use piezometric lines, an approximate “phreatic correction” is employed within SLOPE/W. Instead of computing pressures based on the vertical distance below the piezometric line, pore water pressures (u) are computed as (GEO-SLOPE 2015):

$$u = \gamma_w H_c = \gamma_w H_w \cos^2 A \qquad \textbf{Equation 3}$$

The unit weight of water is γ_w. The heights used to compute the pore pressure at the base center of the slice with and without correction are H_c and H_w, respectively. The variables in Equation 3 are further defined on Figure 14. The correction factor ($\cos^2 A$) is one for a horizontal phreatic surface (A = 0°) and approaches zero as the phreatic surface approaches vertical (A = 90°).

Pore water pressures above the phreatic line are assumed to be zero. That is, pore pressures within the unsaturated material are set to zero so that no additional soil strength along the slip surface is attributed to suction pressures (capillary tension).

Figure 14. Phreatic Surface Correction (from GEO-SLOPE 2015)



6.1.10 Single-Stage Analyses

In a single-stage slope stability analysis, the sliding resistance and factor of safety are computed concurrently, for a given failure surface, problem geometry, and applied load. This approach is correct when the soil mass consolidates under the loading conditions being evaluated for stability. Here, single-stage stability analyses are appropriate for the drained, effective stress analyses. In each of these cases,

the steady state seepage conditions and applied external loads occur under the same conditions (geometry and applied load) and can be modeled in one limit equilibrium calculation.

6.2 STATIC STABILITY

6.2.1 Long-Term, Global Stability

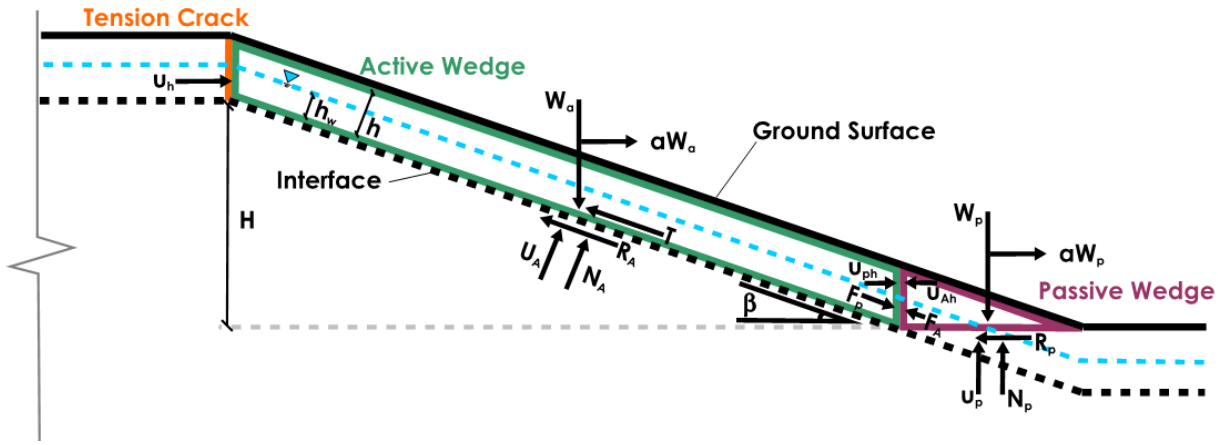
Long-term, global stability is assessed using the methods described in Section 6.1.

6.2.2 Long-Term, Veneer Stability

Veneer stability analyses were used to assess the potential for sliding in the cap system of the CCR unit. The geometry of the veneer stability problem is relatively simple and can be represented with a series of force balance equations.

An equation for the factor of safety for veneer stability was developed following the procedures outlined in Koerner and Soong (2005). A free body diagram (Figure 15) illustrates the forces considered in the analysis. The derivation and definitions of the variables used in the veneer stability derivation are provided in Section 2.0 of Appendix C.

Figure 15. Free body diagram representing veneer stability problem



7.0 RESULTS

The global stability results presented (and compared to the acceptance criteria) are those in which the critical failure surface intercepts the contained CCR within the unit (See Section 6.1.5). The global stability analysis models and critical failure surfaces are shown in Appendix B. Calculations for the veneer stability results presented below are included in Appendix C.

7.1 STATIC STABILITY

7.1.1 Long-Term, Global and Veneer Stability

The static, long-term, global stability of each section was analyzed for each cross section. The static, long-term, veneer stability was analyzed for the typical geometry of the cover system. The results of the static stability analyses, with the minimum required FS, are summarized in Table 9.

Table 9. Long-Term, Static Stability Results at KIF Plant

CCR Unit	Analysis Type	Cross Section	FS Required	FS Sliding
Sluice Trench and Ballfield East of Sluice Trench	Global	A-A’	≥ 1.5	1.9
Sluice Trench and Ballfield East of Sluice Trench	Global	Polishing Pond	≥ 1.5	2.4
Sluice Trench and Ballfield East of Sluice Trench	Veneer	Typical	≥ 1.5	1.8

8.0 VARIATIONS

The proposed scope and procedures for the stability analysis were outlined in the SAP and QAPP, as detailed in the sections above. Variations in scope or procedures discussed with TDEC and/or TVA are described in the following sections. As discussed below, these variations do not impact the overall usability and representativeness of the dataset provided in this SAR for the stability analysis activities at the KIF Plant.

8.1 VARIATIONS IN SCOPE

No variations in scope occurred during stability analysis activities.

8.2 VARIATIONS IN PROCEDURES

Variations in procedures occurring during the stability analysis are provided below.

- This SAR summarizes activities completed to meet the objectives of the Stability SAP (Stantec 2018a), for applicable static load cases. Seismic load cases (if any) required by the SAP are documented in a separate Seismic Stability SAR. This change in procedure was approved by TDEC.

9.0 SUMMARY

The objective of this study was to document the execution of the Stability SAP (Stantec 2018a) and to serve as part of the underlying basis for the EAR. The SAP specified how new and updated global and veneer stability analyses for the Sluice Trench and Ballfield East of Sluice Trench should be developed. Seismic load cases (if any) required by the SAP are documented in a separate Seismic Stability SAR.

The stability analyses performed as part of this SAR include the static, long-term, global and veneer analyses performed in accordance with the methods outlined in the SAP. These analyses were performed at two representative global stability cross sections and one representative veneer cross section at the Sluice Trench and Ballfield East of Sluice Trench.

The static stability results for the KIF Plant are summarized and compared to criteria in Table 9. The global stability of both cross sections and the veneer stability for the typical section exceeds the established factor of safety criteria for the static load cases.

Phase 1 stability analyses, as defined in the Stability SAP, were performed for each defined section and case. The analyses employed available site information, simplified analysis methods, and more conservative acceptance criteria. Because the analyzed cases are meeting or exceeding acceptance criteria, no subsequent phases of stability analysis are required.

Stantec has completed the Phase 1 static stability analyses at the KIF Plant in Harriman, Tennessee, in accordance with the Stability SAP as documented herein. The results are usable for reporting and evaluation in the EAR and meet the objectives of the TDEC Order EIP. The results will be evaluated along with data collected under other TDEC Order SAPs, as well as other State and CCR programs. This evaluation will be provided in the EAR.

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APPENDIX A - EXHIBITS

Exhibit No.

A.1

Title

Site Location Map

Client/Project

Tennessee Valley Authority
Kingston Fossil (KIF) Plant TDEC Order

Project Location

Roane County, Tennessee

175668043
Prepared by MB on 2020-05-19
Technical Review by AB on 2020-05-19

0 1,000 2,000 3,000 4,000 Feet

1:12,000 (At original document size of 22x34)

Legend

- CCR Unit Area (Approximate)
- Engineered Wetlands (Approximate)
- Polishing Pond (Approximate)

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Topographic mapping corresponds to the Harriman Quadrangle (Edition of 2019, Scale 1:24,000) and the Elverton Quadrangle (Edition of 2019, Scale 1:24,000)

Stantec TVA

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APPENDIX B – GLOBAL STABILITY ANALYSIS RESULTS

Summary of Global Static Slope Stability Analyses and Results - KIF - Sluice Trench and Ballfield East of Sluice Trench (Closed Condition)

Cross Section	Load Case	Pool Levels	Incipient Motion	Analysis	Soil Strengths	Pore Pressures	Slope Stability Analysis Results			
							Dmin=10' & CCR Intercept		Dmin=10'	
							Acceptance Criteria	Factor of Safety for Sliding (FS)	Acceptance Criteria	Factor of Safety for Sliding (FS)
Section A-A'	Static, Long-Term	Adjacent Reservoir: Winter Pool	Outboard	Drained	Drained Static	Piezometric Line	FS ≥ 1.5	1.9	N/A	1.3
Polishing Pond	Static, Long-Term	Adjacent Reservoir: Winter Pool	Outboard	Drained	Drained Static	Piezometric Line	FS ≥ 1.5	2.4	N/A	2.0

Kingston Fossil Plant (KIF) TDEC Order

Sluice Trench and Ballfield East of Sluice Trench

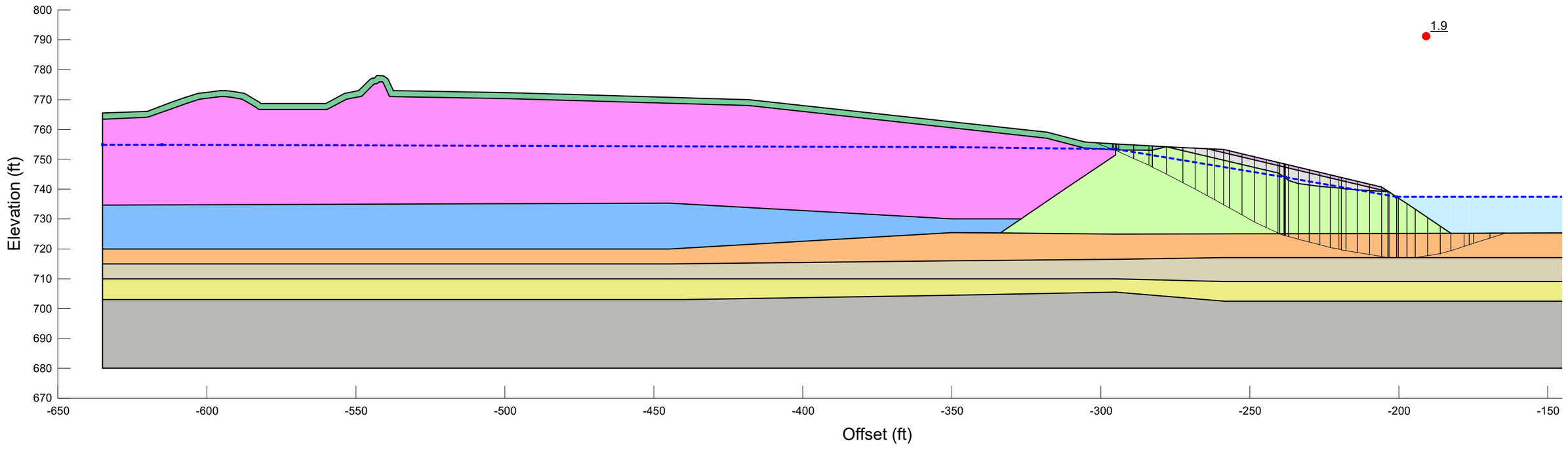
Section A-A'

Slope Stability Analysis – FS = 1.9

Static Long-Term, Global Case (Dmin=10’ & CCR Intercept)
Winter Pool; Drained, Static Strengths; Outboard Incipient Motion;
Slip Surface: Entry-Exit Search, 10' Minimum Depth

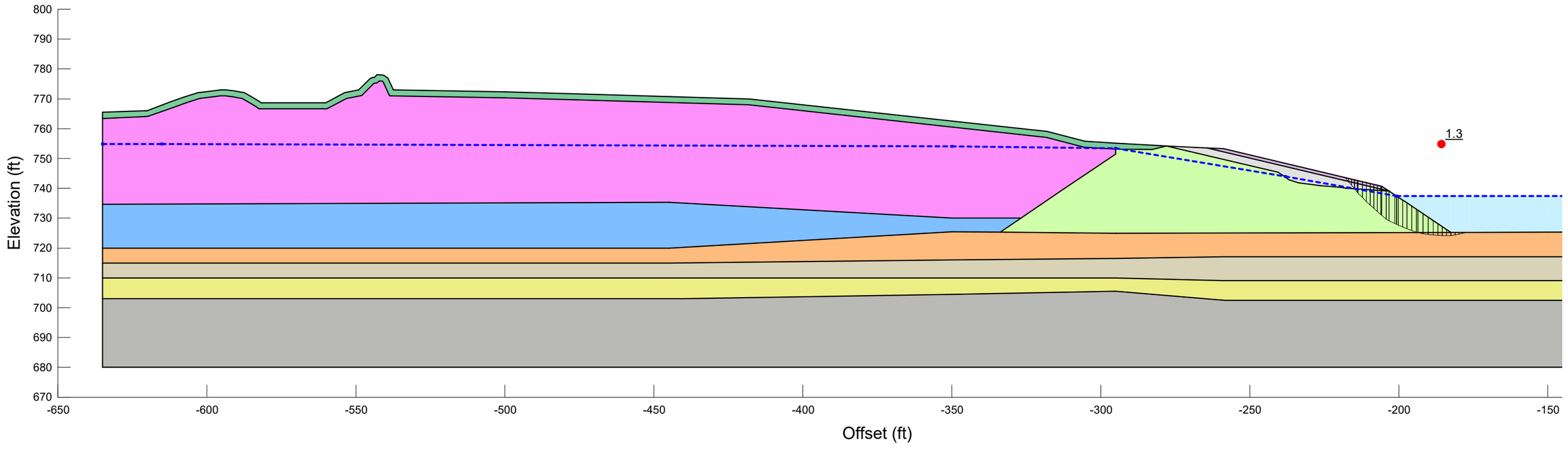
Note: The results of the analysis shown here are based on available subsurface information, laboratory test results and approximate soil properties. The drawing depicts approximate subsurface conditions based on historical drawings or specific borings at the time of drilling. No warranties can be made regarding the continuity of subsurface conditions.

Material	Unit Weight (pcf)	Phi (deg.)	Cohesion (psf)
Bottom Ash (Drained)	124	37	0
Cover Material (Drained)	121	16	0
Embankment Fill (Drained)	128	36	0
Riprap (Drained)	125	40	0
Fly Ash (Drained)	112	34	0
Filter (Drained)	130	33	0
Shale	--	--	--
Subunit 1 (Drained)	127	32	0
Subunit 2 (Drained)	127	35	0
Subunit 3 (Drained)	132	37	0



Kingston Fossil Plant (KIF) TDEC Order	**Slope Stability Analysis – FS = 1.3**	Note: The results of the analysis shown here are based on available subsurface information, laboratory test results and approximate soil properties. The drawing depicts approximate subsurface conditions based on historical drawings or specific borings at the time of drilling. No warranties can be made regarding the continuity of subsurface conditions.
Sluice Trench and Ballfield East of Sluice Trench	Static Long-Term, Global Case (Dmin=10') Winter Pool; Drained, Static Strengths; Outboard Incipient Motion; Slip Surface: Grid & Radius Search, 10' Minimum Depth	
Section A-A'		

Material	Unit Weight (pcf)	Phi (deg.)	Cohesion (psf)
Bottom Ash (Drained)	124	37	0
Cover Material (Drained)	121	16	0
Embankment Fill (Drained)	128	36	0
Riprap (Drained)	125	40	0
Fly Ash (Drained)	112	34	0
Filter (Drained)	130	33	0
Shale	--	--	--
Subunit 1 (Drained)	127	32	0
Subunit 2 (Drained)	127	35	0
Subunit 3 (Drained)	132	37	0



Kingston Fossil Plant (KIF) TDEC Order

Sluice Trench and Ballfield East of Sluice Trench

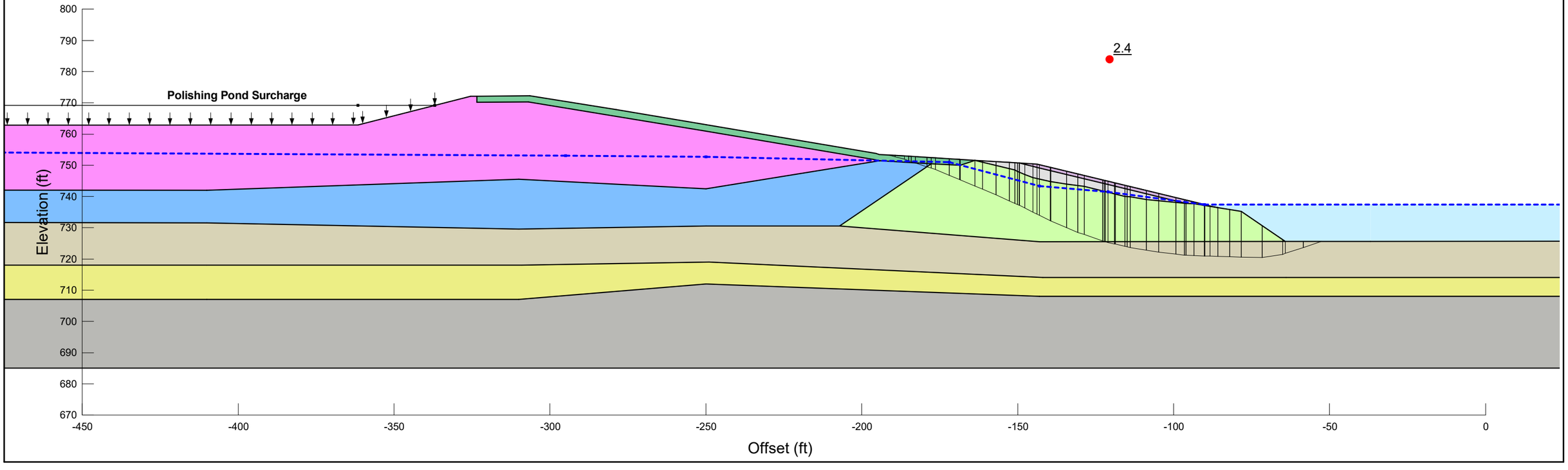
Polishing Pond Section

Slope Stability Analysis – FS = 2.4

Static Long-Term, Global Case (Dmin=10' & CCR Intercept)
Winter Pool; Drained, Static Strengths; Outboard Incipient Motion;
Slip Surface: Entry-Exit Search, 10' Minimum Depth

Note: The results of the analysis shown here are based on available subsurface information, laboratory test results and approximate soil properties. The drawing depicts approximate subsurface conditions based on historical drawings or specific borings at the time of drilling. No warranties can be made regarding the continuity of subsurface conditions.

Material	Unit Weight (pcf)	Phi (deg.)	Cohesion (psf)
Bottom Ash (Drained)	124	37	0
Cover Material (Drained)	121	16	0
Embankment Fill (Drained)	128	36	0
Filter (Drained)	130	33	0
Fly Ash (Drained)	112	34	0
Riprap (Drained)	125	40	0
Shale	--	--	--
Subunit 2 (Drained)	127	35	0
Subunit 3 (Drained)	132	37	0



Project No. 175668043

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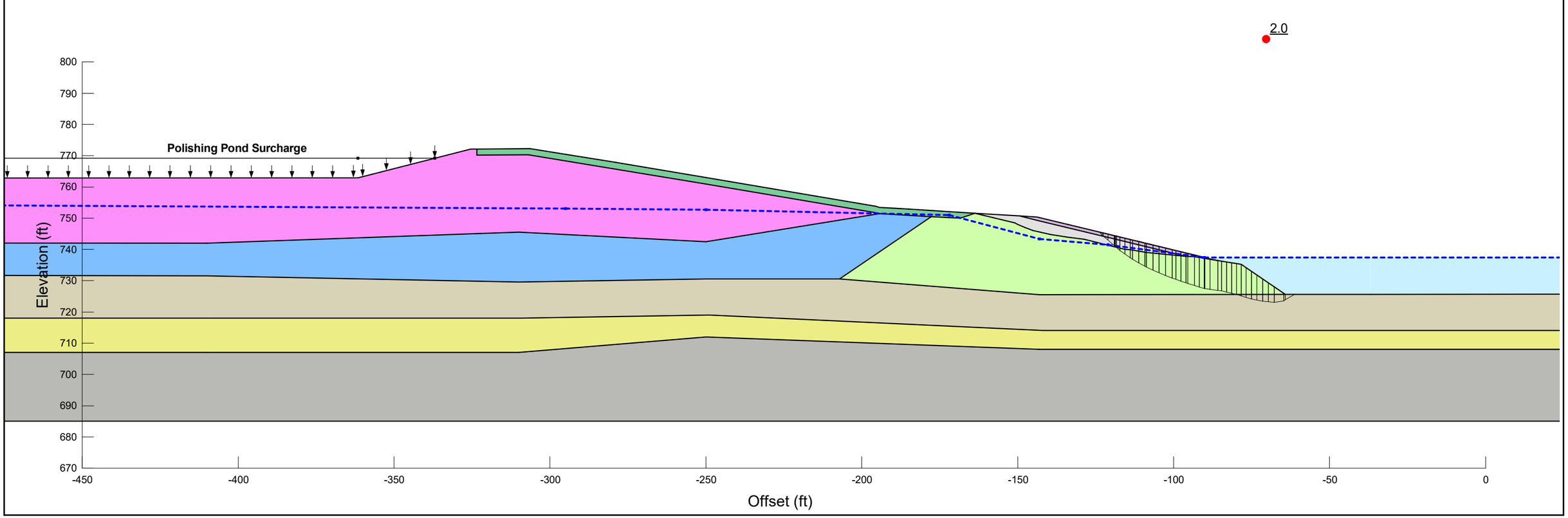
Kingston Fossil Plant (KIF) TDEC Order	**Slope Stability Analysis – FS = 2.0**	Note: The results of the analysis shown here are based on available subsurface information, laboratory test results and approximate soil properties. The drawing depicts approximate subsurface conditions based on historical drawings or specific borings at the time of drilling. No warranties can be made regarding the continuity of subsurface conditions.
Sluice Trench and Ballfield East of Sluice Trench	Static Long-Term, Global Case (Dmin=10') Winter Pool; Drained, Static Strengths; Outboard Incipient Motion; Slip Surface: Grid & Radius Search, 10' Minimum Depth	
Polishing Pond Section		

Material	Unit Weight (pcf)	Phi (deg.)	Cohesion (psf)
Bottom Ash (Drained)	124	37	0
Cover Material (Drained)	121	16	0
Embankment Fill (Drained)	128	36	0
Filter (Drained)	130	33	0
Fly Ash (Drained)	112	34	0
Riprap (Drained)	125	40	0
Shale	--	--	--
Subunit 2 (Drained)	127	35	0
Subunit 3 (Drained)	132	37	0



APPENDIX C – VENEER STABILITY ANALYSIS RESULTS

Tennessee Valley Authority Kingston Fossil Plant Kingston, Roane County, Tennessee	Sluice Trench and Ballfield East of the Sluice Trench

Appendix C
Veneer Stability Analyses

Purpose:

- Analyze stability of the cover system (cap) for the Sluice Trench and Ballfield East of the Sluice Trench.
- Estimate interface strength parameters (adhesion and friction angle) for the cover materials to support the stability analysis.

Methods:

- Consider veneer (infinite slope) stability failure mode for the cover system.
- Use the method developed by Koerner and Soong (2005).

Results:

- Minimum strength parameters (adhesion and friction angle) are estimated for the cover materials.
- The veneer stability of the cap system is compared against the target FS value for static conditions.

Calculation Performed by: Stantec Consulting Services Inc.	
Prepared by: Nick Duda	*Reviewed by:* Jeff Dingrando
Date: 6/25/2020	

1. STABILITY CRITERIA

The stability of the cover system was analyzed for the conditions summarized in Table 1, as defined in the SAP. The associated acceptance criteria for minimum factor of safety (FS) are listed in the last column.

Table 1. Summary of Veneer Stability Cases and Design Criteria

Design Condition	Interface Strength	Cover Soil Strength	Saturated/ Unsaturated	Static/ Pseudostatic	Criteria for Slope Stability
Static Drained	Peak	Drained	Unsaturated	Static	FS ≥ 1.5

2. ANALYSIS METHODOLOGY

Veneer stability analyses were used to assess the potential for sliding in the cap system. The geometry of the veneer stability problem is relatively simple and can be represented with a series of force balance equations.

An equation for the factor of safety for veneer stability was developed following the procedures outlined in Koerner and Soong (2005). The derivation follows. A free body diagram (Figure 1) illustrates the forces considered in the analysis. Definitions of the variables used in the veneer stability derivation are provided in Table 2.

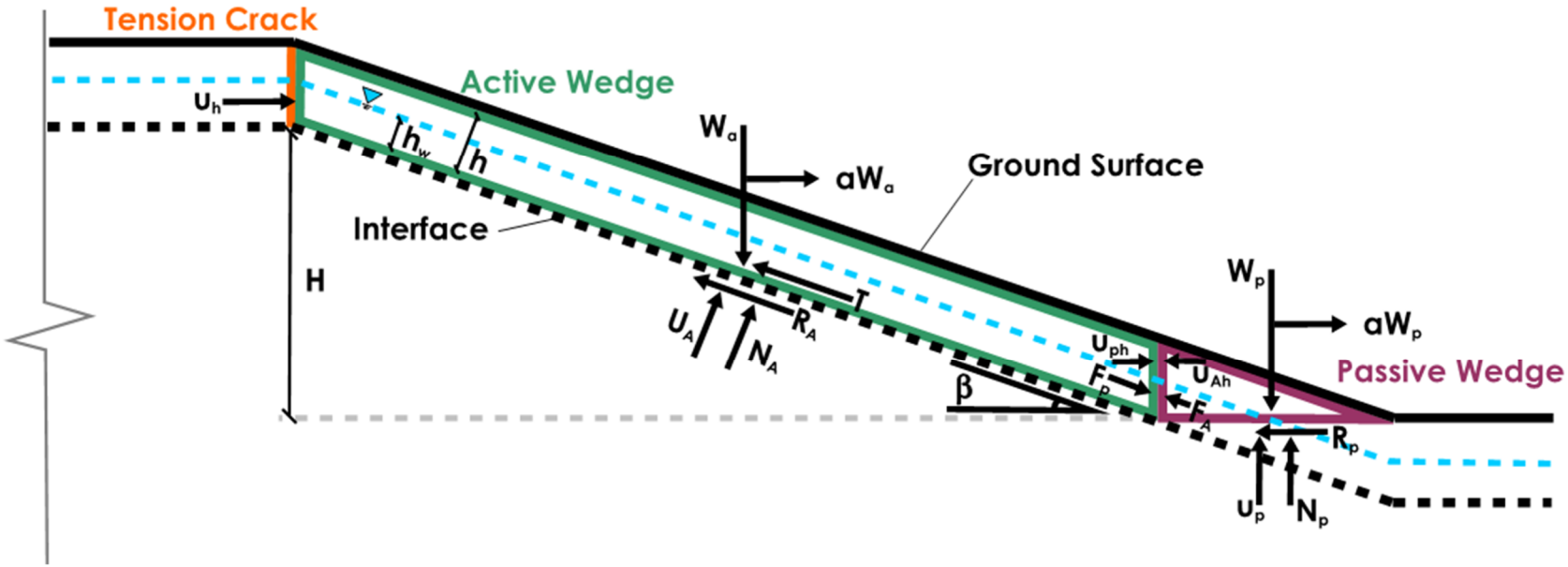


Figure 1. Free Body Diagram Representing Veneer Stability Problem

Table 2. Definition of Variables for Veneer Stability Derivation

Variable	Description
W_A	Total weight of the active wedge
W_P	Total weight of the passive wedge
N_A	Effective force normal to the active wedge failure plane
N_P	Effective force normal the passive wedge failure plane
h	Thickness of the cover soil
H	Height of the slope
β	Slope angle
a	Horizontal acceleration
u_h	Resultant of the pore pressures acting in the tension crack
u_A	Resultant of the pore pressures acting perpendicular to the slope
u_p	Resultant of the pore pressures acting perpendicular to the bottom on the passive wedge
u_{ph}	Resultant of the pore pressures acting on the inter-wedge surface to the passive wedge
u_{Ah}	Resultant o the pore pressures acting on the inter-wedge surface to the active wedge
h_w	Water height measured in the direction perpendicular to the slope
R_A	Resistance along the bottom of the active wedge
R_P	Resistance along the bottom of the passive wedge
F_A	Inter-wedge force acting on the active wedge from the passive wedge
F_P	Inter-wedge force acting on the passive wedge from the active wedge
T	Reinforcement
c_c	Cohesion of the cover soil
ϕ	Friction angle of the cover soil
γ	Moist unit weight of the cover soil
γ_{sat}	Saturated unit weight of the cover soil
Δγ	Difference between saturated and moist unit weight of the cover soil
c_a	Adhesion of the interface
δ	Friction angle of the interface
FS	Factor of safety
A, B, C, D, L, M, N	Arbitrary variables to simplify final equations

For the active wedge:

$$W_A = \left(\frac{H}{\sin\beta}\right) h_w \gamma_{sat} + \left(\frac{H}{\sin(\beta)}\right)(h - h_w)\gamma$$

$$W_A = \left(\frac{H}{\sin\beta}\right)(h_w \gamma_{sat} + h\gamma - h_w\gamma)$$

$$W_A = \left(\frac{H}{\sin\beta}\right)(h_w \Delta\gamma + h\gamma) \qquad \textbf{Equation 1}$$

$$u_h = \frac{1}{2}(\gamma_w h_w \cos\beta)\left(\frac{h_w}{\cos\beta}\right) = \frac{1}{2}\gamma_w {h_w}^2 \qquad \textbf{Equation 2}$$

$$u_{Ah} = \frac{1}{2}(\gamma_w h_w \cos\beta)\left(\frac{h_w}{\cos\beta}\right) = \frac{1}{2}\gamma_w {h_w}^2 = u_h \qquad \textbf{Equation 3}$$

$$u_A = (\gamma_w h_w \cos\beta)\left(\frac{H}{\sin\beta}\right) = \frac{\gamma_w h_w H}{\tan\beta} \qquad \textbf{Equation 4}$$

Considering force balance in the direction perpendicular to the slope:

$$N_A = W_A \cos\beta - aW_A \sin\beta - u_A - u_h \sin\beta + u_{ah} \sin\beta$$

$$N_A = W_A(\cos\beta - a\sin\beta) - u_A \qquad \textbf{Equation 5}$$

$$R_A = N_A \tan\delta + \frac{c_a H}{\sin\beta} \qquad \textbf{Equation 6}$$

Considering force balance in the direction parallel to the slope:

$$F_A = u_h \cos\beta + W_A \sin\beta + aW_A \cos\beta - u_{Ah}\cos\beta - \frac{R_a}{FS} - T$$

$$F_A = W_a(\sin\beta + a\cos\beta) - \frac{R_a}{FS} - T \qquad \textbf{Equation 7}$$

For the passive wedge:

$$W_p = \left(\frac{h}{\cos\beta}\right)\left(\frac{h}{\sin\beta}\right)\frac{\gamma}{2} + \left(\frac{h_w}{\cos\beta}\right)\left(\frac{h_w}{\sin\beta}\right)\frac{\Delta\gamma}{2}$$

$$W_p = \frac{h^2\gamma + {h_w}^2\Delta\gamma}{\sin 2\beta} \qquad \textbf{Equation 8}$$

$$u_p = \frac{1}{2}(\gamma_w h_w \cos\beta)\left(\frac{h_w}{\sin\beta}\right) = \frac{\gamma_w {h_w}^2}{2\tan\beta} \quad \textbf{Equation 9}$$

$$u_{ph} = \frac{1}{2}(\gamma_w h_w \cos\beta)\left(\frac{h_w}{\cos\beta}\right) = \frac{1}{2}\gamma_w {h_w}^2 \quad \textbf{Equation 10}$$

Considering force balance in the vertical direction

$$N_p = W_p + F_p \sin\beta - u_p \quad \textbf{Equation 11}$$

$$R_p = N_p \tan\varphi + c_c \frac{h}{\sin\beta} \quad \textbf{Equation 12}$$

Considering force balance in the horizontal direction

$$F_p \cos\beta + u_{ph} + aW_p = \frac{R_p}{FS}$$

$$FS\left(F_p \cos\beta + u_{ph} + aW_p\right) = \left(W_p + F_p \sin\beta - u_p\right)\tan\varphi + c_c \frac{h}{\sin\beta}$$

$$F_p(FS\cos\beta - \sin\beta\tan\varphi) = \left(W_p - u_p\right)\tan\varphi + c_c \frac{h}{\sin\beta} - FS\left(u_{ph} + aW_p\right)$$

$$F_p = \frac{\left(W_p - u_p\right)\tan\varphi + c_c \frac{h}{\sin\beta} - FS\left(u_{ph} + aW_p\right)}{FS\cos\beta - \sin\beta\tan\varphi} \quad \textbf{Equation 13}$$

Let $F_A = F_p$, then:

$$W_a(\sin\beta + a\cos\beta) - \frac{R_a}{FS} - T = \frac{\left(W_p - u_p\right)\tan\varphi + c_c \frac{h}{\sin\beta} - FS\left(u_{ph} + aW_p\right)}{FS\cos\beta - \sin\beta\tan\varphi} \quad \textbf{Equation 14}$$

Let also:

$$A = W_a(\sin\beta + a\cos\beta) - T \quad \textbf{Equation 15}$$

$$B = \left(W_p - u_p\right)\tan\varphi + c_c \frac{h}{\sin\beta} \quad \textbf{Equation 16}$$

$$C = u_{ph} + aW_p \quad \textbf{Equation 17}$$

$$D = \sin\beta\tan\varphi \quad \textbf{Equation 18}$$

Then Equation 14 becomes:

$$A - \frac{R_a}{FS} = \frac{B - FS * C}{FS \cos\beta - \mathrm{D}}$$

$$\frac{A * FS - R_a}{FS} = \frac{B - FS * C}{FS \cos\beta - \mathrm{D}}$$

$$A \cos\beta \, FS^2 - A * D * FS - R_a \cos\beta \, FS + R_a D = B * FS - C * FS^2$$

$$(A \cos\beta + C)FS^2 - (AD + B + R_a \cos\beta)FS + R_a D = 0 \qquad \textbf{Equation 19}$$

Let:

$$L = A \cos\beta + C \qquad \textbf{Equation 20}$$

$$M = AD + B + R_a \cos\beta \qquad \textbf{Equation 21}$$

$$N = R_a D \qquad \textbf{Equation 22}$$

Then Equation 19 becomes:

$$L * FS^2 - M * FS + N = 0$$

$$FS = \frac{M + \sqrt{M^2 - 4LN}}{2L} \qquad \textbf{Equation 23}$$

Here, FS is the factor of safety for veneer sliding within the cap.

3. ANALYZED CONDITONS

3.1. COVER GEOMETRY

The final cover system (cap) on the Sluice Trench and Ballfield East of the Sluice Trench was constructed with soil and geosynthetic materials overlying CCR (labeled CCP in historical drawings) materials, having an overall thickness of 2.0 feet. The constructed cap system is shown in Figure 3 (AECOM 2019). The veneer stability was evaluated at the steepest section within the unit, along the Polishing Pond section, with the 2.0 feet of soil above the geosynthetic components, where the mid-slope angle is 10˚ and mid-slope height of 11.2 feet above the access road.

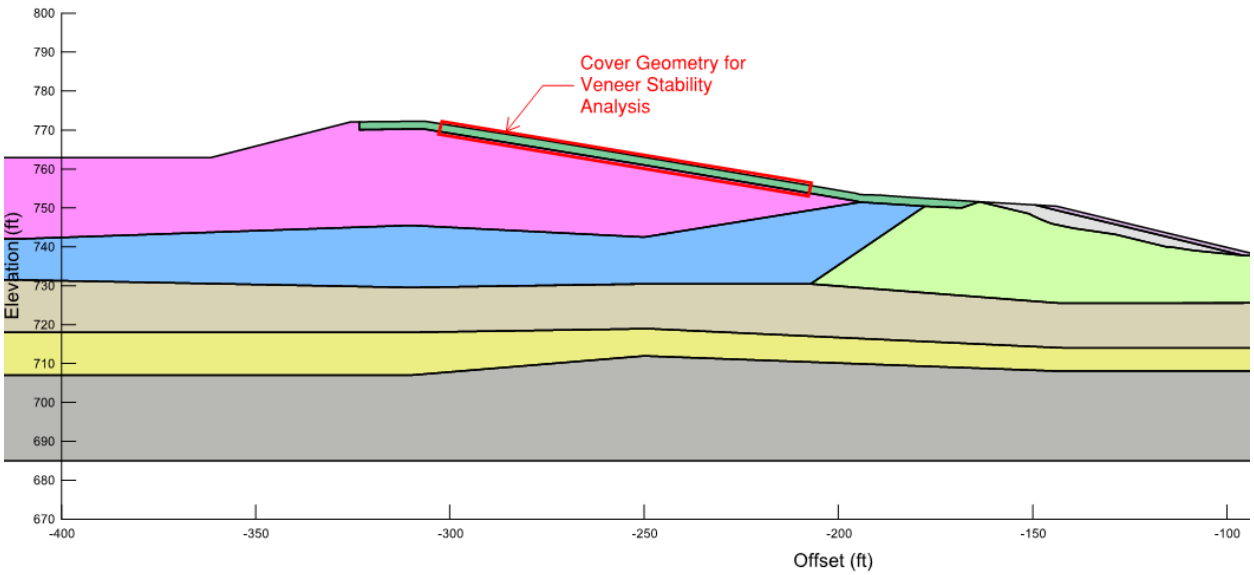


Figure 2. Selected geometry for Veneer Stability analyses

This analysis serves to evaluate the interface strengths encountered in the cap system. The results presented here apply to these interfaces (i.e., whichever has the lowest strength):

- Cover soil (internal shear strength, just above the geosynthetics)
- the cover soil/geocomposite drainage layer interface
- the geocomposite drainage layer/LLDPE textured geomembrane interface
- the LLDPE textured geomembrane/CCR material interface
- CCR (internal shear strength, just below the geosynthetics)

The interface strengths of the various materials in the cap system were evaluated to compare to the minimum acceptable strengths plotted in Section 4.

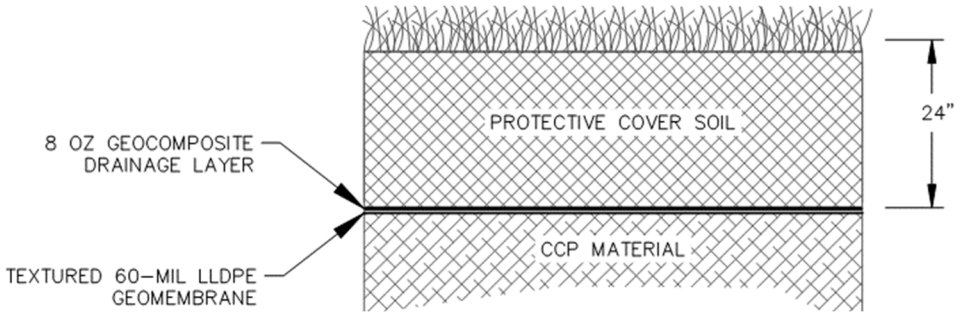


Figure 3. Cap System Constructed at the Sluice Trench and Ballfield East of the Sluice Trench (AECOM 2019)

3.2. COVER SOIL PARAMETERS

Values for the drained shear strength, moist unit weight, and saturated unit weight of the cover soil are required to perform the veneer stability analyses. Estimated parameters for the cover soil are summarized in Table 3.

The cover soil was sourced from the ”I-40 borrow area” and generally classified as fat clay with sand (CH), as detailed in the construction certification report for the closure of the unit in 2016 (AECOM 2016). It is assumed that similar material was used for the cover soil in the 2019 East Dike Area Closure.

Moist and saturated unit weights for the cover soil were estimated from available lab testing results. See Section 4.1 of the SAR for additional details.

For the veneer stability analysis, the drained shear strength parameters for the cover soil were estimated based on typical values from NAVFAC (1986) (see Figure 3 in Appendix D). Additionally, it is assumed that the Cover Material and CCR underlying the cap have no adhesion.

Table 3. Cover Soil Parameter Summary

Parameter	Value
Drained Friction Angle	19˚
Drained Cohesion	0 psf
Moist Unit Weight	120 pcf
Saturated Unit Weight	121 pcf

3.3. GEOSYNTHETIC PARAMETERS

The cover system constructed at the Sluice Trench and Ballfield East of the Sluice Trench was not evaluated for veneer strength prior to construction, likely due to the unit being relatively flat. It is assumed that the geocomposite/geomembrane interface is the weakest (i.e., most critical) of the above listed interfaces within the cap system.

Per the construction certification report for the closure of the East Dike, the geomembrane and geocomposite products used in the cap were the Agru 60-mil Microspike LLDPE and SKAPS Transnet HDPE Geocomposite with TN 330 Geonet (8 oz/yd^2) (AECOM 2019). No product-specific strength data was available in the construction report. In order to estimate the interface strength of the geocomposite/geomembrane interface, a literature review was conducted.

To estimate the geocomposite/geomembrane interface shear strength, a selection of studies was used to estimate the interface strength (Pavanello *et al.* 2018, Akpinar and Benson 2005, Stark *et al.* 1996, Bacas *et al.* 2015). Some of the geosynthetic interfaces evaluated in these papers were comparable to the interfaces within the cap system at KIF. The manufacture sheets for the installed geomembrane and geocomposite were used to compare the material type, asperity height, density, and thickness of the installed materials to those evaluated in the referenced studies. Based on the manufacture sheet, the Agru 60-mil LLDPE geomembrane has a nominal thickness of 1.5 mm and an asperity height of 0.51 mm. The SKAPS Transnet HDPE Geocomposite with TN 330 Geonet is composed of a nonwoven geotextile heat bonded with the geonet and geotextile with a mass per unit area of 8 oz/yd^2, or 270 g/m^2.

- Pavanello *et al.* (2018) evaluated the static interface angle of textured HDPE geomembrane and nonwoven geotextile as part of their investigation of the dynamic friction and seismic performance of various geosynthetic interfaces. The thickness of the textured geomembrane evaluated was 1.5

mm and the nonwoven geotextile evaluated had a mass per unit area of 300 g/m^2. The average, static interface friction angle for the geotextile/geomembrane interface was measured to be about 24˚.

- Akpinar and Benson (2005) evaluated the shear strength of interfaces between nonwoven geotextiles and HDPE geomembranes, including a textured geomembrane, as part of their investigation. The textured geomembrane evaluated had an asperity height of 0.25 mm, and the geotextile evaluated has a mass per unit area of 270 g/m^2. Although asperity height of the geomembrane evaluated is approximately half of height for the installed geomembrane, the system as a whole compares well to the interface within the cap system at the Sluice Trench and Ballfield East of the Sluice Trench. The interface friction angle for the geotextile/geomembrane interface was measured to be approximately 26˚.

- Stark *et al.* (1996) evaluated multiple geosynthetic interfaces, including a co-extruded geomembrane and geocomposite composed of nonwoven geotextile and thermally bonded geonet. The geomembrane evaluated had an asperity height of 0.45 mm and nominal thickness of 1.5 mm. The mass per unit area of the geocomposite evaluated was 270 g/m^2. It was found that the presence of the geonet did not significantly increase the interface shear resistance compared to the textured geomembrane/nonwoven geotextile interface, and the interface friction angle was estimated to be 30˚.

- Bacas *et al.* (2015) evaluated multiple geomembrane/geocomposite interfaces as part of their investigation of frictional behavior of typical geosynthetic interfaces. The interface evaluated most similar to the geocomposite/geomembrane interface within the cap system is a textured geomembrane, with an asperity height of 0.5mm, and a geocomposite composed of nonwoven 200 and 300 g/m^2 geotextile thermally bonded to the geonet. The 300 g/m^2 geotextile face of the geocomposite was placed on top of the geomembrane for the evaluation of the interface friction. The interface friction angle for this interface was found to be 16˚.

Considering all of the above published parameters, the interface friction suggested by Bacas *et al.* of 16˚ was selected as representative for the interface friction of the geomembrane/geocomposite interface within the cap system at KIF. This value was selected because the materials within the study were similar to those used in the cap system, and that this value represented the most conservative choice, as Pavanello *et al.* (2018), Akpinar and Benson (2005) and Stark *et al.* (1996) indicate the value may be much higher.

4. ANALYSIS RESULTS

The calculations for each design condition are presented at the end of this appendix.

4.1. STATIC CASE

The result from the drained, static case is plotted in Figure 4. The interface friction angle/adhesion combinations required to meet the target factor of safety (Table 1) are plotted. The plotted point represents the minimum interface strength within the cap system (applicable to all potential interfaces along the bottom of the cover system). Applying the minimum interface strength within the cap system, the static, drained case has a factor of safety of 1.8.

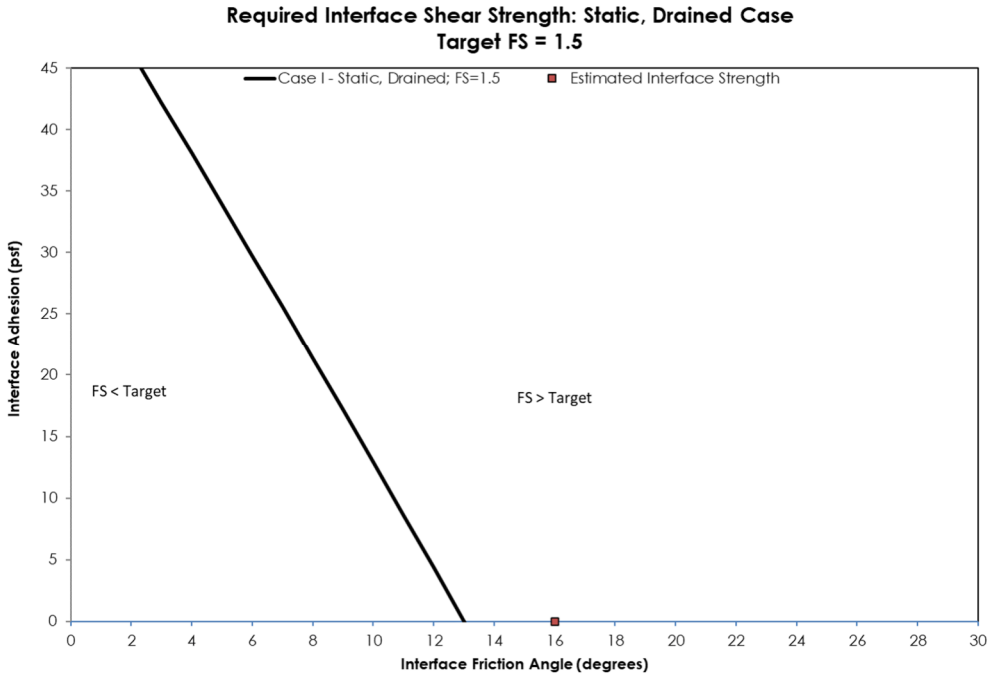


Figure 4. Estimated Interface Strength of Cover System and Adhesion/Friction Angle Combinations for Target Factor of Safety for Static, Drained Case

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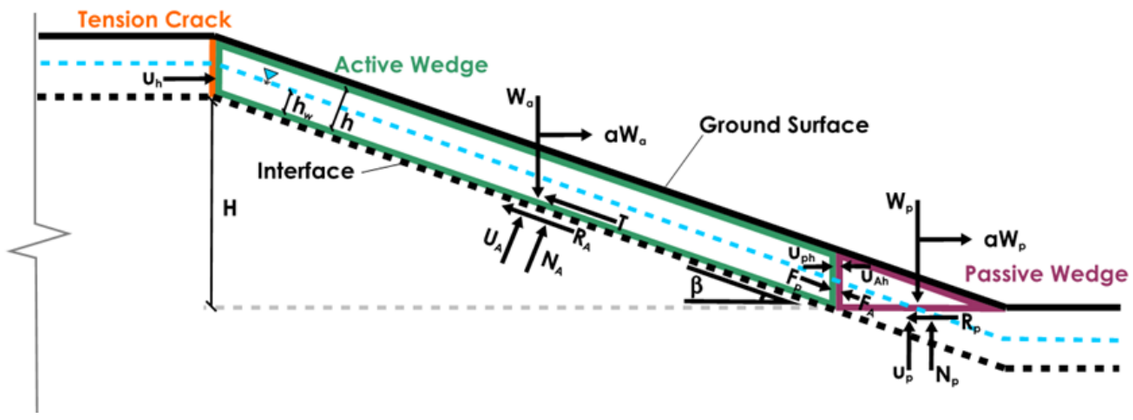
Final Cover Veneer Type Stability Analysis

Kingston Sluice Trench and Ballfield East of the Sluice Trench

Methodology: Koerner and Soong (2005)

Input Parameters:

Cover Thickness, h, ft.	2
Slope Height, H, ft.	11.2
Slope Angle, β, deg.	10.0
Water Height, h_w, ft.	0
Hori. Acceleration, a (g)	0
Unit Weight of Water, γ_w, pcf	62.4
Cover Soil Unit Weight, γ, pcf	120
Cover Soil Sat. Unit Weight, γ_{sat}, pcf	121
Cover Soil Friction Angle, ϕ, deg.	19
Cover Soil Cohesion, c, psf	0



*Stress regime is in lower portion of bilinear drained strength envelope.

Veneer Reinforcement, T, lb/ft	0

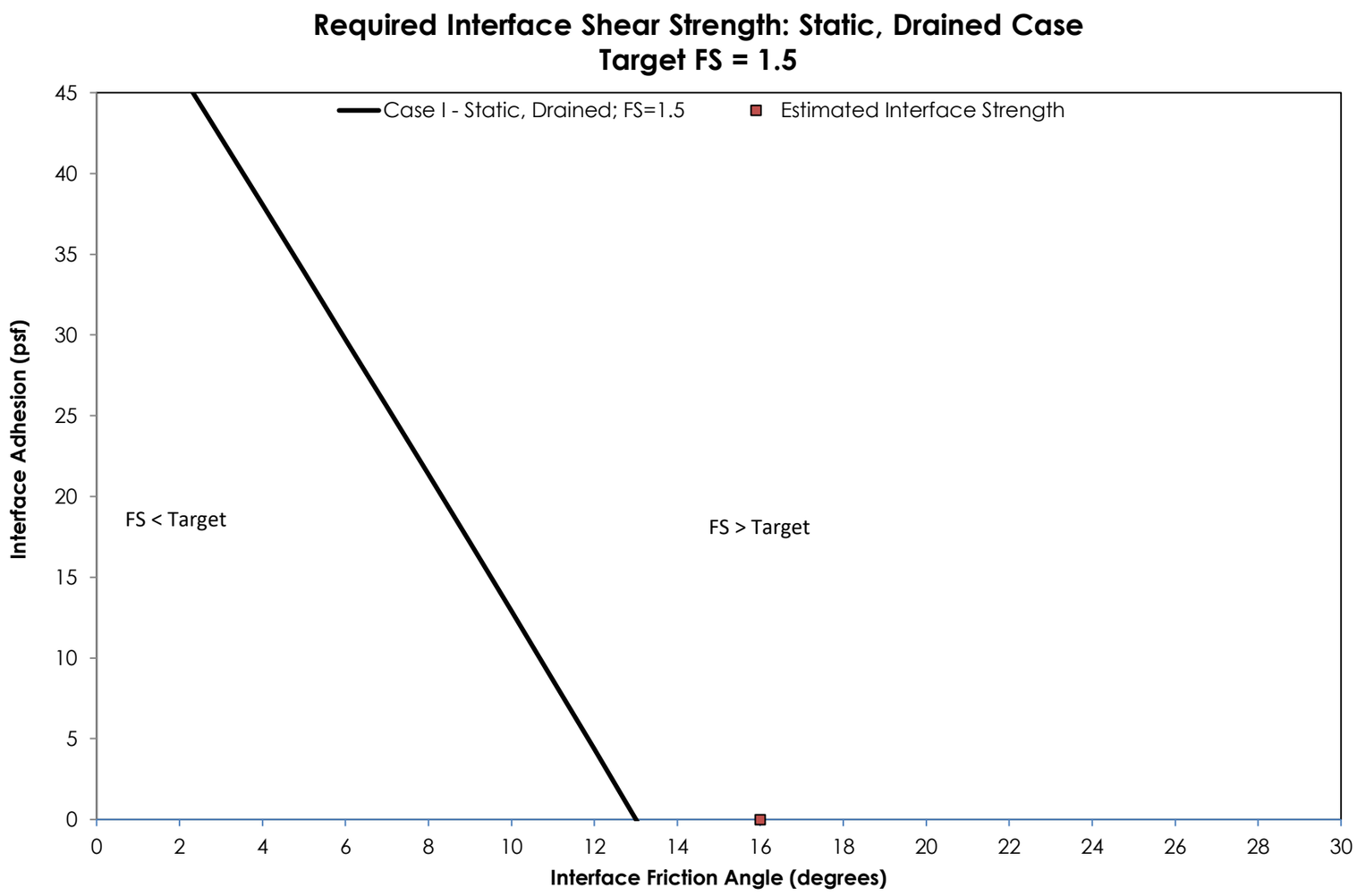
Calculations:

Active Wedge	
Total Weight, W_A, lb/ft	15479.58
Uplift Force, U_A, lb/ft	0.00
Effective Normal Force, N_A, lb/ft	15244.41

Passive Wedge	
Total Weight, W_p, lb/ft	1403.43
Uplift Force, U_p, lb/ft	0.00
Interface P.W.P Force, U_{ph}, lb/ft	0.00

Static, Drained Conditions (Target F.S. = 1.5)

Interface Friction Angle, δ, deg.	Interface Adhesion, c_a, psf	R_A, lb/ft	A	B	C	D	L	M	N	Factor of Safety
0	54.58	3520.61	2688.00	483.24	0.00	0.06	2647.16	4111.08	210.50	1.50
1	50.46	3520.61	2688.00	483.24	0.00	0.06	2647.16	4111.08	210.50	1.50
2	46.33	3520.61	2688.00	483.24	0.00	0.06	2647.16	4111.08	210.50	1.50
3	42.20	3520.61	2688.00	483.24	0.00	0.06	2647.16	4111.08	210.50	1.50
4	38.06	3520.61	2688.00	483.24	0.00	0.06	2647.16	4111.08	210.50	1.50
5	33.91	3520.61	2688.00	483.24	0.00	0.06	2647.16	4111.08	210.50	1.50
6	29.74	3520.61	2688.00	483.24	0.00	0.06	2647.16	4111.08	210.50	1.50
7	25.56	3520.61	2688.00	483.24	0.00	0.06	2647.16	4111.08	210.50	1.50
8	21.37	3520.61	2688.00	483.24	0.00	0.06	2647.16	4111.08	210.50	1.50
9	17.15	3520.61	2688.00	483.24	0.00	0.06	2647.16	4111.08	210.50	1.50
10	12.91	3520.61	2688.00	483.24	0.00	0.06	2647.16	4111.08	210.50	1.50
11	8.64	3520.61	2688.00	483.24	0.00	0.06	2647.16	4111.08	210.50	1.50
12	4.38	3522.52	2688.00	483.24	0.00	0.06	2647.16	4112.97	210.62	1.50
13	0.02	3520.70	2688.00	483.24	0.00	0.06	2647.16	4111.18	210.51	1.50
14	-4.37	3518.95	2688.00	483.24	0.00	0.06	2647.16	4109.45	210.40	1.50
15	-8.75	3520.61	2688.00	483.24	0.00	0.06	2647.16	4111.08	210.50	1.50
16	-13.19	3520.61	2688.00	483.24	0.00	0.06	2647.16	4111.08	210.50	1.50
17	-17.68	3520.61	2688.00	483.24	0.00	0.06	2647.16	4111.08	210.50	1.50
18	-22.21	3520.61	2688.00	483.24	0.00	0.06	2647.16	4111.08	210.50	1.50
19	-26.80	3520.61	2688.00	483.24	0.00	0.06	2647.16	4111.08	210.50	1.50
20	-31.44	3520.61	2688.00	483.24	0.00	0.06	2647.16	4111.08	210.50	1.50
21	-36.14	3520.61	2688.00	483.24	0.00	0.06	2647.16	4111.08	210.50	1.50
22	-40.91	3520.61	2688.00	483.24	0.00	0.06	2647.16	4111.08	210.50	1.50
23	-45.74	3520.61	2688.00	483.24	0.00	0.06	2647.16	4111.08	210.50	1.50
24	-50.65	3520.61	2688.00	483.24	0.00	0.06	2647.16	4111.08	210.50	1.50
25	-55.63	3520.61	2688.00	483.24	0.00	0.06	2647.16	4111.08	210.50	1.50
26	-60.69	3520.61	2688.00	483.24	0.00	0.06	2647.16	4111.08	210.50	1.50
27	-65.84	3520.61	2688.00	483.24	0.00	0.06	2647.16	4111.08	210.50	1.50
28	-71.09	3520.61	2688.00	483.24	0.00	0.06	2647.16	4111.08	210.50	1.50
29	-76.43	3520.61	2688.00	483.24	0.00	0.06	2647.16	4111.08	210.50	1.50
30	-81.87	3520.61	2688.00	483.24	0.00	0.06	2647.16	4111.08	210.50	1.50
Assumed interface strength (Bacas 2015)										
16	0.00	4371.26	2688.00	483.24	0.00	0.06	2647.16	4948.81	261.37	1.82


Required Interface Shear Strength: Static, Drained Case
Target FS = 1.5
Case I - Static, Drained; FS=1.5
Estimated Interface Strength
Interface Adhesion (psf)
45
40
35
30
25
20
15
10
5
0
FS < Target
FS > Target
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
Interface Friction Angle (degrees)

APPENDIX D – A REFERENCE FOR CHARACTERIZING THE ENGINEERING PROPERTIES OF SOILS

A Reference for Characterizing the Engineering Properties of Soils

Purpose:

- This document provides focused background discussion, typical values, empirical correlations, and guidance for selecting engineering soil properties.

Developed by: Stantec Consulting Services Inc.	
Prepared by: Alan Rauch	*Reviewed by:* Jeff Dingrando
Date: 4/16/2020	

Table of Contents

Section **Page No.**

1. Introduction 7

2. Density Parameters 8

3. Hydraulic Conductivity 12
3.1. Saturated Soil Permeability 12
3.2. Permeability from Slug Tests 13
3.3. Permeability from CPT Dissipation Tests 15
3.4. Anisotropic Permeability 16
3.5. Seepage in Unsaturated Soils 22
3.5.1. Soil-Water Characteristic Curve 23
3.5.2. Hydraulic Conductivity Function 24

4. Small-Strain Shear Stiffness 29
4.1. Elastic Stiffness and Wave Velocity 29
4.2. G_{max} Correlations Based on Void Ratio 29
4.3. G_{max} Correlations Based on Penetration Resistance 30
4.4. G_{max} Correlations Based on Site-Specific Data 31

5. Strength Parameters from Laboratory Test Data 33
5.1. Definition of Failure 33
5.2. Fitting Strength Envelopes 34

6. Drained Strength Parameters for Static, Long Term Conditions 35
6.1. Basis 35
6.2. Effective Stress Cohesion Intercept 35
6.3. Fully Softened Strengths of Overconsolidated Clays 36
6.4. Depth of Surficial Softening 39
6.5. Laboratory and Field Measurement 39
6.6. Typical Values 39
6.7. Recommended Practice 40

7. Undrained Strength Parameters for Static, Short Term Conditions 46
7.1. Basis 46
7.2. When to Use Undrained Strengths 47
7.3. Undrained Strength Parameters 49
7.3.1. UU Strengths 49
7.3.2. c/p Ratios 50
7.3.3. Undrained c and ϕ 51
7.4. Laboratory Measurements of Undrained Soil Strengths 51
7.4.1. Specimen Consolidation 51
7.4.2. Loading Path 52

Section **Page No.**

7.4.3. Interpretation of Triaxial Test Data 53
7.4.3.1. UU Tests - Maximum Shear Stress, $(S_U)_{ms}$ 53
7.4.3.2. CU Tests - Maximum Shear Stress, $(S_U)_{ms}$ 54
7.4.3.3. CU Tests - Shear Stress from R-envelope, $(S_U)_R$ 54
7.4.3.4. CU Tests - Shear Stress on the Failure Plane, $(S_U)_{ff}$ .. 55
7.4.3.5. Comparison of Shear Strengths from CU Tests 55
7.5. In Situ Measurements of Undrained Soil Strengths 59
7.5.1. Standard Penetration Test Blowcounts 59
7.5.2. Cone Penetration Resistance 59
7.5.3. Field Vane Shear Tests 60
7.6. Typical Values 60
7.7. Recommended Practice 64
7.8. Composite Drained-Undrained Strength Envelopes 66

8. Strength of Unsaturated Soils 68
8.1. Saturation and Excess Pore Pressures 68
8.2. Conditions above the Water Table 68
8.3. Selection of Strength Parameters 69

9. Undrained Strength Parameters for Seismic Conditions 70
9.1. Basis 70
9.2. Estimation of Dynamic Strengths 70
9.3. Dynamic Strengths for Granular Soils 72
9.4. Undrained Strengths for Pseudostatic Analyses 73

10. Residual Strength Parameters for Liquefied Soils 74
10.1. Basis 74
10.2. Correlations based on SPT Blowcount 74
10.3. Correlations based on CPT Tip Resistance 77
10.4. Recommended Practice 78

11. Residual Strength Parameters for Cyclic Softened Soils 83
11.1. Field and Laboratory Measurements of Remolded Strength 83

12. Properties of Rockfill 84
12.1. Basis 84
12.2. Historical Data 85
12.3. Published Research 85
12.4. Curved Strength Envelopes in Slope/W 87

13. References 94

List of Figures

Figure **Page No.**

Figure 1. Density Properties for Typical Soils 9
Figure 2. Typical Index Properties for Soils (NAVFAC DM 7.01 1986) 10
Figure 3. Typical Properties of Compacted Soils (NAVFAC DM 7.02 1986) 11
Figure 4. Hydraulic conductivity and classification of soils (from Terzaghi and Peck 1967). 17
Figure 5. Typical values of hydraulic conductivity for natural soils (from Lambe and Whitman 1969) 18
Figure 6. Typical permeability parameters for natural soils and rock (from USBR 2011b). 19
Figure 7. Typical permeability parameters for various embankment materials (from USBR 2011b). 20
Figure 8. Geometry and symbols of a partially penetrating, partially perforated well in an unconfined aquifer with gravel pack or developed zone around the perforated section (from Bouwer and Rice 1976). 21
Figure 9. Charts for estimating saturated hydraulic conductivity from piezo-CPT dissipation tests. 22
Figure 10. Example Soil-Water Characteristic Curve (GEO-SLOPE 2010) 25
Figure 11. Tables of SWCC fitting parameters for typical soils. 26
Figure 12. SWCC and fitting parameters for coarse soils. 27
Figure 13. SEEP/W Library of Soil-Water Characteristic Curves (GEO-SLOPE 2010) 28
Figure 14. Example Hydraulic Conductivity Function (GEO-SLOPE 2010) 28
Figure 15. Example site-specific empirical correlation for shear wave velocity 32
Figure 16. (a) Stress-displacement curves for overconsolidated and fully softened (normally consolidated) natural stiff fissured clays, and (b) overconsolidated peak, fully softened peak and residual strength envelopes (from VandenBerge et al. 2013). 37
Figure 17. Correlations for effective stress friction angle in sands from SPT data. 42
Figure 18. Correlations for effective stress friction angle in sands from CPT data. 43

Figure **Page No.**

Figure 19. Typical values of effective stress friction angle for granular soils. 44
Figure 20. Typical values of effective stress friction angle for clay soils. 45
Figure 21. Selection of appropriate shear strength parameters for stability analyses. 48
Figure 22. Undrained shear strength determined from UU triaxial test results fit with a c/p ratio. 56
Figure 23. Undrained strength envelope representing the maximum shear stress measured in CU triaxial tests (this method is not recommended). 57
Figure 24. Undrained shear strengths determined from an R-envelope fit to CU triaxial test results. 57
Figure 25. Undrained strength envelope representing the failure plane shear stresses measured in CU triaxial tests. 58
Figure 26. Drained, undrained, and R strength envelopes from CU triaxial tests (after FERC 2006; USBR 2011a) 58
Figure 27. Comparison of undrained shear strengths, characterized using three different definitions, from CU triaxial tests. 59
Figure 28. Consistency of clays based on undrained strength (based on values from Peck et al. 1974) 61
Figure 29. Correction factor for the interpretation of undrained shear strengths from field vane shear tests (from Ladd and DeGroot 2003). 62
Figure 30. Correlations for c/p ratio in normally consolidated clays (from Duncan et al. 1989). 63
Figure 31. Typical values for estimating the c/p ratio using Equation 30. 64
Figure 32. Specification of a composite strength envelope to avoid undrained shearing resistance due to negative pore pressures. 67
Figure 33. Correlations between residual strength of liquefied soil and SPT penetration resistance. 79
Figure 34. Correlations for the residual strength of liquefied soil by Olson and Stark (2002). 80
Figure 35. Correlations for the residual strength of liquefied soil by Idriss and Boulanger (2008) 81
Figure 36. Correlation for the residual strength of liquefied soil by Castro (1995). 82

Figure **Page No.**

Figure 37. Definition of secant friction angle for representing curved strength envelopes. 88

Figure 38. Shearing strength of three rockfills from large-scale triaxial tests (from Marachi et al. 1972). 89

Figure 39. Data on rockfill properties compiled by Leps (1970). 90

Figure 40. Shearing strength of rockfill from large-scale triaxial tests (from Leps 1970) 93

A Reference for Characterizing the Engineering Properties of Soils

1. Introduction

This document provides focused background discussion, typical values, empirical correlations, and guidance for selecting engineering soil properties. The emphasis is on the soil parameters needed for slope stability analyses. The measurement and selection of soil properties is a broad subject, and this document does not provide a comprehensive review. Good textbook treatments are provided in Lambe and Whitman (1969), Holtz and Kovacs (1981), Terzaghi et al. (1996), and Duncan et al. (2014).

It is impossible to anticipate the conditions that will be encountered at a particular site or project. The engineering team must select the appropriate methods for characterizing each soil, based on the available data, specific characteristics of the material, geologic setting, application of the parameter in the analysis, and professional judgment.

2. Density Parameters

The unit weight of a given soil varies with water content, with different values in a deposit above or below the water table. Unit weights for various moisture conditions can be computed as follows:

Dry unit weight $$\gamma_d = \frac{G_s}{1+e}\,\gamma_w$$ **Equation 1**

Moist unit weight $$\gamma_m = \gamma_d(1+w)$$ **Equation 2**

Saturated unit weight $$\gamma_{sat} = \frac{G_s + e}{1+e}\,\gamma_w$$ **Equation 3**

where G_s is the specific gravity of the solids, e is the void ratio, w is the gravimetric moisture content, and γ_w is the unit weight of water (62.4 pcf). Specific gravity is typically about 2.65 for sands, and about 2.7 for clays.

The gravimetric water content (w) is the ratio of the water weight over dry weight of solids in the soil. The volumetric water content (θ), defined as the ratio of water volume over total soil volume, is used in some analyses. These two measures of moisture content can be related:

$$\theta = \frac{G_s\, w}{1+e} = \frac{S\, e}{1+e} = S\, n$$ **Equation 4**

where e is void ratio, S is saturation, and n is porosity. In a saturated soil (S = 100%), the volumetric water content is equal to the porosity.

Direct measurements of density properties are obtained from field and laboratory testing. When direct measurements are not available, these properties can be estimated using typical values for similar materials, such as those tabulated in Figure 1 through Figure 3. In granular soils, unit weights can be estimated based on penetration resistance, which can be correlated to relative density (see Figure 19).

	Density (Mg/m³)†						
	Dry Density, ρ_d			Wet Density, ρ		Submerged Density, ρ'	
	Min. (loose)	100% Mod. Proctor	Max. (dense)	Min. (loose)	Max. (dense)	Min. (loose)	Max. (dense)
1. Uniform materials:							
(a) Equal spheres (theoretical values)	—	—	—	—	—	—	—
(b) Standard Ottawa sand	1.49	—	1.78	1.51	2.12	0.93	1.12
(c) Clean, uniform sand (fine or medium)	1.35	1.86	1.92	1.37	2.20	0.85	1.18
(d) Uniform, inorganic silt	1.29	—	1.92	1.31	2.20	0.83	1.18
2. Well-graded materials:							
(a) Silty sand	1.41	1.98	2.06	1.43	2.30	0.88	1.28
(b) Clean, fine to course sand	1.38	2.14	2.23	1.40	2.39	0.86	1.40
(c) Micaceous sand	1.23	—	1.95	1.24	2.23	0.77	1.23
(d) Silty sand and gravel	1.44	—	2.36	1.46	2.51	0.91	1.49

†Tabulation is based on $\rho_s = 2.65$ Mg/m³. Multiply by 62.4 to obtain lbf/ft³.

From Holtz and Kovacs (1981)

Description	Porosity, n (%)	Void ratio (e)	Water content, w (%)	Density (Mg/m³)		Unit Weight (kN/m³)	
				ρ_d	ρ_{sat}	γ_d	γ_{sat}
1. Uniform sand, loose	46	0.85	32	1.43	1.89	14.0	18.5
2. Uniform sand, dense	34	0.51	19	1.75	2.09	17.2	20.5
3. Mixed-grained sand, loose	40	0.67	25	1.59	1.99	15.6	19.5
4. Mixed-grained sand, dense	30	0.43	16	1.86	2.16	18.2	21.2
5. Glacial till, very mixed-grained	20	0.25	9	2.12	2.32	20.8	22.7
6. Soft glacial clay	55	1.2	45		1.77	12.0	17.4
7. Stiff glacial clay	37	0.6	22		2.07	16.7	20.3
8. Soft slightly organic clay	66	1.9	70		1.58	9.1	15.5
9. Soft very organic clay	75	3.0	110		1.43	6.7	14.4
10. Soft bentonite	84	5.2	194		1.27	4.2	12.5

w = water content when saturated, in percent of dry weight.
ρ_d = density in dry state.
ρ_{sat} = density in saturated state.
γ_d = unit weight in dry state.
γ_{sat} = unit weight in saturated state.

From Terzaghi et al. (1996)

Figure 1. Density Properties for Typical Soils

Particle Size and Gradation					Voids[1]					Unit Weight[2] (lb./cu.ft.)						
	Approximate Size Range (mm)		Approx. D_{10} (mm)	Approx. Range Uniform Coefficient C_u	Void Ratio			Porosity (%)		Dry Weight			Wet Weight		Submerged Weight	
	D_{max}	D_{min}			e_{max} loose	e_{cr}	e_{min} dense	n_{max} loose	n_{min} dense	Min loose	100% Mod. AASHO	Max dense	Min loose	Max dense	Min loose	Max dense
GRANULAR MATERIALS																
Uniform Materials																
a. Equal spheres (theoretical values)	-	-	-	1.0	0.92	-	0.35	47.6	26	-	-	-	-	-	-	-
b. Standard Ottawa SAND	0.84	0.59	0.67	1.1	0.80	0.75	0.50	44	33	92	-	110	93	131	57	69
c. Clean, uniform SAND (fine or medium)	-	-	-	1.2 to 2.0	1.0	0.80	0.40	50	29	83	115	118	84	136	52	73
d. Uniform, inorganic SILT	0.05	0.005	0.012	1.2 to 2.0	1.1	-	0.40	52	29	80	-	118	81	136	51	73
Well-graded Materials																
a. Silty SAND	2.0	0.005	0.02	5 to 10	0.90	-	0.30	47	23	87	122	127	88	142	54	79
b. Clean, fine to coarse SAND	2.0	0.05	0.09	4 to 6	0.95	0.70	0.20	49	17	85	132	138	86	148	53	86
c. Micaceous SAND	-	-	-	-	1.2	-	0.40	55	29	76	-	120	77	138	48	76
d. Silty SAND & GRAVEL	100	0.005	0.02	15 to 300	0.85	-	0.14	46	12	89	-	146[3]	90	155[3]	56	92
MIXED SOILS																
Sandy or Silty CLAY	2.0	0.001	0.003	10 to 30	1.8	-	0.25	64	20	60	130	135	100	147	38	85
Skip-graded Silty CLAY with stones or rk fgmts	250	0.001	-	-	1.0	-	0.20	50	17	84	-	140	115	151	53	89
Well-graded GRAVEL, SAND, SILT & CLAY mixture	250	0.001	0.002	25 to 1000	0.70	-	0.13	41	11	100	140	148[4]	125	156[4]	62	94
CLAY SOILS																
CLAY (30%-50% clay sizes)	0.05	0.5μ	0.001	-	2.4	-	0.50	71	33	50	105	112	94	133	31	71
Colloidal CLAY (-0.002 mm: 50%)	0.01	10Å	-	-	12	-	0.60	92	37	13	90	106	71	128	8	66
ORGANIC SOILS																
Organic SILT	-	-	-	-	3.0	-	0.55	75	35	40	-	110	87	131	25	69
Organic CLAY (30% - 50% clay sizes)	-	-	-	-	4.4	-	0.70	81	41	30		100	81	125	18	62

Figure 2. Typical Index Properties for Soils (NAVFAC DM 7.01 1986)

Figure 3. Typical Properties of Compacted Soils (NAVFAC DM 7.02 1986)

Group Symbol	Soil Type	Range of Maximum Dry Unit Weight, pcf	Range of Optimum Moisture, Percent	Typical Value of Compression		Typical Strength Characteristics				Typical Coefficient of Permeability ft./min.	Range of CBR Values	Range of Subgrade Modulus k lbs/cu in.
				At 1.4 tsf (20 psi)	At 3.6 tsf (50 psi)	Cohesion (as compacted) psf	Cohesion (saturated) psf	ϕ (Effective Stress Envelope Degrees)	Tan ϕ			
				Percent of Original Height								
GW	Well graded clean gravels, gravel-sand mixtures.	125 - 135	11 - 8	0.3	0.6	0	0	>38	>0.79	5×10^{-2}	40 - 80	300 - 500
GP	Poorly graded clean gravels, gravel-sand mix	115 - 125	14 - 11	0.4	0.9	0	0	>37	>0.74	10^{-1}	30 - 60	250 - 400
GM	Silty gravels, poorly graded gravel-sand-silt.	120 - 135	12 - 8	0.5	1.1	.....	.....	>34	>0.67	$>10^{-6}$	20 - 60	100 - 400
GC	Clayey gravels, poorly graded gravel-sand-clay.	115 - 130	14 - 9	0.7	1.6	.....	.....	>31	>0.60	$>10^{-7}$	20 - 40	100 - 300
SW	Well graded clean sands, gravelly sands.	110 - 130	16 - 9	0.6	1.2	0	0	38	0.79	$>10^{-3}$	20 - 40	200 - 300
SP	Poorly graded clean sands, sand-gravel mix.	100 - 120	21 - 12	0.8	1.4	0	0	37	0.74	$>10^{-3}$	10 - 40	200 - 300
SM	Silty sands, poorly graded sand-silt mix.	110 - 125	16 - 11	0.8	1.6	1050	420	34	0.67	$5 \times >10^{-5}$	10 - 40	100 - 300
SM-SC	Sand-silt clay mix with slightly plastic fines.	110 - 130	15 - 11	0.8	1.4	1050	300	33	0.66	$2 \times >10^{-6}$	5 - 30	100 - 300
SC	Clayey sands, poorly graded sand-clay-mix.	105 - 125	19 - 11	1.1	2.2	1550	230	31	0.60	$5 \times >10^{-7}$	5 - 20	100 - 300
ML	Inorganic silts and clayey silts.	95 - 120	24 - 12	0.9	1.7	1400	190	32	0.62	$>10^{-5}$	15 or less	100 - 200
ML-CL	Mixture of inorganic silt and clay.	100 - 120	22 - 12	1.0	2.2	1350	460	32	0.62	$5 \times >10^{-7}$	.....	
CL	Inorganic clays of low to medium plasticity.	95 - 120	24 - 12	1.3	2.5	1800	270	28	0.54	$>10^{-7}$	15 or less	50 - 200
OL	Organic silts and silt-clays, low plasticity.	80 - 100	33 - 21	.....	.....	.....	.....	.....	.....	.....	5 or less	50 - 100
MH	Inorganic clayey silts, elastic silts.	70 - 95	40 - 24	2.0	3.8	1500	420	25	0.47	$5 \times >10^{-7}$	10 or less	50 - 100
CH	Inorganic clays of high plasticity	75 - 105	36 - 19	2.6	3.9	2150	230	19	0.35	$>10^{-7}$	15 or less	50 - 150
OH	Organic clays and silty clays	65 - 100	45 - 21	.....	.....	.....	.....	.....	.....	.....	5 or less	25 - 100

Notes:

1. All properties are for condition of "Standard Proctor" maximum density, except values of k and CBR which are for "modified Proctor" maximum density.
2. Typical stength characteristics are for effective strength envelopes and are obtained from USBR data.
3. Compression values are for vertical loading with complete lateral confinement.
4. (>) indicates that typical property is greater than the value shown.
   (..) indicates insufficient data available for an estimate.

3. Hydraulic Conductivity

This discussion relates to the seepage of water through soil per Darcy's law, wherein the seepage flow rate is proportional to the hydraulic gradient. The key soil parameter is the hydraulic conductivity (k); here, the generic term "permeability" is assumed to be synonymous with hydraulic conductivity.

Hydraulic conductivity varies over an extremely wide range for different soils, and the permeability of a large soil mass is difficult to determine with precision. Measurements made with discrete soil samples will fail to capture the influence of macro seepage features (fissures, discontinuities, inclusions, thin beds of different material, etc.) that may have a major impact on seepage through the soil mass. More representative values can sometimes be obtained through field testing, but such tests are expensive and difficult to interpret. The characterization of soil permeability parameters requires significant engineering judgment.

Seepage analyses may be performed to characterize the distribution of pore water pressures in an earth slope, without regard to seepage flow rates. For this type of problem, the relative permeabilities between the various soil strata and/or the ratio of horizontal to vertical permeability (anisotropy ratio) within a given soil zone, are more important to the model solution than the absolute permeability of any particular soil. Thinking about the flownet for a uniform, isotropic seepage problem, the head (or pressure) at any location is independent of the hydraulic conductivity. Also, if the permeability in one material is more than about two orders of magnitude higher than the adjacent soil, then the first will act like a drain and can be modeled as a boundary condition.

The engineer should consider these issues in selecting appropriate permeability parameters for a particular analysis, recognizing that the needed solution may not be sensitive to the permeability of some materials. Permeability estimates, based on typical values for similar soils, are often sufficient and appropriate for developing a reasonable seepage model. Testing and evaluation should be concentrated on the soil zones that are critical to the problem.

3.1. Saturated Soil Permeability

The tables and charts provided below are useful when estimating hydraulic conductivity for saturated soils, or when checking the validity of permeability measurements. The charts in Figure 4 classify soil behavior in terms of permeability ranges, while data for common soils and embankment materials are provided in Figure 3 and Figure 5 though Figure 7.

The hydraulic conductivity of clean, loose, uniform sands can be estimated using Hazen's empirical equation:

$$k \approx C\ (D_{10})^2 \qquad \textbf{Equation 5}$$

where k is the hydraulic conductivity (cm/sec), D_{10} (mm) is the effective grain size (10% of soil particles are smaller than D_{10}), and C is an empirical constant that typically varies between 0.8 and 1.2. This empirical correlation illustrates that permeability is strongly affected by the finer particles in a soil. However, Hazen's equation was developed for filter sands, and is thus limited in applicability to loose, uniform sands with less than 5% fines.

Hydraulic conductivity is also affected by how densely the soil particles are packed together. The change in permeability with the change in density, for a particular soil, can be estimated using:

$$k_1\left(\frac{e_2^3}{1+e_2}\right) = k_2\left(\frac{e_1^3}{1+e_1}\right) \qquad \textbf{Equation 6}$$

where k_1 is the permeability at a void ratio of e_1, and k_2 is the permeability of the same soil at a void ratio of e_2. Equation 6 is based on the Kozeny-Carman equation (Lambe and Whitman 1969).

In the laboratory, hydraulic conductivity can be measured directly from constant head permeability tests (preferred for soils with $k > 10^{-3}$ cm/sec) or falling head permeability tests (preferred for soils with $k < 10^{-5}$ cm/sec). The permeability of fine-grained soils can also be determined from the results of one-dimensional consolidation tests. The accuracy of laboratory permeability measurements is limited, in all cases, by how well the test specimen represents the in situ soil deposit.

In the field, hydraulic conductivity can be measured with borehole or well infiltration (slug) tests, with variations of constant head, falling head, and pumping. Large-scale aquifer pumping tests, with arrays of piezometer instrumentation, can also be used to characterize the permeability characteristics of large soil masses. Double ring infiltrometer tests are commonly used to measure vertical permeability on soil liners. Further discussion of all available test methods is beyond the scope of this document.

3.2. Permeability from Slug Tests

Hydraulic conductivity parameters can be determined from slug tests in screened wells or piezometers. In the field, water is either poured into or removed from the well, causing a nearly instantaneous increase or decrease in the water level. The water levels are then recorded at regular intervals until returning to the initial static level. The Bouwer-Rice solution is then fit to this data to estimate the saturated permeability, for horizontal seepage in the soil or rock strata surrounding the screened interval.

The Bouwer-Rice solution (Bouwer and Rice 1976; Bouwer 1989) for estimating the coefficient of saturated hydraulic conductivity assumes a volume of water is instantaneously removed from a well and the return of the water level is measured. The method is based on a solution of the Thiem equation for steady-state, radial water flow to a well (see Figure 8):

$$Q = 2\pi \cdot k \cdot L_e \frac{y}{\ln\left(\frac{R_e}{r_w}\right)}$$ **Equation 7**

where: Q = volumetric flow rate
k = coefficient of saturated hydraulic conductivity
L_e = length of open section of the well (screened interval)
y = vertical distance between water level in the well and static water level of groundwater aquifer
R_e = effective radial distance over which y is dissipated
r_w= radial distance of the undisturbed portion of the aquifer

The change in water elevation within a well over a change in time is:

$$\frac{dy}{dt} = \frac{-Q}{\pi r_c^2}$$ **Equation 8**

where r_c is the inside radius of the well casing if above the open portion of the well (the porosity of the surrounding material may need to be considered if the water level is changing in the open portion of the well)

Bouwer and Rice assumed that the draw-down of the water table around the well is negligible, flow in the vadose (unsaturated) zone can be ignored, head losses are negligible, and the aquifer is both homogeneous and isotropic. Bouwer and Rice combined the two equations and solved for the coefficient of saturated hydraulic conductivity assuming boundary conditions of y_o at t = 0.0 and y_t at t:

$$k = \frac{r_c^2 \cdot \ln\left(\frac{R_e}{r_w}\right)}{2 \cdot L} \cdot \frac{1}{t} \cdot \ln\frac{y_o}{y_t}$$ **Equation 9**

The effective radial distance over which y is dissipated (R_e) was determined by Bouwer and Rice for different geometries based on an electrical resistance network analog. Thus, the value must be determined from their literature (Bouwer and Rice, 1976). This form of the equation allows k to be calculated from the rise in water level after suddenly removing a slug of water from the well. The term $\frac{1}{t} \cdot \ln\frac{y_o}{y_t}$ may be determined from a best fit linear regression of field data plotted as ln(y) versus t.

Bouwer (1989) explained the applicability of using the method to determine the coefficient of saturated hydraulic conductivity from a slug test where water is added to the well.

3.3. Permeability from CPT Dissipation Tests

In situ soil permeability can be estimated from pore pressure dissipation data acquired during cone penetration testing (CPT). When the piezocone probe is stopped, at selected depths or intervals in a saturated deposit, the excess pore water pressures induced by pushing the cone will begin to dissipate. Based on consolidation theory, the rate of pore pressure dissipation can be related to the lateral hydraulic conductivity of the soil surrounding the probe. The method presented below assumes the penetration pore pressures are measured immediately behind the conical tip, at the "u_2" location.

The horizontal permeability (k_h) of a soil is determined from a CPT dissipation test as follows:

(1) Halt advancement of the piezocone and record the soil water pore pressures (u_t) as a function of time (t).

(2) From the data, determine the initial pore pressure (u_i) measured when the piezocone was halted, at t = 0.0.

(3) Estimate the static pore pressure (u_o) at the test location before penetration of the cone. This may be determined from knowledge of the ground water table in relation to the depth of the CPT probe, piezometric readings, or data from piezocone tests in adjacent sand layers.

(4) Compute the normalized excess pore pressure (U) for each measurement of u_t:

$$U = \frac{u_t - u_o}{u_i - u_o} \qquad \textbf{Equation 10}$$

(5) Plot the normalized excess pore pressure dissipation as a function of time, using a log scale for the time axis.

(6) From the plot of data, determine the measured time for 50% pore pressure dissipation (t_{50}, measured at U = 0.5).

(7) Alternatively, t_{50} may be determined from a square root of time plot, using the graphical construction technique commonly used to interpret soil consolidation test data.

(8) The coefficient of saturated, horizontal hydraulic conductivity can then be estimated using either of the charts in Figure 9 (note the difference in time units between the two charts).

The resulting estimates of soil permeability are only approximate and subject to significant uncertainty (Lunne et al. 1997).

3.4. Anisotropic Permeability

Most natural soils and embankment materials are anisotropic, typically with horizontal stratification due to horizontal bedding in natural deposits or the construction of fills in horizontal lifts. This usually results in a horizontal permeability (k_h) greater than the vertical permeability (k_v). Anisotropic permeability is characterized with the ratio of k_h/k_v (Note: SEEP/W uses the inverse ratio of k_v/k_h).

The magnitude of k_h/k_v is an important parameter to consider in a seepage analysis, but can be difficult to characterize. Vertical permeability is usually measured in laboratory tests, consistent with the orientation of borehole samples. Laboratory testing is less effective for measuring horizontal permeability, due to the difficulty of obtaining representative samples suitable for such tests. Field tests, including slug tests in screened wells (Section 3.2) and CPT dissipation tests (Section 3.3), induce mostly radial seepage; horizontal permeability is inferred, but some vertical seepage will occur. There are limitations associated with each of these measurements. The anisotropy of the materials is not measured directly, thus, the value of k_h/k_v must be approximated by combining different test results and considering knowledge of the subsurface stratigraphy.

The U.S. Army Corps of Engineers suggests that values of $k_h/k_v = 1, 10, 25, 100$ should be considered for parametric evaluations of underseepage (EM 1110-2-1901, USACE 1986). Typical ranges of k_h/k_v for various natural soils and embankment fills, as suggested by the U.S. Bureau of Reclamation (USBR 2011b), are listed in Figure 6 and Figure 7.

Selection of an appropriate value of k_h/k_v should consider the depositional environment for the material. Wind-blown soils (dune sands, loess) are relatively uniform, with k_h/k_v values in the range of 0.2 to 2. Residual soils may also have low k_h/k_v, depending on the structure of the parent rock. Deposition in water (alluvial, fluvial, and lacustrine environments) usually leads to highly stratified and variable soil deposits, with relatively high k_h/k_v. These classes of soils may have $k_h/k_v > 100$ (USBR 2011b). Anisotropy in bedrock is generally controlled by the degree of stratification and jointing.

The USBR (2011b) indicates that compacted embankment soils typically have k_h/k_v ratios in the range of 2 to 10. Older dams (built in early 20th century) and hydraulic fill dams may have k_h/k_v up to 50, due to older construction procedures that did not adequately scarify and mix the surface of each compacted soil lift. Coarse grained embankment zones, including drains, filters, and rockfill shells, can be assumed to have $k_h/k_v = 1$.

Degree of Permeability	Hydraulic Conductivity (cm/sec)
High	Greater than 10^{-1}
Medium	10^{-1} to 10^{-3}
Low	10^{-3} to 10^{-5}
Very Low	10^{-5} to 10^{-7}
Practically Impermeable	Less than 10^{-7}

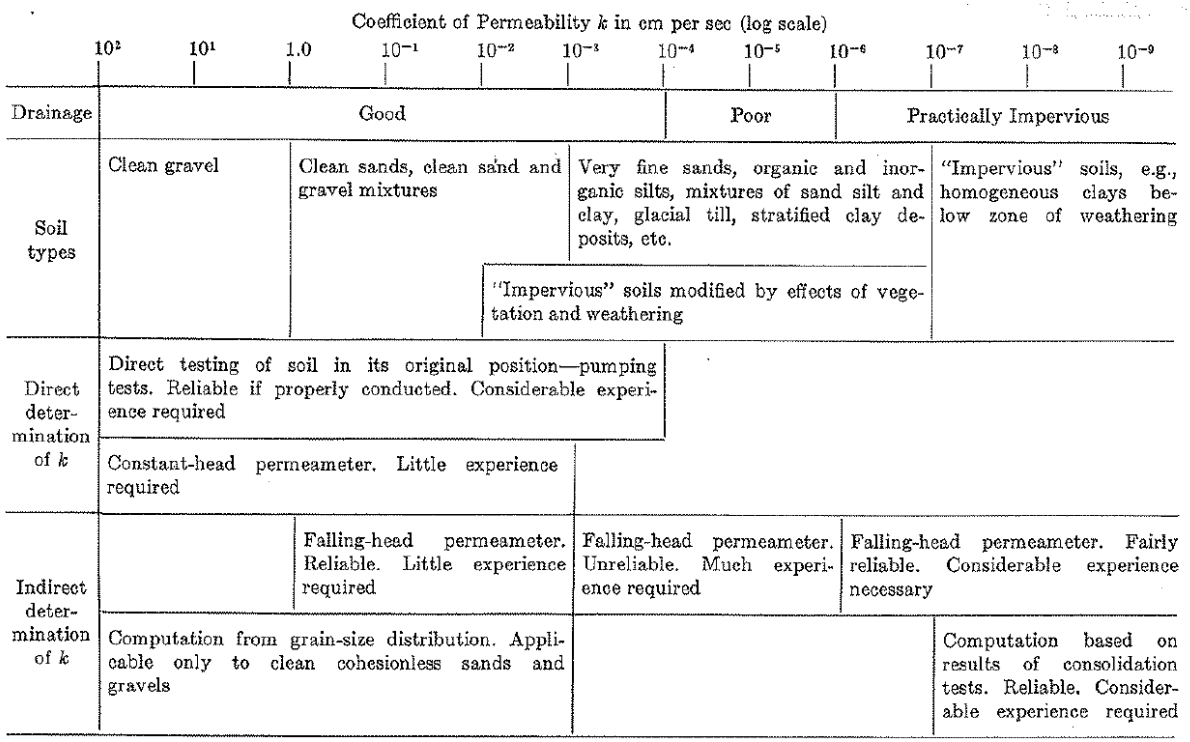
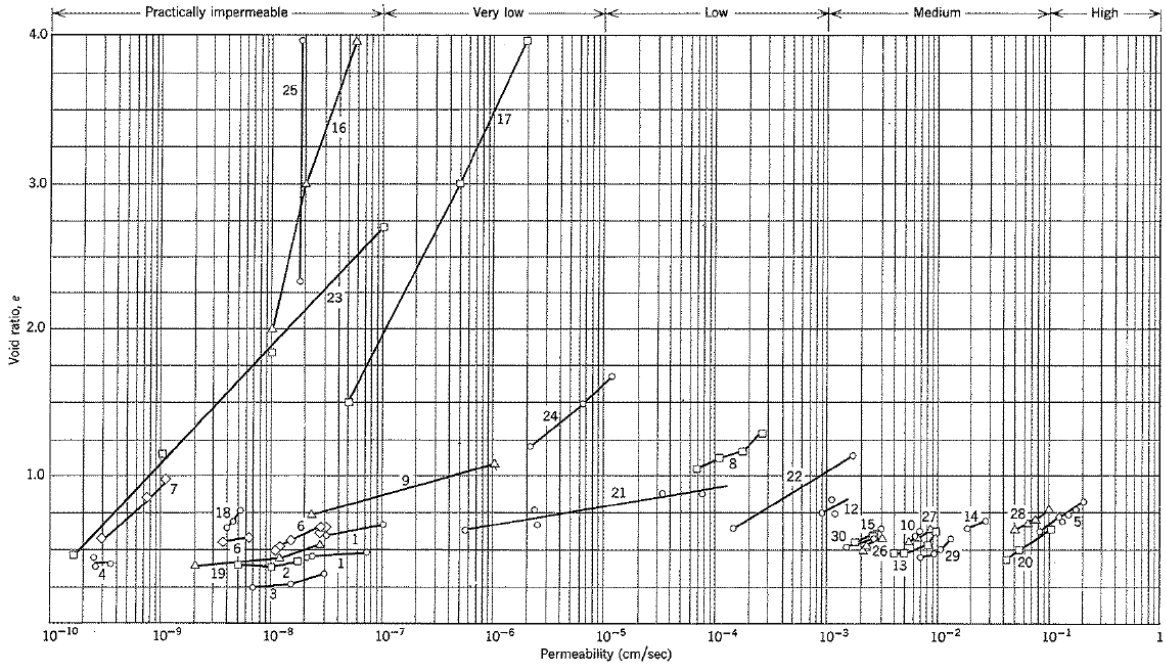


Figure 4. Hydraulic conductivity and classification of soils (from Terzaghi and Peck 1967).

Formation	Value of k (cm/sec)
River deposits	
Rhone at Genissiat	Up to 0.40
Small streams, eastern Alps	0.02–0.16
Missouri	0.02–0.20
Mississippi	0.02–0.12
Glacial deposits	
Outwash plains	0.05–2.00
Esker, Westfield, Mass.	0.01–0.13
Delta, Chicopee, Mass.	0.0001–0.015
Till	Less than 0.0001
Wind deposits	
Dune sand	0.1–0.3
Loess	0.001 ±
Loess loam	0.0001 ±
Lacustrine and marine offshore deposits	
Very fine uniform sand, U^a = 5–2	0.0001–0.0064
Bull's liver, Sixth Ave., N.Y., U = 5–2	0.0001–0.0050
Bull's liver, Brooklyn, U = 5	0.00001–0.0001
Clay	Less than 0.0000001

[a] U = uniformity coefficient.



Soil Identification Code

1 Compacted caliche	10 Ottawa sand	19 Lean clay
2 Compacted caliche	11 Sand—Gaspee Point	20 Sand—Union Falls
3 Silty sand	12 Sand—Franklin Falls	21 Silt—North Carolina
4 Sandy clay	13 Sand—Scituate	22 Sand from dike
5 Beach sand	14 Sand—Plum Island	23 Sodium—Boston blue clay
6 Compacted Boston blue clay	15 Sand—Fort Peck	24 Calcium kaolinite
7 Vicksburg buckshot clay	16 Silt—Boston	25 Sodium montmorillonite
8 Sandy clay	17 Silt—Boston	26–30 Sand (dam filter)
9 Silt—Boston	18 Loess	

Figure 5. Typical values of hydraulic conductivity for natural soils (from Lambe and Whitman 1969)

Permeability k_H of Unconsolidated Natural Soils (k_H inversely related to % finer grains)

Soil	k_H Range (ft/yr or 10^{-6} cm/s)
Gravel, open-work	>2,000,000
Gravel (GP)	200,000 to 2,000,000
Gravel (GW)	10,000 to 1,000,000
Sand, coarse (SP)	10,000 to 500,000
Sand, medium (SP)	1,000 to 100,000
Sand, fine (SP)	500 to 50,000
Sand (SW)	100 to 50,000
Sand, silty (SM)	100 to 10,000
Sand, clayey (SC)	1 to 1,000
Silt (ML)	1 to 1,000
Clay (CL)	~0 to 3

References: [15], [18], [22-29], [33-36]

Permeability k_H of Unfractured Rock (k_H increases with pore size)

Rock	k_H Range (ft/yr or 10^{-6} cm/s)
Sandstone, medium	100 to 200,000
Sandstone, silty	~0 to 5,000
Limestone	~0 to 15,000
Granite, weathered	200 to 10,000
Schist	~0 to 2,000
Tuff	~0 to 1,000
Gabbro, weathered	50 to 500
Basalt	~0 to 50
Dolomite	~0 to 5
Gneiss	~0 to 2

References: [15], [25], [27-28], [34], [36]

Anisotropy of Natural Soil and Rock

Formation	k_H/k_V	Remarks
Stratified deposits	10 to 1,000	k_H/k_V depends on grain size of substrata
Massive soil or rock	1 to 3	Depends on particle shape and orientation
Fractured rock	0.1 to 10	Depends on aperture arrangement
Eolian soil (loess and dune)	0.02 to 2	Depends on consolidation

References: [3], [15], [17], [19-21], [24], [30-31], [35-42]

Figure 6. Typical permeability parameters for natural soils and rock (from USBR 2011b).

Permeability (k_V) of Embankment Core Materials (k_V inversely related to % fines)

Unified Soil Classification	k_V Range (ft/yr or $x10^{-6}$ cm/s)*
GM-SM	0.0 to 10.0
GM or GC	0.0 to 10.0
SP-SM	0.0 to 10.0
SM	0.0 to 10.0
SM-SC	0.0 to 3.0
SM-ML	0.0 to 10.0
SC	0.0 to 3.0
ML	0.0 to 10.0
ML-CL	0.0 to 1.0
CL	0.0 to 1.0
MH	0.0 to 0.1

References: [31-32], [34], [44-45]
* Based primarily on Reclamation laboratory test data

Permeability (k_V) of Embankment Shell Materials (k_V inversely related to % fines)

Unified Soil Classification	k_V Range (ft/yr or $x10^{-6}$ cm/s)
GP	2,000 to 1,000,000
GW	1,000 to 100,000
GP-SP	1,000 to 50,000
GW-SW	500 to 5,000
GM	10 to 500
SP (medium to coarse)	10,000 to 20,000
SP (fine to medium)	5,000 to 10,000
SP (very fine to fine)	500 to 5,000
SW	300 to 5,000
SP-SM	10 to 1,000
SM	10 to 500

References: [18], [26], [33], [36], [44-45]

Permeability (k_V) of Washed Embankment Drain Materials (k_V increases with grain size)

Material	k_V Range (ft/yr or $x10^{-6}$ cm/s)
Coarse sand and gravel	150,000 to 500,000
Medium to coarse sand	50,000 to 150,000
Fine to medium sand	10,000 to 50,000

References: [18], [26], [33], [36], [45]

Anisotropy (k_H/k_V) of embankment materials (k_H/k_V increases with placement water content)

Material	k_H/k_V Range
Embankment core Reclamation standard placement	4 to 9
Nonstandard placement	9 to 36
Hydraulic fill	64 to 225
Embankment shell Reclamation standard	4 to 9
Embankment drains Reclamation standard	1 to 4

References: [3], [17], [21], [31], [37]

Figure 7. Typical permeability parameters for various embankment materials (from USBR 2011b).

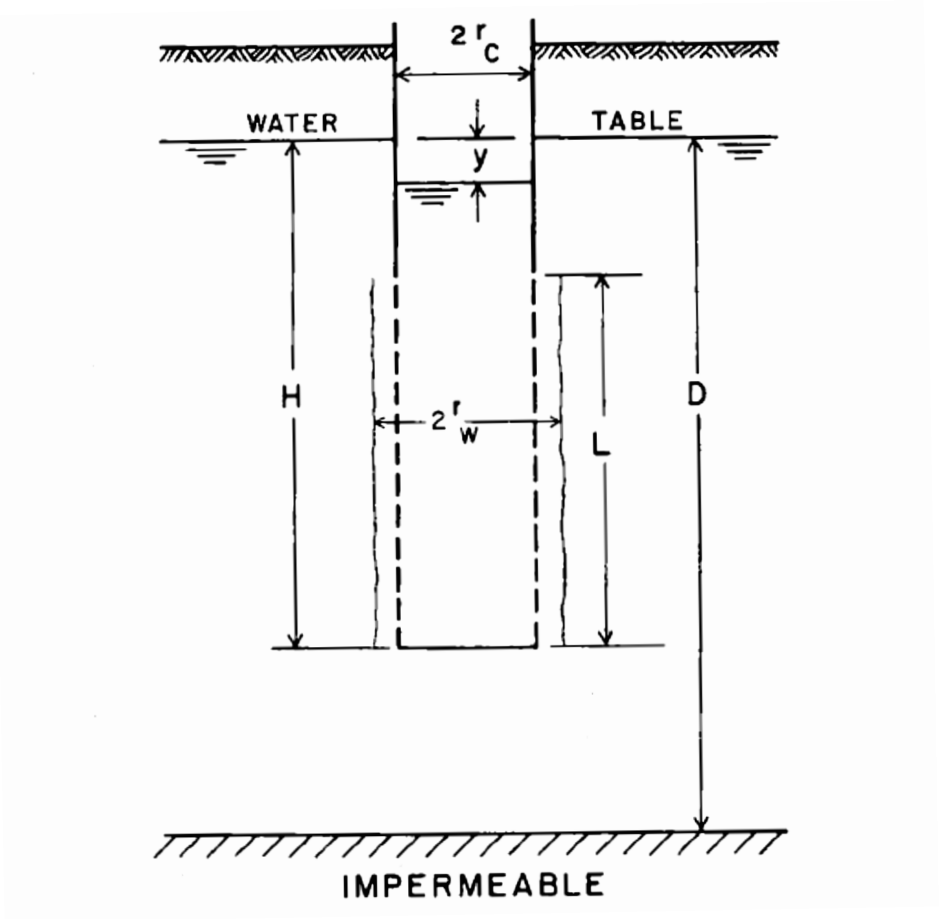
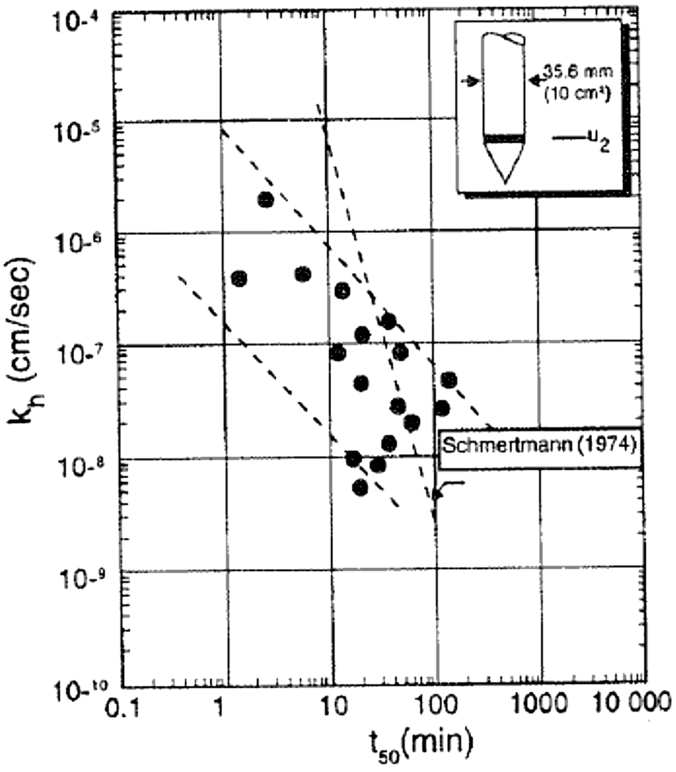


Figure 8. Geometry and symbols of a partially penetrating, partially perforated well in an unconfined aquifer with gravel pack or developed zone around the perforated section (from Bouwer and Rice 1976).

(a) From Lunne et al. (1997)



(b) From NCHRP (2007)

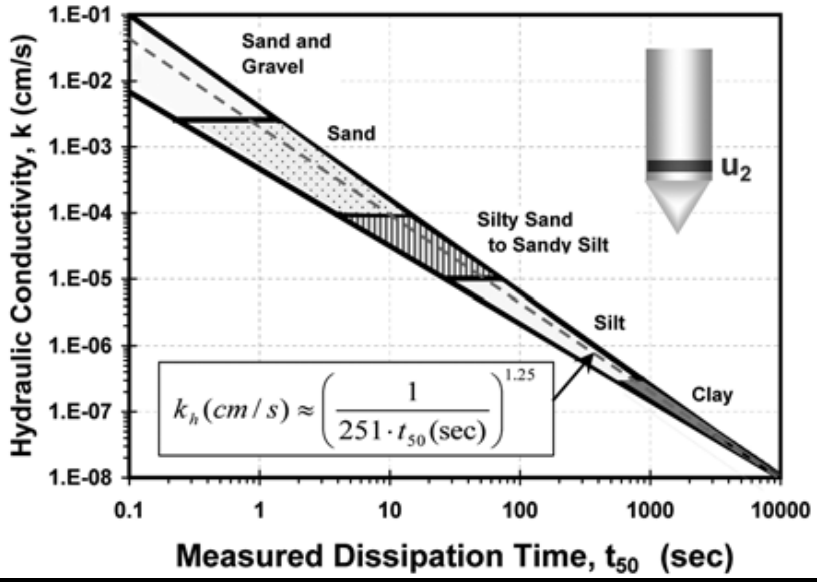


Figure 9. Charts for estimating saturated hydraulic conductivity from piezo-CPT dissipation tests.

3.5. Seepage in Unsaturated Soils

For unconfined seepage through an embankment, SEEP/W locates the phreatic line or water table (where the pressure head is zero) using an iterative process (GEO-SLOPE

2010). To find a rational solution, the software models the reduction in hydraulic conductivity with decreasing degrees of saturation (increasing matric suction) using the soil-water characteristic curve and hydraulic conductivity function described here.

These models are defined in terms of the *volumetric* water content (θ), which is related to the gravimetric water content (w) per Equation 4. Suction pore pressures are quantified in terms of the matric suction, which is the difference between the pore air pressure and the water pressure in an unsaturated soil (Fredlund and Rahardjo 1993).

3.5.1. Soil-Water Characteristic Curve

The Soil-Water Characteristic Curve (SWCC) represents the amount of water within the soil structure at various applied suctions (Fredlund and Rahardjo 1993). Figure 10 shows a typical soil-water characteristic curve, also known as a volumetric water content curve, plotted over a range of pore water pressure (negative to positive). Soils exhibit hysteresis in this relationship for wetting and drying, but only the SWCC curve for drainage (desorption) is discussed here. The SWCC is characterized by four parameters: the air entry pressure (described using a curve-fitting parameter α), the slope of the function for changes in pore water pressure (described using a curve-fitting parameter n), the residual volumetric water content (θ_r), and the saturated volumetric moisture content (θ_s).

The air entry value (AEV), represents the matric suction pressure where a saturated soil begins to de-saturate (where air enters the pores). At pore pressures above the AEV, the water within the soil mass can be removed by compressing the sample; therefore, the slope of the curve under positive pore pressures is equal to the coefficient of volume compressibility (M_v) for one-dimensional consolidation (GEO-SLOPE 2010). Once the pore water pressure falls below the AEV, water cannot be compressed out of the sample; rather, water can only be removed from the voids by applying suction pressure. Therefore, the SWCC for pressures below the AEV indicates how much water can be removed as the matric suction is increased, until the residual water content is reached. The residual volumetric water content (θ_r) occurs where further increases in matric suction do not result in significant changes in water content (Fredlund and Rahardjo 1993). The saturated volumetric moisture content (θ_s), defines the intersection of the SWCC and the x-axis (i.e. pore water pressure equals zero).

Within SEEP/W, the user can define the SWCC using direct measurements from laboratory tests, the built-in library of curves based on material classification, or one of the models proposed by Aubertin at al. (2003), van Genuchten (1980), and Fredlund and Xing (1994).

When available, laboratory test data should be used to define the soil-water characteristic curve in the SEEP/W model. Five standardized test methods, which vary in applicability based on fines content and pressure ranges, are presented in ASTM D6836. Method C, for finer soils and intermediate suctions (100 to 1000 kPa), can be used for most soil samples. When using laboratory data, it may be necessary to augment the data for the higher and lower suction pressures not tested. The Aubertin,

van Genuchten, or SEEP/W soil type models can be used to develop a standard curve shape, which can then be modified to fit the available laboratory data.

In the absence of laboratory testing, the following methods can be used to develop the SWCC:

- The "Modified Kovacs" method (Aubertin et al. 2003) develops the curve using standard laboratory test data such as grain size distribution, Atterberg limits (if applicable), and the saturated volumetric water content.

- SWCC parameters can be estimated from empirical relationships using soil index properties or using typical published values. Figure 11 provides some tables of typical values. Typical van Genuchten model parameters (α, n) including residual (θ_r) and saturated (θ_s) water contents are compiled from the UNSODA database (Leij et al., 1996). N indicates the number of soils or samples of a given textural class from which the mean values are compiled. During desorption, large pores drain more freely than smaller pores. Materials with larger particles and larger pores (e.g., sand and gravel) will retain less water under higher suction pressures. SWCC for coarse soils are difficult to measure in the laboratory. Figure 12 provides published values of curve fitting parameters for coarse soils and illustrates the corresponding SWCC.

- The SWCC can be approximated by choosing one of the functions developed by GEO-SLOPE for a given soil texture, which are based on functions taken from published literature (GEO-SLOPE 2010). The six available models are based on the soil type: Clay, Silty Clay, Silt, Silty Sand, Sand, and Gravel (shown in Figure 13). The models shown are for illustration purposes only and are dependent on the saturated volumetric water content.

3.5.2. Hydraulic Conductivity Function

When the soil is saturated, water flows through the pores easily, but as the water content decreases, the hydraulic conductivity drops rapidly as the water in the soil pores is no longer contiguous. Hence, the hydraulic conductivity of an unsaturated soil is dependent on the volumetric water content. SEEP/W estimates the hydraulic conductivity of unsaturated soils by using the SWCC, the suction pressure within the soil, and the saturated hydraulic conductivity of the soil.

A Hydraulic Conductivity Function can be derived to estimate the hydraulic conductivity over a range of suction pressures. The two methods available in SEEP/W to derive the Hydraulic Conductivity Function are from Fredlund and Xing (1994) and van Genuchten (1980). The saturated hydraulic conductivity (Section 3.1) and the SWCC are required to create the hydraulic conductivity curve. Figure 14 shows an example Hydraulic Conductivity Function for various saturated hydraulic conductivity values.

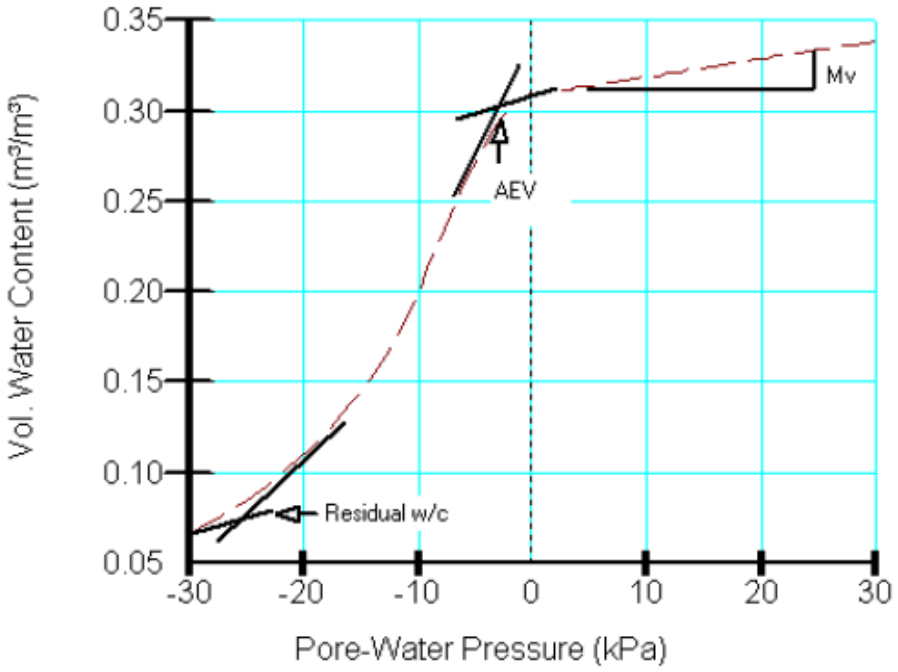


Figure 10. Example Soil-Water Characteristic Curve (GEO-SLOPE 2010)

No.	Texture class	Horizon	θ_s	θ_r	a	n
			------cm^3/cm^3------		cm^{-1}	
1	Medium Sand	C, G, B	0373	0.0304	0.0363	3.03
2	Fiie Sand	C, G	0386	0.0361	0.0251	355
3	Slightly Loamy Sand	C	0339	0.0405	0.0599	151
4	Slightly Loamy Sand	Bv	0362	0.0385	0.0793	1.48
5	Heavy Loamy Sand	C	0.315	0	0.0618	1.225
6	Heavy Loamy Sand	Bg, Cg	0.298	0	0.0131	1.231
7	Heavy Loamy Sand	Go, Gr	0.351	0	0.0538	1.215
8	Silty Sand .	Bg, Cg	0.288	0	0.00440	132
9	Sandy Loam	Bv, Bvt	0.363	0	0.0902	1.188
10	Sandy Loam	Bt, Bvg	0.279	0	0.00199	1.197
11	Sandy Loam	Bg	0320	0	0.0331	1.132
12	Sandy Loam	c, cc	0.322	0	0.0928	1.127
13	Sandy Loam	Cg	0.299	0	0.00185	1.154
14	Loam	Bvt	0.378	0	0.206	1.090
15	Loam	Bt	0.287	0	0.00451	1.142
16	Loam	Bg	0.290	0 --	0.00244	1.153
17	Loam	C, Cg	0.282	0	0.00185	1.154
18	Loamy silt	c, cc	0.382	0.0330	0.00622	1344
19	Loamy silt	Cg	0361	0	0.00245	1.313
20	silty Loam	c, cc	0367	0	0.00608	1.167
21	Silty Loam	Cg	0.363	0	0.00150	1.229
22	Silty Clay	Bvt	0345	0	0.00157	1.160
23	Silty Clay	Bt, Bg	0371	0	0.00090	1.160
24	Silty Clay	c, cc, cg	0347	0	0.00038	1.222

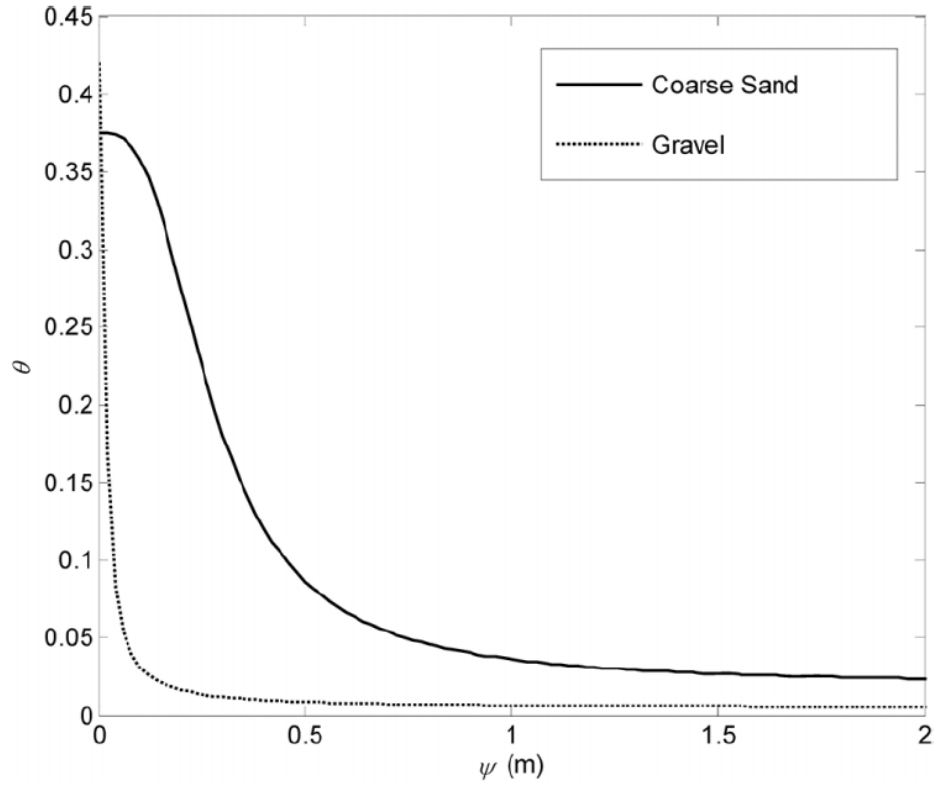
(from van Genuchten et. al. 1992)

Textural Class	N	θ_r [cm^3/cm^3]	θ_s [cm^3/cm^3]	α [1/cm]	n
Sand	126	0.058	0.37	0.035	3.19
Loamy Sand	51	0.074	0.39	0.035	2.39
Sandy Loam	78	0.067	0.37	0.021	1.61
Loam	61	0.083	0.46	0.025	1.31
Silt	3	0.123	0.48	0.006	1.53
Silt Loam	101	0.061	0.43	0.012	1.39
Sandy Clay Loam	37	0.086	0.40	0.033	1.49
Clay Loam	23	0.129	0.47	0.030	1.37
Silty Clay Loam	20	0.098	0.55	0.027	1.41
Silty Clay	12	0.163	0.47	0.023	1.39
Clay	25	0.102	0.51	0.021	1.20

(from Leij, et. al., 1996)

Figure 11. Tables of SWCC fitting parameters for typical soils.

Drianage layer type	K_S (m/s)	α_{vG} (m^{-1})	n (-)	θ_s (-)	θ_r (-)
Coarse sand	0.00463	4.31	3.1	0.375	0.02
Gravel	0.020	100	2.19	0.42	0.005



(from Han-Cheng Dan et. al. 2012)

Figure 12. SWCC and fitting parameters for coarse soils.

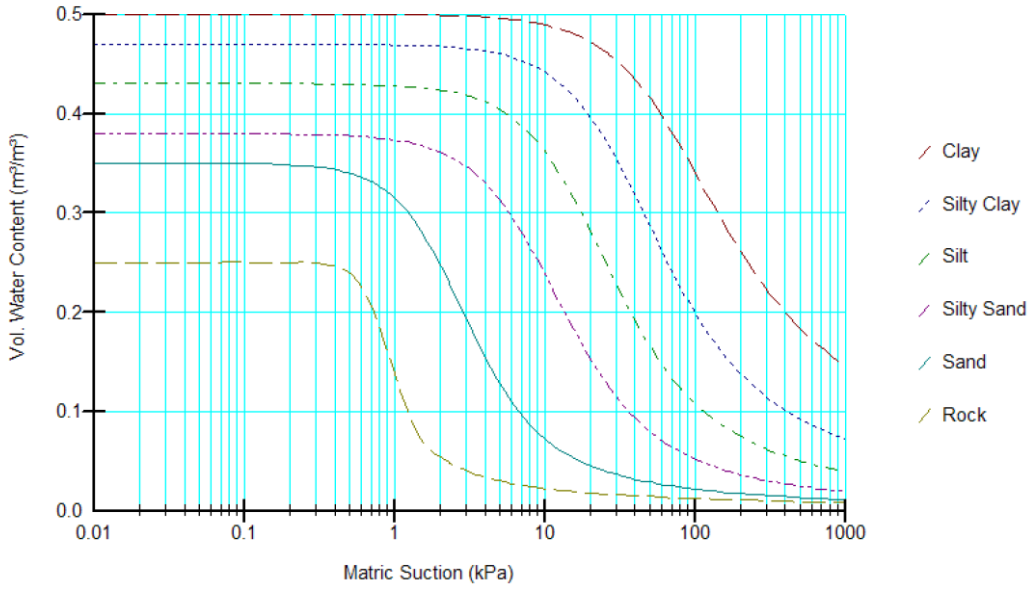


Figure 13. SEEP/W Library of Soil-Water Characteristic Curves (GEO-SLOPE 2010)

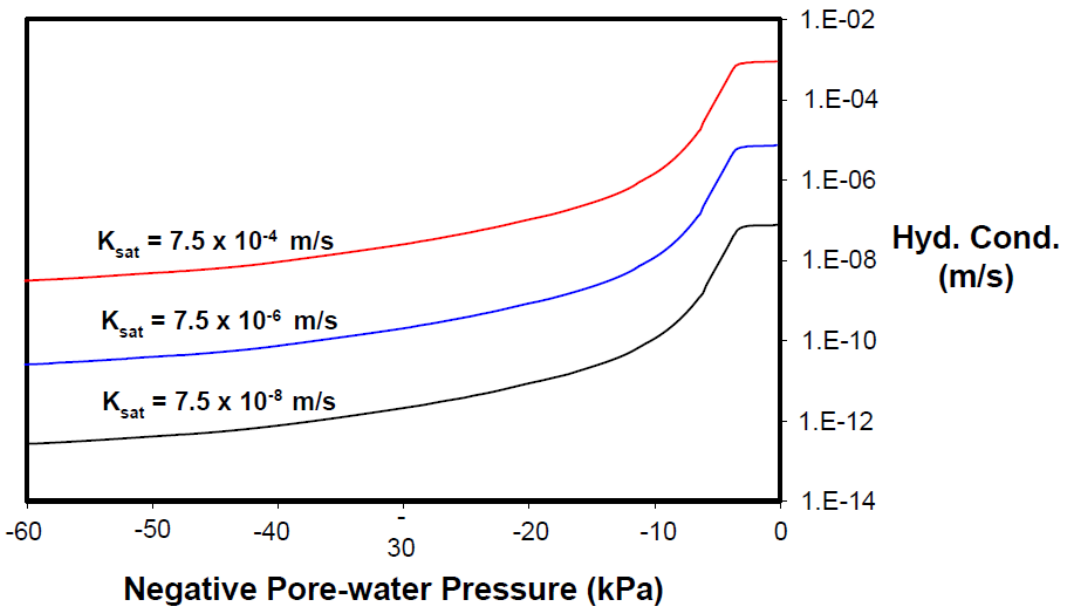


Figure 14. Example Hydraulic Conductivity Function (GEO-SLOPE 2010)

4. Small-Strain Shear Stiffness

4.1. Elastic Stiffness and Wave Velocity

In an elastic medium, the velocity of a stress wave is equal to the square root of the ratio of elastic modulus over mass density. For a shear wave, the velocity (V_s) is related to the shear modulus (G). The shear response of soils is nonlinear, such that the shear modulus declines at increasing shear strains (softening). The elastic response is limited to very small strains, where the shear modulus is maximum. Hence, the maximum shear modulus (G_{max}) in a soil at small strains is proportional to the square of the shear wave velocity in that soil:

$$G_{max} = \rho \, V_s^2 \qquad \textbf{Equation 11}$$

where ρ is the mass density (total unit weight divided by acceleration due to gravity, 32 ft/sec^2).

Shear wave velocities can be measured in multiple ways. Resonant column or cyclic triaxial testing can be used in the laboratory, but in situ field measurements are preferred. Field techniques include cross-hole testing in boreholes, down-hole testing during cone penetration tests, seismic refraction methods, and other surface and downhole geophysical methods. Direct, field measurements of shear wave velocity are the best method for characterizing the small-strain shear modulus of a soil mass.

When shear wave measurements are not available, G_{max} can be estimated using various empirical correlations. Such correlations have been published by Ishihara (1996) and Kramer (1996). A few select correlations are presented below.

4.2. G_{max} Correlations Based on Void Ratio

Seed and Idriss (1970) proposed this correlation for sand:

$$G_{max} = 1{,}000 \, K_{2,max} \, (\sigma'_m)^{0.5} \qquad \textbf{Equation 12}$$

where G_{max} is the small-strain shear modulus (psf) and σ'_m is the mean effective stress (psf). The correlation factor $K_{2,max}$ in Equation 12 is estimated based on the void ratio (e) or relative density (D_r) of the sand:

e	$K_{2,max}$	D_r (%)	$K_{2,max}$
0.4	70	30	34
0.5	60	40	40
0.6	51	45	43
0.7	44	60	52
0.8	39	75	59
0.9	34	90	70

Another relationship, more generally applicable to various soil types, was proposed by Hardin (1978):

$$\frac{G_{max}}{P_a} = \frac{625}{0.3 + 0.7\,e^2}\,OCR^k\left(\frac{\sigma'_m}{P_a}\right)^{0.5} \qquad \textbf{Equation 13}$$

where e is the void ratio and OCR is the overconsolidation ratio. P_a is one atmospheric pressure (101.3 kPa or 2,116 psf), in the same units as G_{max} and the mean effective stress (σ'_m). The exponent k in Equation 13 is related to plasticity index (PI), and can be interpolated between these values (Hardin and Drnevich 1972):

PI	k
0	0.00
20	0.18
40	0.30
60	0.41
80	0.48
≥ 100	0.50

In these correlations, the mean effective stress is defined as

$$\sigma'_m = \frac{1}{3}(\sigma'_1 + \sigma'_2 + \sigma'_3) \approx \frac{2}{3}\,\sigma'_v \qquad \textbf{Equation 14}$$

where σ'_1, σ'_2, and σ'_3 are the principal effective stresses. In most applications, assuming at-rest conditions and $K_o = 0.5$ will provide sufficient accuracy. The mean stress is then about two-thirds of the vertical effective stress, as indicated in Equation 14.

4.3. G_{max} Correlations Based on Penetration Resistance

The value of G_{max} may be estimated on the basis of correlations with in situ penetration resistance. For sand, Seed et al. (1986) suggest:

$$G_{max} = 20{,}000\,(N_1)_{60}^{0.333}\,(\sigma'_m)^{0.5} \qquad \textbf{Equation 15}$$

where G_{max} is the small-strain shear modulus (psf), σ'_m is the mean effective stress (psf), and $(N_1)_{60}$ is the normalized, corrected Standard Penetration Test (SPT) blowcount.

When cone penetration test (CPT) data is available, G_{max} in sands may be estimated using (Rix and Stokoe 1991):

$$G_{max} = 1{,}634\,(q_c)^{0.250}\,(\sigma'_v)^{0.375} \qquad \textbf{Equation 16}$$

where G_{max} is the small-strain shear modulus, q_c is the CPT tip resistance, and σ'_v is the vertical effective stress, all expressed in units of kPa. In clays, G_{max} may be estimated from CPT data using (Mayne and Rix 1993):

$$G_{max} = 406\,(q_c)^{0.695}\,(e)^{-1.130} \qquad \textbf{Equation 17}$$

G_{max} and σ'_v are expressed in units of kPa, and e is initial void ratio of the soil.

4.4. G_{max} Correlations Based on Site-Specific Data

Maximum shear modulus (G_{max}) typically varies with effective stress level and can be generally defined as follows:

$$G_{max} = G_o \left(\frac{\sigma'_m}{P_a}\right)^{0.5} \qquad \textbf{Equation 18}$$

Shear wave velocity measurements obtained from field or lab testing are often available over a limited range of effective stresses that may not encompass the range of stresses of interest in ground response analyses. In this scenario, site-specific data can be extrapolated to a broader stress range by selecting a representative G_o value for a given material. The representative G_o value should be selected such that shear wave velocities calculated using Equation 18 and Equation 11 match field or lab measurements reasonably well over the stress range where data is available. In effect, this creates a site-specific empirical correlation. An example correlation and the associated field data are shown in Figure 15.

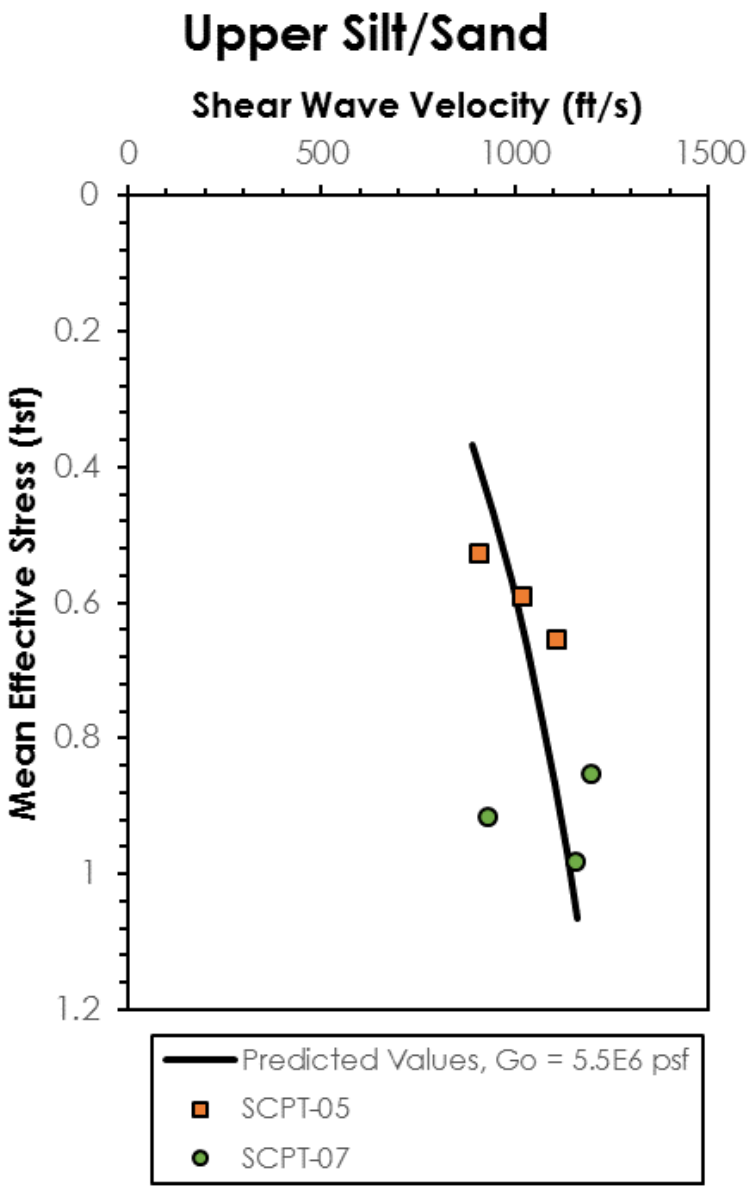


Figure 15. Example site-specific empirical correlation for shear wave velocity

5. Strength Parameters from Laboratory Test Data

Soil strengths can be determined from the results of laboratory tests, including direct shear, triaxial compression, triaxial extension, and direct simple shear tests. From the measured soil response to loading, the "failure" stresses are plotted and a Mohr-Coulomb failure envelope is fit to the data. In geotechnical engineering practice, soil shear strengths (S) are commonly characterized in terms of the intercept (c) and slope (tan ϕ) of the Mohr-Coulomb envelope:

$$S = c + \sigma \tan\phi \qquad \textbf{Equation 19}$$

5.1. Definition of Failure

Selecting the point of failure in a laboratory test record requires some engineering judgment. Criteria that are commonly used to define "failure" include:

- The point of maximum or peak applied shear stress.
- The shearing resistance at some arbitrary, limiting strain level (usually 15% axial strain in triaxial compression).
- The maximum principal effective stress ratio (maximum value of σ'_1/σ'_3); sometimes identified as the point of maximum obliquity, this stress condition is one where the slope of a failure envelope through the origin of stress has a maximum slope (maximum ϕ for c = 0).
- The residual shearing resistance at large strain.

When selecting the point of failure in a particular test, the following guidelines should be followed:

- When considering data from drained (CD) tests, failure can be defined as the point of maximum shear stress or 15% axial strain, whichever occurs first. In a drained triaxial test, the maximum value of σ'_1/σ'_3 occurs at the point of maximum applied shear stress, so both criteria will give the same result.

- In evaluating effective stress parameters (c' and ϕ') from CU test data, failure should be assumed at the maximum principal effective stress ratio.

- When analyzing data from undrained (UU or CU) laboratory tests, the peak axial stress should be assumed to represent failure when determining undrained strength parameters (c and ϕ). If the test data does not exhibit a peak stress prior to 15% axial strain (for triaxial testing), then the stresses at 15% strain should be used as failure.

Note that the drained and undrained failure stresses will occur at different points in a given CU test, due to the different definitions of failure used in each case.

5.2. Fitting Strength Envelopes

Values of c and ϕ are determined from a straight line, tangent envelope fit to Mohr's circles representing failure stresses. When working with data from multiple laboratory tests, fitting of the failure envelope may be facilitated by plotting the failure points on a "p-q plot", where:

$$p = \frac{\sigma_1 + \sigma_3}{2} \qquad \textbf{Equation 20}$$

$$q = \frac{\sigma_1 - \sigma_3}{2} \qquad \textbf{Equation 21}$$

A "best-fit" line through the p-q failure points (identified as the K_f line) will then have an intercept of "d" and a slope of "tan a". Equivalent Mohr-Coulomb parameters can then be computed as:

$$\sin\phi = \tan\alpha \qquad \textbf{Equation 22}$$

$$c = \frac{d}{\cos\phi} \qquad \textbf{Equation 23}$$

Equation 20 through Equation 23 can be used with either drained strengths (c' and ϕ') or undrained strengths (c_R and ϕ_R for R-envelopes).

Note that the Mohr-Coulomb failure model (Equation 19) corresponds to a linear increase in shearing resistance with higher normal stress. Actual failure envelopes for soils are curved, with significant curvature in the effective stress envelopes for granular soils over large pressure ranges and for overconsolidated clays. In practice, values of c and ϕ are determined for soils from straight line envelopes fit to specific ranges of stress.

In fitting strength parameters to multiple test results, the practice of the U.S. Army Corps of Engineers is to select design values of c' and ϕ' (or c and ϕ) so that data from about two-thirds of the tests are above the failure envelope (USACE 2003). This guidance can also be used in selecting design values of undrained shear strength (S_U) or c/p ratios; that is, about two-thirds of the measured strengths should be above the strength used in design.

6. Drained Strength Parameters for Static, Long Term Conditions

6.1. Basis

Excess (or deficient) pore water pressures, generated by changes in mean stress or shearing stress, will dissipate under static, long term conditions. Pore pressures within a soil can then be computed assuming hydrostatic conditions or from a solution for steady state seepage. As long as the distribution of pore pressure within the cross section can be quantified, effective stresses can be computed and the drained shear strength (S_d) of the soils can be determined from effective stress strength parameters (c' and ϕ'):

$$S_d = c' + \sigma' \tan \phi' \qquad \textbf{Equation 24}$$

6.2. Effective Stress Cohesion Intercept

Uncemented, granular soils exhibit no strength at zero effective stress ($\sigma' = 0$), corresponding to c' = 0. Over a wide pressure range, granular soils have a curved strength envelope. Fitting a straight line through segments of a curved failure envelope can result in c' > 0, but these values are applicable only for modeling the shear strength over the specified range of effective stress. In the case of unsaturated soils with fines, suction creates an apparent cohesion, but this component of strength is lost when the soil becomes saturated. In general, zero cohesion (c' = 0) should be assumed for uncemented, granular soils.

Normally consolidated, saturated clays also have no shear strength at zero effective stress. The drained, Mohr-Coulomb failure envelope for the peak strength of a normally consolidated clay will have c' = 0.

The peak strength envelope for an overconsolidated clay will exhibit drained cohesion. Below the effective preconsolidation pressure, the drained strength envelope for an overconsolidated clay is above the envelope for the normally consolidated condition. The overconsolidated, peak strength envelope is nonlinear, and curves toward the origin at very small effective stresses (Figure 16). Linear Mohr-Coulomb failure parameters (with c' > 0) can be fit to the curved strength envelope for overconsolidated soils; however, envelopes fit with c' > 0 will tend to overestimate the drained shearing resistance at shallow depths.

Moderately to heavily overconsolidated clays in the field are often fissured, especially at shallow depths. Because test specimens tend to be taken between the fissures, laboratory tests on smaller specimens tend to yield larger values of c', compared to tests on larger samples of such soils. For overconsolidated soils, c' determined from laboratory testing thus tends to be larger than the in situ cohesion of the soil mass, and thus potentially unconservative. In addition, cycles of shrinking (drying) and swelling (wetting) lead to softening and a loss of stress history over time along the fissures. Fully softened strengths (Section 6.3) with c' = 0 (Stark et al. 2005) are thus appropriate for characterizing the drained strength of stiff, fissured, overconsolidated clayey soils.

Fell et al. (2005) point out that measured values of drained cohesion may be adversely affected by potential shortcomings in the laboratory test results. For example, if tests are run at confining stresses higher than experienced in the field, a straight line fit through that data may overpredict the drained strength at lower effective stresses. If the soil sample is not completely saturated, or if the strain rate is too high to allow equilibration of pore pressures within the sample during the test, then the pore pressure data will not accurately reflect the pore pressures at failure. This will tend to shift the Mohr's failure stress circles, which can result in a misleading indication of drained cohesion.

At very large shear strains, clay particles will align with the slip surface and a residual shearing resistance is realized. Drained, residual strength envelopes (Figure 16) are independent of overconsolidation and have no cohesion (c' = 0). Residual strength parameters should be used when evaluating stability where sliding has previously occurred.

In the absence of particle cementation/bonding, long term (drained) shearing resistance related to c' > 0 may be unreliable. In routine geotechnical design practice, values of c' = 0 are usually assumed for both normally and overconsolidated saturated clays, and for uncemented granular soils. In the evaluation of long-term stability, Stark et al. (2005) recommend using zero effective stress cohesion (c' = 0) for soft to stiff clays, unless back-analysis of local case histories support a greater value. However, this recommendation considers the potential for softening of stiff clays, and may not apply to full depth (See Section 6.3).

Detailed testing and characterization of a particular soil, coupled with careful application of the fitted strength envelopes, are necessary where values of c' are used in a stability evaluation. Fell et al. (2005) recommend that design values of c' for peak strength should not exceed about 200 psf (or 20 psf for residual strengths) without definitive evidence for higher values.

When surficial soils have c' = 0, shallow sliding parallel to the ground surface will be the critical failure mechanism (lowest factor of safety) found in a slope stability analysis. This mode of failure, which might require periodic regrading and maintenance, is often considered to be less critical in a stability analysis.

Specific guidance on the selection of c' values is provided in Section 6.7.

6.3. Fully Softened Strengths of Overconsolidated Clays

In excavations and embankments, long-term failures may develop in overconsolidated clays at shear stresses below the peak drained strength. Seasonal moisture changes near the ground surface, or lateral stress relief in deep excavations, will cause fissures to open, swelling of the soil along the fissures, and the gradual loss of the beneficial effects of overconsolidation. Over time (years to decades), the peak strength of the overconsolidated soil mass may degrade to the lower strength of the soil when normally consolidated (Skempton 1970). "Fully softened strengths" (Figure 16) are appropriate for characterizing the drained strength of such soils. The understanding of this behavior, and the appropriate application of this concept for

design, is an evolving area within geotechnical engineering. Duncan et al. (2011) and VandenBerge et al. (2013) provide an overview of current geotechnical engineering practice, based on the outcomes of a 2011 industry workshop.

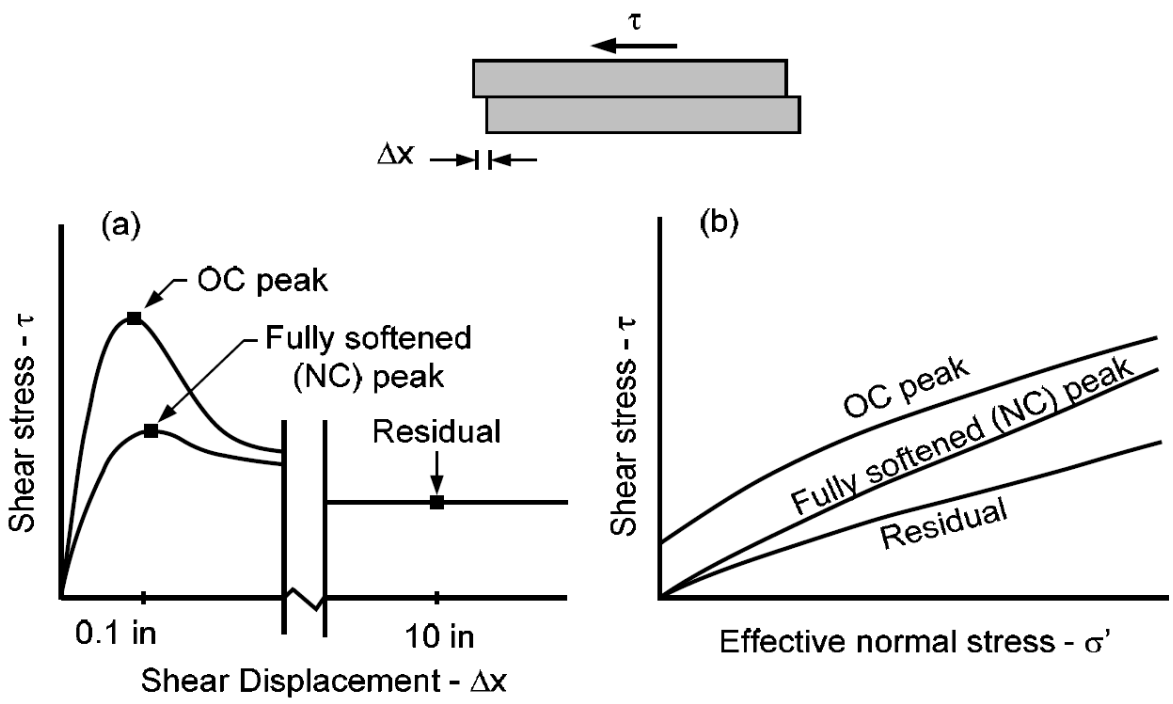


Figure 16. (a) Stress-displacement curves for overconsolidated and fully softened (normally consolidated) natural stiff fissured clays, and (b) overconsolidated peak, fully softened peak and residual strength envelopes (from VandenBerge et al. 2013).

The softening behavior, under drained long-term conditions, may occur in any clayey soil, but is most pronounced in highly plastic clays. The need to consider fully softened, drained strengths is greater in soils with higher plasticity index, the existence of fissures or shrinkage cracks, water contents above the shrinkage limit, higher clay fractions, lower silt or sand content, and higher activity (Duncan et al. 2011; VandenBerge et al. 2013). Long-term instability due to softening should be considered for (1) excavations in stiff fissured clays, where the stress relief caused by the excavation can lead to swelling, and (2) shallow sliding in compacted clay embankments, due to the formation of desiccation cracks from seasonal wetting-drying and freeze-thaw.

Fully softened strengths may be measured in triaxial or ring shear tests, but direct shear tests are preferred (Duncan et al. 2011; VandenBerge et al. 2013). Tests are conducted on remolded, normally consolidated samples that are initially mixed to water contents near the liquid limit, then consolidated back to void ratios matching the field conditions. Peak shear stresses from tests on the remolded samples are used to define the fully softened strength envelope, which should be the same as the drained, peak

strength of the soil when it is normally consolidated (Skempton 1970). When test data are unavailable, the fully softened strength can be approximated by using estimated, drained strength parameters (with c' = 0) for the soil in a normally consolidated condition.

In overconsolidated clays, the fully softened strength envelope is intermediate between the peak and residual drained strength envelopes (Figure 16). The fully softened strength envelope is curved, with essentially no cohesion (c' = 0 at σ' = 0). Hence, when using Mohr-Coulomb parameters for a linear fit, an envelope with c' > 0 will overestimate strengths at very low stress levels (shallow depths). Using an envelope with c' = 0 is conservative, but may be overly conservative when applied to soils at greater depths (higher stress ranges). An alternative is to model the nonlinear strength envelope, using secant friction angles, in the stability analysis (Stark et al. 2005).

In a slope, shear stresses along a potential failure surface are not uniform, and overstressed areas that lose shearing resistance past the peak strength will cause increasing shear stresses on other parts of the slip surface. This can lead to a progressive failure over time. The use of fully softened strengths in design, instead of relying upon the peak strength in strain softening soils, helps to avoid progressive failures (Skempton 1970).

When looking at the stress-strain test data, it is important to note if the laboratory tests were drained or undrained. Stiff, moderately to heavily overconsolidated clays usually exhibit significant strain softening behavior in drained shear. These soils are dilative, resulting in a loss of shearing resistance with localized expansion along the failure surface. Most laboratory tests on clayey soils are conducted using consolidated-undrained conditions. When dilative soils are subjected to undrained testing, a strain hardening behavior will be observed, because the dilative response will cause decreasing pore pressures and increasing effective stresses. Hence, strain hardening in undrained shear is an indicator of expected strain softening under long-term, drained shear.

Fully softened strengths are an important consideration when evaluating the stability of compacted embankments constructed of highly plastic soils. However, it is overly conservative to assume fully softened strengths throughout the full depth of an overconsolidated clay (Duncan et al. 2011; VandenBerge et al. 2013). One exception may be where an embankment is built over an earlier embankment, or foundation soil, that previously experienced softening.

The depth of softening is related to the depth of the excavation, the depth of seasonal moisture change, and/or the depth of desiccation cracking. The appropriate depth will depend on the characteristics of the soil, the climate at the site, and the geologic history. For embankments, the depth of softening may be limited to 2 to 3 meters at most sites, and up to 4 meters in some cases (Duncan et al. 2011; VandenBerge et al. 2013). Lesser depths of softening may be expected in regions without extreme wet and dry seasonal climates.

6.4. Depth of Surficial Softening

A compacted soil near the surface of an embankment may lose some of its drained shear strength (soften) over time. Softening in overconsolidated, fine-grained soils is associated with shrink and swell, due to seasonal variations in moisture content at shallow depths, and freeze-thaw. The development of fully softened strengths is discussed in Section 6.3.

For TVA dams, fully softened strengths are assumed to apply only in highly plastic CH or MH soils having a plasticity index greater than 40 (fine grained soils with LL > 50 and PI > 40). In these soils, the depth of softening is assumed to be 5 feet (measured normal to the ground surface). No softening is assumed on armored slopes that are covered with stone riprap.

6.5. Laboratory and Field Measurement

In the laboratory, values of c' and ϕ' can be measured in consolidated drained (CD) tests, or consolidated undrained (CU) tests with pore pressure measurements. CD tests are preferred, but CU tests are usually specified for low permeability soils where the time required for drained testing becomes excessively long. Effective stress failure envelopes measured with CU tests are typically close to those measured in CD tests, and the two test methods are usually assumed to give equivalent values of c' and ϕ'.

Triaxial compression tests are commonly specified for both CD and CU tests. Consolidated-drained tests can also be run in a direct shear apparatus, which is a valid option for measuring the drained strength of low permeability clays. Because relatively thin samples can be tested in direct shear, the time required for consolidation and loading to failure will be much less than in drained triaxial tests. Direct shear tests force failure along a horizontal plane, which may not be the weakest plane in an anisotropic soil, but can be used to measure the shearing resistance along carefully aligned bedding planes. Direct shear tests, especially those conducted using ring-shear devices, are particularly useful for measuring residual strengths at large shear displacements. These considerations can be usually neglected when coarse grained soils are tested in direct shear.

Effective stress parameters can also be estimated using empirical correlations with in situ penetration resistance. Correlations between ϕ' and Standard Penetration Test (SPT) blowcounts in sands are presented in Figure 17. Correlations with Cone Penetration Test (CPT) tip resistance are given in Figure 18.

6.6. Typical Values

Typical values of drained friction angles (ϕ') for sands and clays are given, respectively, in Figure 19 and Figure 20. Typical drained strengths in compacted soils are listed in Figure 3. These typical values are helpful in judging the veracity of results from laboratory tests or in situ penetration tests. Note that there is significant scatter in these correlations, particularly for the clay strengths in Figure 20.

Estimated strength parameters, estimated on the basis of these typical values, are sometimes used for non-critical soil materials in a stability analysis. However, where the strength parameters assigned to a soil layer are critical to the computed stability of the slope, those values should be backed up by testing.

6.7. Recommended Practice

Natural deposits of granular soils are often highly variable, as a result of their geologic history and means of deposition. Laboratory tests on a few discrete samples from such a deposit are valuable, but may not yield a complete understanding of the variability in shearing resistance in that deposit. Correlations to in situ, field penetration tests (SPT or CPT) may be preferred for characterizing the drained strength of a granular soil deposit, because one can consider many more data points and better understand variability across the deposit. The reasonableness of the results should be checked by comparison to typical values for similar soils, and may be verified with laboratory testing.

Significant variability may also be encountered in clayey soils, particularly in residual soils. However, whether formed in place by weathering or deposited in water, clay soils tend to be more uniform than granular soil deposits. Laboratory testing of field samples will give a useful measure of drained strength parameters for such soils. Consolidated undrained (CU) tests, with the measurement of pore water pressures, can be used to obtain drained, effective stress strength parameters.

In many (but not all) design problems involving fine grained or clay soils, the short term, undrained conditions will govern stability. In those cases, attention should focus on the accurate assessment of undrained strengths, and reasonable estimates of drained strength parameters based on published, typical values may be sufficient for checking long-term stability. In other design problems, long-term, drained conditions may govern, and careful attention must be given to the selection of appropriate effective stress strength parameters.

When determining drained strength parameters, the following practice is recommended:

(1) A cohesion intercept may be appropriate for cemented soils, as long as the cementation is permanent, and not apparent cohesion due to matric suction in an unsaturated soil.

(2) Values of $c' > 0$ may be used to represent segments of curved strength envelopes over specified pressure ranges.

(3) When fitting envelopes through scattered test data, a line forced through $c' = 0$ should be considered first (as opposed to mathematical regression fits). If a good fit to the data is obtained, then the values of $c' = 0$ and ϕ' from that fit should be used.

(4) Values of c' > 0 may be used, but only if supported by adequate test data. If there is little or no test data, and the drained strength parameters are estimated based on typical values, assume c' = 0.

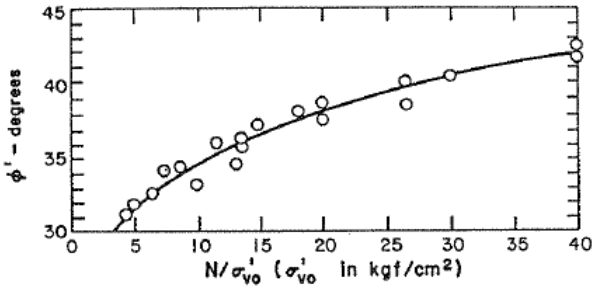
(5) Cohesion may be neglected to avoid progressive failures and/or instability due to softening. Because a fissured soil mass often has a lower strength than laboratory test samples, design values of c' (for peak strengths) should not exceed about 200 psf in overconsolidated clays that may be fissured.

(6) Fully softened strengths may be appropriate for highly plastic, clayey or silty soils in compacted embankments, or in excavations in overconsolidated soils. Fully softened strengths are applicable only for shallow depths along an embankment surface, perhaps to a maximum depth of about 10 feet (measured perpendicular to the ground surface).

(7) Where test data indicates a strength envelope with c' > 0, the value of ϕ' fit to the data may be used with an assumed value of c' = 0. Setting c' = 0 in this manner for an overconsolidated clay provides a conservative approximation of the fully softened strength envelope.

(8) If a value of c' > 0 is critical to the stability of the slope, drained shear tests and/or tests on fully softened samples should be considered to support the selection of an appropriate drained cohesion intercept.

Correlation between normalized SPT blowcount (N) and peak friction angle (ϕ') for sands (after Parry 1977)



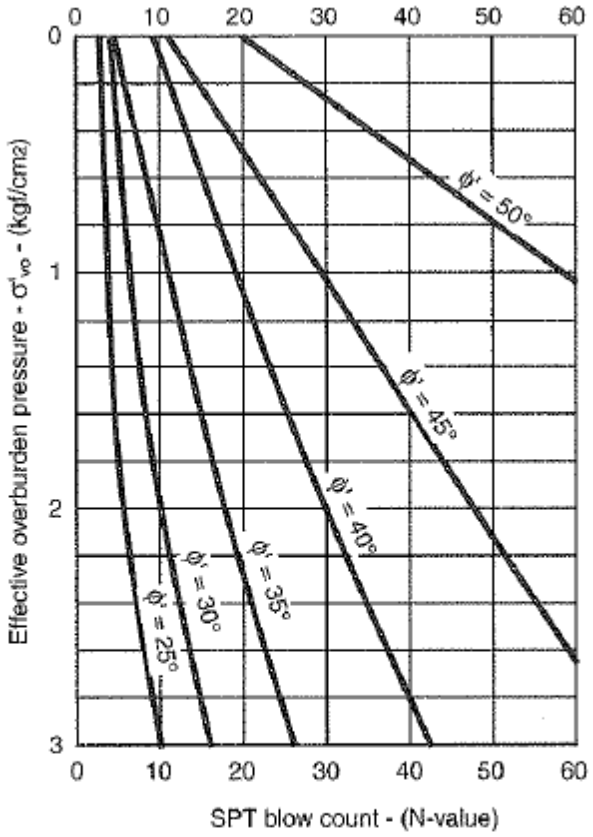
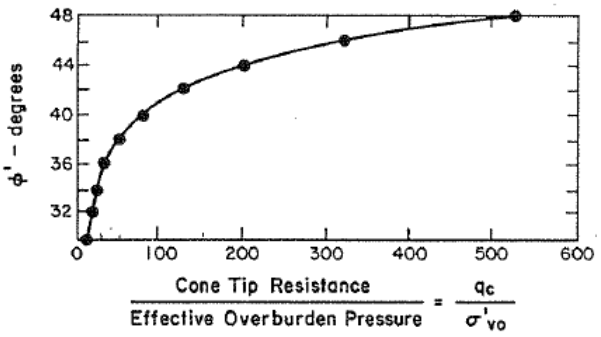


Figure 5.7 Relationship among SPT blow count, overburden pressure, and ϕ' for sands. (After DeMello, 1971, and Schmertmann, 1975.)

From Duncan and Wright (2005)

Figure 17. Correlations for effective stress friction angle in sands from SPT data.

Correlation between normalized CPT tip resistance (q_c) and peak friction angle (ϕ') for normally consolidated, uncemented, quartz sands (after Robertson and Campanella 1983).



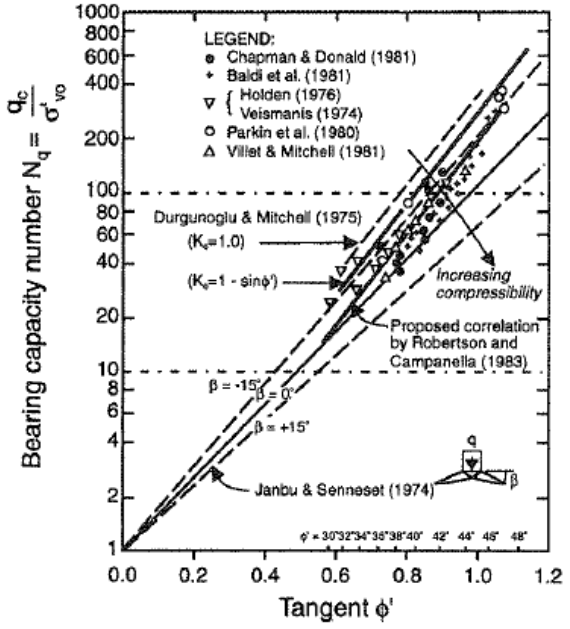


Figure 5.55 Relationship between bearing capacity number and friction angle from large calibration chamber tests (after Robertson and Campanella, 1983b).

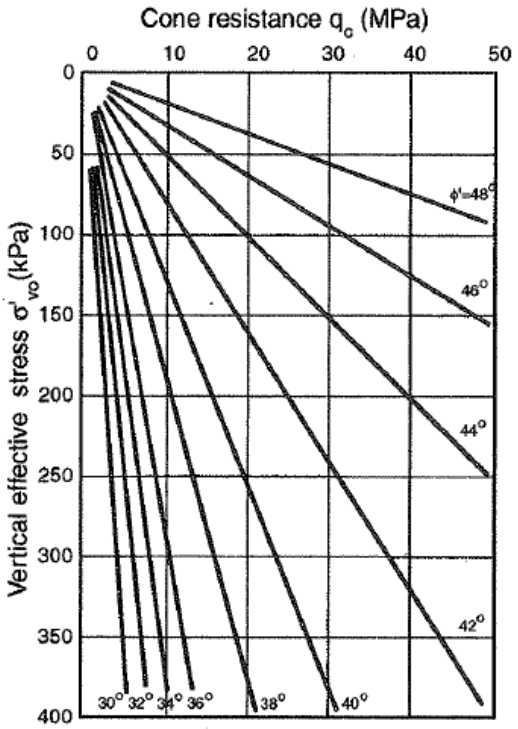


Figure 5.56 σ'_{vo}, q_c, ϕ' relationships (after Robertson and Campanella, 1983b).

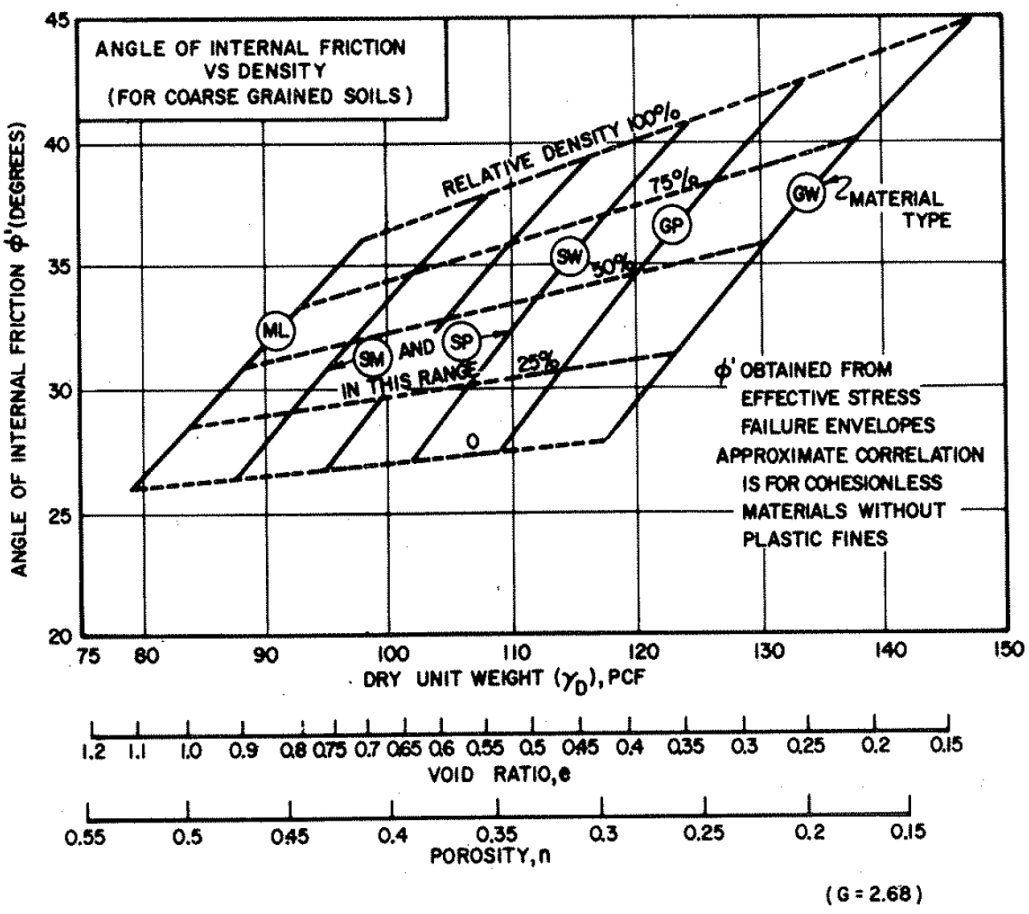
From Lunne et al. (1997)

Figure 18. Correlations for effective stress friction angle in sands from CPT data.

Approximate correlation among density, penetration resistance, and shear strength of normally consolidated, granular soils (after Mitchell and Katti 1981)

Description	Relative Density D_R (%)	Dry Unit Weight γ_{dry} (pcf)	Standard Penetration Test N_1 (blows/foot)	Cone Penetrometer Tip Resistance q_c (tsf)	Friction Angle ϕ' (degrees)
Very Loose	0 - 15	< 90	< 4	< 50	< 30
Loose	15 - 35	90 - 100	4 - 10	50 - 100	30 - 32
Medium Dense	35 - 65	100 - 115	10 – 30	100 - 150	32 - 35
Dense	65 - 85	115 - 127	30 - 50	150 - 200	35 - 38
Very Dense	85 - 100	> 127	> 50	> 200	> 38

Note: N_1 is the SPT blowcount normalized to 1 atmosphere (1 tsf or 100 kPa) of vertical effective stress



From NAVFAC DM 7.01 (1986)

Figure 19. Typical values of effective stress friction angle for granular soils.

Table 5.7 Typical Values of Peak Friction Angle (ϕ') for Normally Consolidated Clays[a]

Plasticity index	ϕ' (deg)
10	33 ± 5
20	31 ± 5
30	29 ± 5
40	27 ± 5
60	24 ± 5
80	22 ± 5

Source: Data from Bjerrum and Simons (1960).
[a] $c' = 0$ for these materials.

From Duncan and Wright (2005)

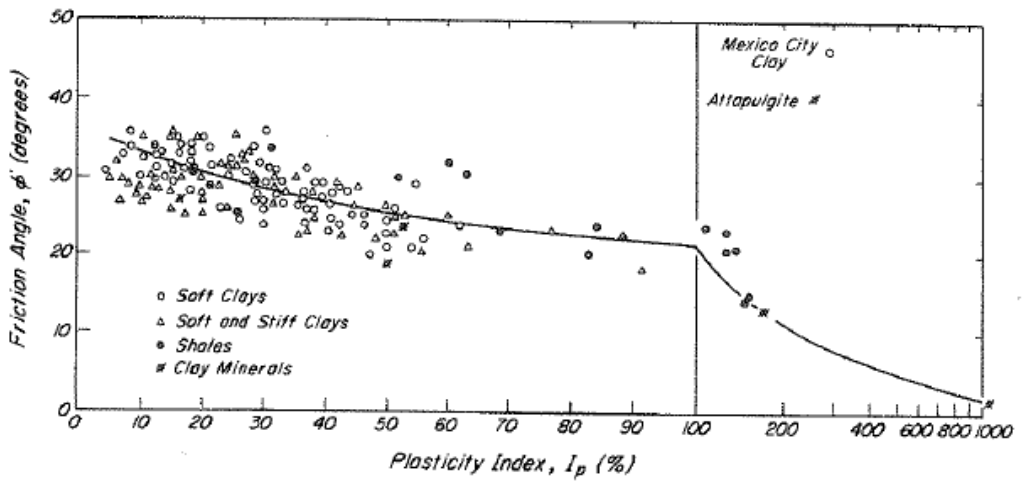


Figure 19.7 Values of friction angle ϕ′ for clays of various compositions as reflected in plasticity index.

From Terzaghi et al. (1996)

Figure 20. Typical values of effective stress friction angle for clay soils.

7. Undrained Strength Parameters for Static, Short Term Conditions

7.1. Basis

Soil shear strengths are characterized using undrained strength parameters where or when pore water pressures are unknown or cannot be predicted with confidence. Typically representing conditions where shear induced pore water pressures (excess or deficient) have not dissipated, the undrained shear strength (S_U) of a soil is expressed using undrained strength parameters (c and ϕ):

$$S_u = c + \sigma'_{con} \tan\phi \qquad \textbf{Equation 25}$$

In practice, the undrained shear strength of a soil may be expressed using UU strengths (Section 7.3.1), "c/p" ratios (Section 7.3.2), or R-envelopes (Section 7.3.3). In each case, undrained strengths are characterized as a function of effective consolidation stress (σ'_{con}), or sometimes approximated as a constant within a soil zone.

Undrained strength parameters are used in "total stress" stability analyses, where excess pore water pressures generated by shearing are unknown. The effective stresses prior to loading (σ'_{con}) are used to quantify the soil strength, but the analysis is carried out using total stresses (pore pressures and effective stresses in the soil under load are not estimated). The underlying assumption is that excess pore pressures generated in a laboratory test specimen are similar to those encountered in the field, so that the fundamental effective stress is similar in both cases. Undrained strength parameters fit to test data implicitly represent the effects of excess pore water pressure on the soil strength in the field.

Some engineers refer to S_U, c, and ϕ as "total stress strength parameters." This causes confusion, because effective consolidation stresses are used with the parameters to compute the shearing resistance (FERC 2006). The term "undrained strength parameters" is thus recommended for S_U, c, and ϕ.

It is challenging to measure and quantify undrained shear strengths that accurately represent the behavior of soils in the field. The assessment of undrained shear strengths is discussed extensively by Ladd (1991), Terzaghi et al. (1996), Ladd and DeGroot (2003), and Duncan et al. (2014). Undrained strengths are dependent on a number of factors, including:

- structural anisotropy in the soil (bedding planes, fissuring, etc.),
- stress history (preconsolidation stress or overconsolidation ratio),
- water content, void ratio, and degree of saturation in the soil,
- sampling disturbance in test specimens,
- mode of shearing (stress path or stress induced anisotropy),
- strain rate dependency, including creep effects, and
- potential for progressive failure in sensitive soils.

7.2. When to Use Undrained Strengths

Shearing resistance is fundamentally related to the effective stress in a soil, and drained strength parameters should be used with effective stress analyses any time the pore pressures (including shear-induced pore pressures) can be reliably predicted. However, when the soil is loaded rapidly, or any time when the shear induced pore water pressures are difficult to accurately predict, effective stress analyses are impractical and undrained analyses are necessary.

Under static conditions, pore pressures equilibrate fairly quickly in high permeability soils, such that undrained shear strengths are usually associated only with clayey or silty soil deposits. Coarse grained soils (sands, gravels, etc.) are often permeable enough that excess pore pressures will rapidly dissipate, even under short term loading conditions. For pervious soils, whether saturated or unsaturated, drained effective stress strength parameters may be used to represent short-term, undrained conditions. This assumes the static or steady-state pore water pressures in the soil are unchanged by the short-term loading, and the shear strength in an "undrained analysis" can be modeled using the drained, effective stress strength parameters.

Earthquakes are an exception, however. Dynamic loading will usually cause excess pore pressures to accumulate even in coarse grained soils. Undrained strengths for seismic conditions (Section 9) are needed for most soils.

To determine if a particular soil will be "drained" under a static load, the Time Factor (T) can be computed:

$$T = \frac{c_v t}{D^2} \qquad \textbf{Equation 26}$$

where c_v is the coefficient of consolidation, t is the elapsed time for the loading condition, and D is the drainage distance. If the Time Factor is greater than or equal to about three ($T \geq 3$), the soil can be assumed to drain; otherwise the soil should be treated as undrained (Duncan et al. 2014). Judgment is usually required to estimate a representative drainage distance when computing the time factor. In most rapid drawdown analyses, full drainage can be assumed in soils having a hydraulic conductivity greater than 10^{-4} cm/sec (USACE 2003; Duncan et al. 2014). These guidelines are reasonable for judging if a soil zone should be modeled as drained or undrained in most slope stability analyses, except for seismic or impact load cases.

The flowchart in Figure 21 provides guidance in the selection of drained versus undrained strength parameters for different soil conditions, based on the assumptions for the analysis. Clean, coarse sands are usually assumed to be fully drained under most loading conditions, but should be treated as undrained under dynamic, seismic, or impact loads. Clean rockfill, including riprap, can generally be assumed to drain even in an earthquake. Drained or undrained strength parameters may be appropriate to represent the strength of unsaturated soils, as discussed in Section 8.

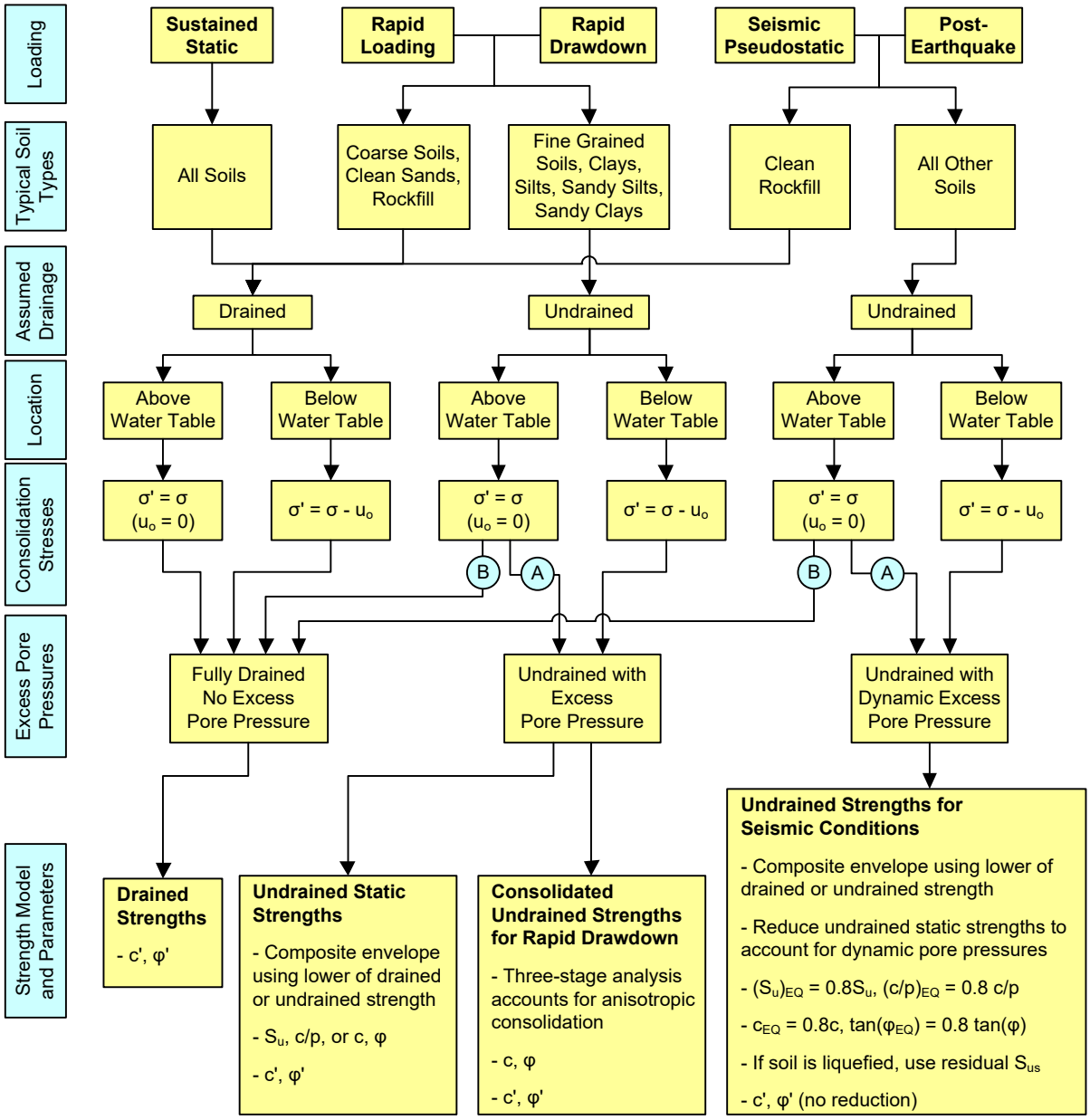


Figure 21. Selection of appropriate shear strength parameters for stability analyses.

7.3. Undrained Strength Parameters

7.3.1. UU Strengths

In unconsolidated undrained (UU) triaxial compression tests, soil samples are subjected to varying confining pressures and then loaded to failure. The samples are unconsolidated, in that no drainage from the soil is allowed as the confinement is increased. If the test samples are saturated, the applied confining pressure will cause a corresponding increase in pore pressure. Then, assuming all test samples are identical (same density), the effective stresses will be the same (in theory) regardless of the confining pressure. The undrained strength (S_U) is then independent of the confining stress ($\phi = 0$):

$$S_u = \text{constant} \qquad \textbf{Equation 27}$$

In practice, the void ratio of soil samples will decrease with depth and effective consolidation pressure, in samples taken from an otherwise uniform deposit. The undrained shear strength from UU tests will thus vary with the depth of the soil sample. In relatively thin or noncritical soil layers, a constant value of S_U may be used to model the entire deposit. In thicker deposits, values of S_U may be determined at various depths and the undrained strength profile might be modeled as a simple function of depth (z):

$$S_u = f(z) \qquad \textbf{Equation 28}$$

Unfortunately, the measurement of S_U in UU triaxial compression tests is fraught with problems, even when the tests are carefully executed in accordance with applicable standards. As detailed by Ladd (1991) and Ladd and DeGroot (2003):

- Unavoidable sample disturbance leads to S_U values that are too low.
- The high rate of shearing results in S_U values that are too high.
- Triaxial compression mode of shearing gives S_U values that are too high.

To get the "right" answer, these errors would have to offset one another. Engineering practice has generally assumed that the effects of sample disturbance dominate, leading to conservative measurements of S_U from UU tests. Ladd (1991) points out that this assumption may not be valid when better quality samples are obtained with modern tools and methods.

A value of S_U determined from a UU triaxial test is more appropriately viewed as an index of the soil's undrained strength, instead of a direct measurement. The relatively low cost of UU tests allows for conducting more laboratory runs, and can provide for a good compromise between testing costs and data quality. In addition, there is an extensive history of satisfactory performance when UU strengths are used in geotechnical design.

Historically, routine practice involved the use of unconfined compression tests to characterize the undrained shear strength (S_U = one half of the unconfined compressive strength) of clayey soils. However, unconfined compression testing

provides a poor, often low measure of soil strength. Specimens tend to dry during testing and, without confinement, dilatant soils are more apt to cavitate; both can cause desaturation of the soil. Unconfined tests should not be used with fissured clays, because of premature failure along the fissures (Terzaghi et al. 1996). UU triaxial tests, which involve little additional cost or effort, are nearly always preferred over unconfined compression tests.

7.3.2. c/p Ratios

To represent the variation in shear resistance with consolidation pressure, the undrained strength can be characterized using the "c/p ratio" ($c/p = S_u/ \sigma'_{1,con}$):

$$S_u = \left(\frac{c}{p}\right)\sigma'_{1,con} \qquad \textbf{Equation 29}$$

where $\sigma'_{1,con}$ is the major principal effective stress to which the soil has been consolidated. The c/p ratio concept is consistent with the experimental observation that the undrained strength of saturated clays varies with the water content (void ratio), which varies with the major principal effective stress to which the soil has been consolidated. The formulation in Equation 29, which avoids the theoretical limitations associated with R-envelopes (Section 7.4.3.3), is the preferred method for representing the undrained strength of soft, saturated soils.

The key to using this approach for a stability analysis is the determination of an appropriate, representative c/p ratio for the conditions of interest. Like S_U in general, values of the c/p ratio depend on the mode of shearing, stress history, sample disturbance, strain rate effects, etc. How these factors may be addressed in a laboratory testing program is outlined in Section 7.4.

For most normally consolidated soils, values of $c/p = 0.22 \pm 0.03$ are typical (Ladd and DeGroot 2003). The ratio will be larger for overconsolidated soils, and can be represented by the following empirical expression (Ladd 1991):

$$\left(\frac{c}{p}\right) = S \cdot OCR^{m} \qquad \textbf{Equation 30}$$

where S is an intercept value (where OCR = 1) and m is an empirical exponent (typical values of 0.75 to 1). Empirical values for estimating c/p ratios are presented in Section 7.6.

Here, the stress history of the soil deposit is represented by the OCR (overconsolidation ratio = preconsolidation pressure / effective stress). Application of Equation 30 in a stability analysis, and use of the c/p ratio in general, thus requires knowledge of the stress history. Accurate characterization of the preconsolidation stress (due to mechanical reductions in stress, desiccation, aging, or other physical-chemical process) is thus needed. Ladd and DeGroot (2003) provide specific recommendations for one dimensional consolidation testing to better quantify the preconsolidation stress.

The c/p approach works well for characterizing the undrained strength of soft clay deposits that are normally to moderately overconsolidated. In compacted embankments, where the preconsolidation stress is highly variable and difficult to quantify, the selection of a representative c/p ratio will be problematic. For unsaturated soils, the undrained strength measured in a UU test will vary with confining pressure, violating the assumption of $\phi = 0$. Therefore, c/p ratios are not recommended for modeling compacted embankment soils or unsaturated soils. Mohr-Coulomb strength parameters, or a single value of S_U (for layers or sublayers of moderate thickness), are usually better choices for such materials.

7.3.3. Undrained c and ϕ

The variation in undrained shear strength with consolidation pressure can also be represented using the Mohr-Coulomb envelope (Equation 19):

$$S_u = c + \sigma'_{con} \tan\phi \qquad \textbf{Equation 31}$$

where σ'_{con} is the effective consolidation pressure, and c and ϕ are undrained strength parameters (cohesion and friction angle, respectively).

This relationship gives the undrained strength on a potential slip surface as a function of the effective consolidation stress normal to the failure plane. When applied in a slope stability analysis, care must be taken to compute the undrained shearing resistance based on the normal stresses to which the soil has been consolidated (σ'_{con} in Equation 31). The steady state pore water pressures should be used in this calculation.

Traditionally, undrained strengths have been characterized using data from consolidated undrained (CU) laboratory tests that are fit with an "R-envelope" (traditional terminology employed by the U.S. Army Corps of Engineers). The undrained R-envelope (Figure 24) is a tangent line to "total stress" Mohr's circles, which are drawn for the consolidation pressure (σ'_{con}) and deviator stress at failure [$\sigma_{df} = (\sigma_1-\sigma_3)_f$]. When used to specifically represent R-envelopes, the undrained parameters are designated as c_R and ϕ_R.

The undrained shear strength obtained from a traditional R-envelope is less than the shear strength that would be measured in a CU test specimen at the same consolidation stress. This effect, and alternate definitions of the undrained strength envelope that may be employed, are discussed in Section 7.4.3.

7.4. Laboratory Measurements of Undrained Soil Strengths

7.4.1. Specimen Consolidation

Key details for handling soil samples and testing in the laboratory to measure undrained shear strengths in soft soils are provided in Ladd (1991) and Ladd and DeGroot (2003). High quality samples with minimal disturbance, generally obtained with thin-walled piston tube samplers, are essential for obtaining representative undrained strengths from laboratory tests. Even with careful handling of the field

sample and preparation of test specimens, the specimen will be affected by changes in stress during the extrusion process and the removal of the in situ stresses. Two methods may be employed during CU testing, to compensate for these effects:

- The Recompression technique (Bjerrum 1973) involves reconsolidating the test specimen back to the in situ stress conditions, prior to undrained shearing.

- The SHANSEP method (Ladd and Foott 1974) involves consolidating test specimens to stresses high enough to achieve virgin compression, then rebounding some so that the strength ratio can be characterized as a function of OCR (Equation 30).

The choice of methods depends on the nature of the soil being tested, as discussed by Ladd (1991), Ladd and DeGroot (2003), and Duncan et al. (2014). Where high quality block samples are available, the Recompression method is usually preferred. The SHANSEP method is preferred for normally to slightly overconsolidated clays, where Recompression to the in situ stress condition induces volumetric compression and a shearing resistance that is too high. The SHANSEP approach is often not practical for heavily overconsolidated soils, because of the high test pressures required; the Recompression technique should be used for such soils. Moreover, the Recompression technique should be chosen for highly structured, sensitive soils, where consolidation to virgin compression in the SHANSEP method will alter the soil structure and give undrained strengths that are too low.

Conventional laboratory triaxial tests consolidate test specimens under isotropic stress prior to undrained shear (designated as ICU or CIU tests). Testing anisotropically consolidated specimens (ACU tests) will generally produce higher and more accurate measurements of undrained shear strength. To simulate typical in situ stress conditions, Ladd (1991; Ladd and Foot 1974; Ladd and DeGroot 2003) advocates consolidating the test soils to K_o conditions ($\sigma'_h = K_o \sigma'_v$) in undrained tests designated as CK_oU.

Consolidated undrained test specimens are pressure-saturated prior to loading, to allow accurate measurement of pore water pressures. This eliminates suction pore pressures in unsaturated samples, but the absence of suction leads to conservative, lower shear strengths. Alternatively, the undrained shear strength of unsaturated soils can be characterized using UU triaxial tests.

7.4.2. Loading Path

The undrained strength also varies with the stress path imposed during shearing. The most commonly followed stress paths are triaxial compression (TC), triaxial extension (TE), and direct simple shear (DSS). Data presented in Terzaghi et al. (1996) and Ladd and DeGroot (2003) show that, for normally consolidated silts and clays:

$$\left(\frac{c}{p}\right)_{TC} > \left(\frac{c}{p}\right)_{DSS} > \left(\frac{c}{p}\right)_{TE} \qquad \textbf{Equation 32}$$

Duncan et al. (2014) point out that all three stress paths yield strengths that are lower than what would be measured under plane strain conditions. However, considering

the various modes of shearing in a slope stability problem, Ladd and Foott (1974) argue that DSS tests provide the best measure of the "average" shearing resistance along a potential slip surface.

Ladd (1991; Ladd and DeGroot 2003) favors the use of K_o-consolidated, direct simple shear (CK_oU-DSS) tests for providing the best measurement of undrained strength. Where DSS test data are not available, K_o-consolidated triaxial compression and triaxial extension tests (CK_oU-TC and CK_oU-TE) can be used. The average value of S_u from the TC and TE tests would then be used in the analyses. More importantly, Ladd argues that undrained strengths determined from CIU triaxial compression tests are too high and unsafe for design (see also Section 7.4.3).

7.4.3. Interpretation of Triaxial Test Data

When using data from laboratory triaxial tests, three different methods can be used to quantify the measured undrained shear strength. As described below, the undrained strength may represent the maximum shear stress $(S_u)_{ms}$, the shear stress from the R-envelope $(S_u)_R$, or the shear stress on the failure plane $(S_u)_{ff}$.

7.4.3.1. UU Tests - Maximum Shear Stress, $(S_u)_{ms}$

The shear strength measured in an unconsolidated undrained (UU) triaxial compression test represents the maximum shear stress in the soil at the time of failure. This shear strength, denoted $(S_u)_{ms}$, is the shear stress on a 45˚ plane in the triaxial test specimen. As depicted in Figure 22, $(S_u)_{ms}$ represents the top of the Mohr's circle of stress at failure, and is equal to one half of the applied deviator stress [$\sigma_{df} = (\sigma_1-\sigma_3)_f$]:

$$(S_u)_{ms} = \frac{\sigma_{df}}{2} \qquad \textbf{Equation 33}$$

The value of $(S_u)_{ms}$ is greater than the shear stress on the failure plane within the triaxial specimen. There are numerous other practical limitations associated with characterizing undrained strengths using UU test data, as outlined in Section 7.3.1. Strengths determined from UU triaxial compression tests represent an index of a soil's undrained shear strength. Hence, using $(S_u)_{ms}$ from a UU triaxial test is an acceptable means of characterizing the undrained shearing resistance on a potential failure surface in the field.

When using data from UU triaxial tests, the undrained shear strength in each test should be determined per Equation 33. Then, using the results from multiple tests, the undrained strength of the deposit may be characterized using:

- a constant value (Equation 27),
- a value that varies with depth (Equation 28), or
- a c/p ratio (Equation 29).

Depending on the quality and consistency of the samples, significant scatter or variation in the $(S_u)_{ms}$ values may be observed. A lower one-third value (where two-thirds of the values are higher), or perhaps the median value of $(S_u)_{ms}$, may be used to represent the soil. When using c/p ratios, a median or lower one-third value of the c/p ratio may be used.

7.4.3.2. CU Tests - Maximum Shear Stress, $(S_u)_{ms}$

To compensate for sample disturbance effects, undrained strengths can be measured using consolidated undrained (CU) triaxial tests. The undrained shear strength is sometimes taken as the maximum shear stress (Equation 33) in the test specimen at failure. The value of $(S_u)_{ms}$ is then plotted as a function of the effective consolidation stress (Figure 23). This interpretation is depicted on Figure 5.31 in Duncan et al. (2014).

However, values of $(S_u)_{ms}$ from CU triaxial compression results tend to be higher than the average shear strength that develops along a field failure surface, as discussed in Section 7.4.2. Therefore, the method shown in Figure 23 is <u>not</u> recommended for characterizing undrained strengths from CU test data.

7.4.3.3. CU Tests - Shear Stress from R-envelope, $(S_u)_R$

An R-envelope is developed by fitting a tangent line to Mohr's circles for the failure stresses measured in CU triaxial tests. The circles are drawn using the effective consolidation stress (σ'_{con}) as the minor principal stress and the deviator stress at failure (σ_{df}). The tangent R-envelope is then fit as shown in Figure 24, and characterized using Mohr-Coulomb parameters (c_R and ϕ_R).

$$(S_u)_R = c_R + \sigma'_{con} \tan \phi_R \qquad \textbf{Equation 34}$$

The strength parameters can also be determined by fitting a line to p-q points, as described in Section 5.2.

There are theoretical objections to the R-envelope formulation in Equation 34. The "Mohr's circles" are plotted using the effective stresses at the start of shearing and the stress difference at failure. Since these stresses do not exist at the same point in time, the plot is not actually a Mohr's circle (Duncan et al. 2014). Furthermore, Ladd (1991) argues that the R-envelope approach does not correctly represent the variation in undrained strength with the direction of the normal consolidation stress along a circular slip surface. The resulting errors are difficult to quantify.

On the other hand, R-envelopes have been widely used in past practice to represent the shear strength of soils under short-term conditions. This approach provides a conservative number for the undrained strength at a given consolidation pressure, as demonstrated in Section 7.4.3.5. For these reasons, a traditional R-envelope remains a valid approach for representing the variation in undrained shear strength with effective consolidation pressure. In particular, using the more conservative R-envelope may be preferred when characterizing the strength of a soil zone based on a limited number of CU test results.

R-envelope strength parameters (c_R, ϕ_R) are required for some analyses, such as for three-stage rapid drawdown calculations. That method explicitly accounts for the shear stress acting on the failure plane in a triaxial test sample.

7.4.3.4. CU Tests - Shear Stress on the Failure Plane, $(S_u)_{ff}$

In a triaxial compression test, failure should develop on a plane that is oriented at (45° + ϕ'/2) above horizontal (Duncan et al. 2014). The shear stresses on the failure plane can be determined using Mohr's circle. As depicted in Figure 25, a line drawn from σ'_{con} at (45° + ϕ'/2) above horizontal will intersect the Mohr's circle at the stresses on the failure plane. The shear stress on the failure plane at failure $(S_u)_{ff}$ can be computed using:

$$(S_u)_{ff} = \frac{\sigma_{df}}{2}\cos\phi' \qquad \textbf{Equation 35}$$

where σ_{df} is the measured deviator stress at failure. The shear stresses on the failure plane are employed explicitly in the three-stage calculation for rapid drawdown analyses.

The drained friction angle (ϕ') is required in Equation 35 to compute the shear stress on the failure plane in a CU test. Assuming pore pressures are measured, ϕ' can be obtained by fitting a drained strength envelope to data from the same CU test results. For a typical drained friction angle in the range of 30° to 35°, $(S_u)_{ff}$ will be 82% to 87% of the maximum shear stress $(S_u)_{ms}$.

Using data from several CU tests, the "undrained strength envelope" (FERC 2006; USBR 2011a) is fit to a plot of $(S_u)_{ff}$ versus specimen consolidation pressure (σ'_{con}). As illustrated in Figure 25, the undrained strength envelope is represented by Mohr-Coulomb parameters (c and ϕ).

Direct simple shear tests directly measure the consolidation pressure and shear stress on the (horizontal) failure plane. Hence, direct simple shear data can be fit directly to obtain c and ϕ.

Drained, undrained, and R strength envelopes are compared in Figure 26. Note that the values of c and ϕ for the undrained strength envelope are greater than c_R and ϕ_R for an R-envelope, which is tangent to the Mohr's circles of stress. Moreover, the undrained strength envelope should not be fit using p-q plots (Section 5.2).

7.4.3.5. Comparison of Shear Strengths from CU Tests

Three definitions for the undrained shear strength in a CU test are discussed above. For a certain consolidation pressure, these strengths will differ in magnitude as illustrated on Figure 27:

$$(S_u)_{ms} > (S_u)_{ff} > (S_u)_R \qquad \textbf{Equation 36}$$

Values of $(S_U)_{ms}$ from CU triaxial tests are unconservative and should not be used for design (Ladd 1991).

Values of $(S_U)_R$ may be obtained from R-envelopes fit to CU triaxial test results. This traditional approach tends to be conservative, in that the shear stresses within the triaxial sample are higher than the corresponding values of $(S_U)_R$ computed for the same consolidation pressure. This definition may be preferred when little test data is available to fit the strength envelope and a more conservative treatment is justified.

Values of $(S_U)_{ff}$ are rational and representative of the undrained strength measured in a CU triaxial test. The value $(S_U)_{ff}$ will always be higher than the corresponding value of $(S_U)_R$, and typically 80% to 90% of $(S_U)_{ms}$. This definition is justified when sufficient test data is available to perform a detailed or refined undrained analysis.

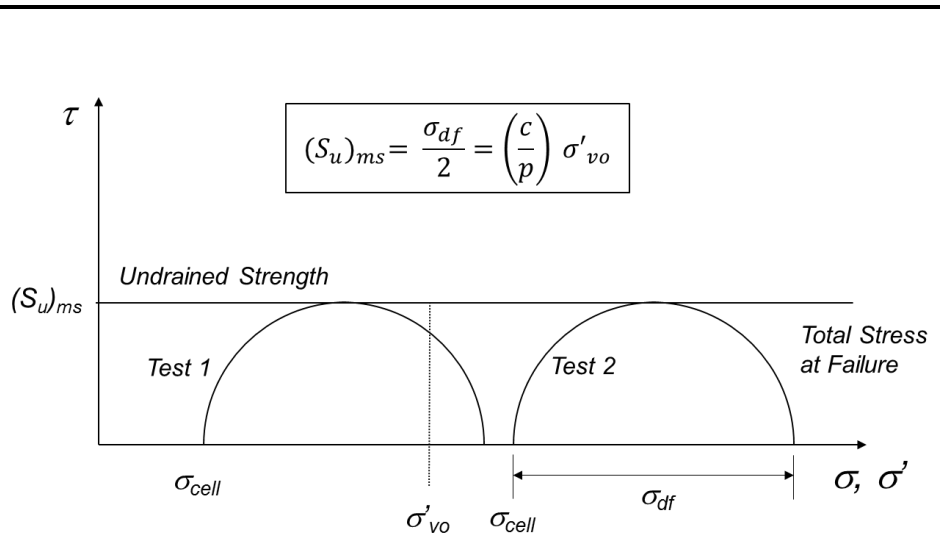


Figure 22. Undrained shear strength determined from UU triaxial test results fit with a c/p ratio.

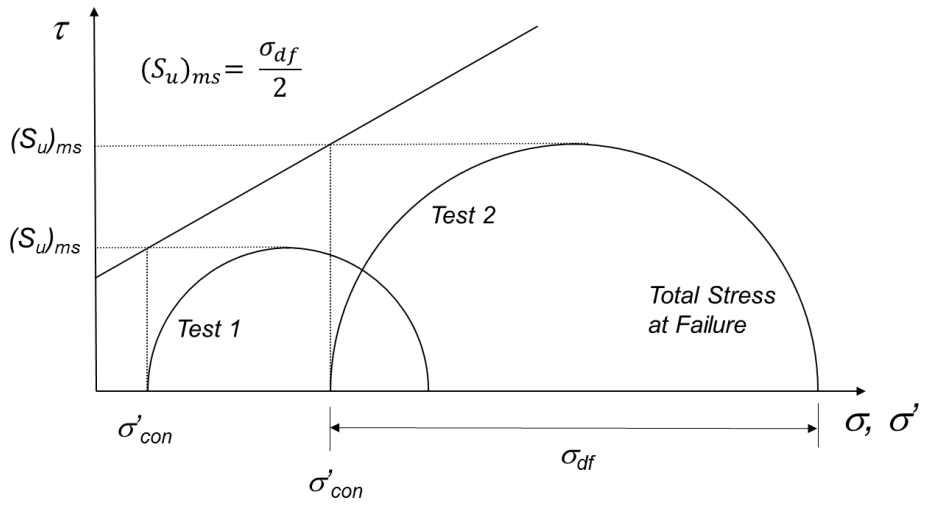


Figure 23. Undrained strength envelope representing the maximum shear stress measured in CU triaxial tests (this method is <u>not</u> recommended).

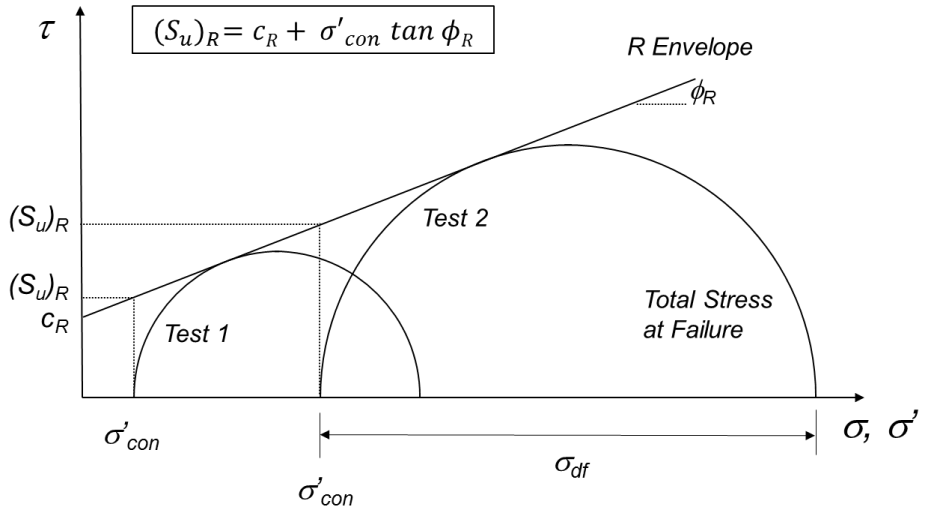


Figure 24. Undrained shear strengths determined from an R-envelope fit to CU triaxial test results.

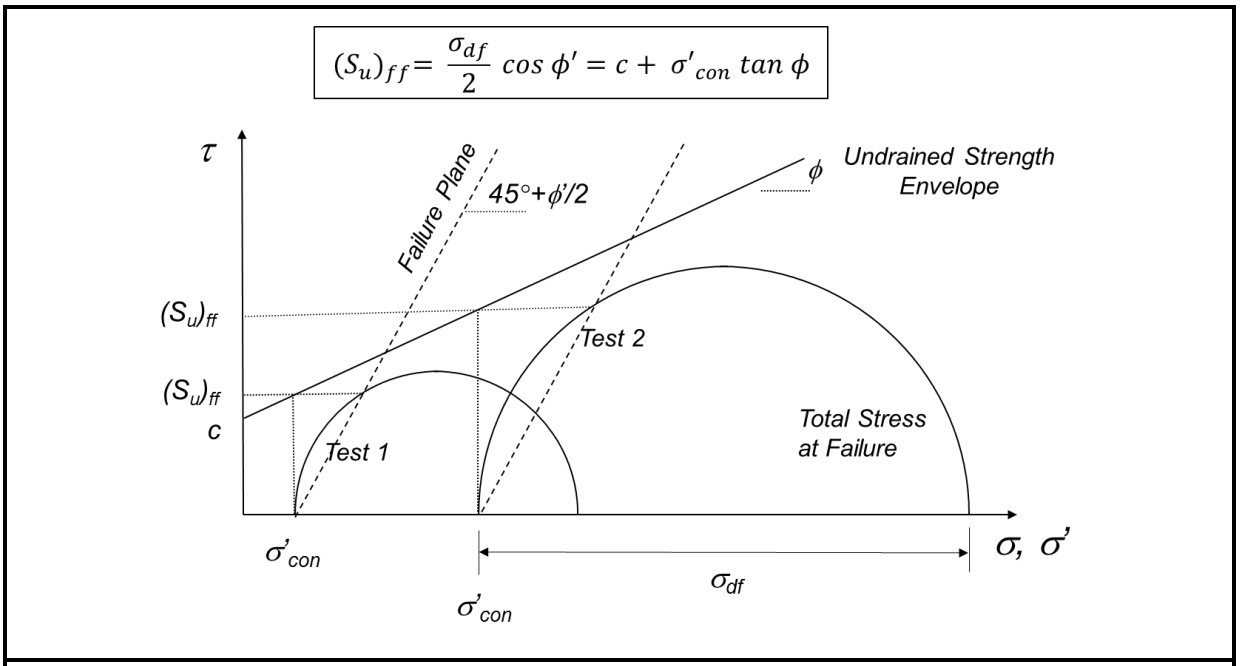


Figure 25. Undrained strength envelope representing the failure plane shear stresses measured in CU triaxial tests.

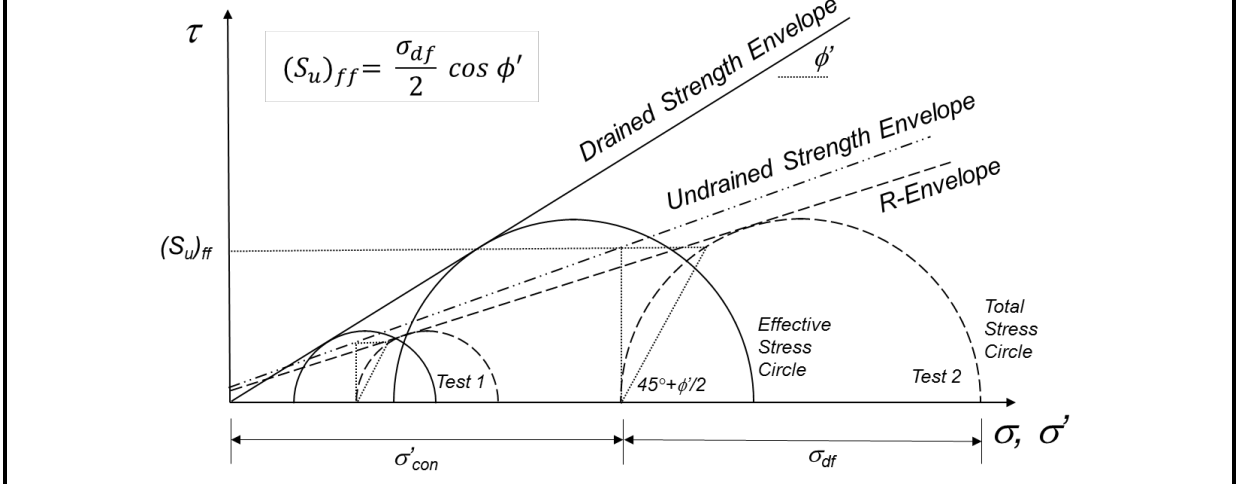


Figure 26. Drained, undrained, and R strength envelopes from CU triaxial tests (after FERC 2006; USBR 2011a).

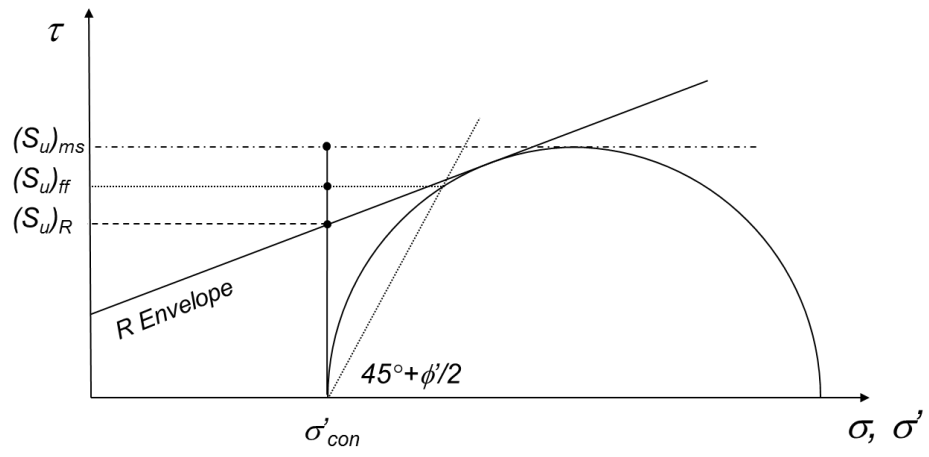


Figure 27. Comparison of undrained shear strengths, characterized using three different definitions, from CU triaxial tests.

7.5. In Situ Measurements of Undrained Soil Strengths

Undrained shear strengths can also be assessed using in situ test methods, which avoid some of the problems related to sample disturbance in laboratory test specimens.

7.5.1. Standard Penetration Test Blowcounts

While values of S_U have been empirically related to Standard Penetration Test (SPT) data (Terzaghi et al. 1996), there is considerable uncertainty in such correlations. The rough correlation in Figure 28, from Peck et al. (1974), is qualitative in nature and should only be used to gauge the reasonableness of measured strengths. In very soft soils, SPT blowcounts (typically $N_{SPT} < 2$) are simply too insensitive for quantifying undrained strengths.

7.5.2. Cone Penetration Resistance

The tip resistance measured in a Cone Penetration Test (CPT) provides a better measurement of undrained shear strength in soft soils. The correlation is usually expressed as (Lunne et al. 1997):

$$S_u = \frac{q_t - \sigma_v}{N_{kt}} \qquad \textbf{Equation 37}$$

where q_t is the corrected CPT tip resistance, σ_v is the total overburden pressure, and N_{kt} is an empirical factor.

Unfortunately, the available empirical data show significant scatter, making the accurate quantification of S_U from CPT data difficult. Lunne et al. (1997) recommend

using N_{kt} = 15 to 20 as a preliminary estimate, while recognizing that values as low as N_{kt} = 10 may be appropriate for normally consolidated clays, and stiff fissured clays may exhibit N_{kt} = 30. To reduce this uncertainty, site-specific correlations between q_t and S_U (from field vane or laboratory testing) should be developed and used.

Ladd and DeGroot (2003) warn that poor quality CPT data, especially misleading pore pressure data, may undermine the reliability of such results. However, when used in conjunction with other site-specific measurements of undrained shear strength, CPT data can provide valuable knowledge on the variation of strength with location and elevation across the site.

7.5.3. Field Vane Shear Tests

The field vane (FV) shear test is generally considered the most reliable means of measuring undrained shear strength in situ. Recommended practice for FV testing includes the use of a thin vane blades with square ends, a gear system at the borehole surface (to rotate the vane at a controlled rate while accurately measuring the torque), and assessment of rod friction (Ladd and DeGroot 2003). To account for the effects of installation disturbance, fast rate of shearing, and the unique mode of failure, FV results should be adjusted using the Bjerrum's vane shear correction factor, μ (Figure 29). Values of μ were empirically determined using shear strengths back-calculated from slope failures.

Considering the scatter apparent in Figure 29, vane shear testing does not provide a precise measure of undrained shear strength. Despite this limitation, the vane shear test is the preferred test for measuring S_U in normally consolidated to moderately overconsolidated clays. The test results are less reliable where coarse inclusions (such as shells) are encountered (Ladd and DeGroot 2003). In silt deposits, which may be one to two orders of magnitude more permeable than clay, partial drainage is likely to occur in a vane shear test run at the standard rate of rotation. The measured shear resistance will then be higher than would be realized under fully undrained loading conditions.

7.6. Typical Values

Typical values and correlations are useful for making preliminary estimates of shear strengths, as well as for checking the reasonableness of field or laboratory test results. The table in Figure 28 indicates the range in S_U associated with the qualitative consistency of clays.

Mesri (1989) suggested this empirical relationship for S_U:

$$S_u = 0.22\,\sigma'_p \qquad \textbf{Equation 38}$$

where σ'_p is the preconsolidation pressure.

For soils with OCR = 1, the c/p ratio (Equation 29) has been empirically correlated to index properties as shown in Figure 30. Hansbo (1957) related the strength ratio in normally consolidated clays to liquid limit (LL):

$$\frac{c}{p} = 0.0045 \cdot LL \qquad \textbf{Equation 39}$$

Skempton (1957) related the strength ratio in normally consolidated clays to plasticity index (PI):

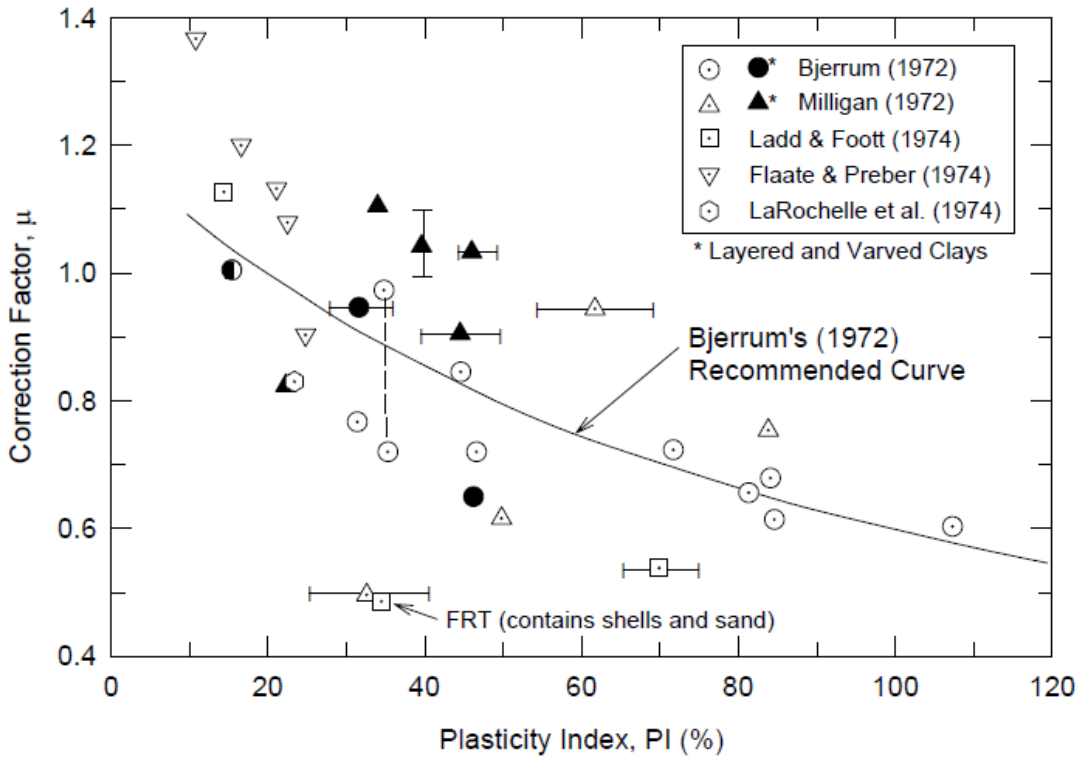
$$\frac{c}{p} = 0.11 + 0.0037 \cdot PI \qquad \textbf{Equation 40}$$

For normally consolidated to overconsolidated soils, typical values and correlations for S and m can be used with Equation 30 to estimate values of the c/p ratio. Suggested values of S and m for typical soils are listed in Figure 31.

Consistency	Field Identification	Undrained Shear Strength, S_u (psf)	Standard Penetration Test Blowcount* (blows/foot)
Very soft	Easily penetrated several inches by fist	< 250	< 2
Soft	Easily penetrated several inches by thumb	250 - 500	2 - 4
Medium	Can be penetrated several inches by thumb with moderate effort	500 - 1000	4 - 8
Stiff	Readily indented by thumb but penetrated only with great effort	1000 - 2000	8 - 15
Very stiff	Readily indented by thumbnail	2000 - 4000	15 - 30
Hard	Indented with difficulty by thumbnail	> 4000	> 30

** The correlation between undrained strength and SPT blowcount is rather unreliable*

Figure 28. Consistency of clays based on undrained strength (based on values from Peck et al. 1974).



$$S_u = \mu \left(S_u\right)_{vane}$$

Figure 29. Correction factor for the interpretation of undrained shear strengths from field vane shear tests (from Ladd and DeGroot 2003).

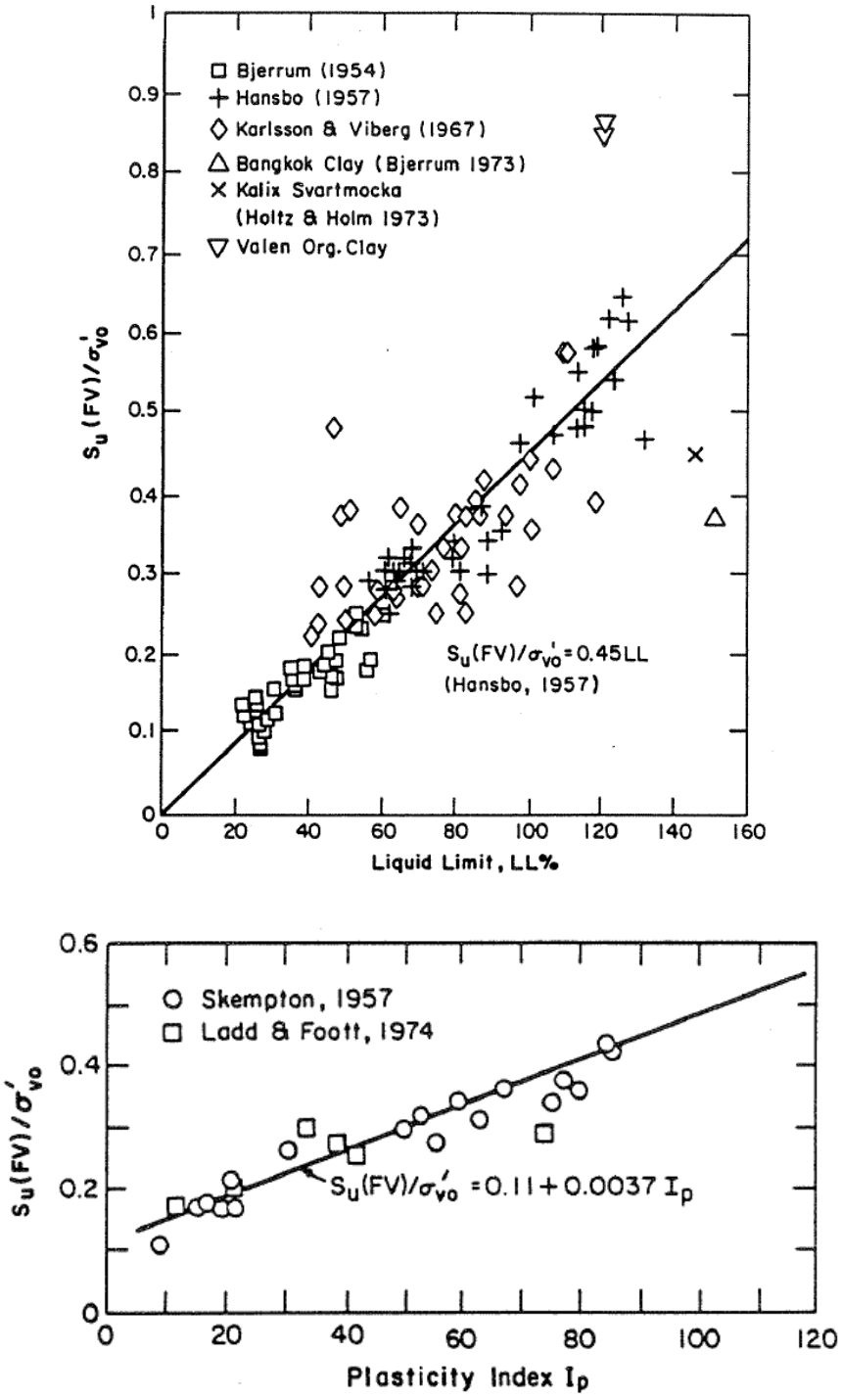


Figure 30. Correlations for c/p ratio in normally consolidated clays (from Duncan et al. 1989).

$$\left(\frac{c}{p}\right) = S \cdot OCR^{m}$$

Suggested, average values for most soils:

	S	m
Jamiolkowski et al. (1985)	0.23	0.8
Ladd (1991); Ladd and DeGroot (2003)	0.22 ± 0.03	0.8 ± 0.1

Suggested values for selected soils (Ladd and DeGroot 2003):

Soil Description	S	m[a]	Remarks
1. Sensitive cemented marine clays (PI < 30%, LI > 1.5)	0.20 Nominal SD = 0.015	1.00	Champlain clays of Canada
2. Homogeneous CL and CH sedimentary clays of low to moderate sensitivity (PI = 20 to 80%)	S = 0.20 + 0.05(PI/100) or Simply 0.22	$0.88(1 - C_s/C_c)$ ± 0.06 SD or simply 0.8	No shells or sand lenses-layers
3. Northeastern US varved clays	0.16	0.75	Assumes that DSS mode of failure predominates
4. Sedimentary deposits of silts and organic soils (Atterberg Limits plot below A-line) and clays with shells	0.25 Nominal SD = 0.05	$0.88(1 - C_s/C_c)$ ± 0.06 SD or simply 0.8	Excludes peat

[a] $m = 0.88(1 - C_s/C_c)$ based on analysis of CK_0UDSS data on 13 soils with max. OCR = 5 - 10

SD = standard deviation
C_s = swell index
C_c = compression index

Figure 31. Typical values for estimating the c/p ratio using Equation 30.

7.7. Recommended Practice

Accurately quantifying the shearing resistance of soils, when subjected to undrained loading, is a challenge. Where the stability of a slope depends on the behavior of soft or weak underlying soils, reasonable estimates of the undrained shear strength are

critical to the analysis and evaluation of the slope. This has been an active area for research throughout the history of modern geotechnical engineering, with disagreements and conflicting advice found in the literature. Moreover, there is usually a need to balance the need for accuracy and safety against the demands for engineering economy in the investigation, analysis, and design of earth structures. In these situations, the engineer must use appropriate judgment when specifying tests and selecting strength parameters for a stability analysis. It is neither feasible nor desirable to define a "recipe" procedure for selecting undrained soil strengths.

Based on the review outlined in this section, the following methods are recommended for the assessment of undrained soil strengths:

(1) Correlations and typical values for S_U and/or c/p ratios.

(2) Unconsolidated undrained (UU) triaxial compression tests:

- Perform numerous tests, measure S_U as one half of the deviator stress at failure, and expect significant scatter.
- Characterize S_U as a median value within a soil deposit, or as a function of depth.
- If there are sufficient data to characterize the consolidation pressure and stress history, characterize the variation in S_U using c/p ratios.

(3) Isotropically consolidated, undrained, triaxial compression tests (CIU TC):

- Fit a tangent line to Mohr's circles (or fit a line using p-q points), to define R-envelope parameters (c_R and ϕ_R). This is a traditional method that results in conservative values for the undrained shear strength, and is thus appropriate where few test results are available.
- Fit a line to the consolidation and shear stresses on the failure plane (Equation 35), to define parameters (c and ϕ) for the undrained strength envelope. This method is less conservative, and is recommended for refined analyses and where many test results are available.

(4) In situ field tests:

- Cone penetration tests (CPT) with site-specific correlations for S_U.
- Field vane (FV) shear tests, with empirical corrections (Figure 29) to obtain S_U.
- Characterize the results using a constant or representative S_U value, S_U expressed as a function of depth, or c/p ratios.

(5) Advanced laboratory testing:

- K_o-consolidated undrained triaxial compression (CK_oU TC) and triaxial extension (CK_oU TE) tests; use the average of S_U values measured in the two tests to define c/p ratios.

- K_o-consolidated direct simple shear (CK_oU DSS) tests, with results used to define c/p ratios.

Note that the use of c/p ratios requires knowledge of the stress history. In critical layers, one-dimensional consolidation tests are thus needed to define the variation in preconsolidation pressure with depth in the deposit. While c/p ratios work well for soft clay deposits, this approach is not recommended for characterizing unsaturated soils and/or compacted embankment soils.

In a roughly general sense, the costs and accuracy of the strength determination increases as one moves down the above list. Based on engineering judgment, more costly and better methods should be employed when characterizing more critical soil layers. Preliminary analyses accomplished with less expensive strength estimates may indicate the need for more in-depth considerations of stability, and the need for more sophisticated characterization of the undrained shear strength. More data from advanced testing can increase one's confidence in the strength parameters, which can also justify the use of smaller factors of safety and more economical designs.

7.8. Composite Drained-Undrained Strength Envelopes

Most soils will exhibit dilative shear behavior at low confining pressures. When saturated soils are consolidated to low effective stress and then sheared without drainage, the tendency to expand will cause decreasing pore pressures (suction). This results in increasing effective stress and shearing resistance, and an undrained strength that exceeds the drained strength. As indicated in Figure 32, the undrained strength envelope will be above the drained strength envelope in the regime of effective stress where the soil is dilative (generates suction pressures). Above a certain transition stress, the undrained strength will be less than the drained strength; in this higher stress range, the soil is contractive, creates increasing pressures in undrained shear, and the undrained strength is less than the drained strength.

The additional shearing resistance due to negative pore pressures may not be sustainable in the field. Over time, water will be drawn toward areas with suction pore pressures, the beneficial effects of the higher effective stress will be lost, and the soil strength will reduce to the drained shearing resistance. Hence, computed factors of safety for stability may be unconservative if some part of the slip surface has an undrained strength greater than the drained strength.

To avoid this issue, a composite (bi-linear) strength envelope (Figure 32) can be specified for undrained analyses. The undrained strength is then taken as the lesser of the undrained or drained strength envelopes at any given normal stress.

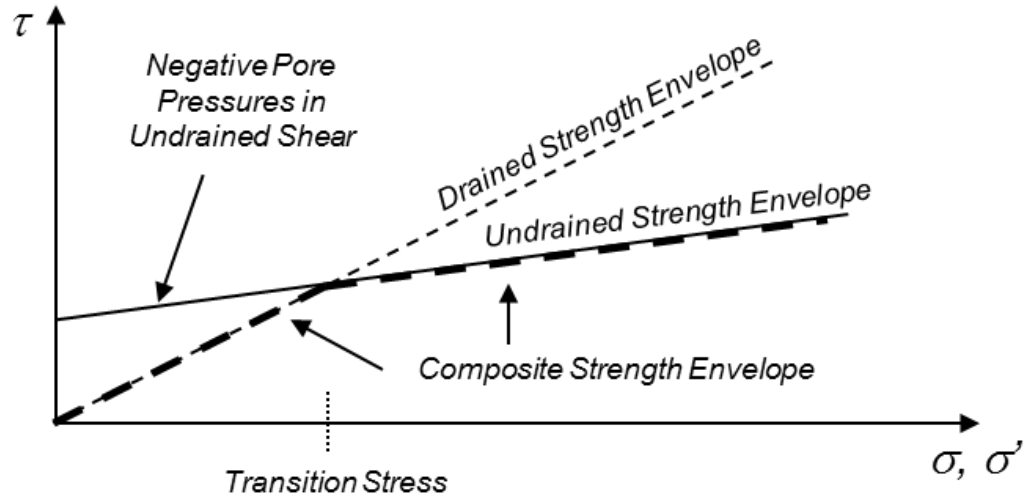


Figure 32. Specification of a composite strength envelope to avoid undrained shearing resistance due to negative pore pressures.

8. Strength of Unsaturated Soils

8.1. Saturation and Excess Pore Pressures

Shear-induced changes in pore pressure result from the movement of soil particles and the redistribution of stress between the soil skeleton and the pore fluid. Air is highly compressible, such that compression (or dilation) of pore space containing air does not generate significant changes in pore water pressure. In many unsaturated soils, shear induced volumetric changes will be accommodated by compression (or expansion) of the pore air. One might assume undrained loadings, including dynamic loadings, will not generate significant excess pore water pressures in these soils.

However, the actual behavior depends on the degree of saturation. Excess pore pressures are likely to occur in soils that are close to being saturated (perhaps at saturations greater than about 90 to 95%). For some soils above the water table, it will be appropriate and prudent to assume undrained loading will cause excess pore pressures and strength parameters should be assigned accordingly (Section 8.3).

Models of unsaturated soil behavior, including shear strength, can be formulated using the concept of "matric suction" (Fredlund and Rahardjo 1993). In most traditional geotechnical engineering problems, however, satisfactory results can be obtained without formal modeling of matric suction. Unsaturated soils may be modeled using conventional, drained or undrained strength parameters, as discussed below.

8.2. Conditions above the Water Table

The water table (phreatic surface) is defined as the line in the ground where pore water pressures are zero. Steady state pore pressures are positive beneath the water table and negative above.

Technically, the water table does not correspond to the top of the saturated zone. In the capillary fringe above the water table, the soils will be saturated or close to saturated. The height of capillary rise can range from a few inches in coarse sands to tens of feet in clayey soils.

In addition, soils above the water table may be saturated with retained water. For example, an embankment dam is subject to a changing phreatic surface as the reservoir rises and falls with dam operations. The phreatic surface drops when the pool is drawn down, inducing drainage from saturated zones above the new, lower water table. Significant water is retained in the pore spaces as the soil drains, with greater retention in finer grained soils. The infiltration and percolation of surface water will also increase the water content and degree of saturation in areas above the phreatic surface.

In assigning strength parameters for soils above the water table, it helps to consider how close to saturation the soil may be. Fine grained soils (silts, clays, sandy silts, sandy clays, etc.) are subject to greater heights of capillary rise, plus greater retention of draining or percolating ground water. Such soils may be close to saturation for

significant heights above the water table. Coarse sands with little fines experience less capillary rise and retain less water. The consideration of soil type is thus an important factor when selecting strength parameters for the unsaturated zone.

Regardless of saturation, the static pore pressures above the water table are negative (suction). Suction pressures increase the inter-particle stresses in the soil (represented by the effective stress) and the shearing resistance. However, in conventional stability calculations, pore pressures are assumed to be zero (absolute pressures equal to the atmospheric pressure) above the phreatic surface. Neglecting the suction pressures results in a conservative computation of consolidation stress and shearing resistance along the slip surface in the unsaturated zone.

8.3. Selection of Strength Parameters

The flowchart in Figure 21 helps to guide the selection of appropriate strength parameters for saturated and unsaturated soils. The chart is entered at the top, based on the loading condition that is being analyzed. Based on the loading rate and type of soil (see Section 7.2), each soil zone is judged to behave as fully drained or fully undrained. How the strengths are modeled may then depend on the whether the soil is found above or below the water table.

Under long-term, static loading conditions, the strength of all soils can be modeled using drained effective stress parameters. For clean, coarse soils, above or below the water table, drained strength parameters may be appropriate for all loads except dynamic, earthquake, or impact loads.

Rapid loading of fine grained soil induces undrained conditions in all cases, but the assigned strengths may differ if the soil is above or below the water table. Above the water table, the engineer has two options for the computing the strength under rapid or dynamic loads. The alternate paths are denoted A and B in Figure 21.

Along path A, excess pore pressures are assumed and undrained strengths are assigned (consolidation stresses are computed assuming zero static pore pressure). This path assumes the soil above the water table behaves as if it was saturated, and reduces the undrained strengths to account for dynamic pressures induced under seismic loading. This path leads to lower strengths and is thus conservative.

Path B in Figure 21 represents a less conservative approach that may be justified in some cases. For example, if the soil zone is well above the capillary fringe, the degree of saturation may be low enough to preclude the generation of excess pore pressures under load. This assumption may be valid for coarser soils that are closer to the water table. Along path B, drained strength parameters are assigned to zones above the water table.

For soils that are not located entirely above or below the phreatic surface, following path B will require specification of different soil zones above and below the water table (so that drained strengths can be assigned above, and undrained strengths can be applied below). The additional modeling effort may or may not be warranted or necessary, depending on the conditions under evaluation.

9. Undrained Strength Parameters for Seismic Conditions

9.1. Basis

Earthquakes generate cycles of shear stress that are rapid and transient. The stability of an earthen slope during an earthquake can be evaluated using pseudostatic analyses, simplified dynamic methods, or sophisticated numerical modeling. In each case, appropriate shear strength parameters must be estimated or measured for the undrained, seismic response of each soil.

To evaluate stability under these conditions, effective stress analyses (using c' and ϕ' strength parameters) are possible, but require a model for predicting the generation of excess pore water pressures under cyclic loading. A relatively high level of model sophistication is needed, along with good test data, to understand the volumetric response of the soil and track changes in effective stress during dynamic shearing.

A simpler approach is to use undrained stability analyses without predicting dynamic, excess pore pressures. Undrained shear strengths during an earthquake (S_{EQ}) can be characterized using undrained strength parameters, UU strengths, or c/p ratios:

$$S_{EQ} = c_{EQ} + \sigma'_{con} \tan\phi_{EQ} \qquad \textbf{Equation 41}$$

$$S_{EQ} = c_{EQ}, \text{ for } \phi_{EQ} = 0 \qquad \textbf{Equation 42}$$

$$S_{EQ} = \left(\frac{c}{p}\right)_{EQ} \sigma'_{1,con} \qquad \textbf{Equation 43}$$

Here, the "EQ" subscript designates parameters representing seismic (earthquake) loading conditions. Because cyclic shearing will generate additional pore pressures, above what might be expected under static shearing, undrained strengths for seismic loads (S_{EQ}) should be lower than for short-term static conditions (S_U). Much lower residual strengths (Section 10) are associated with soils that liquefy in an earthquake.

In most soils, the application of seismic shear stresses generates excess pore water pressures faster than they can dissipate. Undrained strength parameters are thus needed for most soils, even for granular soils that might be treated as fully drained under short-term, static loads. Exceptions might include clean gravels, rockfill, and stone riprap, all of which can usually be characterized using drained strength parameters in a seismic analysis.

9.2. Estimation of Dynamic Strengths

Cyclic shearing during an earthquake will generate additional pore water pressures in a soil. Higher pore pressures lead to softening and reduced shearing resistance, but soils that do not liquefy will retain most of their strength. Estimating appropriate strength parameters to represent these conditions is challenging. Given the inherent difficulties and incomplete knowledge of undrained soil behavior under dynamic loading,

geotechnical engineers have generally used judgment to arrive at appropriate strength parameters.

In their classic work on the seismic deformations of embankment dams, Makdisi and Seed (1977; 1978) recommended using a percentage of the static undrained shear strength to account for the potential loss of shearing resistance in unliquefiable soils during dynamic loading. They found that unliquefiable soils (clayey soils, unsaturated cohesionless soils, and very dense saturated cohesionless soils) exhibit essentially elastic behavior (no yielding) when subjected to many (> 100) cycles of stress at 80% or less of their static undrained shear strength. Substantial deformations generally result when these soils are loaded at higher cyclic shear stresses approaching their undrained shear strength. They thus concluded that for unliquefiable soils (i.e., soils that exhibit no more than small increases in pore pressure when loaded cyclically), the "cyclic yield strength" is, conservatively, at least 80% of the static undrained strength. Others have since used similar strength reductions to characterize the dynamic strength of unliquefied soils, in general.

Within the U.S. Army Corps of Engineers, Hynes-Griffin and Franklin (1984) recommend using reduced, undrained soil strengths in pseudostatic slope stability analyses. Specifically, they recommend using dynamic strengths equal to 80% of the undrained strength for both clays and unliquefied, pervious soils. While a reduced consolidated-undrained (R-type) strength envelope should be used for clayey soils, they recommend using a reduced, composite (bi-linear) drained-undrained (S-R type) envelope for pervious soils, to avoid relying on the increased shearing resistance due to decreasing pore pressures in dilative, granular soils (in this case, the drained strength parameters are not reduced).

Seed and Harder (1990) concluded that soils with a factor of safety against triggering of liquefaction (FS_{liq}) greater than 1.4 would experience only minor pore pressure generation under cyclic loading. Moreover, such soils could be represented in stability and deformation analyses using some large fraction of their static shear strength. For their analysis of the Lower San Fernando Dam failure, Seed and Harder (1990) assumed that granular soils with $FS_{liq} \geq 1.4$ retained 75% of their static strength (determined based on drained conditions) during the earthquake.

In summary, there is precedence for assuming that unliquefied soils will retain at least 80% of their static strength if they do not approach a liquefied state in an earthquake (U.S. Bureau of Reclamation 1999). This condition can be assumed to apply as long as $FS_{liq} \geq 1.4$ (the residual strength of liquefied soils is addressed in Section 10). A 20% reduction in strength can be represented using reduced short-term strength parameters:

$$c_{EQ} = 0.8\, c \qquad \textbf{Equation 44}$$

$$\tan(\phi_{EQ}) = 0.8 \tan(\phi) \qquad \textbf{Equation 45}$$

$$\left(\frac{c}{p}\right)_{EQ} = 0.8\left(\frac{c}{p}\right) \qquad \textbf{Equation 46}$$

When composite drained-undrained strength envelopes are used to avoid relying upon suction pressures for shearing resistance (Section 7.8), the drained strength parameters are not reduced.

9.3. Dynamic Strengths for Granular Soils

The residual strength of liquefied soils is discussed in Section 10.

As discussed in Section 7, undrained peak strengths are sensitive to a number of important details and can be difficult to accurately characterize. These difficulties are managed through the use of standardized test methods and prudent factors of safety, which have been established based on field experience. For fine-grained soils, there is a substantial base of experience, developed over the last century, to support the estimation, measurement, and appropriate application of undrained shear strengths to achieve acceptable field performance.

There is much less field or laboratory data, research, or design experience to support the selection of undrained strength parameters for unliquefied, clean, granular materials. Undrained loadings of such soils are uncommon, with the notable exception of seismic events. Laboratory determinations of in situ strengths are further inhibited by the great difficulty in obtaining undisturbed samples of these soils. Like clays, the determination of undrained yield strengths for sands from laboratory tests will be sensitive to details such as:

- relative density or void ratio of the test specimens,
- grain characteristics, including particle shape and gradation,
- effects of disturbance in "undisturbed" field samples,
- soil fabric resulting from the method of sample formation,
- consolidation stresses, including static shear stress,
- loading stress path (triaxial compression, extension, simple shear, etc.), and
- monotonic versus cyclic loading.

For sandy soils, the pre-earthquake shear strength under drained conditions (S_d, computed using effective stress) can be used to estimate the undrained shearing resistance (for undrained stability analyses) during and immediately after seismic loading. The 20% reduction in strength from the fully drained value is meant to account, in a simplistic manner, for the reduction in the undrained shearing resistance due to the generation of modest pore pressures during dynamic loading for unliquefied sands ($FS_{liq} \geq 1.4$). This approach has the advantage of indexing undrained strengths to ϕ', which can be estimated with relatively good confidence.

In addition, it is more difficult to reliably estimate peak undrained strength (S_U) than residual undrained strength (S_{us}) in a granular soil. Steady state concepts and back-analysis of liquefaction failures have been used to characterize residual strengths (Section 10.2), but ascertaining peak undrained strengths in field case histories is more difficult, and steady state concepts do not apply at the peak shear resistance. Hence, while considerable uncertainty remains in the estimation of residual strengths, peak undrained yield strengths can be estimated even less reliably. There is also a lack of field experience to judge what factors of safety should be considered adequate to ensure satisfactory performance, if that performance is predicted from such strength estimates.

9.4. Undrained Strengths for Pseudostatic Analyses

Pseudostatic stability calculations are carried out using limit equilibrium and the method of slices to compute a factor of safety for slope stability. The shearing resistance on the base of each slice can be computed using an undrained strength envelope (Equation 31), developed from consolidated undrained (CU) laboratory tests with a reduction for dynamic pore pressures (Section 9.2). The effective normal stresses on the base of each slice (σ'_{con} in Equation 31), representing the stresses to which the soil has been consolidated, should be computed using the steady state pore pressures prior to the earthquake.

In a simplified, single stage pseudostatic analysis, the value of σ'_{con} is computed from the total normal stress during the earthquake, which includes the inertial force (applied pseudostatic force). A more rigorous formulation involves a two-stage analysis (Duncan et al. 2014). The effective consolidation stresses normal to the failure surface (σ'_{fc}) are calculated in the first stage (without the pseudostatic force), and the undrained shear strength on that surface (τ_{ff}) is computed in the second stage calculations (with the pseudostatic force). A two-stage analysis requires a modified failure envelope:

$$\tau_{ff} = d_{EQ} + \sigma'_{fc} \tan\psi_{EQ} \qquad \textbf{Equation 47}$$

which can be derived from ϕ' and the seismic undrained strength parameters (c_{EQ} and ϕ_{EQ}):

$$d_{EQ} = c_{EQ}\left(\frac{\cos\phi_{EQ}\ \cos\phi'}{1-\sin\phi_{EQ}}\right) \qquad \textbf{Equation 48}$$

$$\psi_{EQ} = \arctan\left(\frac{\sin\phi_{EQ}\ \cos\phi'}{1-\sin\phi_{EQ}}\right) \qquad \textbf{Equation 49}$$

Duncan et al. (2014) considered a few typical cases, and concluded that a simplified, single-stage pseudostatic analysis should give a conservative estimate of the pseudostatic factor of safety in many cases.

10. Residual Strength Parameters for Liquefied Soils

10.1. Basis

A contractive, saturated sand sheared without drainage will exhibit a peak strength (S_u) followed by a residual shearing resistance with liquefaction at large strains. The residual strength (S_{us}), representing the shearing resistance of a liquefied soil in a steady state of deformation, may be very low. Some authors choose to identify the residual strength as S_r, to differentiate the residual, liquefied soil strength in the field from the steady-state strength in laboratory samples (Idriss and Boulanger 2008).

Soils are typically assumed to liquefy if the factor of safety against triggering of liquefaction (FS_{liq}) is less than or equal to 1.1. In their analysis of the Lower San Fernando Dam failure, for example, Seed and Harder (1990) assigned S_{us} values to soil zones that were indicated to have liquefied, based on $FS_{liq} \leq 1.1$.

The residual or steady state strength can be determined from laboratory tests on high quality "undisturbed" field specimens and reconstituted laboratory samples (Poulos et al. 1985). However, laboratory testing has been shown to give S_{us} values that are unconservatively high, compared to values back-calculated from field conditions (Castro et al. 1992; U. S. Bureau of Reclamation 1999). Correlations developed from liquefaction case histories and in situ penetration resistance (Section 10.2 and Section 10.3) are thus preferred for estimating S_{us} (USACE 2004).

10.2. Correlations based on SPT Blowcount

In the correlations presented in this subsection, the residual strength (S_{us}) or residual strength ratio (S_{us}/σ'_v) is related to SPT blowcount. Each of these correlations uses the corrected, normalized blowcount, $(N_1)_{60}$. The field blowcounts are normalized to one atmosphere of overburden pressure, corrected to 60% hammer efficiency, and adjusted for borehole diameter, short-rod energy loss, and sampler liner effects. The value of $(N_1)_{60}$ is the same as used to evaluate liquefaction triggering.

Some of the correlations presented below use SPT blowcounts that are also adjusted for the fines content of the soil. The corrected, clean-sand equivalent blowcount, $(N_1)_{60cs}$, is defined as:

$$(N_1)_{60cs} = (N_1)_{60} + \Delta(N_1)_{60cs} \qquad \textbf{Equation 50}$$

Approximate values of the fines content adjustment $\Delta(N_1)_{60cs}$ are:

% passing No. 200 sieve	$\Delta(N_1)_{60}$
10	1
25	2
50	4
75	5

Note that the above fines content correction, used in the residual strength correlations, is different than the fines content correction generally used in liquefaction triggering assessments.

Two published correlations for obtaining S_{us} from SPT blowcounts, both developed from limited case history data, are shown in Figure 33. Seed and Harder (1990) related S_{us} to the clean sand equivalent blowcount, while Stark and Mesri (1992) developed a correlation for the ratio of S_{us}/σ'_v. Seed et al. (2003) assert that Stark and Mesri's correlation is overly conservative at low pressure (σ'_v < 1 atm) and somewhat unconservative at high pressure (σ'_v > 3 atm). Seed et al. (2003) also acknowledge that the Seed and Harder (1990) correlation understates the influence of σ'_v on S_{us}.

According to Finn (1998), the practice at the U. S. Bureau of Reclamation has been to determine S_{us} at about the 35th percentile of Seed and Harder's (1990) correlation, using a line sketched between the upper and lower bounds. For $(N_1)_{60CS}$ greater than 15, Seed et al. (2003) recommend extrapolating the correlations in Figure 33 at constant slope. In addition, Seed et al. (2003) recommend that S_{us} should be limited to not exceed the fully drained shear strength (at the residual friction angle), which would require a reliance on significant negative pore pressures from the dilative response of soils at low pressures.

Olson and Stark (2002) used a larger case history dataset to develop correlations between the residual strength ratio and SPT blowcount (upper plot in Figure 34). The average trend line through the data is (Olson and Stark 2002):

$$\frac{S_{us}}{\sigma'_v} = 0.03 + 0.0075\,(N_1)_{60} \pm 0.03 \quad \text{for } (N_1)_{60} \le 12 \qquad \textbf{Equation 51}$$

where $(N_1)_{60}$ is the corrected, normalized SPT blowcount. The penetration resistance is not adjusted for fines content. A significant shortcoming of this correlation is the lack of field data for moderate to large confining pressures, corresponding to $(N_1)_{60}$ > 12.

Idriss and Boulanger (2008) examined the available case history data with the goal of providing better guidance on selecting strength ratios at higher penetration resistance. Among the challenges in developing these correlations, Idriss and Boulanger (2008) note the influence of "void redistribution" in a liquefied deposit, resulting from the migration of pore water within the soil during a liquefaction failure. Using the results from laboratory studies as a guide in extrapolating the case history data, Idriss and Boulanger proposed the two bounding relationships shown in the upper plot in Figure 35.

Where significant void redistribution might be expected, Idriss and Boulanger (2008) recommend a lower-bound estimate of residual strength ratio given by:

$$\frac{S_{us}}{\sigma'_v} = \exp\left[\frac{(N_1)_{60cs}}{16} + \left(\frac{(N_1)_{60cs} - 16}{21.2}\right)^3 - 3.0\right] \leq \tan\phi' \qquad \textbf{Equation 52}$$

Here, $(N_1)_{60CS}$ is the normalized, corrected SPT blowcount with the adjustment for fines content (Equation 50). The strength ratio is limited by the drained strength (tan ϕ'), based on the assumption that negative pore pressures (inferred by $S_{us} > \sigma'$ tanϕ') cannot be sustained. Significant void redistribution might be expected at "*. . . sites with relatively thick layers of liquefiable soil that are overlain by lower-permeability soils that would impede the post-earthquake dissipation of earthquake-induced excess pore water pressures*" (Idriss and Boulanger 2008). For example, Equation 52 would be appropriate for a thick layer of liquefied soil overlain by a clayey embankment.

Where void redistribution is judged to be unlikely, Idriss and Boulanger (2008) recommend an upper-bound estimate of residual strength ratio given by:

$$\frac{S_{us}}{\sigma'_v} = \exp\left[\frac{(N_1)_{60cs}}{16} + \left(\frac{(N_1)_{60cs} - 16}{21.2}\right)^3 - 3.0\right]\left[1 + \exp\left(\frac{(N_1)_{60cs}}{2.4} - 6.6\right)\right] \leq \tan\phi' \qquad \textbf{Equation 53}$$

This relationship is appropriately used for sites where void redistribution effects will be negligible. "*This condition could include sites where the stratigraphy would not impede post-earthquake dissipation of excess pore water pressures, [which] would be accompanied by densification of the soils at all depths*" (Idriss and Boulanger 2008). Where a rockfill dam is built over a relatively thin layer of liquefiable soil, for example, Equation 53 would be appropriate.

Various authors have preferred relationships between S_{us}/σ'_v and SPT blowcount. One can argue that penetration resistance should be correlated to S_{us}, instead of S_{us}/σ'_v. Steady state strengths measured in the laboratory have been shown to vary with void ratio (Poulos et al. 1985). After normalizing SPT blowcounts for the effects of overburden pressure, the value of $(N_1)_{60}$ should also correlate with the void ratio of a sandy soil. Hence, $(N_1)_{60}$ should correlate directly with S_{us}.

Three correlations for S_{us} in terms of $(N_1)_{60}$ or $(N_1)_{60cs}$ are shown in Figure 33a (Seed and Harder 1990), in the lower plot in Figure 35 (Idriss and Boulanger 2008), and in Figure 36 (Castro 1995). In Figure 36, the lower bound curve should be used to estimate liquefied strengths. Another correlation has been recently proposed by Kramer and Wang (2015):

$$\ln S_{us} = -8.444 + 0.109\,(N_1)_{60} + 5.379\,(\sigma'_v)^{0.1} \qquad \textbf{Equation 54}$$

where S_{us} and σ'_v are expressed in units of atmospheres.

10.3. Correlations based on CPT Tip Resistance

In addition to their correlation based on SPT blowcount, Olson and Stark (2002) used their database to develop a correlation between the residual strength ratio and CPT tip resistance (lower plot in Figure 34). The average trend line through the data is (Olson and Stark 2002):

$$\frac{S_{us}}{\sigma'_v} = 0.03 + 0.0143\,(q_{c1}) \pm 0.03 \quad \text{for } (q_{c1}) \le 6.5 \text{ MPa} \qquad \textbf{Equation 55}$$

Here, the normalized CPT tip resistance (MPa) is given by: $q_{c1} = 1.8 \cdot q_c / (0.8 + \sigma'_v/P_a)$. The penetration resistance is not adjusted for fines content. A significant shortcoming of this correlation is the lack of field data for moderate to large confining pressures, corresponding to $q_{c1} > 6.5$ MPa.

Idriss and Boulanger (2008) also used their database (Figure 35) to develop correlations based on CPT tip resistance. For sites without CPT data, they used empirical correlations to estimate the CPT resistance from the available SPT blowcounts. In these correlations, they use a CPT tip resistance (q_{c1N}) that is corrected for the effects of overburden pressure and normalized to a dimensionless value. The value of q_{c1N} is the same as used to evaluate liquefaction triggering.

Idriss and Boulanger (2008) also made an adjustment to account for the fines content of the soil. The normalized, clean-sand tip resistance, q_{c1Ncs}, is defined as:

$$q_{c1Ncs} = q_{c1N} + \Delta q_{c1N} \qquad \textbf{Equation 56}$$

Approximate values of the fines content adjustment Δq_{c1N} are:

% passing No. 200 sieve	Δq_{c1N}
10	10
25	25
50	45
75	55

Where significant void redistribution might be expected, Idriss and Boulanger (2008) recommend a lower-bound estimate of residual strength ratio given by:

$$\frac{S_{us}}{\sigma'_{vo}} = exp\left[\frac{q_{c1Ncs}}{24.5} - \left(\frac{q_{c1Ncs}}{61.7}\right)^2 + \left(\frac{q_{c1Ncs}}{106}\right)^3 - 4.42\right] \le tan\phi' \qquad \textbf{Equation 57}$$

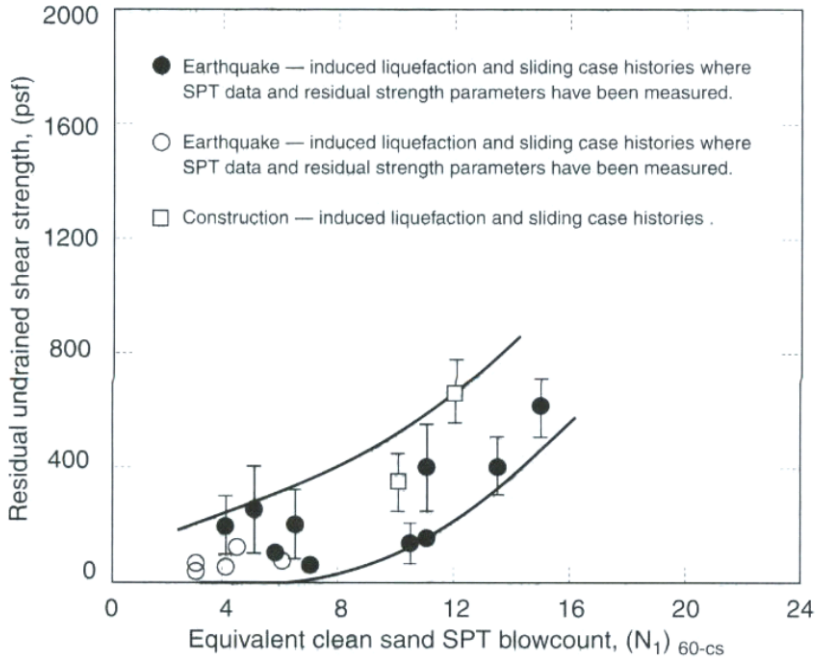
Where void redistribution is judged to be unlikely, Idriss and Boulanger (2008) recommend an upper-bound estimate of residual strength ratio given by:

$$\frac{S_{us}}{\sigma'_{vo}} = exp\left[\frac{q_{c1Ncs}}{24.5} - \left(\frac{q_{c1Ncs}}{61.7}\right)^2 + \left(\frac{q_{c1Ncs}}{106}\right)^3 - 4.42\right]\left[1 + exp\left(\frac{q_{c1Ncs}}{11.1} - 9.82\right)\right] \le tan\phi' \qquad \textbf{Equation 58}$$

10.4. Recommended Practice

Considering the number of published correlations, and the uncertainty associated with each one, the recommended practice is to estimate S_{us} from all applicable correlations. The average or representative blowcount (or CPT tip resistance) in the soil layer should be used in the correlations to estimate S_{us}. Then, engineering judgment should be used to select an appropriate, representative value. Caution is needed to avoid over- or under-estimating S_{us} at confining pressures that are significantly higher or lower than the data set used to derive the correlations.

(a) Seed and Harder (1990)



(b) Stark and Mesri (1992)

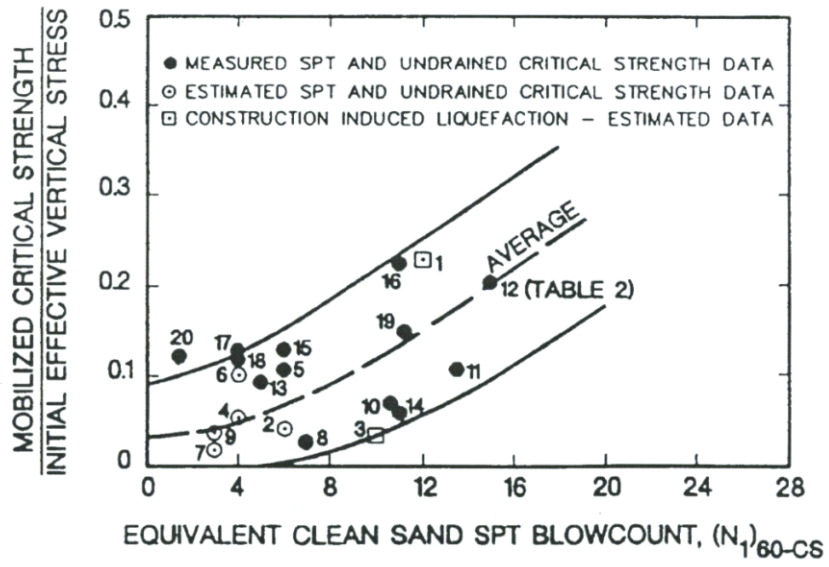


Figure 33. Correlations between residual strength of liquefied soil and SPT penetration resistance.

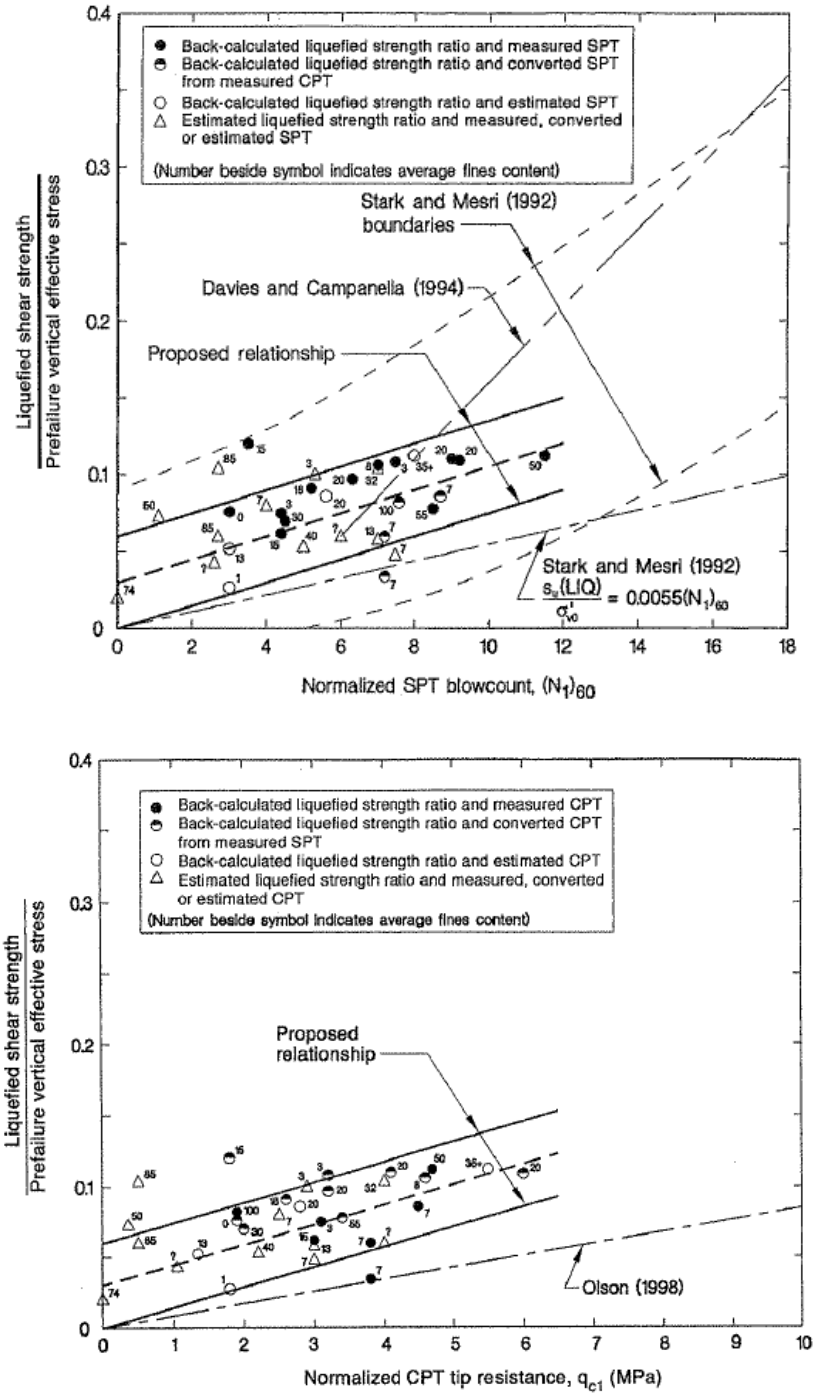


Figure 34. Correlations for the residual strength of liquefied soil by Olson and Stark (2002).

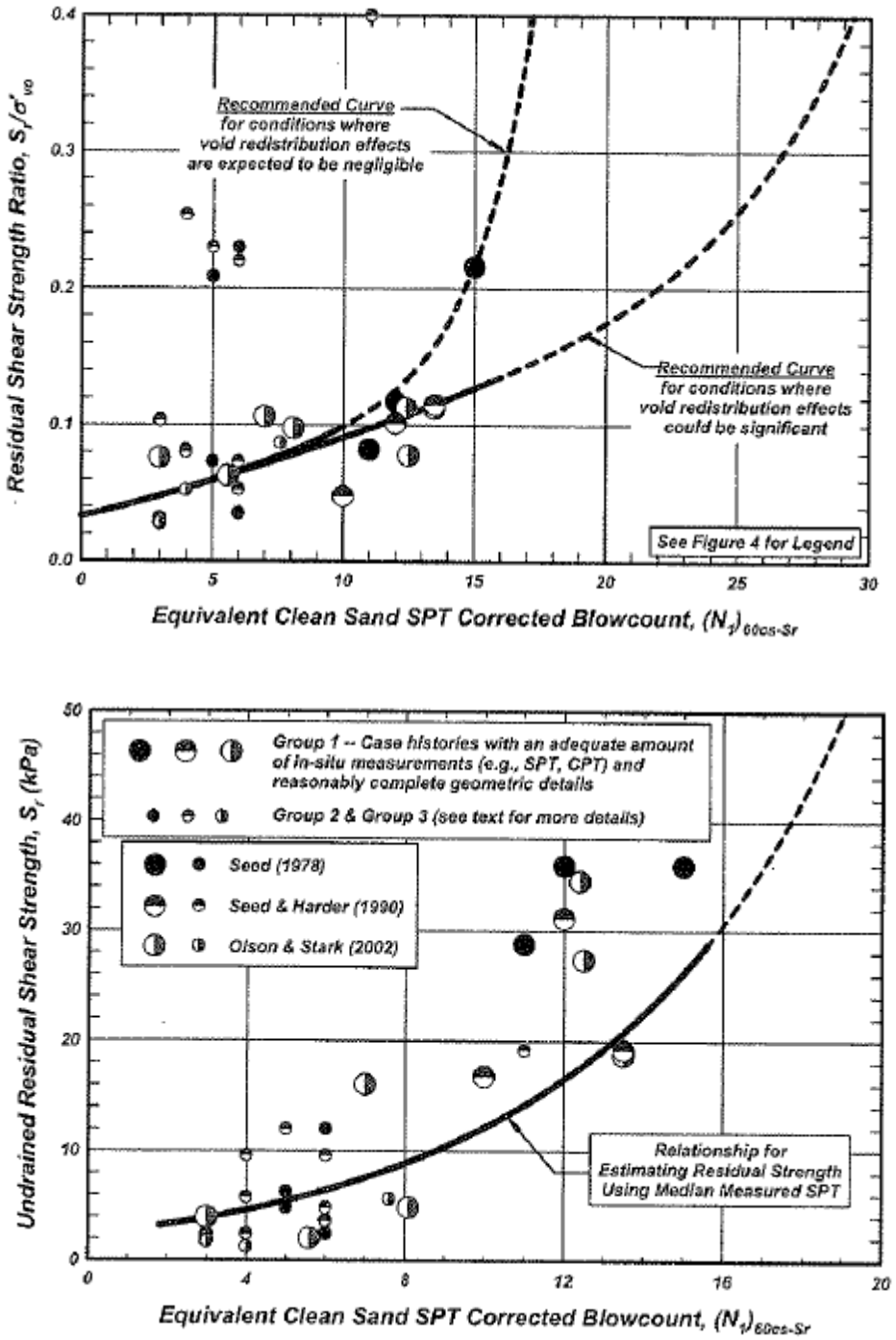


Figure 35. Correlations for the residual strength of liquefied soil by Idriss and Boulanger (2008).

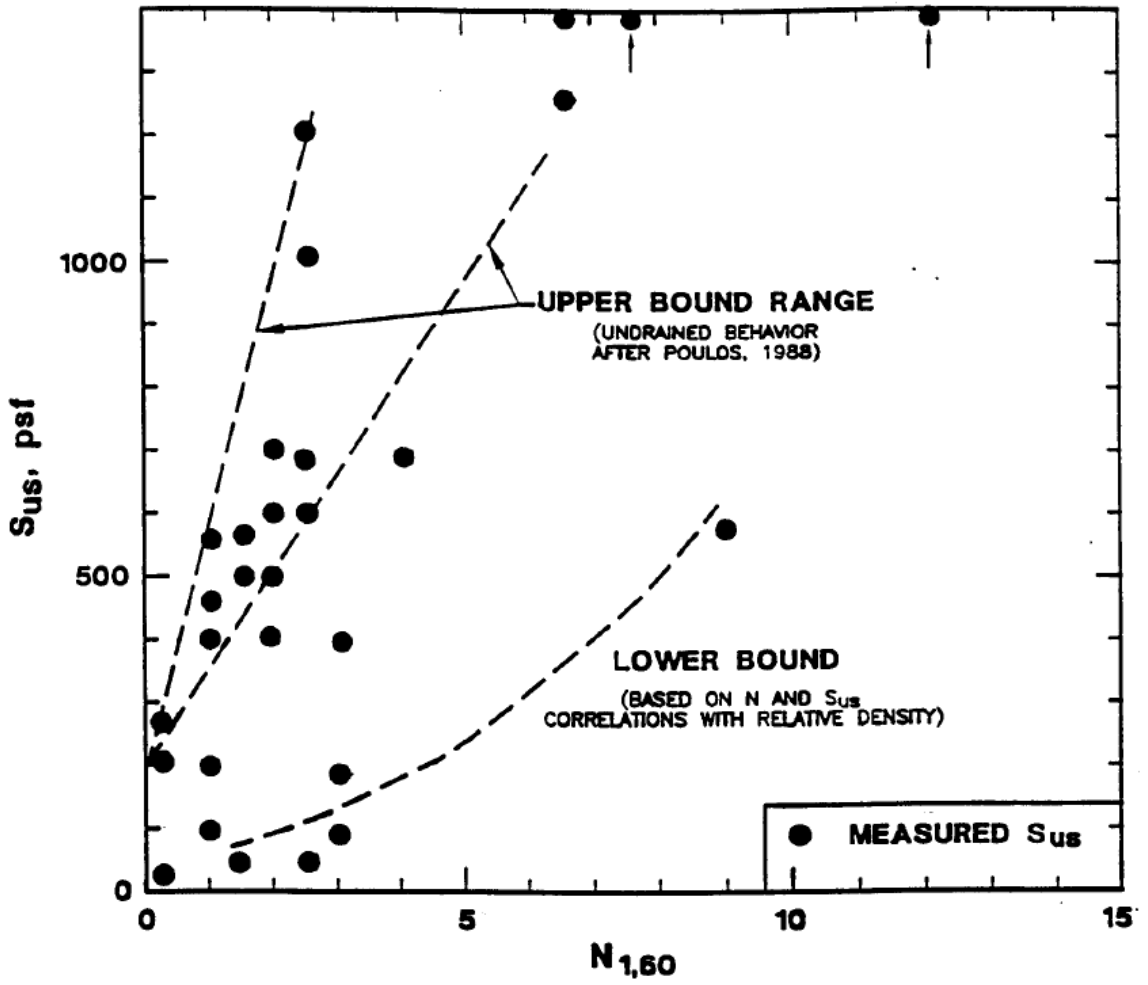


Figure 36. Correlation for the residual strength of liquefied soil by Castro (1995).

11. Residual Strength Parameters for Cyclic Softened Soils

For $FS_{\gamma=3\%}$ estimates less than one, the undrained strength may degrade during earthquake shaking. This behavior may be significant in deformation analyses. The post-earthquake strength of cyclic softened soils may range from the peak undrained strength (S_u) for small cyclic shear strains to the undrained, remolded strength (S_{ur}) at large cyclic shear strains. For clay-like soils with $FS_{\gamma=3\%}$ estimates less than one, using S_{ur} for softened soil horizons in an initial post-earthquake stability or deformation analysis can identify if the softened layers are a concern for post-earthquake stability. If this simple evaluation indicates a potential stability problem, additional evaluation is required to determine if S_{ur} or a greater strength is appropriate.

Laboratory strength tests for S_u and S_{ur} are typically required for high-consequence projects. Post-cyclic monotonic triaxial compression and direct simple shear tests are also valuable in identifying the degradation in peak undrained strength for modest strains. A more extensive discussion of laboratory test methods is provided in MSHA (2010).

11.1. Field and Laboratory Measurements of Remolded Strength

Measurement of S_{ur} requires a device that can achieve large strains, such as a field vane shear apparatus. Field tests are often performed adjacent to CPTs with pore pressure measurements to permit selection of suitable soil layers for testing. Field vane tests should follow accepted procedures, must be performed to high enough strains to mobilize S_{ur}, and must be conducted rapidly enough to capture the undrained behavior of the soil. Laboratory tests on saturated, remolded samples tested at the in situ water content may also be used.

Data from CPT can also be used to estimate remolded strength of clays. According to Lunne et. al (1997), the undrained, remolded shear strength (S_{ur}) of a clay is approximately equal to the sleeve friction measured with a CPT.

12. Properties of Rockfill

12.1. Basis

Coarse rockfill is difficult to characterize by testing. When a material contains cobbles or boulders, it is difficult to obtain representative samples and conduct meaningful tests with conventional laboratory equipment. Large-scale tests reported in the literature provide valuable data on the engineering properties of rockfill (Figure 39), but relatively few such tests have been published. However, appropriate properties can be usually selected on the basis of engineering judgment, where that judgment is supported by the performance of similar materials in other projects.

In the laboratory, the diameter of triaxial test specimens should be at least six times the size of the largest particle (Duncan et al. 2014). Most geotechnical laboratories have equipment for testing 4-inch diameter specimens, and a few facilities can test up to 12-inch samples. The largest particle size that can be tested in this equipment is then 0.7 to 2 inches. For gravelly soils, test samples re-mixed to have parallel grain-size distributions, or scalped to remove particles larger than one-sixth the specimen diameter, will generally have friction angles similar to the original material; however the relative density and gradation of the original material must be known with some confidence.

Testing samples without the largest particles is not recommended for rockfill with cobbles and boulders. There is a tendency for smaller particles to be stronger than larger particles (which may have internal fractures or discontinuities), and removing the larger particles may result in unconservative measurements of strength. Direct measurements on rockfill require testing large volumes of representative material. Few large triaxial compression apparatuses have been developed, and those were generally used for a specific project and are no longer in operation.

Fortunately, rockfill materials exhibit favorable engineering behavior. If the rockfill is relatively clean (voids between the larger rock particles are open), potential excess pore pressures will quickly dissipate. Depending on the gradation, fully drained conditions can often be assumed in rockfill under a variety of loading conditions, including under dynamic or seismic loads. Interlocking between large, angular pieces of durable rock will result in relatively high shear strength. Satisfactory performance in these materials can usually be demonstrated, even when conservative estimates of strength are used.

Published results from large-scale testing show how certain conditions affect the strength of rockfill. In general, friction angles decrease with increasing confining pressure, increasing particle size, and weathering over time. Well graded material generally has higher friction angles than poorly graded material. Angular to sub-angular material generally has higher friction angles than rounded to sub-rounded material. Mineralogy has little effect on friction angle.

Over a large pressure range, rockfill materials exhibit curved strength envelopes. This can be represented using secant friction angles that vary with confining pressure, as

discussed below. The secant friction angle (ϕ'_{sec}) is the slope of a tangent line to the Mohr's circle of stress at failure, with zero cohesion intercept, as depicted in Figure 37.

12.2. Historical Data

During construction of South Holston Dam, TVA performed large-scale tests to determine the friction angle of the quarried and dumped rockfill. Those tests, discussed by Leonard and Raine (1958), consisted of filling a 9.3-feet by 9.3-feet shear box with 6 to 12-inch diameter, quarried rock. The rockfill was vibrated during placement, and was about 3 feet thick when tested. Concrete slabs (total thickness of 6 feet) were placed on top of the apparatus for added confining load. Hydraulic jacks were used to apply a horizontal force until lateral displacement occurred. Three materials were tested: cemented sandstone, uncemented sandstone, and shale.

Data from the specific tests were not published, but Leonard and Raine (1958) reported measured friction angles of 45 degrees for the cemented sandstone, and about 30 degrees for the uncemented sandstone and shale. For design, a friction angle of 45 degrees was used for the downstream slope, where durable sandstone was placed. On the upstream face, a mix of the quarried rock was placed and a friction angle of 40 degrees was assumed. Although the method of measurement is unknown, Leonard and Raine (1958) report that dry unit weights for the rockfill were between 105 and 120 pounds per cubic foot.

The large-scale tests at South Holston Dam were conducted at rather low confining pressures (less than 900 psf). Granular materials, including rockfill, are known to exhibit curved failure envelopes, with secant friction angles that decrease at higher confining pressures. Hence, the South Holston friction angles reported by Leonard and Raine (1958) may be unconservatively high for representing the material strength under significantly higher confining pressures.

12.3. Published Research

Marachi et al. (1972) performed tests on 36-, 12-, and 2.8-inch diameter specimens of rockfill in drained triaxial compression equipment. Three types of rockfill were tested; argillite from Pyramid Dam, quarry blasted crushed basalt, and amphibolite from Oroville Dam. The test specimens were prepared to have grading curves parallel to the field gradation curves. The confining pressures for the tests ranged from 30 to 650 psi. The results of these tests (Figure 38) show a nonlinear Mohr-Coulomb strength envelope, with decreasing secant friction angles over the range of confining pressures tested. The results also show that for larger maximum particle size, the secant friction angle is less at a given confining pressure.

Leps (1970) compiled the database of rockfill test results in Figure 39, and showed the effects of normal pressure on drained friction angle. The data are plotted in Figure 40 on a semi-log graph of secant friction angle versus normal pressure. The data shows that at lower normal pressure, the decrease in friction angle is greater with increasing normal pressure than at higher pressures. The three trend lines in Figure 40 were defined by Leps (1970) for the range of typical rockfill; the trend lines can be represented by the following equations:

- Low density, poorly graded rockfill, with weak particles (unconfined compressive strength between 500 and 2,500 psi)

$$\phi'_{sec} = 41.8° - 6.8° \log\left(\frac{\sigma'_n}{P_a}\right) \quad \textbf{Equation 59}$$

- Average rockfill, with average strength particles (unconfined compressive strength between 2,500 and 10,000 psi)

$$\phi'_{sec} = 47.1° - 6.8° \log\left(\frac{\sigma'_n}{P_a}\right) \quad \textbf{Equation 60}$$

- High density, well graded rockfill with strong particles (unconfined compressive strength between 10,000 and 30,000 psi)

$$\phi'_{sec} = 52.1° - 6.8° \log\left(\frac{\sigma'_n}{P_a}\right) \quad \textbf{Equation 61}$$

Here, ϕ'_{sec} is the secant, effective stress friction angle (slope of a tangent line to the Mohr's circle of stress at failure, with zero cohesion intercept), σ'_n is the effective normal pressure on the failure plane, and P_a is one atmosphere of pressure in the units of σ'_n (P_a = 14.69 psi = 2,116 psf = 101.3 kPa).

Fell et al. (2005) present an empirical correlation, developed by Douglas (2003), for the secant friction angle of rockfill. This equation can be used to estimate the friction angle of the material using gradation data, normal stress, and unconfined compressive strength of the rock.

$$\phi'_{sec} = a + b\,{\sigma'_n}^{c} \quad \textbf{Equation 62}$$

$$a = 36.43 - 0.267ANG - 0.172FINES + 0.756(c_c - 2) + 0.0459(UCS - 150) \quad \textbf{Equation 63}$$

$$b = 69.51 + 10.27ANG + 0.549FINES - 5.105(c_c - 2) - 0.408(UCS - 150) - 0.408 \quad \textbf{Equation 64}$$

$$c = -0.3974 \quad \textbf{Equation 65}$$

ANG is a subjective rating for angularity; use ANG = 3 for crushed angular rock, ANG = 0 for rounded stone. FINES is the percentage of particles passing the No. 200 sieve (< 0.075 mm). From the gradation curve, c_c is the coefficient of curvature ($d_{30}^2/d_{10}d_{60}$). UCS is the unconfined compressive strength of the rock, in MPa, and σ'_n is the effective normal stress in kPa.

With this method, a multi-linear strength envelope can be used to represent the curved Mohr-Coulomb envelope typical of rockfill. This can be plotted by calculating ϕ'_{sec} at varying σ'_n applicable to the stability analysis. Loose dumped rockfill at low normal

pressures will have a secant friction angle approximately 4 degrees lower than calculated using this approach (Fell et al. 2005).

The method proposed by Douglas (2003) may be difficult to implement, because rockfill can be difficult to sample and the gradation may be unknown. If the rock is not durable, weathering may lead to significant changes in gradation over time after construction. The unconfined compressive strength may have to be estimated, if intact samples are not obtained. Finally, the subjective definition of "angularity" introduces additional uncertainty.

12.4. Curved Strength Envelopes in Slope/W

A single, representative friction angle can be selected to model the strength of a relatively thin or shallow rockfill layer. In deep rockfills, such as in the shell of a large rockfill dam, the confining pressure varies over a wide range and the strength model should represent a curved envelope, consistent with the test data discussed in Section 12.3. Some computer codes include an option for directly modeling variable secant friction angles, using equations like those in Equation 59 through Equation 61. The SLOPE/W code (from GEO-SLOPE International, Ltd) does not include this option, but will allow the user to specify points on a curved strength envelope. This can be accomplished using the procedure outlined below.

A curved strength envelope and a secant friction angle (for the Mohr's failure circle at one confining stress) are depicted schematically in Figure 37. Technically, the line at ϕ'_{sec} is not tangent to the Mohr's circle of stress at the same point as for the curved strength envelope, but the difference is not significant. Points on the curved strength envelope can be computed as follows:

(1) Select a range of normal stresses (σ'_n) that span and bracket the problem of interest.

(2) At each σ'_n, determine an appropriate ϕ'_{sec} for the material (for example, using the empirical equations in Section 12.3).

(3) At each σ'_n, compute the shear stress on the failure surface (τ_f) using:

$$\tau_f = \sigma'_n \tan \phi'_{sec} \qquad \textbf{Equation 66}$$

(4) Include a point at the origin ($\sigma'_n = 0$, $\tau_f = 0$), even if ϕ'_{sec} is not defined at zero stress.

These values of (σ'_n, τ_f) are then entered into SLOPE/W, which will interpolate between the entered values (using a spline function) to obtain the shear resistance at any normal effective stress.

SLOPE/W requires linear strength envelopes for three-stage rapid drawdown analyses. In this case, the needed strength parameters can be obtained from an approximate, straight line fit to values of (σ'_n, τ_f) in the appropriate stress range.

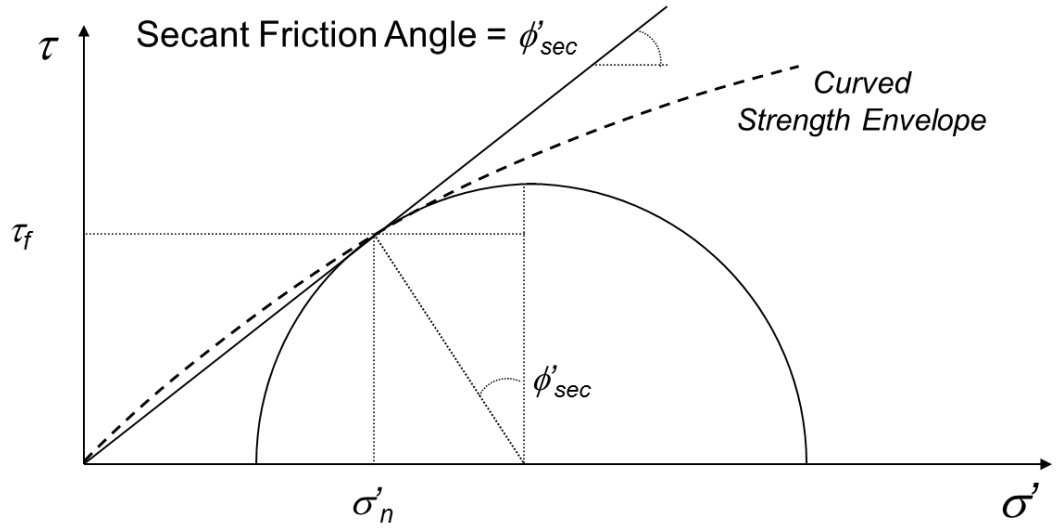


Figure 37. Definition of secant friction angle for representing curved strength envelopes.

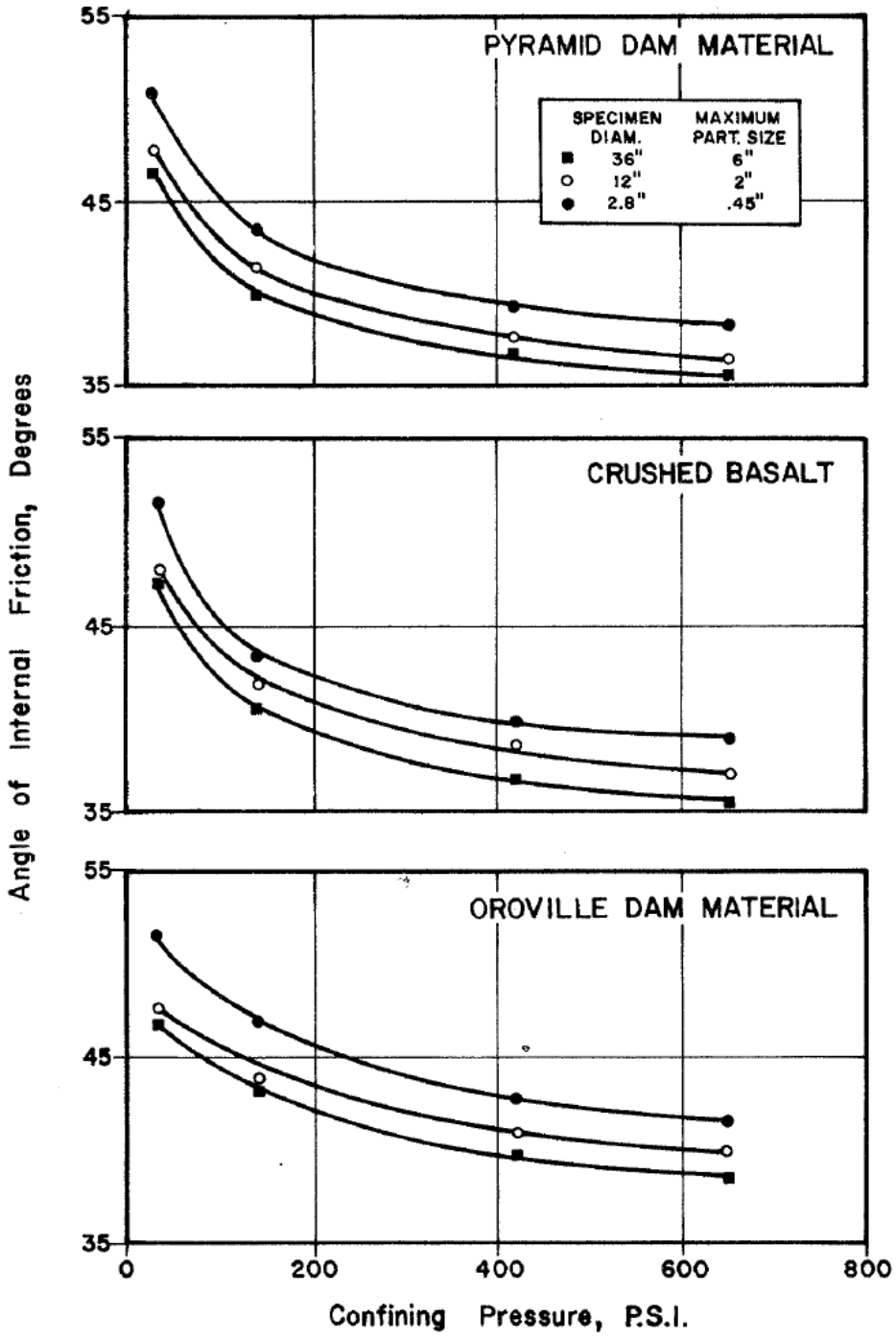


Figure 38. Shearing strength of three rockfills from large-scale triaxial tests (from Marachi et al. 1972).

Location (1)	Material (2)	Maximum particle, in inches (3)	Dry density, in pounds per cubic foot (4)	Normal pressure, in pounds per square inch (5)	Maximum friction angle, in degrees (6)
Isabella	Granite	4	97.0	7.5	47.0
		4	95.0	23.0	43.5
Cachuma	Gravel	0.75	126.0	6.3	54.7
		0.75	125.0	11.3	49.5
		0.75	123.0	21.5	44.5
		0.75	125.0	43.0	45.0
		0.75	124.0	84.0	41.0
		0.75	124.0	165.0	39.5
		0.75	125.0	162.0	38.5
Cachuma	Gravel	3	126.0	6.2	54.0
		3	124.0	11.8	49.5
		3	124.0	22.1	47.0
		3	127.0	45.0	46.5
		3	125.0	86.0	43.5
		3	127.0	167.0	41.5
Cachuma	Quartz Monz.	3	122.0	20.0	40.0
		3	123.0	65.0	39.5
		3	122.0	123.0	39.0
		3	129.0	22.0	44.0
		3	128.0	60.0	42.0
		3	130.0	125.0	41.0
Cachuma	Quartz Monz.	3	117.0	42.0	44.0
		3	117.0	59.0	41.0
		3	127.0	44.0	47.0
		3	127.0	63.0	46.0
Oroville	Tailings	1.5	144.0	490.0	40.0
		1.5	142.0	484.0	38.8
		1.5	148.0	424.0	43.0
		1.5	147.0	700.0	40.5
		1.5	148.0	1160.0	40.0
		3	143.0	208.0	42.0
		3	143.0	206.0	41.3
		3	150.0	213.0	45.0
Soledad	Gravel	3.5	1.02[a]	8.2	44.8
		3.5	0.88	16.6	42.8
		3.5	0.64	8.8	50.0
		3.5	0.69	16.9	47.2
Infiernillo	Diorite	7	0.82	8.3	44.0
		7	0.86	16.1	44.0
		7	0.69	9.1	49.5
		7	0.70	17.2	46.5
		7	0.65	8.7	49.0
		7	0.70	11.7	46.5
		7	0.60	16.0	46.5
Infiernillo	Diorite	8	0.45	9.8	50.0
		8	0.61	21.4	46.1
		8	0.62	44.5	44.4
		8	0.73	114.0	40.7
		8	0.55	230.0	38.0
		8	0.51	385.0	35.0
		8	0.50	567.0	34.7

Figure 39. Data on rockfill properties compiled by Leps (1970).

Location (1)	Material (2)	Maximum particle, in inches (3)	Dry density, in pounds per cubic foot (4)	Normal pressure, in pounds per square inch (5)	Maximum friction angle, in degrees (6)
Infiernillo	Conglomerate	8	0.62[a]	16.1	46.1
		8	0.55	45.0	45.5
		8	0.55	113.0	41.0
		8	0.62	230.0	39.4
		8	0.51	390.0	37.8
		8	0.45	570.0	37.1
		8	0.51	44.8	45.6
		8	0.50	114.0	42.2
		8	0.40	232.0	39.5
		8	0.40	390.0	37.6
		8	0.46	570.0	36.3
Malpaso	Conglomerate	8	0.42	9.8	50.0
		8	0.35	21.9	49.2
		8	0.42	45.5	48.0
		8	0.32	116.0	45.2
		8	0.44	230.0	39.0
		8	0.38	390.0	39.0
		8	0.40	570.0	36.9
		8	0.43	570.0	37.2
		8	0.42	570.0	37.4
		8	0.33	570.0	38.9
		8	0.33	575.0	39.5
Pinzandaran	Gravel	8	0.33	10.2	53.1
		8	0.36	22.3	52.3
		8	0.32	45.6	48.5
		8	0.32	116.0	45.5
		8	0.32	233.0	42.5
		8	0.34	390.0	39.3
		8	0.35	573.0	38.9
Infiernillo	Basalt	7	0.30	10.4	60.0
		7	0.30	25.6	55.0
		7	0.30	122.0	45.7
		7	0.30	239.0	42.7
Infiernillo	Gneiss X	7	0.32	10.0	51.0
		7	0.32	23.0	45.0
Infiernillo	Gneiss Y	7	0.62	6.3	45.0
		7	0.62	20.4	41.3
Contreras	Gravel	7	0.68	8.0	41.6
		7	0.65	8.4	41.6
		7	0.68	17.3	41.0
		7	0.54	8.4	45.5
		7	0.53	17.0	45.5
Santa Fe	Andesite	7	1.06	8.0	42.7
		7	1.07	15.9	40.2
		7	0.92	8.7	48.0
		7	0.84	17.0	46.8
Fort Peck	Sand	No. 20	0.70	27.8	37.9
		No. 20	0.70	55.5	37.1
		No. 20	0.70	83.0	36.3
		No. 20	0.70	111.0	35.3

Figure 39 (continued). Data on rockfill properties compiled by Leps (1970).

Location	Material	Maximum particle, in inches	Dry density, in pounds per cubic foot	Normal pressure, in pounds per square inch	Maximum friction angle, in degrees
(1)	(2)	(3)	(4)	(5)	(6)
Scituate	Sand	No. 8	0.57[a]	27.8	38.0
		No. 8	0.57	55.5	37.5
		No. 8	0.57	111.0	35.5
Ottawa Std.	Sand	No. 14	0.59	6.9	33.6
		No. 14	0.59	13.9	33.0
		No. 14	0.59	27.8	31.8
		No. 14	0.59	41.6	30.8
		No. 14	0.59	55.5	30.0

[a] All subsequent numbers in this column are void ratios.

Figure 39 (continued). Data on rockfill properties compiled by Leps (1970).

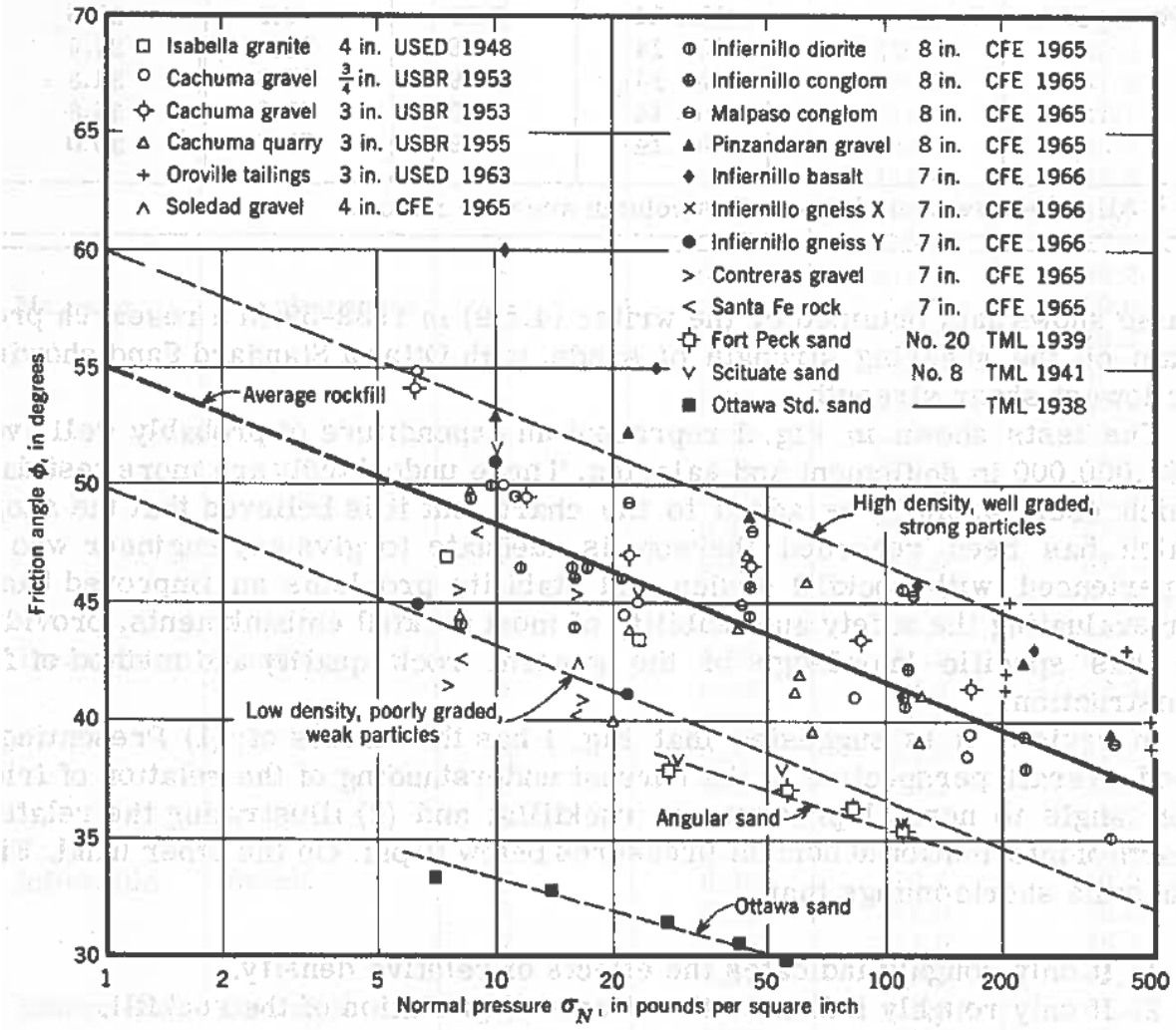


Figure 40. Shearing strength of rockfill from large-scale triaxial tests (from Leps 1970).

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APPENDIX G.4

SEISMIC STABILITY SAMPLING AND ANALYSIS REPORT

Kingston Fossil Plant
Seismic Stability
Sampling and Analysis Report

TDEC Commissioner's Order:
Environmental Investigation Plan
Kingston Fossil Plant
Harriman, Tennessee

February 7, 2023

Prepared for:

Tennessee Valley Authority
Chattanooga, Tennessee

Prepared by:

Stantec Consulting Services Inc.
Lexington, Kentucky

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Sign-off Sheet

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Prepared by Nicholas Duda

Nick Duda, Geotechnical Engineer in Training

Reviewed by Jeffrey S. Dingrando

Jeff Dingrando, PE, Principal

Reviewed by

Hugo Aparicio, PE, Vice President

Approved by Carole M. Farr

Carole M. Farr, Senior Principal Geologist

Table of Contents

ABBREVIATIONS ..... **V**

1.0 INTRODUCTION **1**

2.0 OBJECTIVE AND SCOPE **2**

3.0 PHYSICAL SETTING AND SITE HISTORY **4**
3.1 EXISTING CONDITIONS **4**
3.2 GEOLOGIC SETTING **5**
3.3 SITE HISTORY **5**
3.4 PRIOR SUBSURFACE INVESTIGATIONS **6**
3.5 PRIOR STABILITY ANALYSES **7**

4.0 SUBSURFACE CHARACTERIZATION **8**
4.1 MATERIAL PROPERTIES **8**
4.1.1 General Description and Geologic Origin 9
4.1.2 Index Properties, Classification, and Density Parameters 12
4.1.3 Small-Strain Shear Stiffness 16
4.1.4 Modulus Degradation and Damping 25
4.1.5 Drained Strengths for Static, Long-term Conditions 26
4.1.6 Undrained Strengths for Static, Short-Term Conditions 27
4.1.7 Undrained Strengths for Seismic Conditions 35
4.1.8 Residual Strengths for Liquefied Soils 36
4.1.9 Shear Strength of Bedrock 38
4.1.10 Density and Shear Wave Velocity of Bedrock 38
4.2 ANALYSIS CROSS SECTIONS **39**
4.2.1 Cross Section A-A': Basis for Selection 41
4.2.2 Cross Section "Polishing Pond": Basis for Selection 44
4.2.3 Typical Section for Veneer Stability: Basis for Selection 46

5.0 LOADING CONDITIONS AND ACCEPTANCE CRITERIA **47**
5.1 LOAD CASES, PHASED ASSESSMENT, AND ACCEPTANCE CRITERIA **47**
5.2 POOL LEVELS AND PORE WATER PRESSURES **51**
5.3 SEISMIC LOADING **52**

6.0 METHODOLOGY **54**
6.1 GENERAL **54**
6.1.1 Software 54
6.1.2 Assumed System(s) of Slice Forces 54
6.1.3 Optimization Scheme to Define Critical Rupture Surface 55
6.1.4 Shapes of Rupture Surfaces Considered 55
6.1.5 Consideration of Shallow Slope Instabilities 55
6.1.6 Exclusion of Retrogressive Slope Failure Mechanisms 56
6.1.7 Tension Cracks 56
6.1.8 Drained versus Undrained Analyses 57

6.1.9 Input Pore Pressures 58
6.1.10 Composite Strength Envelopes in Undrained Analyses....59
6.1.11 Single-Stage versus Multiple-Stage Analyses 60
6.2 SEISMIC STABILITY 60
6.2.1 Pseudostatic, Global Stability....60
6.2.2 Pseudostatic, Veneer Stability....63
6.2.3 Liquefaction Triggering....64
6.2.4 Post-Earthquake, Global Stability....64

7.0 RESULTS 65
7.1 SEISMIC STABILITY 65
7.1.1 Liquefaction and Cyclic Softening Triggering Evaluations 66

8.0 VARIATIONS 67
8.1 VARIATIONS IN SCOPE 67
8.2 VARIATIONS IN PROCEDURES....67

9.0 SUMMARY....68

10.0 REFERENCES....69

LIST OF TABLES

Table 1. Stability Analyses Completed for each CCR Unit.... 3
Table 2. Identification of Subsurface Materials at KIF Plant.... 9
Table 3. Density Parameters of the Subsurface Materials at KIF Plant....12
Table 4. Small-Strain Shear Stiffness Parameters of the Subsurface Materials at KIF Plant....17
Table 5. Plasticity Index used in Empirical Relationships for Modulus Reduction and Damping Ratio of the Subsurface Materials at KIF Plant 25
Table 6. Drained Shear Strength Parameters for the Analysis of Static, Long-term Conditions, for the Subsurface Materials at KIF Plant....26
Table 7. Undrained Shear Strength Parameters for the Analysis of Static, Short-Term Conditions, for the Subsurface Materials at KIF Plant....27
Table 8. Undrained Shear Strength Parameters for the Analysis of Seismic Loading Conditions for the Subsurface Materials at the KIF Plant....36
Table 9. Summary of Liquefaction Analysis Results for the Subsurface Materials at KIF Plant 37
Table 10. Residual Strengths for Liquefiable Materials for the Subsurface Materials at KIF Plant 38
Table 11. Small-Strain Shear Stiffness Parameters for the Bedrock Zones beneath KIF Plant....38
Table 12. Analyzed Cross Sections at KIF Plant 40
Table 13. Summary of Load Cases and Acceptance Criteria....50
Table 14. Pool Levels and Phreatic Surfaces at KIF Plant....51
Table 15. Conditions for Drained versus Undrained Analyses....58
Table 16. Seismic Stability Results at KIF Plant 65
Table 17. Liquefaction Triggering Results at KIF Plant....66

LIST OF FIGURES

Figure 1. Sluice Trench and Ballfield East of Sluice Trench, showing East Dike Location 4
Figure 2. Measured Shear Wave Velocity versus Mean Effective Stress in Embankment Fill and Selected Fit Line 18
Figure 3. Measured Shear Wave Velocity versus Mean Effective Stress in Fly Ash and Selected Fit Line 19
Figure 4. Measured Shear Wave Velocity versus Mean Effective Stress in Bottom Ash and Selected Fit Line 20
Figure 5. Measured Shear Wave Velocity versus Mean Effective Stress in Subunit 1 and Selected Fit Line 22
Figure 6. Measured Shear Wave Velocity versus Mean Effective Stress in Subunit 2 and Selected Fit Line 23
Figure 7. Measured Shear Wave Velocity versus Mean Effective Stress in Subunit 3 and Selected Fit Line 24
Figure 8. Undrained Failure Stresses and Strength Envelope from Triaxial Compression Tests on Embankment Fill 28
Figure 9. Undrained Failure Stresses and Strength Envelope from Triaxial Compression Tests on Fly Ash 29
Figure 10. Undrained Failure Stresses and Strength Envelope from Triaxial Compression Tests on Bottom Ash 30
Figure 11. Undrained Failure Stresses and Strength Envelope from Triaxial Compression Tests on Subunit 1 32
Figure 12. Undrained Failure Stresses and Strength Envelope from Triaxial Compression Tests on Subunit 2 33
Figure 13. Undrained Failure Stresses and Strength Envelope from Triaxial Compression Tests on Subunit 3 34
Figure 14. Measured Shale Shear Wave Velocity versus Elevation below El. 675, and the Trend Line (Stantec 2013) 39
Figure 15. Cross section locations 41
Figure 16. Materials in Stability Analysis Section A-A 43
Figure 17. Materials in Stability Analysis Section “Polishing Pond” 45
Figure 18. Selected geometry for Veneer Stability analyses 46
Figure 19. Phreatic Surface Correction (from GEO-SLOPE 2015) 59
Figure 20. Example plot of Newmark displacement versus yield acceleration 63
Figure 21. Free body diagram representing veneer stability problem 64

LIST OF APPENDICES

APPENDIX A - EXHIBITS

APPENDIX B – GLOBAL STABILITY ANALYSIS RESULTS

APPENDIX C – VENEER STABILITY ANALYSIS RESULTS

APPENDIX D – SUPPORTING SEISMIC CALCULATIONS

APPENDIX E – A REFERENCE FOR CHARACTERIZING THE ENGINEERING PROPERTIES OF SOILS

APPENDIX F – COMMON PROCEDURES IN SEISMIC ANALYSIS OF SOIL AND ROCK

Abbreviations

ASTM	American Society for Testing and Materials
c'	drained cohesion
c	undrained cohesion
c_{EQ}	undrained cohesion (seismic conditions)
c_{LIQ}	undrained cohesion (residual strength)
CCR	Coal Combustion Residuals
CU	Consolidated undrained
CU triaxial test	Consolidated Undrained triaxial test
CL	Unified Soil Classification System abbreviation for Lean Clay
CPT	Cone Penetration Test
EAR	Environmental Assessment Report
EIP	Environmental Investigation Plan
deg or º	degrees
ft	feet
FS	Factor of Safety
ft/sec	feet per second
g	acceleration due to gravity
G_{max}	small-strain shear modulus
HEA	Horizontal Equivalent Acceleration
Hz	Hertz
k_h	horizontal pseudostatic coefficient
KIF Plant	Kingston Fossil Plant
KRP	Kingston Recovery Project
LLDPE	Linear Low-Density Polyethylene
M_w	Moment magnitude
ML	Unified Soil Classification System abbreviation for Silt
NP	Non-plastic materials
pcf	pounds per cubic foot
PGA	peak horizontal ground acceleration
psf	pounds per square foot
PI	Plasticity Index
ρ_t	mass density
QAPP	Quality Assurance Project Plan
S_u	undrained shear strength
SAP	Sampling and Analysis Plan
SAR	Sampling and Analysis Report
SCPTu	Seismic Cone Penetration Test with pore pressure measurement
SM	Unified Soil Classification System abbreviation for Silty Sand
SPT	Standard Penetration Test
slugs/ft^3	slugs per cubic foot

Stantec	Stantec Consulting Services Inc.
Subunit 1	Foundation Soil Subunit 1
Subunit 2	Foundation Soil Subunit 2
Subunit 3	Foundation Soil Subunit 3
TDEC	Tennessee Department of Environment and Conservation
TDEC Order	Commissioner's Order No. OGC15-0177
TDOT	Tennessee Department of Transportation
tsf	tons per square foot
TVA	Tennessee Valley Authority
USCS	Unified Soil Classification System
V_s	shear wave velocity
γ	cyclic shear strain
γ_d	Dry unit weight
γ_m	Moist unit weight
γ_{sat}	Saturated unit weight
γ_t	total unit weight
σ'_{vo}	vertical effective stress
ϕ'	drained friction angle
ϕ	undrained friction angle
ϕ_{EQ}	undrained friction angle (seismic conditions)
ϕ_{LIQ}	undrained friction angle (residual strength)

1.0 INTRODUCTION

Stantec Consulting Services Inc. (Stantec) has prepared this sampling and analysis report (SAR), on behalf of the Tennessee Valley Authority (TVA), to document activities related to the seismic stability analyses at TVA's Kingston Fossil Plant (KIF Plant) located in Harriman, Tennessee (see Exhibit A.1 in Appendix A).

The purpose of the Seismic Stability SAR is to develop slope stability models, including material parameters, and perform slope stability analyses for the selected coal combustion residuals (CCR) units, in support of fulfilling the requirements for the Tennessee Department of Environment and Conservation (TDEC) issued Commissioner's Order No. OGC15-0177 (TDEC Order) to the TVA (TDEC 2015). The TDEC Order set forth a "process for the investigation, assessment, and remediation of unacceptable risks" at TVA's coal ash disposal sites in Tennessee.

The purpose of this Seismic Stability SAR is to summarize activities completed to meet the objectives of the Stability Sampling and Analysis Plan (SAP) (Stantec 2018a), for applicable seismic load cases. Static load cases (if any) required by the SAP are documented in a separate Static Stability SAR. This SAR presents results of seismic stability analyses (also referred to herein as stability analyses) and compares those results to acceptance criteria defined in the SAP. However, this SAR is not intended to provide conclusions of the stability analysis. The scope of the stability analysis activities represented herein was conducted pursuant to the SAP and is part of a larger environmental investigation at the KIF Plant. The evaluation of the results will consider other aspects of the environmental investigation, as well as data collected under other State and/or CCR programs and will be presented in the Environmental Assessment Report (EAR).

The Seismic Stability SAR activities were performed in general accordance with the following documents developed by TVA to support fulfilling the requirements of the TDEC Order:

- Stability SAP (Stantec 2018a)
- Environmental Investigation Plan (EIP) (Stantec 2018b)
- Quality Assurance Project Plan (QAPP) (Environmental Standards, Inc. 2018).

2.0 OBJECTIVE AND SCOPE

The primary objective of the Seismic Stability SAR, conducted pursuant to the Stability SAP, was to develop slope stability models, including material parameters, and perform seismic stability analyses for select CCR units at the KIF Plant, in response to the TDEC Order. The Stability SAP included slope stability models and seismic, global analyses at two cross sections at the Sluice Trench and Ballfield East of the Sluice Trench: Section A-A' and the "Polishing Pond" Section. Cross sections are presented in Section 4.2. The Stability SAP also included seismic, veneer stability analyses at a typical cross section at the Sluice Trench and Ballfield East of the Sluice Trench. The approach for the Seismic Stability SAR was to:

- Review historical and TDEC Order subsurface explorations of the site to characterize the subsurface conditions
- Review and compile historical and TDEC Order laboratory testing of materials to determine material properties
- Evaluate the liquefaction potential for the defined materials
- Conduct the required global and veneer stability analyses for the various load cases, including a deformation analysis as part of the pseudostatic load case.

The scope of work of the Seismic Stability SAR consisted of the following tasks:

- Develop material properties and strengths
- Model the subsurface conditions at each cross section, including the phreatic surface
- Conduct global stability analyses for the required load cases (pseudostatic and/or post-earthquake)
- Conduct veneer stability analyses for the required load cases (pseudostatic)
- Compare results against the acceptance criteria defined in the SAP; for cases (if any) not meeting the acceptance criteria, further assessment will be appropriate per the phased approach defined in the Stability SAP.

Table 1 provides the stability analyses (i.e., load cases) conducted for each CCR unit. In cases where new analyses were not performed, existing analyses adequately address the load case(s) for the unit.

Table 1. Stability Analyses Completed for each CCR Unit

CCR[1] Unit and Condition	Seismic Cases		
	Pseudostatic[2], Global	Pseudostatic[2], Veneer[3]	Post-EQ[4], Global
Interim Ash Staging Area (Closed Condition)	–[5]	–[5]	–[5]
Sluice Trench and Ballfield East of Sluice Trench (Closed Condition)	X	X	X
Stilling Pond (Closed Condition)	–[6]	–[6]	–[6]

Notes:
1. CCR = coal combustion residuals
2. Pseudostatic, correlated to a tolerable displacement
3. Veneer stability is the slope stability of the final cover
4. Post-earthquake (Post-EQ) analysis includes a preceding liquefaction triggering assessment
5. Stability calculations are not required to demonstrate performance of the closed conditions due to the higher surrounding grade, flat closure grading, and containment towards the east by the Polishing Pond
6. The reassessment of the Stilling Pond closure design includes analyses sufficient to address the necessary load cases.

The SAP includes a phased assessment process for the stability analyses. Initial phases employ available site information, simplified analysis methods, and more conservative acceptance criteria. If acceptable performance is demonstrated, the analyses for the particular load case(s) are complete. If not, the next phase may include collection of additional site information and/or more advanced analysis methods. Less conservative acceptance criteria may be utilized, commensurate with the improved site characterization. For the KIF Plant, Phase 1 assessments were not sufficient to demonstrate adequate seismic stability for the Sluice Trench and Ballfield East of Sluice Trench. A Phase 2 assessment, including collection of additional information from a Phase 2 Exploratory Drilling effort, was performed to evaluate seismic stability for the Sluice Trench and Ballfield East of Sluice Trench.

Details of the analyses performed are presented in the sections below. Graphical stability analysis results are included in Appendix B (global stability) and Appendix C (veneer stability). Supporting information for the seismic stability analyses is included in Appendix D. Supplemental information for characterizing soil parameters and common seismic procedures are included in Appendix E and Appendix F, respectively.

3.0 PHYSICAL SETTING AND SITE HISTORY

3.1 EXISTING CONDITIONS

The Sluice Trench and Ballfield East of Sluice Trench (Figure 1) was capped and closed in 2019. The unit is located along the Emory River, near the intake for the plant. The unit includes a clay embankment dike known as the East Dike, the water quality channel, and a portion of the Polishing Pond. The East Dike forms the southeastern perimeter of the unit. The Engineered Wetlands area is outside the limits of the CCR unit. With respect to the stability of this CCR unit, the focus is on slope failures along the East Dike that could result in a release of CCR to the adjacent river/intake channel.

Figure 1. Sluice Trench and Ballfield East of Sluice Trench, showing East Dike Location

3.2 GEOLOGIC SETTING

The KIF Plant is situated on the western edge of the Valley and Ridge Physiographic province near the base of the Cumberland Plateau. Numerous faults, trending northeast to southwest as characteristic of the Valley and Ridge Province, are depicted on the geologic mapping. The plant is positioned between the Chattanooga Fault to the north, and the Kingston Fault to the south.

According to the United States Geological Survey Geologic Map of the Harriman Quadrangle (Moore, Finlayson, and Milici 1993), the plant is underlain by Lower Ordovician and Cambrian age limestone and shale bedrock formations. Although not depicted on the geologic mapping, previous drilling programs at the plant indicate that alluvial deposits consisting of fine sands, silty sands and sandy silts are present at the plant, as are commonly found adjacent to rivers.

The majority of the plant, including the Sluice Trench and Ballfield East of Sluice Trench, is underlain by the Conasauga Shale Formation, which consists of an argillaceous to silty shale with zones of shaley limestone scattered throughout. The geologic mapping indicates this formation is contorted, brecciated, and sheared throughout. The geologic mapping indicates Pine Ridge, just north of the plant, and the northern corner of the Kingston Recovery Project (KRP) Ash Landfill are underlain by the Rome Formation, consisting of arenaceous shale interbedded with very thin siltstone layers and thin beds of sandstone.

3.3 SITE HISTORY

TVA constructed the KIF Plant from 1951 to 1954 and commenced operations in 1954. In 1956, the East Dike was constructed as part of the initial ash disposal area, which includes the footprints of the present-day Sluice Trench and Ballfield East of Sluice Trench and the Interim Ash Staging Area. Construction of the perimeter containment dikes around the former main ash pond were completed in 1958.

The sluice trench was constructed in the late 1960s along the east portion of the initial ash disposal area. The sluice trench was used to sluice ash from the plant to the former main ash pond, which is now within the footprint of the KRP Ash Landfill (Calvert 1967 and 1968). Historical annual inspections (Parrish 1970) reported that the ash was generally sluiced quickly enough from the plant to the main ash pond such that there was minimal ash deposition in the sluice trench.

As part of the KRP, CCR was temporarily staged at the sluice trench and the Interim Ash Staging Area. The staged ash was removed in 2015, and as part of the closure a low permeability soil cap was constructed. The closure design of the Interim Ash Staging Area (AECOM 2016a, 2016b, and 2016c) generally leveled the site to conform to the higher surrounding grades, with gentle slopes (3 percent [%] maximum) and small perimeter ditches to promote surface drainage.

In 2015, as part of the cap construction for the Sluice Trench unit, the sluice trench was filled in and a new Water Quality Channel was constructed to the southeast along a parallel alignment. The Water Quality Channel was lined with a geomembrane and designed to convey process water to the Stilling Pond (TVA 2015). During the subsequent Polishing Pond construction, the Water Quality Channel was rerouted to convey the process water to the Polishing Pond.

The Polishing Pond was constructed in 2017 over a segment of the former sluice trench and a portion of the Ballfield East of Sluice Trench. The area was partially excavated and geosynthetic clay liner and a geomembrane were placed over the area within the limits of the Polishing Pond. Outside the limits of the Polishing Pond, a soil cap was constructed over another segment of the former Sluice Trench and another portion of the Ballfield East of Sluice Trench (AECOM 2016b).

CCR excavated during the closure of the Interim Ash Staging Area, sluice trench, and construction of the water quality channel and Polishing Pond was placed in the KRP Ash Landfill.

In 2018, a reverse graded filter and seepage collection system was constructed along the outboard face of the East Dike, as part of a seepage mitigation project (AECOM 2018). The filter and collection system were constructed to mitigate concerns from historical seeps observed along the outboard face of the dike.

In 2019, the last remaining uncapped portion of the Ballfield East of Sluice Trench was regraded and capped with a geomembrane and vegetative soil layer. As part of the regrading effort for the area, a heterogenous mix of CCR and soil was placed as structural fill to prepare the subgrade prior to constructing the cover system. This East Dike Area Closure project (AECOM 2019) capped the corridor between the East Dike and the areas that were already capped as part of the Water Quality Channel and Polishing Pond projects.

3.4 PRIOR SUBSURFACE INVESTIGATIONS

Historical boring and geotechnical data were used to supplement data collected during execution of the Exploratory Drilling, Hydrogeological Investigation, and Background Soil SAPs. The Phase 2 seismic stability assessment for the Sluice Trench and Ballfield East of Sluice Trench utilized information from the Phase 1 and Phase 2 Exploratory Drilling programs.

The prior subsurface investigations used to support the stability analysis of the Sluice Trench and Ballfield East of Sluice Trench include:

- Stantec (2009) – historical boring logs within the Engineered Wetlands adjacent to the Sluice Trench and Ballfield East of Sluice Trench were used to characterize the strengths and index properties of the foundation soil subunits
- MACTEC (2009) – historical boring logs and laboratory testing from borings along the East Dike at the Sluice Trench and Ballfield East of Sluice Trench were used to characterize the strengths and index properties of the CCR and foundation soil subunits
- Geosyntec (2010a) – historical boring logs and laboratory testing from borings along the East Dike at the Sluice Trench and Ballfield East of Sluice Trench were used to characterize the strengths and index properties of the CCR, embankment dike material, and foundation soil subunits
- Geosyntec (2010b) – historical boring logs and laboratory testing from borings along the East Dike at the Sluice Trench and Ballfield East of Sluice Trench were used to characterize the strengths and index properties of the foundation soil subunits

- Geosyntec (2012) – historical boring logs and laboratory testing from borings along the East Dike at the Sluice Trench and Ballfield East of Sluice Trench were used to characterize the strengths and index properties of the CCR, embankment dike material, and foundation soil subunits
- AECOM (2016a) – historical boring logs and laboratory testing of soils from borings at the Sluice Trench and Ballfield East of Sluice Trench were used to characterize the strengths and index properties of CCR, embankment dike material, and foundation soil subunits
- AECOM (2016b) – historical boring logs, laboratory testing of soils from borings, and cone penetration test (CPT) soundings at the Sluice Trench and Ballfield East of Sluice Trench were used to characterize the strengths and index properties of CCR, embankment dike material, and foundation soil subunits
- Stantec (2017) – historical boring logs and laboratory testing were used to characterize the strengths and index properties of the foundation soil subunits.

3.5 PRIOR STABILITY ANALYSES

Prior stability analyses, which were reviewed when developing/updating stability models, for the Sluice Trench and Ballfield East of Sluice Trench include the following:

- Geosyntec (2010a): Static long-term global slope stability analysis of the East Dike
- Geosyntec (2010b): Static long-term and seismic (pseudostatic) short-term global slope stability analyses of the East Dike
- Geosyntec (2012): Static long-term global slope stability analysis of the East Dike, incorporating results of additional geotechnical exploration
- AECOM (2016b): Static long-term and seismic (pseudostatic and post-earthquake) short-term global stability analyses of the East Dike and Polishing Pond, incorporating results of additional geotechnical exploration.

The historical analyses of the Drainage and Flow Management Project (i.e., Polishing Pond and Water Quality Channel) constructed within the Sluice Trench and Ballfield East of Sluice Trench unit (AECOM 2016a, 2016b) do not include veneer stability analyses for seismic conditions. Further, these available analyses did not include geometry changes from recent construction of a graded filter and seepage collection system along the outboard slope of the East Dike (AECOM 2017) or from recent closure (regrading and capping) of the East Dike Area (AECOM 2019). Therefore, new seismic (global and veneer) stability analyses and liquefaction triggering analyses for the existing (with graded filter and East Dike Area closure) conditions were performed. These analyses were performed in accordance with the Stability SAP.

4.0 SUBSURFACE CHARACTERIZATION

4.1 MATERIAL PROPERTIES

Subsurface materials are identified based on the project records, subsurface explorations, laboratory testing, and other available information. A material is a region or zone in the analytical model comprised of an idealized grouping of soil or rock sublayers of similar geologic origin or geotechnical behavior, subject to practical considerations in the analysis. A material is not necessarily a single type of soil or rock and may include significant variability. Field information may identify sub-layers or sub-units within a given material. The key materials (i.e., idealized groupings for characterization) for purposes of seepage and/or stability analyses are represented in Table 2, with the CCR units where the material is located and a brief description. Material delineation/zonation considered the potential for weak or otherwise distinct strata that may affect the seismic stability analyses. Such strata were modeled as separate materials, if/when appropriate. Physical properties of these materials are described in the subsections below. For context, the selected material parameters are compared to those used in historical analyses (where available, and for information only). For the shale bedrock, relevant material properties are described separately in subsections 4.1.9 and 4.1.10.

Table 2. Identification of Subsurface Materials at KIF Plant

Material Name	CCR Units	Description
Embankment Fill	Sluice Trench and Ballfield East of Sluice Trench	Compacted clay fill including the starter dike
Fly Ash	Sluice Trench and Ballfield East of Sluice Trench	Fly ash sluiced into the initial ash storage area
Bottom Ash	Sluice Trench and Ballfield East of Sluice Trench	Bottom ash sluiced (early operations) or placed and compacted (later operations); sometimes used as structural fill
Cover Material	Sluice Trench and Ballfield East of Sluice Trench	Compacted soil fill at the surface of the capped portions of the unit
Filter Materials	Sluice Trench and Ballfield East of Sluice Trench	American Society for Testing and Materials (ASTM) C33 concrete sand and Tennessee Department of Transportation (TDOT) No. 78 stone; part of 2018 reverse graded filter on East Dike outboard slope
Riprap	Sluice Trench and Ballfield East of Sluice Trench	TDOT A1 Riprap; part of 2018 reverse graded filter on East Dike outboard slope
Sediment	Sluice Trench and Ballfield East of Sluice Trench	Natural, alluvial sandy silt to clay sediment deposited in the intake channel after the East Dike was built
Foundation Soil - Subunit 1 (Subunit 1)	Sluice Trench and Ballfield East of Sluice Trench	Natural, alluvial deposits of lean clay to silty lean clay soil
Foundation Soil - Subunit 2 (Subunit 2)	Sluice Trench and Ballfield East of Sluice Trench	Natural, alluvial deposits of silty sand to sandy silt, with no less than about 30% fines
Foundation Soil - Subunit 3 (Subunit 3)	Sluice Trench and Ballfield East of Sluice Trench	Natural, alluvial deposits of sand to silty sand, with less than about 30% fines
Gravel Residuum	Sluice Trench and Ballfield East of Sluice Trench	Natural, silty sand with gravel; Residual soil above bedrock
Shale[1]	Sluice Trench and Ballfield East of Sluice Trench	Weathered shale bedrock, with dipping beds and occasional layers of limestone

Notes:

1. For the shale bedrock, relevant material properties are described separately in subsections 4.1.9 and 4.1.10.

4.1.1 General Description and Geologic Origin

4.1.1.1 Embankment Fill

The Embankment Fill is generally described as a silty clay material with some shale fragments, as encountered during historical exploration. The Embankment Fill material was placed during the original construction of the East Dike at the perimeter of the initial ash disposal area, along the KIF Plant intake channel. Record drawings specify that the material should “be fine and relatively impervious,” and that “select firm shale material be placed below the water level” for a portion of the East Dike (TVA 1956). The Embankment Fill extends up to 29 feet (ft) in thickness along the crest of the original alignment of the East Dike.

In previous stability analyses (Geosyntec 2010a 2012) the Embankment Fill was modeled as two zones, an upper and lower dike fill. The delineation of the zones correlates to a decrease in the Standard Penetration Test (SPT) blowcounts (i.e., N-values). The delineation of the Embankment Fill was reevaluated as part of this study. The higher blowcounts were attributed to suction-induced strength above the phreatic surface. Otherwise, the upper and lower dike fill materials were similar in type and behavior. Therefore, the material was modeled as one material rather than two.

4.1.1.2 Fly Ash

The Fly Ash material is composed primarily of fine-grained CCR that is generally described as a non-plastic, sandy silt. The Fly Ash was sluiced into the initial ash disposal area, during early operations of the plant. The thickness ranges from 4 ft adjacent to the Embankment Fill to 15 ft in the interior of the Ballfield East of Sluice Trench.

4.1.1.3 Bottom Ash

The Bottom Ash material is composed primarily of coarse-grained CCR that is generally described as a silty sand to sandy silt. The Bottom Ash was placed during operation of the sluice trench in the Ballfield East of Sluice Trench, over the Fly Ash material. Some bottom ash was sluiced, while some was placed and compacted. Bottom Ash was sometimes used as structural fill, such as in the Polishing Pond perimeter dike. In some instances, bottom ash used as structural fill may contain some fraction of random soil fill. The Bottom Ash is up to 35 ft thick in the interior of the Ballfield East of Sluice Trench.

4.1.1.4 Cover Material

The Cover Material was placed during the closure of the Sluice Trench and Ballfield East of Sluice Trench as part of the engineered soil cap. The soil was sourced from the “I-40 borrow area”, as detailed in the construction certification report for the closure of the unit (AECOM 2019). Per the closure documentation (AECOM 2019), the cap system consists of 24 inches of protective cover soil, overlying a geocomposite drainage layer (geotextile/geonet/geotextile) and geomembrane (textured 60-mil Linear Low-Density Polyethylene [LLDPE]), overlying the CCR material. The geosynthetics were characterized using the typical properties from their respective manufacture product sheets (AGRU 2018 and SKAPS 2017) because no project-specific testing was available.

4.1.1.5 Filter Materials

The Filter Materials include ASTM C33 sand and TDOT No. 78 stone used in the reverse-graded filter constructed as part of the Seepage and Drainage repair along the East Dike (AECOM 2017). In this analysis, it was adequate to model the ASTM C33 sand and TDOT No. 78 stone as one material. The Filter Materials were sourced from the Rogers Roane County Quarry in Harriman, Tennessee (AECOM 2018). The thickness of the Filter Materials varies from two ft up to 3.5 ft along the outboard face of the East Dike.

4.1.1.6 Riprap

The Riprap consists of TDOT A1 Riprap placed as part of the Seepage and Drainage repair along the East Dike (AECOM 2017). The Riprap was sourced from the Rogers Roane County Quarry in Harriman, Tennessee (AECOM 2018). The Riprap was placed in a two-foot-thick layer over the Filter Materials along the outboard face of the East Dike.

4.1.1.7 Sediment

The Sediment material is a recent deposit that has accumulated since the East Dike was built. It was encountered along the bottom of the intake channel and against the outboard toe of the East Dike. The material is very loose, with typical blowcount values less than one (i.e., weight of SPT hammer or weight of drill rods). It is generally described as an alluvial sandy silt or clay. The Sediment is approximately 6 ft thick at the outboard toe of the East Dike, and extends into the intake channel, tapering to one foot or less in thickness.

4.1.1.8 Foundation Soils

The foundation soils underlying the site were generally more fine-grained and plastic near the original ground surface and transitioned to a sandier, non-plastic material at greater depths, until bedrock was encountered. The transition between the materials was gradual and, although distinct horizon delineations were not noted, the foundation was divided into three subunits using the criteria listed in the subsections below. The varying presence of the uppermost foundation soil (Subunit 1) has been attributed to the alluvial deposition of the foundation soils.

4.1.1.7.1 Subunit 1

Subunit 1 is generally described as an alluvial, silty, lean clay deposit that comprises the upper portions of the alluvial foundation along the Emory River and intake channel, extending into the interior of the Sluice Trench and Ballfield East of Sluice Trench. Based on historical and TDEC Order borings, the presence and thickness of this subunit is highly variable across the site. Subunit 1 was not encountered in the vicinity of the Polishing Pond but was encountered under the East Dike closer to the intake channel. Where encountered, the thickness of Subunit 1 varies between approximately five ft at the interior of the Ballfield East of Sluice Trench and approximately 10 ft extending into the intake channel.

4.1.1.7.2 Subunit 2

Subunit 2 is generally described as a sandy silt to silty sand with no less than about 30% fines, comprising part of the alluvial foundation at the Sluice Trench and Ballfield East of Sluice Trench. Subunit 2 is continuous across the unit footprint and underlies Subunit 1 (where present). Where Subunit 1 is not present (e.g., the Polishing Pond), Subunit 2 is the uppermost foundation material. Subunit 2 varies in thickness from approximately five to 15 ft.

4.1.1.7.3 Subunit 3

Subunit 3 is generally described as an alluvial silty sand with less than about 30% fines and comprises the lower foundation. This subunit overlies the shale bedrock and varies in thickness from approximately five to 10 ft.

4.1.1.9 Gravel Residuum

The Gravel Residuum is generally described as a silty sand with gravel. Based on the historical and TDEC Order borings, the presence and thickness of this material is highly variable across the site. The Gravel Residuum was not encountered at Section A-A' but was encountered in one of the intake channel borings at the Polishing Pond Section. This material overlies the shale bedrock and has a thickness of approximately five ft at the encountered location.

4.1.2 Index Properties, Classification, and Density Parameters

The stability analyses require unit weights (densities) for each material or zone that is modeled. Unit weights for each material are summarized in Table 3. These parameters were derived from available laboratory testing results using the methodology outlined in Appendix E. For several materials, the index, classification, and/or density parameters were updated (compared to those used in the KIF Static Stability SAR) to incorporate data from the Phase 2 Exploratory Drilling program. In general, such updates were modest and had little to no impact on the stability analysis results.

Table 3. Density Parameters of the Subsurface Materials at KIF Plant

Material Name	G_s	w (%)	e	γ_d (pcf)	γ_m (pcf)	γ_{sat} (pcf)
Embankment Fill	2.70	22	0.61	105	128	128
Fly Ash	2.51	40	0.96	80	112	112
Bottom Ash	2.67	21	0.68	99	119	124
Cover Material	2.72	30	0.83	92	120	121
Filter Materials	2.77	20	0.65	105	126	130
Riprap	2.65	15	0.65	100	115	125
Sediment	2.70	38	1.11	80	111	113
Subunit 1	2.69	26	0.65	102	127	127
Subunit 2	2.68	22	0.62	103	126	127
Subunit 3	2.74	24	0.61	106	131	131
Gravel Residuum	2.70	15	0.40	120	138	138

Notes:

G_s	Specific Gravity of the solids	γ_d	dry unit weight
w	natural, gravimetric water content	γ_m	moist unit weight
e	void ratio	γ_{sat}	saturated unit weight
%	percent	pcf	pounds per cubic foot

The following subsections detail the available data and basis for selecting the density parameters for each material.

4.1.2.1 Embankment Fill

Historical index testing (AECOM 2016b, Geosyntec 2010a and 2010b) is available to characterize the Embankment Fill. The aggregated historical laboratory testing of the Embankment Fill material produced an average moist unit weight of 128 pounds per cubic foot (pcf), which was selected as the representative moist unit weight for the material. A dry unit weight of 104 pcf was calculated based on the average moist unit weight and moisture content values. The Embankment Fill generally classified per ASTM D2487: *Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System [USCS])* as a sandy, lean clay (CL) to silty sand (SM). The averages of the historical laboratory testing results were also used as the representative void ratio and specific gravity values (0.61 and 2.70, respectively). The median fines content and average moisture content of the Embankment Fill material were 42% and 22%, respectively. The median fines content was selected due to outliers skewing the average fines content of the material.

The selected values are within the expected range for the material. See Appendix E for additional discussion of typical values. The values are also similar to those used in previous analyses. The supplemental assessment by Geosyntec (2012) used moist unit weights of 125 and 120 pcf for the Upper Dike Fill and Lower Dike Fill, respectively. The unit weight used in the historical analysis by AECOM (2016b) is 132 pcf, for their “Fill: Sandy Silt”, which is analogous to the Embankment Fill.

4.1.2.2 Fly Ash

The Fly Ash material was characterized using data from the Exploratory Drilling SAR and historical index testing (Geosyntec 2010a and 2010b, AECOM 2016b, and MACTEC 2009). Generally, average values from the recent and historical laboratory data were selected for use in the analyses. The Fly Ash material generally classified per USCS as a non-plastic, sandy silt (ML) and had an average fines content of 57% and average moisture content of 40%.

The average moist unit weight was 112 pcf. A dry unit weight of 80 pcf was calculated based on the average moist unit weight and moisture content values. The average void ratio and specific gravity from current and historical laboratory testing were also selected as the representative values (0.96 and 2.51, respectively).

The total unit weight for the Fly Ash is similar to the unit weight used in the latest stability from the Polishing Pond Report (AECOM 2016b) of 117 pcf. The Polishing Pond Report modeled the Fly Ash and Bottom Ash as a single material, Ash Fill. The average of the Fly Ash and Bottom Ash unit weights selected for this analysis is equal to the value used for the Ash Fill in the Polishing Pond assessment (AECOM 2016b). The Seepage and Stability Study for the East Dike (Geosyntec 2010a) and Supplemental Assessment of Seepage and Slope Stability (Geosyntec 2012) used a total unit weight of 75 pcf based on recommended values from previous analyses completed at the KIF Plant.

4.1.2.3 Bottom Ash

The Bottom Ash material was characterized using data from the Exploratory Drilling SAR and historical index testing (Geosyntec 2010a and 2010b, AECOM 2016b, and MACTEC 2009). Generally, average values from the recent and historical laboratory data were selected for use in the analyses. The Bottom Ash material generally classified per USCS as a SM to sandy silt (ML) and had an average fines content of 32% and average moisture content of 21%. The average moist unit weight was 119 pcf. The representative dry unit weight (99 pcf) was calculated based on the selected moist unit weight and moisture content values. The selected void ratio and specific gravity values for the Bottom Ash were also based on averages from laboratory data (0.68 and 2.67, respectively).

The selected moist unit weight for the Bottom Ash material is similar to the value (117 pcf) used for the "Ash Fill" materials in the Polishing Pond Engineering Report (AECOM 2016b). The Bottom Ash and Fly Ash were modeled as one material (Ash Fill) by AECOM. If the unit weights assigned herein to the Bottom Ash and the Fly Ash are averaged, the result is equivalent to the unit weight of the previous Ash Fill. Other historical analyses assumed a lower value (100 pcf) based on limited data.

4.1.2.4 Cover Material

The Cover Material generally classified as a fat clay with sand and was sourced from a borrow area offsite (I-40, Exit 364). Selected parameters for the Cover Material are based on the construction closure record document (AECOM 2019) for the Sluice Trench and Ballfield East of Sluice Trench. The moist unit weight selected was the average from seven proctor tests performed on seven bulk samples from the borrow site. The void ratio and moisture content were selected based on typical values (Appendix E).

4.1.2.5 Filter Materials

The Filter Materials include ASTM C33 sand and TDOT No. 78 stone (AECOM 2017) used to construct the reverse-graded filter along the East Dike. Properties for the Filter Materials in Table 3 were estimated using typical values.

4.1.2.6 Riprap

The Riprap consists of TDOT A1 Riprap (AECOM 2017). Properties for the Riprap in Table 3 were estimated using typical values.

4.1.2.7 Sediment

The Sediment material was characterized using data from the Exploratory Drilling SAR. The Sediment material classified per USCS laboratory testing as a CL. Unit weight testing data was not available for the Sediment. The selected dry unit weight (80 pcf) was estimated using typical values (NAVFAC 1986). The moist unit weight (111 pcf) was calculated using the selected dry unit weight value and the average moisture content from laboratory testing. The void ratio (1.11) was calculated using the selected dry unit weight and an estimated specific gravity value (2.70).

4.1.2.8 Subunit 1

The Subunit 1 material is comprised of alluvial, plastic, fine-grained soil that classifies per USCS laboratory testing as CL. The soil was characterized using data from the Exploratory Drilling SAR and historical index testing (Geosyntec 2010a and 2010b). Generally, average values from the recent and historical laboratory data were selected for use in the analyses. The Subunit 1 material had an average fines content of 81% and average moisture content of 26%.

The average moist unit weight was 127 pcf. The selected dry unit weight (102 pcf) was calculated using the selected moist unit weight and moisture content values. From the current and historical laboratory testing, the average void ratio and specific gravity were also selected as the representative values (0.65 and 2.69, respectively).

The moist unit weight for Subunit 1 is similar to that used in historical analyses. The Seepage and Stability Study for the East Dike (Geosyntec 2010a) and Supplemental Assessment of Seepage and Slope Stability (Geosyntec 2012) used a value of 125 pcf. The Polishing Pond Analysis, which modeled the foundation soil as a single unit, used a value of 117 pcf (AECOM 2016b). The selected moist unit weight for Subunit 1 is also similar to the value (125 pcf) used in the Stilling Pond Analysis (Stantec 2020).

4.1.2.9 Subunit 2

Subunit 2 consists of alluvial deposits classified per USCS laboratory testing as SM to ML with fines content no less than about 30%. Historical index testing (Geosyntec 2010a and 2010b, MACTEC 2009, and AECOM 2016b) from various analyses and subsurface explorations was used to characterize the soil. The Subunit 2 material had an average fines content of 46% and average moisture content of 22%.

The average moist unit weight was 126 pcf. The selected dry unit weight (103 pcf) was calculated using the selected moist unit weight and moisture content values. The average void ratio and specific gravity from historical laboratory testing were selected as the representative values (0.62 and 2.68, respectively).

The moist unit weight for Subunit 2 is similar to the unit weights used in historical stability analyses. The Seepage and Stability Study for the East Dike (Geosyntec 2010a) and Supplemental Assessment of Seepage and Slope Stability (Geosyntec 2012) used a value of 125 pcf. The Polishing Pond Analysis, which modeled the foundation soil as a single unit, used a value of 117 pcf (AECOM 2016b). The moist unit weight assigned to Subunit 2 is similar to the value (125 pcf) used in the KIF Plant Stilling Pond Stability Analysis (Stantec 2020).

4.1.2.10 Subunit 3

Subunit 3 consists of alluvial deposits classified per USCS laboratory testing as SM to ML with fines content of less than about 30%. Historical index testing (Geosyntec 2010a and 2010b, AECOM 2016b) from various analyses and subsurface explorations was used to characterize the soil. The Subunit 3 material had an average fines content of 22% and average moisture content of 24%.

The average moist unit weight was 131 pcf. The selected dry unit weight (106 pcf) was calculated using the selected moist unit weight and moisture content values. The average void ratio and specific gravity from historical laboratory testing were selected as the representative values (0.61 and 2.74, respectively).

The selected moist unit weight for Subunit 3 is higher than the unit weights used in historical stability analyses. The Seepage and Stability Study for the East Dike (Geosyntec 2010a) and Supplemental Assessment of Seepage and Slope Stability (Geosyntec 2012) used a value of 120 pcf. The Polishing Pond Analysis, which modeled the foundation soil as a single unit, used a value of 117 pcf (AECOM 2016b). The moist unit weight assigned to Subunit 3 for the KIF Plant Stilling Pond Stability Analysis is 127 pcf (Stantec 2020).

4.1.2.11 Gravel Residuum

The Gravel Residuum was characterized using data from the Exploratory Drilling SAR. The material classified per USCS laboratory testing as a SM with gravel and fines content of 37% and 18%, respectively.

The selected dry unit weight (120 pcf) was estimated using typical values (NAVFAC 1986). The moist unit weight (138 pcf) was calculated using the selected dry unit weight value and the average moisture content from laboratory testing. The void ratio (0.40) was calculated using the selected dry unit weight and an estimated specific gravity value (2.70).

4.1.3 Small-Strain Shear Stiffness

The range of values for the small-strain shear stiffness parameters are summarized in Table 4. As detailed in Appendix E, small-strain stiffness can be measured or characterized in terms of shear wave velocity (V_s) or small-strain shear modulus (G_{max}). G_{max} was calculated using Equation 1 in Appendix E. The mass densities listed correspond to the unit weights in Table 3.

The values presented in Table 4 are a generic representation and were not directly used in the seismic ground response analyses. Instead, stiffness parameters were modified on a section/profile basis based on the available boring data (i.e., seismic CPT (SCPTu), compression wave-shear wave (P-S) suspension logging). Where certain materials lack section/profile specific V_s data, typical values within the ranges in Table 4 may be used as applicable. See Appendix E for additional information.

Table 4. Small-Strain Shear Stiffness Parameters of the Subsurface Materials at KIF Plant

Material Name	Total[1] Unit Weight γ_t (pcf)	Mass Density ρ_t (slugs/ft^3)	Selected Shear Wave Velocity V_s (ft/sec)	Range in Shear Wave Velocity V_s (ft/sec)	Range in Small-Strain Shear Modulus G_{max} (psf)
Embankment Fill	128	3.98	1,100	790 – 1,298	2.48E+06 – 6.70E+06
Fly Ash	112	3.48	725	443 – 1,681	6.95E+05 – 9.83E+06
Bottom Ash	124	3.85	650	516 – 1,000	1.03E+06 – 3.88E+06
Cover Material	120	3.73	—	294 – 383	3.21E+05 – 5.51E+05
Filter Materials	126	3.92	—	435 – 524	7.42E+05 – 1.07E+06
Riprap	115	3.57	—	289 – 380	2.98E+05 – 5.17E+05
Sediment	113	3.44	260	197 – 363	1.34E+05 – 4.53E+05
Subunit 1	127	3.95	750	545 – 1,599	1.17E+06 – 1.01E+07
Subunit 2	127	3.95	700	558 – 1,849	1.23E+06 – 1.34E+07
Subunit 3	132	4.10	700	559 – 2,236	1.28E+06 – 2.05E+07
Gravel Residuum	138	4.30	770	752 – 788	2.43E+06 – 2.67E+06

Notes:

pcf	pounds per cubic foot	psf	pounds per square foot
slugs/ft^3	slugs per cubic foot	ft/sec	feet per second
V_S	shear wave velocity	G_{max}	small-strain shear modulus
γ_t	total unit weight	ρ_t	mass density

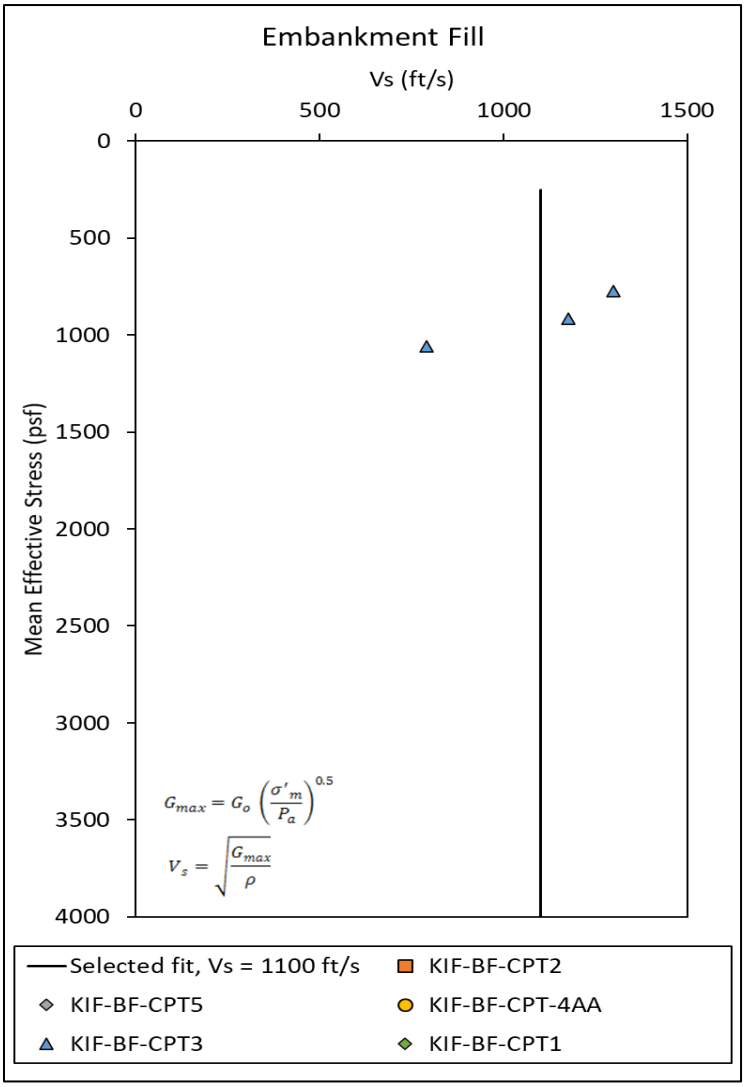
1. Equal to moist unit weight in unsaturated materials or saturated unit weight in saturated materials

The following subsections detail the available data and basis for selecting the small-strain stiffness parameters for each material.

4.1.3.1 Embankment Fill

The measured shear wave velocities within the Embankment Fill were obtained from the 2016 SCPTu soundings (AECOM 2016b). The average V_s of the Embankment Fill was selected as the representative V_s for the material (1,100 ft/sec), as shown on Figure 2.

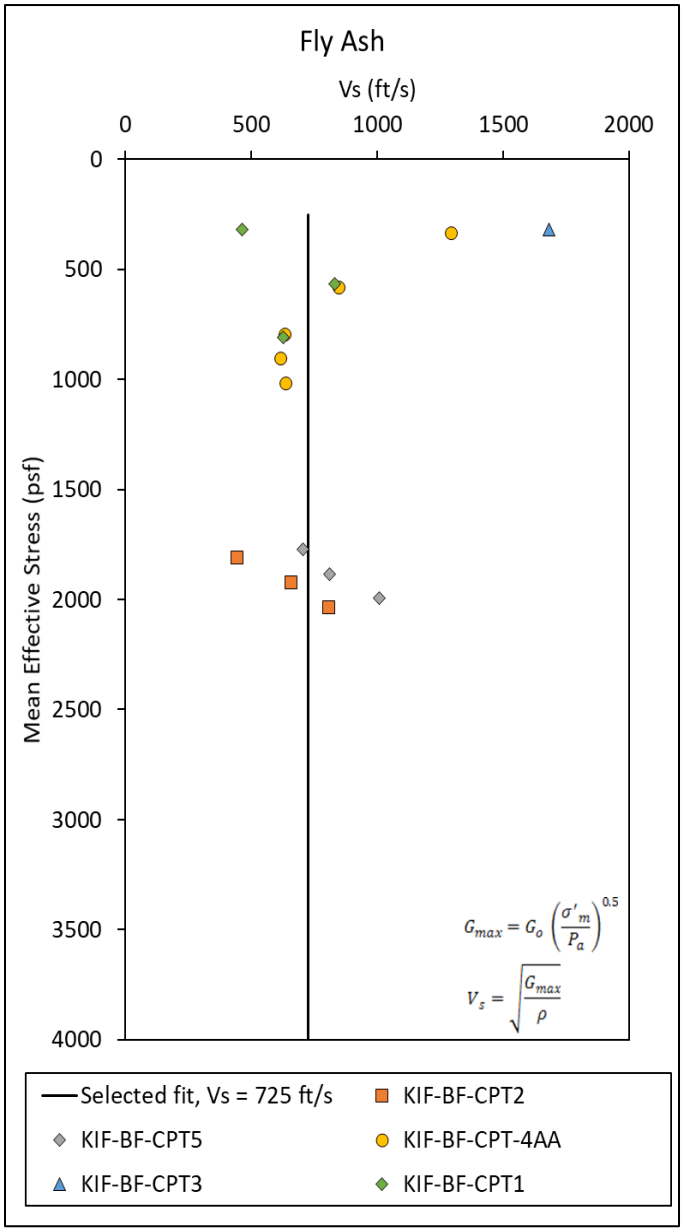
Figure 2. Measured Shear Wave Velocity versus Mean Effective Stress in Embankment Fill and Selected Fit Line



4.1.3.2 Fly Ash

The measured shear wave velocities within the Fly Ash were obtained from the 2016 SCPTu soundings (AECOM 2016b). The median V_s was selected as the representative V_s for the Fly Ash (725 ft/sec), as shown on Figure 3. The median value was selected instead of the average value due to the nature of the scatter in the plot.

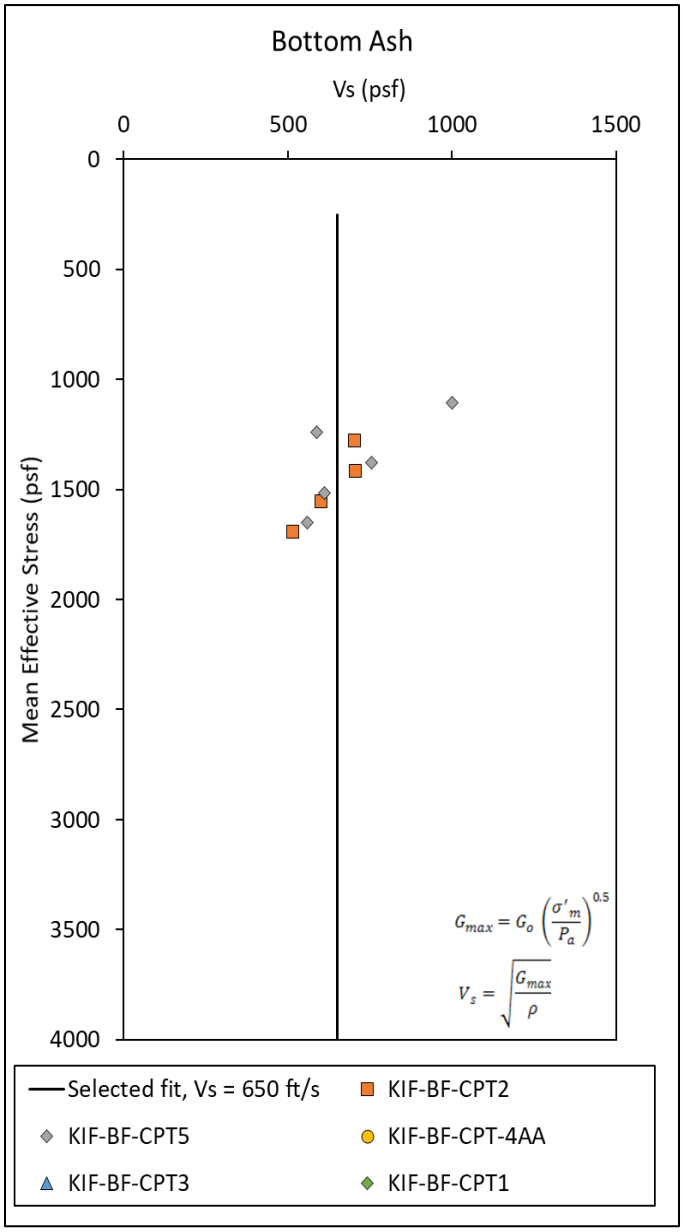
Figure 3. Measured Shear Wave Velocity versus Mean Effective Stress in Fly Ash and Selected Fit Line



4.1.3.3 Bottom Ash

The measured shear wave velocities within the Bottom Ash were obtained from the 2016 SCPTu soundings (AECOM 2016b). The average V_s was selected as the representative V_s for the Bottom Ash (650 ft/sec), as shown on Figure 4.

Figure 4. Measured Shear Wave Velocity versus Mean Effective Stress in Bottom Ash and Selected Fit Line



4.1.3.4 Cover Material

The shear modulus for the Cover Material was determined by using the general Hardin (1978) correlation, shown in Equation 13 in Appendix E. The over consolidation ratio for the soil was assumed to be 2.0 because the Cover Material was compacted when placed. The V_s was calculated using the correlation for G_{max} in soil at small strains where it is proportional to the square of the V_s of the soil, as shown in Equation 11 of Appendix E. The range for the Cover Material's shear modulus is due to the varying depth

of the phreatic surface within the material, resulting in variation of the stress at the midpoint of the material depth.

4.1.3.5 Filter Materials

The G_{max} for the Filter Materials was calculated using the correlation proposed by Seed and Idriss (1970) for sand, as shown in Equation 12 (Appendix E). The range for the Filter Materials' G_{max} is due to variation in the thickness of material, resulting in variation of the stress at the midpoint of the material depth.

4.1.3.6 Riprap

The G_{max} for the Riprap was calculated using the correlation proposed by Seed and Idriss (1970) for sand, as shown in Equation 12 (Appendix E). The range for the Riprap's G_{max} is due to the varying depth of the phreatic surface within the material, resulting in variation of the stress at the midpoint of the material depth.

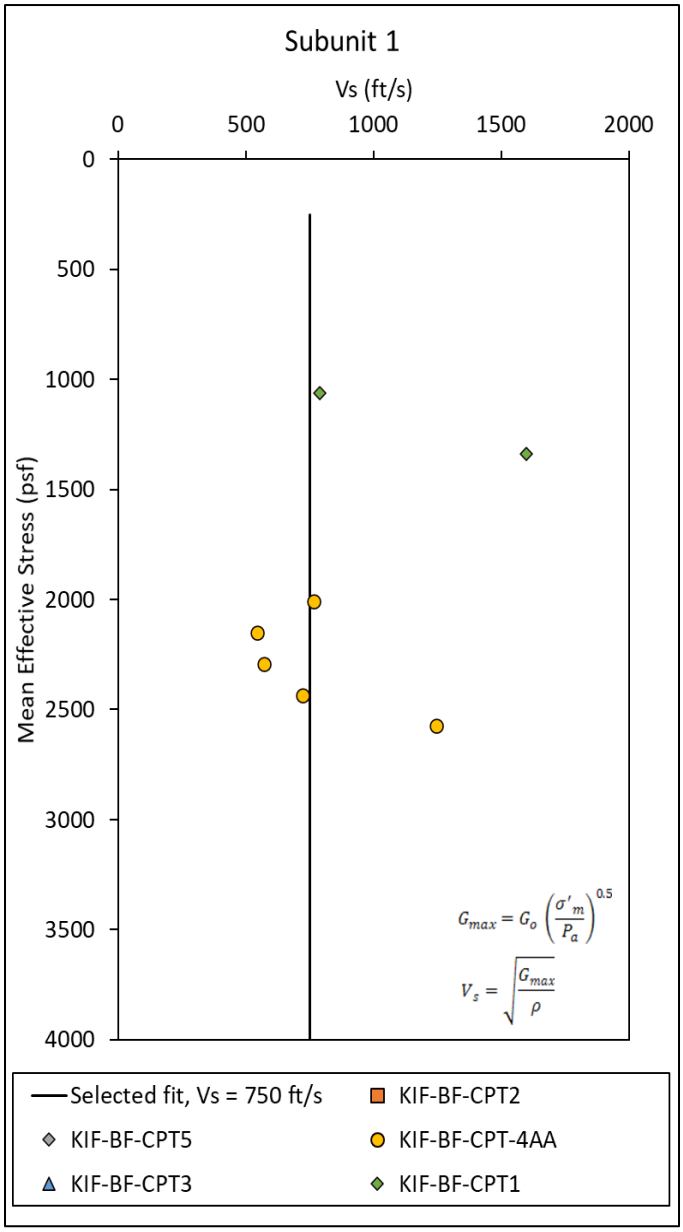
4.1.3.7 Sediment

The G_{max} for the Sediment was calculated using the correlation proposed by Hardin (1978), as shown in Equation 13 (Appendix E). The range of the Sediment's G_{max} is due to the varying thickness of the material, resulting in a variation of the stress at the midpoint of the material. The over consolidation ratio for the material was assumed to be 1.0 because the Sediment was recently deposited (i.e., normally consolidated). The average V_s from the correlation was selected as the representative V_s value for the Sediment (260 ft/sec).

4.1.3.8 Subunit 1

The measured V_s within Subunit 1 were obtained from the 2016 SCPTu soundings (AECOM 2016b). The median V_s was selected as the representative V_s for the Subunit 1 (750 ft/sec), as shown on Figure 5. The median value was selected instead of the average value due to the nature of the scatter in the plot. The V_s for Subunit 1 is slightly higher than the value used for the same material in the latest seismic evaluation of the Stilling Pond design at the KIF Plant. The seismic evaluation of the Stilling Pond design at KIF Plant (Stantec 2020) used a V_s of 700 ft/sec.

Figure 5. Measured Shear Wave Velocity versus Mean Effective Stress in Subunit 1 and Selected Fit Line

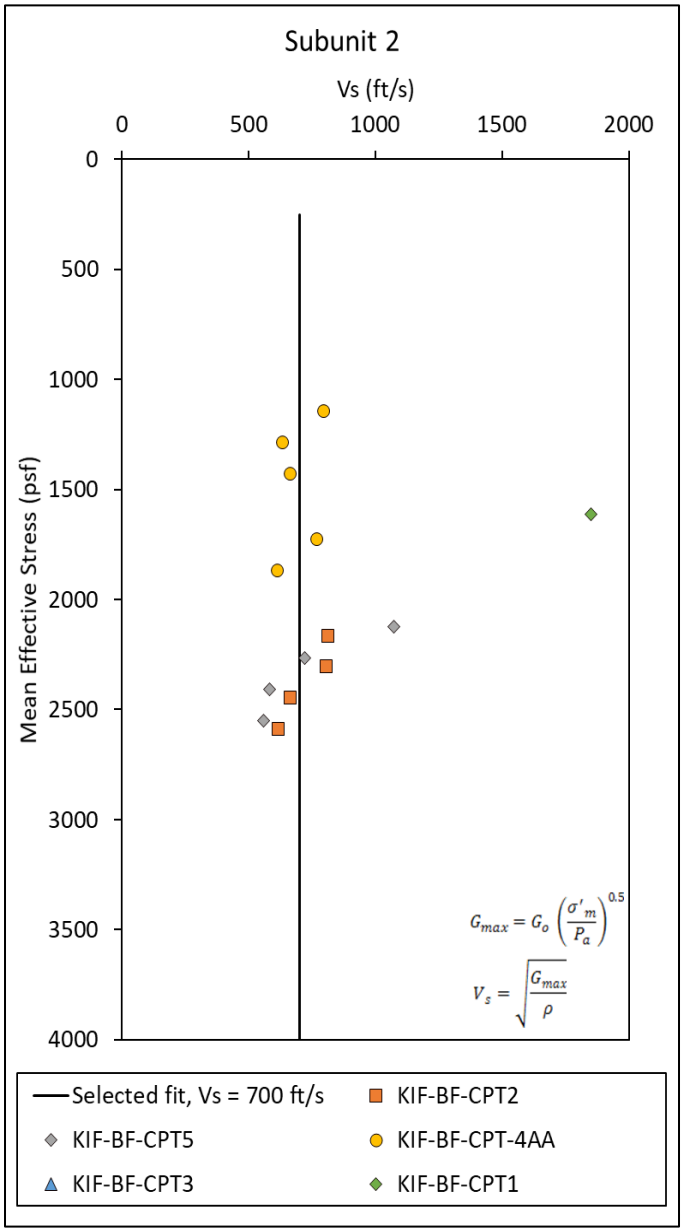


4.1.3.9 Subunit 2

The measured V_s within Subunit 2 were obtained from the 2016 SCPTu soundings (AECOM 2016b). The median V_s was selected as the representative V_s for Subunit 2 (700 ft/sec), as shown on Figure 6. The median value was selected instead of the average due to the nature of the scatter in the plot. The ranges of G_{max} and V_s are similar to the ranges used for these parameters for the Stilling Pond design at the KIF Plant. The seismic evaluation of the Stilling Pond design at KIF Plant (Stantec 2020) developed a site-specific correlation for G_{max} for Subunit 2, in which the ranges for G_{max} are 6.99E+05 to 5.83E+06 psf.

This corresponds to a range of V_s of 424 to 1225 ft/sec, and the representative V_s for the Stilling Pond design is 645 ft/sec.

Figure 6. Measured Shear Wave Velocity versus Mean Effective Stress in Subunit 2 and Selected Fit Line

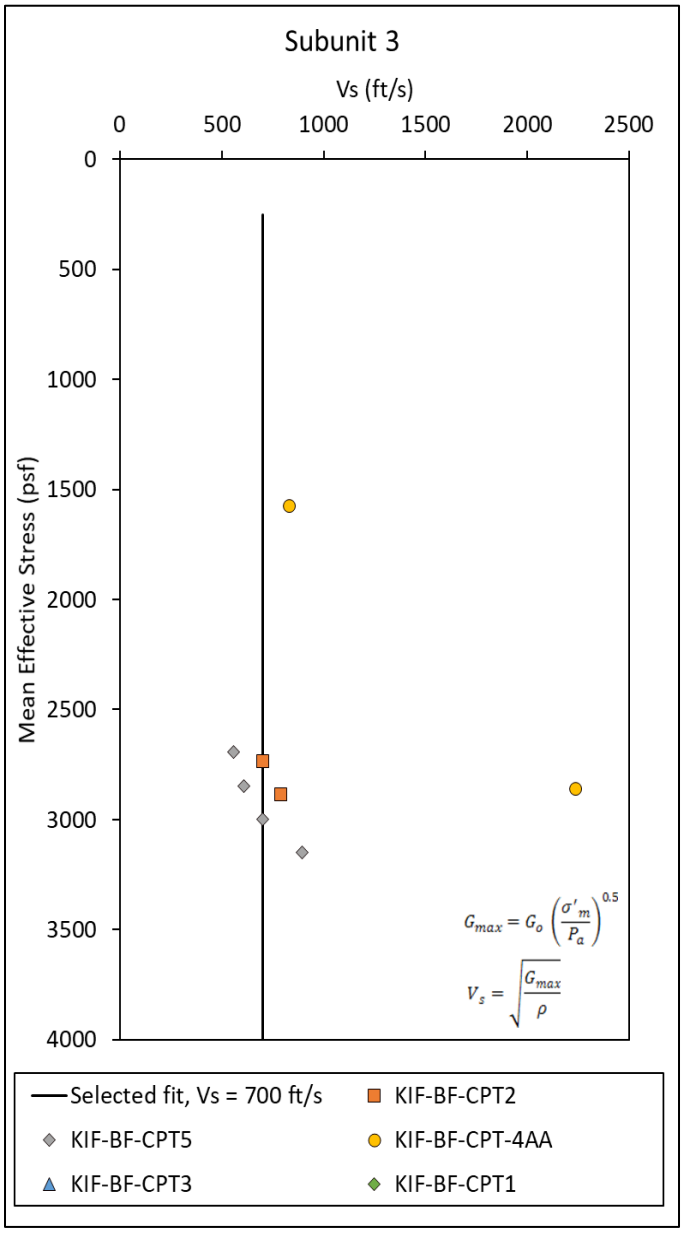


4.1.3.10 Subunit 3

The measured V_s within Subunit 3 were obtained from the 2016 SCPTu soundings (AECOM 2016b). The median V_s was selected as the representative V_s for Subunit 3 (700 ft/sec), as shown on Figure 7. The median value was selected instead of the average value due to the nature of the scatter in the plot. The

V_s for Subunit 3 is similar to the value used for the same material in the latest seismic evaluation of the Stilling Pond design at the KIF Plant. The seismic evaluation of the Stilling Pond design at KIF Plant (Stantec 2020) used a V_s of 670 ft/sec.

Figure 7. Measured Shear Wave Velocity versus Mean Effective Stress in Subunit 3 and Selected Fit Line



4.1.3.11 Gravel Residuum

The G_{max} for the Gravel Residuum was calculated using the correlation proposed by Seed and Idriss (1970) for sand, shown in Equation 12 (Appendix E). The average V_s from the correlations was selected as the representative V_s for the Gravel Residuum (770 ft/sec).

4.1.4 Modulus Degradation and Damping

At shear strains exceeding some small threshold level, soils begin to soften. The softening dynamic response can be represented with shear modulus reduction and damping ratio curves, expressed as functions of the cyclic shear strain (Kramer 1996). Darendeli (2001) developed empirical equations for reduction curves suitable for use in ground response analyses, based on plasticity index (PI), mean effective stress (σ'_m), and cyclic shear strain (γ). The Darendeli (2001) curves were used in these analyses.

The PI of each material is presented in Table 5. These PIs were used to select appropriate modulus reduction and damping curves in *Strata* (ground response analysis software).

Table 5. Plasticity Index used in Empirical Relationships for Modulus Reduction and Damping Ratio of the Subsurface Materials at KIF Plant

Material Name	PI
Embankment Fill	18
Fly Ash	NP
Bottom Ash	NP
Cover Material	38
Filter Materials	NP
Riprap	NP
Sediment	12
Subunit 1	11
Subunit 2	NP
Subunit 3	NP
Gravel Residuum	NP

Notes:

NP Non-plastic

Using the aggregated data from TDEC Order and historical laboratory testing (AECOM 2016b, AECOM 2019, Geosyntec 2010a and 2010b, MACTEC 2009, Stantec 2013), the average PI values were selected as the representative values for each material. For non-plastic materials, a PI of zero was used for shear modulus reduction and selection of the damping curves for the ground response analyses.

4.1.5 Drained Strengths for Static, Long-term Conditions

Drained strength (effective stress) parameters, defined in terms of drained friction angle (ϕ') and drained cohesion (c'), for the subsurface materials under static, long-term conditions are summarized in Table 6. Determination of these drained strengths for the Sediment and the Gravel Residuum (additional materials defined after the Phase 2 Exploratory Drilling) is described in the subsections below. Determination of drained strengths for other materials (unchanged after the Phase 2 Exploratory Drilling) is described in the KIF Static Stability SAR. Background information, typical values, correlations, and measurement methods for characterizing the drained shear strength of soils are discussed in Appendix E. See Section 6.1.8 for discussion on how the drained strengths are applied in the stability model.

Table 6. Drained Shear Strength Parameters for the Analysis of Static, Long-term Conditions, for the Subsurface Materials at KIF Plant

Material Name	ϕ' (deg)	c' (tsf)
Embankment Fill	36	0
Fly Ash	34	0
Bottom Ash	37	0
Cover Material[1]	19	0
Filter Materials	33	0
Riprap	40	0
Sediment	26	0
Subunit 1	32	0
Subunit 2	35	0
Subunit 3	37	0
Gravel Residuum	37	0

Notes:

ϕ'	drained friction angle	c'	drained cohesion
deg	degrees	tsf	tons per square foot

1. To account for possible sliding along the geosynthetic interface within the cap system, the cover system drained strength was assumed to be (φ' = 16º and c' = 0) in the global stability analyses.

4.1.5.1 Sediment

The Sediment is generally composed of very loose, alluvial sediment that classifies as lean clay. The selected drained strength (φ' = 26º and c' = 0) is based on typical values and correlations relating classification and dry unit weight to internal friction angle (NAVFAC 1986), as shown in Appendix E.

4.1.5.2 Gravel Residuum

The Gravel Residuum is generally composed of silty sand with gravel. The Gravel Residuum is assumed to be at least as strong as Subunit 3; thus, it was assigned the same drained strength parameters (φ' = 37º, c' = 0).

4.1.6 Undrained Strengths for Static, Short-Term Conditions

Undrained strength (total stress) parameters, defined in terms of undrained friction angle (ϕ) and undrained cohesion (c), for the subsurface materials under static, short-term conditions are summarized in Table 7. Determination of these parameters for each material is described in the subsections below. Background information, typical values, correlations, and measurement methods for characterizing the undrained shear strength of soils are discussed in Appendix E.

Although the scope of the Stability SAP (Table 1) does not require any static, short-term load cases, the development of undrained strengths for static, short-term conditions is a preliminary step necessary for development of undrained strength for seismic conditions (Section 4.1.7).

In the undrained stability analyses, the contribution of suction pressures to shearing resistance is effectively neglected by specifying composite drained-undrained strength envelopes (Section 6.1.10). The shearing resistance at a given normal stress is then the lesser value of strength computed with the drained or undrained strength parameters (Table 6 and Table 7, respectively).

Table 7. Undrained Shear Strength Parameters for the Analysis of Static, Short-Term Conditions, for the Subsurface Materials at KIF Plant

Material Name	ϕ (deg)	*c* (tsf)
Embankment Fill	11	0.65
Fly Ash	34	0
Bottom Ash	40	0
Cover Material[1]	19	0
Filter Materials	33	0
Riprap	40	0
Subunit 1	21	0.50
Subunit 2	34	0
Subunit 3	34	0
Gravel Residuum	37	0

Notes:

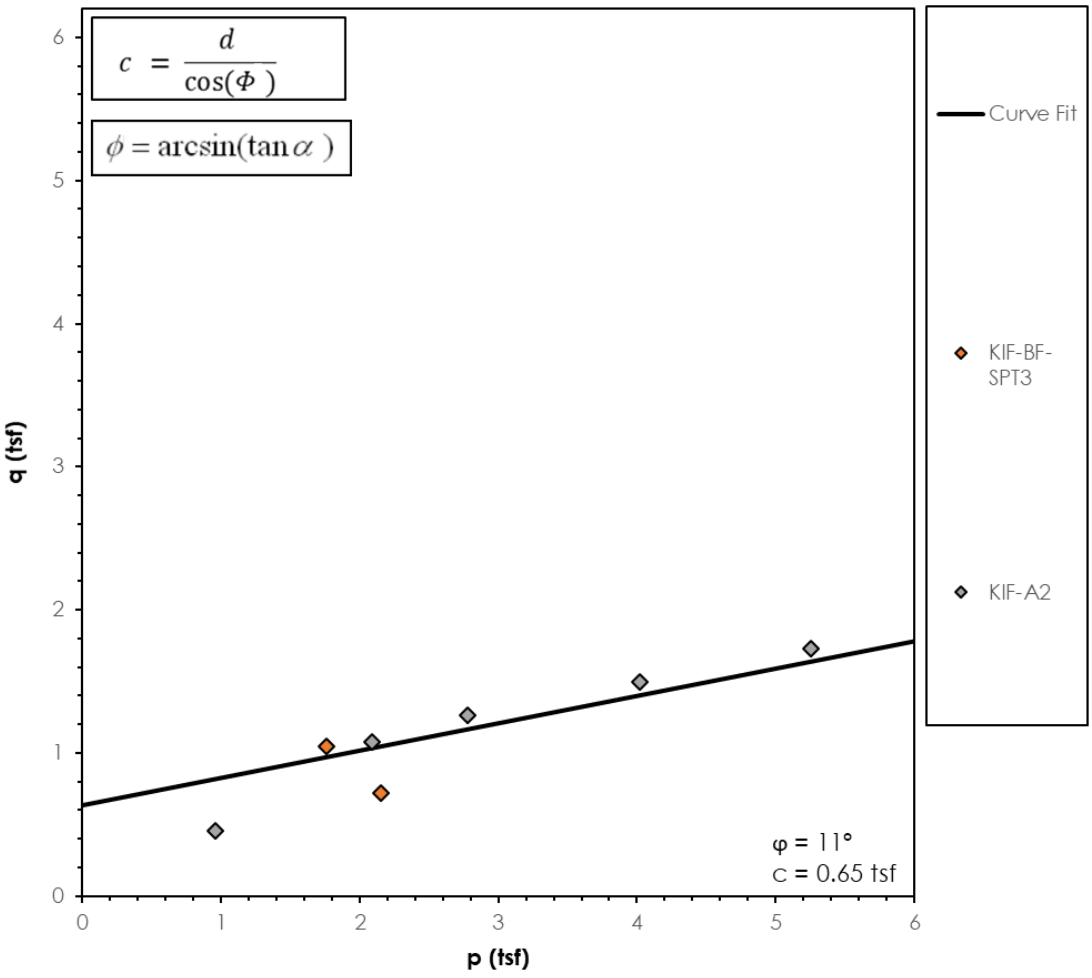
deg degrees tsf tons per square foot

1. To account for possible sliding along the geosynthetic interface within the cap system the cover system undrained strength was assumed to be (φ = 16° and c = 0) in the global stability analyses.

4.1.6.1 Embankment Fill

Undrained strength (total stress) parameters for the Embankment Fill under static, short-term conditions are presented on Figure 8. Determination of these parameters is described below.

Figure 8. Undrained Failure Stresses and Strength Envelope from Triaxial Compression Tests on Embankment Fill



The selected strength envelope (c = 0.65 tsf and φ = 11º) is plotted with the consolidated undrained (CU) triaxial compression data from tests performed on undisturbed samples of the Embankment Fill as part of historical investigations (Geosyntec 2010a and AECOM 2016b). The data was obtained using maximum deviator stress or 15% axial strain as failure criteria The labels on Figure 8 indicate from which boring the samples were obtained.

In total, data is available from seven CU triaxial compression tests (CU triaxial test). Overall, the data plots along a linear trend. The assigned strength parameters were selected by fitting the CU data per the two-thirds best fit rule (see Appendix E).

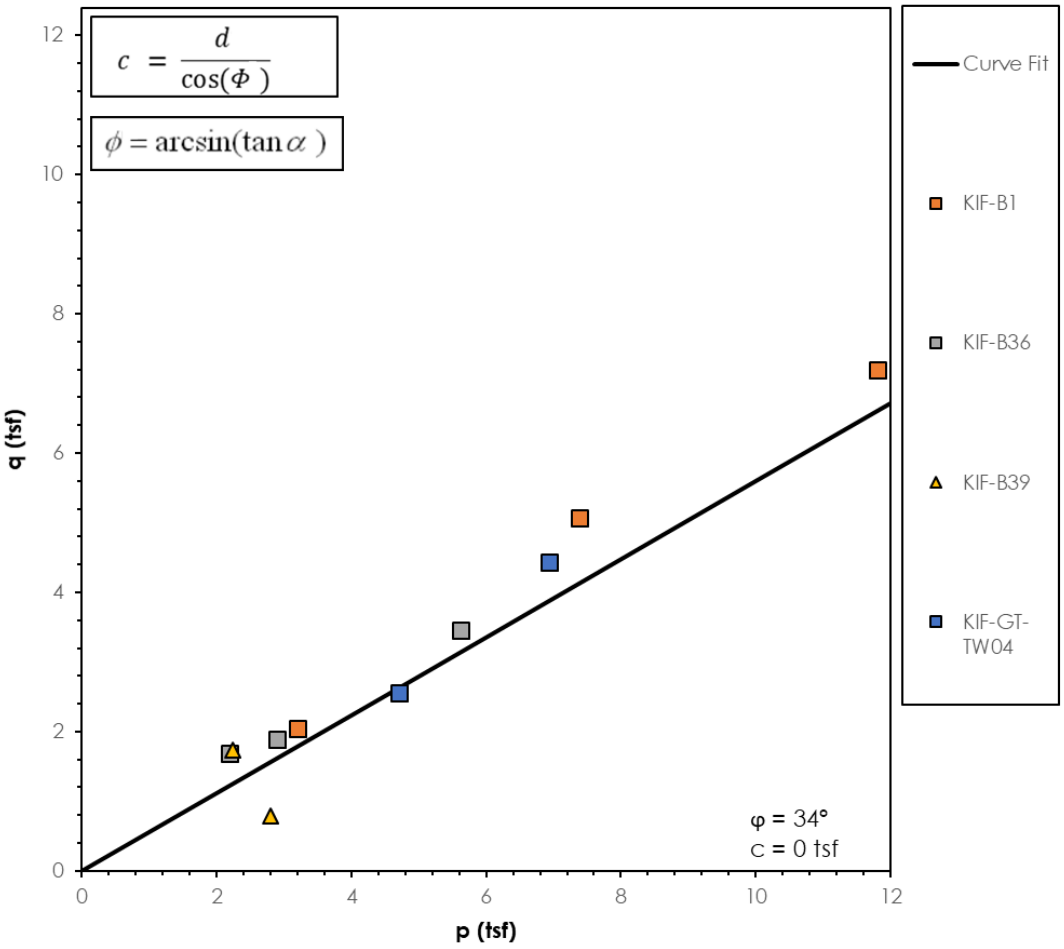
The assigned strength parameters (c = 0.65 tsf and φ = 11º) are different from the values used in the historical Polishing Pond stability analysis. The difference is primarily because an R-envelope (see Appendix E) is employed herein, while a constant value of undrained strength (S_u) was employed in the

historical analysis. The historical Polishing Pond stability analysis used an undrained friction angle of 0 degrees and cohesion of 1500 psf (AECOM 2016b) based on limited data.

4.1.6.2 Fly Ash

Undrained strength (total stress) parameters for the Fly Ash under static, short-term conditions are presented on Figure 9. Determination of these parameters is described below.

Figure 9. Undrained Failure Stresses and Strength Envelope from Triaxial Compression Tests on Fly Ash



The selected strength envelope (c = 0 tsf and ϕ = 34º) is plotted with the CU data from tests performed on undisturbed samples of the Fly Ash material as part of the Exploratory Drilling SAR and the historical investigations (MACTEC 2009 and Geosyntec 2010a). The data were obtained using maximum deviator stress or 15% axial strain as failure criteria. The labels on Figure 9 indicate from which boring the samples were obtained.

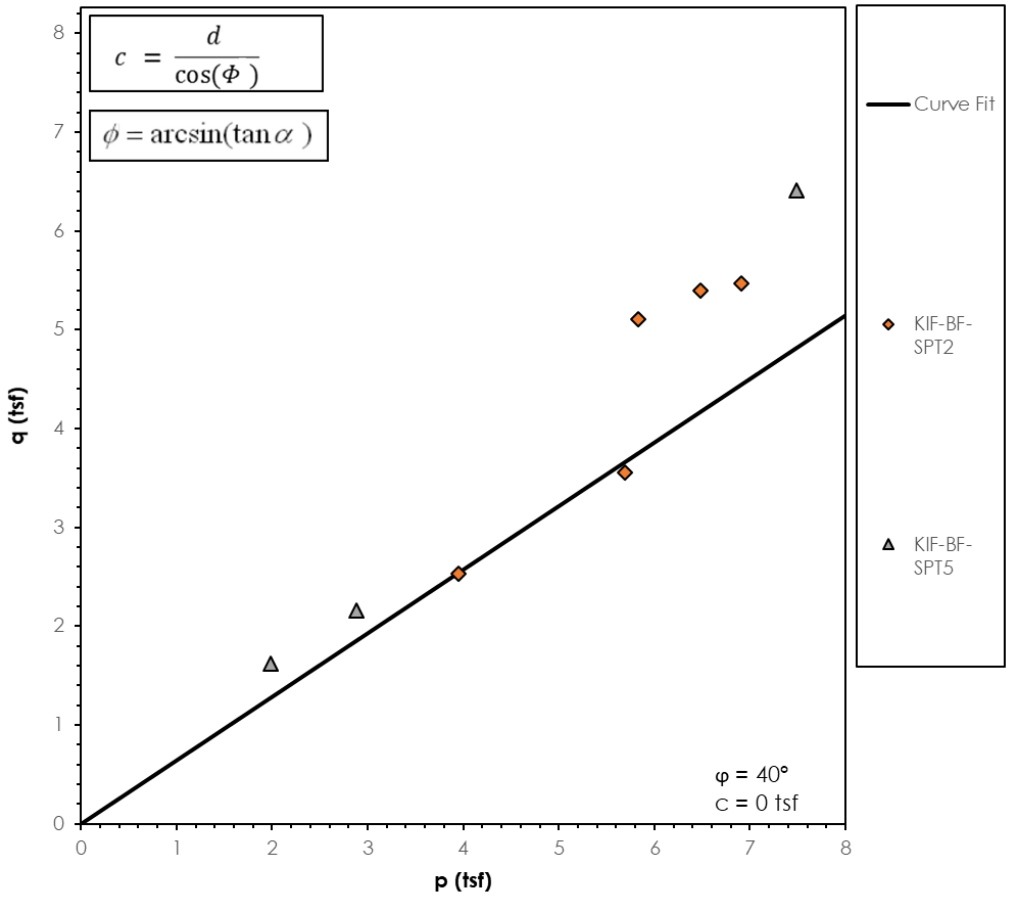
In total, data is available from 10 CU triaxial compression tests. Overall, the data generally plots along a linear trend. The assigned strength parameters were selected by fitting the CU data per the two-thirds best fit rule.

The assigned strength parameters (c = 0 tsf and ϕ = 34º) are higher than what was used in the historical Polishing Pond stability analysis. The historical Polishing Pond stability analysis did not differentiate between the Fly Ash and Bottom Ash materials and modeled them as one material, Ash Fill, with an assigned friction angle of 22 deg. (AECOM 2016b). The strengths assigned in this analysis were determined using additional triaxial data from the Geotechnical Exploration of the KIF Plant (MACTEC 2009) and the Initial Stability Study of the East Dike (Geosyntec 2010a), as well as using a new interpretation of the subsurface conditions separating the Fly Ash and Bottom Ash materials.

4.1.6.3 Bottom Ash

Undrained strength (total stress) parameters for the Bottom Ash under static, short-term conditions are presented on Figure 10. Determination of these parameters is described below.

Figure 10. Undrained Failure Stresses and Strength Envelope from Triaxial Compression Tests on Bottom Ash



The selected strength envelope (c = 0 tsf and φ = 40º) is plotted with the CU data from tests performed on undisturbed samples of the Bottom Ash material as part of historical investigations (AECOM 2016b). The data was obtained using maximum deviator stress or 15% axial strain as failure criteria. The labels on Figure 10 indicate from which boring the samples were obtained.

In total, data is available from eight CU triaxial compression tests. Based on the scatter of the CU data and a relatively small data set, an exact two-thirds fit could not be achieved. The assigned strength parameters were selected by approximating a two-thirds fit, while also considering typical values.

The assigned strength parameters (c = 0 tsf and φ = 40º) are higher than what was used in the historical Polishing Pond stability analysis. The historical Polishing Pond stability analysis did not differentiate between the Fly Ash and Bottom Ash materials and modeled them as one material, Ash Fill, with an assigned friction angle of 22 deg. (AECOM 2016b). The strengths assigned in this analysis were determined by reinterpreting the CU triaxial data from the Polishing Pond stability analysis as well new interpretation of the subsurface conditions separating the Fly Ash and Bottom Ash materials.

4.1.6.4 Cover Material

The Cover Material is assumed to be unsaturated because the material is sufficiently above the capillary fringe and piezometric surface, where no excess pore pressure would develop. Since excess pore pressures are assumed not to develop, the drained strengths assigned in the Static Stability SAR (φ = 19º and c = 0) are assumed. The Cover Material is modeled with a lower drained strength (φ' = 16º and c'=0) in the global stability analysis to account for the geosynthetics interface in the cover system.

4.1.6.5 Filter Materials

The Filter Materials are assumed to be free draining. Independent undrained strength parameters (total stress) were not assigned. The drained strengths (φ = 33º and c = 0) assigned in the Static Stability SAR were assumed.

4.1.6.6 Riprap

The Riprap material is assumed to be free draining. Independent undrained strength parameters (total stress) were not assigned. The drained strengths (φ = 40º, c = 0) assigned in the Static Stability SAR were assumed.

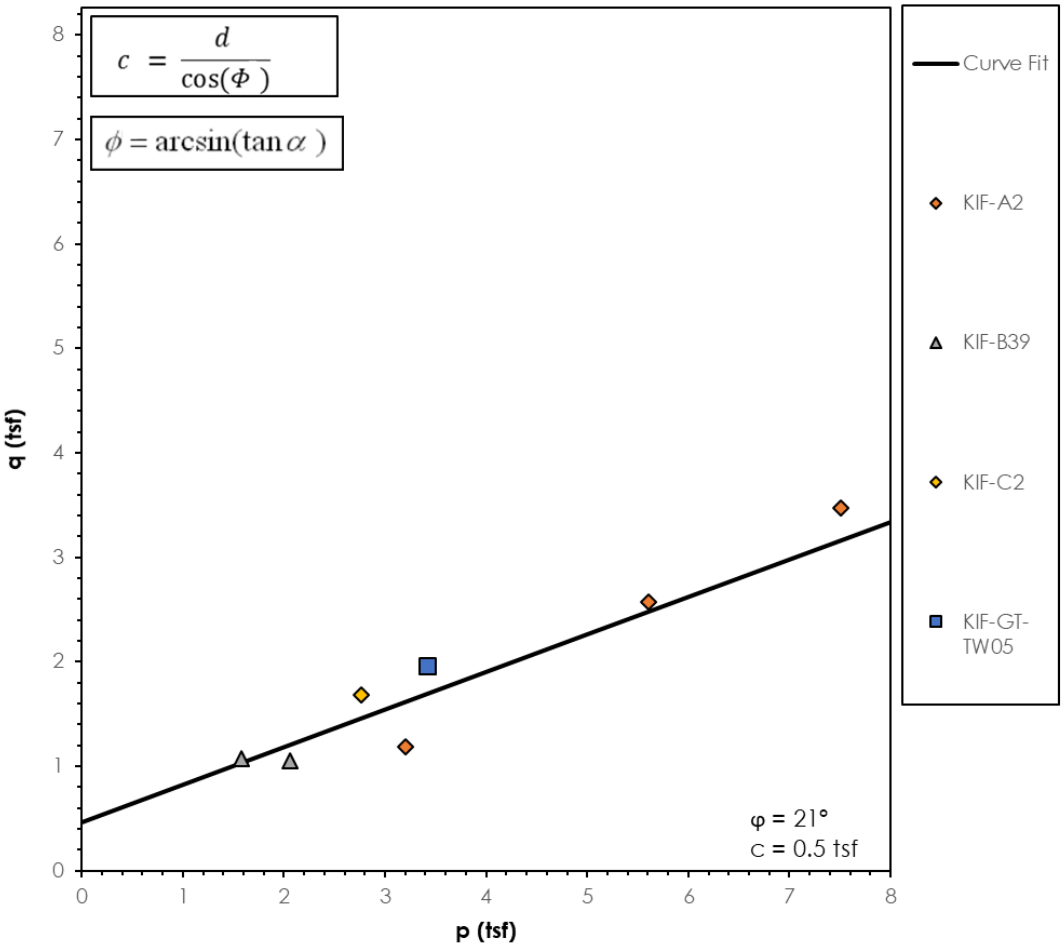
4.1.6.7 Sediment

The determination of the undrained strength parameters (total stress) for the Sediment was not necessary for the seismic stability analyses. Therefore, undrained strength parameters were not assigned for this material.

4.1.6.8 Subunit 1

Undrained strength (total stress) parameters for Subunit 1 under static, short-term conditions are presented on Figure 11. Determination of these parameters is described below.

Figure 11. Undrained Failure Stresses and Strength Envelope from Triaxial Compression Tests on Subunit 1



The selected strength envelope (c = 0.5 tsf and φ = 21º) is plotted with the CU data from tests performed on undisturbed samples of Subunit 1 as part of the Exploratory Drilling SAR and the historical investigations (MACTEC 2009 and Geosyntec 2010a and 2010b). The data was obtained using maximum deviator stress or 15% axial strain as failure criteria. The labels on Figure 11 indicate from which boring the samples were obtained.

In total, data is available from seven isotropically CU triaxial compression tests. Overall, the data generally plots along a linear trend. The assigned strength parameters were selected by fitting the CU data per the two-thirds best fit rule.

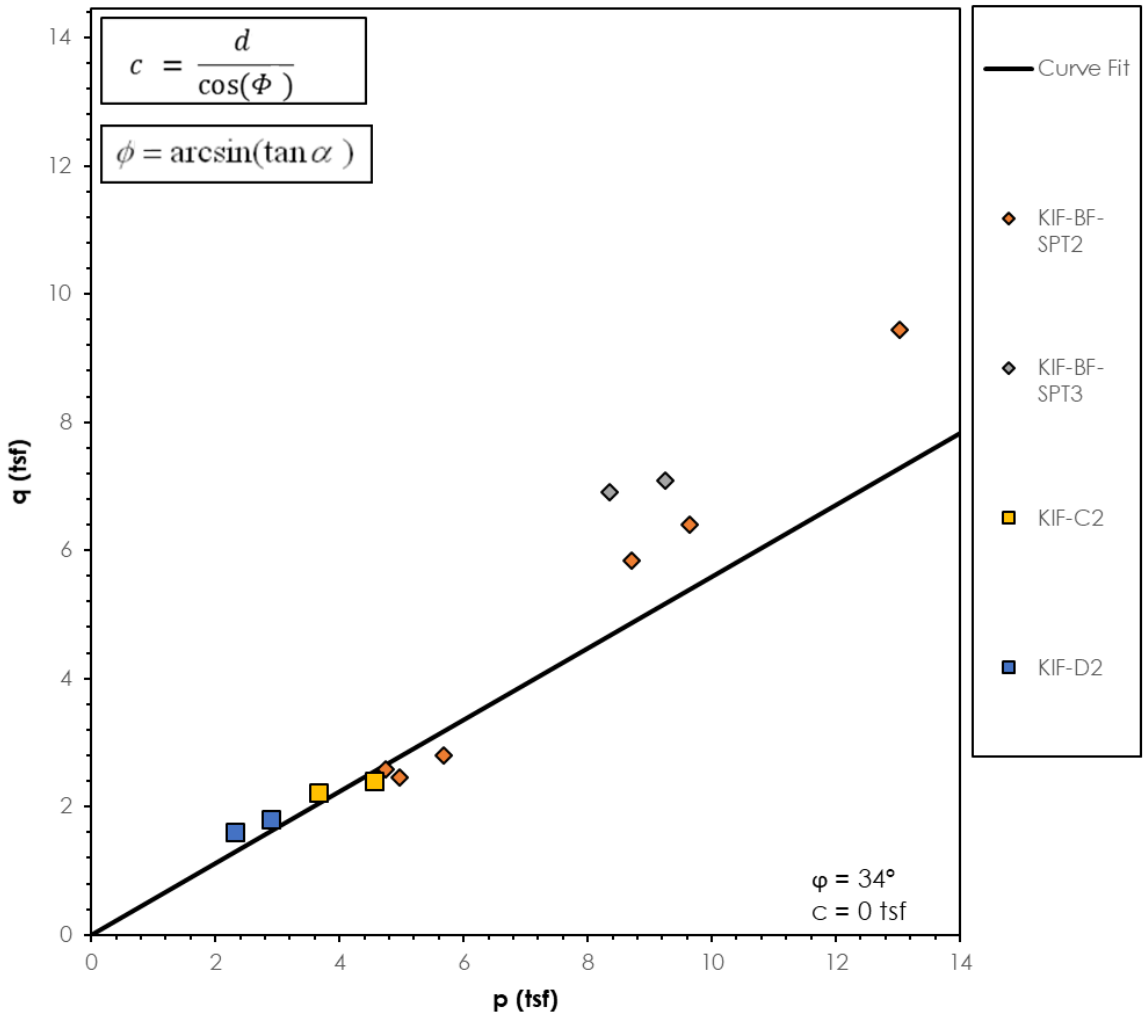
The assigned strength parameters (c = 0.5 tsf and φ = 21º) are higher than what was used in the historical Polishing Pond stability analysis. The historical Polishing Pond stability analysis did not separate the foundation materials into various subunits and modeled them as one material, Silty Sand to Sandy Silt, with an assigned friction angle of 11 degrees and a cohesion of 0.75 tsf (AECOM 2016b)

based on limited data. As provided in the Stilling Pond Updated Seismic Performance (Stantec 2020), an undrained strength of 15 deg. and cohesion of 0.2 tsf was assigned based on laboratory data.

4.1.6.9 Subunit 2

Undrained strength (total stress) parameters for Subunit 2 under static, short-term conditions are presented on Figure 12. Determination of these parameters is described below.

Figure 12. Undrained Failure Stresses and Strength Envelope from Triaxial Compression Tests on Subunit 2



The selected strength envelope (c = 0 tsf and φ = 34º) is plotted with the CU data from tests performed on undisturbed samples of Subunit 2 as part of the historical investigations (AECOM 2016b and Geosyntec 2010b). The data was obtained using maximum deviator stress or 15% axial strain as failure criteria. The labels on Figure 12 indicate from which boring the samples were obtained.

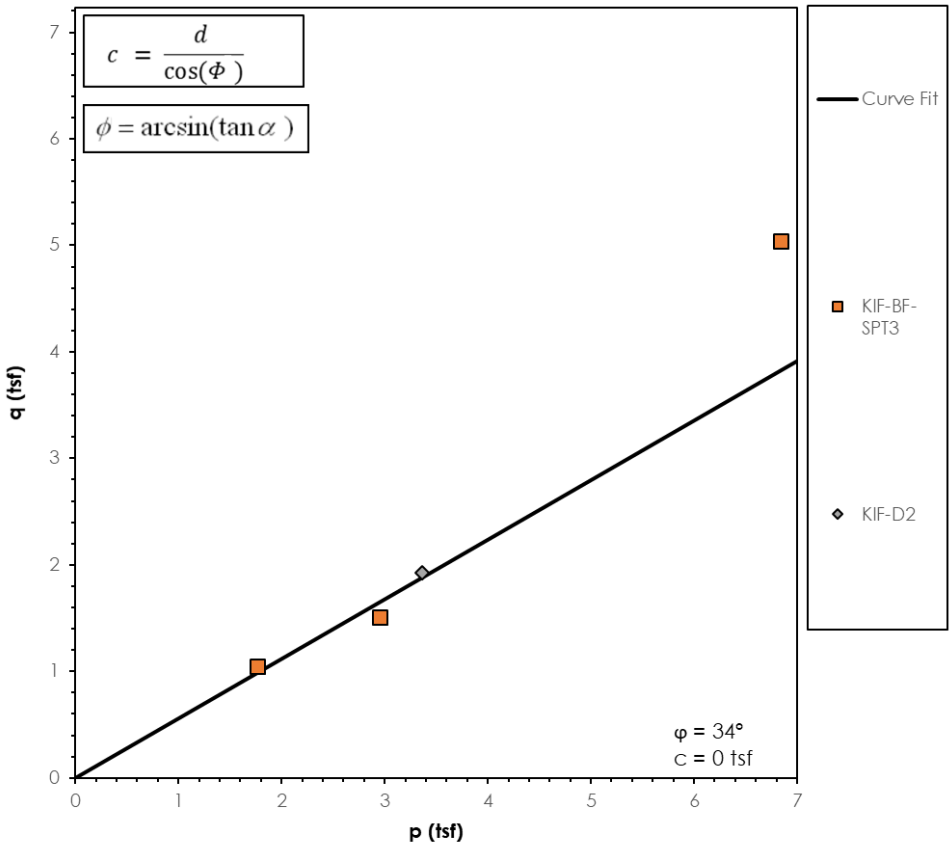
In total, data is available from 12 CU triaxial compression tests. Overall, there is no obvious linear trend in the dataset. The assigned strength parameters were selected by fitting the CU data per the two-thirds best fit rule.

The assigned strength parameters (c = 0 tsf and φ = 34º) are higher than what was used in the historical Polishing Pond stability analysis. The historical Polishing Pond stability analysis did not separate the foundation materials into various subunits and modeled them as one material, Silty Sand to Sandy Silt, with an assigned friction angle of 11 degrees and a cohesion of 0.75 tsf based on limited data (AECOM 2016b). Analysis conducted for the Stilling Pond Updated Seismic Performance (Stantec 2020) considered the material sufficiently permeable such that no significant pore water pressures would develop under static, undrained conditions. That analysis considered the undrained strength to be the same as the drained strength for this material (c = 0 tsf and φ = 26º).

4.1.6.10 Subunit 3

Undrained strength (total stress) parameters for Subunit 3 under static, short-term conditions are presented on Figure 13. Determination of these parameters is described below.

Figure 13. Undrained Failure Stresses and Strength Envelope from Triaxial Compression Tests on Subunit 3



The selected strength envelope (c = 0 tsf and φ = 34º) is plotted with the CU data from tests performed on undisturbed samples of Subunit 3 as part of the historical investigations (AECOM 2016b and Geosyntec 2010b). The data was obtained using maximum deviator stress or 15% axial strain as failure criteria. The labels on Figure 13 indicate from which boring the samples were obtained.

In total, data is available from four CU triaxial compression tests. Overall, the data plots along a linear trend. The assigned strength parameters were selected by fitting the CU data per the two-thirds best fit rule.

The assigned strength parameters (c = 0 tsf and φ = 34º) are higher than what was used in the historical Polishing Pond stability analysis. The historical Polishing Pond stability analysis did not separate the foundation materials into various subunits and modeled them as one material, Silty Sand to Sandy Silt, with an assigned friction angle of 11 degrees and a cohesion of 0.75 tsf (AECOM 2016b) based on limited data. Analysis conducted for the Stilling Pond Updated Seismic Performance (Stantec 2020) considered the material relatively free-draining, such that no significant pore water pressures would develop under static, undrained conditions. That analysis considered the undrained strength to be the same as the drained strength for this material (c = 0 tsf and φ = 30º).

4.1.6.11 Gravel Residuum

The Gravel Residuum material is assumed to be free draining. Independent undrained strength parameters (total stress) were not assigned. The drained strengths assigned in Section 4.1.5.2 (φ = 37º, c = 0) are assumed.

4.1.7 Undrained Strengths for Seismic Conditions

For analyzing seismic stability, the shear strength parameters in Table 8 are used to account for the potential generation of excess pore pressures under dynamic load. These parameters are derived as discussed in Appendix E:

- For saturated soils that do not liquefy, the undrained soil strength parameters are reduced to 80% of the static undrained strength parameters as shown in Table 7
- For very coarse materials, such as rock fill, excess pore pressures will not accumulate, and the drained strength is assumed for the seismic condition
- For unsaturated soils that are sufficiently above the capillary fringe and piezometric surface, excess pore pressures will not accumulate, and the drained strength is assumed for the seismic condition. However, for materials that are only partially above the piezometric surface, it is simpler (and conservative) to model the unsaturated portion using the same seismic undrained strengths applied to the saturated portion.

Consistent with the static undrained stability analyses, the contribution of suction pressures to shearing resistance is effectively neglected by specifying composite drained-undrained strength envelopes (Section 6.1.10). The drained strength parameters, which are applicable at the lower stress range, are not reduced for dynamic pore pressure generation. The shearing resistance at a given normal stress is then

the lesser value of strength computed with the drained or seismic undrained strength parameters (Table 6 and Table 8, respectively).

Table 8. Undrained Shear Strength Parameters for the Analysis of Seismic Loading Conditions for the Subsurface Materials at the KIF Plant

Material Name	ϕ_{EQ} (deg)	c_{EQ} (tsf)
Embankment Fill	9	0.52
Fly Ash[2]	0	0.20
Bottom Ash[3]	34	0
Cover Material[1]	19	0
Filter Materials[3]	33	0
Riprap[3]	40	0
Sediment[2]	0	0.025
Subunit 1	17	0.40
Subunit 2	28	0
Subunit 3[2]	0	0.1875
Subunit 3 (Intake Channel)[2]	0	0.10
Gravel Residuum[3]	37	0

Notes:

ϕ_{EQ} undrained friction angle (seismic conditions) c_{EQ} undrained cohesion (seismic conditions)

1. To account for possible sliding along the geosynthetic interface within the cap system the cover system shear strength was assumed to be (φ = 16º and c = 0) in the global stability analyses.
2. For liquefied materials, the residual strengths were conservatively selected as the seismic strengths rather than the reduced (i.e., 80%), static undrained strengths.
3. Materials where excess pore water pressures assumed to not accumulate. Drained strengths assumed.

4.1.8 Residual Strengths for Liquefied Soils

Liquefaction and cyclic softening potential was assessed for the embankment and foundation materials at the site. The Riprap consists of compacted, angular boulders. The Filter Materials are generally composed of compacted crushed stone or sand. Due to the method of placement of these materials and their free-draining nature, the filter materials are judged to be unliquefiable. The Gravel Residuum is generally composed of gravelly sand and is considered so dense that it is judged to be unliquefiable. Because the Cover Material is unsaturated, it is judged to not be subject to cyclic softening. Therefore, the Riprap, Filter Materials, Gravel Residuum, and Cover Material will not be further discussed with regards to liquefaction or cyclic softening.

Liquefaction and cyclic softening potential was assessed for the Embankment Fill, Fly Ash, Bottom Ash, Subunit 1, Subunit 2, and Subunit 3. First, laboratory and CPT data was used to determine if each material was characteristically clay-like (i.e., potentially susceptible to cyclic softening) or sand-like (potentially susceptible to classic liquefaction). This analysis, summarized in Table 9 and detailed in

Section 7.1.1, found that the Embankment Fill was not susceptible to strength loss due to liquefaction or cyclic softening, regardless of the design earthquake.

Table 9. Summary of Liquefaction Analysis Results for the Subsurface Materials at KIF Plant

Material Name	Clay-like/Sand-like	Liquefaction Predicted?	Cyclic Softening Predicted?
Embankment Fill	Clay-like	No	No
Fly Ash	Sand-like	Yes	No
Bottom Ash	Sand-like	No	No
Subunit 1	Clay-like	No	No
Subunit 2	Sand-like	No	No
Subunit 3	Sand-like	Yes	No

Liquefaction susceptibility was further assessed for the Fly Ash, Bottom Ash, Subunit 1, Subunit 2, and Subunit 3. This analysis determined that the Bottom Ash and Subunit 1 were unliquefiable; that is, the data indicated that the materials were too dense to liquefy or cyclically soften, regardless of the design earthquake.

Next, liquefaction triggering analyses were performed at each SPT boring and CPT sounding location. The results are summarized in Table 9 and the analysis methods are detailed in Appendix F. For the design earthquake, this analysis resulted in predictions of liquefaction in portions of the Fly Ash, Subunit 2, and Subunit 3. However, based on the results of cyclic shear tests conducted on samples of Subunit 2 collected at the Stilling Pond at KIF Plant (Stantec 2020), the soil was determined to not liquefy during the design earthquakes. The cyclic testing results are considered more representative than the empirically based SPT and CPT results for Subunit 2, a borderline sand-like to clay-like material.

The liquefied shear strengths, also referred to as the residual strengths, for the Fly Ash and Subunit 3 were derived for use in the post-earthquake slope stability analysis, using the procedures outlined in Appendix F; the strengths are summarized in Table 10. Based on the Phase 2 Exploratory Drilling data, the zone of Subunit 3 within the intake channel was assigned a slightly lower residual strength, compared to the inboard zone of Subunit 3. To estimate the residual strengths of the Fly Ash and the two zones of Subunit 3, multiple empirical correlations were used and representative values were selected such that an equal number of correlation results lie on each side of the selected value, as shown in Appendix D.

The liquefaction potential of the Sediment was judged qualitatively. As discussed in Section 4.1.1.7, the Sediment is very loose, has very low SPT blowcounts, and has relatively low plasticity. The material was conservatively assumed to liquefy during the design earthquake, and a very low residual strength of 50 psf (0.025 tsf) was assigned. Note that because this deposit is thin and it is located only along the outboard toe of the East Dike, this conservative assumption will have little impact on the results.

The drained strength parameters, which are applicable at the lower stress range (Section 6.1.10), are not reduced for dynamic pore pressure generation. The shearing resistance at a given normal stress is then the lesser value of strength computed with the drained or post-earthquake (residual) strength parameters (Table 6 or Table 10).

Table 10. Residual Strengths for Liquefiable Materials for the Subsurface Materials at KIF Plant

Material Name	ϕ_{LIQ} (deg)	c_{LIQ} (psf)
Fly Ash	0	400
Subunit 3	0	375
Subunit 3 (Intake Channel)	0	200
Sediment	0	50

Notes:

ϕ_{LIQ} undrained friction angle (residual strength) c_{LIQ} undrained cohesion (residual strength)

4.1.9 Shear Strength of Bedrock

The dip of the shale bedrock is to the southeast, which is in the outboard direction relative to the East Dike. This orientation of the bedding planes increases the resistance to sliding within the bedrock. Based on the depth to bedrock, bedding plane orientation, and relative material strengths of the overlying soils, the shale bedrock is modeled as impenetrable in these analyses. See Section 6.1.4 for discussion on how impenetrable materials were considered in the global stability models.

4.1.10 Density and Shear Wave Velocity of Bedrock

The density and stiffness parameters summarized in Table 11 are used in the seismic ground response analyses. As detailed in Appendix F, small-strain stiffness can be measured or characterized in terms of shear wave velocity or small-strain shear modulus. The values for each bedrock zone were determined as described in the subsections below.

Table 11. Small-Strain Shear Stiffness Parameters for the Bedrock Zones beneath KIF Plant

Bedrock Zone	Total Unit Weight γ_t (pcf)		Mass Density ρ_t (slugs/ft^3)	Depth Increment	Shear Wave Velocity V_s (ft/sec)
Shale	Above Elevation 675 ft	140	4.35	*below top of rock:* 0 – 15 ft 15 – 30 ft > 30 ft	 1,220 1,360 1,490
	Below Elevation 675 ft	140	4.35	Depth increments below Elevation 675 ft	$9{,}350 - 10 \times Elev\ (ft)$

For the shale bedrock, published modulus reduction and damping relationships developed by Silva et al. (1996), as presented in Stewart et al. (2008) were used in the ground response analyses. These relationships are available in the *Strata* curve library (Kottke et al. 2013). Selection of appropriate curves were based on the bedrock depth below the ground surface.

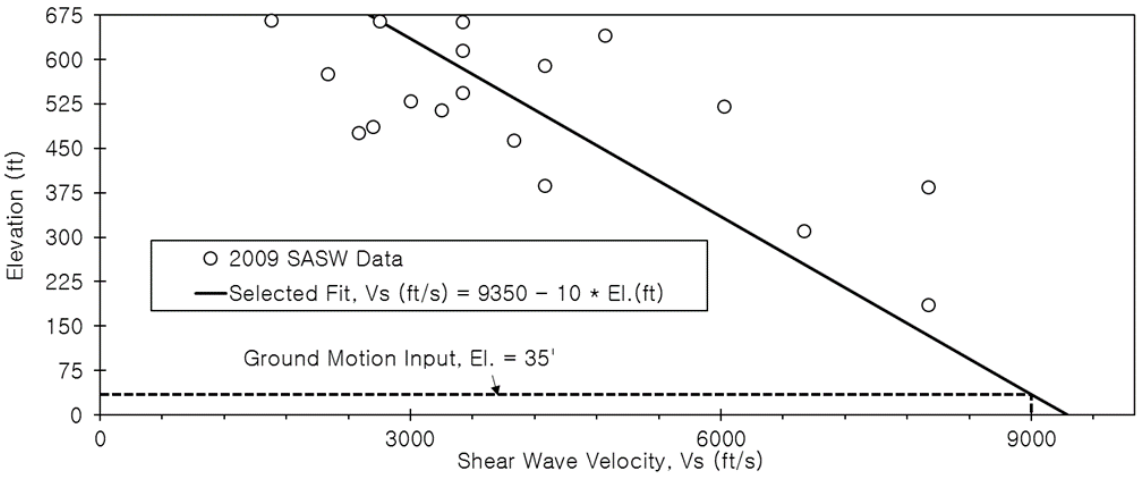
4.1.10.1 Shale Above Elevation 675

The shear wave velocity in the shale bedrock above elevation 675 was developed based on historical Multi-channel Analysis of Surface Waves/Microtremor Array Measurements (MASW/MAM) data collected for the Shear Wave Velocity Testing Project at the Stilling Pond (AECOM 2009). Three intervals of shear wave velocity were developed and assigned to shale above elevation 675, depending on depth below the top of rock (Stantec 2013).

4.1.10.2 Shale Below Elevation 675

The shear wave velocity in the shale bedrock below elevation 675 was estimated using Spectral Analysis of Surface Waves data collected by the University of Texas at Austin (Stantec 2013). The shear wave velocities below elevation 675 were estimated using the equation from the selected fit line, as shown on Figure 14.

Figure 14. Measured Shale Shear Wave Velocity versus Elevation below El. 675, and the Trend Line (Stantec 2013)



4.2 ANALYSIS CROSS SECTIONS

The stability analyses are performed for the specific cross sections listed in Table 12 and shown on Figure 15. Per the Stability SAP, the selected locations represent critical cross sections based on reviews of previous stability analysis results, subsurface stratigraphy, material properties, and structure geometry. For selection of analysis section(s) for post-earthquake stability, the location of potentially liquefiable materials is also considered. If the previously used cross sections were not considered representative for the new analyses, sections were updated or new cross sections were developed using available site-specific data (including data from the Exploratory Drilling SAR). The following subsections present the specific basis for the selection of each section.

Table 12. Analyzed Cross Sections at KIF Plant

CCR Unit	Cross Section	Notes
Sluice Trench and Ballfield East of Sluice Trench	A-A'	Southwest portion of the East Dike near the intake channel at KIF Plant
Sluice Trench and Ballfield East of Sluice Trench	Polishing Pond	Central portion of the East Dike, including the Polishing Pond but excluding the Engineered Wetlands
Sluice Trench and Ballfield East of Sluice Trench	Typical (veneer only)	Representative section for veneer stability analysis; steep portion of the Polishing Pond section.

The previous global slope stability analysis results (Geosyntec 2010a, 2010b, and 2012, AECOM 2016a) for the Sluice Trench and Ballfield East of the Sluice Trench were reviewed to identify the critical cross section(s) for the pseudostatic and post-earthquake loading conditions. Geosyntec (2010a, 2010b, and 2012) considered four slope stability cross sections (Sections A, B, C, D) at the Sluice Trench and Ballfield East of the Sluice Trench. The analyses included static, long-term global cases for the four sections and also seismic (pseudostatic) cases for Sections C and D. Sections C and D included the buttressing effect of the Engineered Wetlands and were judged to be non-critical. Because seismic analyses were not performed for Sections A and B, the static stability results were used to identify the critical cross sections for the unit. The lowest factors of safety for long-term global stability (for the existing condition at that time) were reported at Section A (FS=1.7) and Section B (FS=1.6). During the planning and design of the Polishing Pond, AECOM (2016a) analyzed the "Polishing Pond" cross section, which is located near Geosyntec's Section B. The analysis included pseudostatic and post-earthquake load cases. For the pseudostatic case, the AECOM (2016a) analysis considered a slip surface intercepting the Polishing Pond pool (FS=1.6), so the results are not directly comparable to the slip surface criteria used herein. The post-earthquake case considered a slip surface through the East Dike and intercepting the CCR (FS=1.0). Since the previous analyses, the Polishing Pond has been constructed and the Sluice Trench and Ballfield East of Sluice Trench has been regraded (including fill placed between the Polishing Pond and the East Dike) and capped with geosynthetics and cover soil (AECOM 2019). The outboard slope of the East Dike was also modified for seepage mitigation purposes (AECOM 2017). Based on the historical analysis results and the current unit geometry, Section A-A' and the "Polishing Pond" were selected as the critical cross sections to represent the seismic global stability for existing conditions at the Sluice Trench and Ballfield East of Sluice Trench.

Figure 15. Cross section locations

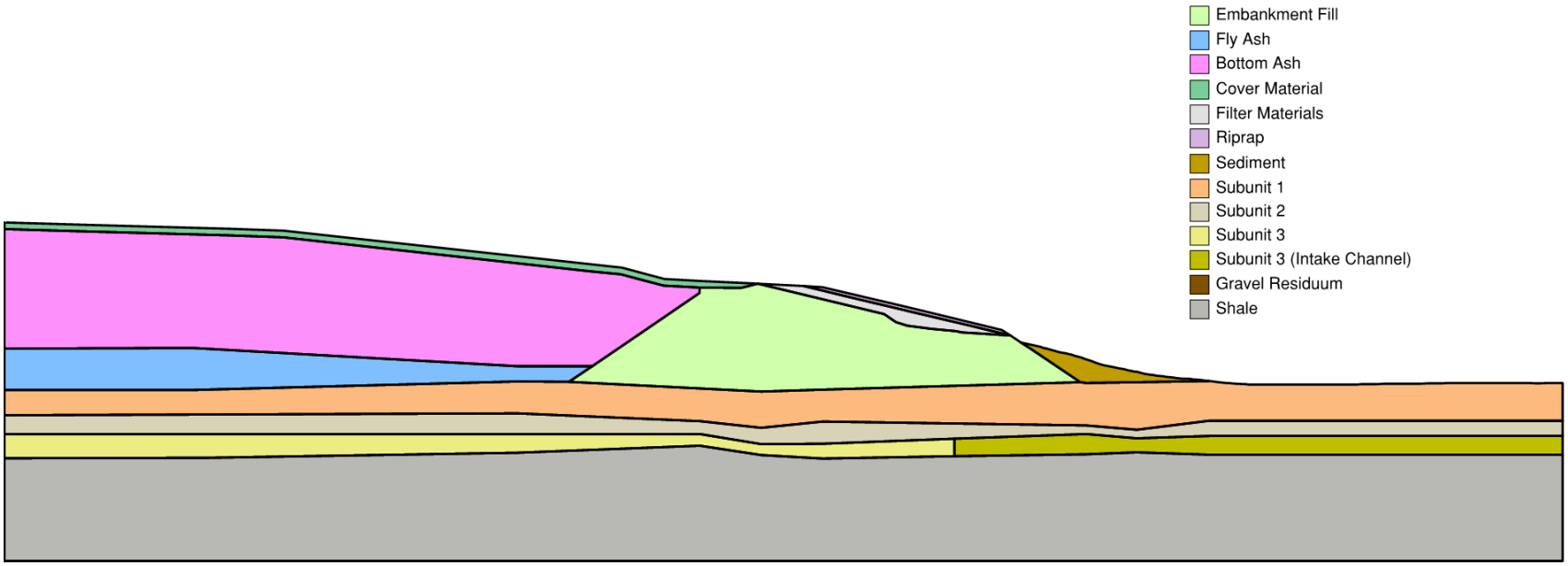
4.2.1 Cross Section A-A': Basis for Selection

Cross section A-A' was selected to represent the typical slope geometry of the portion of the East Dike near the intake channel. This section was previously analyzed by Geosyntec (2010a and 2012). Since the previous analyses, the Sluice Trench and Ballfield East of Sluice Trench has been regraded and capped with geosynthetics and cover soil (AECOM 2019). The outboard slope of the East Dike was also modified for seepage mitigation purposes (AECOM 2017).

The geometry of the groundline was developed by combining the plant-wide LiDAR survey, completed in 2017, the top of ground surveys (i.e., as-built surveys) completed as part of the seepage mitigation construction and closure construction at the East Dike, and a bathymetric survey completed in 2020 as part of the Phase 2 Exploratory Drilling. The original design drawings depict the geometry and extents of the material used in the construction of the East Dike, which is comprised of lean clay fill, with some shale fragments. The outboard face of the dike has a reverse graded filter, which consists of Filter Materials between the Embankment Fill and Riprap. The Cover Material represents the cap system installed over

the Fly Ash and Bottom Ash materials on the inboard side of the East Dike. The section is underlain by alluvial foundation soil, beginning with an alluvial clay (Subunit 1) transitioning to silty sand (Subunits 2 and 3). The foundation soil in the intake channel is generally overlain by a thin veneer of Sediment. Figure 16 shows the analysis section with the various materials color-coded for ease of review.

Figure 16. Materials in Stability Analysis Section A-A

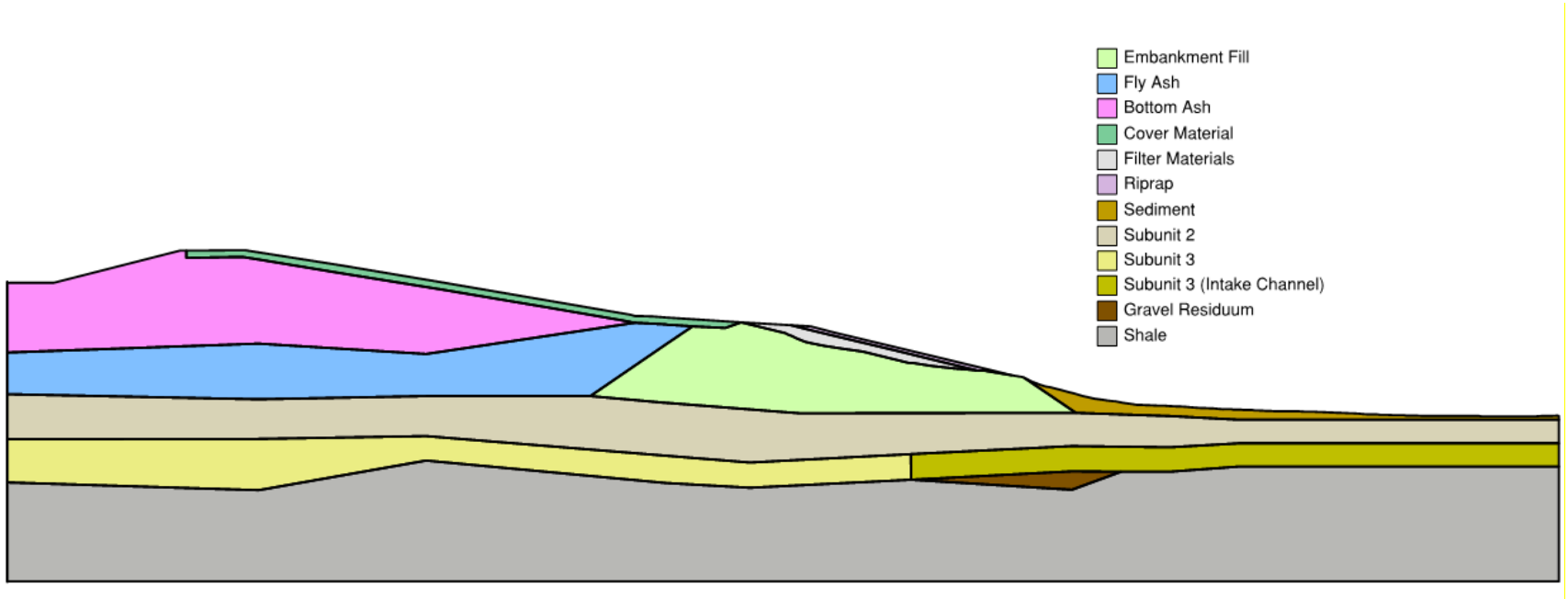


4.2.2 Cross Section “Polishing Pond”: Basis for Selection

Cross section “Polishing Pond” was selected to represent the typical section of the East Dike that includes the Polishing Pond but excludes the buttressing effect of the Engineered Wetlands. This section was previously analyzed by AECOM (2016a) during the planning and design of the Polishing Pond; however, since the previous analyses, the Sluice Trench and Ballfield East of Sluice Trench has been regraded (including fill placed between the Polishing Pond and the East Dike) and capped with geosynthetics and cover soil (AECOM 2019). The outboard slope of the East Dike was also modified for seepage mitigation purposes (AECOM 2017).

Similar to Section A-A’, the geometry of the groundline was developed by combining the plant-wide LiDAR survey, completed in 2017, the top of ground surveys (i.e., as-built surveys) completed as part of the seepage mitigation construction and closure construction at the East Dike, and a bathymetric survey completed in 2020 as part of the Phase 2 Exploratory Drilling. Additionally, the record drawings for the newly constructed Polishing Pond were used to update the slope and pond geometry. The outboard face of the dike also has a reverse-graded filter, which consists of Filter Materials placed on the outboard face of the Embankment Fill and covered with Riprap. The Polishing Pond was constructed overtop of the Fly Ash and Bottom Ash, which is retained by the East Dike. The section is underlain by alluvial foundation soil, beginning with alluvial sandy silt (Subunit 2) and transitioning to a silty sand (Subunit 3) above bedrock. In one small portion of the intake channel at this section, Gravel Residuum was encountered between Subunit 3 and the bedrock. As noted in Section 4.1.1.7, Subunit 1 is generally absent in this vicinity and was not modeled. The foundation soils modeled along the outboard toe of the East Dike are overlain by a thin layer of sediment, similar to Section A-A’. Figure 17 shows the analysis section with the various materials color-coded for ease of review.

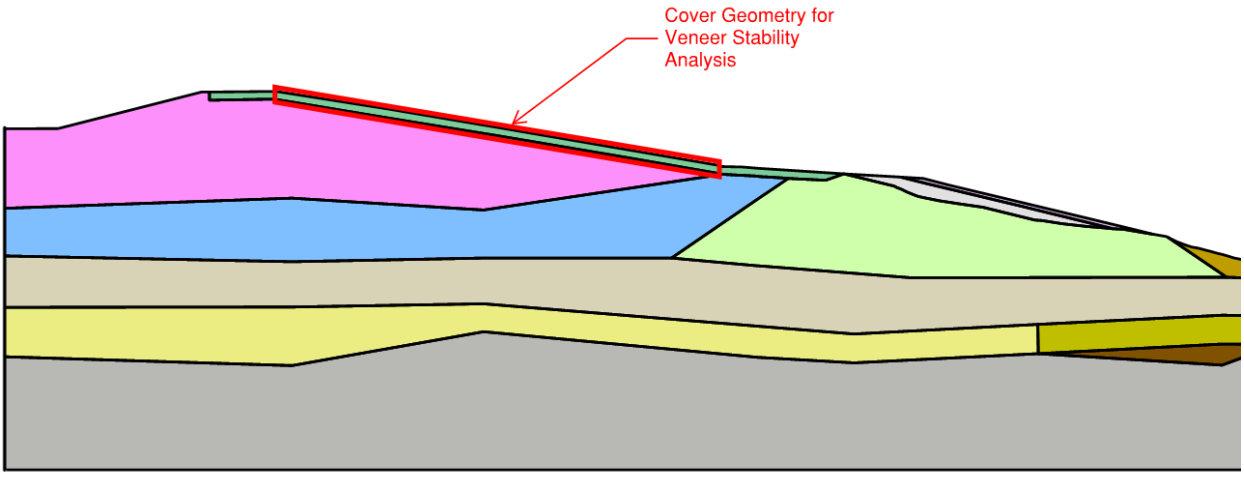
Figure 17. Materials in Stability Analysis Section "Polishing Pond"



4.2.3 Typical Section for Veneer Stability: Basis for Selection

The veneer stability was evaluated at the steepest section within the unit (Figure 18), along the Polishing Pond section, with the 2.0 ft of soil above the geosynthetic components, where the mid-slope angle is 10 degrees and the mid-slope height is 11.2 ft above the access road.

Figure 18. Selected geometry for Veneer Stability analyses



5.0 LOADING CONDITIONS AND ACCEPTANCE CRITERIA

5.1 LOAD CASES, PHASED ASSESSMENT, AND ACCEPTANCE CRITERIA

The load cases, phased assessment, and acceptance criteria presented here were approved in the EIP (Stantec 2018b). The Stability SAP (2018a) contains a detailed explanation of the basis for the load cases and acceptance criteria.

The load cases to be evaluated in the stability analyses are based on conventional practice and appropriate industry standards for landfills and surface impoundments, as applicable.

- Seismic, pseudostatic global stability
- Seismic, pseudostatic veneer stability
- Seismic, post-earthquake global stability (includes a preceding liquefaction triggering assessment).

The stability analyses defined in the Stability SAP are performed using a phased assessment process. Initial phases employ available site information, simplified analysis methods, and more conservative acceptance criteria. If acceptable performance is demonstrated, the analyses for the particular load case(s) are then complete. If not, the next phase may include collection of additional site information and/or more advanced analysis methods. Less conservative acceptance criteria may be utilized, commensurate with the improved site characterization. The process may continue through multiple phases, as outlined in the Stability SAP. The use of a phased approach is consistent with industry standard engineering practices.

The load cases and acceptance criteria presented herein (Table 13) apply specifically for the TDEC Order. The same CCR units may also be subject to other requirements (which may be more or less stringent) for compliance with other regulations such as state permitting, CCR Rule, etc. This Stability SAR documents Phase 2 TDEC Order stability assessments as noted in Table 1. The process for Phase 1 and 2 assessments are as follows:

Phase 1 Assessment (Seismic Load Cases)

- Use available geotechnical data SPT, CPT, laboratory testing, etc.
    - Where geotechnical data is insufficient, collect supplemental data.
- For seismic load cases, use site-specific design earthquake loading
    - If not already available, TVA will perform site-specific seismic hazards assessment (Section 5.3).

- Complete liquefaction triggering assessment based on SPT and CPT data
- Compute pseudostatic factor of safety (global, FS_{pseudo} and veneer, $FS_{pseudo\text{-}veneer}$ slope stability)
    - Using Newmark displacement analyses, compute displacements for range of yield accelerations
    - Select pseudostatic coefficient equal to yield acceleration that gives displacement of three feet in the Newmark analysis
    - Assign strengths considering results of liquefaction assessment
    - Compute pseudostatic FS_{pseudo} and $FS_{pseudo\text{-}veneer}$.
- Compute static, post-earthquake factor of safety (global slope stability)
    - Assign pseudostatic coefficient equal to zero (static case)
    - Assign strengths considering results of liquefaction assessment
    - Compute post-earthquake $FS_{post\text{-}EQ}$.
- Performance is acceptable if the following criteria are met
    - $FS_{pseudo} \geq 1.0$
    - $FS_{pseudo\text{-}veneer} \geq 1.0$
    - $FS_{post\text{-}EQ} \geq 1.1$.
- If any load cases do not meet criteria, go to Phase 2.

Phase 2 Assessment (Seismic Load Cases)

- Perform additional site explorations in targeted areas
    - Critical areas to be identified by parametric analyses
    - SPT using mud rotary drilling (or other suitable drilling method)
    - Seismic CPT soundings (companion to SPT locations)
    - Lab testing tailored to analysis needs (including triaxial and/or direct shear strength testing, as applicable).
- Complete liquefaction triggering assessment
    - Update Phase 1 analyses with new site data.
- Compute pseudostatic factor of safety (FS_{pseudo} and $FS_{pseudo\text{-}veneer}$)

    - Update Phase 1 analyses with new site data.

- Compute post-earthquake factor of safety ($FS_{post\text{-}EQ}$)
    - Update Phase 1 analyses with new site data.
- Performance is acceptable if the following criteria are met
    - $FS_{pseudo} \geq 1.0$
    - $FS_{pseudo\text{-}veneer} \geq 1.0$
    - $FS_{post\text{-}EQ} \geq 1.0$ (lower criteria based on improved site characterization).
- If any load cases do not meet criteria, go to Phase 3 (refer to Stability SAP).

Refer to the Stability SAP for discussion of other phases of stability assessment.

Table 13. Summary of Load Cases and Acceptance Criteria

Load Case	Pool Levels	Incipient Motion	Analysis	Soil Strengths	Pore Pressures	Acceptance Criteria
Pseudostatic, Global and Veneer	Impoundment (where applicable): Normal Operating Pool Adjacent Reservoir: Winter Pool	Inboard (Impoundments Only) and Outboard	Undrained Seismic	Undrained Seismic	Seepage for Modeled Pool Levels and/or Piezometer Data	FS ≥ 1.0 (Correlated to tolerable displacement of 3 feet[1])
Post-Earthquake, Global	Impoundment (where applicable): Normal Operating Pool Adjacent Reservoir: Winter Pool	Inboard (Impoundments Only) and Outboard	Undrained Static	Undrained Seismic; Residual Strengths in Liquefied Materials	Seepage for Modeled Pool Levels and/or Piezometer Data	FS ≥ 1.0 (Phase 2)

Notes:

1. Tolerable displacement subject to adjustment based on site-specific features and consequences of specific failure modes.

5.2 POOL LEVELS AND PORE WATER PRESSURES

Table 14 presents the pool levels and the basis of the phreatic surfaces used to predict pore pressures in the slope stability analyses.

For seismic load cases, the pool within an impoundment (where applicable) is the normal operating pool. The pool in the adjacent body of water (e.g., river or reservoir) is the normal operating pool (Summer or Winter Pool, whichever is more conservative) for the reservoir.

The slope stability analyses require pore water pressures for computing effective consolidation stresses, as defined for the load conditions. Pore water pressures were estimated by assigning a piezometric line to the cross section based, in part, on available site-specific piezometer data.

Consideration of both estimated pore water pressures and adjacent reservoir pool levels (where applicable) will generally encompass the phreatic conditions that will be experienced by the unit.

Table 14. Pool Levels and Phreatic Surfaces at KIF Plant

CCR Unit	Pool Levels		Basis of Phreatic Surface
	Impoundment	Adjacent Water Body	
Sluice Trench and Ballfield East of Sluice Trench	N/A	Emory River/Intake Channel	Nearby temporary well and piezometer data. Construction records for seepage mitigation system along East Dike.

The Emory River (including the Intake Channel for the KIF Plant) is adjacent to the East Dike at each cross section. The Emory River joins the Tennessee River just downstream of the site, both of which are then impounded by Watts Bar Dam approximately 38 miles downstream from the KIF Plant. The headwater of Watts Bar Dam varies seasonally per a prescribed operating guide, which includes target elevations for Winter and Summer Pools. The annual operating guide for Watts Bar Dam targets the Winter Pool, which is approximately five feet lower than the targeted Summer Pool, from December 1 to April 1 (TVA 2020). This seasonal change is observed in the Emory River water levels at the KIF Plant, as recorded by an onsite river gauge. The Winter Pool was modeled in the stability analyses because the lower pool (compared to the Summer Pool) provides less resisting force along the outboard slope of the East Dike and thus is more conservative for slope stability analysis. For this analysis, the elevation of the Winter Pool was defined as the median elevation for the two most recent winters of daily readings during the periods of December 1, 2018 to April 1, 2019 and December 1, 2019 to April 1, 2020. This pool elevation was calculated to be 737.4 ft.

The phreatic surfaces for both sections were developed using the calculated onsite Winter Pool and piezometric data collected from temporary wells and piezometers installed at the Sluice Trench and Ballfield East of Sluice Trench. The piezometric data were obtained from TVA's geotechnical instrumentation database. Median values of available piezometric data from the past two years were used. For most instruments, the available data consisted of periodic readings from May to December

2019 and one reading from April 2020. The available data for vibrating wire piezometers KIF-B09A, KIF-B09B, KIF-B13A, and KIF-B13B, which were installed during the Phase 2 Exploratory Drilling, consisted of automated readings from April to June 2021. The instruments used to create the phreatic surface for Section A-A' include temporary well KIF-TW04 and piezometers PZ-A1, PZ-A2, KIF-B09A, and KIF-B09B (Geosyntec 2010a). The instruments used to create the phreatic surface for the Polishing Pond Section include the temporary wells KIF-TW04 and KIF-TW05, and piezometers PZ-B1, PZ-B2, PZ-B3, KIF-B13A, and KIF-B13B (Geosyntec 2010a). The instruments are located between the interior of the adjacent Interim Ash Staging Area and the crest of the East Dike. Generally, the instruments used for the phreatic surface at the Polishing Pond section were southwest of the section. The instruments used for the phreatic surface at Section A-A' generally aligned with the cross section. The piezometric surface at the outboard face of the East Dike was controlled by the invert elevation of the seepage collection pipe at each section, as defined in construction documentation from the KIF East Dike Seepage Mitigation project (AECOM 2017).

It should be noted that the Polishing Pond (Figure 1), located partially within the boundaries of the Sluice Trench and Ballfield East of Sluice Trench CCR unit, is lined with geomembrane. Thus, the water in this pond is hydraulically isolated from the subsurface and does not influence the underlying phreatic surface. However, the weight of the water within the pond was included as a surcharge load in the Polishing Pond analysis section. The surcharge load was modeled for a pond elevation of 769.2 ft, which is the designed normal pool (AECOM 2016b).

5.3 SEISMIC LOADING

The design earthquake is an event with a two percent probability of exceedance in 50 years (i.e., return period of 2,475 years). This return period is similar to that of an event with a 10% probability of exceedance in 250 years (return period of 2,373 years).

Seismicity at the KIF Plant can primarily be attributed to the New Madrid seismic zone and smaller, less concentrated crustal faults relatively closer to the plant. The New Madrid seismic zone, located along the borders of Tennessee, Kentucky, Arkansas, and Missouri, is capable of producing large magnitude earthquakes, and relatively long durations of ground shaking across the area. While other seismic sources, that may represent significant seismic risks at the KIF Plant, are associated with maximum earthquake magnitudes less than the New Madrid seismic zone, larger accelerations may occur due to their closer proximity to the site (Stantec 2017). The two earthquake scenarios that were considered in the evaluation of the pseudostatic global stability, post-earthquake global stability, and seismic veneer stability of the Sluice Trench and Ballfield East of Sluice Trench at the KIF Plant are:

- The near-field event represents a local, moment magnitude (M_w) = 6.0 earthquake, originating in the East Tennessee Seismic Source Zone. This earthquake scenario produces higher accelerations with dominant frequencies in the range of 10 Hertz (Hz). The peak ground acceleration (hard rock) for this event is 0.106 times the acceleration due to gravity (g).
- The other design earthquake is a far-field, M_w = 7.6, New Madrid event originating in western Tennessee. This event has a larger magnitude but is much farther from the site. The resulting

accelerations are lower, and also in the lower frequency range of about one Hz. The peak ground acceleration (hard rock) for this event is 0.033 g.

This seismic hazard model is the same as that considered in the design of the adjacent dredge cell closure (i.e., KRP Ash Landfill) and adjacent Stilling Pond closure at the KIF Plant.

For the stability analyses, multiple acceleration time histories were used to represent expected bedrock motions under the unit during the design earthquakes. Seven-time histories were developed by Stantec (2019) for the one Hz scenario. Seven-time histories were developed by Stantec (2019) and six-time histories were developed by AMEC Geomatrix (2009) for the 10 Hz scenario. These motions are the same as those considered in the design of the adjacent Stilling Pond closure. Ground response analyses were used to predict the resulting seismic loads in the soil column and unit. Peak accelerations at the ground surface were computed for use in the liquefaction triggering analyses. Acceleration time histories along potential failure surfaces were also estimated, as needed for the seismic deformation analyses. Refer to Appendix D for details of the ground response analyses.

6.0 METHODOLOGY

6.1 GENERAL

6.1.1 Software

Slope stability is evaluated using conventional, limit equilibrium methods as implemented in the GeoStudio SLOPE/W 2016 software (GEO-SLOPE 2015). Available from GEO-SLOPE International, Ltd., of Calgary, Alberta, Canada (www.geo-slope.com), SLOPE/W is a special-purpose computer code designed to compute the stability of earth slopes using two-dimensional, limit equilibrium, method of slices analyses. SLOPE/W 2016, version 8.16, is used for the analyses described herein. With SLOPE/W, the distribution of pore water pressures within the earth mass may be mapped directly from the results of a SEEP/W analysis.

6.1.2 Assumed System(s) of Slice Forces

Limit equilibrium methods for evaluating slope stability consider the static equilibrium of a soil mass above a potential failure surface. In conventional, two-dimensional methods of analysis, the slide mass above an assumed failure surface is split into vertical slices. Stresses are evaluated along the sides and base of each slice. The factor of safety against a slope failure (FS_{slope}) is defined as:

$$FS_{slope} = \frac{shear\ strength\ of\ soil}{shear\ stress\ required\ for\ equilibrium} \qquad \textbf{Equation 1}$$

where the strengths and stresses are computed along a defined failure surface, on the base of the vertical slices. The shearing resistance at locations along the potential slip surface is computed, with appropriate Mohr-Coulomb strength parameters, as a function of the total or effective normal stress.

Spencer's solution procedure (Spencer 1967), which satisfies the conditions of equilibrium for each slice, is used in this study. Key assumptions and features of Spencer's method include (United States Army Corps Engineers 2003; Duncan and Wright 2005):

- Interslice forces are assumed to have the same inclination angle with respect to the horizontal. The inclination is computed as part of the solution.
- The normal force on the base of each slice is assumed to act at the center of the base
- A trial and error solution is required, to solve for equilibrium
- Force and moment equilibrium are satisfied for each slice, and the overall slide mass
- Circular and noncircular potential failure surfaces can be evaluated
- The procedure computes FS_{slope} for an assumed failure surface. A search must be made to find the critical slip surface corresponding to the lowest FS_{slope}.

6.1.3 Optimization Scheme to Define Critical Rupture Surface

Once a critical slip surface is identified by the automated search routine, the "optimization" feature in SLOPE/W is used to consider the possible effects of localized changes in the slip surface. The code divides the critical slip circle into linear segments, then moves the end points while searching for a surface that yields a lower FS_{slope}. The optimization routine will sometimes produce a slip surface with reverse curves, or one that is not otherwise kinematically logical. If the inferred, failure mechanism is not a realistic representation of slope movements, the "optimized" result is discarded.

A variety of these methods is used in searching for the critical slip surface. The details of the employed strategy are relatively unimportant, however, as different approaches usually lead to similar answers. The final failure surface, representing the critical slip surface associated with FS_{slope}, is selected by the engineer based on the analytical results, the automated search outcomes, and knowledge of the geotechnical conditions.

6.1.4 Shapes of Rupture Surfaces Considered

SLOPE/W includes several options and trial routines to facilitate the search for the critical failure surface (GEO-SLOPE 2015). In the "grid and radius" search method, a region (divided into a grid) for the circle centers and a range of possible radii are specified for the trial slip circles. The code then automatically evaluates a large number of trial circles within those parameters, searching for one circle having the lowest FS_{slope}. In the "entry and exit" method, the search considers potential slip circles that intersect the ground surface within specified ranges. Where a potential failure circle intersects a much stronger, "impenetrable" layer (such as rock), SLOPE/W automatically evaluates composite slip surface (circles with straight-line portions along the interface). Non-circular slip surfaces are considered using the "block method".

Slip surfaces are evaluated for two conditions in the analyses: failure surfaces that intercept the contained CCR and shallow (D_{min} = 10 ft) failure surfaces. See additional discussion in Section 6.1.5.

6.1.5 Consideration of Shallow Slope Instabilities

When an earth slope is comprised of a cohesionless soil, an infinite slope mechanism will have the least resistance to sliding. An infinite slope failure will result in shallow raveling of the embankment slope. Localized, shallow slips of this type can be repaired to prevent progression to a deeper sliding mechanism, such that infinite slope failures are usually considered as a potential maintenance issue. Moreover, capillary stresses (which are neglected in the analysis) in the near surface soil will create an apparent cohesion that resists shallow sliding.

In a stability analysis where the surficial soil is modeled with a strength envelope having zero cohesion (c = 0), the lowest factor of safety will be computed for shallow sliding parallel to the slope face. The slope stability analyses presented here are focused on the potential for slope failures of significant mass, which could directly impact the safety of the CCR unit. The search for a critical slip surface in the stability analyses is thus restricted, to consider only potential surfaces where the depth (measured at the base of

at least one slice) is more than 10 ft vertically below the ground surface. Shallower slip surfaces at depths less than 10 ft, representing infinite slope failures, are ignored in the analysis.

The minimum specified depth may be increased or decreased as needed to study failure mechanisms for a given slope geometry. Consideration of sliding depths less than 10 ft may be warranted on relatively short structures. Other criteria are appropriate where shallow sliding could initiate a progressive failure that would impact a significant portion of the CCR unit or critical project components. Any history of shallow slides at the CCR unit would be relevant.

In cases where shallow surface sliding is found to give the lowest safety factor, additional analyses are completed to evaluate failure surfaces that would intercept the contained CCR within the unit. The search parameters are set to find a critical slip surface that intercepts CCR within the unit.

This “CCR intercept” stability analysis will indicate a different factor of safety, for a potential failure mode that would more clearly correspond to an unacceptable CCR release condition. In reporting the stability results, the CCR intercept failures are thus given greater emphasis than the failures that do not intercept CCR.

6.1.6 Exclusion of Retrogressive Slope Failure Mechanisms

A retrogressive slope failure (sometimes called a progressive slope failure) develops as a sequence of soil movements, where an initial slide mass triggers additional movement farther up the slope. If not remediated, a retrogressive failure on a CCR unit can eventually progress to the contained CCR and lead to an uncontrolled release.

Retrogressive slope failures are not evaluated herein. If acceptance criteria are met for the load cases under consideration, a retrogressive slope failure will be unlikely. Furthermore, retrogressive failures develop over a period of time and should be identified with sufficient time for intervention to remediate the failure before the contained CCR is impacted.

6.1.7 Tension Cracks

When the soils at the head of a slip surface are assigned cohesive strength (c > 0) in a slope stability analysis, tensile stresses are often computed along the base of the slices in that area. In the field, tensile stress results in the opening of a tension crack, reducing the lateral stresses to zero. Because tension results in a stabilizing force at the head of the slide mass, it is unconservative to have tensile stresses between the slices in a slope stability analysis. This problem is discussed by Duncan and Wright (2005).

When tensile stresses are reported in the stability calculation, a vertical tension crack is introduced into the analysis at the ground surface. The crack depth is increased until tensile stresses (negative normal stresses on the base of a slice) are no longer indicated. The depth of the tension crack (d_{crack}) should not exceed this theoretical maximum value:

$$(d_{crack})_{max} = \frac{2\,c_d}{\gamma_m \tan(45 - 0.5\phi_d)}$$ **Equation 2**

Here, γ_m is the moist unit weight, and c_d and ϕ_d are the developed shear strength parameters ($c_d = c / FS_{slope}$, $\tan\phi_d = \tan\phi / FS_{slope}$), for the upper soil layer at the head of the slip surface.

For earthquake load cases, tension cracks are assumed to be dry. For other load cases, an incipient failure may coincide with rain and surface runoff, which would fill a tension crack with water and create an additional lateral force on the slide mass. Tension cracks are thus assumed to be full of water for these load cases.

6.1.8 Drained versus Undrained Analyses

Conventional, geotechnical stability is evaluated for only two bounding conditions:

- Drained conditions, where the pore pressures are assumed to be unchanged, shear strengths are computed based on the effective stress at failure, and effective stress stability analyses are used
- Undrained conditions, where the final pore pressures (including pore pressures induced by shearing) are unknown, shear strengths are constant or computed based on the effective consolidation stress, and total stress analyses are used.

The inherent assumptions for each condition are summarized in Table 15. The type of analysis to be used for each load case is defined in Section 5.1.

When setting up the slope stability analysis, each material zone is considered individually to determine which strength parameters (drained or undrained) should be assigned for a particular load case. Within an undrained, total stress stability analysis, it may be appropriate to treat some permeable material zones as fully drained (that is, assume no excess pore pressure at failure and assign effective stress strength parameters), while undrained strength parameters are specified in other zones.

The decision to treat a particular material zone as drained or undrained is based on how rapidly the loading condition develops with respect to how quickly pore pressures induced by the loading can dissipate. In most cases, clean, coarse rockfill will be fully drained under the considered loading conditions, even during seismic loading. Most other soils, including sands, will behave undrained during seismic loading. In marginal cases, the time factor (T) can be estimated to judge when a particular soil zone is drained or undrained in a particular load case (see Appendix E).

For either drained or undrained stability analyses, pore pressures are specified for each material zone consistent with how the strength parameters model the shearing resistance in that soil. The input pore pressures are used to compute the effective consolidation stresses along the trial failure surfaces. When “drained” strengths (c’, ϕ’) or “consolidated undrained” (c, ϕ) strengths are used, the shearing resistance is computed from the consolidation stresses normal to the failure surface. When undrained strengths are characterized using c/p (S_u/σ'_{vo}) ratios, the shearing resistance (S_u) is computed based on the vertical effective stress to which the soil has been consolidated at points along the slip surface. Technically, pore pressures are not needed where “unconsolidated undrained” (S_u, $\phi = 0$) strengths are specified. Because the assigned strength is constant in this case, pore pressures input for $\phi = 0$ soils will have no impact on the slope stability solution.

In practice, it is therefore acceptable to provide steady-state pore pressures for each material for both drained, effective-stress and undrained, total-stress analyses. In each considered load case, pore pressures are computed to represent the steady-state seepage condition, prior to loading to failure (Section 6.1.9).

Table 15. Conditions for Drained versus Undrained Analyses

	Drained Condition	Undrained Condition	
Loading Cases (Section 5.1)	Long-Term	Pseudostatic Post-Earthquake	
Type of Stability Analysis	Effective Stress	Total Stress	
Pore Pressures at Failure	Assumed equal to steady state seepage	Unknown, cannot be predicted with confidence	
Characterization of Shear Strength	Drained, effective stress parameters	Undrained strength parameters	
Strength Parameters	c', ϕ'	S_u, ϕ = 0	c, ϕ or S_u/σ'_{vo}
Pore Pressures used in Stability Analysis	From steady state seepage model	Pore pressures not used	From steady state seepage model

6.1.9 Input Pore Pressures

The slope stability analyses require pore water pressures for computing effective consolidation stresses, as defined for the specified load conditions (Section 5.1). Pore pressures are predicted based on the depth below the assumed phreatic surface, sometimes called the piezometric line. This line illustrates the locations in the cross section at which the pore pressure is assumed to be zero. The pore pressure increases hydrostatically with distance below this line.

The pore water pressures in some stability analyses must be computed using piezometric lines. Due to software limitations, SLOPE/W cannot use mapped pressures from the SEEP/W solution for certain load cases.

A piezometric line is assumed to correspond to the phreatic line (line of zero pore pressure) predicted by SEEP/W. The phreatic line is manually digitized for input to SLOPE/W, which then computes pore pressures at any point based on the depth below this line. Some of the detailed information from the seepage analysis is thus lost because SLOPE/W cannot interpolate the nodal pore pressures from the finite element solution.

The less rigorous method, using piezometric lines to compute pore pressures, may or may not be conservative, depending on the geometry and details of the seepage problem. Little to no error occurs when seepage passes through a uniform cross section and the phreatic surface is horizontal. Greater inaccuracies are introduced when pore pressures are computed from more steeply sloping piezometric lines.

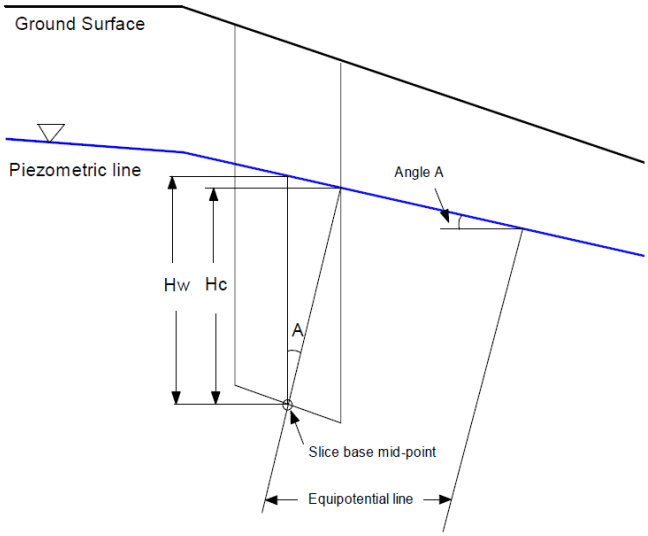
To reduce this error in the undrained analyses that use piezometric lines, an approximate "phreatic correction" is employed within SLOPE/W. Instead of computing pressures based on the vertical distance below the piezometric line, pore water pressures (u) are computed as (GEO-SLOPE 2015):

$$u = \gamma_w H_c = \gamma_w H_w \cos^2 A \qquad \textbf{Equation 3}$$

The unit weight of water is γ_w. The heights used to compute the pore pressure at the base center of the slice with and without correction are H_c and H_w, respectively. The variables in Equation 3 are further defined on Figure 19. The correction factor ($\cos^2 A$) is one for a horizontal phreatic surface (A = 0°) and approaches zero as the phreatic surface approaches vertical (A = 90°).

Pore water pressures above the phreatic line are assumed to be zero. That is, pore pressures within the unsaturated material are set to zero so that no additional soil strength along the slip surface is attributed to suction pressures (capillary tension).

Figure 19. Phreatic Surface Correction (from GEO-SLOPE 2015)



6.1.10 Composite Strength Envelopes in Undrained Analyses

Most soils will exhibit dilative shear behavior at low confining pressures. When saturated soils are consolidated to low effective stress and then sheared without drainage, the tendency to expand will cause decreasing pore pressures (suction). This results in increasing effective stress and shearing resistance, but the additional shear strength due to negative pore pressures may not be sustainable in the field. Hence, computed factors of safety for stability may be unconservative if some part of the slip surface has an undrained strength greater than the drained strength.

To avoid relying upon suction pressures for undrained shearing resistance, composite (bi-linear) drained-undrained strength envelopes (see Appendix E) are used in the undrained stability analyses. The undrained strength is then the lesser of the undrained or drained strength envelopes at any given normal stress. Composite strength envelopes are used for the undrained stability analyses, including the seismic stability analyses, as indicated in the summaries of the undrained strength parameters.

In SLOPE/W, composite or bi-linear strength envelopes are specified in terms of the intercept and friction angle of the drained strength branch, the friction angle of the undrained strength branch, and the transition normal stress (where the drained and undrained envelopes cross).

6.1.11 Single-Stage versus Multiple-Stage Analyses

In a single-stage slope stability analysis, the sliding resistance and factor of safety are computed concurrently, for a given failure surface, problem geometry, and applied load. This approach is correct when the soil mass consolidates under the loading conditions being evaluated for stability. Here, single-stage stability analyses are appropriate for the construction, normal operations, post-earthquake, and each of the drained, effective stress analyses. In each of these cases, the steady state seepage conditions and applied external loads occur under the same conditions (geometry and applied load) and can be modeled in one limit equilibrium calculation.

In the other undrained load cases, the soils in the slope consolidate under an initial set of conditions, and the factor of safety is desired for a later, different load condition. In a multiple-stage stability analysis, the sliding resistance is quantified in the first stage and the factor of safety is computed in subsequent stages of the calculation for a given slip surface (Duncan and Wright 2005). Multiple-stage stability analyses provide a more rigorous model of the stability conditions for the pseudostatic earthquake load cases.

Two-stage analyses are used for the pseudostatic load cases (Section 6.2). SLOPE/W implements these multi-stage calculations automatically. The effective consolidation stresses and pore water pressures are computed along a trial slip surface in the first stage of the calculation, without the applied pseudostatic forces. The undrained shear resistance along the slip surface is quantified based on these effective stresses. The factor of safety is then computed for the same trial slip surface in the second stage of the calculation, with the pseudostatic forces applied and no change in the computed shearing resistance.

6.2 SEISMIC STABILITY

6.2.1 Pseudostatic, Global Stability

Dynamic slope stability during an earthquake is evaluated using pseudostatic, limit equilibrium methods. A constant, uniform, horizontal pseudostatic force is applied to the materials in the slope to approximate the dynamic, inertial loads generated by seismic shaking.

The simple concept of a constant pseudostatic force does not adequately account for soil flexibility, degradation in soil strength during the earthquake, the effects of embankment geometry on the ground motions, and the very short duration of the acceleration peaks. These factors make it difficult to select a pseudostatic coefficient that will adequately represent the dynamic effects of an earthquake on an earth slope. Pseudostatic analyses are acceptable for screening-level evaluations of embankments or slopes, where the computed factors of safety can be used to judge if more detailed analyses are warranted. The results are generally invalid, however, for marginally stable slopes subjected to strong accelerations, when significant soil liquefaction is predicted, or when substantial slope deformations are expected.

Pseudostatic forces are applied only in the horizontal direction in the stability analyses. Vertical inertia is ignored, because vertical accelerations will tend to reduce (or increase, depending on the direction of motion) both the driving soil weight and the sliding resistance (Kramer 1996). In the analysis of a dam, the pseudostatic forces are applied in the assumed direction of incipient motion. That is, a pseudostatic, horizontal force acting in the downstream direction is applied when evaluating downstream stability. The

applied direction is upstream for upstream stability. Seismic shear stresses are not transmitted through a water column, so pseudostatic forces are not applied to ponded water above the ground surface (GEO-SLOPE 2015).

The pseudostatic analyses are run in SLOPE/W so that the shear strength along the slip surface is not altered by the pseudostatic forces. That is, a two-stage pseudostatic analysis (Section 6.1.11) is completed. Consolidation stresses and shear strength are computed in the first stage, without the pseudostatic forces, and the factor of safety is computed in the second stage with the pseudostatic forces applied.

Seismic strength parameters (Table 8) are used for each soil. Undrained soil strengths are reduced to 80% of the static undrained strength, to account for pore pressure buildup, some strain-softening, and strain incompatibility during the earthquake (Section 4.1.7). The contribution of suction pressures to shearing resistance is neglected by specifying composite drained-undrained strength envelopes (Section 6.1.10). For liquefied soils, residual strengths (Section 4.1.8) are conservatively applied in the pseudostatic stability analyses.

The pseudostatic force, which is applied to the centroid of each slice in the limit equilibrium stability analyses, is computed as:

$$F_h = \frac{a_h W}{g} = k_h W \qquad \textbf{Equation 4}$$

Here, F_h is the applied inertial force, a_h is the horizontal acceleration, W is the weight of soil in each slice, and g is the acceleration due to gravity. The horizontal pseudostatic coefficient (k_h) is a dimensionless ratio, or fraction of gravity, representing the horizontal acceleration due to shaking. The value of k_h is usually selected as a fraction of the peak horizontal ground acceleration (PGA, in g's).

Guidelines for selecting an appropriate pseudostatic coefficient (k_h) to evaluate seismic slope stability have been suggested by several authors:

- Terzaghi (1950) suggested using k_h = 0.10, 0.20, and 0.50 for "severe", "violent, destructive", and "catastrophic" earthquakes, respectively
- For dams, Marcuson (1981) suggested using k_h = (0.33 to 0.50) PGA, with consideration for potential amplification or deamplification of the ground motions due to the dynamic characteristics of the structure
- Hynes-Griffin and Franklin (1984) recommended using k_h = 0.50•PGA, where PGA is the maximum horizontal acceleration at the bedrock surface. Their method was calibrated to the results of deformation analyses, so that a pseudostatic factor of safety of one would correspond to acceptable displacements (about 1 meter or less).
- Several authors (Seed and Martin 1966; Seed 1979; Taniguchi and Sasaki 1986; Dakoulas and Gazetas 1986; and Krinitzsky et al. 1993) showed that the value of k_h for an earth dam is a

function of the size of the sliding mass. They suggested k_h = PGA for a small sliding mass, k_h = 0.65 PGA for an intermediate sliding mass, and k_h = 0.10 to 0.15 for a large sliding mass.

- Kramer (1996) indicated that the Hynes-Griffin and Franklin (1984) method is appropriate for most slopes, but that the seismic coefficient should be based on the actual anticipated level of acceleration in the soil mass being evaluated, taking into account the effects of amplification or deamplification within the slope

- Kavazanjian et al. (1997) recommend using k_h = 0.17 PGA if a ground response analysis is performed, and k_h = 0.50 PGA if a ground response analysis is not performed. In this case, they use PGA computed at the ground surface, at the top of the slope.

For this stability evaluation, the pseudostatic coefficient is estimated based on the results of a Newmark sliding block analysis as defined in Appendix F. That is, the pseudostatic coefficient is taken as the yield acceleration corresponding to a Newmark displacement equal to the tolerable displacement (36 inches for this stability evaluation, per Section 5.1).

The procedure is as follows:

- A pseudostatic slope stability analysis is conducted, with the horizontal acceleration coefficient adjusted until a sliding factor of safety of one is obtained (FS=1). The critical failure surface from this analysis defines the slide mass and failure surface used in the subsequent step.

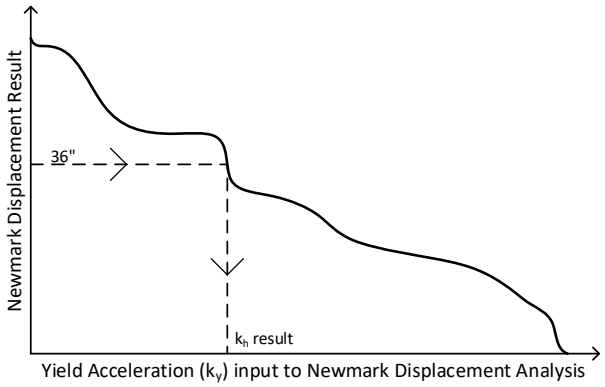
- Using the failure surface from the previous step, the ground motion time history is converted to a Horizontal Equivalent Acceleration (HEA) time history as described in Appendix F using Ground Response Analysis

- The Newmark displacement calculation is performed for the HEA time history repeatedly, using a different value of the yield acceleration each time. The results are plotted on a figure similar to Figure 20.

- From the plot produced in the proceeding step, the yield acceleration corresponding to a displacement of 36 inches is selected as the pseudostatic coefficient.

One value of k_h is obtained from each ground motion time history. However, pseudostatic stability analyses are needed only for the maximum value of k_h, as lower values of k_h will result in higher calculated factors of safety. For each earthquake load case (scenario event), k_h is obtained for each time history, and the maximum of these values is then used in the pseudostatic stability analyses.

Figure 20. Example plot of Newmark displacement versus yield acceleration



In the Newmark analysis, residual strength parameters were conservatively applied to the liquefied soils throughout the duration of the earthquake. In reality, soil shear strength would decrease from the drained strength to the residual strength as the earthquake progressed and pore water pressures accumulate.

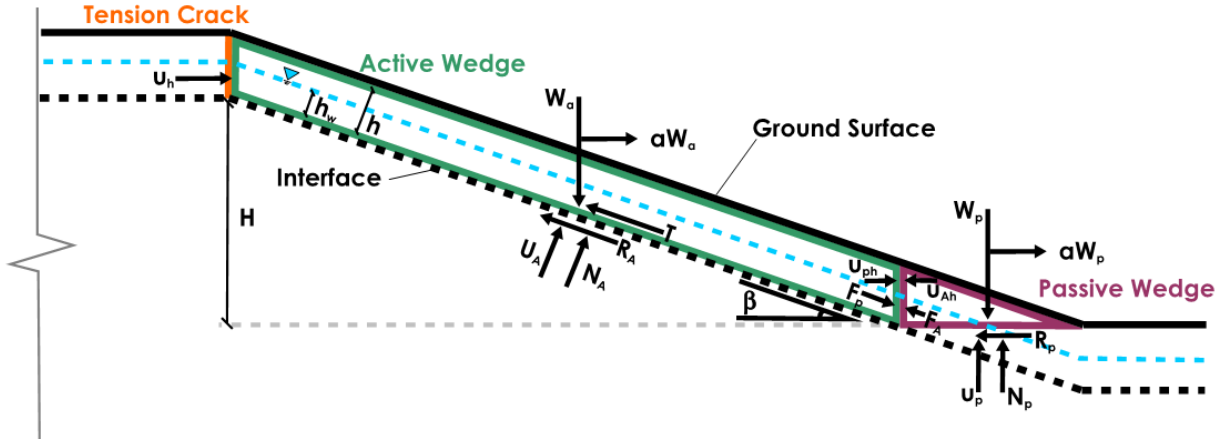
The predicted slope displacements are conservatively high because the yield acceleration is computed with reduced, undrained soil strengths for unliquefied materials and residual strengths for liquefied materials. The displacement analysis assumes liquefaction has already triggered at the start of the earthquake. In reality, the yield acceleration declines in successive cycles of seismic loading, as pore pressures accumulate and saturated soils become weaker. The analysis outlined here assumes reduced strengths at the start of the earthquake, so the computed yield acceleration is lower than the initial value in the slope. This results in conservatively larger predictions of displacements. Given the approximations involved in this simplified method of analysis, a more complex treatment of the yield acceleration is not warranted.

6.2.2 Pseudostatic, Veneer Stability

Veneer stability analyses were used to assess the potential for sliding in the cap system of the CCR unit. The geometry of the veneer stability problem is relatively simple and can be represented with a series of force balance equations.

An equation for the factor of safety for veneer stability was developed following the procedures outlined in Koerner and Soong (2005). A free body diagram (Figure 21) illustrates the forces considered in the analysis. The derivation and definitions of the variables used in the veneer stability derivation are provided in Section 2.0 of Appendix C.

Figure 21. Free body diagram representing veneer stability problem



The veneer stability analysis is a pseudostatic analysis when a nonzero value is used for the lateral acceleration, a. The nonzero value for the lateral acceleration at the base of the Cover Material was determined per the following process, which is further detailed in Appendix C.

The ground response analyses discussed in Section 5.3 and Appendix D were used to determine a pseudostatic acceleration for the veneer stability analysis of the cover system. The ground response analysis results (from Appendix D) for vertical profiles that pass through the midslope of the East Dike, were used. The computed accelerations at the base of the cover system were examined.

The peak acceleration at the base of the cover layer was selected, for each of the input ground motions that were analyzed. The maximum of all computed peak accelerations was selected. The peak acceleration is a very short duration, high frequency pulse. To obtain a reasonable indication of the seismic force, the lateral acceleration (a) used in the pseudostatic veneer stability analysis was assumed to be 65% of the peak acceleration at the base of the cover layer.

6.2.3 Liquefaction Triggering

The methodology employed to predict liquefaction triggering is described in Appendix F.

6.2.4 Post-Earthquake, Global Stability

Stability is also evaluated for the static conditions immediately following the cessation of the earthquake motions. No pseudostatic forces are applied. Residual or steady state strengths are assigned in zones where soil liquefaction is predicted (Appendix F).

The seismic strength parameters summarized in Table 8 and Table 10 are specified for unliquefied and liquefied soils, respectively. For unliquefied soils, the undrained strengths are reduced to 80% of the static undrained strength, to account for cyclic softening and pore pressure buildup during the earthquake. The contribution of suction pressures to shearing resistance is neglected by specifying composite drained-undrained strength envelopes (Section 6.1.10).

7.0 RESULTS

The global stability results presented (and compared to the acceptance criteria) are those in which the critical failure surface intercepts the contained CCR within the unit (See Section 6.1.5). The global stability analysis models and critical failure surfaces are shown in Appendix B. Calculations for the veneer stability results presented below are included in Appendix C.

7.1 SEISMIC STABILITY

The seismic stability analyses presented below are the lowest sliding factors of safety of the two design earthquake scenarios considered: the one Hz and 10 Hz scenarios.

The pseudostatic, global stability and post-earthquake, global stability were analyzed for each cross section. The pseudostatic, veneer stability was analyzed for the typical geometry of the cover system. The results of the seismic stability analyses, with the minimum required FS for each case, are summarized in Table 16.

Table 16. Seismic Stability Results at KIF Plant

CCR Unit	Analysis Type	Cross Section	FS Required[1]	FS Sliding[1]
Sluice Trench and Ballfield East of Sluice Trench	Pseudostatic, Global	A-A'	≥ 1.0	< 1.0 (see discussion below)
Sluice Trench and Ballfield East of Sluice Trench	Pseudostatic, Global	Polishing Pond	≥ 1.0	< 1.0 (see discussion below)
Sluice Trench and Ballfield East of Sluice Trench	Pseudostatic, Veneer	Typical	≥ 1.0	1.0
Sluice Trench and Ballfield East of Sluice Trench	Post-Earthquake, Global	A-A'	≥ 1.0	1.0
Sluice Trench and Ballfield East of Sluice Trench	Post-Earthquake, Global	Polishing Pond	≥ 1.0	0.8

1. Required and calculated FS for Factor of Safety from Phase 2 assessment

The ability to compute a factor of safety for the pseudostatic case is first dependent on the slope being stable (FS Sliding ≥ 1.0) with no seismic loading ($k_h = 0$). Recall that in the Newmark analysis (Section 6.2.1), residual strength parameters were conservatively applied to the liquefied soils throughout the duration of the earthquake. Thus, the post-earthquake case ($k_h = 0$) conservatively represents the starting condition for the pseudostatic case. For the Polishing Pond section, the post-earthquake FS is less than 1.0, thus a valid yield acceleration cannot be computed for the Newmark analysis and the displacement is inferred to exceed the tolerable value of three ft. For Section A-A', the post-earthquake FS is 1.0 and the yield acceleration therefore is zero. Given the design earthquake accelerations, the displacement is inferred to exceed the tolerable value of three ft. As defined herein, Newmark displacements in excess of three ft correlate to pseudostatic FS less than 1.0.

7.1.1 Liquefaction and Cyclic Softening Triggering Evaluations

Each material, excluding the Riprap, Filter Materials, Gravel Residuum, and Cover Material, was first evaluated to determine whether the material was characteristically sand-like or clay-like using CPT, SPT, and laboratory data. The Riprap, Filter Materials, Gravel Residuum, and Cover Material were not evaluated because these materials are either free draining (Riprap and Filter Materials), too dense to liquefy (Gravel Residuum), or unsaturated (Cover Material).

Laboratory testing results indicate that the Bottom Ash, Fly Ash, Subunit 2, and Subunit 3 are sand-like materials. CPT data was also used to evaluate whether the material is sand-like or clay-like using criteria from Robertson (2008), where CPT data is placed into one of four zones, shown in Section 3.4 of Appendix D. The Bottom Ash CPT data indicated equal proportions of clay-like and sand-like samples; 50% of samples were sand-like based on the Robertson criteria. A large proportion of the Fly Ash CPT samples, 84%, were found to be sand-like. Subunit 2 had near equal proportions of sand-like and clay-like samples based on the CPT data, 48% of samples were sand-like. A large portion of the CPT data for Subunit 3, 91% of samples, were sand-like, similar to the laboratory testing results.

Liquefaction triggering was assessed using the process outlined in Appendix F. Using this process, the materials predicted to liquefy extensively at both cross sections in the Sluice Trench and Ballfield East of Sluice Trench during the design earthquakes are the Fly Ash and Subunit 3. As discussed in Section 4.1.8, the Sediment is also assumed to liquefy. Results are summarized in Table 17, and are accounted for in the pseudostatic and post-earthquake, global stability analyses.

The Embankment Fill and Subunit 1 were clay-like materials based on laboratory testing results. The CPT data indicated that the Embankment Fill had near equal proportions of sand-like and clay-like material, where 49% of the samples were clay-like. The CPT data for Subunit 1 indicated a similar proportion of clay-like samples as the laboratory testing, where 99% of the CPT samples were clay-like. A summary of the clay-like and sand-like determination for the materials is presented previously in Table 9 (Section 4.1.8). Cyclic softening is not predicted to occur in the clay-like materials, Subunit 1 and the Embankment Fill, for the design earthquakes. Results are summarized in Table 17, and are accounted for in the pseudostatic and post-earthquake, global stability analyses.

Table 17. Liquefaction Triggering Results at KIF Plant

CCR Unit	Cross Section	Liquefaction Predicted?	Cyclic Softening Predicted?
Sluice Trench and Ballfield East of Sluice Trench	A-A’	Yes, in Fly Ash, Subunit 3, and Sediment	None
Sluice Trench and Ballfield East of Sluice Trench	Polishing Pond	Yes, in Fly Ash, Subunit 3, and Sediment	None

8.0 VARIATIONS

The proposed scope and procedures for the stability analysis were outlined in the SAP and QAPP, as detailed in the sections above. Variations in scope or procedures discussed with TDEC and/or TVA are described in the following sections. As discussed below, these variations do not impact the overall usability and representativeness of the dataset provided in this SAR for the stability analysis activities at the KIF Plant.

8.1 VARIATIONS IN SCOPE

No variations in scope occurred during stability analysis activities.

8.2 VARIATIONS IN PROCEDURES

Variations in procedures occurring during the stability analysis are provided below.

- This SAR summarizes activities completed to meet the objectives of the Stability SAP (Stantec 2018a), for applicable seismic load cases. Static load cases (if any) required by the SAP are documented in a separate Static Stability SAR. This change in procedure was approved by TDEC.

9.0 SUMMARY

The objective of this study was to document the execution of the seismic stability analyses, conducted pursuant to the Stability SAP (Stantec 2018a), and to serve as part of the underlying basis for the EAR. The SAP specified how new and updated global and veneer stability analyses for the Sluice Trench and Ballfield East of Sluice Trench should be developed. Static load cases (if any) required by the SAP are documented in a separate Static Stability SAR.

The stability analyses performed as part of this SAR include pseudostatic, global and veneer stability analyses and post-earthquake, global stability analyses performed in accordance with the methods outlined in the SAP. These analyses were performed at two representative global stability cross sections and one representative veneer cross section at the Sluice Trench and Ballfield East of Sluice Trench.

The seismic stability results for the KIF Plant are summarized and compared to criteria in Table 16. The veneer stability for the typical section meets the established factor of safety criteria for the pseudostatic load case. In this Phase 2 assessment, the global stability results of both cross sections are below the established factor of safety criteria for the pseudostatic and post-earthquake load cases. The global pseudostatic and post-earthquake stability results are primarily driven by the liquefaction potential and residual strengths within the foundation soil subunits, which can be evaluated further in Phase 3 and Phase 4 assessments as described below.

Phase 2 stability analyses, as defined in the Stability SAP, were performed for each defined section and case. The analyses employed available site information, including additional Exploratory Drilling data, and simplified analysis methods. For cases meeting acceptance criteria, no subsequent phases of stability analysis are required. For cases not meeting acceptance criteria, Phase 3 and Phase 4 assessments may be appropriate, per the Stability SAP. A Phase 3 assessment may include a nonlinear deformation analysis to estimate displacements due to the design earthquake. A Phase 4 assessment considers the consequences (impacts to human health and/or environment) of the predicted deformations (from Phase 3).

Instead of pursuing the Phases 3 and 4 of analysis of the existing conditions, TVA has elected to pursue seismic mitigation of the Sluice Trench and Ballfield East of Sluice Trench. TVA is currently evaluating mitigation alternatives that would be designed to meet the seismic stability acceptance criteria as defined in the Stability SAP. This path forward will be noted in the EAR, and it is anticipated that the mitigation design process will commence in parallel with the Corrective Action/Risk Assessment phase of the TDEC Order program.

Stantec has completed the Phase 2 seismic stability analyses at the KIF Plant in Harriman, Tennessee, in accordance with the Stability SAP as documented herein. The results are usable for reporting and evaluation in the EAR and meet the objectives of the TDEC Order EIP. The results will be evaluated along with data collected under other TDEC Order SAPs, as well as other State and CCR programs. This evaluation will be provided in the EAR.

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APPENDIX A - EXHIBITS

Exhibit No.

A.1

Title

Site Location Map

Client/Project

Tennessee Valley Authority
Kingston Fossil (KIF) Plant TDEC Order

Project Location

Roane County, Tennessee

175668043
Prepared by MB on 2020-05-19
Technical Review by AB on 2020-05-19

0 1,000 2,000 3,000 4,000 Feet

1:12,000 (At original document size of 22x34)

Legend

- CCR Unit Area (Approximate)
- Engineered Wetlands (Approximate)
- Polishing Pond (Approximate)

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Topographic mapping corresponds to the Harriman Quadrangle (Edition of 2019, Scale 1:24,000) and the Elverton Quadrangle (Edition of 2019, Scale 1:24,000)

Stantec TVA

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APPENDIX B – GLOBAL STABILITY ANALYSIS RESULTS

Summary of Global Slope Stability Analyses and Results - KIF - Sluice Trench and Ballfield East of Sluice Trench (Closed Condition)

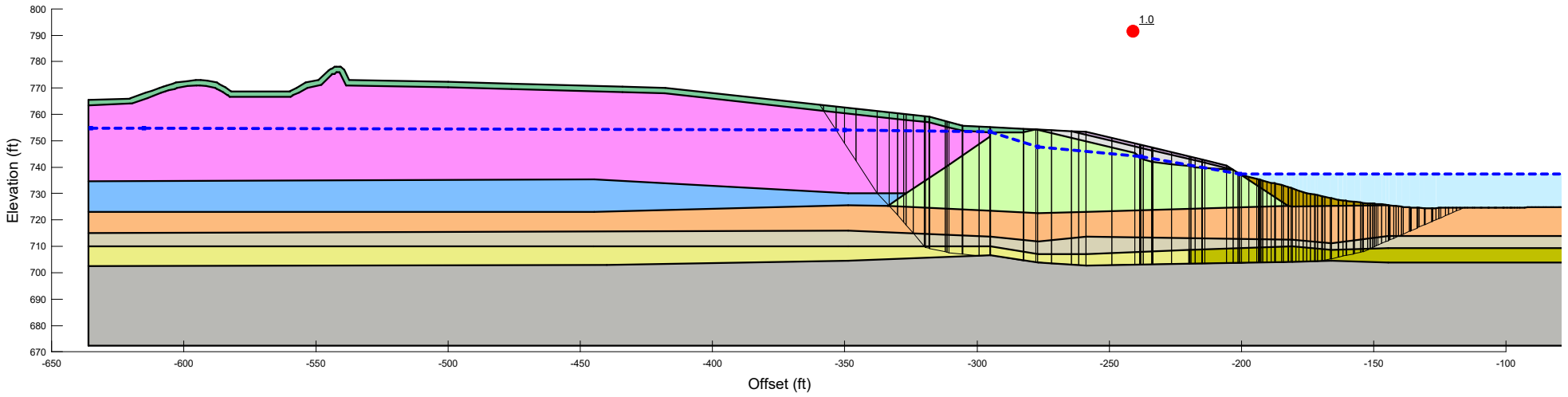
Cross Section	Load Case	Pool Levels	Incipient Motion	Analysis	Soil Strengths	Pore Pressures	Slope Stability Analysis Results			
							Dmin=10' & CCR Intercept		Dmin=10'	
							Acceptance Criteria	Factor of Safety for Sliding (FS)	Acceptance Criteria	Factor of Safety for Sliding (FS)
Section A-A'	Pseudostatic	Adjacent Reservoir: Winter Pool	Outboard	Undrained Seismic	Undrained Seismic; Residual Strengths in Liquefied Materials	Piezometric Line	FS ≥ 1.0	< 1.0 (see note)	N/A	< 1.0 (see note)
	Post-Earthquake			Undrained Static	Undrained Seismic; Residual Strengths in Liquefied Materials		FS ≥ 1.0	1.0	N/A	1.0
Polishing Pond	Pseudostatic	Adjacent Reservoir: Winter Pool	Outboard	Undrained Seismic	Undrained Seismic; Residual Strengths in Liquefied Materials	Piezometric Line	FS ≥ 1.0	< 1.0 (see note)	N/A	< 1.0 (see note)
	Post-Earthquake			Undrained Static	Undrained Seismic; Residual Strengths in Liquefied Materials		FS ≥ 1.0	0.8	N/A	0.8

Note: The ability to compute a factor of safety for the pseudostatic case is first dependent on the slope being stable (FS Sliding ≥ 1.0) with no seismic loading (kh = 0). In the Newmark analysis, residual strength parameters were conservatively applied to the liquefied soils throughout the duration of the earthquake. Thus, the post-earthquake case (kh = 0) conservatively represents the starting condition for the pseudostatic case. For Section A-A', the post-earthquake FS is 1.0 and the yield acceleration therefore is zero (ky = 0 g). Given the design earthquake accelerations, the displacement is inferred to exceed the tolerable value of 3 feet. For the Polishing Pond section, the post-earthquake FS is less than 1.0, thus a valid yield acceleration cannot be computed for the Newmark analysis and the displacement is inferred to exceed the tolerable value of 3 feet. Newmark displacements in excess of 3 feet correlate to pseudostatic FS less than 1.0.

Kingston Fossil Plant (KIF) TDEC Order	**Slope Stability Analysis – FS = 1.0**	Note: The results of the analysis shown here are based on available subsurface information, laboratory test results and approximate soil properties. The drawing depicts approximate subsurface conditions based on historical drawings or specific borings at the time of drilling. No warranties can be made regarding the continuity of subsurface conditions.
Sluice Trench and Ballfield East of Sluice Trench	Post-EQ, Global Case (Dmin=10' & CCR Intercept) Winter Pool; Undrained, PostEQ Strengths; Outboard Incipient Motion; Slip Surface: Entry-Exit Search, 10' Minimum Depth	
Section A-A'		

Material	Unit Weight (pcf)	Drained Strength Parameters Phi (deg.)	Drained Strength Parameters Cohesion (psf)	Undrained Strength Parameters Phi (deg.)	Undrained Strength Parameters Cohesion (psf)
Bottom Ash (Post EQ)	124	37	0	34	0
Cover Material (Post EQ)	121	16	0	16	0
Embankment Fill (Post EQ)	128	36	0	9	1,040
Filter (Post EQ)	130	33	0	33	0
Fly Ash (Post EQ)	112	34	0	0	400
Riprap (Post EQ)	125	40	0	40	0
Sediment (Post EQ)	113	26	0	0	50
Shale	--	--	--	--	--
Subunit 1 (Post EQ)	127	32	0	17	800
Subunit 2 (Post EQ)	127	35	0	28	0
Subunit 3 (Post EQ)	131	37	0	0	375
Subunit 3 (Intake Channel) (Post EQ)	131	37	0	0	200

At a given effective stress, the lesser of the drained and undrained strengths is used.

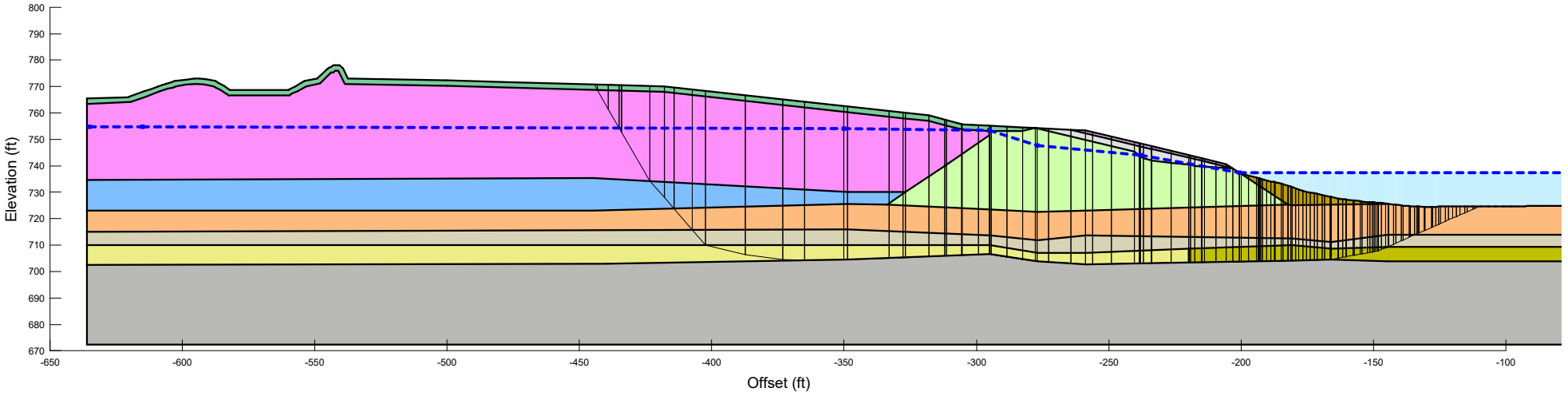


Kingston Fossil Plant (KIF) TDEC Order	**Slope Stability Analysis – FS = 1.0**	Note: The results of the analysis shown here are based on available subsurface information, laboratory test results and approximate soil properties. The drawing depicts approximate subsurface conditions based on historical drawings or specific borings at the time of drilling. No warranties can be made regarding the continuity of subsurface conditions.
Sluice Trench and Ballfield East of Sluice Trench	Post-EQ, Global Case (Dmin=10') Winter Pool; Undrained, PostEQ Strengths; Outboard Incipient Motion; Slip Surface: Grid & Radius Search, 10' Minimum Depth	
Section A-A'		

		Drained Strength Parameters		Undrained Strength Parameters	
Material	Unit Weight (pcf)	Phi (deg.)	Cohesion (psf)	Phi (deg.)	Cohesion (psf)
Bottom Ash (Post EQ)	124	37	0	34	0
Cover Material (Post EQ)	121	16	0	16	0
Embankment Fill (Post EQ)	128	36	0	9	1,040
Filter (Post EQ)	130	33	0	33	0
Fly Ash (Post EQ)	112	34	0	0	400
Riprap (Post EQ)	125	40	0	40	0
Sediment (Post EQ)	113	26	0	0	50
Shale	--	--	--	--	--
Subunit 1 (Post EQ)	127	32	0	17	800
Subunit 2 (Post EQ)	127	35	0	28	0
Subunit 3 (Post EQ)	131	37	0	0	375
Subunit 3 (Intake Channel) (Post EQ)	131	37	0	0	200

At a given effective stress, the lesser of the drained and undrained strengths is used.

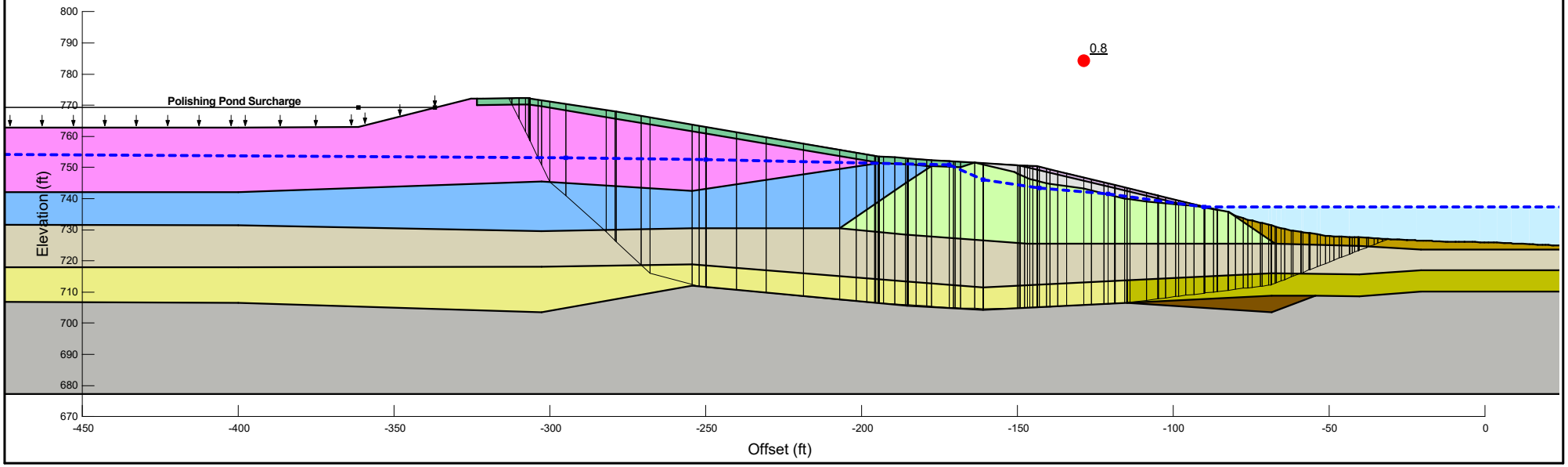
1.0



Kingston Fossil Plant (KIF) TDEC Order	**Slope Stability Analysis – FS = 0.8**	Note: The results of the analysis shown here are based on available subsurface information, laboratory test results and approximate soil properties. The drawing depicts approximate subsurface conditions based on historical drawings or specific borings at the time of drilling. No warranties can be made regarding the continuity of subsurface conditions.
Sluice Trench and Ballfield East of Sluice Trench	Post-EQ, Global Case (Dmin=10' & CCR Intercept) Winter Pool; Undrained, PostEQ Strengths; Outboard Incipient Motion; Slip Surface: Entry-Exit Search, 10' Minimum Depth	
Polishing Pond Section		

		Drained Strength Parameters		**Undrained Strength Parameters**	
Material	Unit Weight (pcf)	Phi (deg.)	Cohesion (psf)	Phi (deg.)	Cohesion (psf)
Bottom Ash (Post EQ)	124	37	0	34	0
Cover Material (Post EQ)	121	16	0	16	0
Embankment Fill (Post EQ)	128	36	0	9	1,040
Filter (Post EQ)	130	33	0	33	0
Fly Ash (Post EQ)	112	34	0	0	400
Gravel Residuum (Post EQ)	138	37	0	37	0
Riprap (Post EQ)	125	40	0	40	0
Sediment (Post EQ)	113	26	0	0	50
Shale	--	--	--	--	--
Subunit 2 (Post EQ)	127	35	0	28	0
Subunit 3 (Post EQ)	131	37	0	0	375
Subunit 3 (Intake Channel) (Post EQ)	131	37	0	0	200

At a given effective stress, the lesser of the drained and undrained strengths is used.



Kingston Fossil Plant (KIF) TDEC Order

Sluice Trench and Ballfield East of Sluice Trench

Polishing Pond Section

Slope Stability Analysis – FS = 0.8

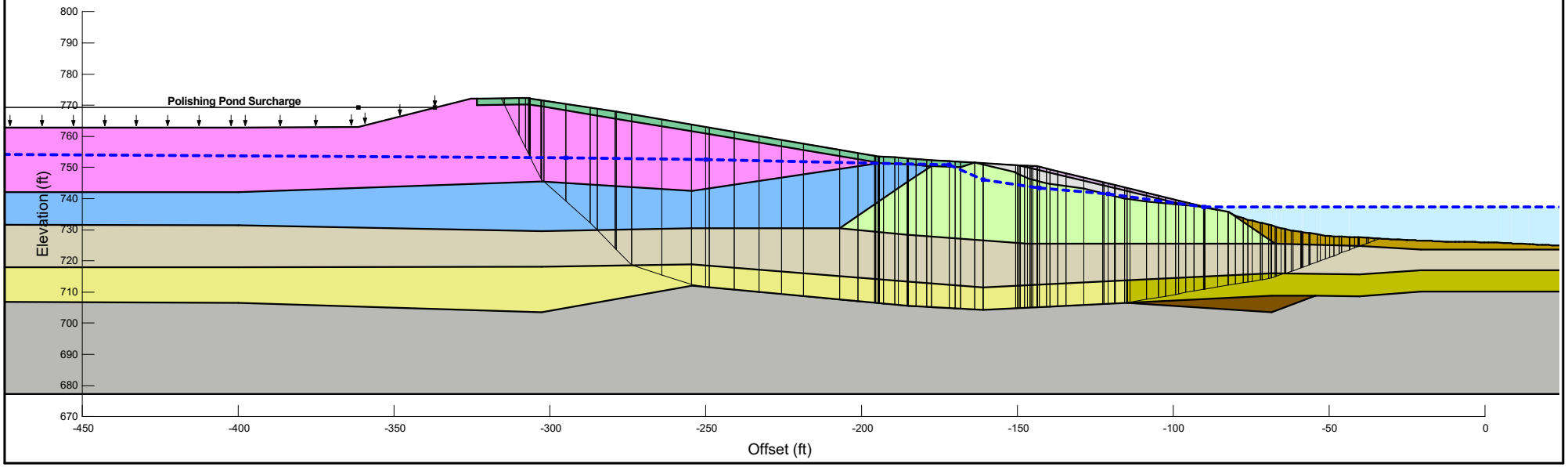
Post-EQ, Global Case (Dmin=10')
Winter Pool; Undrained, PostEQ Strengths; Outboard Incipient Motion;
Slip Surface: Grid & Radius Search, 10' Minimum Depth

Note: The results of the analysis shown here are based on available subsurface information, laboratory test results and approximate soil properties. The drawing depicts approximate subsurface conditions based on historical drawings or specific borings at the time of drilling. No warranties can be made regarding the continuity of subsurface conditions.

Material	Unit Weight (pcf)	Drained Strength Parameters Phi (deg.)	Drained Strength Parameters Cohesion (psf)	Undrained Strength Parameters Phi (deg.)	Undrained Strength Parameters Cohesion (psf)
Bottom Ash (Post EQ)	124	37	0	34	0
Cover Material (Post EQ)	121	16	0	16	0
Embankment Fill (Post EQ)	128	36	0	9	1,040
Filter (Post EQ)	130	33	0	33	0
Fly Ash (Post EQ)	112	34	0	0	400
Gravel Residuum (Post EQ)	138	37	0	37	0
Riprap (Post EQ)	125	40	0	40	0
Shale	--	--	--	--	--
Subunit 2 (Post EQ)	127	35	0	28	0
Subunit 3 (Post EQ)	131	37	0	0	375
Subunit 3 (Intake Channel) (Post EQ)	131	37	0	0	200

At a given effective stress, the lesser of the drained and undrained strengths is used.

0.8



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APPENDIX C – VENEER STABILITY ANALYSIS RESULTS

Tennessee Valley Authority Kingston Fossil Plant Kingston, Roane County, Tennessee	Sluice Trench and Ballfield East of the Sluice Trench

Appendix C
Veneer Stability Analyses

Purpose:

- Analyze stability of the cover system (cap) for the Sluice Trench and Ballfield East of the Sluice Trench.
- Estimate interface strength parameters (adhesion and friction angle) for the cover materials to support the stability analysis.

Methods:

- Consider veneer (infinite slope) stability failure mode for the cover system.
- Use the method developed by Koerner and Soong (2005).

Results:

- The veneer stability of the cap system is compared against the target FS value for a pseudostatic case.

Calculation Performed by: Stantec Consulting Services Inc.	
Prepared by: Nick Duda	*Reviewed by:* Jeff Dingrando
Date: 7/6/2021	

1. STABILITY CRITERIA

The stability of the cover system was analyzed for the conditions summarized in Table 1, as defined in the SAP. The associated acceptance criteria for minimum factor of safety (FS) are listed in the last column.

Table 1. Summary of Veneer Stability Cases and Design Criteria

Design Condition	Interface Strength	Cover Soil Strength	Saturated/ Unsaturated	Static/ Pseudostatic	Criteria for Slope Stability
Seismic	Peak	Drained	Unsaturated	Pseudostatic	FS > 1.0

2. ANALYSIS METHODOLOGY

Veneer stability analyses were used to assess the potential for sliding in the cap system. The geometry of the veneer stability problem is relatively simple and can be represented with a series of force balance equations.

An equation for the factor of safety for veneer stability was developed following the procedures outlined in Koerner and Soong (2005). The derivation follows. A free body diagram (Figure 1) illustrates the forces considered in the analysis. Definitions of the variables used in the veneer stability derivation are provided in Table 2.

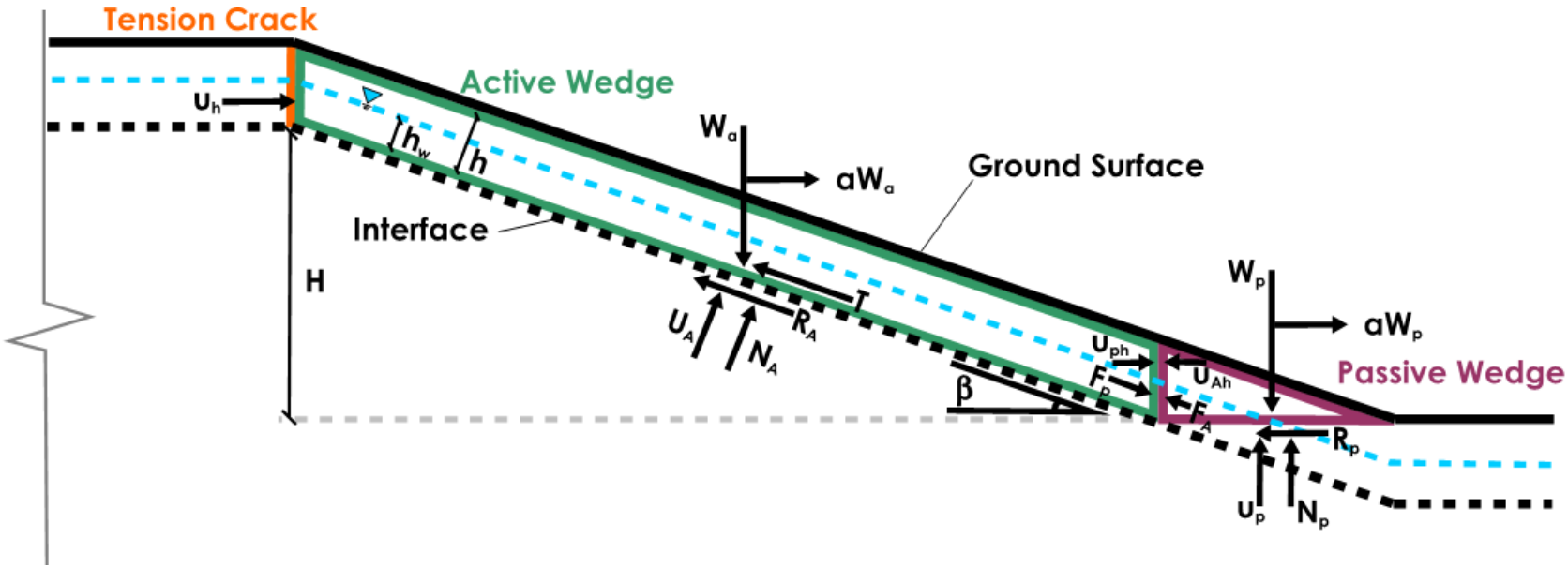
Tension Crack
Active Wedge
U_h
h_w
h
W_a
aW_a
Ground Surface
Interface
H
W_p
aW_p
Passive Wedge
T
U_A
R_A
N_A
U_{ph}
F_p
U_{Ah}
F_A
β
R_p
U_p
N_p

Table 2. Definition of Variables for Veneer Stability Derivation

Variable	Description
W_A	Total weight of the active wedge
W_P	Total weight of the passive wedge
N_A	Effective force normal to the active wedge failure plane
N_P	Effective force normal the passive wedge failure plane
h	Thickness of the cover soil
H	Height of the slope
β	Slope angle
a	Horizontal acceleration
u_h	Resultant of the pore pressures acting in the tension crack
u_A	Resultant of the pore pressures acting perpendicular to the slope
u_p	Resultant of the pore pressures acting perpendicular to the bottom on the passive wedge
u_{ph}	Resultant of the pore pressures acting on the inter-wedge surface to the passive wedge
u_{Ah}	Resultant o the pore pressures acting on the inter-wedge surface to the active wedge
h_w	Water height measured in the direction perpendicular to the slope
R_A	Resistance along the bottom of the active wedge
R_P	Resistance along the bottom of the passive wedge
F_A	Inter-wedge force acting on the active wedge from the passive wedge
F_P	Inter-wedge force acting on the passive wedge from the active wedge
T	Reinforcement
c_c	Cohesion of the cover soil
ϕ	Friction angle of the cover soil
γ	Moist unit weight of the cover soil
γ_{sat}	Saturated unit weight of the cover soil
Δγ	Difference between saturated and moist unit weight of the cover soil
c_a	Adhesion of the interface
δ	Friction angle of the interface
FS	Factor of safety
A, B, C, D, L, M, N	Arbitrary variables to simplify final equations

For the active wedge:

$$W_A = \left(\frac{H}{\sin\beta}\right) h_w \gamma_{sat} + \left(\frac{H}{\sin(\beta)}\right)(h - h_w)\gamma$$

$$W_A = \left(\frac{H}{\sin\beta}\right)(h_w \gamma_{sat} + h\gamma - h_w \gamma)$$

$$W_A = \left(\frac{H}{\sin\beta}\right)(h_w \Delta\gamma + h\gamma) \qquad \textbf{Equation 1}$$

$$u_h = \frac{1}{2}(\gamma_w h_w \cos\beta)\left(\frac{h_w}{\cos\beta}\right) = \frac{1}{2}\gamma_w {h_w}^2 \qquad \textbf{Equation 2}$$

$$u_{Ah} = \frac{1}{2}(\gamma_w h_w \cos\beta)\left(\frac{h_w}{\cos\beta}\right) = \frac{1}{2}\gamma_w {h_w}^2 = u_h \qquad \textbf{Equation 3}$$

$$u_A = (\gamma_w h_w \cos\beta)\left(\frac{H}{\sin\beta}\right) = \frac{\gamma_w h_w H}{\tan\beta} \qquad \textbf{Equation 4}$$

Considering force balance in the direction perpendicular to the slope:

$$N_A = W_A \cos\beta - aW_A \sin\beta - u_A - u_h \sin\beta + u_{ah} \sin\beta$$

$$N_A = W_A(\cos\beta - a\sin\beta) - u_A \qquad \textbf{Equation 5}$$

$$R_A = N_A \tan\delta + \frac{c_a H}{\sin\beta} \qquad \textbf{Equation 6}$$

Considering force balance in the direction parallel to the slope:

$$F_A = u_h \cos\beta + W_A \sin\beta + aW_A \cos\beta - u_{Ah} \cos\beta - \frac{R_a}{FS} - T$$

$$F_A = W_a(\sin\beta + a\cos\beta) - \frac{R_a}{FS} - T \qquad \textbf{Equation 7}$$

For the passive wedge:

$$W_p = \left(\frac{h}{\cos\beta}\right)\left(\frac{h}{\sin\beta}\right)\frac{\gamma}{2} + \left(\frac{h_w}{\cos\beta}\right)\left(\frac{h_w}{\sin\beta}\right)\frac{\Delta\gamma}{2}$$

$$W_p = \frac{h^2\gamma + {h_w}^2 \Delta\gamma}{\sin 2\beta} \qquad \textbf{Equation 8}$$

$$u_p = \frac{1}{2}(\gamma_w h_w \cos\beta)\left(\frac{h_w}{\sin\beta}\right) = \frac{\gamma_w {h_w}^2}{2\tan\beta} \quad \textbf{Equation 9}$$

$$u_{ph} = \frac{1}{2}(\gamma_w h_w \cos\beta)\left(\frac{h_w}{\cos\beta}\right) = \frac{1}{2}\gamma_w {h_w}^2 \quad \textbf{Equation 10}$$

Considering force balance in the vertical direction

$$N_p = W_p + F_p \sin\beta - u_p \quad \textbf{Equation 11}$$

$$R_p = N_p \tan\varphi + c_c \frac{h}{\sin\beta} \quad \textbf{Equation 12}$$

Considering force balance in the horizontal direction

$$F_p \cos\beta + u_{ph} + aW_p = \frac{R_p}{FS}$$

$$FS\left(F_p \cos\beta + u_{ph} + aW_p\right) = \left(W_p + F_p \sin\beta - u_p\right)\tan\varphi + c_c \frac{h}{\sin\beta}$$

$$F_p(FS\cos\beta - \sin\beta\tan\varphi) = \left(W_p - u_p\right)\tan\varphi + c_c \frac{h}{\sin\beta} - FS\left(u_{ph} + aW_p\right)$$

$$F_p = \frac{\left(W_p - u_p\right)\tan\varphi + c_c \frac{h}{\sin\beta} - FS\left(u_{ph} + aW_p\right)}{FS\cos\beta - \sin\beta\tan\varphi} \quad \textbf{Equation 13}$$

Let $F_A = F_p$, then:

$$W_a(\sin\beta + a\cos\beta) - \frac{R_a}{FS} - T = \frac{\left(W_p - u_p\right)\tan\varphi + c_c \frac{h}{\sin\beta} - FS\left(u_{ph} + aW_p\right)}{FS\cos\beta - \sin\beta\tan\varphi} \quad \textbf{Equation 14}$$

Let also:

$$A = W_a(\sin\beta + a\cos\beta) - T \quad \textbf{Equation 15}$$

$$B = \left(W_p - u_p\right)\tan\varphi + c_c \frac{h}{\sin\beta} \quad \textbf{Equation 16}$$

$$C = u_{ph} + aW_p \quad \textbf{Equation 17}$$

$$D = \sin\beta\tan\varphi \quad \textbf{Equation 18}$$

Then Equation 14 becomes:

$$A - \frac{R_a}{FS} = \frac{B - FS * C}{FS\cos\beta - \mathrm{D}}$$

$$\frac{A * FS - R_a}{FS} = \frac{B - FS * C}{FS\cos\beta - \mathrm{D}}$$

$$A\cos\beta\, FS^2 - A * D * FS - R_a\cos\beta\, FS + R_a D = B * FS - C * FS^2$$

$$(A\cos\beta + C)FS^2 - (AD + B + R_a\cos\beta)FS + R_a D = 0 \qquad \textbf{Equation 19}$$

Let:

$$L = A\cos\beta + C \qquad \textbf{Equation 20}$$

$$M = AD + B + R_a\cos\beta \qquad \textbf{Equation 21}$$

$$N = R_a D \qquad \textbf{Equation 22}$$

Then Equation 19 becomes:

$$L * FS^2 - M * FS + N = 0$$

$$FS = \frac{M + \sqrt{M^2 - 4LN}}{2L} \qquad \textbf{Equation 23}$$

Here, FS is the factor of safety for veneer sliding within the cap.

3. ANALYZED CONDITONS

3.1. COVER GEOMETRY

The final cover system (cap) on the Sluice Trench and Ballfield East of the Sluice Trench was constructed with soil and geosynthetic materials overlying CCR (labeled CCP in historical drawings) materials, having an overall thickness of 2.0 feet. The constructed cap system is shown in Figure 2 (AECOM 2019). The veneer stability was evaluated at the steepest section within the unit, along the Polishing Pond section, with the 2.0 feet of soil above the geosynthetic components, where the mid-slope angle is 10˚ and mid-slope height of 11.2 feet above the access road.

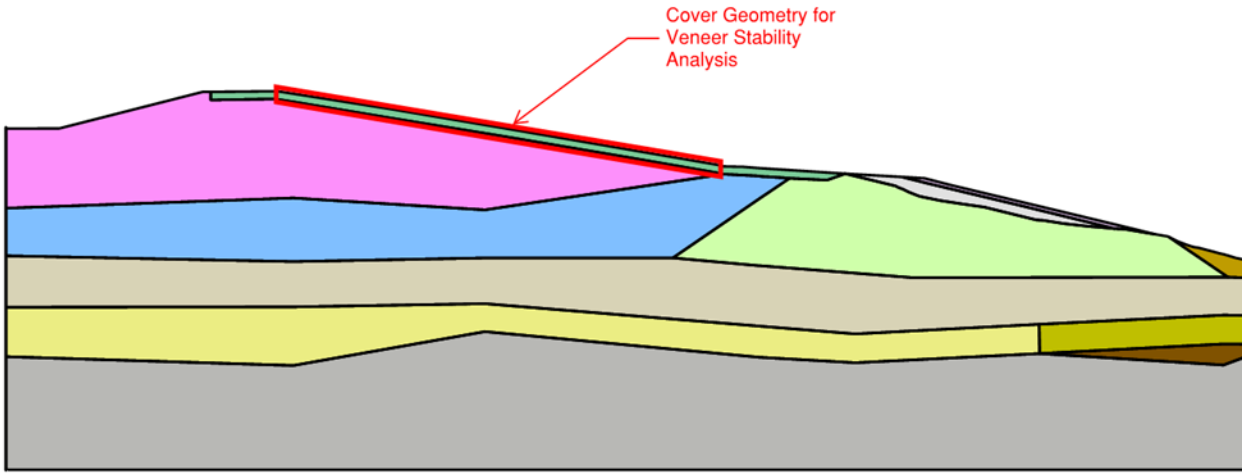

Figure 2. Selected geometry for Veneer Stability analyses

This analysis serves to evaluate the interface strengths encountered in the cap system. The results presented here apply to these interfaces (i.e., whichever has the lowest strength):

- Cover soil (internal shear strength, just above the geosynthetics)
- the cover soil/geocomposite drainage layer interface
- the geocomposite drainage layer/LLDPE textured geomembrane interface
- the LLDPE textured geomembrane/CCR material interface
- CCR (internal shear strength, just below the geosynthetics)

The interface strengths of the various materials in the cap system were evaluated to identify the critical interface and then compute the veneer factor of safety.

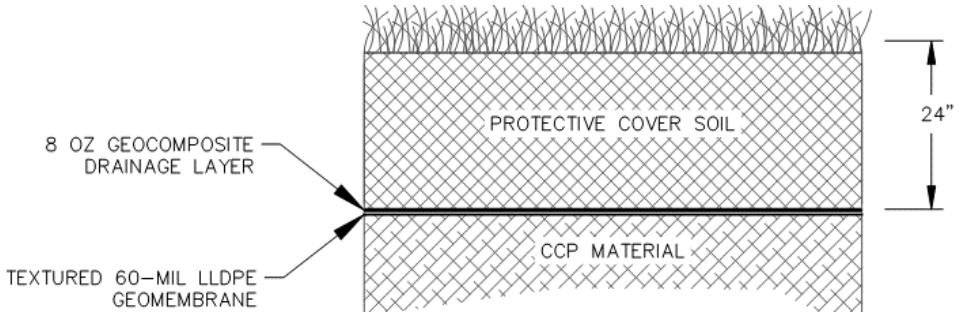

Figure 3. Cap System Constructed at the Sluice Trench and Ballfield East of the Sluice Trench (AECOM 2019)

3.2. COVER SOIL PARAMETERS

Values for the drained shear strength, moist unit weight, and saturated unit weight of the cover soil are required to perform the veneer stability analyses. Estimated parameters for the cover soil are summarized in Table 3.

The cover soil was sourced from the ”I-40 borrow area” and generally classified as fat clay with sand (CH), as detailed in the construction certification report for the closure of the unit in 2016 (AECOM 2016). It is assumed that similar material was used for the cover soil in the 2019 East Dike Area Closure.

Moist and saturated unit weights for the cover soil were estimated from available lab testing results. See Section 4.1 of the SAR for additional details.

For the veneer stability analysis, the drained shear strength parameters for the cover soil were estimated based on typical values from NAVFAC (1986) (see Figure 3 in Appendix D). Additionally, it is assumed that the Cover Material and CCR underlying the cap have no adhesion.

Table 3. Cover Soil Parameter Summary

Parameter	Value
Drained Friction Angle	19˚
Drained Cohesion	0 psf
Moist Unit Weight	120 pcf
Saturated Unit Weight	121 pcf

3.3. GEOSYNTHETIC PARAMETERS

The cover system constructed at the Sluice Trench and Ballfield East of the Sluice Trench was not evaluated for veneer strength prior to construction, likely due to the unit being relatively flat. It is assumed that the geocomposite/geomembrane interface is the weakest (i.e., most critical) of the above listed interfaces within the cap system.

Per the construction certification report for the closure of the East Dike, the geomembrane and geocomposite products used in the cap were the Agru 60-mil Microspike LLDPE and SKAPS Transnet HDPE Geocomposite with TN 330 Geonet (8 oz/yd^2) (AECOM 2019). No product-specific strength data was available in the construction report. In order to estimate the interface strength of the geocomposite/geomembrane interface, a literature review was conducted.

To estimate the geocomposite/geomembrane interface shear strength, a selection of studies was used to estimate the interface strength (Pavanello *et al.* 2018, Akpinar and Benson 2005, Stark *et al.* 1996, Bacas *et al.* 2015). Some of the geosynthetic interfaces evaluated in these papers were comparable to the interfaces within the cap system at KIF. The manufacture sheets for the installed geomembrane and geocomposite were used to compare the material type, asperity height, density, and thickness of the installed materials to those evaluated in the referenced studies. Based on the manufacture sheet, the Agru 60-mil LLDPE geomembrane has a nominal thickness of 1.5 mm and an asperity height of 0.51 mm. The SKAPS Transnet HDPE Geocomposite with TN 330 Geonet is composed of a nonwoven geotextile heat bonded with the geonet and geotextile with a mass per unit area of 8 oz/yd^2, or 270 g/m^2.

- Pavanello *et al.* (2018) evaluated the static interface angle of textured HDPE geomembrane and nonwoven geotextile as part of their investigation of the dynamic friction and seismic performance of various geosynthetic interfaces. The thickness of the textured geomembrane evaluated was 1.5

mm and the nonwoven geotextile evaluated had a mass per unit area of 300 g/m^2. The average, static interface friction angle for the geotextile/geomembrane interface was measured to be about 24˚.

- Akpinar and Benson (2005) evaluated the shear strength of interfaces between nonwoven geotextiles and HDPE geomembranes, including a textured geomembrane, as part of their investigation. The textured geomembrane evaluated had an asperity height of 0.25 mm, and the geotextile evaluated has a mass per unit area of 270 g/m^2. Although asperity height of the geomembrane evaluated is approximately half of height for the installed geomembrane, the system as a whole compares well to the interface within the cap system at the Sluice Trench and Ballfield East of the Sluice Trench. The interface friction angle for the geotextile/geomembrane interface was measured to be approximately 26˚.

- Stark *et al.* (1996) evaluated multiple geosynthetic interfaces, including a co-extruded geomembrane and geocomposite composed of nonwoven geotextile and thermally bonded geonet. The geomembrane evaluated had an asperity height of 0.45 mm and nominal thickness of 1.5 mm. The mass per unit area of the geocomposite evaluated was 270 g/m^2. It was found that the presence of the geonet did not significantly increase the interface shear resistance compared to the textured geomembrane/nonwoven geotextile interface, and the interface friction angle was estimated to be 30˚.

- Bacas *et al.* (2015) evaluated multiple geomembrane/geocomposite interfaces as part of their investigation of frictional behavior of typical geosynthetic interfaces. The interface evaluated most similar to the geocomposite/geomembrane interface within the cap system is a textured geomembrane, with an asperity height of 0.5mm, and a geocomposite composed of nonwoven 200 and 300 g/m^2 geotextile thermally bonded to the geonet. The 300 g/m^2 geotextile face of the geocomposite was placed on top of the geomembrane for the evaluation of the interface friction. The interface friction angle for this interface was found to be 16˚.

Considering all of the above published parameters, the interface friction suggested by Bacas *et al.* of 16˚ was selected as representative for the interface friction of the geomembrane/geocomposite interface within the cap system at KIF. This value was selected because the materials within the study were similar to those used in the cap system, and that this value represented the most conservative choice, as Pavanello *et al.* (2018), Akpinar and Benson (2005) and Stark *et al.* (1996) indicate the value may be much higher.

3.4. SUBGRADE PARAMETERS

Values for the drained shear strength, moist unit weight, and saturated unit weight of the two subgrade materials (Fly Ash and Bottom Ash) are required to perform the veneer stability analyses. The parameters for the subgrade materials are summarized in Table 4.

The drained shear strength parameters for the Fly Ash and Bottom Ash were derived from Exploratory Drilling SAR and historical consolidated undrained (CU) triaxial compression laboratory testing results. The moist unit weight and saturated unit weight values were determined from Exploratory Drilling SAR and historical laboratory testing data. The material parameter selection is detailed in Section 4 of the Static Stability SAR.

Table 4. Subgrade Parameter Summary

Material	Drained Friction Angle (degrees)	Drained Cohesion (psf)	Moist Unit Weight (pcf)	Saturated Unit Weight (pcf)
Fly Ash	34	0	112	112
Bottom Ash	37	0	119	124

3.5. SELECTED INTERFACE FOR VENEER ANALYSIS

Based on parameters provided in Section 3.2 through Section 3.4, the weakest (i.e., most critical) zone of the cap system is the interface friction angle of the geomembrane/geocomposite interface.

3.6. PSEUDOSTATIC ACCELERATION

To model seismic stability in the cover, a pseudostatic acceleration (a) is applied as shown in the Koerner and Soong (2005) equations in Section 2.

Ground response analyses were completed to develop ground motion time histories for use in the pseudostatic global stability and liquefaction triggering analyses (Appendix D). These same ground response analyses were used here to determine a pseudostatic acceleration for the veneer stability analysis of the cover system.

The Strata results (from Appendix D), for vertical profiles that pass through selected portion of the Polishing Pond Section (Figure 2), were used. The computed accelerations at the base of the cover system were examined.

The peak accelerations at the base of the cover layer for each input ground motion were analyzed. The peak accelerations for the 1 Hz scenario ground motions were averaged. Separately, the peak accelerations for the 10 Hz scenario ground motions were averaged. Then the greater of the two averages (either the 1 Hz average or the 10 Hz average) was selected as the peak acceleration. However, the peak acceleration is a very short duration, high frequency pulse. To obtain a reasonable indication of the seismic force, the pseudostatic acceleration was assumed to be 65% of the peak acceleration.

For the twenty input ground motions (13 motions for the 10 Hz scenario and seven motions for the 1 Hz scenario), the ground response analyses predicted an average peak acceleration at the base of the cover of 0.191 g for the 10 Hz motions and 0.096 g for the 1 Hz motions. The pseudostatic acceleration selected for use in the analysis (a = 0.124 g) is 65% of the larger of the two average peak acceleration values (65% of 0.191 g).

4. ANALYSIS RESULTS

The calculations for each design condition are presented at the end of this appendix.

4.1. SEISMIC CASE

Applying the minimum interface strength within the cap system (Section 3.5), the pseudostatic case has a factor of safety of 1.0.

5. REFERENCES

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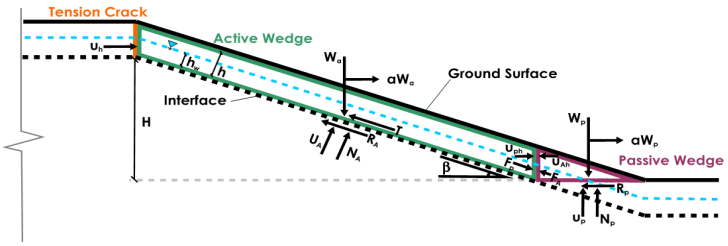
Final Cover Veneer Type Stability Analysis

Kingston Sluice Trench and Ballfield East of the Sluice Trench

Methodology: Koerner and Soong (2005)

Input Parameters:

Cover Thickness, h, ft.	2
Slope Height, H, ft.	11.2
Slope Angle, β, deg.	10.0
Water Height, h_w, ft.	0
Hori. Acceleration, a (g)	0.124
Unit Weight of Water, γ_w, pcf	62.4
Cover Soil Unit Weight, γ, pcf	120
Cover Soil Sat. Unit Weight, γ_{sat}, pcf	121
Cover Soil Friction Angle, ϕ, deg.	19
Cover Soil Cohesion, c, psf	0



*Stress regime is in lower portion of bilinear undrained strength envelope.

Veneer Reinforcement, T, lb/ft	0

Calculations:

Active Wedge	
Total Weight, W_A, lb/ft	15479.58
Uplift Force, U_A, lb/ft	0.00
Effective Normal Force, N_A, lb/ft	14911.09

Passive Wedge	
Total Weight, W_p, lb/ft	1403.43
Uplift Force, U_p, lb/ft	0.00
Interface P.W.P Force, U_{ph}, lb/ft	0.00

Seismic Conditions (Target F.S. = 1.0)

Interface Friction Angle, δ, deg.	Interface Adhesion, c_a, psf	R_A, lb/ft	A	B	C	D	L	M	N	Factor of Safety
16	0.00	4275.69	4578.31	483.24	174.02	0.06	4682.78	4967.71	255.65	1.01
Assumed interface strength (Bacas 2015)										

APPENDIX D – SUPPORTING SEISMIC CALCULATIONS

Appendix D – Supporting Seismic Calculations

1 Introduction 3
2 Ground Response Analysis 4
2.1 Graphical Depictions of V_s Measurements and Selected Fits 4
2.2 Analyzed Profiles 11
2.2.1 Section A-A' Profiles 11
2.2.2 Polishing Pond Section Profiles 27
2.2.3 Alternate Section Profiles 56
2.3 Peak Acceleration Calculations 61
2.3.1 Section A-A' 61
2.3.2 Polishing Pond Section 81
2.3.3 Alternate Section 119
3 Liquefaction and Cyclic Softening Analysis 129
3.1 Clay-like/Sand-like Determination 129
3.1.1 Embankment Fill 129
3.1.2 Fly Ash 135
3.1.3 Bottom Ash 141
3.1.4 Sediment 147
3.1.5 Subunit 1 153
3.1.6 Subunit 2 159
3.1.7 Subunit 3 165
3.2 Static Shear Stress Ratio (α) 171
3.2.1 SIGMA/W Graphical Outputs 171
3.2.2 α Calculations 177
3.3 SPT-Based Liquefaction Assessment for Sand-like Soils 221
3.3.1 1 Hz Design Earthquake 221
3.3.2 10 Hz Design Earthquake 400
3.4 CPT-Based Liquefaction Assessment for Sand-like Soils 579
3.4.1 1 Hz Design Earthquake 579
3.4.2 10 Hz Design Earthquake 808
3.5 Graphical Depictions of Clay-like / Sand-Like Behavior and Liquefaction Results 1037
3.5.1 All Materials 1037
3.5.2 Embankment Fill 1052
3.5.3 Fly Ash 1057

3.5.4 Bottom Ash 1062
3.5.5 Sediment 1067
3.5.6 Subunit 1 1070
3.5.7 Subunit 2 1075
3.5.8 Subunit 3 1080
3.5.9 Gravel Residuum 1085
3.6 Sample Calculations 1088
3.6.1 SPT Liquefaction Sample Calculation 1088
3.6.2 CPT Liquefaction Sample Calculation 1101
4 Residual Strength Derivation 1115
4.1 Fly Ash 1115
4.2 Subunit 3 1120
4.3 Subunit 3 (Intake Channel) 1125

1 INTRODUCTION

This appendix contains information pertaining to the ground response analysis, liquefaction and cyclic softening analysis, and residual strength derivation.

Information supporting the ground response analysis is in Section 2. Section 2.1 contains plots of shear wave velocity data versus mean effective stress. These plots are used to develop characteristic models for each material in the ground response analysis. Appendix E contains additional information regarding small-strain shear stiffness parameters.

Section 2.2 contains discretized profiles for use in the ground response software, Strata. Profiles were generated at each boring location where liquefaction or cyclic softening potential was identified.

Section 2.3 contains peak acceleration calculations for use in the liquefaction and cyclic softening triggering analysis.

Section 3 contains information supporting the liquefaction and cyclic softening analysis. Section 3.1 contains laboratory-based sand-like/clay-like determinations for each material with the necessary data.

Section 3.2 contains information supporting static shear stress ratio calculations. Section 3.2.1 contains graphical outputs with contours of vertical effective stress and XY-shear stress at the analyzed cross-section. Calculations of static shear stress ratio for each boring/sounding analyzed in the liquefaction triggering analysis is located in Section 3.2.2.

Section 3.3 contains outputs from the SPT-based liquefaction assessment for both design earthquakes considered.

Section 3.4 contains outputs from the CPT-based liquefaction assessment. Included in these outputs are plots showing soil behavior type according to Robertson (2008).

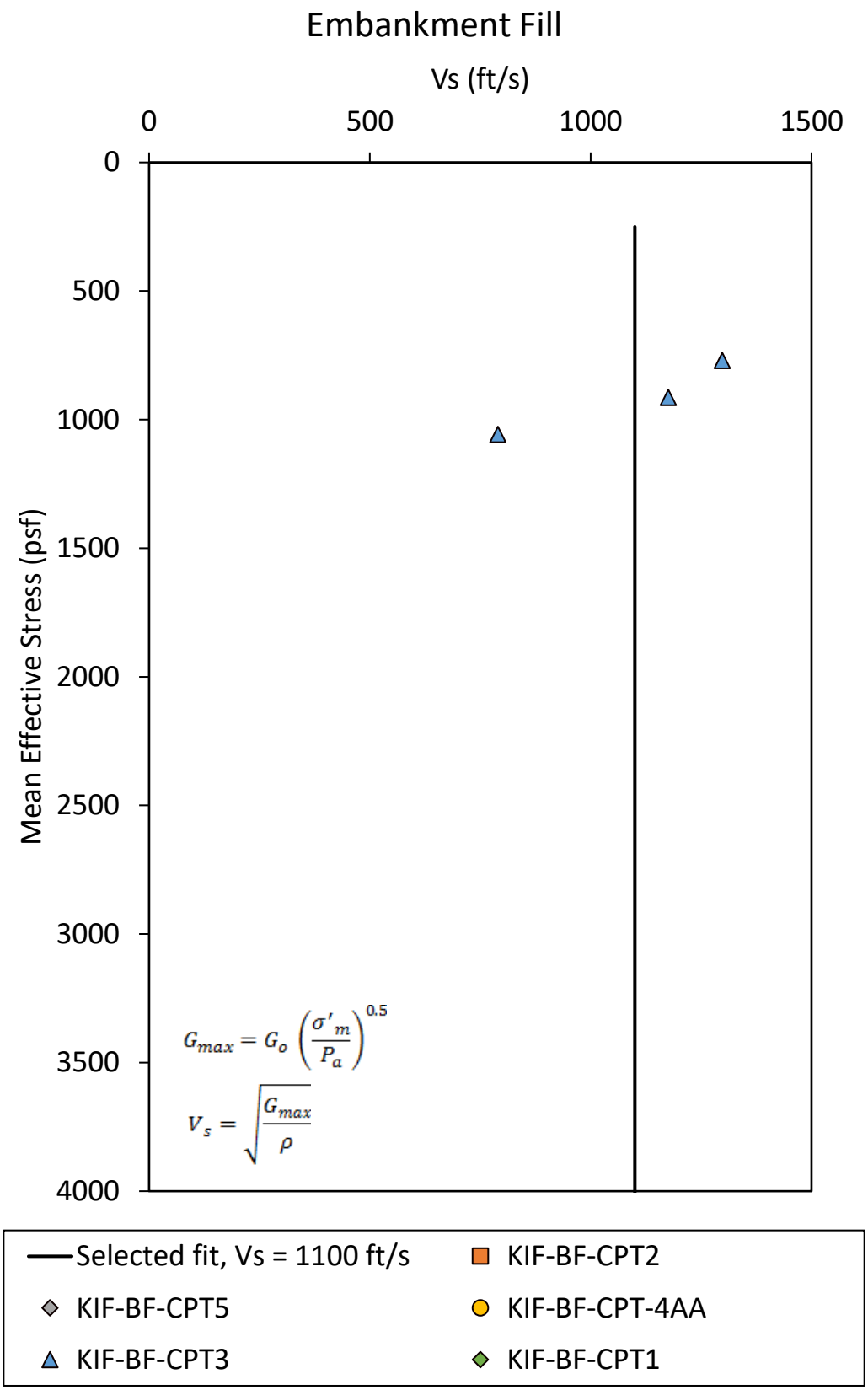
Section 3.5 contains several figures illustrated the results of the liquefaction and cyclic softening analyses. These figures show liquefaction triggering and clay-like/sand-like determination results. Plan views are presented for each applicable soil horizon. Cross-section views are also presented for the full boring/sounding.

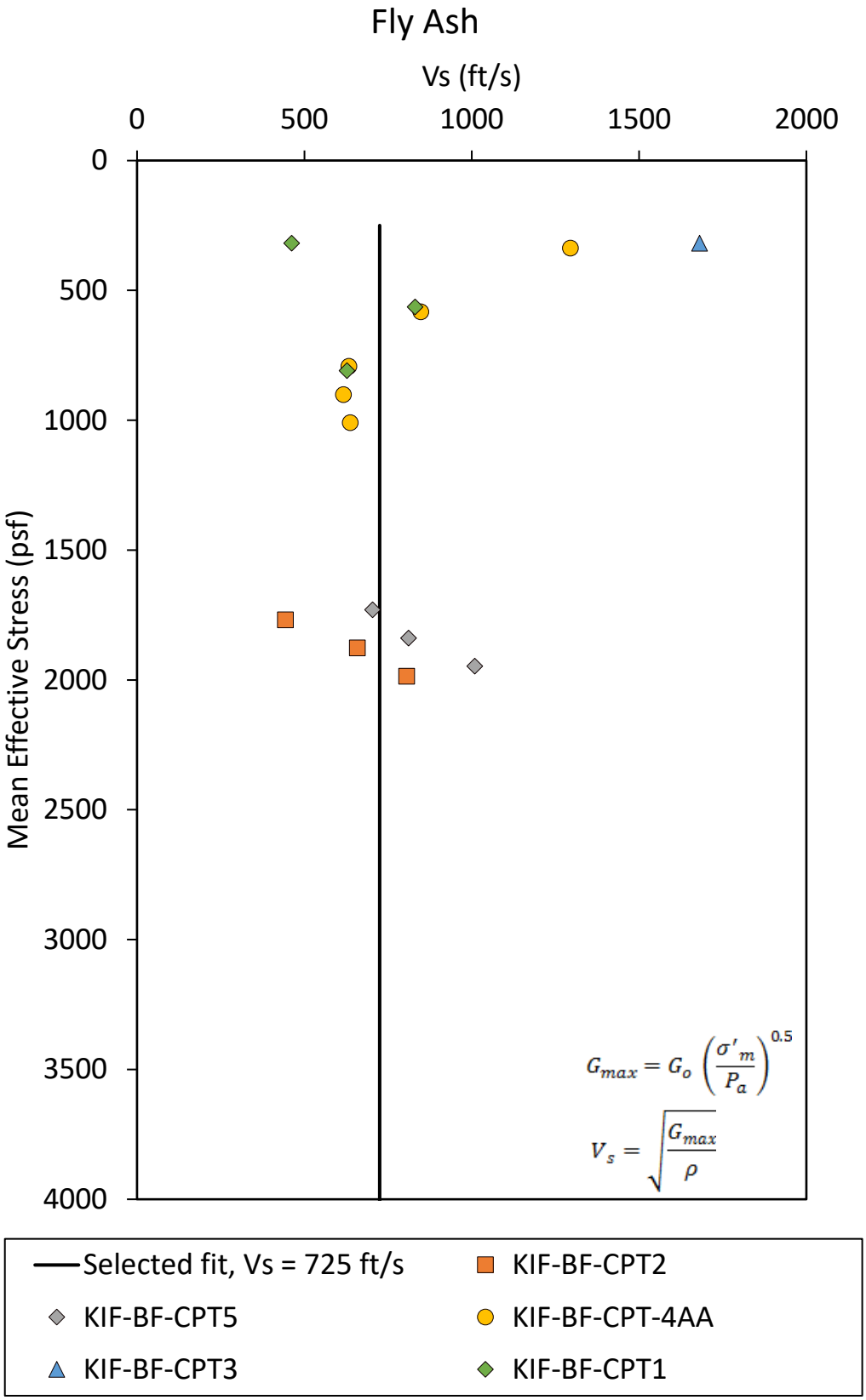
Section 3.6 contains samples of SPT and CPT-based liquefaction triggering calculations.

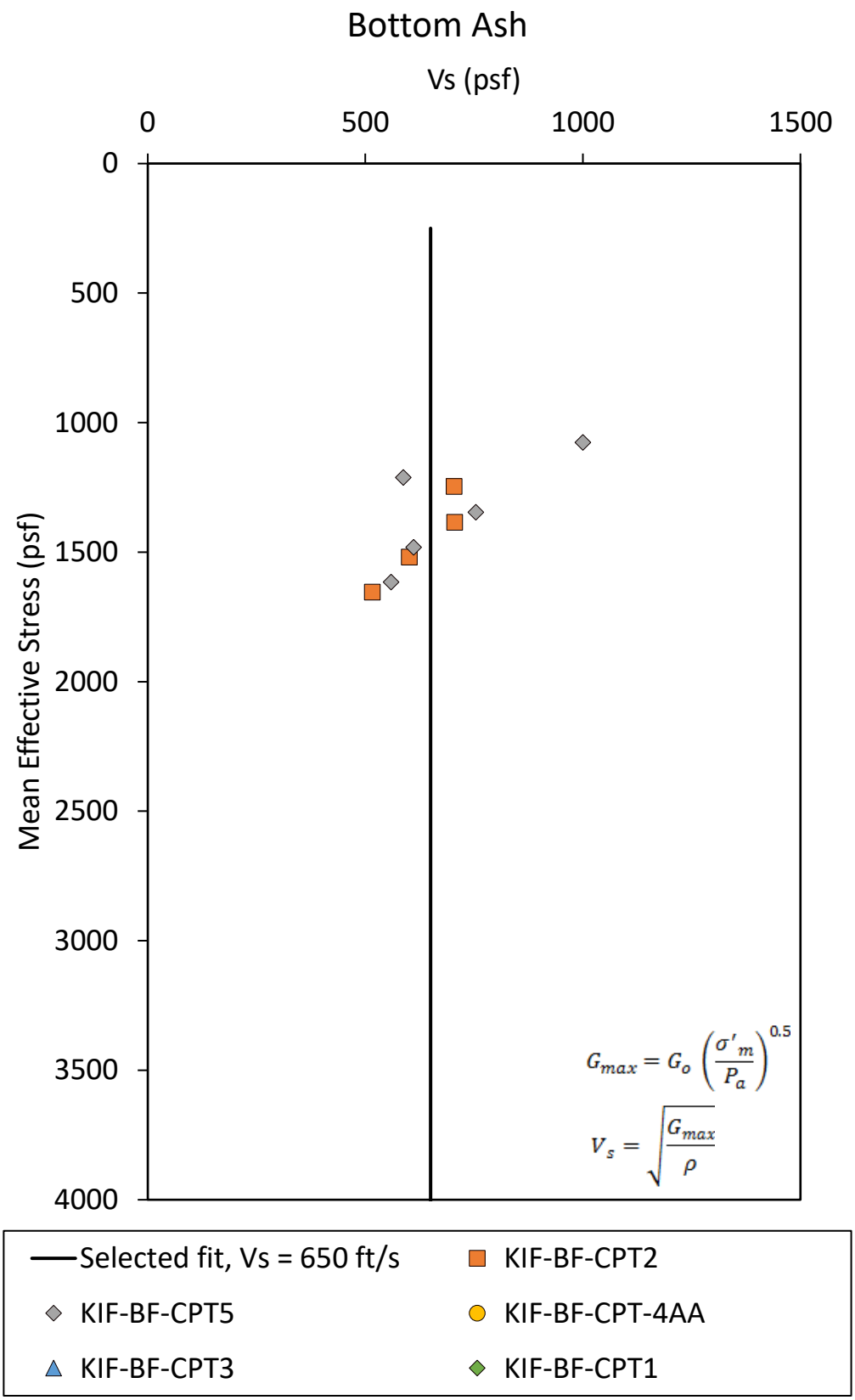
Section 4 contains details calculations supporting the liquefied residual strength derivations for the Fly Ash and Subunit 3.

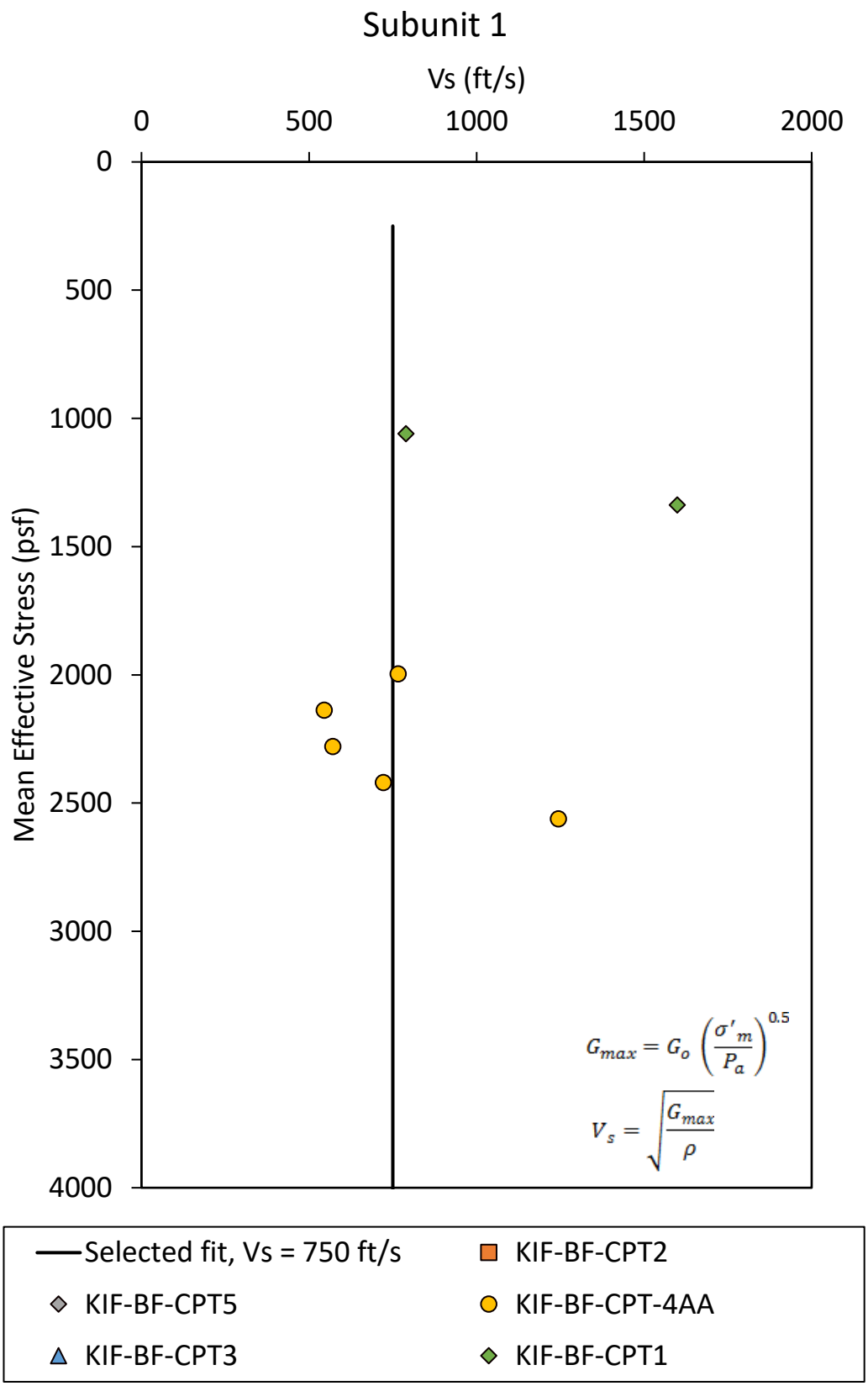
2 GROUND RESPONSE ANALYSIS

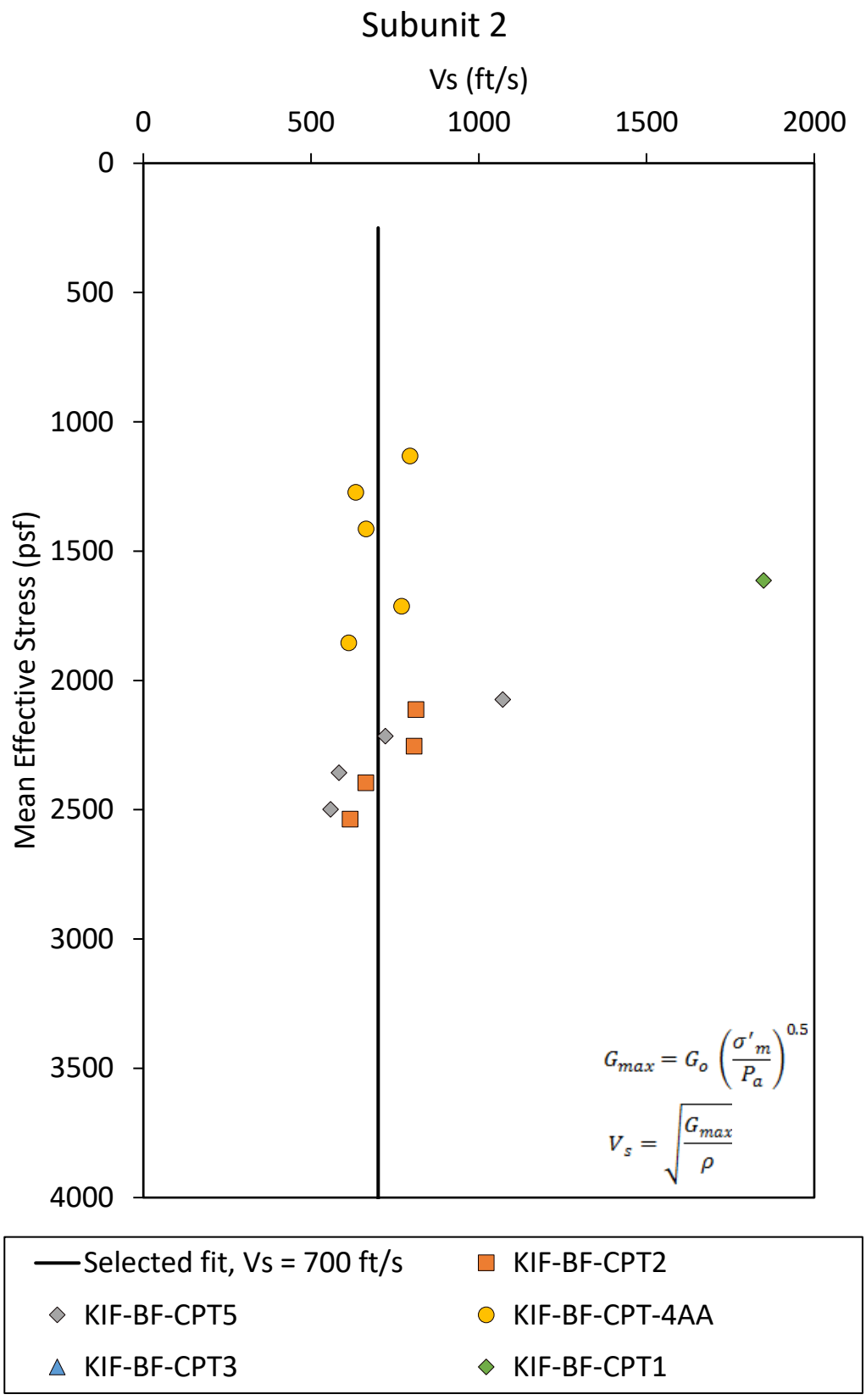
2.1 GRAPHICAL DEPICTIONS OF V_S MEASUREMENTS AND SELECTED FITS

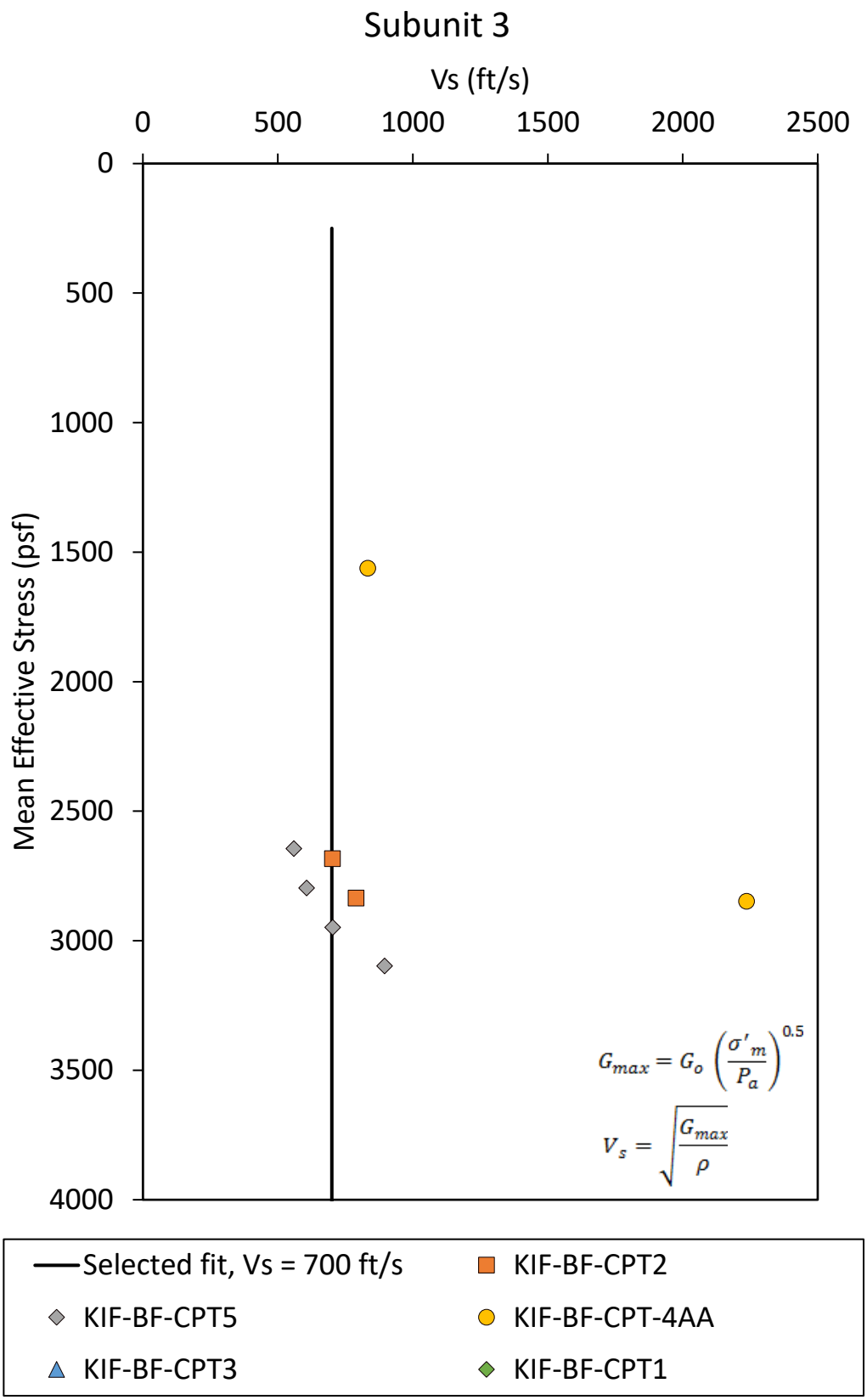

Embankment Fill
Vs (ft/s)
0
500
1000
1500
Mean Effective Stress (psf)
0
500
1000
1500
2000
2500
3000
3500
4000
$G_{max} = G_o \left(\frac{\sigma'_m}{P_a}\right)^{0.5}$
$V_s = \sqrt{\frac{G_{max}}{\rho}}$
Selected fit, Vs = 1100 ft/s
KIF-BF-CPT2
KIF-BF-CPT5
KIF-BF-CPT-4AA
KIF-BF-CPT3
KIF-BF-CPT1


Fly Ash
Vs (ft/s)
0
500
1000
1500
2000
Mean Effective Stress (psf)
0
500
1000
1500
2000
2500
3000
3500
4000
$G_{max} = G_o \left(\frac{\sigma'_m}{P_a}\right)^{0.5}$
$V_s = \sqrt{\frac{G_{max}}{\rho}}$
Selected fit, Vs = 725 ft/s
KIF-BF-CPT2
KIF-BF-CPT5
KIF-BF-CPT-4AA
KIF-BF-CPT3
KIF-BF-CPT1


Bottom Ash
Vs (psf)
0
500
1000
1500
Mean Effective Stress (psf)
0
500
1000
1500
2000
2500
3000
3500
4000
$G_{max} = G_o \left(\frac{\sigma'_m}{P_a}\right)^{0.5}$
$V_s = \sqrt{\frac{G_{max}}{\rho}}$
Selected fit, Vs = 650 ft/s
KIF-BF-CPT2
KIF-BF-CPT5
KIF-BF-CPT-4AA
KIF-BF-CPT3
KIF-BF-CPT1


Subunit 1
Vs (ft/s)
0
500
1000
1500
2000
Mean Effective Stress (psf)
0
500
1000
1500
2000
2500
3000
3500
4000
$G_{max} = G_o \left(\frac{\sigma'_m}{P_a}\right)^{0.5}$
$V_s = \sqrt{\frac{G_{max}}{\rho}}$
Selected fit, Vs = 750 ft/s
KIF-BF-CPT2
KIF-BF-CPT5
KIF-BF-CPT-4AA
KIF-BF-CPT3
KIF-BF-CPT1


Subunit 2
Vs (ft/s)
0
500
1000
1500
2000
Mean Effective Stress (psf)
0
500
1000
1500
2000
2500
3000
3500
4000
$G_{max} = G_o \left(\frac{\sigma'_m}{P_a}\right)^{0.5}$
$V_s = \sqrt{\frac{G_{max}}{\rho}}$
Selected fit, Vs = 700 ft/s
KIF-BF-CPT2
KIF-BF-CPT5
KIF-BF-CPT-4AA
KIF-BF-CPT3
KIF-BF-CPT1


Subunit 3
Vs (ft/s)
0
500
1000
1500
2000
2500
Mean Effective Stress (psf)
0
500
1000
1500
2000
2500
3000
3500
4000
$G_{max} = G_o \left(\frac{\sigma'_m}{P_a}\right)^{0.5}$
$V_s = \sqrt{\frac{G_{max}}{\rho}}$
Selected fit, Vs = 700 ft/s
KIF-BF-CPT2
KIF-BF-CPT5
KIF-BF-CPT-4AA
KIF-BF-CPT3
KIF-BF-CPT1

2.2 ANALYZED PROFILES

2.2.1 Section A-A’ Profiles

Facility	KIF	
Section/Group	A-A'	
Profile Name	KIF-B09_NOR	
Top of Profile Elevation	754.5	ft
Depth to water table during EQ	5.9	ft
Surcharge Pressure	0	psf

Strata Profile

Non-input Information								Strata "Soil Types" Input				Strata "Soil Profile" Input		
Top Depth (ft)	**Bottom Depth (ft)**	**Layer Name**	**Layer Type**	**G_{max} (psf)**	**K_o**	**Mean Effective Stress at midpoint (psf)**	**Plasticity Index**	**Name (for Strata)**	**Unit Weight (pcf)**	**Modulus Reduction (G/Gmax) Model**	**Damping Model**	**Thickness (ft)**	**Soil Type (for Strata)**	**Shear Wave Velocity (fps)**
0	1.75	Embankment Fill	Soil	1.95E+06	0.5	74.7	13	Embankment Fill_1	128	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	1.75	Embankment Fill_1	700
1.75	3.5	Embankment Fill	Soil	1.95E+06	0.5	224.0	13	Embankment Fill_2	128	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	1.75	Embankment Fill_2	700
3.5	5.25	Embankment Fill	Soil	1.95E+06	0.5	373.3	13	Embankment Fill_3	128	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	1.75	Embankment Fill_3	700
5.25	5.9	Embankment Fill	Soil	1.95E+06	0.5	475.7	13	Embankment Fill_4	128	D&S, p'=400-800, PI=10-15	D&S, p'=400-800, PI=10-15	0.65	Embankment Fill_4	700
5.9	7.65	Embankment Fill	Soil	1.95E+06	0.5	541.7	13	Embankment Fill_5	128	D&S, p'=400-800, PI=10-15	D&S, p'=400-800, PI=10-15	1.75	Embankment Fill_5	700
7.65	9.4	Embankment Fill	Soil	1.95E+06	0.5	618.3	13	Embankment Fill_6	128	D&S, p'=400-800, PI=10-15	D&S, p'=400-800, PI=10-15	1.75	Embankment Fill_6	700
9.4	11.15	Embankment Fill	Soil	1.95E+06	0.5	694.8	13	Embankment Fill_7	128	D&S, p'=400-800, PI=10-15	D&S, p'=400-800, PI=10-15	1.75	Embankment Fill_7	700
11.15	12.9	Embankment Fill	Soil	1.95E+06	0.5	771.3	13	Embankment Fill_8	128	D&S, p'=400-800, PI=10-15	D&S, p'=400-800, PI=10-15	1.75	Embankment Fill_8	700
12.9	14.65	Embankment Fill	Soil	1.95E+06	0.5	847.9	13	Embankment Fill_9	128	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.75	Embankment Fill_9	700
14.65	16.4	Embankment Fill	Soil	1.95E+06	0.5	924.4	13	Embankment Fill_10	128	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.75	Embankment Fill_10	700
16.4	18.15	Embankment Fill	Soil	1.95E+06	0.5	1000.9	13	Embankment Fill_11	128	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.75	Embankment Fill_11	700
18.15	19.9	Embankment Fill	Soil	1.95E+06	0.5	1077.5	13	Embankment Fill_12	128	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.75	Embankment Fill_12	700
19.9	21.65	Embankment Fill	Soil	1.95E+06	0.5	1154.0	13	Embankment Fill_13	128	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.75	Embankment Fill_13	700
21.65	23.4	Embankment Fill	Soil	1.95E+06	0.5	1230.5	13	Embankment Fill_14	128	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.75	Embankment Fill_14	700
23.4	25.15	Embankment Fill	Soil	1.95E+06	0.5	1307.1	13	Embankment Fill_15	128	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.75	Embankment Fill_15	700
25.15	26.9	Embankment Fill	Soil	1.95E+06	0.5	1383.6	13	Embankment Fill_16	128	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.75	Embankment Fill_16	700
26.9	28.65	Embankment Fill	Soil	1.95E+06	0.5	1460.1	13	Embankment Fill_17	128	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.75	Embankment Fill_17	700
28.65	30.4	Embankment Fill	Soil	1.95E+06	0.5	1536.7	13	Embankment Fill_18	128	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.75	Embankment Fill_18	700
30.4	32	Embankment Fill	Soil	1.95E+06	0.5	1609.9	13	Embankment Fill_19	128	D&S, p'=1600-2500, PI=10-15	D&S, p'=1600-2500, PI=10-15	1.6	Embankment Fill_19	700
32	33.87	Subunit 1	Soil	2.22E+06	0.5	1685.2	13	Subunit 1_20	127	D&S, p'=1600-2500, PI=10-15	D&S, p'=1600-2500, PI=10-15	1.87	Subunit 1_20	750
33.87	35.74	Subunit 1	Soil	2.22E+06	0.5	1765.7	13	Subunit 1_21	127	D&S, p'=1600-2500, PI=10-15	D&S, p'=1600-2500, PI=10-15	1.87	Subunit 1_21	750
35.74	37.61	Subunit 1	Soil	2.22E+06	0.5	1846.2	13	Subunit 1_22	127	D&S, p'=1600-2500, PI=10-15	D&S, p'=1600-2500, PI=10-15	1.87	Subunit 1_22	750
37.61	39.48	Subunit 1	Soil	2.22E+06	0.5	1926.8	13	Subunit 1_23	127	D&S, p'=1600-2500, PI=10-15	D&S, p'=1600-2500, PI=10-15	1.87	Subunit 1_23	750
39.48	41	Subunit 1	Soil	2.22E+06	0.5	1999.8	13	Subunit 1_24	127	D&S, p'=1600-2500, PI=10-15	D&S, p'=1600-2500, PI=10-15	1.52	Subunit 1_24	750
41	42.75	Subunit 2	Soil	1.93E+06	0.5	2070.2	0	Subunit 2_25	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 2_25	700
42.75	44.5	Subunit 2	Soil	1.93E+06	0.5	2145.6	0	Subunit 2_26	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 2_26	700
44.5	46.25	Subunit 2	Soil	1.93E+06	0.5	2220.9	0	Subunit 2_27	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 2_27	700
46.25	47.5	Subunit 2	Soil	1.93E+06	0.5	2285.5	0	Subunit 2_28	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.25	Subunit 2_28	700
47.5	49.25	Subunit 3	Soil	2.01E+06	0.5	2353.0	0	Subunit 3_29	132	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 3_29	700
49.25	50.7	Subunit 3	Soil	2.01E+06	0.5	2427.3	0	Subunit 3_30	132	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.45	Subunit 3_30	700
50.7	53.75	Shale (0'-15')	Soft Rock	6.47E+06	0.5	2539.8	0	Shale (0'-15')_31	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_31	1220
53.75	56.8	Shale (0'-15')	Soft Rock	6.47E+06	0.5	2697.6	0	Shale (0'-15')_32	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_32	1220
56.8	59.85	Shale (0'-15')	Soft Rock	6.47E+06	0.5	2855.4	0	Shale (0'-15')_33	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_33	1220
59.85	62.9	Shale (0'-15')	Soft Rock	6.47E+06	0.5	3013.2	0	Shale (0'-15')_34	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_34	1220
62.9	65.7	Shale (0'-15')	Soft Rock	6.47E+06	0.5	3164.5	0	Shale (0'-15')_35	140	Silva et al., 50'-120'	Silva et al., 50'-120'	2.8	Shale (0'-15')_35	1220
65.7	69.1	Shale (15'-30')	Soft Rock	8.04E+06	0.5	3324.9	0	Shale (15'-30')_36	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_36	1360
69.1	72.5	Shale (15'-30')	Soft Rock	8.04E+06	0.5	3500.8	0	Shale (15'-30')_37	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_37	1360
72.5	75.9	Shale (15'-30')	Soft Rock	8.04E+06	0.5	3676.7	0	Shale (15'-30')_38	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_38	1360
75.9	79.3	Shale (15'-30')	Soft Rock	8.04E+06	0.5	3852.5	0	Shale (15'-30')_39	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_39	1360
79.3	79.5	Shale (15'-30')	Soft Rock	8.04E+06	0.5	3945.7	0	Shale (15'-30')_40	140	Silva et al., 50'-120'	Silva et al., 50'-120'	0.2	Shale (15'-30')_40	1360
79.5	179.5	Shale (El. 575'-675')	Firm Rock	4.18E+07	0.5	6537.5	0	Shale (El. 575'-675')_41	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 575'-675')_41	3100
179.5	279.5	Shale (El. 475'-575')	Firm Rock	7.31E+07	0.5	11710.8	0	Shale (El. 475'-575')_42	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 475'-575')_42	4100
279.5	379.5	Shale (El. 375'-475')	Firm Rock	1.13E+08	0.5	16884.2	0	Shale (El. 375'-475')_43	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 375'-475')_43	5100
379.5	479.5	Shale (El. 275'-375')	Firm Rock	1.62E+08	0.5	22057.5	0	Shale (El. 275'-375')_44	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 275'-375')_44	6100
479.5	579.5	Shale (El. 175'-275')	Firm Rock	2.19E+08	0.5	27230.8	0	Shale (El. 175'-275')_45	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 175'-275')_45	7100
579.5	679.5	Shale (El. 75'-175')	Firm Rock	2.85E+08	0.5	32404.2	0	Shale (El. 75'-175')_46	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 75'-175')_46	8100
679.5	719.5	Shale (El. 35'-75')	Firm Rock	3.37E+08	0.5	36025.5	0	Shale (El. 35'-75')_47	140	Firm/Hard Rock	Firm/Hard Rock	40	Shale (El. 35'-75')_47	8800
719.5	Half-Space	Shale (El. < 35')	Half-Space	3.52E+08	0.5	Half-Space	0	Bedrock	140	NA, Half-Space	Damping = 0.5%	Half Space	Bedrock	9000

Facility	KIF	
Section/Group	A-A'	
Profile Name	KIF-B10_NOR	
Top of Profile Elevation	732.02	ft
Depth to water table during EQ	0	ft
Surcharge Pressure	0	psf

Strata Profile

Non-input Information								Strata "Soil Types" Input				Strata "Soil Profile" Input		
Top Depth (ft)	Bottom Depth (ft)	Layer Name	Layer Type	G_{max} (psf)	K_o	Mean Effective Stress at midpoint (psf)	Plasticity Index	Name (for Strata)	Unit Weight (pcf)	Modulus Reduction (G/Gmax) Model	Damping Model	Thickness (ft)	Soil Type (for Strata)	Shear Wave Velocity (fps)
0	0.65	Sediment	Soil	2.37E+05	0.5	11.0	12	Sediment_1	113	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	0.65	Sediment_1	260
0.65	1.3	Sediment	Soil	2.37E+05	0.5	32.9	12	Sediment_2	113	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	0.65	Sediment_2	260
1.3	1.95	Sediment	Soil	2.37E+05	0.5	54.8	12	Sediment_3	113	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	0.65	Sediment_3	260
1.95	2.6	Sediment	Soil	2.37E+05	0.5	76.7	12	Sediment_4	113	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	0.65	Sediment_4	260
2.6	3.25	Sediment	Soil	2.37E+05	0.5	98.7	12	Sediment_5	113	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	0.65	Sediment_5	260
3.25	3.9	Sediment	Soil	2.37E+05	0.5	120.6	12	Sediment_6	113	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	0.65	Sediment_6	260
3.9	4.55	Sediment	Soil	2.37E+05	0.5	142.5	12	Sediment_7	113	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	0.65	Sediment_7	260
4.55	5.2	Sediment	Soil	2.37E+05	0.5	164.5	12	Sediment_8	113	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	0.65	Sediment_8	260
5.2	5.85	Sediment	Soil	2.37E+05	0.5	186.4	12	Sediment_9	113	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	0.65	Sediment_9	260
5.85	6.5	Sediment	Soil	2.37E+05	0.5	208.3	12	Sediment_10	113	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	0.65	Sediment_10	260
6.5	6.92	Sediment	Soil	2.37E+05	0.5	226.4	12	Sediment_11	113	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	0.42	Sediment_11	260
6.92	8.79	Subunit 1	Soil	2.22E+06	0.5	273.7	13	Subunit 1_12	127	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	1.87	Subunit 1_12	750
8.79	10.66	Subunit 1	Soil	2.22E+06	0.5	354.2	13	Subunit 1_13	127	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	1.87	Subunit 1_13	750
10.66	12.53	Subunit 1	Soil	2.22E+06	0.5	434.8	13	Subunit 1_14	127	D&S, p'=400-800, PI=10-15	D&S, p'=400-800, PI=10-15	1.87	Subunit 1_14	750
12.53	14.4	Subunit 1	Soil	2.22E+06	0.5	515.3	13	Subunit 1_15	127	D&S, p'=400-800, PI=10-15	D&S, p'=400-800, PI=10-15	1.87	Subunit 1_15	750
14.4	16.27	Subunit 1	Soil	2.22E+06	0.5	595.8	13	Subunit 1_16	127	D&S, p'=400-800, PI=10-15	D&S, p'=400-800, PI=10-15	1.87	Subunit 1_16	750
16.27	18.14	Subunit 1	Soil	2.22E+06	0.5	676.4	13	Subunit 1_17	127	D&S, p'=400-800, PI=10-15	D&S, p'=400-800, PI=10-15	1.87	Subunit 1_17	750
18.14	19.42	Subunit 1	Soil	2.22E+06	0.5	744.2	13	Subunit 1_18	127	D&S, p'=400-800, PI=10-15	D&S, p'=400-800, PI=10-15	1.28	Subunit 1_18	750
19.42	21.17	Subunit 2	Soil	1.93E+06	0.5	809.5	0	Subunit 2_19	127	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Subunit 2_19	700
21.17	21.92	Subunit 2	Soil	1.93E+06	0.5	863.3	0	Subunit 2_20	127	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	0.75	Subunit 2_20	700
21.92	23.67	Subunit 3	Soil	2.01E+06	0.5	920.0	0	Subunit 3_21	132	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Subunit 3_21	700
23.67	25.42	Subunit 3	Soil	2.01E+06	0.5	1001.2	0	Subunit 3_22	132	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Subunit 3_22	700
25.42	27.17	Subunit 3	Soil	2.01E+06	0.5	1082.4	0	Subunit 3_23	132	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Subunit 3_23	700
27.17	27.92	Subunit 3	Soil	2.01E+06	0.5	1140.4	0	Subunit 3_24	132	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	0.75	Subunit 3_24	700
27.92	30.97	Shale (0'-15')	Soft Rock	6.47E+06	0.5	1236.7	0	Shale (0'-15')_25	140	Silva et al., 20'-50'	Silva et al., 20'-50'	3.05	Shale (0'-15')_25	1220
30.97	34.02	Shale (0'-15')	Soft Rock	6.47E+06	0.5	1394.5	0	Shale (0'-15')_26	140	Silva et al., 20'-50'	Silva et al., 20'-50'	3.05	Shale (0'-15')_26	1220
34.02	37.07	Shale (0'-15')	Soft Rock	6.47E+06	0.5	1552.3	0	Shale (0'-15')_27	140	Silva et al., 20'-50'	Silva et al., 20'-50'	3.05	Shale (0'-15')_27	1220
37.07	40.12	Shale (0'-15')	Soft Rock	6.47E+06	0.5	1710.1	0	Shale (0'-15')_28	140	Silva et al., 20'-50'	Silva et al., 20'-50'	3.05	Shale (0'-15')_28	1220
40.12	42.92	Shale (0'-15')	Soft Rock	6.47E+06	0.5	1861.4	0	Shale (0'-15')_29	140	Silva et al., 20'-50'	Silva et al., 20'-50'	2.8	Shale (0'-15')_29	1220
42.92	46.32	Shale (15'-30')	Soft Rock	8.04E+06	0.5	2021.8	0	Shale (15'-30')_30	140	Silva et al., 20'-50'	Silva et al., 20'-50'	3.4	Shale (15'-30')_30	1360
46.32	49.72	Shale (15'-30')	Soft Rock	8.04E+06	0.5	2197.7	0	Shale (15'-30')_31	140	Silva et al., 20'-50'	Silva et al., 20'-50'	3.4	Shale (15'-30')_31	1360
49.72	53.12	Shale (15'-30')	Soft Rock	8.04E+06	0.5	2373.6	0	Shale (15'-30')_32	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_32	1360
53.12	56.52	Shale (15'-30')	Soft Rock	8.04E+06	0.5	2549.5	0	Shale (15'-30')_33	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_33	1360
56.52	57.02	Shale (15'-30')	Soft Rock	8.04E+06	0.5	2650.3	0	Shale (15'-30')_34	140	Silva et al., 50'-120'	Silva et al., 50'-120'	0.5	Shale (15'-30')_34	1360
57.02	157.02	Shale (El. 575'-675')	Firm Rock	4.18E+07	0.5	5249.9	0	Shale (El. 575'-675')_35	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 575'-675')_35	3100
157.02	257.02	Shale (El. 475'-575')	Firm Rock	7.31E+07	0.5	10423.3	0	Shale (El. 475'-575')_36	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 475'-575')_36	4100
257.02	357.02	Shale (El. 375'-475')	Firm Rock	1.13E+08	0.5	15596.6	0	Shale (El. 375'-475')_37	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 375'-475')_37	5100
357.02	457.02	Shale (El. 275'-375')	Firm Rock	1.62E+08	0.5	20769.9	0	Shale (El. 275'-375')_38	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 275'-375')_38	6100
457.02	557.02	Shale (El. 175'-275')	Firm Rock	2.19E+08	0.5	25943.3	0	Shale (El. 175'-275')_39	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 175'-275')_39	7100
557.02	657.02	Shale (El. 75'-175')	Firm Rock	2.85E+08	0.5	31116.6	0	Shale (El. 75'-175')_40	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 75'-175')_40	8100
657.02	697.02	Shale (El. 35'-75')	Firm Rock	3.37E+08	0.5	34737.9	0	Shale (El. 35'-75')_41	140	Firm/Hard Rock	Firm/Hard Rock	40	Shale (El. 35'-75')_41	8800
697.02	Half-Space	Shale (El. < 35')	Half-Space	3.52E+08	0.5	Half-Space	0	Bedrock	140	NA, Half-Space	Damping = 0.5%	Half Space	Bedrock	9000

Facility	KIF	
Section/Group	A-A'	
Profile Name	KIF-B11_NOR	
Top of Profile Elevation	727.4	ft
Depth to water table during EQ	0	ft
Surcharge Pressure	0	psf

Strata Profile

Non-input Information								Strata "Soil Types" Input				Strata "Soil Profile" Input		
Top Depth (ft)	Bottom Depth (ft)	Layer Name	Layer Type	G_{max} (psf)	K_o	Mean Effective Stress at midpoint (psf)	Plasticity Index	Name (for Strata)	Unit Weight (pcf)	Modulus Reduction (G/Gmax) Model	Damping Model	Thickness (ft)	Soil Type (for Strata)	Shear Wave Velocity (fps)
0	0.65	Sediment	Soil	2.37E+05	0.5	11.0	12	Sediment_1	113	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	0.65	Sediment_1	260
0.65	1.3	Sediment	Soil	2.37E+05	0.5	32.9	12	Sediment_2	113	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	0.65	Sediment_2	260
1.3	1.95	Sediment	Soil	2.37E+05	0.5	54.8	12	Sediment_3	113	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	0.65	Sediment_3	260
1.95	2	Sediment	Soil	2.37E+05	0.5	66.6	12	Sediment_4	113	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	0.05	Sediment_4	260
2	3.87	Subunit 1	Soil	2.22E+06	0.5	107.7	13	Subunit 1_5	127	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	1.87	Subunit 1_5	750
3.87	5.74	Subunit 1	Soil	2.22E+06	0.5	188.3	13	Subunit 1_6	127	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	1.87	Subunit 1_6	750
5.74	7.61	Subunit 1	Soil	2.22E+06	0.5	268.8	13	Subunit 1_7	127	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	1.87	Subunit 1_7	750
7.61	9.48	Subunit 1	Soil	2.22E+06	0.5	349.3	13	Subunit 1_8	127	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	1.87	Subunit 1_8	750
9.48	11.35	Subunit 1	Soil	2.22E+06	0.5	429.9	13	Subunit 1_9	127	D&S, p'=400-800, PI=10-15	D&S, p'=400-800, PI=10-15	1.87	Subunit 1_9	750
11.35	13.22	Subunit 1	Soil	2.22E+06	0.5	510.4	13	Subunit 1_10	127	D&S, p'=400-800, PI=10-15	D&S, p'=400-800, PI=10-15	1.87	Subunit 1_10	750
13.22	15.09	Subunit 1	Soil	2.22E+06	0.5	590.9	13	Subunit 1_11	127	D&S, p'=400-800, PI=10-15	D&S, p'=400-800, PI=10-15	1.87	Subunit 1_11	750
15.09	16.1	Subunit 1	Soil	2.22E+06	0.5	653.0	13	Subunit 1_12	127	D&S, p'=400-800, PI=10-15	D&S, p'=400-800, PI=10-15	1.01	Subunit 1_12	750
16.1	17.85	Subunit 2	Soil	1.93E+06	0.5	712.4	0	Subunit 2_13	127	D&S, p'=400-800, PI=0	D&S, p'=400-800, PI=0	1.75	Subunit 2_13	700
17.85	18.6	Subunit 2	Soil	1.93E+06	0.5	766.2	0	Subunit 2_14	127	D&S, p'=400-800, PI=0	D&S, p'=400-800, PI=0	0.75	Subunit 2_14	700
18.6	20.35	Subunit 3	Soil	2.01E+06	0.5	823.0	0	Subunit 3_15	132	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Subunit 3_15	700
20.35	22.1	Subunit 3	Soil	2.01E+06	0.5	904.2	0	Subunit 3_16	132	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Subunit 3_16	700
22.1	22.7	Subunit 3	Soil	2.01E+06	0.5	958.7	0	Subunit 3_17	132	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	0.6	Subunit 3_17	700
22.7	25.75	Shale (0'-15')	Soft Rock	6.47E+06	0.5	1051.5	0	Shale (0'-15')_18	140	Silva et al., 20'-50'	Silva et al., 20'-50'	3.05	Shale (0'-15')_18	1220
25.75	28.8	Shale (0'-15')	Soft Rock	6.47E+06	0.5	1209.3	0	Shale (0'-15')_19	140	Silva et al., 20'-50'	Silva et al., 20'-50'	3.05	Shale (0'-15')_19	1220
28.8	31.85	Shale (0'-15')	Soft Rock	6.47E+06	0.5	1367.1	0	Shale (0'-15')_20	140	Silva et al., 20'-50'	Silva et al., 20'-50'	3.05	Shale (0'-15')_20	1220
31.85	34.9	Shale (0'-15')	Soft Rock	6.47E+06	0.5	1524.9	0	Shale (0'-15')_21	140	Silva et al., 20'-50'	Silva et al., 20'-50'	3.05	Shale (0'-15')_21	1220
34.9	37.7	Shale (0'-15')	Soft Rock	6.47E+06	0.5	1676.2	0	Shale (0'-15')_22	140	Silva et al., 20'-50'	Silva et al., 20'-50'	2.8	Shale (0'-15')_22	1220
37.7	41.1	Shale (15'-30')	Soft Rock	8.04E+06	0.5	1836.6	0	Shale (15'-30')_23	140	Silva et al., 20'-50'	Silva et al., 20'-50'	3.4	Shale (15'-30')_23	1360
41.1	44.5	Shale (15'-30')	Soft Rock	8.04E+06	0.5	2012.5	0	Shale (15'-30')_24	140	Silva et al., 20'-50'	Silva et al., 20'-50'	3.4	Shale (15'-30')_24	1360
44.5	47.9	Shale (15'-30')	Soft Rock	8.04E+06	0.5	2188.3	0	Shale (15'-30')_25	140	Silva et al., 20'-50'	Silva et al., 20'-50'	3.4	Shale (15'-30')_25	1360
47.9	51.3	Shale (15'-30')	Soft Rock	8.04E+06	0.5	2364.2	0	Shale (15'-30')_26	140	Silva et al., 20'-50'	Silva et al., 20'-50'	3.4	Shale (15'-30')_26	1360
51.3	52.4	Shale (15'-30')	Soft Rock	8.04E+06	0.5	2480.6	0	Shale (15'-30')_27	140	Silva et al., 50'-120'	Silva et al., 50'-120'	1.1	Shale (15'-30')_27	1360
52.4	152.4	Shale (El. 575'-675')	Firm Rock	4.18E+07	0.5	5095.8	0	Shale (El. 575'-675')_28	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 575'-675')_28	3100
152.4	252.4	Shale (El. 475'-575')	Firm Rock	7.31E+07	0.5	10269.1	0	Shale (El. 475'-575')_29	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 475'-575')_29	4100
252.4	352.4	Shale (El. 375'-475')	Firm Rock	1.13E+08	0.5	15442.4	0	Shale (El. 375'-475')_30	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 375'-475')_30	5100
352.4	452.4	Shale (El. 275'-375')	Firm Rock	1.62E+08	0.5	20615.8	0	Shale (El. 275'-375')_31	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 275'-375')_31	6100
452.4	552.4	Shale (El. 175'-275')	Firm Rock	2.19E+08	0.5	25789.1	0	Shale (El. 175'-275')_32	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 175'-275')_32	7100
552.4	652.4	Shale (El. 75'-175')	Firm Rock	2.85E+08	0.5	30962.4	0	Shale (El. 75'-175')_33	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 75'-175')_33	8100
652.4	692.4	Shale (El. 35'-75')	Firm Rock	3.37E+08	0.5	34583.8	0	Shale (El. 35'-75')_34	140	Firm/Hard Rock	Firm/Hard Rock	40	Shale (El. 35'-75')_34	8800
692.4	Half-Space	Shale (El. < 35')	Half-Space	3.52E+08	0.5	Half-Space	0	Bedrock	140	NA, Half-Space	Damping = 0.5%	Half Space	Bedrock	9000

Facility	KIF	
Section/Group	A-A'	
Profile Name	KIF-B12_NOR	
Top of Profile Elevation	725.6	ft
Depth to water table during EQ	0	ft
Surcharge Pressure	0	psf

Strata Profile

Non-input Information								Strata "Soil Types" Input				Strata "Soil Profile" Input		
Top Depth (ft)	Bottom Depth (ft)	Layer Name	Layer Type	G_{max} (psf)	K_o	Mean Effective Stress at midpoint (psf)	Plasticity Index	Name (for Strata)	Unit Weight (pcf)	Modulus Reduction (G/Gmax) Model	Damping Model	Thickness (ft)	Soil Type (for Strata)	Shear Wave Velocity (fps)
0	1.87	Subunit 1	Soil	2.22E+06	0.5	40.3	13	Subunit 1_1	127	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	1.87	Subunit 1_1	750
1.87	3.74	Subunit 1	Soil	2.22E+06	0.5	120.8	13	Subunit 1_2	127	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	1.87	Subunit 1_2	750
3.74	5.61	Subunit 1	Soil	2.22E+06	0.5	201.3	13	Subunit 1_3	127	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	1.87	Subunit 1_3	750
5.61	7.48	Subunit 1	Soil	2.22E+06	0.5	281.9	13	Subunit 1_4	127	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	1.87	Subunit 1_4	750
7.48	9.35	Subunit 1	Soil	2.22E+06	0.5	362.4	13	Subunit 1_5	127	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	1.87	Subunit 1_5	750
9.35	11.22	Subunit 1	Soil	2.22E+06	0.5	442.9	13	Subunit 1_6	127	D&S, p'=400-800, PI=10-15	D&S, p'=400-800, PI=10-15	1.87	Subunit 1_6	750
11.22	11.6	Subunit 1	Soil	2.22E+06	0.5	491.4	13	Subunit 1_7	127	D&S, p'=400-800, PI=10-15	D&S, p'=400-800, PI=10-15	0.38	Subunit 1_7	750
11.6	13.35	Subunit 2	Soil	1.93E+06	0.5	537.3	0	Subunit 2_8	127	D&S, p'=400-800, PI=0	D&S, p'=400-800, PI=0	1.75	Subunit 2_8	700
13.35	15.1	Subunit 2	Soil	1.93E+06	0.5	612.6	0	Subunit 2_9	127	D&S, p'=400-800, PI=0	D&S, p'=400-800, PI=0	1.75	Subunit 2_9	700
15.1	16.1	Subunit 2	Soil	1.93E+06	0.5	671.8	0	Subunit 2_10	127	D&S, p'=400-800, PI=0	D&S, p'=400-800, PI=0	1	Subunit 2_10	700
16.1	17.85	Subunit 3	Soil	2.01E+06	0.5	734.0	0	Subunit 3_11	132	D&S, p'=400-800, PI=0	D&S, p'=400-800, PI=0	1.75	Subunit 3_11	700
17.85	19.6	Subunit 3	Soil	2.01E+06	0.5	815.2	0	Subunit 3_12	132	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Subunit 3_12	700
19.6	21.35	Subunit 3	Soil	2.01E+06	0.5	896.4	0	Subunit 3_13	132	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Subunit 3_13	700
21.35	21.6	Subunit 3	Soil	2.01E+06	0.5	942.8	0	Subunit 3_14	132	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	0.25	Subunit 3_14	700
21.6	24.65	Shale (0'-15')	Soft Rock	6.47E+06	0.5	1027.5	0	Shale (0'-15')_15	140	Silva et al., 20'-50'	Silva et al., 20'-50'	3.05	Shale (0'-15')_15	1220
24.65	27.7	Shale (0'-15')	Soft Rock	6.47E+06	0.5	1185.3	0	Shale (0'-15')_16	140	Silva et al., 20'-50'	Silva et al., 20'-50'	3.05	Shale (0'-15')_16	1220
27.7	30.75	Shale (0'-15')	Soft Rock	6.47E+06	0.5	1343.0	0	Shale (0'-15')_17	140	Silva et al., 20'-50'	Silva et al., 20'-50'	3.05	Shale (0'-15')_17	1220
30.75	33.8	Shale (0'-15')	Soft Rock	6.47E+06	0.5	1500.8	0	Shale (0'-15')_18	140	Silva et al., 20'-50'	Silva et al., 20'-50'	3.05	Shale (0'-15')_18	1220
33.8	36.6	Shale (0'-15')	Soft Rock	6.47E+06	0.5	1652.1	0	Shale (0'-15')_19	140	Silva et al., 20'-50'	Silva et al., 20'-50'	2.8	Shale (0'-15')_19	1220
36.6	40	Shale (15'-30')	Soft Rock	8.04E+06	0.5	1812.5	0	Shale (15'-30')_20	140	Silva et al., 20'-50'	Silva et al., 20'-50'	3.4	Shale (15'-30')_20	1360
40	43.4	Shale (15'-30')	Soft Rock	8.04E+06	0.5	1988.4	0	Shale (15'-30')_21	140	Silva et al., 20'-50'	Silva et al., 20'-50'	3.4	Shale (15'-30')_21	1360
43.4	46.8	Shale (15'-30')	Soft Rock	8.04E+06	0.5	2164.3	0	Shale (15'-30')_22	140	Silva et al., 20'-50'	Silva et al., 20'-50'	3.4	Shale (15'-30')_22	1360
46.8	50.2	Shale (15'-30')	Soft Rock	8.04E+06	0.5	2340.2	0	Shale (15'-30')_23	140	Silva et al., 20'-50'	Silva et al., 20'-50'	3.4	Shale (15'-30')_23	1360
50.2	50.6	Shale (15'-30')	Soft Rock	8.04E+06	0.5	2438.5	0	Shale (15'-30')_24	140	Silva et al., 50'-120'	Silva et al., 50'-120'	0.4	Shale (15'-30')_24	1360
50.6	150.6	Shale (El. 575'-675')	Firm Rock	4.18E+07	0.5	5035.5	0	Shale (El. 575'-675')_25	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 575'-675')_25	3100
150.6	250.6	Shale (El. 475'-575')	Firm Rock	7.31E+07	0.5	10208.8	0	Shale (El. 475'-575')_26	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 475'-575')_26	4100
250.6	350.6	Shale (El. 375'-475')	Firm Rock	1.13E+08	0.5	15382.2	0	Shale (El. 375'-475')_27	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 375'-475')_27	5100
350.6	450.6	Shale (El. 275'-375')	Firm Rock	1.62E+08	0.5	20555.5	0	Shale (El. 275'-375')_28	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 275'-375')_28	6100
450.6	550.6	Shale (El. 175'-275')	Firm Rock	2.19E+08	0.5	25728.8	0	Shale (El. 175'-275')_29	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 175'-275')_29	7100
550.6	650.6	Shale (El. 75'-175')	Firm Rock	2.85E+08	0.5	30902.2	0	Shale (El. 75'-175')_30	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 75'-175')_30	8100
650.6	690.6	Shale (El. 35'-75')	Firm Rock	3.37E+08	0.5	34523.5	0	Shale (El. 35'-75')_31	140	Firm/Hard Rock	Firm/Hard Rock	40	Shale (El. 35'-75')_31	8800
690.6	Half-Space	Shale (El. < 35')	Half-Space	3.52E+08	0.5	Half-Space	0	Bedrock	140	NA, Half-Space	Damping = 0.5%	Half Space	Bedrock	9000

Facility	KIF East Dike	
Section/Group	A-A'	
Profile Name	KIF-A1_NOR	
Top of Profile Elevation	762.7	ft
Depth to water table during EQ	8.69	ft
Surcharge Pressure	0	psf

Strata Profile

Non-input Information								Strata "Soil Types" Input				Strata "Soil Profile" Input		
Top Depth (ft)	**Bottom Depth (ft)**	**Layer Name**	**Layer Type**	**G_{max} (psf)**	**K_o**	**Mean Effective Stress at midpoint (psf)**	**Plasticity Index**	**Name (for Strata)**	**Unit Weight (pcf)**	**Modulus Reduction (G/Gmax) Model**	**Damping Model**	**Thickness (ft)**	**Soil Type (for Strata)**	**Shear Wave Velocity (fps)**
0	0.82	Cover Material	Soil	4.01E+05	0.5	32.8	38	Cover Material_1	120	D&S, p'=0-400, PI=30-40	D&S, p'=0-400, PI=30-40	0.82	Cover Material_1	328
0.82	1.64	Cover Material	Soil	4.01E+05	0.5	98.4	38	Cover Material_2	120	D&S, p'=0-400, PI=30-40	D&S, p'=0-400, PI=30-40	0.82	Cover Material_2	328
1.64	2	Cover Material	Soil	4.01E+05	0.5	145.6	38	Cover Material_3	120	D&S, p'=0-400, PI=30-40	D&S, p'=0-400, PI=30-40	0.36	Cover Material_3	328
2	3.62	Bottom Ash	Soil	1.56E+06	0.5	224.3	0	Bottom Ash_4	119	D&S, p'=0-400, PI=0	D&S, p'=0-400, PI=0	1.62	Bottom Ash_4	650
3.62	5.24	Bottom Ash	Soil	1.56E+06	0.5	352.8	0	Bottom Ash_5	119	D&S, p'=0-400, PI=0	D&S, p'=0-400, PI=0	1.62	Bottom Ash_5	650
5.24	6.86	Bottom Ash	Soil	1.56E+06	0.5	481.3	0	Bottom Ash_6	119	D&S, p'=400-800, PI=0	D&S, p'=400-800, PI=0	1.62	Bottom Ash_6	650
6.86	8.48	Bottom Ash	Soil	1.56E+06	0.5	609.8	0	Bottom Ash_7	119	D&S, p'=400-800, PI=0	D&S, p'=400-800, PI=0	1.62	Bottom Ash_7	650
8.48	8.69	Bottom Ash	Soil	1.56E+06	0.5	682.4	0	Bottom Ash_8	119	D&S, p'=400-800, PI=0	D&S, p'=400-800, PI=0	0.21	Bottom Ash_8	650
8.69	10.31	Bottom Ash	Soil	1.63E+06	0.5	724.0	0	Bottom Ash_9	124	D&S, p'=400-800, PI=0	D&S, p'=400-800, PI=0	1.62	Bottom Ash_9	650
10.31	11.93	Bottom Ash	Soil	1.63E+06	0.5	790.5	0	Bottom Ash_10	124	D&S, p'=400-800, PI=0	D&S, p'=400-800, PI=0	1.62	Bottom Ash_10	650
11.93	13.55	Bottom Ash	Soil	1.63E+06	0.5	857.1	0	Bottom Ash_11	124	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.62	Bottom Ash_11	650
13.55	15.17	Bottom Ash	Soil	1.63E+06	0.5	923.6	0	Bottom Ash_12	124	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.62	Bottom Ash_12	650
15.17	16.79	Bottom Ash	Soil	1.63E+06	0.5	990.1	0	Bottom Ash_13	124	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.62	Bottom Ash_13	650
16.79	18.41	Bottom Ash	Soil	1.63E+06	0.5	1056.6	0	Bottom Ash_14	124	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.62	Bottom Ash_14	650
18.41	20.03	Bottom Ash	Soil	1.63E+06	0.5	1123.2	0	Bottom Ash_15	124	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.62	Bottom Ash_15	650
20.03	21.65	Bottom Ash	Soil	1.63E+06	0.5	1189.7	0	Bottom Ash_16	124	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.62	Bottom Ash_16	650
21.65	23.27	Bottom Ash	Soil	1.63E+06	0.5	1256.2	0	Bottom Ash_17	124	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.62	Bottom Ash_17	650
23.27	24.89	Bottom Ash	Soil	1.63E+06	0.5	1322.8	0	Bottom Ash_18	124	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.62	Bottom Ash_18	650
24.89	26.51	Bottom Ash	Soil	1.63E+06	0.5	1389.3	0	Bottom Ash_19	124	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.62	Bottom Ash_19	650
26.51	28.13	Bottom Ash	Soil	1.63E+06	0.5	1455.8	0	Bottom Ash_20	124	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.62	Bottom Ash_20	650
28.13	29.75	Bottom Ash	Soil	1.63E+06	0.5	1522.3	0	Bottom Ash_21	124	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.62	Bottom Ash_21	650
29.75	31.37	Bottom Ash	Soil	1.63E+06	0.5	1588.9	0	Bottom Ash_22	124	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.62	Bottom Ash_22	650
31.37	32.7	Bottom Ash	Soil	1.63E+06	0.5	1649.4	0	Bottom Ash_23	124	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.33	Bottom Ash_23	650
32.7	34.45	Fly Ash	Soil	1.70E+06	0.5	1705.7	0	Fly Ash_24	112	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Fly Ash_24	700
34.45	36.2	Fly Ash	Soil	1.70E+06	0.5	1763.6	0	Fly Ash_25	112	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Fly Ash_25	700
36.2	37.2	Fly Ash	Soil	1.70E+06	0.5	1809.0	0	Fly Ash_26	112	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1	Fly Ash_26	700
37.2	39.07	Subunit 1	Soil	2.22E+06	0.5	1865.8	11	Subunit 1_27	127	D&S, p'=1600-2500, PI=10-15	D&S, p'=1600-2500, PI=10-15	1.87	Subunit 1_27	750
39.07	40.94	Subunit 1	Soil	2.22E+06	0.5	1946.4	11	Subunit 1_28	127	D&S, p'=1600-2500, PI=10-15	D&S, p'=1600-2500, PI=10-15	1.87	Subunit 1_28	750
40.94	42.81	Subunit 1	Soil	2.22E+06	0.5	2026.9	11	Subunit 1_29	127	D&S, p'=1600-2500, PI=10-15	D&S, p'=1600-2500, PI=10-15	1.87	Subunit 1_29	750
42.81	44.68	Subunit 1	Soil	2.22E+06	0.5	2107.4	11	Subunit 1_30	127	D&S, p'=1600-2500, PI=10-15	D&S, p'=1600-2500, PI=10-15	1.87	Subunit 1_30	750
44.68	46.55	Subunit 1	Soil	2.22E+06	0.5	2188.0	11	Subunit 1_31	127	D&S, p'=1600-2500, PI=10-15	D&S, p'=1600-2500, PI=10-15	1.87	Subunit 1_31	750
46.55	46.7	Subunit 1	Soil	2.22E+06	0.5	2231.5	11	Subunit 1_32	127	D&S, p'=1600-2500, PI=10-15	D&S, p'=1600-2500, PI=10-15	0.15	Subunit 1_32	750
46.7	48.45	Subunit 2	Soil	1.93E+06	0.5	2272.4	0	Subunit 2_33	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 2_33	700
48.45	50.2	Subunit 2	Soil	1.93E+06	0.5	2347.7	0	Subunit 2_34	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 2_34	700
50.2	51.95	Subunit 2	Soil	1.93E+06	0.5	2423.1	0	Subunit 2_35	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 2_35	700
51.95	52.7	Subunit 2	Soil	1.93E+06	0.5	2476.9	0	Subunit 2_36	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	0.75	Subunit 2_36	700
52.7	54.45	Subunit 3	Soil	2.01E+06	0.5	2533.7	0	Subunit 3_37	132	D&S, p'=2500-5000, PI=0	D&S, p'=2500-5000, PI=0	1.75	Subunit 3_37	700
54.45	56.2	Subunit 3	Soil	2.01E+06	0.5	2614.9	0	Subunit 3_38	132	D&S, p'=2500-5000, PI=0	D&S, p'=2500-5000, PI=0	1.75	Subunit 3_38	700
56.2	57.95	Subunit 3	Soil	2.01E+06	0.5	2696.1	0	Subunit 3_39	132	D&S, p'=2500-5000, PI=0	D&S, p'=2500-5000, PI=0	1.75	Subunit 3_39	700
57.95	58.2	Subunit 3	Soil	2.01E+06	0.5	2742.5	0	Subunit 3_40	132	D&S, p'=2500-5000, PI=0	D&S, p'=2500-5000, PI=0	0.25	Subunit 3_40	700
58.2	61.25	Shale (0'-15')	Soft Rock	6.47E+06	0.5	2827.2	0	Shale (0'-15')_41	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_41	1220
61.25	64.3	Shale (0'-15')	Soft Rock	6.47E+06	0.5	2985.0	0	Shale (0'-15')_42	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_42	1220
64.3	67.35	Shale (0'-15')	Soft Rock	6.47E+06	0.5	3142.8	0	Shale (0'-15')_43	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_43	1220
67.35	70.4	Shale (0'-15')	Soft Rock	6.47E+06	0.5	3300.5	0	Shale (0'-15')_44	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_44	1220
70.4	73.2	Shale (0'-15')	Soft Rock	6.47E+06	0.5	3451.9	0	Shale (0'-15')_45	140	Silva et al., 50'-120'	Silva et al., 50'-120'	2.8	Shale (0'-15')_45	1220
73.2	76.6	Shale (15'-30')	Soft Rock	8.04E+06	0.5	3612.2	0	Shale (15'-30')_46	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_46	1360
76.6	80	Shale (15'-30')	Soft Rock	8.04E+06	0.5	3788.1	0	Shale (15'-30')_47	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_47	1360

Strata Profile														
Non-input Information								Strata "Soil Types" Input				Strata "Soil Profile" Input		
Top Depth (ft)	Bottom Depth (ft)	Layer Name	Layer Type	G_{max} (psf)	K_o	Mean Effective Stress at midpoint (psf)	Plasticity Index	Name (for Strata)	Unit Weight (pcf)	Modulus Reduction (G/Gmax) Model	Damping Model	Thickness (ft)	Soil Type (for Strata)	Shear Wave Velocity (fps)
80	83.4	Shale (15'-30')	Soft Rock	8.04E+06	0.5	3964.0	0	Shale (15'-30')_48	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_48	1360
83.4	86.8	Shale (15'-30')	Soft Rock	8.04E+06	0.5	4139.9	0	Shale (15'-30')_49	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_49	1360
86.8	87.7	Shale (15'-30')	Soft Rock	8.04E+06	0.5	4251.1	0	Shale (15'-30')_50	140	Silva et al., 50'-120'	Silva et al., 50'-120'	0.9	Shale (15'-30')_50	1360
87.7	187.7	Shale (El. 575'-675')	Firm Rock	4.18E+07	0.5	6861.1	0	Shale (El. 575'-675')_51	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 575'-675')_51	3100
187.7	287.7	Shale (El. 475'-575')	Firm Rock	7.31E+07	0.5	12034.4	0	Shale (El. 475'-575')_52	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 475'-575')_52	4100
287.7	387.7	Shale (El. 375'-475')	Firm Rock	1.13E+08	0.5	17207.8	0	Shale (El. 375'-475')_53	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 375'-475')_53	5100
387.7	487.7	Shale (El. 275'-375')	Firm Rock	1.62E+08	0.5	22381.1	0	Shale (El. 275'-375')_54	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 275'-375')_54	6100
487.7	587.7	Shale (El. 175'-275')	Firm Rock	2.19E+08	0.5	27554.4	0	Shale (El. 175'-275')_55	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 175'-275')_55	7100
587.7	687.7	Shale (El. 75'-175')	Firm Rock	2.85E+08	0.5	32727.8	0	Shale (El. 75'-175')_56	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 75'-175')_56	8100
687.7	727.7	Shale (El. 35'-75')	Firm Rock	3.37E+08	0.5	36349.1	0	Shale (El. 35'-75')_57	140	Firm/Hard Rock	Firm/Hard Rock	40	Shale (El. 35'-75')_57	8800
727.7	Half-Space	Shale (El. < 35')	Half-Space	3.52E+08	0.5	Half-Space	0	Bedrock	140	NA, Half-Space	Damping = 0.5%	Half Space	Bedrock	9000

Facility	KIF	
Section/Group	A-A'	
Profile Name	KIF-A2_NOR	
Top of Profile Elevation	755.2	ft
Depth to water table during EQ	1.85	ft
Surcharge Pressure	0	psf

Strata Profile

Non-input Information								Strata "Soil Types" Input				Strata "Soil Profile" Input		
Top Depth (ft)	**Bottom Depth (ft)**	**Layer Name**	**Layer Type**	**G_{max} (psf)**	**K_o**	**Mean Effective Stress at midpoint (psf)**	**Plasticity Index**	**Name (for Strata)**	**Unit Weight (pcf)**	**Modulus Reduction (G/Gmax) Model**	**Damping Model**	**Thickness (ft)**	**Soil Type (for Strata)**	**Shear Wave Velocity (fps)**
0	0.8	Cover Material	Soil	3.86E+05	0.5	32.0	38	Cover Material_1	120	D&S, p'=0-400, PI=30-40	D&S, p'=0-400, PI=30-40	0.8	Cover Material_1	322
0.8	1.6	Cover Material	Soil	3.86E+05	0.5	96.0	38	Cover Material_2	120	D&S, p'=0-400, PI=30-40	D&S, p'=0-400, PI=30-40	0.8	Cover Material_2	322
1.6	1.85	Cover Material	Soil	3.86E+05	0.5	138.0	38	Cover Material_3	120	D&S, p'=0-400, PI=30-40	D&S, p'=0-400, PI=30-40	0.25	Cover Material_3	322
1.85	2	Cover Material	Soil	5.51E+05	0.5	150.9	38	Cover Material_4	121	D&S, p'=0-400, PI=30-40	D&S, p'=0-400, PI=30-40	0.15	Cover Material_4	383
2	3.62	Bottom Ash	Soil	1.63E+06	0.5	187.1	0	Bottom Ash_5	124	D&S, p'=0-400, PI=0	D&S, p'=0-400, PI=0	1.62	Bottom Ash_5	650
3.62	3.7	Bottom Ash	Soil	1.63E+06	0.5	222.0	0	Bottom Ash_6	124	D&S, p'=0-400, PI=0	D&S, p'=0-400, PI=0	0.08	Bottom Ash_6	650
3.7	5.45	Embankment Fill	Soil	1.95E+06	0.5	261.9	13	Embankment Fill_7	128	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	1.75	Embankment Fill_7	700
5.45	7.2	Embankment Fill	Soil	1.95E+06	0.5	338.5	13	Embankment Fill_8	128	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	1.75	Embankment Fill_8	700
7.2	8.95	Embankment Fill	Soil	1.95E+06	0.5	415.0	13	Embankment Fill_9	128	D&S, p'=400-800, PI=10-15	D&S, p'=400-800, PI=10-15	1.75	Embankment Fill_9	700
8.95	10.7	Embankment Fill	Soil	1.95E+06	0.5	491.5	13	Embankment Fill_10	128	D&S, p'=400-800, PI=10-15	D&S, p'=400-800, PI=10-15	1.75	Embankment Fill_10	700
10.7	12.45	Embankment Fill	Soil	1.95E+06	0.5	568.1	13	Embankment Fill_11	128	D&S, p'=400-800, PI=10-15	D&S, p'=400-800, PI=10-15	1.75	Embankment Fill_11	700
12.45	14.2	Embankment Fill	Soil	1.95E+06	0.5	644.6	13	Embankment Fill_12	128	D&S, p'=400-800, PI=10-15	D&S, p'=400-800, PI=10-15	1.75	Embankment Fill_12	700
14.2	15.95	Embankment Fill	Soil	1.95E+06	0.5	721.1	13	Embankment Fill_13	128	D&S, p'=400-800, PI=10-15	D&S, p'=400-800, PI=10-15	1.75	Embankment Fill_13	700
15.95	17.7	Embankment Fill	Soil	1.95E+06	0.5	797.7	13	Embankment Fill_14	128	D&S, p'=400-800, PI=10-15	D&S, p'=400-800, PI=10-15	1.75	Embankment Fill_14	700
17.7	19.45	Embankment Fill	Soil	1.95E+06	0.5	874.2	13	Embankment Fill_15	128	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.75	Embankment Fill_15	700
19.45	21.2	Embankment Fill	Soil	1.95E+06	0.5	950.7	13	Embankment Fill_16	128	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.75	Embankment Fill_16	700
21.2	22.95	Embankment Fill	Soil	1.95E+06	0.5	1027.3	13	Embankment Fill_17	128	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.75	Embankment Fill_17	700
22.95	24.7	Embankment Fill	Soil	1.95E+06	0.5	1103.8	13	Embankment Fill_18	128	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.75	Embankment Fill_18	700
24.7	26.45	Embankment Fill	Soil	1.95E+06	0.5	1180.3	13	Embankment Fill_19	128	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.75	Embankment Fill_19	700
26.45	28.2	Embankment Fill	Soil	1.95E+06	0.5	1256.9	13	Embankment Fill_20	128	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.75	Embankment Fill_20	700
28.2	29.95	Embankment Fill	Soil	1.95E+06	0.5	1333.4	13	Embankment Fill_21	128	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.75	Embankment Fill_21	700
29.95	31.7	Embankment Fill	Soil	1.95E+06	0.5	1409.9	13	Embankment Fill_22	128	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.75	Embankment Fill_22	700
31.7	31.8	Embankment Fill	Soil	1.95E+06	0.5	1450.4	13	Embankment Fill_23	128	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	0.1	Embankment Fill_23	700
31.8	33.67	Subunit 1	Soil	2.22E+06	0.5	1492.8	13	Subunit 1_24	127	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.87	Subunit 1_24	750
33.67	35.54	Subunit 1	Soil	2.22E+06	0.5	1573.4	13	Subunit 1_25	127	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.87	Subunit 1_25	750
35.54	37.41	Subunit 1	Soil	2.22E+06	0.5	1653.9	13	Subunit 1_26	127	D&S, p'=1600-2500, PI=10-15	D&S, p'=1600-2500, PI=10-15	1.87	Subunit 1_26	750
37.41	39.28	Subunit 1	Soil	2.22E+06	0.5	1734.5	13	Subunit 1_27	127	D&S, p'=1600-2500, PI=10-15	D&S, p'=1600-2500, PI=10-15	1.87	Subunit 1_27	750
39.28	41.15	Subunit 1	Soil	2.22E+06	0.5	1815.0	13	Subunit 1_28	127	D&S, p'=1600-2500, PI=10-15	D&S, p'=1600-2500, PI=10-15	1.87	Subunit 1_28	750
41.15	41.4	Subunit 1	Soil	2.22E+06	0.5	1860.6	13	Subunit 1_29	127	D&S, p'=1600-2500, PI=10-15	D&S, p'=1600-2500, PI=10-15	0.25	Subunit 1_29	750
41.4	43.15	Subunit 2	Soil	1.93E+06	0.5	1903.7	0	Subunit 2_30	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 2_30	700
43.15	44.9	Subunit 2	Soil	1.93E+06	0.5	1979.1	0	Subunit 2_31	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 2_31	700
44.9	45.2	Subunit 2	Soil	1.93E+06	0.5	2023.2	0	Subunit 2_32	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	0.3	Subunit 2_32	700
45.2	46.95	Subunit 3	Soil	2.01E+06	0.5	2070.3	0	Subunit 3_33	132	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 3_33	700
46.95	48.7	Subunit 3	Soil	2.01E+06	0.5	2151.5	0	Subunit 3_34	132	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 3_34	700
48.7	51.75	Shale (0'-15')	Soft Rock	6.47E+06	0.5	2271.0	0	Shale (0'-15')_35	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_35	1220
51.75	54.8	Shale (0'-15')	Soft Rock	6.47E+06	0.5	2428.8	0	Shale (0'-15')_36	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_36	1220
54.8	57.85	Shale (0'-15')	Soft Rock	6.47E+06	0.5	2586.5	0	Shale (0'-15')_37	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_37	1220
57.85	60.9	Shale (0'-15')	Soft Rock	6.47E+06	0.5	2744.3	0	Shale (0'-15')_38	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_38	1220
60.9	63.7	Shale (0'-15')	Soft Rock	6.47E+06	0.5	2895.6	0	Shale (0'-15')_39	140	Silva et al., 50'-120'	Silva et al., 50'-120'	2.8	Shale (0'-15')_39	1220
63.7	67.1	Shale (15'-30')	Soft Rock	8.04E+06	0.5	3056.0	0	Shale (15'-30')_40	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_40	1360
67.1	70.5	Shale (15'-30')	Soft Rock	8.04E+06	0.5	3231.9	0	Shale (15'-30')_41	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_41	1360
70.5	73.9	Shale (15'-30')	Soft Rock	8.04E+06	0.5	3407.8	0	Shale (15'-30')_42	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_42	1360
73.9	77.3	Shale (15'-30')	Soft Rock	8.04E+06	0.5	3583.7	0	Shale (15'-30')_43	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_43	1360
77.3	79.7	Shale (15'-30')	Soft Rock	8.04E+06	0.5	3733.7	0	Shale (15'-30')_44	140	Silva et al., 50'-120'	Silva et al., 50'-120'	2.4	Shale (15'-30')_44	1360
79.7	80.2	Shale (>30')	Soft Rock	9.65E+06	0.5	3808.7	0	Shale (>30')_45	140	Silva et al., 50'-120'	Silva et al., 50'-120'	0.5	Shale (>30')_45	1490
80.2	180.2	Shale (El. 575'-675')	Firm Rock	4.18E+07	0.5	6408.3	0	Shale (El. 575'-675')_46	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 575'-675')_46	3100
180.2	280.2	Shale (El. 475'-575')	Firm Rock	7.31E+07	0.5	11581.7	0	Shale (El. 475'-575')_47	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 475'-575')_47	4100
280.2	380.2	Shale (El. 375'-475')	Firm Rock	1.13E+08	0.5	16755.0	0	Shale (El. 375'-475')_48	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 375'-475')_48	5100
380.2	480.2	Shale (El. 275'-375')	Firm Rock	1.62E+08	0.5	21928.3	0	Shale (El. 275'-375')_49	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 275'-375')_49	6100

Strata Profile														
Non-input Information								Strata "Soil Types" Input				Strata "Soil Profile" Input		
Top Depth (ft)	Bottom Depth (ft)	Layer Name	Layer Type	G_{max} (psf)	K_o	Mean Effective Stress at midpoint (psf)	Plasticity Index	Name (for Strata)	Unit Weight (pcf)	Modulus Reduction (G/Gmax) Model	Damping Model	Thickness (ft)	Soil Type (for Strata)	Shear Wave Velocity (fps)
480.2	580.2	Shale (El. 175'-275')	Firm Rock	2.19E+08	0.5	27101.7	0	Shale (El. 175'-275')_50	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 175'-275')_50	7100
580.2	680.2	Shale (El. 75'-175')	Firm Rock	2.85E+08	0.5	32275.0	0	Shale (El. 75'-175')_51	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 75'-175')_51	8100
680.2	720.2	Shale (El. 35'-75')	Firm Rock	3.37E+08	0.5	35896.3	0	Shale (El. 35'-75')_52	140	Firm/Hard Rock	Firm/Hard Rock	40	Shale (El. 35'-75')_52	8800
720.2	Half-Space	Shale (El. < 35')	Half-Space	3.52E+08	0.5	Half-Space	0	Bedrock	140	NA, Half-Space	Damping = 0.5%	Half Space	Bedrock	9000

Facility	KIF	
Section/Group	A-A'	
Profile Name	KIF-A3_NOR	
Top of Profile Elevation	753.3	ft
Depth to water table during EQ	5.8	ft
Surcharge Pressure	0	psf

Strata Profile

Non-input Information								Strata "Soil Types" Input				Strata "Soil Profile" Input		
Top Depth (ft)	**Bottom Depth (ft)**	**Layer Name**	**Layer Type**	**G_{max} (psf)**	**K_o**	**Mean Effective Stress at midpoint (psf)**	**Plasticity Index**	**Name (for Strata)**	**Unit Weight (pcf)**	**Modulus Reduction (G/Gmax) Model**	**Damping Model**	**Thickness (ft)**	**Soil Type (for Strata)**	**Shear Wave Velocity (fps)**
0	0.72	Riprap	Soil	2.98E+05	0.5	27.6	0	Riprap_1	115	D&S, p'=0-400, PI=0	D&S, p'=0-400, PI=0	0.72	Riprap_1	289
0.72	1	Riprap	Soil	2.98E+05	0.5	65.9	0	Riprap_2	115	D&S, p'=0-400, PI=0	D&S, p'=0-400, PI=0	0.28	Riprap_2	289
1	2.08	Filter Material	Soil	7.42E+05	0.5	122.0	0	Filter Material_3	126	D&S, p'=0-400, PI=0	D&S, p'=0-400, PI=0	1.08	Filter Material_3	435
2.08	3.16	Filter Material	Soil	7.42E+05	0.5	212.7	0	Filter Material_4	126	D&S, p'=0-400, PI=0	D&S, p'=0-400, PI=0	1.08	Filter Material_4	435
3.16	3.5	Filter Material	Soil	7.42E+05	0.5	272.4	0	Filter Material_5	126	D&S, p'=0-400, PI=0	D&S, p'=0-400, PI=0	0.34	Filter Material_5	435
3.5	5.25	Embankment Fill	Soil	1.95E+06	0.5	361.3	13	Embankment Fill_6	128	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	1.75	Embankment Fill_6	700
5.25	5.8	Embankment Fill	Soil	1.95E+06	0.5	459.5	13	Embankment Fill_7	128	D&S, p'=400-800, PI=10-15	D&S, p'=400-800, PI=10-15	0.55	Embankment Fill_7	700
5.8	7.55	Embankment Fill	Soil	1.95E+06	0.5	521.2	13	Embankment Fill_8	128	D&S, p'=400-800, PI=10-15	D&S, p'=400-800, PI=10-15	1.75	Embankment Fill_8	700
7.55	9.3	Embankment Fill	Soil	1.95E+06	0.5	597.7	13	Embankment Fill_9	128	D&S, p'=400-800, PI=10-15	D&S, p'=400-800, PI=10-15	1.75	Embankment Fill_9	700
9.3	11.05	Embankment Fill	Soil	1.95E+06	0.5	674.3	13	Embankment Fill_10	128	D&S, p'=400-800, PI=10-15	D&S, p'=400-800, PI=10-15	1.75	Embankment Fill_10	700
11.05	12.8	Embankment Fill	Soil	1.95E+06	0.5	750.8	13	Embankment Fill_11	128	D&S, p'=400-800, PI=10-15	D&S, p'=400-800, PI=10-15	1.75	Embankment Fill_11	700
12.8	14.55	Embankment Fill	Soil	1.95E+06	0.5	827.3	13	Embankment Fill_12	128	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.75	Embankment Fill_12	700
14.55	16.3	Embankment Fill	Soil	1.95E+06	0.5	903.9	13	Embankment Fill_13	128	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.75	Embankment Fill_13	700
16.3	18.05	Embankment Fill	Soil	1.95E+06	0.5	980.4	13	Embankment Fill_14	128	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.75	Embankment Fill_14	700
18.05	19.8	Embankment Fill	Soil	1.95E+06	0.5	1056.9	13	Embankment Fill_15	128	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.75	Embankment Fill_15	700
19.8	21.55	Embankment Fill	Soil	1.95E+06	0.5	1133.5	13	Embankment Fill_16	128	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.75	Embankment Fill_16	700
21.55	23.3	Embankment Fill	Soil	1.95E+06	0.5	1210.0	13	Embankment Fill_17	128	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.75	Embankment Fill_17	700
23.3	25.05	Embankment Fill	Soil	1.95E+06	0.5	1286.5	13	Embankment Fill_18	128	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.75	Embankment Fill_18	700
25.05	26.8	Embankment Fill	Soil	1.95E+06	0.5	1363.1	13	Embankment Fill_19	128	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.75	Embankment Fill_19	700
26.8	28.55	Embankment Fill	Soil	1.95E+06	0.5	1439.6	13	Embankment Fill_20	128	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.75	Embankment Fill_20	700
28.55	30.3	Embankment Fill	Soil	1.95E+06	0.5	1516.1	13	Embankment Fill_21	128	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.75	Embankment Fill_21	700
30.3	32.17	Subunit 1	Soil	2.22E+06	0.5	1594.7	13	Subunit 1_22	127	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.87	Subunit 1_22	750
32.17	34.04	Subunit 1	Soil	2.22E+06	0.5	1675.2	13	Subunit 1_23	127	D&S, p'=1600-2500, PI=10-15	D&S, p'=1600-2500, PI=10-15	1.87	Subunit 1_23	750
34.04	35.91	Subunit 1	Soil	2.22E+06	0.5	1755.7	13	Subunit 1_24	127	D&S, p'=1600-2500, PI=10-15	D&S, p'=1600-2500, PI=10-15	1.87	Subunit 1_24	750
35.91	37.78	Subunit 1	Soil	2.22E+06	0.5	1836.3	13	Subunit 1_25	127	D&S, p'=1600-2500, PI=10-15	D&S, p'=1600-2500, PI=10-15	1.87	Subunit 1_25	750
37.78	39.6	Subunit 1	Soil	2.22E+06	0.5	1915.7	13	Subunit 1_26	127	D&S, p'=1600-2500, PI=10-15	D&S, p'=1600-2500, PI=10-15	1.82	Subunit 1_26	750
39.6	41.35	Subunit 2	Soil	1.93E+06	0.5	1992.6	0	Subunit 2_27	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 2_27	700
41.35	43.1	Subunit 2	Soil	1.93E+06	0.5	2068.0	0	Subunit 2_28	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 2_28	700
43.1	44.85	Subunit 2	Soil	1.93E+06	0.5	2143.3	0	Subunit 2_29	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 2_29	700
44.85	46.2	Subunit 2	Soil	1.93E+06	0.5	2210.1	0	Subunit 2_30	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.35	Subunit 2_30	700
46.2	47.95	Subunit 3	Soil	2.01E+06	0.5	2279.8	0	Subunit 3_31	132	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 3_31	700
47.95	49.7	Subunit 3	Soil	2.01E+06	0.5	2361.0	0	Subunit 3_32	132	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 3_32	700
49.7	50.5	Subunit 3	Soil	2.01E+06	0.5	2420.1	0	Subunit 3_33	132	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	0.8	Subunit 3_33	700
50.5	53.55	Shale (0'-15')	Soft Rock	6.47E+06	0.5	2517.6	0	Shale (0'-15')_34	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_34	1220
53.55	56.6	Shale (0'-15')	Soft Rock	6.47E+06	0.5	2675.4	0	Shale (0'-15')_35	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_35	1220
56.6	59.65	Shale (0'-15')	Soft Rock	6.47E+06	0.5	2833.1	0	Shale (0'-15')_36	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_36	1220
59.65	62.7	Shale (0'-15')	Soft Rock	6.47E+06	0.5	2990.9	0	Shale (0'-15')_37	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_37	1220
62.7	65.5	Shale (0'-15')	Soft Rock	6.47E+06	0.5	3142.3	0	Shale (0'-15')_38	140	Silva et al., 50'-120'	Silva et al., 50'-120'	2.8	Shale (0'-15')_38	1220
65.5	68.9	Shale (15'-30')	Soft Rock	8.04E+06	0.5	3302.6	0	Shale (15'-30')_39	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_39	1360
68.9	72.3	Shale (15'-30')	Soft Rock	8.04E+06	0.5	3478.5	0	Shale (15'-30')_40	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_40	1360
72.3	75.7	Shale (15'-30')	Soft Rock	8.04E+06	0.5	3654.4	0	Shale (15'-30')_41	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_41	1360
75.7	78.3	Shale (15'-30')	Soft Rock	8.04E+06	0.5	3809.6	0	Shale (15'-30')_42	140	Silva et al., 50'-120'	Silva et al., 50'-120'	2.6	Shale (15'-30')_42	1360
78.3	178.3	Shale (El. 575'-675')	Firm Rock	4.18E+07	0.5	6463.5	0	Shale (El. 575'-675')_43	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 575'-675')_43	3100
178.3	278.3	Shale (El. 475'-575')	Firm Rock	7.31E+07	0.5	11636.9	0	Shale (El. 475'-575')_44	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 475'-575')_44	4100
278.3	378.3	Shale (El. 375'-475')	Firm Rock	1.13E+08	0.5	16810.2	0	Shale (El. 375'-475')_45	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 375'-475')_45	5100
378.3	478.3	Shale (El. 275'-375')	Firm Rock	1.62E+08	0.5	21983.5	0	Shale (El. 275'-375')_46	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 275'-375')_46	6100
478.3	578.3	Shale (El. 175'-275')	Firm Rock	2.19E+08	0.5	27156.9	0	Shale (El. 175'-275')_47	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 175'-275')_47	7100
578.3	678.3	Shale (El. 75'-175')	Firm Rock	2.85E+08	0.5	32330.2	0	Shale (El. 75'-175')_48	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 75'-175')_48	8100
678.3	718.3	Shale (El. 35'-75')	Firm Rock	3.37E+08	0.5	35951.5	0	Shale (El. 35'-75')_49	140	Firm/Hard Rock	Firm/Hard Rock	40	Shale (El. 35'-75')_49	8800

Strata Profile														
Non-input Information								Strata "Soil Types" Input				Strata "Soil Profile" Input		
Top Depth (ft)	Bottom Depth (ft)	Layer Name	Layer Type	G_{max} (psf)	K_o	Mean Effective Stress at midpoint (psf)	Plasticity Index	Name (for Strata)	Unit Weight (pcf)	Modulus Reduction (G/Gmax) Model	Damping Model	Thickness (ft)	Soil Type (for Strata)	Shear Wave Velocity (fps)
718.3	Half-Space	Shale (El. < 35')	Half-Space	3.52E+08	0.5	Half-Space	0	Bedrock	140	NA, Half-Space	Damping = 0.5%	Half Space	Bedrock	9000

Facility	KIF East Dike	
Section/Group	A-A'	
Profile Name	KIF-B39_NOR	
Top of Profile Elevation	769.1	ft
Depth to water table during EQ	14.26	ft
Surcharge Pressure	0	psf

Strata Profile

Non-input Information								Strata "Soil Types" Input				Strata "Soil Profile" Input		
Top Depth (ft)	**Bottom Depth (ft)**	**Layer Name**	**Layer Type**	**G_{max} (psf)**	**K_o**	**Mean Effective Stress at midpoint (psf)**	**Plasticity Index**	**Name (for Strata)**	**Unit Weight (pcf)**	**Modulus Reduction (G/Gmax) Model**	**Damping Model**	**Thickness (ft)**	**Soil Type (for Strata)**	**Shear Wave Velocity (fps)**
0	0.82	Cover Material	Soil	4.01E+05	0.5	32.8	38	Cover Material_1	120	D&S, p'=0-400, PI=30-40	D&S, p'=0-400, PI=30-40	0.82	Cover Material_1	328
0.82	1.64	Cover Material	Soil	4.01E+05	0.5	98.4	38	Cover Material_2	120	D&S, p'=0-400, PI=30-40	D&S, p'=0-400, PI=30-40	0.82	Cover Material_2	328
1.64	2	Cover Material	Soil	4.01E+05	0.5	145.6	38	Cover Material_3	120	D&S, p'=0-400, PI=30-40	D&S, p'=0-400, PI=30-40	0.36	Cover Material_3	328
2	3.75	Fly Ash	Soil	1.70E+06	0.5	225.3	0	Fly Ash_4	112	D&S, p'=0-400, PI=0	D&S, p'=0-400, PI=0	1.75	Fly Ash_4	700
3.75	5.5	Fly Ash	Soil	1.70E+06	0.5	356.0	0	Fly Ash_5	112	D&S, p'=0-400, PI=0	D&S, p'=0-400, PI=0	1.75	Fly Ash_5	700
5.5	7.25	Fly Ash	Soil	1.70E+06	0.5	486.7	0	Fly Ash_6	112	D&S, p'=400-800, PI=0	D&S, p'=400-800, PI=0	1.75	Fly Ash_6	700
7.25	9	Fly Ash	Soil	1.70E+06	0.5	617.3	0	Fly Ash_7	112	D&S, p'=400-800, PI=0	D&S, p'=400-800, PI=0	1.75	Fly Ash_7	700
9	10.75	Fly Ash	Soil	1.70E+06	0.5	748.0	0	Fly Ash_8	112	D&S, p'=400-800, PI=0	D&S, p'=400-800, PI=0	1.75	Fly Ash_8	700
10.75	12.5	Fly Ash	Soil	1.70E+06	0.5	878.7	0	Fly Ash_9	112	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Fly Ash_9	700
12.5	14	Fly Ash	Soil	1.70E+06	0.5	1000.0	0	Fly Ash_10	112	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.5	Fly Ash_10	700
14	14.26	Bottom Ash	Soil	1.56E+06	0.5	1066.3	0	Bottom Ash_11	119	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	0.26	Bottom Ash_11	650
14.26	15.88	Bottom Ash	Soil	1.63E+06	0.5	1109.9	0	Bottom Ash_12	124	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.62	Bottom Ash_12	650
15.88	17.5	Bottom Ash	Soil	1.63E+06	0.5	1176.4	0	Bottom Ash_13	124	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.62	Bottom Ash_13	650
17.5	19.12	Bottom Ash	Soil	1.63E+06	0.5	1242.9	0	Bottom Ash_14	124	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.62	Bottom Ash_14	650
19.12	20.74	Bottom Ash	Soil	1.63E+06	0.5	1309.5	0	Bottom Ash_15	124	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.62	Bottom Ash_15	650
20.74	22.36	Bottom Ash	Soil	1.63E+06	0.5	1376.0	0	Bottom Ash_16	124	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.62	Bottom Ash_16	650
22.36	23.98	Bottom Ash	Soil	1.63E+06	0.5	1442.5	0	Bottom Ash_17	124	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.62	Bottom Ash_17	650
23.98	25.6	Bottom Ash	Soil	1.63E+06	0.5	1509.1	0	Bottom Ash_18	124	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.62	Bottom Ash_18	650
25.6	27.22	Bottom Ash	Soil	1.63E+06	0.5	1575.6	0	Bottom Ash_19	124	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.62	Bottom Ash_19	650
27.22	28.84	Bottom Ash	Soil	1.63E+06	0.5	1642.1	0	Bottom Ash_20	124	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.62	Bottom Ash_20	650
28.84	30.46	Bottom Ash	Soil	1.63E+06	0.5	1708.6	0	Bottom Ash_21	124	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.62	Bottom Ash_21	650
30.46	32.08	Bottom Ash	Soil	1.63E+06	0.5	1775.2	0	Bottom Ash_22	124	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.62	Bottom Ash_22	650
32.08	33.7	Bottom Ash	Soil	1.63E+06	0.5	1841.7	0	Bottom Ash_23	124	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.62	Bottom Ash_23	650
33.7	35.32	Bottom Ash	Soil	1.63E+06	0.5	1908.2	0	Bottom Ash_24	124	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.62	Bottom Ash_24	650
35.32	36.94	Bottom Ash	Soil	1.63E+06	0.5	1974.8	0	Bottom Ash_25	124	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.62	Bottom Ash_25	650
36.94	38.56	Bottom Ash	Soil	1.63E+06	0.5	2041.3	0	Bottom Ash_26	124	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.62	Bottom Ash_26	650
38.56	39	Bottom Ash	Soil	1.63E+06	0.5	2083.6	0	Bottom Ash_27	124	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	0.44	Bottom Ash_27	650
39	40.75	Fly Ash	Soil	1.70E+06	0.5	2121.5	0	Fly Ash_28	112	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Fly Ash_28	700
40.75	42.5	Fly Ash	Soil	1.70E+06	0.5	2179.4	0	Fly Ash_29	112	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Fly Ash_29	700
42.5	44.25	Fly Ash	Soil	1.70E+06	0.5	2237.3	0	Fly Ash_30	112	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Fly Ash_30	700
44.25	46	Fly Ash	Soil	1.70E+06	0.5	2295.1	0	Fly Ash_31	112	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Fly Ash_31	700
46	47.75	Fly Ash	Soil	1.70E+06	0.5	2353.0	0	Fly Ash_32	112	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Fly Ash_32	700
47.75	49	Fly Ash	Soil	1.70E+06	0.5	2402.6	0	Fly Ash_33	112	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.25	Fly Ash_33	700
49	50.87	Subunit 1	Soil	2.22E+06	0.5	2463.6	11	Subunit 1_34	127	D&S, p'=1600-2500, PI=10-15	D&S, p'=1600-2500, PI=10-15	1.87	Subunit 1_34	750
50.87	52.74	Subunit 1	Soil	2.22E+06	0.5	2544.1	11	Subunit 1_35	127	D&S, p'=2500-5000, PI=10-15	D&S, p'=2500-5000, PI=10-15	1.87	Subunit 1_35	750
52.74	54.61	Subunit 1	Soil	2.22E+06	0.5	2624.6	11	Subunit 1_36	127	D&S, p'=2500-5000, PI=10-15	D&S, p'=2500-5000, PI=10-15	1.87	Subunit 1_36	750
54.61	56	Subunit 1	Soil	2.22E+06	0.5	2694.8	11	Subunit 1_37	127	D&S, p'=2500-5000, PI=10-15	D&S, p'=2500-5000, PI=10-15	1.39	Subunit 1_37	750
56	57.75	Subunit 2	Soil	1.93E+06	0.5	2762.4	0	Subunit 2_38	127	D&S, p'=2500-5000, PI=0	D&S, p'=2500-5000, PI=0	1.75	Subunit 2_38	700
57.75	59.5	Subunit 2	Soil	1.93E+06	0.5	2837.8	0	Subunit 2_39	127	D&S, p'=2500-5000, PI=0	D&S, p'=2500-5000, PI=0	1.75	Subunit 2_39	700
59.5	61.25	Subunit 2	Soil	1.93E+06	0.5	2913.2	0	Subunit 2_40	127	D&S, p'=2500-5000, PI=0	D&S, p'=2500-5000, PI=0	1.75	Subunit 2_40	700
61.25	63	Subunit 2	Soil	1.93E+06	0.5	2988.5	0	Subunit 2_41	127	D&S, p'=2500-5000, PI=0	D&S, p'=2500-5000, PI=0	1.75	Subunit 2_41	700
63	64.75	Subunit 2	Soil	1.93E+06	0.5	3063.9	0	Subunit 2_42	127	D&S, p'=2500-5000, PI=0	D&S, p'=2500-5000, PI=0	1.75	Subunit 2_42	700
64.75	66.5	Subunit 2	Soil	1.93E+06	0.5	3139.3	0	Subunit 2_43	127	D&S, p'=2500-5000, PI=0	D&S, p'=2500-5000, PI=0	1.75	Subunit 2_43	700
66.5	67.5	Subunit 2	Soil	1.93E+06	0.5	3198.5	0	Subunit 2_44	127	D&S, p'=2500-5000, PI=0	D&S, p'=2500-5000, PI=0	1	Subunit 2_44	700
67.5	68.1	Subunit 3	Soil	2.01E+06	0.5	3233.9	0	Subunit 3_45	132	D&S, p'=2500-5000, PI=0	D&S, p'=2500-5000, PI=0	0.6	Subunit 3_45	700
68.1	71.15	Shale (0'-15')	Soft Rock	6.47E+06	0.5	3326.7	0	Shale (0'-15')_46	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_46	1220
71.15	74.2	Shale (0'-15')	Soft Rock	6.47E+06	0.5	3484.5	0	Shale (0'-15')_47	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_47	1220

Strata Profile														
Non-input Information								Strata "Soil Types" Input				Strata "Soil Profile" Input		
Top Depth (ft)	Bottom Depth (ft)	Layer Name	Layer Type	G_{max} (psf)	K_o	Mean Effective Stress at midpoint (psf)	Plasticity Index	Name (for Strata)	Unit Weight (pcf)	Modulus Reduction (G/Gmax) Model	Damping Model	Thickness (ft)	Soil Type (for Strata)	Shear Wave Velocity (fps)
74.2	77.25	Shale (0'-15')	Soft Rock	6.47E+06	0.5	3642.3	0	Shale (0'-15')_48	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_48	1220
77.25	80.3	Shale (0'-15')	Soft Rock	6.47E+06	0.5	3800.1	0	Shale (0'-15')_49	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_49	1220
80.3	83.1	Shale (0'-15')	Soft Rock	6.47E+06	0.5	3951.4	0	Shale (0'-15')_50	140	Silva et al., 50'-120'	Silva et al., 50'-120'	2.8	Shale (0'-15')_50	1220
83.1	86.5	Shale (15'-30')	Soft Rock	8.04E+06	0.5	4111.8	0	Shale (15'-30')_51	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_51	1360
86.5	89.9	Shale (15'-30')	Soft Rock	8.04E+06	0.5	4287.7	0	Shale (15'-30')_52	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_52	1360
89.9	93.3	Shale (15'-30')	Soft Rock	8.04E+06	0.5	4463.6	0	Shale (15'-30')_53	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_53	1360
93.3	94.1	Shale (15'-30')	Soft Rock	8.04E+06	0.5	4572.2	0	Shale (15'-30')_54	140	Silva et al., 50'-120'	Silva et al., 50'-120'	0.8	Shale (15'-30')_54	1360
94.1	194.1	Shale (El. 575'-675')	Firm Rock	4.18E+07	0.5	7179.6	0	Shale (El. 575'-675')_55	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 575'-675')_55	3100
194.1	294.1	Shale (El. 475'-575')	Firm Rock	7.31E+07	0.5	12352.9	0	Shale (El. 475'-575')_56	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 475'-575')_56	4100
294.1	394.1	Shale (El. 375'-475')	Firm Rock	1.13E+08	0.5	17526.3	0	Shale (El. 375'-475')_57	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 375'-475')_57	5100
394.1	494.1	Shale (El. 275'-375')	Firm Rock	1.62E+08	0.5	22699.6	0	Shale (El. 275'-375')_58	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 275'-375')_58	6100
494.1	594.1	Shale (El. 175'-275')	Firm Rock	2.19E+08	0.5	27872.9	0	Shale (El. 175'-275')_59	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 175'-275')_59	7100
594.1	694.1	Shale (El. 75'-175')	Firm Rock	2.85E+08	0.5	33046.3	0	Shale (El. 75'-175')_60	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 75'-175')_60	8100
694.1	734.1	Shale (El. 35'-75')	Firm Rock	3.37E+08	0.5	36667.6	0	Shale (El. 35'-75')_61	140	Firm/Hard Rock	Firm/Hard Rock	40	Shale (El. 35'-75')_61	8800
734.1	Half-Space	Shale (El. < 35')	Half-Space	3.52E+08	0.5	Half-Space	0	Bedrock	140	NA, Half-Space	Damping = 0.5%	Half Space	Bedrock	9000

Facility	KIF East Dike	
Section/Group	A-A'	
Profile Name	KIF-TW04_NOR	
Top of Profile Elevation	767.9	ft
Depth to water table during EQ	13.06	ft
Surcharge Pressure	0	psf

Strata Profile

Non-input Information								Strata "Soil Types" Input				Strata "Soil Profile" Input		
Top Depth (ft)	**Bottom Depth (ft)**	**Layer Name**	**Layer Type**	**G_{max} (psf)**	**K_o**	**Mean Effective Stress at midpoint (psf)**	**Plasticity Index**	**Name (for Strata)**	**Unit Weight (pcf)**	**Modulus Reduction (G/Gmax) Model**	**Damping Model**	**Thickness (ft)**	**Soil Type (for Strata)**	**Shear Wave Velocity (fps)**
0	0.82	Cover Material	Soil	4.01E+05	0.5	32.8	38	Cover Material_1	120	D&S, p'=0-400, PI=30-40	D&S, p'=0-400, PI=30-40	0.82	Cover Material_1	328
0.82	1.64	Cover Material	Soil	4.01E+05	0.5	98.4	38	Cover Material_2	120	D&S, p'=0-400, PI=30-40	D&S, p'=0-400, PI=30-40	0.82	Cover Material_2	328
1.64	2	Cover Material	Soil	4.01E+05	0.5	145.6	38	Cover Material_3	120	D&S, p'=0-400, PI=30-40	D&S, p'=0-400, PI=30-40	0.36	Cover Material_3	328
2	3.62	Bottom Ash	Soil	1.56E+06	0.5	224.3	0	Bottom Ash_4	119	D&S, p'=0-400, PI=0	D&S, p'=0-400, PI=0	1.62	Bottom Ash_4	650
3.62	5.24	Bottom Ash	Soil	1.56E+06	0.5	352.8	0	Bottom Ash_5	119	D&S, p'=0-400, PI=0	D&S, p'=0-400, PI=0	1.62	Bottom Ash_5	650
5.24	6.86	Bottom Ash	Soil	1.56E+06	0.5	481.3	0	Bottom Ash_6	119	D&S, p'=400-800, PI=0	D&S, p'=400-800, PI=0	1.62	Bottom Ash_6	650
6.86	8.48	Bottom Ash	Soil	1.56E+06	0.5	609.8	0	Bottom Ash_7	119	D&S, p'=400-800, PI=0	D&S, p'=400-800, PI=0	1.62	Bottom Ash_7	650
8.48	10.1	Bottom Ash	Soil	1.56E+06	0.5	738.3	0	Bottom Ash_8	119	D&S, p'=400-800, PI=0	D&S, p'=400-800, PI=0	1.62	Bottom Ash_8	650
10.1	11.72	Bottom Ash	Soil	1.56E+06	0.5	866.9	0	Bottom Ash_9	119	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.62	Bottom Ash_9	650
11.72	13.06	Bottom Ash	Soil	1.56E+06	0.5	984.3	0	Bottom Ash_10	119	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.34	Bottom Ash_10	650
13.06	14.68	Bottom Ash	Soil	1.63E+06	0.5	1070.7	0	Bottom Ash_11	124	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.62	Bottom Ash_11	650
14.68	16.3	Bottom Ash	Soil	1.63E+06	0.5	1137.2	0	Bottom Ash_12	124	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.62	Bottom Ash_12	650
16.3	17.92	Bottom Ash	Soil	1.63E+06	0.5	1203.7	0	Bottom Ash_13	124	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.62	Bottom Ash_13	650
17.92	19.54	Bottom Ash	Soil	1.63E+06	0.5	1270.3	0	Bottom Ash_14	124	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.62	Bottom Ash_14	650
19.54	21.16	Bottom Ash	Soil	1.63E+06	0.5	1336.8	0	Bottom Ash_15	124	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.62	Bottom Ash_15	650
21.16	22.78	Bottom Ash	Soil	1.63E+06	0.5	1403.3	0	Bottom Ash_16	124	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.62	Bottom Ash_16	650
22.78	24.4	Bottom Ash	Soil	1.63E+06	0.5	1469.9	0	Bottom Ash_17	124	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.62	Bottom Ash_17	650
24.4	26.02	Bottom Ash	Soil	1.63E+06	0.5	1536.4	0	Bottom Ash_18	124	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.62	Bottom Ash_18	650
26.02	27.64	Bottom Ash	Soil	1.63E+06	0.5	1602.9	0	Bottom Ash_19	124	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.62	Bottom Ash_19	650
27.64	29.26	Bottom Ash	Soil	1.63E+06	0.5	1669.4	0	Bottom Ash_20	124	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.62	Bottom Ash_20	650
29.26	30.88	Bottom Ash	Soil	1.63E+06	0.5	1736.0	0	Bottom Ash_21	124	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.62	Bottom Ash_21	650
30.88	32.5	Bottom Ash	Soil	1.63E+06	0.5	1802.5	0	Bottom Ash_22	124	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.62	Bottom Ash_22	650
32.5	33.2	Bottom Ash	Soil	1.63E+06	0.5	1850.1	0	Bottom Ash_23	124	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	0.7	Bottom Ash_23	650
33.2	34.95	Fly Ash	Soil	1.70E+06	0.5	1893.4	0	Fly Ash_24	112	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Fly Ash_24	700
34.95	36.7	Fly Ash	Soil	1.70E+06	0.5	1951.3	0	Fly Ash_25	112	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Fly Ash_25	700
36.7	38.45	Fly Ash	Soil	1.70E+06	0.5	2009.2	0	Fly Ash_26	112	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Fly Ash_26	700
38.45	40.2	Fly Ash	Soil	1.70E+06	0.5	2067.0	0	Fly Ash_27	112	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Fly Ash_27	700
40.2	41.95	Fly Ash	Soil	1.70E+06	0.5	2124.9	0	Fly Ash_28	112	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Fly Ash_28	700
41.95	43.7	Fly Ash	Soil	1.70E+06	0.5	2182.8	0	Fly Ash_29	112	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Fly Ash_29	700
43.7	45.45	Fly Ash	Soil	1.70E+06	0.5	2240.6	0	Fly Ash_30	112	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Fly Ash_30	700
45.45	47.2	Fly Ash	Soil	1.70E+06	0.5	2298.5	0	Fly Ash_31	112	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Fly Ash_31	700
47.2	47.9	Fly Ash	Soil	1.70E+06	0.5	2339.0	0	Fly Ash_32	112	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	0.7	Fly Ash_32	700
47.9	49.77	Subunit 1	Soil	2.22E+06	0.5	2390.9	11	Subunit 1_33	127	D&S, p'=1600-2500, PI=10-15	D&S, p'=1600-2500, PI=10-15	1.87	Subunit 1_33	750
49.77	51.64	Subunit 1	Soil	2.22E+06	0.5	2471.4	11	Subunit 1_34	127	D&S, p'=1600-2500, PI=10-15	D&S, p'=1600-2500, PI=10-15	1.87	Subunit 1_34	750
51.64	52.9	Subunit 1	Soil	2.22E+06	0.5	2538.8	11	Subunit 1_35	127	D&S, p'=2500-5000, PI=10-15	D&S, p'=2500-5000, PI=10-15	1.26	Subunit 1_35	750
52.9	54.65	Subunit 2	Soil	1.93E+06	0.5	2603.6	0	Subunit 2_36	127	D&S, p'=2500-5000, PI=0	D&S, p'=2500-5000, PI=0	1.75	Subunit 2_36	700
54.65	56.4	Subunit 2	Soil	1.93E+06	0.5	2679.0	0	Subunit 2_37	127	D&S, p'=2500-5000, PI=0	D&S, p'=2500-5000, PI=0	1.75	Subunit 2_37	700
56.4	57.9	Subunit 2	Soil	1.93E+06	0.5	2749.0	0	Subunit 2_38	127	D&S, p'=2500-5000, PI=0	D&S, p'=2500-5000, PI=0	1.5	Subunit 2_38	700
57.9	59.65	Subunit 3	Soil	2.01E+06	0.5	2821.9	0	Subunit 3_39	132	D&S, p'=2500-5000, PI=0	D&S, p'=2500-5000, PI=0	1.75	Subunit 3_39	700
59.65	61.4	Subunit 3	Soil	2.01E+06	0.5	2903.1	0	Subunit 3_40	132	D&S, p'=2500-5000, PI=0	D&S, p'=2500-5000, PI=0	1.75	Subunit 3_40	700
61.4	63.15	Subunit 3	Soil	2.01E+06	0.5	2984.3	0	Subunit 3_41	132	D&S, p'=2500-5000, PI=0	D&S, p'=2500-5000, PI=0	1.75	Subunit 3_41	700
63.15	64.9	Subunit 3	Soil	2.01E+06	0.5	3065.5	0	Subunit 3_42	132	D&S, p'=2500-5000, PI=0	D&S, p'=2500-5000, PI=0	1.75	Subunit 3_42	700
64.9	67.95	Shale (0'-15')	Soft Rock	6.47E+06	0.5	3184.9	0	Shale (0'-15')_43	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_43	1220
67.95	71	Shale (0'-15')	Soft Rock	6.47E+06	0.5	3342.7	0	Shale (0'-15')_44	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_44	1220
71	74.05	Shale (0'-15')	Soft Rock	6.47E+06	0.5	3500.5	0	Shale (0'-15')_45	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_45	1220
74.05	77.1	Shale (0'-15')	Soft Rock	6.47E+06	0.5	3658.3	0	Shale (0'-15')_46	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_46	1220
77.1	79.9	Shale (0'-15')	Soft Rock	6.47E+06	0.5	3809.6	0	Shale (0'-15')_47	140	Silva et al., 50'-120'	Silva et al., 50'-120'	2.8	Shale (0'-15')_47	1220

Strata Profile														
Non-input Information								Strata "Soil Types" Input				Strata "Soil Profile" Input		
Top Depth (ft)	Bottom Depth (ft)	Layer Name	Layer Type	G_{max} (psf)	K_o	Mean Effective Stress at midpoint (psf)	Plasticity Index	Name (for Strata)	Unit Weight (pcf)	Modulus Reduction (G/Gmax) Model	Damping Model	Thickness (ft)	Soil Type (for Strata)	Shear Wave Velocity (fps)
79.9	83.3	Shale (15'-30')	Soft Rock	8.04E+06	0.5	3970.0	0	Shale (15'-30')_48	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_48	1360
83.3	86.7	Shale (15'-30')	Soft Rock	8.04E+06	0.5	4145.9	0	Shale (15'-30')_49	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_49	1360
86.7	90.1	Shale (15'-30')	Soft Rock	8.04E+06	0.5	4321.8	0	Shale (15'-30')_50	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_50	1360
90.1	92.9	Shale (15'-30')	Soft Rock	8.04E+06	0.5	4482.2	0	Shale (15'-30')_51	140	Silva et al., 50'-120'	Silva et al., 50'-120'	2.8	Shale (15'-30')_51	1360
92.9	192.9	Shale (El. 575'-675')	Firm Rock	4.18E+07	0.5	7141.3	0	Shale (El. 575'-675')_52	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 575'-675')_52	3100
192.9	292.9	Shale (El. 475'-575')	Firm Rock	7.31E+07	0.5	12314.6	0	Shale (El. 475'-575')_53	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 475'-575')_53	4100
292.9	392.9	Shale (El. 375'-475')	Firm Rock	1.13E+08	0.5	17487.9	0	Shale (El. 375'-475')_54	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 375'-475')_54	5100
392.9	492.9	Shale (El. 275'-375')	Firm Rock	1.62E+08	0.5	22661.3	0	Shale (El. 275'-375')_55	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 275'-375')_55	6100
492.9	592.9	Shale (El. 175'-275')	Firm Rock	2.19E+08	0.5	27834.6	0	Shale (El. 175'-275')_56	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 175'-275')_56	7100
592.9	692.9	Shale (El. 75'-175')	Firm Rock	2.85E+08	0.5	33007.9	0	Shale (El. 75'-175')_57	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 75'-175')_57	8100
692.9	732.9	Shale (El. 35'-75')	Firm Rock	3.37E+08	0.5	36629.3	0	Shale (El. 35'-75')_58	140	Firm/Hard Rock	Firm/Hard Rock	40	Shale (El. 35'-75')_58	8800
732.9	Half-Space	Shale (El. < 35')	Half-Space	3.52E+08	0.5	Half-Space	0	Bedrock	140	NA, Half-Space	Damping = 0.5%	Half Space	Bedrock	9000

Facility	KIF East Dike	
Section/Group	A-A'	
Profile Name	KIF-CPT03C_NOR	
Top of Profile Elevation	754	ft
Depth to water table during EQ	3.08	ft
Surcharge Pressure	0	psf

Strata Profile

Non-input Information								Strata "Soil Types" Input				Strata "Soil Profile" Input		
Top Depth (ft)	**Bottom Depth (ft)**	**Layer Name**	**Layer Type**	**G_{max} (psf)**	**K_o**	**Mean Effective Stress at midpoint (psf)**	**Plasticity Index**	**Name (for Strata)**	**Unit Weight (pcf)**	**Modulus Reduction (G/Gmax) Model**	**Damping Model**	**Thickness (ft)**	**Soil Type (for Strata)**	**Shear Wave Velocity (fps)**
0	0.82	Cover Material	Soil	4.01E+05	0.5	32.8	38	Cover Material_1	120	D&S, p'=0-400, PI=30-40	D&S, p'=0-400, PI=30-40	0.82	Cover Material_1	328
0.82	1.64	Cover Material	Soil	4.01E+05	0.5	98.4	38	Cover Material_2	120	D&S, p'=0-400, PI=30-40	D&S, p'=0-400, PI=30-40	0.82	Cover Material_2	328
1.64	2	Cover Material	Soil	4.01E+05	0.5	145.6	38	Cover Material_3	120	D&S, p'=0-400, PI=30-40	D&S, p'=0-400, PI=30-40	0.36	Cover Material_3	328
2	3.08	Embankment Fill	Soil	4.81E+06	0.5	206.1	18	Embankment Fill_4	128	D&S, p'=0-400, PI=15-20	D&S, p'=0-400, PI=15-20	1.08	Embankment Fill_4	1100
3.08	5.83	Embankment Fill	Soil	4.81E+06	0.5	312.3	18	Embankment Fill_5	128	D&S, p'=0-400, PI=15-20	D&S, p'=0-400, PI=15-20	2.75	Embankment Fill_5	1100
5.83	8.58	Embankment Fill	Soil	4.81E+06	0.5	432.6	18	Embankment Fill_6	128	D&S, p'=400-800, PI=15-20	D&S, p'=400-800, PI=15-20	2.75	Embankment Fill_6	1100
8.58	11.33	Embankment Fill	Soil	4.81E+06	0.5	552.8	18	Embankment Fill_7	128	D&S, p'=400-800, PI=15-20	D&S, p'=400-800, PI=15-20	2.75	Embankment Fill_7	1100
11.33	14.08	Embankment Fill	Soil	4.81E+06	0.5	673.1	18	Embankment Fill_8	128	D&S, p'=400-800, PI=15-20	D&S, p'=400-800, PI=15-20	2.75	Embankment Fill_8	1100
14.08	16.83	Embankment Fill	Soil	4.81E+06	0.5	793.4	18	Embankment Fill_9	128	D&S, p'=400-800, PI=15-20	D&S, p'=400-800, PI=15-20	2.75	Embankment Fill_9	1100
16.83	19.58	Embankment Fill	Soil	4.81E+06	0.5	913.6	18	Embankment Fill_10	128	D&S, p'=800-1600, PI=15-20	D&S, p'=800-1600, PI=15-20	2.75	Embankment Fill_10	1100
19.58	22.33	Embankment Fill	Soil	4.81E+06	0.5	1033.9	18	Embankment Fill_11	128	D&S, p'=800-1600, PI=15-20	D&S, p'=800-1600, PI=15-20	2.75	Embankment Fill_11	1100
22.33	25.08	Embankment Fill	Soil	4.81E+06	0.5	1154.2	18	Embankment Fill_12	128	D&S, p'=800-1600, PI=15-20	D&S, p'=800-1600, PI=15-20	2.75	Embankment Fill_12	1100
25.08	27.83	Embankment Fill	Soil	4.81E+06	0.5	1274.4	18	Embankment Fill_13	128	D&S, p'=800-1600, PI=15-20	D&S, p'=800-1600, PI=15-20	2.75	Embankment Fill_13	1100
27.83	30	Embankment Fill	Soil	4.81E+06	0.5	1382.0	18	Embankment Fill_14	128	D&S, p'=800-1600, PI=15-20	D&S, p'=800-1600, PI=15-20	2.17	Embankment Fill_14	1100
30	31.87	Subunit 1	Soil	2.22E+06	0.5	1469.7	11	Subunit 1_15	127	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.87	Subunit 1_15	750
31.87	32.7	Subunit 1	Soil	2.22E+06	0.5	1527.9	11	Subunit 1_16	127	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	0.83	Subunit 1_16	750
32.7	34.45	Subunit 2	Soil	1.93E+06	0.5	1583.4	0	Subunit 2_17	127	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Subunit 2_17	700
34.45	36.2	Subunit 2	Soil	1.93E+06	0.5	1658.8	0	Subunit 2_18	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 2_18	700
36.2	37.95	Subunit 2	Soil	1.93E+06	0.5	1734.2	0	Subunit 2_19	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 2_19	700
37.95	39.7	Subunit 2	Soil	1.93E+06	0.5	1809.5	0	Subunit 2_20	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 2_20	700
39.7	41.45	Subunit 2	Soil	1.93E+06	0.5	1884.9	0	Subunit 2_21	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 2_21	700
41.45	43.2	Subunit 2	Soil	1.93E+06	0.5	1960.3	0	Subunit 2_22	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 2_22	700
43.2	44.8	Subunit 2	Soil	1.93E+06	0.5	2032.4	0	Subunit 2_23	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.6	Subunit 2_23	700
44.8	46.55	Subunit 3	Soil	2.01E+06	0.5	2107.4	0	Subunit 3_24	132	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 3_24	700
46.55	48.3	Subunit 3	Soil	2.01E+06	0.5	2188.6	0	Subunit 3_25	132	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 3_25	700
48.3	50.05	Subunit 3	Soil	2.01E+06	0.5	2269.8	0	Subunit 3_26	132	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 3_26	700
50.05	50.2	Subunit 3	Soil	2.01E+06	0.5	2313.9	0	Subunit 3_27	132	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	0.15	Subunit 3_27	700
50.2	53.25	Shale (0'-15')	Soft Rock	6.47E+06	0.5	2396.3	0	Shale (0'-15')_28	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_28	1220
53.25	56.3	Shale (0'-15')	Soft Rock	6.47E+06	0.5	2554.1	0	Shale (0'-15')_29	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_29	1220
56.3	59.35	Shale (0'-15')	Soft Rock	6.47E+06	0.5	2711.9	0	Shale (0'-15')_30	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_30	1220
59.35	62.4	Shale (0'-15')	Soft Rock	6.47E+06	0.5	2869.7	0	Shale (0'-15')_31	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_31	1220
62.4	65.2	Shale (0'-15')	Soft Rock	6.47E+06	0.5	3021.0	0	Shale (0'-15')_32	140	Silva et al., 50'-120'	Silva et al., 50'-120'	2.8	Shale (0'-15')_32	1220
65.2	68.6	Shale (15'-30')	Soft Rock	8.04E+06	0.5	3181.4	0	Shale (15'-30')_33	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_33	1360
68.6	72	Shale (15'-30')	Soft Rock	8.04E+06	0.5	3357.2	0	Shale (15'-30')_34	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_34	1360
72	75.4	Shale (15'-30')	Soft Rock	8.04E+06	0.5	3533.1	0	Shale (15'-30')_35	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_35	1360
75.4	78.8	Shale (15'-30')	Soft Rock	8.04E+06	0.5	3709.0	0	Shale (15'-30')_36	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_36	1360
78.8	79	Shale (15'-30')	Soft Rock	8.04E+06	0.5	3802.2	0	Shale (15'-30')_37	140	Silva et al., 50'-120'	Silva et al., 50'-120'	0.2	Shale (15'-30')_37	1360
79	179	Shale (El. 575'-675')	Firm Rock	4.18E+07	0.5	6394.0	0	Shale (El. 575'-675')_38	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 575'-675')_38	3100
179	279	Shale (El. 475'-575')	Firm Rock	7.31E+07	0.5	11567.3	0	Shale (El. 475'-575')_39	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 475'-575')_39	4100
279	379	Shale (El. 375'-475')	Firm Rock	1.13E+08	0.5	16740.7	0	Shale (El. 375'-475')_40	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 375'-475')_40	5100
379	479	Shale (El. 275'-375')	Firm Rock	1.62E+08	0.5	21914.0	0	Shale (El. 275'-375')_41	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 275'-375')_41	6100
479	579	Shale (El. 175'-275')	Firm Rock	2.19E+08	0.5	27087.3	0	Shale (El. 175'-275')_42	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 175'-275')_42	7100
579	679	Shale (El. 75'-175')	Firm Rock	2.85E+08	0.5	32260.7	0	Shale (El. 75'-175')_43	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 75'-175')_43	8100
679	719	Shale (El. 35'-75')	Firm Rock	3.37E+08	0.5	35882.0	0	Shale (El. 35'-75')_44	140	Firm/Hard Rock	Firm/Hard Rock	40	Shale (El. 35'-75')_44	8800
719	Half-Space	Shale (El. < 35')	Half-Space	3.52E+08	0.5	Half-Space	0	Bedrock	140	NA, Half-Space	Damping = 0.5%	Half Space	Bedrock	9000

2.2.2 Polishing Pond Section Profiles

Facility	KIF	
Section/Group	Polishing Pond	
Profile Name	KIF-B13_NOR	
Top of Profile Elevation	753.2	ft
Depth to water table during EQ	6.1	ft
Surcharge Pressure		psf

Strata Profile

Non-input Information								Strata "Soil Types" Input				Strata "Soil Profile" Input		
Top Depth (ft)	**Bottom Depth (ft)**	**Layer Name**	**Layer Type**	**G_{max} (psf)**	**K_o**	**Mean Effective Stress at midpoint (psf)**	**Plasticity Index**	**Name (for Strata)**	**Unit Weight (pcf)**	**Modulus Reduction (G/Gmax) Model**	**Damping Model**	**Thickness (ft)**	**Soil Type (for Strata)**	**Shear Wave Velocity (fps)**
0	1.75	Embankment Fill	Soil	1.95E+06	0.5	74.7	13	Embankment Fill_1	128	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	1.75	Embankment Fill_1	700
1.75	3.5	Embankment Fill	Soil	1.95E+06	0.5	224.0	13	Embankment Fill_2	128	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	1.75	Embankment Fill_2	700
3.5	5.25	Embankment Fill	Soil	1.95E+06	0.5	373.3	13	Embankment Fill_3	128	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	1.75	Embankment Fill_3	700
5.25	6.1	Embankment Fill	Soil	1.95E+06	0.5	484.3	13	Embankment Fill_4	128	D&S, p'=400-800, PI=10-15	D&S, p'=400-800, PI=10-15	0.85	Embankment Fill_4	700
6.1	7.85	Embankment Fill	Soil	1.95E+06	0.5	558.8	13	Embankment Fill_5	128	D&S, p'=400-800, PI=10-15	D&S, p'=400-800, PI=10-15	1.75	Embankment Fill_5	700
7.85	9.6	Embankment Fill	Soil	1.95E+06	0.5	635.3	13	Embankment Fill_6	128	D&S, p'=400-800, PI=10-15	D&S, p'=400-800, PI=10-15	1.75	Embankment Fill_6	700
9.6	11.35	Embankment Fill	Soil	1.95E+06	0.5	711.9	13	Embankment Fill_7	128	D&S, p'=400-800, PI=10-15	D&S, p'=400-800, PI=10-15	1.75	Embankment Fill_7	700
11.35	13.1	Embankment Fill	Soil	1.95E+06	0.5	788.4	13	Embankment Fill_8	128	D&S, p'=400-800, PI=10-15	D&S, p'=400-800, PI=10-15	1.75	Embankment Fill_8	700
13.1	14.85	Embankment Fill	Soil	1.95E+06	0.5	864.9	13	Embankment Fill_9	128	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.75	Embankment Fill_9	700
14.85	16.6	Embankment Fill	Soil	1.95E+06	0.5	941.5	13	Embankment Fill_10	128	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.75	Embankment Fill_10	700
16.6	18.35	Embankment Fill	Soil	1.95E+06	0.5	1018.0	13	Embankment Fill_11	128	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.75	Embankment Fill_11	700
18.35	20.1	Embankment Fill	Soil	1.95E+06	0.5	1094.5	13	Embankment Fill_12	128	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.75	Embankment Fill_12	700
20.1	21.85	Embankment Fill	Soil	1.95E+06	0.5	1171.1	13	Embankment Fill_13	128	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.75	Embankment Fill_13	700
21.85	23.6	Embankment Fill	Soil	1.95E+06	0.5	1247.6	13	Embankment Fill_14	128	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.75	Embankment Fill_14	700
23.6	25.35	Embankment Fill	Soil	1.95E+06	0.5	1324.1	13	Embankment Fill_15	128	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.75	Embankment Fill_15	700
25.35	27	Embankment Fill	Soil	1.95E+06	0.5	1398.5	13	Embankment Fill_16	128	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.65	Embankment Fill_16	700
27	28.75	Subunit 2	Soil	1.93E+06	0.5	1472.2	0	Subunit 2_17	127	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Subunit 2_17	700
28.75	30.5	Subunit 2	Soil	1.93E+06	0.5	1547.6	0	Subunit 2_18	127	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Subunit 2_18	700
30.5	32.25	Subunit 2	Soil	1.93E+06	0.5	1623.0	0	Subunit 2_19	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 2_19	700
32.25	34	Subunit 2	Soil	1.93E+06	0.5	1698.3	0	Subunit 2_20	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 2_20	700
34	35.75	Subunit 2	Soil	1.93E+06	0.5	1773.7	0	Subunit 2_21	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 2_21	700
35.75	37.5	Subunit 2	Soil	1.93E+06	0.5	1849.1	0	Subunit 2_22	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 2_22	700
37.5	39.25	Subunit 2	Soil	1.93E+06	0.5	1924.4	0	Subunit 2_23	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 2_23	700
39.25	41	Subunit 2	Soil	1.93E+06	0.5	1999.8	0	Subunit 2_24	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 2_24	700
41	42.75	Subunit 2	Soil	1.93E+06	0.5	2075.2	0	Subunit 2_25	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 2_25	700
42.75	44	Subunit 2	Soil	1.93E+06	0.5	2139.8	0	Subunit 2_26	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.25	Subunit 2_26	700
44	45.75	Subunit 3	Soil	2.01E+06	0.5	2207.3	0	Subunit 3_27	132	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 3_27	700
45.75	47.5	Subunit 3	Soil	2.01E+06	0.5	2288.5	0	Subunit 3_28	132	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 3_28	700
47.5	48.8	Subunit 3	Soil	2.01E+06	0.5	2359.3	0	Subunit 3_29	132	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.3	Subunit 3_29	700
48.8	51.85	Shale (0'-15')	Soft Rock	6.47E+06	0.5	2468.3	0	Shale (0'-15')_30	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_30	1220
51.85	54.9	Shale (0'-15')	Soft Rock	6.47E+06	0.5	2626.1	0	Shale (0'-15')_31	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_31	1220
54.9	57.95	Shale (0'-15')	Soft Rock	6.47E+06	0.5	2783.9	0	Shale (0'-15')_32	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_32	1220
57.95	61	Shale (0'-15')	Soft Rock	6.47E+06	0.5	2941.7	0	Shale (0'-15')_33	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_33	1220
61	63.8	Shale (0'-15')	Soft Rock	6.47E+06	0.5	3093.0	0	Shale (0'-15')_34	140	Silva et al., 50'-120'	Silva et al., 50'-120'	2.8	Shale (0'-15')_34	1220
63.8	67.2	Shale (15'-30')	Soft Rock	8.04E+06	0.5	3253.4	0	Shale (15'-30')_35	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_35	1360
67.2	70.6	Shale (15'-30')	Soft Rock	8.04E+06	0.5	3429.3	0	Shale (15'-30')_36	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_36	1360
70.6	74	Shale (15'-30')	Soft Rock	8.04E+06	0.5	3605.1	0	Shale (15'-30')_37	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_37	1360
74	77.4	Shale (15'-30')	Soft Rock	8.04E+06	0.5	3781.0	0	Shale (15'-30')_38	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_38	1360
77.4	78.2	Shale (15'-30')	Soft Rock	8.04E+06	0.5	3889.7	0	Shale (15'-30')_39	140	Silva et al., 50'-120'	Silva et al., 50'-120'	0.8	Shale (15'-30')_39	1360
78.2	178.2	Shale (El. 575'-675')	Firm Rock	4.18E+07	0.5	6497.0	0	Shale (El. 575'-675')_40	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 575'-675')_40	3100
178.2	278.2	Shale (El. 475'-575')	Firm Rock	7.31E+07	0.5	11670.4	0	Shale (El. 475'-575')_41	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 475'-575')_41	4100
278.2	378.2	Shale (El. 375'-475')	Firm Rock	1.13E+08	0.5	16843.7	0	Shale (El. 375'-475')_42	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 375'-475')_42	5100
378.2	478.2	Shale (El. 275'-375')	Firm Rock	1.62E+08	0.5	22017.0	0	Shale (El. 275'-375')_43	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 275'-375')_43	6100
478.2	578.2	Shale (El. 175'-275')	Firm Rock	2.19E+08	0.5	27190.4	0	Shale (El. 175'-275')_44	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 175'-275')_44	7100
578.2	678.2	Shale (El. 75'-175')	Firm Rock	2.85E+08	0.5	32363.7	0	Shale (El. 75'-175')_45	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 75'-175')_45	8100
678.2	718.2	Shale (El. 35'-75')	Firm Rock	3.37E+08	0.5	35985.0	0	Shale (El. 35'-75')_46	140	Firm/Hard Rock	Firm/Hard Rock	40	Shale (El. 35'-75')_46	8800
718.2	Half-Space	Shale (El. < 35')	Half-Space	3.52E+08	0.5	Half-Space	0	Bedrock	140	NA, Half-Space	Damping = 0.5%	Half Space	Bedrock	9000

Facility	KIF	
Section/Group	Polishing Pond	
Profile Name	KIF-B14_NOR	
Top of Profile Elevation	731	ft
Depth to water table during EQ	0	ft
Surcharge Pressure		psf

Strata Profile

Non-input Information								Strata "Soil Types" Input				Strata "Soil Profile" Input		
Top Depth (ft)	**Bottom Depth (ft)**	**Layer Name**	**Layer Type**	**G_{max} (psf)**	**K_o**	**Mean Effective Stress at midpoint (psf)**	**Plasticity Index**	**Name (for Strata)**	**Unit Weight (pcf)**	**Modulus Reduction (G/Gmax) Model**	**Damping Model**	**Thickness (ft)**	**Soil Type (for Strata)**	**Shear Wave Velocity (fps)**
0	0.65	Sediment	Soil	2.37E+05	0.5	11.0	12	Sediment_1	113	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	0.65	Sediment_1	260
0.65	1.3	Sediment	Soil	2.37E+05	0.5	32.9	12	Sediment_2	113	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	0.65	Sediment_2	260
1.3	1.95	Sediment	Soil	2.37E+05	0.5	54.8	12	Sediment_3	113	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	0.65	Sediment_3	260
1.95	2.6	Sediment	Soil	2.37E+05	0.5	76.7	12	Sediment_4	113	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	0.65	Sediment_4	260
2.6	3.1	Sediment	Soil	2.37E+05	0.5	96.1	12	Sediment_5	113	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	0.5	Sediment_5	260
3.1	4.85	Subunit 2	Soil	1.93E+06	0.5	142.3	0	Subunit 2_6	127	D&S, p'=0-400, PI=0	D&S, p'=0-400, PI=0	1.75	Subunit 2_6	700
4.85	6.6	Subunit 2	Soil	1.93E+06	0.5	217.6	0	Subunit 2_7	127	D&S, p'=0-400, PI=0	D&S, p'=0-400, PI=0	1.75	Subunit 2_7	700
6.6	8.35	Subunit 2	Soil	1.93E+06	0.5	293.0	0	Subunit 2_8	127	D&S, p'=0-400, PI=0	D&S, p'=0-400, PI=0	1.75	Subunit 2_8	700
8.35	10.1	Subunit 2	Soil	1.93E+06	0.5	368.4	0	Subunit 2_9	127	D&S, p'=0-400, PI=0	D&S, p'=0-400, PI=0	1.75	Subunit 2_9	700
10.1	11.85	Subunit 2	Soil	1.93E+06	0.5	443.7	0	Subunit 2_10	127	D&S, p'=400-800, PI=0	D&S, p'=400-800, PI=0	1.75	Subunit 2_10	700
11.85	13.6	Subunit 2	Soil	1.93E+06	0.5	519.1	0	Subunit 2_11	127	D&S, p'=400-800, PI=0	D&S, p'=400-800, PI=0	1.75	Subunit 2_11	700
13.6	15.3	Subunit 2	Soil	1.93E+06	0.5	593.4	0	Subunit 2_12	127	D&S, p'=400-800, PI=0	D&S, p'=400-800, PI=0	1.7	Subunit 2_12	700
15.3	17.05	Subunit 3	Soil	2.01E+06	0.5	670.6	0	Subunit 3_13	132	D&S, p'=400-800, PI=0	D&S, p'=400-800, PI=0	1.75	Subunit 3_13	700
17.05	18.8	Subunit 3	Soil	2.01E+06	0.5	751.8	0	Subunit 3_14	132	D&S, p'=400-800, PI=0	D&S, p'=400-800, PI=0	1.75	Subunit 3_14	700
18.8	20.55	Subunit 3	Soil	2.01E+06	0.5	833.0	0	Subunit 3_15	132	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Subunit 3_15	700
20.55	22.2	Subunit 3	Soil	2.01E+06	0.5	911.9	0	Subunit 3_16	132	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.65	Subunit 3_16	700
22.2	24.12	Gravel Residuum	Soil	2.54E+06	0.5	998.5	0	Gravel Residuum_17	138	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.92	Gravel Residuum_17	770
24.12	26.04	Gravel Residuum	Soil	2.54E+06	0.5	1095.3	0	Gravel Residuum_18	138	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.92	Gravel Residuum_18	770
26.04	27.9	Gravel Residuum	Soil	2.54E+06	0.5	1190.6	0	Gravel Residuum_19	138	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.86	Gravel Residuum_19	770
27.9	30.95	Shale (0'-15')	Soft Rock	6.47E+06	0.5	1316.3	0	Shale (0'-15')_20	140	Silva et al., 20'-50'	Silva et al., 20'-50'	3.05	Shale (0'-15')_20	1220
30.95	34	Shale (0'-15')	Soft Rock	6.47E+06	0.5	1474.1	0	Shale (0'-15')_21	140	Silva et al., 20'-50'	Silva et al., 20'-50'	3.05	Shale (0'-15')_21	1220
34	37.05	Shale (0'-15')	Soft Rock	6.47E+06	0.5	1631.9	0	Shale (0'-15')_22	140	Silva et al., 20'-50'	Silva et al., 20'-50'	3.05	Shale (0'-15')_22	1220
37.05	40.1	Shale (0'-15')	Soft Rock	6.47E+06	0.5	1789.7	0	Shale (0'-15')_23	140	Silva et al., 20'-50'	Silva et al., 20'-50'	3.05	Shale (0'-15')_23	1220
40.1	42.9	Shale (0'-15')	Soft Rock	6.47E+06	0.5	1941.0	0	Shale (0'-15')_24	140	Silva et al., 20'-50'	Silva et al., 20'-50'	2.8	Shale (0'-15')_24	1220
42.9	46.3	Shale (15'-30')	Soft Rock	8.04E+06	0.5	2101.4	0	Shale (15'-30')_25	140	Silva et al., 20'-50'	Silva et al., 20'-50'	3.4	Shale (15'-30')_25	1360
46.3	49.7	Shale (15'-30')	Soft Rock	8.04E+06	0.5	2277.3	0	Shale (15'-30')_26	140	Silva et al., 20'-50'	Silva et al., 20'-50'	3.4	Shale (15'-30')_26	1360
49.7	53.1	Shale (15'-30')	Soft Rock	8.04E+06	0.5	2453.2	0	Shale (15'-30')_27	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_27	1360
53.1	56	Shale (15'-30')	Soft Rock	8.04E+06	0.5	2616.1	0	Shale (15'-30')_28	140	Silva et al., 50'-120'	Silva et al., 50'-120'	2.9	Shale (15'-30')_28	1360
56	156	Shale (El. 575'-675')	Firm Rock	4.18E+07	0.5	5277.8	0	Shale (El. 575'-675')_29	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 575'-675')_29	3100
156	256	Shale (El. 475'-575')	Firm Rock	7.31E+07	0.5	10451.1	0	Shale (El. 475'-575')_30	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 475'-575')_30	4100
256	356	Shale (El. 375'-475')	Firm Rock	1.13E+08	0.5	15624.5	0	Shale (El. 375'-475')_31	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 375'-475')_31	5100
356	456	Shale (El. 275'-375')	Firm Rock	1.62E+08	0.5	20797.8	0	Shale (El. 275'-375')_32	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 275'-375')_32	6100
456	556	Shale (El. 175'-275')	Firm Rock	2.19E+08	0.5	25971.1	0	Shale (El. 175'-275')_33	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 175'-275')_33	7100
556	656	Shale (El. 75'-175')	Firm Rock	2.85E+08	0.5	31144.5	0	Shale (El. 75'-175')_34	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 75'-175')_34	8100
656	696	Shale (El. 35'-75')	Firm Rock	3.37E+08	0.5	34765.8	0	Shale (El. 35'-75')_35	140	Firm/Hard Rock	Firm/Hard Rock	40	Shale (El. 35'-75')_35	8800
696	Half-Space	Shale (El. < 35')	Half-Space	3.52E+08	0.5	Half-Space	0	Bedrock	140	NA, Half-Space	Damping = 0.5%	Half Space	Bedrock	9000

Facility	KIF	
Section/Group	Polishing Pond	
Profile Name	KIF-B15_NOR	
Top of Profile Elevation	727.6	ft
Depth to water table during EQ	0	ft
Surcharge Pressure		psf

Strata Profile

Non-input Information								Strata "Soil Types" Input				Strata "Soil Profile" Input		
Top Depth (ft)	**Bottom Depth (ft)**	**Layer Name**	**Layer Type**	**G_{max} (psf)**	**K_o**	**Mean Effective Stress at midpoint (psf)**	**Plasticity Index**	**Name (for Strata)**	**Unit Weight (pcf)**	**Modulus Reduction (G/Gmax) Model**	**Damping Model**	**Thickness (ft)**	**Soil Type (for Strata)**	**Shear Wave Velocity (fps)**
0	0.65	Sediment	Soil	2.37E+05	0.5	11.0	12	Sediment_1	113	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	0.65	Sediment_1	260
0.65	1.3	Sediment	Soil	2.37E+05	0.5	32.9	12	Sediment_2	113	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	0.65	Sediment_2	260
1.3	1.95	Sediment	Soil	2.37E+05	0.5	54.8	12	Sediment_3	113	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	0.65	Sediment_3	260
1.95	2.6	Sediment	Soil	2.37E+05	0.5	76.7	12	Sediment_4	113	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	0.65	Sediment_4	260
2.6	3	Sediment	Soil	2.37E+05	0.5	94.5	12	Sediment_5	113	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	0.4	Sediment_5	260
3	4.75	Subunit 2	Soil	1.93E+06	0.5	138.9	0	Subunit 2_6	127	D&S, p'=0-400, PI=0	D&S, p'=0-400, PI=0	1.75	Subunit 2_6	700
4.75	6.5	Subunit 2	Soil	1.93E+06	0.5	214.3	0	Subunit 2_7	127	D&S, p'=0-400, PI=0	D&S, p'=0-400, PI=0	1.75	Subunit 2_7	700
6.5	8.25	Subunit 2	Soil	1.93E+06	0.5	289.6	0	Subunit 2_8	127	D&S, p'=0-400, PI=0	D&S, p'=0-400, PI=0	1.75	Subunit 2_8	700
8.25	10	Subunit 2	Soil	1.93E+06	0.5	365.0	0	Subunit 2_9	127	D&S, p'=0-400, PI=0	D&S, p'=0-400, PI=0	1.75	Subunit 2_9	700
10	11.75	Subunit 2	Soil	1.93E+06	0.5	440.4	0	Subunit 2_10	127	D&S, p'=400-800, PI=0	D&S, p'=400-800, PI=0	1.75	Subunit 2_10	700
11.75	12	Subunit 2	Soil	1.93E+06	0.5	483.4	0	Subunit 2_11	127	D&S, p'=400-800, PI=0	D&S, p'=400-800, PI=0	0.25	Subunit 2_11	700
12	13.75	Subunit 3	Soil	2.01E+06	0.5	529.4	0	Subunit 3_12	132	D&S, p'=400-800, PI=0	D&S, p'=400-800, PI=0	1.75	Subunit 3_12	700
13.75	15.5	Subunit 3	Soil	2.01E+06	0.5	610.6	0	Subunit 3_13	132	D&S, p'=400-800, PI=0	D&S, p'=400-800, PI=0	1.75	Subunit 3_13	700
15.5	17.25	Subunit 3	Soil	2.01E+06	0.5	691.8	0	Subunit 3_14	132	D&S, p'=400-800, PI=0	D&S, p'=400-800, PI=0	1.75	Subunit 3_14	700
17.25	19	Subunit 3	Soil	2.01E+06	0.5	773.0	0	Subunit 3_15	132	D&S, p'=400-800, PI=0	D&S, p'=400-800, PI=0	1.75	Subunit 3_15	700
19	22.05	Shale (0'-15')	Soft Rock	6.47E+06	0.5	892.5	0	Shale (0'-15')_16	140	Silva et al., 20'-50'	Silva et al., 20'-50'	3.05	Shale (0'-15')_16	1220
22.05	25.1	Shale (0'-15')	Soft Rock	6.47E+06	0.5	1050.3	0	Shale (0'-15')_17	140	Silva et al., 20'-50'	Silva et al., 20'-50'	3.05	Shale (0'-15')_17	1220
25.1	28.15	Shale (0'-15')	Soft Rock	6.47E+06	0.5	1208.1	0	Shale (0'-15')_18	140	Silva et al., 20'-50'	Silva et al., 20'-50'	3.05	Shale (0'-15')_18	1220
28.15	31.2	Shale (0'-15')	Soft Rock	6.47E+06	0.5	1365.9	0	Shale (0'-15')_19	140	Silva et al., 20'-50'	Silva et al., 20'-50'	3.05	Shale (0'-15')_19	1220
31.2	34	Shale (0'-15')	Soft Rock	6.47E+06	0.5	1517.2	0	Shale (0'-15')_20	140	Silva et al., 20'-50'	Silva et al., 20'-50'	2.8	Shale (0'-15')_20	1220
34	37.4	Shale (15'-30')	Soft Rock	8.04E+06	0.5	1677.5	0	Shale (15'-30')_21	140	Silva et al., 20'-50'	Silva et al., 20'-50'	3.4	Shale (15'-30')_21	1360
37.4	40.8	Shale (15'-30')	Soft Rock	8.04E+06	0.5	1853.4	0	Shale (15'-30')_22	140	Silva et al., 20'-50'	Silva et al., 20'-50'	3.4	Shale (15'-30')_22	1360
40.8	44.2	Shale (15'-30')	Soft Rock	8.04E+06	0.5	2029.3	0	Shale (15'-30')_23	140	Silva et al., 20'-50'	Silva et al., 20'-50'	3.4	Shale (15'-30')_23	1360
44.2	47.6	Shale (15'-30')	Soft Rock	8.04E+06	0.5	2205.2	0	Shale (15'-30')_24	140	Silva et al., 20'-50'	Silva et al., 20'-50'	3.4	Shale (15'-30')_24	1360
47.6	51	Shale (15'-30')	Soft Rock	8.04E+06	0.5	2381.1	0	Shale (15'-30')_25	140	Silva et al., 20'-50'	Silva et al., 20'-50'	3.4	Shale (15'-30')_25	1360
51	52.6	Shale (15'-30')	Soft Rock	8.04E+06	0.5	2510.5	0	Shale (15'-30')_26	140	Silva et al., 50'-120'	Silva et al., 50'-120'	1.6	Shale (15'-30')_26	1360
52.6	152.6	Shale (El. 575'-675')	Firm Rock	4.18E+07	0.5	5138.5	0	Shale (El. 575'-675')_27	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 575'-675')_27	3100
152.6	252.6	Shale (El. 475'-575')	Firm Rock	7.31E+07	0.5	10311.8	0	Shale (El. 475'-575')_28	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 475'-575')_28	4100
252.6	352.6	Shale (El. 375'-475')	Firm Rock	1.13E+08	0.5	15485.2	0	Shale (El. 375'-475')_29	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 375'-475')_29	5100
352.6	452.6	Shale (El. 275'-375')	Firm Rock	1.62E+08	0.5	20658.5	0	Shale (El. 275'-375')_30	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 275'-375')_30	6100
452.6	552.6	Shale (El. 175'-275')	Firm Rock	2.19E+08	0.5	25831.8	0	Shale (El. 175'-275')_31	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 175'-275')_31	7100
552.6	652.6	Shale (El. 75'-175')	Firm Rock	2.85E+08	0.5	31005.2	0	Shale (El. 75'-175')_32	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 75'-175')_32	8100
652.6	692.6	Shale (El. 35'-75')	Firm Rock	3.37E+08	0.5	34626.5	0	Shale (El. 35'-75')_33	140	Firm/Hard Rock	Firm/Hard Rock	40	Shale (El. 35'-75')_33	8800
692.6	Half-Space	Shale (El. < 35')	Half-Space	3.52E+08	0.5	Half-Space	0	Bedrock	140	NA, Half-Space	Damping = 0.5%	Half Space	Bedrock	9000

Facility	KIF	
Section/Group	Polishing Pond	
Profile Name	KIF-B16_NOR	
Top of Profile Elevation	726.5	ft
Depth to water table during EQ	0	ft
Surcharge Pressure		psf

Strata Profile

Non-input Information								Strata "Soil Types" Input				Strata "Soil Profile" Input		
Top Depth (ft)	**Bottom Depth (ft)**	**Layer Name**	**Layer Type**	**G_{max} (psf)**	**K_o**	**Mean Effective Stress at midpoint (psf)**	**Plasticity Index**	**Name (for Strata)**	**Unit Weight (pcf)**	**Modulus Reduction (G/Gmax) Model**	**Damping Model**	**Thickness (ft)**	**Soil Type (for Strata)**	**Shear Wave Velocity (fps)**
0	0.65	Sediment	Soil	2.37E+05	0.5	11.0	12	Sediment_1	113	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	0.65	Sediment_1	260
0.65	1.3	Sediment	Soil	2.37E+05	0.5	32.9	12	Sediment_2	113	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	0.65	Sediment_2	260
1.3	1.95	Sediment	Soil	2.37E+05	0.5	54.8	12	Sediment_3	113	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	0.65	Sediment_3	260
1.95	2.6	Sediment	Soil	2.37E+05	0.5	76.7	12	Sediment_4	113	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	0.65	Sediment_4	260
2.6	3.25	Sediment	Soil	2.37E+05	0.5	98.7	12	Sediment_5	113	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	0.65	Sediment_5	260
3.25	3.5	Sediment	Soil	2.37E+05	0.5	113.9	12	Sediment_6	113	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	0.25	Sediment_6	260
3.5	5.25	Subunit 2	Soil	1.93E+06	0.5	155.8	0	Subunit 2_7	127	D&S, p'=0-400, PI=0	D&S, p'=0-400, PI=0	1.75	Subunit 2_7	700
5.25	7	Subunit 2	Soil	1.93E+06	0.5	231.1	0	Subunit 2_8	127	D&S, p'=0-400, PI=0	D&S, p'=0-400, PI=0	1.75	Subunit 2_8	700
7	8.75	Subunit 2	Soil	1.93E+06	0.5	306.5	0	Subunit 2_9	127	D&S, p'=0-400, PI=0	D&S, p'=0-400, PI=0	1.75	Subunit 2_9	700
8.75	10.3	Subunit 2	Soil	1.93E+06	0.5	377.5	0	Subunit 2_10	127	D&S, p'=0-400, PI=0	D&S, p'=0-400, PI=0	1.55	Subunit 2_10	700
10.3	12.05	Subunit 3	Soil	2.01E+06	0.5	451.5	0	Subunit 3_11	132	D&S, p'=400-800, PI=0	D&S, p'=400-800, PI=0	1.75	Subunit 3_11	700
12.05	13.8	Subunit 3	Soil	2.01E+06	0.5	532.7	0	Subunit 3_12	132	D&S, p'=400-800, PI=0	D&S, p'=400-800, PI=0	1.75	Subunit 3_12	700
13.8	15.55	Subunit 3	Soil	2.01E+06	0.5	613.9	0	Subunit 3_13	132	D&S, p'=400-800, PI=0	D&S, p'=400-800, PI=0	1.75	Subunit 3_13	700
15.55	17	Subunit 3	Soil	2.01E+06	0.5	688.2	0	Subunit 3_14	132	D&S, p'=400-800, PI=0	D&S, p'=400-800, PI=0	1.45	Subunit 3_14	700
17	20.05	Shale (0'-15')	Soft Rock	6.47E+06	0.5	800.7	0	Shale (0'-15')_15	140	Silva et al., 0'-20'	Silva et al., 0'-20'	3.05	Shale (0'-15')_15	1220
20.05	23.1	Shale (0'-15')	Soft Rock	6.47E+06	0.5	958.5	0	Shale (0'-15')_16	140	Silva et al., 20'-50'	Silva et al., 20'-50'	3.05	Shale (0'-15')_16	1220
23.1	26.15	Shale (0'-15')	Soft Rock	6.47E+06	0.5	1116.3	0	Shale (0'-15')_17	140	Silva et al., 20'-50'	Silva et al., 20'-50'	3.05	Shale (0'-15')_17	1220
26.15	29.2	Shale (0'-15')	Soft Rock	6.47E+06	0.5	1274.1	0	Shale (0'-15')_18	140	Silva et al., 20'-50'	Silva et al., 20'-50'	3.05	Shale (0'-15')_18	1220
29.2	32	Shale (0'-15')	Soft Rock	6.47E+06	0.5	1425.4	0	Shale (0'-15')_19	140	Silva et al., 20'-50'	Silva et al., 20'-50'	2.8	Shale (0'-15')_19	1220
32	35.4	Shale (15'-30')	Soft Rock	8.04E+06	0.5	1585.7	0	Shale (15'-30')_20	140	Silva et al., 20'-50'	Silva et al., 20'-50'	3.4	Shale (15'-30')_20	1360
35.4	38.8	Shale (15'-30')	Soft Rock	8.04E+06	0.5	1761.6	0	Shale (15'-30')_21	140	Silva et al., 20'-50'	Silva et al., 20'-50'	3.4	Shale (15'-30')_21	1360
38.8	42.2	Shale (15'-30')	Soft Rock	8.04E+06	0.5	1937.5	0	Shale (15'-30')_22	140	Silva et al., 20'-50'	Silva et al., 20'-50'	3.4	Shale (15'-30')_22	1360
42.2	45.6	Shale (15'-30')	Soft Rock	8.04E+06	0.5	2113.4	0	Shale (15'-30')_23	140	Silva et al., 20'-50'	Silva et al., 20'-50'	3.4	Shale (15'-30')_23	1360
45.6	49	Shale (15'-30')	Soft Rock	8.04E+06	0.5	2289.3	0	Shale (15'-30')_24	140	Silva et al., 20'-50'	Silva et al., 20'-50'	3.4	Shale (15'-30')_24	1360
49	51.5	Shale (15'-30')	Soft Rock	8.04E+06	0.5	2441.9	0	Shale (15'-30')_25	140	Silva et al., 50'-120'	Silva et al., 50'-120'	2.5	Shale (15'-30')_25	1360
51.5	151.5	Shale (El. 575'-675')	Firm Rock	4.18E+07	0.5	5093.3	0	Shale (El. 575'-675')_26	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 575'-675')_26	3100
151.5	251.5	Shale (El. 475'-575')	Firm Rock	7.31E+07	0.5	10266.6	0	Shale (El. 475'-575')_27	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 475'-575')_27	4100
251.5	351.5	Shale (El. 375'-475')	Firm Rock	1.13E+08	0.5	15439.9	0	Shale (El. 375'-475')_28	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 375'-475')_28	5100
351.5	451.5	Shale (El. 275'-375')	Firm Rock	1.62E+08	0.5	20613.3	0	Shale (El. 275'-375')_29	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 275'-375')_29	6100
451.5	551.5	Shale (El. 175'-275')	Firm Rock	2.19E+08	0.5	25786.6	0	Shale (El. 175'-275')_30	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 175'-275')_30	7100
551.5	651.5	Shale (El. 75'-175')	Firm Rock	2.85E+08	0.5	30959.9	0	Shale (El. 75'-175')_31	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 75'-175')_31	8100
651.5	691.5	Shale (El. 35'-75')	Firm Rock	3.37E+08	0.5	34581.3	0	Shale (El. 35'-75')_32	140	Firm/Hard Rock	Firm/Hard Rock	40	Shale (El. 35'-75')_32	8800
691.5	Half-Space	Shale (El. < 35')	Half-Space	3.52E+08	0.5	Half-Space	0	Bedrock	140	NA, Half-Space	Damping = 0.5%	Half Space	Bedrock	9000

Facility	KIF East Dike	
Section/Group	Polishing Pond	
Profile Name	KIF-BF-SPT5_NOR	
Top of Profile Elevation	763	ft
Depth to water table during EQ	9.3	ft
Surcharge Pressure		psf

Strata Profile

Non-input Information							Strata "Soil Types" Input				Strata "Soil Profile" Input		
Top Depth (ft)	**Bottom Depth (ft)**	**Layer Name**	**Layer Type**	**G_{max} (psf)**	**K_o**	**Mean Effective Stress at midpoint (psf)**	**Plasticity Index**	**Name (for Strata)**	**Unit Weight (pcf)**	**Modulus Reduction (G/Gmax) Model**	**Damping Model**	**Thickness (ft)**	**Soil Type (for Strata)**	**Shear Wave Velocity (fps)**
0	1.62	Bottom Ash	Soil	1.56E+06	0.5	64.3	0	Bottom Ash_1	119	D&S, p'=0-400, PI=0	D&S, p'=0-400, PI=0	1.62	Bottom Ash_1	650
1.62	3.24	Bottom Ash	Soil	1.56E+06	0.5	192.8	0	Bottom Ash_2	119	D&S, p'=0-400, PI=0	D&S, p'=0-400, PI=0	1.62	Bottom Ash_2	650
3.24	4.86	Bottom Ash	Soil	1.56E+06	0.5	321.3	0	Bottom Ash_3	119	D&S, p'=0-400, PI=0	D&S, p'=0-400, PI=0	1.62	Bottom Ash_3	650
4.86	6.48	Bottom Ash	Soil	1.56E+06	0.5	449.8	0	Bottom Ash_4	119	D&S, p'=400-800, PI=0	D&S, p'=400-800, PI=0	1.62	Bottom Ash_4	650
6.48	8.1	Bottom Ash	Soil	1.56E+06	0.5	578.3	0	Bottom Ash_5	119	D&S, p'=400-800, PI=0	D&S, p'=400-800, PI=0	1.62	Bottom Ash_5	650
8.1	9.3	Bottom Ash	Soil	1.56E+06	0.5	690.2	0	Bottom Ash_6	119	D&S, p'=400-800, PI=0	D&S, p'=400-800, PI=0	1.2	Bottom Ash_6	650
9.3	10.92	Bottom Ash	Soil	1.63E+06	0.5	771.1	0	Bottom Ash_7	124	D&S, p'=400-800, PI=0	D&S, p'=400-800, PI=0	1.62	Bottom Ash_7	650
10.92	12.54	Bottom Ash	Soil	1.63E+06	0.5	837.6	0	Bottom Ash_8	124	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.62	Bottom Ash_8	650
12.54	14.16	Bottom Ash	Soil	1.63E+06	0.5	904.1	0	Bottom Ash_9	124	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.62	Bottom Ash_9	650
14.16	15.78	Bottom Ash	Soil	1.63E+06	0.5	970.6	0	Bottom Ash_10	124	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.62	Bottom Ash_10	650
15.78	17.4	Bottom Ash	Soil	1.63E+06	0.5	1037.2	0	Bottom Ash_11	124	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.62	Bottom Ash_11	650
17.4	19.02	Bottom Ash	Soil	1.63E+06	0.5	1103.7	0	Bottom Ash_12	124	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.62	Bottom Ash_12	650
19.02	20.64	Bottom Ash	Soil	1.63E+06	0.5	1170.2	0	Bottom Ash_13	124	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.62	Bottom Ash_13	650
20.64	21	Bottom Ash	Soil	1.63E+06	0.5	1210.9	0	Bottom Ash_14	124	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	0.36	Bottom Ash_14	650
21	22.75	Fly Ash	Soil	1.70E+06	0.5	1247.2	0	Fly Ash_15	112	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Fly Ash_15	700
22.75	24.5	Fly Ash	Soil	1.70E+06	0.5	1305.1	0	Fly Ash_16	112	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Fly Ash_16	700
24.5	26.25	Fly Ash	Soil	1.70E+06	0.5	1362.9	0	Fly Ash_17	112	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Fly Ash_17	700
26.25	28	Fly Ash	Soil	1.70E+06	0.5	1420.8	0	Fly Ash_18	112	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Fly Ash_18	700
28	29.75	Fly Ash	Soil	1.70E+06	0.5	1478.7	0	Fly Ash_19	112	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Fly Ash_19	700
29.75	31.5	Fly Ash	Soil	1.70E+06	0.5	1536.5	0	Fly Ash_20	112	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Fly Ash_20	700
31.5	33.25	Subunit 2	Soil	1.93E+06	0.5	1603.2	0	Subunit 2_21	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 2_21	700
33.25	35	Subunit 2	Soil	1.93E+06	0.5	1678.5	0	Subunit 2_22	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 2_22	700
35	36.75	Subunit 2	Soil	1.93E+06	0.5	1753.9	0	Subunit 2_23	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 2_23	700
36.75	38.5	Subunit 2	Soil	1.93E+06	0.5	1829.3	0	Subunit 2_24	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 2_24	700
38.5	40.25	Subunit 2	Soil	1.93E+06	0.5	1904.6	0	Subunit 2_25	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 2_25	700
40.25	42	Subunit 2	Soil	1.93E+06	0.5	1980.0	0	Subunit 2_26	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 2_26	700
42	43.75	Subunit 2	Soil	1.93E+06	0.5	2055.4	0	Subunit 2_27	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 2_27	700
43.75	45	Subunit 2	Soil	1.93E+06	0.5	2120.0	0	Subunit 2_28	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.25	Subunit 2_28	700
45	46.75	Subunit 3	Soil	2.01E+06	0.5	2187.5	0	Subunit 3_29	132	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 3_29	700
46.75	48.5	Subunit 3	Soil	2.01E+06	0.5	2268.7	0	Subunit 3_30	132	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 3_30	700
48.5	50.25	Subunit 3	Soil	2.01E+06	0.5	2349.9	0	Subunit 3_31	132	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 3_31	700
50.25	52	Subunit 3	Soil	2.01E+06	0.5	2431.1	0	Subunit 3_32	132	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 3_32	700
52	53.75	Subunit 3	Soil	2.01E+06	0.5	2512.3	0	Subunit 3_33	132	D&S, p'=2500-5000, PI=0	D&S, p'=2500-5000, PI=0	1.75	Subunit 3_33	700
53.75	55.5	Subunit 3	Soil	2.01E+06	0.5	2593.5	0	Subunit 3_34	132	D&S, p'=2500-5000, PI=0	D&S, p'=2500-5000, PI=0	1.75	Subunit 3_34	700
55.5	56	Subunit 3	Soil	2.01E+06	0.5	2645.7	0	Subunit 3_35	132	D&S, p'=2500-5000, PI=0	D&S, p'=2500-5000, PI=0	0.5	Subunit 3_35	700
56	59.05	Shale (0'-15')	Soft Rock	6.47E+06	0.5	2736.2	0	Shale (0'-15')_36	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_36	1220
59.05	62.1	Shale (0'-15')	Soft Rock	6.47E+06	0.5	2894.0	0	Shale (0'-15')_37	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_37	1220
62.1	65.15	Shale (0'-15')	Soft Rock	6.47E+06	0.5	3051.7	0	Shale (0'-15')_38	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_38	1220
65.15	68.2	Shale (0'-15')	Soft Rock	6.47E+06	0.5	3209.5	0	Shale (0'-15')_39	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_39	1220
68.2	71	Shale (0'-15')	Soft Rock	6.47E+06	0.5	3360.9	0	Shale (0'-15')_40	140	Silva et al., 50'-120'	Silva et al., 50'-120'	2.8	Shale (0'-15')_40	1220
71	74.4	Shale (15'-30')	Soft Rock	8.04E+06	0.5	3521.2	0	Shale (15'-30')_41	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_41	1360
74.4	77.8	Shale (15'-30')	Soft Rock	8.04E+06	0.5	3697.1	0	Shale (15'-30')_42	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_42	1360
77.8	81.2	Shale (15'-30')	Soft Rock	8.04E+06	0.5	3873.0	0	Shale (15'-30')_43	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_43	1360
81.2	84.6	Shale (15'-30')	Soft Rock	8.04E+06	0.5	4048.9	0	Shale (15'-30')_44	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_44	1360
84.6	86	Shale (15'-30')	Soft Rock	8.04E+06	0.5	4173.1	0	Shale (15'-30')_45	140	Silva et al., 50'-120'	Silva et al., 50'-120'	1.4	Shale (15'-30')_45	1360
86	88	Shale (>30')	Soft Rock	9.65E+06	0.5	4261.0	0	Shale (>30')_46	140	Silva et al., 50'-120'	Silva et al., 50'-120'	2	Shale (>30')_46	1490
88	188	Shale (El. 575'-675')	Firm Rock	4.18E+07	0.5	6899.4	0	Shale (El. 575'-675')_47	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 575'-675')_47	3100
188	288	Shale (El. 475'-575')	Firm Rock	7.31E+07	0.5	12072.7	0	Shale (El. 475'-575')_48	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 475'-575')_48	4100
288	388	Shale (El. 375'-475')	Firm Rock	1.13E+08	0.5	17246.1	0	Shale (El. 375'-475')_49	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 375'-475')_49	5100

Strata Profile														
Non-input Information								Strata "Soil Types" Input				Strata "Soil Profile" Input		
Top Depth (ft)	Bottom Depth (ft)	Layer Name	Layer Type	G_{max} (psf)	K_o	Mean Effective Stress at midpoint (psf)	Plasticity Index	Name (for Strata)	Unit Weight (pcf)	Modulus Reduction (G/Gmax) Model	Damping Model	Thickness (ft)	Soil Type (for Strata)	Shear Wave Velocity (fps)
388	488	Shale (El. 275'-375')	Firm Rock	1.62E+08	0.5	22419.4	0	Shale (El. 275'-375')_50	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 275'-375')_50	6100
488	588	Shale (El. 175'-275')	Firm Rock	2.19E+08	0.5	27592.7	0	Shale (El. 175'-275')_51	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 175'-275')_51	7100
588	688	Shale (El. 75'-175')	Firm Rock	2.85E+08	0.5	32766.1	0	Shale (El. 75'-175')_52	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 75'-175')_52	8100
688	728	Shale (El. 35'-75')	Firm Rock	3.37E+08	0.5	36387.4	0	Shale (El. 35'-75')_53	140	Firm/Hard Rock	Firm/Hard Rock	40	Shale (El. 35'-75')_53	8800
728	Half-Space	Shale (El. < 35')	Half-Space	3.52E+08	0.5	Half-Space	0	Bedrock	140	NA, Half-Space	Damping = 0.5%	Half Space	Bedrock	9000

Facility	KIF East Dike	
Section/Group	Polishing Pond	
Profile Name	KIF-BF-SPT2_NOR	
Top of Profile Elevation	772.3	ft
Depth to water table during EQ	19	ft
Surcharge Pressure		psf

Strata Profile

Non-input Information								Strata "Soil Types" Input				Strata "Soil Profile" Input		
Top Depth (ft)	**Bottom Depth (ft)**	**Layer Name**	**Layer Type**	**G_{max} (psf)**	**K_o**	**Mean Effective Stress at midpoint (psf)**	**Plasticity Index**	**Name (for Strata)**	**Unit Weight (pcf)**	**Modulus Reduction (G/Gmax) Model**	**Damping Model**	**Thickness (ft)**	**Soil Type (for Strata)**	**Shear Wave Velocity (fps)**
0	0.82	Cover Material	Soil	4.01E+05	0.5	32.8	38	Cover Material_1	120	D&S, p'=0-400, PI=30-40	D&S, p'=0-400, PI=30-40	0.82	Cover Material_1	328
0.82	1.64	Cover Material	Soil	4.01E+05	0.5	98.4	38	Cover Material_2	120	D&S, p'=0-400, PI=30-40	D&S, p'=0-400, PI=30-40	0.82	Cover Material_2	328
1.64	2	Cover Material	Soil	4.01E+05	0.5	145.6	38	Cover Material_3	120	D&S, p'=0-400, PI=30-40	D&S, p'=0-400, PI=30-40	0.36	Cover Material_3	328
2	3.62	Bottom Ash	Soil	1.56E+06	0.5	224.3	0	Bottom Ash_4	119	D&S, p'=0-400, PI=0	D&S, p'=0-400, PI=0	1.62	Bottom Ash_4	650
3.62	5.24	Bottom Ash	Soil	1.56E+06	0.5	352.8	0	Bottom Ash_5	119	D&S, p'=0-400, PI=0	D&S, p'=0-400, PI=0	1.62	Bottom Ash_5	650
5.24	6.86	Bottom Ash	Soil	1.56E+06	0.5	481.3	0	Bottom Ash_6	119	D&S, p'=400-800, PI=0	D&S, p'=400-800, PI=0	1.62	Bottom Ash_6	650
6.86	8.48	Bottom Ash	Soil	1.56E+06	0.5	609.8	0	Bottom Ash_7	119	D&S, p'=400-800, PI=0	D&S, p'=400-800, PI=0	1.62	Bottom Ash_7	650
8.48	10.1	Bottom Ash	Soil	1.56E+06	0.5	738.3	0	Bottom Ash_8	119	D&S, p'=400-800, PI=0	D&S, p'=400-800, PI=0	1.62	Bottom Ash_8	650
10.1	11.72	Bottom Ash	Soil	1.56E+06	0.5	866.9	0	Bottom Ash_9	119	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.62	Bottom Ash_9	650
11.72	13.34	Bottom Ash	Soil	1.56E+06	0.5	995.4	0	Bottom Ash_10	119	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.62	Bottom Ash_10	650
13.34	14.96	Bottom Ash	Soil	1.56E+06	0.5	1123.9	0	Bottom Ash_11	119	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.62	Bottom Ash_11	650
14.96	16.58	Bottom Ash	Soil	1.56E+06	0.5	1252.4	0	Bottom Ash_12	119	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.62	Bottom Ash_12	650
16.58	18.2	Bottom Ash	Soil	1.56E+06	0.5	1380.9	0	Bottom Ash_13	119	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.62	Bottom Ash_13	650
18.2	19	Bottom Ash	Soil	1.56E+06	0.5	1476.9	0	Bottom Ash_14	119	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	0.8	Bottom Ash_14	650
19	20.62	Bottom Ash	Soil	1.63E+06	0.5	1541.9	0	Bottom Ash_15	124	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.62	Bottom Ash_15	650
20.62	22.24	Bottom Ash	Soil	1.63E+06	0.5	1608.5	0	Bottom Ash_16	124	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.62	Bottom Ash_16	650
22.24	23.86	Bottom Ash	Soil	1.63E+06	0.5	1675.0	0	Bottom Ash_17	124	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.62	Bottom Ash_17	650
23.86	25.48	Bottom Ash	Soil	1.63E+06	0.5	1741.5	0	Bottom Ash_18	124	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.62	Bottom Ash_18	650
25.48	26.8	Bottom Ash	Soil	1.63E+06	0.5	1801.9	0	Bottom Ash_19	124	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.32	Bottom Ash_19	650
26.8	28.55	Fly Ash	Soil	1.70E+06	0.5	1857.9	0	Fly Ash_20	112	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Fly Ash_20	700
28.55	30.3	Fly Ash	Soil	1.70E+06	0.5	1915.8	0	Fly Ash_21	112	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Fly Ash_21	700
30.3	32.05	Fly Ash	Soil	1.70E+06	0.5	1973.7	0	Fly Ash_22	112	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Fly Ash_22	700
32.05	33.8	Fly Ash	Soil	1.70E+06	0.5	2031.5	0	Fly Ash_23	112	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Fly Ash_23	700
33.8	35.55	Fly Ash	Soil	1.70E+06	0.5	2089.4	0	Fly Ash_24	112	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Fly Ash_24	700
35.55	37.3	Fly Ash	Soil	1.70E+06	0.5	2147.3	0	Fly Ash_25	112	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Fly Ash_25	700
37.3	39.05	Fly Ash	Soil	1.70E+06	0.5	2205.1	0	Fly Ash_26	112	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Fly Ash_26	700
39.05	40.8	Fly Ash	Soil	1.70E+06	0.5	2263.0	0	Fly Ash_27	112	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Fly Ash_27	700
40.8	42.55	Fly Ash	Soil	1.70E+06	0.5	2320.9	0	Fly Ash_28	112	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Fly Ash_28	700
42.55	42.8	Fly Ash	Soil	1.70E+06	0.5	2353.9	0	Fly Ash_29	112	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	0.25	Fly Ash_29	700
42.8	44.55	Subunit 2	Soil	1.93E+06	0.5	2395.7	0	Subunit 2_30	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 2_30	700
44.55	46.3	Subunit 2	Soil	1.93E+06	0.5	2471.1	0	Subunit 2_31	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 2_31	700
46.3	48.05	Subunit 2	Soil	1.93E+06	0.5	2546.5	0	Subunit 2_32	127	D&S, p'=2500-5000, PI=0	D&S, p'=2500-5000, PI=0	1.75	Subunit 2_32	700
48.05	49.8	Subunit 2	Soil	1.93E+06	0.5	2621.8	0	Subunit 2_33	127	D&S, p'=2500-5000, PI=0	D&S, p'=2500-5000, PI=0	1.75	Subunit 2_33	700
49.8	51.55	Subunit 2	Soil	1.93E+06	0.5	2697.2	0	Subunit 2_34	127	D&S, p'=2500-5000, PI=0	D&S, p'=2500-5000, PI=0	1.75	Subunit 2_34	700
51.55	53.3	Subunit 2	Soil	1.93E+06	0.5	2772.6	0	Subunit 2_35	127	D&S, p'=2500-5000, PI=0	D&S, p'=2500-5000, PI=0	1.75	Subunit 2_35	700
53.3	54.3	Subunit 2	Soil	1.93E+06	0.5	2831.8	0	Subunit 2_36	127	D&S, p'=2500-5000, PI=0	D&S, p'=2500-5000, PI=0	1	Subunit 2_36	700
54.3	56.05	Subunit 3	Soil	2.01E+06	0.5	2893.9	0	Subunit 3_37	132	D&S, p'=2500-5000, PI=0	D&S, p'=2500-5000, PI=0	1.75	Subunit 3_37	700
56.05	57.8	Subunit 3	Soil	2.01E+06	0.5	2975.1	0	Subunit 3_38	132	D&S, p'=2500-5000, PI=0	D&S, p'=2500-5000, PI=0	1.75	Subunit 3_38	700
57.8	59.55	Subunit 3	Soil	2.01E+06	0.5	3056.3	0	Subunit 3_39	132	D&S, p'=2500-5000, PI=0	D&S, p'=2500-5000, PI=0	1.75	Subunit 3_39	700
59.55	61.3	Subunit 3	Soil	2.01E+06	0.5	3137.5	0	Subunit 3_40	132	D&S, p'=2500-5000, PI=0	D&S, p'=2500-5000, PI=0	1.75	Subunit 3_40	700
61.3	63.05	Subunit 3	Soil	2.01E+06	0.5	3218.7	0	Subunit 3_41	132	D&S, p'=2500-5000, PI=0	D&S, p'=2500-5000, PI=0	1.75	Subunit 3_41	700
63.05	64.8	Subunit 3	Soil	2.01E+06	0.5	3299.9	0	Subunit 3_42	132	D&S, p'=2500-5000, PI=0	D&S, p'=2500-5000, PI=0	1.75	Subunit 3_42	700
64.8	65.3	Subunit 3	Soil	2.01E+06	0.5	3352.1	0	Subunit 3_43	132	D&S, p'=2500-5000, PI=0	D&S, p'=2500-5000, PI=0	0.5	Subunit 3_43	700
65.3	68.35	Shale (0'-15')	Soft Rock	6.47E+06	0.5	3442.6	0	Shale (0'-15')_44	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_44	1220
68.35	71.4	Shale (0'-15')	Soft Rock	6.47E+06	0.5	3600.4	0	Shale (0'-15')_45	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_45	1220
71.4	74.45	Shale (0'-15')	Soft Rock	6.47E+06	0.5	3758.2	0	Shale (0'-15')_46	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_46	1220
74.45	77.5	Shale (0'-15')	Soft Rock	6.47E+06	0.5	3916.0	0	Shale (0'-15')_47	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_47	1220
77.5	80.3	Shale (0'-15')	Soft Rock	6.47E+06	0.5	4067.3	0	Shale (0'-15')_48	140	Silva et al., 50'-120'	Silva et al., 50'-120'	2.8	Shale (0'-15')_48	1220
80.3	83.7	Shale (15'-30')	Soft Rock	8.04E+06	0.5	4227.7	0	Shale (15'-30')_49	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_49	1360

Strata Profile														
Non-input Information								Strata "Soil Types" Input				Strata "Soil Profile" Input		
Top Depth (ft)	Bottom Depth (ft)	Layer Name	Layer Type	G_{max} (psf)	K_o	Mean Effective Stress at midpoint (psf)	Plasticity Index	Name (for Strata)	Unit Weight (pcf)	Modulus Reduction (G/Gmax) Model	Damping Model	Thickness (ft)	Soil Type (for Strata)	Shear Wave Velocity (fps)
83.7	87.1	Shale (15'-30')	Soft Rock	8.04E+06	0.5	4403.6	0	Shale (15'-30')_50	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_50	1360
87.1	90.5	Shale (15'-30')	Soft Rock	8.04E+06	0.5	4579.5	0	Shale (15'-30')_51	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_51	1360
90.5	93.9	Shale (15'-30')	Soft Rock	8.04E+06	0.5	4755.3	0	Shale (15'-30')_52	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_52	1360
93.9	95.3	Shale (15'-30')	Soft Rock	8.04E+06	0.5	4879.5	0	Shale (15'-30')_53	140	Silva et al., 50'-120'	Silva et al., 50'-120'	1.4	Shale (15'-30')_53	1360
95.3	97.3	Shale (>30')	Soft Rock	9.65E+06	0.5	4967.5	0	Shale (>30')_54	140	Silva et al., 50'-120'	Silva et al., 50'-120'	2	Shale (>30')_54	1490
97.3	197.3	Shale (El. 575'-675')	Firm Rock	4.18E+07	0.5	7605.9	0	Shale (El. 575'-675')_55	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 575'-675')_55	3100
197.3	297.3	Shale (El. 475'-575')	Firm Rock	7.31E+07	0.5	12779.2	0	Shale (El. 475'-575')_56	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 475'-575')_56	4100
297.3	397.3	Shale (El. 375'-475')	Firm Rock	1.13E+08	0.5	17952.5	0	Shale (El. 375'-475')_57	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 375'-475')_57	5100
397.3	497.3	Shale (El. 275'-375')	Firm Rock	1.62E+08	0.5	23125.9	0	Shale (El. 275'-375')_58	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 275'-375')_58	6100
497.3	597.3	Shale (El. 175'-275')	Firm Rock	2.19E+08	0.5	28299.2	0	Shale (El. 175'-275')_59	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 175'-275')_59	7100
597.3	697.3	Shale (El. 75'-175')	Firm Rock	2.85E+08	0.5	33472.5	0	Shale (El. 75'-175')_60	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 75'-175')_60	8100
697.3	737.3	Shale (El. 35'-75')	Firm Rock	3.37E+08	0.5	37093.9	0	Shale (El. 35'-75')_61	140	Firm/Hard Rock	Firm/Hard Rock	40	Shale (El. 35'-75')_61	8800
737.3	Half-Space	Shale (El. < 35')	Half-Space	3.52E+08	0.5	Half-Space	0	Bedrock	140	NA, Half-Space	Damping = 0.5%	Half Space	Bedrock	9000

Facility	KIF East Dike	
Section/Group	Polishing Pond	
Profile Name	KIF-B1_NOR	
Top of Profile Elevation	763	ft
Depth to water table during EQ	10.37	ft
Surcharge Pressure		psf

Strata Profile

Non-input Information							Strata "Soil Types" Input				Strata "Soil Profile" Input		
Top Depth (ft)	**Bottom Depth (ft)**	**Layer Name**	**Layer Type**	**G_{max} (psf)**	**K_o**	**Mean Effective Stress at midpoint (psf)**	**Plasticity Index**	**Name (for Strata)**	**Unit Weight (pcf)**	**Modulus Reduction (G/Gmax) Model**	**Damping Model**	**Thickness (ft)**	**Soil Type (for Strata)**	**Shear Wave Velocity (fps)**
0	0.82	Cover Material	Soil	4.01E+05	0.5	32.8	38	Cover Material_1	120	D&S, p'=0-400, PI=30-40	D&S, p'=0-400, PI=30-40	0.82	Cover Material_1	328
0.82	1.64	Cover Material	Soil	4.01E+05	0.5	98.4	38	Cover Material_2	120	D&S, p'=0-400, PI=30-40	D&S, p'=0-400, PI=30-40	0.82	Cover Material_2	328
1.64	2	Cover Material	Soil	4.01E+05	0.5	145.6	38	Cover Material_3	120	D&S, p'=0-400, PI=30-40	D&S, p'=0-400, PI=30-40	0.36	Cover Material_3	328
2	3.62	Bottom Ash	Soil	1.56E+06	0.5	224.3	0	Bottom Ash_4	119	D&S, p'=0-400, PI=0	D&S, p'=0-400, PI=0	1.62	Bottom Ash_4	650
3.62	5.24	Bottom Ash	Soil	1.56E+06	0.5	352.8	0	Bottom Ash_5	119	D&S, p'=0-400, PI=0	D&S, p'=0-400, PI=0	1.62	Bottom Ash_5	650
5.24	6.86	Bottom Ash	Soil	1.56E+06	0.5	481.3	0	Bottom Ash_6	119	D&S, p'=400-800, PI=0	D&S, p'=400-800, PI=0	1.62	Bottom Ash_6	650
6.86	8.48	Bottom Ash	Soil	1.56E+06	0.5	609.8	0	Bottom Ash_7	119	D&S, p'=400-800, PI=0	D&S, p'=400-800, PI=0	1.62	Bottom Ash_7	650
8.48	10.1	Bottom Ash	Soil	1.56E+06	0.5	738.3	0	Bottom Ash_8	119	D&S, p'=400-800, PI=0	D&S, p'=400-800, PI=0	1.62	Bottom Ash_8	650
10.1	10.37	Bottom Ash	Soil	1.56E+06	0.5	813.3	0	Bottom Ash_9	119	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	0.27	Bottom Ash_9	650
10.37	11.99	Bottom Ash	Soil	1.63E+06	0.5	857.3	0	Bottom Ash_10	124	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.62	Bottom Ash_10	650
11.99	13.61	Bottom Ash	Soil	1.63E+06	0.5	923.8	0	Bottom Ash_11	124	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.62	Bottom Ash_11	650
13.61	15.23	Bottom Ash	Soil	1.63E+06	0.5	990.3	0	Bottom Ash_12	124	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.62	Bottom Ash_12	650
15.23	16.85	Bottom Ash	Soil	1.63E+06	0.5	1056.9	0	Bottom Ash_13	124	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.62	Bottom Ash_13	650
16.85	18.47	Bottom Ash	Soil	1.63E+06	0.5	1123.4	0	Bottom Ash_14	124	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.62	Bottom Ash_14	650
18.47	20.09	Bottom Ash	Soil	1.63E+06	0.5	1189.9	0	Bottom Ash_15	124	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.62	Bottom Ash_15	650
20.09	20.5	Bottom Ash	Soil	1.63E+06	0.5	1231.6	0	Bottom Ash_16	124	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	0.41	Bottom Ash_16	650
20.5	22.25	Fly Ash	Soil	1.70E+06	0.5	1269.0	0	Fly Ash_17	112	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Fly Ash_17	700
22.25	24	Fly Ash	Soil	1.70E+06	0.5	1326.8	0	Fly Ash_18	112	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Fly Ash_18	700
24	25.75	Fly Ash	Soil	1.70E+06	0.5	1384.7	0	Fly Ash_19	112	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Fly Ash_19	700
25.75	27.5	Fly Ash	Soil	1.70E+06	0.5	1442.6	0	Fly Ash_20	112	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Fly Ash_20	700
27.5	29.25	Fly Ash	Soil	1.70E+06	0.5	1500.4	0	Fly Ash_21	112	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Fly Ash_21	700
29.25	31	Fly Ash	Soil	1.70E+06	0.5	1558.3	0	Fly Ash_22	112	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Fly Ash_22	700
31	32.5	Fly Ash	Soil	1.70E+06	0.5	1612.0	0	Fly Ash_23	112	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.5	Fly Ash_23	700
32.5	34.25	Subunit 2	Soil	1.93E+06	0.5	1674.5	0	Subunit 2_24	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 2_24	700
34.25	36	Subunit 2	Soil	1.93E+06	0.5	1749.9	0	Subunit 2_25	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 2_25	700
36	37.75	Subunit 2	Soil	1.93E+06	0.5	1825.2	0	Subunit 2_26	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 2_26	700
37.75	39.5	Subunit 2	Soil	1.93E+06	0.5	1900.6	0	Subunit 2_27	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 2_27	700
39.5	41.25	Subunit 2	Soil	1.93E+06	0.5	1976.0	0	Subunit 2_28	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 2_28	700
41.25	43	Subunit 2	Soil	1.93E+06	0.5	2051.3	0	Subunit 2_29	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 2_29	700
43	44	Subunit 2	Soil	1.93E+06	0.5	2110.6	0	Subunit 2_30	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1	Subunit 2_30	700
44	45.75	Subunit 3	Soil	2.01E+06	0.5	2172.7	0	Subunit 3_31	132	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 3_31	700
45.75	47.5	Subunit 3	Soil	2.01E+06	0.5	2253.9	0	Subunit 3_32	132	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 3_32	700
47.5	49.25	Subunit 3	Soil	2.01E+06	0.5	2335.1	0	Subunit 3_33	132	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 3_33	700
49.25	51	Subunit 3	Soil	2.01E+06	0.5	2416.3	0	Subunit 3_34	132	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 3_34	700
51	54.05	Shale (0'-15')	Soft Rock	6.47E+06	0.5	2535.8	0	Shale (0'-15')_35	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_35	1220
54.05	57.1	Shale (0'-15')	Soft Rock	6.47E+06	0.5	2693.6	0	Shale (0'-15')_36	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_36	1220
57.1	60.15	Shale (0'-15')	Soft Rock	6.47E+06	0.5	2851.4	0	Shale (0'-15')_37	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_37	1220
60.15	63.2	Shale (0'-15')	Soft Rock	6.47E+06	0.5	3009.1	0	Shale (0'-15')_38	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_38	1220
63.2	66	Shale (0'-15')	Soft Rock	6.47E+06	0.5	3160.5	0	Shale (0'-15')_39	140	Silva et al., 50'-120'	Silva et al., 50'-120'	2.8	Shale (0'-15')_39	1220
66	69.4	Shale (15'-30')	Soft Rock	8.04E+06	0.5	3320.8	0	Shale (15'-30')_40	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_40	1360
69.4	72.8	Shale (15'-30')	Soft Rock	8.04E+06	0.5	3496.7	0	Shale (15'-30')_41	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_41	1360
72.8	76.2	Shale (15'-30')	Soft Rock	8.04E+06	0.5	3672.6	0	Shale (15'-30')_42	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_42	1360
76.2	79.6	Shale (15'-30')	Soft Rock	8.04E+06	0.5	3848.5	0	Shale (15'-30')_43	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_43	1360
79.6	81	Shale (15'-30')	Soft Rock	8.04E+06	0.5	3972.7	0	Shale (15'-30')_44	140	Silva et al., 50'-120'	Silva et al., 50'-120'	1.4	Shale (15'-30')_44	1360
81	84.72	Shale (>30')	Soft Rock	9.65E+06	0.5	4105.1	0	Shale (>30')_45	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.72	Shale (>30')_45	1490
84.72	88	Shale (>30')	Soft Rock	9.65E+06	0.5	4286.2	0	Shale (>30')_46	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.28	Shale (>30')_46	1490
88	188	Shale (El. 575'-675')	Firm Rock	4.18E+07	0.5	6957.7	0	Shale (El. 575'-675')_47	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 575'-675')_47	3100
188	288	Shale (El. 475'-575')	Firm Rock	7.31E+07	0.5	12131.0	0	Shale (El. 475'-575')_48	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 475'-575')_48	4100
288	388	Shale (El. 375'-475')	Firm Rock	1.13E+08	0.5	17304.4	0	Shale (El. 375'-475')_49	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 375'-475')_49	5100

Strata Profile														
Non-input Information								Strata "Soil Types" Input				Strata "Soil Profile" Input		
Top Depth (ft)	Bottom Depth (ft)	Layer Name	Layer Type	G_{max} (psf)	K_o	Mean Effective Stress at midpoint (psf)	Plasticity Index	Name (for Strata)	Unit Weight (pcf)	Modulus Reduction (G/Gmax) Model	Damping Model	Thickness (ft)	Soil Type (for Strata)	Shear Wave Velocity (fps)
388	488	Shale (El. 275'-375')	Firm Rock	1.62E+08	0.5	22477.7	0	Shale (El. 275'-375')_50	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 275'-375')_50	6100
488	588	Shale (El. 175'-275')	Firm Rock	2.19E+08	0.5	27651.0	0	Shale (El. 175'-275')_51	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 175'-275')_51	7100
588	688	Shale (El. 75'-175')	Firm Rock	2.85E+08	0.5	32824.4	0	Shale (El. 75'-175')_52	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 75'-175')_52	8100
688	728	Shale (El. 35'-75')	Firm Rock	3.37E+08	0.5	36445.7	0	Shale (El. 35'-75')_53	140	Firm/Hard Rock	Firm/Hard Rock	40	Shale (El. 35'-75')_53	8800
728	Half-Space	Shale (El. < 35')	Half-Space	3.52E+08	0.5	Half-Space	0	Bedrock	140	NA, Half-Space	Damping = 0.5%	Half Space	Bedrock	9000

Facility	KIF	
Section/Group	Polishing Pond	
Profile Name	KIF-B2_NOR	
Top of Profile Elevation	753.02	ft
Depth to water table during EQ	2.1	ft
Surcharge Pressure		psf

Strata Profile

Non-input Information								Strata "Soil Types" Input				Strata "Soil Profile" Input		
Top Depth (ft)	**Bottom Depth (ft)**	**Layer Name**	**Layer Type**	**G_{max} (psf)**	**K_o**	**Mean Effective Stress at midpoint (psf)**	**Plasticity Index**	**Name (for Strata)**	**Unit Weight (pcf)**	**Modulus Reduction (G/Gmax) Model**	**Damping Model**	**Thickness (ft)**	**Soil Type (for Strata)**	**Shear Wave Velocity (fps)**
0	0.82	Cover Material	Soil	4.03E+05	0.5	32.8	38	Cover Material_1	120	D&S, p'=0-400, PI=30-40	D&S, p'=0-400, PI=30-40	0.82	Cover Material_1	329
0.82	1.64	Cover Material	Soil	4.03E+05	0.5	98.4	38	Cover Material_2	120	D&S, p'=0-400, PI=30-40	D&S, p'=0-400, PI=30-40	0.82	Cover Material_2	329
1.64	2.02	Cover Material	Soil	4.03E+05	0.5	146.4	38	Cover Material_3	120	D&S, p'=0-400, PI=30-40	D&S, p'=0-400, PI=30-40	0.38	Cover Material_3	329
2.02	2.1	Bottom Ash	Soil	1.56E+06	0.5	164.8	0	Bottom Ash_4	119	D&S, p'=0-400, PI=0	D&S, p'=0-400, PI=0	0.08	Bottom Ash_4	650
2.1	3.72	Bottom Ash	Soil	1.63E+06	0.5	201.2	0	Bottom Ash_5	124	D&S, p'=0-400, PI=0	D&S, p'=0-400, PI=0	1.62	Bottom Ash_5	650
3.72	5.34	Bottom Ash	Soil	1.63E+06	0.5	267.7	0	Bottom Ash_6	124	D&S, p'=0-400, PI=0	D&S, p'=0-400, PI=0	1.62	Bottom Ash_6	650
5.34	6.92	Bottom Ash	Soil	1.63E+06	0.5	333.4	0	Bottom Ash_7	124	D&S, p'=0-400, PI=0	D&S, p'=0-400, PI=0	1.58	Bottom Ash_7	650
6.92	8.67	Embankment Fill	Soil	1.95E+06	0.5	404.2	13	Embankment Fill_8	128	D&S, p'=400-800, PI=10-15	D&S, p'=400-800, PI=10-15	1.75	Embankment Fill_8	700
8.67	10.42	Embankment Fill	Soil	1.95E+06	0.5	480.7	13	Embankment Fill_9	128	D&S, p'=400-800, PI=10-15	D&S, p'=400-800, PI=10-15	1.75	Embankment Fill_9	700
10.42	12.17	Embankment Fill	Soil	1.95E+06	0.5	557.2	13	Embankment Fill_10	128	D&S, p'=400-800, PI=10-15	D&S, p'=400-800, PI=10-15	1.75	Embankment Fill_10	700
12.17	13.92	Embankment Fill	Soil	1.95E+06	0.5	633.8	13	Embankment Fill_11	128	D&S, p'=400-800, PI=10-15	D&S, p'=400-800, PI=10-15	1.75	Embankment Fill_11	700
13.92	15.67	Embankment Fill	Soil	1.95E+06	0.5	710.3	13	Embankment Fill_12	128	D&S, p'=400-800, PI=10-15	D&S, p'=400-800, PI=10-15	1.75	Embankment Fill_12	700
15.67	17.42	Embankment Fill	Soil	1.95E+06	0.5	786.8	13	Embankment Fill_13	128	D&S, p'=400-800, PI=10-15	D&S, p'=400-800, PI=10-15	1.75	Embankment Fill_13	700
17.42	19.17	Embankment Fill	Soil	1.95E+06	0.5	863.4	13	Embankment Fill_14	128	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.75	Embankment Fill_14	700
19.17	20.92	Embankment Fill	Soil	1.95E+06	0.5	939.9	13	Embankment Fill_15	128	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.75	Embankment Fill_15	700
20.92	22.67	Embankment Fill	Soil	1.95E+06	0.5	1016.4	13	Embankment Fill_16	128	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.75	Embankment Fill_16	700
22.67	24.42	Embankment Fill	Soil	1.95E+06	0.5	1093.0	13	Embankment Fill_17	128	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.75	Embankment Fill_17	700
24.42	24.72	Embankment Fill	Soil	1.95E+06	0.5	1137.8	13	Embankment Fill_18	128	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	0.3	Embankment Fill_18	700
24.72	26.47	Subunit 2	Soil	1.93E+06	0.5	1182.0	0	Subunit 2_19	127	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Subunit 2_19	700
26.47	28.22	Subunit 2	Soil	1.93E+06	0.5	1257.4	0	Subunit 2_20	127	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Subunit 2_20	700
28.22	29.97	Subunit 2	Soil	1.93E+06	0.5	1332.8	0	Subunit 2_21	127	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Subunit 2_21	700
29.97	31.72	Subunit 2	Soil	1.93E+06	0.5	1408.1	0	Subunit 2_22	127	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Subunit 2_22	700
31.72	33.47	Subunit 2	Soil	1.93E+06	0.5	1483.5	0	Subunit 2_23	127	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Subunit 2_23	700
33.47	35.22	Subunit 2	Soil	1.93E+06	0.5	1558.9	0	Subunit 2_24	127	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Subunit 2_24	700
35.22	36.97	Subunit 2	Soil	1.93E+06	0.5	1634.2	0	Subunit 2_25	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 2_25	700
36.97	38.72	Subunit 2	Soil	1.93E+06	0.5	1709.6	0	Subunit 2_26	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 2_26	700
38.72	39.72	Subunit 2	Soil	1.93E+06	0.5	1768.8	0	Subunit 2_27	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1	Subunit 2_27	700
39.72	41.47	Subunit 3	Soil	2.01E+06	0.5	1830.9	0	Subunit 3_28	132	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 3_28	700
41.47	43.22	Subunit 3	Soil	2.01E+06	0.5	1912.1	0	Subunit 3_29	132	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 3_29	700
43.22	44.97	Subunit 3	Soil	2.01E+06	0.5	1993.3	0	Subunit 3_30	132	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 3_30	700
44.97	46.72	Subunit 3	Soil	2.01E+06	0.5	2074.5	0	Subunit 3_31	132	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 3_31	700
46.72	47.62	Subunit 3	Soil	2.01E+06	0.5	2136.0	0	Subunit 3_32	132	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	0.9	Subunit 3_32	700
47.62	50.67	Shale (0'-15')	Soft Rock	6.47E+06	0.5	2235.8	0	Shale (0'-15')_33	140	Silva et al., 20'-50'	Silva et al., 20'-50'	3.05	Shale (0'-15')_33	1220
50.67	53.72	Shale (0'-15')	Soft Rock	6.47E+06	0.5	2393.6	0	Shale (0'-15')_34	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_34	1220
53.72	56.77	Shale (0'-15')	Soft Rock	6.47E+06	0.5	2551.4	0	Shale (0'-15')_35	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_35	1220
56.77	59.82	Shale (0'-15')	Soft Rock	6.47E+06	0.5	2709.2	0	Shale (0'-15')_36	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_36	1220
59.82	62.62	Shale (0'-15')	Soft Rock	6.47E+06	0.5	2860.5	0	Shale (0'-15')_37	140	Silva et al., 50'-120'	Silva et al., 50'-120'	2.8	Shale (0'-15')_37	1220
62.62	66.02	Shale (15'-30')	Soft Rock	8.04E+06	0.5	3020.8	0	Shale (15'-30')_38	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_38	1360
66.02	69.42	Shale (15'-30')	Soft Rock	8.04E+06	0.5	3196.7	0	Shale (15'-30')_39	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_39	1360
69.42	72.82	Shale (15'-30')	Soft Rock	8.04E+06	0.5	3372.6	0	Shale (15'-30')_40	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_40	1360
72.82	76.22	Shale (15'-30')	Soft Rock	8.04E+06	0.5	3548.5	0	Shale (15'-30')_41	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_41	1360
76.22	77.62	Shale (15'-30')	Soft Rock	8.04E+06	0.5	3672.7	0	Shale (15'-30')_42	140	Silva et al., 50'-120'	Silva et al., 50'-120'	1.4	Shale (15'-30')_42	1360
77.62	78.02	Shale (>30')	Soft Rock	9.65E+06	0.5	3719.2	0	Shale (>30')_43	140	Silva et al., 50'-120'	Silva et al., 50'-120'	0.4	Shale (>30')_43	1490
78.02	178.02	Shale (El. 575'-675')	Firm Rock	4.18E+07	0.5	6316.3	0	Shale (El. 575'-675')_44	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 575'-675')_44	3100
178.02	278.02	Shale (El. 475'-575')	Firm Rock	7.31E+07	0.5	11489.6	0	Shale (El. 475'-575')_45	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 475'-575')_45	4100
278.02	378.02	Shale (El. 375'-475')	Firm Rock	1.13E+08	0.5	16662.9	0	Shale (El. 375'-475')_46	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 375'-475')_46	5100
378.02	478.02	Shale (El. 275'-375')	Firm Rock	1.62E+08	0.5	21836.3	0	Shale (El. 275'-375')_47	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 275'-375')_47	6100
478.02	578.02	Shale (El. 175'-275')	Firm Rock	2.19E+08	0.5	27009.6	0	Shale (El. 175'-275')_48	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 175'-275')_48	7100
578.02	678.02	Shale (El. 75'-175')	Firm Rock	2.85E+08	0.5	32182.9	0	Shale (El. 75'-175')_49	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 75'-175')_49	8100

Strata Profile														
Non-input Information								Strata "Soil Types" Input				Strata "Soil Profile" Input		
Top Depth (ft)	Bottom Depth (ft)	Layer Name	Layer Type	G_{max} (psf)	K_o	Mean Effective Stress at midpoint (psf)	Plasticity Index	Name (for Strata)	Unit Weight (pcf)	Modulus Reduction (G/Gmax) Model	Damping Model	Thickness (ft)	Soil Type (for Strata)	Shear Wave Velocity (fps)
678.02	718.02	Shale (El. 35'-75')	Firm Rock	3.37E+08	0.5	35804.3	0	Shale (El. 35'-75')_50	140	Firm/Hard Rock	Firm/Hard Rock	40	Shale (El. 35'-75')_50	8800
718.02	Half-Space	Shale (El. < 35')	Half-Space	3.52E+08	0.5	Half-Space	0	Bedrock	140	NA, Half-Space	Damping = 0.5%	Half Space	Bedrock	9000

Facility	KIF	
Section/Group	Polishing Pond	
Profile Name	KIF-B3_NOR	
Top of Profile Elevation	750.6	ft
Depth to water table during EQ	7.3	ft
Surcharge Pressure		psf

Strata Profile

Non-input Information								Strata "Soil Types" Input				Strata "Soil Profile" Input		
Top Depth (ft)	**Bottom Depth (ft)**	**Layer Name**	**Layer Type**	**G_{max} (psf)**	**K_o**	**Mean Effective Stress at midpoint (psf)**	**Plasticity Index**	**Name (for Strata)**	**Unit Weight (pcf)**	**Modulus Reduction (G/Gmax) Model**	**Damping Model**	**Thickness (ft)**	**Soil Type (for Strata)**	**Shear Wave Velocity (fps)**
0	0.5	Riprap	Soil	2.11E+05	0.5	19.2	0	Riprap_1	115	D&S, p'=0-400, PI=0	D&S, p'=0-400, PI=0	0.5	Riprap_1	243
0.5	1.59	Filter Material	Soil	7.49E+05	0.5	84.1	0	Filter Material_2	126	D&S, p'=0-400, PI=0	D&S, p'=0-400, PI=0	1.09	Filter Material_2	438
1.59	2.68	Filter Material	Soil	7.49E+05	0.5	175.7	0	Filter Material_3	126	D&S, p'=0-400, PI=0	D&S, p'=0-400, PI=0	1.09	Filter Material_3	438
2.68	3.77	Filter Material	Soil	7.49E+05	0.5	267.2	0	Filter Material_4	126	D&S, p'=0-400, PI=0	D&S, p'=0-400, PI=0	1.09	Filter Material_4	438
3.77	4	Filter Material	Soil	7.49E+05	0.5	322.7	0	Filter Material_5	126	D&S, p'=0-400, PI=0	D&S, p'=0-400, PI=0	0.23	Filter Material_5	438
4	5.75	Embankment Fill	Soil	1.95E+06	0.5	407.0	13	Embankment Fill_6	128	D&S, p'=400-800, PI=10-15	D&S, p'=400-800, PI=10-15	1.75	Embankment Fill_6	700
5.75	7.28	Embankment Fill	Soil	1.95E+06	0.5	546.9	13	Embankment Fill_7	128	D&S, p'=400-800, PI=10-15	D&S, p'=400-800, PI=10-15	1.53	Embankment Fill_7	700
7.28	7.3	Embankment Fill	Soil	1.95E+06	0.5	613.1	13	Embankment Fill_8	128	D&S, p'=400-800, PI=10-15	D&S, p'=400-800, PI=10-15	0.02	Embankment Fill_8	700
7.3	9.05	Embankment Fill	Soil	1.95E+06	0.5	652.2	13	Embankment Fill_9	128	D&S, p'=400-800, PI=10-15	D&S, p'=400-800, PI=10-15	1.75	Embankment Fill_9	700
9.05	10.8	Embankment Fill	Soil	1.95E+06	0.5	728.7	13	Embankment Fill_10	128	D&S, p'=400-800, PI=10-15	D&S, p'=400-800, PI=10-15	1.75	Embankment Fill_10	700
10.8	12.55	Embankment Fill	Soil	1.95E+06	0.5	805.3	13	Embankment Fill_11	128	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.75	Embankment Fill_11	700
12.55	14.3	Embankment Fill	Soil	1.95E+06	0.5	881.8	13	Embankment Fill_12	128	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.75	Embankment Fill_12	700
14.3	16.05	Embankment Fill	Soil	1.95E+06	0.5	958.3	13	Embankment Fill_13	128	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.75	Embankment Fill_13	700
16.05	17.8	Embankment Fill	Soil	1.95E+06	0.5	1034.9	13	Embankment Fill_14	128	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.75	Embankment Fill_14	700
17.8	19.55	Embankment Fill	Soil	1.95E+06	0.5	1111.4	13	Embankment Fill_15	128	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.75	Embankment Fill_15	700
19.55	21.3	Embankment Fill	Soil	1.95E+06	0.5	1187.9	13	Embankment Fill_16	128	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.75	Embankment Fill_16	700
21.3	23.05	Embankment Fill	Soil	1.95E+06	0.5	1264.5	13	Embankment Fill_17	128	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.75	Embankment Fill_17	700
23.05	24.8	Embankment Fill	Soil	1.95E+06	0.5	1341.0	13	Embankment Fill_18	128	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.75	Embankment Fill_18	700
24.8	25.1	Embankment Fill	Soil	1.95E+06	0.5	1385.8	13	Embankment Fill_19	128	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	0.3	Embankment Fill_19	700
25.1	26.85	Subunit 2	Soil	1.93E+06	0.5	1430.1	0	Subunit 2_20	127	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Subunit 2_20	700
26.85	28.6	Subunit 2	Soil	1.93E+06	0.5	1505.4	0	Subunit 2_21	127	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Subunit 2_21	700
28.6	30.35	Subunit 2	Soil	1.93E+06	0.5	1580.8	0	Subunit 2_22	127	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Subunit 2_22	700
30.35	32.1	Subunit 2	Soil	1.93E+06	0.5	1656.2	0	Subunit 2_23	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 2_23	700
32.1	33.85	Subunit 2	Soil	1.93E+06	0.5	1731.5	0	Subunit 2_24	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 2_24	700
33.85	35.6	Subunit 2	Soil	1.93E+06	0.5	1806.9	0	Subunit 2_25	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 2_25	700
35.6	37.35	Subunit 2	Soil	1.93E+06	0.5	1882.3	0	Subunit 2_26	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 2_26	700
37.35	38.4	Subunit 2	Soil	1.93E+06	0.5	1942.6	0	Subunit 2_27	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.05	Subunit 2_27	700
38.4	40.15	Subunit 3	Soil	2.01E+06	0.5	2005.8	0	Subunit 3_28	132	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 3_28	700
40.15	41.9	Subunit 3	Soil	2.01E+06	0.5	2087.0	0	Subunit 3_29	132	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 3_29	700
41.9	43.65	Subunit 3	Soil	2.01E+06	0.5	2168.2	0	Subunit 3_30	132	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 3_30	700
43.65	45.4	Subunit 3	Soil	2.01E+06	0.5	2249.4	0	Subunit 3_31	132	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 3_31	700
45.4	45.7	Subunit 3	Soil	2.01E+06	0.5	2296.9	0	Subunit 3_32	132	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	0.3	Subunit 3_32	700
45.7	48.75	Shale (0'-15')	Soft Rock	6.47E+06	0.5	2382.8	0	Shale (0'-15')_33	140	Silva et al., 20'-50'	Silva et al., 20'-50'	3.05	Shale (0'-15')_33	1220
48.75	51.8	Shale (0'-15')	Soft Rock	6.47E+06	0.5	2540.6	0	Shale (0'-15')_34	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_34	1220
51.8	54.85	Shale (0'-15')	Soft Rock	6.47E+06	0.5	2698.4	0	Shale (0'-15')_35	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_35	1220
54.85	57.9	Shale (0'-15')	Soft Rock	6.47E+06	0.5	2856.1	0	Shale (0'-15')_36	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_36	1220
57.9	60.7	Shale (0'-15')	Soft Rock	6.47E+06	0.5	3007.5	0	Shale (0'-15')_37	140	Silva et al., 50'-120'	Silva et al., 50'-120'	2.8	Shale (0'-15')_37	1220
60.7	64.1	Shale (15'-30')	Soft Rock	8.04E+06	0.5	3167.8	0	Shale (15'-30')_38	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_38	1360
64.1	67.5	Shale (15'-30')	Soft Rock	8.04E+06	0.5	3343.7	0	Shale (15'-30')_39	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_39	1360
67.5	70.9	Shale (15'-30')	Soft Rock	8.04E+06	0.5	3519.6	0	Shale (15'-30')_40	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_40	1360
70.9	74.3	Shale (15'-30')	Soft Rock	8.04E+06	0.5	3695.5	0	Shale (15'-30')_41	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_41	1360
74.3	75.6	Shale (15'-30')	Soft Rock	8.04E+06	0.5	3817.1	0	Shale (15'-30')_42	140	Silva et al., 50'-120'	Silva et al., 50'-120'	1.3	Shale (15'-30')_42	1360
75.6	175.6	Shale (El. 575'-675')	Firm Rock	4.18E+07	0.5	6437.4	0	Shale (El. 575'-675')_43	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 575'-675')_43	3100
175.6	275.6	Shale (El. 475'-575')	Firm Rock	7.31E+07	0.5	11610.7	0	Shale (El. 475'-575')_44	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 475'-575')_44	4100
275.6	375.6	Shale (El. 375'-475')	Firm Rock	1.13E+08	0.5	16784.1	0	Shale (El. 375'-475')_45	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 375'-475')_45	5100
375.6	475.6	Shale (El. 275'-375')	Firm Rock	1.62E+08	0.5	21957.4	0	Shale (El. 275'-375')_46	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 275'-375')_46	6100
475.6	575.6	Shale (El. 175'-275')	Firm Rock	2.19E+08	0.5	27130.7	0	Shale (El. 175'-275')_47	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 175'-275')_47	7100
575.6	675.6	Shale (El. 75'-175')	Firm Rock	2.85E+08	0.5	32304.1	0	Shale (El. 75'-175')_48	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 75'-175')_48	8100
675.6	715.6	Shale (El. 35'-75')	Firm Rock	3.37E+08	0.5	35925.4	0	Shale (El. 35'-75')_49	140	Firm/Hard Rock	Firm/Hard Rock	40	Shale (El. 35'-75')_49	8800

Strata Profile														
Non-input Information								Strata "Soil Types" Input				Strata "Soil Profile" Input		
Top Depth (ft)	Bottom Depth (ft)	Layer Name	Layer Type	G_{max} (psf)	K_o	Mean Effective Stress at midpoint (psf)	Plasticity Index	Name (for Strata)	Unit Weight (pcf)	Modulus Reduction (G/Gmax) Model	Damping Model	Thickness (ft)	Soil Type (for Strata)	Shear Wave Velocity (fps)
715.6	Half-Space	Shale (El. < 35')	Half-Space	3.52E+08	0.5	Half-Space	0	Bedrock	140	NA, Half-Space	Damping = 0.5%	Half Space	Bedrock	9000

Facility	KIF East Dike	
Section/Group	Polishing Pond	
Profile Name	KIF-B35_NOR	
Top of Profile Elevation	768.1	ft
Depth to water table during EQ	13.26	ft
Surcharge Pressure		psf

Strata Profile

Non-input Information								Strata "Soil Types" Input				Strata "Soil Profile" Input		
Top Depth (ft)	Bottom Depth (ft)	Layer Name	Layer Type	G_{max} (psf)	K_o	Mean Effective Stress at midpoint (psf)	Plasticity Index	Name (for Strata)	Unit Weight (pcf)	Modulus Reduction (G/Gmax) Model	Damping Model	Thickness (ft)	Soil Type (for Strata)	Shear Wave Velocity (fps)
0	0.82	Cover Material	Soil	4.01E+05	0.5	32.8	38	Cover Material_1	120	D&S, p'=0-400, PI=30-40	D&S, p'=0-400, PI=30-40	0.82	Cover Material_1	328
0.82	1.64	Cover Material	Soil	4.01E+05	0.5	98.4	38	Cover Material_2	120	D&S, p'=0-400, PI=30-40	D&S, p'=0-400, PI=30-40	0.82	Cover Material_2	328
1.64	2	Cover Material	Soil	4.01E+05	0.5	145.6	38	Cover Material_3	120	D&S, p'=0-400, PI=30-40	D&S, p'=0-400, PI=30-40	0.36	Cover Material_3	328
2	3.62	Bottom Ash	Soil	1.56E+06	0.5	224.3	0	Bottom Ash_4	119	D&S, p'=0-400, PI=0	D&S, p'=0-400, PI=0	1.62	Bottom Ash_4	650
3.62	5.24	Bottom Ash	Soil	1.56E+06	0.5	352.8	0	Bottom Ash_5	119	D&S, p'=0-400, PI=0	D&S, p'=0-400, PI=0	1.62	Bottom Ash_5	650
5.24	6.86	Bottom Ash	Soil	1.56E+06	0.5	481.3	0	Bottom Ash_6	119	D&S, p'=400-800, PI=0	D&S, p'=400-800, PI=0	1.62	Bottom Ash_6	650
6.86	8.48	Bottom Ash	Soil	1.56E+06	0.5	609.8	0	Bottom Ash_7	119	D&S, p'=400-800, PI=0	D&S, p'=400-800, PI=0	1.62	Bottom Ash_7	650
8.48	10.1	Bottom Ash	Soil	1.56E+06	0.5	738.3	0	Bottom Ash_8	119	D&S, p'=400-800, PI=0	D&S, p'=400-800, PI=0	1.62	Bottom Ash_8	650
10.1	11.72	Bottom Ash	Soil	1.56E+06	0.5	866.9	0	Bottom Ash_9	119	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.62	Bottom Ash_9	650
11.72	13.26	Bottom Ash	Soil	1.56E+06	0.5	992.2	0	Bottom Ash_10	119	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.54	Bottom Ash_10	650
13.26	14.88	Bottom Ash	Soil	1.63E+06	0.5	1086.6	0	Bottom Ash_11	124	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.62	Bottom Ash_11	650
14.88	16.5	Bottom Ash	Soil	1.63E+06	0.5	1153.1	0	Bottom Ash_12	124	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.62	Bottom Ash_12	650
16.5	18.12	Bottom Ash	Soil	1.63E+06	0.5	1219.6	0	Bottom Ash_13	124	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.62	Bottom Ash_13	650
18.12	19.5	Bottom Ash	Soil	1.63E+06	0.5	1281.2	0	Bottom Ash_14	124	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.38	Bottom Ash_14	650
19.5	21.25	Fly Ash	Soil	1.70E+06	0.5	1338.5	0	Fly Ash_15	112	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Fly Ash_15	700
21.25	23	Fly Ash	Soil	1.70E+06	0.5	1396.3	0	Fly Ash_16	112	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Fly Ash_16	700
23	24.75	Fly Ash	Soil	1.70E+06	0.5	1454.2	0	Fly Ash_17	112	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Fly Ash_17	700
24.75	26.5	Fly Ash	Soil	1.70E+06	0.5	1512.1	0	Fly Ash_18	112	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Fly Ash_18	700
26.5	28.25	Fly Ash	Soil	1.70E+06	0.5	1569.9	0	Fly Ash_19	112	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Fly Ash_19	700
28.25	30	Fly Ash	Soil	1.70E+06	0.5	1627.8	0	Fly Ash_20	112	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Fly Ash_20	700
30	31.75	Fly Ash	Soil	1.70E+06	0.5	1685.7	0	Fly Ash_21	112	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Fly Ash_21	700
31.75	33.5	Fly Ash	Soil	1.70E+06	0.5	1743.5	0	Fly Ash_22	112	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Fly Ash_22	700
33.5	35.25	Fly Ash	Soil	1.70E+06	0.5	1801.4	0	Fly Ash_23	112	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Fly Ash_23	700
35.25	36	Fly Ash	Soil	1.70E+06	0.5	1842.7	0	Fly Ash_24	112	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	0.75	Fly Ash_24	700
36	37.87	Subunit 1	Soil	2.22E+06	0.5	1895.4	11	Subunit 1_25	127	D&S, p'=1600-2500, PI=10-15	D&S, p'=1600-2500, PI=10-15	1.87	Subunit 1_25	750
37.87	39.74	Subunit 1	Soil	2.22E+06	0.5	1976.0	11	Subunit 1_26	127	D&S, p'=1600-2500, PI=10-15	D&S, p'=1600-2500, PI=10-15	1.87	Subunit 1_26	750
39.74	41.61	Subunit 1	Soil	2.22E+06	0.5	2056.5	11	Subunit 1_27	127	D&S, p'=1600-2500, PI=10-15	D&S, p'=1600-2500, PI=10-15	1.87	Subunit 1_27	750
41.61	43.48	Subunit 1	Soil	2.22E+06	0.5	2137.0	11	Subunit 1_28	127	D&S, p'=1600-2500, PI=10-15	D&S, p'=1600-2500, PI=10-15	1.87	Subunit 1_28	750
43.48	45.35	Subunit 1	Soil	2.22E+06	0.5	2217.6	11	Subunit 1_29	127	D&S, p'=1600-2500, PI=10-15	D&S, p'=1600-2500, PI=10-15	1.87	Subunit 1_29	750
45.35	46	Subunit 1	Soil	2.22E+06	0.5	2271.8	11	Subunit 1_30	127	D&S, p'=1600-2500, PI=10-15	D&S, p'=1600-2500, PI=10-15	0.65	Subunit 1_30	750
46	47.75	Subunit 2	Soil	1.93E+06	0.5	2323.5	0	Subunit 2_31	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 2_31	700
47.75	49.5	Subunit 2	Soil	1.93E+06	0.5	2398.9	0	Subunit 2_32	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 2_32	700
49.5	51	Subunit 2	Soil	1.93E+06	0.5	2468.8	0	Subunit 2_33	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.5	Subunit 2_33	700
51	52.75	Subunit 3	Soil	2.01E+06	0.5	2541.7	0	Subunit 3_34	132	D&S, p'=2500-5000, PI=0	D&S, p'=2500-5000, PI=0	1.75	Subunit 3_34	700
52.75	54.5	Subunit 3	Soil	2.01E+06	0.5	2622.9	0	Subunit 3_35	132	D&S, p'=2500-5000, PI=0	D&S, p'=2500-5000, PI=0	1.75	Subunit 3_35	700
54.5	56.25	Subunit 3	Soil	2.01E+06	0.5	2704.1	0	Subunit 3_36	132	D&S, p'=2500-5000, PI=0	D&S, p'=2500-5000, PI=0	1.75	Subunit 3_36	700
56.25	58	Subunit 3	Soil	2.01E+06	0.5	2785.3	0	Subunit 3_37	132	D&S, p'=2500-5000, PI=0	D&S, p'=2500-5000, PI=0	1.75	Subunit 3_37	700
58	59.75	Subunit 3	Soil	2.01E+06	0.5	2866.5	0	Subunit 3_38	132	D&S, p'=2500-5000, PI=0	D&S, p'=2500-5000, PI=0	1.75	Subunit 3_38	700
59.75	60.5	Subunit 3	Soil	2.01E+06	0.5	2924.5	0	Subunit 3_39	132	D&S, p'=2500-5000, PI=0	D&S, p'=2500-5000, PI=0	0.75	Subunit 3_39	700
60.5	63.55	Shale (0'-15')	Soft Rock	6.47E+06	0.5	3020.8	0	Shale (0'-15')_40	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_40	1220
63.55	66.6	Shale (0'-15')	Soft Rock	6.47E+06	0.5	3178.6	0	Shale (0'-15')_41	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_41	1220
66.6	69.65	Shale (0'-15')	Soft Rock	6.47E+06	0.5	3336.4	0	Shale (0'-15')_42	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_42	1220
69.65	72.7	Shale (0'-15')	Soft Rock	6.47E+06	0.5	3494.2	0	Shale (0'-15')_43	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_43	1220
72.7	75.5	Shale (0'-15')	Soft Rock	6.47E+06	0.5	3645.5	0	Shale (0'-15')_44	140	Silva et al., 50'-120'	Silva et al., 50'-120'	2.8	Shale (0'-15')_44	1220
75.5	78.9	Shale (15'-30')	Soft Rock	8.04E+06	0.5	3805.9	0	Shale (15'-30')_45	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_45	1360

Strata Profile														
Non-input Information								Strata "Soil Types" Input				Strata "Soil Profile" Input		
Top Depth (ft)	Bottom Depth (ft)	Layer Name	Layer Type	G_{max} (psf)	K_o	Mean Effective Stress at midpoint (psf)	Plasticity Index	Name (for Strata)	Unit Weight (pcf)	Modulus Reduction (G/Gmax) Model	Damping Model	Thickness (ft)	Soil Type (for Strata)	Shear Wave Velocity (fps)
78.9	82.3	Shale (15'-30')	Soft Rock	8.04E+06	0.5	3981.8	0	Shale (15'-30')_46	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_46	1360
82.3	85.7	Shale (15'-30')	Soft Rock	8.04E+06	0.5	4157.7	0	Shale (15'-30')_47	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_47	1360
85.7	89.1	Shale (15'-30')	Soft Rock	8.04E+06	0.5	4333.6	0	Shale (15'-30')_48	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_48	1360
89.1	90.5	Shale (15'-30')	Soft Rock	8.04E+06	0.5	4457.7	0	Shale (15'-30')_49	140	Silva et al., 50'-120'	Silva et al., 50'-120'	1.4	Shale (15'-30')_49	1360
90.5	93.1	Shale (>30')	Soft Rock	9.65E+06	0.5	4561.2	0	Shale (>30')_50	140	Silva et al., 50'-120'	Silva et al., 50'-120'	2.6	Shale (>30')_50	1490
93.1	193.1	Shale (El. 575'-675')	Firm Rock	4.18E+07	0.5	7215.1	0	Shale (El. 575'-675')_51	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 575'-675')_51	3100
193.1	293.1	Shale (El. 475'-575')	Firm Rock	7.31E+07	0.5	12388.5	0	Shale (El. 475'-575')_52	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 475'-575')_52	4100
293.1	393.1	Shale (El. 375'-475')	Firm Rock	1.13E+08	0.5	17561.8	0	Shale (El. 375'-475')_53	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 375'-475')_53	5100
393.1	493.1	Shale (El. 275'-375')	Firm Rock	1.62E+08	0.5	22735.1	0	Shale (El. 275'-375')_54	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 275'-375')_54	6100
493.1	593.1	Shale (El. 175'-275')	Firm Rock	2.19E+08	0.5	27908.5	0	Shale (El. 175'-275')_55	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 175'-275')_55	7100
593.1	693.1	Shale (El. 75'-175')	Firm Rock	2.85E+08	0.5	33081.8	0	Shale (El. 75'-175')_56	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 75'-175')_56	8100
693.1	733.1	Shale (El. 35'-75')	Firm Rock	3.37E+08	0.5	36703.1	0	Shale (El. 35'-75')_57	140	Firm/Hard Rock	Firm/Hard Rock	40	Shale (El. 35'-75')_57	8800
733.1	Half-Space	Shale (El. < 35')	Half-Space	3.52E+08	0.5	Half-Space	0	Bedrock	140	NA, Half-Space	Damping = 0.5%	Half Space	Bedrock	9000

Facility	KIF East Dike	
Section/Group	Polishing Pond	
Profile Name	KIF-BF-SPT3_NOR	
Top of Profile Elevation	754	ft
Depth to water table during EQ	3.08	ft
Surcharge Pressure		psf

Strata Profile

Non-input Information							Strata "Soil Types" Input				Strata "Soil Profile" Input		
Top Depth (ft)	**Bottom Depth (ft)**	**Layer Name**	**Layer Type**	**G_{max} (psf)**	**K_o**	**Mean Effective Stress at midpoint (psf)**	**Plasticity Index**	**Name (for Strata)**	**Unit Weight (pcf)**	**Modulus Reduction (G/Gmax) Model**	**Damping Model**	**Thickness (ft)**	**Soil Type (for Strata)**	**Shear Wave Velocity (fps)**
0	0.82	Cover Material	Soil	4.01E+05	0.5	32.8	38	Cover Material_1	120	D&S, p'=0-400, PI=30-40	D&S, p'=0-400, PI=30-40	0.82	Cover Material_1	328
0.82	1.64	Cover Material	Soil	4.01E+05	0.5	98.4	38	Cover Material_2	120	D&S, p'=0-400, PI=30-40	D&S, p'=0-400, PI=30-40	0.82	Cover Material_2	328
1.64	2	Cover Material	Soil	4.01E+05	0.5	145.6	38	Cover Material_3	120	D&S, p'=0-400, PI=30-40	D&S, p'=0-400, PI=30-40	0.36	Cover Material_3	328
2	3.08	Fly Ash	Soil	1.70E+06	0.5	200.3	0	Fly Ash_4	112	D&S, p'=0-400, PI=0	D&S, p'=0-400, PI=0	1.08	Fly Ash_4	700
3.08	4.83	Fly Ash	Soil	1.70E+06	0.5	269.6	0	Fly Ash_5	112	D&S, p'=0-400, PI=0	D&S, p'=0-400, PI=0	1.75	Fly Ash_5	700
4.83	6.58	Fly Ash	Soil	1.70E+06	0.5	327.4	0	Fly Ash_6	112	D&S, p'=0-400, PI=0	D&S, p'=0-400, PI=0	1.75	Fly Ash_6	700
6.58	8.33	Fly Ash	Soil	1.70E+06	0.5	385.3	0	Fly Ash_7	112	D&S, p'=0-400, PI=0	D&S, p'=0-400, PI=0	1.75	Fly Ash_7	700
8.33	8.5	Fly Ash	Soil	1.70E+06	0.5	417.1	0	Fly Ash_8	112	D&S, p'=400-800, PI=0	D&S, p'=400-800, PI=0	0.17	Fly Ash_8	700
8.5	11.25	Embankment Fill	Soil	4.81E+06	0.5	480.0	18	Embankment Fill_9	128	D&S, p'=400-800, PI=15-20	D&S, p'=400-800, PI=15-20	2.75	Embankment Fill_9	1100
11.25	14	Embankment Fill	Soil	4.81E+06	0.5	600.3	18	Embankment Fill_10	128	D&S, p'=400-800, PI=15-20	D&S, p'=400-800, PI=15-20	2.75	Embankment Fill_10	1100
14	16.75	Embankment Fill	Soil	4.81E+06	0.5	720.5	18	Embankment Fill_11	128	D&S, p'=400-800, PI=15-20	D&S, p'=400-800, PI=15-20	2.75	Embankment Fill_11	1100
16.75	19.5	Embankment Fill	Soil	4.81E+06	0.5	840.8	18	Embankment Fill_12	128	D&S, p'=800-1600, PI=15-20	D&S, p'=800-1600, PI=15-20	2.75	Embankment Fill_12	1100
19.5	22.25	Embankment Fill	Soil	4.81E+06	0.5	961.1	18	Embankment Fill_13	128	D&S, p'=800-1600, PI=15-20	D&S, p'=800-1600, PI=15-20	2.75	Embankment Fill_13	1100
22.25	23.5	Embankment Fill	Soil	4.81E+06	0.5	1048.5	18	Embankment Fill_14	128	D&S, p'=800-1600, PI=15-20	D&S, p'=800-1600, PI=15-20	1.25	Embankment Fill_14	1100
23.5	25.25	Subunit 3	Soil	2.01E+06	0.5	1116.5	0	Subunit 3_15	132	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Subunit 3_15	700
25.25	27	Subunit 3	Soil	2.01E+06	0.5	1197.7	0	Subunit 3_16	132	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Subunit 3_16	700
27	28.75	Subunit 3	Soil	2.01E+06	0.5	1278.9	0	Subunit 3_17	132	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Subunit 3_17	700
28.75	30.5	Subunit 3	Soil	2.01E+06	0.5	1360.1	0	Subunit 3_18	132	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Subunit 3_18	700
30.5	32.25	Subunit 3	Soil	2.01E+06	0.5	1441.3	0	Subunit 3_19	132	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Subunit 3_19	700
32.25	34	Subunit 3	Soil	2.01E+06	0.5	1522.5	0	Subunit 3_20	132	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Subunit 3_20	700
34	35.75	Subunit 3	Soil	2.01E+06	0.5	1603.7	0	Subunit 3_21	132	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 3_21	700
35.75	37.5	Subunit 3	Soil	2.01E+06	0.5	1684.9	0	Subunit 3_22	132	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 3_22	700
37.5	38.5	Subunit 3	Soil	2.01E+06	0.5	1748.7	0	Subunit 3_23	132	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1	Subunit 3_23	700
38.5	40.37	Subunit 1	Soil	2.22E+06	0.5	1812.1	11	Subunit 1_24	127	D&S, p'=1600-2500, PI=10-15	D&S, p'=1600-2500, PI=10-15	1.87	Subunit 1_24	750
40.37	42.24	Subunit 1	Soil	2.22E+06	0.5	1892.7	11	Subunit 1_25	127	D&S, p'=1600-2500, PI=10-15	D&S, p'=1600-2500, PI=10-15	1.87	Subunit 1_25	750
42.24	44.11	Subunit 1	Soil	2.22E+06	0.5	1973.2	11	Subunit 1_26	127	D&S, p'=1600-2500, PI=10-15	D&S, p'=1600-2500, PI=10-15	1.87	Subunit 1_26	750
44.11	45.98	Subunit 1	Soil	2.22E+06	0.5	2053.7	11	Subunit 1_27	127	D&S, p'=1600-2500, PI=10-15	D&S, p'=1600-2500, PI=10-15	1.87	Subunit 1_27	750
45.98	47.85	Subunit 1	Soil	2.22E+06	0.5	2134.3	11	Subunit 1_28	127	D&S, p'=1600-2500, PI=10-15	D&S, p'=1600-2500, PI=10-15	1.87	Subunit 1_28	750
47.85	48.5	Subunit 1	Soil	2.22E+06	0.5	2188.5	11	Subunit 1_29	127	D&S, p'=1600-2500, PI=10-15	D&S, p'=1600-2500, PI=10-15	0.65	Subunit 1_29	750
48.5	50.25	Subunit 3	Soil	2.01E+06	0.5	2243.1	0	Subunit 3_30	132	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 3_30	700
50.25	52	Subunit 3	Soil	2.01E+06	0.5	2324.3	0	Subunit 3_31	132	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 3_31	700
52	53.6	Subunit 3	Soil	2.01E+06	0.5	2402.0	0	Subunit 3_32	132	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.6	Subunit 3_32	700
53.6	56.65	Shale (0'-15')	Soft Rock	6.47E+06	0.5	2518.1	0	Shale (0'-15')_33	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_33	1220
56.65	59.7	Shale (0'-15')	Soft Rock	6.47E+06	0.5	2675.8	0	Shale (0'-15')_34	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_34	1220
59.7	62.75	Shale (0'-15')	Soft Rock	6.47E+06	0.5	2833.6	0	Shale (0'-15')_35	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_35	1220
62.75	65.8	Shale (0'-15')	Soft Rock	6.47E+06	0.5	2991.4	0	Shale (0'-15')_36	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_36	1220
65.8	68.6	Shale (0'-15')	Soft Rock	6.47E+06	0.5	3142.7	0	Shale (0'-15')_37	140	Silva et al., 50'-120'	Silva et al., 50'-120'	2.8	Shale (0'-15')_37	1220
68.6	72	Shale (15'-30')	Soft Rock	8.04E+06	0.5	3303.1	0	Shale (15'-30')_38	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_38	1360
72	75.4	Shale (15'-30')	Soft Rock	8.04E+06	0.5	3479.0	0	Shale (15'-30')_39	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_39	1360
75.4	78.8	Shale (15'-30')	Soft Rock	8.04E+06	0.5	3654.9	0	Shale (15'-30')_40	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_40	1360
78.8	79	Shale (15'-30')	Soft Rock	8.04E+06	0.5	3748.0	0	Shale (15'-30')_41	140	Silva et al., 50'-120'	Silva et al., 50'-120'	0.2	Shale (15'-30')_41	1360
79	179	Shale (El. 575'-675')	Firm Rock	4.18E+07	0.5	6339.9	0	Shale (El. 575'-675')_42	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 575'-675')_42	3100
179	279	Shale (El. 475'-575')	Firm Rock	7.31E+07	0.5	11513.2	0	Shale (El. 475'-575')_43	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 475'-575')_43	4100
279	379	Shale (El. 375'-475')	Firm Rock	1.13E+08	0.5	16686.5	0	Shale (El. 375'-475')_44	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 375'-475')_44	5100
379	479	Shale (El. 275'-375')	Firm Rock	1.62E+08	0.5	21859.9	0	Shale (El. 275'-375')_45	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 275'-375')_45	6100
479	579	Shale (El. 175'-275')	Firm Rock	2.19E+08	0.5	27033.2	0	Shale (El. 175'-275')_46	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 175'-275')_46	7100
579	679	Shale (El. 75'-175')	Firm Rock	2.85E+08	0.5	32206.5	0	Shale (El. 75'-175')_47	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 75'-175')_47	8100
679	719	Shale (El. 35'-75')	Firm Rock	3.37E+08	0.5	35827.9	0	Shale (El. 35'-75')_48	140	Firm/Hard Rock	Firm/Hard Rock	40	Shale (El. 35'-75')_48	8800
719	Half-Space	Shale (El. < 35')	Half-Space	3.52E+08	0.5	Half-Space	0	Bedrock	140	NA, Half-Space	Damping = 0.5%	Half Space	Bedrock	9000

Facility	KIF East Dike	
Section/Group	Polishing Pond	
Profile Name	KIF-BF-CPT4AA_NOR	
Top of Profile Elevation	769	ft
Depth to water table during EQ	15.91	ft
Surcharge Pressure		psf

Strata Profile

Non-input Information							Strata "Soil Types" Input				Strata "Soil Profile" Input		
Top Depth (ft)	**Bottom Depth (ft)**	**Layer Name**	**Layer Type**	**G_{max} (psf)**	**K_o**	**Mean Effective Stress at midpoint (psf)**	**Plasticity Index**	**Name (for Strata)**	**Unit Weight (pcf)**	**Modulus Reduction (G/Gmax) Model**	**Damping Model**	**Thickness (ft)**	**Soil Type (for Strata)**	**Shear Wave Velocity (fps)**
0	0.82	Cover Material	Soil	4.01E+05	0.5	32.8	38	Cover Material_1	120	D&S, p'=0-400, PI=30-40	D&S, p'=0-400, PI=30-40	0.82	Cover Material_1	328
0.82	1.64	Cover Material	Soil	4.01E+05	0.5	98.4	38	Cover Material_2	120	D&S, p'=0-400, PI=30-40	D&S, p'=0-400, PI=30-40	0.82	Cover Material_2	328
1.64	2	Cover Material	Soil	4.01E+05	0.5	145.6	38	Cover Material_3	120	D&S, p'=0-400, PI=30-40	D&S, p'=0-400, PI=30-40	0.36	Cover Material_3	328
2	3.32	Clay Fill (Irrelevant)	Soil	1.04E+06	0.5	212.8	24	Clay Fill (Irrelevant)_4	120	D&S, p'=0-400, PI=20-25	D&S, p'=0-400, PI=20-25	1.32	Clay Fill (Irrelevant)_4	529
3.32	4.5	Clay Fill (Irrelevant)	Soil	1.04E+06	0.5	312.8	24	Clay Fill (Irrelevant)_5	120	D&S, p'=0-400, PI=20-25	D&S, p'=0-400, PI=20-25	1.18	Clay Fill (Irrelevant)_5	529
4.5	6.25	Fly Ash	Soil	1.70E+06	0.5	425.3	0	Fly Ash_6	112	D&S, p'=400-800, PI=0	D&S, p'=400-800, PI=0	1.75	Fly Ash_6	700
6.25	8	Fly Ash	Soil	1.70E+06	0.5	556.0	0	Fly Ash_7	112	D&S, p'=400-800, PI=0	D&S, p'=400-800, PI=0	1.75	Fly Ash_7	700
8	9.75	Fly Ash	Soil	1.70E+06	0.5	686.7	0	Fly Ash_8	112	D&S, p'=400-800, PI=0	D&S, p'=400-800, PI=0	1.75	Fly Ash_8	700
9.75	11.5	Fly Ash	Soil	1.70E+06	0.5	817.3	0	Fly Ash_9	112	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Fly Ash_9	700
11.5	13.25	Fly Ash	Soil	1.70E+06	0.5	948.0	0	Fly Ash_10	112	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Fly Ash_10	700
13.25	15	Fly Ash	Soil	1.70E+06	0.5	1078.7	0	Fly Ash_11	112	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Fly Ash_11	700
15	15.91	Fly Ash	Soil	1.70E+06	0.5	1178.0	0	Fly Ash_12	112	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	0.91	Fly Ash_12	700
15.91	17.66	Fly Ash	Soil	1.70E+06	0.5	1240.9	0	Fly Ash_13	112	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Fly Ash_13	700
17.66	19.41	Fly Ash	Soil	1.70E+06	0.5	1298.7	0	Fly Ash_14	112	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Fly Ash_14	700
19.41	19.5	Fly Ash	Soil	1.70E+06	0.5	1329.2	0	Fly Ash_15	112	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	0.09	Fly Ash_15	700
19.5	21	Bottom Ash	Soil	1.63E+06	0.5	1361.5	0	Bottom Ash_16	124	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.5	Bottom Ash_16	650
21	22.75	Subunit 2	Soil	1.93E+06	0.5	1429.9	0	Subunit 2_17	127	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Subunit 2_17	700
22.75	24.5	Subunit 2	Soil	1.93E+06	0.5	1505.3	0	Subunit 2_18	127	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Subunit 2_18	700
24.5	26.25	Subunit 2	Soil	1.93E+06	0.5	1580.7	0	Subunit 2_19	127	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Subunit 2_19	700
26.25	28	Subunit 2	Soil	1.93E+06	0.5	1656.0	0	Subunit 2_20	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 2_20	700
28	28.5	Subunit 2	Soil	1.93E+06	0.5	1704.5	0	Subunit 2_21	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	0.5	Subunit 2_21	700
28.5	30.25	Subunit 3	Soil	2.01E+06	0.5	1755.9	0	Subunit 3_22	132	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 3_22	700
30.25	32	Subunit 3	Soil	2.01E+06	0.5	1837.1	0	Subunit 3_23	132	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 3_23	700
32	33.5	Subunit 3	Soil	2.01E+06	0.5	1912.5	0	Subunit 3_24	132	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.5	Subunit 3_24	700
33.5	35.25	Subunit 2	Soil	1.93E+06	0.5	1984.9	0	Subunit 2_25	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 2_25	700
35.25	37	Subunit 2	Soil	1.93E+06	0.5	2060.3	0	Subunit 2_26	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 2_26	700
37	38.75	Subunit 2	Soil	1.93E+06	0.5	2135.7	0	Subunit 2_27	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 2_27	700
38.75	40.5	Subunit 2	Soil	1.93E+06	0.5	2211.0	0	Subunit 2_28	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 2_28	700
40.5	42.25	Subunit 2	Soil	1.93E+06	0.5	2286.4	0	Subunit 2_29	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 2_29	700
42.25	44	Subunit 2	Soil	1.93E+06	0.5	2361.8	0	Subunit 2_30	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 2_30	700
44	45.75	Subunit 2	Soil	1.93E+06	0.5	2437.1	0	Subunit 2_31	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 2_31	700
45.75	47.5	Subunit 2	Soil	1.93E+06	0.5	2512.5	0	Subunit 2_32	127	D&S, p'=2500-5000, PI=0	D&S, p'=2500-5000, PI=0	1.75	Subunit 2_32	700
47.5	49.25	Subunit 2	Soil	1.93E+06	0.5	2587.9	0	Subunit 2_33	127	D&S, p'=2500-5000, PI=0	D&S, p'=2500-5000, PI=0	1.75	Subunit 2_33	700
49.25	51	Subunit 2	Soil	1.93E+06	0.5	2663.2	0	Subunit 2_34	127	D&S, p'=2500-5000, PI=0	D&S, p'=2500-5000, PI=0	1.75	Subunit 2_34	700
51	52.75	Subunit 2	Soil	1.93E+06	0.5	2738.6	0	Subunit 2_35	127	D&S, p'=2500-5000, PI=0	D&S, p'=2500-5000, PI=0	1.75	Subunit 2_35	700
52.75	54.5	Subunit 2	Soil	1.93E+06	0.5	2814.0	0	Subunit 2_36	127	D&S, p'=2500-5000, PI=0	D&S, p'=2500-5000, PI=0	1.75	Subunit 2_36	700
54.5	56.25	Subunit 2	Soil	1.93E+06	0.5	2889.3	0	Subunit 2_37	127	D&S, p'=2500-5000, PI=0	D&S, p'=2500-5000, PI=0	1.75	Subunit 2_37	700
56.25	58	Subunit 2	Soil	1.93E+06	0.5	2964.7	0	Subunit 2_38	127	D&S, p'=2500-5000, PI=0	D&S, p'=2500-5000, PI=0	1.75	Subunit 2_38	700
58	59.75	Subunit 2	Soil	1.93E+06	0.5	3040.1	0	Subunit 2_39	127	D&S, p'=2500-5000, PI=0	D&S, p'=2500-5000, PI=0	1.75	Subunit 2_39	700
59.75	61.5	Subunit 2	Soil	1.93E+06	0.5	3115.4	0	Subunit 2_40	127	D&S, p'=2500-5000, PI=0	D&S, p'=2500-5000, PI=0	1.75	Subunit 2_40	700
61.5	63.25	Subunit 2	Soil	1.93E+06	0.5	3190.8	0	Subunit 2_41	127	D&S, p'=2500-5000, PI=0	D&S, p'=2500-5000, PI=0	1.75	Subunit 2_41	700
63.25	65	Subunit 2	Soil	1.93E+06	0.5	3266.2	0	Subunit 2_42	127	D&S, p'=2500-5000, PI=0	D&S, p'=2500-5000, PI=0	1.75	Subunit 2_42	700
65	68.05	Shale (0'-15')	Soft Rock	6.47E+06	0.5	3382.7	0	Shale (0'-15')_43	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_43	1220
68.05	71.1	Shale (0'-15')	Soft Rock	6.47E+06	0.5	3540.5	0	Shale (0'-15')_44	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_44	1220
71.1	74.15	Shale (0'-15')	Soft Rock	6.47E+06	0.5	3698.3	0	Shale (0'-15')_45	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_45	1220
74.15	77.2	Shale (0'-15')	Soft Rock	6.47E+06	0.5	3856.1	0	Shale (0'-15')_46	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_46	1220
77.2	80	Shale (0'-15')	Soft Rock	6.47E+06	0.5	4007.4	0	Shale (0'-15')_47	140	Silva et al., 50'-120'	Silva et al., 50'-120'	2.8	Shale (0'-15')_47	1220
80	83.4	Shale (15'-30')	Soft Rock	8.04E+06	0.5	4167.8	0	Shale (15'-30')_48	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_48	1360
83.4	86.8	Shale (15'-30')	Soft Rock	8.04E+06	0.5	4343.7	0	Shale (15'-30')_49	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_49	1360
86.8	90.2	Shale (15'-30')	Soft Rock	8.04E+06	0.5	4519.6	0	Shale (15'-30')_50	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_50	1360

Strata Profile														
Non-input Information								Strata "Soil Types" Input				Strata "Soil Profile" Input		
Top Depth (ft)	Bottom Depth (ft)	Layer Name	Layer Type	G_{max} (psf)	K_o	Mean Effective Stress at midpoint (psf)	Plasticity Index	Name (for Strata)	Unit Weight (pcf)	Modulus Reduction (G/Gmax) Model	Damping Model	Thickness (ft)	Soil Type (for Strata)	Shear Wave Velocity (fps)
90.2	93.6	Shale (15'-30')	Soft Rock	8.04E+06	0.5	4695.5	0	Shale (15'-30')_51	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_51	1360
93.6	94	Shale (15'-30')	Soft Rock	8.04E+06	0.5	4793.8	0	Shale (15'-30')_52	140	Silva et al., 50'-120'	Silva et al., 50'-120'	0.4	Shale (15'-30')_52	1360
94	194	Shale (El. 575'-675')	Firm Rock	4.18E+07	0.5	7390.8	0	Shale (El. 575'-675')_53	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 575'-675')_53	3100
194	294	Shale (El. 475'-575')	Firm Rock	7.31E+07	0.5	12564.1	0	Shale (El. 475'-575')_54	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 475'-575')_54	4100
294	394	Shale (El. 375'-475')	Firm Rock	1.13E+08	0.5	17737.5	0	Shale (El. 375'-475')_55	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 375'-475')_55	5100
394	494	Shale (El. 275'-375')	Firm Rock	1.62E+08	0.5	22910.8	0	Shale (El. 275'-375')_56	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 275'-375')_56	6100
494	594	Shale (El. 175'-275')	Firm Rock	2.19E+08	0.5	28084.1	0	Shale (El. 175'-275')_57	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 175'-275')_57	7100
594	694	Shale (El. 75'-175')	Firm Rock	2.85E+08	0.5	33257.5	0	Shale (El. 75'-175')_58	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 75'-175')_58	8100
694	734	Shale (El. 35'-75')	Firm Rock	3.37E+08	0.5	36878.8	0	Shale (El. 35'-75')_59	140	Firm/Hard Rock	Firm/Hard Rock	40	Shale (El. 35'-75')_59	8800
734	Half-Space	Shale (El. < 35')	Half-Space	3.52E+08	0.5	Half-Space	0	Bedrock	140	NA, Half-Space	Damping = 0.5%	Half Space	Bedrock	9000

Facility	KIF East Dike	
Section/Group	Polishing Pond	
Profile Name	KIF-C1_NOR	
Top of Profile Elevation	748.4	ft
Depth to water table during EQ	2.2	ft
Surcharge Pressure		psf

Strata Profile

Non-input Information							Strata "Soil Types" Input				Strata "Soil Profile" Input		
Top Depth (ft)	**Bottom Depth (ft)**	**Layer Name**	**Layer Type**	**G_{max} (psf)**	**K_o**	**Mean Effective Stress at midpoint (psf)**	**Plasticity Index**	**Name (for Strata)**	**Unit Weight (pcf)**	**Modulus Reduction (G/Gmax) Model**	**Damping Model**	**Thickness (ft)**	**Soil Type (for Strata)**	**Shear Wave Velocity (fps)**
0	1	Clay Fill (Irrelevant)	Soil	6.07E+05	0.5	40.0	24	Clay Fill (Irrelevant)_1	120	D&S, p'=0-400, PI=20-25	D&S, p'=0-400, PI=20-25	1	Clay Fill (Irrelevant)_1	404
1	2	Clay Fill (Irrelevant)	Soil	6.07E+05	0.5	120.0	24	Clay Fill (Irrelevant)_2	120	D&S, p'=0-400, PI=20-25	D&S, p'=0-400, PI=20-25	1	Clay Fill (Irrelevant)_2	404
2	2.2	Clay Fill (Irrelevant)	Soil	6.07E+05	0.5	168.0	24	Clay Fill (Irrelevant)_3	120	D&S, p'=0-400, PI=20-25	D&S, p'=0-400, PI=20-25	0.2	Clay Fill (Irrelevant)_3	404
2.2	3.7	Clay Fill (Irrelevant)	Soil	1.36E+06	0.5	204.8	24	Clay Fill (Irrelevant)_4	120	D&S, p'=0-400, PI=20-25	D&S, p'=0-400, PI=20-25	1.5	Clay Fill (Irrelevant)_4	604
3.7	5.2	Clay Fill (Irrelevant)	Soil	1.36E+06	0.5	262.4	24	Clay Fill (Irrelevant)_5	120	D&S, p'=0-400, PI=20-25	D&S, p'=0-400, PI=20-25	1.5	Clay Fill (Irrelevant)_5	604
5.2	6.7	Clay Fill (Irrelevant)	Soil	1.36E+06	0.5	320.0	24	Clay Fill (Irrelevant)_6	120	D&S, p'=0-400, PI=20-25	D&S, p'=0-400, PI=20-25	1.5	Clay Fill (Irrelevant)_6	604
6.7	8.2	Clay Fill (Irrelevant)	Soil	1.36E+06	0.5	377.6	24	Clay Fill (Irrelevant)_7	120	D&S, p'=0-400, PI=20-25	D&S, p'=0-400, PI=20-25	1.5	Clay Fill (Irrelevant)_7	604
8.2	9.7	Clay Fill (Irrelevant)	Soil	1.36E+06	0.5	435.2	24	Clay Fill (Irrelevant)_8	120	D&S, p'=400-800, PI=20-25	D&S, p'=400-800, PI=20-25	1.5	Clay Fill (Irrelevant)_8	604
9.7	11.2	Clay Fill (Irrelevant)	Soil	1.36E+06	0.5	492.8	24	Clay Fill (Irrelevant)_9	120	D&S, p'=400-800, PI=20-25	D&S, p'=400-800, PI=20-25	1.5	Clay Fill (Irrelevant)_9	604
11.2	12.7	Clay Fill (Irrelevant)	Soil	1.36E+06	0.5	550.4	24	Clay Fill (Irrelevant)_10	120	D&S, p'=400-800, PI=20-25	D&S, p'=400-800, PI=20-25	1.5	Clay Fill (Irrelevant)_10	604
12.7	14.2	Clay Fill (Irrelevant)	Soil	1.36E+06	0.5	608.0	24	Clay Fill (Irrelevant)_11	120	D&S, p'=400-800, PI=20-25	D&S, p'=400-800, PI=20-25	1.5	Clay Fill (Irrelevant)_11	604
14.2	15.7	Clay Fill (Irrelevant)	Soil	1.36E+06	0.5	665.6	24	Clay Fill (Irrelevant)_12	120	D&S, p'=400-800, PI=20-25	D&S, p'=400-800, PI=20-25	1.5	Clay Fill (Irrelevant)_12	604
15.7	16	Clay Fill (Irrelevant)	Soil	1.36E+06	0.5	700.2	24	Clay Fill (Irrelevant)_13	120	D&S, p'=400-800, PI=20-25	D&S, p'=400-800, PI=20-25	0.3	Clay Fill (Irrelevant)_13	604
16	17.87	Subunit 1	Soil	2.22E+06	0.5	746.2	11	Subunit 1_14	127	D&S, p'=400-800, PI=10-15	D&S, p'=400-800, PI=10-15	1.87	Subunit 1_14	750
17.87	19.74	Subunit 1	Soil	2.22E+06	0.5	826.7	11	Subunit 1_15	127	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.87	Subunit 1_15	750
19.74	21.61	Subunit 1	Soil	2.22E+06	0.5	907.3	11	Subunit 1_16	127	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.87	Subunit 1_16	750
21.61	23.48	Subunit 1	Soil	2.22E+06	0.5	987.8	11	Subunit 1_17	127	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.87	Subunit 1_17	750
23.48	25.35	Subunit 1	Soil	2.22E+06	0.5	1068.3	11	Subunit 1_18	127	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.87	Subunit 1_18	750
25.35	27.22	Subunit 1	Soil	2.22E+06	0.5	1148.9	11	Subunit 1_19	127	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.87	Subunit 1_19	750
27.22	29.09	Subunit 1	Soil	2.22E+06	0.5	1229.4	11	Subunit 1_20	127	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.87	Subunit 1_20	750
29.09	30.5	Subunit 1	Soil	2.22E+06	0.5	1300.0	11	Subunit 1_21	127	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.41	Subunit 1_21	750
30.5	32.25	Subunit 2	Soil	1.93E+06	0.5	1368.1	0	Subunit 2_22	127	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Subunit 2_22	700
32.25	34	Subunit 2	Soil	1.93E+06	0.5	1443.4	0	Subunit 2_23	127	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Subunit 2_23	700
34	35.75	Subunit 2	Soil	1.93E+06	0.5	1518.8	0	Subunit 2_24	127	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Subunit 2_24	700
35.75	37.5	Subunit 2	Soil	1.93E+06	0.5	1594.2	0	Subunit 2_25	127	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Subunit 2_25	700
37.5	39.25	Subunit 2	Soil	1.93E+06	0.5	1669.5	0	Subunit 2_26	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 2_26	700
39.25	41	Subunit 2	Soil	1.93E+06	0.5	1744.9	0	Subunit 2_27	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 2_27	700
41	42.75	Subunit 2	Soil	1.93E+06	0.5	1820.3	0	Subunit 2_28	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 2_28	700
42.75	44.5	Subunit 2	Soil	1.93E+06	0.5	1895.6	0	Subunit 2_29	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 2_29	700
44.5	44.6	Subunit 2	Soil	1.93E+06	0.5	1935.5	0	Subunit 2_30	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	0.1	Subunit 2_30	700
44.6	46.35	Subunit 2	Soil	1.93E+06	0.5	1975.3	0	Subunit 2_31	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 2_31	700
46.35	47.2	Subunit 2	Soil	1.93E+06	0.5	2031.3	0	Subunit 2_32	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	0.85	Subunit 2_32	700
47.2	50.25	Shale (0'-15')	Soft Rock	6.47E+06	0.5	2128.5	0	Shale (0'-15')_33	140	Silva et al., 20'-50'	Silva et al., 20'-50'	3.05	Shale (0'-15')_33	1220
50.25	53.3	Shale (0'-15')	Soft Rock	6.47E+06	0.5	2286.3	0	Shale (0'-15')_34	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_34	1220
53.3	56.35	Shale (0'-15')	Soft Rock	6.47E+06	0.5	2444.1	0	Shale (0'-15')_35	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_35	1220
56.35	59.4	Shale (0'-15')	Soft Rock	6.47E+06	0.5	2601.9	0	Shale (0'-15')_36	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_36	1220
59.4	62.2	Shale (0'-15')	Soft Rock	6.47E+06	0.5	2753.2	0	Shale (0'-15')_37	140	Silva et al., 50'-120'	Silva et al., 50'-120'	2.8	Shale (0'-15')_37	1220
62.2	65.6	Shale (15'-30')	Soft Rock	8.04E+06	0.5	2913.5	0	Shale (15'-30')_38	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_38	1360
65.6	69	Shale (15'-30')	Soft Rock	8.04E+06	0.5	3089.4	0	Shale (15'-30')_39	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_39	1360
69	72.4	Shale (15'-30')	Soft Rock	8.04E+06	0.5	3265.3	0	Shale (15'-30')_40	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_40	1360
72.4	73.4	Shale (15'-30')	Soft Rock	8.04E+06	0.5	3379.1	0	Shale (15'-30')_41	140	Silva et al., 50'-120'	Silva et al., 50'-120'	1	Shale (15'-30')_41	1360
73.4	173.4	Shale (El. 575'-675')	Firm Rock	4.18E+07	0.5	5991.7	0	Shale (El. 575'-675')_42	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 575'-675')_42	3100
173.4	273.4	Shale (El. 475'-575')	Firm Rock	7.31E+07	0.5	11165.0	0	Shale (El. 475'-575')_43	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 475'-575')_43	4100
273.4	373.4	Shale (El. 375'-475')	Firm Rock	1.13E+08	0.5	16338.3	0	Shale (El. 375'-475')_44	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 375'-475')_44	5100
373.4	473.4	Shale (El. 275'-375')	Firm Rock	1.62E+08	0.5	21511.7	0	Shale (El. 275'-375')_45	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 275'-375')_45	6100
473.4	573.4	Shale (El. 175'-275')	Firm Rock	2.19E+08	0.5	26685.0	0	Shale (El. 175'-275')_46	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 175'-275')_46	7100
573.4	673.4	Shale (El. 75'-175')	Firm Rock	2.85E+08	0.5	31858.3	0	Shale (El. 75'-175')_47	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 75'-175')_47	8100
673.4	713.4	Shale (El. 35'-75')	Firm Rock	3.37E+08	0.5	35479.7	0	Shale (El. 35'-75')_48	140	Firm/Hard Rock	Firm/Hard Rock	40	Shale (El. 35'-75')_48	8800
713.4	Half-Space	Shale (El. < 35')	Half-Space	3.52E+08	0.5	Half-Space	0	Bedrock	140	NA, Half-Space	Damping = 0.5%	Half Space	Bedrock	9000

Facility	KIF East Dike	
Section/Group	Polishing Pond	
Profile Name	KIF-C2_NOR	
Top of Profile Elevation	748.4	ft
Depth to water table during EQ	6.4	ft
Surcharge Pressure		psf

Strata Profile

Non-input Information							Strata "Soil Types" Input				Strata "Soil Profile" Input		
Top Depth (ft)	**Bottom Depth (ft)**	**Layer Name**	**Layer Type**	**G_{max} (psf)**	**K_o**	**Mean Effective Stress at midpoint (psf)**	**Plasticity Index**	**Name (for Strata)**	**Unit Weight (pcf)**	**Modulus Reduction (G/Gmax) Model**	**Damping Model**	**Thickness (ft)**	**Soil Type (for Strata)**	**Shear Wave Velocity (fps)**
0	1.31	Clay Fill (Irrelevant)	Soil	1.04E+06	0.5	52.4	24	Clay Fill (Irrelevant)_1	120	D&S, p'=0-400, PI=20-25	D&S, p'=0-400, PI=20-25	1.31	Clay Fill (Irrelevant)_1	527
1.31	2.62	Clay Fill (Irrelevant)	Soil	1.04E+06	0.5	157.2	24	Clay Fill (Irrelevant)_2	120	D&S, p'=0-400, PI=20-25	D&S, p'=0-400, PI=20-25	1.31	Clay Fill (Irrelevant)_2	527
2.62	3.93	Clay Fill (Irrelevant)	Soil	1.04E+06	0.5	262.0	24	Clay Fill (Irrelevant)_3	120	D&S, p'=0-400, PI=20-25	D&S, p'=0-400, PI=20-25	1.31	Clay Fill (Irrelevant)_3	527
3.93	5.24	Clay Fill (Irrelevant)	Soil	1.04E+06	0.5	366.8	24	Clay Fill (Irrelevant)_4	120	D&S, p'=0-400, PI=20-25	D&S, p'=0-400, PI=20-25	1.31	Clay Fill (Irrelevant)_4	527
5.24	6.4	Clay Fill (Irrelevant)	Soil	1.04E+06	0.5	465.6	24	Clay Fill (Irrelevant)_5	120	D&S, p'=400-800, PI=20-25	D&S, p'=400-800, PI=20-25	1.16	Clay Fill (Irrelevant)_5	527
6.4	8	Clay Fill (Irrelevant)	Soil	1.53E+06	0.5	542.7	24	Clay Fill (Irrelevant)_6	120	D&S, p'=400-800, PI=20-25	D&S, p'=400-800, PI=20-25	1.6	Clay Fill (Irrelevant)_6	642
8	9	Clay Fill (Irrelevant)	Soil	1.53E+06	0.5	592.6	24	Clay Fill (Irrelevant)_7	120	D&S, p'=400-800, PI=20-25	D&S, p'=400-800, PI=20-25	1	Clay Fill (Irrelevant)_7	642
9	10.75	Subunit 3	Soil	2.01E+06	0.5	652.4	0	Subunit 3_8	132	D&S, p'=400-800, PI=0	D&S, p'=400-800, PI=0	1.75	Subunit 3_8	700
10.75	12.5	Subunit 3	Soil	2.01E+06	0.5	733.6	0	Subunit 3_9	132	D&S, p'=400-800, PI=0	D&S, p'=400-800, PI=0	1.75	Subunit 3_9	700
12.5	14.25	Subunit 3	Soil	2.01E+06	0.5	814.8	0	Subunit 3_10	132	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Subunit 3_10	700
14.25	16	Subunit 3	Soil	2.01E+06	0.5	896.0	0	Subunit 3_11	132	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Subunit 3_11	700
16	16.5	Subunit 3	Soil	2.01E+06	0.5	948.2	0	Subunit 3_12	132	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	0.5	Subunit 3_12	700
16.5	18.37	Subunit 1	Soil	2.22E+06	0.5	1000.1	11	Subunit 1_13	127	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.87	Subunit 1_13	750
18.37	20.24	Subunit 1	Soil	2.22E+06	0.5	1080.6	11	Subunit 1_14	127	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.87	Subunit 1_14	750
20.24	22.11	Subunit 1	Soil	2.22E+06	0.5	1161.2	11	Subunit 1_15	127	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.87	Subunit 1_15	750
22.11	23.98	Subunit 1	Soil	2.22E+06	0.5	1241.7	11	Subunit 1_16	127	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.87	Subunit 1_16	750
23.98	25.85	Subunit 1	Soil	2.22E+06	0.5	1322.2	11	Subunit 1_17	127	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.87	Subunit 1_17	750
25.85	27.72	Subunit 1	Soil	2.22E+06	0.5	1402.8	11	Subunit 1_18	127	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.87	Subunit 1_18	750
27.72	29.59	Subunit 1	Soil	2.22E+06	0.5	1483.3	11	Subunit 1_19	127	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.87	Subunit 1_19	750
29.59	30	Subunit 1	Soil	2.22E+06	0.5	1532.4	11	Subunit 1_20	127	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	0.41	Subunit 1_20	750
30	31.75	Subunit 2	Soil	1.93E+06	0.5	1578.9	0	Subunit 2_21	127	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Subunit 2_21	700
31.75	33.5	Subunit 2	Soil	1.93E+06	0.5	1654.3	0	Subunit 2_22	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 2_22	700
33.5	35.25	Subunit 2	Soil	1.93E+06	0.5	1729.7	0	Subunit 2_23	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 2_23	700
35.25	37	Subunit 2	Soil	1.93E+06	0.5	1805.0	0	Subunit 2_24	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 2_24	700
37	38.75	Subunit 2	Soil	1.93E+06	0.5	1880.4	0	Subunit 2_25	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 2_25	700
38.75	40.5	Subunit 2	Soil	1.93E+06	0.5	1955.8	0	Subunit 2_26	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 2_26	700
40.5	42.25	Subunit 2	Soil	1.93E+06	0.5	2031.1	0	Subunit 2_27	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 2_27	700
42.25	43.5	Subunit 2	Soil	1.93E+06	0.5	2095.7	0	Subunit 2_28	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.25	Subunit 2_28	700
43.5	45.25	Subunit 3	Soil	2.01E+06	0.5	2163.2	0	Subunit 3_29	132	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 3_29	700
45.25	47	Subunit 3	Soil	2.01E+06	0.5	2244.4	0	Subunit 3_30	132	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 3_30	700
47	47.9	Subunit 3	Soil	2.01E+06	0.5	2305.9	0	Subunit 3_31	132	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	0.9	Subunit 3_31	700
47.9	50.95	Shale (0'-15')	Soft Rock	6.47E+06	0.5	2405.7	0	Shale (0'-15')_32	140	Silva et al., 20'-50'	Silva et al., 20'-50'	3.05	Shale (0'-15')_32	1220
50.95	54	Shale (0'-15')	Soft Rock	6.47E+06	0.5	2563.5	0	Shale (0'-15')_33	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_33	1220
54	57.05	Shale (0'-15')	Soft Rock	6.47E+06	0.5	2721.3	0	Shale (0'-15')_34	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_34	1220
57.05	60.1	Shale (0'-15')	Soft Rock	6.47E+06	0.5	2879.1	0	Shale (0'-15')_35	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_35	1220
60.1	62.9	Shale (0'-15')	Soft Rock	6.47E+06	0.5	3030.4	0	Shale (0'-15')_36	140	Silva et al., 50'-120'	Silva et al., 50'-120'	2.8	Shale (0'-15')_36	1220
62.9	66.3	Shale (15'-30')	Soft Rock	8.04E+06	0.5	3190.7	0	Shale (15'-30')_37	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_37	1360
66.3	69.7	Shale (15'-30')	Soft Rock	8.04E+06	0.5	3366.6	0	Shale (15'-30')_38	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_38	1360
69.7	73.1	Shale (15'-30')	Soft Rock	8.04E+06	0.5	3542.5	0	Shale (15'-30')_39	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_39	1360
73.1	73.4	Shale (15'-30')	Soft Rock	8.04E+06	0.5	3638.2	0	Shale (15'-30')_40	140	Silva et al., 50'-120'	Silva et al., 50'-120'	0.3	Shale (15'-30')_40	1360
73.4	173.4	Shale (El. 575'-675')	Firm Rock	4.18E+07	0.5	6232.7	0	Shale (El. 575'-675')_41	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 575'-675')_41	3100
173.4	273.4	Shale (El. 475'-575')	Firm Rock	7.31E+07	0.5	11406.0	0	Shale (El. 475'-575')_42	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 475'-575')_42	4100
273.4	373.4	Shale (El. 375'-475')	Firm Rock	1.13E+08	0.5	16579.3	0	Shale (El. 375'-475')_43	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 375'-475')_43	5100
373.4	473.4	Shale (El. 275'-375')	Firm Rock	1.62E+08	0.5	21752.7	0	Shale (El. 275'-375')_44	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 275'-375')_44	6100
473.4	573.4	Shale (El. 175'-275')	Firm Rock	2.19E+08	0.5	26926.0	0	Shale (El. 175'-275')_45	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 175'-275')_45	7100
573.4	673.4	Shale (El. 75'-175')	Firm Rock	2.85E+08	0.5	32099.3	0	Shale (El. 75'-175')_46	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 75'-175')_46	8100
673.4	713.4	Shale (El. 35'-75')	Firm Rock	3.37E+08	0.5	35720.7	0	Shale (El. 35'-75')_47	140	Firm/Hard Rock	Firm/Hard Rock	40	Shale (El. 35'-75')_47	8800
713.4	Half-Space	Shale (El. < 35')	Half-Space	3.52E+08	0.5	Half-Space	0	Bedrock	140	NA, Half-Space	Damping = 0.5%	Half Space	Bedrock	9000

Facility	KIF East Dike	
Section/Group	Polishing Pond	
Profile Name	KIF-D1_NOR	
Top of Profile Elevation	748.7	ft
Depth to water table during EQ	3	ft
Surcharge Pressure		psf

Strata Profile

Non-input Information								Strata "Soil Types" Input				Strata "Soil Profile" Input		
Top Depth (ft)	Bottom Depth (ft)	Layer Name	Layer Type	G_{max} (psf)	K_o	Mean Effective Stress at midpoint (psf)	Plasticity Index	Name (for Strata)	Unit Weight (pcf)	Modulus Reduction (G/Gmax) Model	Damping Model	Thickness (ft)	Soil Type (for Strata)	Shear Wave Velocity (fps)
0	1.09	Clay Fill (Irrelevant)	Soil	7.09E+05	0.5	43.6	24	Clay Fill (Irrelevant)_1	120	D&S, p'=0-400, PI=20-25	D&S, p'=0-400, PI=20-25	1.09	Clay Fill (Irrelevant)_1	436
1.09	2.18	Clay Fill (Irrelevant)	Soil	7.09E+05	0.5	130.8	24	Clay Fill (Irrelevant)_2	120	D&S, p'=0-400, PI=20-25	D&S, p'=0-400, PI=20-25	1.09	Clay Fill (Irrelevant)_2	436
2.18	3	Clay Fill (Irrelevant)	Soil	7.09E+05	0.5	207.2	24	Clay Fill (Irrelevant)_3	120	D&S, p'=0-400, PI=20-25	D&S, p'=0-400, PI=20-25	0.82	Clay Fill (Irrelevant)_3	436
3	4.53	Clay Fill (Irrelevant)	Soil	1.40E+06	0.5	269.4	24	Clay Fill (Irrelevant)_4	120	D&S, p'=0-400, PI=20-25	D&S, p'=0-400, PI=20-25	1.53	Clay Fill (Irrelevant)_4	614
4.53	6.06	Clay Fill (Irrelevant)	Soil	1.40E+06	0.5	328.1	24	Clay Fill (Irrelevant)_5	120	D&S, p'=0-400, PI=20-25	D&S, p'=0-400, PI=20-25	1.53	Clay Fill (Irrelevant)_5	614
6.06	7.59	Clay Fill (Irrelevant)	Soil	1.40E+06	0.5	386.9	24	Clay Fill (Irrelevant)_6	120	D&S, p'=0-400, PI=20-25	D&S, p'=0-400, PI=20-25	1.53	Clay Fill (Irrelevant)_6	614
7.59	9.12	Clay Fill (Irrelevant)	Soil	1.40E+06	0.5	445.6	24	Clay Fill (Irrelevant)_7	120	D&S, p'=400-800, PI=20-25	D&S, p'=400-800, PI=20-25	1.53	Clay Fill (Irrelevant)_7	614
9.12	10.65	Clay Fill (Irrelevant)	Soil	1.40E+06	0.5	504.4	24	Clay Fill (Irrelevant)_8	120	D&S, p'=400-800, PI=20-25	D&S, p'=400-800, PI=20-25	1.53	Clay Fill (Irrelevant)_8	614
10.65	12.18	Clay Fill (Irrelevant)	Soil	1.40E+06	0.5	563.1	24	Clay Fill (Irrelevant)_9	120	D&S, p'=400-800, PI=20-25	D&S, p'=400-800, PI=20-25	1.53	Clay Fill (Irrelevant)_9	614
12.18	13.71	Clay Fill (Irrelevant)	Soil	1.40E+06	0.5	621.9	24	Clay Fill (Irrelevant)_10	120	D&S, p'=400-800, PI=20-25	D&S, p'=400-800, PI=20-25	1.53	Clay Fill (Irrelevant)_10	614
13.71	15	Clay Fill (Irrelevant)	Soil	1.40E+06	0.5	676.0	24	Clay Fill (Irrelevant)_11	120	D&S, p'=400-800, PI=20-25	D&S, p'=400-800, PI=20-25	1.29	Clay Fill (Irrelevant)_11	614
15	16.87	Subunit 1	Soil	2.22E+06	0.5	741.1	11	Subunit 1_12	127	D&S, p'=400-800, PI=10-15	D&S, p'=400-800, PI=10-15	1.87	Subunit 1_12	750
16.87	18.74	Subunit 1	Soil	2.22E+06	0.5	821.6	11	Subunit 1_13	127	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.87	Subunit 1_13	750
18.74	20.61	Subunit 1	Soil	2.22E+06	0.5	902.1	11	Subunit 1_14	127	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.87	Subunit 1_14	750
20.61	22.48	Subunit 1	Soil	2.22E+06	0.5	982.7	11	Subunit 1_15	127	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.87	Subunit 1_15	750
22.48	24.35	Subunit 1	Soil	2.22E+06	0.5	1063.2	11	Subunit 1_16	127	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.87	Subunit 1_16	750
24.35	26.22	Subunit 1	Soil	2.22E+06	0.5	1143.7	11	Subunit 1_17	127	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.87	Subunit 1_17	750
26.22	27	Subunit 1	Soil	2.22E+06	0.5	1200.8	11	Subunit 1_18	127	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	0.78	Subunit 1_18	750
27	28.75	Subunit 3	Soil	2.01E+06	0.5	1258.2	0	Subunit 3_19	132	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Subunit 3_19	700
28.75	30.5	Subunit 3	Soil	2.01E+06	0.5	1339.4	0	Subunit 3_20	132	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Subunit 3_20	700
30.5	32.25	Subunit 3	Soil	2.01E+06	0.5	1420.6	0	Subunit 3_21	132	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Subunit 3_21	700
32.25	33	Subunit 3	Soil	2.01E+06	0.5	1478.6	0	Subunit 3_22	132	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	0.75	Subunit 3_22	700
33	34.75	Subunit 2	Soil	1.93E+06	0.5	1533.7	0	Subunit 2_23	127	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Subunit 2_23	700
34.75	36.5	Subunit 2	Soil	1.93E+06	0.5	1609.1	0	Subunit 2_24	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 2_24	700
36.5	37.5	Subunit 2	Soil	1.93E+06	0.5	1668.3	0	Subunit 2_25	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1	Subunit 2_25	700
37.5	39.25	Subunit 3	Soil	2.01E+06	0.5	1730.4	0	Subunit 3_26	132	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 3_26	700
39.25	41	Subunit 3	Soil	2.01E+06	0.5	1811.6	0	Subunit 3_27	132	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 3_27	700
41	42.75	Subunit 3	Soil	2.01E+06	0.5	1892.8	0	Subunit 3_28	132	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 3_28	700
42.75	44.5	Subunit 3	Soil	2.01E+06	0.5	1974.0	0	Subunit 3_29	132	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 3_29	700
44.5	46.25	Subunit 3	Soil	2.01E+06	0.5	2055.2	0	Subunit 3_30	132	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 3_30	700
46.25	48	Subunit 3	Soil	2.01E+06	0.5	2136.4	0	Subunit 3_31	132	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 3_31	700
48	49.75	Subunit 3	Soil	2.01E+06	0.5	2217.6	0	Subunit 3_32	132	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 3_32	700
49.75	51.5	Subunit 3	Soil	2.01E+06	0.5	2298.8	0	Subunit 3_33	132	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 3_33	700
51.5	53.25	Subunit 3	Soil	2.01E+06	0.5	2380.0	0	Subunit 3_34	132	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 3_34	700
53.25	53.7	Subunit 3	Soil	2.01E+06	0.5	2431.0	0	Subunit 3_35	132	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	0.45	Subunit 3_35	700
53.7	56.75	Shale (0'-15')	Soft Rock	6.47E+06	0.5	2520.4	0	Shale (0'-15')_36	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_36	1220
56.75	59.8	Shale (0'-15')	Soft Rock	6.47E+06	0.5	2678.2	0	Shale (0'-15')_37	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_37	1220
59.8	62.85	Shale (0'-15')	Soft Rock	6.47E+06	0.5	2835.9	0	Shale (0'-15')_38	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_38	1220
62.85	65.9	Shale (0'-15')	Soft Rock	6.47E+06	0.5	2993.7	0	Shale (0'-15')_39	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_39	1220
65.9	68.7	Shale (0'-15')	Soft Rock	6.47E+06	0.5	3145.1	0	Shale (0'-15')_40	140	Silva et al., 50'-120'	Silva et al., 50'-120'	2.8	Shale (0'-15')_40	1220
68.7	72.1	Shale (15'-30')	Soft Rock	8.04E+06	0.5	3305.4	0	Shale (15'-30')_41	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_41	1360
72.1	73.7	Shale (15'-30')	Soft Rock	8.04E+06	0.5	3434.8	0	Shale (15'-30')_42	140	Silva et al., 50'-120'	Silva et al., 50'-120'	1.6	Shale (15'-30')_42	1360
73.7	173.7	Shale (El. 575'-675')	Firm Rock	4.18E+07	0.5	6062.8	0	Shale (El. 575'-675')_43	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 575'-675')_43	3100
173.7	273.7	Shale (El. 475'-575')	Firm Rock	7.31E+07	0.5	11236.1	0	Shale (El. 475'-575')_44	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 475'-575')_44	4100
273.7	373.7	Shale (El. 375'-475')	Firm Rock	1.13E+08	0.5	16409.5	0	Shale (El. 375'-475')_45	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 375'-475')_45	5100

Strata Profile														
Non-input Information								Strata "Soil Types" Input				Strata "Soil Profile" Input		
Top Depth (ft)	Bottom Depth (ft)	Layer Name	Layer Type	G_{max} (psf)	K_o	Mean Effective Stress at midpoint (psf)	Plasticity Index	Name (for Strata)	Unit Weight (pcf)	Modulus Reduction (G/Gmax) Model	Damping Model	Thickness (ft)	Soil Type (for Strata)	Shear Wave Velocity (fps)
373.7	473.7	Shale (El. 275'-375')	Firm Rock	1.62E+08	0.5	21582.8	0	Shale (El. 275'-375')_46	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 275'-375')_46	6100
473.7	573.7	Shale (El. 175'-275')	Firm Rock	2.19E+08	0.5	26756.1	0	Shale (El. 175'-275')_47	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 175'-275')_47	7100
573.7	673.7	Shale (El. 75'-175')	Firm Rock	2.85E+08	0.5	31929.5	0	Shale (El. 75'-175')_48	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 75'-175')_48	8100
673.7	713.7	Shale (El. 35'-75')	Firm Rock	3.37E+08	0.5	35550.8	0	Shale (El. 35'-75')_49	140	Firm/Hard Rock	Firm/Hard Rock	40	Shale (El. 35'-75')_49	8800
713.7	Half-Space	Shale (El. < 35')	Half-Space	3.52E+08	0.5	Half-Space	0	Bedrock	140	NA, Half-Space	Damping = 0.5%	Half Space	Bedrock	9000

Facility	KIF East Dike	
Section/Group	Polishing Pond	
Profile Name	KIF-D2_NOR	
Top of Profile Elevation	748.7	ft
Depth to water table during EQ	11.8	ft
Surcharge Pressure		psf

Strata Profile

Non-input Information							Strata "Soil Types" Input				Strata "Soil Profile" Input		
Top Depth (ft)	**Bottom Depth (ft)**	**Layer Name**	**Layer Type**	**G_{max} (psf)**	**K_o**	**Mean Effective Stress at midpoint (psf)**	**Plasticity Index**	**Name (for Strata)**	**Unit Weight (pcf)**	**Modulus Reduction (G/Gmax) Model**	**Damping Model**	**Thickness (ft)**	**Soil Type (for Strata)**	**Shear Wave Velocity (fps)**
0	1.53	Clay Fill (Irrelevant)	Soil	1.41E+06	0.5	61.2	24	Clay Fill (Irrelevant)_1	120	D&S, p'=0-400, PI=20-25	D&S, p'=0-400, PI=20-25	1.53	Clay Fill (Irrelevant)_1	614
1.53	3.06	Clay Fill (Irrelevant)	Soil	1.41E+06	0.5	183.6	24	Clay Fill (Irrelevant)_2	120	D&S, p'=0-400, PI=20-25	D&S, p'=0-400, PI=20-25	1.53	Clay Fill (Irrelevant)_2	614
3.06	4.59	Clay Fill (Irrelevant)	Soil	1.41E+06	0.5	306.0	24	Clay Fill (Irrelevant)_3	120	D&S, p'=0-400, PI=20-25	D&S, p'=0-400, PI=20-25	1.53	Clay Fill (Irrelevant)_3	614
4.59	6.12	Clay Fill (Irrelevant)	Soil	1.41E+06	0.5	428.4	24	Clay Fill (Irrelevant)_4	120	D&S, p'=400-800, PI=20-25	D&S, p'=400-800, PI=20-25	1.53	Clay Fill (Irrelevant)_4	614
6.12	7.65	Clay Fill (Irrelevant)	Soil	1.41E+06	0.5	550.8	24	Clay Fill (Irrelevant)_5	120	D&S, p'=400-800, PI=20-25	D&S, p'=400-800, PI=20-25	1.53	Clay Fill (Irrelevant)_5	614
7.65	9.18	Clay Fill (Irrelevant)	Soil	1.41E+06	0.5	673.2	24	Clay Fill (Irrelevant)_6	120	D&S, p'=400-800, PI=20-25	D&S, p'=400-800, PI=20-25	1.53	Clay Fill (Irrelevant)_6	614
9.18	10.71	Clay Fill (Irrelevant)	Soil	1.41E+06	0.5	795.6	24	Clay Fill (Irrelevant)_7	120	D&S, p'=400-800, PI=20-25	D&S, p'=400-800, PI=20-25	1.53	Clay Fill (Irrelevant)_7	614
10.71	11.8	Clay Fill (Irrelevant)	Soil	1.41E+06	0.5	900.4	24	Clay Fill (Irrelevant)_8	120	D&S, p'=800-1600, PI=20-25	D&S, p'=800-1600, PI=20-25	1.09	Clay Fill (Irrelevant)_8	614
11.8	13.65	Clay Fill (Irrelevant)	Soil	2.06E+06	0.5	979.5	24	Clay Fill (Irrelevant)_9	120	D&S, p'=800-1600, PI=20-25	D&S, p'=800-1600, PI=20-25	1.85	Clay Fill (Irrelevant)_9	743
13.65	15.4	Clay Fill (Irrelevant)	Soil	2.06E+06	0.5	1048.6	24	Clay Fill (Irrelevant)_10	120	D&S, p'=800-1600, PI=20-25	D&S, p'=800-1600, PI=20-25	1.75	Clay Fill (Irrelevant)_10	743
15.4	17.15	Subunit 2	Soil	1.93E+06	0.5	1119.9	0	Subunit 2_11	127	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Subunit 2_11	700
17.15	18.9	Subunit 2	Soil	1.93E+06	0.5	1195.3	0	Subunit 2_12	127	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Subunit 2_12	700
18.9	20.65	Subunit 2	Soil	1.93E+06	0.5	1270.7	0	Subunit 2_13	127	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Subunit 2_13	700
20.65	21.4	Subunit 2	Soil	1.93E+06	0.5	1324.5	0	Subunit 2_14	127	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	0.75	Subunit 2_14	700
21.4	23.15	Subunit 3	Soil	2.01E+06	0.5	1381.2	0	Subunit 3_15	132	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Subunit 3_15	700
23.15	24.9	Subunit 3	Soil	2.01E+06	0.5	1462.4	0	Subunit 3_16	132	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Subunit 3_16	700
24.9	26.65	Subunit 3	Soil	2.01E+06	0.5	1543.6	0	Subunit 3_17	132	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Subunit 3_17	700
26.65	28.4	Subunit 3	Soil	2.01E+06	0.5	1624.8	0	Subunit 3_18	132	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 3_18	700
28.4	30.15	Subunit 3	Soil	2.01E+06	0.5	1706.0	0	Subunit 3_19	132	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 3_19	700
30.15	31.9	Subunit 3	Soil	2.01E+06	0.5	1787.2	0	Subunit 3_20	132	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 3_20	700
31.9	33.65	Subunit 3	Soil	2.01E+06	0.5	1868.4	0	Subunit 3_21	132	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 3_21	700
33.65	35.4	Subunit 3	Soil	2.01E+06	0.5	1949.6	0	Subunit 3_22	132	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 3_22	700
35.4	37.15	Subunit 3	Soil	2.01E+06	0.5	2030.8	0	Subunit 3_23	132	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 3_23	700
37.15	38.9	Subunit 3	Soil	2.01E+06	0.5	2112.0	0	Subunit 3_24	132	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 3_24	700
38.9	40.65	Subunit 3	Soil	2.01E+06	0.5	2193.2	0	Subunit 3_25	132	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 3_25	700
40.65	42.4	Subunit 3	Soil	2.01E+06	0.5	2274.4	0	Subunit 3_26	132	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 3_26	700
42.4	44.15	Subunit 3	Soil	2.01E+06	0.5	2355.6	0	Subunit 3_27	132	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 3_27	700
44.15	45.9	Subunit 3	Soil	2.01E+06	0.5	2436.8	0	Subunit 3_28	132	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 3_28	700
45.9	47.65	Subunit 3	Soil	2.01E+06	0.5	2518.0	0	Subunit 3_29	132	D&S, p'=2500-5000, PI=0	D&S, p'=2500-5000, PI=0	1.75	Subunit 3_29	700
47.65	49.4	Subunit 3	Soil	2.01E+06	0.5	2599.2	0	Subunit 3_30	132	D&S, p'=2500-5000, PI=0	D&S, p'=2500-5000, PI=0	1.75	Subunit 3_30	700
49.4	50.3	Subunit 3	Soil	2.01E+06	0.5	2660.7	0	Subunit 3_31	132	D&S, p'=2500-5000, PI=0	D&S, p'=2500-5000, PI=0	0.9	Subunit 3_31	700
50.3	53.35	Shale (0'-15')	Soft Rock	6.47E+06	0.5	2760.5	0	Shale (0'-15')_32	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_32	1220
53.35	56.4	Shale (0'-15')	Soft Rock	6.47E+06	0.5	2918.3	0	Shale (0'-15')_33	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_33	1220
56.4	59.45	Shale (0'-15')	Soft Rock	6.47E+06	0.5	3076.1	0	Shale (0'-15')_34	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_34	1220
59.45	62.5	Shale (0'-15')	Soft Rock	6.47E+06	0.5	3233.9	0	Shale (0'-15')_35	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_35	1220
62.5	65.3	Shale (0'-15')	Soft Rock	6.47E+06	0.5	3385.2	0	Shale (0'-15')_36	140	Silva et al., 50'-120'	Silva et al., 50'-120'	2.8	Shale (0'-15')_36	1220
65.3	68.7	Shale (15'-30')	Soft Rock	8.04E+06	0.5	3545.5	0	Shale (15'-30')_37	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_37	1360
68.7	72.1	Shale (15'-30')	Soft Rock	8.04E+06	0.5	3721.4	0	Shale (15'-30')_38	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_38	1360
72.1	73.7	Shale (15'-30')	Soft Rock	8.04E+06	0.5	3850.8	0	Shale (15'-30')_39	140	Silva et al., 50'-120'	Silva et al., 50'-120'	1.6	Shale (15'-30')_39	1360
73.7	173.7	Shale (El. 575'-675')	Firm Rock	4.18E+07	0.5	6478.8	0	Shale (El. 575'-675')_40	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 575'-675')_40	3100
173.7	273.7	Shale (El. 475'-575')	Firm Rock	7.31E+07	0.5	11652.2	0	Shale (El. 475'-575')_41	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 475'-575')_41	4100
273.7	373.7	Shale (El. 375'-475')	Firm Rock	1.13E+08	0.5	16825.5	0	Shale (El. 375'-475')_42	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 375'-475')_42	5100
373.7	473.7	Shale (El. 275'-375')	Firm Rock	1.62E+08	0.5	21998.8	0	Shale (El. 275'-375')_43	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 275'-375')_43	6100
473.7	573.7	Shale (El. 175'-275')	Firm Rock	2.19E+08	0.5	27172.2	0	Shale (El. 175'-275')_44	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 175'-275')_44	7100
573.7	673.7	Shale (El. 75'-175')	Firm Rock	2.85E+08	0.5	32345.5	0	Shale (El. 75'-175')_45	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 75'-175')_45	8100
673.7	713.7	Shale (El. 35'-75')	Firm Rock	3.37E+08	0.5	35966.8	0	Shale (El. 35'-75')_46	140	Firm/Hard Rock	Firm/Hard Rock	40	Shale (El. 35'-75')_46	8800
713.7	Half-Space	Shale (El. < 35')	Half-Space	3.52E+08	0.5	Half-Space	0	Bedrock	140	NA, Half-Space	Damping = 0.5%	Half Space	Bedrock	9000

Facility	KIF East Dike	
Section/Group	Polishing Pond	
Profile Name	KIF-STN50_NOR	
Top of Profile Elevation	741.6	ft
Depth to water table during EQ	4.6	ft
Surcharge Pressure		psf

Strata Profile

Non-input Information								Strata "Soil Types" Input				Strata "Soil Profile" Input		
Top Depth (ft)	**Bottom Depth (ft)**	**Layer Name**	**Layer Type**	**G_{max} (psf)**	**K_o**	**Mean Effective Stress at midpoint (psf)**	**Plasticity Index**	**Name (for Strata)**	**Unit Weight (pcf)**	**Modulus Reduction (G/Gmax) Model**	**Damping Model**	**Thickness (ft)**	**Soil Type (for Strata)**	**Shear Wave Velocity (fps)**
0	1.21	Clay Fill (Irrelevant)	Soil	8.78E+05	0.5	48.4	24	Clay Fill (Irrelevant)_1	120	D&S, p'=0-400, PI=20-25	D&S, p'=0-400, PI=20-25	1.21	Clay Fill (Irrelevant)_1	485
1.21	2.42	Clay Fill (Irrelevant)	Soil	8.78E+05	0.5	145.2	24	Clay Fill (Irrelevant)_2	120	D&S, p'=0-400, PI=20-25	D&S, p'=0-400, PI=20-25	1.21	Clay Fill (Irrelevant)_2	485
2.42	3.63	Clay Fill (Irrelevant)	Soil	8.78E+05	0.5	242.0	24	Clay Fill (Irrelevant)_3	120	D&S, p'=0-400, PI=20-25	D&S, p'=0-400, PI=20-25	1.21	Clay Fill (Irrelevant)_3	485
3.63	4.6	Clay Fill (Irrelevant)	Soil	8.78E+05	0.5	329.2	24	Clay Fill (Irrelevant)_4	120	D&S, p'=0-400, PI=20-25	D&S, p'=0-400, PI=20-25	0.97	Clay Fill (Irrelevant)_4	485
4.6	6.11	Clay Fill (Irrelevant)	Soil	1.36E+06	0.5	397.0	24	Clay Fill (Irrelevant)_5	120	D&S, p'=0-400, PI=20-25	D&S, p'=0-400, PI=20-25	1.51	Clay Fill (Irrelevant)_5	605
6.11	7.62	Clay Fill (Irrelevant)	Soil	1.36E+06	0.5	455.0	24	Clay Fill (Irrelevant)_6	120	D&S, p'=400-800, PI=20-25	D&S, p'=400-800, PI=20-25	1.51	Clay Fill (Irrelevant)_6	605
7.62	8.5	Clay Fill (Irrelevant)	Soil	1.36E+06	0.5	500.9	24	Clay Fill (Irrelevant)_7	120	D&S, p'=400-800, PI=20-25	D&S, p'=400-800, PI=20-25	0.88	Clay Fill (Irrelevant)_7	605
8.5	10.25	Fly Ash	Soil	1.70E+06	0.5	546.7	0	Fly Ash_8	112	D&S, p'=400-800, PI=0	D&S, p'=400-800, PI=0	1.75	Fly Ash_8	700
10.25	12	Fly Ash	Soil	1.70E+06	0.5	604.6	0	Fly Ash_9	112	D&S, p'=400-800, PI=0	D&S, p'=400-800, PI=0	1.75	Fly Ash_9	700
12	12.5	Fly Ash	Soil	1.70E+06	0.5	641.8	0	Fly Ash_10	112	D&S, p'=400-800, PI=0	D&S, p'=400-800, PI=0	0.5	Fly Ash_10	700
12.5	14	Clay Fill (Irrelevant)	Soil	1.69E+06	0.5	678.8	24	Clay Fill (Irrelevant)_11	120	D&S, p'=400-800, PI=20-25	D&S, p'=400-800, PI=20-25	1.5	Clay Fill (Irrelevant)_11	673
14	15.75	Fly Ash	Soil	1.70E+06	0.5	736.6	0	Fly Ash_12	112	D&S, p'=400-800, PI=0	D&S, p'=400-800, PI=0	1.75	Fly Ash_12	700
15.75	17.5	Fly Ash	Soil	1.70E+06	0.5	794.4	0	Fly Ash_13	112	D&S, p'=400-800, PI=0	D&S, p'=400-800, PI=0	1.75	Fly Ash_13	700
17.5	18	Fly Ash	Soil	1.70E+06	0.5	831.6	0	Fly Ash_14	112	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	0.5	Fly Ash_14	700
18	19.87	Subunit 1	Soil	2.22E+06	0.5	880.2	11	Subunit 1_15	127	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.87	Subunit 1_15	750
19.87	21.74	Subunit 1	Soil	2.22E+06	0.5	960.7	11	Subunit 1_16	127	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.87	Subunit 1_16	750
21.74	23.5	Subunit 1	Soil	2.22E+06	0.5	1038.9	11	Subunit 1_17	127	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.76	Subunit 1_17	750
23.5	25.25	Subunit 2	Soil	1.93E+06	0.5	1114.4	0	Subunit 2_18	127	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Subunit 2_18	700
25.25	27	Subunit 2	Soil	1.93E+06	0.5	1189.8	0	Subunit 2_19	127	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Subunit 2_19	700
27	28.75	Subunit 2	Soil	1.93E+06	0.5	1265.2	0	Subunit 2_20	127	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Subunit 2_20	700
28.75	30.5	Subunit 2	Soil	1.93E+06	0.5	1340.5	0	Subunit 2_21	127	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Subunit 2_21	700
30.5	32.25	Subunit 2	Soil	1.93E+06	0.5	1415.9	0	Subunit 2_22	127	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Subunit 2_22	700
32.25	34	Subunit 2	Soil	1.93E+06	0.5	1491.3	0	Subunit 2_23	127	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Subunit 2_23	700
34	35.7	Subunit 2	Soil	1.93E+06	0.5	1565.6	0	Subunit 2_24	127	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.7	Subunit 2_24	700
35.7	38.75	Shale (0'-15')	Soft Rock	6.47E+06	0.5	1681.1	0	Shale (0'-15')_25	140	Silva et al., 20'-50'	Silva et al., 20'-50'	3.05	Shale (0'-15')_25	1220
38.75	41.8	Shale (0'-15')	Soft Rock	6.47E+06	0.5	1838.9	0	Shale (0'-15')_26	140	Silva et al., 20'-50'	Silva et al., 20'-50'	3.05	Shale (0'-15')_26	1220
41.8	44.85	Shale (0'-15')	Soft Rock	6.47E+06	0.5	1996.6	0	Shale (0'-15')_27	140	Silva et al., 20'-50'	Silva et al., 20'-50'	3.05	Shale (0'-15')_27	1220
44.85	47.9	Shale (0'-15')	Soft Rock	6.47E+06	0.5	2154.4	0	Shale (0'-15')_28	140	Silva et al., 20'-50'	Silva et al., 20'-50'	3.05	Shale (0'-15')_28	1220
47.9	50.7	Shale (0'-15')	Soft Rock	6.47E+06	0.5	2305.7	0	Shale (0'-15')_29	140	Silva et al., 20'-50'	Silva et al., 20'-50'	2.8	Shale (0'-15')_29	1220
50.7	54.1	Shale (15'-30')	Soft Rock	8.04E+06	0.5	2466.1	0	Shale (15'-30')_30	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_30	1360
54.1	57.5	Shale (15'-30')	Soft Rock	8.04E+06	0.5	2642.0	0	Shale (15'-30')_31	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_31	1360
57.5	60.9	Shale (15'-30')	Soft Rock	8.04E+06	0.5	2817.9	0	Shale (15'-30')_32	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_32	1360
60.9	64.3	Shale (15'-30')	Soft Rock	8.04E+06	0.5	2993.8	0	Shale (15'-30')_33	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_33	1360
64.3	65.7	Shale (15'-30')	Soft Rock	8.04E+06	0.5	3118.0	0	Shale (15'-30')_34	140	Silva et al., 50'-120'	Silva et al., 50'-120'	1.4	Shale (15'-30')_34	1360
65.7	66.6	Shale (>30')	Soft Rock	9.65E+06	0.5	3177.5	0	Shale (>30')_35	140	Silva et al., 50'-120'	Silva et al., 50'-120'	0.9	Shale (>30')_35	1490
66.6	166.6	Shale (El. 575'-675')	Firm Rock	4.18E+07	0.5	5787.4	0	Shale (El. 575'-675')_36	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 575'-675')_36	3100
166.6	266.6	Shale (El. 475'-575')	Firm Rock	7.31E+07	0.5	10960.7	0	Shale (El. 475'-575')_37	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 475'-575')_37	4100
266.6	366.6	Shale (El. 375'-475')	Firm Rock	1.13E+08	0.5	16134.1	0	Shale (El. 375'-475')_38	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 375'-475')_38	5100
366.6	466.6	Shale (El. 275'-375')	Firm Rock	1.62E+08	0.5	21307.4	0	Shale (El. 275'-375')_39	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 275'-375')_39	6100
466.6	566.6	Shale (El. 175'-275')	Firm Rock	2.19E+08	0.5	26480.7	0	Shale (El. 175'-275')_40	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 175'-275')_40	7100
566.6	666.6	Shale (El. 75'-175')	Firm Rock	2.85E+08	0.5	31654.1	0	Shale (El. 75'-175')_41	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 75'-175')_41	8100
666.6	706.6	Shale (El. 35'-75')	Firm Rock	3.37E+08	0.5	35275.4	0	Shale (El. 35'-75')_42	140	Firm/Hard Rock	Firm/Hard Rock	40	Shale (El. 35'-75')_42	8800
706.6	Half-Space	Shale (El. < 35')	Half-Space	3.52E+08	0.5	Half-Space	0	Bedrock	140	NA, Half-Space	Damping = 0.5%	Half Space	Bedrock	9000

Facility	KIF East Dike	
Section/Group	Polishing Pond	
Profile Name	KIF-STN51_NOR	
Top of Profile Elevation	750.4	ft
Depth to water table during EQ	750.4	ft
Surcharge Pressure		psf

Strata Profile

Non-input Information								Strata "Soil Types" Input				Strata "Soil Profile" Input		
Top Depth (ft)	**Bottom Depth (ft)**	**Layer Name**	**Layer Type**	**G_{max} (psf)**	**K_o**	**Mean Effective Stress at midpoint (psf)**	**Plasticity Index**	**Name (for Strata)**	**Unit Weight (pcf)**	**Modulus Reduction (G/Gmax) Model**	**Damping Model**	**Thickness (ft)**	**Soil Type (for Strata)**	**Shear Wave Velocity (fps)**
0	1.85	Clay Fill (Irrelevant)	Soil	2.05E+06	0.5	74.0	24	Clay Fill (Irrelevant)_1	120	D&S, p'=0-400, PI=20-25	D&S, p'=0-400, PI=20-25	1.85	Clay Fill (Irrelevant)_1	741
1.85	3.7	Clay Fill (Irrelevant)	Soil	2.05E+06	0.5	222.0	24	Clay Fill (Irrelevant)_2	120	D&S, p'=0-400, PI=20-25	D&S, p'=0-400, PI=20-25	1.85	Clay Fill (Irrelevant)_2	741
3.7	5.55	Clay Fill (Irrelevant)	Soil	2.05E+06	0.5	370.0	24	Clay Fill (Irrelevant)_3	120	D&S, p'=0-400, PI=20-25	D&S, p'=0-400, PI=20-25	1.85	Clay Fill (Irrelevant)_3	741
5.55	7.4	Clay Fill (Irrelevant)	Soil	2.05E+06	0.5	518.0	24	Clay Fill (Irrelevant)_4	120	D&S, p'=400-800, PI=20-25	D&S, p'=400-800, PI=20-25	1.85	Clay Fill (Irrelevant)_4	741
7.4	9.25	Clay Fill (Irrelevant)	Soil	2.05E+06	0.5	666.0	24	Clay Fill (Irrelevant)_5	120	D&S, p'=400-800, PI=20-25	D&S, p'=400-800, PI=20-25	1.85	Clay Fill (Irrelevant)_5	741
9.25	11.1	Clay Fill (Irrelevant)	Soil	2.05E+06	0.5	814.0	24	Clay Fill (Irrelevant)_6	120	D&S, p'=800-1600, PI=20-25	D&S, p'=800-1600, PI=20-25	1.85	Clay Fill (Irrelevant)_6	741
11.1	12.95	Clay Fill (Irrelevant)	Soil	2.05E+06	0.5	962.0	24	Clay Fill (Irrelevant)_7	120	D&S, p'=800-1600, PI=20-25	D&S, p'=800-1600, PI=20-25	1.85	Clay Fill (Irrelevant)_7	741
12.95	14.8	Clay Fill (Irrelevant)	Soil	2.05E+06	0.5	1110.0	24	Clay Fill (Irrelevant)_8	120	D&S, p'=800-1600, PI=20-25	D&S, p'=800-1600, PI=20-25	1.85	Clay Fill (Irrelevant)_8	741
14.8	16.65	Clay Fill (Irrelevant)	Soil	2.05E+06	0.5	1258.0	24	Clay Fill (Irrelevant)_9	120	D&S, p'=800-1600, PI=20-25	D&S, p'=800-1600, PI=20-25	1.85	Clay Fill (Irrelevant)_9	741
16.65	18.5	Clay Fill (Irrelevant)	Soil	2.05E+06	0.5	1406.0	24	Clay Fill (Irrelevant)_10	120	D&S, p'=800-1600, PI=20-25	D&S, p'=800-1600, PI=20-25	1.85	Clay Fill (Irrelevant)_10	741
18.5	20.35	Clay Fill (Irrelevant)	Soil	2.05E+06	0.5	1554.0	24	Clay Fill (Irrelevant)_11	120	D&S, p'=800-1600, PI=20-25	D&S, p'=800-1600, PI=20-25	1.85	Clay Fill (Irrelevant)_11	741
20.35	22.2	Clay Fill (Irrelevant)	Soil	2.05E+06	0.5	1702.0	24	Clay Fill (Irrelevant)_12	120	D&S, p'=1600-2500, PI=20-25	D&S, p'=1600-2500, PI=20-25	1.85	Clay Fill (Irrelevant)_12	741
22.2	24.05	Clay Fill (Irrelevant)	Soil	2.05E+06	0.5	1850.0	24	Clay Fill (Irrelevant)_13	120	D&S, p'=1600-2500, PI=20-25	D&S, p'=1600-2500, PI=20-25	1.85	Clay Fill (Irrelevant)_13	741
24.05	25	Clay Fill (Irrelevant)	Soil	2.05E+06	0.5	1962.0	24	Clay Fill (Irrelevant)_14	120	D&S, p'=1600-2500, PI=20-25	D&S, p'=1600-2500, PI=20-25	0.95	Clay Fill (Irrelevant)_14	741
25	26.87	Subunit 1	Soil	2.22E+06	0.5	2079.2	11	Subunit 1_15	127	D&S, p'=1600-2500, PI=10-15	D&S, p'=1600-2500, PI=10-15	1.87	Subunit 1_15	750
26.87	28.74	Subunit 1	Soil	2.22E+06	0.5	2237.5	11	Subunit 1_16	127	D&S, p'=1600-2500, PI=10-15	D&S, p'=1600-2500, PI=10-15	1.87	Subunit 1_16	750
28.74	30.61	Subunit 1	Soil	2.22E+06	0.5	2395.8	11	Subunit 1_17	127	D&S, p'=1600-2500, PI=10-15	D&S, p'=1600-2500, PI=10-15	1.87	Subunit 1_17	750
30.61	31.4	Subunit 1	Soil	2.22E+06	0.5	2508.4	11	Subunit 1_18	127	D&S, p'=2500-5000, PI=10-15	D&S, p'=2500-5000, PI=10-15	0.79	Subunit 1_18	750
31.4	33.15	Subunit 3	Soil	1.99E+06	0.5	2618.3	0	Subunit 3_19	131	D&S, p'=2500-5000, PI=0	D&S, p'=2500-5000, PI=0	1.75	Subunit 3_19	700
33.15	34.9	Subunit 3	Soil	1.99E+06	0.5	2771.1	0	Subunit 3_20	131	D&S, p'=2500-5000, PI=0	D&S, p'=2500-5000, PI=0	1.75	Subunit 3_20	700
34.9	36.65	Subunit 3	Soil	1.99E+06	0.5	2924.0	0	Subunit 3_21	131	D&S, p'=2500-5000, PI=0	D&S, p'=2500-5000, PI=0	1.75	Subunit 3_21	700
36.65	38.4	Subunit 3	Soil	1.99E+06	0.5	3076.8	0	Subunit 3_22	131	D&S, p'=2500-5000, PI=0	D&S, p'=2500-5000, PI=0	1.75	Subunit 3_22	700
38.4	40.15	Subunit 3	Soil	1.99E+06	0.5	3229.6	0	Subunit 3_23	131	D&S, p'=2500-5000, PI=0	D&S, p'=2500-5000, PI=0	1.75	Subunit 3_23	700
40.15	41.9	Subunit 3	Soil	1.99E+06	0.5	3382.5	0	Subunit 3_24	131	D&S, p'=2500-5000, PI=0	D&S, p'=2500-5000, PI=0	1.75	Subunit 3_24	700
41.9	43.65	Subunit 3	Soil	1.99E+06	0.5	3535.3	0	Subunit 3_25	131	D&S, p'=2500-5000, PI=0	D&S, p'=2500-5000, PI=0	1.75	Subunit 3_25	700
43.65	45.4	Subunit 3	Soil	1.99E+06	0.5	3688.1	0	Subunit 3_26	131	D&S, p'=2500-5000, PI=0	D&S, p'=2500-5000, PI=0	1.75	Subunit 3_26	700
45.4	47.15	Subunit 3	Soil	1.99E+06	0.5	3841.0	0	Subunit 3_27	131	D&S, p'=2500-5000, PI=0	D&S, p'=2500-5000, PI=0	1.75	Subunit 3_27	700
47.15	48.9	Subunit 3	Soil	1.99E+06	0.5	3993.8	0	Subunit 3_28	131	D&S, p'=2500-5000, PI=0	D&S, p'=2500-5000, PI=0	1.75	Subunit 3_28	700
48.9	51.95	Shale (0'-15')	Soft Rock	6.47E+06	0.5	4212.5	0	Shale (0'-15')_29	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_29	1220
51.95	55	Shale (0'-15')	Soft Rock	6.47E+06	0.5	4497.2	0	Shale (0'-15')_30	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_30	1220
55	58.05	Shale (0'-15')	Soft Rock	6.47E+06	0.5	4781.9	0	Shale (0'-15')_31	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_31	1220
58.05	61.1	Shale (0'-15')	Soft Rock	6.47E+06	0.5	5066.5	0	Shale (0'-15')_32	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_32	1220
61.1	63.9	Shale (0'-15')	Soft Rock	6.47E+06	0.5	5339.5	0	Shale (0'-15')_33	140	Silva et al., 50'-120'	Silva et al., 50'-120'	2.8	Shale (0'-15')_33	1220
63.9	67.3	Shale (15'-30')	Soft Rock	8.04E+06	0.5	5628.9	0	Shale (15'-30')_34	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_34	1360
67.3	70.7	Shale (15'-30')	Soft Rock	8.04E+06	0.5	5946.2	0	Shale (15'-30')_35	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_35	1360
70.7	74.1	Shale (15'-30')	Soft Rock	8.04E+06	0.5	6263.5	0	Shale (15'-30')_36	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_36	1360
74.1	75.4	Shale (15'-30')	Soft Rock	8.04E+06	0.5	6482.9	0	Shale (15'-30')_37	140	Silva et al., 50'-120'	Silva et al., 50'-120'	1.3	Shale (15'-30')_37	1360
75.4	175.4	Shale (El. 575'-675')	Firm Rock	4.18E+07	0.5	11210.2	0	Shale (El. 575'-675')_38	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 575'-675')_38	3100
175.4	275.4	Shale (El. 475'-575')	Firm Rock	7.31E+07	0.5	20543.5	0	Shale (El. 475'-575')_39	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 475'-575')_39	4100
275.4	375.4	Shale (El. 375'-475')	Firm Rock	1.13E+08	0.5	29876.9	0	Shale (El. 375'-475')_40	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 375'-475')_40	5100
375.4	475.4	Shale (El. 275'-375')	Firm Rock	1.62E+08	0.5	39210.2	0	Shale (El. 275'-375')_41	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 275'-375')_41	6100
475.4	575.4	Shale (El. 175'-275')	Firm Rock	2.19E+08	0.5	48543.5	0	Shale (El. 175'-275')_42	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 175'-275')_42	7100
575.4	675.4	Shale (El. 75'-175')	Firm Rock	2.85E+08	0.5	57876.9	0	Shale (El. 75'-175')_43	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 75'-175')_43	8100
675.4	715.4	Shale (El. 35'-75')	Firm Rock	3.37E+08	0.5	64410.2	0	Shale (El. 35'-75')_44	140	Firm/Hard Rock	Firm/Hard Rock	40	Shale (El. 35'-75')_44	8800
715.4	Half-Space	Shale (El. < 35')	Half-Space	3.52E+08	0.5	Half-Space	0	Bedrock	140	NA, Half-Space	Damping = 0.5%	Half Space	Bedrock	9000

Facility	KIF East Dike	
Section/Group	Polishing Pond	
Profile Name	KIF-TW05_NOR	
Top of Profile Elevation	770.5	ft
Depth to water table during EQ	17.41	ft
Surcharge Pressure		psf

Strata Profile

Non-input Information								Strata "Soil Types" Input				Strata "Soil Profile" Input		
Top Depth (ft)	**Bottom Depth (ft)**	**Layer Name**	**Layer Type**	**G_{max} (psf)**	**K_o**	**Mean Effective Stress at midpoint (psf)**	**Plasticity Index**	**Name (for Strata)**	**Unit Weight (pcf)**	**Modulus Reduction (G/Gmax) Model**	**Damping Model**	**Thickness (ft)**	**Soil Type (for Strata)**	**Shear Wave Velocity (fps)**
0	0.82	Cover Material	Soil	4.01E+05	0.5	32.8	38	Cover Material_1	120	D&S, p'=0-400, PI=30-40	D&S, p'=0-400, PI=30-40	0.82	Cover Material_1	328
0.82	1.64	Cover Material	Soil	4.01E+05	0.5	98.4	38	Cover Material_2	120	D&S, p'=0-400, PI=30-40	D&S, p'=0-400, PI=30-40	0.82	Cover Material_2	328
1.64	2	Cover Material	Soil	4.01E+05	0.5	145.6	38	Cover Material_3	120	D&S, p'=0-400, PI=30-40	D&S, p'=0-400, PI=30-40	0.36	Cover Material_3	328
2	3.62	Bottom Ash	Soil	1.56E+06	0.5	224.3	0	Bottom Ash_4	119	D&S, p'=0-400, PI=0	D&S, p'=0-400, PI=0	1.62	Bottom Ash_4	650
3.62	5.24	Bottom Ash	Soil	1.56E+06	0.5	352.8	0	Bottom Ash_5	119	D&S, p'=0-400, PI=0	D&S, p'=0-400, PI=0	1.62	Bottom Ash_5	650
5.24	6.86	Bottom Ash	Soil	1.56E+06	0.5	481.3	0	Bottom Ash_6	119	D&S, p'=400-800, PI=0	D&S, p'=400-800, PI=0	1.62	Bottom Ash_6	650
6.86	8.48	Bottom Ash	Soil	1.56E+06	0.5	609.8	0	Bottom Ash_7	119	D&S, p'=400-800, PI=0	D&S, p'=400-800, PI=0	1.62	Bottom Ash_7	650
8.48	10.1	Bottom Ash	Soil	1.56E+06	0.5	738.3	0	Bottom Ash_8	119	D&S, p'=400-800, PI=0	D&S, p'=400-800, PI=0	1.62	Bottom Ash_8	650
10.1	11.72	Bottom Ash	Soil	1.56E+06	0.5	866.9	0	Bottom Ash_9	119	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.62	Bottom Ash_9	650
11.72	13.34	Bottom Ash	Soil	1.56E+06	0.5	995.4	0	Bottom Ash_10	119	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.62	Bottom Ash_10	650
13.34	14.96	Bottom Ash	Soil	1.56E+06	0.5	1123.9	0	Bottom Ash_11	119	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.62	Bottom Ash_11	650
14.96	16.58	Bottom Ash	Soil	1.56E+06	0.5	1252.4	0	Bottom Ash_12	119	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.62	Bottom Ash_12	650
16.58	17.41	Bottom Ash	Soil	1.56E+06	0.5	1349.6	0	Bottom Ash_13	119	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	0.83	Bottom Ash_13	650
17.41	19.03	Bottom Ash	Soil	1.63E+06	0.5	1415.8	0	Bottom Ash_14	124	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.62	Bottom Ash_14	650
19.03	20.65	Bottom Ash	Soil	1.63E+06	0.5	1482.3	0	Bottom Ash_15	124	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.62	Bottom Ash_15	650
20.65	22.27	Bottom Ash	Soil	1.63E+06	0.5	1548.8	0	Bottom Ash_16	124	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.62	Bottom Ash_16	650
22.27	23.89	Bottom Ash	Soil	1.63E+06	0.5	1615.4	0	Bottom Ash_17	124	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.62	Bottom Ash_17	650
23.89	25.51	Bottom Ash	Soil	1.63E+06	0.5	1681.9	0	Bottom Ash_18	124	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.62	Bottom Ash_18	650
25.51	27.13	Bottom Ash	Soil	1.63E+06	0.5	1748.4	0	Bottom Ash_19	124	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.62	Bottom Ash_19	650
27.13	27.7	Bottom Ash	Soil	1.63E+06	0.5	1793.4	0	Bottom Ash_20	124	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	0.57	Bottom Ash_20	650
27.7	29.45	Fly Ash	Soil	1.70E+06	0.5	1834.0	0	Fly Ash_21	112	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Fly Ash_21	700
29.45	31.2	Fly Ash	Soil	1.70E+06	0.5	1891.9	0	Fly Ash_22	112	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Fly Ash_22	700
31.2	32.95	Fly Ash	Soil	1.70E+06	0.5	1949.8	0	Fly Ash_23	112	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Fly Ash_23	700
32.95	34.7	Fly Ash	Soil	1.70E+06	0.5	2007.6	0	Fly Ash_24	112	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Fly Ash_24	700
34.7	36.45	Fly Ash	Soil	1.70E+06	0.5	2065.5	0	Fly Ash_25	112	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Fly Ash_25	700
36.45	38	Fly Ash	Soil	1.70E+06	0.5	2120.1	0	Fly Ash_26	112	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.55	Fly Ash_26	700
38	39.87	Subunit 1	Soil	2.22E+06	0.5	2186.0	11	Subunit 1_27	127	D&S, p'=1600-2500, PI=10-15	D&S, p'=1600-2500, PI=10-15	1.87	Subunit 1_27	750
39.87	41.74	Subunit 1	Soil	2.22E+06	0.5	2266.5	11	Subunit 1_28	127	D&S, p'=1600-2500, PI=10-15	D&S, p'=1600-2500, PI=10-15	1.87	Subunit 1_28	750
41.74	43.5	Subunit 1	Soil	2.22E+06	0.5	2344.7	11	Subunit 1_29	127	D&S, p'=1600-2500, PI=10-15	D&S, p'=1600-2500, PI=10-15	1.76	Subunit 1_29	750
43.5	45.25	Subunit 2	Soil	1.93E+06	0.5	2420.2	0	Subunit 2_30	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 2_30	700
45.25	47	Subunit 2	Soil	1.93E+06	0.5	2495.6	0	Subunit 2_31	127	D&S, p'=1600-2500, PI=0	D&S, p'=1600-2500, PI=0	1.75	Subunit 2_31	700
47	48.75	Subunit 2	Soil	1.93E+06	0.5	2571.0	0	Subunit 2_32	127	D&S, p'=2500-5000, PI=0	D&S, p'=2500-5000, PI=0	1.75	Subunit 2_32	700
48.75	50.5	Subunit 2	Soil	1.93E+06	0.5	2646.3	0	Subunit 2_33	127	D&S, p'=2500-5000, PI=0	D&S, p'=2500-5000, PI=0	1.75	Subunit 2_33	700
50.5	52.25	Subunit 2	Soil	1.93E+06	0.5	2721.7	0	Subunit 2_34	127	D&S, p'=2500-5000, PI=0	D&S, p'=2500-5000, PI=0	1.75	Subunit 2_34	700
52.25	52.5	Subunit 2	Soil	1.93E+06	0.5	2764.8	0	Subunit 2_35	127	D&S, p'=2500-5000, PI=0	D&S, p'=2500-5000, PI=0	0.25	Subunit 2_35	700
52.5	54.25	Subunit 3	Soil	2.01E+06	0.5	2810.8	0	Subunit 3_36	132	D&S, p'=2500-5000, PI=0	D&S, p'=2500-5000, PI=0	1.75	Subunit 3_36	700
54.25	56	Subunit 3	Soil	2.01E+06	0.5	2892.0	0	Subunit 3_37	132	D&S, p'=2500-5000, PI=0	D&S, p'=2500-5000, PI=0	1.75	Subunit 3_37	700
56	57.75	Subunit 3	Soil	2.01E+06	0.5	2973.2	0	Subunit 3_38	132	D&S, p'=2500-5000, PI=0	D&S, p'=2500-5000, PI=0	1.75	Subunit 3_38	700
57.75	59.5	Subunit 3	Soil	2.01E+06	0.5	3054.4	0	Subunit 3_39	132	D&S, p'=2500-5000, PI=0	D&S, p'=2500-5000, PI=0	1.75	Subunit 3_39	700
59.5	61.25	Subunit 3	Soil	2.01E+06	0.5	3135.6	0	Subunit 3_40	132	D&S, p'=2500-5000, PI=0	D&S, p'=2500-5000, PI=0	1.75	Subunit 3_40	700
61.25	61.5	Subunit 3	Soil	2.01E+06	0.5	3182.0	0	Subunit 3_41	132	D&S, p'=2500-5000, PI=0	D&S, p'=2500-5000, PI=0	0.25	Subunit 3_41	700
61.5	64.55	Shale (0'-15')	Soft Rock	6.47E+06	0.5	3266.6	0	Shale (0'-15')_42	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_42	1220
64.55	67.6	Shale (0'-15')	Soft Rock	6.47E+06	0.5	3424.4	0	Shale (0'-15')_43	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_43	1220
67.6	70.65	Shale (0'-15')	Soft Rock	6.47E+06	0.5	3582.2	0	Shale (0'-15')_44	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_44	1220
70.65	73.7	Shale (0'-15')	Soft Rock	6.47E+06	0.5	3740.0	0	Shale (0'-15')_45	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_45	1220

Strata Profile														
Non-input Information								Strata "Soil Types" Input				Strata "Soil Profile" Input		
Top Depth (ft)	Bottom Depth (ft)	Layer Name	Layer Type	G_{max} (psf)	K_o	Mean Effective Stress at midpoint (psf)	Plasticity Index	Name (for Strata)	Unit Weight (pcf)	Modulus Reduction (G/Gmax) Model	Damping Model	Thickness (ft)	Soil Type (for Strata)	Shear Wave Velocity (fps)
73.7	76.5	Shale (0'-15')	Soft Rock	6.47E+06	0.5	3891.3	0	Shale (0'-15')_46	140	Silva et al., 50'-120'	Silva et al., 50'-120'	2.8	Shale (0'-15')_46	1220
76.5	79.9	Shale (15'-30')	Soft Rock	8.04E+06	0.5	4051.7	0	Shale (15'-30')_47	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_47	1360
79.9	83.3	Shale (15'-30')	Soft Rock	8.04E+06	0.5	4227.6	0	Shale (15'-30')_48	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_48	1360
83.3	86.7	Shale (15'-30')	Soft Rock	8.04E+06	0.5	4403.5	0	Shale (15'-30')_49	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_49	1360
86.7	90.1	Shale (15'-30')	Soft Rock	8.04E+06	0.5	4579.4	0	Shale (15'-30')_50	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_50	1360
90.1	91.5	Shale (15'-30')	Soft Rock	8.04E+06	0.5	4703.5	0	Shale (15'-30')_51	140	Silva et al., 50'-120'	Silva et al., 50'-120'	1.4	Shale (15'-30')_51	1360
91.5	95.22	Shale (>30')	Soft Rock	9.65E+06	0.5	4836.0	0	Shale (>30')_52	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.72	Shale (>30')_52	1490
95.22	95.5	Shale (>30')	Soft Rock	9.65E+06	0.5	4939.4	0	Shale (>30')_53	140	Silva et al., 50'-120'	Silva et al., 50'-120'	0.28	Shale (>30')_53	1490
95.5	195.5	Shale (El. 575'-675')	Firm Rock	4.18E+07	0.5	7533.4	0	Shale (El. 575'-675')_54	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 575'-675')_54	3100
195.5	295.5	Shale (El. 475'-575')	Firm Rock	7.31E+07	0.5	12706.7	0	Shale (El. 475'-575')_55	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 475'-575')_55	4100
295.5	395.5	Shale (El. 375'-475')	Firm Rock	1.13E+08	0.5	17880.0	0	Shale (El. 375'-475')_56	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 375'-475')_56	5100
395.5	495.5	Shale (El. 275'-375')	Firm Rock	1.62E+08	0.5	23053.4	0	Shale (El. 275'-375')_57	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 275'-375')_57	6100
495.5	595.5	Shale (El. 175'-275')	Firm Rock	2.19E+08	0.5	28226.7	0	Shale (El. 175'-275')_58	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 175'-275')_58	7100
595.5	695.5	Shale (El. 75'-175')	Firm Rock	2.85E+08	0.5	33400.0	0	Shale (El. 75'-175')_59	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 75'-175')_59	8100
695.5	735.5	Shale (El. 35'-75')	Firm Rock	3.37E+08	0.5	37021.4	0	Shale (El. 35'-75')_60	140	Firm/Hard Rock	Firm/Hard Rock	40	Shale (El. 35'-75')_60	8800
735.5	Half-Space	Shale (El. < 35')	Half-Space	3.52E+08	0.5	Half-Space	0	Bedrock	140	NA, Half-Space	Damping = 0.5%	Half Space	Bedrock	9000

2.2.3 Alternate Section Profiles

Facility	KIF	
Section/Group	Alternate	
Profile Name	KIF-B05_NOR	
Top of Profile Elevation	756.5	ft
Depth to water table during EQ	5.9	ft
Surcharge Pressure		psf

Strata Profile

Non-input Information								Strata "Soil Types" Input				Strata "Soil Profile" Input		
Top Depth (ft)	**Bottom Depth (ft)**	**Layer Name**	**Layer Type**	**G_{max} (psf)**	**K_o**	**Mean Effective Stress at midpoint (psf)**	**Plasticity Index**	**Name (for Strata)**	**Unit Weight (pcf)**	**Modulus Reduction (G/Gmax) Model**	**Damping Model**	**Thickness (ft)**	**Soil Type (for Strata)**	**Shear Wave Velocity (fps)**
0	1.75	Embankment Fill	Soil	1.95E+06	0.5	74.7	13	Embankment Fill_1	128	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	1.75	Embankment Fill_1	700
1.75	3.5	Embankment Fill	Soil	1.95E+06	0.5	224.0	13	Embankment Fill_2	128	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	1.75	Embankment Fill_2	700
3.5	5.25	Embankment Fill	Soil	1.95E+06	0.5	373.3	13	Embankment Fill_3	128	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	1.75	Embankment Fill_3	700
5.25	5.9	Embankment Fill	Soil	1.95E+06	0.5	475.7	13	Embankment Fill_4	128	D&S, p'=400-800, PI=10-15	D&S, p'=400-800, PI=10-15	0.65	Embankment Fill_4	700
5.9	7.65	Embankment Fill	Soil	1.95E+06	0.5	541.7	13	Embankment Fill_5	128	D&S, p'=400-800, PI=10-15	D&S, p'=400-800, PI=10-15	1.75	Embankment Fill_5	700
7.65	9.4	Embankment Fill	Soil	1.95E+06	0.5	618.3	13	Embankment Fill_6	128	D&S, p'=400-800, PI=10-15	D&S, p'=400-800, PI=10-15	1.75	Embankment Fill_6	700
9.4	11.15	Embankment Fill	Soil	1.95E+06	0.5	694.8	13	Embankment Fill_7	128	D&S, p'=400-800, PI=10-15	D&S, p'=400-800, PI=10-15	1.75	Embankment Fill_7	700
11.15	12.9	Embankment Fill	Soil	1.95E+06	0.5	771.3	13	Embankment Fill_8	128	D&S, p'=400-800, PI=10-15	D&S, p'=400-800, PI=10-15	1.75	Embankment Fill_8	700
12.9	14.65	Embankment Fill	Soil	1.95E+06	0.5	847.9	13	Embankment Fill_9	128	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.75	Embankment Fill_9	700
14.65	16.4	Embankment Fill	Soil	1.95E+06	0.5	924.4	13	Embankment Fill_10	128	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.75	Embankment Fill_10	700
16.4	18.15	Embankment Fill	Soil	1.95E+06	0.5	1000.9	13	Embankment Fill_11	128	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.75	Embankment Fill_11	700
18.15	19.9	Embankment Fill	Soil	1.95E+06	0.5	1077.5	13	Embankment Fill_12	128	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.75	Embankment Fill_12	700
19.9	21.65	Embankment Fill	Soil	1.95E+06	0.5	1154.0	13	Embankment Fill_13	128	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.75	Embankment Fill_13	700
21.65	23.4	Embankment Fill	Soil	1.95E+06	0.5	1230.5	13	Embankment Fill_14	128	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.75	Embankment Fill_14	700
23.4	25.15	Embankment Fill	Soil	1.95E+06	0.5	1307.1	13	Embankment Fill_15	128	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.75	Embankment Fill_15	700
25.15	26.9	Embankment Fill	Soil	1.95E+06	0.5	1383.6	13	Embankment Fill_16	128	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.75	Embankment Fill_16	700
26.9	28.65	Embankment Fill	Soil	1.95E+06	0.5	1460.1	13	Embankment Fill_17	128	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.75	Embankment Fill_17	700
28.65	30.4	Embankment Fill	Soil	1.95E+06	0.5	1536.7	13	Embankment Fill_18	128	D&S, p'=800-1600, PI=10-15	D&S, p'=800-1600, PI=10-15	1.75	Embankment Fill_18	700
30.4	32.15	Embankment Fill	Soil	1.95E+06	0.5	1613.2	13	Embankment Fill_19	128	D&S, p'=1600-2500, PI=10-15	D&S, p'=1600-2500, PI=10-15	1.75	Embankment Fill_19	700
32.15	32.5	Embankment Fill	Soil	1.95E+06	0.5	1659.1	13	Embankment Fill_20	128	D&S, p'=1600-2500, PI=10-15	D&S, p'=1600-2500, PI=10-15	0.35	Embankment Fill_20	700
32.5	34.37	Subunit 1	Soil	2.22E+06	0.5	1707.0	13	Subunit 1_21	127	D&S, p'=1600-2500, PI=10-15	D&S, p'=1600-2500, PI=10-15	1.87	Subunit 1_21	750
34.37	36.24	Subunit 1	Soil	2.22E+06	0.5	1787.6	13	Subunit 1_22	127	D&S, p'=1600-2500, PI=10-15	D&S, p'=1600-2500, PI=10-15	1.87	Subunit 1_22	750
36.24	38.11	Subunit 1	Soil	2.22E+06	0.5	1868.1	13	Subunit 1_23	127	D&S, p'=1600-2500, PI=10-15	D&S, p'=1600-2500, PI=10-15	1.87	Subunit 1_23	750
38.11	39.98	Subunit 1	Soil	2.22E+06	0.5	1948.6	13	Subunit 1_24	127	D&S, p'=1600-2500, PI=10-15	D&S, p'=1600-2500, PI=10-15	1.87	Subunit 1_24	750
39.98	41.85	Subunit 1	Soil	2.22E+06	0.5	2029.2	13	Subunit 1_25	127	D&S, p'=1600-2500, PI=10-15	D&S, p'=1600-2500, PI=10-15	1.87	Subunit 1_25	750
41.85	43.72	Subunit 1	Soil	2.22E+06	0.5	2109.7	13	Subunit 1_26	127	D&S, p'=1600-2500, PI=10-15	D&S, p'=1600-2500, PI=10-15	1.87	Subunit 1_26	750
43.72	45.59	Subunit 1	Soil	2.22E+06	0.5	2190.2	13	Subunit 1_27	127	D&S, p'=1600-2500, PI=10-15	D&S, p'=1600-2500, PI=10-15	1.87	Subunit 1_27	750
45.59	47.46	Subunit 1	Soil	2.22E+06	0.5	2270.8	13	Subunit 1_28	127	D&S, p'=1600-2500, PI=10-15	D&S, p'=1600-2500, PI=10-15	1.87	Subunit 1_28	750
47.46	48.6	Subunit 1	Soil	2.22E+06	0.5	2335.6	13	Subunit 1_29	127	D&S, p'=1600-2500, PI=10-15	D&S, p'=1600-2500, PI=10-15	1.14	Subunit 1_29	750
48.6	51.65	Shale (0'-15')	Soft Rock	6.47E+06	0.5	2439.0	0	Shale (0'-15')_30	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_30	1220
51.65	54.7	Shale (0'-15')	Soft Rock	6.47E+06	0.5	2596.8	0	Shale (0'-15')_31	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_31	1220
54.7	57.75	Shale (0'-15')	Soft Rock	6.47E+06	0.5	2754.6	0	Shale (0'-15')_32	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_32	1220
57.75	60.8	Shale (0'-15')	Soft Rock	6.47E+06	0.5	2912.4	0	Shale (0'-15')_33	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.05	Shale (0'-15')_33	1220
60.8	63.6	Shale (0'-15')	Soft Rock	6.47E+06	0.5	3063.7	0	Shale (0'-15')_34	140	Silva et al., 50'-120'	Silva et al., 50'-120'	2.8	Shale (0'-15')_34	1220
63.6	67	Shale (15'-30')	Soft Rock	8.04E+06	0.5	3224.1	0	Shale (15'-30')_35	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_35	1360
67	70.4	Shale (15'-30')	Soft Rock	8.04E+06	0.5	3400.0	0	Shale (15'-30')_36	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_36	1360
70.4	73.8	Shale (15'-30')	Soft Rock	8.04E+06	0.5	3575.9	0	Shale (15'-30')_37	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_37	1360
73.8	77.2	Shale (15'-30')	Soft Rock	8.04E+06	0.5	3751.8	0	Shale (15'-30')_38	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_38	1360
77.2	78.6	Shale (15'-30')	Soft Rock	8.04E+06	0.5	3875.9	0	Shale (15'-30')_39	140	Silva et al., 50'-120'	Silva et al., 50'-120'	1.4	Shale (15'-30')_39	1360
78.6	81.5	Shale (>30')	Soft Rock	9.65E+06	0.5	3987.2	0	Shale (>30')_40	140	Silva et al., 50'-120'	Silva et al., 50'-120'	2.9	Shale (>30')_40	1490
81.5	181.5	Shale (El. 575'-675')	Firm Rock	4.18E+07	0.5	6648.8	0	Shale (El. 575'-675')_41	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 575'-675')_41	3100
181.5	281.5	Shale (El. 475'-575')	Firm Rock	7.31E+07	0.5	11822.2	0	Shale (El. 475'-575')_42	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 475'-575')_42	4100
281.5	381.5	Shale (El. 375'-475')	Firm Rock	1.13E+08	0.5	16995.5	0	Shale (El. 375'-475')_43	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 375'-475')_43	5100
381.5	481.5	Shale (El. 275'-375')	Firm Rock	1.62E+08	0.5	22168.8	0	Shale (El. 275'-375')_44	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 275'-375')_44	6100
481.5	581.5	Shale (El. 175'-275')	Firm Rock	2.19E+08	0.5	27342.2	0	Shale (El. 175'-275')_45	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 175'-275')_45	7100
581.5	681.5	Shale (El. 75'-175')	Firm Rock	2.85E+08	0.5	32515.5	0	Shale (El. 75'-175')_46	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 75'-175')_46	8100
681.5	721.5	Shale (El. 35'-75')	Firm Rock	3.37E+08	0.5	36136.8	0	Shale (El. 35'-75')_47	140	Firm/Hard Rock	Firm/Hard Rock	40	Shale (El. 35'-75')_47	8800
721.5	Half-Space	Shale (El. < 35')	Half-Space	3.52E+08	0.5	Half-Space	0	Bedrock	140	NA, Half-Space	Damping = 0.5%	Half Space	Bedrock	9000

Facility	KIF	
Section/Group	Alternate	
Profile Name	KIF-B06_NOR	
Top of Profile Elevation	733.9	ft
Depth to water table during EQ	0	ft
Surcharge Pressure		psf

Strata Profile

Non-input Information								Strata "Soil Types" Input				Strata "Soil Profile" Input		
Top Depth (ft)	**Bottom Depth (ft)**	**Layer Name**	**Layer Type**	**G_{max} (psf)**	**K_o**	**Mean Effective Stress at midpoint (psf)**	**Plasticity Index**	**Name (for Strata)**	**Unit Weight (pcf)**	**Modulus Reduction (G/Gmax) Model**	**Damping Model**	**Thickness (ft)**	**Soil Type (for Strata)**	**Shear Wave Velocity (fps)**
0	0.65	Sediment	Soil	2.37E+05	0.5	11.0	12	Sediment_1	113	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	0.65	Sediment_1	260
0.65	1.3	Sediment	Soil	2.37E+05	0.5	32.9	12	Sediment_2	113	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	0.65	Sediment_2	260
1.3	1.95	Sediment	Soil	2.37E+05	0.5	54.8	12	Sediment_3	113	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	0.65	Sediment_3	260
1.95	2.6	Sediment	Soil	2.37E+05	0.5	76.7	12	Sediment_4	113	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	0.65	Sediment_4	260
2.6	3.25	Sediment	Soil	2.37E+05	0.5	98.7	12	Sediment_5	113	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	0.65	Sediment_5	260
3.25	3.9	Sediment	Soil	2.37E+05	0.5	120.6	12	Sediment_6	113	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	0.65	Sediment_6	260
3.9	4.55	Sediment	Soil	2.37E+05	0.5	142.5	12	Sediment_7	113	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	0.65	Sediment_7	260
4.55	5.2	Sediment	Soil	2.37E+05	0.5	164.5	12	Sediment_8	113	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	0.65	Sediment_8	260
5.2	5.85	Sediment	Soil	2.37E+05	0.5	186.4	12	Sediment_9	113	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	0.65	Sediment_9	260
5.85	6.5	Sediment	Soil	2.37E+05	0.5	208.3	12	Sediment_10	113	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	0.65	Sediment_10	260
6.5	7.15	Sediment	Soil	2.37E+05	0.5	230.2	12	Sediment_11	113	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	0.65	Sediment_11	260
7.15	7.5	Sediment	Soil	2.37E+05	0.5	247.1	12	Sediment_12	113	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	0.35	Sediment_12	260
7.5	9.25	Embankment Fill	Soil	1.95E+06	0.5	291.3	13	Embankment Fill_13	128	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	1.75	Embankment Fill_13	700
9.25	11	Embankment Fill	Soil	1.95E+06	0.5	367.8	13	Embankment Fill_14	128	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	1.75	Embankment Fill_14	700
11	12	Embankment Fill	Soil	1.95E+06	0.5	427.9	13	Embankment Fill_15	128	D&S, p'=400-800, PI=10-15	D&S, p'=400-800, PI=10-15	1	Embankment Fill_15	700
12	13.87	Subunit 1	Soil	2.22E+06	0.5	490.1	13	Subunit 1_16	127	D&S, p'=400-800, PI=10-15	D&S, p'=400-800, PI=10-15	1.87	Subunit 1_16	750
13.87	15.74	Subunit 1	Soil	2.22E+06	0.5	570.6	13	Subunit 1_17	127	D&S, p'=400-800, PI=10-15	D&S, p'=400-800, PI=10-15	1.87	Subunit 1_17	750
15.74	17.61	Subunit 1	Soil	2.22E+06	0.5	651.1	13	Subunit 1_18	127	D&S, p'=400-800, PI=10-15	D&S, p'=400-800, PI=10-15	1.87	Subunit 1_18	750
17.61	19.48	Subunit 1	Soil	2.22E+06	0.5	731.7	13	Subunit 1_19	127	D&S, p'=400-800, PI=10-15	D&S, p'=400-800, PI=10-15	1.87	Subunit 1_19	750
19.48	19.5	Subunit 1	Soil	2.22E+06	0.5	772.4	13	Subunit 1_20	127	D&S, p'=400-800, PI=10-15	D&S, p'=400-800, PI=10-15	0.02	Subunit 1_20	750
19.5	21.25	Subunit 2	Soil	1.93E+06	0.5	810.5	0	Subunit 2_21	127	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Subunit 2_21	700
21.25	23	Subunit 2	Soil	1.93E+06	0.5	885.8	0	Subunit 2_22	127	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Subunit 2_22	700
23	24.5	Subunit 2	Soil	1.93E+06	0.5	955.8	0	Subunit 2_23	127	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.5	Subunit 2_23	700
24.5	25.7	Subunit 3	Soil	2.01E+06	0.5	1016.0	0	Subunit 3_24	132	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.2	Subunit 3_24	700
25.7	28.75	Shale (0'-15')	Soft Rock	6.47E+06	0.5	1122.7	0	Shale (0'-15')_25	140	Silva et al., 20'-50'	Silva et al., 20'-50'	3.05	Shale (0'-15')_25	1220
28.75	31.8	Shale (0'-15')	Soft Rock	6.47E+06	0.5	1280.5	0	Shale (0'-15')_26	140	Silva et al., 20'-50'	Silva et al., 20'-50'	3.05	Shale (0'-15')_26	1220
31.8	34.85	Shale (0'-15')	Soft Rock	6.47E+06	0.5	1438.3	0	Shale (0'-15')_27	140	Silva et al., 20'-50'	Silva et al., 20'-50'	3.05	Shale (0'-15')_27	1220
34.85	37.9	Shale (0'-15')	Soft Rock	6.47E+06	0.5	1596.1	0	Shale (0'-15')_28	140	Silva et al., 20'-50'	Silva et al., 20'-50'	3.05	Shale (0'-15')_28	1220
37.9	40.7	Shale (0'-15')	Soft Rock	6.47E+06	0.5	1747.4	0	Shale (0'-15')_29	140	Silva et al., 20'-50'	Silva et al., 20'-50'	2.8	Shale (0'-15')_29	1220
40.7	44.1	Shale (15'-30')	Soft Rock	8.04E+06	0.5	1907.8	0	Shale (15'-30')_30	140	Silva et al., 20'-50'	Silva et al., 20'-50'	3.4	Shale (15'-30')_30	1360
44.1	47.5	Shale (15'-30')	Soft Rock	8.04E+06	0.5	2083.7	0	Shale (15'-30')_31	140	Silva et al., 20'-50'	Silva et al., 20'-50'	3.4	Shale (15'-30')_31	1360
47.5	50.9	Shale (15'-30')	Soft Rock	8.04E+06	0.5	2259.5	0	Shale (15'-30')_32	140	Silva et al., 20'-50'	Silva et al., 20'-50'	3.4	Shale (15'-30')_32	1360
50.9	54.3	Shale (15'-30')	Soft Rock	8.04E+06	0.5	2435.4	0	Shale (15'-30')_33	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_33	1360
54.3	55.7	Shale (15'-30')	Soft Rock	8.04E+06	0.5	2559.6	0	Shale (15'-30')_34	140	Silva et al., 50'-120'	Silva et al., 50'-120'	1.4	Shale (15'-30')_34	1360
55.7	58.9	Shale (>30')	Soft Rock	9.65E+06	0.5	2678.6	0	Shale (>30')_35	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.2	Shale (>30')_35	1490
58.9	158.9	Shale (El. 575'-675')	Firm Rock	4.18E+07	0.5	5348.0	0	Shale (El. 575'-675')_36	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 575'-675')_36	3100
158.9	258.9	Shale (El. 475'-575')	Firm Rock	7.31E+07	0.5	10521.4	0	Shale (El. 475'-575')_37	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 475'-575')_37	4100
258.9	358.9	Shale (El. 375'-475')	Firm Rock	1.13E+08	0.5	15694.7	0	Shale (El. 375'-475')_38	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 375'-475')_38	5100
358.9	458.9	Shale (El. 275'-375')	Firm Rock	1.62E+08	0.5	20868.0	0	Shale (El. 275'-375')_39	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 275'-375')_39	6100
458.9	558.9	Shale (El. 175'-275')	Firm Rock	2.19E+08	0.5	26041.4	0	Shale (El. 175'-275')_40	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 175'-275')_40	7100
558.9	658.9	Shale (El. 75'-175')	Firm Rock	2.85E+08	0.5	31214.7	0	Shale (El. 75'-175')_41	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 75'-175')_41	8100
658.9	698.9	Shale (El. 35'-75')	Firm Rock	3.37E+08	0.5	34836.0	0	Shale (El. 35'-75')_42	140	Firm/Hard Rock	Firm/Hard Rock	40	Shale (El. 35'-75')_42	8800
698.9	Half-Space	Shale (El. < 35')	Half-Space	3.52E+08	0.5	Half-Space	0	Bedrock	140	NA, Half-Space	Damping = 0.5%	Half Space	Bedrock	9000

Facility	KIF	
Section/Group	Alternate	
Profile Name	KIF-B07_NOR	
Top of Profile Elevation	731.6	ft
Depth to water table during EQ	0	ft
Surcharge Pressure		psf

Strata Profile

Non-input Information								Strata "Soil Types" Input				Strata "Soil Profile" Input		
Top Depth (ft)	**Bottom Depth (ft)**	**Layer Name**	**Layer Type**	**G_{max} (psf)**	**K_o**	**Mean Effective Stress at midpoint (psf)**	**Plasticity Index**	**Name (for Strata)**	**Unit Weight (pcf)**	**Modulus Reduction (G/Gmax) Model**	**Damping Model**	**Thickness (ft)**	**Soil Type (for Strata)**	**Shear Wave Velocity (fps)**
0	0.65	Sediment	Soil	2.37E+05	0.5	11.0	12	Sediment_1	113	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	0.65	Sediment_1	260
0.65	1.3	Sediment	Soil	2.37E+05	0.5	32.9	12	Sediment_2	113	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	0.65	Sediment_2	260
1.3	1.95	Sediment	Soil	2.37E+05	0.5	54.8	12	Sediment_3	113	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	0.65	Sediment_3	260
1.95	2.6	Sediment	Soil	2.37E+05	0.5	76.7	12	Sediment_4	113	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	0.65	Sediment_4	260
2.6	3.25	Sediment	Soil	2.37E+05	0.5	98.7	12	Sediment_5	113	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	0.65	Sediment_5	260
3.25	3.9	Sediment	Soil	2.37E+05	0.5	120.6	12	Sediment_6	113	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	0.65	Sediment_6	260
3.9	4.55	Sediment	Soil	2.37E+05	0.5	142.5	12	Sediment_7	113	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	0.65	Sediment_7	260
4.55	5.2	Sediment	Soil	2.37E+05	0.5	164.5	12	Sediment_8	113	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	0.65	Sediment_8	260
5.2	5.85	Sediment	Soil	2.37E+05	0.5	186.4	12	Sediment_9	113	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	0.65	Sediment_9	260
5.85	6.5	Sediment	Soil	2.37E+05	0.5	208.3	12	Sediment_10	113	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	0.65	Sediment_10	260
6.5	7.15	Sediment	Soil	2.37E+05	0.5	230.2	12	Sediment_11	113	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	0.65	Sediment_11	260
7.15	7.8	Sediment	Soil	2.37E+05	0.5	252.2	12	Sediment_12	113	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	0.65	Sediment_12	260
7.8	8.45	Sediment	Soil	2.37E+05	0.5	274.1	12	Sediment_13	113	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	0.65	Sediment_13	260
8.45	9.1	Sediment	Soil	2.37E+05	0.5	296.0	12	Sediment_14	113	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	0.65	Sediment_14	260
9.1	9.75	Sediment	Soil	2.37E+05	0.5	317.9	12	Sediment_15	113	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	0.65	Sediment_15	260
9.75	10.2	Sediment	Soil	2.37E+05	0.5	336.5	12	Sediment_16	113	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	0.45	Sediment_16	260
10.2	12.07	Subunit 1	Soil	2.22E+06	0.5	384.3	13	Subunit 1_17	127	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	1.87	Subunit 1_17	750
12.07	12.7	Subunit 1	Soil	2.22E+06	0.5	438.2	13	Subunit 1_18	127	D&S, p'=400-800, PI=10-15	D&S, p'=400-800, PI=10-15	0.63	Subunit 1_18	750
12.7	14.45	Subunit 2	Soil	1.93E+06	0.5	489.4	0	Subunit 2_19	127	D&S, p'=400-800, PI=0	D&S, p'=400-800, PI=0	1.75	Subunit 2_19	700
14.45	16.2	Subunit 2	Soil	1.93E+06	0.5	564.8	0	Subunit 2_20	127	D&S, p'=400-800, PI=0	D&S, p'=400-800, PI=0	1.75	Subunit 2_20	700
16.2	17.95	Subunit 2	Soil	1.93E+06	0.5	640.2	0	Subunit 2_21	127	D&S, p'=400-800, PI=0	D&S, p'=400-800, PI=0	1.75	Subunit 2_21	700
17.95	19.7	Subunit 2	Soil	1.93E+06	0.5	715.5	0	Subunit 2_22	127	D&S, p'=400-800, PI=0	D&S, p'=400-800, PI=0	1.75	Subunit 2_22	700
19.7	21.45	Subunit 2	Soil	1.93E+06	0.5	790.9	0	Subunit 2_23	127	D&S, p'=400-800, PI=0	D&S, p'=400-800, PI=0	1.75	Subunit 2_23	700
21.45	22.2	Subunit 2	Soil	1.93E+06	0.5	844.7	0	Subunit 2_24	127	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	0.75	Subunit 2_24	700
22.2	23.6	Subunit 3	Soil	2.01E+06	0.5	893.4	0	Subunit 3_25	132	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.4	Subunit 3_25	700
23.6	26.65	Shale (0'-15')	Soft Rock	6.47E+06	0.5	1004.7	0	Shale (0'-15')_26	140	Silva et al., 20'-50'	Silva et al., 20'-50'	3.05	Shale (0'-15')_26	1220
26.65	29.7	Shale (0'-15')	Soft Rock	6.47E+06	0.5	1162.5	0	Shale (0'-15')_27	140	Silva et al., 20'-50'	Silva et al., 20'-50'	3.05	Shale (0'-15')_27	1220
29.7	32.75	Shale (0'-15')	Soft Rock	6.47E+06	0.5	1320.3	0	Shale (0'-15')_28	140	Silva et al., 20'-50'	Silva et al., 20'-50'	3.05	Shale (0'-15')_28	1220
32.75	35.8	Shale (0'-15')	Soft Rock	6.47E+06	0.5	1478.1	0	Shale (0'-15')_29	140	Silva et al., 20'-50'	Silva et al., 20'-50'	3.05	Shale (0'-15')_29	1220
35.8	38.6	Shale (0'-15')	Soft Rock	6.47E+06	0.5	1629.4	0	Shale (0'-15')_30	140	Silva et al., 20'-50'	Silva et al., 20'-50'	2.8	Shale (0'-15')_30	1220
38.6	42	Shale (15'-30')	Soft Rock	8.04E+06	0.5	1789.8	0	Shale (15'-30')_31	140	Silva et al., 20'-50'	Silva et al., 20'-50'	3.4	Shale (15'-30')_31	1360
42	45.4	Shale (15'-30')	Soft Rock	8.04E+06	0.5	1965.7	0	Shale (15'-30')_32	140	Silva et al., 20'-50'	Silva et al., 20'-50'	3.4	Shale (15'-30')_32	1360
45.4	48.8	Shale (15'-30')	Soft Rock	8.04E+06	0.5	2141.6	0	Shale (15'-30')_33	140	Silva et al., 20'-50'	Silva et al., 20'-50'	3.4	Shale (15'-30')_33	1360
48.8	52.2	Shale (15'-30')	Soft Rock	8.04E+06	0.5	2317.5	0	Shale (15'-30')_34	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_34	1360
52.2	53.6	Shale (15'-30')	Soft Rock	8.04E+06	0.5	2441.6	0	Shale (15'-30')_35	140	Silva et al., 50'-120'	Silva et al., 50'-120'	1.4	Shale (15'-30')_35	1360
53.6	56.6	Shale (>30')	Soft Rock	9.65E+06	0.5	2555.4	0	Shale (>30')_36	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3	Shale (>30')_36	1490
56.6	156.6	Shale (El. 575'-675')	Firm Rock	4.18E+07	0.5	5219.7	0	Shale (El. 575'-675')_37	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 575'-675')_37	3100
156.6	256.6	Shale (El. 475'-575')	Firm Rock	7.31E+07	0.5	10393.0	0	Shale (El. 475'-575')_38	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 475'-575')_38	4100
256.6	356.6	Shale (El. 375'-475')	Firm Rock	1.13E+08	0.5	15566.4	0	Shale (El. 375'-475')_39	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 375'-475')_39	5100
356.6	456.6	Shale (El. 275'-375')	Firm Rock	1.62E+08	0.5	20739.7	0	Shale (El. 275'-375')_40	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 275'-375')_40	6100
456.6	556.6	Shale (El. 175'-275')	Firm Rock	2.19E+08	0.5	25913.0	0	Shale (El. 175'-275')_41	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 175'-275')_41	7100
556.6	656.6	Shale (El. 75'-175')	Firm Rock	2.85E+08	0.5	31086.4	0	Shale (El. 75'-175')_42	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 75'-175')_42	8100
656.6	696.6	Shale (El. 35'-75')	Firm Rock	3.37E+08	0.5	34707.7	0	Shale (El. 35'-75')_43	140	Firm/Hard Rock	Firm/Hard Rock	40	Shale (El. 35'-75')_43	8800
696.6	Half-Space	Shale (El. < 35')	Half-Space	3.52E+08	0.5	Half-Space	0	Bedrock	140	NA, Half-Space	Damping = 0.5%	Half Space	Bedrock	9000

Facility	KIF	
Section/Group	Alternate	
Profile Name	KIF-B08_NOR	
Top of Profile Elevation	730.8	ft
Depth to water table during EQ	0	ft
Surcharge Pressure		psf

Strata Profile

Non-input Information								Strata "Soil Types" Input				Strata "Soil Profile" Input		
Top Depth (ft)	**Bottom Depth (ft)**	**Layer Name**	**Layer Type**	**G_{max} (psf)**	**K_o**	**Mean Effective Stress at midpoint (psf)**	**Plasticity Index**	**Name (for Strata)**	**Unit Weight (pcf)**	**Modulus Reduction (G/Gmax) Model**	**Damping Model**	**Thickness (ft)**	**Soil Type (for Strata)**	**Shear Wave Velocity (fps)**
0	0.65	Sediment	Soil	2.37E+05	0.5	11.0	12	Sediment_1	113	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	0.65	Sediment_1	260
0.65	1.3	Sediment	Soil	2.37E+05	0.5	32.9	12	Sediment_2	113	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	0.65	Sediment_2	260
1.3	1.95	Sediment	Soil	2.37E+05	0.5	54.8	12	Sediment_3	113	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	0.65	Sediment_3	260
1.95	2.6	Sediment	Soil	2.37E+05	0.5	76.7	12	Sediment_4	113	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	0.65	Sediment_4	260
2.6	3.25	Sediment	Soil	2.37E+05	0.5	98.7	12	Sediment_5	113	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	0.65	Sediment_5	260
3.25	3.9	Sediment	Soil	2.37E+05	0.5	120.6	12	Sediment_6	113	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	0.65	Sediment_6	260
3.9	4.55	Sediment	Soil	2.37E+05	0.5	142.5	12	Sediment_7	113	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	0.65	Sediment_7	260
4.55	5.2	Sediment	Soil	2.37E+05	0.5	164.5	12	Sediment_8	113	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	0.65	Sediment_8	260
5.2	5.85	Sediment	Soil	2.37E+05	0.5	186.4	12	Sediment_9	113	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	0.65	Sediment_9	260
5.85	6.5	Sediment	Soil	2.37E+05	0.5	208.3	12	Sediment_10	113	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	0.65	Sediment_10	260
6.5	7.15	Sediment	Soil	2.37E+05	0.5	230.2	12	Sediment_11	113	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	0.65	Sediment_11	260
7.15	7.8	Sediment	Soil	2.37E+05	0.5	252.2	12	Sediment_12	113	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	0.65	Sediment_12	260
7.8	8.45	Sediment	Soil	2.37E+05	0.5	274.1	12	Sediment_13	113	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	0.65	Sediment_13	260
8.45	9.1	Sediment	Soil	2.37E+05	0.5	296.0	12	Sediment_14	113	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	0.65	Sediment_14	260
9.1	9.75	Sediment	Soil	2.37E+05	0.5	317.9	12	Sediment_15	113	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	0.65	Sediment_15	260
9.75	10.4	Sediment	Soil	2.37E+05	0.5	339.9	12	Sediment_16	113	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	0.65	Sediment_16	260
10.4	11.05	Sediment	Soil	2.37E+05	0.5	361.8	12	Sediment_17	113	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	0.65	Sediment_17	260
11.05	11.7	Sediment	Soil	2.37E+05	0.5	383.7	12	Sediment_18	113	D&S, p'=0-400, PI=10-15	D&S, p'=0-400, PI=10-15	0.65	Sediment_18	260
11.7	12.35	Sediment	Soil	2.37E+05	0.5	405.6	12	Sediment_19	113	D&S, p'=400-800, PI=10-15	D&S, p'=400-800, PI=10-15	0.65	Sediment_19	260
12.35	12.5	Sediment	Soil	2.37E+05	0.5	419.1	12	Sediment_20	113	D&S, p'=400-800, PI=10-15	D&S, p'=400-800, PI=10-15	0.15	Sediment_20	260
12.5	14.37	Subunit 1	Soil	2.22E+06	0.5	461.9	13	Subunit 1_21	127	D&S, p'=400-800, PI=10-15	D&S, p'=400-800, PI=10-15	1.87	Subunit 1_21	750
14.37	16.24	Subunit 1	Soil	2.22E+06	0.5	542.5	13	Subunit 1_22	127	D&S, p'=400-800, PI=10-15	D&S, p'=400-800, PI=10-15	1.87	Subunit 1_22	750
16.24	18.11	Subunit 1	Soil	2.22E+06	0.5	623.0	13	Subunit 1_23	127	D&S, p'=400-800, PI=10-15	D&S, p'=400-800, PI=10-15	1.87	Subunit 1_23	750
18.11	19.98	Subunit 1	Soil	2.22E+06	0.5	703.5	13	Subunit 1_24	127	D&S, p'=400-800, PI=10-15	D&S, p'=400-800, PI=10-15	1.87	Subunit 1_24	750
19.98	20.5	Subunit 1	Soil	2.22E+06	0.5	755.0	13	Subunit 1_25	127	D&S, p'=400-800, PI=10-15	D&S, p'=400-800, PI=10-15	0.52	Subunit 1_25	750
20.5	22.25	Subunit 2	Soil	1.93E+06	0.5	803.9	0	Subunit 2_26	127	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Subunit 2_26	700
22.25	24	Subunit 2	Soil	1.93E+06	0.5	879.2	0	Subunit 2_27	127	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.75	Subunit 2_27	700
24	24.1	Subunit 2	Soil	1.93E+06	0.5	919.1	0	Subunit 2_28	127	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	0.1	Subunit 2_28	700
24.1	25.5	Subunit 3	Soil	2.01E+06	0.5	953.7	0	Subunit 3_29	132	D&S, p'=800-1600, PI=0	D&S, p'=800-1600, PI=0	1.4	Subunit 3_29	700
25.5	28.55	Shale (0'-15')	Soft Rock	6.47E+06	0.5	1065.1	0	Shale (0'-15')_30	140	Silva et al., 20'-50'	Silva et al., 20'-50'	3.05	Shale (0'-15')_30	1220
28.55	31.6	Shale (0'-15')	Soft Rock	6.47E+06	0.5	1222.9	0	Shale (0'-15')_31	140	Silva et al., 20'-50'	Silva et al., 20'-50'	3.05	Shale (0'-15')_31	1220
31.6	34.65	Shale (0'-15')	Soft Rock	6.47E+06	0.5	1380.7	0	Shale (0'-15')_32	140	Silva et al., 20'-50'	Silva et al., 20'-50'	3.05	Shale (0'-15')_32	1220
34.65	37.7	Shale (0'-15')	Soft Rock	6.47E+06	0.5	1538.5	0	Shale (0'-15')_33	140	Silva et al., 20'-50'	Silva et al., 20'-50'	3.05	Shale (0'-15')_33	1220
37.7	40.5	Shale (0'-15')	Soft Rock	6.47E+06	0.5	1689.8	0	Shale (0'-15')_34	140	Silva et al., 20'-50'	Silva et al., 20'-50'	2.8	Shale (0'-15')_34	1220
40.5	43.9	Shale (15'-30')	Soft Rock	8.04E+06	0.5	1850.1	0	Shale (15'-30')_35	140	Silva et al., 20'-50'	Silva et al., 20'-50'	3.4	Shale (15'-30')_35	1360
43.9	47.3	Shale (15'-30')	Soft Rock	8.04E+06	0.5	2026.0	0	Shale (15'-30')_36	140	Silva et al., 20'-50'	Silva et al., 20'-50'	3.4	Shale (15'-30')_36	1360
47.3	50.7	Shale (15'-30')	Soft Rock	8.04E+06	0.5	2201.9	0	Shale (15'-30')_37	140	Silva et al., 20'-50'	Silva et al., 20'-50'	3.4	Shale (15'-30')_37	1360
50.7	54.1	Shale (15'-30')	Soft Rock	8.04E+06	0.5	2377.8	0	Shale (15'-30')_38	140	Silva et al., 50'-120'	Silva et al., 50'-120'	3.4	Shale (15'-30')_38	1360
54.1	55.5	Shale (15'-30')	Soft Rock	8.04E+06	0.5	2502.0	0	Shale (15'-30')_39	140	Silva et al., 50'-120'	Silva et al., 50'-120'	1.4	Shale (15'-30')_39	1360
55.5	55.8	Shale (>30')	Soft Rock	9.65E+06	0.5	2546.0	0	Shale (>30')_40	140	Silva et al., 50'-120'	Silva et al., 50'-120'	0.3	Shale (>30')_40	1490
55.8	155.8	Shale (El. 575'-675')	Firm Rock	4.18E+07	0.5	5140.4	0	Shale (El. 575'-675')_41	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 575'-675')_41	3100
155.8	255.8	Shale (El. 475'-575')	Firm Rock	7.31E+07	0.5	10313.7	0	Shale (El. 475'-575')_42	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 475'-575')_42	4100
255.8	355.8	Shale (El. 375'-475')	Firm Rock	1.13E+08	0.5	15487.1	0	Shale (El. 375'-475')_43	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 375'-475')_43	5100
355.8	455.8	Shale (El. 275'-375')	Firm Rock	1.62E+08	0.5	20660.4	0	Shale (El. 275'-375')_44	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 275'-375')_44	6100
455.8	555.8	Shale (El. 175'-275')	Firm Rock	2.19E+08	0.5	25833.7	0	Shale (El. 175'-275')_45	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 175'-275')_45	7100
555.8	655.8	Shale (El. 75'-175')	Firm Rock	2.85E+08	0.5	31007.1	0	Shale (El. 75'-175')_46	140	Firm/Hard Rock	Firm/Hard Rock	100	Shale (El. 75'-175')_46	8100
655.8	695.8	Shale (El. 35'-75')	Firm Rock	3.37E+08	0.5	34628.4	0	Shale (El. 35'-75')_47	140	Firm/Hard Rock	Firm/Hard Rock	40	Shale (El. 35'-75')_47	8800
695.8	Half-Space	Shale (El. < 35')	Half-Space	3.52E+08	0.5	Half-Space	0	Bedrock	140	NA, Half-Space	Damping = 0.5%	Half Space	Bedrock	9000

2.3 PEAK ACCELERATION CALCULATIONS

2.3.1 Section A-A'

2.3.1.1 1 Hz Design Earthquake

Results Summary:

Site:	KIF East Dike
Section:	Section_AA
Profile:	KIF-A1_NOR
EQ Event:	Design EQ
EQ Source:	1 Hz
Average amax:	**0.10**

Detailed Results:

Motion Index	Motion Filename	a_{max} at Surface
1Hz_01	RSN4060_HE.csv	0.10
1Hz_02	RSN592_HE.csv	0.12
1Hz_03	RSN596_HE.csv	0.09
1Hz_04	RSN66_HE.csv	0.09
1Hz_05	RSN8409_HN.csv	0.09
1Hz_06	RSN8556_HE.csv	0.09
1Hz_07	RSN8565_HE.csv	0.11

Results Summary:

Site:	Kingston Fossil Plant
Section:	Section_AA
Profile:	KIF-A2_NOR
EQ Event:	Design EQ
EQ Source:	1 Hz
Average amax:	**0.10**

Detailed Results:

Motion Index	Motion Filename	a_{max} at Surface
1Hz_01	RSN4060_HE.csv	0.10
1Hz_02	RSN592_HE.csv	0.12
1Hz_03	RSN596_HE.csv	0.09
1Hz_04	RSN66_HE.csv	0.10
1Hz_05	RSN8409_HN.csv	0.08
1Hz_06	RSN8556_HE.csv	0.09
1Hz_07	RSN8565_HE.csv	0.12

Results Summary:

Site:	Kingston Fossil Plant
Section:	Section_AA
Profile:	KIF-A3_NOR
EQ Event:	Design EQ
EQ Source:	1 Hz
Average amax:	**0.10**

Detailed Results:

Motion Index	Motion Filename	a_{max} at Surface
1Hz_01	RSN4060_HE.csv	0.10
1Hz_02	RSN592_HE.csv	0.12
1Hz_03	RSN596_HE.csv	0.09
1Hz_04	RSN66_HE.csv	0.10
1Hz_05	RSN8409_HN.csv	0.09
1Hz_06	RSN8556_HE.csv	0.09
1Hz_07	RSN8565_HE.csv	0.12

Results Summary:

Site:	Kingston Fossil Plant
Section:	Section_AA
Profile:	KIF-B09_NOR
EQ Event:	Design EQ
EQ Source:	1 Hz
Average amax:	**0.09**

Detailed Results:

Motion Index	Motion Filename	a_{max} at Surface
1Hz_01	RSN4060_HE.csv	0.10
1Hz_02	RSN592_HE.csv	0.11
1Hz_03	RSN596_HE.csv	0.08
1Hz_04	RSN66_HE.csv	0.09
1Hz_05	RSN8409_HN.csv	0.08
1Hz_06	RSN8556_HE.csv	0.08
1Hz_07	RSN8565_HE.csv	0.12

Results Summary:

Site:	Kingston Fossil Plant
Section:	Section_AA
Profile:	KIF-B10_NOR
EQ Event:	Design EQ
EQ Source:	1 Hz
Average amax:	**0.13**

Detailed Results:

Motion Index	Motion Filename	a_{max} at Surface
1Hz_01	RSN4060_HE.csv	0.12
1Hz_02	RSN592_HE.csv	0.13
1Hz_03	RSN596_HE.csv	0.12
1Hz_04	RSN66_HE.csv	0.12
1Hz_05	RSN8409_HN.csv	0.13
1Hz_06	RSN8556_HE.csv	0.13
1Hz_07	RSN8565_HE.csv	0.13

Results Summary:

Site:	Kingston Fossil Plant
Section:	Section_AA
Profile:	KIF-B11_NOR
EQ Event:	Design EQ
EQ Source:	1 Hz
Average amax:	**0.11**

Detailed Results:

Motion Index	Motion Filename	a_{max} at Surface
1Hz_01	RSN4060_HE.csv	0.11
1Hz_02	RSN592_HE.csv	0.11
1Hz_03	RSN596_HE.csv	0.15
1Hz_04	RSN66_HE.csv	0.13
1Hz_05	RSN8409_HN.csv	0.10
1Hz_06	RSN8556_HE.csv	0.11
1Hz_07	RSN8565_HE.csv	0.11

Results Summary:

Site:	Kingston Fossil Plant
Section:	Section_AA
Profile:	KIF-B12_NOR
EQ Event:	Design EQ
EQ Source:	1 Hz
Average amax:	**0.10**

Detailed Results:

Motion Index	Motion Filename	a_{max} at Surface
1Hz_01	RSN4060_HE.csv	0.10
1Hz_02	RSN592_HE.csv	0.11
1Hz_03	RSN596_HE.csv	0.10
1Hz_04	RSN66_HE.csv	0.10
1Hz_05	RSN8409_HN.csv	0.09
1Hz_06	RSN8556_HE.csv	0.09
1Hz_07	RSN8565_HE.csv	0.10

Results Summary:

Site:	KIF East Dike
Section:	Section_AA
Profile:	KIF-B39_NOR
EQ Event:	Design EQ
EQ Source:	1 Hz
Average amax:	**0.09**

Detailed Results:

Motion Index	Motion Filename	a_{max} at Surface
1Hz_01	RSN4060_HE.csv	0.09
1Hz_02	RSN592_HE.csv	0.11
1Hz_03	RSN596_HE.csv	0.10
1Hz_04	RSN66_HE.csv	0.10
1Hz_05	RSN8409_HN.csv	0.09
1Hz_06	RSN8556_HE.csv	0.08
1Hz_07	RSN8565_HE.csv	0.08

Results Summary:

Site:	KIF East Dike
Section:	Section_AA
Profile:	KIF-CPT03_NOR
EQ Event:	Design EQ
EQ Source:	1 Hz
Average amax:	**0.09**

Detailed Results:

Motion Index	Motion Filename	a_{max} at Surface
1Hz_01	RSN4060_HE.csv	0.09
1Hz_02	RSN592_HE.csv	0.10
1Hz_03	RSN596_HE.csv	0.08
1Hz_04	RSN66_HE.csv	0.08
1Hz_05	RSN8409_HN.csv	0.08
1Hz_06	RSN8556_HE.csv	0.08
1Hz_07	RSN8565_HE.csv	0.10

2.3.1.2 10 Hz Design Earthquake

Results Summary:

Site:	KIF East Dike
Section:	Section_AA
Profile:	KIF-A1_NOR
EQ Event:	Design EQ
EQ Source:	10 Hz
Average amax:	**0.20**

Detailed Results:

Motion Index	Motion Filename	a_{max} at Surface
10Hz_01	GRV060H1.EQ	0.18
10Hz_02	GRV330H2.EQ	0.21
10Hz_03	HCP045H1.EQ	0.26
10Hz_04	HCP135H2.EQ	0.19
10Hz_05	RSN1684_HE.csv	0.18
10Hz_06	RSN1684_HN.csv	0.15
10Hz_07	RSN3982_HE.csv	0.15
10Hz_08	RSN3982_HN.csv	0.24
10Hz_09	RSN4039_HN.csv	0.23
10Hz_10	RSN8529_HE.csv	0.18
10Hz_11	RSN8529_HN.csv	0.18
10Hz_12	S08LH2.EQ	0.17
10Hz_13	S08TH1.EQ	0.20

Results Summary:

Site:	Kingston Fossil Plant
Section:	Section_AA
Profile:	KIF-A2_NOR
EQ Event:	Design EQ
EQ Source:	10 Hz
Average amax:	**0.22**

Detailed Results:

Motion Index	Motion Filename	a_{max} at Surface
10Hz_01	GRV060H1.EQ	0.22
10Hz_02	GRV330H2.EQ	0.23
10Hz_03	HCP045H1.EQ	0.24
10Hz_04	HCP135H2.EQ	0.21
10Hz_05	RSN1684_HE.csv	0.19
10Hz_06	RSN1684_HN.csv	0.20
10Hz_07	RSN3982_HE.csv	0.18
10Hz_08	RSN3982_HN.csv	0.26
10Hz_09	RSN4039_HN.csv	0.25
10Hz_10	RSN8529_HE.csv	0.19
10Hz_11	RSN8529_HN.csv	0.21
10Hz_12	S08LH2.EQ	0.21
10Hz_13	S08TH1.EQ	0.23

Results Summary:

Site:	Kingston Fossil Plant
Section:	Section_AA
Profile:	KIF-A3_NOR
EQ Event:	Design EQ
EQ Source:	10 Hz
Average amax:	**0.22**

Detailed Results:

Motion Index	Motion Filename	a_{max} at Surface
10Hz_01	GRV060H1.EQ	0.21
10Hz_02	GRV330H2.EQ	0.22
10Hz_03	HCP045H1.EQ	0.25
10Hz_04	HCP135H2.EQ	0.22
10Hz_05	RSN1684_HE.csv	0.22
10Hz_06	RSN1684_HN.csv	0.20
10Hz_07	RSN3982_HE.csv	0.19
10Hz_08	RSN3982_HN.csv	0.24
10Hz_09	RSN4039_HN.csv	0.25
10Hz_10	RSN8529_HE.csv	0.21
10Hz_11	RSN8529_HN.csv	0.24
10Hz_12	S08LH2.EQ	0.21
10Hz_13	S08TH1.EQ	0.23

Results Summary:

Site:	Kingston Fossil Plant
Section:	Section_AA
Profile:	KIF-B09_NOR
EQ Event:	Design EQ
EQ Source:	10 Hz
Average amax:	**0.20**

Detailed Results:

Motion Index	Motion Filename	a_{max} at Surface
10Hz_01	GRV060H1.EQ	0.19
10Hz_02	GRV330H2.EQ	0.21
10Hz_03	HCP045H1.EQ	0.21
10Hz_04	HCP135H2.EQ	0.21
10Hz_05	RSN1684_HE.csv	0.19
10Hz_06	RSN1684_HN.csv	0.17
10Hz_07	RSN3982_HE.csv	0.17
10Hz_08	RSN3982_HN.csv	0.24
10Hz_09	RSN4039_HN.csv	0.24
10Hz_10	RSN8529_HE.csv	0.17
10Hz_11	RSN8529_HN.csv	0.19
10Hz_12	S08LH2.EQ	0.18
10Hz_13	S08TH1.EQ	0.21

Results Summary:

Site:	Kingston Fossil Plant
Section:	Section_AA
Profile:	KIF-B10_NOR
EQ Event:	Design EQ
EQ Source:	10 Hz
Average amax:	**0.20**

Detailed Results:

Motion Index	Motion Filename	a_{max} at Surface
10Hz_01	GRV060H1.EQ	0.21
10Hz_02	GRV330H2.EQ	0.20
10Hz_03	HCP045H1.EQ	0.22
10Hz_04	HCP135H2.EQ	0.21
10Hz_05	RSN1684_HE.csv	0.21
10Hz_06	RSN1684_HN.csv	0.16
10Hz_07	RSN3982_HE.csv	0.21
10Hz_08	RSN3982_HN.csv	0.18
10Hz_09	RSN4039_HN.csv	0.21
10Hz_10	RSN8529_HE.csv	0.18
10Hz_11	RSN8529_HN.csv	0.17
10Hz_12	S08LH2.EQ	0.24
10Hz_13	S08TH1.EQ	0.22

Results Summary:

Site:	Kingston Fossil Plant
Section:	Section_AA
Profile:	KIF-B11_NOR
EQ Event:	Design EQ
EQ Source:	10 Hz
Average amax:	**0.31**

Detailed Results:

Motion Index	Motion Filename	a_{max} at Surface
10Hz_01	GRV060H1.EQ	0.27
10Hz_02	GRV330H2.EQ	0.30
10Hz_03	HCP045H1.EQ	0.39
10Hz_04	HCP135H2.EQ	0.36
10Hz_05	RSN1684_HE.csv	0.29
10Hz_06	RSN1684_HN.csv	0.30
10Hz_07	RSN3982_HE.csv	0.25
10Hz_08	RSN3982_HN.csv	0.26
10Hz_09	RSN4039_HN.csv	0.26
10Hz_10	RSN8529_HE.csv	0.32
10Hz_11	RSN8529_HN.csv	0.36
10Hz_12	S08LH2.EQ	0.35
10Hz_13	S08TH1.EQ	0.30

Results Summary:

Site:	Kingston Fossil Plant
Section:	Section_AA
Profile:	KIF-B12_NOR
EQ Event:	Design EQ
EQ Source:	10 Hz
Average amax:	**0.24**

Detailed Results:

Motion Index	Motion Filename	a_{max} at Surface
10Hz_01	GRV060H1.EQ	0.20
10Hz_02	GRV330H2.EQ	0.21
10Hz_03	HCP045H1.EQ	0.27
10Hz_04	HCP135H2.EQ	0.25
10Hz_05	RSN1684_HE.csv	0.26
10Hz_06	RSN1684_HN.csv	0.22
10Hz_07	RSN3982_HE.csv	0.18
10Hz_08	RSN3982_HN.csv	0.26
10Hz_09	RSN4039_HN.csv	0.21
10Hz_10	RSN8529_HE.csv	0.23
10Hz_11	RSN8529_HN.csv	0.24
10Hz_12	S08LH2.EQ	0.30
10Hz_13	S08TH1.EQ	0.28

Results Summary:

Site:	KIF East Dike
Section:	Section_AA
Profile:	KIF-B39_NOR
EQ Event:	Design EQ
EQ Source:	10 Hz
Average amax:	**0.18**

Detailed Results:

Motion Index	Motion Filename	a_{max} at Surface
10Hz_01	GRV060H1.EQ	0.16
10Hz_02	GRV330H2.EQ	0.16
10Hz_03	HCP045H1.EQ	0.23
10Hz_04	HCP135H2.EQ	0.18
10Hz_05	RSN1684_HE.csv	0.17
10Hz_06	RSN1684_HN.csv	0.16
10Hz_07	RSN3982_HE.csv	0.15
10Hz_08	RSN3982_HN.csv	0.22
10Hz_09	RSN4039_HN.csv	0.21
10Hz_10	RSN8529_HE.csv	0.17
10Hz_11	RSN8529_HN.csv	0.17
10Hz_12	S08LH2.EQ	0.16
10Hz_13	S08TH1.EQ	0.20

Results Summary:

Site:	KIF East Dike
Section:	Section_AA
Profile:	KIF-CPT03_NOR
EQ Event:	Design EQ
EQ Source:	10 Hz
Average amax:	**0.19**

Detailed Results:

Motion Index	Motion Filename	a_{max} at Surface
10Hz_01	GRV060H1.EQ	0.18
10Hz_02	GRV330H2.EQ	0.20
10Hz_03	HCP045H1.EQ	0.21
10Hz_04	HCP135H2.EQ	0.17
10Hz_05	RSN1684_HE.csv	0.18
10Hz_06	RSN1684_HN.csv	0.21
10Hz_07	RSN3982_HE.csv	0.17
10Hz_08	RSN3982_HN.csv	0.22
10Hz_09	RSN4039_HN.csv	0.21
10Hz_10	RSN8529_HE.csv	0.15
10Hz_11	RSN8529_HN.csv	0.17
10Hz_12	S08LH2.EQ	0.17
10Hz_13	S08TH1.EQ	0.18

2.3.2 Polishing Pond Section

2.3.2.1 1 Hz Design Earthquake

Results Summary:

Site:	KIF East Dike
Section:	Polishing_Pond_Section
Profile:	KIF-B1
EQ Event:	Design EQ
EQ Source:	1 Hz
Average amax:	**0.10**

Detailed Results:

Motion Index	Motion Filename	a_{max} at Surface
1Hz_01	RSN4060_HE.csv	0.11
1Hz_02	RSN592_HE.csv	0.12
1Hz_03	RSN596_HE.csv	0.09
1Hz_04	RSN66_HE.csv	0.10
1Hz_05	RSN8409_HN.csv	0.08
1Hz_06	RSN8556_HE.csv	0.08
1Hz_07	RSN8565_HE.csv	0.12

Results Summary:

Site:	Kingston Fossil Plant
Section:	Polishing_Pond
Profile:	KIF-B2_NOR
EQ Event:	Design EQ
EQ Source:	1 Hz
Average amax:	**0.10**

Detailed Results:

Motion Index	Motion Filename	a_{max} at Surface
1Hz_01	RSN4060_HE.csv	0.10
1Hz_02	RSN592_HE.csv	0.12
1Hz_03	RSN596_HE.csv	0.09
1Hz_04	RSN66_HE.csv	0.10
1Hz_05	RSN8409_HN.csv	0.08
1Hz_06	RSN8556_HE.csv	0.09
1Hz_07	RSN8565_HE.csv	0.12

Results Summary:

Site:	Kingston Fossil Plant
Section:	Polishing_Pond
Profile:	KIF-B3_NOR
EQ Event:	Design EQ
EQ Source:	1 Hz
Average amax:	**0.10**

Detailed Results:

Motion Index	Motion Filename	a_{max} at Surface
1Hz_01	RSN4060_HE.csv	0.10
1Hz_02	RSN592_HE.csv	0.12
1Hz_03	RSN596_HE.csv	0.09
1Hz_04	RSN66_HE.csv	0.11
1Hz_05	RSN8409_HN.csv	0.08
1Hz_06	RSN8556_HE.csv	0.09
1Hz_07	RSN8565_HE.csv	0.13

Results Summary:

Site:	Kingston Fossil Plant
Section:	Polishing_Pond
Profile:	KIF-B13_NOR
EQ Event:	Design EQ
EQ Source:	1 Hz
Average amax:	**0.09**

Detailed Results:

Motion Index	Motion Filename	a_{max} at Surface
1Hz_01	RSN4060_HE.csv	0.09
1Hz_02	RSN592_HE.csv	0.11
1Hz_03	RSN596_HE.csv	0.08
1Hz_04	RSN66_HE.csv	0.09
1Hz_05	RSN8409_HN.csv	0.08
1Hz_06	RSN8556_HE.csv	0.08
1Hz_07	RSN8565_HE.csv	0.12

Results Summary:

Site:	Kingston Fossil Plant
Section:	Polishing_Pond
Profile:	KIF-B14_NOR
EQ Event:	Design EQ
EQ Source:	1 Hz
Average amax:	**0.12**

Detailed Results:

Motion Index	Motion Filename	a_{max} at Surface
1Hz_01	RSN4060_HE.csv	0.13
1Hz_02	RSN592_HE.csv	0.12
1Hz_03	RSN596_HE.csv	0.13
1Hz_04	RSN66_HE.csv	0.15
1Hz_05	RSN8409_HN.csv	0.11
1Hz_06	RSN8556_HE.csv	0.12
1Hz_07	RSN8565_HE.csv	0.11

Results Summary:

Site:	Kingston Fossil Plant
Section:	Polishing_Pond
Profile:	KIF-B15_NOR
EQ Event:	Design EQ
EQ Source:	1 Hz
Average amax:	**0.12**

Detailed Results:

Motion Index	Motion Filename	a_{max} at Surface
1Hz_01	RSN4060_HE.csv	0.13
1Hz_02	RSN592_HE.csv	0.11
1Hz_03	RSN596_HE.csv	0.11
1Hz_04	RSN66_HE.csv	0.13
1Hz_05	RSN8409_HN.csv	0.11
1Hz_06	RSN8556_HE.csv	0.11
1Hz_07	RSN8565_HE.csv	0.12

Results Summary:

Site:	Kingston Fossil Plant
Section:	Polishing_Pond
Profile:	KIF-B16_NOR
EQ Event:	Design EQ
EQ Source:	1 Hz
Average amax:	**0.12**

Detailed Results:

Motion Index	Motion Filename	a_{max} at Surface
1Hz_01	RSN4060_HE.csv	0.14
1Hz_02	RSN592_HE.csv	0.11
1Hz_03	RSN596_HE.csv	0.13
1Hz_04	RSN66_HE.csv	0.13
1Hz_05	RSN8409_HN.csv	0.12
1Hz_06	RSN8556_HE.csv	0.11
1Hz_07	RSN8565_HE.csv	0.12

Results Summary:

Site:	KIF East Dike
Section:	Polishing_Pond_Section
Profile:	KIF-B35
EQ Event:	Design EQ
EQ Source:	1 Hz
Average amax:	**0.10**

Detailed Results:

Motion Index	Motion Filename	a_{max} at Surface
1Hz_01	RSN4060_HE.csv	0.10
1Hz_02	RSN592_HE.csv	0.12
1Hz_03	RSN596_HE.csv	0.09
1Hz_04	RSN66_HE.csv	0.09
1Hz_05	RSN8409_HN.csv	0.09
1Hz_06	RSN8556_HE.csv	0.09
1Hz_07	RSN8565_HE.csv	0.11

Results Summary:

Site:	KIF East Dike
Section:	Polishing_Pond_Section
Profile:	KIF-BF-CPT4AA
EQ Event:	Design EQ
EQ Source:	1 Hz
Average amax:	**0.10**

Detailed Results:

Motion Index	Motion Filename	a_{max} at Surface
1Hz_01	RSN4060_HE.csv	0.09
1Hz_02	RSN592_HE.csv	0.11
1Hz_03	RSN596_HE.csv	0.09
1Hz_04	RSN66_HE.csv	0.10
1Hz_05	RSN8409_HN.csv	0.09
1Hz_06	RSN8556_HE.csv	0.09
1Hz_07	RSN8565_HE.csv	0.09

Results Summary:

Site:	KIF East Dike
Section:	Polishing_Pond_Section
Profile:	KIF-BF-SPT2
EQ Event:	Design EQ
EQ Source:	1 Hz
Average amax:	**0.10**

Detailed Results:

Motion Index	Motion Filename	a_{max} at Surface
1Hz_01	RSN4060_HE.csv	0.09
1Hz_02	RSN592_HE.csv	0.12
1Hz_03	RSN596_HE.csv	0.09
1Hz_04	RSN66_HE.csv	0.10
1Hz_05	RSN8409_HN.csv	0.09
1Hz_06	RSN8556_HE.csv	0.09
1Hz_07	RSN8565_HE.csv	0.09

Results Summary:

Site:	KIF East Dike
Section:	Polishing_Pond_Section
Profile:	KIF-BF-SPT3
EQ Event:	Design EQ
EQ Source:	1 Hz
Average amax:	**0.09**

Detailed Results:

Motion Index	Motion Filename	a_{max} at Surface
1Hz_01	RSN4060_HE.csv	0.09
1Hz_02	RSN592_HE.csv	0.11
1Hz_03	RSN596_HE.csv	0.08
1Hz_04	RSN66_HE.csv	0.09
1Hz_05	RSN8409_HN.csv	0.08
1Hz_06	RSN8556_HE.csv	0.08
1Hz_07	RSN8565_HE.csv	0.11

Results Summary:

Site:	KIF East Dike
Section:	Polishing_Pond_Section
Profile:	KIF-BF-SPT5
EQ Event:	Design EQ
EQ Source:	1 Hz
Average amax:	**0.10**

Detailed Results:

Motion Index	Motion Filename	a_{max} at Surface
1Hz_01	RSN4060_HE.csv	0.10
1Hz_02	RSN592_HE.csv	0.12
1Hz_03	RSN596_HE.csv	0.09
1Hz_04	RSN66_HE.csv	0.09
1Hz_05	RSN8409_HN.csv	0.09
1Hz_06	RSN8556_HE.csv	0.09
1Hz_07	RSN8565_HE.csv	0.11

Results Summary:

Site:	KIF East Dike
Section:	Polishing_Pond_Section
Profile:	KIF-C1
EQ Event:	Design EQ
EQ Source:	1 Hz
Average amax:	**0.10**

Detailed Results:

Motion Index	Motion Filename	a_{max} at Surface
1Hz_01	RSN4060_HE.csv	0.11
1Hz_02	RSN592_HE.csv	0.12
1Hz_03	RSN596_HE.csv	0.10
1Hz_04	RSN66_HE.csv	0.10
1Hz_05	RSN8409_HN.csv	0.09
1Hz_06	RSN8556_HE.csv	0.09
1Hz_07	RSN8565_HE.csv	0.13

Results Summary:

Site:	KIF East Dike
Section:	Polishing_Pond_Section
Profile:	KIF-C2
EQ Event:	Design EQ
EQ Source:	1 Hz
Average amax:	**0.10**

Detailed Results:

Motion Index	Motion Filename	a_{max} at Surface
1Hz_01	RSN4060_HE.csv	0.10
1Hz_02	RSN592_HE.csv	0.12
1Hz_03	RSN596_HE.csv	0.10
1Hz_04	RSN66_HE.csv	0.11
1Hz_05	RSN8409_HN.csv	0.08
1Hz_06	RSN8556_HE.csv	0.09
1Hz_07	RSN8565_HE.csv	0.12

Results Summary:

Site:	KIF East Dike
Section:	Polishing_Pond_Section
Profile:	KIF-D1
EQ Event:	Design EQ
EQ Source:	1 Hz
Average amax:	**0.10**

Detailed Results:

Motion Index	Motion Filename	a_{max} at Surface
1Hz_01	RSN4060_HE.csv	0.10
1Hz_02	RSN592_HE.csv	0.11
1Hz_03	RSN596_HE.csv	0.09
1Hz_04	RSN66_HE.csv	0.10
1Hz_05	RSN8409_HN.csv	0.08
1Hz_06	RSN8556_HE.csv	0.08
1Hz_07	RSN8565_HE.csv	0.12

Results Summary:

Site:	KIF East Dike
Section:	Polishing_Pond_Section
Profile:	KIF-D2
EQ Event:	Design EQ
EQ Source:	1 Hz
Average amax:	**0.10**

Detailed Results:

Motion Index	Motion Filename	a_{max} at Surface
1Hz_01	RSN4060_HE.csv	0.10
1Hz_02	RSN592_HE.csv	0.11
1Hz_03	RSN596_HE.csv	0.09
1Hz_04	RSN66_HE.csv	0.10
1Hz_05	RSN8409_HN.csv	0.08
1Hz_06	RSN8556_HE.csv	0.08
1Hz_07	RSN8565_HE.csv	0.13

Results Summary:

Site:	KIF East Dike
Section:	Polishing_Pond_Section
Profile:	KIF-STN50
EQ Event:	Design EQ
EQ Source:	1 Hz
Average amax:	**0.11**

Detailed Results:

Motion Index	Motion Filename	a_{max} at Surface
1Hz_01	RSN4060_HE.csv	0.12
1Hz_02	RSN592_HE.csv	0.11
1Hz_03	RSN596_HE.csv	0.10
1Hz_04	RSN66_HE.csv	0.11
1Hz_05	RSN8409_HN.csv	0.10
1Hz_06	RSN8556_HE.csv	0.11
1Hz_07	RSN8565_HE.csv	0.13

Results Summary:

Site:	KIF East Dike
Section:	Polishing_Pond_Section
Profile:	KIF-STN51
EQ Event:	Design EQ
EQ Source:	1 Hz
Average amax:	**0.10**

Detailed Results:

Motion Index	Motion Filename	a_{max} at Surface
1Hz_01	RSN4060_HE.csv	0.10
1Hz_02	RSN592_HE.csv	0.11
1Hz_03	RSN596_HE.csv	0.09
1Hz_04	RSN66_HE.csv	0.10
1Hz_05	RSN8409_HN.csv	0.08
1Hz_06	RSN8556_HE.csv	0.09
1Hz_07	RSN8565_HE.csv	0.12

2.3.2.2 10 Hz Design Earthquake

Results Summary:

Site:	KIF East Dike
Section:	Polishing_Pond_Section
Profile:	KIF-B1
EQ Event:	Design EQ
EQ Source:	10 Hz
Average amax:	**0.20**

Detailed Results:

Motion Index	Motion Filename	a_{max} at Surface
10Hz_01	GRV060H1.EQ	0.19
10Hz_02	GRV330H2.EQ	0.21
10Hz_03	HCP045H1.EQ	0.26
10Hz_04	HCP135H2.EQ	0.20
10Hz_05	RSN1684_HE.csv	0.19
10Hz_06	RSN1684_HN.csv	0.17
10Hz_07	RSN3982_HE.csv	0.17
10Hz_08	RSN3982_HN.csv	0.24
10Hz_09	RSN4039_HN.csv	0.24
10Hz_10	RSN8529_HE.csv	0.18
10Hz_11	RSN8529_HN.csv	0.19
10Hz_12	S08LH2.EQ	0.20
10Hz_13	S08TH1.EQ	0.21

Results Summary:

Site:	Kingston Fossil Plant
Section:	Polishing_Pond
Profile:	KIF-B2_NOR
EQ Event:	Design EQ
EQ Source:	10 Hz
Average amax:	**0.21**

Detailed Results:

Motion Index	Motion Filename	a_{max} at Surface
10Hz_01	GRV060H1.EQ	0.20
10Hz_02	GRV330H2.EQ	0.22
10Hz_03	HCP045H1.EQ	0.25
10Hz_04	HCP135H2.EQ	0.21
10Hz_05	RSN1684_HE.csv	0.20
10Hz_06	RSN1684_HN.csv	0.19
10Hz_07	RSN3982_HE.csv	0.17
10Hz_08	RSN3982_HN.csv	0.25
10Hz_09	RSN4039_HN.csv	0.25
10Hz_10	RSN8529_HE.csv	0.19
10Hz_11	RSN8529_HN.csv	0.20
10Hz_12	S08LH2.EQ	0.20
10Hz_13	S08TH1.EQ	0.22

Results Summary:

Site:	Kingston Fossil Plant
Section:	Polishing_Pond
Profile:	KIF-B3_NOR
EQ Event:	Design EQ
EQ Source:	10 Hz
Average amax:	**0.23**

Detailed Results:

Motion Index	Motion Filename	a_{max} at Surface
10Hz_01	GRV060H1.EQ	0.20
10Hz_02	GRV330H2.EQ	0.24
10Hz_03	HCP045H1.EQ	0.27
10Hz_04	HCP135H2.EQ	0.24
10Hz_05	RSN1684_HE.csv	0.21
10Hz_06	RSN1684_HN.csv	0.19
10Hz_07	RSN3982_HE.csv	0.18
10Hz_08	RSN3982_HN.csv	0.26
10Hz_09	RSN4039_HN.csv	0.26
10Hz_10	RSN8529_HE.csv	0.20
10Hz_11	RSN8529_HN.csv	0.23
10Hz_12	S08LH2.EQ	0.23
10Hz_13	S08TH1.EQ	0.23

Results Summary:

Site:	Kingston Fossil Plant
Section:	Polishing_Pond
Profile:	KIF-B13_NOR
EQ Event:	Design EQ
EQ Source:	10 Hz
Average amax:	**0.19**

Detailed Results:

Motion Index	Motion Filename	a_{max} at Surface
10Hz_01	GRV060H1.EQ	0.19
10Hz_02	GRV330H2.EQ	0.20
10Hz_03	HCP045H1.EQ	0.21
10Hz_04	HCP135H2.EQ	0.19
10Hz_05	RSN1684_HE.csv	0.18
10Hz_06	RSN1684_HN.csv	0.17
10Hz_07	RSN3982_HE.csv	0.17
10Hz_08	RSN3982_HN.csv	0.24
10Hz_09	RSN4039_HN.csv	0.24
10Hz_10	RSN8529_HE.csv	0.16
10Hz_11	RSN8529_HN.csv	0.18
10Hz_12	S08LH2.EQ	0.18
10Hz_13	S08TH1.EQ	0.20

Results Summary:

Site:	Kingston Fossil Plant
Section:	Polishing_Pond
Profile:	KIF-B14_NOR
EQ Event:	Design EQ
EQ Source:	10 Hz
Average amax:	**0.31**

Detailed Results:

Motion Index	Motion Filename	a_{max} at Surface
10Hz_01	GRV060H1.EQ	0.30
10Hz_02	GRV330H2.EQ	0.28
10Hz_03	HCP045H1.EQ	0.29
10Hz_04	HCP135H2.EQ	0.35
10Hz_05	RSN1684_HE.csv	0.35
10Hz_06	RSN1684_HN.csv	0.31
10Hz_07	RSN3982_HE.csv	0.21
10Hz_08	RSN3982_HN.csv	0.33
10Hz_09	RSN4039_HN.csv	0.34
10Hz_10	RSN8529_HE.csv	0.26
10Hz_11	RSN8529_HN.csv	0.32
10Hz_12	S08LH2.EQ	0.33
10Hz_13	S08TH1.EQ	0.38

Results Summary:

Site:	Kingston Fossil Plant
Section:	Polishing_Pond
Profile:	KIF-B15_NOR
EQ Event:	Design EQ
EQ Source:	10 Hz
Average amax:	**0.32**

Detailed Results:

Motion Index	Motion Filename	a_{max} at Surface
10Hz_01	GRV060H1.EQ	0.34
10Hz_02	GRV330H2.EQ	0.29
10Hz_03	HCP045H1.EQ	0.31
10Hz_04	HCP135H2.EQ	0.36
10Hz_05	RSN1684_HE.csv	0.36
10Hz_06	RSN1684_HN.csv	0.31
10Hz_07	RSN3982_HE.csv	0.24
10Hz_08	RSN3982_HN.csv	0.35
10Hz_09	RSN4039_HN.csv	0.36
10Hz_10	RSN8529_HE.csv	0.28
10Hz_11	RSN8529_HN.csv	0.31
10Hz_12	S08LH2.EQ	0.32
10Hz_13	S08TH1.EQ	0.41

Results Summary:

Site:	Kingston Fossil Plant
Section:	Polishing_Pond
Profile:	KIF-B16_NOR
EQ Event:	Design EQ
EQ Source:	10 Hz
Average amax:	**0.31**

Detailed Results:

Motion Index	Motion Filename	a_{max} at Surface
10Hz_01	GRV060H1.EQ	0.32
10Hz_02	GRV330H2.EQ	0.26
10Hz_03	HCP045H1.EQ	0.29
10Hz_04	HCP135H2.EQ	0.33
10Hz_05	RSN1684_HE.csv	0.33
10Hz_06	RSN1684_HN.csv	0.31
10Hz_07	RSN3982_HE.csv	0.26
10Hz_08	RSN3982_HN.csv	0.32
10Hz_09	RSN4039_HN.csv	0.31
10Hz_10	RSN8529_HE.csv	0.29
10Hz_11	RSN8529_HN.csv	0.29
10Hz_12	S08LH2.EQ	0.35
10Hz_13	S08TH1.EQ	0.37

Results Summary:

Site:	KIF East Dike
Section:	Polishing_Pond_Section
Profile:	KIF-B35
EQ Event:	Design EQ
EQ Source:	10 Hz
Average amax:	**0.20**

Detailed Results:

Motion Index	Motion Filename	a_{max} at Surface
10Hz_01	GRV060H1.EQ	0.18
10Hz_02	GRV330H2.EQ	0.21
10Hz_03	HCP045H1.EQ	0.27
10Hz_04	HCP135H2.EQ	0.20
10Hz_05	RSN1684_HE.csv	0.18
10Hz_06	RSN1684_HN.csv	0.16
10Hz_07	RSN3982_HE.csv	0.16
10Hz_08	RSN3982_HN.csv	0.25
10Hz_09	RSN4039_HN.csv	0.23
10Hz_10	RSN8529_HE.csv	0.18
10Hz_11	RSN8529_HN.csv	0.19
10Hz_12	S08LH2.EQ	0.18
10Hz_13	S08TH1.EQ	0.20

Results Summary:

Site:	KIF East Dike
Section:	Polishing_Pond_Section
Profile:	KIF-BF-CPT4AA
EQ Event:	Design EQ
EQ Source:	10 Hz
Average amax:	**0.20**

Detailed Results:

Motion Index	Motion Filename	a_{max} at Surface
10Hz_01	GRV060H1.EQ	0.19
10Hz_02	GRV330H2.EQ	0.18
10Hz_03	HCP045H1.EQ	0.26
10Hz_04	HCP135H2.EQ	0.20
10Hz_05	RSN1684_HE.csv	0.19
10Hz_06	RSN1684_HN.csv	0.16
10Hz_07	RSN3982_HE.csv	0.17
10Hz_08	RSN3982_HN.csv	0.23
10Hz_09	RSN4039_HN.csv	0.22
10Hz_10	RSN8529_HE.csv	0.19
10Hz_11	RSN8529_HN.csv	0.18
10Hz_12	S08LH2.EQ	0.17
10Hz_13	S08TH1.EQ	0.22

Results Summary:

Site:	KIF East Dike
Section:	Polishing_Pond_Section
Profile:	KIF-BF-SPT2
EQ Event:	Design EQ
EQ Source:	10 Hz
Average amax:	**0.19**

Detailed Results:

Motion Index	Motion Filename	a_{max} at Surface
10Hz_01	GRV060H1.EQ	0.17
10Hz_02	GRV330H2.EQ	0.17
10Hz_03	HCP045H1.EQ	0.24
10Hz_04	HCP135H2.EQ	0.19
10Hz_05	RSN1684_HE.csv	0.17
10Hz_06	RSN1684_HN.csv	0.16
10Hz_07	RSN3982_HE.csv	0.15
10Hz_08	RSN3982_HN.csv	0.24
10Hz_09	RSN4039_HN.csv	0.22
10Hz_10	RSN8529_HE.csv	0.18
10Hz_11	RSN8529_HN.csv	0.18
10Hz_12	S08LH2.EQ	0.17
10Hz_13	S08TH1.EQ	0.21

Results Summary:

Site:	KIF East Dike
Section:	Polishing_Pond_Section
Profile:	KIF-BF-SPT3
EQ Event:	Design EQ
EQ Source:	10 Hz
Average amax:	**0.21**

Detailed Results:

Motion Index	Motion Filename	a_{max} at Surface
10Hz_01	GRV060H1.EQ	0.19
10Hz_02	GRV330H2.EQ	0.21
10Hz_03	HCP045H1.EQ	0.25
10Hz_04	HCP135H2.EQ	0.20
10Hz_05	RSN1684_HE.csv	0.23
10Hz_06	RSN1684_HN.csv	0.20
10Hz_07	RSN3982_HE.csv	0.20
10Hz_08	RSN3982_HN.csv	0.22
10Hz_09	RSN4039_HN.csv	0.22
10Hz_10	RSN8529_HE.csv	0.18
10Hz_11	RSN8529_HN.csv	0.21
10Hz_12	S08LH2.EQ	0.20
10Hz_13	S08TH1.EQ	0.19

Results Summary:

Site:	KIF East Dike
Section:	Polishing_Pond_Section
Profile:	KIF-BF-SPT5
EQ Event:	Design EQ
EQ Source:	10 Hz
Average amax:	**0.19**

Detailed Results:

Motion Index	Motion Filename	a_{max} at Surface
10Hz_01	GRV060H1.EQ	0.18
10Hz_02	GRV330H2.EQ	0.20
10Hz_03	HCP045H1.EQ	0.25
10Hz_04	HCP135H2.EQ	0.19
10Hz_05	RSN1684_HE.csv	0.18
10Hz_06	RSN1684_HN.csv	0.15
10Hz_07	RSN3982_HE.csv	0.16
10Hz_08	RSN3982_HN.csv	0.22
10Hz_09	RSN4039_HN.csv	0.23
10Hz_10	RSN8529_HE.csv	0.18
10Hz_11	RSN8529_HN.csv	0.19
10Hz_12	S08LH2.EQ	0.17
10Hz_13	S08TH1.EQ	0.20

Results Summary:

Site:	KIF East Dike
Section:	Polishing_Pond_Section
Profile:	KIF-C1
EQ Event:	Design EQ
EQ Source:	10 Hz
Average amax:	**0.22**

Detailed Results:

Motion Index	Motion Filename	a_{max} at Surface
10Hz_01	GRV060H1.EQ	0.21
10Hz_02	GRV330H2.EQ	0.21
10Hz_03	HCP045H1.EQ	0.22
10Hz_04	HCP135H2.EQ	0.22
10Hz_05	RSN1684_HE.csv	0.23
10Hz_06	RSN1684_HN.csv	0.20
10Hz_07	RSN3982_HE.csv	0.18
10Hz_08	RSN3982_HN.csv	0.27
10Hz_09	RSN4039_HN.csv	0.25
10Hz_10	RSN8529_HE.csv	0.19
10Hz_11	RSN8529_HN.csv	0.21
10Hz_12	S08LH2.EQ	0.23
10Hz_13	S08TH1.EQ	0.23

Results Summary:

Site:	KIF East Dike
Section:	Polishing_Pond_Section
Profile:	KIF-C2
EQ Event:	Design EQ
EQ Source:	10 Hz
Average amax:	**0.22**

Detailed Results:

Motion Index	Motion Filename	a_{max} at Surface
10Hz_01	GRV060H1.EQ	0.21
10Hz_02	GRV330H2.EQ	0.23
10Hz_03	HCP045H1.EQ	0.25
10Hz_04	HCP135H2.EQ	0.24
10Hz_05	RSN1684_HE.csv	0.22
10Hz_06	RSN1684_HN.csv	0.20
10Hz_07	RSN3982_HE.csv	0.17
10Hz_08	RSN3982_HN.csv	0.27
10Hz_09	RSN4039_HN.csv	0.26
10Hz_10	RSN8529_HE.csv	0.19
10Hz_11	RSN8529_HN.csv	0.21
10Hz_12	S08LH2.EQ	0.23
10Hz_13	S08TH1.EQ	0.22

Results Summary:

Site:	KIF East Dike
Section:	Polishing_Pond_Section
Profile:	KIF-D1
EQ Event:	Design EQ
EQ Source:	10 Hz
Average amax:	**0.21**

Detailed Results:

Motion Index	Motion Filename	a_{max} at Surface
10Hz_01	GRV060H1.EQ	0.21
10Hz_02	GRV330H2.EQ	0.21
10Hz_03	HCP045H1.EQ	0.23
10Hz_04	HCP135H2.EQ	0.21
10Hz_05	RSN1684_HE.csv	0.22
10Hz_06	RSN1684_HN.csv	0.21
10Hz_07	RSN3982_HE.csv	0.19
10Hz_08	RSN3982_HN.csv	0.25
10Hz_09	RSN4039_HN.csv	0.25
10Hz_10	RSN8529_HE.csv	0.20
10Hz_11	RSN8529_HN.csv	0.20
10Hz_12	S08LH2.EQ	0.19
10Hz_13	S08TH1.EQ	0.21

Results Summary:

Site:	KIF East Dike
Section:	Polishing_Pond_Section
Profile:	KIF-D2
EQ Event:	Design EQ
EQ Source:	10 Hz
Average amax:	**0.21**

Detailed Results:

Motion Index	Motion Filename	a_{max} at Surface
10Hz_01	GRV060H1.EQ	0.20
10Hz_02	GRV330H2.EQ	0.22
10Hz_03	HCP045H1.EQ	0.24
10Hz_04	HCP135H2.EQ	0.21
10Hz_05	RSN1684_HE.csv	0.21
10Hz_06	RSN1684_HN.csv	0.19
10Hz_07	RSN3982_HE.csv	0.19
10Hz_08	RSN3982_HN.csv	0.24
10Hz_09	RSN4039_HN.csv	0.25
10Hz_10	RSN8529_HE.csv	0.19
10Hz_11	RSN8529_HN.csv	0.20
10Hz_12	S08LH2.EQ	0.21
10Hz_13	S08TH1.EQ	0.22

Results Summary:

Site:	KIF East Dike
Section:	Polishing_Pond_Section
Profile:	KIF-STN50
EQ Event:	Design EQ
EQ Source:	10 Hz
Average amax:	**0.24**

Detailed Results:

Motion Index	Motion Filename	a_{max} at Surface
10Hz_01	GRV060H1.EQ	0.20
10Hz_02	GRV330H2.EQ	0.21
10Hz_03	HCP045H1.EQ	0.27
10Hz_04	HCP135H2.EQ	0.31
10Hz_05	RSN1684_HE.csv	0.29
10Hz_06	RSN1684_HN.csv	0.23
10Hz_07	RSN3982_HE.csv	0.19
10Hz_08	RSN3982_HN.csv	0.24
10Hz_09	RSN4039_HN.csv	0.26
10Hz_10	RSN8529_HE.csv	0.23
10Hz_11	RSN8529_HN.csv	0.23
10Hz_12	S08LH2.EQ	0.26
10Hz_13	S08TH1.EQ	0.25

Results Summary:

Site:	KIF East Dike
Section:	Polishing_Pond_Section
Profile:	KIF-STN51
EQ Event:	Design EQ
EQ Source:	10 Hz
Average amax:	**0.21**

Detailed Results:

Motion Index	Motion Filename	a_{max} at Surface
10Hz_01	GRV060H1.EQ	0.21
10Hz_02	GRV330H2.EQ	0.21
10Hz_03	HCP045H1.EQ	0.23
10Hz_04	HCP135H2.EQ	0.21
10Hz_05	RSN1684_HE.csv	0.21
10Hz_06	RSN1684_HN.csv	0.20
10Hz_07	RSN3982_HE.csv	0.19
10Hz_08	RSN3982_HN.csv	0.25
10Hz_09	RSN4039_HN.csv	0.25
10Hz_10	RSN8529_HE.csv	0.18
10Hz_11	RSN8529_HN.csv	0.18
10Hz_12	S08LH2.EQ	0.23
10Hz_13	S08TH1.EQ	0.22

2.3.3 Alternate Section

2.3.3.1 1 Hz Design Earthquake

Results Summary:

Site:	Kingston Fossil Plant
Section:	Alternate
Profile:	KIF-B05_NOR
EQ Event:	Design EQ
EQ Source:	1 Hz
Average amax:	**0.10**

Detailed Results:

Motion Index	Motion Filename	a_{max} at Surface
1Hz_01	RSN4060_HE.csv	0.10
1Hz_02	RSN592_HE.csv	0.12
1Hz_03	RSN596_HE.csv	0.09
1Hz_04	RSN66_HE.csv	0.10
1Hz_05	RSN8409_HN.csv	0.08
1Hz_06	RSN8556_HE.csv	0.08
1Hz_07	RSN8565_HE.csv	0.12

Results Summary:

Site:	Kingston Fossil Plant
Section:	Alternate
Profile:	KIF-B06_NOR
EQ Event:	Design EQ
EQ Source:	1 Hz
Average amax:	**0.12**

Detailed Results:

Motion Index	Motion Filename	a_{max} at Surface
1Hz_01	RSN4060_HE.csv	0.13
1Hz_02	RSN592_HE.csv	0.12
1Hz_03	RSN596_HE.csv	0.11
1Hz_04	RSN66_HE.csv	0.12
1Hz_05	RSN8409_HN.csv	0.13
1Hz_06	RSN8556_HE.csv	0.13
1Hz_07	RSN8565_HE.csv	0.13

Results Summary:

Site:	Kingston Fossil Plant
Section:	Alternate
Profile:	KIF-B07_NOR
EQ Event:	Design EQ
EQ Source:	1 Hz
Average amax:	**0.10**

Detailed Results:

Motion Index	Motion Filename	a_{max} at Surface
1Hz_01	RSN4060_HE.csv	0.09
1Hz_02	RSN592_HE.csv	0.11
1Hz_03	RSN596_HE.csv	0.10
1Hz_04	RSN66_HE.csv	0.10
1Hz_05	RSN8409_HN.csv	0.10
1Hz_06	RSN8556_HE.csv	0.09
1Hz_07	RSN8565_HE.csv	0.12

Results Summary:

Site:	Kingston Fossil Plant
Section:	Alternate
Profile:	KIF-B08_NOR
EQ Event:	Design EQ
EQ Source:	1 Hz
Average amax:	**0.09**

Detailed Results:

Motion Index	Motion Filename	a_{max} at Surface
1Hz_01	RSN4060_HE.csv	0.09
1Hz_02	RSN592_HE.csv	0.10
1Hz_03	RSN596_HE.csv	0.09
1Hz_04	RSN66_HE.csv	0.09
1Hz_05	RSN8409_HN.csv	0.08
1Hz_06	RSN8556_HE.csv	0.08
1Hz_07	RSN8565_HE.csv	0.11

2.3.3.2 10 Hz Design Earthquake

Results Summary:

Site:	Kingston Fossil Plant
Section:	Alternate
Profile:	KIF-B05_NOR
EQ Event:	Design EQ
EQ Source:	10 Hz
Average amax:	**0.21**

Detailed Results:

Motion Index	Motion Filename	a_{max} at Surface
10Hz_01	GRV060H1.EQ	0.19
10Hz_02	GRV330H2.EQ	0.22
10Hz_03	HCP045H1.EQ	0.24
10Hz_04	HCP135H2.EQ	0.21
10Hz_05	RSN1684_HE.csv	0.20
10Hz_06	RSN1684_HN.csv	0.18
10Hz_07	RSN3982_HE.csv	0.18
10Hz_08	RSN3982_HN.csv	0.24
10Hz_09	RSN4039_HN.csv	0.25
10Hz_10	RSN8529_HE.csv	0.17
10Hz_11	RSN8529_HN.csv	0.19
10Hz_12	S08LH2.EQ	0.22
10Hz_13	S08TH1.EQ	0.23

Results Summary:

Site:	Kingston Fossil Plant
Section:	Alternate
Profile:	KIF-B06_NOR
EQ Event:	Design EQ
EQ Source:	10 Hz
Average amax:	**0.19**

Detailed Results:

Motion Index	Motion Filename	a_{max} at Surface
10Hz_01	GRV060H1.EQ	0.18
10Hz_02	GRV330H2.EQ	0.20
10Hz_03	HCP045H1.EQ	0.22
10Hz_04	HCP135H2.EQ	0.18
10Hz_05	RSN1684_HE.csv	0.17
10Hz_06	RSN1684_HN.csv	0.15
10Hz_07	RSN3982_HE.csv	0.19
10Hz_08	RSN3982_HN.csv	0.20
10Hz_09	RSN4039_HN.csv	0.21
10Hz_10	RSN8529_HE.csv	0.16
10Hz_11	RSN8529_HN.csv	0.18
10Hz_12	S08LH2.EQ	0.23
10Hz_13	S08TH1.EQ	0.21

Results Summary:

Site:	Kingston Fossil Plant
Section:	Alternate
Profile:	KIF-B07_NOR
EQ Event:	Design EQ
EQ Source:	10 Hz
Average amax:	**0.15**

Detailed Results:

Motion Index	Motion Filename	a_{max} at Surface
10Hz_01	GRV060H1.EQ	0.15
10Hz_02	GRV330H2.EQ	0.16
10Hz_03	HCP045H1.EQ	0.17
10Hz_04	HCP135H2.EQ	0.14
10Hz_05	RSN1684_HE.csv	0.14
10Hz_06	RSN1684_HN.csv	0.10
10Hz_07	RSN3982_HE.csv	0.12
10Hz_08	RSN3982_HN.csv	0.18
10Hz_09	RSN4039_HN.csv	0.17
10Hz_10	RSN8529_HE.csv	0.14
10Hz_11	RSN8529_HN.csv	0.16
10Hz_12	S08LH2.EQ	0.14
10Hz_13	S08TH1.EQ	0.16

Results Summary:

Site:	Kingston Fossil Plant
Section:	Alternate
Profile:	KIF-B08_NOR
EQ Event:	Design EQ
EQ Source:	10 Hz
Average amax:	**0.13**

Detailed Results:

Motion Index	Motion Filename	a_{max} at Surface
10Hz_01	GRV060H1.EQ	0.13
10Hz_02	GRV330H2.EQ	0.14
10Hz_03	HCP045H1.EQ	0.15
10Hz_04	HCP135H2.EQ	0.14
10Hz_05	RSN1684_HE.csv	0.13
10Hz_06	RSN1684_HN.csv	0.11
10Hz_07	RSN3982_HE.csv	0.11
10Hz_08	RSN3982_HN.csv	0.16
10Hz_09	RSN4039_HN.csv	0.14
10Hz_10	RSN8529_HE.csv	0.14
10Hz_11	RSN8529_HN.csv	0.13
10Hz_12	S08LH2.EQ	0.11
10Hz_13	S08TH1.EQ	0.13

3 LIQUEFACTION AND CYCLIC SOFTENING ANALYSIS

3.1 CLAY-LIKE/SAND-LIKE DETERMINATION

3.1.1 Embankment Fill

CLAM - Clay-like Laboratory-Based Assessment of Materials

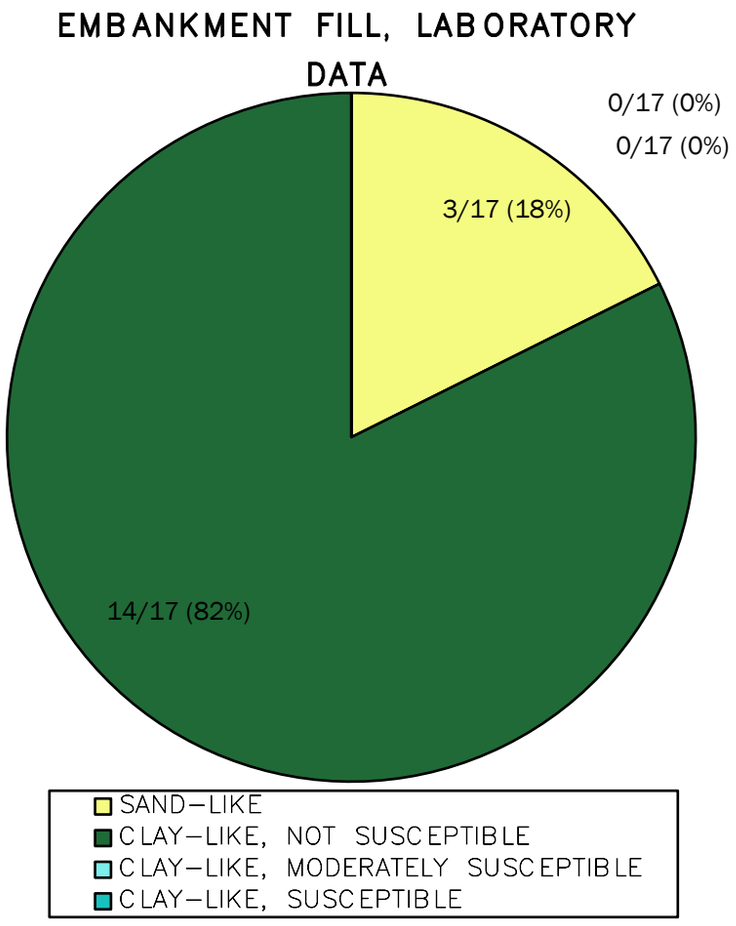
Stantec Project Number:	175668043
Project Name:	KIF TDEC Stability
Material	Embankment Fill

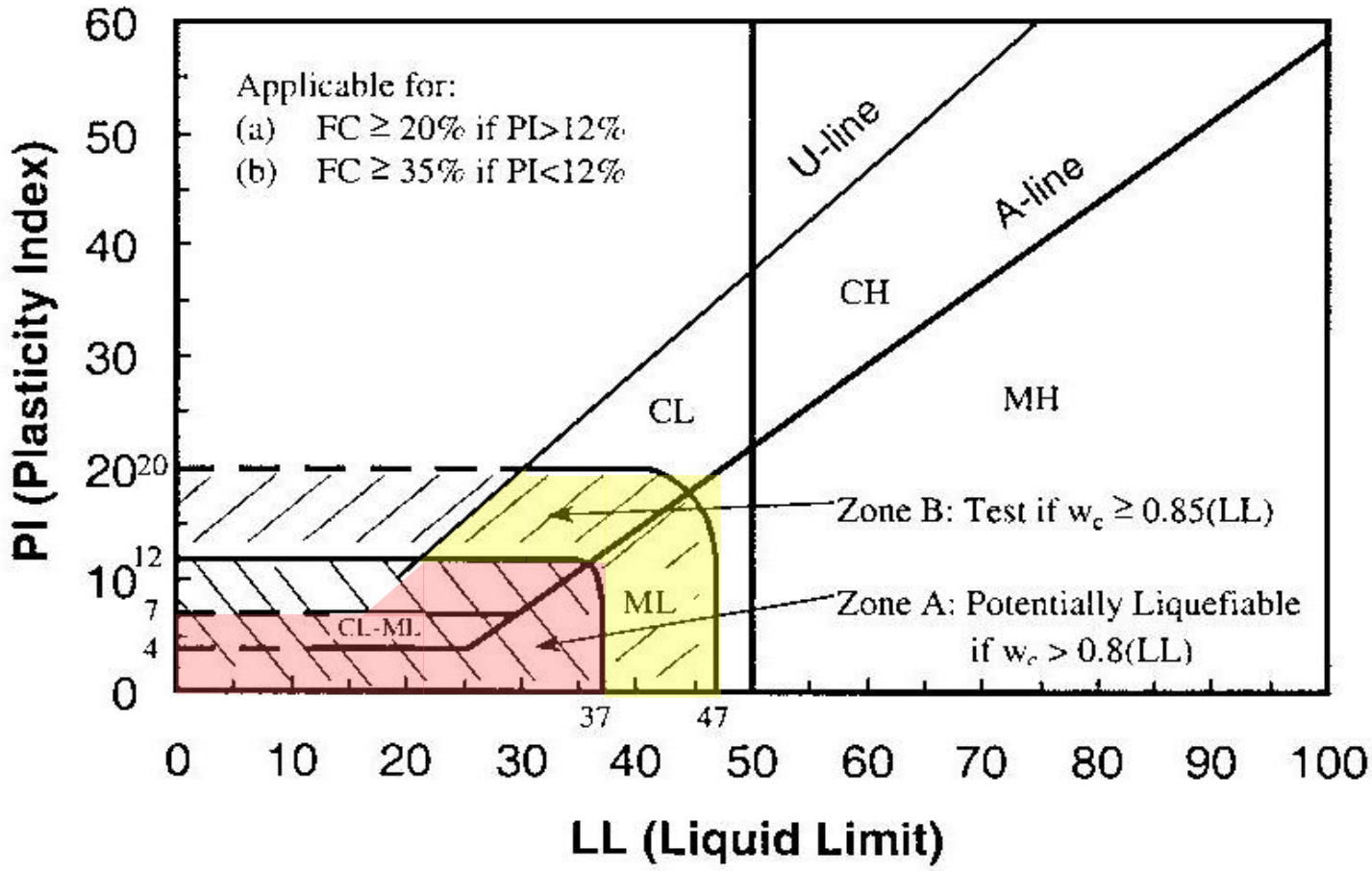
Note: NP = Non-Plastic

									Sand-like versus Clay-like Behavior (-1 indicates result does not meet criteria)														**Susceptibility of Clay-like Soils to Cyclic Softening (-1 indicates result does not meet criteria)**								
									Using Criteria published by Seed et al (2003)										Using Criteria published by Idriss and Boulanger (2008)		Using criteria published by MSHA (2010)				Using Criteria published by Seed et al (2003)		Using Criteria published by Bray and Sancio (2006)						
									Meets criteria for sand-like behavior		In Zone B		in B with w >= .85LL		Meets criteria for clay-like behavior				Meets criteria for sand-like behavior	Meets criteria for clay-like behavior	Meets criteria for sand-like behavior	Meets criteria for clay-like behavior	Borderline soils (treat as sand-like)		Meets all criteria for B (clay-like and potentially liquefiable, -2 indicates zone A but susceptible, -3 indicates not applicable due to fines content		Clay-like soil is susceptible (must meet both)		Clay-like soil is not susceptible (must meet one or both)		Clay-like soil is moderately susceptible		
Elevation at Midpoint (ft)	Lab ID	Boring	Depth(s) (ft)	Soil Classification	NMC (w_c) (%)	% Passing #200	% Passing #40	LL	PI	LL in Zone A (see plot)	PI in Zone A (see plot)	LL	PI	LL	PI	LL in Zone B (see plot)	PI in Zone B (see plot)	LL in Zone C (see plot)	PI in Zone C (see plot)	PI < 7	PI >= 7	PI <= 7	P40>=35%, P200>=20%, and PI>=10	7 < PI < 10, or does not meet P40 or P200	Overall Judgement based on 3 methods (sand-like or clay-like)	LL	PI	w_c/LL >= 0.85	PI <= 12	w_c/LL < 0.80	PI > 18	Intermediate w_c/LL (see plot)	Intermediate PI (see plot)	Overall Judgement based on 2 methods (susceptibility)
734.3	X	KIF-A2	19.5'-21.0'	MH	21	67.6	85.2	56	24	-1	-1	-1	-1	-1	-1	-1	-1	56	24	-1	24	-1	24	-1	**Clay-like**	-1	-1	-1.00	-1	0.38	24	-1.00	-1	**Not Susceptible**
729.4	X	KIF-A3	17.0'-18.5'	CL	30	51.5	77.2	47	24	-1	-1	-1	-1	-1	-1	-1	-1	47	24	-1	24	-1	24	-1	**Clay-like**	-1	-1	-1.00	-1	0.64	24	-1.00	-1	**Not Susceptible**
743.5	X	KIF-B2	9.0'-10.5'	SC		27	46.8	35	13	-1	-1	35	13	-1	-1	35	13	-1	-1	-1	13	-1	13	-1	**Clay-like**	-1	-1	-1.00	-1	0.00	13	-1.00	-1	**Not Susceptible**
728.3	X	KIF-B3	19.5'-21.0'	SM		36	52.9	37	11	37	11	-1	-1	-1	-1	-1	-1	-1	-1	-1	11	-1	11	-1	**Clay-like**	-1	-1	-1.00	-1	0.00	11	-1.00	-1	**Not Susceptible**
734.8	X	KIF-BF-SPT3	18.5'-20.0'	ML	22			46	18	-1	-1	46	18	-1	-1	46	18	-1	-1	-1	18	-1	-1	18	**Clay-like**	-1	-1	-1.00	-1	0.48	18	-1.00	-1	**Not Susceptible**
733.0	X	KIF-BF-SPT3	20.0'-22.0'	CL	33			43	18	-1	-1	43	18	-1	-1	43	18	-1	-1	-1	18	-1	-1	18	**Clay-like**	-1	-1	-1.00	-1	0.77	18	-1.00	-1	**Not Susceptible**
750.5	170	KIF-B05	5.5'-6.5'	CL	26.4	51.1	92.1576633	42	18	-1	-1	42	18	-1	-1	42	18	-1	-1	-1	18	-1	18	-1	**Clay-like**	-1	-1	-1.00	-1	0.63	18	-1.00	-1	**Not Susceptible**
745.8	172	KIF-B05	10.0'-11.5'		21							-1	-1	-1	-1																			
740.8	174	KIF-B05	15.0'-16.5'	SC	20.9	20.2	85.5593088	28	11	28	11	-1	-1	-1	-1	-1	-1	-1	-1	-1	11	-1	11	-1	**Clay-like**	-1	-1	-1.00	-1	0.75	11	-1.00	-1	**Not Susceptible**
727.8	177	KIF-B05	28.0'-29.5'	SM	23.5	36.3	85.2999471	37	12	37	12	-1	-1	-1	-1	-1	-1	-1	-1	-1	12	-1	12	-1	**Clay-like**	-1	-1	-1.00	-1	0.64	12	-1.00	-1	**Not Susceptible**
725.7	187	KIF-B06	13.2'-14.7'	SM	30.3	46	94.3151754	38	13	-1	-1	38	13	-1	-1	38	13	-1	-1	-1	13	-1	13	-1	**Clay-like**	-1	-1	-1.00	-1	0.80	13	-1.00	-1	**Not Susceptible**
748.8	225	KIF-B09	5.0'-6.5'	SM	24.7	37.9	77.6168158	42	15	-1	-1	42	15	-1	-1	42	15	-1	-1	-1	15	-1	15	-1	**Clay-like**	-1	-1	-1.00	-1	0.59	15	-1.00	-1	**Not Susceptible**
743.8	227	KIF-B09	10.0'-11.5'	GM	5.5	13.8	38.7374426	NP	NP																**Sand-like**									
738.8	229	KIF-B09	15.0'-16.5'	SC	17.6	48.9	90.2374812	37	14	-1	-1	37	14	-1	-1	37	14	-1	-1	-1	14	-1	14	-1	**Clay-like**	-1	-1	-1.00	-1	0.48	14	-1.00	-1	**Not Susceptible**
734.3	231	KIF-B09	20.0'-20.5'		32.7							-1	-1	-1	-1																			
726.3	233	KIF-B09	27.5'-29.0'	ML	32.6	61.4	97.8028041	42	16	-1	-1	42	16	-1	-1	42	16	-1	-1	-1	16	-1	16	-1	**Clay-like**	-1	-1	-1.00	-1	0.78	16	-1.00	-1	**Not Susceptible**
749.6	281	KIF-B13	2.9'-4.0'	SC	20	41.4	93.7251107	35	13	-1	-1	35	13	-1	-1	35	13	-1	-1	-1	13	-1	13	-1	**Clay-like**	-1	-1	-1.00	-1	0.57	13	-1.00	-1	**Not Susceptible**
747.3	282	KIF-B13	5.0'-6.5'		16.9							-1	-1	-1	-1																			
742.3	284	KIF-B13	10.0'-11.5'	SC	18.4	29.7	76.807687	33	13	-1	-1	33	13	-1	-1	33	13	-1	-1	-1	13	-1	13	-1	**Clay-like**	-1	-1	-1.00	-1	0.56	13	-1.00	-1	**Not Susceptible**
734.8	286	KIF-B13	17.5'-19.0'		18.1							-1	-1	-1	-1																			
726.8	288	KIF-B13	26.0'-26.5'	CL	20.3	57.1	100	23	8	23	8	-1	-1	-1	-1	-1	-1	-1	-1	-1	8	-1	-1	8	**Sand-like**									

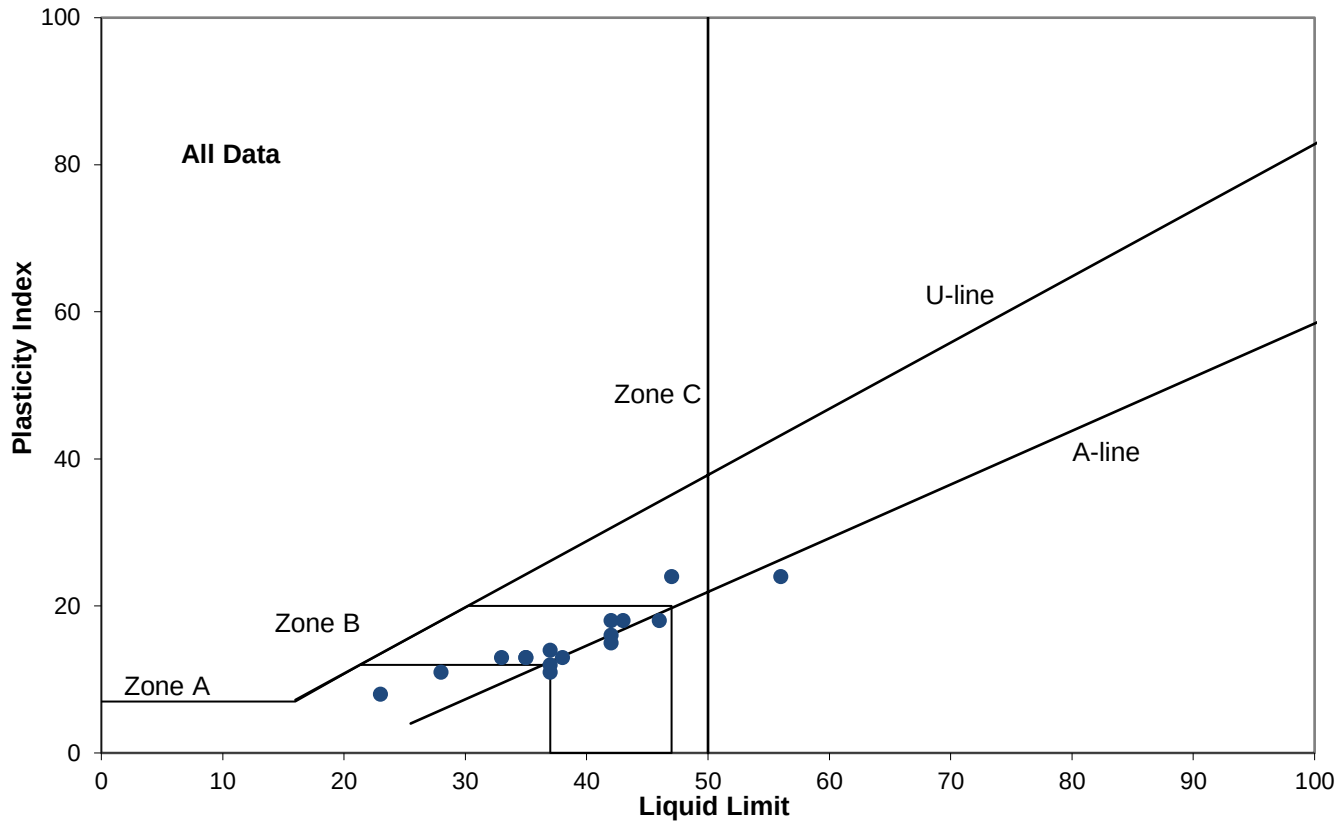
Embankment Fill, Fine-grained Screening and Cyclic Softening Susceptibility Summary

Soil Classification	Clay-like vs. Sand-like	Clay-like Susceptibility	Sample Count	Sample Percent
CL			**4**	**19%**
	Clay-like		3	75%
		Not Susceptible	3	100%
	Sand-like		1	25%
		Sand-like	1	100%
SM			**4**	**19%**
	Clay-like		4	100%
		Not Susceptible	4	100%
SC			**5**	**24%**
	Clay-like		5	100%
		Not Susceptible	5	100%
MH			**1**	**5%**
	Clay-like		1	100%
		Not Susceptible	1	100%
ML			**2**	**10%**
	Clay-like		2	100%
		Not Susceptible	2	100%
0			**4**	**19%**
			4	100%
		Sand-like	4	100%
GM			**1**	**5%**
	Sand-like		1	100%
		Sand-like	1	100%
Grand Total			**21**	**100%**



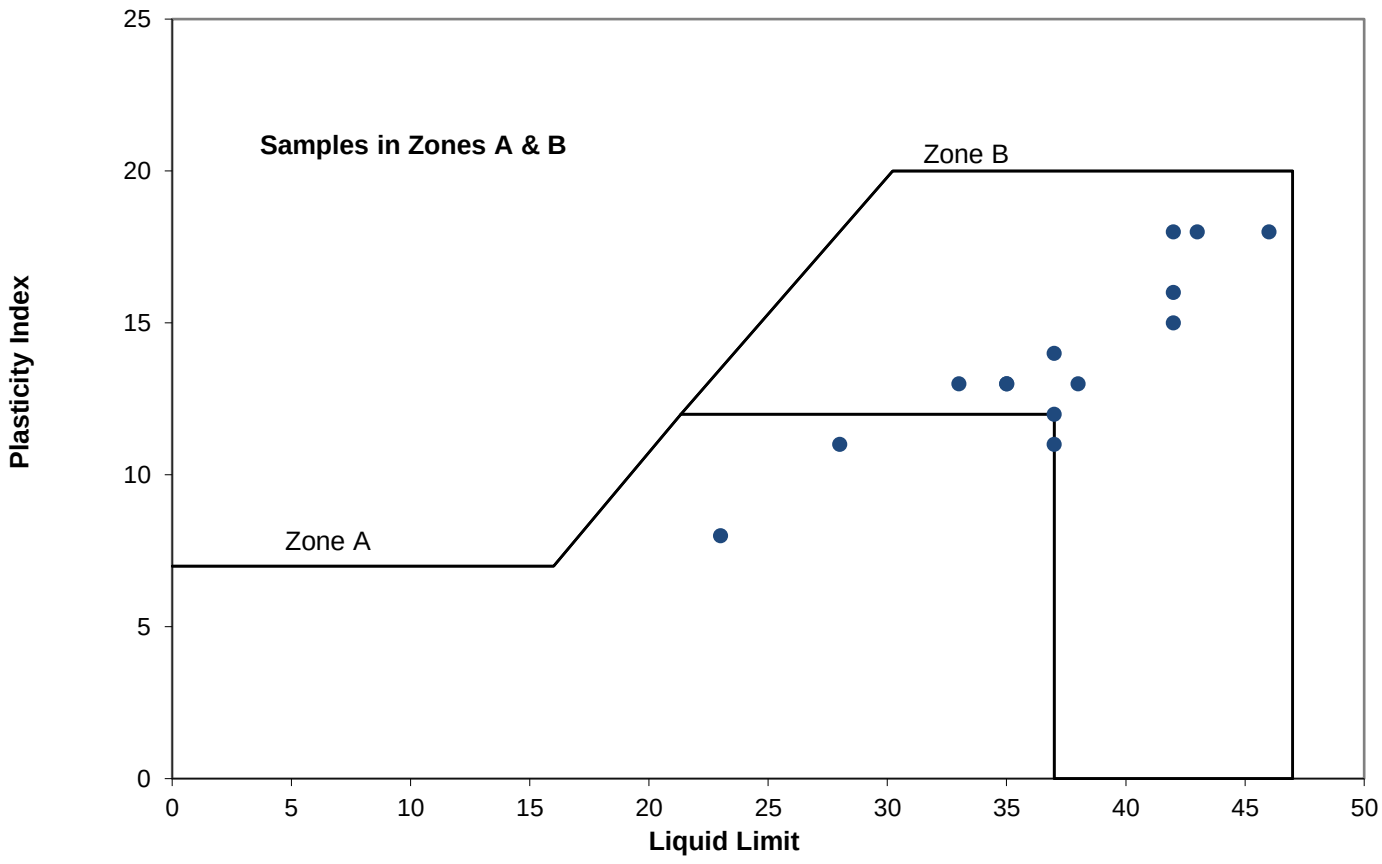


(a)



(b)

Screening Criteria for Liquefiable Fine-Grained Soils (Seed et al. 2003)



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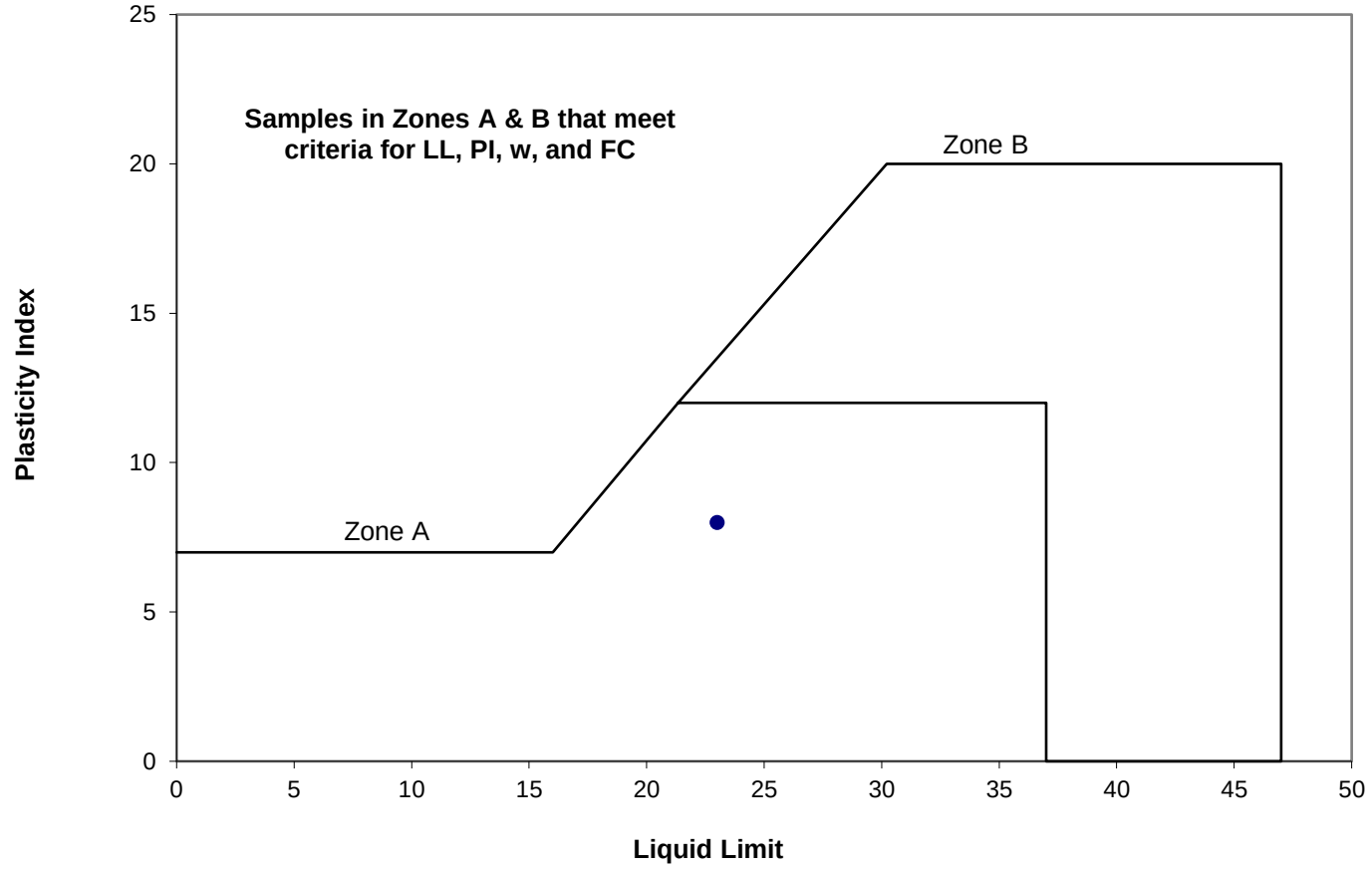
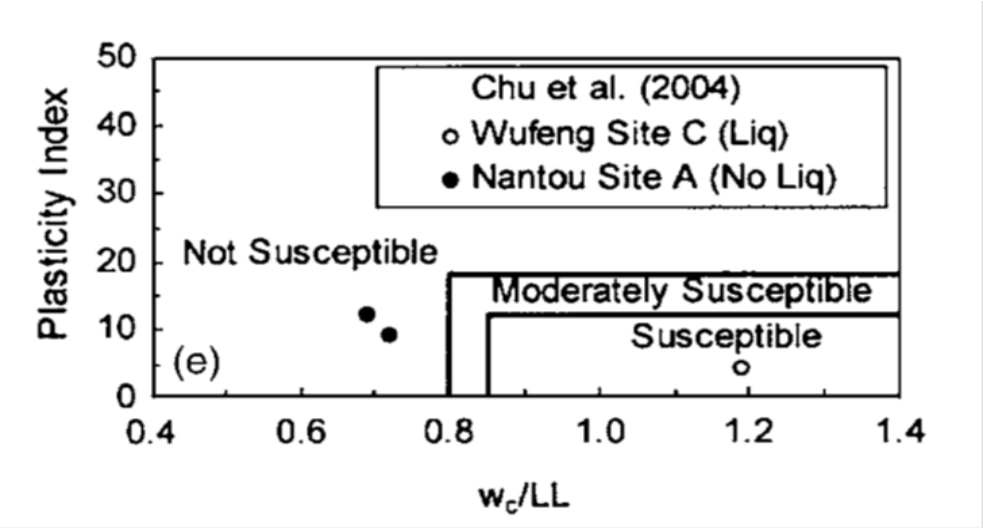
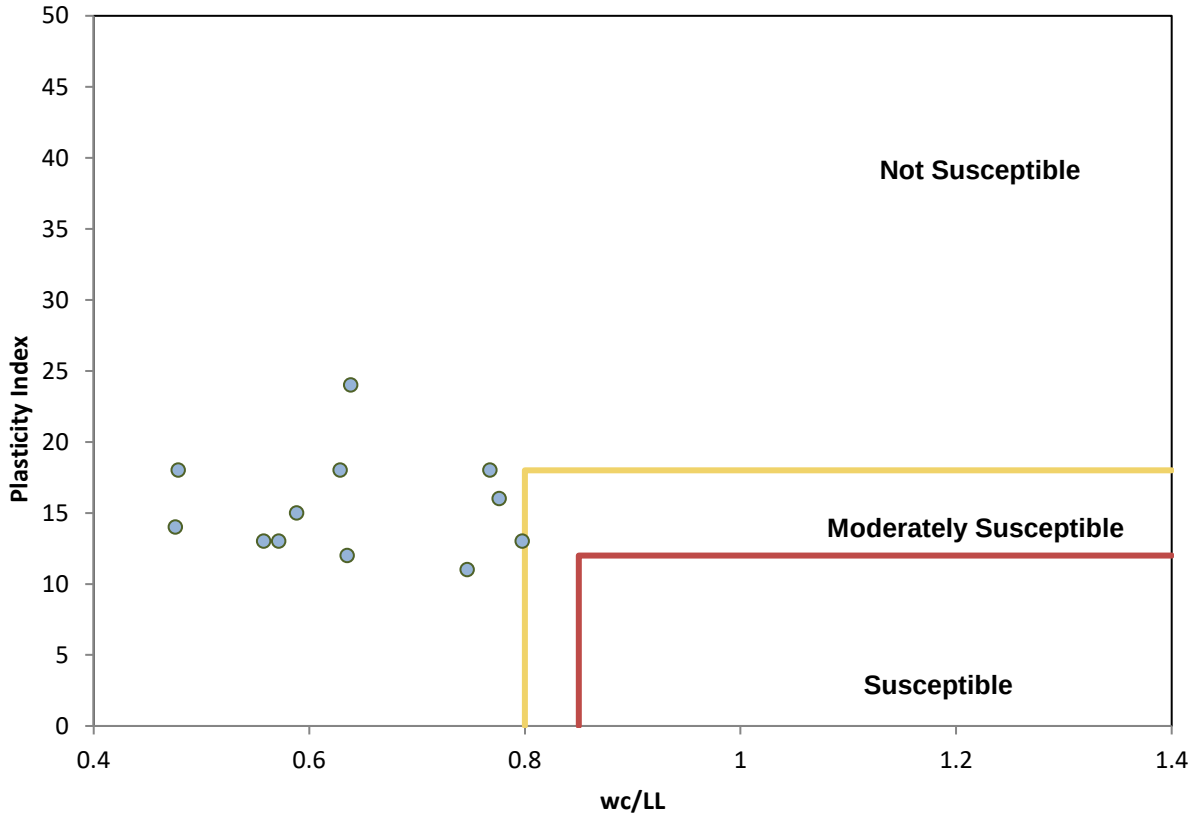


(d)

Screening Criteria for Liquefiable Fine-Grained Soils (Seed et al. 2003)





Screening Criteria for Assessing Liquefaction in Fine Grained Soils (Bray and Sancio 2006)

3.1.2 Fly Ash

CLAM - **C**lay-like **L**aboratory-Based **A**ssessment of **M**aterials

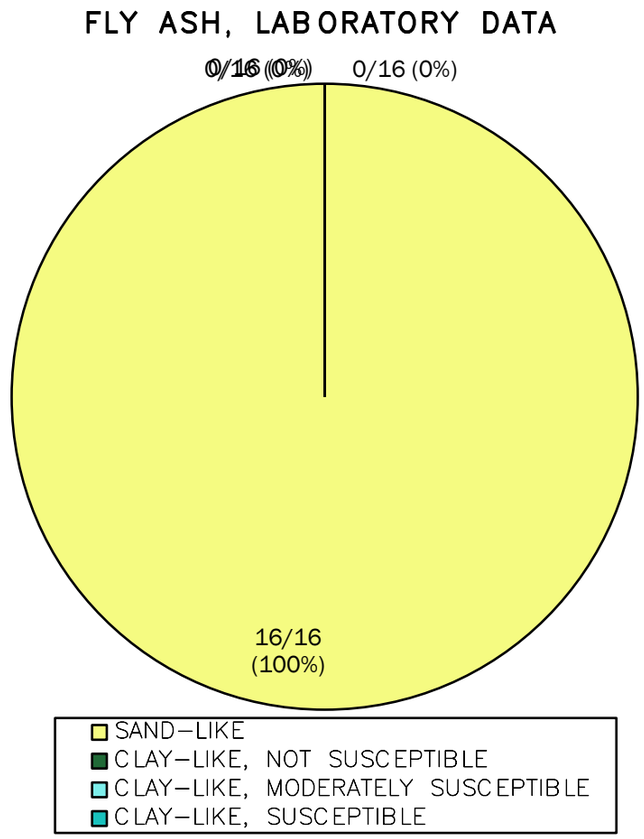
Stantec Project Number:	175668043
Project Name:	KIF TDEC Stability
Material	Fly Ash

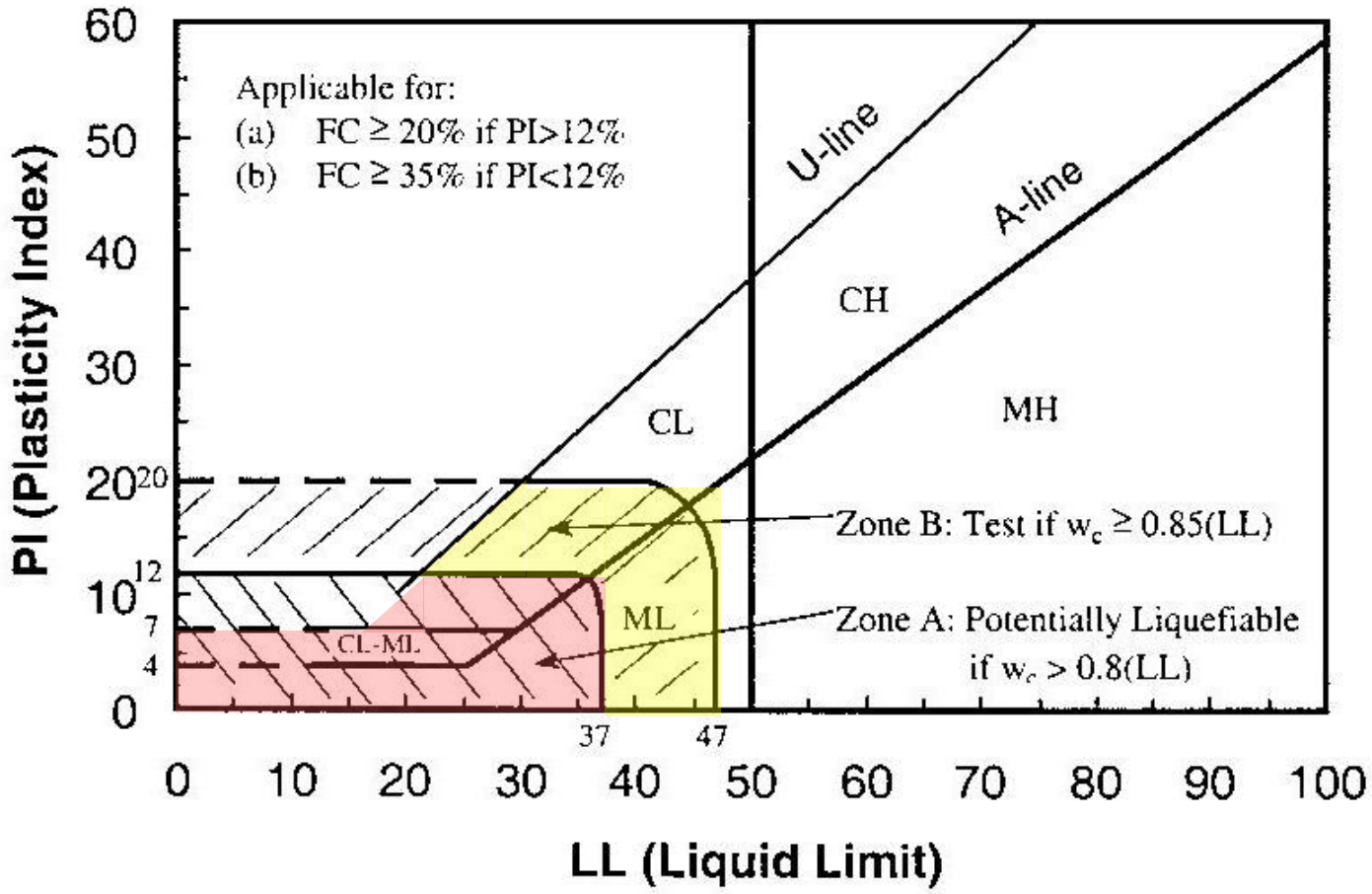
Note: NP = Non-Plastic

									Sand-like versus Clay-like Behavior (-1 indicates result does not meet criteria)															**Susceptibility of Clay-like Soils to Cyclic Softening (-1 indicates result does not meet criteria)**							
									Using Criteria published by Seed et al (2003)										Using Criteria published by Idriss and Boulanger (2008)		Using criteria published by MSHA (2010)				Using Criteria published by Seed et al (2003)		Using Criteria published by Bray and Sancio (2006)					
									Meets criteria for sand-like behavior		In Zone B		in B with w >= .85LL		Meets criteria for clay-like behavior				Meets criteria for sand-like behavior	Meets criteria for clay-like behavior	Meets criteria for sand-like behavior	Meets criteria for clay-like behavior	Borderline soils (treat as sand-like)		Meets all criteria for B (clay-like and potentially liquefiable, -2 indicates zone A but susceptible, -3 indicates not applicable due to fines content		Clay-like soil is susceptible (must meet both)		Clay-like soil is not susceptible (must meet one or both)		Clay-like soil is moderately susceptible		
Elevation at Midpoint (ft)	Lab ID	Boring	Depth(s) (ft)	Soil Classification	NMC (w_c) (%)	% Passing #200	% Passing #40	LL	PI	LL in Zone A (see plot)	PI in Zone A (see plot)	LL	PI	LL	PI	LL in Zone B (see plot)	PI in Zone B (see plot)	LL in Zone C (see plot)	PI in Zone C (see plot)	PI < 7	PI >= 7	PI <= 7	P40>=35%, P200>=20%, and PI>=10	7 < PI < 10, or does not meet P40 or P200	Overall Judgement based on 3 methods (sand-like or clay-like)	LL	PI	w_c/LL >= 0.85	PI <= 12	w_c/LL < 0.80	PI > 18	Intermediate w_c/LL (see plot)	Intermediate PI (see plot)	Overall Judgement based on 2 methods (susceptibility)
741.3	8	KIF-GT-TW05	28.5'-30.0'	ML	38	62.8	88.8	NP	NP																**Sand-like**									
735.3	11	KIF-GT-TW05	34.5'-36.0'	ML	45	83.5	98.2	NP	NP																**Sand-like**									
759.5	95	KIF-GT-TW04	5.5'-6.0'	ML	50	83.1	98.9	NP	NP																**Sand-like**									
751.0	100	KIF-GT-TW04	13.5'-15.0'	ML	41	94	99	NP	NP																**Sand-like**									
736.0	106	KIF-GT-TW04	28.5'-30.0'	SM	39	37.7	70.1	NP	NP																**Sand-like**									
731.2	108	KIF-GT-TW04	33.5'-34.5'	ML	58	64.5	95.3	NP	NP																**Sand-like**									
740.0	104	KIF-GT-TW04	24.9'-25.5'	ML	49	60.7	90.9	NP	NP																**Sand-like**									
725.6	112	KIF-GT-TW04	39.3'-39.9'	ML	34	66	85.4	NP	NP																**Sand-like**									
727.8	X	KIF-A1	28.5'-30.0'	ML		96.5	100	NP	NP																**Sand-like**									
741.8	X	KIF-B1	16.5'-18.0'	ML	57	62.2	96.3	NP	NP																**Sand-like**									
760.0	X	KIF-B5	6.5'-10.5'	SM		43.3	64.1	NP	NP																**Sand-like**									
751.3	X	KIF-B5	14.0'-20.5'	SM		42.5	50.4	NP	NP																**Sand-like**									
762.4	X	KIF-B39	6.0'-7.5'	ML	21	75.6	90	NP	NP																**Sand-like**									
743.8	X	KIF-BF-SPT2	23.5'-25.0'	SM	32	25	55	NP	NP																**Sand-like**									
738.8	X	KIF-BF-SPT2	28.5'-30.0'	SM	52	35	78	NP	NP																**Sand-like**									
733.8	X	KIF-BF-SPT2	33.5'-35.0'		43			NP	NP																**Sand-like**									
752.3	X	KIF-BF-SPT3	1.0'-2.5'			46	66	NP	NP																**Sand-like**									
749.8	X	KIF-BF-SPT3	3.5'-5.0'			54	68	NP	NP																**Sand-like**									
759.8	X	KIF-BF-SPT4	8.5'-10.0'	ML				27	1	27	1	-1	-1	-1	-1	-1	-1	-1	-1	1	-1	1	-1	-1	**Sand-like**									

Fly Ash, Fine-grained Screening and Cyclic Softening Susceptibility Summary

Soil Classification	Clay-like vs. Sand-like	Clay-like Susceptibility	Sample Count	Sample Percent
SM			**1**	**13%**
	Sand-like		1	100%
		Sand-like	1	100%
ML			**7**	**88%**
	Sand-like		7	100%
		Sand-like	7	100%
Grand Total			**8**	**100%**





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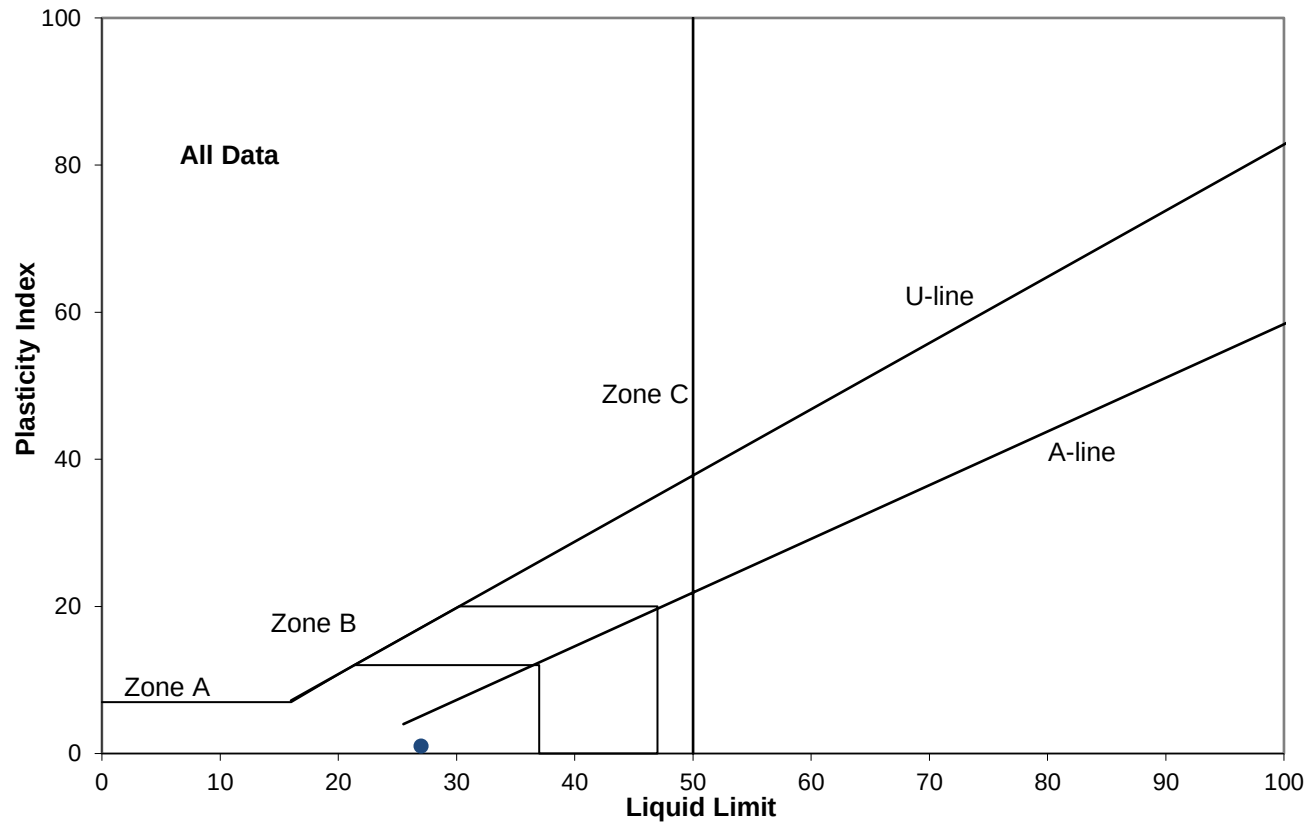
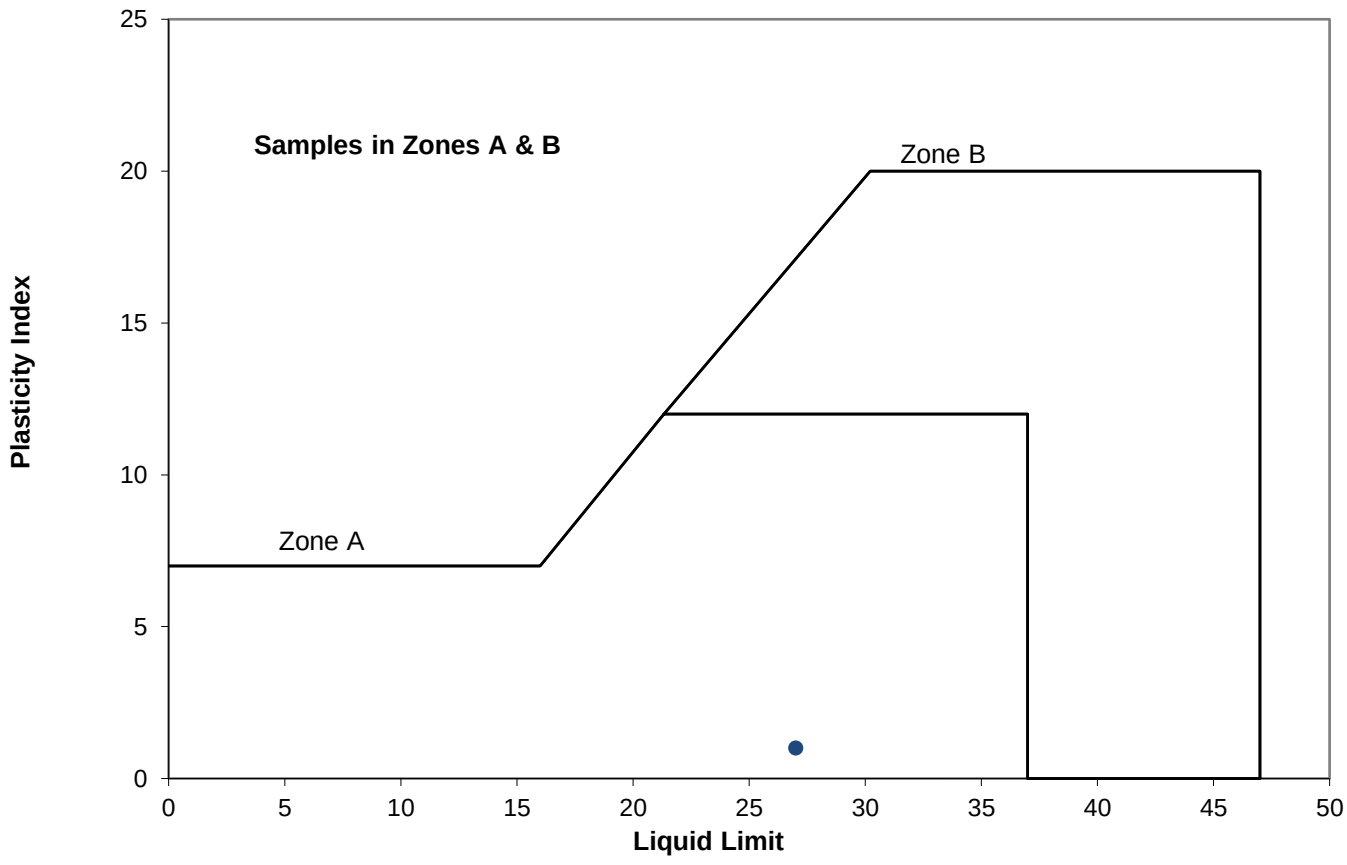


(b)

Screening Criteria for Liquefiable Fine-Grained Soils (Seed et al. 2003)



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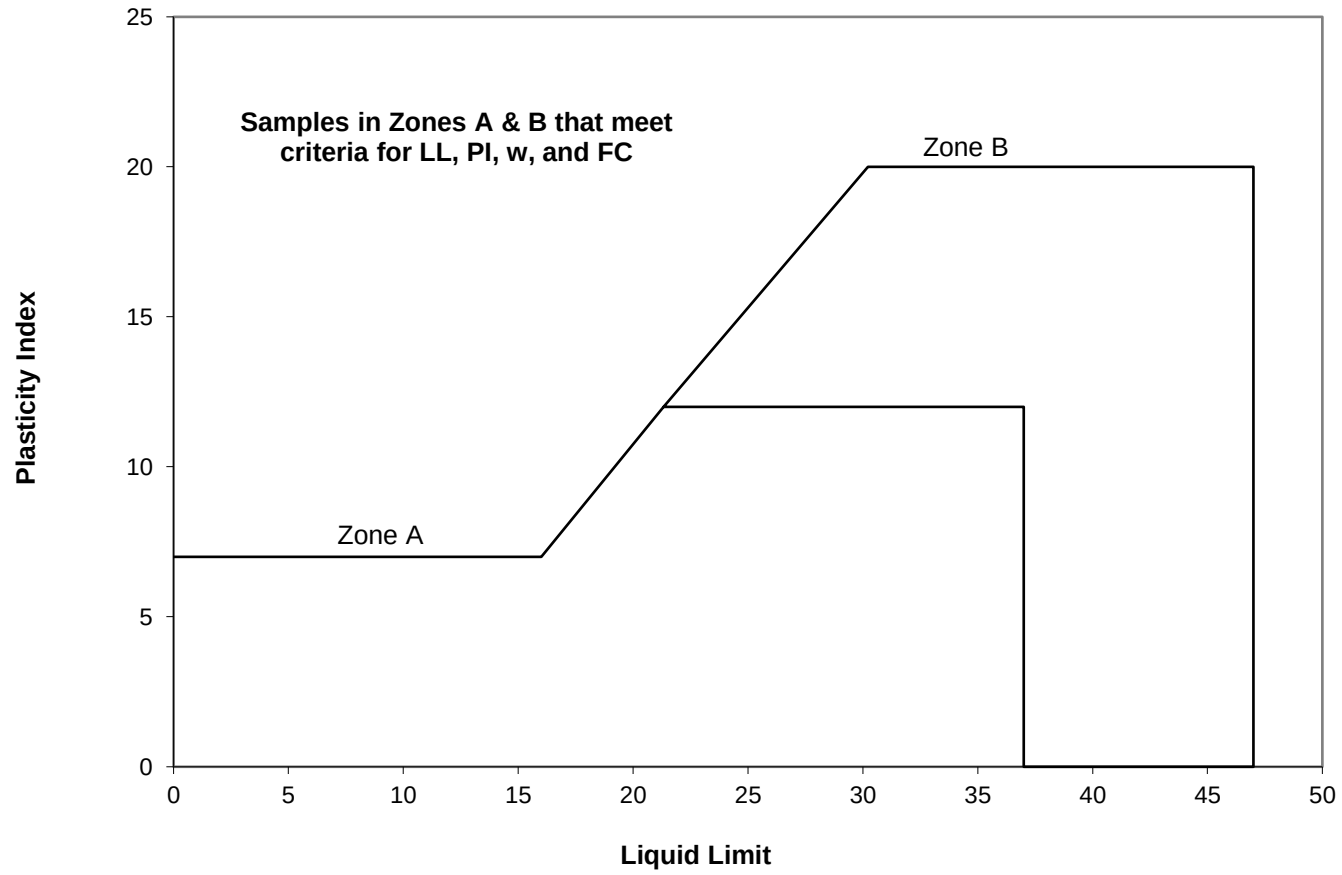

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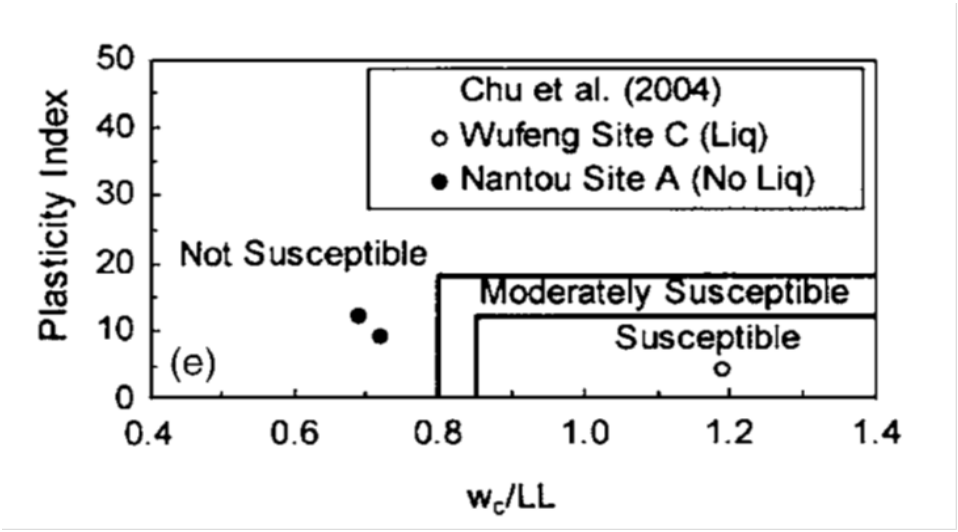
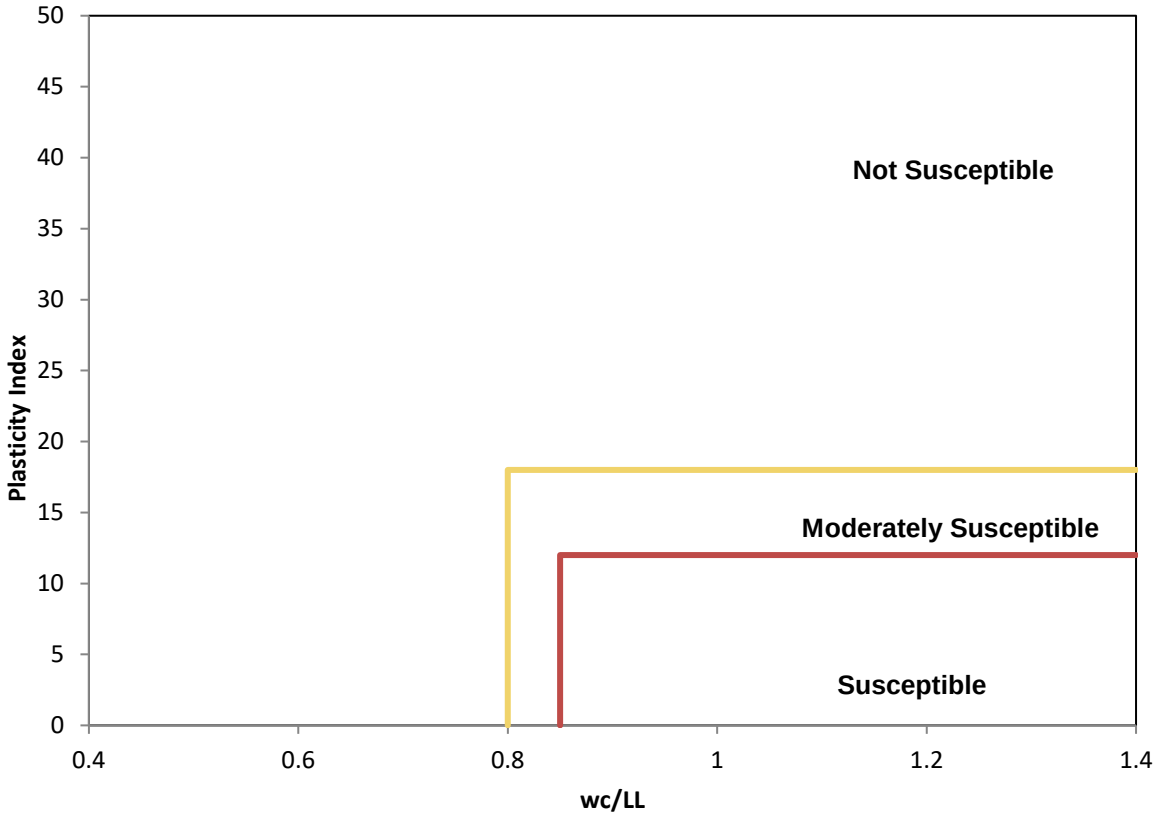
Screening Criteria for Liquefiable Fine-Grained Soils (Seed et al. 2003)





Screening Criteria for Assessing Liquefaction in Fine Grained Soils (Bray and Sancio 2006)

3.1.3 Bottom Ash

CLAM - **C**lay-like **L**aboratory-Based **A**ssessment of **M**aterials

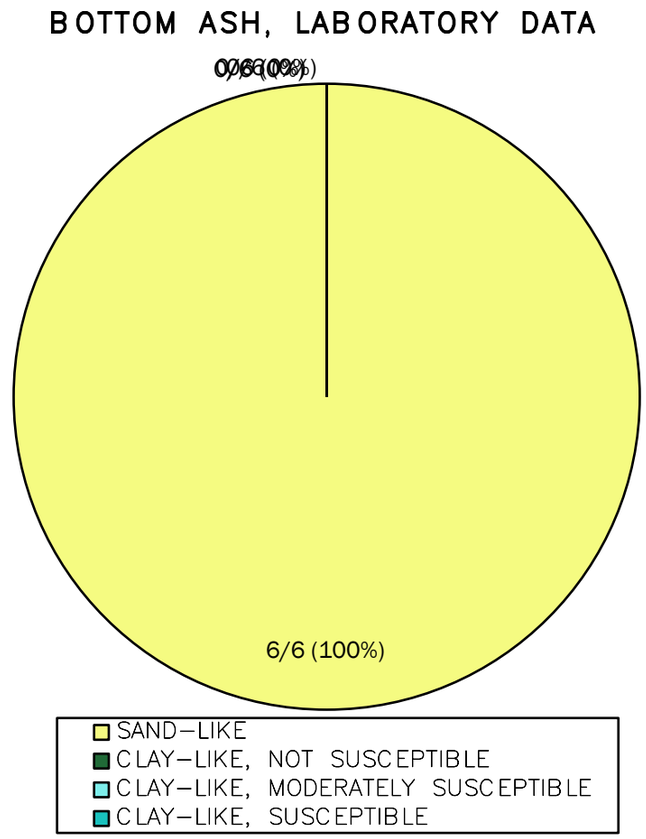
Stantec Project Number:	175668043
Project Name:	KIF TDEC Stability
Material	Bottom Ash

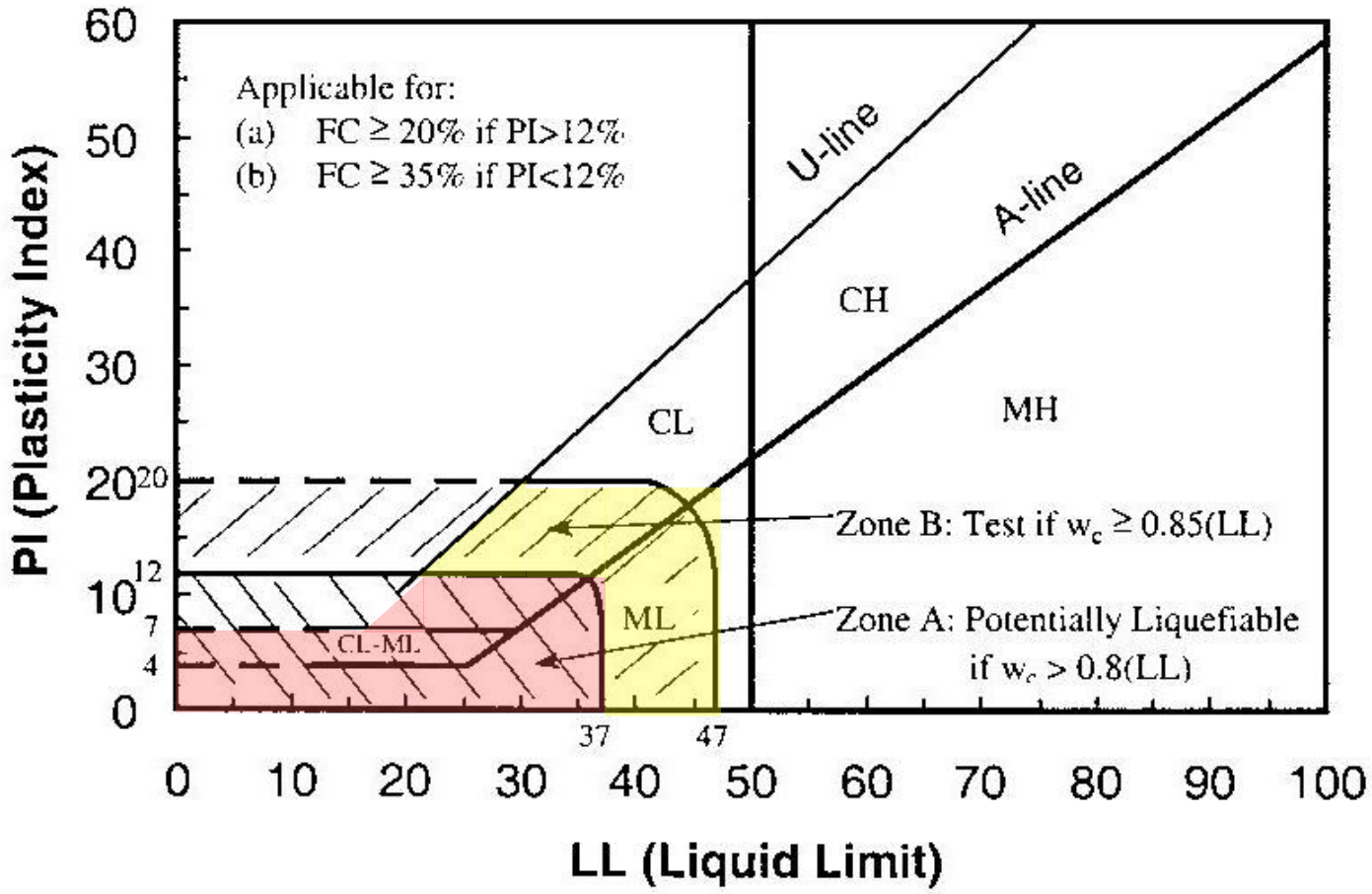
Note: NP = Non-Plastic

									Sand-like versus Clay-like Behavior (-1 indicates result does not meet criteria)														**Susceptibility of Clay-like Soils to Cyclic Softening (-1 indicates result does not meet criteria)**								
									Using Criteria published by Seed et al (2003)										Using Criteria published by Idriss and Boulanger (2008)		Using criteria published by MSHA (2010)				Using Criteria published by Seed et al (2003)		Using Criteria published by Bray and Sancio (2006)						
									Meets criteria for sand-like behavior		In Zone B		in B with w >= .85LL		Meets criteria for clay-like behavior				Meets criteria for sand-like behavior	Meets criteria for clay-like behavior	Meets criteria for sand-like behavior	Meets criteria for clay-like behavior	Borderline soils (treat as sand-like)		Meets all criteria for B (clay-like and potentially liquefiable, -2 indicates zone A but susceptible, -3 indicates not applicable due to fines content		Clay-like soil is susceptible (must meet both)		Clay-like soil is not susceptible (must meet one or both)		Clay-like soil is moderately susceptible		
Elevation at Midpoint (ft)	Lab ID	Boring	Depth(s) (ft)	Soil Classification	NMC (w_c) (%)	% Passing #200	% Passing #40	LL	PI	LL in Zone A (see plot)	PI in Zone A (see plot)	LL	PI	LL	PI	LL in Zone B (see plot)	PI in Zone B (see plot)	LL in Zone C (see plot)	PI in Zone C (see plot)	PI < 7	PI >= 7	PI <= 7	P40>=35%, P200>=20%, and PI>=10	7 < PI < 10, or does not meet P40 or P200	Overall Judgement based on 3 methods (sand-like or clay-like)	LL	PI	w_c/LL >= 0.85	PI <= 12	w_c/LL < 0.80	PI > 18	Intermediate w_c/LL (see plot)	Intermediate PI (see plot)	Overall Judgement based on 2 methods (susceptibility)
745.8	X	KIF-A1	10.5'-12.0'	SM	20	16	35.4	NP	NP																**Sand-like**									
745.2	X	KIF-B40	24.0'-25.5'	SP		3.3	6.1	NP	NP																**Sand-like**									
738.2	X	KIF-B40	31.0'-32.5'	SP		3.7	8.1	NP	NP																**Sand-like**									
761.3	X	KIF-BF-SPT2	6.0'-7.5'		17	38	73	NP	NP																**Sand-like**									
760.8	X	KIF-BF-SPT5	8.5'-10.0'	ML	30			31	2	31	2	-1	-1	-1	-1	-1	-1	-1	-1	2	-1	2	-1	-1	**Sand-like**									
760.8	3	KIF-GT-TW05	9.0'-10.5'	SM	13	23.1	46.8	NP	NP																**Sand-like**									
750.3	6	KIF-GT-TW05	19.5'-21.0'	SW-SM	13	11.1	25.1	NP	NP																**Sand-like**									

Bottom Ash, Fine-grained Screening and Cyclic Softening Susceptibility Summary

Soil Classification	Clay-like vs. Sand-like	Clay-like Susceptibility	Sample Count	Sample Percent
SM			**2**	**29%**
	Sand-like		2	100%
		Sand-like	2	100%
SP			**2**	**29%**
	Sand-like		2	100%
		Sand-like	2	100%
0			**1**	**14%**
	Sand-like		1	100%
		Sand-like	1	100%
ML			**1**	**14%**
	Sand-like		1	100%
		Sand-like	1	100%
SW-SM			**1**	**14%**
	Sand-like		1	100%
		Sand-like	1	100%
Grand Total			**7**	**100%**





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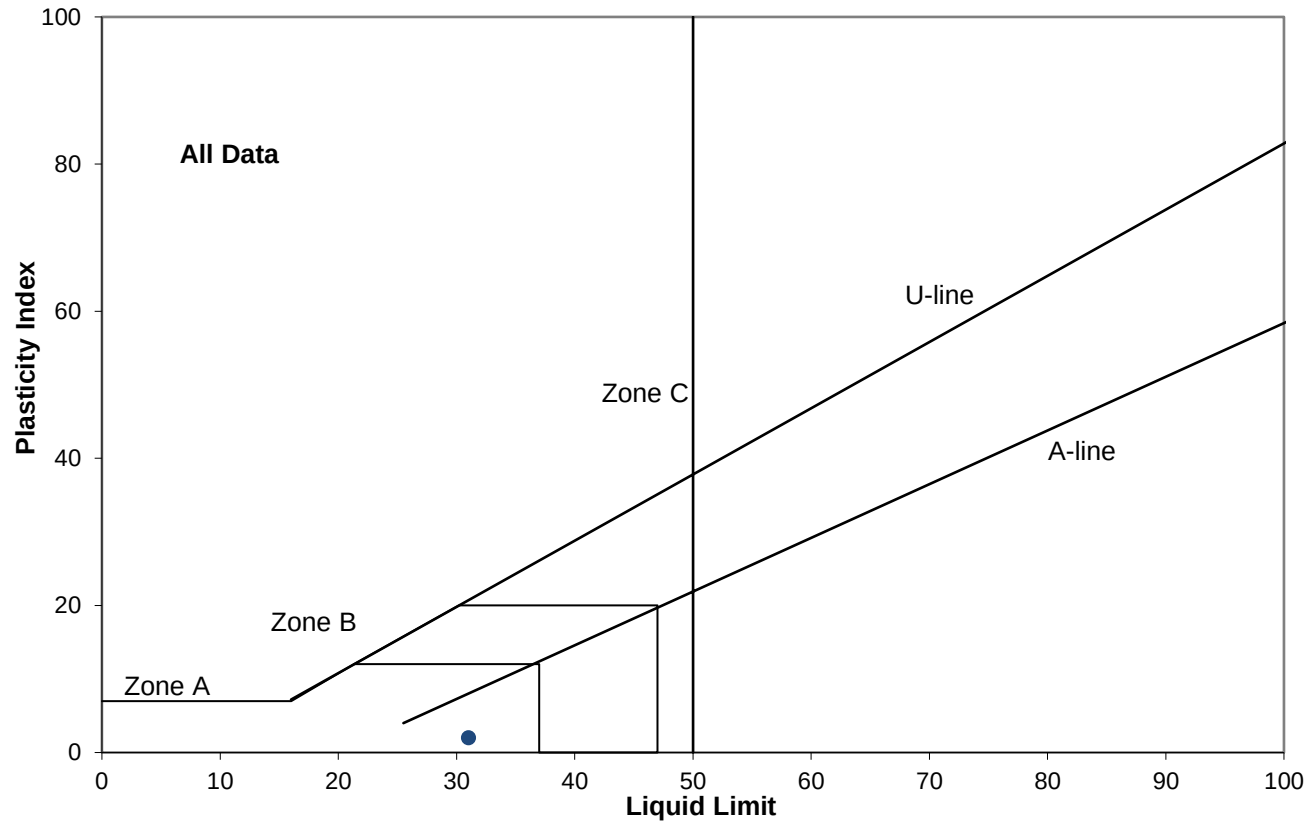
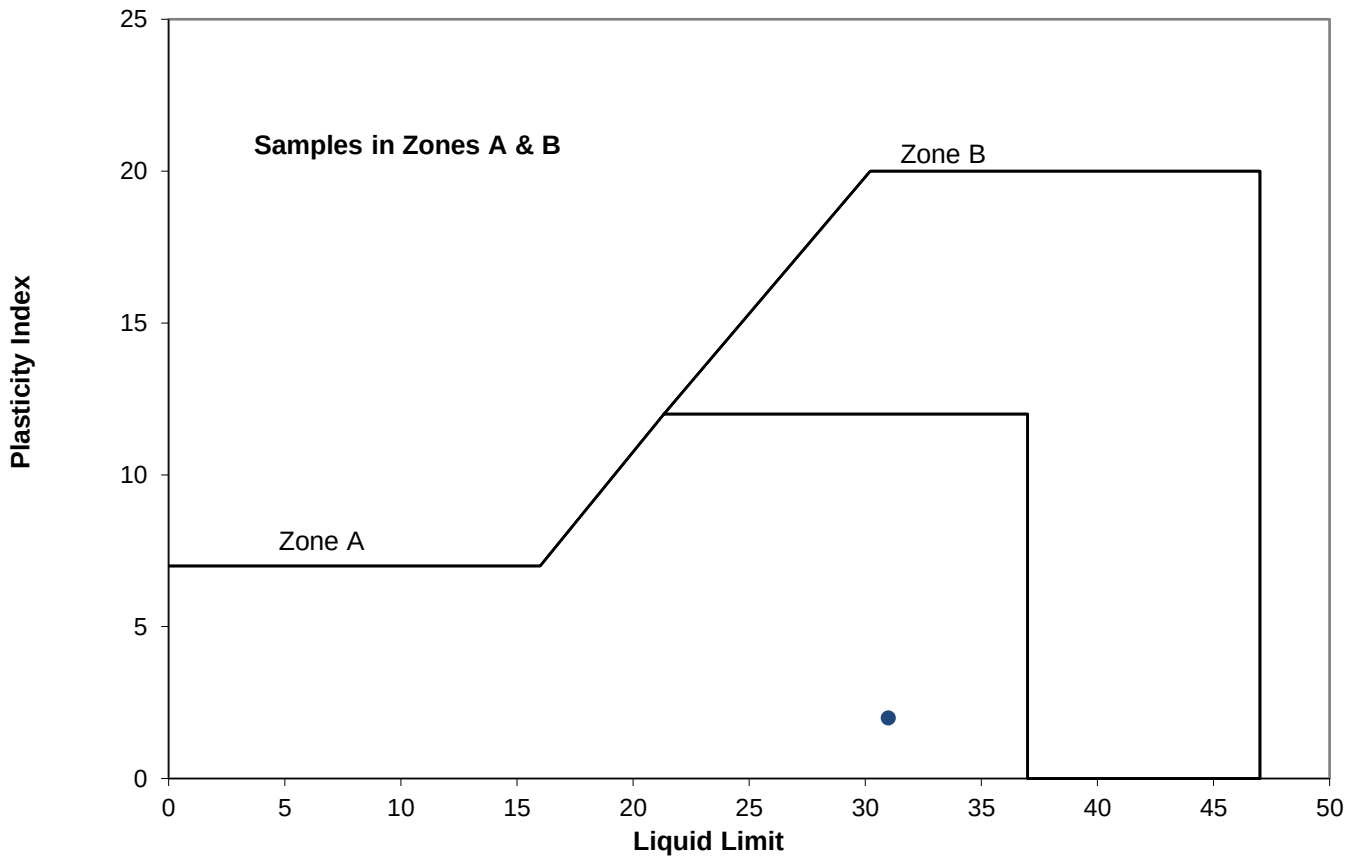


(b)

Screening Criteria for Liquefiable Fine-Grained Soils (Seed et al. 2003)



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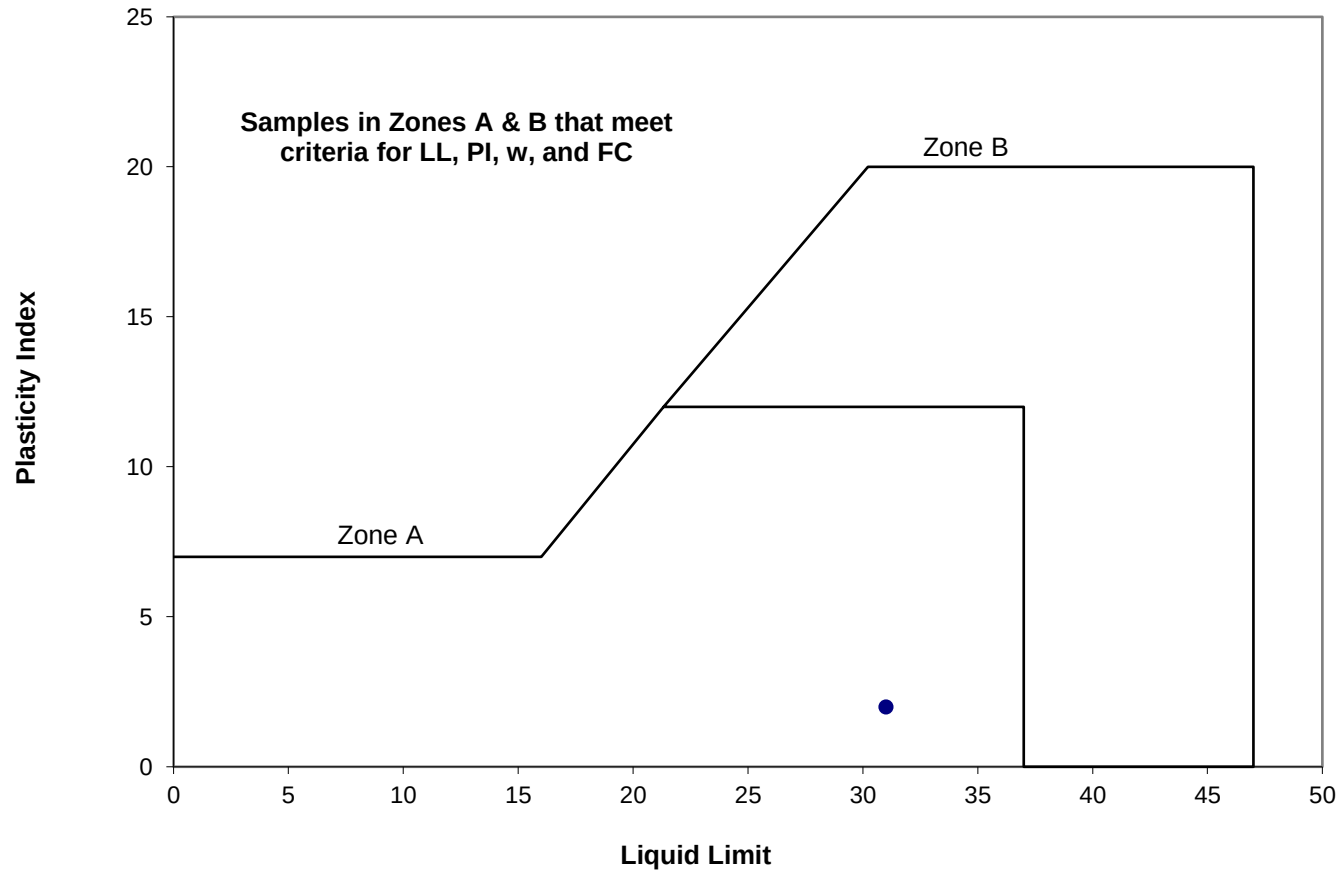

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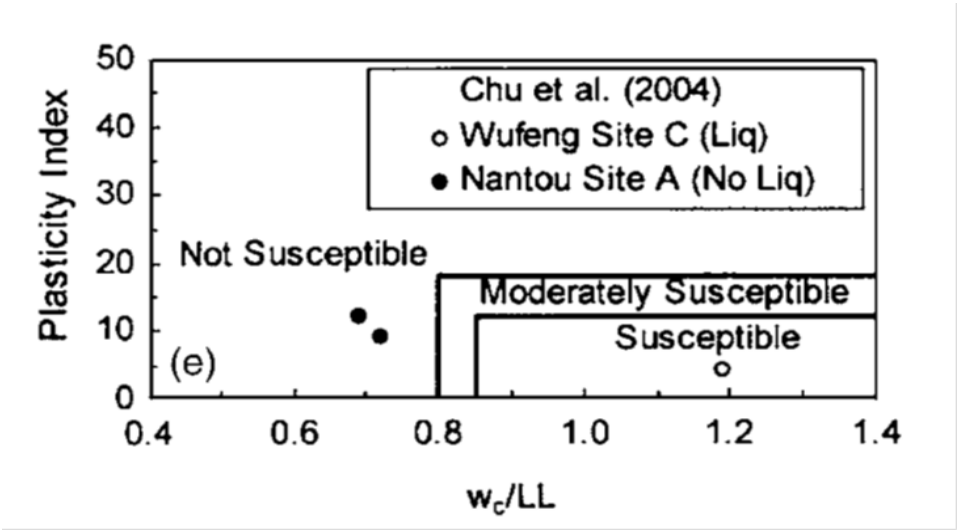
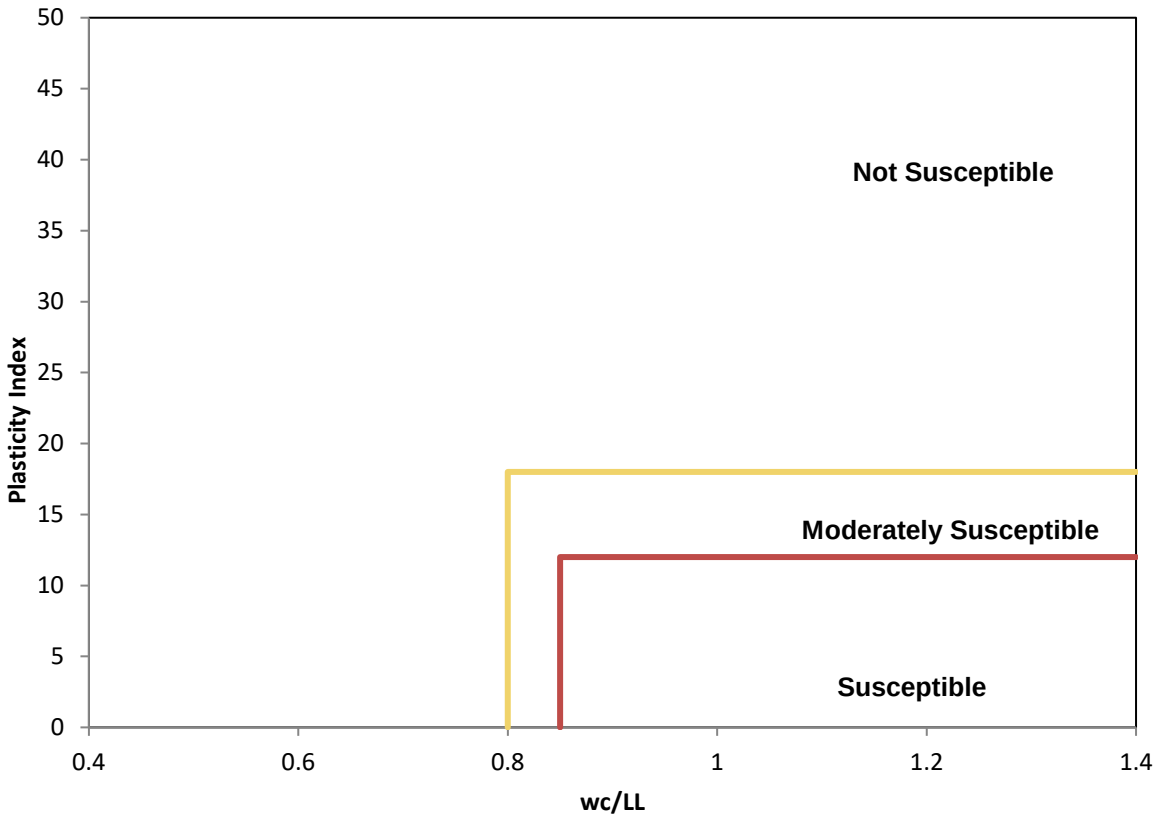
Screening Criteria for Liquefiable Fine-Grained Soils (Seed et al. 2003)





Screening Criteria for Assessing Liquefaction in Fine Grained Soils (Bray and Sancio 2006)

3.1.4 Sediment

CLAM - **C**lay-like **L**aboratory-Based **A**ssessment of **M**aterials

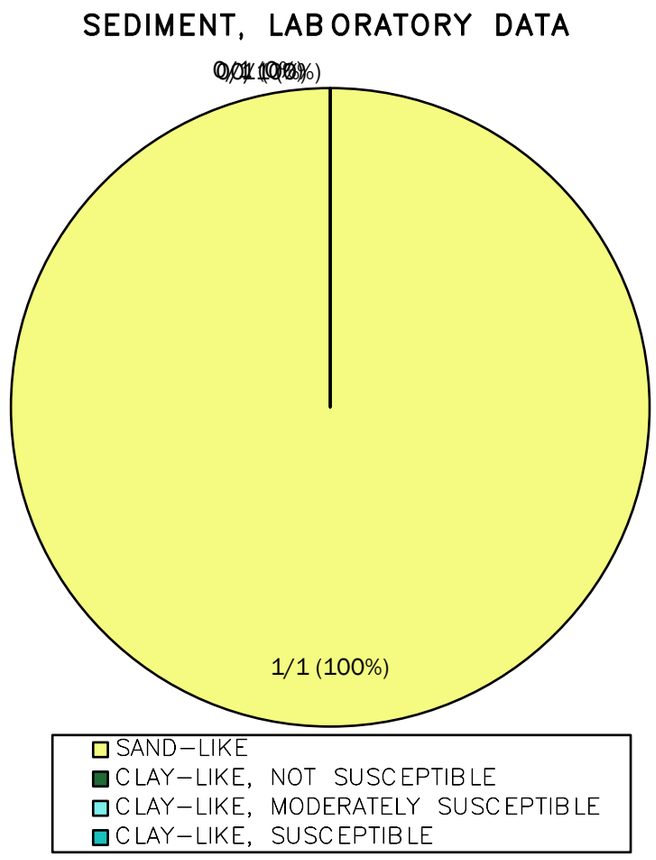
Stantec Project Number:	175668043
Project Name:	KIF TDEC Seismic Stability
Material	Sediment

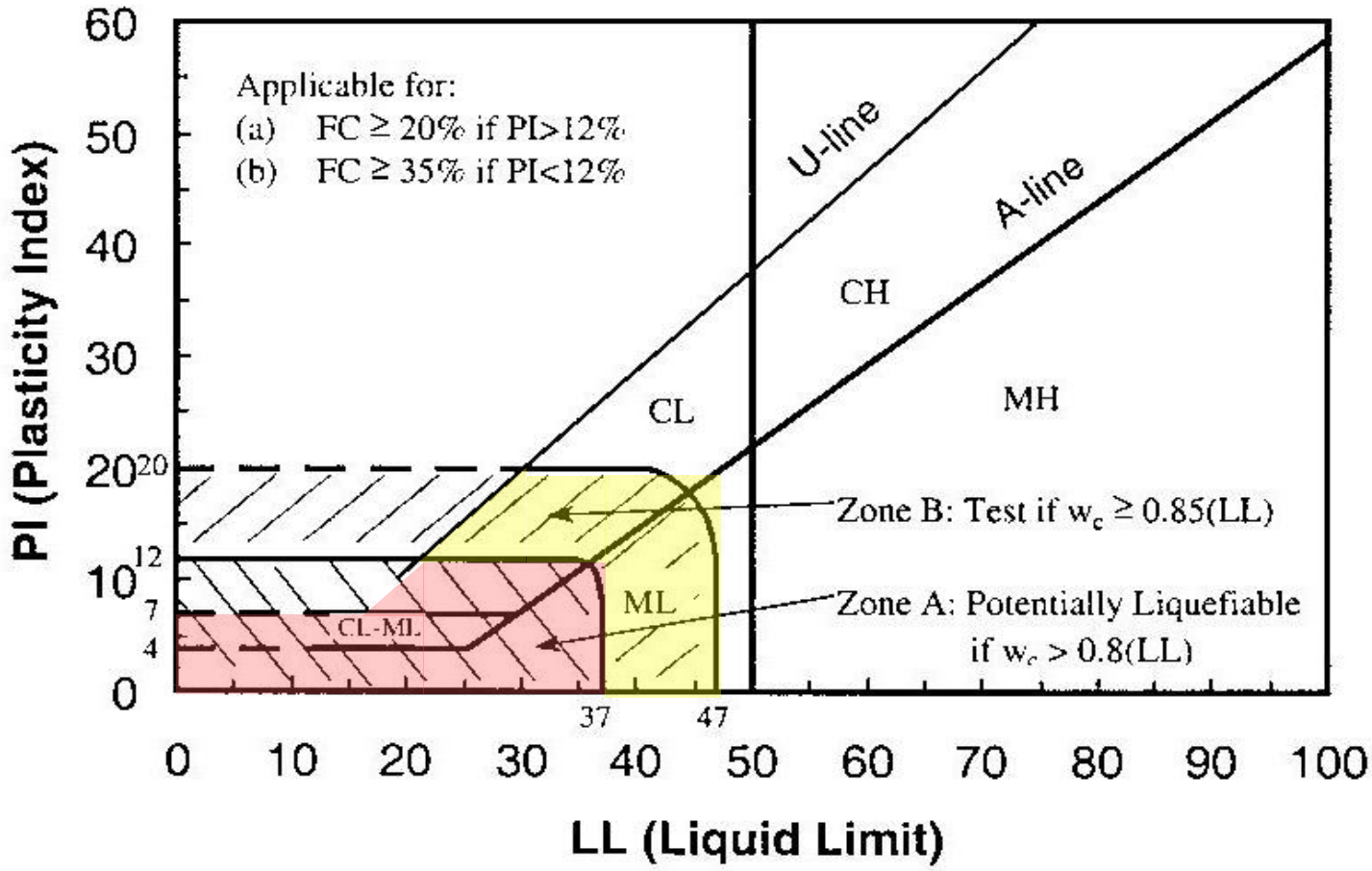
Note: NP = Non-Plastic

									Sand-like versus Clay-like Behavior (-1 indicates result does not meet criteria)														**Susceptibility of Clay-like Soils to Cyclic Softening (-1 indicates result does not meet criteria)**								
									Using Criteria published by Seed et al (2003)								Using Criteria published by Idriss and Boulanger (2008)		Using criteria published by MSHA (2010)				Using Criteria published by Seed et al (2003)		Using Criteria published by Bray and Sancio (2006)						
									Meets criteria for sand-like behavior		In Zone B		in B with w >= .85LL		Meets criteria for clay-like behavior								Meets all criteria for B (clay-like and potentially liquefiable, -2 indicates zone A but susceptible, -3 indicates not applicable due to fines content		Clay-like soil is susceptible (must meet both)		Clay-like soil is not susceptible (must meet one or both)		Clay-like soil is moderately susceptible		
Elevation at Midpoint (ft)	Lab ID	Boring	Depth(s) (ft)	Soil Classification	NMC (w_c) (%)	% Passing #200	% Passing #40	LL	PI	LL in Zone A (see plot)	PI in Zone A (see plot)	LL	PI	LL	PI	LL in Zone B (see plot)	PI in Zone B (see plot)	LL in Zone C (see plot)	PI in Zone C (see plot)	Meets criteria for sand-like behavior	Meets criteria for clay-like behavior	Meets criteria for sand-like behavior	Meets criteria for clay-like behavior	Borderline soils (treat as sand-like)	Overall Judgement based on 3 methods (sand-like or clay-like)	LL	PI	w_c/LL >= 0.85	PI <= 12	w_c/LL < 0.80	PI > 18	Intermediate w_c/LL (see plot)	Intermediate PI (see plot)	Overall Judgement based on 2 methods (susceptibility)
									PI < 7	PI >= 7													P40>=35%, P200>=20%, and PI>=10	7 < PI < 10, or does not meet P40 or P200										
728.2	198	KIF-B07	11.0'-12.5'		39.5								-1	-1	-1	-1																			
725.7	199	KIF-B07	13.5'-15.0'		43.1								-1	-1	-1	-1																			
728.9	296	KIF-B14	9.5'-10.0'		27.9			28	7	28	7	-1	-1	-1	-1	-1	-1	-1	-1	-1	7	7	-1	-1	**Sand-like**										
726.8	311	KIF-B15	12.1'-13.0'		33.1			37	18	-1	-1	37	18	37	18	37	18	-1	-1	-1	18	-1	-1	18	**Clay-like**	-3	-3	-1.00	-1	-1.00	-1	0.89	18	**Moderately Susceptible**
725.7	322	KIF-B16	12.5'-13.5'		47.4			44	16	-1	-1	44	16	44	16	44	16	-1	-1	-1	16	-1	-1	16	**Clay-like**	-3	-3	-1.00	-1	-1.00	-1	1.08	16	**Moderately Susceptible**
726.9	197	KIF-B07	11.0'-12.5', 13.5'-15.0'	CL		51.6	66.1	36	14	-1	-1	36	14	-1	-1	36	14	-1	-1	-1	14	-1	14	-1	**Clay-like**	-1	-1	-1.00	-1	0.00	14	-1.00	-1	**Not Susceptible**
726.3	209	KIF-B08	11.0'-12.5', 13.5'-15.0'					35	6	35	6	-1	-1	-1	-1	-1	-1	-1	-1	6	-1	6	-1	-1	**Sand-like**										

Sediment, Fine-grained Screening and Cyclic Softening Susceptibility Summary

Soil Classification	Clay-like vs. Sand-like	Clay-like Susceptibility	Sample Count	Sample Percent
CL			**13**	**62%**
	Clay-like		11	85%
		Not Susceptible	9	82%
		Susceptible	2	18%
	Sand-like		2	15%
		Sand-like	2	100%
CL-ML			**3**	**14%**
	Sand-like		3	100%
		Sand-like	3	100%
ML			**3**	**14%**
	Sand-like		3	100%
		Sand-like	3	100%
0			**2**	**10%**
	Clay-like		1	50%
		Not Susceptible	1	100%
			1	50%
		Sand-like	1	100%
Grand Total			**21**	**100%**





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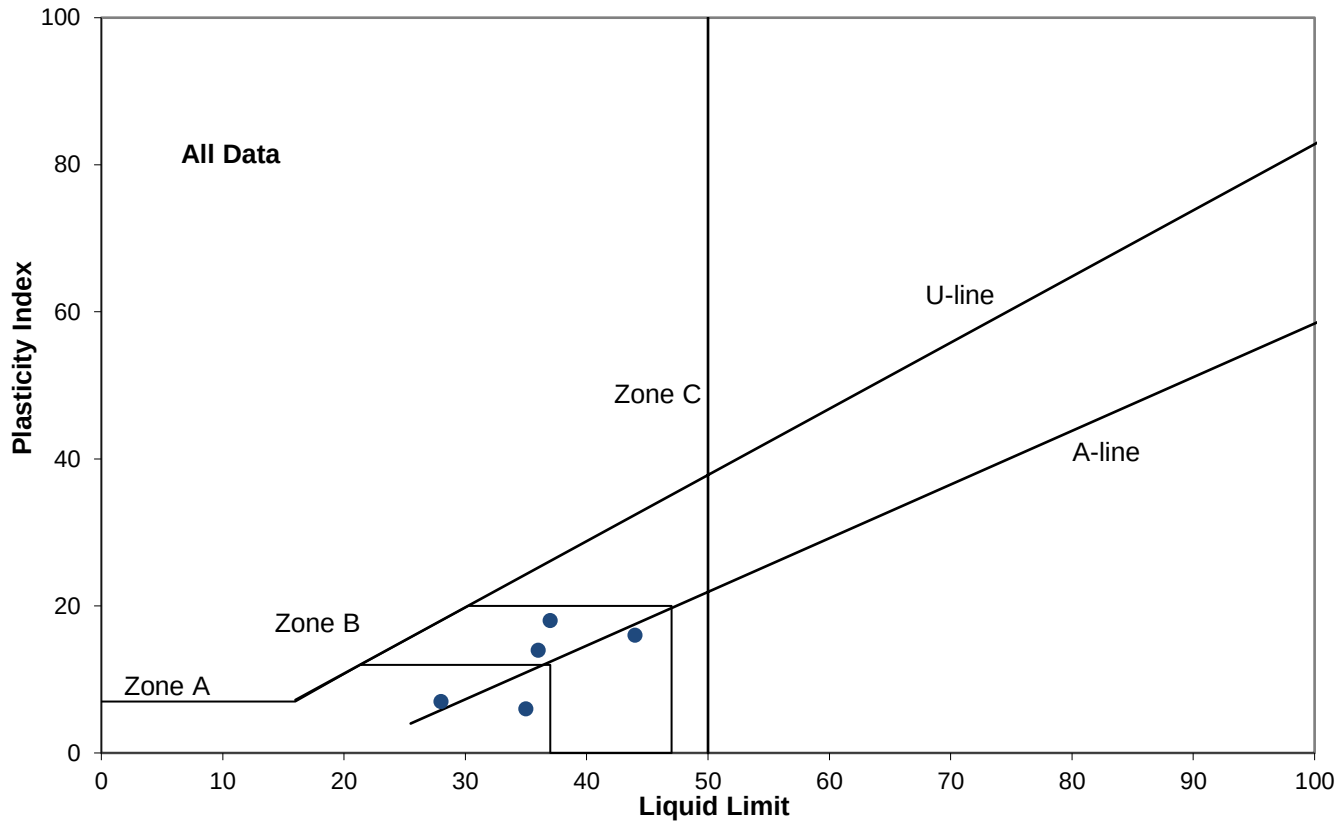

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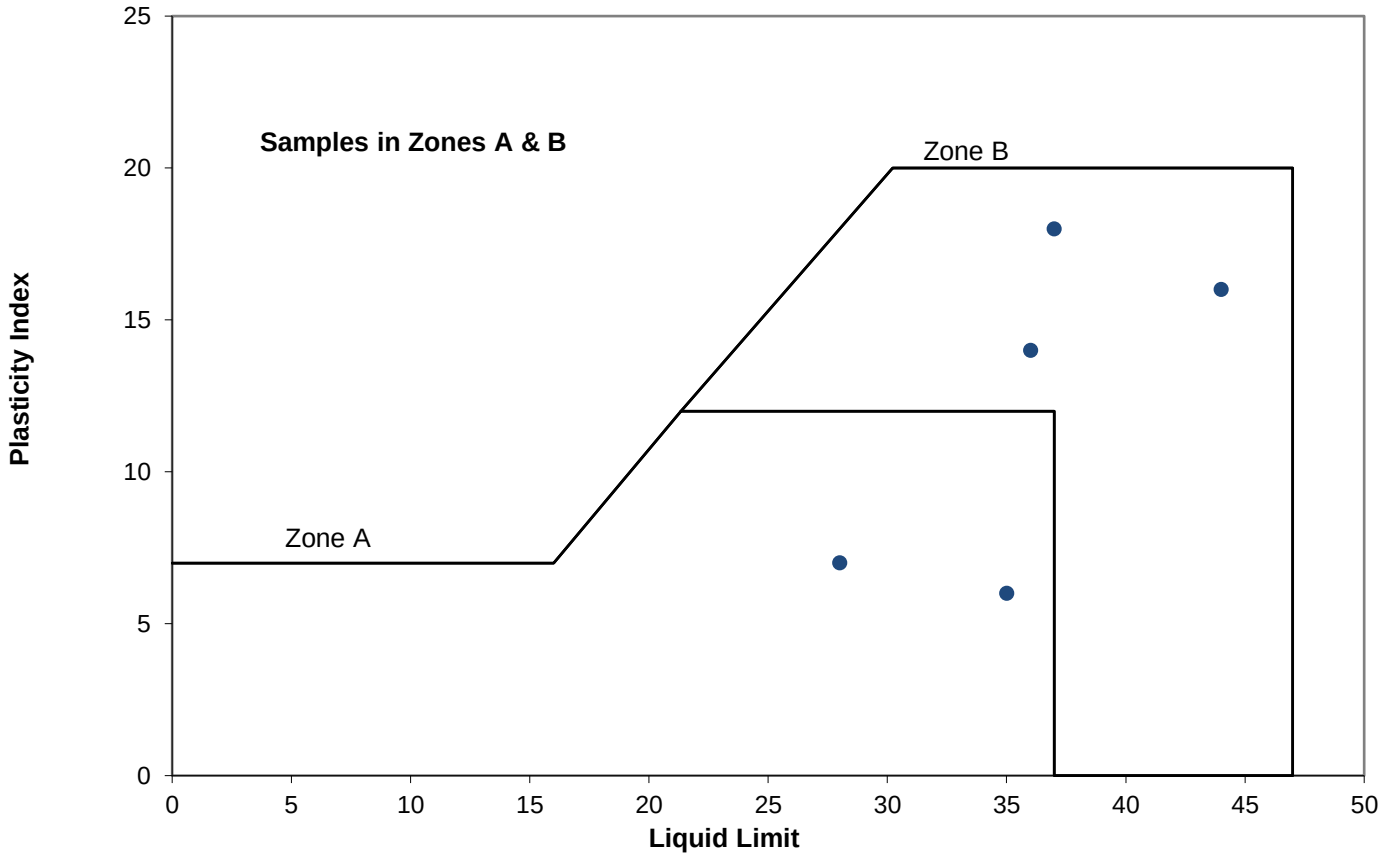
Screening Criteria for Liquefiable Fine-Grained Soils (Seed et al. 2003)



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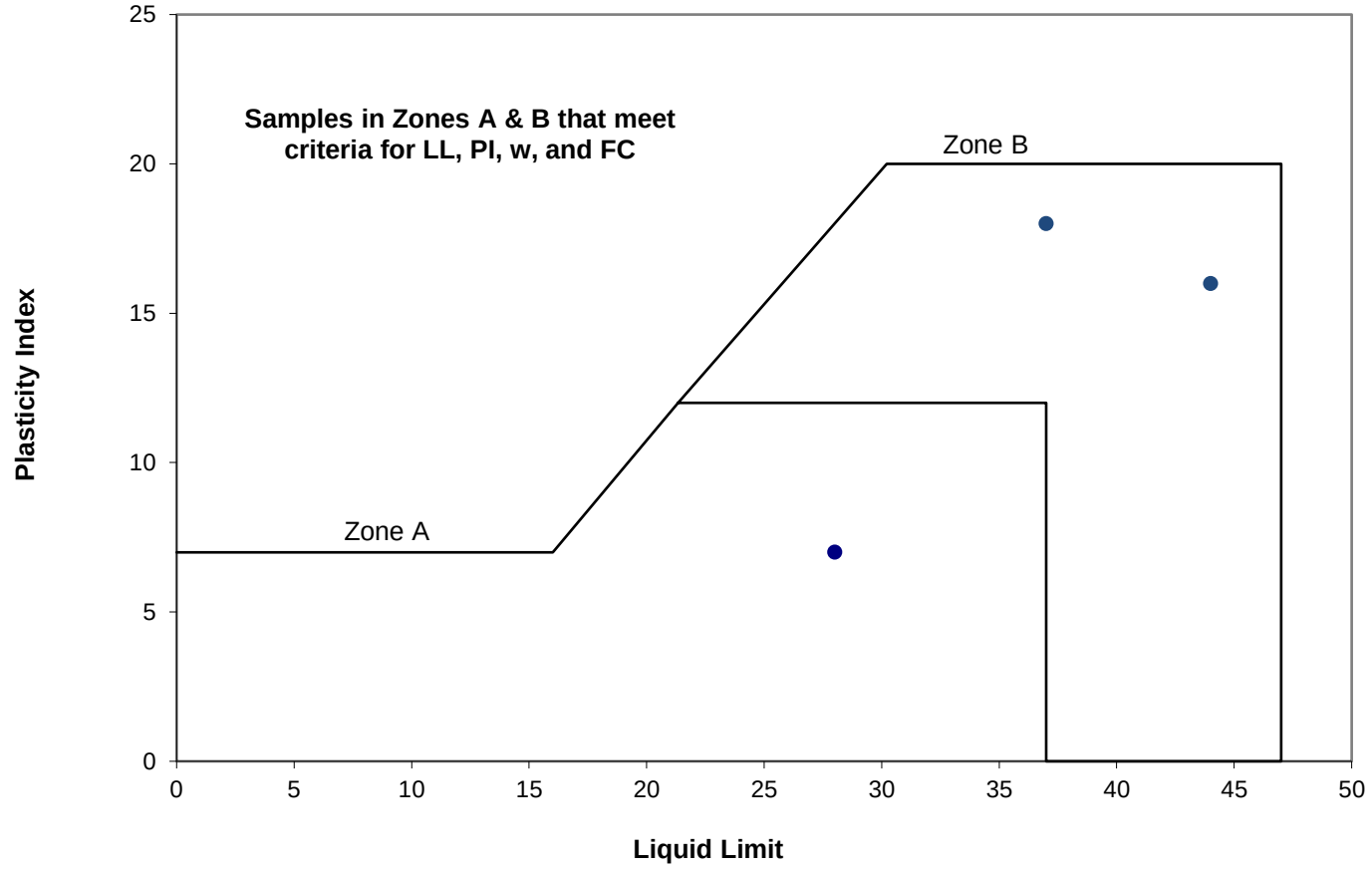
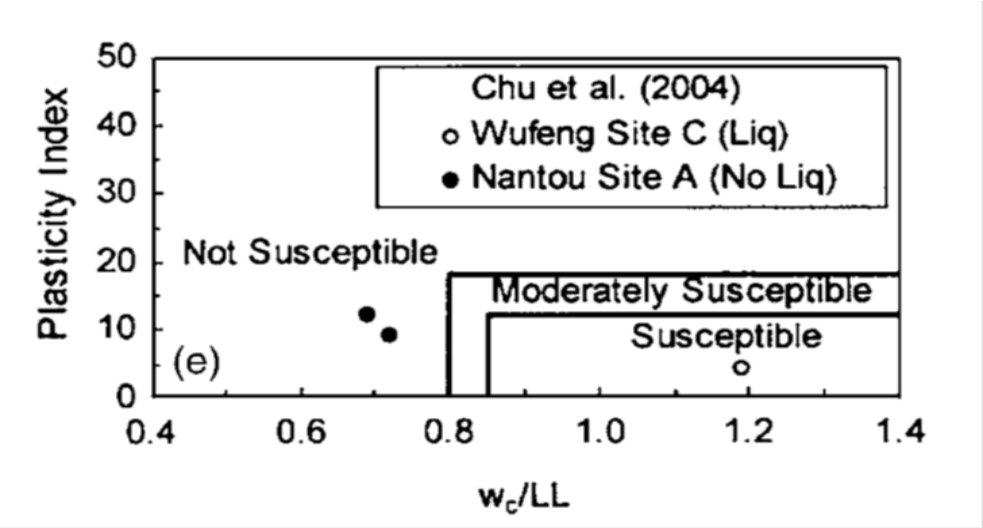
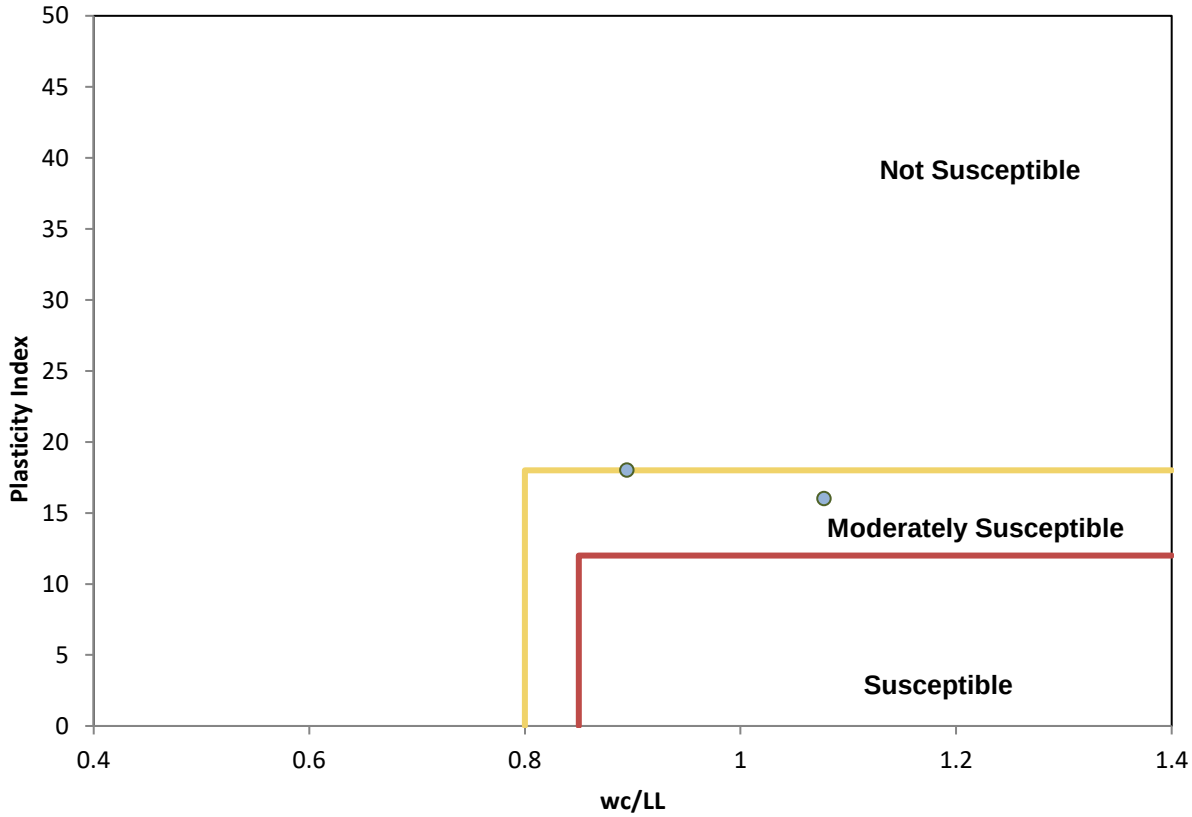


(d)

Screening Criteria for Liquefiable Fine-Grained Soils (Seed et al. 2003)





Screening Criteria for Assessing Liquefaction in Fine Grained Soils (Bray and Sancio 2006)

3.1.5 Subunit 1

CLAM - **C**lay-like **L**aboratory-Based **A**ssessment of **M**aterials

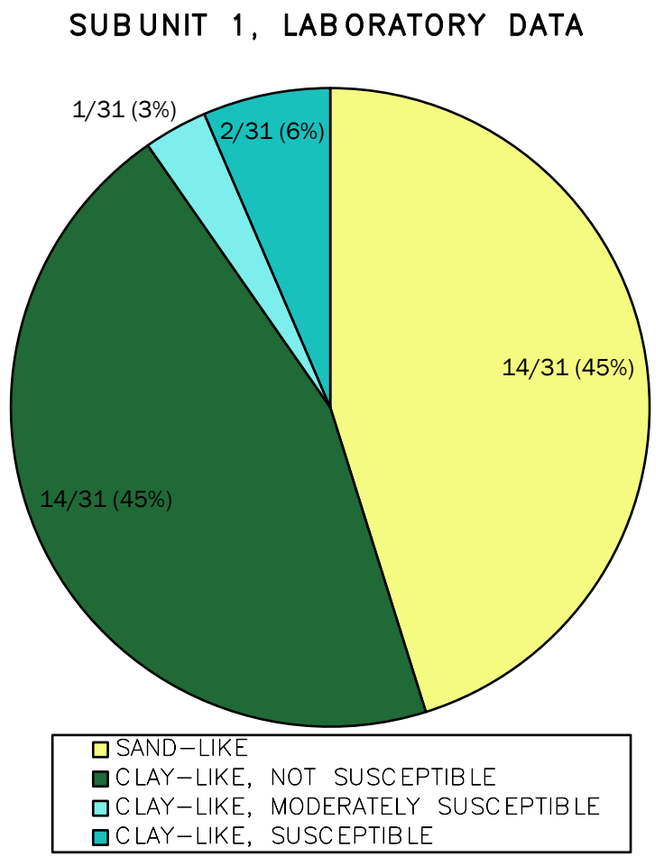
Stantec Project Number:	175668043
Project Name:	KIF TDEC Stability
Material	Subunit 1

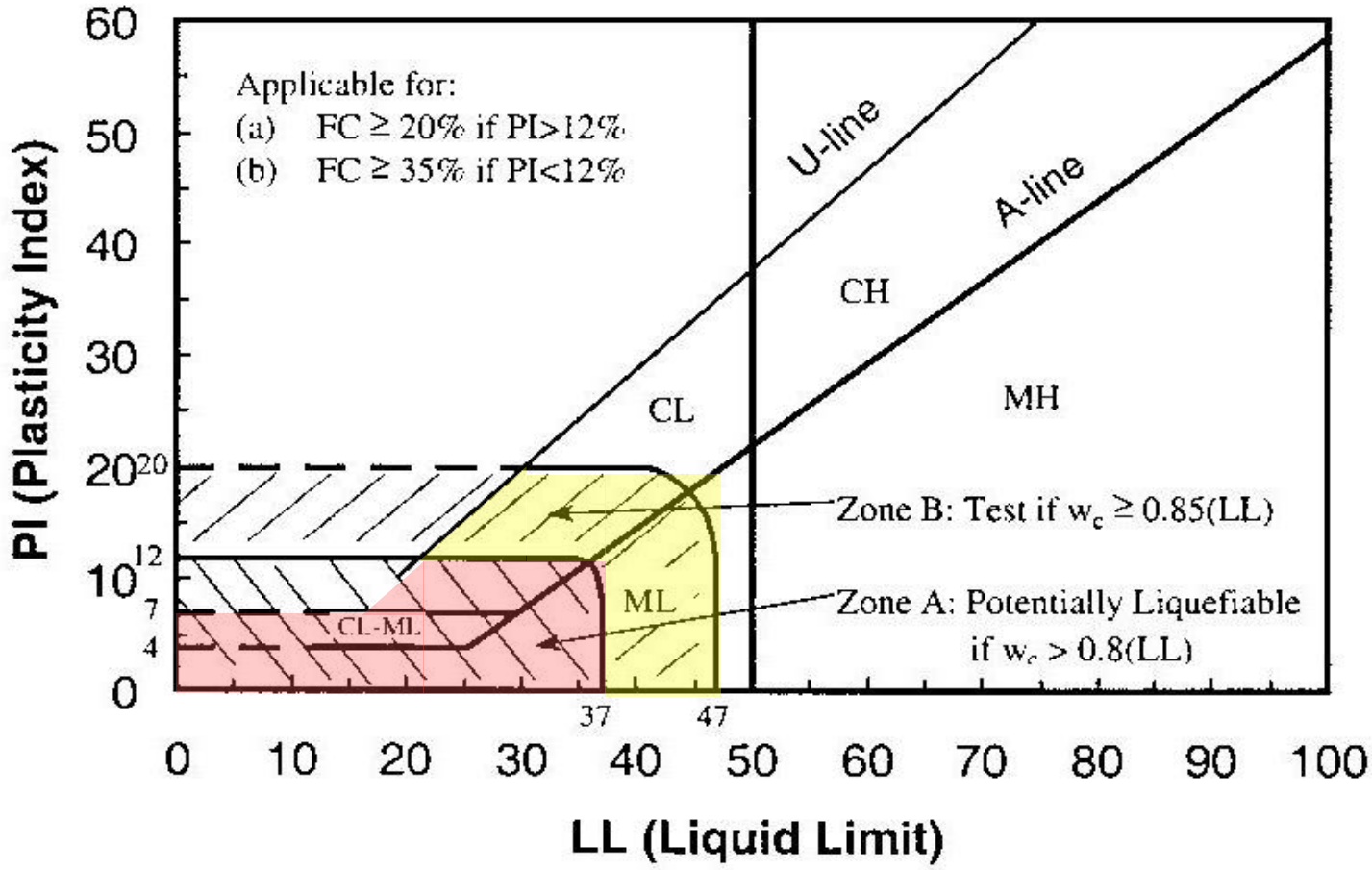
Note: NP = Non-Plastic

									Sand-like versus Clay-like Behavior (-1 indicates result does not meet criteria)													**Susceptibility of Clay-like Soils to Cyclic Softening (-1 indicates result does not meet criteria)**								
									Using Criteria published by Seed et al (2003)										Using Criteria published by Idriss and Boulanger (2008)		Using criteria published by MSHA (2010)			Overall Judgement based on 3 methods (sand-like or clay-like)	Using Criteria published by Seed et al (2003)		Using Criteria published by Bray and Sancio (2006)						Overall Judgement based on 2 methods (susceptibility)
									Meets criteria for sand-like behavior	In Zone B		in B with w >= .85LL		Meets criteria for clay-like behavior					Meets criteria for sand-like behavior	Meets criteria for clay-like behavior	Meets criteria for sand-like behavior	Meets criteria for clay-like behavior	Borderline soils (treat as sand-like)		Meets all criteria for B (clay-like and potentially liquefiable, -2 indicates zone A but susceptible, -3 indicates not applicable due to fines content		Clay-like soil is susceptible (must meet both)		Clay-like soil is not susceptible (must meet one or both)		Clay-like soil is moderately susceptible		
Elevation at Midpoint (ft)	Lab ID	Boring	Depth(s) (ft)	Soil Classification	NMC (w_c) (%)	% Passing #200	% Passing #40	LL	PI	LL in Zone A (see plot)	PI in Zone A (see plot)	LL	PI	LL	PI	LL in Zone B (see plot)	PI in Zone B (see plot)	LL in Zone C (see plot)	PI in Zone C (see plot)	PI < 7	PI >= 7	PI <= 7	P40>=35%, P200>=20%, and PI>=10	7 < PI < 10, or does not meet P40 or P200		LL	PI	w_c/LL >= 0.85	PI <= 12	w_c/LL < 0.80	PI > 18	Intermediate w_c/LL (see plot)	Intermediate PI (see plot)	
730.6	12	KIF-GT-TW05	39.7'-40.2'	CL	22	81.3	97.7	26	9	26	9	-1	-1	-1	-1	-1	-1	-1	-1	-1	9	-1	-1	9	**Sand-like**									
756.8	X	KIF-BF-SPT1	13.5'-15.0'	ML	20			30	3	30	3	-1	-1	-1	-1	-1	-1	-1	-1	3	-1	3	-1	-1	**Sand-like**									
709.8	X	KIF-BF-SPT3	43.5'-45.0'	CL	25			29	13	-1	-1	29	13	29	13	29	13	-1	-1	-1	13	-1	-1	13	**Clay-like**	-3	-3	-1.00	-1	-1.00	-1	0.86	13	**Moderately Susceptible**
730.9	X	KIF-C1	16.0'-19.0'	CL	23	73.2	93	31	11	31	11	-1	-1	-1	-1	-1	-1	-1	-1	-1	11	-1	11	-1	**Clay-like**	-1	-1	-1.00	-1	0.74	11	-1.00	-1	**Not Susceptible**
727.9	X	KIF-C1	19.0'-22.0'	CL	23	73.9	91.3	33	13	-1	-1	33	13	-1	-1	33	13	-1	-1	-1	13	-1	13	-1	**Clay-like**	-1	-1	-1.00	-1	0.70	13	-1.00	-1	**Not Susceptible**
730.4	X	KIF-C2	12.0'-15.0'	CL		65	86.3	29	9	29	9	-1	-1	-1	-1	-1	-1	-1	-1	-1	9	-1	-1	9	**Sand-like**									
731.5	X	KIF-D1	15.0'-19.5'	CL		82.3	96.8	34	14	-1	-1	34	14	-1	-1	34	14	-1	-1	-1	14	-1	14	-1	**Clay-like**	-1	-1	-1.00	-1	0.00	14	-1.00	-1	**Not Susceptible**
716.5	X	KIF-A1	39.5'-41.5'	CL		85.4	100	39	19	-1	-1	39	19	-1	-1	39	19	-1	-1	-1	19	-1	19	-1	**Clay-like**	-1	-1	-1.00	-1	0.00	19	-1.00	-1	**Not Susceptible**
720.8	X	KIF-A2	33.0'-34.5'	CL	27	95.1	100	35	16	-1	-1	35	16	-1	-1	35	16	-1	-1	-1	16	-1	16	-1	**Clay-like**	-1	-1	-1.00	-1	0.77	16	-1.00	-1	**Not Susceptible**
713.3	X	KIF-A2	40.5'-42.0'	ML		85.9	99.3	34	9	34	9	-1	-1	-1	-1	-1	-1	-1	-1	-1	9	-1	-1	9	**Sand-like**									
718.9	X	KIF-A3	27.5'-29.0'	CL		89.9	99.3	33	13	-1	-1	33	13	-1	-1	33	13	-1	-1	-1	13	-1	13	-1	**Clay-like**	-1	-1	-1.00	-1	0.00	13	-1.00	-1	**Not Susceptible**
720.9	X	KIF-STN50	20.5'-21.0'	CL	24	59.2	78.5	26	9	26	9	-1	-1	-1	-1	-1	-1	-1	-1	-1	9	-1	-1	9	**Sand-like**									
722.8	179	KIF-B05	33.0'-34.5'	CL	34.7	60.1	100	36	14	-1	-1	36	14	36	14	36	14	-1	-1	-1	14	-1	14	-1	**Clay-like**	36	14	-1.00	-1	-1.00	-1	0.96	14	**Susceptible**
718.3	181	KIF-B05	38.0'-38.5'	CL	24	93.3	99.8037475	33	13	-1	-1	33	13	-1	-1	33	13	-1	-1	-1	13	-1	13	-1	**Clay-like**	-1	-1	-1.00	-1	0.73	13	-1.00	-1	**Not Susceptible**
712.8	183	KIF-B05	43.0'-44.5'	CL	21.6	78.7	100	31	14	-1	-1	31	14	-1	-1	31	14	-1	-1	-1	14	-1	14	-1	**Clay-like**	-1	-1	-1.00	-1	0.70	14	-1.00	-1	**Not Susceptible**
710.0	185	KIF-B05	46.0'-47.0'	CL	25.2	84.9	100	35	18	-1	-1	35	18	-1	-1	35	18	-1	-1	-1	18	-1	18	-1	**Clay-like**	-1	-1	-1.00	-1	0.72	18	-1.00	-1	**Not Susceptible**
720.7	188	KIF-B06	18.2'-19.7'	CL	37.6	86.2	98.859969	38	16	-1	-1	38	16	38	16	38	16	-1	-1	-1	16	-1	16	-1	**Clay-like**	38	16	-1.00	-1	-1.00	-1	0.99	16	**Susceptible**
715.7	190	KIF-B06	23.2'-24.7'	CL	20.8	68.2	100	25	9	25	9	-1	-1	-1	-1	-1	-1	-1	-1	-1	9	-1	-1	9	**Sand-like**									
720.2	200	KIF-B07	19.0'-20.5'	CL-ML	25.2	79.5	100	25	7	25	7	-1	-1	-1	-1	-1	-1	-1	-1	-1	7	7	-1	-1	**Sand-like**									
713.8	214	KIF-B08	25.0'-26.0'	CL-ML	19.1	72.4	100	24	7	24	7	-1	-1	-1	-1	-1	-1	-1	-1	-1	7	7	-1	-1	**Sand-like**									
711.2	216	KIF-B08	27.7'-28.5'	CL-ML	24.4	73.6	100	21	4	21	4	-1	-1	-1	-1	-1	-1	-1	-1	4	-1	4	-1	-1	**Sand-like**									
721.8	235	KIF-B09	32.5'-33.0'	ML	33.5	93.6	99.3924793	NP	NP																**Sand-like**									
714.3	237	KIF-B09	39.5'-41.0'	CL	23.8	89.3	100	36	15	-1	-1	36	15	-1	-1	36	15	-1	-1	-1	15	-1	15	-1	**Clay-like**	-1	-1	-1.00	-1	0.66	15	-1.00	-1	**Not Susceptible**
723.9	243	KIF-B10	14.5'-16.0'	ML	41.4	91	95.426364	NP	NP																**Sand-like**									
721.4	245	KIF-B10	17.0'-18.5'		25.8							-1	-1	-1	-1																			
720.1	245	KIF-B10	17.0'-18.5', 19.5'-21.0'	ML	25.8	80.5	93.1622686	NP	NP																**Sand-like**									
713.9	247	KIF-B10	24.5'-26.0'	CL	26.4	89.5	100	40	20	-1	-1	40	20	-1	-1	40	20	-1	-1	-1	20	-1	20	-1	**Clay-like**	-1	-1	-1.00	-1	0.66	20	-1.00	-1	**Not Susceptible**
724.1	255	KIF-B11	14.5'-16.0'	CL	32.2	89.9	99.602537	41	19	-1	-1	41	19	-1	-1	41	19	-1	-1	-1	19	-1	19	-1	**Clay-like**	-1	-1	-1.00	-1	0.79	19	-1.00	-1	**Not Susceptible**
721.6	256	KIF-B11	17.0'-18.5'	CL	26.7	94.1	98.62238	41	18	-1	-1	41	18	-1	-1	41	18	-1	-1	-1	18	-1	18	-1	**Clay-like**	-1	-1	-1.00	-1	0.65	18	-1.00	-1	**Not Susceptible**
715.1	259	KIF-B11	23.5'-25.0'	CL	22.3	86.6	100	35	17	-1	-1	35	17	-1	-1	35	17	-1	-1	-1	17	-1	17	-1	**Clay-like**	-1	-1	-1.00	-1	0.64	17	-1.00	-1	**Not Susceptible**
712.6	260	KIF-B11	26.0'-27.5'	CL	25.9	63.8	100	23	8	23	8	-1	-1	-1	-1	-1	-1	-1	-1	-1	8	-1	-1	8	**Sand-like**									
724.5	267	KIF-B12	14.6'-15.1'					35	15	-1	-1	35	15	-1	-1	35	15	-1	-1	-1	15	-1	-1	15	**Clay-like**	-1	-1	-1.00	-1	0.00	15	-1.00	-1	**Not Susceptible**
715.3	271	KIF-B12	23.3'-24.8'	CL	23.8	82.8	99.776779	33	15	-1	-1	33	15	-1	-1	33	15	-1	-1	-1	15	-1	15	-1	**Clay-like**	-1	-1	-1.00	-1	0.72	15	-1.00	-1	**Not Susceptible**

Subunit 1, Fine-grained Screening and Cyclic Softening Susceptibility Summary

Soil Classification	Clay-like vs. Sand-like	Clay-like Susceptibility	Sample Count	Sample Percent
CL			**23**	**70%**
	Clay-like		18	78%
		Moderately Susceptible	1	6%
		Not Susceptible	15	83%
		Susceptible	2	11%
	Sand-like		5	22%
		Sand-like	5	100%
ML			**5**	**15%**
	Sand-like		5	100%
		Sand-like	5	100%
CL-ML			**3**	**9%**
	Sand-like		3	100%
		Sand-like	3	100%
0			**2**	**6%**
	Clay-like		1	50%
		Not Susceptible	1	100%
			1	50%
		Sand-like	1	100%
Grand Total			**33**	**100%**





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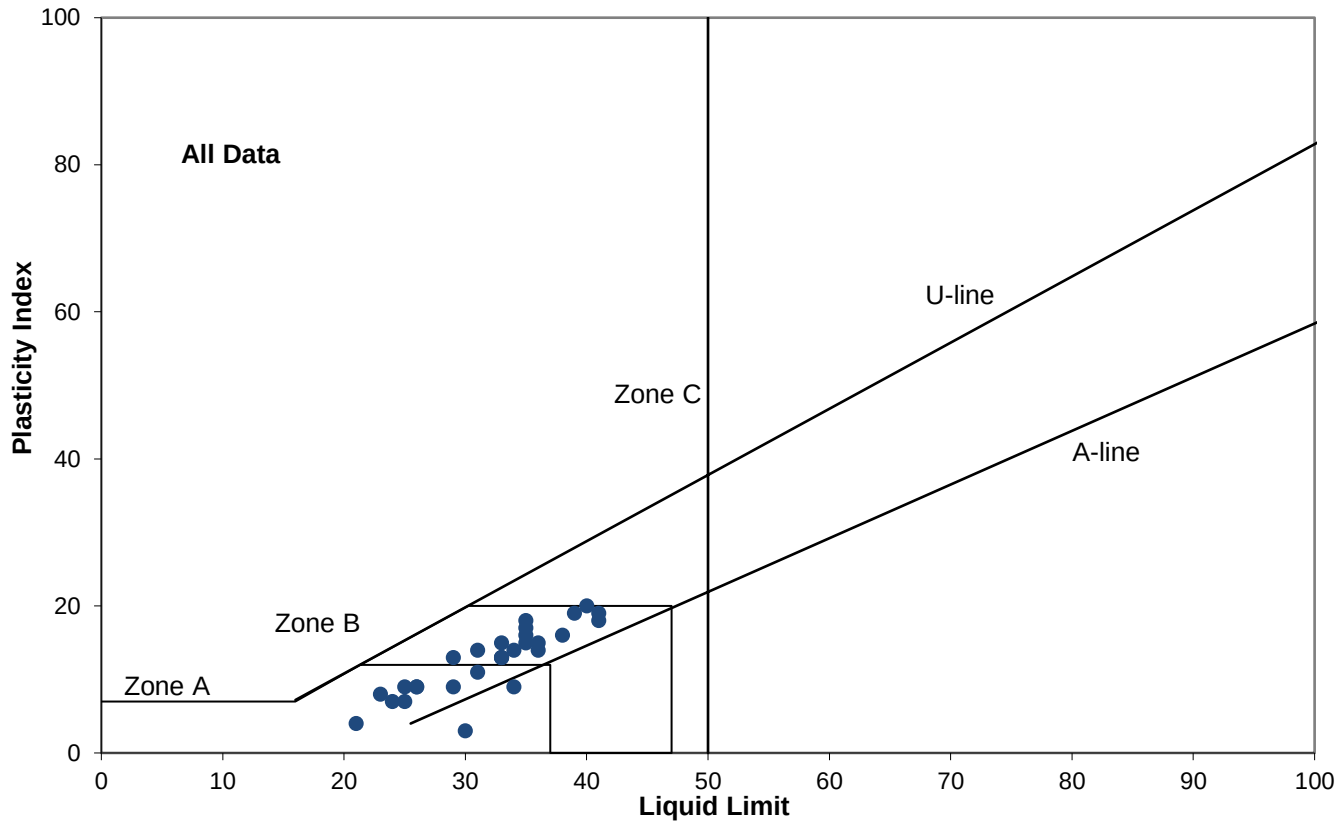
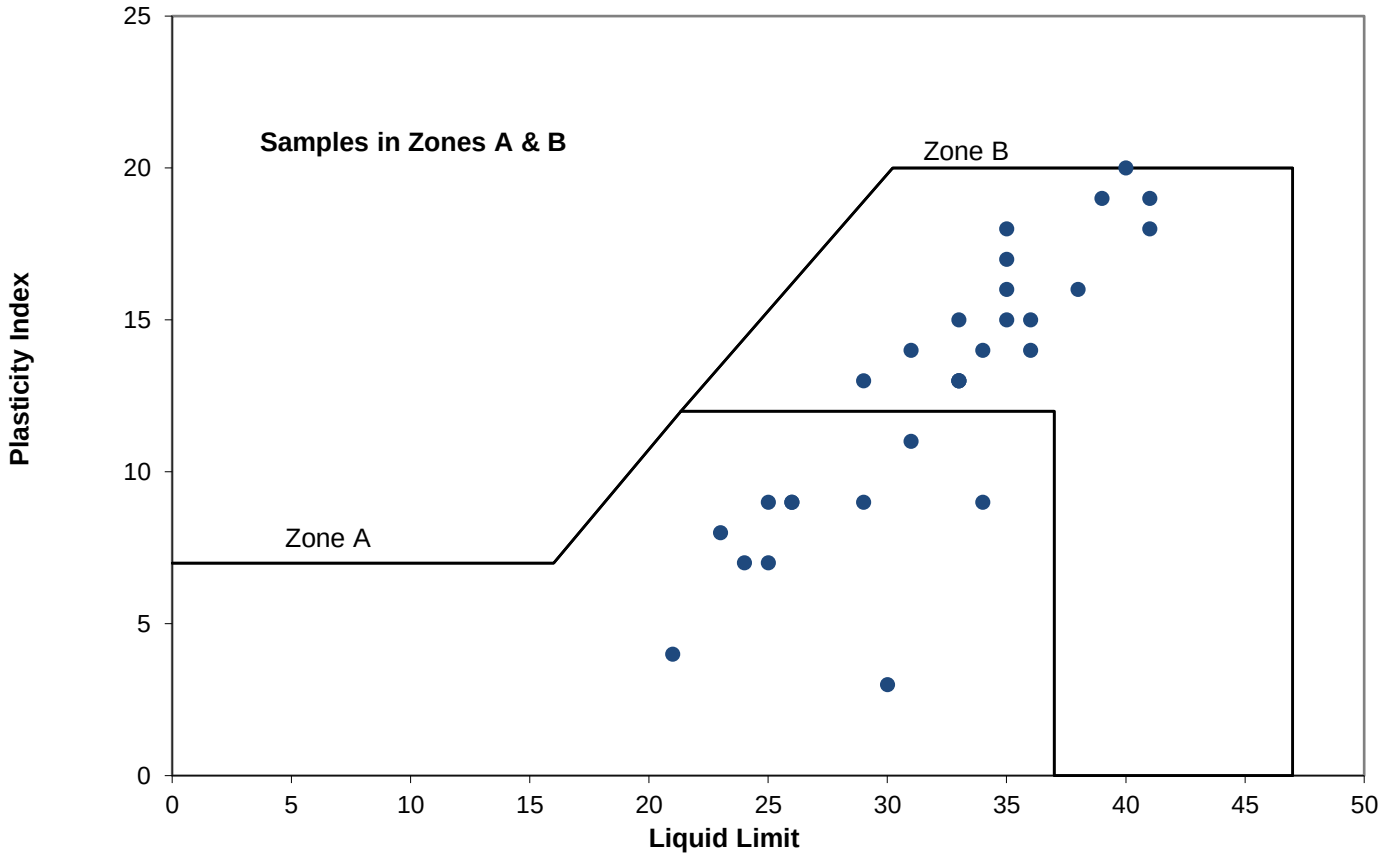


(b)

Screening Criteria for Liquefiable Fine-Grained Soils (Seed et al. 2003)



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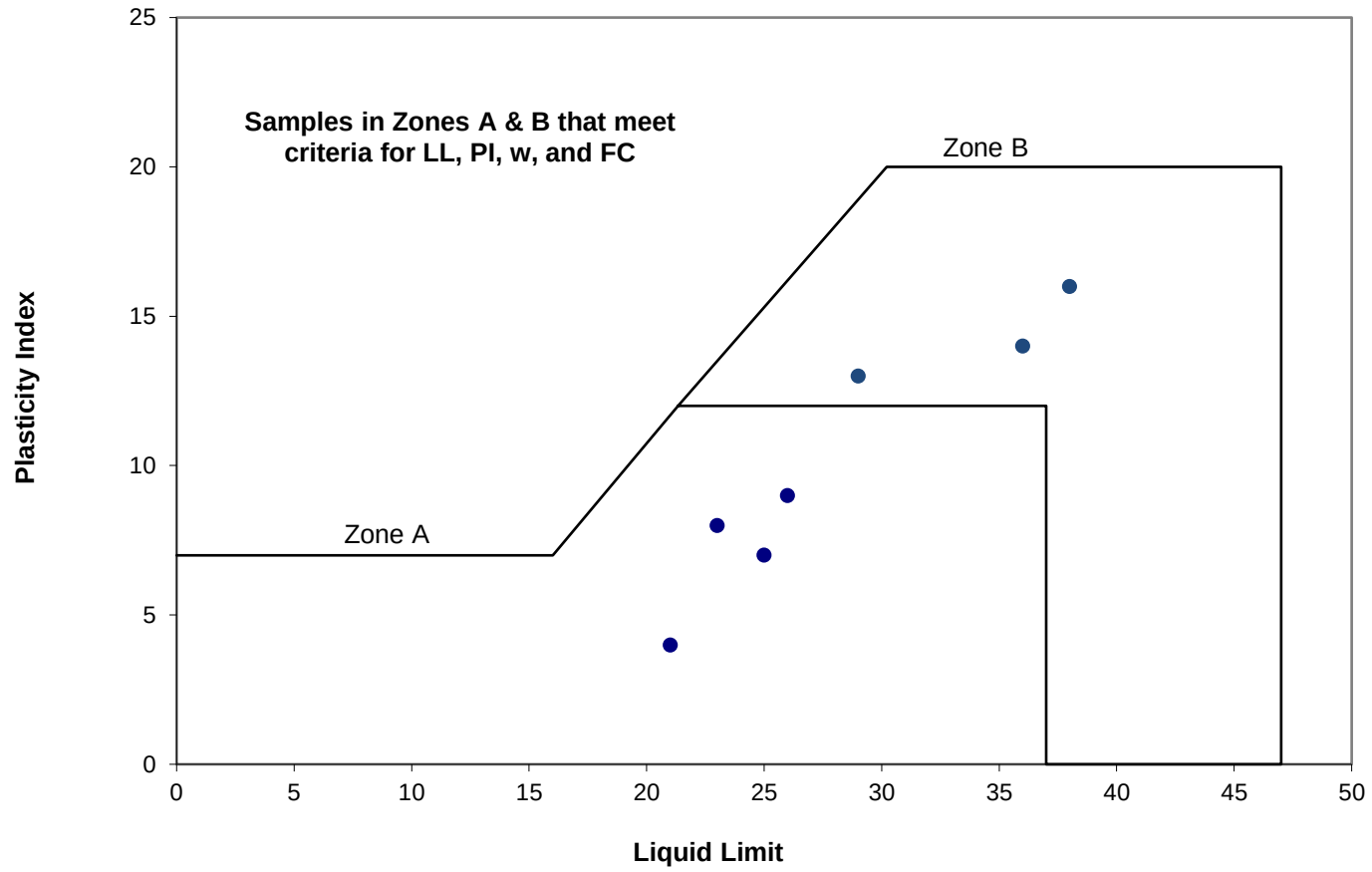
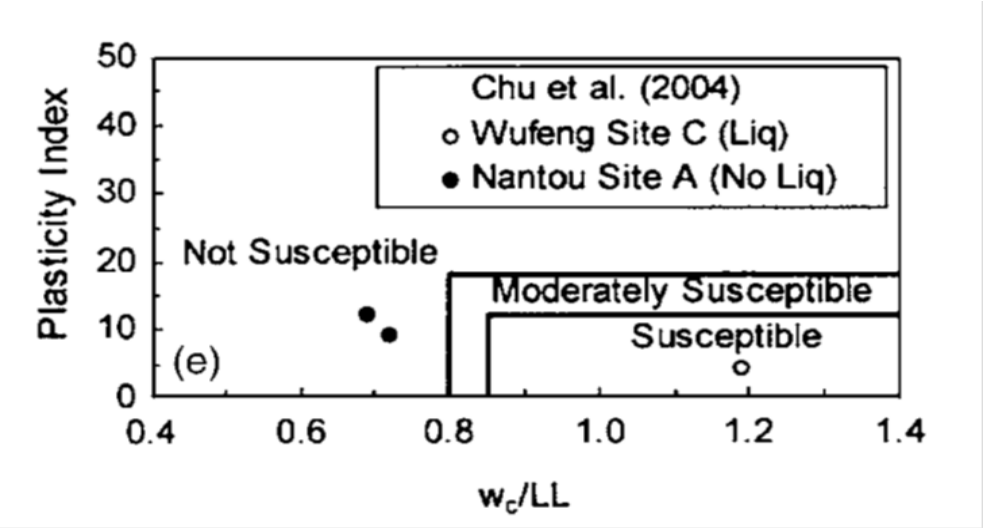
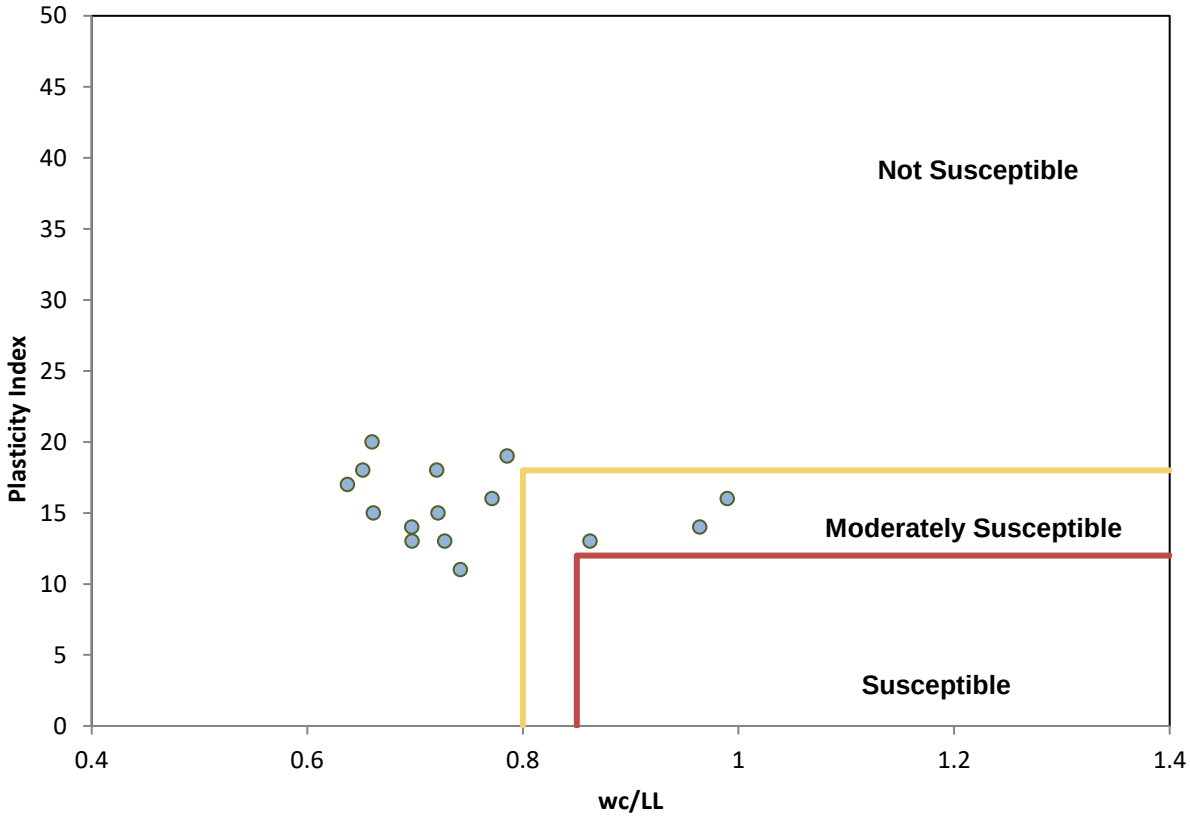


(d)

Screening Criteria for Liquefiable Fine-Grained Soils (Seed et al. 2003)





Screening Criteria for Assessing Liquefaction in Fine Grained Soils (Bray and Sancio 2006)

3.1.6 Subunit 2

CLAM - Clay-like **L**aboratory-Based **A**ssessment of **M**aterials

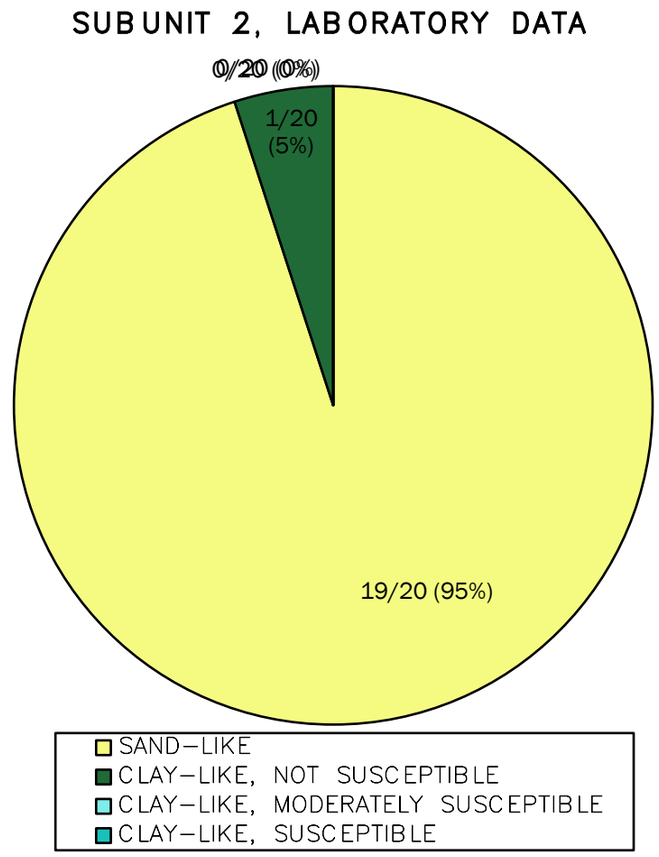
Stantec Project Number:	175668043
Project Name:	KIF TDEC Stability
Material	Subunit 2

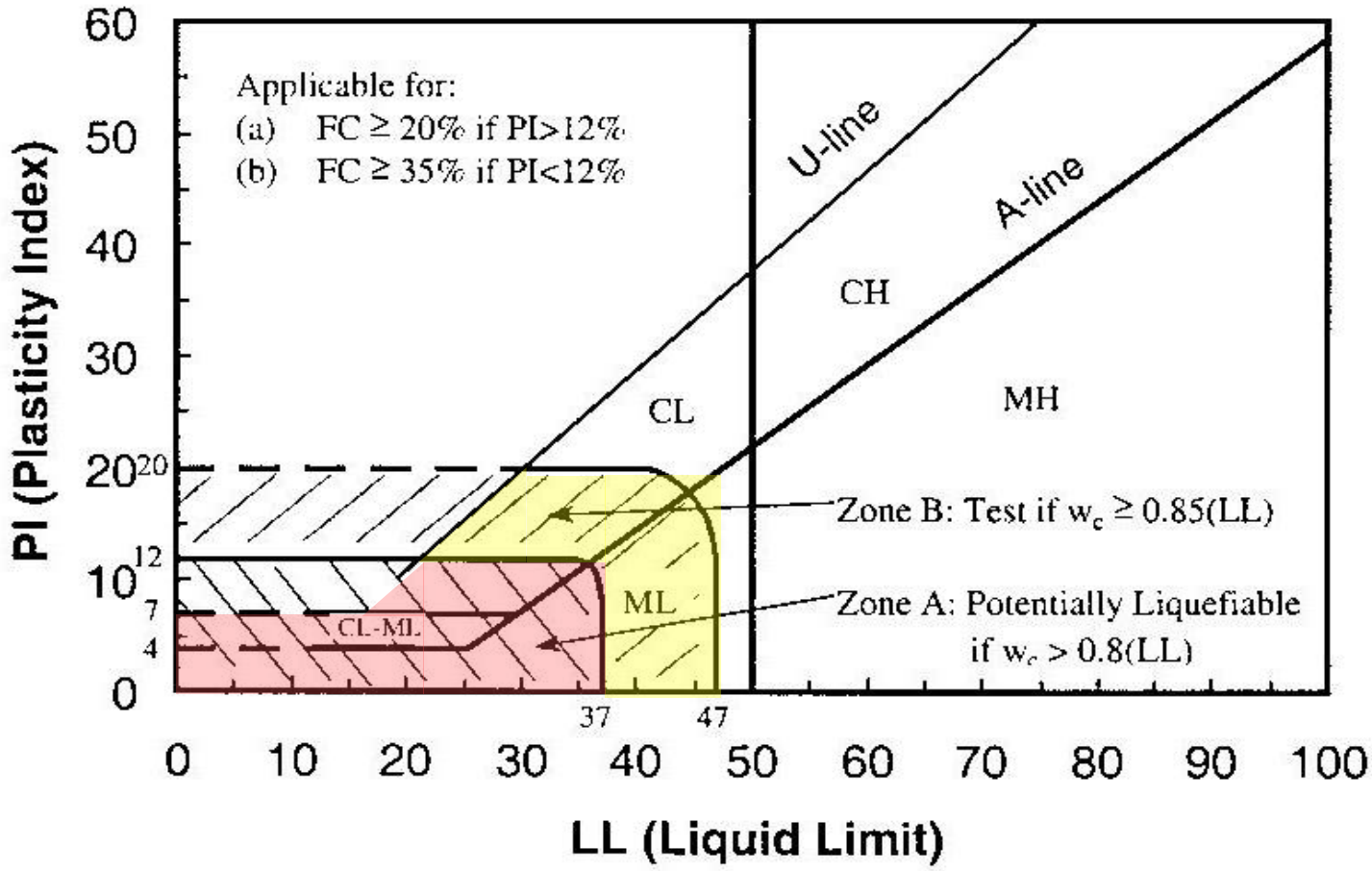
Note: NP = Non-Plastic

									Sand-like versus Clay-like Behavior (-1 indicates result does not meet criteria)															**Susceptibility of Clay-like Soils to Cyclic Softening (-1 indicates result does not meet criteria)**								
									Using Criteria published by Seed et al (2003)										Using Criteria published by Idriss and Boulanger (2008)		Using criteria published by MSHA (2010)				Using Criteria published by Seed et al (2003)		Using Criteria published by Bray and Sancio (2006)						
									Meets criteria for sand-like behavior		In Zone B		in B with w >= .85LL		Meets criteria for clay-like behavior				Meets criteria for sand-like behavior	Meets criteria for clay-like behavior	Meets criteria for sand-like behavior	Meets criteria for clay-like behavior	Borderline soils (treat as sand-like)		Meets all criteria for B (clay-like and potentially liquefiable, -2 indicates zone A but susceptible, -3 indicates not applicable due to fines content		Clay-like soil is susceptible (must meet both)		Clay-like soil is not susceptible (must meet one or both)		Clay-like soil is moderately susceptible		
Elevation at Midpoint (ft)	Lab ID	Boring	Depth(s) (ft)	Soil Classification	NMC (w_c) (%)	% Passing #200	% Passing #40	LL	PI	LL in Zone A (see plot)	PI in Zone A (see plot)	LL	PI	LL	PI	LL in Zone B (see plot)	PI in Zone B (see plot)	LL in Zone C (see plot)	PI in Zone C (see plot)	PI < 7	PI >= 7	PI <= 7	P40>=35%, P200>=20%, and PI>=10	7 < PI < 10, or does not meet P40 or P200	Overall Judgement based on 3 methods (sand-like or clay-like)	LL	PI	w_c/LL >= 0.85	PI <= 12	w_c/LL < 0.80	PI > 18	Intermediate w_c/LL (see plot)	Intermediate PI (see plot)	Overall Judgement based on 2 methods (susceptibility)
710.8	X	KIF-A1	45.5'-47'	SC		42.3	100	NP	NP																**Sand-like**									
728.3	X	KIF-B1	30.0'-31.5'			41.2	95.8					-1	-1	-1	-1																		
721.4	X	KIF-B35	44.0'-45.5'	SM	24	47.5	100	NP	NP																**Sand-like**									
712.4	X	KIF-B39	56.0'-57.5'	SM		23.7	99	NP	NP																**Sand-like**									
723.8	X	KIF-BF-SPT2	43.5'-45.0'		18	44	99					-1	-1	-1	-1																		
747.8	X	KIF-BF-SPT4	20.5'-22.0'		29			NP	NP																**Sand-like**									
716.9	X	KIF-C2	25.5'-28.5'	SM		49.2	98	NP	NP																**Sand-like**									
731.8	X	KIF-D2	10.0'-13.0'	CL	17	84.1	99.5	30	11	30	11	-1	-1	-1	-1	-1	-1	-1	-1	-1	11	-1	11	-1	**Clay-like**	-1	-1	-1.00	-1	0.57	11	-1.00	-1	**Not Susceptible**
710.7	192	KIF-B06	28.2'-29.7'	ML	24.2	55.6	100	NP	NP																**Sand-like**									
713.2	203	KIF-B07	26.0'-27.5'	CL	20.9	79.5	100	25	8	25	8	-1	-1	-1	-1	-1	-1	-1	-1	-1	8	-1	-1	8	**Sand-like**									
710.7	204	KIF-B07	28.5'-30.0'	SC-SM	23	43.7	98.6	24	6	24	6	-1	-1	-1	-1	-1	-1	-1	-1	6	-1	6	-1	-1	**Sand-like**									
708.7	218	KIF-B08	30.3'-31.0'	SM	22	44.5	98.0	NP	NP																**Sand-like**									
709.5	240	KIF-B09	44.5'-45.5'	ML	23.4	79.6	100	NP	NP																**Sand-like**									
710.8	273	KIF-B12	27.8'-29.3'	SM	25.8	47.9	100	NP	NP																**Sand-like**									
724.8	289	KIF-B13	27.5'-29.0'	SM	19.8	49	100	NP	NP																**Sand-like**									
717.8	291	KIF-B13	34.5'-36.0'	SM	22.4	23	100	NP	NP																**Sand-like**									
715.3	292	KIF-B13	37.0'-38.5'	SM	18.4	38.4	99.9	NP	NP																**Sand-like**									
725.9	299	KIF-B14	12.0'-13.5'	SM	19.4	42.1	94.7	NP	NP																**Sand-like**									
720.9	301	KIF-B14	17.0'-18.5'	SM	18.5	40.4	100	NP	NP																**Sand-like**									
722.1	313	KIF-B15	16.5'-18.0'	SM	21.9	32.9	100	NP	NP																**Sand-like**									
717.7	315	KIF-B15	21.5'-21.8'		24.8							-1	-1	-1	-1																		
721.5	324	KIF-B16	16.5'-18.0'	SM	23.5	39.8	100	NP	NP																**Sand-like**									
721.2	324	KIF-B16	16.5'-18.5'		23.5							-1	-1	-1	-1																		
719.0	325	KIF-B16	19.0'-20.5'	SM	18.8	29.2	100	NP	NP																**Sand-like**									
713.4	293	KIF-B13	39.5'-39.7'	SM		39.4	100	NP	NP																**Sand-like**									

Subunit 2, Fine-grained Screening and Cyclic Softening Susceptibility Summary

Soil Classification	Clay-like vs. Sand-like	Clay-like Susceptibility	Sample Count	Sample Percent
CL			**2**	**8%**
	Clay-like		1	50%
		Not Susceptible	1	100%
	Sand-like		1	50%
		Sand-like	1	100%
SM			**14**	**56%**
	Sand-like		14	100%
		Sand-like	14	100%
SC			**1**	**4%**
	Sand-like		1	100%
		Sand-like	1	100%
0			**5**	**20%**
	Sand-like		1	20%
		Sand-like	1	100%
			4	80%
		Sand-like	4	100%
ML			**2**	**8%**
	Sand-like		2	100%
		Sand-like	2	100%
SC-SM			**1**	**4%**
	Sand-like		1	100%
		Sand-like	1	100%
Grand Total			**25**	**100%**





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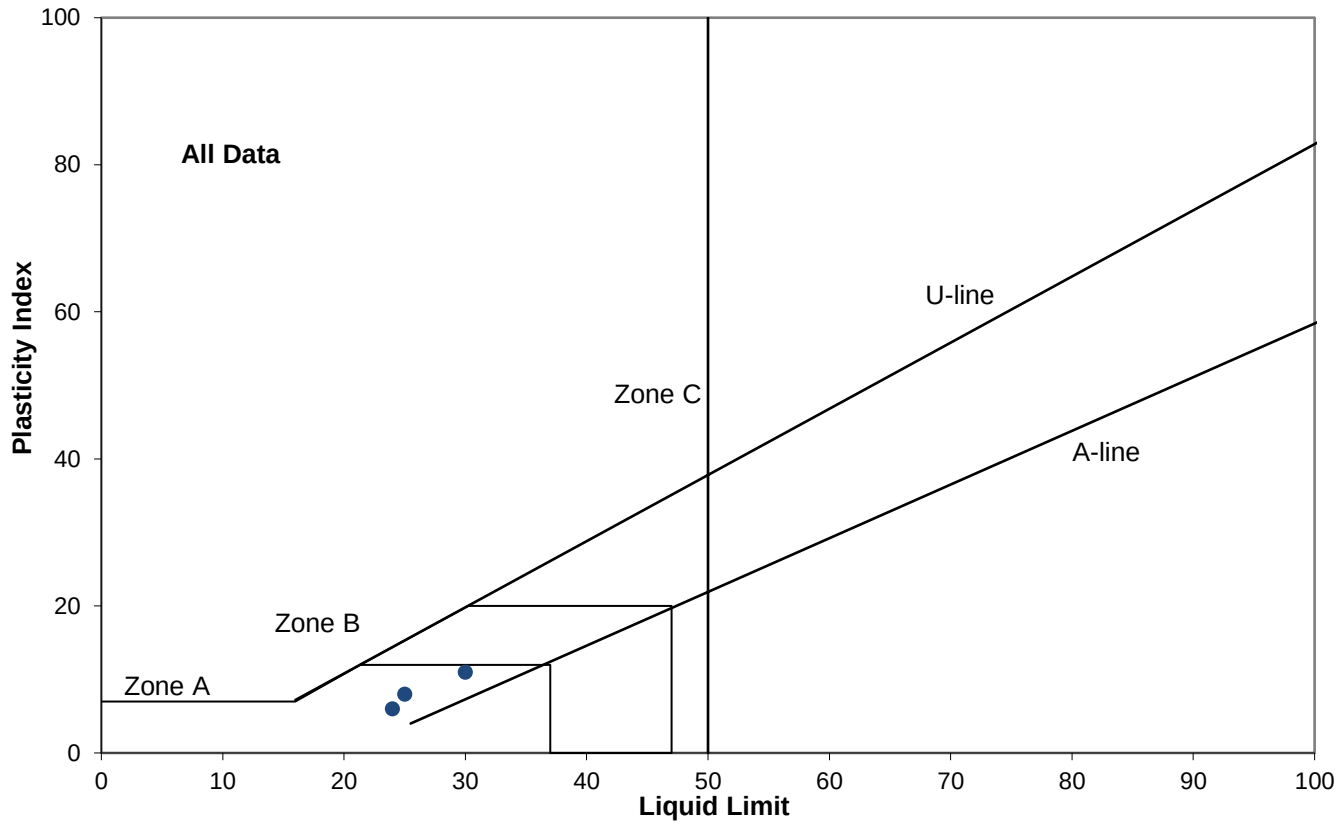
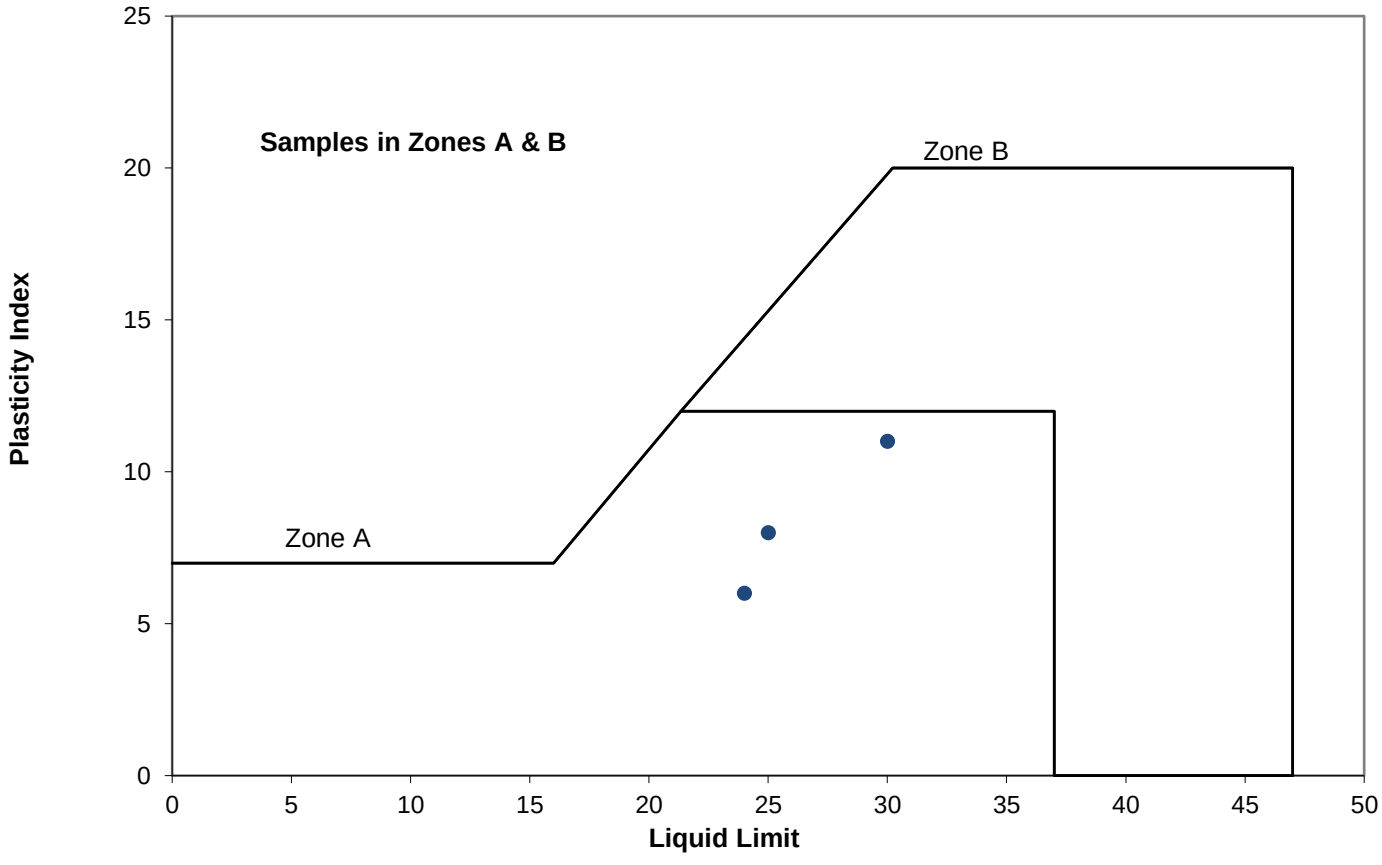


(b)

Screening Criteria for Liquefiable Fine-Grained Soils (Seed et al. 2003)



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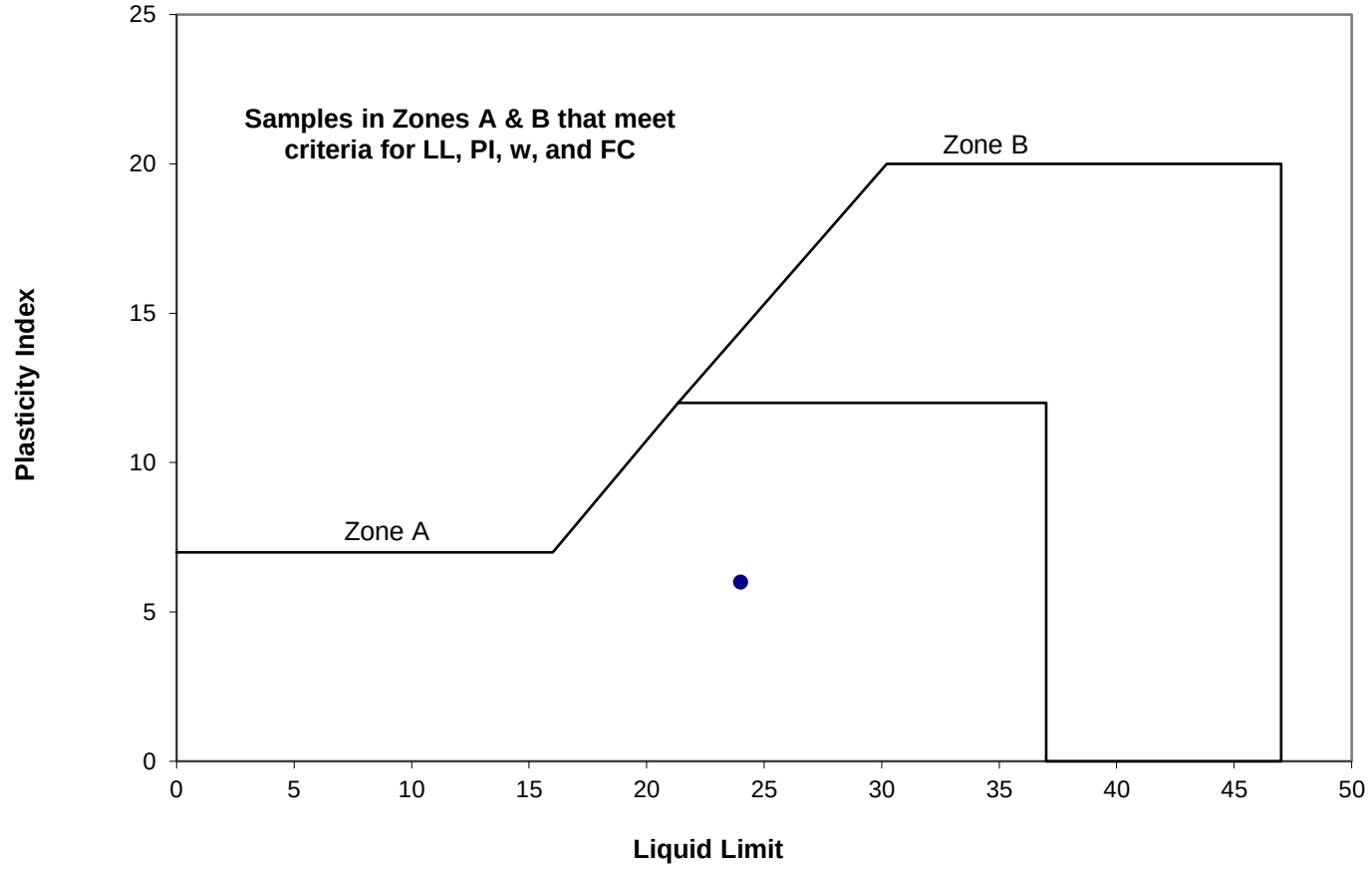
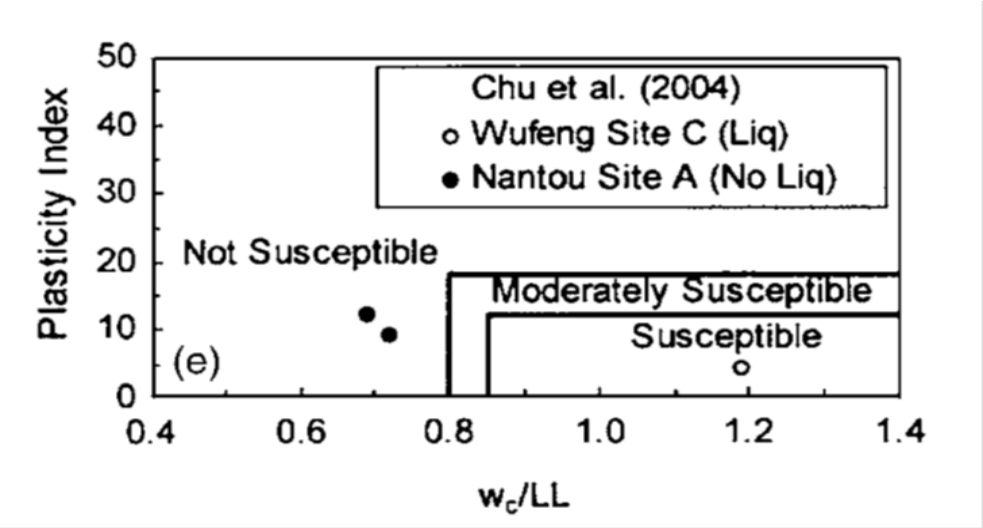
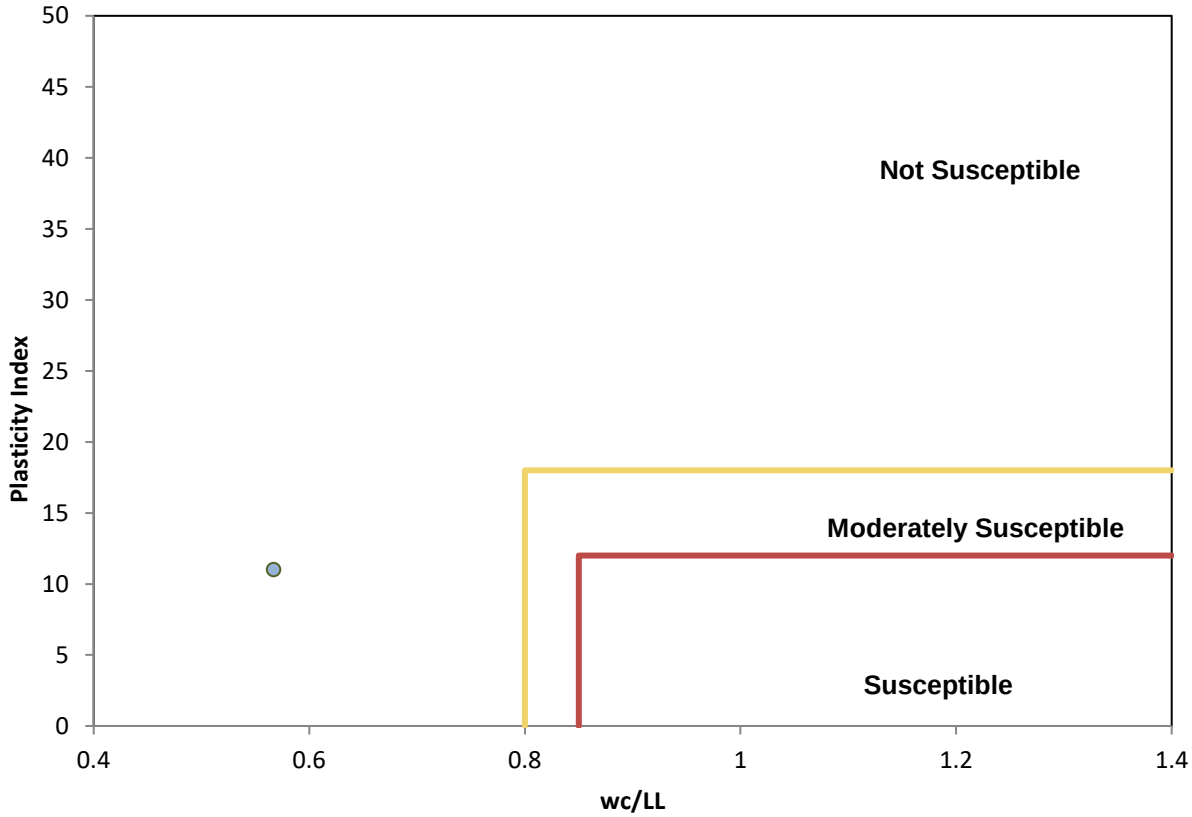


(d)

Screening Criteria for Liquefiable Fine-Grained Soils (Seed et al. 2003)





Screening Criteria for Assessing Liquefaction in Fine Grained Soils (Bray and Sancio 2006)

3.1.7 Subunit 3

CLAM - Clay-like **L**aboratory-Based **A**ssessment of **M**aterials

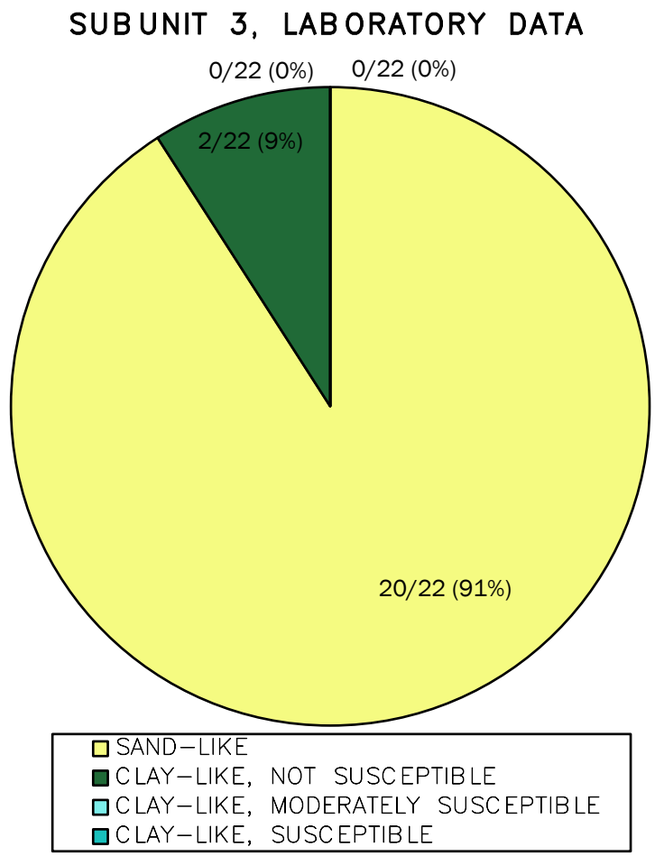
Stantec Project Number:	175668043
Project Name:	KIF TDEC Stability
Material	Subunit 3

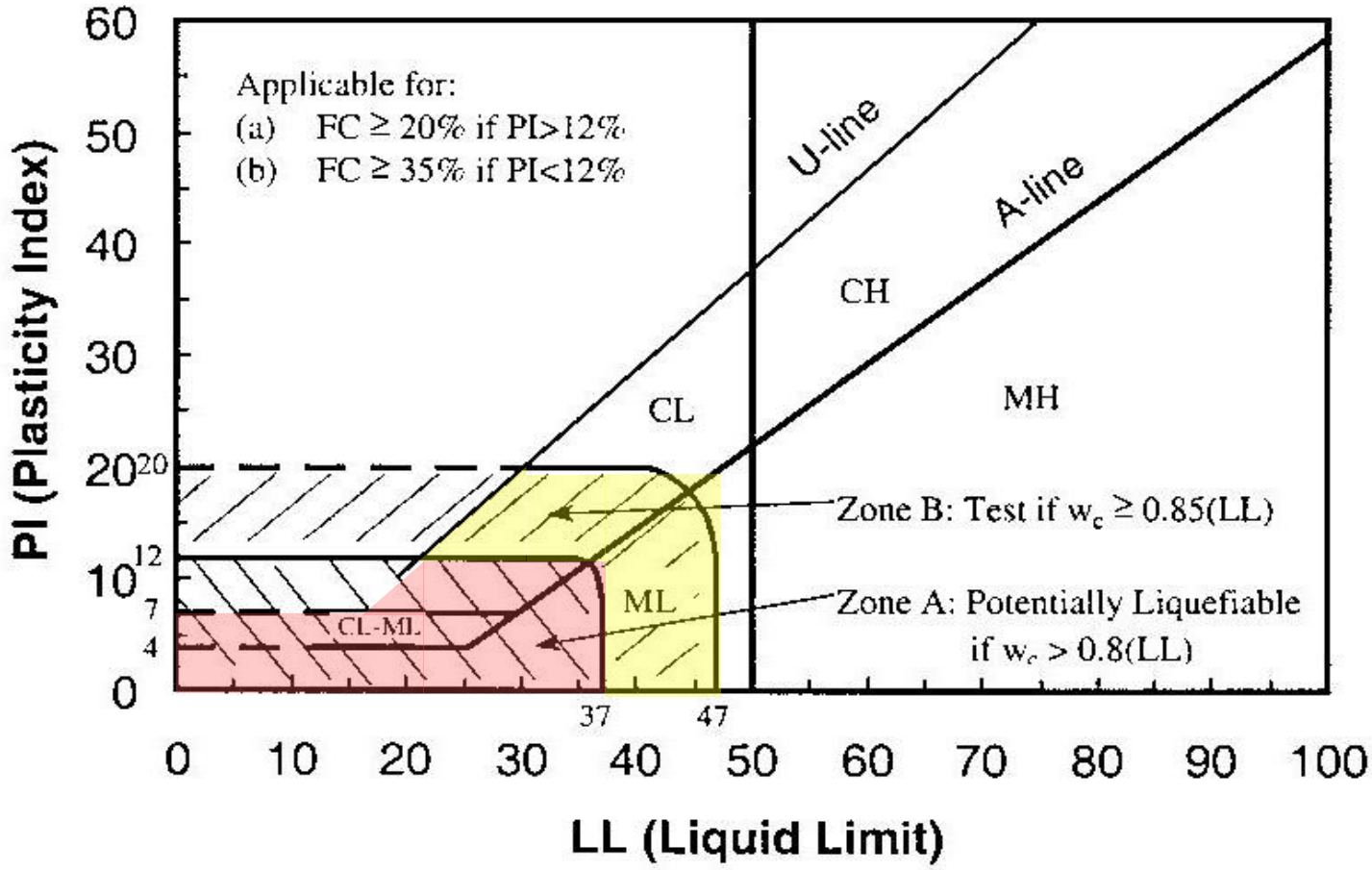
Note: NP = Non-Plastic

									Sand-like versus Clay-like Behavior (-1 indicates result does not meet criteria)															**Susceptibility of Clay-like Soils to Cyclic Softening (-1 indicates result does not meet criteria)**									
									Using Criteria published by Seed et al (2003)								Using Criteria published by Idriss and Boulanger (2008)		Using criteria published by MSHA (2010)				Using Criteria published by Seed et al (2003)		Using Criteria published by Bray and Sancio (2006)							
									Meets criteria for sand-like behavior		In Zone B		in B with w >= .85LL		Meets criteria for clay-like behavior								Meets all criteria for B (clay-like and potentially liquefiable, -2 indicates zone A but susceptible, -3 indicates not applicable due to fines content		Clay-like soil is susceptible (must meet both)		Clay-like soil is not susceptible (must meet one or both)		Clay-like soil is moderately susceptible			
Elevation at Midpoint (ft)	Lab ID	Boring	Depth(s) (ft)	Soil Classification	NMC (w_c) (%)	% Passing #200	% Passing #40	LL	PI	LL in Zone A (see plot)	PI in Zone A (see plot)	LL	PI	LL	PI	LL in Zone B (see plot)	PI in Zone B (see plot)	LL in Zone C (see plot)	PI in Zone C (see plot)	Meets criteria for sand-like behavior	Meets criteria for clay-like behavior	Meets criteria for sand-like behavior	Meets criteria for clay-like behavior	Borderline soils (treat as sand-like)	Overall Judgement based on 3 methods (sand-like or clay-like)	LL	PI	w_c/LL >= 0.85	PI <= 12	w_c/LL < 0.80	PI > 18	Intermediate w_c/LL (see plot)	Intermediate PI (see plot)	Overall Judgement based on 2 methods (susceptibility)
									PI < 7	PI >= 7	PI <= 7	P40>=35%, P200>=20%, and PI>=10	7 < PI < 10, or does not meet P40 or P200																		
712.1	X	KIF-STN50	28.0'-31.0'	SM		39.3	98.8	17	2	17	2	-1	-1	-1	-1	-1	-1	-1	-1	2	-1	2	-1	-1	**Sand-like**									
705.9	X	KIF-STN51	43.0'-46.0'	SP-SM		10.5	96.2	NP	NP																**Sand-like**									
735.2	X	KIF-STN52	16.5'-19.5'	SM		20.3	98.4	NP	NP																**Sand-like**									
720.7	X	KIF-STN53	41.0'-45.5'	SM		34.7	98	NP	NP																**Sand-like**									
728.0	X	KIF-STN71	22.5'-25.5'	SM		26.2	99.1	NP	NP																**Sand-like**									
719.8	X	KIF-BF-SPT3	33.5'-35.0'		22			NP	NP																**Sand-like**									
710.8	X	KIF-BF-SPT5	58.5'-60.0'			26	98					-1	-1	-1	-1																			
730.8	X	KIF-BF-SPT5	38.5'-40.0'					NP	NP																**Sand-like**									
706.9	X	KIF-C1	40.0'-43.0'	SM	21	33.1	99.7	NP	NP																**Sand-like**									
735.7	X	KIF-C2	7.5'-9.0'	SC		30.1	43.8	40	15	-1	-1	40	15	-1	-1	40	15	-1	-1	-1	15	-1	15	-1	**Clay-like**	-1	-1	-1.00	-1	0.00	15	-1.00	-1	**Not Susceptible**
732.7	X	KIF-C2	10.5'-12.0'	SC		30.1	43.8	40	15	-1	-1	40	15	-1	-1	40	15	-1	-1	-1	15	-1	15	-1	**Clay-like**	-1	-1	-1.00	-1	0.00	15	-1.00	-1	**Not Susceptible**
706.3	220	KIF-B08	32.6'-33.5'	SM	17.2	30.6	46.1	NP	NP																**Sand-like**									
708.6	250	KIF-B10	30.0'-31.0'	SM	32.4	24.6	99.6	NP	NP																**Sand-like**									
707.6	262	KIF-B11	31.0'-32.5'	SM	30.9	16.7	99.8	NP	NP																**Sand-like**									
705.3	263	KIF-B11	33.5'-34.6'	SM	24.8	15.9	92.3	NP	NP																**Sand-like**									
708.3	274	KIF-B12	30.3'-31.8'	SM	31.2	28.2	99.9	NP	NP																**Sand-like**									
705.3	294	KIF-B13	47.0'-48.5'	GM	16.2	15	31.2	NP	NP																**Sand-like**									
713.4	303	KIF-B14	24.5'-26.0'	SM	27.6	22.1	98.8	NP	NP																**Sand-like**									
714.6	317	KIF-B15	24.0'-25.5'	SM	25	21.3	99.1	NP	NP																**Sand-like**									
712.1	318	KIF-B15	26.5'-28.0'	SM	27.1	13.3	99.6	NP	NP																**Sand-like**									
716.1	327	KIF-B16	22.3'-23.0'	SM	22.5	29.3	99.1	NP	NP																**Sand-like**									
704.3	241	KIF-B09	50.0'-50.5'	SP-SM		11.2	99.8	NP	NP																**Sand-like**									
706.4	251	KIF-B10	32.0'-33.5'	SP-SM	28	10.9	99.4	NP	NP																**Sand-like**									
705.8	275	KIF-B12	32.8'-34.3'	SP-SM	24.6	10.5	93.1	NP	NP																**Sand-like**									
711.5	329	KIF-B16	26.5'-28.0'	SM	22.8	17.1	79.9	NP	NP																**Sand-like**									

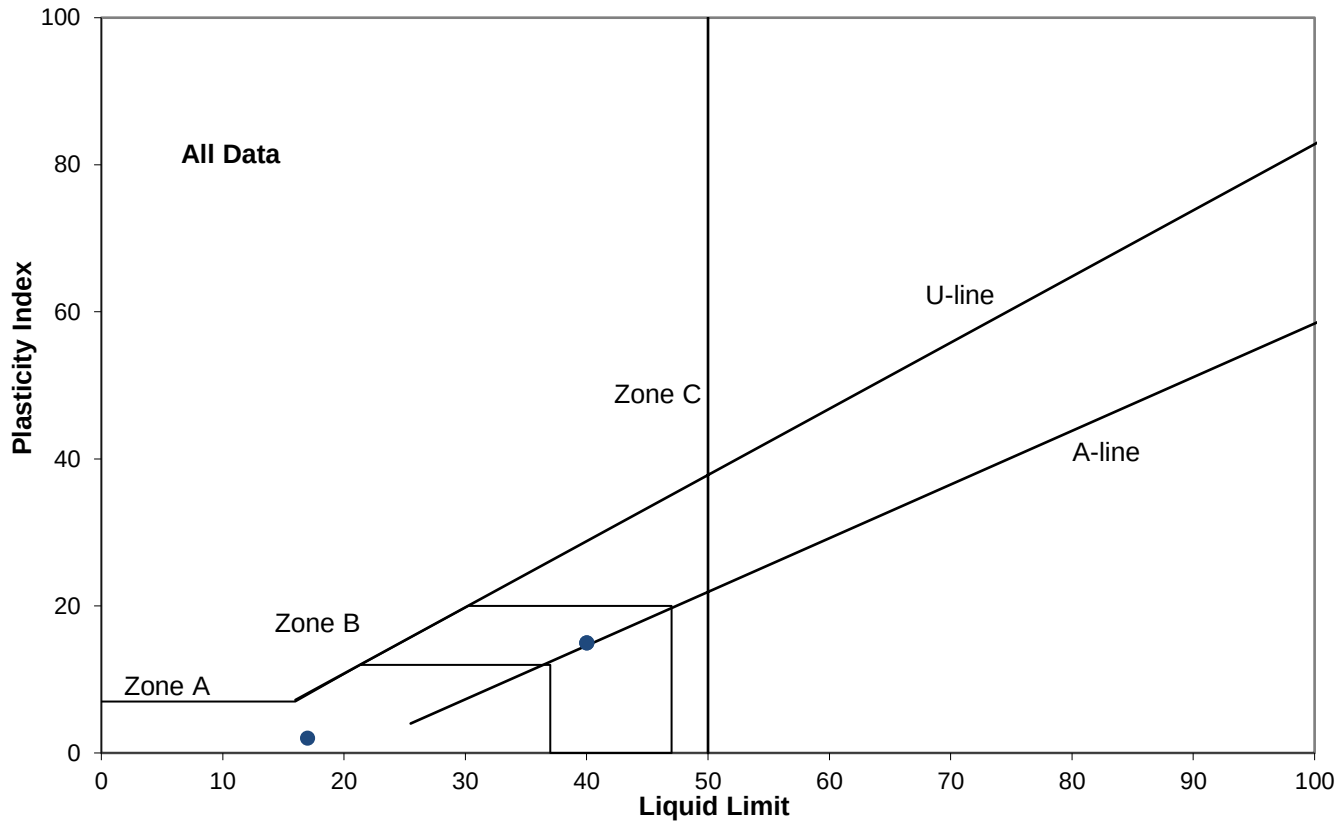
Subunit 3, Fine-grained Screening and Cyclic Softening Susceptibility Summary

Soil Classification	Clay-like vs. Sand-like	Clay-like Susceptibility	Sample Count	Sample Percent
SM			**15**	**60%**
	Sand-like		15	100%
		Sand-like	15	100%
SC			**2**	**8%**
	Clay-like		2	100%
		Not Susceptible	2	100%
SP-SM			**4**	**16%**
	Sand-like		4	100%
		Sand-like	4	100%
0			**3**	**12%**
	Sand-like		2	67%
		Sand-like	2	100%
			1	33%
		Sand-like	1	100%
GM			**1**	**4%**
	Sand-like		1	100%
		Sand-like	1	100%
Grand Total			**25**	**100%**



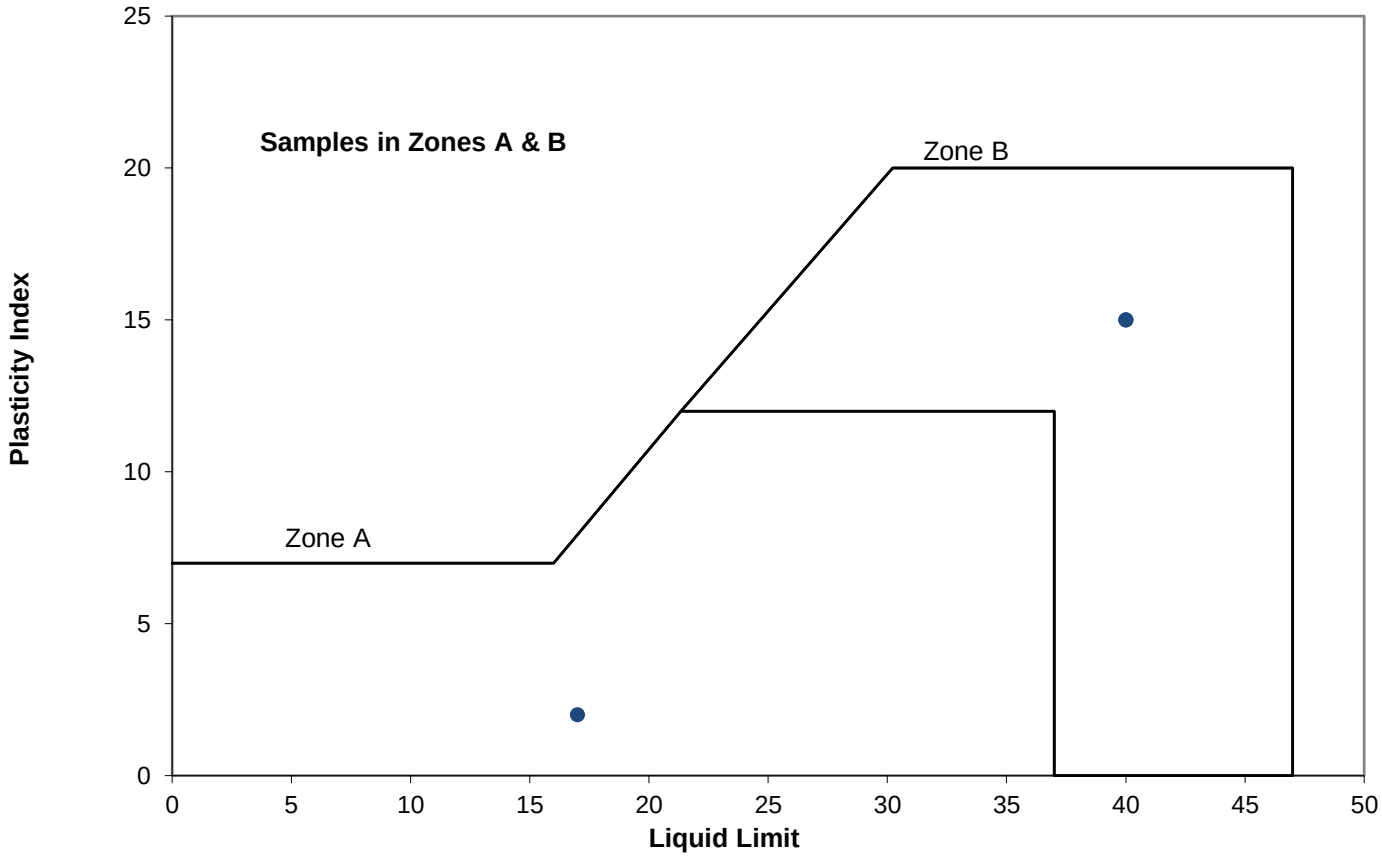


(a)



(b)

Screening Criteria for Liquefiable Fine-Grained Soils (Seed et al. 2003)



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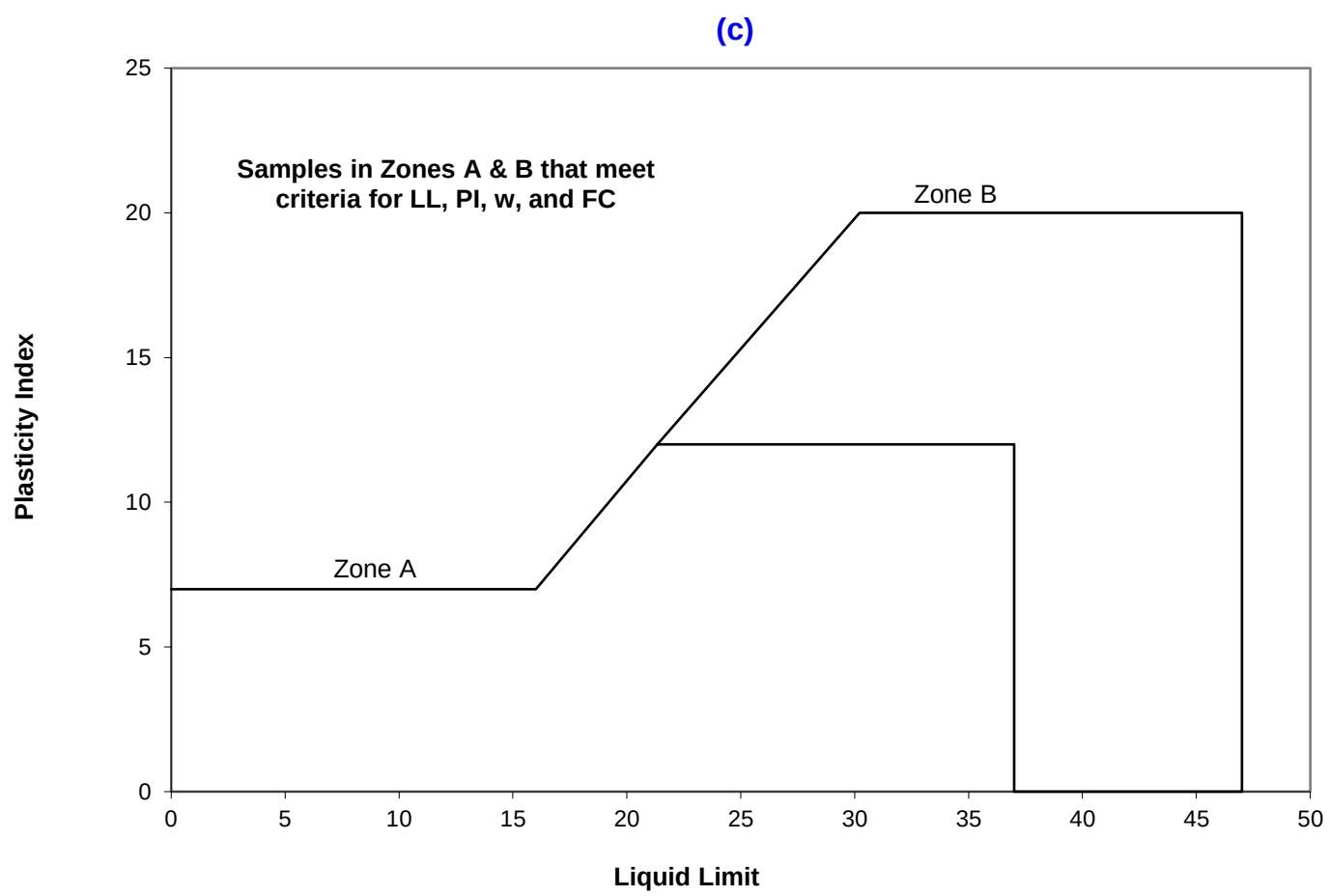
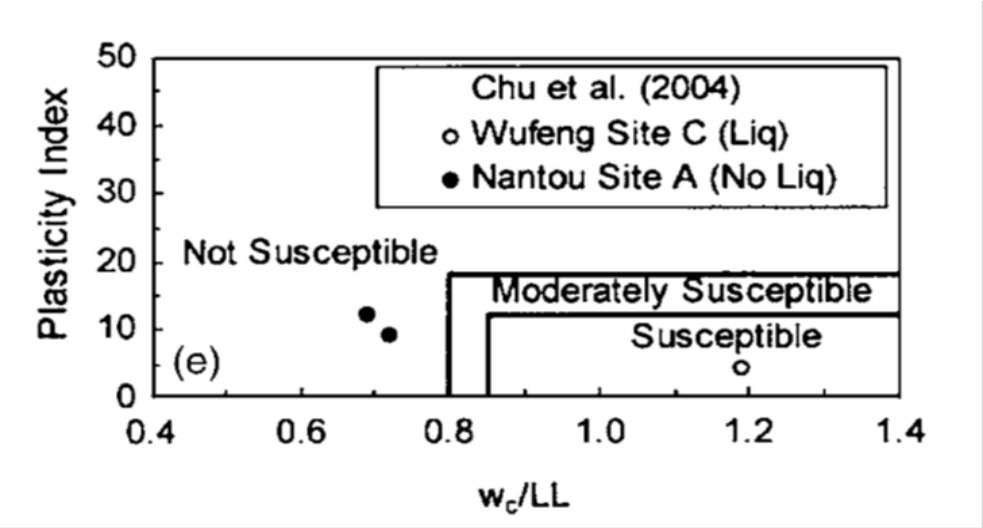
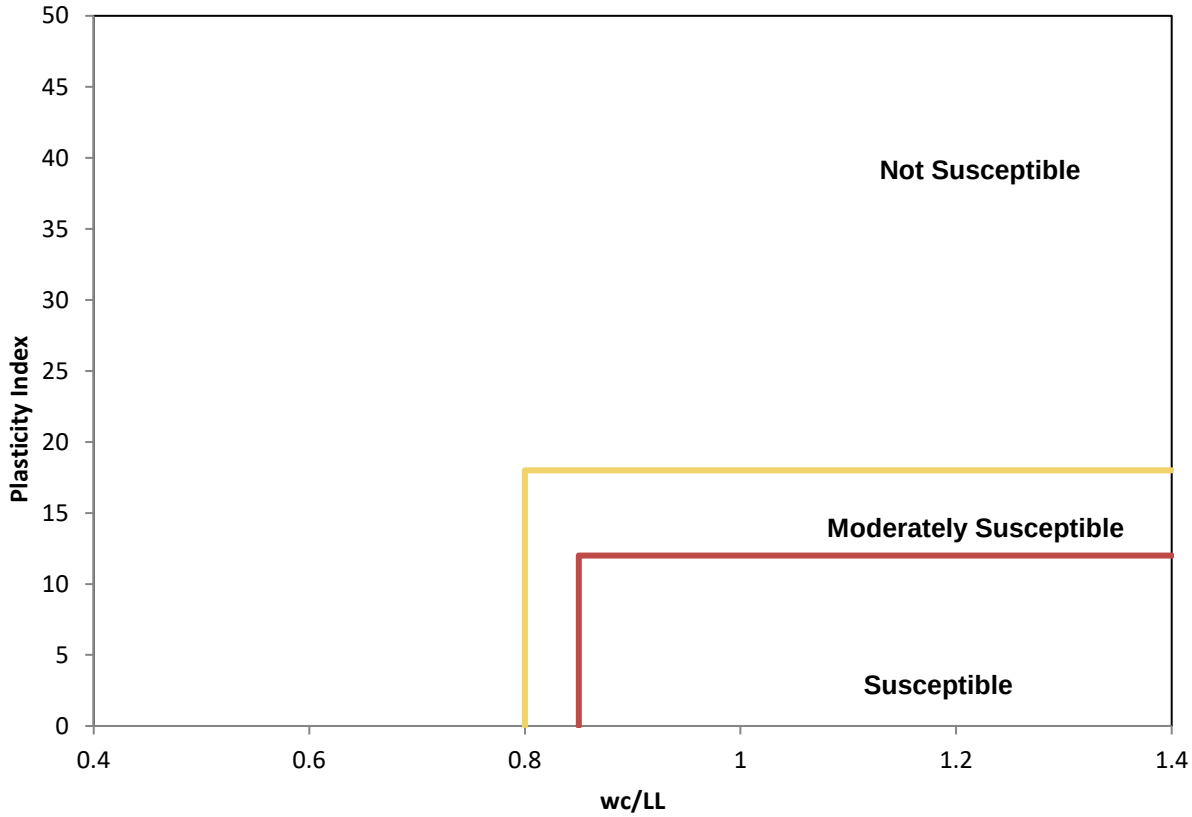


(d)

Screening Criteria for Liquefiable Fine-Grained Soils (Seed et al. 2003)





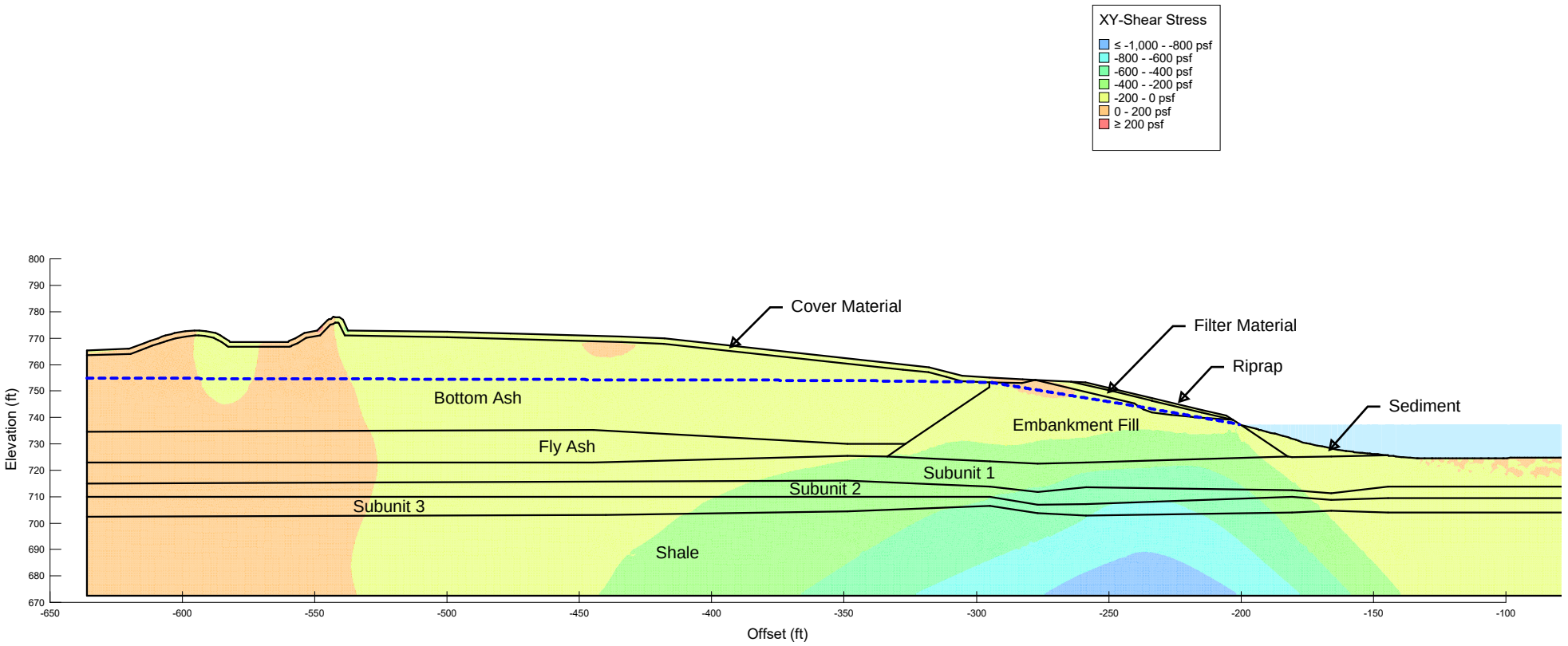
Screening Criteria for Assessing Liquefaction in Fine Grained Soils (Bray and Sancio 2006)

3.2 STATIC SHEAR STRESS RATIO (α)

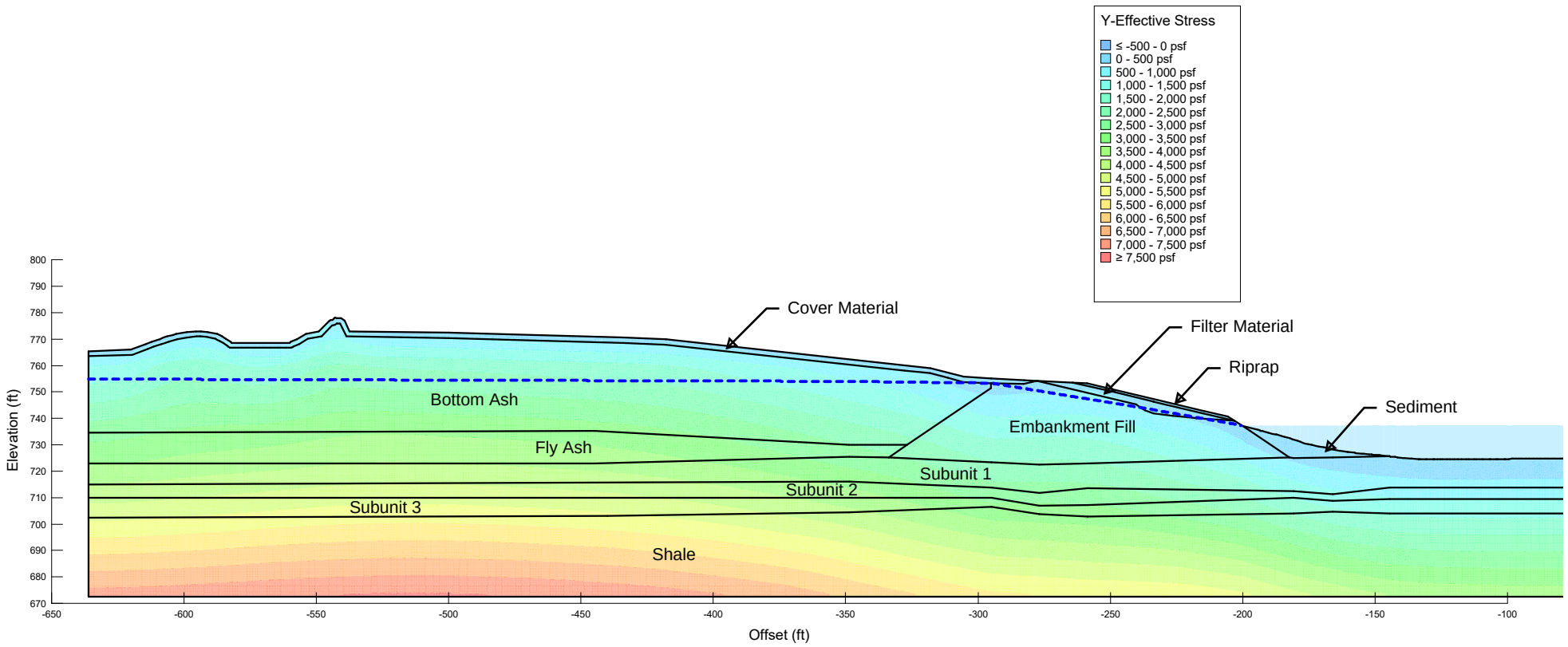
3.2.1 SIGMA/W Graphical Outputs

3.2.1.1 Section A-A'

Kingston Fossil Plant (KIF) TDEC Order		Note: The results of the analysis shown here are based on available subsurface information, laboratory test results and approximate soil properties. The drawing depicts approximate subsurface conditions based on historical drawings or specific borings at the time of drilling. No warranties can be made regarding the continuity of subsurface conditions.
Sluice Trench and Ballfield East of Sluice Trench	Section A-A' SIGMA/W Analyses for Seismic Effort XY-Shear Stress	
Section A-A'		

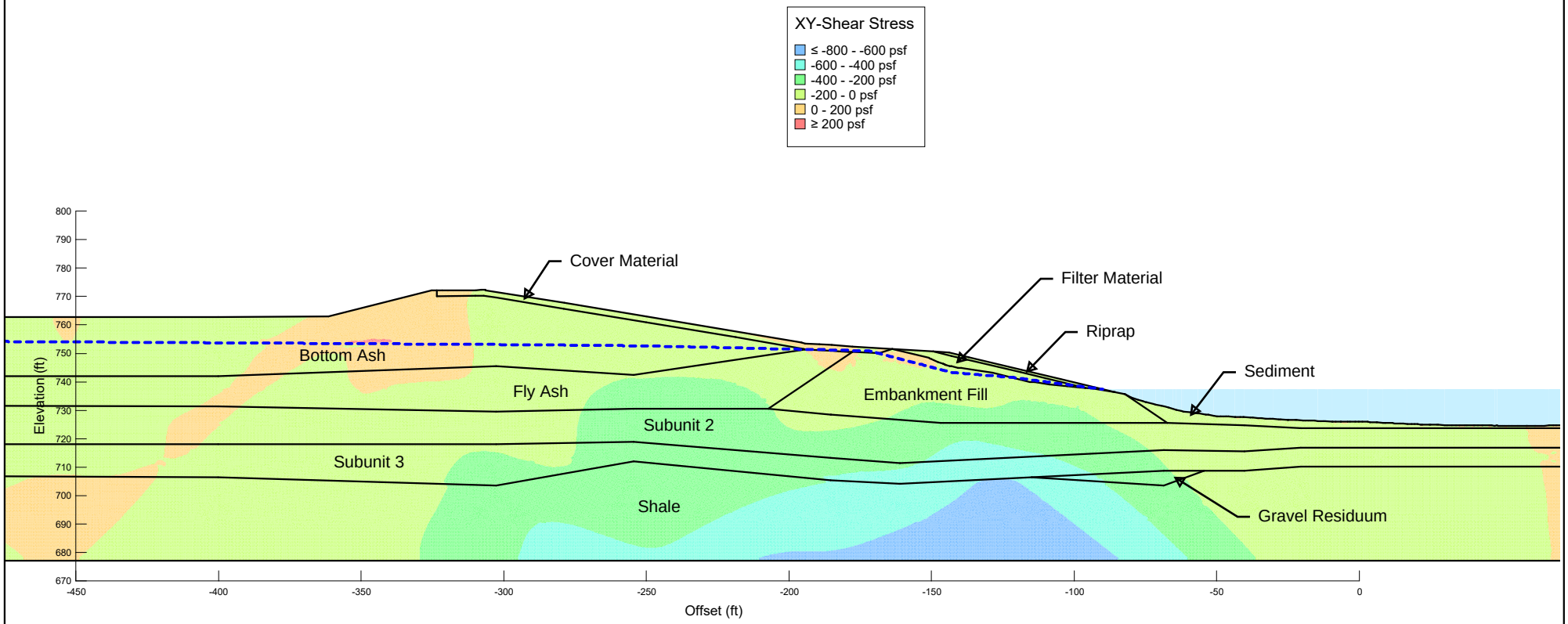


Kingston Fossil Plant (KIF) TDEC Order		Note: The results of the analysis shown here are based on available subsurface information, laboratory test results and approximate soil properties. The drawing depicts approximate subsurface conditions based on historical drawings or specific borings at the time of drilling. No warranties can be made regarding the continuity of subsurface conditions.
Sluice Trench and Ballfield East of Sluice Trench	Section A-A' SIGMA/W Analyses for Seismic Effort Y-Effective Stress	
Section A-A'		

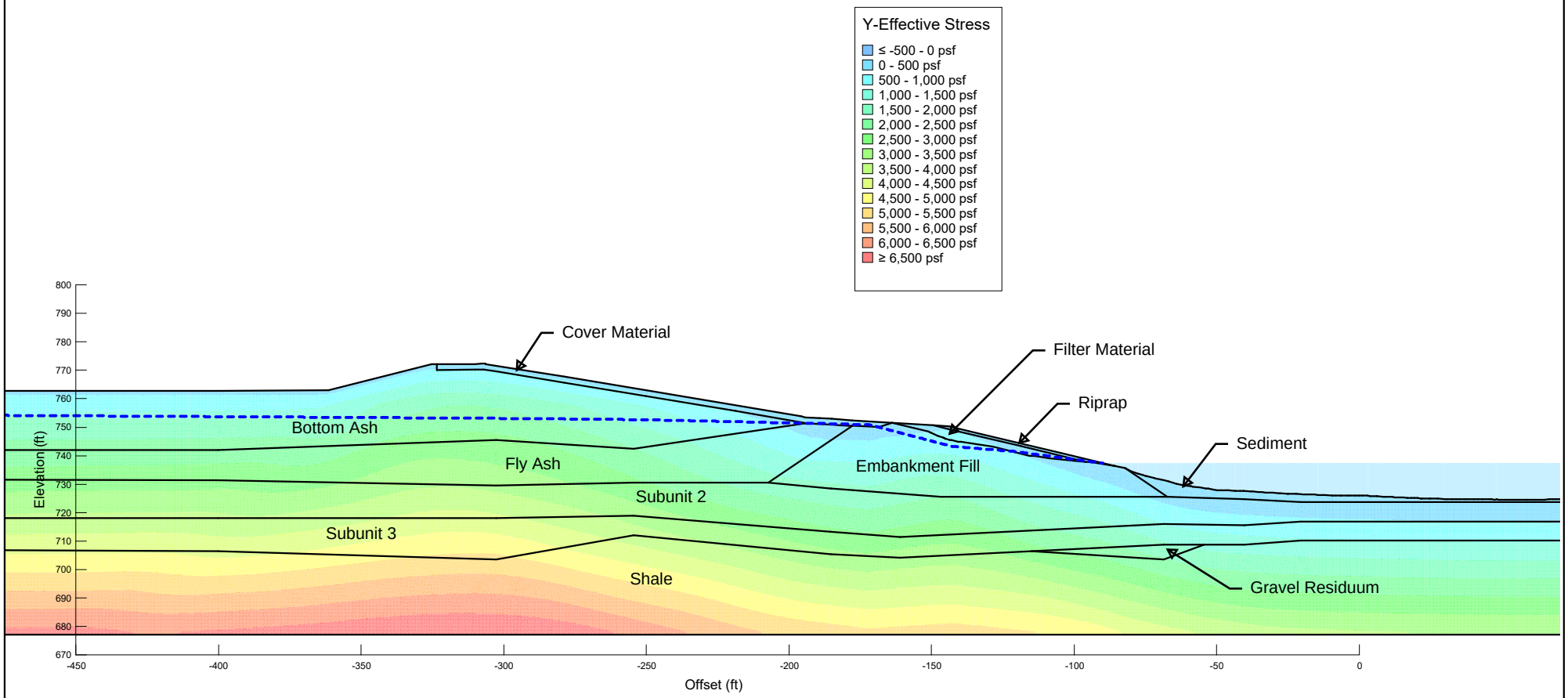


3.2.1.2 Polishing Pond Section

Kingston Fossil Plant (KIF) TDEC Order Sluice Trench and Ballfield East of Sluice Trench Polishing Pond Section	Polishing Pond Section SIGMA/W Analyses for Seismic Effort XY-Shear Stress	Note: The results of the analysis shown here are based on available subsurface information, laboratory test results and approximate soil properties. The drawing depicts approximate subsurface conditions based on historical drawings or specific borings at the time of drilling. No warranties can be made regarding the continuity of subsurface conditions.



Kingston Fossil Plant (KIF) TDEC Order		Note: The results of the analysis shown here are based on available subsurface information, laboratory test results and approximate soil properties. The drawing depicts approximate subsurface conditions based on historical drawings or specific borings at the time of drilling. No warranties can be made regarding the continuity of subsurface conditions.
Sluice Trench and Ballfield East of Sluice Trench	Polishing Pond Section SIGMA/W Analyses for Seismic Effort Y-Effective Stress	
Polishing Pond Section		

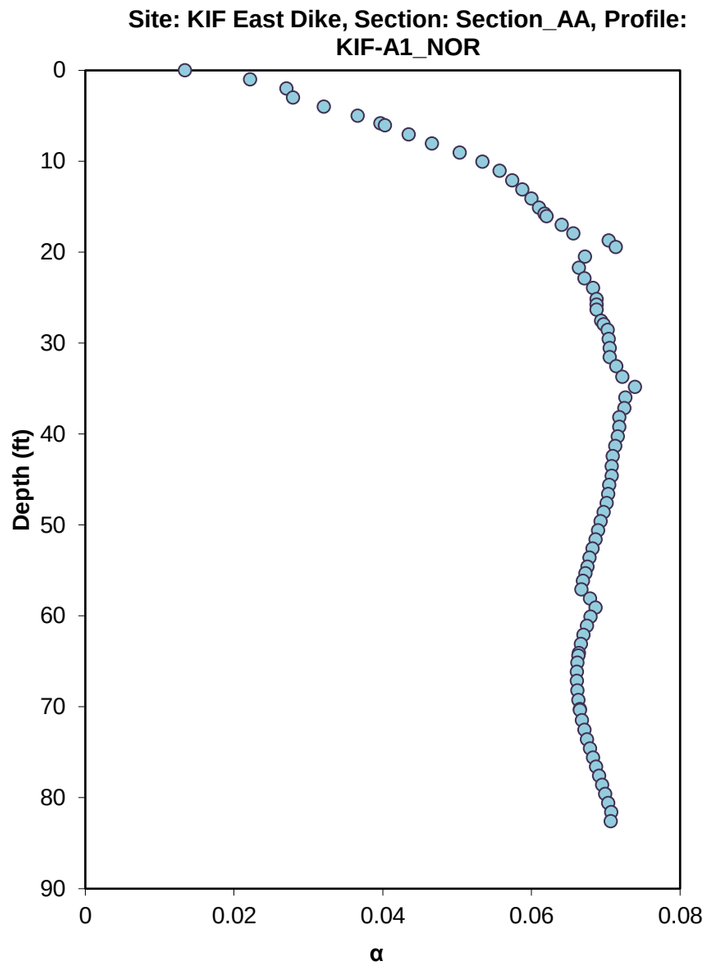


3.2.2 α Calculations

3.2.2.1 Section A-A'

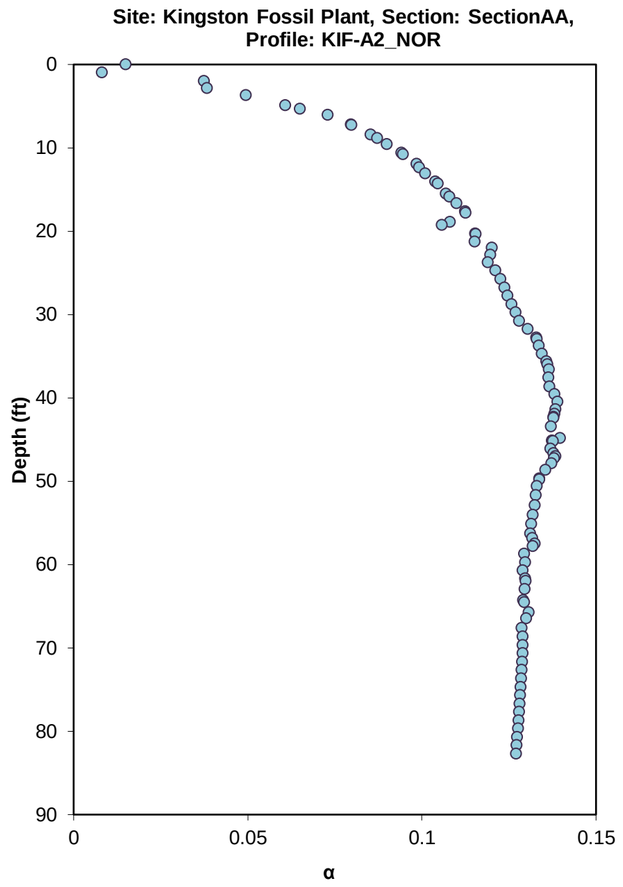
Site: KIF East Dike
Section: Section_AA
Profile: KIF-A1_NOR

From GeoStudio					
Depth (ft)	XY-Shear Stress (psf)	Depth (ft)	Vertical Effective Stress (psf)	Depth (ft)	Alpha
0.00	-4.98	0.00	371.38	0.00	0.013
1.01	-9.62	1.01	434.05	1.01	0.022
2.01	-15.06	2.01	555.76	2.01	0.027
3.02	-18.92	3.02	676.16	3.02	0.028
4.03	-24.71	4.03	770.39	4.03	0.032
5.04	-30.34	5.04	828.54	5.04	0.037
5.88	-34.82	5.88	876.86	5.88	0.040
6.05	-35.76	6.05	886.84	6.05	0.040
7.06	-41.12	7.06	945.13	7.06	0.044
8.07	-46.60	8.07	999.29	8.07	0.047
9.08	-53.46	9.08	1061.28	9.08	0.050
10.09	-59.70	10.09	1117.16	10.09	0.053
11.10	-65.44	11.10	1174.65	11.10	0.056
12.10	-70.78	12.10	1232.44	12.10	0.057
13.11	-75.86	13.11	1290.31	13.11	0.059
14.12	-80.85	14.12	1347.83	14.12	0.060
15.11	-85.72	15.11	1404.32	15.11	0.061
15.82	-89.25	15.82	1444.85	15.82	0.062
16.07	-90.54	16.07	1459.68	16.07	0.062
17.04	-96.90	17.04	1512.02	17.04	0.064
17.94	-102.47	17.94	1560.46	17.94	0.066
18.75	-113.12	18.75	1606.05	18.75	0.070
19.48	-117.93	19.48	1652.91	19.48	0.071
20.52	-115.70	20.52	1721.70	20.52	0.067
21.72	-118.30	21.72	1781.89	21.72	0.066
22.92	-123.74	22.92	1842.74	22.92	0.067
23.97	-130.55	23.97	1911.86	23.97	0.068
25.16	-135.90	25.16	1975.55	25.16	0.069
25.81	-138.47	25.81	2013.70	25.81	0.069
26.33	-140.58	26.33	2044.90	26.33	0.069
27.57	-146.29	27.57	2107.63	27.57	0.069
27.97	-148.71	27.97	2131.82	27.97	0.070
28.59	-152.46	28.59	2169.44	28.59	0.070
29.58	-156.69	29.58	2225.87	29.58	0.070
30.57	-160.87	30.57	2281.38	30.57	0.071
31.56	-164.81	31.56	2336.96	31.56	0.071
32.57	-171.00	32.57	2394.82	32.57	0.071
33.71	-177.02	33.71	2450.02	33.71	0.072
34.86	-185.55	34.86	2508.94	34.86	0.074
36.02	-186.44	36.02	2566.76	36.02	0.073
37.16	-190.18	37.16	2622.60	37.16	0.073
38.17	-193.08	38.17	2688.67	38.17	0.072
39.21	-197.93	39.21	2755.30	39.21	0.072
40.27	-202.15	40.27	2823.30	40.27	0.072
41.35	-206.17	41.35	2892.62	41.35	0.071
42.47	-210.18	42.47	2962.56	42.47	0.071
43.55	-214.70	43.55	3032.06	43.55	0.071
44.61	-219.53	44.61	3100.45	44.61	0.071
45.62	-223.18	45.62	3166.62	45.62	0.070
46.62	-227.32	46.62	3231.47	46.62	0.070
47.62	-231.22	47.62	3295.93	47.62	0.070
48.61	-234.40	48.61	3360.57	48.61	0.070
49.62	-237.44	49.62	3425.41	49.62	0.069
50.61	-240.69	50.61	3490.11	50.61	0.069
51.61	-243.92	51.61	3554.99	51.61	0.069
52.61	-247.11	52.61	3621.26	52.61	0.068
53.61	-250.36	53.61	3689.51	53.61	0.068
54.60	-253.44	54.60	3751.75	54.60	0.068
55.36	-256.53	55.36	3812.93	55.36	0.067
56.14	-259.46	56.14	3874.20	56.14	0.067
57.14	-262.79	57.14	3936.39	57.14	0.067
58.13	-272.09	58.13	4007.53	58.13	0.068
59.13	-280.17	59.13	4082.56	59.13	0.069
60.13	-282.83	60.13	4159.70	60.13	0.068
61.13	-285.79	61.13	4236.57	61.13	0.067
62.13	-289.06	62.13	4313.18	62.13	0.067
63.13	-292.67	63.13	4389.65	63.13	0.067
64.14	-296.55	64.14	4465.96	64.14	0.066
64.3679	-297.53	64.36792	4483.54	64.37	0.066
65.1417	-300.76	65.14167	4541.99	65.14	0.066
66.1412	-305.26	66.14124	4617.82	66.14	0.066
67.1509	-310.36	67.15091	4694.73	67.15	0.066
68.2074	-316.03	68.20738	4773.08	68.21	0.066
69.2705	-321.94	69.27052	4853.08	69.27	0.066
70.2771	-327.80	70.27714	4927.12	70.28	0.067
70.3695	-328.34	70.36953	4933.91	70.37	0.067
71.4775	-335.13	71.47752	5014.35	71.48	0.067
72.5481	-341.98	72.54813	5094.23	72.55	0.067
73.6008	-349.12	73.6008	5171.19	73.60	0.068
74.6072	-356.13	74.60722	5246.68	74.61	0.068
75.6109	-363.32	75.61086	5320.72	75.61	0.068
76.6124	-370.59	76.61238	5394.46	76.61	0.069
77.6131	-377.90	77.61311	5468.05	77.61	0.069
78.6135	-385.29	78.61347	5541.58	78.61	0.070
79.6137	-392.74	79.61366	5615.08	79.61	0.070
80.6138	-400.26	80.61377	5688.56	80.61	0.070
81.6138	-407.83	81.61384	5762.02	81.61	0.071
82.6139	-407.78	82.61391	5769.70	82.61	0.071



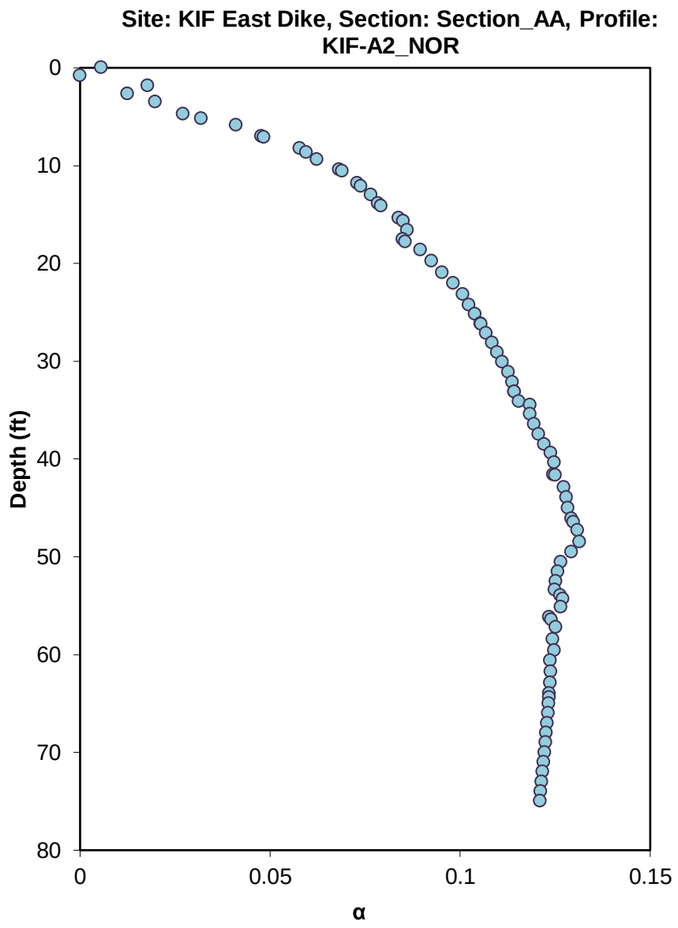
Site: Kingston Fossil Plant
Section: SectionAA
Profile: KIF-A2_NOR

From GeoStudio					
Depth (ft)	XY-Shear Stress (psf)	Depth (ft)	Vertical Effective Stress (psf)	Depth (ft)	Alpha
0.00	2.16	0.00	144.73	0.00	0.015
0.97	-1.42	0.97	173.27	0.97	0.008
1.98	-9.49	1.98	253.12	1.98	0.038
2.82	-10.84	2.82	282.85	2.82	0.038
3.66	-16.20	3.66	326.87	3.66	0.050
4.93	-25.51	4.93	419.37	4.93	0.061
5.32	-28.82	5.32	443.40	5.32	0.065
6.06	-35.46	6.06	485.78	6.06	0.073
7.18	-43.87	7.18	550.49	7.18	0.080
7.23	-44.22	7.23	553.88	7.23	0.080
8.39	-53.43	8.39	625.83	8.39	0.085
8.86	-57.15	8.86	655.47	8.86	0.087
9.59	-63.22	9.59	702.68	9.59	0.090
10.61	-71.71	10.61	761.64	10.61	0.094
10.76	-72.92	10.76	770.35	10.76	0.095
11.92	-82.92	11.92	841.83	11.92	0.099
12.36	-86.15	12.36	867.96	12.36	0.099
13.10	-92.22	13.10	912.59	13.10	0.101
14.05	-101.03	14.05	971.88	14.05	0.104
14.31	-103.38	14.31	988.32	14.31	0.105
15.47	-113.11	15.47	1057.51	15.47	0.107
15.86	-116.65	15.86	1081.06	15.86	0.108
16.66	-124.31	16.66	1130.45	16.66	0.110
17.60	-133.45	17.60	1186.22	17.60	0.113
17.83	-135.23	17.83	1200.16	17.83	0.113
18.88	-137.35	18.88	1270.95	18.88	0.108
19.25	-137.30	19.25	1297.25	19.25	0.106
20.29	-156.10	20.29	1352.46	20.29	0.115
20.33	-156.55	20.33	1355.44	20.33	0.116
21.26	-163.53	21.26	1419.22	21.26	0.115
22.00	-174.60	22.00	1452.58	22.00	0.120
22.83	-180.49	22.83	1508.27	22.83	0.120
23.72	-185.45	23.72	1558.80	23.72	0.119
24.72	-195.86	24.72	1616.08	24.72	0.121
25.73	-205.52	25.73	1676.50	25.73	0.123
26.75	-214.99	26.75	1736.99	26.75	0.124
27.76	-224.11	27.76	1797.05	27.76	0.125
28.76	-233.60	28.76	1856.67	28.76	0.126
29.76	-243.14	29.76	1915.77	29.76	0.127
30.76	-252.63	30.76	1974.68	30.76	0.128
31.77	-265.54	31.77	2034.51	31.77	0.131
32.75	-278.75	32.75	2097.13	32.75	0.133
32.97	-280.96	32.97	2111.01	32.97	0.133
33.74	-288.69	33.74	2160.09	33.74	0.134
34.71	-298.63	34.71	2220.77	34.71	0.134
35.62	-309.60	35.62	2280.10	35.62	0.136
35.95	-313.21	35.95	2301.67	35.95	0.136
36.60	-320.14	36.60	2343.92	36.60	0.137
37.53	-329.05	37.53	2411.66	37.53	0.136
38.62	-337.69	38.62	2469.31	38.62	0.137
39.54	-349.60	39.54	2530.50	39.54	0.138
40.46	-359.56	40.46	2587.26	40.46	0.139
41.37	-366.05	41.37	2643.11	41.37	0.138
41.94	-369.82	41.94	2678.04	41.94	0.138
42.28	-371.89	42.28	2698.58	42.28	0.138
42.38	-372.75	42.38	2704.02	42.38	0.138
43.41	-378.81	43.41	2762.02	43.41	0.137
44.81	-396.39	44.81	2837.42	44.81	0.140
45.16	-393.45	45.16	2864.11	45.16	0.137
45.17	-398.42	45.17	2894.03	45.17	0.138
46.11	-402.46	46.11	2937.32	46.11	0.137
46.67	-409.66	46.67	2973.01	46.67	0.138
47.03	-414.79	47.03	2995.80	47.03	0.138
47.26	-415.67	47.26	3011.73	47.26	0.138
47.84	-419.18	47.84	3052.86	47.84	0.137
48.66	-421.28	48.66	3109.40	48.66	0.135
49.66	-425.29	49.66	3177.60	49.66	0.134
49.77	-426.19	49.77	3186.55	49.77	0.134
50.6059	-433.00	50.60587	3255.25	50.61	0.133
51.6956	-443.53	51.69562	3341.75	51.70	0.133
52.8727	-454.74	52.87266	3434.34	52.87	0.132
54.0176	-464.67	54.01757	3521.35	54.02	0.132
55.1416	-474.43	55.14162	3606.92	55.14	0.132
56.2757	-484.35	56.27573	3693.77	56.28	0.131
56.8249	-492.12	56.82491	3734.03	56.82	0.132
57.5071	-501.45	57.50709	3784.50	57.51	0.133
57.7852	-501.90	57.78521	3806.05	57.79	0.132
58.7187	-502.41	58.71872	3881.00	58.72	0.129
59.7316	-513.17	59.73164	3956.18	59.73	0.130
60.7091	-519.00	60.70909	4024.92	60.71	0.129
61.6646	-530.78	61.66462	4089.79	61.66	0.130
61.9627	-535.01	61.96266	4118.07	61.96	0.130
62.9278	-543.48	62.92778	4194.94	62.93	0.130
64.2671	-553.22	64.26713	4282.63	64.27	0.129
64.5205	-556.95	64.52048	4305.22	64.52	0.129
65.7523	-576.38	65.75227	4406.24	65.75	0.131
66.4752	-579.73	66.47518	4456.66	66.48	0.130
67.5903	-583.70	67.5903	4536.81	67.59	0.129
68.6298	-595.23	68.62979	4611.99	68.63	0.129
69.6499	-604.68	69.64986	4687.22	69.65	0.129
70.6552	-613.96	70.65521	4761.65	70.66	0.129
71.6598	-622.88	71.65976	4835.64	71.66	0.129
72.6656	-631.75	72.66561	4909.58	72.67	0.129
73.6677	-640.61	73.66772	4983.41	73.67	0.129
74.6694	-649.45	74.66937	5057.12	74.67	0.128
75.6702	-658.21	75.67016	5130.77	75.67	0.128
76.6712	-666.92	76.67124	5204.36	76.67	0.128
77.6715	-675.55	77.67153	5277.95	77.67	0.128
78.6721	-684.09	78.67211	5351.53	78.67	0.128
79.6725	-692.53	79.67246	5425.15	79.67	0.128
80.6727	-700.86	80.67272	5498.81	80.67	0.127
81.6729	-709.09	81.67294	5572.51	81.67	0.127
82.6731	-709.15	82.6731	5580.08	82.67	0.127



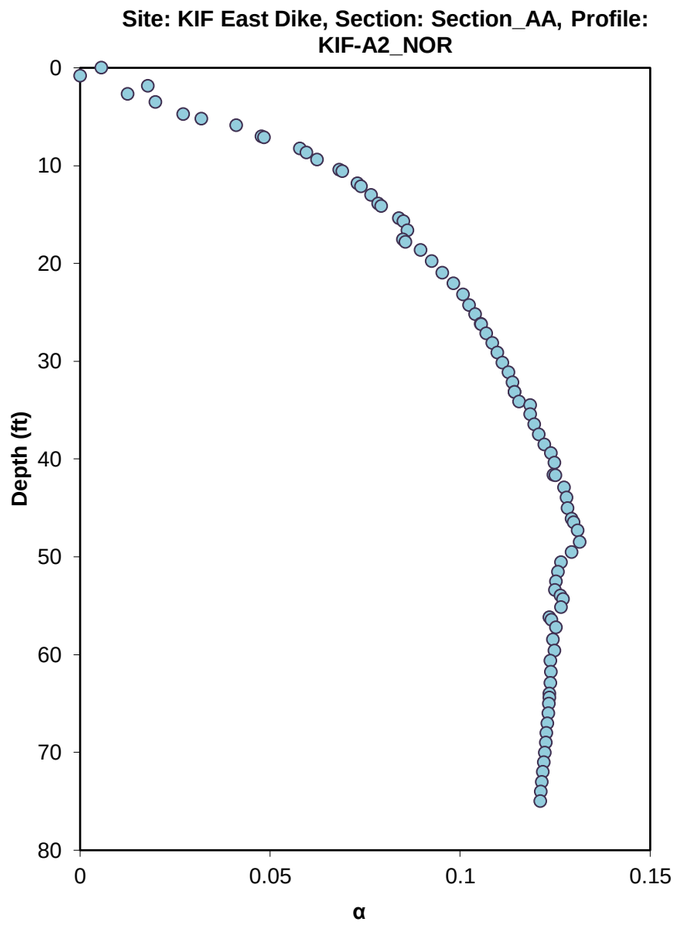
Site: KIF East Dike
Section: Section_AA
Profile: KIF-A2_NOR

From GeoStudio					
Depth (ft)	XY-Shear Stress (psf)	Depth (ft)	Vertical Effective Stress (psf)	Depth (ft)	Alpha
0.00	0.88	0.00	158.64	0.00	0.006
0.81	0.00	0.81	170.21	0.81	0.000
1.82	-4.29	1.82	241.44	1.82	0.018
2.66	-3.48	2.66	279.41	2.66	0.012
3.50	-6.40	3.50	323.25	3.50	0.020
4.74	-11.20	4.74	414.79	4.74	0.027
5.18	-14.11	5.18	443.15	5.18	0.032
5.86	-19.94	5.86	486.27	5.86	0.041
7.02	-26.55	7.02	556.38	7.02	0.048
7.09	-27.13	7.09	560.59	7.09	0.048
8.24	-36.99	8.24	639.89	8.24	0.058
8.68	-39.81	8.68	669.35	8.68	0.059
9.40	-44.75	9.40	717.74	9.40	0.062
10.41	-53.32	10.41	781.91	10.41	0.068
10.59	-54.63	10.59	793.13	10.59	0.069
11.79	-63.39	11.79	870.09	11.79	0.073
12.10	-65.85	12.10	891.98	12.10	0.074
12.99	-72.89	12.99	953.40	12.99	0.076
13.89	-79.01	13.89	1008.07	13.89	0.078
14.14	-81.10	14.14	1024.20	14.14	0.079
15.38	-92.70	15.38	1106.09	15.38	0.084
15.66	-95.67	15.66	1125.65	15.66	0.085
16.61	-102.61	16.61	1192.12	16.61	0.086
17.52	-107.27	17.52	1264.62	17.52	0.085
17.81	-109.89	17.81	1284.90	17.81	0.086
18.61	-118.87	18.61	1328.19	18.61	0.090
19.75	-129.33	19.75	1399.60	19.75	0.092
20.93	-140.34	20.93	1473.41	20.93	0.095
22.05	-152.16	22.05	1548.92	22.05	0.098
23.19	-163.76	23.19	1626.74	23.19	0.101
24.24	-173.12	24.24	1692.89	24.24	0.102
25.19	-181.87	25.19	1751.06	25.19	0.104
26.16	-190.98	26.16	1813.12	26.16	0.105
26.22	-191.58	26.22	1817.07	26.22	0.105
27.14	-200.55	27.14	1876.75	27.14	0.107
28.13	-210.26	28.13	1940.58	28.13	0.108
29.12	-219.88	29.12	2004.50	29.12	0.110
30.12	-229.88	30.12	2068.87	30.12	0.111
31.13	-240.12	31.13	2132.44	31.13	0.113
32.14	-249.48	32.14	2194.66	32.14	0.114
33.11	-259.98	33.11	2275.07	33.11	0.114
33.16	-259.94	33.16	2275.81	33.16	0.114
34.14	-266.41	34.14	2308.39	34.14	0.115
34.49	-278.76	34.49	2354.09	34.49	0.118
35.42	-285.22	35.42	2409.01	35.42	0.118
36.46	-294.90	36.46	2469.41	36.46	0.119
37.49	-305.61	37.49	2533.27	37.49	0.121
38.50	-316.67	38.50	2594.01	38.50	0.122
39.39	-328.60	39.39	2652.81	39.39	0.124
40.36	-338.08	40.36	2709.44	40.36	0.125
41.59	-346.09	41.59	2779.33	41.59	0.125
41.68	-348.33	41.68	2787.26	41.68	0.125
42.88	-364.44	42.88	2862.36	42.88	0.127
43.94	-374.50	43.94	2927.73	43.94	0.128
45.00	-383.95	45.00	2993.22	45.00	0.128
46.10	-396.26	46.10	3063.94	46.10	0.129
46.47	-400.60	46.47	3086.09	46.47	0.130
47.30	-410.37	47.30	3135.94	47.30	0.131
48.46	-420.62	48.46	3200.11	48.46	0.131
49.50	-423.02	49.50	3272.84	49.50	0.129
50.54	-423.31	50.54	3348.37	50.54	0.126
51.53	-431.50	51.53	3432.47	51.53	0.126
52.53	-439.24	52.53	3508.05	52.53	0.125
53.41	-447.21	53.41	3579.86	53.41	0.125
53.97	-455.02	53.97	3599.78	53.97	0.126
54.34	-459.66	54.34	3618.71	54.34	0.127
55.12	-469.59	55.12	3713.09	55.12	0.126
56.16	-466.02	56.16	3774.32	56.16	0.123
56.4357	-470.40	56.43569	3793.38	56.44	0.124
57.1903	-483.26	57.19026	3859.58	57.19	0.125
58.4527	-492.15	58.45267	3957.27	58.45	0.124
59.5867	-504.89	59.58667	4046.16	59.59	0.125
60.602	-509.99	60.60203	4121.59	60.60	0.124
61.7699	-519.27	61.76993	4195.90	61.77	0.124
62.8889	-529.32	62.88894	4280.98	62.89	0.124
63.9699	-538.42	63.96991	4360.43	63.97	0.123
64.3666	-541.90	64.36656	4390.36	64.37	0.123
64.9893	-547.36	64.98927	4437.38	64.99	0.123
65.9947	-555.57	65.9947	4511.56	65.99	0.123
66.997	-563.61	66.99697	4585.20	67.00	0.123
67.9998	-571.52	67.99978	4658.61	68.00	0.123
68.9983	-579.37	68.9983	4731.96	69.00	0.122
69.9992	-587.18	69.99921	4805.18	70.00	0.122
70.9996	-594.95	70.9996	4878.36	71.00	0.122
71.9998	-602.62	71.99977	4951.45	72.00	0.122
72.9999	-610.21	72.99986	5024.48	73.00	0.121
74	-617.72	73.99996	5097.44	74.00	0.121
75	-617.77	75	5105.07	75.00	0.121



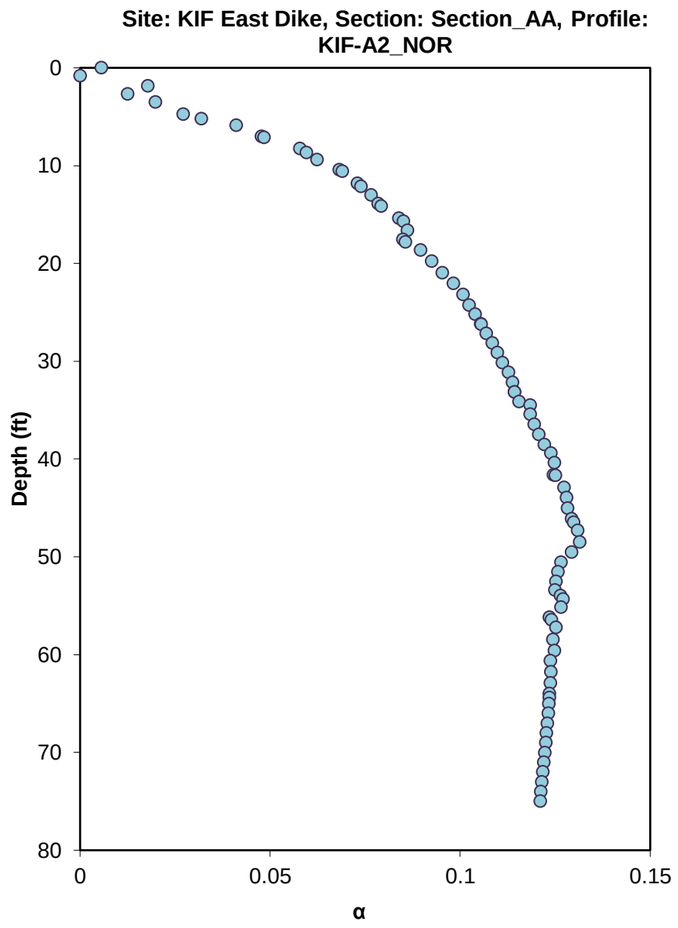
Site: KIF East Dike
Section: Section_AA
Profile: KIF-A2_NOR

From GeoStudio					
Depth (ft)	XY-Shear Stress (psf)	Depth (ft)	Vertical Effective Stress (psf)	Depth (ft)	Alpha
0.00	0.88	0.00	158.64	0.00	0.006
0.81	0.00	0.81	170.21	0.81	0.000
1.82	-4.29	1.82	241.44	1.82	0.018
2.66	-3.48	2.66	279.41	2.66	0.012
3.50	-6.40	3.50	323.25	3.50	0.020
4.74	-11.20	4.74	414.79	4.74	0.027
5.18	-14.11	5.18	443.15	5.18	0.032
5.86	-19.94	5.86	486.27	5.86	0.041
7.02	-26.55	7.02	556.38	7.02	0.048
7.09	-27.13	7.09	560.59	7.09	0.048
8.24	-36.99	8.24	639.89	8.24	0.058
8.68	-39.81	8.68	669.35	8.68	0.059
9.40	-44.75	9.40	717.74	9.40	0.062
10.41	-53.32	10.41	781.91	10.41	0.068
10.59	-54.63	10.59	793.13	10.59	0.069
11.79	-63.39	11.79	870.09	11.79	0.073
12.10	-65.85	12.10	891.98	12.10	0.074
12.99	-72.89	12.99	953.40	12.99	0.076
13.89	-79.01	13.89	1008.07	13.89	0.078
14.14	-81.10	14.14	1024.20	14.14	0.079
15.38	-92.70	15.38	1106.09	15.38	0.084
15.66	-95.67	15.66	1125.65	15.66	0.085
16.61	-102.61	16.61	1192.12	16.61	0.086
17.52	-107.27	17.52	1264.62	17.52	0.085
17.81	-109.89	17.81	1284.90	17.81	0.086
18.61	-118.87	18.61	1328.19	18.61	0.090
19.75	-129.33	19.75	1399.60	19.75	0.092
20.93	-140.34	20.93	1473.41	20.93	0.095
22.05	-152.16	22.05	1548.92	22.05	0.098
23.19	-163.76	23.19	1626.74	23.19	0.101
24.24	-173.12	24.24	1692.89	24.24	0.102
25.19	-181.87	25.19	1751.06	25.19	0.104
26.16	-190.98	26.16	1813.12	26.16	0.105
26.22	-191.58	26.22	1817.07	26.22	0.105
27.14	-200.55	27.14	1876.75	27.14	0.107
28.13	-210.26	28.13	1940.58	28.13	0.108
29.12	-219.88	29.12	2004.50	29.12	0.110
30.12	-229.88	30.12	2068.87	30.12	0.111
31.13	-240.12	31.13	2132.44	31.13	0.113
32.14	-249.48	32.14	2194.66	32.14	0.114
33.11	-259.98	33.11	2275.07	33.11	0.114
33.16	-259.94	33.16	2275.81	33.16	0.114
34.14	-266.41	34.14	2308.39	34.14	0.115
34.49	-278.76	34.49	2354.09	34.49	0.118
35.42	-285.22	35.42	2409.01	35.42	0.118
36.46	-294.90	36.46	2469.41	36.46	0.119
37.49	-305.61	37.49	2533.27	37.49	0.121
38.50	-316.67	38.50	2594.01	38.50	0.122
39.39	-328.60	39.39	2652.81	39.39	0.124
40.36	-338.08	40.36	2709.44	40.36	0.125
41.59	-346.09	41.59	2779.33	41.59	0.125
41.68	-348.33	41.68	2787.26	41.68	0.125
42.88	-364.44	42.88	2862.36	42.88	0.127
43.94	-374.50	43.94	2927.73	43.94	0.128
45.00	-383.95	45.00	2993.22	45.00	0.128
46.10	-396.26	46.10	3063.94	46.10	0.129
46.47	-400.60	46.47	3086.09	46.47	0.130
47.30	-410.37	47.30	3135.94	47.30	0.131
48.46	-420.62	48.46	3200.11	48.46	0.131
49.50	-423.02	49.50	3272.84	49.50	0.129
50.54	-423.31	50.54	3348.37	50.54	0.126
51.53	-431.50	51.53	3432.47	51.53	0.126
52.53	-439.24	52.53	3508.05	52.53	0.125
53.41	-447.21	53.41	3579.86	53.41	0.125
53.97	-455.02	53.97	3599.78	53.97	0.126
54.34	-459.66	54.34	3618.71	54.34	0.127
55.12	-469.59	55.12	3713.09	55.12	0.126
56.16	-466.02	56.16	3774.32	56.16	0.123
56.4357	-470.40	56.43569	3793.38	56.44	0.124
57.1903	-483.26	57.19026	3859.58	57.19	0.125
58.4527	-492.15	58.45267	3957.27	58.45	0.124
59.5867	-504.89	59.58667	4046.16	59.59	0.125
60.602	-509.99	60.60203	4121.59	60.60	0.124
61.7699	-519.27	61.76993	4195.90	61.77	0.124
62.8889	-529.32	62.88894	4280.98	62.89	0.124
63.9699	-538.42	63.96991	4360.43	63.97	0.123
64.3666	-541.90	64.36656	4390.36	64.37	0.123
64.9893	-547.36	64.98927	4437.38	64.99	0.123
65.9947	-555.57	65.9947	4511.56	65.99	0.123
66.997	-563.61	66.99697	4585.20	67.00	0.123
67.9998	-571.52	67.99978	4658.61	68.00	0.123
68.9983	-579.37	68.9983	4731.96	69.00	0.122
69.9992	-587.18	69.99921	4805.18	70.00	0.122
70.9996	-594.95	70.9996	4878.36	71.00	0.122
71.9998	-602.62	71.99977	4951.45	72.00	0.122
72.9999	-610.21	72.99986	5024.48	73.00	0.121
74	-617.72	73.99996	5097.44	74.00	0.121
75	-617.77	75	5105.07	75.00	0.121



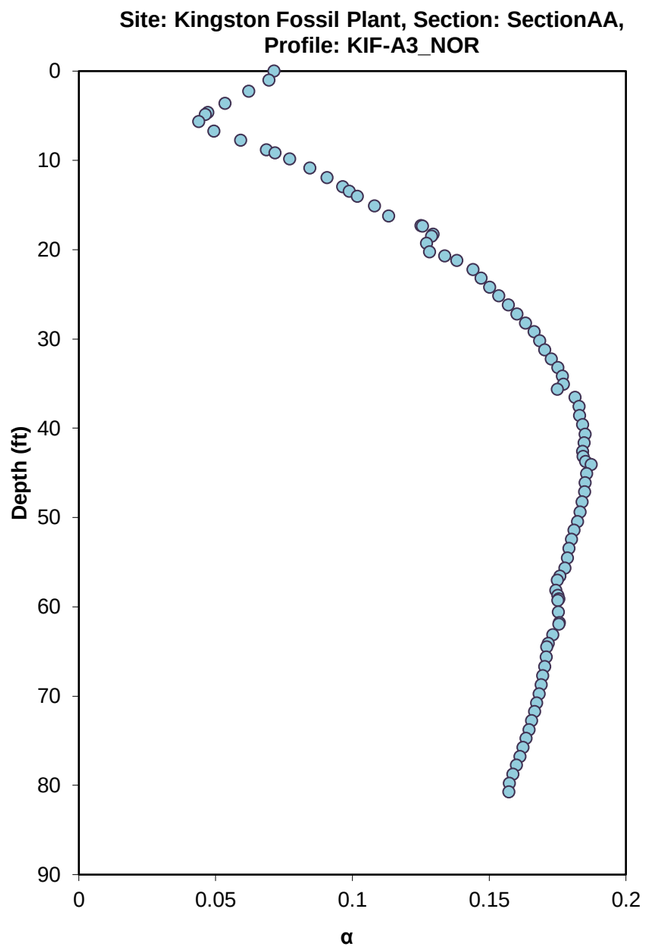
Site: KIF East Dike
Section: Section_AA
Profile: KIF-A2_NOR

From GeoStudio					
Depth (ft)	XY-Shear Stress (psf)	Depth (ft)	Vertical Effective Stress (psf)	Depth (ft)	Alpha
0.00	0.88	0.00	158.64	0.00	0.006
0.81	0.00	0.81	170.21	0.81	0.000
1.82	-4.29	1.82	241.44	1.82	0.018
2.66	-3.48	2.66	279.41	2.66	0.012
3.50	-6.40	3.50	323.25	3.50	0.020
4.74	-11.20	4.74	414.79	4.74	0.027
5.18	-14.11	5.18	443.15	5.18	0.032
5.86	-19.94	5.86	486.27	5.86	0.041
7.02	-26.55	7.02	556.38	7.02	0.048
7.09	-27.13	7.09	560.59	7.09	0.048
8.24	-36.99	8.24	639.89	8.24	0.058
8.68	-39.81	8.68	669.35	8.68	0.059
9.40	-44.75	9.40	717.74	9.40	0.062
10.41	-53.32	10.41	781.91	10.41	0.068
10.59	-54.63	10.59	793.13	10.59	0.069
11.79	-63.39	11.79	870.09	11.79	0.073
12.10	-65.85	12.10	891.98	12.10	0.074
12.99	-72.89	12.99	953.40	12.99	0.076
13.89	-79.01	13.89	1008.07	13.89	0.078
14.14	-81.10	14.14	1024.20	14.14	0.079
15.38	-92.70	15.38	1106.09	15.38	0.084
15.66	-95.67	15.66	1125.65	15.66	0.085
16.61	-102.61	16.61	1192.12	16.61	0.086
17.52	-107.27	17.52	1264.62	17.52	0.085
17.81	-109.89	17.81	1284.90	17.81	0.086
18.61	-118.87	18.61	1328.19	18.61	0.090
19.75	-129.33	19.75	1399.60	19.75	0.092
20.93	-140.34	20.93	1473.41	20.93	0.095
22.05	-152.16	22.05	1548.92	22.05	0.098
23.19	-163.76	23.19	1626.74	23.19	0.101
24.24	-173.12	24.24	1692.89	24.24	0.102
25.19	-181.87	25.19	1751.06	25.19	0.104
26.16	-190.98	26.16	1813.12	26.16	0.105
26.22	-191.58	26.22	1817.07	26.22	0.105
27.14	-200.55	27.14	1876.75	27.14	0.107
28.13	-210.26	28.13	1940.58	28.13	0.108
29.12	-219.88	29.12	2004.50	29.12	0.110
30.12	-229.88	30.12	2068.87	30.12	0.111
31.13	-240.12	31.13	2132.44	31.13	0.113
32.14	-249.48	32.14	2194.66	32.14	0.114
33.11	-259.98	33.11	2275.07	33.11	0.114
33.16	-259.94	33.16	2275.81	33.16	0.114
34.14	-266.41	34.14	2308.39	34.14	0.115
34.49	-278.76	34.49	2354.09	34.49	0.118
35.42	-285.22	35.42	2409.01	35.42	0.118
36.46	-294.90	36.46	2469.41	36.46	0.119
37.49	-305.61	37.49	2533.27	37.49	0.121
38.50	-316.67	38.50	2594.01	38.50	0.122
39.39	-328.60	39.39	2652.81	39.39	0.124
40.36	-338.08	40.36	2709.44	40.36	0.125
41.59	-346.09	41.59	2779.33	41.59	0.125
41.68	-348.33	41.68	2787.26	41.68	0.125
42.88	-364.44	42.88	2862.36	42.88	0.127
43.94	-374.50	43.94	2927.73	43.94	0.128
45.00	-383.95	45.00	2993.22	45.00	0.128
46.10	-396.26	46.10	3063.94	46.10	0.129
46.47	-400.60	46.47	3086.09	46.47	0.130
47.30	-410.37	47.30	3135.94	47.30	0.131
48.46	-420.62	48.46	3200.11	48.46	0.131
49.50	-423.02	49.50	3272.84	49.50	0.129
50.54	-423.31	50.54	3348.37	50.54	0.126
51.53	-431.50	51.53	3432.47	51.53	0.126
52.53	-439.24	52.53	3508.05	52.53	0.125
53.41	-447.21	53.41	3579.86	53.41	0.125
53.97	-455.02	53.97	3599.78	53.97	0.126
54.34	-459.66	54.34	3618.71	54.34	0.127
55.12	-469.59	55.12	3713.09	55.12	0.126
56.16	-466.02	56.16	3774.32	56.16	0.123
56.4357	-470.40	56.43569	3793.38	56.44	0.124
57.1903	-483.26	57.19026	3859.58	57.19	0.125
58.4527	-492.15	58.45267	3957.27	58.45	0.124
59.5867	-504.89	59.58667	4046.16	59.59	0.125
60.602	-509.99	60.60203	4121.59	60.60	0.124
61.7699	-519.27	61.76993	4195.90	61.77	0.124
62.8889	-529.32	62.88894	4280.98	62.89	0.124
63.9699	-538.42	63.96991	4360.43	63.97	0.123
64.3666	-541.90	64.36656	4390.36	64.37	0.123
64.9893	-547.36	64.98927	4437.38	64.99	0.123
65.9947	-555.57	65.9947	4511.56	65.99	0.123
66.997	-563.61	66.99697	4585.20	67.00	0.123
67.9998	-571.52	67.99978	4658.61	68.00	0.123
68.9983	-579.37	68.9983	4731.96	69.00	0.122
69.9992	-587.18	69.99921	4805.18	70.00	0.122
70.9996	-594.95	70.9996	4878.36	71.00	0.122
71.9998	-602.62	71.99977	4951.45	72.00	0.122
72.9999	-610.21	72.99986	5024.48	73.00	0.121
74	-617.72	73.99996	5097.44	74.00	0.121
75	-617.77	75	5105.07	75.00	0.121



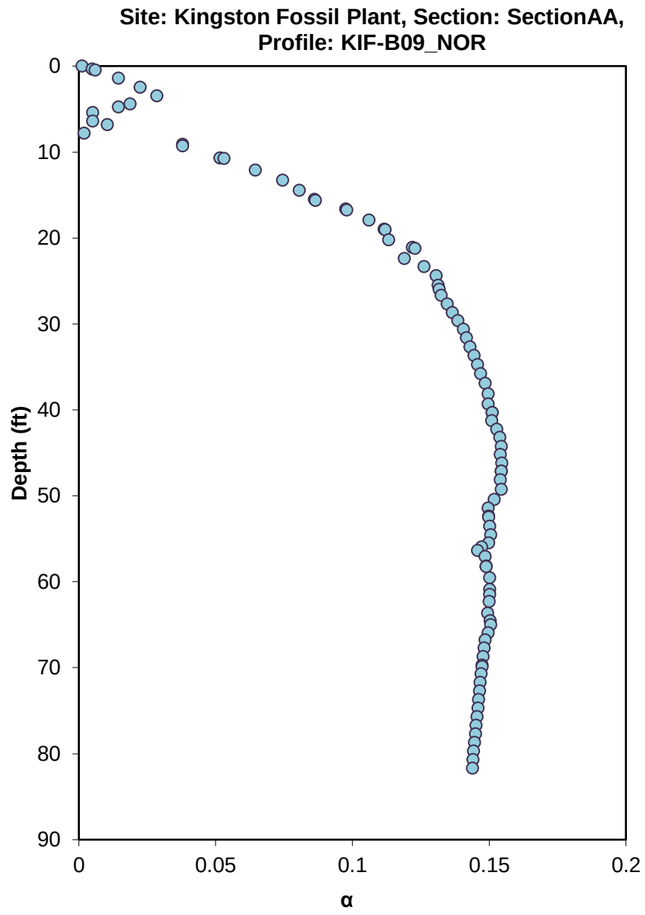
Site: Kingston Fossil Plant
Section: SectionAA
Profile: KIF-A3_NOR

From GeoStudio					
Depth (ft)	XY-Shear Stress (psf)	Depth (ft)	Vertical Effective Stress (psf)	Depth (ft)	Alpha
0.00	-26.91	0.00	376.39	0.00	0.071
1.03	-29.89	1.03	429.57	1.03	0.070
2.29	-30.32	2.29	487.05	2.29	0.062
3.60	-29.14	3.60	544.43	3.60	0.054
4.64	-28.63	4.64	606.13	4.64	0.047
4.89	-28.67	4.89	617.63	4.89	0.046
5.69	-28.78	5.69	654.97	5.69	0.044
6.73	-35.44	6.73	715.45	6.73	0.050
7.77	-45.77	7.77	771.97	7.77	0.059
8.81	-56.93	8.81	829.48	8.81	0.069
9.18	-60.98	9.18	849.52	9.18	0.072
9.85	-68.49	9.85	886.71	9.85	0.077
10.90	-79.85	10.90	943.78	10.90	0.085
11.94	-91.03	11.94	1000.90	11.94	0.091
12.98	-102.19	12.98	1057.83	12.98	0.097
13.45	-107.46	13.45	1084.46	13.45	0.099
14.02	-113.84	14.02	1116.44	14.02	0.102
15.13	-127.37	15.13	1176.35	15.13	0.108
16.24	-140.34	16.24	1238.10	16.24	0.113
17.31	-162.13	17.31	1294.62	17.31	0.125
17.36	-163.26	17.36	1297.64	17.36	0.126
18.28	-174.93	18.28	1348.52	18.28	0.130
18.52	-175.92	18.52	1361.75	18.52	0.129
19.27	-178.68	19.27	1403.68	19.27	0.127
20.27	-186.70	20.27	1454.33	20.27	0.128
20.70	-198.49	20.70	1483.33	20.70	0.134
21.23	-209.88	21.23	1517.74	21.23	0.138
22.24	-226.84	22.24	1571.89	22.24	0.144
23.22	-239.81	23.22	1629.18	23.22	0.147
24.21	-253.25	24.21	1684.70	24.21	0.150
25.20	-267.75	25.20	1741.48	25.20	0.154
26.20	-282.57	26.20	1798.84	26.20	0.157
27.21	-297.65	27.21	1856.32	27.21	0.160
28.21	-312.88	28.21	1913.83	28.21	0.163
29.22	-328.22	29.22	1971.21	29.22	0.167
30.23	-342.36	30.23	2030.48	30.23	0.169
31.23	-356.65	31.23	2091.79	31.23	0.170
32.24	-372.57	32.24	2154.28	32.24	0.173
33.24	-388.49	33.24	2216.02	33.24	0.175
34.19	-402.13	34.19	2272.92	34.19	0.177
35.07	-411.93	35.07	2322.31	35.07	0.177
35.67	-412.63	35.67	2357.90	35.67	0.175
36.54	-439.89	36.54	2422.48	36.54	0.182
37.56	-454.06	37.56	2481.26	37.56	0.183
38.60	-465.37	38.60	2541.40	38.60	0.183
39.60	-480.32	39.60	2605.42	39.60	0.184
40.67	-493.57	40.67	2665.41	40.67	0.185
41.65	-504.00	41.65	2726.02	41.65	0.185
42.63	-510.81	42.63	2771.78	42.63	0.184
43.20	-521.75	43.20	2829.21	43.20	0.184
43.72	-529.76	43.72	2857.58	43.72	0.185
44.11	-538.71	44.11	2875.03	44.11	0.187
45.12	-545.04	45.12	2934.98	45.12	0.186
46.13	-555.52	46.13	2998.28	46.13	0.185
47.14	-566.98	47.14	3065.18	47.14	0.185
48.29	-576.78	48.29	3133.95	48.29	0.184
49.39	-588.12	49.39	3206.79	49.39	0.183
50.45	-597.57	50.45	3276.38	50.45	0.182
51.45	-606.30	51.45	3347.94	51.45	0.181
52.46	-616.04	52.46	3419.11	52.46	0.180
53.48	-626.33	53.48	3492.59	53.48	0.179
54.55	-637.51	54.55	3567.94	54.55	0.179
55.66	-648.79	55.66	3646.44	55.66	0.178
56.60	-654.23	56.60	3716.30	56.60	0.176
57.06	-656.68	57.06	3750.75	57.06	0.175
58.16	-665.91	58.16	3816.21	58.16	0.174
58.74	-676.84	58.74	3861.46	58.74	0.175
59.15	-683.29	59.15	3891.94	59.15	0.176
59.3085	-684.17	59.30854	3904.04	59.31	0.175
60.6011	-702.00	60.60109	3999.22	60.60	0.176
61.8039	-718.55	61.80389	4085.11	61.80	0.176
61.9398	-719.35	61.93978	4095.38	61.94	0.176
63.1435	-724.81	63.14351	4181.12	63.14	0.173
64.1368	-730.63	64.13675	4253.37	64.14	0.172
64.5113	-733.50	64.51131	4284.43	64.51	0.171
65.6631	-746.24	65.66307	4364.22	65.66	0.171
66.7378	-757.14	66.73779	4441.31	66.74	0.170
67.7552	-766.86	67.75523	4516.16	67.76	0.170
68.7595	-776.12	68.75953	4589.68	68.76	0.169
69.7614	-785.22	69.76144	4663.05	69.76	0.168
70.7635	-793.74	70.76354	4736.72	70.76	0.168
71.764	-801.89	71.76399	4810.86	71.76	0.167
72.7663	-809.72	72.76626	4885.28	72.77	0.166
73.7666	-817.14	73.76658	4960.06	73.77	0.165
74.7669	-824.13	74.76693	5035.11	74.77	0.164
75.7673	-830.71	75.76735	5110.48	75.77	0.163
76.7678	-836.86	76.76781	5186.14	76.77	0.161
77.7681	-842.58	77.76813	5262.08	77.77	0.160
78.7684	-847.90	78.7684	5338.24	78.77	0.159
79.7687	-852.84	79.76867	5414.61	79.77	0.158
80.7689	-853.03	80.76885	5422.11	80.77	0.157



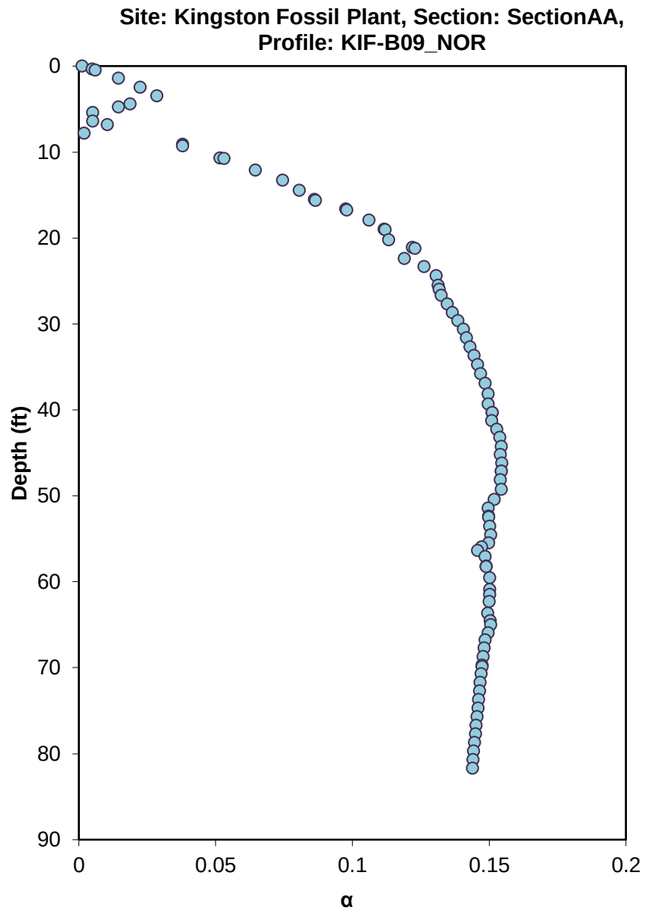
Site: Kingston Fossil Plant
Section: SectionAA
Profile: KIF-B09_NOR

From GeoStudio					
Depth (ft)	XY-Shear Stress (psf)	Depth (ft)	Vertical Effective Stress (psf)	Depth (ft)	Alpha
0.00	-0.36	0.00	270.22	0.00	0.001
0.37	1.46	0.37	287.93	0.37	0.005
0.47	1.78	0.47	291.69	0.47	0.006
1.43	4.83	1.43	329.30	1.43	0.015
2.47	8.79	2.47	389.68	2.47	0.023
3.47	12.69	3.47	442.45	3.47	0.029
4.42	9.55	4.42	504.24	4.42	0.019
4.79	7.62	4.79	520.83	4.79	0.015
5.43	2.84	5.43	555.99	5.43	0.005
6.42	-3.15	6.42	616.21	6.42	0.005
6.83	-6.91	6.83	657.83	6.83	0.011
7.82	1.43	7.82	711.76	7.82	0.002
9.11	-30.38	9.11	796.33	9.11	0.038
9.27	-30.67	9.27	806.36	9.27	0.038
10.68	-45.17	10.68	871.98	10.68	0.052
10.75	-46.57	10.75	875.95	10.75	0.053
12.14	-62.93	12.14	974.23	12.14	0.065
13.30	-77.56	13.30	1040.18	13.30	0.075
14.47	-89.27	14.47	1105.24	14.47	0.081
15.54	-100.94	15.54	1169.99	15.54	0.086
15.64	-102.03	15.64	1176.61	15.64	0.087
16.65	-122.72	16.65	1256.10	16.65	0.098
16.77	-123.76	16.77	1260.82	16.77	0.098
17.94	-138.25	17.94	1300.90	17.94	0.106
18.97	-154.07	18.97	1379.82	18.97	0.112
19.05	-155.25	19.05	1385.37	19.05	0.112
20.21	-164.07	20.21	1446.70	20.21	0.113
21.12	-182.76	21.12	1496.60	21.12	0.122
21.25	-184.77	21.25	1502.99	21.25	0.123
22.41	-186.80	22.41	1568.78	22.41	0.119
23.32	-206.32	23.32	1634.24	23.32	0.126
24.37	-220.83	24.37	1687.89	24.37	0.131
25.50	-229.55	25.50	1745.40	25.50	0.132
25.97	-233.69	25.97	1772.46	25.97	0.132
26.68	-240.61	26.68	1814.00	26.68	0.133
27.70	-252.35	27.70	1870.54	27.70	0.135
28.67	-263.20	28.67	1924.55	28.67	0.137
29.64	-274.55	29.64	1978.96	29.64	0.139
30.65	-286.14	30.65	2033.74	30.65	0.141
31.65	-296.85	31.65	2092.03	31.65	0.142
32.67	-308.11	32.67	2152.92	32.67	0.143
33.69	-320.60	33.69	2217.84	33.69	0.145
34.75	-333.23	34.75	2282.88	34.75	0.146
35.81	-345.37	35.81	2349.77	35.81	0.147
36.91	-359.70	36.91	2420.84	36.91	0.149
38.13	-373.70	38.13	2494.86	38.13	0.150
39.32	-384.94	39.32	2570.33	39.32	0.150
40.33	-399.02	40.33	2638.51	40.33	0.151
40.33	-399.05	40.33	2638.63	40.33	0.151
41.27	-406.67	41.27	2692.91	41.27	0.151
42.24	-420.44	42.24	2750.77	42.24	0.153
43.22	-433.63	43.22	2813.86	43.22	0.154
44.23	-444.20	44.23	2873.21	44.23	0.155
45.21	-452.73	45.21	2934.89	45.21	0.154
46.17	-463.69	46.17	2995.26	46.17	0.155
47.15	-472.87	47.15	3057.98	47.15	0.155
47.15	-473.58	47.15	3064.07	47.15	0.155
48.15	-481.40	48.15	3121.89	48.15	0.154
49.28	-494.21	49.28	3195.42	49.28	0.155
50.42	-496.45	50.42	3267.06	50.42	0.152
51.45	-500.61	51.45	3343.73	51.45	0.150
52.38	-511.30	52.38	3411.19	52.38	0.150
52.48	-512.49	52.48	3418.80	52.48	0.150
53.52	-525.35	53.52	3494.89	53.52	0.150
54.57	-537.93	54.57	3568.33	54.57	0.151
55.51	-544.46	55.51	3632.48	55.51	0.150
55.95	-539.32	55.95	3657.62	55.95	0.147
56.39	-538.09	56.39	3686.64	56.39	0.146
57.1014	-557.85	57.10136	3750.56	57.10	0.149
58.1686	-571.33	58.16858	3831.80	58.17	0.149
58.2247	-571.84	58.22469	3835.94	58.22	0.149
59.5127	-590.96	59.51266	3932.45	59.51	0.150
60.8956	-605.63	60.89556	4030.85	60.90	0.150
61.4736	-612.02	61.47364	4073.20	61.47	0.150
62.2864	-620.53	62.2864	4134.09	62.29	0.150
63.6298	-632.99	63.6298	4232.73	63.63	0.150
64.5422	-646.72	64.54218	4298.63	64.54	0.150
65.0047	-652.80	65.00473	4331.42	65.00	0.151
65.9639	-663.57	65.96393	4429.12	65.96	0.150
66.7761	-664.26	66.77607	4467.82	66.78	0.149
67.704	-672.23	67.70397	4534.39	67.70	0.148
68.7136	-681.55	68.71356	4606.11	68.71	0.148
69.6933	-690.63	69.69327	4679.69	69.69	0.148
69.9089	-692.59	69.90886	4695.45	69.91	0.148
70.6846	-699.65	70.68464	4752.15	70.68	0.147
71.681	-708.83	71.68099	4824.94	71.68	0.147
72.6791	-718.06	72.6791	4897.77	72.68	0.147
73.6785	-727.30	73.67847	4970.65	73.68	0.146
74.679	-736.48	74.67899	5043.58	74.68	0.146
75.6795	-745.62	75.67945	5116.51	75.68	0.146
76.6799	-754.71	76.67986	5189.43	76.68	0.145
77.6803	-763.73	77.68029	5262.32	77.68	0.145
78.6807	-772.66	78.68065	5335.18	78.68	0.145
79.6809	-781.49	79.68094	5408.01	79.68	0.145
80.6812	-790.16	80.68117	5480.83	80.68	0.144
81.6813	-790.24	81.68133	5488.44	81.68	0.144



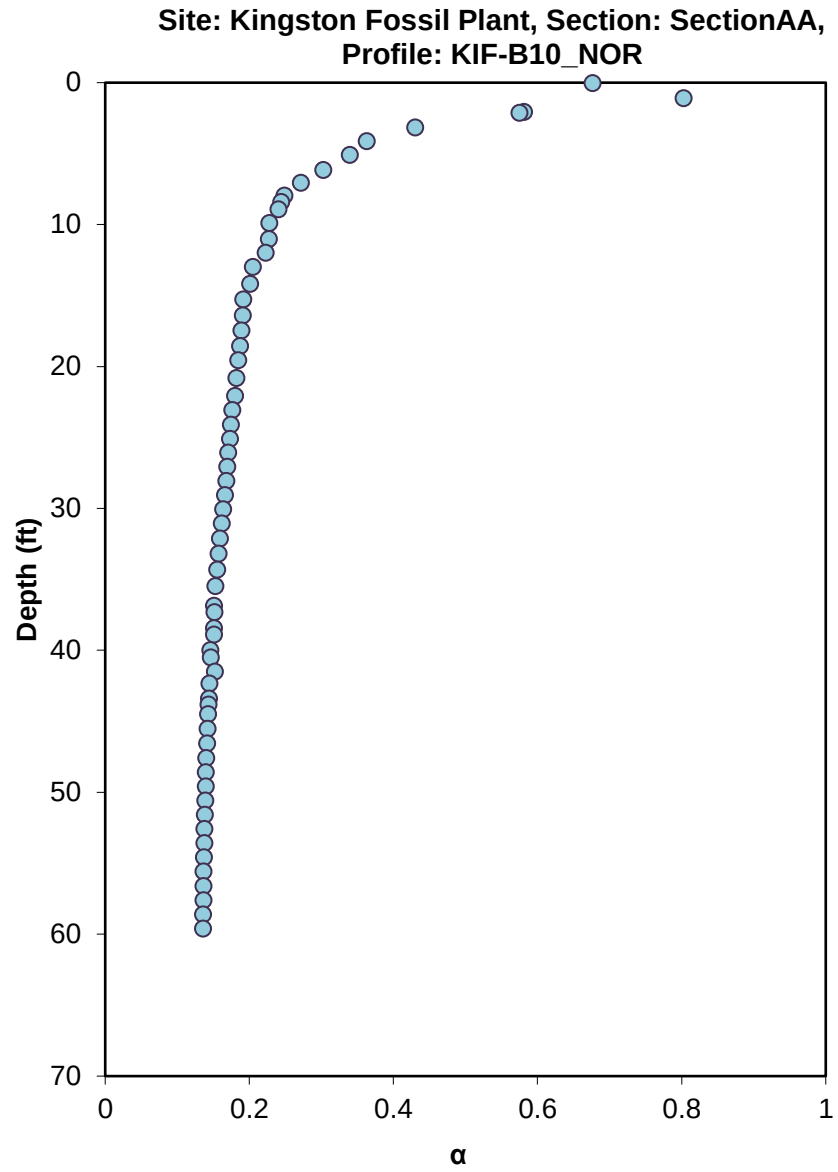
Site: Kingston Fossil Plant
Section: SectionAA
Profile: KIF-B09_NOR

From GeoStudio					
Depth (ft)	XY-Shear Stress (psf)	Depth (ft)	Vertical Effective Stress (psf)	Depth (ft)	Alpha
0.00	-0.36	0.00	270.22	0.00	0.001
0.37	1.46	0.37	287.93	0.37	0.005
0.47	1.78	0.47	291.69	0.47	0.006
1.43	4.83	1.43	329.30	1.43	0.015
2.47	8.79	2.47	389.68	2.47	0.023
3.47	12.69	3.47	442.45	3.47	0.029
4.42	9.55	4.42	504.24	4.42	0.019
4.79	7.62	4.79	520.83	4.79	0.015
5.43	2.84	5.43	555.99	5.43	0.005
6.42	-3.15	6.42	616.21	6.42	0.005
6.83	-6.91	6.83	657.83	6.83	0.011
7.82	1.43	7.82	711.76	7.82	0.002
9.11	-30.38	9.11	796.33	9.11	0.038
9.27	-30.67	9.27	806.36	9.27	0.038
10.68	-45.17	10.68	871.98	10.68	0.052
10.75	-46.57	10.75	875.95	10.75	0.053
12.14	-62.93	12.14	974.23	12.14	0.065
13.30	-77.56	13.30	1040.18	13.30	0.075
14.47	-89.27	14.47	1105.24	14.47	0.081
15.54	-100.94	15.54	1169.99	15.54	0.086
15.64	-102.03	15.64	1176.61	15.64	0.087
16.65	-122.72	16.65	1256.10	16.65	0.098
16.77	-123.76	16.77	1260.82	16.77	0.098
17.94	-138.25	17.94	1300.90	17.94	0.106
18.97	-154.07	18.97	1379.82	18.97	0.112
19.05	-155.25	19.05	1385.37	19.05	0.112
20.21	-164.07	20.21	1446.70	20.21	0.113
21.12	-182.76	21.12	1496.60	21.12	0.122
21.25	-184.77	21.25	1502.99	21.25	0.123
22.41	-186.80	22.41	1568.78	22.41	0.119
23.32	-206.32	23.32	1634.24	23.32	0.126
24.37	-220.83	24.37	1687.89	24.37	0.131
25.50	-229.55	25.50	1745.40	25.50	0.132
25.97	-233.69	25.97	1772.46	25.97	0.132
26.68	-240.61	26.68	1814.00	26.68	0.133
27.70	-252.35	27.70	1870.54	27.70	0.135
28.67	-263.20	28.67	1924.55	28.67	0.137
29.64	-274.55	29.64	1978.96	29.64	0.139
30.65	-286.14	30.65	2033.74	30.65	0.141
31.65	-296.85	31.65	2092.03	31.65	0.142
32.67	-308.11	32.67	2152.92	32.67	0.143
33.69	-320.60	33.69	2217.84	33.69	0.145
34.75	-333.23	34.75	2282.88	34.75	0.146
35.81	-345.37	35.81	2349.77	35.81	0.147
36.91	-359.70	36.91	2420.84	36.91	0.149
38.13	-373.70	38.13	2494.86	38.13	0.150
39.32	-384.94	39.32	2570.33	39.32	0.150
40.33	-399.02	40.33	2638.51	40.33	0.151
40.33	-399.05	40.33	2638.63	40.33	0.151
41.27	-406.67	41.27	2692.91	41.27	0.151
42.24	-420.44	42.24	2750.77	42.24	0.153
43.22	-433.63	43.22	2813.86	43.22	0.154
44.23	-444.20	44.23	2873.21	44.23	0.155
45.21	-452.73	45.21	2934.89	45.21	0.154
46.17	-463.69	46.17	2995.26	46.17	0.155
47.15	-472.87	47.15	3057.98	47.15	0.155
47.15	-473.58	47.15	3064.07	47.15	0.155
48.15	-481.40	48.15	3121.89	48.15	0.154
49.28	-494.21	49.28	3195.42	49.28	0.155
50.42	-496.45	50.42	3267.06	50.42	0.152
51.45	-500.61	51.45	3343.73	51.45	0.150
52.38	-511.30	52.38	3411.19	52.38	0.150
52.48	-512.49	52.48	3418.80	52.48	0.150
53.52	-525.35	53.52	3494.89	53.52	0.150
54.57	-537.93	54.57	3568.33	54.57	0.151
55.51	-544.46	55.51	3632.48	55.51	0.150
55.95	-539.32	55.95	3657.62	55.95	0.147
56.39	-538.09	56.39	3686.64	56.39	0.146
57.1014	-557.85	57.10136	3750.56	57.10	0.149
58.1686	-571.33	58.16858	3831.80	58.17	0.149
58.2247	-571.84	58.22469	3835.94	58.22	0.149
59.5127	-590.96	59.51266	3932.45	59.51	0.150
60.8956	-605.63	60.89556	4030.85	60.90	0.150
61.4736	-612.02	61.47364	4073.20	61.47	0.150
62.2864	-620.53	62.2864	4134.09	62.29	0.150
63.6298	-632.99	63.6298	4232.73	63.63	0.150
64.5422	-646.72	64.54218	4298.63	64.54	0.150
65.0047	-652.80	65.00473	4331.42	65.00	0.151
65.9639	-663.57	65.96393	4429.12	65.96	0.150
66.7761	-664.26	66.77607	4467.82	66.78	0.149
67.704	-672.23	67.70397	4534.39	67.70	0.148
68.7136	-681.55	68.71356	4606.11	68.71	0.148
69.6933	-690.63	69.69327	4679.69	69.69	0.148
69.9089	-692.59	69.90886	4695.45	69.91	0.148
70.6846	-699.65	70.68464	4752.15	70.68	0.147
71.681	-708.83	71.68099	4824.94	71.68	0.147
72.6791	-718.06	72.6791	4897.77	72.68	0.147
73.6785	-727.30	73.67847	4970.65	73.68	0.146
74.679	-736.48	74.67899	5043.58	74.68	0.146
75.6795	-745.62	75.67945	5116.51	75.68	0.146
76.6799	-754.71	76.67986	5189.43	76.68	0.145
77.6803	-763.73	77.68029	5262.32	77.68	0.145
78.6807	-772.66	78.68065	5335.18	78.68	0.145
79.6809	-781.49	79.68094	5408.01	79.68	0.145
80.6812	-790.16	80.68117	5480.83	80.68	0.144
81.6813	-790.24	81.68133	5488.44	81.68	0.144



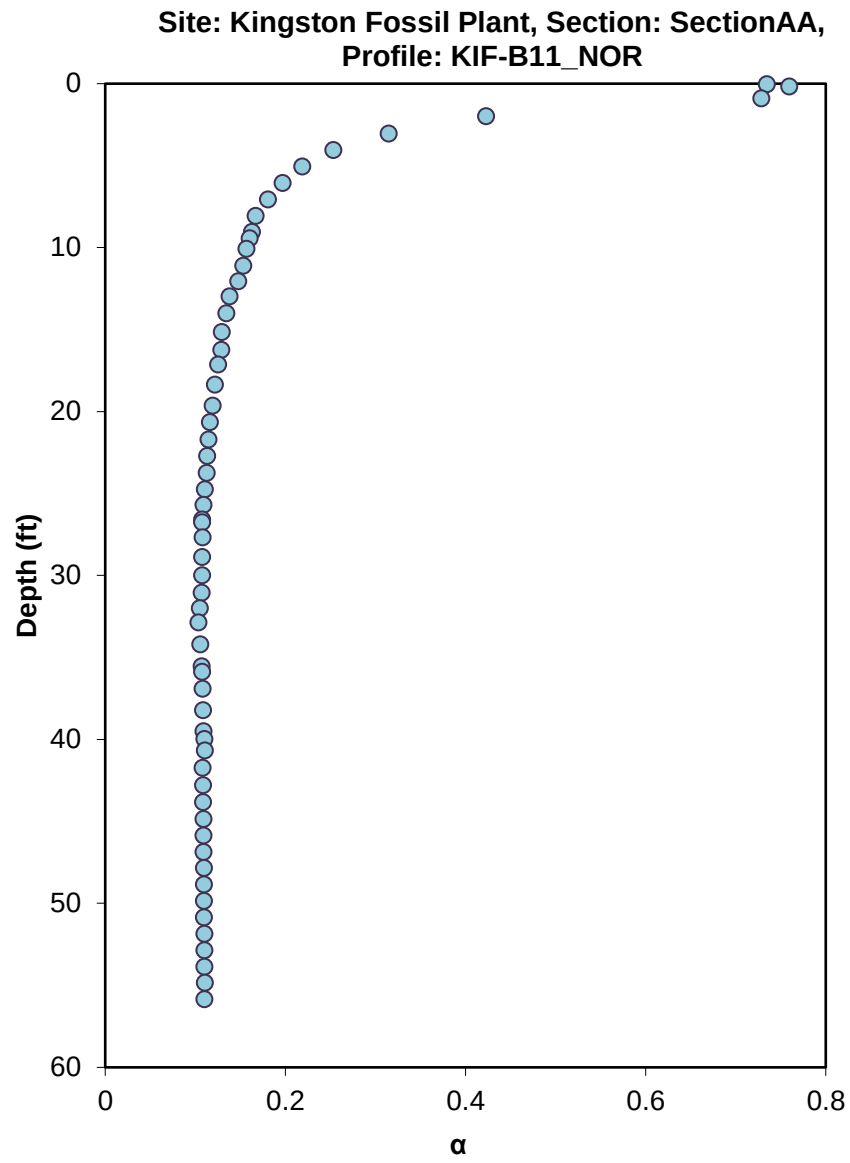
Site: Kingston Fossil Plant
Section: SectionAA
Profile: KIF-B10_NOR

From GeoStudio					
Depth (ft)	XY-Shear Stress (psf)	Depth (ft)	Vertical Effective Stress (psf)	Depth (ft)	Alpha
0.00	-38.90	0.00	57.57	0.00	0.676
1.07	-57.59	1.07	71.75	1.07	0.803
2.04	-69.05	2.04	118.86	2.04	0.581
2.09	-69.69	2.09	121.37	2.09	0.574
3.12	-83.09	3.12	193.28	3.12	0.430
4.10	-89.23	4.10	245.98	4.10	0.363
5.06	-99.86	5.06	294.28	5.06	0.339
6.11	-105.54	6.11	349.32	6.11	0.302
7.02	-109.67	7.02	404.21	7.02	0.271
7.93	-115.32	7.93	464.84	7.93	0.248
8.38	-120.68	8.38	494.90	8.38	0.244
8.90	-126.82	8.90	528.97	8.90	0.240
9.86	-136.04	9.86	598.13	9.86	0.227
10.99	-151.93	10.99	670.39	10.99	0.227
11.95	-169.69	11.95	762.67	11.95	0.222
12.95	-167.65	12.95	820.46	12.95	0.204
14.14	-177.80	14.14	887.21	14.14	0.200
15.26	-187.27	15.26	980.75	15.26	0.191
16.37	-201.60	16.37	1057.65	16.37	0.191
17.45	-214.77	17.45	1139.70	17.45	0.188
18.52	-227.47	18.52	1218.21	18.52	0.187
19.53	-239.85	19.53	1304.08	19.53	0.184
20.79	-252.27	20.79	1389.89	20.79	0.182
22.04	-264.75	22.04	1475.19	22.04	0.179
23.03	-275.80	23.03	1564.84	23.03	0.176
24.08	-286.72	24.08	1647.56	24.08	0.174
25.08	-298.17	25.08	1728.77	25.08	0.172
26.05	-308.39	26.05	1809.46	26.05	0.170
27.04	-318.65	27.04	1888.66	27.04	0.169
28.04	-330.46	28.04	1970.25	28.04	0.168
29.03	-341.25	29.03	2056.02	29.03	0.166
30.04	-350.52	30.04	2143.90	30.04	0.163
31.05	-359.80	31.05	2233.10	31.05	0.161
32.09	-369.54	32.09	2323.75	32.09	0.159
33.15	-379.55	33.15	2418.28	33.15	0.157
34.28	-389.80	34.28	2517.06	34.28	0.155
35.45	-400.64	35.45	2624.78	35.45	0.153
36.84	-412.25	36.84	2733.38	36.84	0.151
37.27	-420.04	37.27	2777.88	37.27	0.151
38.41	-436.01	38.41	2890.40	38.41	0.151
38.85	-442.66	38.85	2936.21	38.85	0.151
39.96	-438.08	39.96	3004.73	39.96	0.146
40.48	-445.74	40.48	3056.94	40.48	0.146
41.48	-478.62	41.48	3157.52	41.48	0.152
42.30	-465.59	42.30	3221.41	42.30	0.145
43.38	-474.87	43.38	3311.23	43.38	0.143
43.80	-478.72	43.80	3346.83	43.80	0.143
44.46	-484.78	44.46	3403.77	44.46	0.142
45.51	-495.15	45.51	3495.61	45.51	0.142
46.53	-505.16	46.53	3586.15	46.53	0.141
47.55	-514.90	47.55	3675.34	47.55	0.140
48.56	-524.71	48.56	3763.54	48.56	0.139
49.56	-534.66	49.56	3851.01	49.56	0.139
50.56	-544.61	50.56	3938.09	50.56	0.138
51.57	-554.68	51.57	4025.01	51.57	0.138
52.57	-564.84	52.57	4111.86	52.57	0.137
53.57	-575.08	53.57	4198.70	53.57	0.137
54.57	-585.43	54.57	4285.55	54.57	0.137
55.57	-595.90	55.57	4372.40	55.57	0.136
56.57	-606.51	56.57	4459.25	56.57	0.136
57.57	-617.29	57.57	4546.10	57.57	0.136
58.57	-628.24	58.57	4632.96	58.57	0.136
59.57	-628.14	59.57	4640.56	59.57	0.135



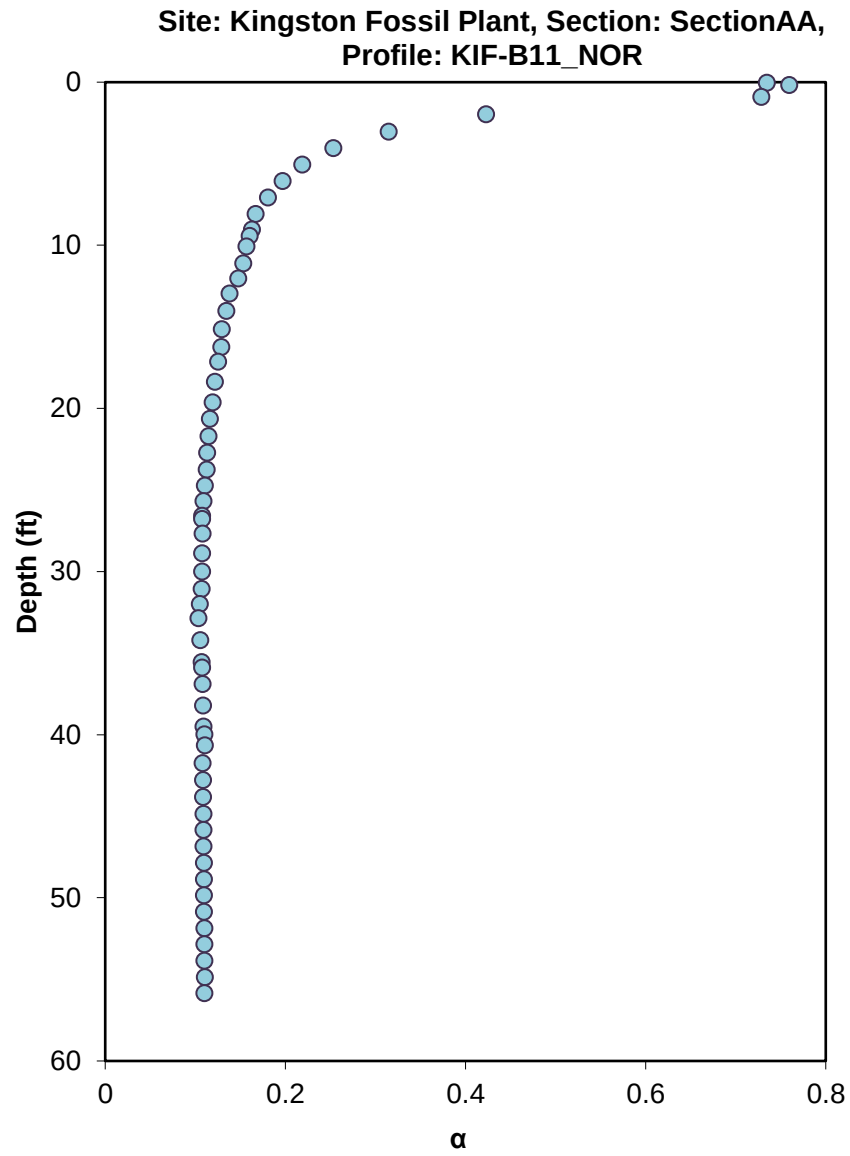
Site: Kingston Fossil Plant
Section: SectionAA
Profile: KIF-B11_NOR

From GeoStudio					
Depth (ft)	XY-Shear Stress (psf)	Depth (ft)	Vertical Effective Stress (psf)	Depth (ft)	Alpha
0.00	-29.97	0.00	40.81	0.00	0.734
0.15	-30.73	0.15	40.48	0.15	0.759
0.89	-38.40	0.89	52.74	0.89	0.728
1.95	-46.74	1.95	110.65	1.95	0.422
3.02	-51.90	3.02	165.18	3.02	0.314
4.02	-58.58	4.02	231.67	4.02	0.253
5.03	-65.50	5.03	300.12	5.03	0.218
6.03	-72.46	6.03	368.84	6.03	0.196
7.04	-78.97	7.04	438.16	7.04	0.180
8.05	-84.25	8.05	506.17	8.05	0.166
9.02	-91.92	9.02	565.36	9.02	0.163
9.41	-94.51	9.41	589.67	9.41	0.160
10.04	-99.62	10.04	636.15	10.04	0.157
11.08	-109.42	11.08	715.30	11.08	0.153
12.02	-114.97	12.02	780.76	12.02	0.147
12.94	-116.50	12.94	846.56	12.94	0.138
13.99	-122.69	13.99	915.81	13.99	0.134
15.12	-128.98	15.12	998.12	15.12	0.129
16.21	-137.48	16.21	1069.39	16.21	0.129
17.11	-142.79	17.11	1142.84	17.11	0.125
18.35	-147.87	18.35	1216.71	18.35	0.122
19.61	-154.30	19.61	1295.29	19.61	0.119
20.61	-159.76	20.61	1378.33	20.61	0.116
21.68	-166.08	21.68	1453.43	21.68	0.114
22.69	-172.95	22.69	1529.52	22.69	0.113
23.72	-180.45	23.72	1607.93	23.72	0.112
24.71	-186.38	24.71	1690.72	24.71	0.110
25.67	-192.72	25.67	1771.86	25.67	0.109
26.57	-198.83	26.57	1850.07	26.57	0.107
26.74	-200.11	26.74	1863.65	26.74	0.107
27.66	-209.10	27.66	1938.19	27.66	0.108
28.85	-219.88	28.85	2048.11	28.85	0.107
29.97	-230.21	29.97	2145.11	29.97	0.107
31.04	-238.18	31.04	2232.60	31.04	0.107
31.97	-242.49	31.97	2312.91	31.97	0.105
32.84	-248.70	32.84	2405.91	32.84	0.103
34.18	-264.60	34.18	2512.53	34.18	0.105
35.52	-281.37	35.52	2630.71	35.52	0.107
35.86	-285.74	35.86	2662.31	35.86	0.107
36.88	-296.95	36.88	2755.29	36.88	0.108
38.20	-310.60	38.20	2863.40	38.20	0.108
39.48	-324.51	39.48	2980.25	39.48	0.109
39.96	-331.68	39.96	3025.10	39.96	0.110
40.63	-340.61	40.63	3087.31	40.63	0.110
41.71	-343.07	41.71	3177.76	41.71	0.108
42.77	-353.69	42.77	3268.77	42.77	0.108
43.80	-364.19	43.80	3359.49	43.80	0.108
44.82	-374.65	44.82	3449.17	44.82	0.109
45.82	-384.99	45.82	3537.90	45.82	0.109
46.83	-395.19	46.83	3626.07	46.83	0.109
47.83	-405.32	47.83	3714.09	47.83	0.109
48.83	-415.42	48.83	3802.02	48.83	0.109
49.83	-425.55	49.83	3890.05	49.83	0.109
50.83	-435.73	50.83	3978.15	50.83	0.110
51.83	-445.97	51.83	4066.30	51.83	0.110
52.83	-456.29	52.83	4154.50	52.83	0.110
53.83	-466.73	53.83	4242.76	53.83	0.110
54.83	-477.30	54.83	4331.07	54.83	0.110
55.83	-477.23	55.83	4338.65	55.83	0.110



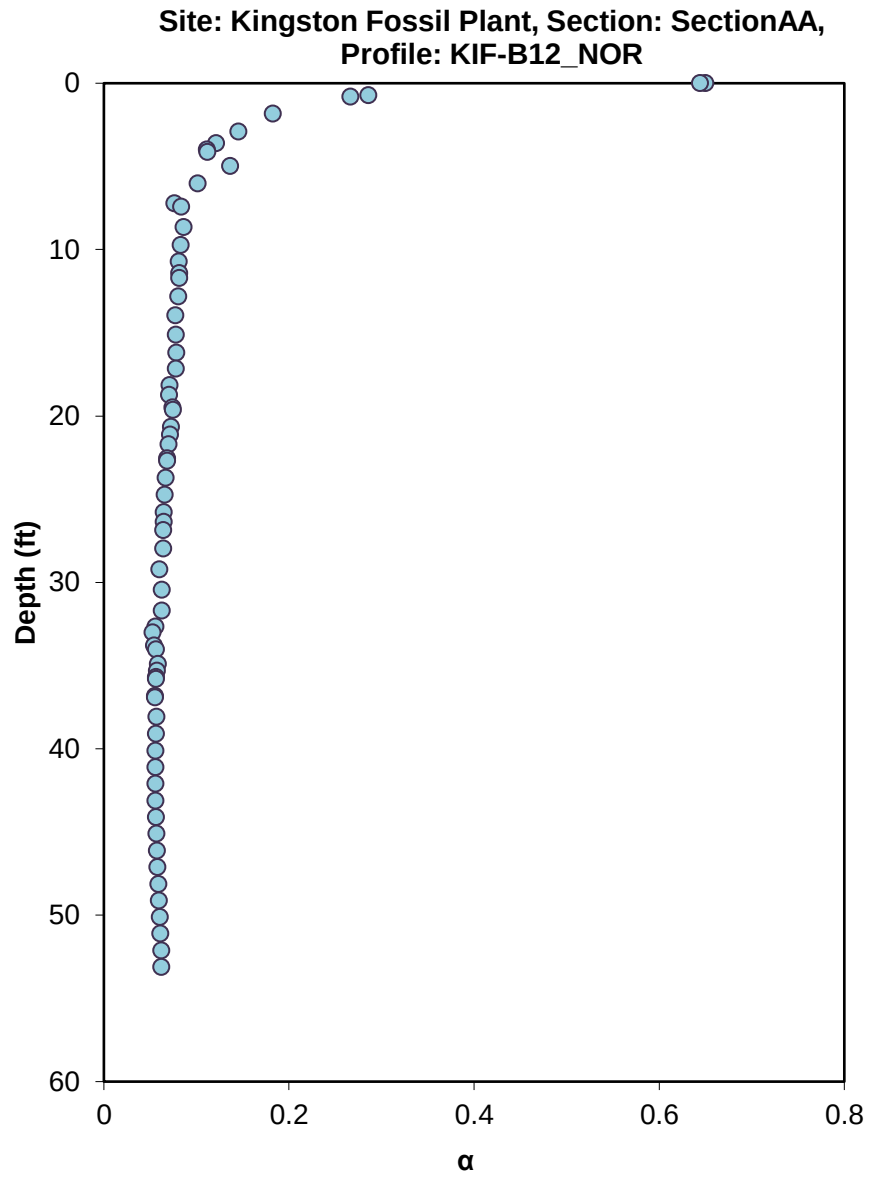
Site: Kingston Fossil Plant
Section: SectionAA
Profile: KIF-B11_NOR

From GeoStudio					
Depth (ft)	XY-Shear Stress (psf)	Depth (ft)	Vertical Effective Stress (psf)	Depth (ft)	Alpha
0.00	-29.97	0.00	40.81	0.00	0.734
0.15	-30.73	0.15	40.48	0.15	0.759
0.89	-38.40	0.89	52.74	0.89	0.728
1.95	-46.74	1.95	110.65	1.95	0.422
3.02	-51.90	3.02	165.18	3.02	0.314
4.02	-58.58	4.02	231.67	4.02	0.253
5.03	-65.50	5.03	300.12	5.03	0.218
6.03	-72.46	6.03	368.84	6.03	0.196
7.04	-78.97	7.04	438.16	7.04	0.180
8.05	-84.25	8.05	506.17	8.05	0.166
9.02	-91.92	9.02	565.36	9.02	0.163
9.41	-94.51	9.41	589.67	9.41	0.160
10.04	-99.62	10.04	636.15	10.04	0.157
11.08	-109.42	11.08	715.30	11.08	0.153
12.02	-114.97	12.02	780.76	12.02	0.147
12.94	-116.50	12.94	846.56	12.94	0.138
13.99	-122.69	13.99	915.81	13.99	0.134
15.12	-128.98	15.12	998.12	15.12	0.129
16.21	-137.48	16.21	1069.39	16.21	0.129
17.11	-142.79	17.11	1142.84	17.11	0.125
18.35	-147.87	18.35	1216.71	18.35	0.122
19.61	-154.30	19.61	1295.29	19.61	0.119
20.61	-159.76	20.61	1378.33	20.61	0.116
21.68	-166.08	21.68	1453.43	21.68	0.114
22.69	-172.95	22.69	1529.52	22.69	0.113
23.72	-180.45	23.72	1607.93	23.72	0.112
24.71	-186.38	24.71	1690.72	24.71	0.110
25.67	-192.72	25.67	1771.86	25.67	0.109
26.57	-198.83	26.57	1850.07	26.57	0.107
26.74	-200.11	26.74	1863.65	26.74	0.107
27.66	-209.10	27.66	1938.19	27.66	0.108
28.85	-219.88	28.85	2048.11	28.85	0.107
29.97	-230.21	29.97	2145.11	29.97	0.107
31.04	-238.18	31.04	2232.60	31.04	0.107
31.97	-242.49	31.97	2312.91	31.97	0.105
32.84	-248.70	32.84	2405.91	32.84	0.103
34.18	-264.60	34.18	2512.53	34.18	0.105
35.52	-281.37	35.52	2630.71	35.52	0.107
35.86	-285.74	35.86	2662.31	35.86	0.107
36.88	-296.95	36.88	2755.29	36.88	0.108
38.20	-310.60	38.20	2863.40	38.20	0.108
39.48	-324.51	39.48	2980.25	39.48	0.109
39.96	-331.68	39.96	3025.10	39.96	0.110
40.63	-340.61	40.63	3087.31	40.63	0.110
41.71	-343.07	41.71	3177.76	41.71	0.108
42.77	-353.69	42.77	3268.77	42.77	0.108
43.80	-364.19	43.80	3359.49	43.80	0.108
44.82	-374.65	44.82	3449.17	44.82	0.109
45.82	-384.99	45.82	3537.90	45.82	0.109
46.83	-395.19	46.83	3626.07	46.83	0.109
47.83	-405.32	47.83	3714.09	47.83	0.109
48.83	-415.42	48.83	3802.02	48.83	0.109
49.83	-425.55	49.83	3890.05	49.83	0.109
50.83	-435.73	50.83	3978.15	50.83	0.110
51.83	-445.97	51.83	4066.30	51.83	0.110
52.83	-456.29	52.83	4154.50	52.83	0.110
53.83	-466.73	53.83	4242.76	53.83	0.110
54.83	-477.30	54.83	4331.07	54.83	0.110
55.83	-477.23	55.83	4338.65	55.83	0.110



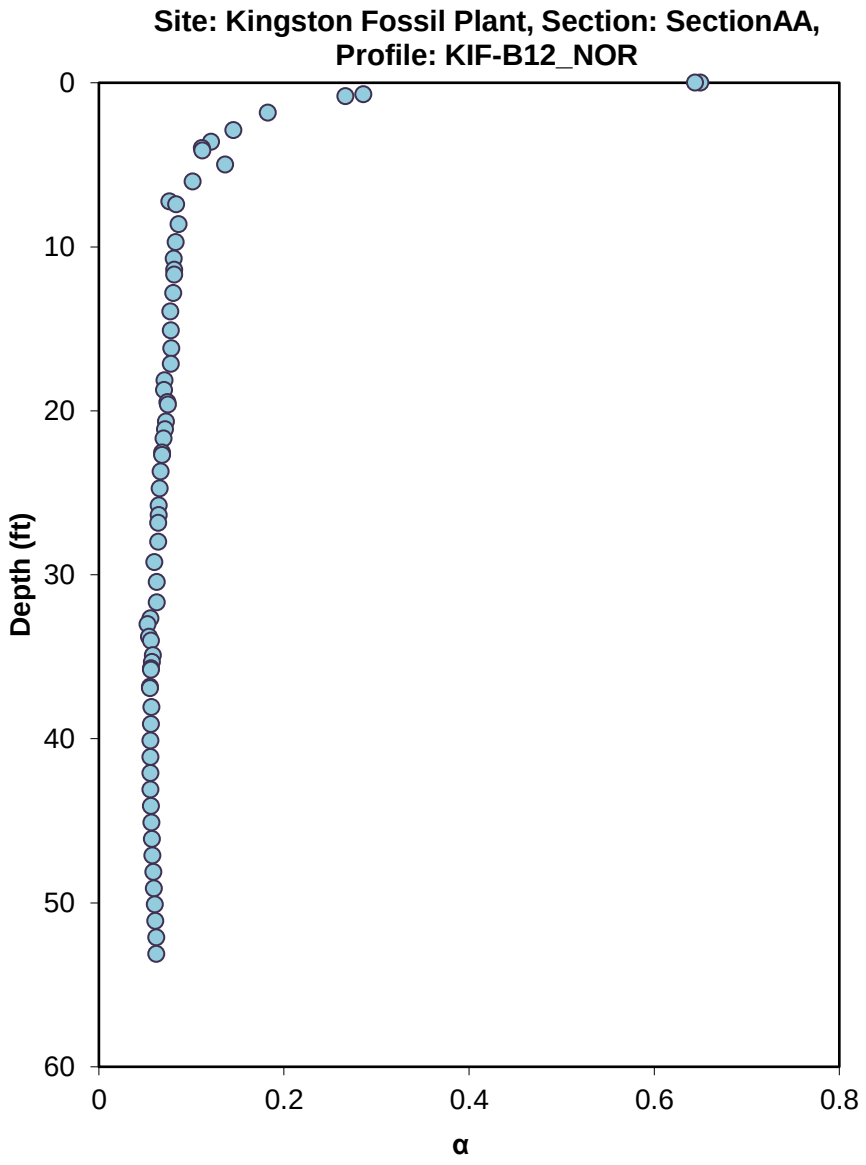
Site: Kingston Fossil Plant
Section: SectionAA
Profile: KIF-B12_NOR

From GeoStudio					
Depth (ft)	XY-Shear Stress (psf)	Depth (ft)	Vertical Effective Stress (psf)	Depth (ft)	Alpha
0.00	-23.96	0.00	36.88	0.00	0.650
0.00	-24.04	0.00	37.31	0.00	0.644
0.71	-15.79	0.71	55.24	0.71	0.286
0.82	-16.33	0.82	61.30	0.82	0.266
1.83	-21.76	1.83	119.16	1.83	0.183
2.90	-26.81	2.90	184.19	2.90	0.146
3.60	-27.63	3.60	228.21	3.60	0.121
3.97	-28.08	3.97	252.24	3.97	0.111
4.12	-29.41	4.12	263.08	4.12	0.112
4.99	-46.22	4.99	338.88	4.99	0.136
6.01	-39.39	6.01	387.52	6.01	0.102
7.23	-35.47	7.23	464.17	7.23	0.076
7.42	-40.32	7.42	482.39	7.42	0.084
8.63	-48.38	8.63	561.07	8.63	0.086
9.71	-52.42	9.71	632.58	9.71	0.083
10.72	-56.61	10.72	699.35	10.72	0.081
11.41	-60.78	11.41	748.04	11.41	0.081
11.71	-62.61	11.71	769.31	11.71	0.081
12.81	-67.55	12.81	840.43	12.81	0.080
13.94	-70.89	13.94	916.35	13.94	0.077
15.11	-76.97	15.11	991.59	15.11	0.078
16.20	-83.43	16.20	1064.38	16.20	0.078
17.15	-88.13	17.15	1135.22	17.15	0.078
18.15	-84.85	18.15	1198.22	18.15	0.071
18.74	-88.91	18.74	1257.48	18.74	0.071
19.47	-96.90	19.47	1309.41	19.47	0.074
19.63	-98.64	19.63	1320.68	19.63	0.075
20.64	-100.76	20.64	1390.50	20.64	0.072
21.12	-101.72	21.12	1425.06	21.12	0.071
21.70	-102.88	21.70	1467.00	21.70	0.070
22.54	-105.08	22.54	1534.05	22.54	0.069
22.71	-105.53	22.71	1547.48	22.71	0.068
23.71	-109.08	23.71	1628.58	23.71	0.067
24.73	-112.65	24.73	1710.59	24.73	0.066
25.77	-116.54	25.77	1793.95	25.77	0.065
26.35	-118.81	26.35	1840.50	26.35	0.065
26.85	-120.69	26.85	1880.06	26.85	0.064
27.97	-126.75	27.97	1972.79	27.97	0.064
29.22	-124.15	29.22	2072.99	29.22	0.060
30.43	-136.04	30.43	2173.51	30.43	0.063
31.70	-141.17	31.70	2252.17	31.70	0.063
32.66	-131.88	32.66	2354.36	32.66	0.056
33.00	-125.95	33.00	2382.99	33.00	0.053
33.79	-132.92	33.79	2437.75	33.79	0.055
34.02	-138.34	34.02	2453.35	34.02	0.056
34.91	-150.18	34.91	2559.40	34.91	0.059
35.32	-148.75	35.32	2584.51	35.32	0.058
35.69	-147.25	35.69	2606.69	35.69	0.056
35.80	-147.46	35.80	2614.12	35.80	0.056
36.82	-148.40	36.82	2680.29	36.82	0.055
36.92	-148.81	36.92	2690.64	36.92	0.055
38.08	-159.30	38.08	2788.81	38.08	0.057
39.10	-161.52	39.10	2871.54	39.10	0.056
40.11	-164.95	40.11	2954.34	40.11	0.056
41.10	-169.09	41.10	3036.98	41.10	0.056
42.10	-173.98	42.10	3120.03	42.10	0.056
43.11	-179.39	43.11	3204.02	43.11	0.056
44.11	-185.30	44.11	3288.54	44.11	0.056
45.11	-191.72	45.11	3373.66	45.11	0.057
46.11	-198.59	46.11	3459.18	46.11	0.057
47.11	-205.90	47.11	3545.16	47.11	0.058
48.11	-213.62	48.11	3631.56	48.11	0.059
49.11	-221.70	49.11	3718.40	49.11	0.060
50.12	-230.10	50.12	3805.62	50.12	0.060
51.12	-238.75	51.12	3893.19	51.12	0.061
52.12	-247.57	52.12	3981.05	52.12	0.062
53.12	-247.51	53.12	3988.51	53.12	0.062



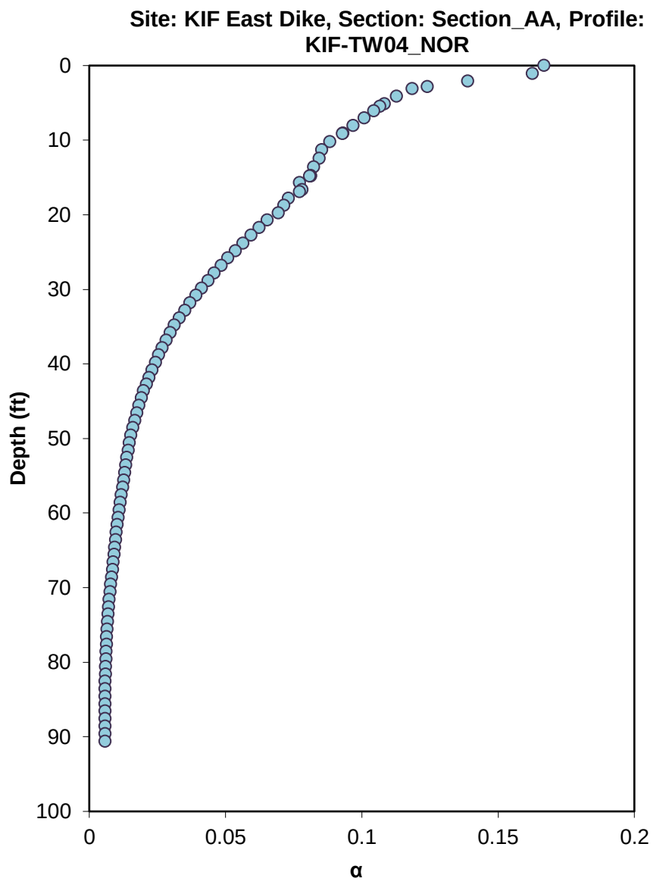
Site: Kingston Fossil Plant
Section: SectionAA
Profile: KIF-B12_NOR

From GeoStudio					
Depth (ft)	XY-Shear Stress (psf)	Depth (ft)	Vertical Effective Stress (psf)	Depth (ft)	Alpha
0.00	-23.96	0.00	36.88	0.00	0.650
0.00	-24.04	0.00	37.31	0.00	0.644
0.71	-15.79	0.71	55.24	0.71	0.286
0.82	-16.33	0.82	61.30	0.82	0.266
1.83	-21.76	1.83	119.16	1.83	0.183
2.90	-26.81	2.90	184.19	2.90	0.146
3.60	-27.63	3.60	228.21	3.60	0.121
3.97	-28.08	3.97	252.24	3.97	0.111
4.12	-29.41	4.12	263.08	4.12	0.112
4.99	-46.22	4.99	338.88	4.99	0.136
6.01	-39.39	6.01	387.52	6.01	0.102
7.23	-35.47	7.23	464.17	7.23	0.076
7.42	-40.32	7.42	482.39	7.42	0.084
8.63	-48.38	8.63	561.07	8.63	0.086
9.71	-52.42	9.71	632.58	9.71	0.083
10.72	-56.61	10.72	699.35	10.72	0.081
11.41	-60.78	11.41	748.04	11.41	0.081
11.71	-62.61	11.71	769.31	11.71	0.081
12.81	-67.55	12.81	840.43	12.81	0.080
13.94	-70.89	13.94	916.35	13.94	0.077
15.11	-76.97	15.11	991.59	15.11	0.078
16.20	-83.43	16.20	1064.38	16.20	0.078
17.15	-88.13	17.15	1135.22	17.15	0.078
18.15	-84.85	18.15	1198.22	18.15	0.071
18.74	-88.91	18.74	1257.48	18.74	0.071
19.47	-96.90	19.47	1309.41	19.47	0.074
19.63	-98.64	19.63	1320.68	19.63	0.075
20.64	-100.76	20.64	1390.50	20.64	0.072
21.12	-101.72	21.12	1425.06	21.12	0.071
21.70	-102.88	21.70	1467.00	21.70	0.070
22.54	-105.08	22.54	1534.05	22.54	0.069
22.71	-105.53	22.71	1547.48	22.71	0.068
23.71	-109.08	23.71	1628.58	23.71	0.067
24.73	-112.65	24.73	1710.59	24.73	0.066
25.77	-116.54	25.77	1793.95	25.77	0.065
26.35	-118.81	26.35	1840.50	26.35	0.065
26.85	-120.69	26.85	1880.06	26.85	0.064
27.97	-126.75	27.97	1972.79	27.97	0.064
29.22	-124.15	29.22	2072.99	29.22	0.060
30.43	-136.04	30.43	2173.51	30.43	0.063
31.70	-141.17	31.70	2252.17	31.70	0.063
32.66	-131.88	32.66	2354.36	32.66	0.056
33.00	-125.95	33.00	2382.99	33.00	0.053
33.79	-132.92	33.79	2437.75	33.79	0.055
34.02	-138.34	34.02	2453.35	34.02	0.056
34.91	-150.18	34.91	2559.40	34.91	0.059
35.32	-148.75	35.32	2584.51	35.32	0.058
35.69	-147.25	35.69	2606.69	35.69	0.056
35.80	-147.46	35.80	2614.12	35.80	0.056
36.82	-148.40	36.82	2680.29	36.82	0.055
36.92	-148.81	36.92	2690.64	36.92	0.055
38.08	-159.30	38.08	2788.81	38.08	0.057
39.10	-161.52	39.10	2871.54	39.10	0.056
40.11	-164.95	40.11	2954.34	40.11	0.056
41.10	-169.09	41.10	3036.98	41.10	0.056
42.10	-173.98	42.10	3120.03	42.10	0.056
43.11	-179.39	43.11	3204.02	43.11	0.056
44.11	-185.30	44.11	3288.54	44.11	0.056
45.11	-191.72	45.11	3373.66	45.11	0.057
46.11	-198.59	46.11	3459.18	46.11	0.057
47.11	-205.90	47.11	3545.16	47.11	0.058
48.11	-213.62	48.11	3631.56	48.11	0.059
49.11	-221.70	49.11	3718.40	49.11	0.060
50.12	-230.10	50.12	3805.62	50.12	0.060
51.12	-238.75	51.12	3893.19	51.12	0.061
52.12	-247.57	52.12	3981.05	52.12	0.062
53.12	-247.51	53.12	3988.51	53.12	0.062



Site: KIF East Dike
Section: Section_AA
Profile: KIF-TW04_NOR

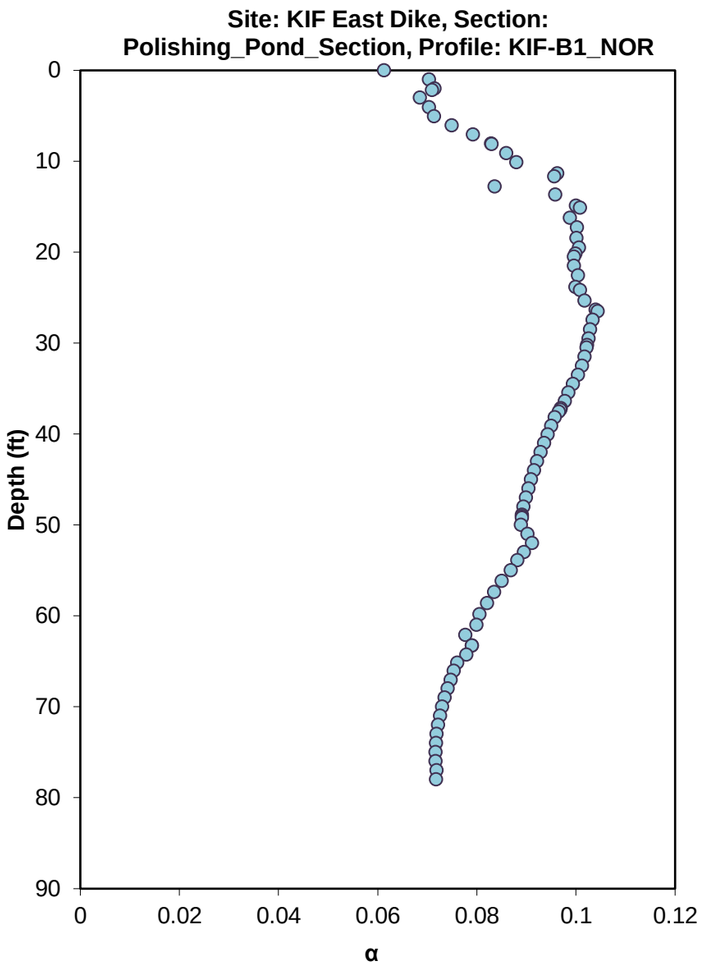
From GeoStudio					
Depth (ft)	XY-Shear Stress (psf)	Depth (ft)	Vertical Effective Stress (psf)	Depth (ft)	Alpha
0.00	68.90	0.00	413.19	0.00	0.167
1.08	74.83	1.08	460.25	1.08	0.163
2.13	80.96	2.13	583.19	2.13	0.139
2.81	82.68	2.81	666.61	2.81	0.124
3.13	83.60	3.13	705.54	3.13	0.118
4.11	92.80	4.11	823.42	4.11	0.113
5.11	101.89	5.11	941.35	5.11	0.108
5.49	105.18	5.49	986.65	5.49	0.107
6.10	110.42	6.10	1057.85	6.10	0.104
7.06	117.87	7.06	1168.32	7.06	0.101
8.03	123.71	8.03	1277.75	8.03	0.097
9.07	130.73	9.07	1404.91	9.07	0.093
9.12	131.10	9.12	1411.41	9.12	0.093
10.23	135.30	10.23	1533.37	10.23	0.088
11.32	139.60	11.32	1635.97	11.32	0.085
12.48	143.23	12.48	1696.15	12.48	0.084
13.60	144.44	13.60	1752.40	13.60	0.082
14.75	146.90	14.75	1808.96	14.75	0.081
14.80	146.97	14.80	1811.02	14.80	0.081
14.84	146.77	14.84	1813.21	14.84	0.081
15.72	143.44	15.72	1857.64	15.72	0.077
16.64	149.12	16.64	1911.35	16.64	0.078
16.93	148.67	16.93	1926.94	16.93	0.077
17.80	143.63	17.80	1967.27	17.80	0.073
18.77	144.29	18.77	2023.07	18.77	0.071
19.77	143.93	19.77	2075.83	19.77	0.069
20.75	138.69	20.75	2126.86	20.75	0.065
21.76	135.90	21.76	2179.63	21.76	0.062
22.78	132.72	22.78	2233.99	22.78	0.059
23.82	129.05	23.82	2288.65	23.82	0.056
24.83	125.57	24.83	2343.55	24.83	0.054
25.83	122.03	25.83	2398.17	25.83	0.051
26.83	118.58	26.83	2453.17	26.83	0.048
27.83	115.10	27.83	2508.76	27.83	0.046
28.83	111.62	28.83	2564.91	28.83	0.044
29.83	108.13	29.83	2621.57	29.83	0.041
30.83	104.64	30.83	2678.68	30.83	0.039
31.83	101.18	31.83	2736.11	31.83	0.037
32.83	97.75	32.83	2793.81	32.83	0.035
33.83	94.35	33.83	2851.72	33.83	0.033
34.83	90.99	34.83	2909.81	34.83	0.031
35.83	87.97	35.83	2966.67	35.83	0.030
36.83	85.27	36.83	3021.42	36.83	0.028
37.83	82.47	37.83	3074.88	37.83	0.027
38.84	79.77	38.84	3128.43	38.84	0.025
39.84	77.15	39.84	3182.05	39.84	0.024
40.84	74.50	40.84	3235.52	40.84	0.023
41.84	72.32	41.84	3286.96	41.84	0.022
42.75	70.04	42.75	3336.13	42.75	0.021
43.59	67.65	43.59	3387.93	43.59	0.020
44.58	65.76	44.58	3436.89	44.58	0.019
45.58	63.74	45.58	3490.28	45.58	0.018
46.58	61.74	46.58	3543.98	46.58	0.017
47.58	59.94	47.58	3597.86	47.58	0.017
48.58	58.29	48.58	3651.82	48.58	0.016
49.58	56.80	49.58	3705.84	49.58	0.015
50.58	55.50	50.58	3761.65	50.58	0.015
51.58	54.48	51.58	3821.04	51.58	0.014
52.58	53.61	52.58	3882.04	52.58	0.014
53.58	52.81	53.58	3943.47	53.58	0.013
54.58	52.07	54.58	4004.62	54.58	0.013
55.58	51.31	55.58	4066.71	55.58	0.013
56.58	50.44	56.58	4130.38	56.58	0.012
57.58	49.53	57.58	4194.88	57.58	0.012
58.58	48.60	58.58	4259.44	58.58	0.011
59.58	47.68	59.58	4324.05	59.58	0.011
60.58	46.78	60.58	4389.95	60.58	0.011
61.58	45.89	61.58	4458.41	61.58	0.010
62.5819	45.05	62.58188	4528.16	62.58	0.010
63.5819	44.27	63.58189	4597.95	63.58	0.010
64.5819	43.55	64.5819	4667.78	64.58	0.009
65.5819	42.90	65.58191	4737.66	65.58	0.009
66.5819	42.34	66.58192	4807.57	66.58	0.009
67.5819	41.77	67.58193	4879.34	67.58	0.009
68.5819	40.81	68.58194	4955.44	68.58	0.008
69.5819	39.84	69.58195	5033.40	69.58	0.008
70.582	38.97	70.58196	5111.36	70.58	0.008
71.582	38.20	71.58197	5189.31	71.58	0.007
72.582	37.52	72.58198	5267.25	72.58	0.007
73.582	36.95	73.58199	5345.17	73.58	0.007
74.582	36.47	74.582	5423.08	74.58	0.007
75.582	36.09	75.58201	5500.97	75.58	0.007
76.582	35.79	76.58202	5578.86	76.58	0.006
77.582	35.58	77.58203	5656.75	77.58	0.006
78.582	35.44	78.58204	5734.65	78.58	0.006
79.5821	35.37	79.58205	5812.57	79.58	0.006
80.5821	35.37	80.58206	5890.52	80.58	0.006
81.5821	35.43	81.58207	5968.51	81.58	0.006
82.5821	35.56	82.58208	6046.55	82.58	0.006
83.5821	35.75	83.58209	6124.65	83.58	0.006
84.5821	36.01	84.5821	6202.80	84.58	0.006
85.5821	36.35	85.58212	6281.02	85.58	0.006
86.5821	36.77	86.58213	6359.30	86.58	0.006
87.5821	37.29	87.58214	6437.65	87.58	0.006
88.5821	37.92	88.58215	6516.05	88.58	0.006
89.5822	38.67	89.58216	6594.51	89.58	0.006
90.5822	38.59	90.58217	6602.06	90.58	0.006



3.2.2.2 Polishing Pond Section

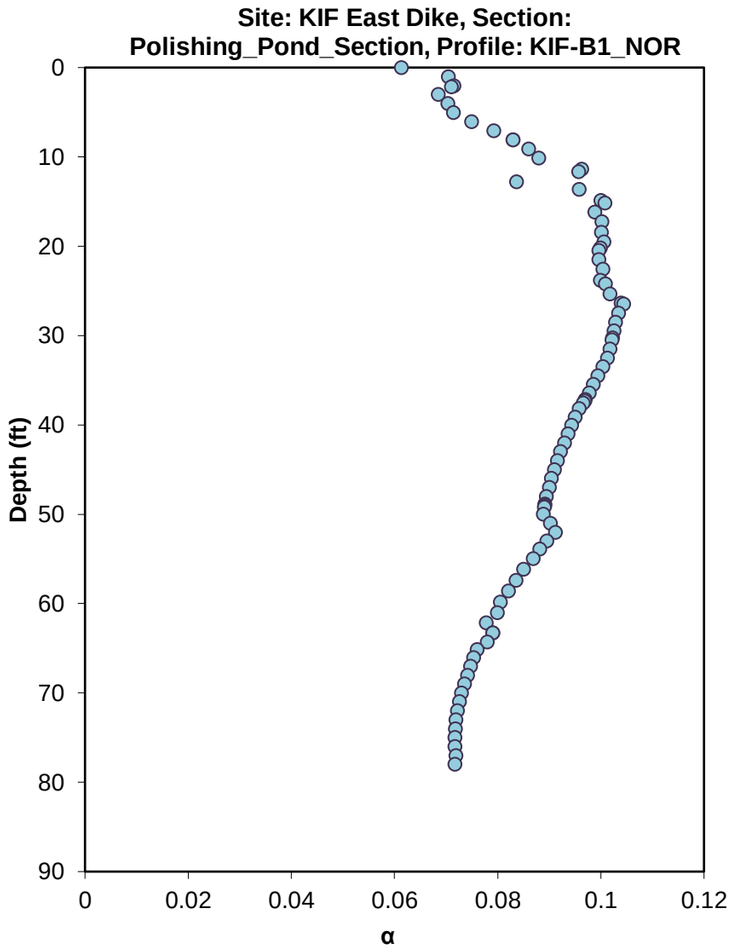
Site: KIF East Dike
Section: Polishing_Pond_Section
Profile: KIF-B1_NOR

From GeoStudio					
Depth (ft)	XY-Shear Stress (psf)	Depth (ft)	Vertical Effective Stress (psf)	Depth (ft)	Alpha
0.00	-23.19	0.00	378.09	0.00	0.061
1.02	-30.93	1.02	439.50	1.02	0.070
2.03	-40.23	2.03	562.58	2.03	0.072
2.18	-41.22	2.18	580.59	2.18	0.071
3.04	-46.95	3.04	685.37	3.04	0.069
4.05	-56.81	4.05	807.77	4.05	0.070
5.06	-66.34	5.06	929.71	5.06	0.071
6.07	-75.58	6.07	1008.47	6.07	0.075
7.07	-84.52	7.07	1066.90	7.07	0.079
8.09	-93.20	8.09	1124.16	8.09	0.083
8.10	-93.32	8.10	1124.96	8.10	0.083
9.10	-101.61	9.10	1181.93	9.10	0.086
10.13	-108.93	10.13	1238.11	10.13	0.088
11.36	-127.05	11.36	1319.70	11.36	0.096
11.66	-127.82	11.66	1336.16	11.66	0.096
12.78	-115.68	12.78	1383.79	12.78	0.084
13.66	-138.67	13.66	1447.14	13.66	0.096
14.89	-151.36	14.89	1513.10	14.89	0.100
15.15	-154.74	15.15	1535.29	15.15	0.101
16.21	-157.28	16.21	1592.47	16.21	0.099
17.29	-165.15	17.29	1647.80	17.29	0.100
18.43	-171.69	18.43	1715.72	18.43	0.100
19.54	-178.73	19.54	1776.79	19.54	0.101
20.18	-180.69	20.18	1808.45	20.18	0.100
20.50	-181.64	20.50	1824.35	20.50	0.100
21.49	-186.78	21.49	1875.85	21.49	0.100
22.58	-193.89	22.58	1931.74	22.58	0.100
23.83	-199.07	23.83	1992.52	23.83	0.100
24.20	-202.82	24.20	2010.75	24.20	0.101
25.32	-210.55	25.32	2069.60	25.32	0.102
26.34	-219.80	26.34	2114.50	26.34	0.104
26.49	-221.36	26.49	2120.67	26.49	0.104
27.47	-224.30	27.47	2169.49	27.47	0.103
28.49	-228.22	28.49	2219.73	28.49	0.103
29.50	-232.70	29.50	2269.19	29.50	0.103
30.25	-235.74	30.25	2305.29	30.25	0.102
30.51	-236.80	30.51	2317.92	30.51	0.102
31.51	-240.85	31.51	2366.32	31.51	0.102
32.51	-244.80	32.51	2418.33	32.51	0.101
33.51	-248.65	33.51	2477.23	33.51	0.100
34.49	-252.40	34.49	2539.72	34.49	0.099
35.47	-256.17	35.47	2600.62	35.47	0.099
36.41	-259.97	36.41	2660.40	36.41	0.098
37.17	-262.56	37.17	2707.08	37.17	0.097
37.33	-263.07	37.33	2716.26	37.33	0.097
37.54	-263.74	37.54	2730.81	37.54	0.097
38.19	-265.74	38.19	2774.53	38.19	0.096
39.13	-269.03	39.13	2831.62	39.13	0.095
40.06	-272.49	40.06	2890.56	40.06	0.094
41.04	-276.11	41.04	2950.32	41.04	0.094
42.02	-279.75	42.02	3011.41	42.02	0.093
43.02	-283.30	43.02	3072.68	43.02	0.092
44.02	-287.17	44.02	3135.48	44.02	0.092
45.02	-291.13	45.02	3200.30	45.02	0.091
46.01	-295.37	46.01	3267.00	46.01	0.090
47.02	-299.76	47.02	3332.38	47.02	0.090
48.03	-303.69	48.03	3397.91	48.03	0.089
48.90	-307.50	48.90	3449.51	48.90	0.089
49.06	-308.21	49.06	3459.17	49.06	0.089
49.20	-308.82	49.20	3467.39	49.20	0.089
50.02	-312.27	50.02	3514.48	50.02	0.089
51.01	-323.30	51.01	3583.44	51.01	0.090
52.03	-333.22	52.03	3656.50	52.03	0.091
52.99	-334.74	52.99	3738.64	52.99	0.090
53.89	-335.88	53.89	3809.28	53.89	0.088
54.98	-338.59	54.98	3898.22	54.98	0.087
56.19	-339.33	56.19	3993.15	56.19	0.085
57.40	-341.46	57.40	4087.27	57.40	0.084
58.6071	-343.29	58.6071	4182.19	58.61	0.082
59.8196	-344.38	59.81965	4276.39	59.82	0.081
61.0266	-348.68	61.02661	4363.92	61.03	0.080
62.1312	-345.90	62.13115	4449.65	62.13	0.078
63.287	-358.13	63.28696	4531.62	63.29	0.079
63.2885	-358.15	63.28853	4531.75	63.29	0.079
64.3009	-361.76	64.30085	4641.43	64.30	0.078
65.1827	-355.91	65.18273	4682.05	65.18	0.076
66.0675	-357.87	66.06749	4751.18	66.07	0.075
67.0316	-360.47	67.03163	4823.09	67.03	0.075
68.0198	-363.08	68.0198	4898.24	68.02	0.074
69.0141	-365.76	69.01408	4974.77	69.01	0.074
70.0101	-368.72	70.01007	5051.06	70.01	0.073
71.0067	-371.99	71.00669	5127.44	71.01	0.073
72.0053	-375.66	72.00527	5203.98	72.01	0.072
73.0049	-379.76	73.00493	5280.82	73.00	0.072
74.0051	-384.39	74.0051	5357.84	74.01	0.072
75.0051	-389.58	75.00511	5435.04	75.01	0.072
76.0051	-395.40	76.00508	5512.42	76.01	0.072
77.0051	-401.89	77.00509	5589.98	77.01	0.072
78.005	-401.53	78.00503	5597.48	78.01	0.072



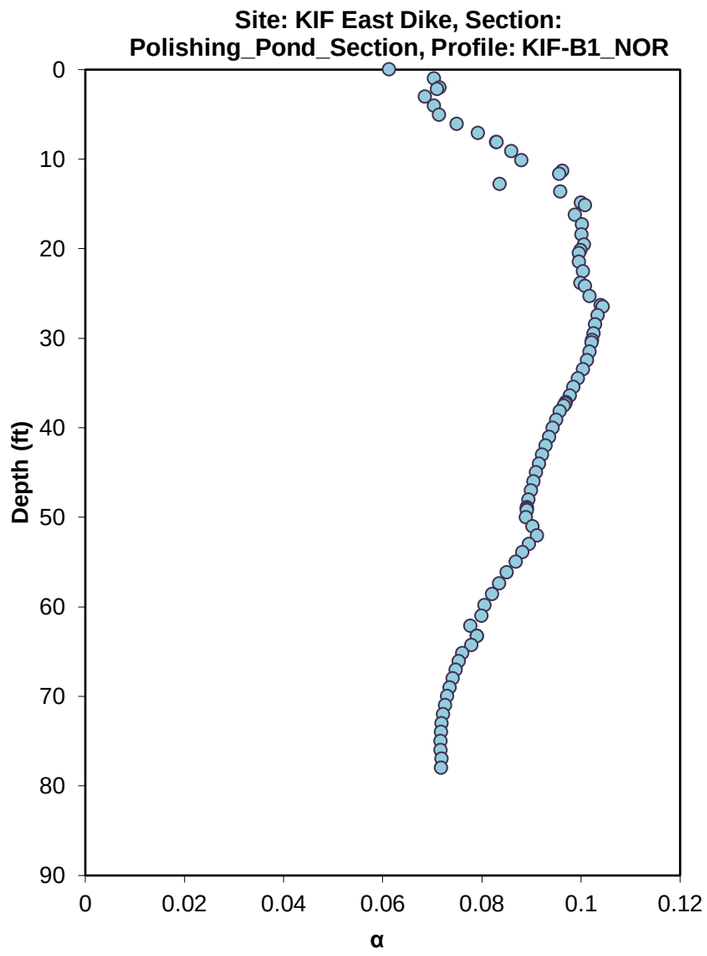
Site: KIF East Dike
Section: Polishing_Pond_Section
Profile: KIF-B1_NOR

From GeoStudio					
Depth (ft)	XY-Shear Stress (psf)	Depth (ft)	Vertical Effective Stress (psf)	Depth (ft)	Alpha
0.00	-23.19	0.00	378.09	0.00	0.061
1.02	-30.93	1.02	439.50	1.02	0.070
2.03	-40.23	2.03	562.58	2.03	0.072
2.18	-41.22	2.18	580.59	2.18	0.071
3.04	-46.95	3.04	685.37	3.04	0.069
4.05	-56.81	4.05	807.77	4.05	0.070
5.06	-66.34	5.06	929.71	5.06	0.071
6.07	-75.58	6.07	1008.47	6.07	0.075
7.07	-84.52	7.07	1066.90	7.07	0.079
8.09	-93.20	8.09	1124.16	8.09	0.083
8.10	-93.32	8.10	1124.96	8.10	0.083
9.10	-101.61	9.10	1181.93	9.10	0.086
10.13	-108.93	10.13	1238.11	10.13	0.088
11.36	-127.05	11.36	1319.70	11.36	0.096
11.66	-127.82	11.66	1336.16	11.66	0.096
12.78	-115.68	12.78	1383.79	12.78	0.084
13.66	-138.67	13.66	1447.14	13.66	0.096
14.89	-151.36	14.89	1513.10	14.89	0.100
15.15	-154.74	15.15	1535.29	15.15	0.101
16.21	-157.28	16.21	1592.47	16.21	0.099
17.29	-165.15	17.29	1647.80	17.29	0.100
18.43	-171.69	18.43	1715.72	18.43	0.100
19.54	-178.73	19.54	1776.79	19.54	0.101
20.18	-180.69	20.18	1808.45	20.18	0.100
20.50	-181.64	20.50	1824.35	20.50	0.100
21.49	-186.78	21.49	1875.85	21.49	0.100
22.58	-193.89	22.58	1931.74	22.58	0.100
23.83	-199.07	23.83	1992.52	23.83	0.100
24.20	-202.82	24.20	2010.75	24.20	0.101
25.32	-210.55	25.32	2069.60	25.32	0.102
26.34	-219.80	26.34	2114.50	26.34	0.104
26.49	-221.36	26.49	2120.67	26.49	0.104
27.47	-224.30	27.47	2169.49	27.47	0.103
28.49	-228.22	28.49	2219.73	28.49	0.103
29.50	-232.70	29.50	2269.19	29.50	0.103
30.25	-235.74	30.25	2305.29	30.25	0.102
30.51	-236.80	30.51	2317.92	30.51	0.102
31.51	-240.85	31.51	2366.32	31.51	0.102
32.51	-244.80	32.51	2418.33	32.51	0.101
33.51	-248.65	33.51	2477.23	33.51	0.100
34.49	-252.40	34.49	2539.72	34.49	0.099
35.47	-256.17	35.47	2600.62	35.47	0.099
36.41	-259.97	36.41	2660.40	36.41	0.098
37.17	-262.56	37.17	2707.08	37.17	0.097
37.33	-263.07	37.33	2716.26	37.33	0.097
37.54	-263.74	37.54	2730.81	37.54	0.097
38.19	-265.74	38.19	2774.53	38.19	0.096
39.13	-269.03	39.13	2831.62	39.13	0.095
40.06	-272.49	40.06	2890.56	40.06	0.094
41.04	-276.11	41.04	2950.32	41.04	0.094
42.02	-279.75	42.02	3011.41	42.02	0.093
43.02	-283.30	43.02	3072.68	43.02	0.092
44.02	-287.17	44.02	3135.48	44.02	0.092
45.02	-291.13	45.02	3200.30	45.02	0.091
46.01	-295.37	46.01	3267.00	46.01	0.090
47.02	-299.76	47.02	3332.38	47.02	0.090
48.03	-303.69	48.03	3397.91	48.03	0.089
48.90	-307.50	48.90	3449.51	48.90	0.089
49.06	-308.21	49.06	3459.17	49.06	0.089
49.20	-308.82	49.20	3467.39	49.20	0.089
50.02	-312.27	50.02	3514.48	50.02	0.089
51.01	-323.30	51.01	3583.44	51.01	0.090
52.03	-333.22	52.03	3656.50	52.03	0.091
52.99	-334.74	52.99	3738.64	52.99	0.090
53.89	-335.88	53.89	3809.28	53.89	0.088
54.98	-338.59	54.98	3898.22	54.98	0.087
56.19	-339.33	56.19	3993.15	56.19	0.085
57.40	-341.46	57.40	4087.27	57.40	0.084
58.6071	-343.29	58.6071	4182.19	58.61	0.082
59.8196	-344.38	59.81965	4276.39	59.82	0.081
61.0266	-348.68	61.02661	4363.92	61.03	0.080
62.1312	-345.90	62.13115	4449.65	62.13	0.078
63.287	-358.13	63.28696	4531.62	63.29	0.079
63.2885	-358.15	63.28853	4531.75	63.29	0.079
64.3009	-361.76	64.30085	4641.43	64.30	0.078
65.1827	-355.91	65.18273	4682.05	65.18	0.076
66.0675	-357.87	66.06749	4751.18	66.07	0.075
67.0316	-360.47	67.03163	4823.09	67.03	0.075
68.0198	-363.08	68.0198	4898.24	68.02	0.074
69.0141	-365.76	69.01408	4974.77	69.01	0.074
70.0101	-368.72	70.01007	5051.06	70.01	0.073
71.0067	-371.99	71.00669	5127.44	71.01	0.073
72.0053	-375.66	72.00527	5203.98	72.01	0.072
73.0049	-379.76	73.00493	5280.82	73.00	0.072
74.0051	-384.39	74.0051	5357.84	74.01	0.072
75.0051	-389.58	75.00511	5435.04	75.01	0.072
76.0051	-395.40	76.00508	5512.42	76.01	0.072
77.0051	-401.89	77.00509	5589.98	77.01	0.072
78.005	-401.53	78.00503	5597.48	78.01	0.072



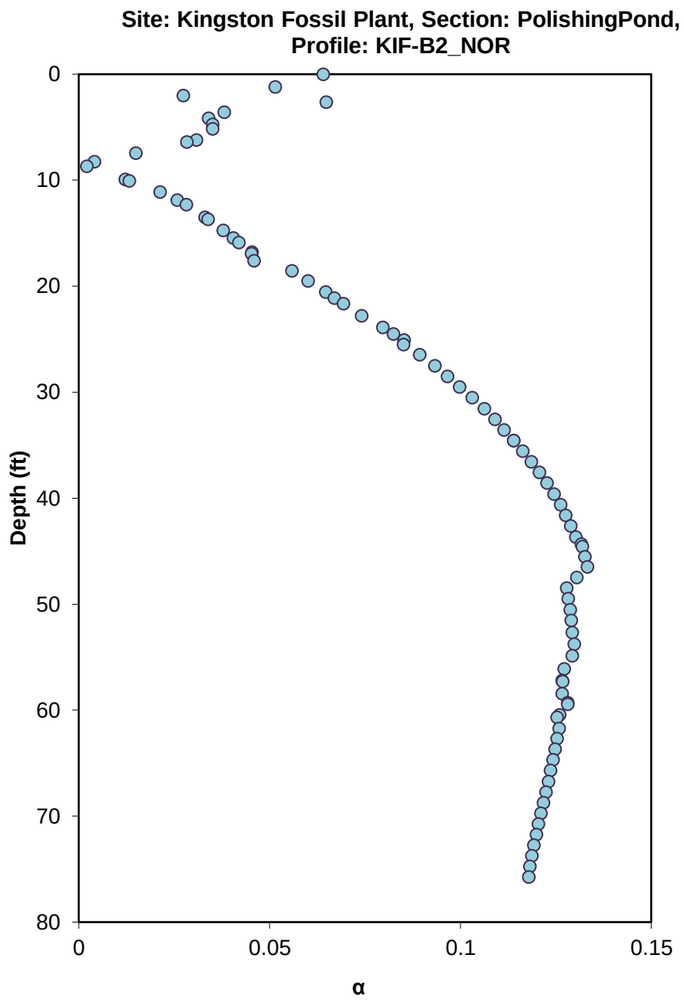
Site: KIF East Dike
Section: Polishing_Pond_Section
Profile: KIF-B1_NOR

From GeoStudio					
Depth (ft)	XY-Shear Stress (psf)	Depth (ft)	Vertical Effective Stress (psf)	Depth (ft)	Alpha
0.00	-23.19	0.00	378.09	0.00	0.061
1.02	-30.93	1.02	439.50	1.02	0.070
2.03	-40.23	2.03	562.58	2.03	0.072
2.18	-41.22	2.18	580.59	2.18	0.071
3.04	-46.95	3.04	685.37	3.04	0.069
4.05	-56.81	4.05	807.77	4.05	0.070
5.06	-66.34	5.06	929.71	5.06	0.071
6.07	-75.58	6.07	1008.47	6.07	0.075
7.07	-84.52	7.07	1066.90	7.07	0.079
8.09	-93.20	8.09	1124.16	8.09	0.083
8.10	-93.32	8.10	1124.96	8.10	0.083
9.10	-101.61	9.10	1181.93	9.10	0.086
10.13	-108.93	10.13	1238.11	10.13	0.088
11.36	-127.05	11.36	1319.70	11.36	0.096
11.66	-127.82	11.66	1336.16	11.66	0.096
12.78	-115.68	12.78	1383.79	12.78	0.084
13.66	-138.67	13.66	1447.14	13.66	0.096
14.89	-151.36	14.89	1513.10	14.89	0.100
15.15	-154.74	15.15	1535.29	15.15	0.101
16.21	-157.28	16.21	1592.47	16.21	0.099
17.29	-165.15	17.29	1647.80	17.29	0.100
18.43	-171.69	18.43	1715.72	18.43	0.100
19.54	-178.73	19.54	1776.79	19.54	0.101
20.18	-180.69	20.18	1808.45	20.18	0.100
20.50	-181.64	20.50	1824.35	20.50	0.100
21.49	-186.78	21.49	1875.85	21.49	0.100
22.58	-193.89	22.58	1931.74	22.58	0.100
23.83	-199.07	23.83	1992.52	23.83	0.100
24.20	-202.82	24.20	2010.75	24.20	0.101
25.32	-210.55	25.32	2069.60	25.32	0.102
26.34	-219.80	26.34	2114.50	26.34	0.104
26.49	-221.36	26.49	2120.67	26.49	0.104
27.47	-224.30	27.47	2169.49	27.47	0.103
28.49	-228.22	28.49	2219.73	28.49	0.103
29.50	-232.70	29.50	2269.19	29.50	0.103
30.25	-235.74	30.25	2305.29	30.25	0.102
30.51	-236.80	30.51	2317.92	30.51	0.102
31.51	-240.85	31.51	2366.32	31.51	0.102
32.51	-244.80	32.51	2418.33	32.51	0.101
33.51	-248.65	33.51	2477.23	33.51	0.100
34.49	-252.40	34.49	2539.72	34.49	0.099
35.47	-256.17	35.47	2600.62	35.47	0.099
36.41	-259.97	36.41	2660.40	36.41	0.098
37.17	-262.56	37.17	2707.08	37.17	0.097
37.33	-263.07	37.33	2716.26	37.33	0.097
37.54	-263.74	37.54	2730.81	37.54	0.097
38.19	-265.74	38.19	2774.53	38.19	0.096
39.13	-269.03	39.13	2831.62	39.13	0.095
40.06	-272.49	40.06	2890.56	40.06	0.094
41.04	-276.11	41.04	2950.32	41.04	0.094
42.02	-279.75	42.02	3011.41	42.02	0.093
43.02	-283.30	43.02	3072.68	43.02	0.092
44.02	-287.17	44.02	3135.48	44.02	0.092
45.02	-291.13	45.02	3200.30	45.02	0.091
46.01	-295.37	46.01	3267.00	46.01	0.090
47.02	-299.76	47.02	3332.38	47.02	0.090
48.03	-303.69	48.03	3397.91	48.03	0.089
48.90	-307.50	48.90	3449.51	48.90	0.089
49.06	-308.21	49.06	3459.17	49.06	0.089
49.20	-308.82	49.20	3467.39	49.20	0.089
50.02	-312.27	50.02	3514.48	50.02	0.089
51.01	-323.30	51.01	3583.44	51.01	0.090
52.03	-333.22	52.03	3656.50	52.03	0.091
52.99	-334.74	52.99	3738.64	52.99	0.090
53.89	-335.88	53.89	3809.28	53.89	0.088
54.98	-338.59	54.98	3898.22	54.98	0.087
56.19	-339.33	56.19	3993.15	56.19	0.085
57.40	-341.46	57.40	4087.27	57.40	0.084
58.6071	-343.29	58.6071	4182.19	58.61	0.082
59.8196	-344.38	59.81965	4276.39	59.82	0.081
61.0266	-348.68	61.02661	4363.92	61.03	0.080
62.1312	-345.90	62.13115	4449.65	62.13	0.078
63.287	-358.13	63.28696	4531.62	63.29	0.079
63.2885	-358.15	63.28853	4531.75	63.29	0.079
64.3009	-361.76	64.30085	4641.43	64.30	0.078
65.1827	-355.91	65.18273	4682.05	65.18	0.076
66.0675	-357.87	66.06749	4751.18	66.07	0.075
67.0316	-360.47	67.03163	4823.09	67.03	0.075
68.0198	-363.08	68.0198	4898.24	68.02	0.074
69.0141	-365.76	69.01408	4974.77	69.01	0.074
70.0101	-368.72	70.01007	5051.06	70.01	0.073
71.0067	-371.99	71.00669	5127.44	71.01	0.073
72.0053	-375.66	72.00527	5203.98	72.01	0.072
73.0049	-379.76	73.00493	5280.82	73.00	0.072
74.0051	-384.39	74.0051	5357.84	74.01	0.072
75.0051	-389.58	75.00511	5435.04	75.01	0.072
76.0051	-395.40	76.00508	5512.42	76.01	0.072
77.0051	-401.89	77.00509	5589.98	77.01	0.072
78.005	-401.53	78.00503	5597.48	78.01	0.072



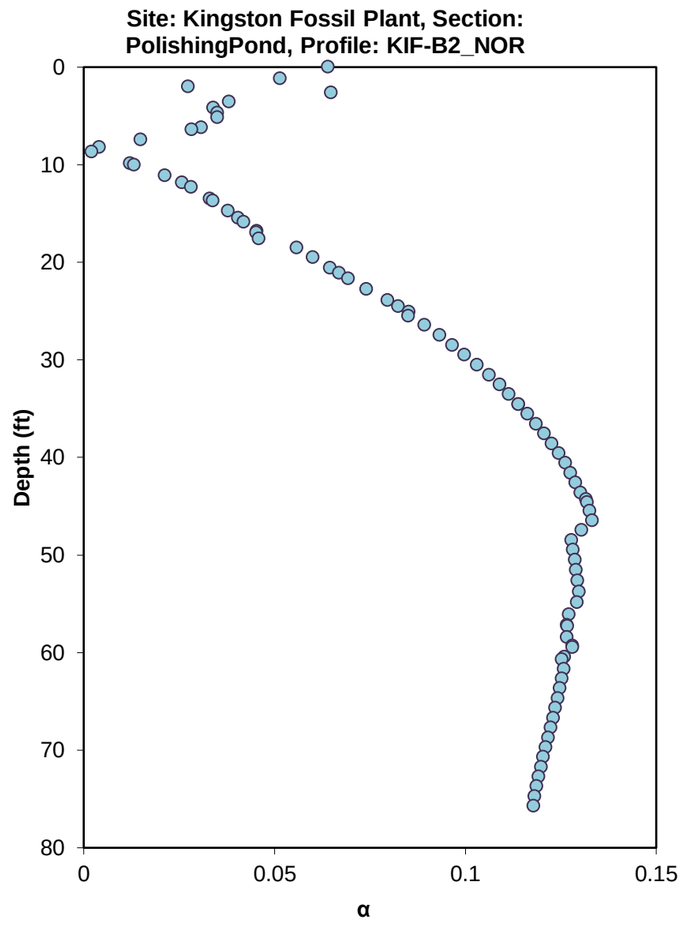
Site: Kingston Fossil Plant
Section: PolishingPond
Profile: KIF-B2_NOR

From GeoStudio					
Depth (ft)	XY-Shear Stress (psf)	Depth (ft)	Vertical Effective Stress (psf)	Depth (ft)	Alpha
0.00	9.69	0.00	151.12	0.00	0.064
1.19	9.49	1.19	184.19	1.19	0.052
2.00	6.08	2.00	221.61	2.00	0.027
2.63	16.11	2.63	248.36	2.63	0.065
3.58	11.27	3.58	294.74	3.58	0.038
4.16	10.91	4.16	320.02	4.16	0.034
4.71	12.23	4.71	347.64	4.71	0.035
5.16	13.10	5.16	372.82	5.16	0.035
6.22	13.33	6.22	430.68	6.22	0.031
6.42	12.50	6.42	441.39	6.42	0.028
7.44	7.46	7.44	496.01	7.44	0.015
8.23	2.24	8.23	544.56	8.23	0.004
8.67	-1.27	8.67	571.81	8.67	0.002
9.90	-8.03	9.90	656.09	9.90	0.012
10.04	-8.88	10.04	665.98	10.04	0.013
11.11	-15.77	11.11	739.76	11.11	0.021
11.86	-20.51	11.86	791.31	11.86	0.026
12.32	-23.25	12.32	823.15	12.32	0.028
13.52	-29.98	13.52	905.13	13.52	0.033
13.70	-31.16	13.70	917.48	13.70	0.034
14.72	-37.44	14.72	988.32	14.72	0.038
15.45	-41.87	15.45	1033.53	15.45	0.041
15.87	-44.60	15.87	1061.53	15.87	0.042
16.81	-51.93	16.81	1143.02	16.81	0.045
16.95	-52.35	16.95	1154.30	16.95	0.045
17.59	-54.87	17.59	1193.16	17.59	0.046
18.53	-69.30	18.53	1238.92	18.53	0.056
19.52	-78.53	19.52	1305.04	19.52	0.060
20.57	-88.87	20.57	1373.41	20.57	0.065
21.10	-94.41	21.10	1408.24	21.10	0.067
21.66	-100.36	21.66	1445.10	21.66	0.069
22.77	-112.41	22.77	1516.38	22.77	0.074
23.90	-126.19	23.90	1583.98	23.90	0.080
24.50	-133.80	24.50	1622.82	24.50	0.082
25.10	-142.22	25.10	1668.54	25.10	0.085
25.50	-144.56	25.50	1698.17	25.50	0.085
26.45	-156.82	26.45	1754.38	26.45	0.089
27.48	-169.62	27.48	1817.24	27.48	0.093
28.50	-181.93	28.50	1881.51	28.50	0.097
29.50	-194.41	29.50	1946.02	29.50	0.100
30.53	-207.42	30.53	2010.49	30.53	0.103
31.55	-220.65	31.55	2074.99	31.55	0.106
32.55	-233.43	32.55	2138.90	32.55	0.109
33.55	-245.66	33.55	2202.25	33.55	0.112
34.55	-258.37	34.55	2265.80	34.55	0.114
34.56	-258.55	34.56	2266.70	34.56	0.114
35.55	-271.21	35.55	2329.65	35.55	0.116
36.56	-283.92	36.56	2393.38	36.56	0.119
37.57	-296.63	37.57	2457.11	37.57	0.121
38.58	-309.30	38.58	2520.82	38.58	0.123
39.59	-322.15	39.59	2585.38	39.59	0.125
40.59	-334.91	40.59	2652.81	40.59	0.126
41.61	-347.22	41.61	2720.32	41.61	0.128
42.59	-359.68	42.59	2789.02	42.59	0.129
43.64	-373.40	43.64	2865.50	43.64	0.130
44.32	-383.44	44.32	2911.08	44.32	0.132
44.59	-386.67	44.59	2927.90	44.59	0.132
45.51	-396.19	45.51	2987.74	45.51	0.133
46.48	-406.99	46.48	3053.41	46.48	0.133
47.46	-407.41	47.46	3121.61	47.46	0.131
48.47	-408.53	48.47	3194.18	48.47	0.128
49.48	-419.75	49.48	3269.98	49.48	0.128
50.51	-431.03	50.51	3347.05	50.51	0.129
51.55	-442.51	51.55	3426.95	51.55	0.129
52.65	-454.21	52.65	3509.50	52.65	0.129
53.76	-466.80	53.76	3595.22	53.76	0.130
54.88	-475.94	54.88	3680.96	54.88	0.129
56.11	-480.39	56.11	3774.35	56.11	0.127
57.2127	-489.14	57.21274	3858.80	57.21	0.127
57.2967	-490.11	57.29666	3864.97	57.30	0.127
58.417	-500.20	58.41701	3948.68	58.42	0.127
59.2994	-513.81	59.29945	4008.63	59.30	0.128
59.4603	-515.18	59.46035	4021.65	59.46	0.128
60.4284	-518.63	60.42844	4113.94	60.43	0.126
60.6859	-518.09	60.68588	4132.11	60.69	0.125
61.7053	-529.50	61.70533	4204.87	61.71	0.126
62.687	-536.93	62.68702	4280.82	62.69	0.125
63.6736	-544.03	63.67357	4357.55	63.67	0.125
64.6883	-551.25	64.68829	4434.96	64.69	0.124
65.7007	-558.34	65.70074	4513.35	65.70	0.124
66.7096	-565.12	66.70955	4591.55	66.71	0.123
67.7136	-571.66	67.71356	4669.40	67.71	0.122
68.7151	-578.11	68.71508	4746.94	68.72	0.122
69.7154	-584.46	69.71542	4824.26	69.72	0.121
70.7157	-590.75	70.7157	4901.38	70.72	0.121
71.7159	-597.01	71.7159	4978.36	71.72	0.120
72.716	-603.22	72.71603	5055.22	72.72	0.119
73.7161	-609.40	73.71609	5131.96	73.72	0.119
74.7161	-615.55	74.71609	5208.59	74.72	0.118
75.716	-615.57	75.71603	5216.24	75.72	0.118



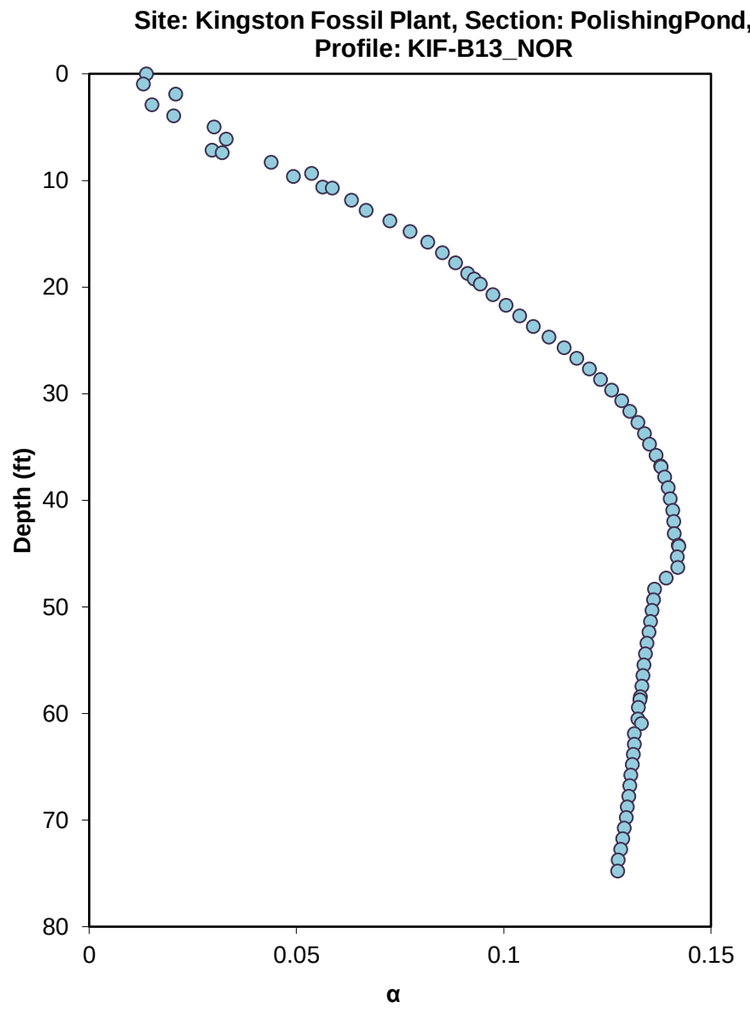
Site: Kingston Fossil Plant
Section: PolishingPond
Profile: KIF-B2_NOR

From GeoStudio					
Depth (ft)	XY-Shear Stress (psf)	Depth (ft)	Vertical Effective Stress (psf)	Depth (ft)	Alpha
0.00	9.69	0.00	151.12	0.00	0.064
1.19	9.49	1.19	184.19	1.19	0.052
2.00	6.08	2.00	221.61	2.00	0.027
2.63	16.11	2.63	248.36	2.63	0.065
3.58	11.27	3.58	294.74	3.58	0.038
4.16	10.91	4.16	320.02	4.16	0.034
4.71	12.23	4.71	347.64	4.71	0.035
5.16	13.10	5.16	372.82	5.16	0.035
6.22	13.33	6.22	430.68	6.22	0.031
6.42	12.50	6.42	441.39	6.42	0.028
7.44	7.46	7.44	496.01	7.44	0.015
8.23	2.24	8.23	544.56	8.23	0.004
8.67	-1.27	8.67	571.81	8.67	0.002
9.90	-8.03	9.90	656.09	9.90	0.012
10.04	-8.88	10.04	665.98	10.04	0.013
11.11	-15.77	11.11	739.76	11.11	0.021
11.86	-20.51	11.86	791.31	11.86	0.026
12.32	-23.25	12.32	823.15	12.32	0.028
13.52	-29.98	13.52	905.13	13.52	0.033
13.70	-31.16	13.70	917.48	13.70	0.034
14.72	-37.44	14.72	988.32	14.72	0.038
15.45	-41.87	15.45	1033.53	15.45	0.041
15.87	-44.60	15.87	1061.53	15.87	0.042
16.81	-51.93	16.81	1143.02	16.81	0.045
16.95	-52.35	16.95	1154.30	16.95	0.045
17.59	-54.87	17.59	1193.16	17.59	0.046
18.53	-69.30	18.53	1238.92	18.53	0.056
19.52	-78.53	19.52	1305.04	19.52	0.060
20.57	-88.87	20.57	1373.41	20.57	0.065
21.10	-94.41	21.10	1408.24	21.10	0.067
21.66	-100.36	21.66	1445.10	21.66	0.069
22.77	-112.41	22.77	1516.38	22.77	0.074
23.90	-126.19	23.90	1583.98	23.90	0.080
24.50	-133.80	24.50	1622.82	24.50	0.082
25.10	-142.22	25.10	1668.54	25.10	0.085
25.50	-144.56	25.50	1698.17	25.50	0.085
26.45	-156.82	26.45	1754.38	26.45	0.089
27.48	-169.62	27.48	1817.24	27.48	0.093
28.50	-181.93	28.50	1881.51	28.50	0.097
29.50	-194.41	29.50	1946.02	29.50	0.100
30.53	-207.42	30.53	2010.49	30.53	0.103
31.55	-220.65	31.55	2074.99	31.55	0.106
32.55	-233.43	32.55	2138.90	32.55	0.109
33.55	-245.66	33.55	2202.25	33.55	0.112
34.55	-258.37	34.55	2265.80	34.55	0.114
34.56	-258.55	34.56	2266.70	34.56	0.114
35.55	-271.21	35.55	2329.65	35.55	0.116
36.56	-283.92	36.56	2393.38	36.56	0.119
37.57	-296.63	37.57	2457.11	37.57	0.121
38.58	-309.30	38.58	2520.82	38.58	0.123
39.59	-322.15	39.59	2585.38	39.59	0.125
40.59	-334.91	40.59	2652.81	40.59	0.126
41.61	-347.22	41.61	2720.32	41.61	0.128
42.59	-359.68	42.59	2789.02	42.59	0.129
43.64	-373.40	43.64	2865.50	43.64	0.130
44.32	-383.44	44.32	2911.08	44.32	0.132
44.59	-386.67	44.59	2927.90	44.59	0.132
45.51	-396.19	45.51	2987.74	45.51	0.133
46.48	-406.99	46.48	3053.41	46.48	0.133
47.46	-407.41	47.46	3121.61	47.46	0.131
48.47	-408.53	48.47	3194.18	48.47	0.128
49.48	-419.75	49.48	3269.98	49.48	0.128
50.51	-431.03	50.51	3347.05	50.51	0.129
51.55	-442.51	51.55	3426.95	51.55	0.129
52.65	-454.21	52.65	3509.50	52.65	0.129
53.76	-466.80	53.76	3595.22	53.76	0.130
54.88	-475.94	54.88	3680.96	54.88	0.129
56.11	-480.39	56.11	3774.35	56.11	0.127
57.2127	-489.14	57.21274	3858.80	57.21	0.127
57.2967	-490.11	57.29666	3864.97	57.30	0.127
58.417	-500.20	58.41701	3948.68	58.42	0.127
59.2994	-513.81	59.29945	4008.63	59.30	0.128
59.4603	-515.18	59.46035	4021.65	59.46	0.128
60.4284	-518.63	60.42844	4113.94	60.43	0.126
60.6859	-518.09	60.68588	4132.11	60.69	0.125
61.7053	-529.50	61.70533	4204.87	61.71	0.126
62.687	-536.93	62.68702	4280.82	62.69	0.125
63.6736	-544.03	63.67357	4357.55	63.67	0.125
64.6883	-551.25	64.68829	4434.96	64.69	0.124
65.7007	-558.34	65.70074	4513.35	65.70	0.124
66.7096	-565.12	66.70955	4591.55	66.71	0.123
67.7136	-571.66	67.71356	4669.40	67.71	0.122
68.7151	-578.11	68.71508	4746.94	68.72	0.122
69.7154	-584.46	69.71542	4824.26	69.72	0.121
70.7157	-590.75	70.7157	4901.38	70.72	0.121
71.7159	-597.01	71.7159	4978.36	71.72	0.120
72.716	-603.22	72.71603	5055.22	72.72	0.119
73.7161	-609.40	73.71609	5131.96	73.72	0.119
74.7161	-615.55	74.71609	5208.59	74.72	0.118
75.716	-615.57	75.71603	5216.24	75.72	0.118



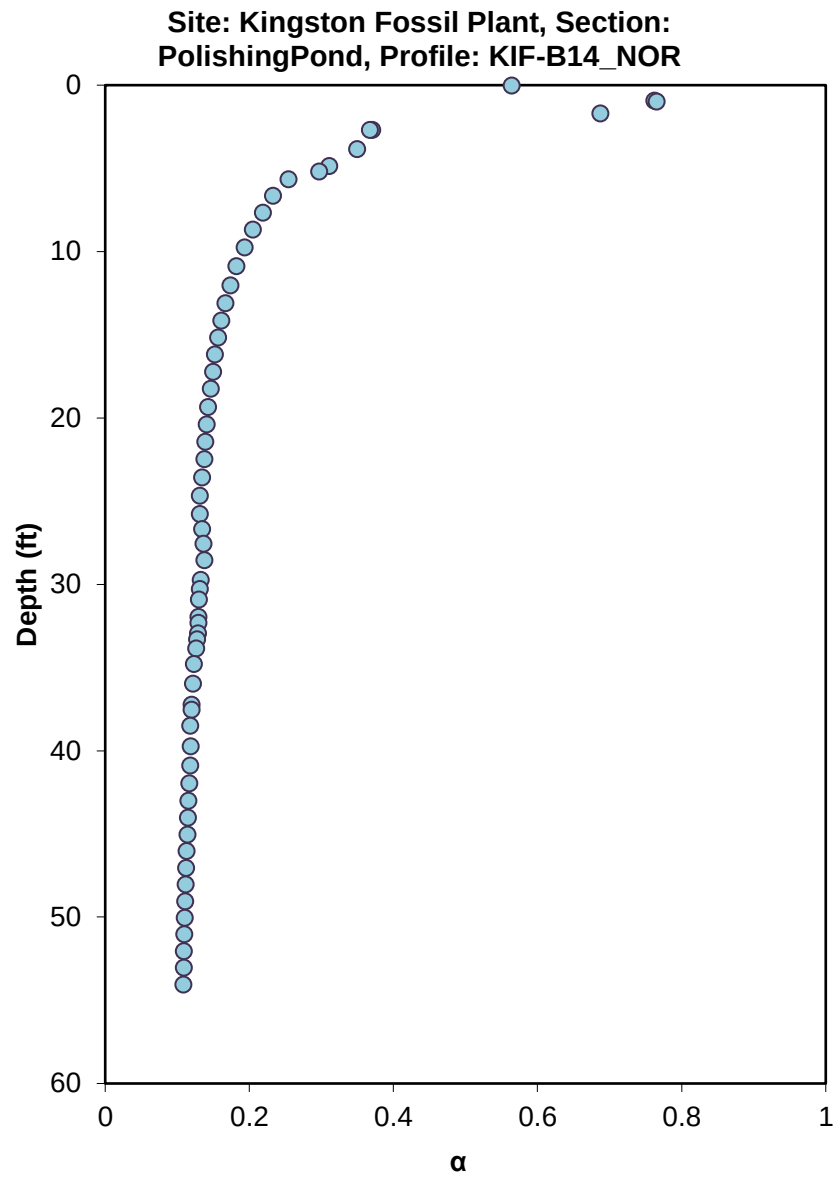
Site: Kingston Fossil Plant
Section: PolishingPond
Profile: KIF-B13_NOR

From GeoStudio					
Depth (ft)	XY-Shear Stress (psf)	Depth (ft)	Vertical Effective Stress (psf)	Depth (ft)	Alpha
0.00	-1.89	0.00	135.78	0.00	0.014
0.94	-2.10	0.94	159.29	0.94	0.013
1.88	-4.74	1.88	227.15	1.88	0.021
2.92	-4.18	2.92	275.14	2.92	0.015
3.95	-7.03	3.95	343.26	3.95	0.020
4.98	-12.33	4.98	408.38	4.98	0.030
6.11	-15.81	6.11	478.12	6.11	0.033
7.16	-16.08	7.16	540.46	7.16	0.030
7.39	-17.86	7.39	555.37	7.39	0.032
8.27	-27.15	8.27	618.10	8.27	0.044
9.33	-36.57	9.33	680.10	9.33	0.054
9.63	-34.89	9.63	706.51	9.63	0.049
10.61	-43.09	10.61	763.95	10.61	0.056
10.72	-45.33	10.72	771.89	10.72	0.059
11.86	-54.00	11.86	853.25	11.86	0.063
12.81	-60.85	12.81	910.86	12.81	0.067
13.77	-70.19	13.77	967.65	13.77	0.073
14.77	-79.77	14.77	1029.06	14.77	0.078
15.76	-89.11	15.76	1090.75	15.76	0.082
16.76	-98.18	16.76	1152.09	16.76	0.085
17.75	-107.28	17.75	1213.22	17.75	0.088
18.74	-116.45	18.74	1274.37	18.74	0.091
19.24	-121.33	19.24	1305.48	19.24	0.093
19.73	-126.09	19.73	1335.77	19.73	0.094
20.73	-136.24	20.73	1397.37	20.73	0.098
21.72	-146.89	21.72	1459.08	21.72	0.101
22.71	-158.02	22.71	1520.80	22.71	0.104
23.70	-169.56	23.70	1582.50	23.70	0.107
24.69	-182.39	24.69	1643.95	24.69	0.111
25.68	-195.48	25.68	1704.82	25.68	0.115
26.67	-207.83	26.67	1765.32	26.67	0.118
27.66	-220.30	27.66	1825.75	27.66	0.121
28.66	-232.78	28.66	1886.17	28.66	0.123
29.65	-245.48	29.65	1946.89	29.65	0.126
30.66	-257.97	30.66	2008.15	30.66	0.128
31.68	-270.23	31.68	2070.25	31.68	0.131
32.71	-282.40	32.71	2133.06	32.71	0.132
33.73	-294.35	33.73	2196.31	33.73	0.134
34.76	-305.60	34.76	2259.61	34.76	0.135
35.77	-317.72	35.77	2322.64	35.77	0.137
36.79	-329.09	36.79	2385.77	36.79	0.138
36.84	-329.73	36.84	2389.42	36.84	0.138
37.80	-340.23	37.80	2449.32	37.80	0.139
38.82	-351.26	38.82	2513.26	38.82	0.140
39.83	-361.88	39.83	2580.39	39.83	0.140
40.92	-373.58	40.92	2651.62	40.92	0.141
42.00	-384.84	42.00	2727.40	42.00	0.141
43.15	-396.92	43.15	2812.29	43.15	0.141
44.22	-409.78	44.22	2881.21	44.22	0.142
44.30	-410.51	44.30	2885.85	44.30	0.142
45.29	-419.07	45.29	2953.05	45.29	0.142
46.30	-429.23	46.30	3021.68	46.30	0.142
47.30	-430.83	47.30	3093.12	47.30	0.139
48.31	-432.43	48.31	3168.70	48.31	0.136
49.32	-442.05	49.32	3246.96	49.32	0.136
50.34	-451.59	50.34	3325.04	50.34	0.136
51.35	-460.93	51.35	3402.98	51.35	0.135
52.36	-470.06	52.36	3480.75	52.36	0.135
53.38	-479.11	53.38	3558.54	53.38	0.135
54.40	-488.08	54.40	3636.27	54.40	0.134
55.42	-497.21	55.42	3714.38	55.42	0.134
56.44	-506.52	56.44	3790.34	56.44	0.134
57.42	-515.73	57.42	3866.08	57.42	0.133
58.41	-524.10	58.41	3939.14	58.41	0.133
58.70	-526.32	58.70	3960.42	58.70	0.133
59.43	-531.97	59.43	4014.46	59.43	0.133
60.49	-542.22	60.49	4095.83	60.49	0.132
60.92	-553.07	60.92	4149.12	60.92	0.133
61.9036	-553.44	61.90365	4207.56	61.90	0.132
62.8616	-562.23	62.86157	4275.26	62.86	0.132
63.8055	-570.85	63.8055	4346.72	63.81	0.131
64.7748	-579.11	64.77483	4419.01	64.77	0.131
65.762	-587.47	65.76197	4492.48	65.76	0.131
66.7557	-595.92	66.75572	4566.53	66.76	0.130
67.7514	-604.35	67.75139	4640.88	67.75	0.130
68.7507	-612.57	68.75074	4715.35	68.75	0.130
69.7499	-620.56	69.74986	4789.91	69.75	0.130
70.7499	-628.28	70.74989	4864.46	70.75	0.129
71.75	-635.70	71.74999	4939.02	71.75	0.129
72.7501	-642.82	72.75007	5013.57	72.75	0.128
73.7501	-649.67	73.7501	5088.13	73.75	0.128
74.75	-649.81	74.75002	5095.73	74.75	0.128



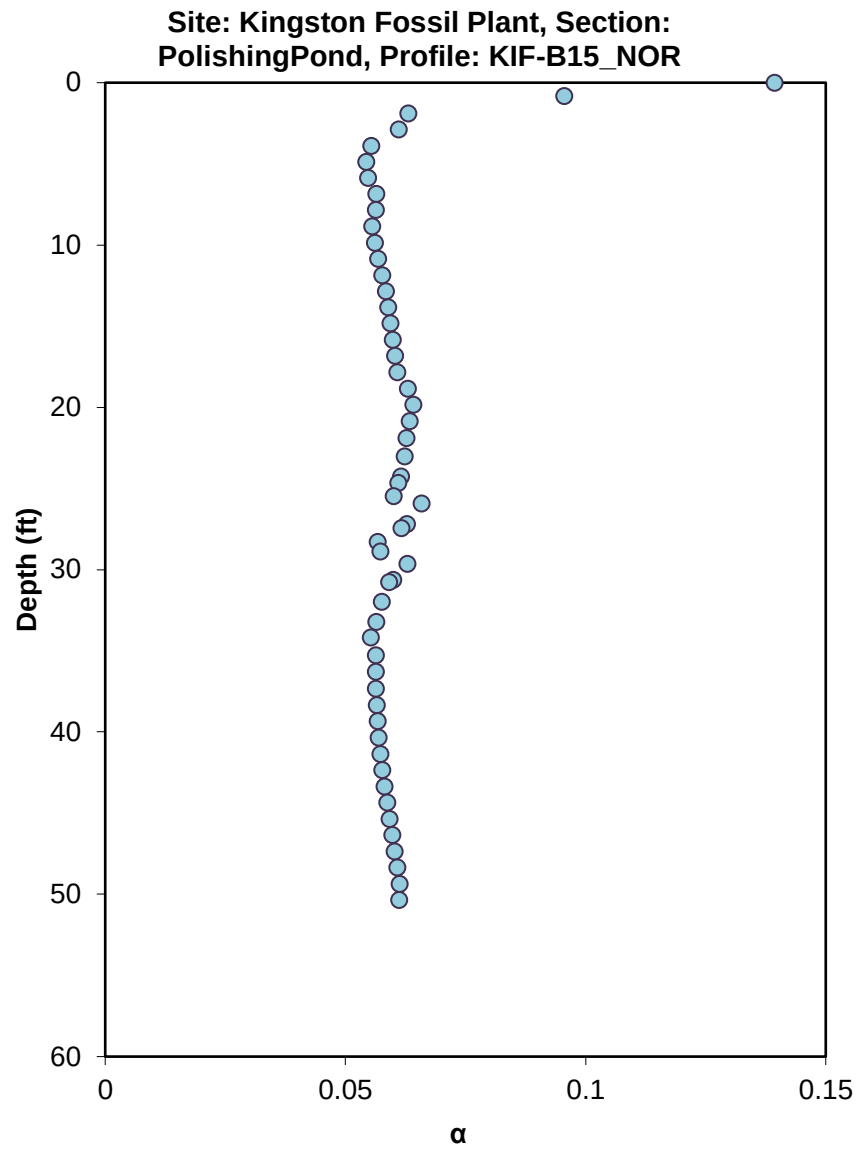
Site: Kingston Fossil Plant
Section: PolishingPond
Profile: KIF-B14_NOR

From GeoStudio					
Depth (ft)	XY-Shear Stress (psf)	Depth (ft)	Vertical Effective Stress (psf)	Depth (ft)	Alpha
0.00	-27.34	0.00	48.47	0.00	0.564
0.92	-45.95	0.92	60.34	0.92	0.762
0.95	-46.43	0.95	60.72	0.95	0.765
1.67	-52.22	1.67	76.00	1.67	0.687
2.65	-58.83	2.65	159.06	2.65	0.370
2.68	-59.10	2.68	160.98	2.68	0.367
3.83	-77.33	3.83	221.43	3.83	0.349
4.83	-87.60	4.83	282.18	4.83	0.310
5.16	-90.35	5.16	304.56	5.16	0.297
5.62	-87.45	5.62	343.99	5.62	0.254
6.63	-92.96	6.63	399.99	6.63	0.232
7.63	-102.77	7.63	470.60	7.63	0.218
8.65	-111.04	8.65	542.15	8.65	0.205
9.73	-119.31	9.73	618.38	9.73	0.193
10.86	-126.63	10.86	697.14	10.86	0.182
12.01	-134.51	12.01	775.67	12.01	0.173
13.08	-141.88	13.08	853.81	13.08	0.166
14.14	-148.84	14.14	927.33	14.14	0.161
15.13	-156.45	15.13	1001.85	15.13	0.156
16.16	-164.23	16.16	1080.37	16.16	0.152
17.21	-173.09	17.21	1160.20	17.21	0.149
18.23	-181.80	18.23	1243.42	18.23	0.146
19.32	-188.60	19.32	1324.32	19.32	0.142
20.38	-197.31	20.38	1407.62	20.38	0.140
21.42	-205.89	21.42	1489.46	21.42	0.138
22.45	-215.61	22.45	1573.70	22.45	0.137
23.56	-223.97	23.56	1666.84	23.56	0.134
24.64	-231.17	24.64	1763.02	24.64	0.131
25.75	-241.53	25.75	1848.35	25.75	0.131
26.67	-262.00	26.67	1957.78	26.67	0.134
27.53	-273.17	27.53	2009.86	27.53	0.136
28.53	-287.50	28.53	2094.73	28.53	0.137
29.70	-290.88	29.70	2195.95	29.70	0.132
30.26	-294.02	30.26	2244.30	30.26	0.131
30.90	-296.78	30.90	2292.45	30.90	0.129
31.94	-306.95	31.94	2377.99	31.94	0.129
32.28	-309.75	32.28	2405.80	32.28	0.129
32.92	-315.66	32.92	2455.16	32.92	0.129
33.28	-316.84	33.28	2493.55	33.28	0.127
33.83	-320.14	33.83	2548.72	33.83	0.126
34.77	-322.93	34.77	2626.35	34.77	0.123
35.95	-329.07	35.95	2717.00	35.95	0.121
37.20	-337.88	37.20	2824.08	37.20	0.120
37.51	-340.14	37.51	2853.97	37.51	0.119
38.48	-346.43	38.48	2946.92	38.48	0.118
39.70	-360.08	39.70	3045.06	39.70	0.118
40.86	-368.39	40.86	3134.21	40.86	0.118
41.93	-375.40	41.93	3228.38	41.93	0.116
42.97	-382.39	42.97	3317.18	42.97	0.115
44.00	-389.46	44.00	3403.74	44.00	0.114
45.01	-396.32	45.01	3488.99	45.01	0.114
46.02	-403.04	46.02	3573.40	46.02	0.113
47.02	-409.72	47.02	3657.39	47.02	0.112
48.02	-416.38	48.02	3741.15	48.02	0.111
49.02	-423.08	49.02	3824.81	49.02	0.111
50.02	-429.88	50.02	3908.46	50.02	0.110
51.02	-436.83	51.02	3992.12	51.02	0.109
52.02	-443.98	52.02	4075.85	52.02	0.109
53.02	-451.37	53.02	4159.71	53.02	0.109
54.02	-451.23	54.02	4167.22	54.02	0.108



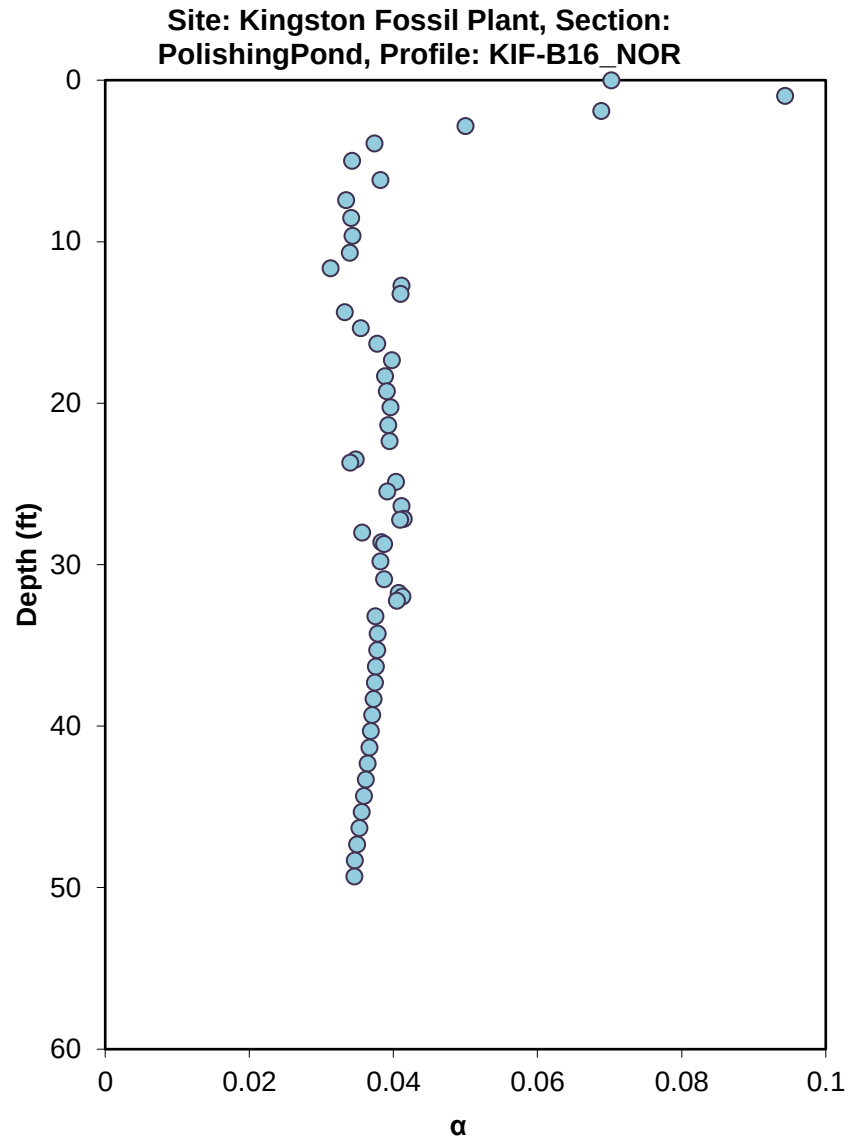
Site: Kingston Fossil Plant
Section: PolishingPond
Profile: KIF-B15_NOR

From GeoStudio					
Depth (ft)	XY-Shear Stress (psf)	Depth (ft)	Vertical Effective Stress (psf)	Depth (ft)	Alpha
0.00	-5.94	0.00	42.64	0.00	0.139
0.81	-4.53	0.81	47.40	0.81	0.096
1.86	-5.92	1.86	93.93	1.86	0.063
2.87	-9.10	2.87	149.21	2.87	0.061
3.87	-11.55	3.87	208.65	3.87	0.055
4.86	-14.85	4.86	273.46	4.86	0.054
5.85	-18.48	5.85	337.99	5.85	0.055
6.83	-22.68	6.83	402.54	6.83	0.056
7.83	-26.37	7.83	468.26	7.83	0.056
8.83	-29.66	8.83	534.26	8.83	0.056
9.84	-33.67	9.84	600.53	9.84	0.056
10.83	-37.85	10.83	667.23	10.83	0.057
11.84	-42.31	11.84	734.57	11.84	0.058
12.83	-46.95	12.83	804.72	12.83	0.058
13.82	-51.57	13.82	875.65	13.82	0.059
14.81	-56.15	14.81	947.02	14.81	0.059
15.82	-60.91	15.82	1019.16	15.82	0.060
16.82	-65.84	16.82	1092.10	16.82	0.060
17.82	-70.82	17.82	1166.08	17.82	0.061
18.83	-78.03	18.83	1240.52	18.83	0.063
19.83	-84.55	19.83	1318.83	19.83	0.064
20.84	-88.58	20.84	1399.02	20.84	0.063
21.88	-92.96	21.88	1482.80	21.88	0.063
22.99	-97.98	22.99	1572.89	22.99	0.062
24.24	-103.40	24.24	1681.84	24.24	0.061
24.63	-104.41	24.63	1712.21	24.63	0.061
25.44	-106.25	25.44	1770.21	25.44	0.060
25.90	-119.31	25.90	1813.83	25.90	0.066
27.16	-119.78	27.16	1909.28	27.16	0.063
27.42	-118.82	27.42	1929.93	27.42	0.062
28.28	-113.29	28.28	1999.16	28.28	0.057
28.86	-116.88	28.86	2042.47	28.86	0.057
29.62	-131.94	29.62	2100.23	29.62	0.063
30.60	-130.92	30.60	2186.85	30.60	0.060
30.74	-129.93	30.74	2199.45	30.74	0.059
31.97	-132.12	31.97	2297.36	31.97	0.058
33.20	-135.30	33.20	2399.79	33.20	0.056
34.17	-136.74	34.17	2473.85	34.17	0.055
35.25	-143.92	35.25	2556.95	35.25	0.056
36.28	-148.80	36.28	2643.96	36.28	0.056
37.30	-153.60	37.30	2728.18	37.30	0.056
38.32	-158.72	38.32	2812.06	38.32	0.056
39.32	-163.97	39.32	2895.62	39.32	0.057
40.33	-169.45	40.33	2979.14	40.33	0.057
41.33	-175.26	41.33	3062.85	41.33	0.057
42.33	-181.38	42.33	3146.84	42.33	0.058
43.33	-187.76	43.33	3231.14	43.33	0.058
44.33	-194.36	44.33	3315.78	44.33	0.059
45.33	-201.14	45.33	3400.75	45.33	0.059
46.33	-208.06	46.33	3486.01	46.33	0.060
47.33	-215.08	47.33	3571.52	47.33	0.060
48.33	-222.17	48.33	3657.26	48.33	0.061
49.33	-229.29	49.33	3743.19	49.33	0.061
50.33	-229.29	50.33	3750.70	50.33	0.061



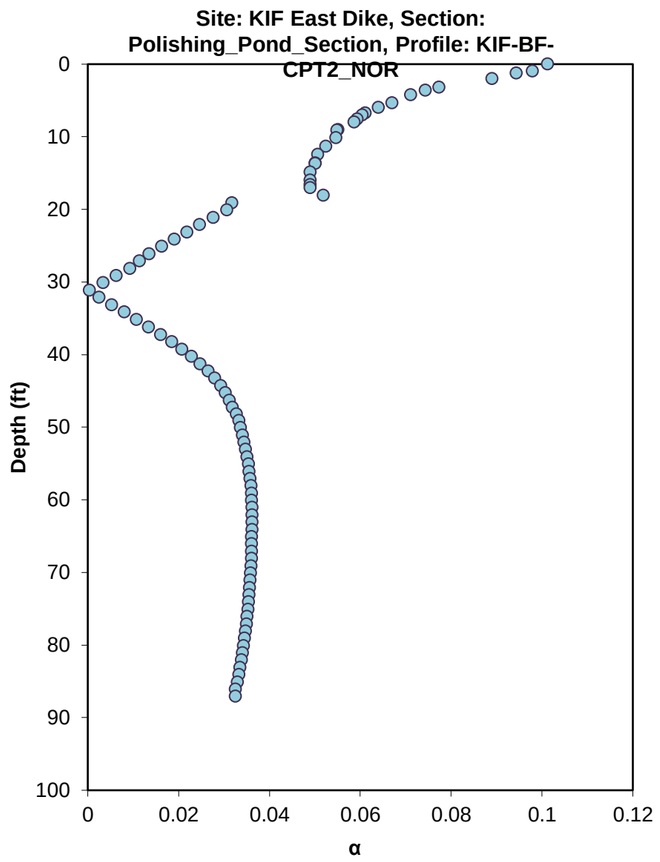
Site: Kingston Fossil Plant
Section: PolishingPond
Profile: KIF-B16_NOR

From GeoStudio					
Depth (ft)	XY-Shear Stress (psf)	Depth (ft)	Vertical Effective Stress (psf)	Depth (ft)	Alpha
0.00	-3.44	0.00	49.01	0.00	0.070
0.95	-4.47	0.95	47.44	0.95	0.094
1.90	-6.55	1.90	95.21	1.90	0.069
2.81	-7.57	2.81	151.37	2.81	0.050
3.89	-7.96	3.89	213.19	3.89	0.037
4.99	-9.76	4.99	285.25	4.99	0.034
6.16	-13.77	6.16	361.06	6.16	0.038
7.40	-14.60	7.40	437.27	7.40	0.033
8.51	-17.48	8.51	512.62	8.51	0.034
9.61	-20.03	9.61	583.92	9.61	0.034
10.65	-22.21	10.65	655.38	10.65	0.034
11.63	-22.67	11.63	725.17	11.63	0.031
12.70	-32.71	12.70	796.81	12.70	0.041
13.21	-34.41	13.21	840.58	13.21	0.041
14.35	-30.29	14.35	912.20	14.35	0.033
15.34	-34.84	15.34	982.61	15.34	0.035
16.31	-39.76	16.31	1054.26	16.31	0.038
17.32	-44.92	17.32	1130.00	17.32	0.040
18.30	-46.80	18.30	1207.36	18.30	0.039
19.23	-49.96	19.23	1279.32	19.23	0.039
20.23	-53.62	20.23	1356.37	20.23	0.040
21.33	-56.81	21.33	1446.82	21.33	0.039
22.34	-60.40	22.34	1531.72	22.34	0.039
23.46	-56.03	23.46	1614.36	23.46	0.035
23.65	-55.30	23.65	1629.27	23.65	0.034
24.84	-69.50	24.84	1724.13	24.84	0.040
25.45	-70.19	25.45	1795.99	25.45	0.039
26.35	-75.30	26.35	1832.97	26.35	0.041
27.14	-79.25	27.14	1914.54	27.14	0.041
27.21	-78.52	27.21	1919.23	27.21	0.041
28.00	-70.26	28.00	1971.87	28.00	0.036
28.58	-77.03	28.58	2013.84	28.58	0.038
28.69	-78.22	28.69	2022.32	28.69	0.039
29.77	-80.61	29.77	2113.90	29.77	0.038
30.87	-85.22	30.87	2203.42	30.87	0.039
31.74	-92.70	31.74	2276.68	31.74	0.041
31.96	-94.53	31.96	2295.42	31.96	0.041
32.20	-93.55	32.20	2312.76	32.20	0.040
33.18	-89.31	33.18	2385.95	33.18	0.037
34.24	-93.43	34.24	2471.93	34.24	0.038
35.26	-96.23	35.26	2553.69	35.26	0.038
36.27	-98.87	36.27	2634.55	36.27	0.038
37.29	-101.46	37.29	2714.58	37.29	0.037
38.29	-103.98	38.29	2794.71	38.29	0.037
39.29	-106.44	39.29	2874.63	39.29	0.037
40.29	-108.83	40.29	2954.52	40.29	0.037
41.29	-111.15	41.29	3034.43	41.29	0.037
42.29	-113.36	42.29	3114.36	42.29	0.036
43.29	-115.45	43.29	3194.31	43.29	0.036
44.29	-117.42	44.29	3274.30	44.29	0.036
45.29	-119.28	45.29	3354.34	45.29	0.036
46.29	-121.04	46.29	3434.44	46.29	0.035
47.29	-122.72	47.29	3514.63	47.29	0.035
48.29	-124.33	48.29	3594.92	48.29	0.035
49.29	-124.40	49.29	3602.53	49.29	0.035



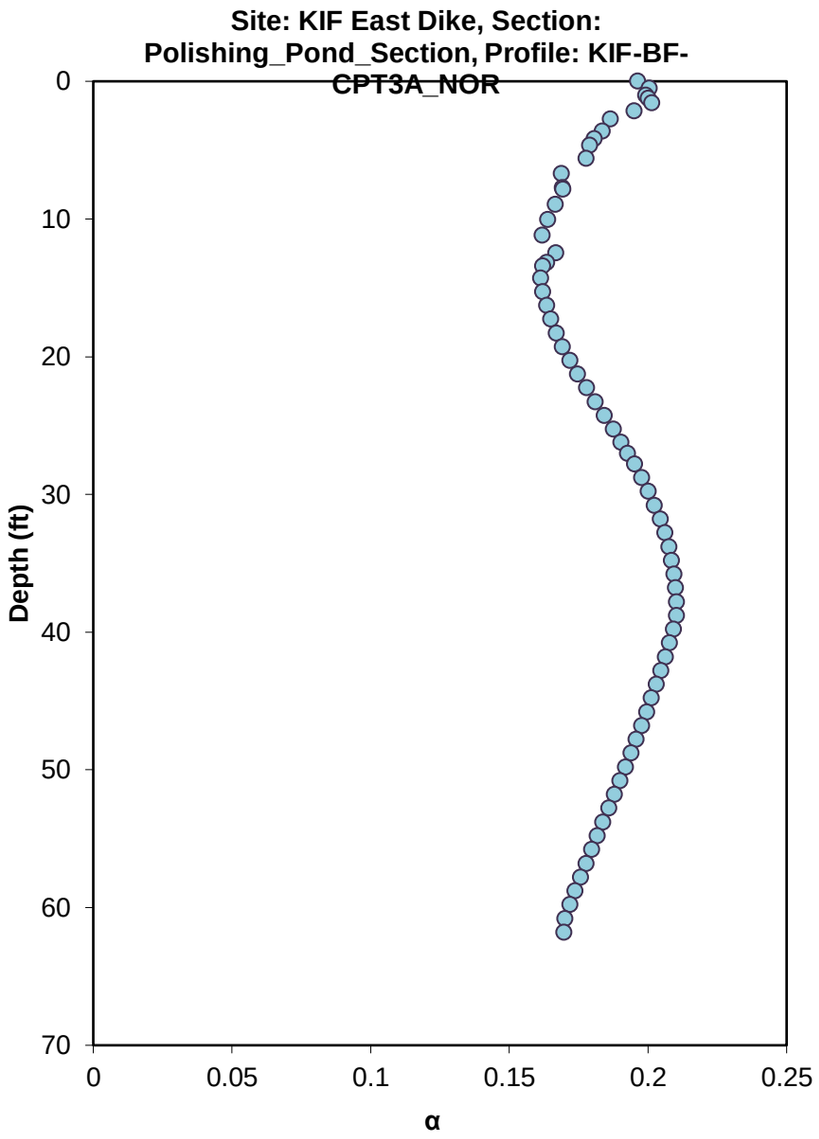
Site: KIF East Dike
Section: Polishing_Pond_Section
Profile: KIF-BF-CPT2_NOR

From GeoStudio					
Depth (ft)	XY-Shear Stress (psf)	Depth (ft)	Vertical Effective Stress (psf)	Depth (ft)	Alpha
0.00	37.67	0.00	372.19	0.00	0.101
1.00	40.45	1.00	413.40	1.00	0.098
1.21	41.08	1.21	435.68	1.21	0.094
2.03	46.34	2.03	520.75	2.03	0.089
3.17	50.42	3.17	652.17	3.17	0.077
3.63	52.28	3.63	703.01	3.63	0.074
4.25	54.88	4.25	772.13	4.25	0.071
5.34	59.81	5.34	892.59	5.34	0.067
5.99	61.81	5.99	966.10	5.99	0.064
6.71	64.25	6.71	1051.14	6.71	0.061
7.01	65.58	7.01	1086.28	7.01	0.060
7.55	68.20	7.55	1149.43	7.55	0.059
7.99	70.51	7.99	1201.65	7.99	0.059
9.02	71.56	9.02	1300.64	9.02	0.055
9.08	71.63	9.08	1305.87	9.08	0.055
10.12	78.13	10.12	1430.66	10.12	0.055
11.31	82.20	11.31	1568.68	11.31	0.052
12.46	85.83	12.46	1696.63	12.46	0.051
13.65	91.79	13.65	1832.40	13.65	0.050
13.68	91.91	13.68	1835.50	13.68	0.050
14.88	93.22	14.88	1903.95	14.88	0.049
15.99	95.79	15.99	1958.54	15.99	0.049
16.63	97.45	16.63	1991.14	16.63	0.049
17.05	98.58	17.05	2012.57	17.05	0.049
18.07	106.69	18.07	2056.26	18.07	0.052
19.09	67.96	19.09	2144.62	19.09	0.032
20.11	67.28	20.11	2194.16	20.11	0.031
21.12	62.14	21.12	2249.10	21.12	0.028
22.12	56.77	22.12	2304.14	22.12	0.025
23.12	51.39	23.12	2359.54	23.12	0.022
24.12	45.94	24.12	2415.22	24.12	0.019
25.12	40.26	25.12	2471.05	25.12	0.016
26.13	34.14	26.13	2526.99	26.13	0.014
27.13	29.36	27.13	2581.49	27.13	0.011
28.13	24.28	28.13	2632.41	28.13	0.009
29.13	16.92	29.13	2681.86	29.13	0.006
30.13	9.17	30.13	2731.52	30.13	0.003
31.13	1.16	31.13	2781.33	31.13	0.000
32.14	-7.03	32.14	2831.18	32.14	0.002
33.14	-15.18	33.14	2881.53	33.14	0.005
34.16	-23.62	34.16	2932.48	34.16	0.008
35.21	-31.92	35.21	2982.96	35.21	0.011
36.24	-40.74	36.24	3034.35	36.24	0.013
37.26	-49.44	37.26	3085.35	37.26	0.016
38.28	-57.85	38.28	3135.73	38.28	0.018
39.28	-65.96	39.28	3185.53	39.28	0.021
40.28	-73.83	40.28	3234.93	40.28	0.023
41.28	-81.35	41.28	3283.95	41.28	0.025
42.28	-88.42	42.28	3336.33	42.28	0.027
43.28	-95.04	43.28	3395.77	43.28	0.028
44.28	-101.13	44.28	3458.44	44.28	0.029
45.28	-106.68	45.28	3520.57	45.28	0.030
46.28	-111.71	46.28	3582.17	46.28	0.031
47.28	-115.69	47.28	3640.03	47.28	0.032
48.19	-121.15	48.19	3699.11	48.19	0.033
49.10	-125.03	49.10	3756.46	49.10	0.033
50.09	-128.00	50.09	3813.59	50.09	0.034
51.09	-131.72	51.09	3873.17	51.09	0.034
52.09	-135.31	52.09	3932.67	52.09	0.034
53.09	-138.80	53.09	3992.17	53.09	0.035
54.09	-142.18	54.09	4052.84	54.09	0.035
55.09	-145.45	55.09	4115.94	55.09	0.035
56.09	-148.62	56.09	4180.27	56.09	0.036
57.09	-151.70	57.09	4244.58	57.09	0.036
58.09	-154.67	58.09	4308.88	58.09	0.036
59.09	-157.51	59.09	4373.18	59.09	0.036
60.09	-160.24	60.09	4437.47	60.09	0.036
61.09	-162.82	61.09	4501.75	61.09	0.036
62.0883	-165.25	62.08829	4566.01	62.09	0.036
63.0883	-167.53	63.08829	4630.23	63.09	0.036
64.0883	-169.66	64.08829	4694.40	64.09	0.036
65.0883	-171.77	65.08829	4761.28	65.09	0.036
66.0883	-174.27	66.08829	4830.68	66.09	0.036
67.0883	-176.79	67.08829	4902.81	67.09	0.036
68.0883	-179.19	68.08829	4974.97	68.09	0.036
69.0883	-181.49	69.08829	5047.15	69.09	0.036
70.0883	-183.67	70.08829	5119.38	70.09	0.036
71.0883	-185.76	71.08829	5191.68	71.09	0.036
72.0883	-187.75	72.08829	5264.06	72.09	0.036
73.0883	-189.65	73.08829	5336.54	73.09	0.036
74.0883	-191.47	74.08829	5409.13	74.09	0.035
75.0883	-193.20	75.08829	5481.81	75.09	0.035
76.0883	-194.85	76.08829	5554.58	76.09	0.035
77.0883	-196.42	77.08829	5627.42	77.09	0.035
78.0883	-197.91	78.08829	5700.33	78.09	0.035
79.0883	-199.31	79.08829	5773.29	79.09	0.035
80.0883	-200.59	80.08829	5846.29	80.09	0.034
81.0883	-201.74	81.08829	5919.31	81.09	0.034
82.0883	-202.72	82.08829	5992.36	82.09	0.034
83.0883	-203.49	83.08829	6065.40	83.09	0.034
84.0883	-204.04	84.08829	6138.42	84.09	0.033
85.0883	-204.35	85.08829	6211.39	85.09	0.033
86.0883	-204.40	86.08829	6284.27	86.09	0.033
87.0883	-204.53	87.08829	6291.92	87.09	0.033



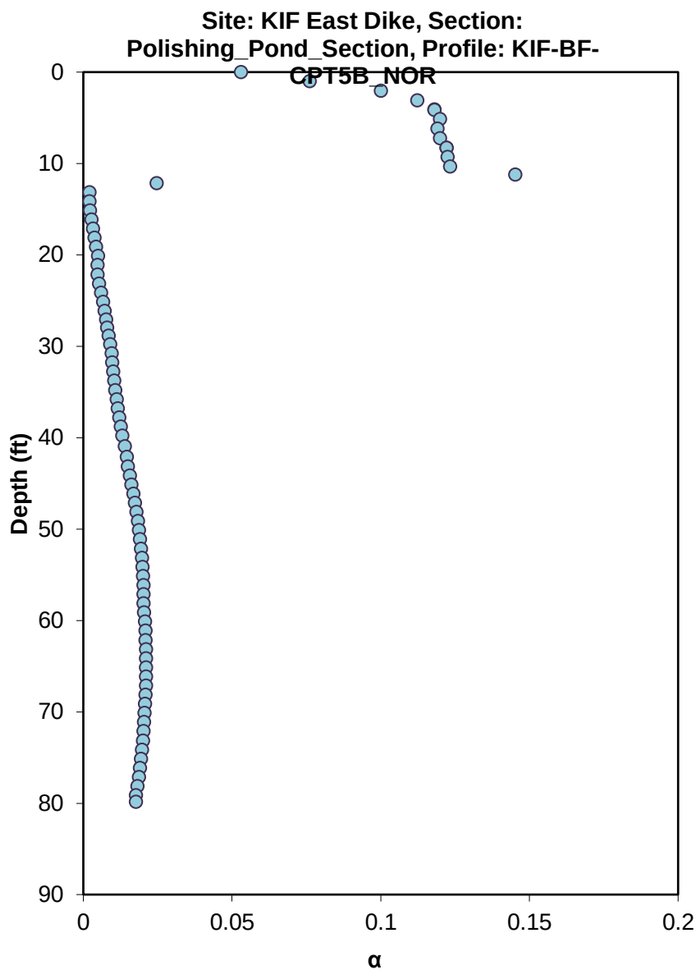
Site: KIF East Dike
Section: Polishing_Pond_Section
Profile: KIF-BF-CPT3A_NOR

From GeoStudio					
Depth (ft)	XY-Shear Stress (psf)	Depth (ft)	Vertical Effective Stress (psf)	Depth (ft)	Alpha
0.00	-66.26	0.00	337.68	0.00	0.196
0.52	-66.93	0.52	333.85	0.52	0.200
1.03	-72.33	1.03	363.33	1.03	0.199
1.25	-75.49	1.25	377.37	1.25	0.200
1.55	-79.99	1.55	397.29	1.55	0.201
2.14	-84.85	2.14	435.12	2.14	0.195
2.73	-90.30	2.73	484.33	2.73	0.186
3.61	-98.70	3.61	538.08	3.61	0.183
4.17	-103.15	4.17	571.32	4.17	0.181
4.63	-107.02	4.63	598.38	4.63	0.179
5.61	-117.44	5.61	661.27	5.61	0.178
6.71	-124.02	6.71	734.96	6.71	0.169
7.74	-135.35	7.74	800.29	7.74	0.169
7.84	-136.49	7.84	806.38	7.84	0.169
8.94	-146.35	8.94	878.94	8.94	0.167
10.06	-155.52	10.06	949.55	10.06	0.164
11.17	-165.82	11.17	1025.43	11.17	0.162
12.46	-184.44	12.46	1105.88	12.46	0.167
13.15	-188.59	13.15	1153.51	13.15	0.163
13.40	-189.82	13.40	1171.86	13.40	0.162
14.29	-197.62	14.29	1225.51	14.29	0.161
15.27	-208.34	15.27	1286.38	15.27	0.162
16.27	-220.82	16.27	1351.20	16.27	0.163
17.27	-233.77	17.27	1417.18	17.27	0.165
18.27	-247.55	18.27	1483.70	18.27	0.167
19.27	-262.29	19.27	1550.92	19.27	0.169
20.27	-278.00	20.27	1618.67	20.27	0.172
21.27	-294.54	21.27	1686.65	21.27	0.175
22.27	-311.86	22.27	1754.48	22.27	0.178
23.26	-329.84	23.26	1822.38	23.26	0.181
24.26	-348.36	24.26	1890.59	24.26	0.184
25.26	-366.98	25.26	1958.02	25.26	0.187
26.22	-383.91	26.22	2019.29	26.22	0.190
27.02	-400.44	27.02	2079.71	27.02	0.193
27.81	-418.03	27.81	2141.48	27.81	0.195
28.79	-435.39	28.79	2203.16	28.79	0.198
29.79	-454.39	29.79	2271.53	29.79	0.200
30.79	-473.41	30.79	2340.33	30.79	0.202
31.79	-492.23	31.79	2408.87	31.79	0.204
32.79	-510.77	32.79	2478.29	32.79	0.206
33.79	-528.91	33.79	2549.72	33.79	0.207
34.79	-546.57	34.79	2621.81	34.79	0.208
35.79	-563.66	35.79	2693.23	35.79	0.209
36.79	-580.13	36.79	2763.94	36.79	0.210
37.79	-595.96	37.79	2833.90	37.79	0.210
38.79	-610.83	38.79	2905.30	38.79	0.210
39.79	-623.26	39.79	2979.61	39.79	0.209
40.79	-634.73	40.79	3055.43	40.79	0.208
41.79	-645.55	41.79	3130.63	41.79	0.206
42.79	-655.78	42.79	3205.29	42.79	0.205
43.79	-665.46	43.79	3279.46	43.79	0.203
44.79	-674.65	44.79	3353.24	44.79	0.201
45.79	-683.37	45.79	3426.72	45.79	0.199
46.79	-691.61	46.79	3500.01	46.79	0.198
47.79	-699.40	47.79	3573.21	47.79	0.196
48.79	-706.74	48.79	3646.40	48.79	0.194
49.79	-713.66	49.79	3719.65	49.79	0.192
50.79	-720.16	50.79	3793.01	50.79	0.190
51.79	-726.28	51.79	3866.54	51.79	0.188
52.79	-732.04	52.79	3940.27	52.79	0.186
53.79	-737.49	53.79	4014.22	53.79	0.184
54.79	-742.68	54.79	4088.39	54.79	0.182
55.79	-747.66	55.79	4162.80	55.79	0.180
56.79	-752.51	56.79	4237.44	56.79	0.178
57.79	-757.27	57.79	4312.29	57.79	0.176
58.79	-761.98	58.79	4387.29	58.79	0.174
59.79	-766.67	59.79	4462.41	59.79	0.172
60.79	-771.38	60.79	4537.58	60.79	0.170
61.79	-771.35	61.78996	4545.19	61.79	0.170



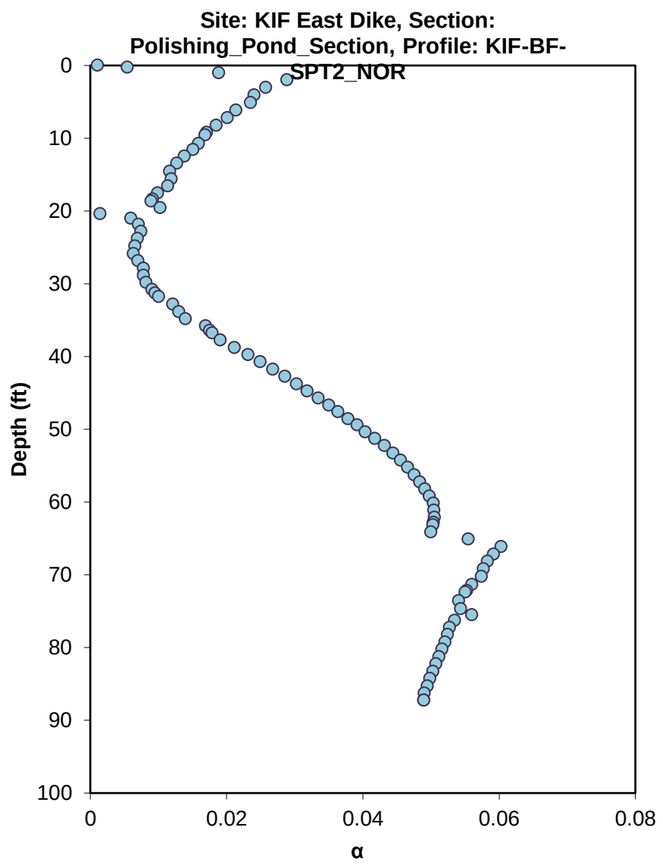
Site: KIF East Dike
Section: Polishing_Pond_Section
Profile: KIF-BF-CPT5B_NOR

From GeoStudio					
Depth (ft)	XY-Shear Stress (psf)	Depth (ft)	Vertical Effective Stress (psf)	Depth (ft)	Alpha
0.00	20.00	0.00	376.81	0.00	0.053
1.04	34.08	1.04	447.53	1.04	0.076
2.08	58.07	2.08	579.98	2.08	0.100
3.11	79.90	3.11	711.14	3.11	0.112
4.14	99.17	4.14	839.76	4.14	0.118
4.15	99.39	4.15	841.24	4.15	0.118
5.19	116.43	5.19	970.49	5.19	0.120
6.23	130.98	6.23	1099.37	6.23	0.119
7.27	143.20	7.27	1194.35	7.27	0.120
8.31	153.52	8.31	1256.80	8.31	0.122
8.34	153.70	8.34	1258.19	8.34	0.122
9.33	161.54	9.33	1318.74	9.33	0.122
10.35	169.84	10.35	1377.26	10.35	0.123
11.24	202.45	11.24	1393.03	11.24	0.145
12.17	-42.65	12.17	1732.83	12.17	0.025
13.15	-3.76	13.15	1750.83	13.15	0.002
14.15	-3.83	14.15	1808.83	14.15	0.002
15.16	-4.11	15.16	1868.00	15.16	0.002
16.16	-5.38	16.16	1926.44	16.16	0.003
17.16	-6.53	17.16	1985.42	17.16	0.003
18.16	-7.83	18.16	2044.59	18.16	0.004
19.16	-9.20	19.16	2104.23	19.16	0.004
20.16	-10.72	20.16	2164.32	20.16	0.005
21.16	-10.87	21.16	2223.08	21.16	0.005
22.16	-10.82	22.16	2278.24	22.16	0.005
23.17	-12.46	23.17	2331.56	23.17	0.005
24.17	-14.25	24.17	2384.50	24.17	0.006
25.16	-16.11	25.16	2437.09	25.16	0.007
26.16	-17.91	26.16	2487.72	26.16	0.007
27.11	-19.40	27.11	2536.35	27.11	0.008
27.99	-20.61	27.99	2584.80	27.99	0.008
28.90	-22.44	28.90	2632.35	28.90	0.009
29.83	-24.36	29.83	2681.09	29.83	0.009
30.82	-25.92	30.82	2730.69	30.82	0.009
31.82	-27.31	31.82	2781.96	31.82	0.010
32.82	-28.69	32.82	2833.20	32.82	0.010
33.82	-30.21	33.82	2884.49	33.82	0.010
34.82	-31.83	34.82	2939.47	34.82	0.011
35.82	-33.65	35.82	3001.86	35.82	0.011
36.82	-35.69	36.82	3067.89	36.82	0.012
37.82	-37.91	37.82	3133.79	37.82	0.012
38.82	-40.29	38.82	3200.41	38.82	0.013
39.84	-42.94	39.84	3271.44	39.84	0.013
40.99	-46.69	40.99	3342.43	40.99	0.014
42.15	-50.00	42.15	3413.16	42.15	0.015
43.17	-52.56	43.17	3484.30	43.17	0.015
44.17	-55.66	44.17	3550.57	44.17	0.016
45.17	-58.82	45.17	3616.15	45.17	0.016
46.17	-61.98	46.17	3681.69	46.17	0.017
47.17	-65.13	47.17	3748.42	47.17	0.017
48.17	-68.24	48.17	3817.57	48.17	0.018
49.17	-71.28	49.17	3887.87	49.17	0.018
50.17	-74.22	50.17	3958.05	50.17	0.019
51.17	-77.02	51.17	4028.11	51.17	0.019
52.17	-79.67	52.17	4098.03	52.17	0.019
53.17	-82.15	53.17	4167.80	53.17	0.020
54.17	-84.43	54.17	4237.44	54.17	0.020
55.17	-86.52	55.17	4306.95	55.17	0.020
56.17	-88.40	56.17	4376.33	56.17	0.020
57.17	-90.07	57.17	4445.59	57.17	0.020
58.17	-91.74	58.17	4516.94	58.17	0.020
59.17	-94.24	59.17	4591.84	59.17	0.021
60.17	-96.77	60.17	4668.82	60.17	0.021
61.17	-99.11	61.17	4745.74	61.17	0.021
62.17	-101.29	62.17	4822.58	62.17	0.021
63.17	-103.29	63.17	4899.36	63.17	0.021
64.17	-105.12	64.17	4976.06	64.17	0.021
65.17	-106.78	65.17	5052.68	65.17	0.021
66.1694	-108.27	66.16937	5129.22	66.17	0.021
67.1694	-109.60	67.16937	5205.66	67.17	0.021
68.1694	-110.75	68.16938	5282.01	68.17	0.021
69.1694	-111.71	69.16938	5358.25	69.17	0.021
70.1694	-112.49	70.16938	5434.39	70.17	0.021
71.1694	-113.07	71.16938	5510.43	71.17	0.021
72.1694	-113.44	72.16938	5586.36	72.17	0.020
73.1694	-113.58	73.16939	5662.21	73.17	0.020
74.1694	-113.47	74.16939	5737.97	74.17	0.020
75.1694	-113.11	75.16939	5813.66	75.17	0.019
76.1694	-112.47	76.16939	5889.29	76.17	0.019
77.1694	-111.54	77.16939	5964.87	77.17	0.019
78.1694	-110.29	78.1694	6040.42	78.17	0.018
79.1694	-108.71	79.1694	6115.96	79.17	0.018
79.8539	-108.83	79.85392	6121.17	79.85	0.018



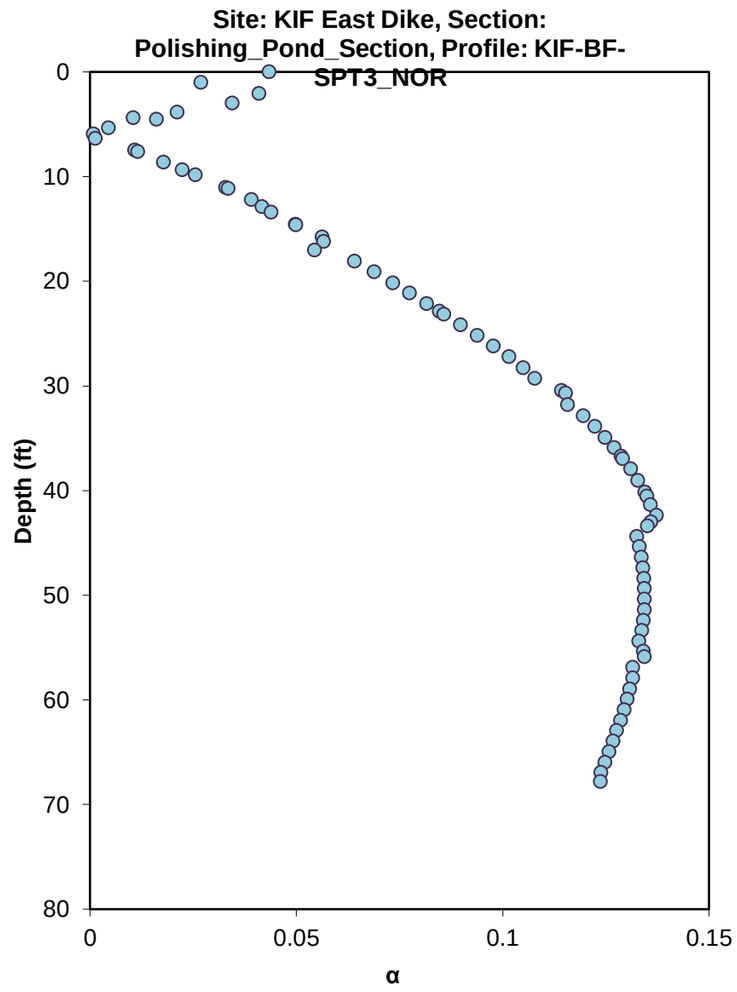
Site: KIF East Dike
Section: Polishing_Pond_Section
Profile: KIF-BF-SPT2_NOR

From GeoStudio					
Depth (ft)	XY-Shear Stress (psf)	Depth (ft)	Vertical Effective Stress (psf)	Depth (ft)	Alpha
0.00	-0.41	0.00	396.70	0.00	0.001
0.24	-2.19	0.24	403.73	0.24	0.005
1.00	-8.01	1.00	424.49	1.00	0.019
2.01	-15.46	2.01	535.50	2.01	0.029
3.04	-16.90	3.04	656.14	3.04	0.026
4.06	-18.65	4.06	776.71	4.06	0.024
5.14	-21.10	5.14	897.04	5.14	0.024
6.13	-21.67	6.13	1012.41	6.13	0.021
7.18	-22.68	7.18	1128.85	7.18	0.020
8.20	-22.93	8.20	1240.10	8.20	0.018
9.23	-23.13	9.23	1354.80	9.23	0.017
9.54	-23.48	9.54	1395.36	9.54	0.017
10.70	-24.20	10.70	1526.73	10.70	0.016
11.54	-24.54	11.54	1628.39	11.54	0.015
12.48	-23.93	12.48	1730.70	12.48	0.014
13.42	-23.44	13.42	1844.33	13.42	0.013
14.55	-22.54	14.55	1932.58	14.55	0.012
15.56	-23.53	15.56	1986.73	15.56	0.012
16.54	-23.02	16.54	2024.59	16.54	0.011
17.52	-20.75	17.52	2093.39	17.52	0.010
18.37	-19.36	18.37	2121.15	18.37	0.009
18.63	-18.99	18.63	2129.07	18.63	0.009
19.53	-22.39	19.53	2184.87	19.53	0.010
20.42	-3.17	20.42	2229.46	20.42	0.001
21.05	-13.49	21.05	2263.82	21.05	0.006
21.84	-16.21	21.84	2306.47	21.84	0.007
22.80	-17.46	22.80	2351.50	22.80	0.007
23.82	-16.60	23.82	2401.54	23.82	0.007
24.84	-16.01	24.84	2452.41	24.84	0.007
25.85	-15.82	25.85	2503.57	25.85	0.006
26.86	-17.84	26.86	2552.42	26.86	0.007
27.85	-20.25	27.85	2598.17	27.85	0.008
28.85	-20.57	28.85	2641.52	28.85	0.008
29.83	-21.88	29.83	2684.83	29.83	0.008
30.78	-24.72	30.78	2731.30	30.78	0.009
31.26	-26.16	31.26	2752.27	31.26	0.010
31.80	-27.81	31.80	2775.94	31.80	0.010
32.83	-34.13	32.83	2823.88	32.83	0.012
33.86	-37.19	33.86	2869.18	33.86	0.013
34.82	-40.70	34.82	2917.80	34.82	0.014
35.83	-50.19	35.83	2965.41	35.83	0.017
36.44	-52.53	36.44	2993.04	36.44	0.018
36.79	-53.87	36.79	3009.43	36.79	0.018
37.76	-58.26	37.76	3058.16	37.76	0.019
38.78	-65.73	38.78	3105.31	38.78	0.021
39.76	-73.01	39.76	3152.98	39.76	0.023
40.75	-79.88	40.75	3200.75	40.75	0.025
41.75	-86.99	41.75	3249.29	41.75	0.027
42.75	-94.29	42.75	3301.93	42.75	0.029
43.75	-101.67	43.75	3362.56	43.75	0.030
44.75	-109.09	44.75	3427.07	44.75	0.032
45.73	-116.85	45.73	3490.96	45.73	0.033
46.71	-124.30	46.71	3553.28	46.71	0.035
47.63	-131.40	47.63	3614.37	47.63	0.036
48.54	-138.96	48.54	3673.95	48.54	0.038
49.43	-146.18	49.43	3734.17	49.43	0.039
50.36	-152.96	50.36	3794.00	50.36	0.040
51.30	-161.10	51.30	3856.67	51.30	0.042
52.28	-169.08	52.28	3920.03	52.28	0.043
53.26	-176.93	53.26	3984.81	53.26	0.044
54.26	-184.58	54.26	4051.34	54.26	0.046
55.27	-191.93	55.27	4120.47	55.27	0.047
56.26	-199.33	56.26	4190.91	56.26	0.048
57.26	-205.96	57.26	4259.65	57.26	0.048
58.23	-212.43	58.23	4327.76	58.23	0.049
59.19	-218.80	59.19	4395.27	59.19	0.050
60.16	-224.72	60.16	4463.10	60.16	0.050
61.14	-228.61	61.14	4531.04	61.14	0.050
62.1204	-232.41	62.12035	4599.94	62.12	0.051
62.8316	-234.01	62.83165	4648.48	62.83	0.050
63.1279	-234.67	63.1279	4668.72	63.13	0.050
64.1336	-236.74	64.13365	4738.14	64.13	0.050
65.1239	-266.52	65.12389	4804.83	65.12	0.055
66.1381	-294.01	66.13807	4874.40	66.14	0.060
67.1536	-292.57	67.1536	4946.43	67.15	0.059
68.1596	-292.66	68.1596	5018.47	68.16	0.058
69.1859	-293.56	69.18586	5090.49	69.19	0.058
70.2269	-296.35	70.22686	5165.10	70.23	0.057
71.3359	-293.41	71.33588	5239.23	71.34	0.056
72.1838	-292.97	72.18379	5305.01	72.18	0.055
72.3624	-292.84	72.36245	5319.58	72.36	0.055
73.6024	-292.49	73.6024	5409.59	73.60	0.054
74.6974	-297.65	74.69736	5478.09	74.70	0.054
75.5472	-311.36	75.54717	5557.88	75.55	0.056
76.3069	-299.38	76.30686	5600.27	76.31	0.053
77.2467	-298.42	77.24667	5663.17	77.25	0.053
78.2374	-300.57	78.23736	5732.73	78.24	0.052
79.2485	-302.08	79.24854	5804.36	79.25	0.052
80.2615	-303.28	80.26152	5876.23	80.26	0.052
81.2681	-304.21	81.26814	5947.66	81.27	0.051
82.2714	-305.15	82.27144	6018.67	82.27	0.051
83.2735	-306.09	83.2735	6089.43	83.27	0.050
84.2744	-307.05	84.27439	6160.05	84.27	0.050
85.2745	-308.01	85.27448	6230.56	85.27	0.049
86.2748	-308.97	86.27484	6301.00	86.27	0.049
87.2754	-309.00	87.27541	6308.63	87.28	0.049
87.2754	-309.00	87.27541	6308.63	87.28	0.049



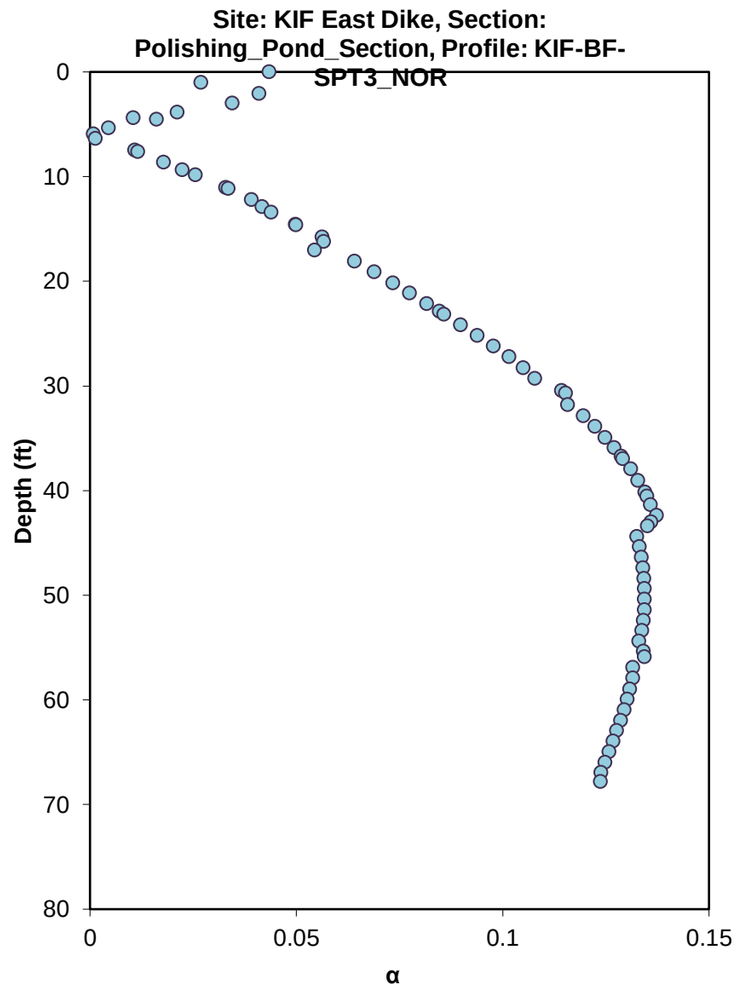
Site: KIF East Dike
Section: Polishing_Pond_Section
Profile: KIF-BF-SPT3_NOR

From GeoStudio					
Depth (ft)	XY-Shear Stress (psf)	Depth (ft)	Vertical Effective Stress (psf)	Depth (ft)	Alpha
0.00	6.58	0.00	151.84	0.00	0.043
1.01	4.43	1.01	165.27	1.01	0.027
2.06	9.24	2.06	225.81	2.06	0.041
2.97	9.23	2.97	268.51	2.97	0.034
3.84	6.46	3.84	306.00	3.84	0.021
4.39	-3.38	4.39	323.86	4.39	0.010
4.51	-5.27	4.51	328.76	4.51	0.016
5.32	-1.70	5.32	381.26	5.32	0.004
5.89	-0.29	5.89	411.63	5.89	0.001
6.33	-0.56	6.33	435.03	6.33	0.001
7.44	-5.41	7.44	498.27	7.44	0.011
7.59	-5.86	7.59	507.57	7.59	0.012
8.63	-10.19	8.63	572.79	8.63	0.018
9.35	-13.89	9.35	621.56	9.35	0.022
9.82	-16.67	9.82	654.08	9.82	0.025
11.02	-24.16	11.02	735.71	11.02	0.033
11.11	-24.82	11.11	742.20	11.11	0.033
12.21	-31.91	12.21	816.60	12.21	0.039
12.87	-35.80	12.87	860.27	12.87	0.042
13.40	-39.22	13.40	895.76	13.40	0.044
14.57	-48.49	14.57	975.05	14.57	0.050
14.59	-48.62	14.59	976.43	14.59	0.050
15.77	-59.45	15.77	1057.56	15.77	0.056
16.19	-61.35	16.19	1085.48	16.19	0.057
17.02	-62.15	17.02	1144.46	17.02	0.054
18.06	-77.13	18.06	1204.13	18.06	0.064
19.09	-87.55	19.09	1271.64	19.09	0.069
20.13	-98.07	20.13	1337.99	20.13	0.073
21.14	-108.59	21.14	1404.12	21.14	0.077
22.15	-119.74	22.15	1468.86	22.15	0.082
22.87	-128.10	22.87	1515.18	22.87	0.085
23.16	-131.42	23.16	1533.45	23.16	0.086
24.17	-143.46	24.17	1597.98	24.17	0.090
25.18	-155.87	25.18	1662.04	25.18	0.094
26.20	-168.66	26.20	1726.20	26.20	0.098
27.22	-181.66	27.22	1790.42	27.22	0.101
28.25	-194.49	28.25	1854.74	28.25	0.105
29.29	-206.76	29.29	1919.23	29.29	0.108
30.42	-227.26	30.42	1990.63	30.42	0.114
30.68	-231.65	30.68	2010.81	30.68	0.115
31.79	-240.15	31.79	2075.03	31.79	0.116
32.87	-255.81	32.87	2141.63	32.87	0.119
33.89	-269.79	33.89	2206.70	33.89	0.122
34.90	-283.05	34.90	2269.76	34.90	0.125
35.91	-296.13	35.91	2332.67	35.91	0.127
36.72	-306.60	36.72	2383.19	36.72	0.129
36.93	-309.32	36.93	2396.32	36.93	0.129
37.93	-322.94	37.93	2465.59	37.93	0.131
39.04	-336.42	39.04	2536.33	39.04	0.133
40.15	-351.31	40.15	2613.14	40.15	0.134
40.52	-355.26	40.52	2634.69	40.52	0.135
41.37	-364.39	41.37	2684.59	41.37	0.136
42.37	-378.34	42.37	2757.30	42.37	0.137
42.98	-380.20	42.98	2798.39	42.98	0.136
43.37	-381.41	43.37	2825.19	43.37	0.135
44.37	-383.88	44.37	2897.55	44.37	0.132
45.37	-395.41	45.37	2972.09	45.37	0.133
46.37	-406.76	46.37	3046.73	46.37	0.134
47.38	-417.91	47.38	3121.54	47.38	0.134
48.38	-428.81	48.38	3196.55	48.38	0.134
49.38	-439.41	49.38	3271.79	49.38	0.134
50.38	-449.68	50.38	3347.31	50.38	0.134
51.38	-459.66	51.38	3422.88	51.38	0.134
52.38	-469.10	52.38	3498.88	52.38	0.134
53.38	-477.89	53.38	3574.97	53.38	0.134
54.37	-484.94	54.37	3649.07	54.37	0.133
55.33	-499.23	55.33	3723.22	55.33	0.134
55.87	-505.95	55.87	3768.85	55.87	0.134
56.9075	-505.89	56.90754	3847.34	56.91	0.131
57.9249	-515.66	57.92494	3923.13	57.92	0.131
58.9391	-523.37	58.93907	4001.56	58.94	0.131
59.9406	-530.61	59.94064	4079.52	59.94	0.130
60.94	-537.64	60.93995	4156.99	60.94	0.129
61.94	-544.05	61.93999	4234.60	61.94	0.128
62.94	-550.24	62.94002	4312.21	62.94	0.128
63.94	-556.15	63.94004	4389.86	63.94	0.127
64.9401	-561.79	64.94006	4467.51	64.94	0.126
65.9401	-567.17	65.94007	4545.15	65.94	0.125
66.9401	-572.30	66.94007	4622.75	66.94	0.124
67.8049	-572.41	67.80487	4629.34	67.80	0.124



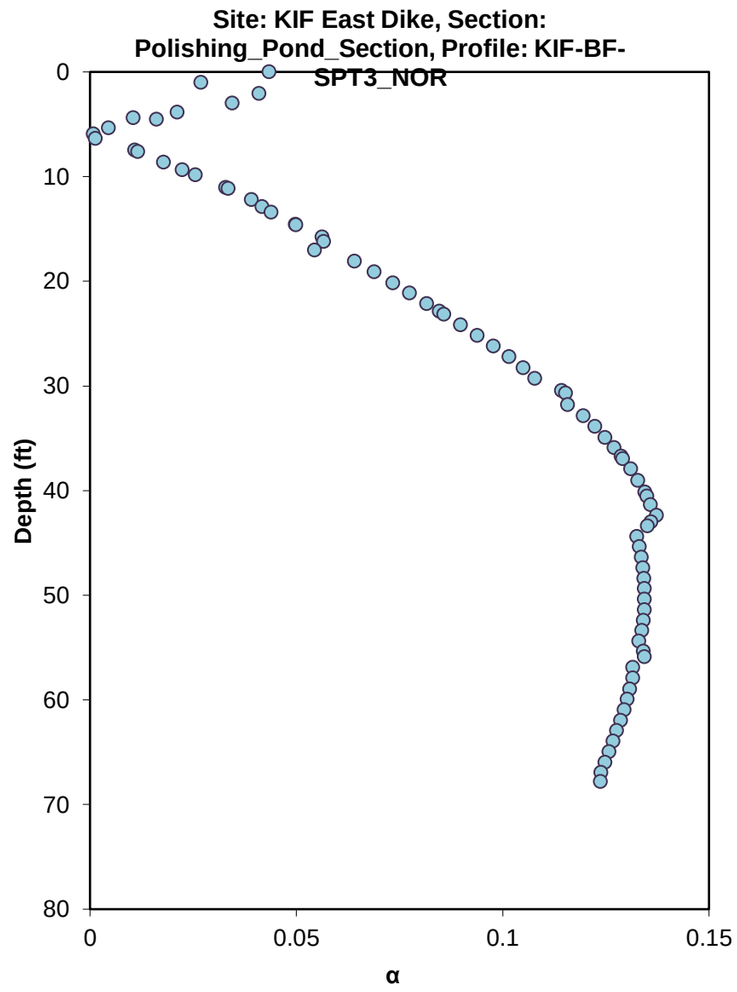
Site: KIF East Dike
Section: Polishing_Pond_Section
Profile: KIF-BF-SPT3_NOR

From GeoStudio					
Depth (ft)	XY-Shear Stress (psf)	Depth (ft)	Vertical Effective Stress (psf)	Depth (ft)	Alpha
0.00	6.58	0.00	151.84	0.00	0.043
1.01	4.43	1.01	165.27	1.01	0.027
2.06	9.24	2.06	225.81	2.06	0.041
2.97	9.23	2.97	268.51	2.97	0.034
3.84	6.46	3.84	306.00	3.84	0.021
4.39	-3.38	4.39	323.86	4.39	0.010
4.51	-5.27	4.51	328.76	4.51	0.016
5.32	-1.70	5.32	381.26	5.32	0.004
5.89	-0.29	5.89	411.63	5.89	0.001
6.33	-0.56	6.33	435.03	6.33	0.001
7.44	-5.41	7.44	498.27	7.44	0.011
7.59	-5.86	7.59	507.57	7.59	0.012
8.63	-10.19	8.63	572.79	8.63	0.018
9.35	-13.89	9.35	621.56	9.35	0.022
9.82	-16.67	9.82	654.08	9.82	0.025
11.02	-24.16	11.02	735.71	11.02	0.033
11.11	-24.82	11.11	742.20	11.11	0.033
12.21	-31.91	12.21	816.60	12.21	0.039
12.87	-35.80	12.87	860.27	12.87	0.042
13.40	-39.22	13.40	895.76	13.40	0.044
14.57	-48.49	14.57	975.05	14.57	0.050
14.59	-48.62	14.59	976.43	14.59	0.050
15.77	-59.45	15.77	1057.56	15.77	0.056
16.19	-61.35	16.19	1085.48	16.19	0.057
17.02	-62.15	17.02	1144.46	17.02	0.054
18.06	-77.13	18.06	1204.13	18.06	0.064
19.09	-87.55	19.09	1271.64	19.09	0.069
20.13	-98.07	20.13	1337.99	20.13	0.073
21.14	-108.59	21.14	1404.12	21.14	0.077
22.15	-119.74	22.15	1468.86	22.15	0.082
22.87	-128.10	22.87	1515.18	22.87	0.085
23.16	-131.42	23.16	1533.45	23.16	0.086
24.17	-143.46	24.17	1597.98	24.17	0.090
25.18	-155.87	25.18	1662.04	25.18	0.094
26.20	-168.66	26.20	1726.20	26.20	0.098
27.22	-181.66	27.22	1790.42	27.22	0.101
28.25	-194.49	28.25	1854.74	28.25	0.105
29.29	-206.76	29.29	1919.23	29.29	0.108
30.42	-227.26	30.42	1990.63	30.42	0.114
30.68	-231.65	30.68	2010.81	30.68	0.115
31.79	-240.15	31.79	2075.03	31.79	0.116
32.87	-255.81	32.87	2141.63	32.87	0.119
33.89	-269.79	33.89	2206.70	33.89	0.122
34.90	-283.05	34.90	2269.76	34.90	0.125
35.91	-296.13	35.91	2332.67	35.91	0.127
36.72	-306.60	36.72	2383.19	36.72	0.129
36.93	-309.32	36.93	2396.32	36.93	0.129
37.93	-322.94	37.93	2465.59	37.93	0.131
39.04	-336.42	39.04	2536.33	39.04	0.133
40.15	-351.31	40.15	2613.14	40.15	0.134
40.52	-355.26	40.52	2634.69	40.52	0.135
41.37	-364.39	41.37	2684.59	41.37	0.136
42.37	-378.34	42.37	2757.30	42.37	0.137
42.98	-380.20	42.98	2798.39	42.98	0.136
43.37	-381.41	43.37	2825.19	43.37	0.135
44.37	-383.88	44.37	2897.55	44.37	0.132
45.37	-395.41	45.37	2972.09	45.37	0.133
46.37	-406.76	46.37	3046.73	46.37	0.134
47.38	-417.91	47.38	3121.54	47.38	0.134
48.38	-428.81	48.38	3196.55	48.38	0.134
49.38	-439.41	49.38	3271.79	49.38	0.134
50.38	-449.68	50.38	3347.31	50.38	0.134
51.38	-459.66	51.38	3422.88	51.38	0.134
52.38	-469.10	52.38	3498.88	52.38	0.134
53.38	-477.89	53.38	3574.97	53.38	0.134
54.37	-484.94	54.37	3649.07	54.37	0.133
55.33	-499.23	55.33	3723.22	55.33	0.134
55.87	-505.95	55.87	3768.85	55.87	0.134
56.9075	-505.89	56.90754	3847.34	56.91	0.131
57.9249	-515.66	57.92494	3923.13	57.92	0.131
58.9391	-523.37	58.93907	4001.56	58.94	0.131
59.9406	-530.61	59.94064	4079.52	59.94	0.130
60.94	-537.64	60.93995	4156.99	60.94	0.129
61.94	-544.05	61.93999	4234.60	61.94	0.128
62.94	-550.24	62.94002	4312.21	62.94	0.128
63.94	-556.15	63.94004	4389.86	63.94	0.127
64.9401	-561.79	64.94006	4467.51	64.94	0.126
65.9401	-567.17	65.94007	4545.15	65.94	0.125
66.9401	-572.30	66.94007	4622.75	66.94	0.124
67.8049	-572.41	67.80487	4629.34	67.80	0.124



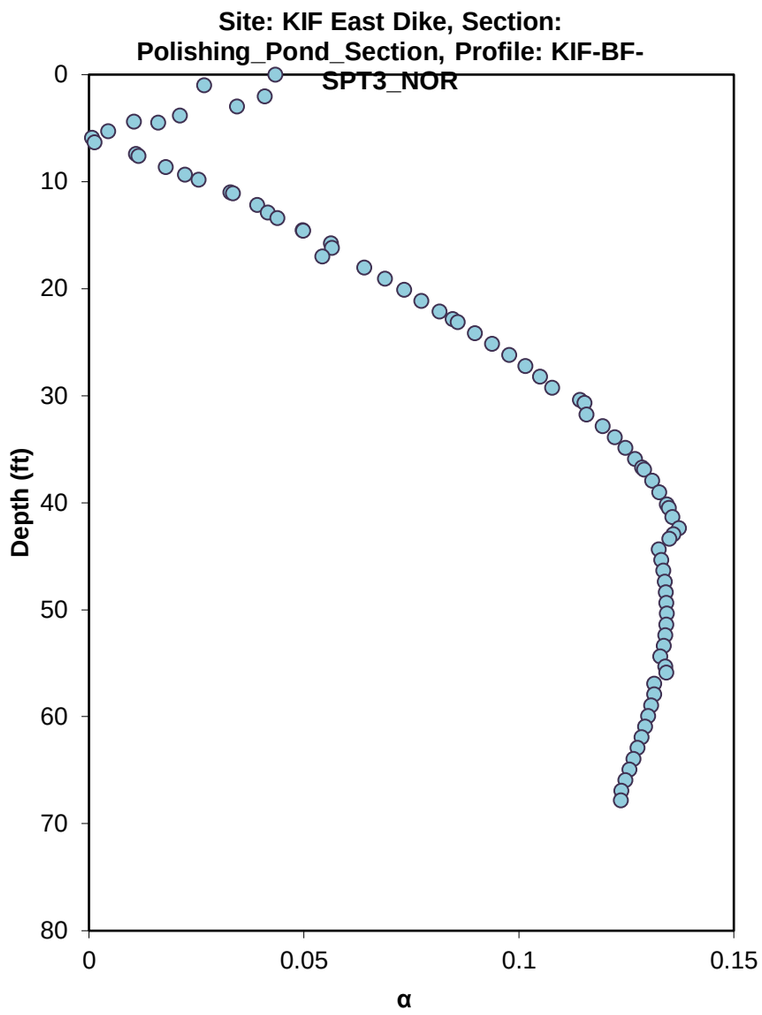
Site: KIF East Dike
Section: Polishing_Pond_Section
Profile: KIF-BF-SPT3_NOR

From GeoStudio					
Depth (ft)	XY-Shear Stress (psf)	Depth (ft)	Vertical Effective Stress (psf)	Depth (ft)	Alpha
0.00	6.58	0.00	151.84	0.00	0.043
1.01	4.43	1.01	165.27	1.01	0.027
2.06	9.24	2.06	225.81	2.06	0.041
2.97	9.23	2.97	268.51	2.97	0.034
3.84	6.46	3.84	306.00	3.84	0.021
4.39	-3.38	4.39	323.86	4.39	0.010
4.51	-5.27	4.51	328.76	4.51	0.016
5.32	-1.70	5.32	381.26	5.32	0.004
5.89	-0.29	5.89	411.63	5.89	0.001
6.33	-0.56	6.33	435.03	6.33	0.001
7.44	-5.41	7.44	498.27	7.44	0.011
7.59	-5.86	7.59	507.57	7.59	0.012
8.63	-10.19	8.63	572.79	8.63	0.018
9.35	-13.89	9.35	621.56	9.35	0.022
9.82	-16.67	9.82	654.08	9.82	0.025
11.02	-24.16	11.02	735.71	11.02	0.033
11.11	-24.82	11.11	742.20	11.11	0.033
12.21	-31.91	12.21	816.60	12.21	0.039
12.87	-35.80	12.87	860.27	12.87	0.042
13.40	-39.22	13.40	895.76	13.40	0.044
14.57	-48.49	14.57	975.05	14.57	0.050
14.59	-48.62	14.59	976.43	14.59	0.050
15.77	-59.45	15.77	1057.56	15.77	0.056
16.19	-61.35	16.19	1085.48	16.19	0.057
17.02	-62.15	17.02	1144.46	17.02	0.054
18.06	-77.13	18.06	1204.13	18.06	0.064
19.09	-87.55	19.09	1271.64	19.09	0.069
20.13	-98.07	20.13	1337.99	20.13	0.073
21.14	-108.59	21.14	1404.12	21.14	0.077
22.15	-119.74	22.15	1468.86	22.15	0.082
22.87	-128.10	22.87	1515.18	22.87	0.085
23.16	-131.42	23.16	1533.45	23.16	0.086
24.17	-143.46	24.17	1597.98	24.17	0.090
25.18	-155.87	25.18	1662.04	25.18	0.094
26.20	-168.66	26.20	1726.20	26.20	0.098
27.22	-181.66	27.22	1790.42	27.22	0.101
28.25	-194.49	28.25	1854.74	28.25	0.105
29.29	-206.76	29.29	1919.23	29.29	0.108
30.42	-227.26	30.42	1990.63	30.42	0.114
30.68	-231.65	30.68	2010.81	30.68	0.115
31.79	-240.15	31.79	2075.03	31.79	0.116
32.87	-255.81	32.87	2141.63	32.87	0.119
33.89	-269.79	33.89	2206.70	33.89	0.122
34.90	-283.05	34.90	2269.76	34.90	0.125
35.91	-296.13	35.91	2332.67	35.91	0.127
36.72	-306.60	36.72	2383.19	36.72	0.129
36.93	-309.32	36.93	2396.32	36.93	0.129
37.93	-322.94	37.93	2465.59	37.93	0.131
39.04	-336.42	39.04	2536.33	39.04	0.133
40.15	-351.31	40.15	2613.14	40.15	0.134
40.52	-355.26	40.52	2634.69	40.52	0.135
41.37	-364.39	41.37	2684.59	41.37	0.136
42.37	-378.34	42.37	2757.30	42.37	0.137
42.98	-380.20	42.98	2798.39	42.98	0.136
43.37	-381.41	43.37	2825.19	43.37	0.135
44.37	-383.88	44.37	2897.55	44.37	0.132
45.37	-395.41	45.37	2972.09	45.37	0.133
46.37	-406.76	46.37	3046.73	46.37	0.134
47.38	-417.91	47.38	3121.54	47.38	0.134
48.38	-428.81	48.38	3196.55	48.38	0.134
49.38	-439.41	49.38	3271.79	49.38	0.134
50.38	-449.68	50.38	3347.31	50.38	0.134
51.38	-459.66	51.38	3422.88	51.38	0.134
52.38	-469.10	52.38	3498.88	52.38	0.134
53.38	-477.89	53.38	3574.97	53.38	0.134
54.37	-484.94	54.37	3649.07	54.37	0.133
55.33	-499.23	55.33	3723.22	55.33	0.134
55.87	-505.95	55.87	3768.85	55.87	0.134
56.9075	-505.89	56.90754	3847.34	56.91	0.131
57.9249	-515.66	57.92494	3923.13	57.92	0.131
58.9391	-523.37	58.93907	4001.56	58.94	0.131
59.9406	-530.61	59.94064	4079.52	59.94	0.130
60.94	-537.64	60.93995	4156.99	60.94	0.129
61.94	-544.05	61.93999	4234.60	61.94	0.128
62.94	-550.24	62.94002	4312.21	62.94	0.128
63.94	-556.15	63.94004	4389.86	63.94	0.127
64.9401	-561.79	64.94006	4467.51	64.94	0.126
65.9401	-567.17	65.94007	4545.15	65.94	0.125
66.9401	-572.30	66.94007	4622.75	66.94	0.124
67.8049	-572.41	67.80487	4629.34	67.80	0.124



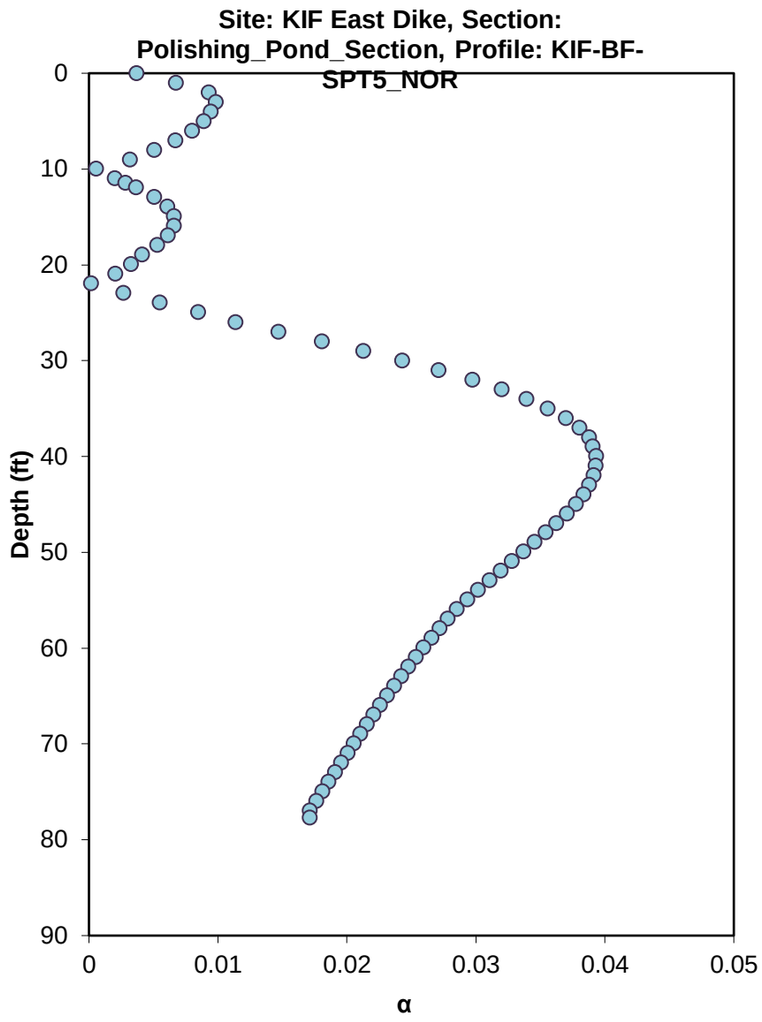
Site: KIF East Dike
Section: Polishing_Pond_Section
Profile: KIF-BF-SPT3_NOR

From GeoStudio					
Depth (ft)	XY-Shear Stress (psf)	Depth (ft)	Vertical Effective Stress (psf)	Depth (ft)	Alpha
0.00	6.58	0.00	151.84	0.00	0.043
1.01	4.43	1.01	165.27	1.01	0.027
2.06	9.24	2.06	225.81	2.06	0.041
2.97	9.23	2.97	268.51	2.97	0.034
3.84	6.46	3.84	306.00	3.84	0.021
4.39	-3.38	4.39	323.86	4.39	0.010
4.51	-5.27	4.51	328.76	4.51	0.016
5.32	-1.70	5.32	381.26	5.32	0.004
5.89	-0.29	5.89	411.63	5.89	0.001
6.33	-0.56	6.33	435.03	6.33	0.001
7.44	-5.41	7.44	498.27	7.44	0.011
7.59	-5.86	7.59	507.57	7.59	0.012
8.63	-10.19	8.63	572.79	8.63	0.018
9.35	-13.89	9.35	621.56	9.35	0.022
9.82	-16.67	9.82	654.08	9.82	0.025
11.02	-24.16	11.02	735.71	11.02	0.033
11.11	-24.82	11.11	742.20	11.11	0.033
12.21	-31.91	12.21	816.60	12.21	0.039
12.87	-35.80	12.87	860.27	12.87	0.042
13.40	-39.22	13.40	895.76	13.40	0.044
14.57	-48.49	14.57	975.05	14.57	0.050
14.59	-48.62	14.59	976.43	14.59	0.050
15.77	-59.45	15.77	1057.56	15.77	0.056
16.19	-61.35	16.19	1085.48	16.19	0.057
17.02	-62.15	17.02	1144.46	17.02	0.054
18.06	-77.13	18.06	1204.13	18.06	0.064
19.09	-87.55	19.09	1271.64	19.09	0.069
20.13	-98.07	20.13	1337.99	20.13	0.073
21.14	-108.59	21.14	1404.12	21.14	0.077
22.15	-119.74	22.15	1468.86	22.15	0.082
22.87	-128.10	22.87	1515.18	22.87	0.085
23.16	-131.42	23.16	1533.45	23.16	0.086
24.17	-143.46	24.17	1597.98	24.17	0.090
25.18	-155.87	25.18	1662.04	25.18	0.094
26.20	-168.66	26.20	1726.20	26.20	0.098
27.22	-181.66	27.22	1790.42	27.22	0.101
28.25	-194.49	28.25	1854.74	28.25	0.105
29.29	-206.76	29.29	1919.23	29.29	0.108
30.42	-227.26	30.42	1990.63	30.42	0.114
30.68	-231.65	30.68	2010.81	30.68	0.115
31.79	-240.15	31.79	2075.03	31.79	0.116
32.87	-255.81	32.87	2141.63	32.87	0.119
33.89	-269.79	33.89	2206.70	33.89	0.122
34.90	-283.05	34.90	2269.76	34.90	0.125
35.91	-296.13	35.91	2332.67	35.91	0.127
36.72	-306.60	36.72	2383.19	36.72	0.129
36.93	-309.32	36.93	2396.32	36.93	0.129
37.93	-322.94	37.93	2465.59	37.93	0.131
39.04	-336.42	39.04	2536.33	39.04	0.133
40.15	-351.31	40.15	2613.14	40.15	0.134
40.52	-355.26	40.52	2634.69	40.52	0.135
41.37	-364.39	41.37	2684.59	41.37	0.136
42.37	-378.34	42.37	2757.30	42.37	0.137
42.98	-380.20	42.98	2798.39	42.98	0.136
43.37	-381.41	43.37	2825.19	43.37	0.135
44.37	-383.88	44.37	2897.55	44.37	0.132
45.37	-395.41	45.37	2972.09	45.37	0.133
46.37	-406.76	46.37	3046.73	46.37	0.134
47.38	-417.91	47.38	3121.54	47.38	0.134
48.38	-428.81	48.38	3196.55	48.38	0.134
49.38	-439.41	49.38	3271.79	49.38	0.134
50.38	-449.68	50.38	3347.31	50.38	0.134
51.38	-459.66	51.38	3422.88	51.38	0.134
52.38	-469.10	52.38	3498.88	52.38	0.134
53.38	-477.89	53.38	3574.97	53.38	0.134
54.37	-484.94	54.37	3649.07	54.37	0.133
55.33	-499.23	55.33	3723.22	55.33	0.134
55.87	-505.95	55.87	3768.85	55.87	0.134
56.9075	-505.89	56.90754	3847.34	56.91	0.131
57.9249	-515.66	57.92494	3923.13	57.92	0.131
58.9391	-523.37	58.93907	4001.56	58.94	0.131
59.9406	-530.61	59.94064	4079.52	59.94	0.130
60.94	-537.64	60.93995	4156.99	60.94	0.129
61.94	-544.05	61.93999	4234.60	61.94	0.128
62.94	-550.24	62.94002	4312.21	62.94	0.128
63.94	-556.15	63.94004	4389.86	63.94	0.127
64.9401	-561.79	64.94006	4467.51	64.94	0.126
65.9401	-567.17	65.94007	4545.15	65.94	0.125
66.9401	-572.30	66.94007	4622.75	66.94	0.124
67.8049	-572.41	67.80487	4629.34	67.80	0.124



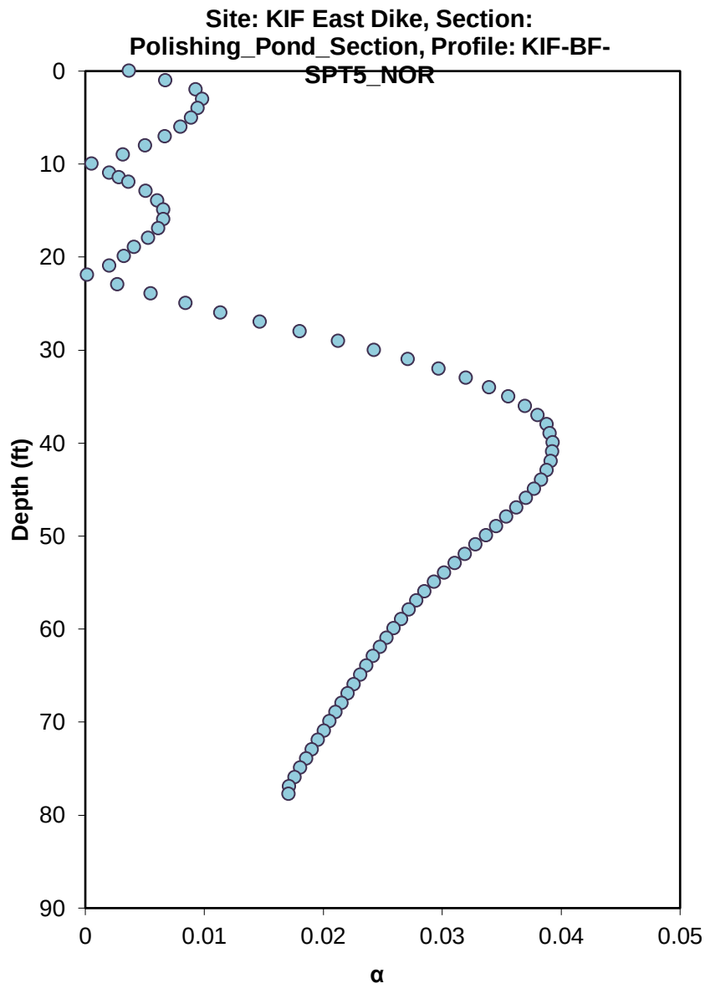
Site: KIF East Dike
Section: Polishing_Pond_Section
Profile: KIF-BF-SPT5_NOR

From GeoStudio					
Depth (ft)	XY-Shear Stress (psf)	Depth (ft)	Vertical Effective Stress (psf)	Depth (ft)	Alpha
0.00	-1.35	0.00	367.73	0.00	0.004
1.00	-2.90	1.00	431.15	1.00	0.007
2.00	-5.10	2.00	550.33	2.00	0.009
3.01	-6.59	3.01	669.52	3.01	0.010
4.01	-7.44	4.01	788.81	4.01	0.009
5.01	-7.69	5.01	865.45	5.01	0.009
6.01	-7.38	6.01	922.49	6.01	0.008
7.01	-6.55	7.01	979.68	7.01	0.007
8.01	-5.23	8.01	1036.84	8.01	0.005
9.00	-3.23	9.00	1017.47	9.00	0.003
9.97	0.86	9.97	1616.58	9.97	0.001
10.94	3.20	10.94	1600.87	10.94	0.002
11.42	4.59	11.42	1629.17	11.42	0.003
11.93	6.05	11.93	1659.03	11.93	0.004
12.93	8.68	12.93	1718.05	12.93	0.005
13.93	10.78	13.93	1777.56	13.93	0.006
14.93	12.08	14.93	1837.23	14.93	0.007
15.93	12.46	15.93	1896.71	15.93	0.007
16.93	11.96	16.93	1955.67	16.93	0.006
17.93	10.63	17.93	2013.79	17.93	0.005
18.93	8.50	18.93	2070.78	18.93	0.004
19.93	6.89	19.93	2124.70	19.93	0.003
20.93	4.41	20.93	2173.96	20.93	0.002
21.93	-0.37	21.93	2220.07	21.93	0.000
22.94	-6.06	22.94	2265.08	22.94	0.003
23.94	-12.64	23.94	2309.14	23.94	0.005
24.94	-19.85	24.94	2353.05	24.94	0.008
25.97	-27.20	25.97	2396.17	25.97	0.011
26.99	-35.82	26.99	2439.82	26.99	0.015
28.00	-44.77	28.00	2482.71	28.00	0.018
29.00	-53.65	29.00	2525.44	29.00	0.021
30.00	-62.35	30.00	2568.36	30.00	0.024
31.01	-70.79	31.01	2611.54	31.01	0.027
32.01	-78.98	32.01	2658.88	32.01	0.030
33.01	-86.78	33.01	2714.26	33.01	0.032
34.01	-94.10	34.01	2773.84	34.01	0.034
35.01	-100.72	35.01	2834.07	35.01	0.036
36.01	-106.94	36.01	2894.61	36.01	0.037
37.00	-112.34	37.00	2955.71	37.00	0.038
37.99	-116.95	37.99	3016.78	37.99	0.039
38.96	-120.21	38.96	3078.85	38.96	0.039
39.95	-123.44	39.95	3141.15	39.95	0.039
40.94	-125.81	40.94	3204.52	40.94	0.039
41.94	-127.87	41.94	3268.37	41.94	0.039
42.94	-129.26	42.94	3333.11	42.94	0.039
43.94	-130.24	43.94	3398.25	43.94	0.038
44.94	-130.74	44.94	3465.05	44.94	0.038
45.94	-130.86	45.94	3534.64	45.94	0.037
46.94	-130.66	46.94	3605.72	46.94	0.036
47.94	-130.18	47.94	3676.99	47.94	0.035
48.94	-129.49	48.94	3748.38	48.94	0.035
49.94	-128.61	49.94	3819.88	49.94	0.034
50.94	-127.60	50.94	3891.44	50.94	0.033
51.94	-126.46	51.94	3963.04	51.94	0.032
52.94	-125.21	52.94	4034.68	52.94	0.031
53.94	-123.88	53.94	4106.34	53.94	0.030
54.94	-122.46	54.94	4178.01	54.94	0.029
55.94	-121.11	55.94	4251.50	55.94	0.028
56.94	-120.42	56.94	4329.30	56.94	0.028
57.94	-119.81	57.94	4408.88	57.94	0.027
58.94	-119.16	58.94	4488.40	58.94	0.027
59.94	-118.48	59.94	4567.85	59.94	0.026
60.94	-117.76	60.94	4647.21	60.94	0.025
61.94	-117.02	61.94	4726.48	61.94	0.025
62.94	-116.25	62.94	4805.66	62.94	0.024
63.94	-115.46	63.94	4884.74	63.94	0.024
64.94	-114.64	64.94	4963.72	64.94	0.023
65.94	-113.80	65.94	5042.61	65.94	0.023
66.9355	-112.91	66.93553	5121.40	66.94	0.022
67.9355	-111.99	67.93553	5200.11	67.94	0.022
68.9355	-111.02	68.93553	5278.75	68.94	0.021
69.9355	-110.00	69.93553	5357.33	69.94	0.021
70.9355	-108.92	70.93553	5435.86	70.94	0.020
71.9355	-107.78	71.93553	5514.35	71.94	0.020
72.9355	-106.57	72.93553	5592.84	72.94	0.019
73.9355	-105.30	73.93553	5671.32	73.94	0.019
74.9355	-103.97	74.93553	5749.83	74.94	0.018
75.9355	-102.57	75.93553	5828.38	75.94	0.018
76.9355	-101.11	76.93553	5906.99	76.94	0.017
77.7112	-101.13	77.71124	5912.86	77.71	0.017



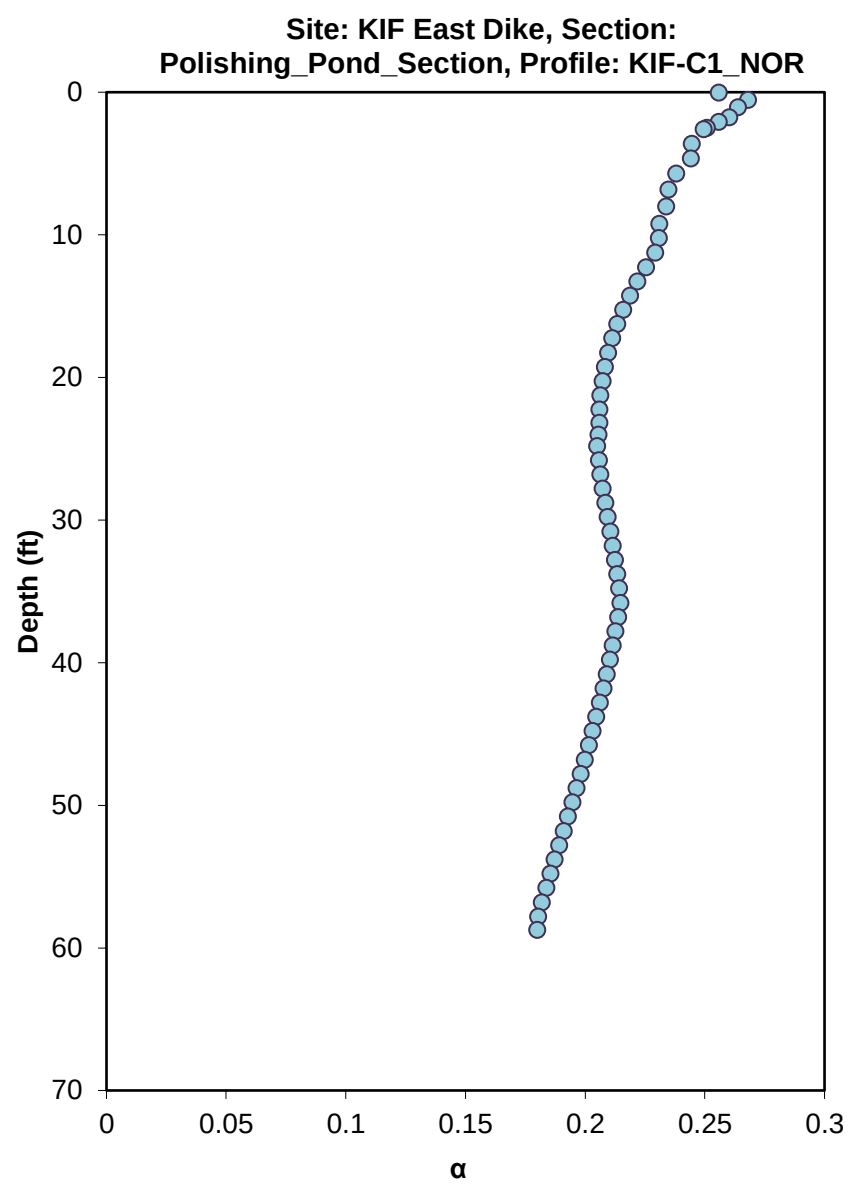
Site: KIF East Dike
Section: Polishing_Pond_Section
Profile: KIF-BF-SPT5_NOR

From GeoStudio					
Depth (ft)	XY-Shear Stress (psf)	Depth (ft)	Vertical Effective Stress (psf)	Depth (ft)	Alpha
0.00	-1.35	0.00	367.73	0.00	0.004
1.00	-2.90	1.00	431.15	1.00	0.007
2.00	-5.10	2.00	550.33	2.00	0.009
3.01	-6.59	3.01	669.52	3.01	0.010
4.01	-7.44	4.01	788.81	4.01	0.009
5.01	-7.69	5.01	865.45	5.01	0.009
6.01	-7.38	6.01	922.49	6.01	0.008
7.01	-6.55	7.01	979.68	7.01	0.007
8.01	-5.23	8.01	1036.84	8.01	0.005
9.00	-3.23	9.00	1017.47	9.00	0.003
9.97	0.86	9.97	1616.58	9.97	0.001
10.94	3.20	10.94	1600.87	10.94	0.002
11.42	4.59	11.42	1629.17	11.42	0.003
11.93	6.05	11.93	1659.03	11.93	0.004
12.93	8.68	12.93	1718.05	12.93	0.005
13.93	10.78	13.93	1777.56	13.93	0.006
14.93	12.08	14.93	1837.23	14.93	0.007
15.93	12.46	15.93	1896.71	15.93	0.007
16.93	11.96	16.93	1955.67	16.93	0.006
17.93	10.63	17.93	2013.79	17.93	0.005
18.93	8.50	18.93	2070.78	18.93	0.004
19.93	6.89	19.93	2124.70	19.93	0.003
20.93	4.41	20.93	2173.96	20.93	0.002
21.93	-0.37	21.93	2220.07	21.93	0.000
22.94	-6.06	22.94	2265.08	22.94	0.003
23.94	-12.64	23.94	2309.14	23.94	0.005
24.94	-19.85	24.94	2353.05	24.94	0.008
25.97	-27.20	25.97	2396.17	25.97	0.011
26.99	-35.82	26.99	2439.82	26.99	0.015
28.00	-44.77	28.00	2482.71	28.00	0.018
29.00	-53.65	29.00	2525.44	29.00	0.021
30.00	-62.35	30.00	2568.36	30.00	0.024
31.01	-70.79	31.01	2611.54	31.01	0.027
32.01	-78.98	32.01	2658.88	32.01	0.030
33.01	-86.78	33.01	2714.26	33.01	0.032
34.01	-94.10	34.01	2773.84	34.01	0.034
35.01	-100.72	35.01	2834.07	35.01	0.036
36.01	-106.94	36.01	2894.61	36.01	0.037
37.00	-112.34	37.00	2955.71	37.00	0.038
37.99	-116.95	37.99	3016.78	37.99	0.039
38.96	-120.21	38.96	3078.85	38.96	0.039
39.95	-123.44	39.95	3141.15	39.95	0.039
40.94	-125.81	40.94	3204.52	40.94	0.039
41.94	-127.87	41.94	3268.37	41.94	0.039
42.94	-129.26	42.94	3333.11	42.94	0.039
43.94	-130.24	43.94	3398.25	43.94	0.038
44.94	-130.74	44.94	3465.05	44.94	0.038
45.94	-130.86	45.94	3534.64	45.94	0.037
46.94	-130.66	46.94	3605.72	46.94	0.036
47.94	-130.18	47.94	3676.99	47.94	0.035
48.94	-129.49	48.94	3748.38	48.94	0.035
49.94	-128.61	49.94	3819.88	49.94	0.034
50.94	-127.60	50.94	3891.44	50.94	0.033
51.94	-126.46	51.94	3963.04	51.94	0.032
52.94	-125.21	52.94	4034.68	52.94	0.031
53.94	-123.88	53.94	4106.34	53.94	0.030
54.94	-122.46	54.94	4178.01	54.94	0.029
55.94	-121.11	55.94	4251.50	55.94	0.028
56.94	-120.42	56.94	4329.30	56.94	0.028
57.94	-119.81	57.94	4408.88	57.94	0.027
58.94	-119.16	58.94	4488.40	58.94	0.027
59.94	-118.48	59.94	4567.85	59.94	0.026
60.94	-117.76	60.94	4647.21	60.94	0.025
61.94	-117.02	61.94	4726.48	61.94	0.025
62.94	-116.25	62.94	4805.66	62.94	0.024
63.94	-115.46	63.94	4884.74	63.94	0.024
64.94	-114.64	64.94	4963.72	64.94	0.023
65.94	-113.80	65.94	5042.61	65.94	0.023
66.9355	-112.91	66.93553	5121.40	66.94	0.022
67.9355	-111.99	67.93553	5200.11	67.94	0.022
68.9355	-111.02	68.93553	5278.75	68.94	0.021
69.9355	-110.00	69.93553	5357.33	69.94	0.021
70.9355	-108.92	70.93553	5435.86	70.94	0.020
71.9355	-107.78	71.93553	5514.35	71.94	0.020
72.9355	-106.57	72.93553	5592.84	72.94	0.019
73.9355	-105.30	73.93553	5671.32	73.94	0.019
74.9355	-103.97	74.93553	5749.83	74.94	0.018
75.9355	-102.57	75.93553	5828.38	75.94	0.018
76.9355	-101.11	76.93553	5906.99	76.94	0.017
77.7112	-101.13	77.71124	5912.86	77.71	0.017



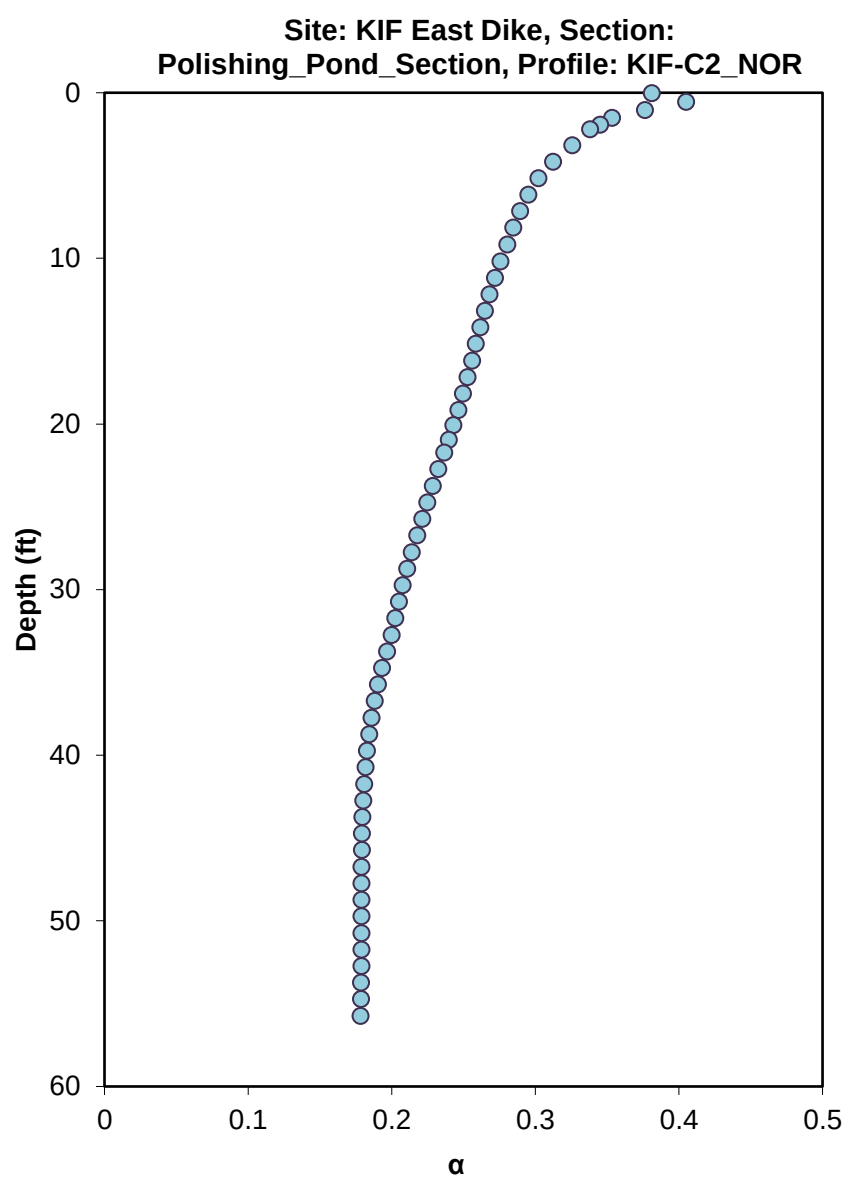
Site: KIF East Dike
Section: Polishing_Pond_Section
Profile: KIF-C1_NOR

From GeoStudio					
Depth (ft)	XY-Shear Stress (psf)	Depth (ft)	Vertical Effective Stress (psf)	Depth (ft)	Alpha
0.00	-57.37	0.00	224.42	0.00	0.256
0.51	-59.51	0.51	222.18	0.51	0.268
1.03	-66.84	1.03	253.38	1.03	0.264
1.71	-77.55	1.71	298.15	1.71	0.260
2.05	-80.81	2.05	315.99	2.05	0.256
2.48	-84.26	2.48	336.16	2.48	0.251
2.57	-86.06	2.57	345.10	2.57	0.249
3.60	-105.12	3.60	429.97	3.60	0.244
4.62	-121.84	4.62	499.10	4.62	0.244
5.68	-136.73	5.68	574.46	5.68	0.238
6.80	-152.24	6.80	648.53	6.80	0.235
7.98	-169.35	7.98	724.31	7.98	0.234
9.18	-184.87	9.18	800.94	9.18	0.231
10.20	-200.70	10.20	870.10	10.20	0.231
11.21	-214.63	11.21	936.46	11.21	0.229
12.24	-225.89	12.24	1002.61	12.24	0.225
13.23	-236.98	13.23	1068.78	13.23	0.222
14.23	-247.74	14.23	1133.55	14.23	0.219
15.23	-258.68	15.23	1198.57	15.23	0.216
16.23	-269.49	16.23	1263.13	16.23	0.213
17.23	-280.45	17.23	1327.58	17.23	0.211
18.22	-291.61	18.22	1391.63	18.22	0.210
19.22	-302.98	19.22	1455.27	19.22	0.208
20.22	-314.59	20.22	1518.56	20.22	0.207
21.21	-326.38	21.21	1581.97	21.21	0.206
22.20	-338.48	22.20	1644.52	22.20	0.206
23.16	-350.61	23.16	1703.63	23.16	0.206
23.99	-361.66	23.99	1759.87	23.99	0.206
24.77	-372.47	24.77	1818.41	24.77	0.205
25.77	-386.15	25.77	1877.78	25.77	0.206
26.77	-401.01	26.77	1944.01	26.77	0.206
27.77	-416.57	27.77	2010.95	27.77	0.207
28.77	-432.85	28.77	2078.59	28.77	0.208
29.77	-449.78	29.77	2148.20	29.77	0.209
30.77	-467.27	30.77	2221.03	30.77	0.210
31.77	-485.22	31.77	2295.80	31.77	0.211
32.77	-503.49	32.77	2371.26	32.77	0.212
33.77	-521.95	33.77	2447.38	33.77	0.213
34.77	-540.47	34.77	2524.10	34.77	0.214
35.77	-558.56	35.77	2603.36	35.77	0.215
36.77	-574.36	36.77	2687.08	36.77	0.214
37.77	-589.56	37.77	2773.15	37.77	0.213
38.77	-604.48	38.77	2859.47	38.77	0.211
39.77	-619.06	39.77	2945.89	39.77	0.210
40.77	-633.26	40.77	3032.30	40.77	0.209
41.77	-647.02	41.77	3118.55	41.77	0.207
42.77	-660.31	42.77	3204.52	42.77	0.206
43.77	-673.08	43.77	3290.09	43.77	0.205
44.77	-685.29	44.77	3375.16	44.77	0.203
45.77	-696.91	45.77	3459.65	45.77	0.201
46.77	-707.94	46.77	3543.47	46.77	0.200
47.77	-718.35	47.77	3626.59	47.77	0.198
48.77	-728.17	48.77	3708.98	48.77	0.196
49.77	-737.41	49.77	3790.62	49.77	0.195
50.77	-746.11	50.77	3871.52	50.77	0.193
51.77	-754.32	51.77	3951.71	51.77	0.191
52.77	-762.07	52.77	4031.22	52.77	0.189
53.77	-769.45	53.77	4110.09	53.77	0.187
54.77	-776.50	54.77	4188.39	54.77	0.185
55.77	-783.29	55.77	4266.17	55.77	0.184
56.77	-789.89	56.77	4343.48	56.77	0.182
57.77	-796.37	57.77	4420.39	57.77	0.180
58.72	-796.40	58.72	4427.83	58.72	0.180



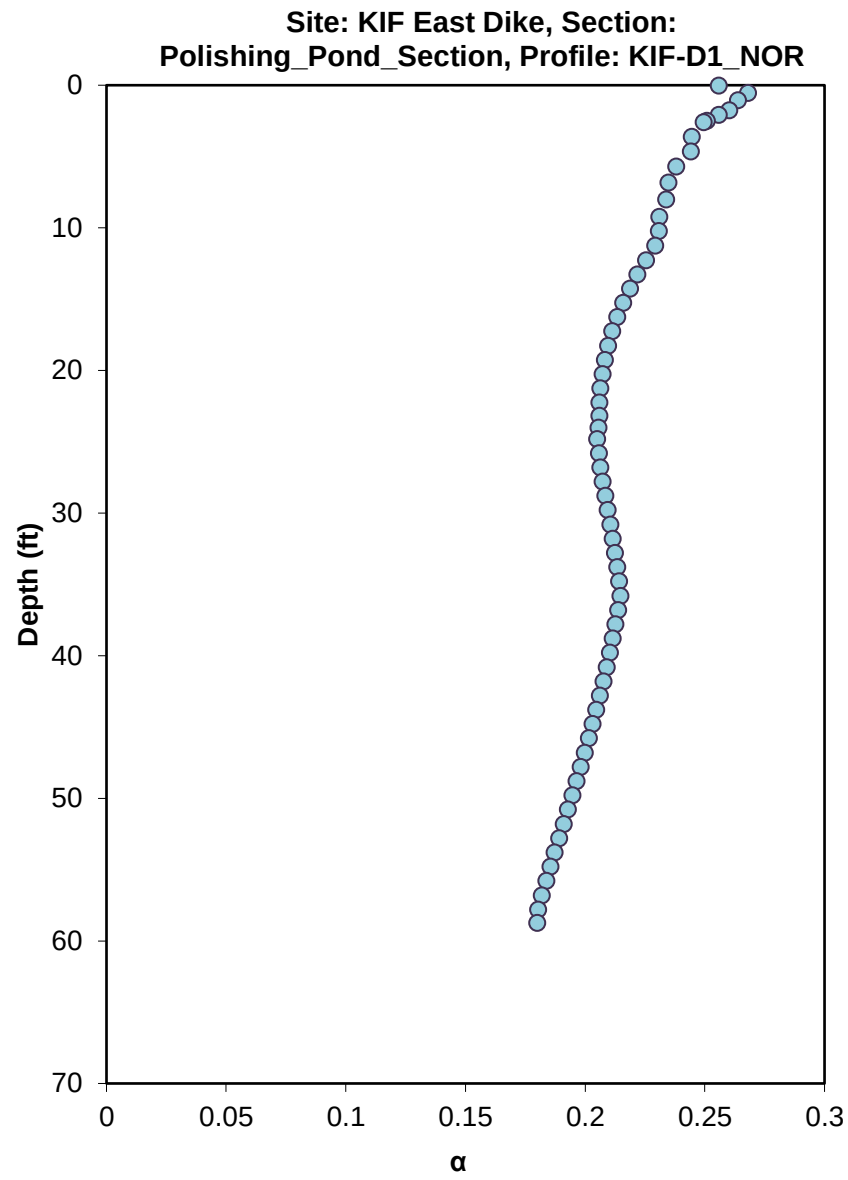
Site: KIF East Dike
Section: Polishing_Pond_Section
Profile: KIF-C2_NOR

From GeoStudio					
Depth (ft)	XY-Shear Stress (psf)	Depth (ft)	Vertical Effective Stress (psf)	Depth (ft)	Alpha
0.00	-51.49	0.00	135.11	0.00	0.381
0.51	-54.13	0.51	133.67	0.51	0.405
1.03	-61.09	1.03	162.39	1.03	0.376
1.50	-68.57	1.50	194.12	1.50	0.353
1.89	-79.17	1.89	229.39	1.89	0.345
2.17	-85.98	2.17	254.39	2.17	0.338
3.15	-100.08	3.15	307.44	3.15	0.326
4.14	-117.32	4.14	375.84	4.14	0.312
5.13	-134.27	5.13	444.65	5.13	0.302
6.12	-151.56	6.12	513.85	6.12	0.295
7.11	-168.66	7.11	583.29	7.11	0.289
8.12	-185.10	8.12	651.02	8.12	0.284
9.14	-202.84	9.14	723.23	9.14	0.280
10.15	-218.65	10.15	793.55	10.15	0.276
11.15	-234.17	11.15	861.91	11.15	0.272
12.15	-249.18	12.15	929.71	12.15	0.268
13.14	-263.87	13.14	997.17	13.14	0.265
14.14	-278.27	14.14	1064.27	14.14	0.261
15.14	-292.37	15.14	1130.95	15.14	0.259
16.14	-306.08	16.14	1197.10	16.14	0.256
17.13	-319.25	17.13	1263.04	17.13	0.253
18.13	-331.69	18.13	1328.92	18.13	0.250
19.12	-342.80	19.12	1392.53	19.12	0.246
20.05	-353.14	20.05	1454.34	20.05	0.243
20.91	-362.15	20.91	1511.48	20.91	0.240
21.70	-372.29	21.70	1574.49	21.70	0.236
22.70	-379.63	22.70	1633.68	22.70	0.232
23.70	-388.50	23.70	1700.64	23.70	0.228
24.70	-397.08	24.70	1767.66	24.70	0.225
25.70	-405.51	25.70	1834.77	25.70	0.221
26.70	-413.89	26.70	1903.23	26.70	0.217
27.70	-422.33	27.70	1974.33	27.70	0.214
28.70	-430.93	28.70	2046.86	28.70	0.211
29.70	-439.76	29.70	2119.62	29.70	0.207
30.70	-448.91	30.70	2192.68	30.70	0.205
31.70	-458.47	31.70	2266.08	31.70	0.202
32.70	-468.09	32.70	2341.75	32.70	0.200
33.70	-475.90	33.70	2422.21	33.70	0.196
34.70	-483.92	34.70	2505.02	34.70	0.193
35.70	-492.61	35.70	2588.40	35.70	0.190
36.70	-502.03	36.70	2672.37	36.70	0.188
37.70	-512.21	37.70	2756.96	37.70	0.186
38.70	-523.13	38.70	2842.16	38.70	0.184
39.70	-534.80	39.70	2927.95	39.70	0.183
40.70	-547.19	40.70	3014.32	40.70	0.182
41.70	-560.24	41.70	3101.19	41.70	0.181
42.70	-573.89	42.70	3188.53	42.70	0.180
43.70	-588.09	43.70	3276.26	43.70	0.180
44.70	-602.76	44.70	3364.28	44.70	0.179
45.70	-617.82	45.70	3452.53	45.70	0.179
46.70	-633.18	46.70	3540.90	46.70	0.179
47.70	-648.75	47.70	3629.29	47.70	0.179
48.70	-664.45	48.70	3717.60	48.70	0.179
49.70	-680.19	49.70	3805.74	49.70	0.179
50.70	-695.89	50.70	3893.61	50.70	0.179
51.70	-711.46	51.70	3981.11	51.70	0.179
52.70	-726.83	52.70	4068.16	52.70	0.179
53.70	-741.94	53.70	4154.67	53.70	0.179
54.70	-756.73	54.70	4240.58	54.70	0.178
55.70	-756.89	55.70	4248.46	55.70	0.178



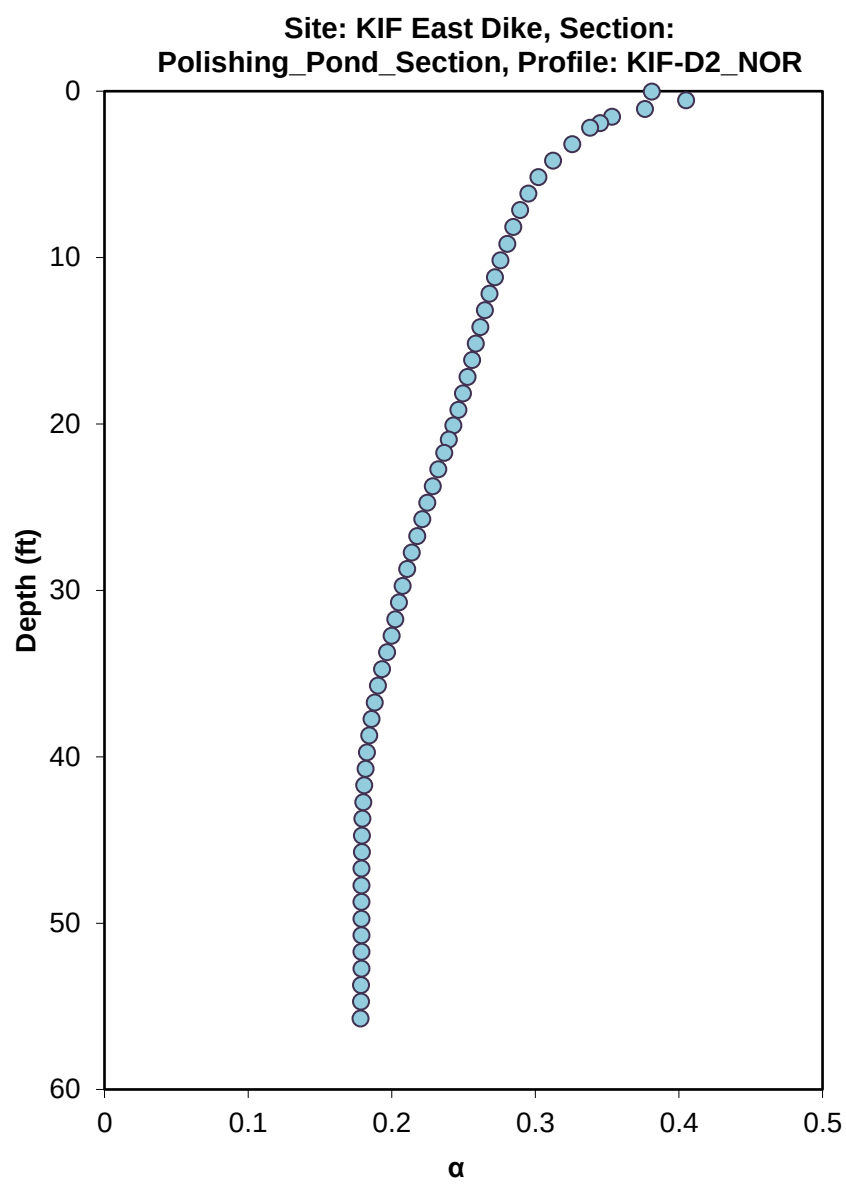
Site: KIF East Dike
Section: Polishing_Pond_Section
Profile: KIF-D1_NOR

From GeoStudio					
Depth (ft)	XY-Shear Stress (psf)	Depth (ft)	Vertical Effective Stress (psf)	Depth (ft)	Alpha
0.00	-57.37	0.00	224.42	0.00	0.256
0.51	-59.51	0.51	222.18	0.51	0.268
1.03	-66.84	1.03	253.38	1.03	0.264
1.71	-77.55	1.71	298.15	1.71	0.260
2.05	-80.81	2.05	315.99	2.05	0.256
2.48	-84.26	2.48	336.16	2.48	0.251
2.57	-86.06	2.57	345.10	2.57	0.249
3.60	-105.12	3.60	429.97	3.60	0.244
4.62	-121.84	4.62	499.10	4.62	0.244
5.68	-136.73	5.68	574.46	5.68	0.238
6.80	-152.24	6.80	648.53	6.80	0.235
7.98	-169.35	7.98	724.31	7.98	0.234
9.18	-184.87	9.18	800.94	9.18	0.231
10.20	-200.70	10.20	870.10	10.20	0.231
11.21	-214.63	11.21	936.46	11.21	0.229
12.24	-225.89	12.24	1002.61	12.24	0.225
13.23	-236.98	13.23	1068.78	13.23	0.222
14.23	-247.74	14.23	1133.55	14.23	0.219
15.23	-258.68	15.23	1198.57	15.23	0.216
16.23	-269.49	16.23	1263.13	16.23	0.213
17.23	-280.45	17.23	1327.58	17.23	0.211
18.22	-291.61	18.22	1391.63	18.22	0.210
19.22	-302.98	19.22	1455.27	19.22	0.208
20.22	-314.59	20.22	1518.56	20.22	0.207
21.21	-326.38	21.21	1581.97	21.21	0.206
22.20	-338.48	22.20	1644.52	22.20	0.206
23.16	-350.61	23.16	1703.63	23.16	0.206
23.99	-361.66	23.99	1759.87	23.99	0.206
24.77	-372.47	24.77	1818.41	24.77	0.205
25.77	-386.15	25.77	1877.78	25.77	0.206
26.77	-401.01	26.77	1944.01	26.77	0.206
27.77	-416.57	27.77	2010.95	27.77	0.207
28.77	-432.85	28.77	2078.59	28.77	0.208
29.77	-449.78	29.77	2148.20	29.77	0.209
30.77	-467.27	30.77	2221.03	30.77	0.210
31.77	-485.22	31.77	2295.80	31.77	0.211
32.77	-503.49	32.77	2371.26	32.77	0.212
33.77	-521.95	33.77	2447.38	33.77	0.213
34.77	-540.47	34.77	2524.10	34.77	0.214
35.77	-558.56	35.77	2603.36	35.77	0.215
36.77	-574.36	36.77	2687.08	36.77	0.214
37.77	-589.56	37.77	2773.15	37.77	0.213
38.77	-604.48	38.77	2859.47	38.77	0.211
39.77	-619.06	39.77	2945.89	39.77	0.210
40.77	-633.26	40.77	3032.30	40.77	0.209
41.77	-647.02	41.77	3118.55	41.77	0.207
42.77	-660.31	42.77	3204.52	42.77	0.206
43.77	-673.08	43.77	3290.09	43.77	0.205
44.77	-685.29	44.77	3375.16	44.77	0.203
45.77	-696.91	45.77	3459.65	45.77	0.201
46.77	-707.94	46.77	3543.47	46.77	0.200
47.77	-718.35	47.77	3626.59	47.77	0.198
48.77	-728.17	48.77	3708.98	48.77	0.196
49.77	-737.41	49.77	3790.62	49.77	0.195
50.77	-746.11	50.77	3871.52	50.77	0.193
51.77	-754.32	51.77	3951.71	51.77	0.191
52.77	-762.07	52.77	4031.22	52.77	0.189
53.77	-769.45	53.77	4110.09	53.77	0.187
54.77	-776.50	54.77	4188.39	54.77	0.185
55.77	-783.29	55.77	4266.17	55.77	0.184
56.77	-789.89	56.77	4343.48	56.77	0.182
57.77	-796.37	57.77	4420.39	57.77	0.180
58.72	-796.40	58.72	4427.83	58.72	0.180



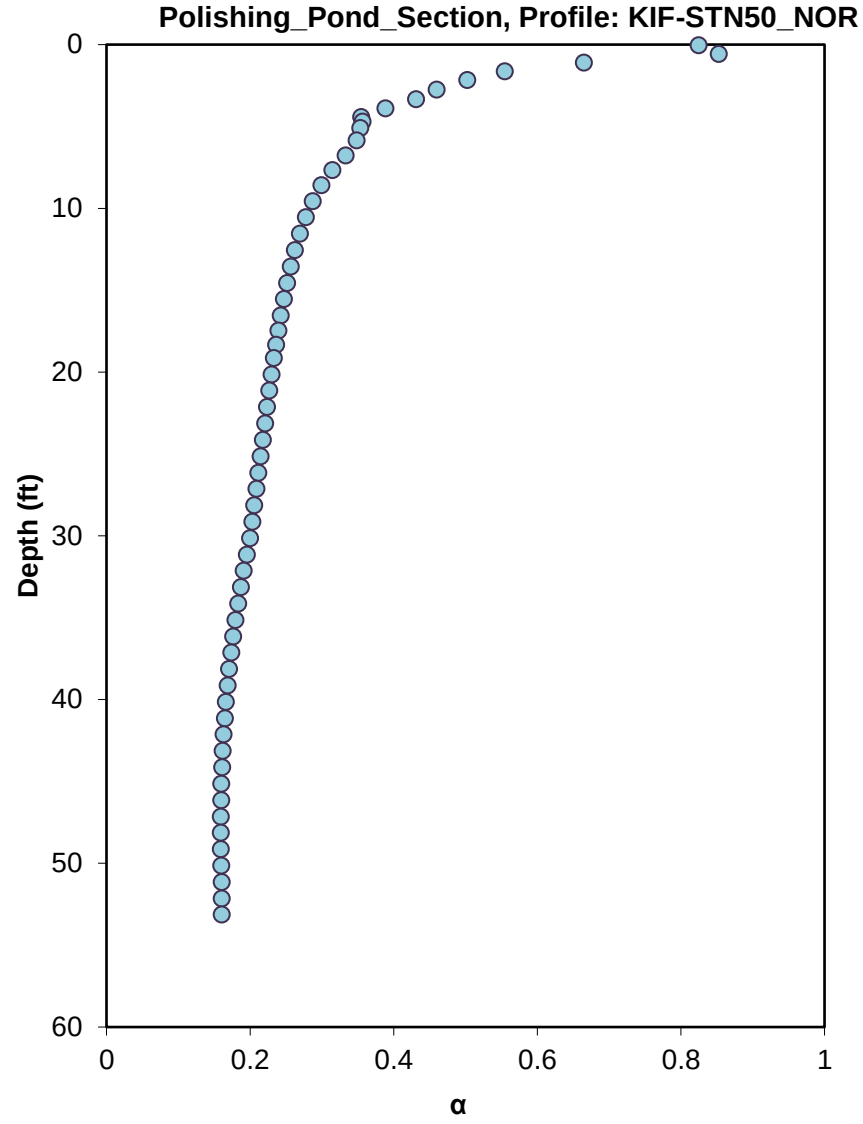
Site: KIF East Dike
Section: Polishing_Pond_Section
Profile: KIF-D2_NOR

From GeoStudio					
Depth (ft)	XY-Shear Stress (psf)	Depth (ft)	Vertical Effective Stress (psf)	Depth (ft)	Alpha
0.00	-51.49	0.00	135.11	0.00	0.381
0.51	-54.13	0.51	133.67	0.51	0.405
1.03	-61.09	1.03	162.39	1.03	0.376
1.50	-68.57	1.50	194.12	1.50	0.353
1.89	-79.17	1.89	229.39	1.89	0.345
2.17	-85.98	2.17	254.39	2.17	0.338
3.15	-100.08	3.15	307.44	3.15	0.326
4.14	-117.32	4.14	375.84	4.14	0.312
5.13	-134.27	5.13	444.65	5.13	0.302
6.12	-151.56	6.12	513.85	6.12	0.295
7.11	-168.66	7.11	583.29	7.11	0.289
8.12	-185.10	8.12	651.02	8.12	0.284
9.14	-202.84	9.14	723.23	9.14	0.280
10.15	-218.65	10.15	793.55	10.15	0.276
11.15	-234.17	11.15	861.91	11.15	0.272
12.15	-249.18	12.15	929.71	12.15	0.268
13.14	-263.87	13.14	997.17	13.14	0.265
14.14	-278.27	14.14	1064.27	14.14	0.261
15.14	-292.37	15.14	1130.95	15.14	0.259
16.14	-306.08	16.14	1197.10	16.14	0.256
17.13	-319.25	17.13	1263.04	17.13	0.253
18.13	-331.69	18.13	1328.92	18.13	0.250
19.12	-342.80	19.12	1392.53	19.12	0.246
20.05	-353.14	20.05	1454.34	20.05	0.243
20.91	-362.15	20.91	1511.48	20.91	0.240
21.70	-372.29	21.70	1574.49	21.70	0.236
22.70	-379.63	22.70	1633.68	22.70	0.232
23.70	-388.50	23.70	1700.64	23.70	0.228
24.70	-397.08	24.70	1767.66	24.70	0.225
25.70	-405.51	25.70	1834.77	25.70	0.221
26.70	-413.89	26.70	1903.23	26.70	0.217
27.70	-422.33	27.70	1974.33	27.70	0.214
28.70	-430.93	28.70	2046.86	28.70	0.211
29.70	-439.76	29.70	2119.62	29.70	0.207
30.70	-448.91	30.70	2192.68	30.70	0.205
31.70	-458.47	31.70	2266.08	31.70	0.202
32.70	-468.09	32.70	2341.75	32.70	0.200
33.70	-475.90	33.70	2422.21	33.70	0.196
34.70	-483.92	34.70	2505.02	34.70	0.193
35.70	-492.61	35.70	2588.40	35.70	0.190
36.70	-502.03	36.70	2672.37	36.70	0.188
37.70	-512.21	37.70	2756.96	37.70	0.186
38.70	-523.13	38.70	2842.16	38.70	0.184
39.70	-534.80	39.70	2927.95	39.70	0.183
40.70	-547.19	40.70	3014.32	40.70	0.182
41.70	-560.24	41.70	3101.19	41.70	0.181
42.70	-573.89	42.70	3188.53	42.70	0.180
43.70	-588.09	43.70	3276.26	43.70	0.180
44.70	-602.76	44.70	3364.28	44.70	0.179
45.70	-617.82	45.70	3452.53	45.70	0.179
46.70	-633.18	46.70	3540.90	46.70	0.179
47.70	-648.75	47.70	3629.29	47.70	0.179
48.70	-664.45	48.70	3717.60	48.70	0.179
49.70	-680.19	49.70	3805.74	49.70	0.179
50.70	-695.89	50.70	3893.61	50.70	0.179
51.70	-711.46	51.70	3981.11	51.70	0.179
52.70	-726.83	52.70	4068.16	52.70	0.179
53.70	-741.94	53.70	4154.67	53.70	0.179
54.70	-756.73	54.70	4240.58	54.70	0.178
55.70	-756.89	55.70	4248.46	55.70	0.178



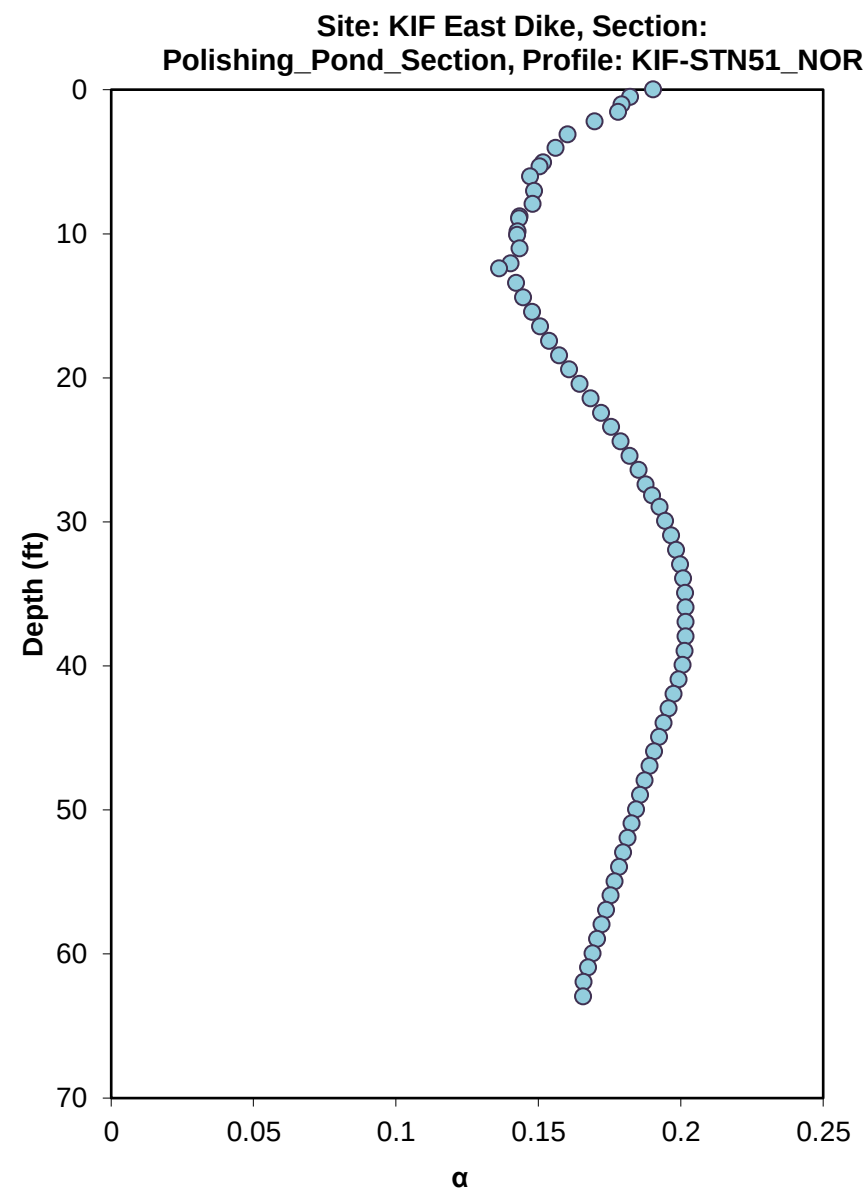
Site: KIF East Dike
Section: Polishing_Pond_Section
Profile: KIF-STN50_NOR

From GeoStudio					
Depth (ft)	XY-Shear Stress (psf)	Depth (ft)	Vertical Effective Stress (psf)	Depth (ft)	Alpha
0.00	-47.53	0.00	57.66	0.00	0.824
0.55	-54.37	0.55	63.80	0.55	0.852
1.07	-64.52	1.07	97.09	1.07	0.664
1.59	-73.61	1.59	132.72	1.59	0.555
2.13	-85.76	2.13	170.75	2.13	0.502
2.71	-97.27	2.71	211.72	2.71	0.459
3.31	-107.66	3.31	249.81	3.31	0.431
3.86	-113.24	3.86	291.72	3.86	0.388
4.40	-115.43	4.40	325.94	4.40	0.354
4.67	-124.54	4.67	349.67	4.67	0.356
5.07	-135.22	5.07	382.83	5.07	0.353
5.82	-152.46	5.82	437.77	5.82	0.348
6.73	-164.12	6.73	493.45	6.73	0.333
7.62	-175.82	7.62	559.52	7.62	0.314
8.56	-187.85	8.56	627.69	8.56	0.299
9.53	-200.44	9.53	698.47	9.53	0.287
10.51	-213.66	10.51	770.22	10.51	0.277
11.50	-226.93	11.50	843.13	11.50	0.269
12.53	-239.95	12.53	915.44	12.53	0.262
13.53	-253.04	13.53	987.71	13.53	0.256
14.52	-265.90	14.52	1058.93	14.52	0.251
15.52	-278.58	15.52	1129.82	15.52	0.247
16.51	-290.55	16.51	1197.88	16.51	0.243
17.44	-302.03	17.44	1263.97	17.44	0.239
18.31	-312.40	18.31	1324.78	18.31	0.236
19.11	-324.15	19.11	1392.26	19.11	0.233
20.11	-334.06	20.11	1454.24	20.11	0.230
21.11	-345.27	21.11	1524.15	21.11	0.227
22.11	-356.18	22.11	1593.77	22.11	0.223
23.11	-366.81	23.11	1663.09	23.11	0.221
24.11	-377.17	24.11	1733.38	24.11	0.218
25.11	-387.28	25.11	1805.90	25.11	0.214
26.11	-397.14	26.11	1879.42	26.11	0.211
27.11	-406.75	27.11	1952.69	27.11	0.208
28.11	-416.13	28.11	2025.75	28.11	0.205
29.11	-425.30	29.11	2098.61	29.11	0.203
30.11	-433.87	30.11	2173.10	30.11	0.200
31.11	-439.85	31.11	2251.88	31.11	0.195
32.11	-445.33	32.11	2332.39	32.11	0.191
33.11	-450.80	33.11	2412.87	33.11	0.187
34.11	-456.34	34.11	2493.38	34.11	0.183
35.11	-462.01	35.11	2574.00	35.11	0.179
36.11	-467.90	36.11	2654.77	36.11	0.176
37.11	-474.08	37.11	2735.78	37.11	0.173
38.11	-480.63	38.11	2817.08	38.11	0.171
39.11	-487.63	39.11	2898.74	39.11	0.168
40.11	-495.16	40.11	2980.83	40.11	0.166
41.11	-503.28	41.11	3063.40	41.11	0.164
42.11	-512.07	42.11	3146.52	42.11	0.163
43.11	-521.58	43.11	3230.21	43.11	0.161
44.11	-531.86	44.11	3314.53	44.11	0.160
45.11	-542.96	45.11	3399.48	45.11	0.160
46.11	-554.89	46.11	3485.09	46.11	0.159
47.11	-567.67	47.11	3571.34	47.11	0.159
48.11	-581.28	48.11	3658.21	48.11	0.159
49.11	-595.70	49.11	3745.66	49.11	0.159
50.11	-610.92	50.11	3833.65	50.11	0.159
51.11	-626.86	51.11	3922.10	51.11	0.160
52.11	-643.48	52.11	4010.95	52.11	0.160
53.11	-643.14	53.11	4018.34	53.11	0.160



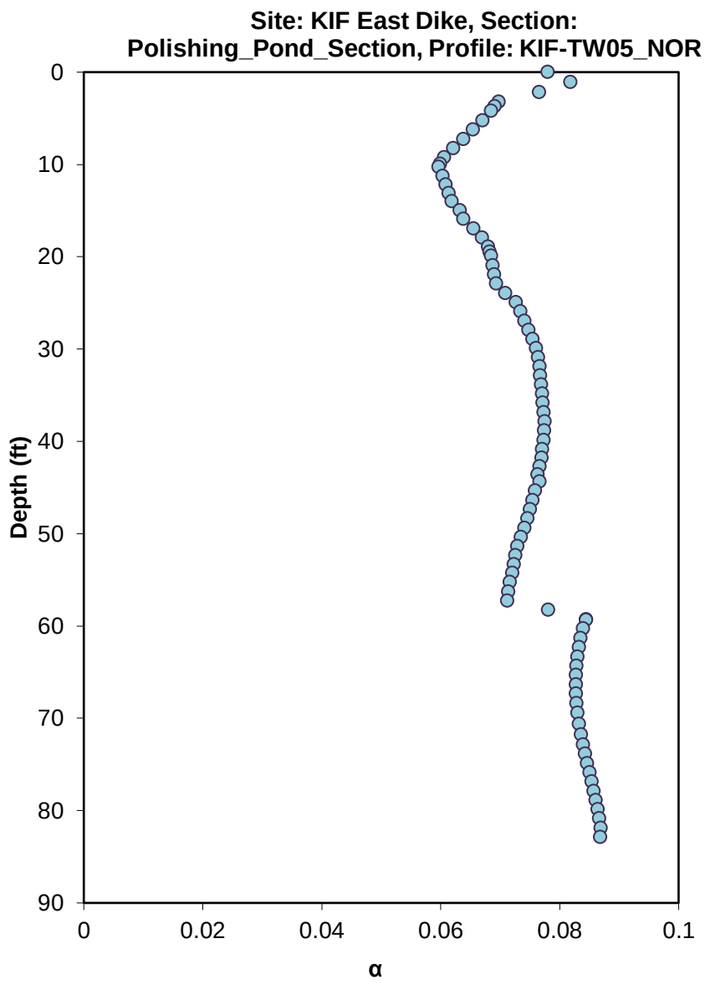
Site: KIF East Dike
Section: Polishing_Pond_Section
Profile: KIF-STN51_NOR

From GeoStudio					
Depth (ft)	XY-Shear Stress (psf)	Depth (ft)	Vertical Effective Stress (psf)	Depth (ft)	Alpha
0.00	-68.76	0.00	361.44	0.00	0.190
0.52	-69.45	0.52	381.11	0.52	0.182
1.03	-73.73	1.03	411.39	1.03	0.179
1.55	-79.41	1.55	446.31	1.55	0.178
2.20	-81.83	2.20	482.12	2.20	0.170
3.10	-87.02	3.10	543.12	3.10	0.160
4.05	-94.14	4.05	603.58	4.05	0.156
5.05	-99.89	5.05	658.87	5.05	0.152
5.32	-101.88	5.32	677.66	5.32	0.150
6.04	-107.19	6.04	729.15	6.04	0.147
7.02	-117.20	7.02	789.91	7.02	0.148
7.92	-125.25	7.92	847.13	7.92	0.148
8.79	-128.36	8.79	895.36	8.79	0.143
8.94	-129.46	8.94	904.03	8.94	0.143
9.84	-137.62	9.84	964.65	9.84	0.143
10.09	-139.90	10.09	981.91	10.09	0.142
11.03	-149.85	11.03	1045.64	11.03	0.143
12.05	-155.62	12.05	1110.21	12.05	0.140
12.41	-154.79	12.41	1136.30	12.41	0.136
13.41	-170.39	13.41	1198.15	13.41	0.142
14.41	-182.92	14.41	1264.33	14.41	0.145
15.44	-196.62	15.44	1330.98	15.44	0.148
16.44	-210.72	16.44	1398.77	16.44	0.151
17.44	-225.58	17.44	1466.66	17.44	0.154
18.44	-241.29	18.44	1534.82	18.44	0.157
19.44	-257.75	19.44	1603.15	19.44	0.161
20.44	-274.96	20.44	1671.60	20.44	0.164
21.44	-292.75	21.44	1740.33	21.44	0.168
22.43	-310.99	22.43	1809.03	22.43	0.172
23.43	-329.47	23.43	1877.34	23.43	0.176
24.43	-347.95	24.43	1945.21	24.43	0.179
25.42	-366.47	25.42	2012.93	25.42	0.182
26.41	-385.04	26.41	2079.99	26.41	0.185
27.40	-401.24	27.40	2139.47	27.40	0.188
28.18	-417.73	28.18	2199.62	28.18	0.190
28.97	-435.24	28.97	2260.54	28.97	0.193
29.95	-451.04	29.95	2319.05	29.95	0.194
30.95	-468.64	30.95	2384.78	30.95	0.197
31.95	-485.92	31.95	2450.50	31.95	0.198
32.95	-502.52	32.95	2515.60	32.95	0.200
33.95	-518.38	33.95	2581.32	33.95	0.201
34.95	-533.52	34.95	2648.88	34.95	0.201
35.95	-547.93	35.95	2717.01	35.95	0.202
36.95	-561.66	36.95	2784.44	36.95	0.202
37.95	-574.72	37.95	2851.18	37.95	0.202
38.95	-587.19	38.95	2917.27	38.95	0.201
39.95	-598.86	39.95	2985.03	39.95	0.201
40.95	-608.49	40.95	3055.86	40.95	0.199
41.95	-617.47	41.95	3128.50	41.95	0.197
42.95	-626.18	42.95	3200.79	42.95	0.196
43.95	-634.69	43.95	3272.77	43.95	0.194
44.95	-643.04	44.95	3344.56	44.95	0.192
45.95	-651.19	45.95	3416.13	45.95	0.191
46.95	-658.99	46.95	3487.53	46.95	0.189
47.95	-666.71	47.95	3558.95	47.95	0.187
48.95	-674.36	48.95	3630.40	48.95	0.186
49.95	-681.85	49.95	3701.80	49.95	0.184
50.95	-689.33	50.95	3773.03	50.95	0.183
51.95	-696.72	51.95	3844.47	51.95	0.181
52.95	-703.85	52.95	3916.35	52.95	0.180
53.95	-710.88	53.95	3988.51	53.95	0.178
54.95	-717.78	54.95	4060.95	54.95	0.177
55.95	-724.45	55.95	4133.69	55.95	0.175
56.95	-730.87	56.95	4206.72	56.95	0.174
57.95	-737.01	57.95	4280.00	57.95	0.172
58.95	-742.88	58.95	4353.56	58.95	0.171
59.95	-748.51	59.95	4427.39	59.95	0.169
60.95	-753.95	60.95	4501.49	60.95	0.167
61.949	-759.21	61.94901	4575.84	61.95	0.166
62.949	-759.30	62.94901	4583.30	62.95	0.166



Site: KIF East Dike
Section: Polishing_Pond_Section
Profile: KIF-TW05_NOR

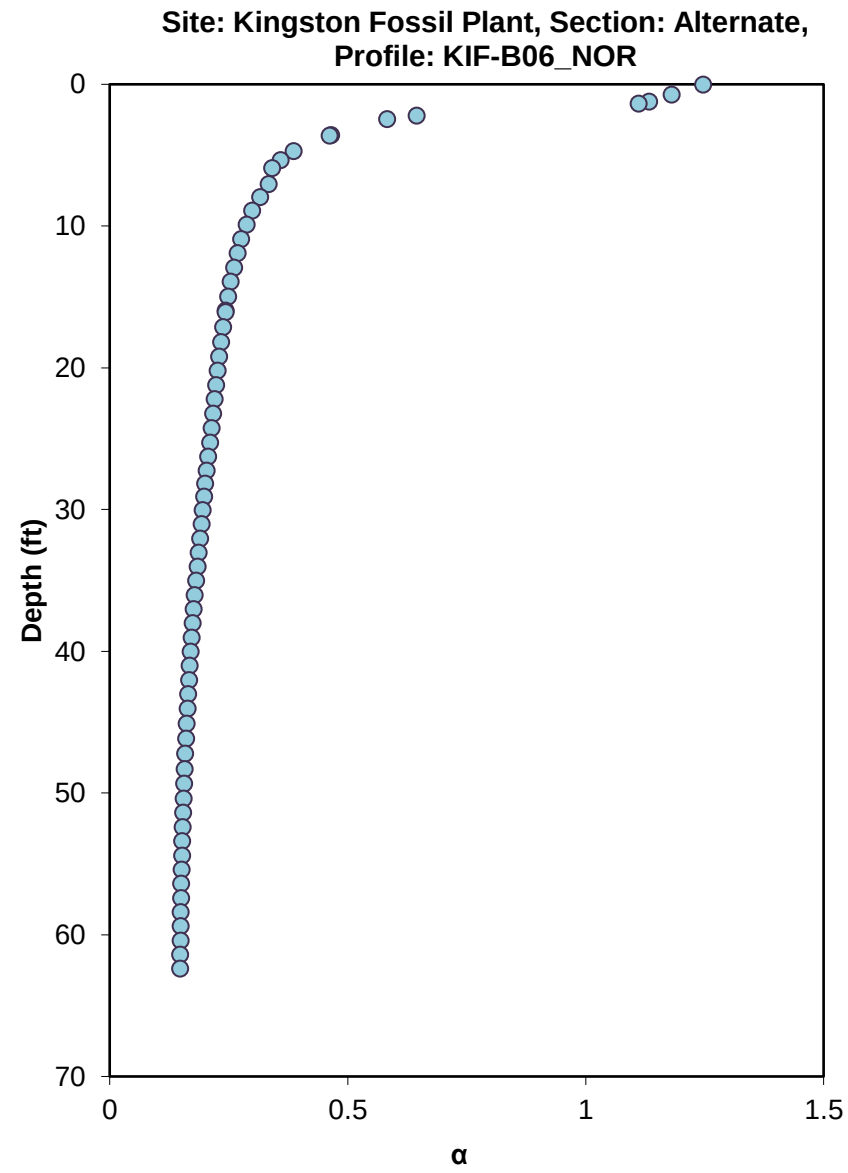
From GeoStudio					
Depth (ft)	XY-Shear Stress (psf)	Depth (ft)	Vertical Effective Stress (psf)	Depth (ft)	Alpha
0.00	-30.30	0.00	388.44	0.00	0.078
1.10	-36.89	1.10	451.06	1.10	0.082
2.20	-44.48	2.20	580.91	2.20	0.077
3.21	-49.48	3.21	709.50	3.21	0.070
3.71	-53.27	3.71	771.01	3.71	0.069
4.22	-57.19	4.22	834.82	4.22	0.069
5.23	-64.36	5.23	960.20	5.23	0.067
6.24	-71.04	6.24	1085.61	6.24	0.065
7.25	-77.25	7.25	1211.00	7.25	0.064
8.25	-83.05	8.25	1336.27	8.25	0.062
9.26	-88.47	9.26	1461.15	9.26	0.061
9.96	-91.99	9.96	1535.48	9.96	0.060
10.26	-93.50	10.26	1567.30	10.26	0.060
11.24	-98.20	11.24	1628.07	11.24	0.060
12.21	-102.67	12.21	1687.24	12.21	0.061
13.14	-106.95	13.14	1743.11	13.14	0.061
14.00	-111.50	14.00	1802.34	14.00	0.062
14.96	-117.91	14.96	1866.28	14.96	0.063
15.93	-121.89	15.93	1910.67	15.93	0.064
16.93	-128.90	16.93	1968.69	16.93	0.065
17.92	-135.76	17.92	2027.14	17.92	0.067
18.92	-141.71	18.92	2085.39	18.92	0.068
19.45	-144.39	19.45	2116.12	19.45	0.068
19.92	-146.76	19.92	2143.27	19.92	0.068
20.92	-151.32	20.92	2200.63	20.92	0.069
21.93	-155.78	21.93	2257.41	21.93	0.069
22.93	-160.41	22.93	2313.78	22.93	0.069
23.93	-167.86	23.93	2368.96	23.93	0.071
24.93	-175.80	24.93	2421.08	24.93	0.073
25.93	-181.35	25.93	2471.90	25.93	0.073
26.94	-186.87	26.94	2522.52	26.94	0.074
27.94	-192.30	27.94	2572.99	27.94	0.075
28.94	-197.75	28.94	2622.20	28.94	0.075
29.92	-203.12	29.92	2671.79	29.92	0.076
30.89	-207.81	30.89	2720.37	30.89	0.076
31.87	-212.18	31.87	2769.27	31.87	0.077
32.86	-216.26	32.86	2818.09	32.86	0.077
33.85	-220.36	33.85	2866.36	33.85	0.077
34.85	-224.51	34.85	2914.90	34.85	0.077
35.85	-228.70	35.85	2963.33	35.85	0.077
36.85	-232.93	36.85	3011.58	36.85	0.077
37.85	-237.18	37.85	3062.19	37.85	0.077
38.85	-241.38	38.85	3117.69	38.85	0.077
39.85	-245.52	39.85	3175.67	39.85	0.077
40.85	-249.16	40.85	3232.34	40.85	0.077
41.79	-253.09	41.79	3288.21	41.79	0.077
42.73	-256.19	42.73	3341.54	42.73	0.077
43.61	-258.81	43.61	3391.33	43.61	0.076
44.37	-263.93	44.37	3443.31	44.37	0.077
45.37	-265.37	45.37	3496.65	45.37	0.076
46.37	-268.36	46.37	3555.54	46.37	0.075
47.37	-271.21	47.37	3614.77	47.37	0.075
48.37	-273.94	48.37	3674.36	48.37	0.075
49.37	-276.60	49.37	3735.58	49.37	0.074
50.37	-279.28	50.37	3799.68	50.37	0.074
51.37	-281.77	51.37	3865.69	51.37	0.073
52.35	-285.28	52.35	3931.37	52.35	0.073
53.33	-288.85	53.33	3996.41	53.33	0.072
54.29	-292.57	54.29	4061.80	54.29	0.072
55.27	-295.60	55.27	4128.73	55.27	0.072
56.27	-299.54	56.27	4196.27	56.27	0.071
57.27	-303.58	57.27	4265.40	57.27	0.071
58.28	-338.44	58.28	4335.11	58.28	0.078
59.29	-372.43	59.29	4408.40	59.29	0.084
59.35	-372.71	59.35	4413.52	59.35	0.084
60.29	-376.77	60.29	4487.18	60.29	0.084
61.30	-381.50	61.30	4566.33	61.30	0.084
62.31	-386.62	62.31	4645.78	62.31	0.083
63.3156	-392.11	63.31563	4725.52	63.32	0.083
64.3247	-397.97	64.32475	4805.48	64.32	0.083
65.3342	-404.19	65.33416	4885.74	65.33	0.083
66.3466	-410.74	66.34662	4966.29	66.35	0.083
67.363	-417.54	67.36304	5047.66	67.36	0.083
68.3961	-424.72	68.39613	5130.07	68.40	0.083
69.4426	-433.20	69.44262	5217.53	69.44	0.083
70.6172	-442.14	70.61725	5308.08	70.62	0.083
71.7867	-451.13	71.78674	5397.83	71.79	0.084
72.8446	-460.38	72.84464	5484.75	72.84	0.084
73.8586	-469.13	73.85858	5566.85	73.86	0.084
74.8648	-477.96	74.86482	5647.31	74.86	0.085
75.8676	-486.98	75.86757	5727.40	75.87	0.085
76.8695	-495.77	76.86949	5807.22	76.87	0.085
77.8705	-504.60	77.87048	5886.80	77.87	0.086
78.8706	-513.39	78.8706	5966.09	78.87	0.086
79.8707	-522.12	79.87074	6045.07	79.87	0.086
80.8708	-530.74	80.87083	6123.72	80.87	0.087
81.8708	-539.23	81.87079	6201.98	81.87	0.087
82.8708	-539.31	82.87079	6209.80	82.87	0.087



3.2.2.3 Alternate Section

Site: Kingston Fossil Plant
Section: Alternate
Profile: KIF-B06_NOR

From GeoStudio					
Depth (ft)	XY-Shear Stress (psf)	Depth (ft)	Vertical Effective Stress (psf)	Depth (ft)	Alpha
0.00	-52.59	0.00	42.19	0.00	1.246
0.71	-73.06	0.71	61.92	0.71	1.180
1.21	-91.72	1.21	80.94	1.21	1.133
1.36	-95.49	1.36	85.98	1.36	1.111
2.21	-87.22	2.21	135.35	2.21	0.644
2.46	-90.82	2.46	155.85	2.46	0.583
3.57	-104.51	3.57	224.61	3.57	0.465
3.61	-104.85	3.61	227.15	3.61	0.462
4.72	-110.88	4.72	287.29	4.72	0.386
5.33	-116.84	5.33	325.34	5.33	0.359
5.89	-124.68	5.89	366.03	5.89	0.341
7.02	-151.12	7.02	453.47	7.02	0.333
7.97	-163.19	7.97	516.48	7.97	0.316
8.91	-174.53	8.91	583.47	8.91	0.299
9.91	-187.86	9.91	654.57	9.91	0.287
10.91	-201.47	10.91	728.93	10.91	0.276
11.91	-216.09	11.91	805.11	11.91	0.268
12.92	-230.03	12.92	880.72	12.92	0.261
13.92	-243.38	13.92	958.26	13.92	0.254
14.97	-257.16	14.97	1036.61	14.97	0.248
15.96	-269.97	15.96	1108.83	15.96	0.243
16.05	-271.18	16.05	1115.65	16.05	0.243
17.13	-284.77	17.13	1195.97	17.13	0.238
18.20	-297.86	18.20	1273.29	18.20	0.234
19.20	-310.68	19.20	1351.16	19.20	0.230
20.21	-322.96	20.21	1426.18	20.21	0.226
21.21	-335.00	21.21	1500.71	21.21	0.223
22.21	-346.84	22.21	1575.96	22.21	0.220
23.24	-357.87	23.24	1650.76	23.24	0.217
24.25	-368.39	24.25	1725.81	24.25	0.213
25.26	-378.89	25.26	1801.48	25.26	0.210
26.26	-389.01	26.26	1879.52	26.26	0.207
27.26	-397.74	27.26	1955.27	27.26	0.203
28.15	-406.76	28.15	2028.43	28.15	0.201
29.07	-415.44	29.07	2101.07	29.07	0.198
30.05	-424.39	30.05	2176.68	30.05	0.195
31.03	-435.21	31.03	2256.12	31.03	0.193
32.03	-445.08	32.03	2340.27	32.03	0.190
33.03	-453.71	33.03	2426.83	33.03	0.187
34.03	-462.44	34.03	2513.43	34.03	0.184
35.02	-471.22	35.02	2600.04	35.02	0.181
36.02	-480.02	36.02	2686.58	36.02	0.179
37.02	-488.78	37.02	2773.01	37.02	0.176
38.02	-497.49	38.02	2859.33	38.02	0.174
39.02	-506.18	39.02	2945.56	39.02	0.172
40.01	-514.91	40.01	3031.82	40.01	0.170
41.01	-523.71	41.01	3118.04	41.01	0.168
42.01	-532.61	42.01	3204.68	42.01	0.166
43.02	-541.74	43.02	3292.17	43.02	0.165
44.05	-551.36	44.05	3380.72	44.05	0.163
45.08	-560.73	45.08	3470.38	45.08	0.162
46.14	-570.20	46.14	3560.85	46.14	0.160
47.23	-579.18	47.23	3651.58	47.23	0.159
48.30	-588.67	48.30	3743.82	48.30	0.157
49.35	-597.81	49.35	3833.33	49.35	0.156
50.37	-607.65	50.37	3922.06	50.37	0.155
51.39	-617.28	51.39	4009.25	51.39	0.154
52.39	-626.90	52.39	4095.41	52.39	0.153
53.39	-636.76	53.39	4181.50	53.39	0.152
54.40	-646.69	54.40	4267.25	54.40	0.152
55.40	-656.81	55.40	4352.99	55.40	0.151
56.40	-667.07	56.40	4438.72	56.40	0.150
57.40	-677.51	57.40	4524.50	57.40	0.150
58.40	-688.12	58.40	4610.30	58.40	0.149
59.40	-698.91	59.40	4696.16	59.40	0.149
60.40	-709.92	60.40	4782.06	60.40	0.148
61.40	-721.18	61.40	4868.00	61.40	0.148
62.40	-721.04	62.40	4875.59	62.40	0.148



3.3 SPT-BASED LIQUEFACTION ASSESSMENT FOR SAND-LIKE SOILS

3.3.1 1 Hz Design Earthquake

Project Name = KIF TDEC Seismic Stability

Boring ID = KIF-B05

Boring Location

Northing =

Easting =

OR

Baseline Station =

Offset (+ Right) =

Drilling Information

Boring Inner Diameter (ID) = 4.625 inches

Top of Hole Elevation = 756.5 feet

Water Depth during SPT (negative for U/S borings)= 52 feet

Depth Sampling Began = 0 feet

Total Unit Wt. above 1st SPT = pcf

Assumed Rod Stickup = 5 feet *(Typ assume 5ft)*

E_m Measurement based on Fv method? = 1 (1: Yes, 0: No)

SPT Sampler w/ Liners? = 0 (1: Yes, 0: No) *(Typ. no)*

During EQ Information

Water Depth during EQ (relative to SPT TOH, negative for U/S borings) = 5.9 feet

Final Grade Elevation during EQ = 756.5 feet

Average Total Unit Wt. of Cut/Fill = pcf

Fines Content Correction

Fines content correction for samples with blow counts of zero? = 1 (1: Yes, 0: No)

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile? = 0 (1: Yes, 0: No)

If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile: SectionAA, KIF-B09_NOR

Alpha at each sample depth known? = 1 (1: Yes, 0: No)

If previous answer is No, then enter curve fit parameters below (α vs. depth curve)

If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_α will be one.

m4:
m3:
m2:
m1:
m0:

Associated ground response profile: Alternate, KIF-B05_NOR

Get CSR from shear stress envelope? = 0 (1: Yes, 0: No)

If previous answer is No, then CSR will be calculated using a_{max} and r_d

Max. Shear Stress at each sample depth known? = (1: Yes, 0: No)

If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4:
m3:
m2:
m1:

Earthquake Information

EQ Source (e.g., New Madrid): 1 Hz

Event (e.g., MCE, 10KEQ, OBE): Design EQ

a_{max} (g) (top of ground surface): 0.10

EQ Mag (Mw): 7.6

Inputs

Depth of Sample Midpoint (ft.)	SPT N Value	Hammer Efficiency, E_m (%)	Unified Soil Classification	Fines Content (%)	Total Unit Weight (pcf)	Material (optional)	Clay-like / Sand-like Override (optional)	Clay-like Susceptibility (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure during SPT (psf)	Static Pore Water Pressure during EQ (psf)
1.0	25	89.8	CL	51.1	128	Embankment Fill	Clay-like	Not Susceptible		0.011			
3.5	18	89.8	CL	51.1	128	Embankment Fill	Clay-like	Not Susceptible		0.028			
6.0	3	89.8	CL	51.1	128	Embankment Fill	Clay-like	Not Susceptible		0.005			
8.5	14	89.8	CL	51.1	128	Embankment Fill	Clay-like	Not Susceptible		0.021			
11.0	8	89.8	CL	51.1	128	Embankment Fill	Clay-like	Not Susceptible		0.055			
13.5	31	89.8	SC	20.2	128	Embankment Fill	Clay-like	Not Susceptible		0.076			
16.0	19	89.8	SC	20.2	128	Embankment Fill	Clay-like	Not Susceptible		0.091			
18.5	13	89.8	SC	20.2	128	Embankment Fill	Clay-like	Not Susceptible		0.109			
20.0	6	89.8	SC	20.2	128	Embankment Fill	Clay-like	Not Susceptible		0.113			
21.5	7	89.8	SM	36.3	128	Embankment Fill	Clay-like	Not Susceptible		0.122			
24.0	2	89.8	SM	36.3	128	Embankment Fill	Clay-like	Not Susceptible		0.129			
26.5	0	89.8	SM	36.3	128	Embankment Fill	Clay-like	Not Susceptible		0.132			
29.0	3	89.8	SM	36.3	128	Embankment Fill	Clay-like	Not Susceptible		0.137			
31.5	5	89.8	SM	36.3	128	Embankment Fill	Clay-like	Not Susceptible		0.142			
34.0	0	89.8	CL	60.1	127	Subunit 1				0.145			
39.0	14	89.8	CL	93.3	127	Subunit 1				0.150			
41.5	4	89.8	CL	93.3	127	Subunit 1				0.151			
44.0	15	89.8	CL	78.7	127	Subunit 1				0.154			
46.5	5	89.8	CL	84.9	127	Subunit 1				0.155			

KIF TDEC Seismic Stability, Boring ID: KIF-B05

Liquefaction Potential Evaluations

For Coarse Grained Soils

Elev. Of Mid. Pt. of Sample (ft)	Depth of Mid. Pt. of Sample (ft.)	Unit Weight (pcf)	Vert. Total Stress during SPT (tsf)	Static Pore Pressure during SPT (tsf)	Vert. Eff. Stress during SPT (tsf)	SPT N Value	Hammer Efficiency (%)	Borehole Diameter Correction	Sampler Correction	Rod Length Correction	Overburden Stress Correction Factor	Hammer Energy Correction Factor	Corrected Blow Count	Normalized Blow Count	Relative Density (%)	Unified Soil Classification	Fines Content (%)
	z	γ_T	σ_v	u	σ'_v	N	E_m	C_B	C_s	C_R	C_N	C_E	N_{60}	$(N_1)_{60}$	D_r		

Top of Hole Elevation (ft) = 756.5 | Boring ID = **KIF-B05**

begin sampling (depth-ft) = 0.0 | Boring Inner Dia. (in) = 4.625

total unit wt. above 1st SPT (pcf) = 0

water elevation during SPT (ft) = 704.5 ft *(relative to ground surface during SPT)* | Assumed Rod Stickup = 5.0 feet

water depth during SPT (ft) = 52.0 | E_m Measurement? = 1 (1: Yes, 0: No)

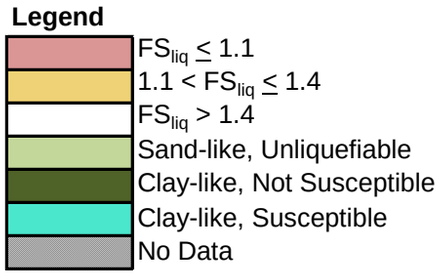
water elevation during EQ (ft) = 750.6 ft *(relative to ground surface during SPT)* | SPT Sampler w/ Liners? = 0 (1: Yes, 0: No)

	u-top	effstr-top
water during EQ (depth-ft) =	5.9	
vert. total stress above 1st SPT (tsf) =	**0.00**	0.00

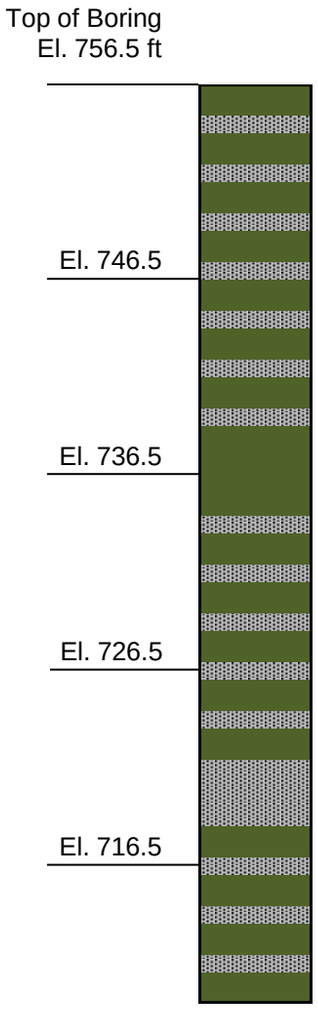
755.5	1.0	128	0.06	0.00	0.06	25	89.8	1.004	1.30	1.00	1.70	1.50	49	83	100	CL	51.1
753.0	3.5	128	0.22	0.00	0.22	18	89.8	1.004	1.30	1.00	1.50	1.50	35	53	100	CL	51.1
750.5	6.0	128	0.38	0.00	0.38	3	89.8	1.004	1.10	1.00	1.66	1.50	5	8	55	CL	51.1
748.0	8.5	128	0.54	0.00	0.54	14	89.8	1.004	1.30	1.00	1.22	1.50	27	33	92	CL	51.1
745.5	11.0	128	0.70	0.00	0.70	8	89.8	1.004	1.17	1.00	1.19	1.50	14	17	70	CL	51.1
743.0	13.5	128	0.86	0.00	0.86	31	89.8	1.004	1.30	1.00	1.05	1.50	61	64	100	SC	20.2
740.5	16.0	128	1.02	0.00	1.02	19	89.8	1.004	1.30	1.00	1.01	1.50	37	37	96	SC	20.2
738.0	18.5	128	1.18	0.00	1.18	13	89.8	1.004	1.23	1.00	0.96	1.50	24	23	77	SC	20.2
736.5	20.0	128	1.28	0.00	1.28	6	89.8	1.004	1.10	1.00	0.91	1.50	10	9	54	SC	20.2
735.0	21.5	128	1.38	0.00	1.38	7	89.8	1.004	1.10	1.00	0.88	1.50	12	10	59	SM	36.3
732.5	24.0	128	1.54	0.00	1.54	2	89.8	1.004	1.10	1.00	0.81	1.50	3	3	42	SM	36.3
730.0	26.5	128	1.70	0.00	1.70	0	89.8	1.004	1.10	1.00	0.75	1.50	0	0	35	SM	36.3
727.5	29.0	128	1.86	0.00	1.86	3	89.8	1.004	1.10	1.00	0.73	1.50	5	4	45	SM	36.3
725.0	31.5	128	2.02	0.00	2.02	5	89.8	1.004	1.10	1.00	0.71	1.50	8	6	50	SM	36.3
722.5	34.0	127	2.18	0.00	2.18	0	89.8	1.004	1.10	1.00	0.65	1.50	0	0	35	CL	60.1
717.5	39.0	127	2.49	0.00	2.49	14	89.8	1.004	1.17	1.00	0.70	1.50	25	17	70	CL	93.3
715.0	41.5	127	2.65	0.00	2.65	4	89.8	1.004	1.10	1.00	0.60	1.50	7	4	45	CL	93.3
712.5	44.0	127	2.81	0.00	2.81	15	89.8	1.004	1.18	1.00	0.67	1.50	27	18	71	CL	78.7
710.0	46.5	127	2.97	0.00	2.97	5	89.8	1.004	1.10	1.00	0.57	1.50	8	5	47	CL	84.9

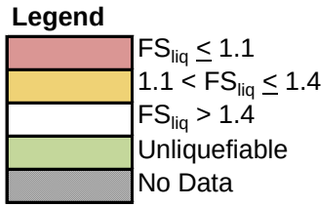
KIF TDEC Seismic Stability, Boring ID: KIF-B05
Liquefaction Potential Evaluations
For Coarse Grained Soils

Depth of Mid. Pt. of Sample (ft.) z	Clean Sand Correction $\Delta(N_1)_{60cs}$	Equivalent Clean Sand N-Value $(N_1)_{60cs}$	Sample Screened for: Clay-like	High Blow Count $(N_1)_{60cs} \geq 32$	Unsaturated	Factor of Safety FS_{liq}	Material (optional)
ft			*Note: A factor of safety shown as "N/A" implies that the soil type is not appropriately evaluated using this methodology. This applies to clay-like soils (typically CL, CH, CL-ML and MH material type), samples with high blow counts, and unsaturated samples.*				
ft *(relative to ground surface during SPT)*							
pcf							
tsf							
1.0	5.61	89	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**
3.5	5.61	59	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**
6.0	5.61	14	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
8.5	5.61	39	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**
11.0	5.61	22	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
13.5	4.51	68	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**
16.0	4.51	42	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**
18.5	4.51	28	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
20.0	4.51	14	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
21.5	5.53	16	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
24.0	5.53	8	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
26.5	5.53	6	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
29.0	5.53	9	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
31.5	5.53	11	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
34.0	5.60	6	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
39.0	5.50	23	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
41.5	5.50	10	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
44.0	5.55	23	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
46.5	5.53	10	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**

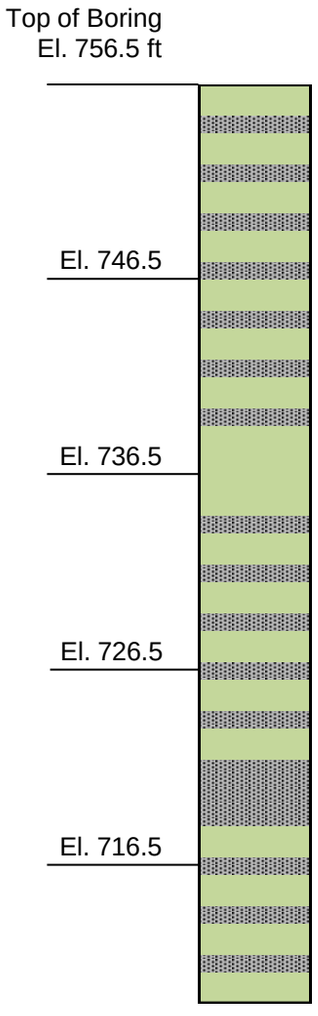


KIF-B05, Liquefaction Triggering Results

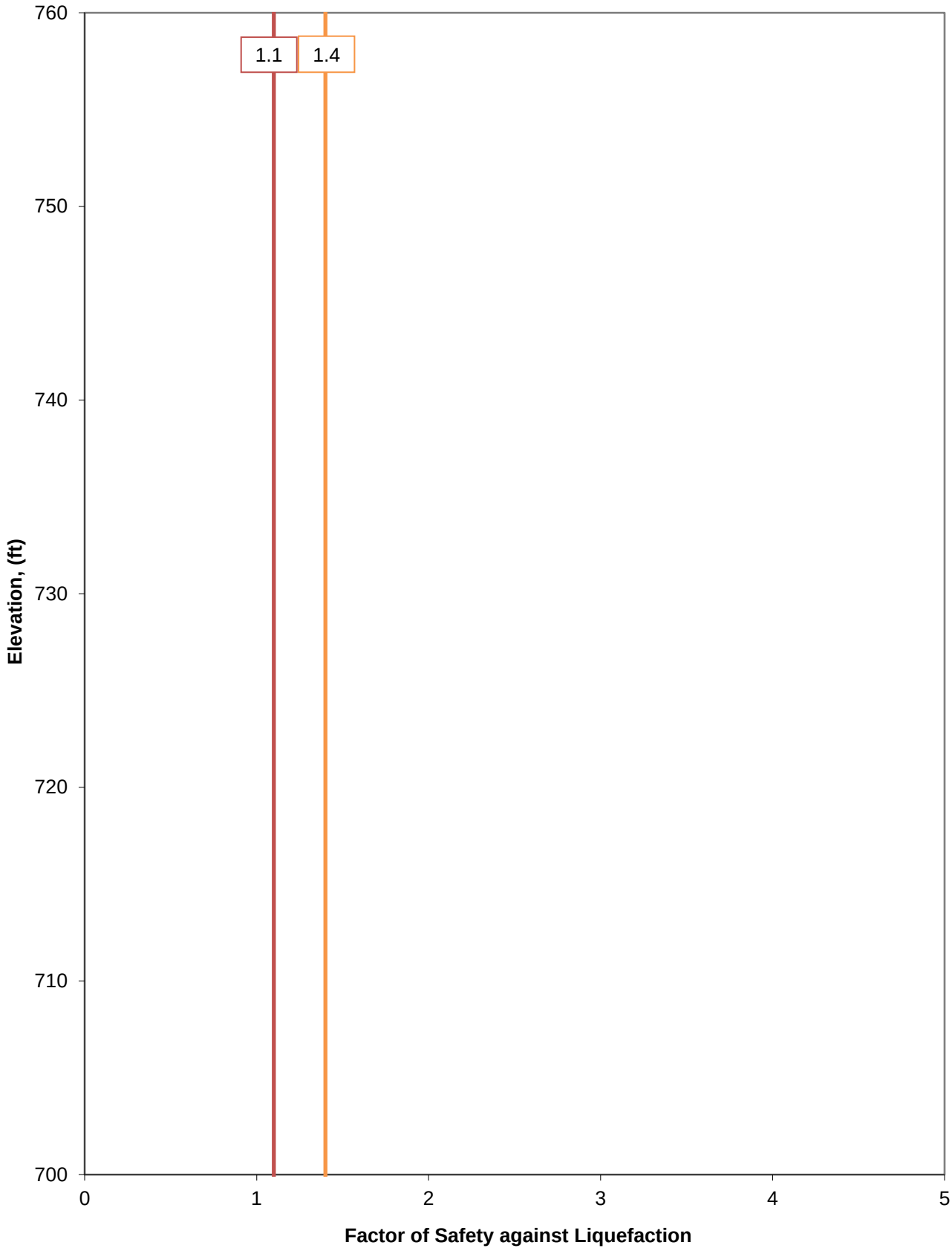




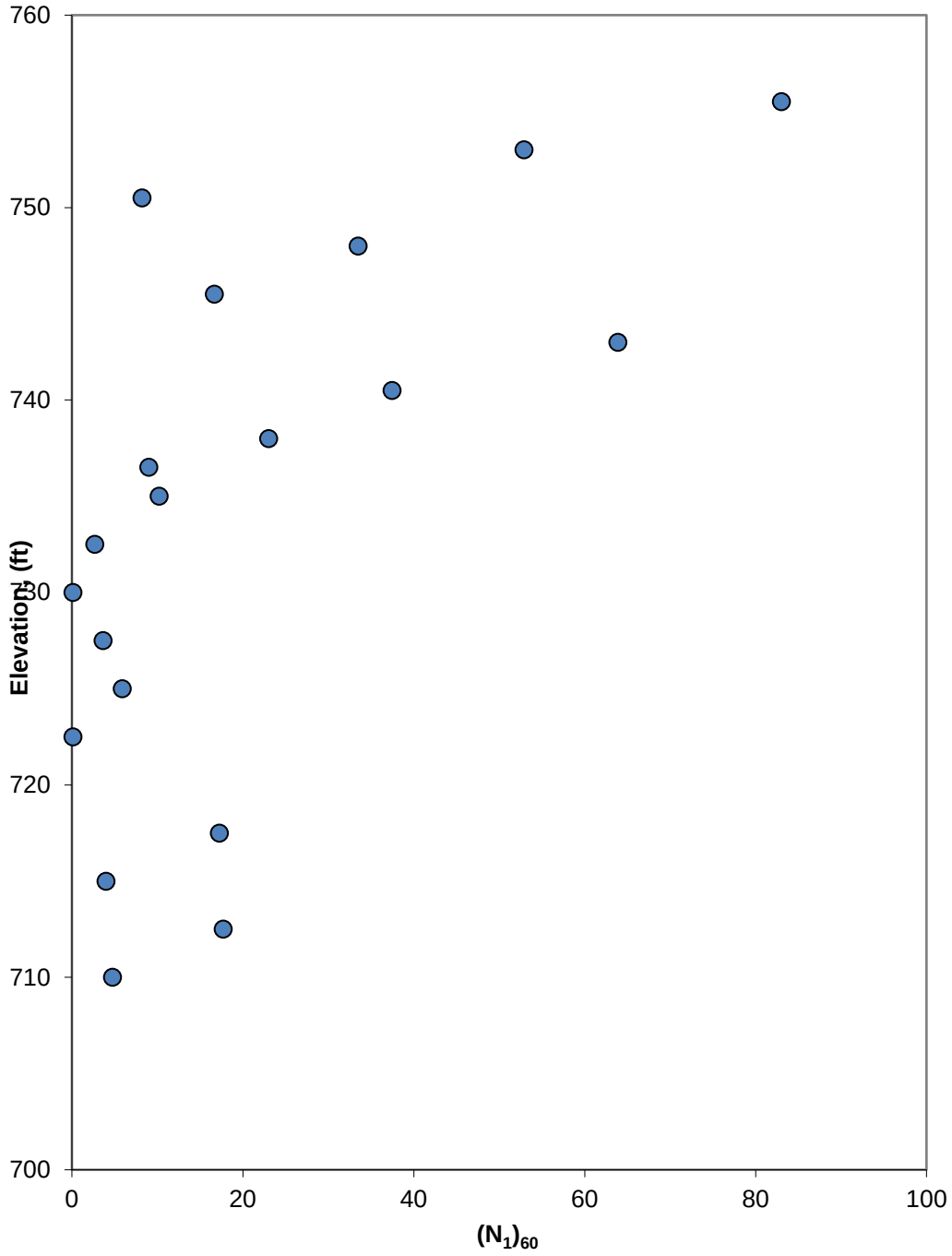
KIF-B05, Liquefaction Triggering Results



KIF TDEC Seismic Stability, Boring ID: KIF-B05, Source = 1 Hz, Mw = 7.6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



KIF TDEC Seismic Stability, Boring ID: KIF-B05, Source = 1 Hz,
Mw = 7.6, Event = Design EQ, SPT Data, Simplified Stress-Based



Project Name = KIF TDEC Seismic Stability

Boring ID = KIF-B06

Boring Location

Northing =

Easting =

OR

Baseline Station =

Offset (+ Right) =

Drilling Information

Boring Inner Diameter (ID) = 5.875 inches

Top of Hole Elevation = 733.9 feet

Water Depth during SPT (negative for U/S borings)= -2.8 feet

Depth Sampling Began = 0 feet

Total Unit Wt. above 1st SPT = 62.4 pcf

Assumed Rod Stickup = 5 feet *(Typ assume 5ft)*

E_m Measurement based on Fv method? = 1 (1: Yes, 0: No)

SPT Sampler w/ Liners? = 0 (1: Yes, 0: No) *(Typ. no)*

During EQ Information

Water Depth during EQ (relative to SPT TOH, negative for U/S borings) = -3.5 feet

Final Grade Elevation during EQ = 733.9 feet

Average Total Unit Wt. of Cut/Fill = pcf

Fines Content Correction

Fines content correction for samples with blow counts of zero? = 1 (1: Yes, 0: No)

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile? = 0 (1: Yes, 0: No)

If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile: Alternate, KIF-B06_NOR

Alpha at each sample depth known? = 1 (1: Yes, 0: No)

If previous answer is No, then enter curve fit parameters below (α vs. depth curve)

If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_α will be one.

m4:
m3:
m2:
m1:
m0:

Associated ground response profile: Alternate, KIF-B06_NOR

Get CSR from shear stress envelope? = 0 (1: Yes, 0: No)

If previous answer is No, then CSR will be calculated using a_{max} and r_d

Max. Shear Stress at each sample depth known? = (1: Yes, 0: No)

If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4:
m3:
m2:
m1:

Earthquake Information

EQ Source (e.g., New Madrid): 1 Hz

Event (e.g., MCE, 10KEQ, OBE): Design EQ

a_{max} (g) (top of ground surface): 0.12

EQ Mag (Mw): 7.6

Inputs

Depth of Sample Midpoint (ft.)	SPT N Value	Hammer Efficiency, E_m (%)	Unified Soil Classification	Fines Content (%)	Total Unit Weight (pcf)	Material (optional)	Clay-like / Sand-like Override (optional)	Clay-like Susceptibility (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure during SPT (psf)	Static Pore Water Pressure during EQ (psf)
1.0	0	89.8	CL	52	111	Sediment	Sand-like			1.153			
3.5	0	89.8	CL	52	111	Sediment	Sand-like			0.472			
6.0	0	89.8	CL	52	111	Sediment	Sand-like			0.340			
8.5	0	89.8	SM	46	128	Embankment Fill	Clay-like	Not Susceptible		0.306			
11.0	0	89.8	SM	46	128	Embankment Fill	Clay-like	Not Susceptible		0.276			
13.5	0	89.8	CL	86.2	127	Subunit 1				0.257			
16.0	0	89.8	CL	68.2	127	Subunit 1				0.243			
18.5	3	89.8	CL	68.2	127	Subunit 1				0.233			
21.0	5	89.8	ML	55.6	126	Subunit 2	Sand-like			0.224			
23.5	2	89.8	ML	55.6	126	Subunit 2	Sand-like			0.216			
26.0	4	89.8	SM	19	131	Subunit 3	Sand-like			0.208			

KIF TDEC Seismic Stability, Boring ID: KIF-B06

Liquefaction Potential Evaluations

For Coarse Grained Soils

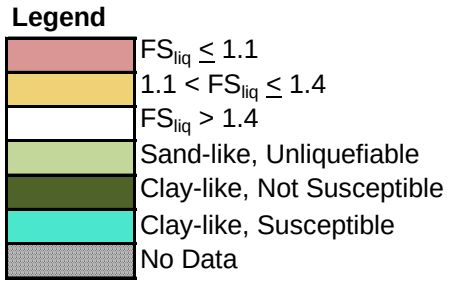
Elev. Of Mid. Pt. of Sample (ft)	Depth of Mid. Pt. of Sample (ft.)	Unit Weight (pcf)	Vert. Total Stress during SPT (tsf)	Static Pore Pressure during SPT (tsf)	Vert. Eff. Stress during SPT (tsf)	SPT N Value	Hammer Efficiency (%)	Borehole Diameter Correction	Sampler Correction	Rod Length Correction	Overburden Stress Correction Factor	Hammer Energy Correction Factor	Corrected Blow Count	Normalized Blow Count	Relative Density (%)	Unified Soil Classification	Fines Content (%)
	z	γ_T	σ_v	u	σ'_v	N	E_m	C_B	C_s	C_R	C_N	C_E	N_{60}	$(N_1)_{60}$	D_r		
		Top of Hole Elevation (ft)	733.9				Boring ID =	**KIF-B06**									
		begin sampling (depth-ft)	0.0				Boring Inner Dia. (in) =	5.875									
		total unit wt. above 1st SPT (pcf) =	62														
		water elevation during SPT (ft) =	736.7	ft *(relative to ground surface during SPT)*					Assumed Rod Stickup =	5.0	feet						
		water depth during SPT (ft) =	-2.8						E_m Measurement? =	1	(1: Yes, 0: No)						
		water elevation during EQ (ft) =	737.4	ft *(relative to ground surface during SPT)*					SPT Sampler w/ Liners? =	0	(1: Yes, 0: No)						
		water during EQ (depth-ft) =	-3.5	u-top	effstr-top												
		vert. total stress above 1st SPT (tsf) =	**0.09**	**0.09**	0.00												
732.9	1.0	111	0.14	0.12	0.02	0	89.8	1.046	1.10	1.00	1.70	1.50	0	0	36	CL	52
730.4	3.5	111	0.28	0.20	0.09	0	89.8	1.046	1.10	1.00	1.70	1.50	0	0	36	CL	52
727.9	6.0	111	0.42	0.27	0.15	0	89.8	1.046	1.10	1.00	1.70	1.50	0	0	36	CL	52
725.4	8.5	128	0.57	0.35	0.22	0	89.8	1.046	1.10	1.00	1.70	1.50	0	0	36	SM	46
722.9	11.0	128	0.73	0.43	0.30	0	89.8	1.046	1.10	1.00	1.70	1.50	0	0	36	SM	46
720.4	13.5	127	0.89	0.51	0.38	0	89.8	1.046	1.10	1.00	1.70	1.50	0	0	36	CL	86.2
717.9	16.0	127	1.05	0.59	0.46	0	89.8	1.046	1.10	1.00	1.64	1.50	0	0	36	CL	68.2
715.4	18.5	127	1.21	0.66	0.54	3	89.8	1.046	1.10	1.00	1.41	1.50	5	7	53	CL	68.2
712.9	21.0	126	1.36	0.74	0.62	5	89.8	1.046	1.11	1.00	1.28	1.50	9	11	60	ML	55.6
710.4	23.5	126	1.52	0.82	0.70	2	89.8	1.046	1.10	1.00	1.25	1.50	3	4	46	ML	55.6
707.9	26.0	131	1.68	0.90	0.78	4	89.8	1.046	1.10	1.00	1.17	1.50	7	8	52	SM	19

KIF TDEC Seismic Stability, Boring ID: KIF-B06
Liquefaction Potential Evaluations
For Coarse Grained Soils

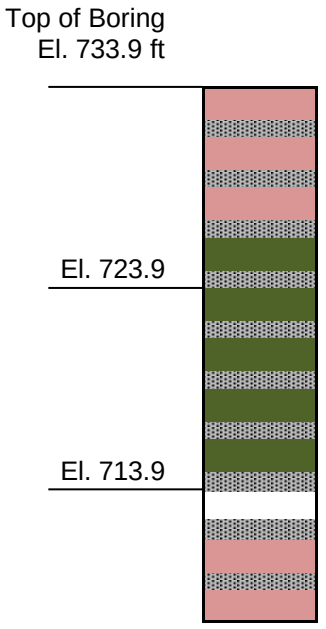
Depth of Mid. Pt. of Sample (ft.) z	Clean Sand Correction $\Delta(N_1)_{60cs}$	Equivalent Clean Sand N-Value $(N_1)_{60cs}$	Sample Screened for: Clay-like	High Blow Count $(N_1)_{60cs} \geq 32$	Unsaturated	Factor of Safety FS_{liq}	Material (optional)
	ft						
	ft	*(relative to ground surface during SPT)*					
	pcf						
	tsf						

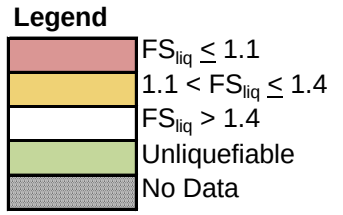
Note: A factor of safety shown as "N/A" implies that the soil type is not appropriately evaluated using this methodology. This applies to clay-like soils (typically CL, CH, CL-ML and MH material type), samples with high blow counts, and unsaturated samples.

1.0	5.61	6	FALSE	FALSE	FALSE	**0.1**	**Sediment**
3.5	5.61	6	FALSE	FALSE	FALSE	**0.2**	**Sediment**
6.0	5.61	6	FALSE	FALSE	FALSE	**0.3**	**Sediment**
8.5	5.61	6	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
11.0	5.61	6	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
13.5	5.53	6	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
16.0	5.58	6	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
18.5	5.58	13	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
21.0	5.61	17	FALSE	FALSE	FALSE	**1.5**	**Subunit 2**
23.5	5.61	10	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**
26.0	4.30	12	FALSE	FALSE	FALSE	**0.9**	**Subunit 3**

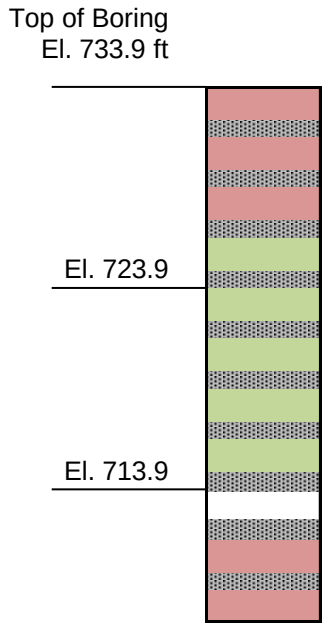


KIF-B06, Liquefaction Triggering Results

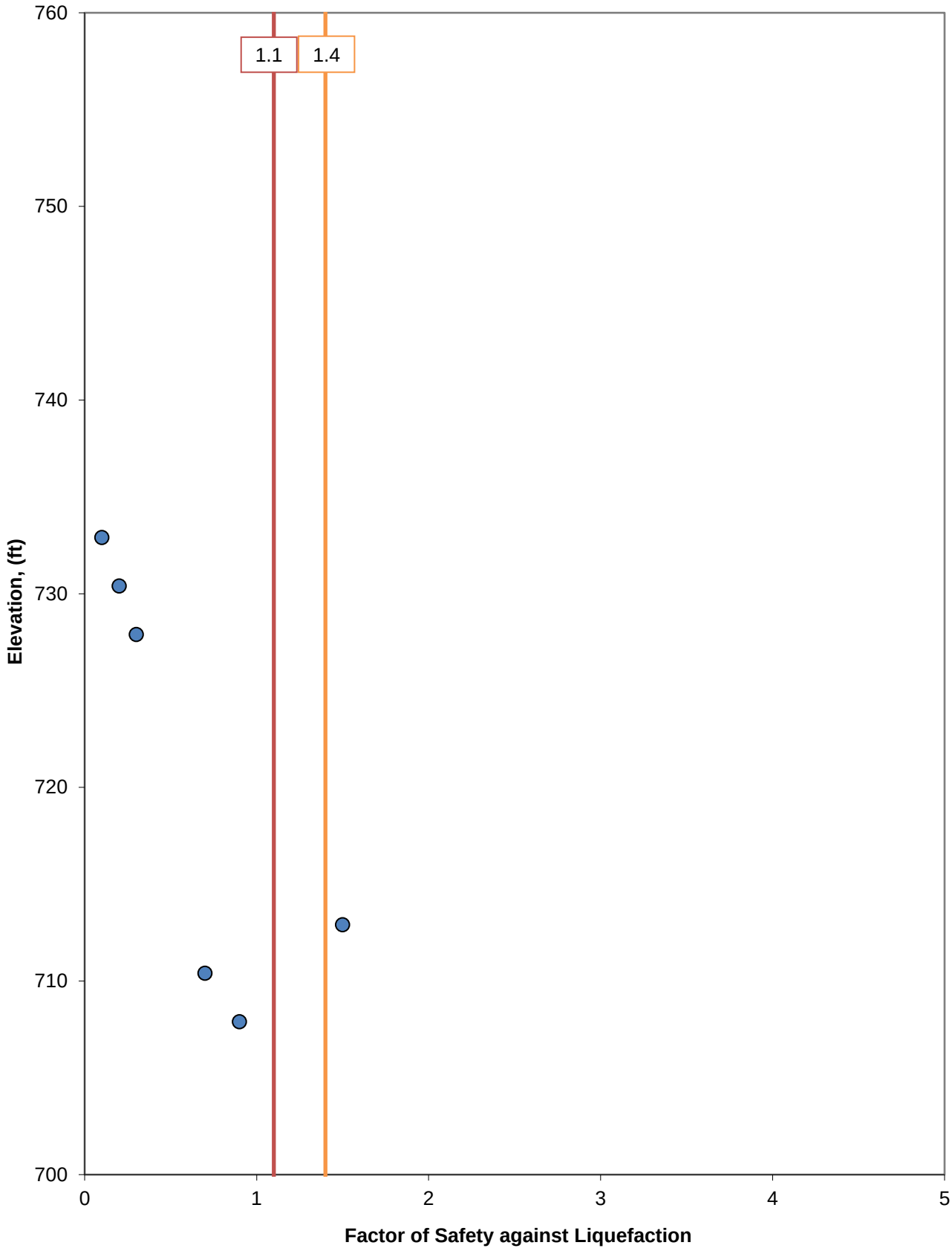




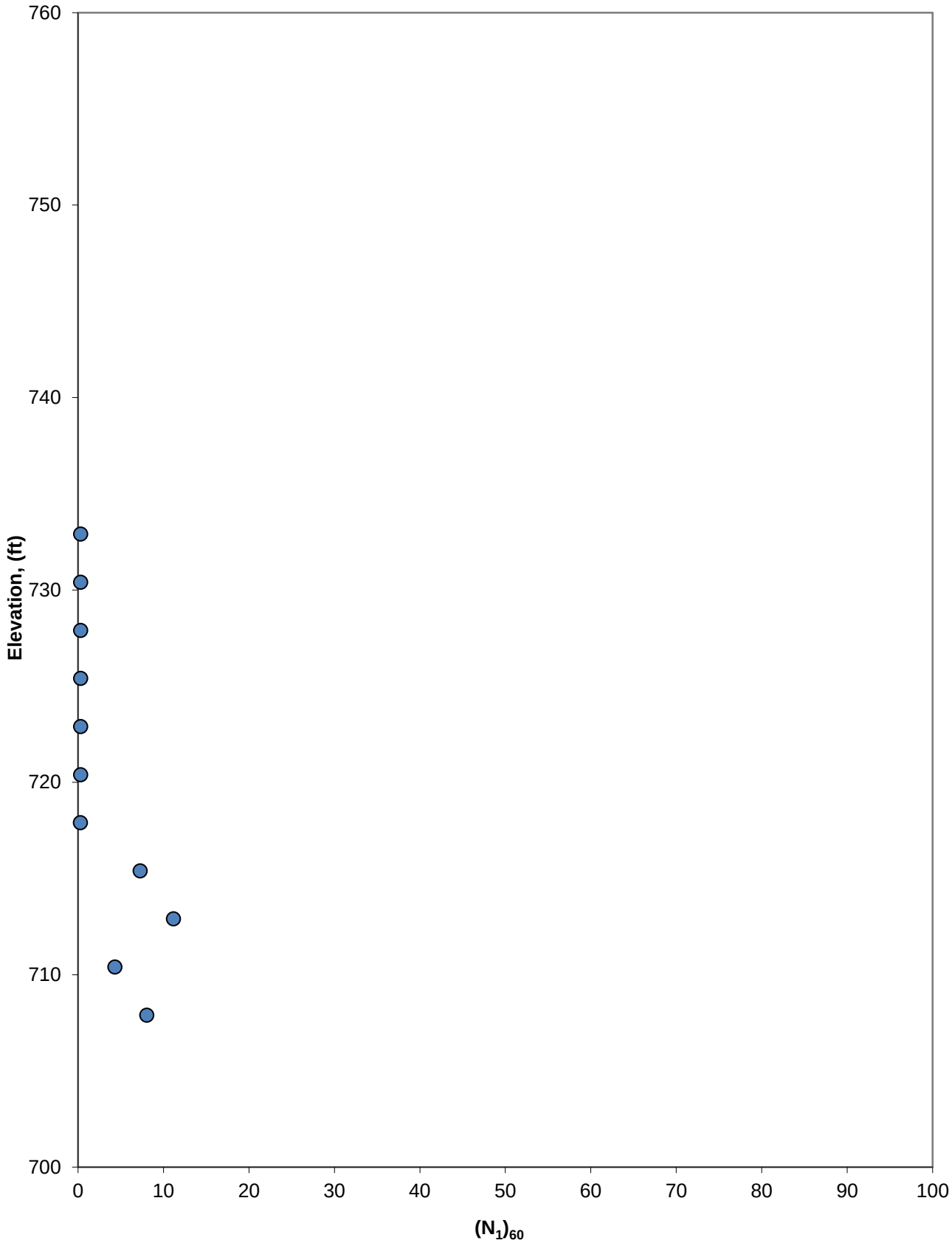
KIF-B06, Liquefaction Triggering Results



KIF TDEC Seismic Stability, Boring ID: KIF-B06, Source = 1 Hz, Mw = 7.6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



KIF TDEC Seismic Stability, Boring ID: KIF-B06, Source = 1 Hz, Mw = 7.6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



Project Name = KIF TDEC Seismic Stability

Boring ID = KIF-B07

Boring Location

Northing =

Easting =

OR

Baseline Station =

Offset (+ Right) =

Drilling Information

Boring Inner Diameter (ID) =	5.875	inches	
Top of Hole Elevation	731.6	feet	
Water Depth during SPT (negative for U/S borings)=	-5.3	feet	
Depth Sampling Began	0	feet	
Total Unit Wt. above 1st SPT =	62.4	pcf	
Assumed Rod Stickup =	5	feet	*(Typ assume 5ft)*
E_m Measurement based on Fv method? =	1	(1: Yes, 0: No)	
SPT Sampler w/ Liners? =	0	(1: Yes, 0: No)	*(Typ. no)*

During EQ Information

Water Depth during EQ (relative to SPT TOH, negative for U/S borings) =	-5.8	feet
Final Grade Elevation during EQ	731.6	feet
Average Total Unit Wt. of Cut/Fill		pcf

Fines Content Correction

Fines content correction for samples with blow counts of zero? 1 (1: Yes, 0: No)

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile? 0 (1: Yes, 0: No)

If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile: SectionAA, KIF-B11_NOR

Alpha at each sample depth known? 1 (1: Yes, 0: No)

If previous answer is No, then enter curve fit parameters below (α vs. depth curve)

If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_α will be one.

m4:
m3:
m2:
m1:
m0:

Associated ground response profile: Alternate, KIF-B07_NOR

Get CSR from shear stress envelope? 0 (1: Yes, 0: No)

If previous answer is No, then CSR will be calculated using a_{max} and r_d

Max. Shear Stress at each sample depth known? (1: Yes, 0: No)

If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4:
m3:
m2:
m1:

Earthquake Information

EQ Source (e.g., New Madrid)	1 Hz
Event (e.g., MCE, 10KEQ, OBE)	Design EQ
a_{max} (g) (top of ground surface)	0.10
EQ Mag (Mw)	7.6

Inputs

Depth of Sample Midpoint (ft.)	SPT N Value	Hammer Efficiency, E_m (%)	Unified Soil Classification	Fines Content (%)	Total Unit Weight (pcf)	Material (optional)	Clay-like / Sand-like Override (optional)	Clay-like Susceptibility (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure during SPT (psf)	Static Pore Water Pressure during EQ (psf)
1.0	0	89.8	CL	52	111	Sediment	Sand-like			0.696			
3.7	0	89.8	CL	52	111	Sediment	Sand-like			0.273			
6.7	0	89.8	CL	52	111	Sediment	Sand-like			0.186			
9.2	0	89.8	CL	52	111	Sediment	Sand-like			0.162			
11.7	2	89.8	CL-ML	79.5	127	Subunit 1				0.149			
14.2	7	89.8	CL	79.5	126	Subunit 2	Sand-like			0.133			
18.7	8	89.8	SC-SM	43.7	126	Subunit 2	Sand-like			0.121			
21.2	4	89.8	SC-SM	43.7	126	Subunit 2	Sand-like			0.115			
23.7	14	89.8	SM	19	131	Subunit 3	Sand-like			0.112			

KIF TDEC Seismic Stability, Boring ID: KIF-B07

Liquefaction Potential Evaluations

For Coarse Grained Soils

Elev. Of Mid. Pt. of Sample (ft)	Depth of Mid. Pt. of Sample (ft.)	Unit Weight (pcf)	Vert. Total Stress during SPT (tsf)	Static Pore Pressure during SPT (tsf)	Vert. Eff. Stress during SPT (tsf)	SPT N Value	Hammer Efficiency (%)	Borehole Diameter Correction	Sampler Correction	Rod Length Correction	Overburden Stress Correction Factor	Hammer Energy Correction Factor	Corrected Blow Count	Normalized Blow Count	Relative Density (%)	Unified Soil Classification	Fines Content (%)
	z	γ_T	σ_v	u	σ'_v	N	E_m	C_B	C_s	C_R	C_N	C_E	N_{60}	$(N_1)_{60}$	D_r		

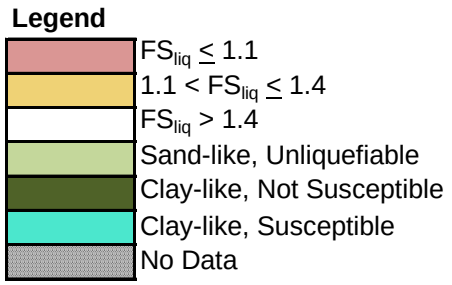
			Top of Hole Elevation (ft) =	731.6				Boring ID =	KIF-B07								
			begin sampling (depth-ft) =	0.0				Boring Inner Dia. (in) =	5.875								
			total unit wt. above 1st SPT (pcf) =	62													
			water elevation during SPT (ft) =	736.9	ft *(relative to ground surface during SPT)*			Assumed Rod Stickup =	5.0	feet							
			water depth during SPT (ft) =	-5.3				E_m Measurement? =	1	(1: Yes, 0: No)							
			water elevation during EQ (ft) =	737.4	ft *(relative to ground surface during SPT)*			SPT Sampler w/ Liners? =	0	(1: Yes, 0: No)							
			water during EQ (depth-ft) =	-5.8	u-top	effstr-top											
			vert. total stress above 1st SPT (tsf) =	**0.17**	**0.17**	0.00											
730.6	1.0	111		0.22	0.20	0.02	0	89.8	1.046	1.10	1.00	1.70	1.50	0	0	36	CL	52
727.9	3.7	111		0.37	0.28	0.09	0	89.8	1.046	1.10	1.00	1.70	1.50	0	0	36	CL	52
724.9	6.7	111		0.54	0.37	0.16	0	89.8	1.046	1.10	1.00	1.70	1.50	0	0	36	CL	52
722.4	9.2	111		0.68	0.45	0.22	0	89.8	1.046	1.10	1.00	1.70	1.50	0	0	36	CL	52
719.9	11.7	127		0.82	0.53	0.29	2	89.8	1.046	1.10	1.00	1.70	1.50	3	6	50	CL-ML	79.5
717.4	14.2	126		0.98	0.61	0.37	7	89.8	1.046	1.20	1.00	1.51	1.50	13	20	74	CL	79.5
712.9	18.7	126		1.27	0.75	0.52	8	89.8	1.046	1.20	1.00	1.33	1.50	15	20	75	SC-SM	43.7
710.4	21.2	126		1.42	0.83	0.60	4	89.8	1.046	1.10	1.00	1.32	1.50	7	9	57	SC-SM	43.7
707.9	23.7	131		1.58	0.90	0.68	14	89.8	1.046	1.30	1.00	1.15	1.50	28	33	90	SM	19

KIF TDEC Seismic Stability, Boring ID: KIF-B07
Liquefaction Potential Evaluations
For Coarse Grained Soils

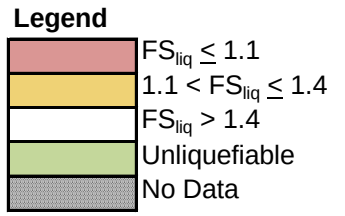
Depth of Mid. Pt. of Sample (ft.) z	Clean Sand Correction $\Delta(N_1)_{60cs}$	Equivalent Clean Sand N-Value $(N_1)_{60cs}$	Sample Screened for: Clay-like	High Blow Count $(N_1)_{60cs} \geq 32$	Unsaturated	Factor of Safety FS_{liq}	Material (optional)
ft							
ft *(relative to ground surface during SPT)*							
pcf							
tsf							

Note: A factor of safety shown as "N/A" implies that the soil type is not appropriately evaluated using this methodology. This applies to clay-like soils (typically CL, CH, CL-ML and MH material type), samples with high blow counts, and unsaturated samples.

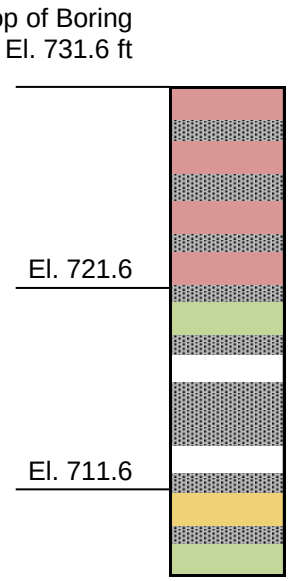
1.0	5.61	6	FALSE	FALSE	FALSE	**0.1**	**Sediment**
3.7	5.61	6	FALSE	FALSE	FALSE	**0.3**	**Sediment**
6.7	5.61	6	FALSE	FALSE	FALSE	**0.4**	**Sediment**
9.2	5.61	6	FALSE	FALSE	FALSE	**0.4**	**Sediment**
11.7	5.55	11	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
14.2	5.55	25	FALSE	FALSE	FALSE	**3.7**	**Subunit 2**
18.7	5.60	26	FALSE	FALSE	FALSE	**3.8**	**Subunit 2**
21.2	5.60	15	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**
23.7	4.30	37	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**



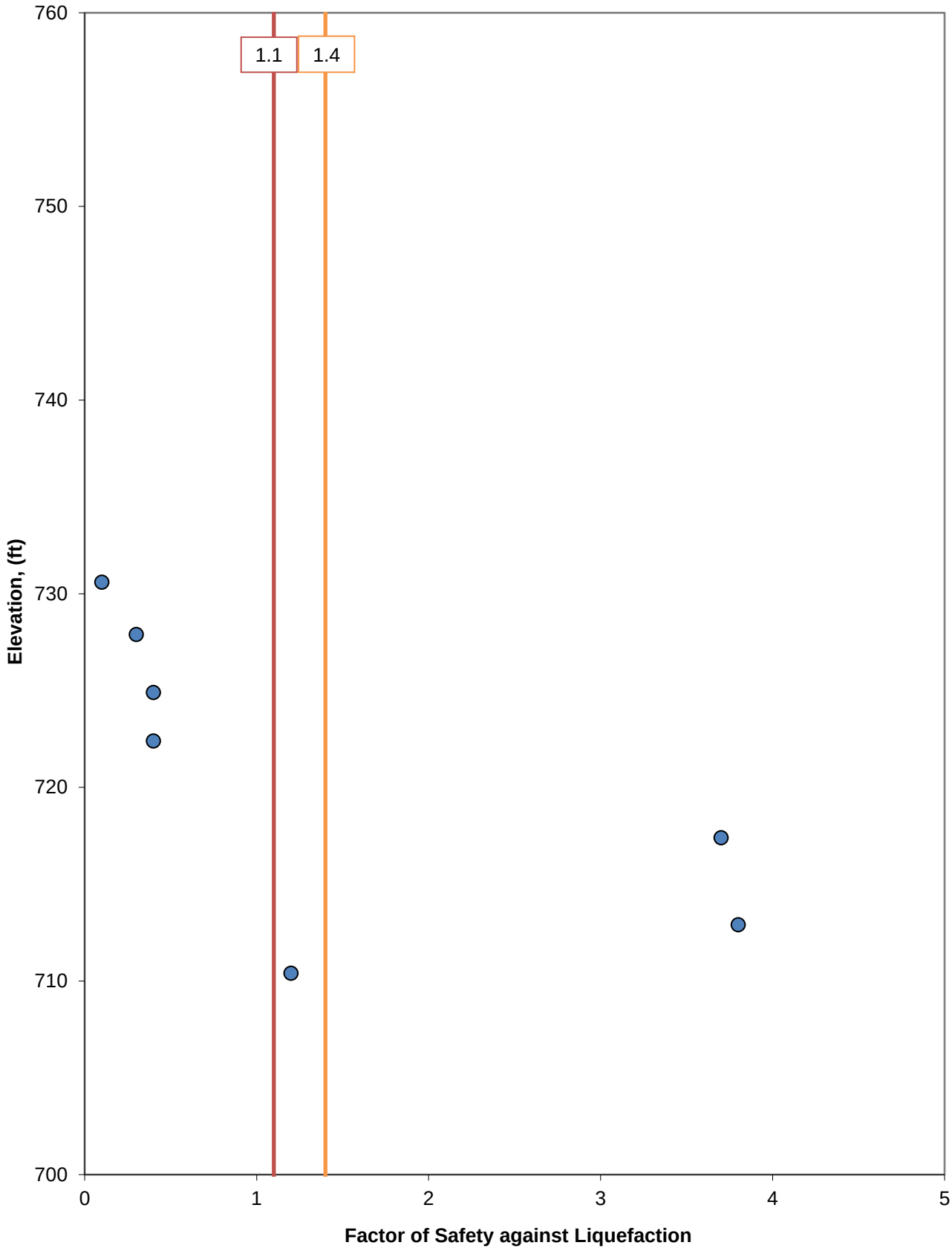
KIF-B07, Liquefaction Triggering Results



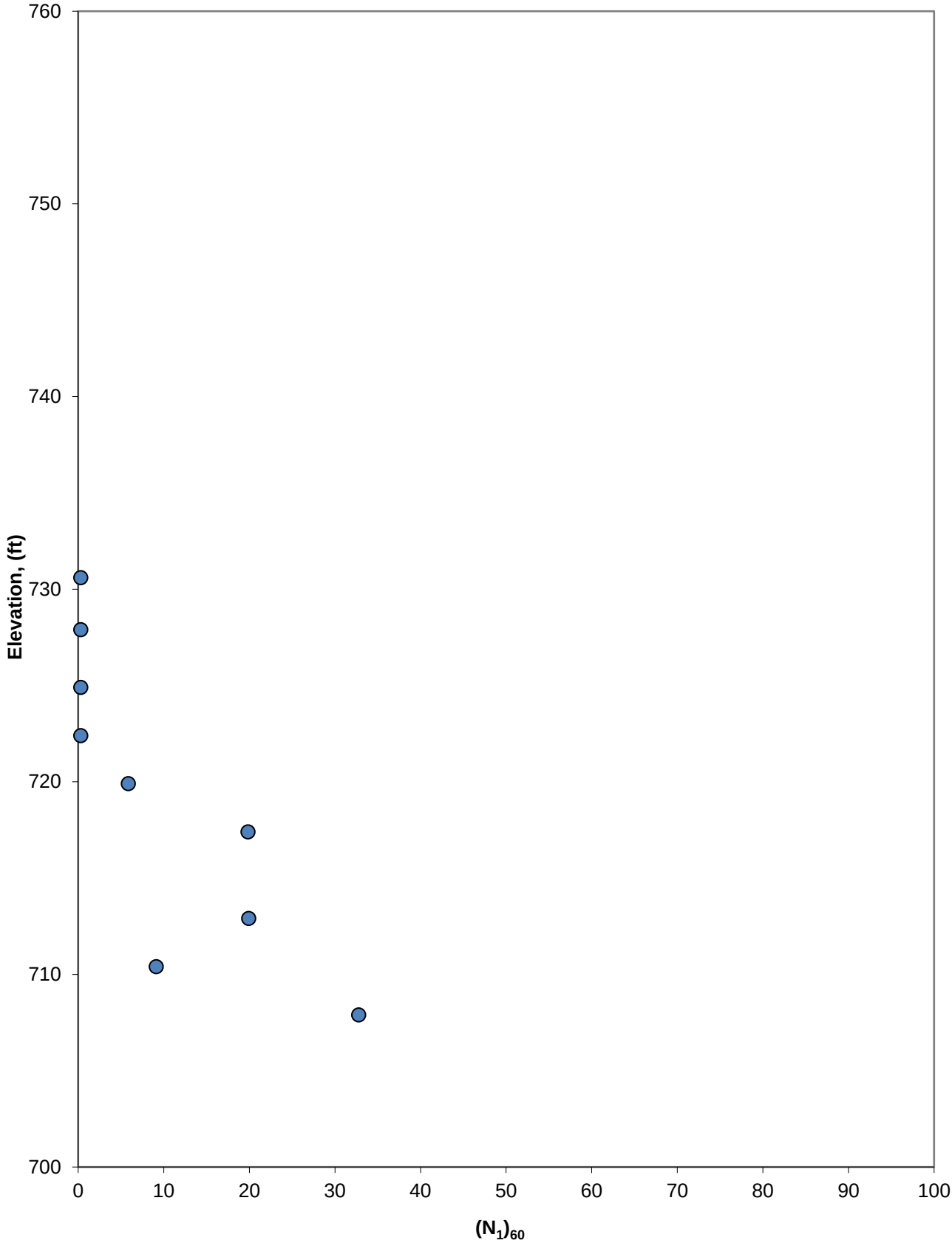
KIF-B07, Liquefaction Triggering Results



KIF TDEC Seismic Stability, Boring ID: KIF-B07, Source = 1 Hz, Mw = 7.6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



KIF TDEC Seismic Stability, Boring ID: KIF-B07, Source = 1 Hz, Mw = 7.6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



Project Name = KIF TDEC Seismic Stability

Boring ID = KIF-B08

Boring Location

Northing =

Easting =

OR

Baseline Station =

Offset (+ Right) =

Drilling Information

Boring Inner Diameter (ID) = 5.875 inches

Top of Hole Elevation = 730.8 feet

Water Depth during SPT (negative for U/S borings)= -5.5 feet

Depth Sampling Began = 0 feet

Total Unit Wt. above 1st SPT = 62.4 pcf

Assumed Rod Stickup = 5 feet *(Typ assume 5ft)*

E_m Measurement based on Fv method? = 1 (1: Yes, 0: No)

SPT Sampler w/ Liners? = 0 (1: Yes, 0: No) *(Typ. no)*

During EQ Information

Water Depth during EQ (relative to SPT TOH, negative for U/S borings) = -6.6 feet

Final Grade Elevation during EQ = 730.8 feet

Average Total Unit Wt. of Cut/Fill = pcf

Fines Content Correction

Fines content correction for samples with blow counts of zero? = 1 (1: Yes, 0: No)

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile? = 0 (1: Yes, 0: No)

If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile: SectionAA, KIF-B12_NOR

Alpha at each sample depth known? = 1 (1: Yes, 0: No)

If previous answer is No, then enter curve fit parameters below (α vs. depth curve)

If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_α will be one.

m4:
m3:
m2:
m1:
m0:

Associated ground response profile: Alternate, KIF-B08_NOR

Get CSR from shear stress envelope? = 0 (1: Yes, 0: No)

If previous answer is No, then CSR will be calculated using a_{max} and r_d

Max. Shear Stress at each sample depth known? = (1: Yes, 0: No)

If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4:
m3:
m2:
m1:

Earthquake Information

EQ Source (e.g., New Madrid): 1 Hz

Event (e.g., MCE, 10KEQ, OBE): Design EQ

a_{max} (g) (top of ground surface): 0.09

EQ Mag (Mw): 7.6

Inputs

Depth of Sample Midpoint (ft.)	SPT N Value	Hammer Efficiency, E_m (%)	Unified Soil Classification	Fines Content (%)	Total Unit Weight (pcf)	Material (optional)	Clay-like / Sand-like Override (optional)	Clay-like Susceptibility (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure during SPT (psf)	Static Pore Water Pressure during EQ (psf)
1.0	0	89.8	CL	52	111	Sediment	Sand-like			0.251			
3.5	2	89.8	CL	52	111	Sediment	Sand-like			0.124			
6.5	2	89.8	CL	52	111	Sediment	Sand-like			0.092			
9.0	0	89.8	CL	52	111	Sediment	Sand-like			0.085			
11.5	0	89.8	CL	52	111	Sediment	Sand-like			0.081			
17.0	14	89.8	CL-ML	72.4	127	Subunit 1				0.078			
19.5	2	89.8	CL-ML	73.6	127	Subunit 1				0.074			
22.0	5	89.8	SM	44.5	126	Subunit 2	Sand-like			0.070			
24.5	13	89.8	SM	30.6	131	Subunit 3	Sand-like			0.066			

KIF TDEC Seismic Stability, Boring ID: KIF-B08

Liquefaction Potential Evaluations

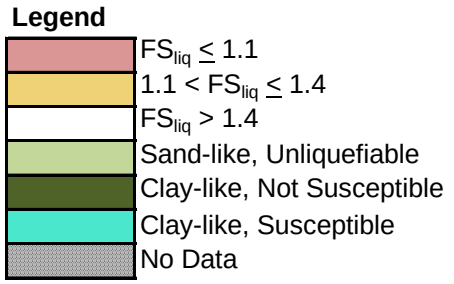
For Coarse Grained Soils

Top of Hole Elevation (ft) =	730.8			Boring ID =	KIF-B08											
begin sampling (depth-ft) =	0.0			Boring Inner Dia. (in) =	5.875											
total unit wt. above 1st SPT (pcf) =	62															
water elevation during SPT (ft) =	736.3	ft *(relative to ground surface during SPT)*						Assumed Rod Stickup =	5.0	feet						
water depth during SPT (ft) =	-5.5							E_m Measurement? =	1	(1: Yes, 0: No)						
water elevation during EQ (ft) =	737.4	ft *(relative to ground surface during SPT)*						SPT Sampler w/ Liners? =	0	(1: Yes, 0: No)						
water during EQ (depth-ft) =	-6.6	u-top	effstr-top													
vert. total stress above 1st SPT (tsf) =	**0.17**	**0.17**	0.00													

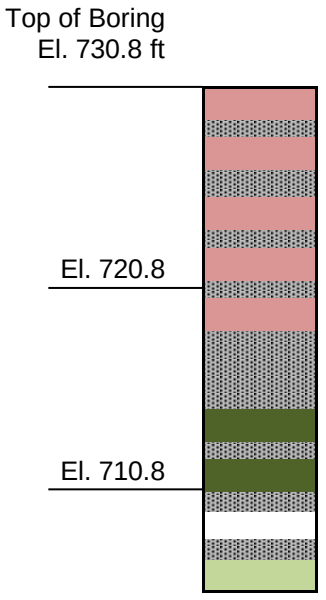
Elev. Of Mid. Pt. of Sample (ft)	Depth of Mid. Pt. of Sample (ft.) z	Unit Weight (pcf) γ_T	Vert. Total Stress during SPT (tsf) σ_v	Static Pore Pressure during SPT (tsf) u	Vert. Eff. Stress during SPT (tsf) σ'_v	SPT N Value N	Hammer Efficiency (%) E_m	Borehole Diameter Correction C_B	Sampler Correction C_s	Rod Length Correction C_R	Overburden Stress Correction Factor C_N	Hammer Energy Correction Factor C_E	Corrected Blow Count N_{60}	Normalized Blow Count $(N_1)_{60}$	Relative Density (%) D_r	Unified Soil Classification	Fines Content (%)
729.8	1.0	111	0.23	0.20	0.02	0	89.8	1.046	1.10	1.00	1.70	1.50	0	0	36	CL	52
727.3	3.5	111	0.37	0.28	0.09	2	89.8	1.046	1.10	1.00	1.70	1.50	3	6	50	CL	52
724.3	6.5	111	0.53	0.37	0.16	2	89.8	1.046	1.10	1.00	1.70	1.50	3	6	50	CL	52
721.8	9.0	111	0.67	0.45	0.22	0	89.8	1.046	1.10	1.00	1.70	1.50	0	0	36	CL	52
719.3	11.5	111	0.81	0.53	0.28	0	89.8	1.046	1.10	1.00	1.70	1.50	0	0	36	CL	52
713.8	17.0	127	1.14	0.70	0.44	14	89.8	1.046	1.30	1.00	1.29	1.50	28	37	96	CL-ML	72.4
711.3	19.5	127	1.30	0.78	0.52	2	89.8	1.046	1.10	1.00	1.47	1.50	3	5	48	CL-ML	73.6
708.8	22.0	126	1.45	0.86	0.60	5	89.8	1.046	1.11	1.00	1.31	1.50	9	11	61	SM	44.5
706.3	24.5	131	1.61	0.94	0.68	13	89.8	1.046	1.30	1.00	1.15	1.50	26	31	88	SM	30.6

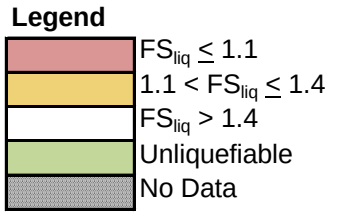
KIF TDEC Seismic Stability, Boring ID: KIF-B08
Liquefaction Potential Evaluations
For Coarse Grained Soils

Depth of Mid. Pt. of Sample (ft.) z	Clean Sand Correction $\Delta(N_1)_{60cs}$	Equivalent Clean Sand N-Value $(N_1)_{60cs}$	Sample Screened for: Clay-like	High Blow Count $(N_1)_{60cs} \geq 32$	Unsaturated	Factor of Safety FS_{liq}	Material (optional)
	ft		*Note: A factor of safety shown as "N/A" implies that the soil type is not appropriately evaluated using this methodology. This applies during clay-like soils (typically CL, CH, CL-ML and MH material type), samples with high blow counts, and unsaturated samples.*				
	ft *(relative to ground surface during SPT)*						
	pcf						
	tsf						
1.0	5.61	6	FALSE	FALSE	FALSE	**0.1**	**Sediment**
3.5	5.61	11	FALSE	FALSE	FALSE	**0.5**	**Sediment**
6.5	5.61	11	FALSE	FALSE	FALSE	**0.7**	**Sediment**
9.0	5.61	6	FALSE	FALSE	FALSE	**0.5**	**Sediment**
11.5	5.61	6	FALSE	FALSE	FALSE	**0.5**	**Sediment**
17.0	5.57	42	TRUE	TRUE	FALSE	**N/A**	**Subunit 1**
19.5	5.56	11	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
22.0	5.60	17	FALSE	FALSE	FALSE	**1.5**	**Subunit 2**
24.5	5.39	36	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**

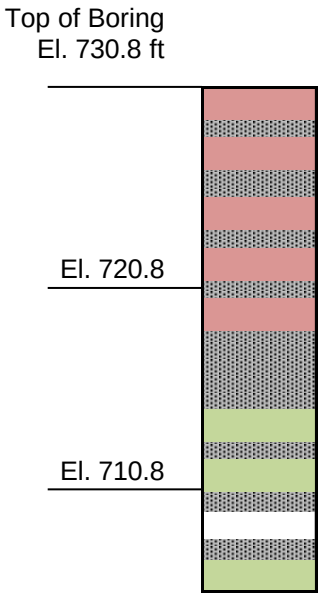


KIF-B08, Liquefaction Triggering Results

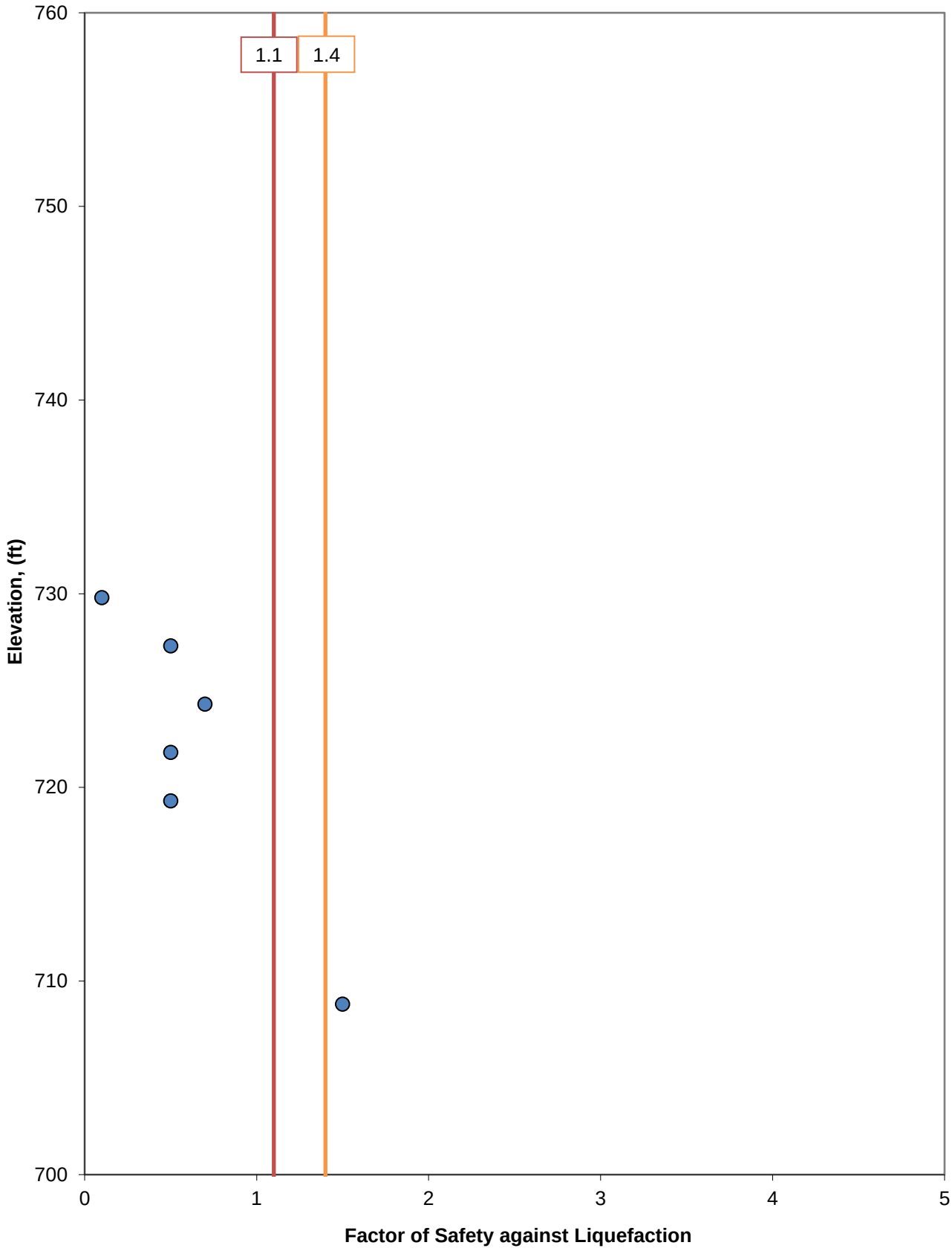




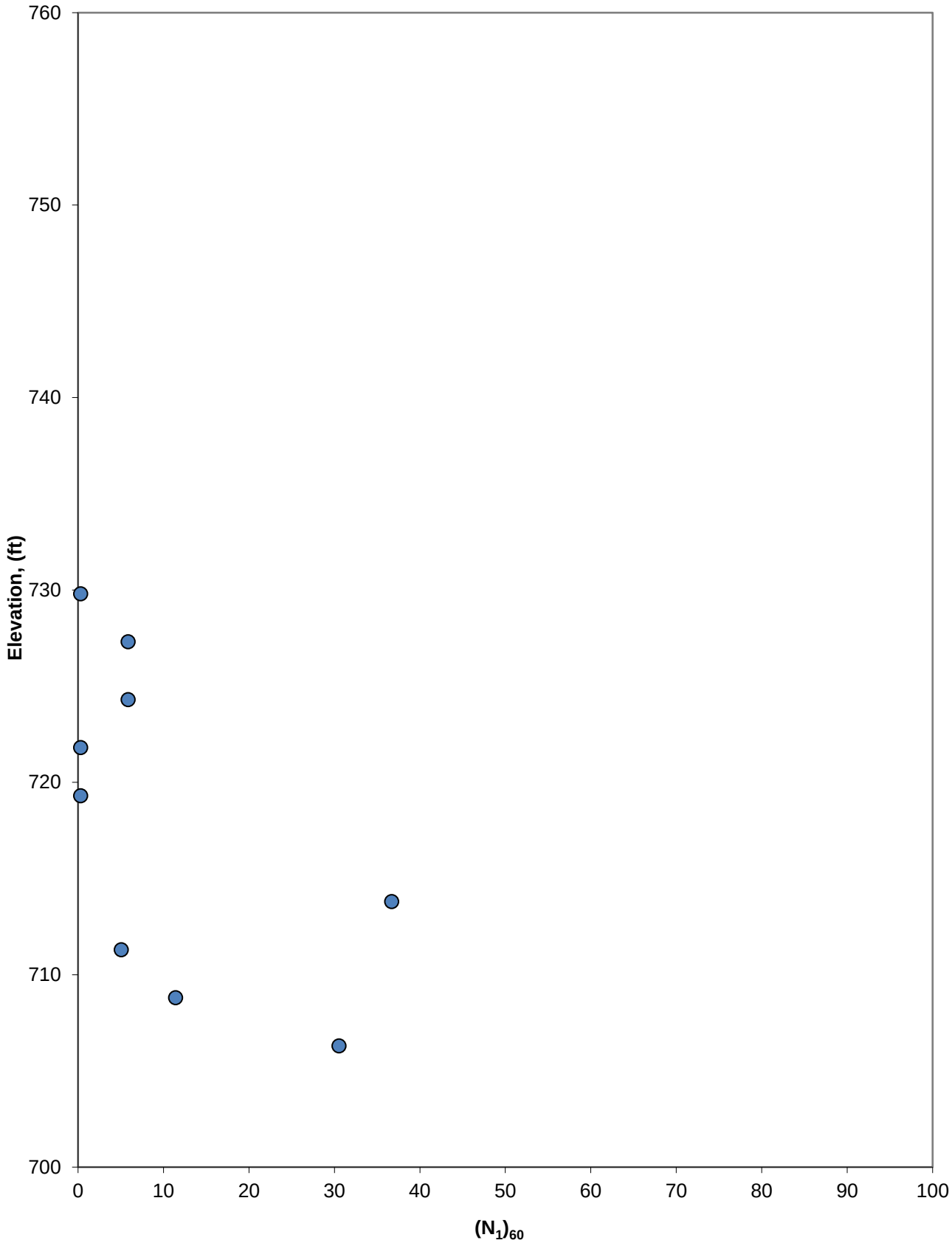
KIF-B08, Liquefaction Triggering Results



KIF TDEC Seismic Stability, Boring ID: KIF-B08, Source = 1 Hz, Mw = 7.6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



KIF TDEC Seismic Stability, Boring ID: KIF-B08, Source = 1 Hz, Mw = 7.6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



Project Name = KIF TDEC Seismic Stability

Boring ID = KIF-B09

Boring Location

Northing =

Easting =

OR

Baseline Station =

Offset (+ Right) =

Drilling Information

Boring Inner Diameter (ID) = 4.625 inches

Top of Hole Elevation = 754.5 feet

Water Depth during SPT (negative for U/S borings)= 52 feet

Depth Sampling Began = 0 feet

Total Unit Wt. above 1st SPT = pcf

Assumed Rod Stickup = 5 feet *(Typ assume 5ft)*

E_m Measurement based on Fv method? = 1 (1: Yes, 0: No)

SPT Sampler w/ Liners? = 0 (1: Yes, 0: No) *(Typ. no)*

During EQ Information

Water Depth during EQ (relative to SPT TOH, negative for U/S borings) = 5.9 feet

Final Grade Elevation during EQ = 754.5 feet

Average Total Unit Wt. of Cut/Fill pcf

Fines Content Correction

Fines content correction for samples with blow counts of zero? 1 (1: Yes, 0: No)

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile? 0 (1: Yes, 0: No)

If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile: SectionAA, KIF-B09_NOR

Alpha at each sample depth known? 1 (1: Yes, 0: No)

If previous answer is No, then enter curve fit parameters below (α vs. depth curve)

If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_α will be one.

m4:
m3:
m2:
m1:
m0:

Associated ground response profile: Section_AA, KIF-B09_NOR

Get CSR from shear stress envelope? 0 (1: Yes, 0: No)

If previous answer is No, then CSR will be calculated using a_{max} and r_d

Max. Shear Stress at each sample depth known? (1: Yes, 0: No)

If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4:
m3:
m2:
m1:

Earthquake Information

EQ Source (e.g., New Madrid) 1 Hz

Event (e.g., MCE, 10KEQ, OBE) Design EQ

a_{max} (g) (top of ground surface) 0.09

EQ Mag (Mw) 7.6

Inputs

Depth of Sample Midpoint (ft.)	SPT N Value	Hammer Efficiency, E_m (%)	Unified Soil Classification	Fines Content (%)	Total Unit Weight (pcf)	Material (optional)	Clay-like / Sand-like Override (optional)	Clay-like Susceptibility (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure during SPT (psf)	Static Pore Water Pressure during EQ (psf)
1.0	17	89.8	SM	37.9	128	Embankment Fill	Clay-like	Not Susceptible		0.011			
3.5	26	89.8	SM	37.9	128	Embankment Fill	Clay-like	Not Susceptible		0.028			
6.0	22	89.8	SM	37.9	128	Embankment Fill	Clay-like	Not Susceptible		0.005			
8.5	11	89.8	SM	37.9	128	Embankment Fill	Clay-like	Not Susceptible		0.021			
11.0	37	89.8	GM	13.8	128	Embankment Fill	Clay-like	Not Susceptible		0.055			
13.5	33	89.8	SC	48.9	128	Embankment Fill	Clay-like	Not Susceptible		0.076			
16.0	17	89.8	SC	48.9	128	Embankment Fill	Clay-like	Not Susceptible		0.091			
18.5	0	89.8	SC	48.9	128	Embankment Fill	Clay-like	Not Susceptible		0.109			
21.0	0	89.8	SC	48.9	128	Embankment Fill	Clay-like	Not Susceptible		0.121			
23.5	0	89.8	ML	61.4	128	Embankment Fill	Clay-like	Not Susceptible		0.127			
26.0	0	89.8	ML	61.4	128	Embankment Fill	Clay-like	Not Susceptible		0.132			
28.5	0	89.8	ML	61.4	128	Embankment Fill	Clay-like	Not Susceptible		0.136			
31.0	1	89.8	ML	61.4	128	Embankment Fill	Clay-like	Not Susceptible		0.141			
33.5	0	89.8	ML	93.6	127	Subunit 1				0.144			
36.0	0	89.8	CL	82	127	Subunit 1				0.147			
40.5	16	89.8	CL	89.3	127	Subunit 1				0.151			
45.0	8	89.8	ML	79.6	126	Subunit 2	Sand-like			0.154			
47.5	2	89.8	SM	45.7	126	Subunit 2	Sand-like			0.154			
50.0	18	89.8	SP-SM	11.2	131	Subunit 3	Sand-like			0.153			

KIF TDEC Seismic Stability, Boring ID: KIF-B09

Liquefaction Potential Evaluations

For Coarse Grained Soils

Elev. Of Mid. Pt. of Sample (ft)	Depth of Mid. Pt. of Sample (ft.)	Unit Weight (pcf)	Vert. Total Stress during SPT (tsf)	Static Pore Pressure during SPT (tsf)	Vert. Eff. Stress during SPT (tsf)	SPT N Value	Hammer Efficiency (%)	Borehole Diameter Correction	Sampler Correction	Rod Length Correction	Overburden Stress Correction Factor	Hammer Energy Correction Factor	Corrected Blow Count	Normalized Blow Count	Relative Density (%)	Unified Soil Classification	Fines Content (%)
	z	γ_T	σ_v	u	σ'_v	N	E_m	C_B	C_s	C_R	C_N	C_E	N_{60}	$(N_1)_{60}$	D_r		

Top of Hole Elevation (ft) = 754.5 | Boring ID = KIF-B09

begin sampling (depth-ft) = 0.0 | Boring Inner Dia. (in) = 4.625

total unit wt. above 1st SPT (pcf) = 0

water elevation during SPT (ft) = 702.5 ft *(relative to ground surface during SPT)* | Assumed Rod Stickup = 5.0 feet

water depth during SPT (ft) = 52.0 | E_m Measurement? = 1 (1: Yes, 0: No)

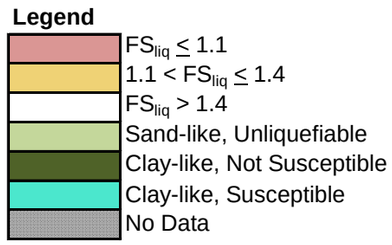
water elevation during EQ (ft) = 748.6 ft *(relative to ground surface during SPT)* | SPT Sampler w/ Liners? = 0 (1: Yes, 0: No)

	u-top	effstr-top
water during EQ (depth-ft) =	5.9	
vert. total stress above 1st SPT (tsf) =	**0.00**	0.00

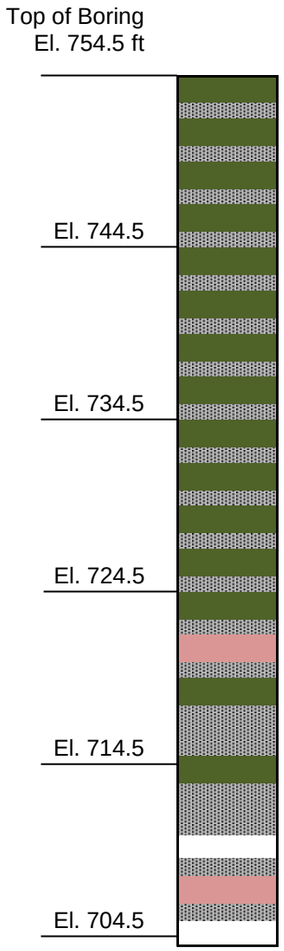
753.5	1.0	128	0.06	0.00	0.06	17	89.8	1.004	1.30	1.00	1.70	1.50	33	56	100	SM	37.9
751.0	3.5	128	0.22	0.00	0.22	26	89.8	1.004	1.30	1.00	1.50	1.50	51	76	100	SM	37.9
748.5	6.0	128	0.38	0.00	0.38	22	89.8	1.004	1.30	1.00	1.31	1.50	43	56	100	SM	37.9
746.0	8.5	128	0.54	0.00	0.54	11	89.8	1.004	1.26	1.00	1.26	1.50	21	26	83	SM	37.9
743.5	11.0	128	0.70	0.00	0.70	37	89.8	1.004	1.30	1.00	1.11	1.50	72	80	100	GM	13.8
741.0	13.5	128	0.86	0.00	0.86	33	89.8	1.004	1.30	1.00	1.05	1.50	64	68	100	SC	48.9
738.5	16.0	128	1.02	0.00	1.02	17	89.8	1.004	1.30	1.00	1.01	1.50	33	34	92	SC	48.9
736.0	18.5	128	1.18	0.00	1.18	0	89.8	1.004	1.10	1.00	0.93	1.50	0	0	35	SC	48.9
733.5	21.0	128	1.34	0.00	1.34	0	89.8	1.004	1.10	1.00	0.87	1.50	0	0	35	SC	48.9
731.0	23.5	128	1.50	0.00	1.50	0	89.8	1.004	1.10	1.00	0.81	1.50	0	0	35	ML	61.4
728.5	26.0	128	1.66	0.00	1.66	0	89.8	1.004	1.10	1.00	0.76	1.50	0	0	35	ML	61.4
726.0	28.5	128	1.82	0.00	1.82	0	89.8	1.004	1.10	1.00	0.72	1.50	0	0	35	ML	61.4
723.5	31.0	128	1.98	0.00	1.98	1	89.8	1.004	1.10	1.00	0.69	1.50	2	1	38	ML	61.4
721.0	33.5	127	2.14	0.00	2.14	0	89.8	1.004	1.10	1.00	0.65	1.50	0	0	35	ML	93.6
718.5	36.0	127	2.30	0.00	2.30	0	89.8	1.004	1.10	1.00	0.63	1.50	0	0	35	CL	82
714.0	40.5	127	2.59	0.00	2.59	16	89.8	1.004	1.20	1.00	0.70	1.50	29	20	75	CL	89.3
709.5	45.0	126	2.87	0.00	2.87	8	89.8	1.004	1.10	1.00	0.61	1.50	13	8	54	ML	79.6
707.0	47.5	126	3.03	0.00	3.03	2	89.8	1.004	1.10	1.00	0.55	1.50	3	2	40	SM	45.7
704.5	50.0	131	3.19	0.00	3.19	18	89.8	1.004	1.20	1.00	0.63	1.50	33	20	69	SP-SM	11.2

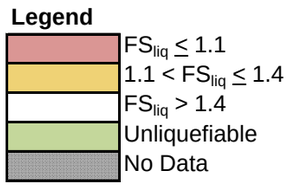
KIF TDEC Seismic Stability, Boring ID: KIF-B09
Liquefaction Potential Evaluations
For Coarse Grained Soils

Depth of Mid. Pt. of Sample (ft.) z	Clean Sand Correction $\Delta(N_1)_{60cs}$	Equivalent Clean Sand N-Value $(N_1)_{60cs}$	Sample Screened for: Clay-like	High Blow Count $(N_1)_{60cs} \geq 32$	Unsaturated	Factor of Safety FS_{liq}	Material (optional)
ft			*Note: A factor of safety shown as "N/A" implies that the soil type is not appropriately evaluated using this methodology. This applies to clay-like soils (typically CL, CH, CL-ML and MH material type), samples with high blow counts, and unsaturated samples.*				
ft	*(relative to ground surface during SPT)*						
pcf							
tsf							
1.0	5.55	62	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**
3.5	5.55	82	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**
6.0	5.55	62	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**
8.5	5.55	32	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**
11.0	2.83	83	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**
13.5	5.61	74	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**
16.0	5.61	39	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**
18.5	5.61	6	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
21.0	5.61	6	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
23.5	5.60	6	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
26.0	5.60	6	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
28.5	5.60	6	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
31.0	5.60	7	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
33.5	5.50	6	FALSE	FALSE	FALSE	**0.8**	**Subunit 1**
36.0	5.54	6	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
40.5	5.52	26	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
45.0	5.55	14	FALSE	FALSE	FALSE	**1.6**	**Subunit 2**
47.5	5.61	7	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**
50.0	1.71	22	FALSE	FALSE	FALSE	**3.6**	**Subunit 3**

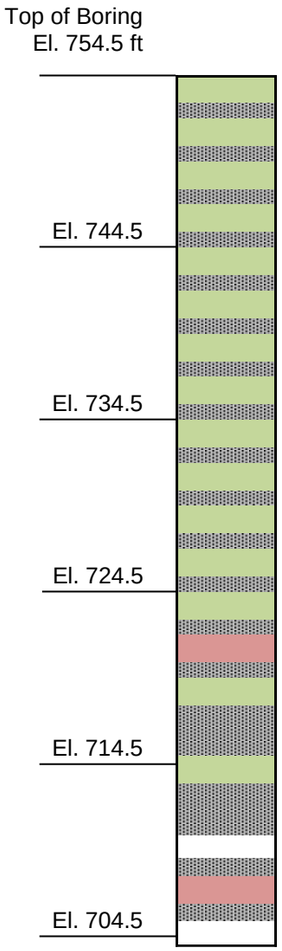


KIF-B09, Liquefaction Triggering Results

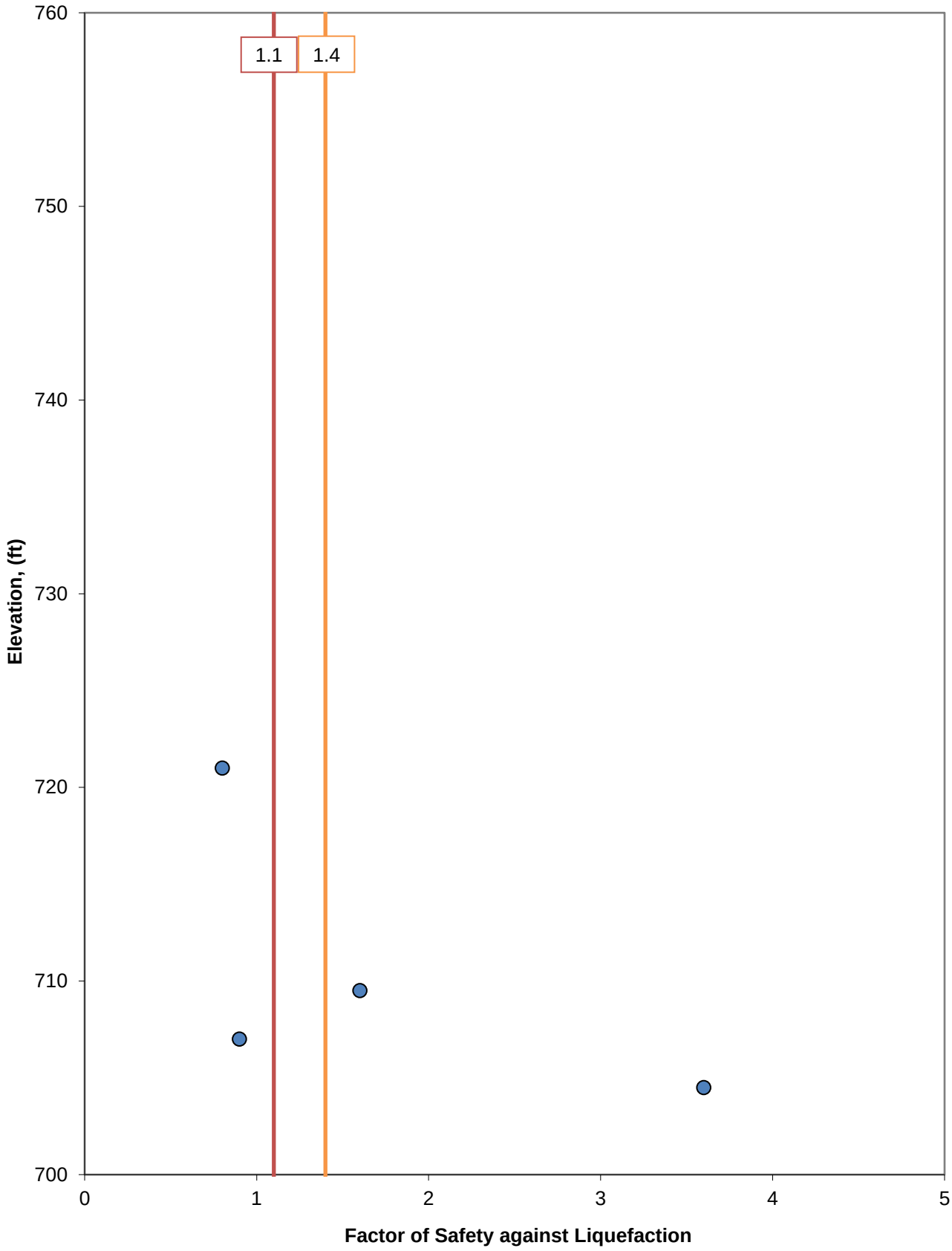




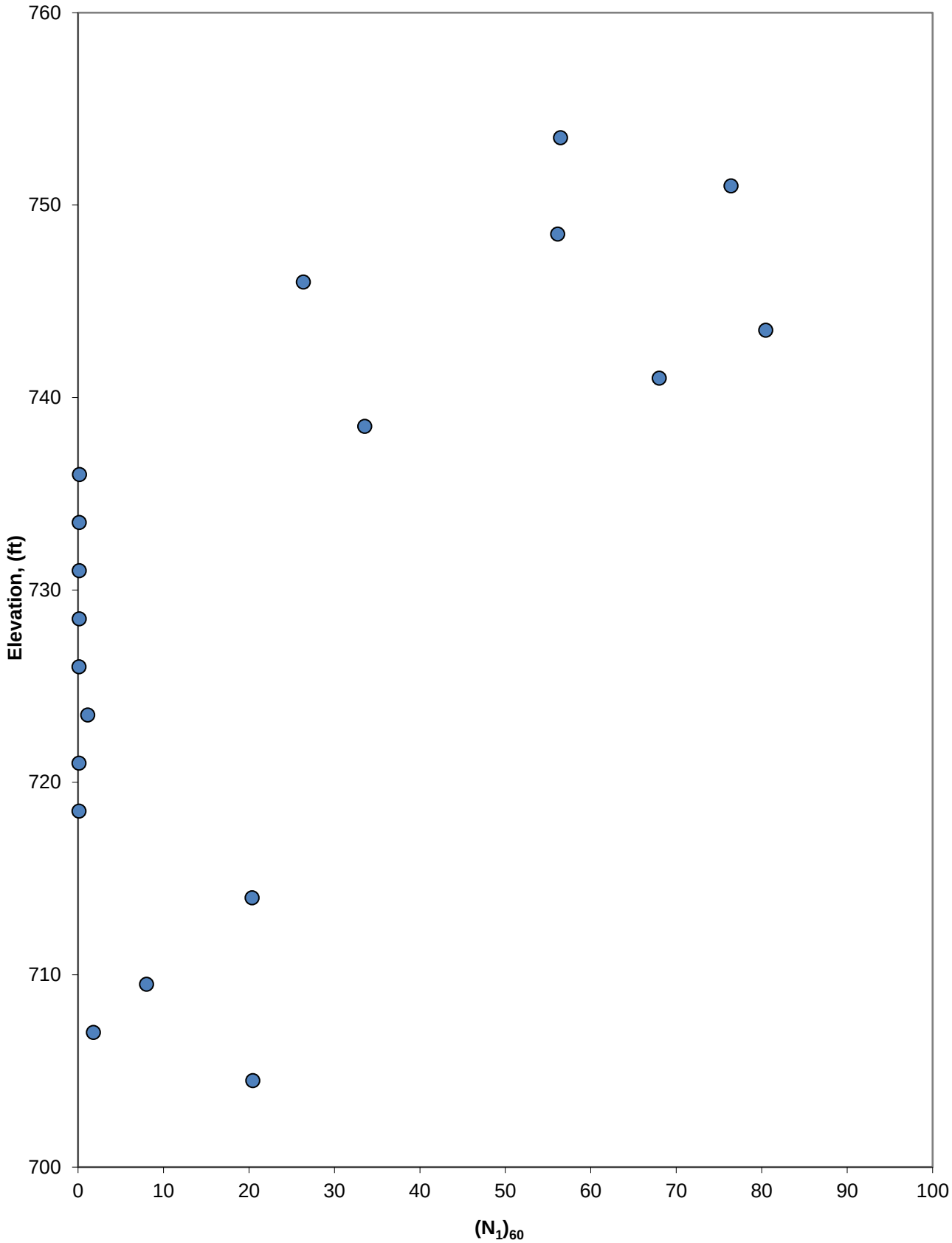
KIF-B09, Liquefaction Triggering Results



KIF TDEC Seismic Stability, Boring ID: KIF-B09, Source = 1 Hz, Mw = 7.6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



KIF TDEC Seismic Stability, Boring ID: KIF-B09, Source = 1 Hz, Mw = 7.6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



Project Name = KIF TDEC Seismic Stability
Boring ID = KIF-B10

Boring Location

Northing =
Easting =

OR

Baseline Station =
Offset (+ Right) =

Drilling Information

Boring Inner Diameter (ID) =	5.875	inches	
Top of Hole Elevation	732.02	feet	
Water Depth during SPT (negative for U/S borings)=	-4.2	feet	
Depth Sampling Began	0	feet	
Total Unit Wt. above 1st SPT =	62.4	pcf	
Assumed Rod Stickup =	5	feet	*(Typ assume 5ft)*
E_m Measurement based on Fv method? =	1	(1: Yes, 0: No)	
SPT Sampler w/ Liners? =	0	(1: Yes, 0: No)	*(Typ. no)*

During EQ Information

Water Depth during EQ (relative to SPT TOH, negative for U/S borings) =	-5.4	feet
Final Grade Elevation during EQ	732.02	feet
Average Total Unit Wt. of Cut/Fill		pcf

Fines Content Correction

Fines content correction for samples with blow counts of zero? 1 (1: Yes, 0: No)

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile? 0 (1: Yes, 0: No)
If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile: SectionAA, KIF-B10_NOR
Alpha at each sample depth known? 1 (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (α vs. depth curve)
If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_α will be one.

m4:
m3:
m2:
m1:
m0:

Associated ground response profile: Section_AA, KIF-B10_NOR
Get CSR from shear stress envelope? 0 (1: Yes, 0: No)
If previous answer is No, then CSR will be calculated using a_{max} and r_d
Max. Shear Stress at each sample depth known? (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4:
m3:
m2:
m1:

Earthquake Information

EQ Source (e.g., New Madrid)	1 Hz
Event (e.g., MCE, 10KEQ, OBE)	Design EQ
a_{max} (g) (top of ground surface)	0.13
EQ Mag (Mw)	7.6

Inputs

Depth of Sample Midpoint (ft.)	SPT N Value	Hammer Efficiency, E_m (%)	Unified Soil Classification	Fines Content (%)	Total Unit Weight (pcf)	Material (optional)	Clay-like / Sand-like Override (optional)	Clay-like Susceptibility (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure during SPT (psf)	Static Pore Water Pressure during EQ (psf)
1.0	3	89.8	CL	52	111	Sediment	Sand-like			0.794			
3.5	0	89.8	CL	52	111	Sediment	Sand-like			0.404			
6.0	0	89.8	CL	52	111	Sediment	Sand-like			0.306			
8.5	0	89.8	ML	91	127	Subunit 1				0.243			
11.0	1	89.8	ML	80.5	127	Subunit 1				0.227			
13.5	8	89.8	ML	80.5	127	Subunit 1				0.203			
16.0	11	89.8	CL	89.5	127	Subunit 1				0.191			
18.5	8	89.8	CL	89.5	127	Subunit 1				0.187			
21.0	0	89.8	SM	45.7	126	Subunit 2	Sand-like			0.181			
23.5	0	89.8	SM	24.6	131	Subunit 3	Sand-like			0.175			
26.0	1	89.8	SP-SM	10.9	131	Subunit 3	Sand-like			0.171			

KIF TDEC Seismic Stability, Boring ID: KIF-B10

Liquefaction Potential Evaluations

For Coarse Grained Soils

Elev. Of Mid. Pt. of Sample (ft)	Depth of Mid. Pt. of Sample (ft.)	Unit Weight (pcf)	Vert. Total Stress during SPT (tsf)	Static Pore Pressure during SPT (tsf)	Vert. Eff. Stress during SPT (tsf)	SPT N Value	Hammer Efficiency (%)	Borehole Diameter Correction	Sampler Correction	Rod Length Correction	Overburden Stress Correction Factor	Hammer Energy Correction Factor	Corrected Blow Count	Normalized Blow Count	Relative Density (%)	Unified Soil Classification	Fines Content (%)
	z	γ_T	σ_v	u	σ'_v	N	E_m	C_B	C_s	C_R	C_N	C_E	N_{60}	$(N_1)_{60}$	D_r		

Top of Hole Elevation (ft) = 732.0 | Boring ID = **KIF-B10**

begin sampling (depth-ft) = 0.0 | Boring Inner Dia. (in) = 5.875

total unit wt. above 1st SPT (pcf) = 62

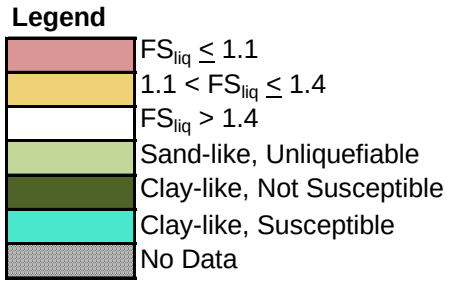
water elevation during SPT (ft) = 736.2 ft *(relative to ground surface during SPT)* | Assumed Rod Stickup = 5.0 feet

water depth during SPT (ft) = -4.2 | E_m Measurement? = 1 (1: Yes, 0: No)

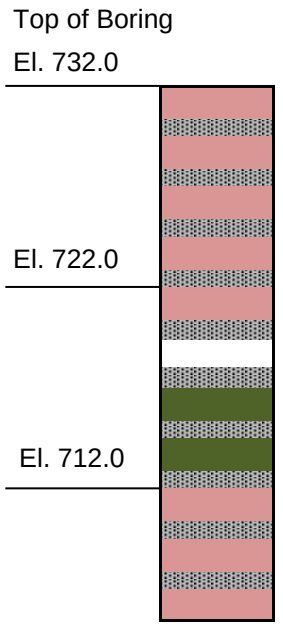
water elevation during EQ (ft) = 737.4 ft *(relative to ground surface during SPT)* | SPT Sampler w/ Liners? = 0 (1: Yes, 0: No)

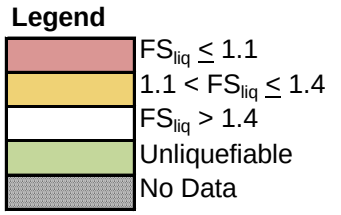
		u-top	effstr-top
water during EQ (depth-ft) =	-5.4		
vert. total stress above 1st SPT (tsf) =	**0.13**	**0.13**	0.00

731.0	1.0	111	0.19	0.16	0.02	3	89.8	1.046	1.10	1.00	1.70	1.50	5	9	56	CL	52
728.5	3.5	111	0.33	0.24	0.09	0	89.8	1.046	1.10	1.00	1.70	1.50	0	0	36	CL	52
726.0	6.0	111	0.46	0.32	0.15	0	89.8	1.046	1.10	1.00	1.70	1.50	0	0	36	CL	52
723.5	8.5	127	0.61	0.40	0.22	0	89.8	1.046	1.10	1.00	1.70	1.50	0	0	36	ML	91
721.0	11.0	127	0.77	0.47	0.30	1	89.8	1.046	1.10	1.00	1.70	1.50	2	3	43	ML	80.5
718.5	13.5	127	0.93	0.55	0.38	8	89.8	1.046	1.23	1.00	1.47	1.50	15	23	78	ML	80.5
716.0	16.0	127	1.09	0.63	0.46	11	89.8	1.046	1.29	1.00	1.32	1.50	22	29	87	CL	89.5
713.5	18.5	127	1.25	0.71	0.54	8	89.8	1.046	1.20	1.00	1.31	1.50	15	20	74	CL	89.5
711.0	21.0	126	1.41	0.79	0.62	0	89.8	1.046	1.10	1.00	1.38	1.50	0	0	36	SM	45.7
708.5	23.5	131	1.57	0.86	0.70	0	89.8	1.046	1.10	1.00	1.28	1.50	0	0	34	SM	24.6
706.0	26.0	131	1.73	0.94	0.79	1	89.8	1.046	1.10	1.00	1.21	1.50	2	2	28	SP-SM	10.9

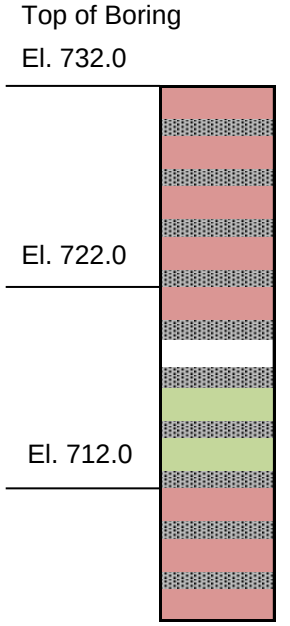


KIF-B10, Liquefaction Triggering Results





KIF-B10, Liquefaction Triggering Results



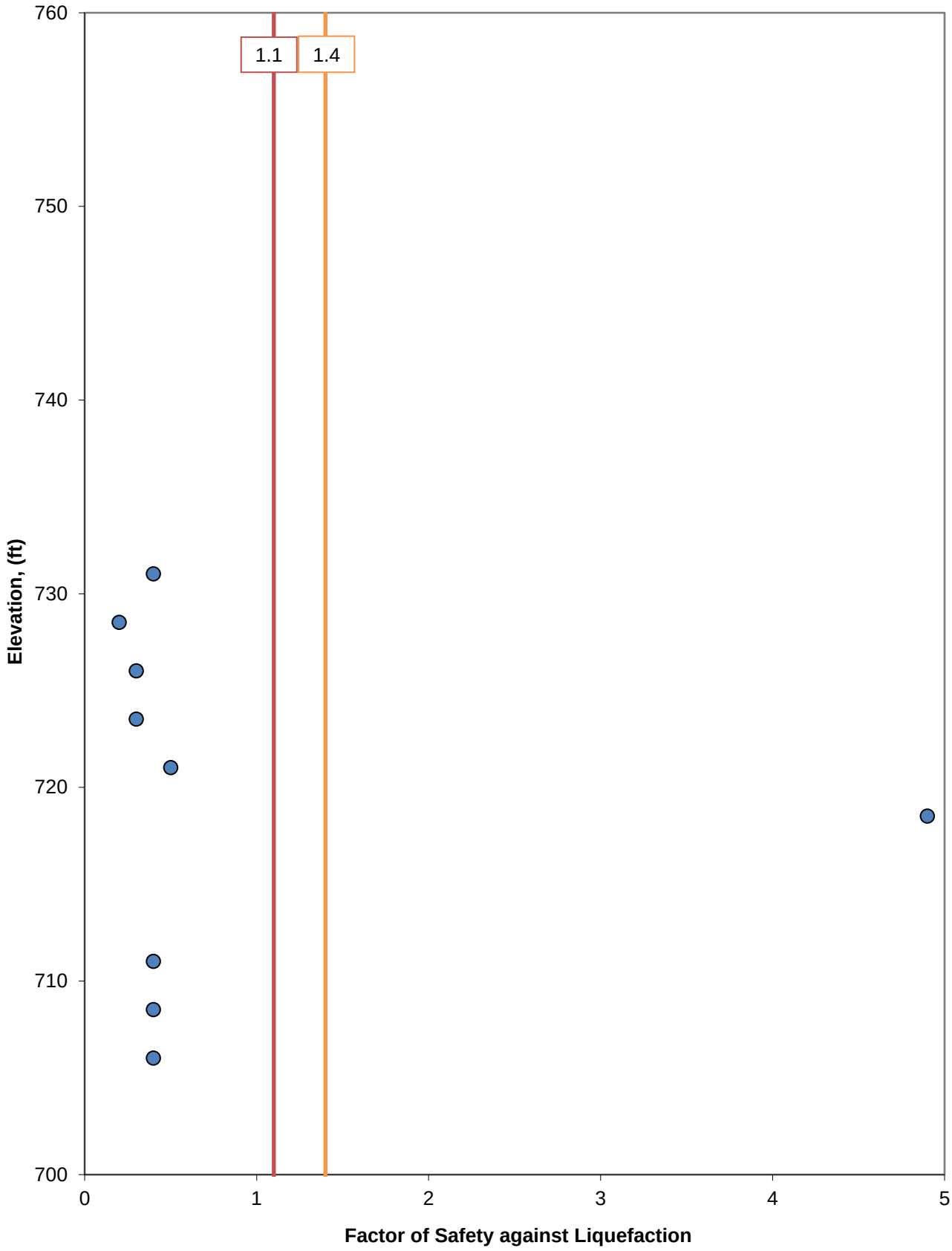
KIF TDEC Seismic Stability, Boring ID: KIF-B10
Liquefaction Potential Evaluations
For Coarse Grained Soils

Depth of Mid. Pt. of Sample (ft.) z	Clean Sand Correction $\Delta(N_1)_{60cs}$	Equivalent Clean Sand N-Value $(N_1)_{60cs}$	Sample Screened for: Clay-like	High Blow Count $(N_1)_{60cs} \geq 32$	Unsaturated	Factor of Safety FS_{liq}	Material (optional)
	ft						
	ft *(relative to ground surface during SPT)*						
	pcf						
	tsf						

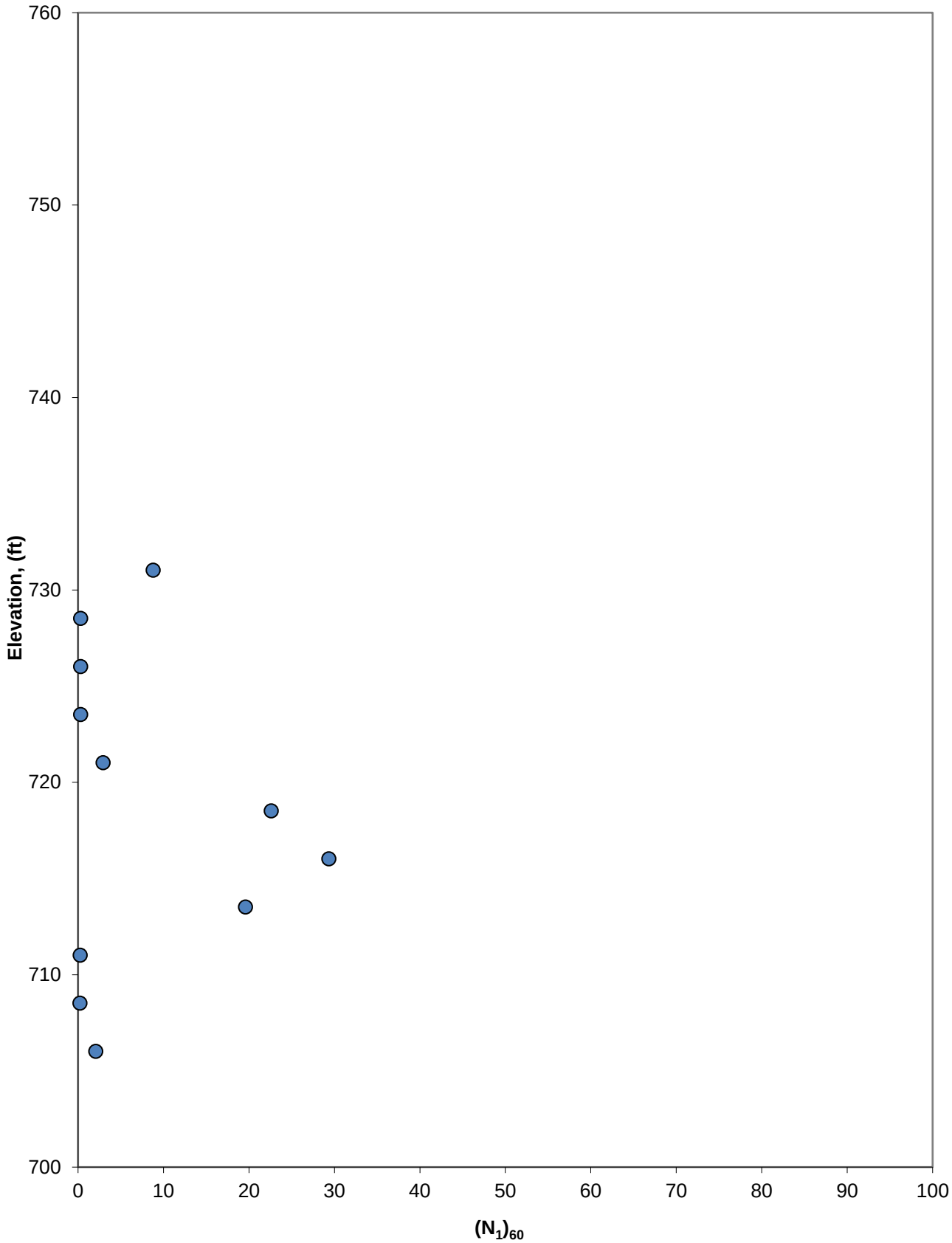
Note: A factor of safety shown as "N/A" implies that the soil type is not appropriately evaluated using this methodology. This applies to clay-like soils (typically CL, CH, CL-ML and MH material type), samples with high blow counts, and unsaturated samples.

1.0	5.61	14	FALSE	FALSE	FALSE	**0.4**	**Sediment**
3.5	5.61	6	FALSE	FALSE	FALSE	**0.2**	**Sediment**
6.0	5.61	6	FALSE	FALSE	FALSE	**0.3**	**Sediment**
8.5	5.51	6	FALSE	FALSE	FALSE	**0.3**	**Subunit 1**
11.0	5.54	8	FALSE	FALSE	FALSE	**0.5**	**Subunit 1**
13.5	5.54	28	FALSE	FALSE	FALSE	**4.9**	**Subunit 1**
16.0	5.52	35	TRUE	TRUE	FALSE	**N/A**	**Subunit 1**
18.5	5.52	25	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
21.0	5.61	6	FALSE	FALSE	FALSE	**0.4**	**Subunit 2**
23.5	5.04	5	FALSE	FALSE	FALSE	**0.4**	**Subunit 3**
26.0	1.57	4	FALSE	FALSE	FALSE	**0.4**	**Subunit 3**

KIF TDEC Seismic Stability, Boring ID: KIF-B10, Source = 1 Hz, Mw = 7.6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



KIF TDEC Seismic Stability, Boring ID: KIF-B10, Source = 1 Hz, Mw = 7.6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



Project Name = KIF TDEC Seismic Stability

Boring ID = KIF-B11

Boring Location

Northing =

Easting =

OR

Baseline Station =

Offset (+ Right) =

Drilling Information

Boring Inner Diameter (ID) =	5.875	inches	
Top of Hole Elevation	727.3	feet	
Water Depth during SPT (negative for U/S borings)=	-9.1	feet	
Depth Sampling Began	0	feet	
Total Unit Wt. above 1st SPT =	62.4	pcf	
Assumed Rod Stickup =	5	feet	*(Typ assume 5ft)*
E_m Measurement based on Fv method? =	1	(1: Yes, 0: No)	
SPT Sampler w/ Liners? =	0	(1: Yes, 0: No)	*(Typ. no)*

During EQ Information

Water Depth during EQ (relative to SPT TOH, negative for U/S borings) =	-10.1	feet
Final Grade Elevation during EQ	727.3	feet
Average Total Unit Wt. of Cut/Fill		pcf

Fines Content Correction

Fines content correction for samples with blow counts of zero? 1 (1: Yes, 0: No)

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile? 0 (1: Yes, 0: No)

If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile: SectionAA, KIF-B11_NOR

Alpha at each sample depth known? 1 (1: Yes, 0: No)

If previous answer is No, then enter curve fit parameters below (α vs. depth curve)

If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_α will be one.

m4:
m3:
m2:
m1:
m0:

Associated ground response profile: Section_AA, KIF-B11_NOR

Get CSR from shear stress envelope? 0 (1: Yes, 0: No)

If previous answer is No, then CSR will be calculated using a_{max} and r_d

Max. Shear Stress at each sample depth known? (1: Yes, 0: No)

If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4:
m3:
m2:
m1:

Earthquake Information

EQ Source (e.g., New Madrid)	1 Hz
Event (e.g., MCE, 10KEQ, OBE)	Design EQ
a_{max} (g) (top of ground surface)	0.11
EQ Mag (Mw)	7.6

Inputs

Depth of Sample Midpoint (ft.)	SPT N Value	Hammer Efficiency, E_m (%)	Unified Soil Classification	Fines Content (%)	Total Unit Weight (pcf)	Material (optional)	Clay-like / Sand-like Override (optional)	Clay-like Susceptibility (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure during SPT (psf)	Static Pore Water Pressure during EQ (psf)
1.0	0	89.8	CL	52	111	Sediment	Sand-like			0.696			
3.6	0	89.8	CL	89.9	127	Subunit 1				0.279			
6.1	3	89.8	CL	94.1	127	Subunit 1				0.195			
12.6	11	89.8	CL	86.6	127	Subunit 1				0.141			
15.1	0	89.8	CL	63.8	127	Subunit 1				0.129			
17.6	0	89.8	SM	46	126	Subunit 2	Sand-like			0.124			
20.1	1	89.8	SM	16.7	131	Subunit 3	Sand-like			0.118			
22.6	17	89.8	SM	15.9	131	Subunit 3	Sand-like			0.113			

KIF TDEC Seismic Stability, Boring ID: KIF-B11

Liquefaction Potential Evaluations

For Coarse Grained Soils

Elev. Of Mid. Pt. of Sample (ft)	Depth of Mid. Pt. of Sample (ft.)	Unit Weight (pcf)	Vert. Total Stress during SPT (tsf)	Static Pore Pressure during SPT (tsf)	Vert. Eff. Stress during SPT (tsf)	SPT N Value	Hammer Efficiency (%)	Borehole Diameter Correction	Sampler Correction	Rod Length Correction	Overburden Stress Correction Factor	Hammer Energy Correction Factor	Corrected Blow Count	Normalized Blow Count	Relative Density (%)	Unified Soil Classification	Fines Content (%)
	z	γ_T	σ_v	u	σ'_v	N	E_m	C_B	C_s	C_R	C_N	C_E	N_{60}	$(N_1)_{60}$	D_r		

Top of Hole Elevation (ft)	727.3		Boring ID =	**KIF-B11**	
begin sampling (depth-ft)	0.0		Boring Inner Dia. (in) =	5.875	
total unit wt. above 1st SPT (pcf) =	62				
water elevation during SPT (ft) =	736.4	ft *(relative to ground surface during SPT)*	Assumed Rod Stickup =	5.0	feet
water depth during SPT (ft) =	-9.1		E_m Measurement? =	1	(1: Yes, 0: No)
water elevation during EQ (ft) =	737.4	ft *(relative to ground surface during SPT)*	SPT Sampler w/ Liners? =	0	(1: Yes, 0: No)
water during EQ (depth-ft) =	-10.1	u-top / effstr-top			
vert. total stress above 1st SPT (tsf) =	**0.28**	**0.28** / 0.00			

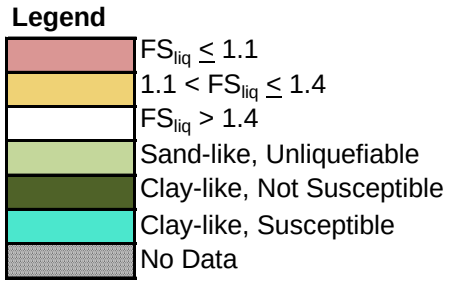
726.3	1.0	111	0.34	0.32	0.02	0	89.8	1.046	1.10	1.00	1.70	1.50	0	0	36	CL	52
723.7	3.6	127	0.49	0.40	0.10	0	89.8	1.046	1.10	1.00	1.70	1.50	0	0	36	CL	89.9
721.2	6.1	127	0.65	0.47	0.18	3	89.8	1.046	1.10	1.00	1.70	1.50	5	9	56	CL	94.1
714.7	12.6	127	1.07	0.68	0.39	11	89.8	1.046	1.30	1.00	1.38	1.50	22	31	89	CL	86.6
712.2	15.1	127	1.22	0.76	0.47	0	89.8	1.046	1.10	1.00	1.63	1.50	0	0	36	CL	63.8
709.7	17.6	126	1.38	0.83	0.55	0	89.8	1.046	1.10	1.00	1.48	1.50	0	0	36	SM	46
707.2	20.1	131	1.54	0.91	0.63	1	89.8	1.046	1.10	1.00	1.36	1.50	2	2	36	SM	16.7
704.7	22.6	131	1.71	0.99	0.72	17	89.8	1.046	1.30	1.00	1.12	1.50	35	39	96	SM	15.9

KIF TDEC Seismic Stability, Boring ID: KIF-B11
Liquefaction Potential Evaluations
For Coarse Grained Soils

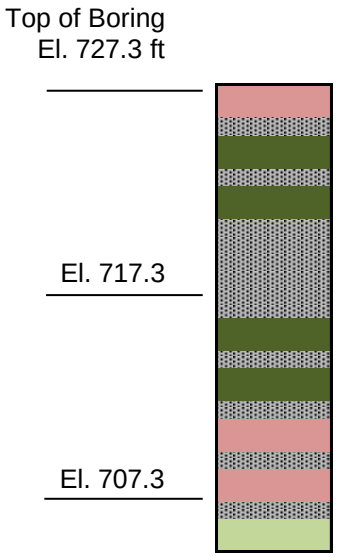
Depth of Mid. Pt. of Sample (ft.) z	Clean Sand Correction $\Delta(N_1)_{60cs}$	Equivalent Clean Sand N-Value $(N_1)_{60cs}$	Sample Screened for: Clay-like	High Blow Count $(N_1)_{60cs} \geq 32$	Unsaturated	Factor of Safety FS_{liq}	Material (optional)
	ft						
	ft *(relative to ground surface during SPT)*						
	pcf						
	tsf						

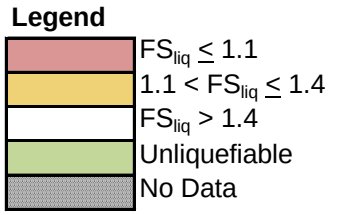
Note: A factor of safety shown as "N/A" implies that the soil type is not appropriately evaluated using this methodology. This applies to clay-like soils (typically CL, CH, CL-ML and MH material type), samples with high blow counts, and unsaturated samples.

1.0	5.61	6	FALSE	FALSE	FALSE	**0.1**	**Sediment**
3.6	5.51	6	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
6.1	5.50	14	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
12.6	5.52	36	TRUE	TRUE	FALSE	**N/A**	**Subunit 1**
15.1	5.59	6	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
17.6	5.61	6	FALSE	FALSE	FALSE	**0.5**	**Subunit 2**
20.1	3.77	6	FALSE	FALSE	FALSE	**0.5**	**Subunit 3**
22.6	3.55	42	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**

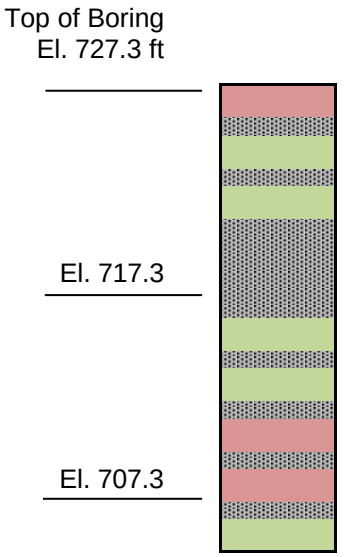


KIF-B11, Liquefaction Triggering Results

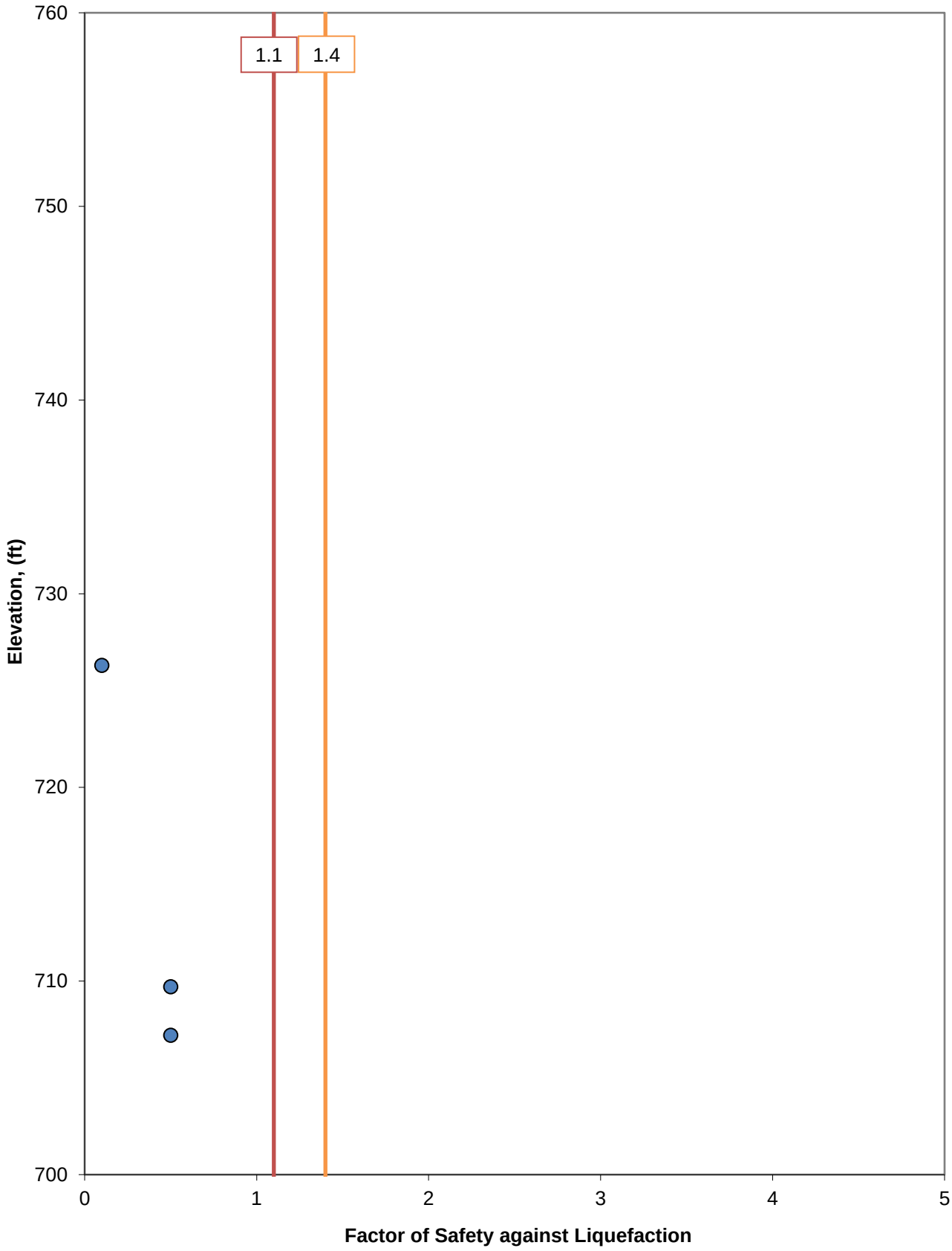




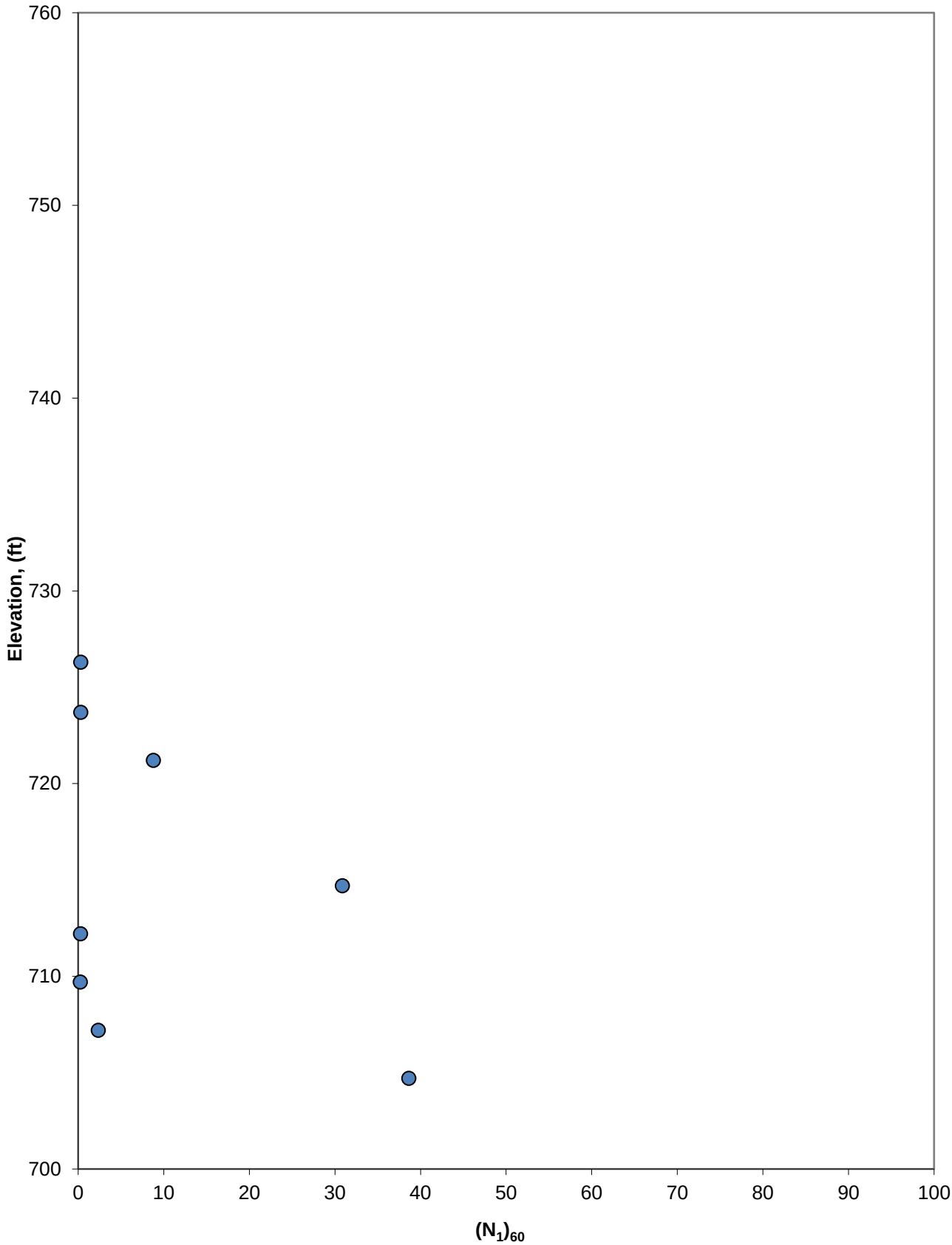
KIF-B11, Liquefaction Triggering Results



KIF TDEC Seismic Stability, Boring ID: KIF-B11, Source = 1 Hz, Mw = 7.6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



KIF TDEC Seismic Stability, Boring ID: KIF-B11, Source = 1 Hz, Mw = 7.6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



Project Name = KIF TDEC Seismic Stability
Boring ID = KIF-B12

Boring Location

Northing =
Easting =

OR

Baseline Station =
Offset (+ Right) =

Drilling Information

Boring Inner Diameter (ID) =	5.875	inches	
Top of Hole Elevation	725.6	feet	
Water Depth during SPT (negative for U/S borings)=	-10.8	feet	
Depth Sampling Began	0	feet	
Total Unit Wt. above 1st SPT =	62.4	pcf	
Assumed Rod Stickup =	5	feet	*(Typ assume 5ft)*
E_m Measurement based on Fv method? =	1	(1: Yes, 0: No)	
SPT Sampler w/ Liners? =	0	(1: Yes, 0: No)	*(Typ. no)*

During EQ Information

Water Depth during EQ (relative to SPT TOH, negative for U/S borings) =	-11.8	feet
Final Grade Elevation during EQ	725.6	feet
Average Total Unit Wt. of Cut/Fill		pcf

Fines Content Correction

Fines content correction for samples with blow counts of zero? 1 (1: Yes, 0: No)

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile? 0 (1: Yes, 0: No)
If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile: SectionAA, KIF-B12_NOR
Alpha at each sample depth known? 1 (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (α vs. depth curve)
If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_α will be one.

m4:
m3:
m2:
m1:
m0:

Associated ground response profile: Section_AA, KIF-B12_NOR
Get CSR from shear stress envelope? 0 (1: Yes, 0: No)
If previous answer is No, then CSR will be calculated using a_{max} and r_d
Max. Shear Stress at each sample depth known? (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4:
m3:
m2:
m1:

Earthquake Information

EQ Source (e.g., New Madrid)	1 Hz
Event (e.g., MCE, 10KEQ, OBE)	Design EQ
a_{max} (g) (top of ground surface)	0.10
EQ Mag (Mw)	7.6

Inputs

Depth of Sample Midpoint (ft.)	SPT N Value	Hammer Efficiency, E_m (%)	Unified Soil Classification	Fines Content (%)	Total Unit Weight (pcf)	Material (optional)	Clay-like / Sand-like Override (optional)	Clay-like Susceptibility (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure during SPT (psf)	Static Pore Water Pressure during EQ (psf)
1.0	0	89.8	CL	82.8	127	Subunit 1				0.251			
3.4	0	89.8	CL	82.8	127	Subunit 1				0.128			
10.7	12	89.8	CL	82.8	127	Subunit 1				0.081			
15.2	0	89.8	SM	47.9	126	Subunit 2	Sand-like			0.078			
17.7	0	89.8	SM	28.2	131	Subunit 3	Sand-like			0.074			
20.2	26	89.8	SP-SM	10.5	131	Subunit 3	Sand-like			0.073			

KIF TDEC Seismic Stability, Boring ID: KIF-B12

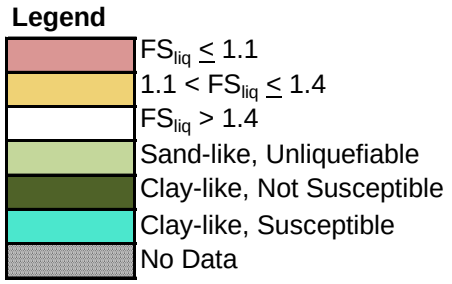
Liquefaction Potential Evaluations

For Coarse Grained Soils

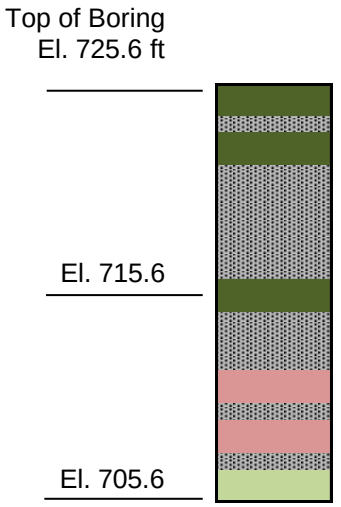
Elev. Of Mid. Pt. of Sample (ft)	Depth of Mid. Pt. of Sample (ft.)	Unit Weight (pcf)	Vert. Total Stress during SPT (tsf)	Static Pore Pressure during SPT (tsf)	Vert. Eff. Stress during SPT (tsf)	SPT N Value	Hammer Efficiency (%)	Borehole Diameter Correction	Sampler Correction	Rod Length Correction	Overburden Stress Correction Factor	Hammer Energy Correction Factor	Corrected Blow Count	Normalized Blow Count	Relative Density (%)	Unified Soil Classification	Fines Content (%)
	z	γ_T	σ_v	u	σ'_v	N	E_m	C_B	C_s	C_R	C_N	C_E	N_{60}	$(N_1)_{60}$	D_r		
		Top of Hole Elevation (ft)	725.6				Boring ID =	**KIF-B12**									
		begin sampling (depth-ft)	0.0				Boring Inner Dia. (in) =	5.875									
		total unit wt. above 1st SPT (pcf) =	62														
		water elevation during SPT (ft) =	736.4	ft *(relative to ground surface during SPT)*					Assumed Rod Stickup =	5.0	feet						
		water depth during SPT (ft) =	-10.8						E_m Measurement? =	1	(1: Yes, 0: No)						
		water elevation during EQ (ft) =	737.4	ft *(relative to ground surface during SPT)*					SPT Sampler w/ Liners? =	0	(1: Yes, 0: No)						
		water during EQ (depth-ft) =	-11.8	u-top	effstr-top												
		vert. total stress above 1st SPT (tsf) =	**0.34**	**0.34**	0.00												
724.6	1.0	127	0.40	0.37	0.03	0	89.8	1.046	1.10	1.00	1.70	1.50	0	0	36	CL	82.8
722.2	3.4	127	0.55	0.44	0.11	0	89.8	1.046	1.10	1.00	1.70	1.50	0	0	36	CL	82.8
714.9	10.7	127	1.02	0.67	0.35	12	89.8	1.046	1.30	1.00	1.40	1.50	24	34	93	CL	82.8
710.4	15.2	126	1.30	0.81	0.49	0	89.8	1.046	1.10	1.00	1.58	1.50	0	0	36	SM	47.9
707.9	17.7	131	1.46	0.89	0.57	0	89.8	1.046	1.10	1.00	1.45	1.50	0	0	35	SM	28.2
705.4	20.2	131	1.63	0.97	0.66	26	89.8	1.046	1.30	1.00	1.13	1.50	53	60	100	SP-SM	10.5

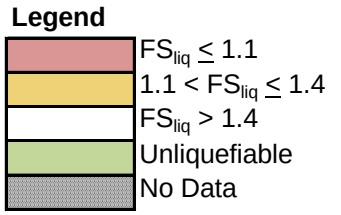
KIF TDEC Seismic Stability, Boring ID: KIF-B12
Liquefaction Potential Evaluations
For Coarse Grained Soils

Depth of Mid. Pt. of Sample (ft.) z	Clean Sand Correction $\Delta(N_1)_{60cs}$	Equivalent Clean Sand N-Value $(N_1)_{60cs}$	Sample Screened for: Clay-like	High Blow Count $(N_1)_{60cs} \geq 32$	Unsaturated	Factor of Safety FS_{liq}	Material (optional)
	ft		*Note: A factor of safety shown as "N/A" implies that the soil type is not appropriately evaluated using this methodology. This applies to clay-like soils (typically CL, CH, CL-ML and MH material type), samples with high blow counts, and unsaturated samples.*				
	ft *(relative to ground surface during SPT)*						
	pcf						
	tsf						
1.0	5.54	6	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
3.4	5.54	6	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
10.7	5.54	40	TRUE	TRUE	FALSE	**N/A**	**Subunit 1**
15.2	5.61	6	FALSE	FALSE	FALSE	**0.5**	**Subunit 2**
17.7	5.28	6	FALSE	FALSE	FALSE	**0.5**	**Subunit 3**
20.2	1.38	61	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**

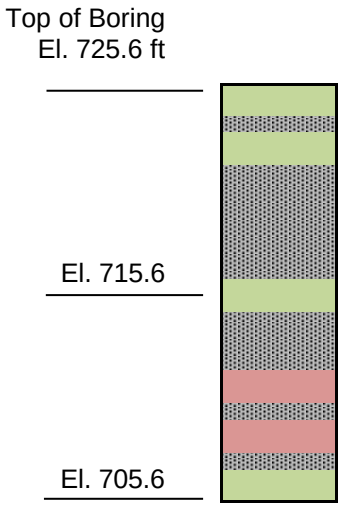


KIF-B12, Liquefaction Triggering Results

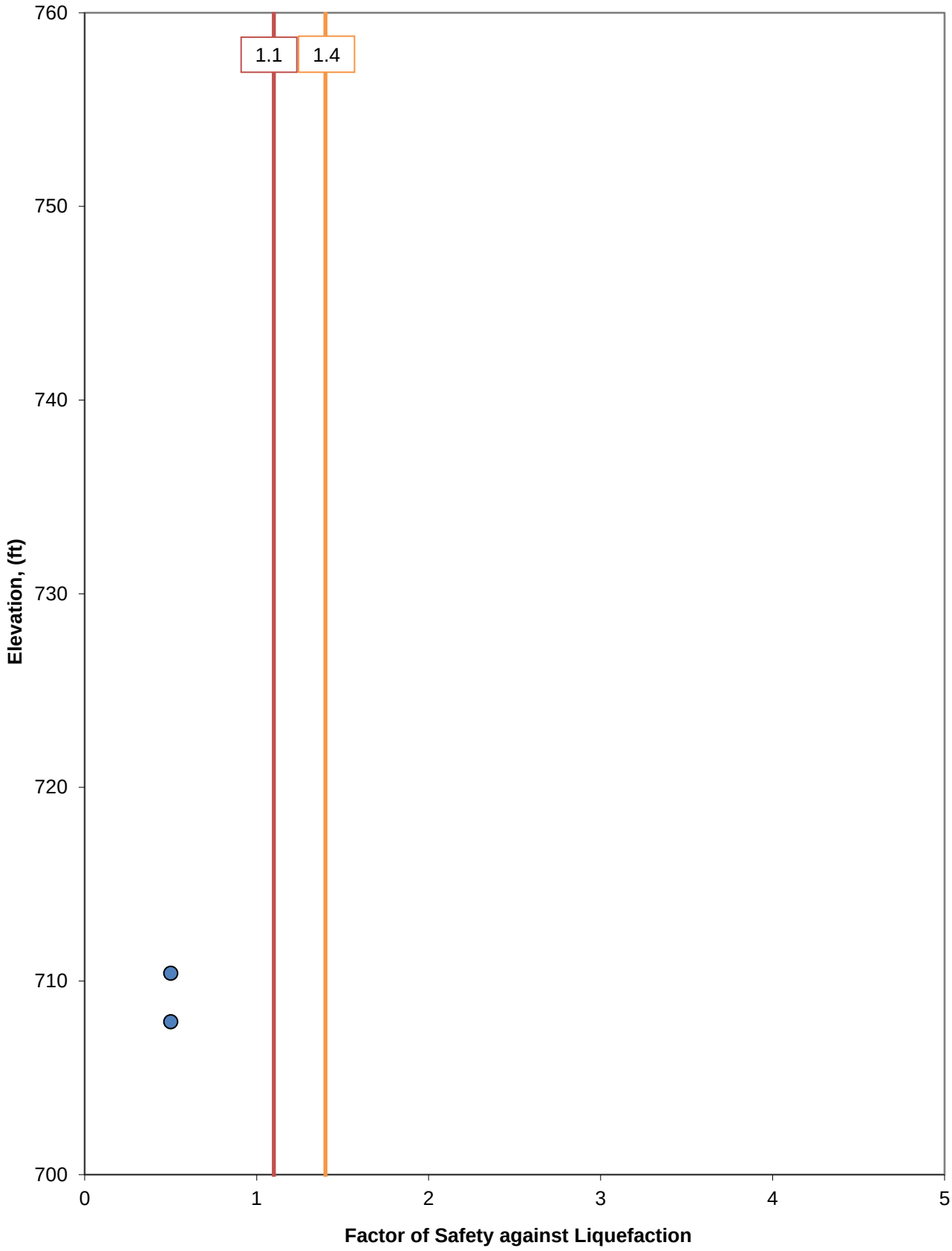




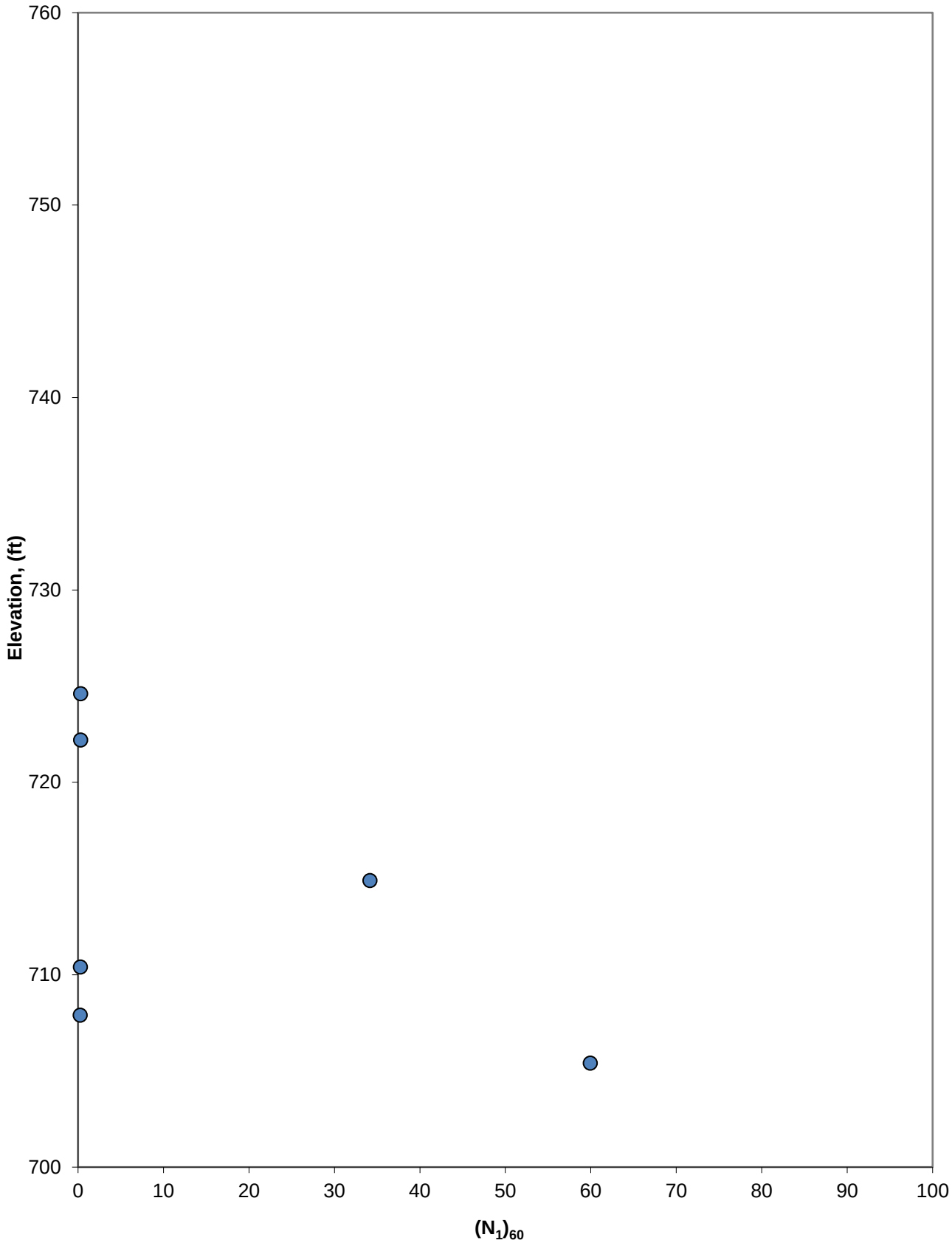
KIF-B12, Liquefaction Triggering Results



KIF TDEC Seismic Stability, Boring ID: KIF-B12, Source = 1 Hz, Mw = 7.6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



KIF TDEC Seismic Stability, Boring ID: KIF-B12, Source = 1 Hz, Mw = 7.6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



Project Name = KIF TDEC Seismic Stability

Boring ID = KIF-B13

Boring Location

Northing =

Easting =

OR

Baseline Station =

Offset (+ Right) =

Drilling Information

Boring Inner Diameter (ID) = 4.625 inches

Top of Hole Elevation = 753.2 feet

Water Depth during SPT (negative for U/S borings)= 52 feet

Depth Sampling Began = 0 feet

Total Unit Wt. above 1st SPT = pcf

Assumed Rod Stickup = 5 feet *(Typ assume 5ft)*

E_m Measurement based on Fv method? = 1 (1: Yes, 0: No)

SPT Sampler w/ Liners? = 0 (1: Yes, 0: No) *(Typ. no)*

During EQ Information

Water Depth during EQ (relative to SPT TOH, negative for U/S borings) = 6.1 feet

Final Grade Elevation during EQ = 753.2 feet

Average Total Unit Wt. of Cut/Fill pcf

Fines Content Correction

Fines content correction for samples with blow counts of zero? 1 (1: Yes, 0: No)

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile? 0 (1: Yes, 0: No)

If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile: lishingPond, KIF-B13_NOR

Alpha at each sample depth known? 1 (1: Yes, 0: No)

If previous answer is No, then enter curve fit parameters below (α vs. depth curve)

If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_α will be one.

m4:
m3:
m2:
m1:
m0:

Associated ground response profile: ishing_Pond, KIF-B13_NOR

Get CSR from shear stress envelope? 0 (1: Yes, 0: No)

If previous answer is No, then CSR will be calculated using a_{max} and r_d

Max. Shear Stress at each sample depth known? (1: Yes, 0: No)

If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4:
m3:
m2:
m1:

Earthquake Information

EQ Source (e.g., New Madrid) 1 Hz

Event (e.g., MCE, 10KEQ, OBE) Design EQ

a_{max} (g) (top of ground surface) 0.09

EQ Mag (Mw) 7.6

Inputs

Depth of Sample Midpoint (ft.)	SPT N Value	Hammer Efficiency, E_m (%)	Unified Soil Classification	Fines Content (%)	Total Unit Weight (pcf)	Material (optional)	Clay-like / Sand-like Override (optional)	Clay-like Susceptibility (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure during SPT (psf)	Static Pore Water Pressure during EQ (psf)
1.0	39	89.8	SC	41.4	128	Embankment Fill	Clay-like	Not Susceptible		0.014			
3.5	24	89.8	SC	41.4	128	Embankment Fill	Clay-like	Not Susceptible		0.018			
6.0	13	89.8	SC	41.4	128	Embankment Fill	Clay-like	Not Susceptible		0.033			
8.5	32	89.8	SC	41.4	128	Embankment Fill	Clay-like	Not Susceptible		0.046			
11.0	7	89.8	SC	29.7	128	Embankment Fill	Clay-like	Not Susceptible		0.060			
13.5	22	89.8	SC	29.7	128	Embankment Fill	Clay-like	Not Susceptible		0.071			
16.0	6	89.8	SC	29.7	128	Embankment Fill	Clay-like	Not Susceptible		0.083			
18.5	5	89.8	CL	57.1	128	Embankment Fill	Clay-like	Not Susceptible		0.091			
21.0	2	89.8	CL	57.1	128	Embankment Fill	Clay-like	Not Susceptible		0.098			
23.5	2	89.8	CL	57.1	128	Embankment Fill	Clay-like	Not Susceptible		0.106			
26.0	3	89.8	CL	57.1	128	Embankment Fill	Clay-like	Not Susceptible		0.116			
28.5	3	89.8	SM	49	126	Subunit 2	Sand-like			0.123			
33.0	7	89.8	SM	49	126	Subunit 2	Sand-like			0.133			
35.5	6	89.8	SM	23	126	Subunit 2	Sand-like			0.136			
38.0	5	89.8	SM	38.4	126	Subunit 2	Sand-like			0.139			
40.5	3	89.8	SM	39.4	126	Subunit 2	Sand-like			0.141			
43.0	8	89.8	SM	39.4	126	Subunit 2	Sand-like			0.141			
45.5	19	89.8	SM	19	131	Subunit 3	Sand-like			0.142			
48.0	20	89.8	GM	15	131	Subunit 3	Sand-like			0.137			

KIF TDEC Seismic Stability, Boring ID: KIF-B13

Liquefaction Potential Evaluations

For Coarse Grained Soils

Elev. Of Mid. Pt. of Sample (ft)	Depth of Mid. Pt. of Sample (ft.)	Unit Weight (pcf)	Vert. Total Stress during SPT (tsf)	Static Pore Pressure during SPT (tsf)	Vert. Eff. Stress during SPT (tsf)	SPT N Value	Hammer Efficiency (%)	Borehole Diameter Correction	Sampler Correction	Rod Length Correction	Overburden Stress Correction Factor	Hammer Energy Correction Factor	Corrected Blow Count	Normalized Blow Count	Relative Density (%)	Unified Soil Classification	Fines Content (%)
	z	γ_T	σ_v	u	σ'_v	N	E_m	C_B	C_s	C_R	C_N	C_E	N_{60}	$(N_1)_{60}$	D_r		

Top of Hole Elevation (ft) = 753.2 | Boring ID = **KIF-B13**

begin sampling (depth-ft) = 0.0 | Boring Inner Dia. (in) = 4.625

total unit wt. above 1st SPT (pcf) = 0

water elevation during SPT (ft) = 701.2 ft *(relative to ground surface during SPT)* | Assumed Rod Stickup = 5.0 feet

water depth during SPT (ft) = 52.0 | E_m Measurement? = 1 (1: Yes, 0: No)

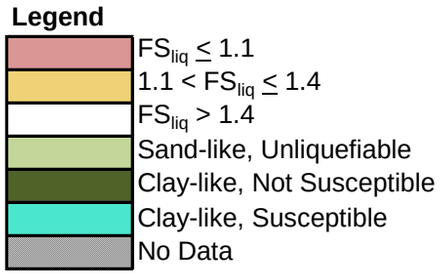
water elevation during EQ (ft) = 747.1 ft *(relative to ground surface during SPT)* | SPT Sampler w/ Liners? = 0 (1: Yes, 0: No)

	u-top	effstr-top
water during EQ (depth-ft) =	6.1	
vert. total stress above 1st SPT (tsf) =	**0.00**	0.00

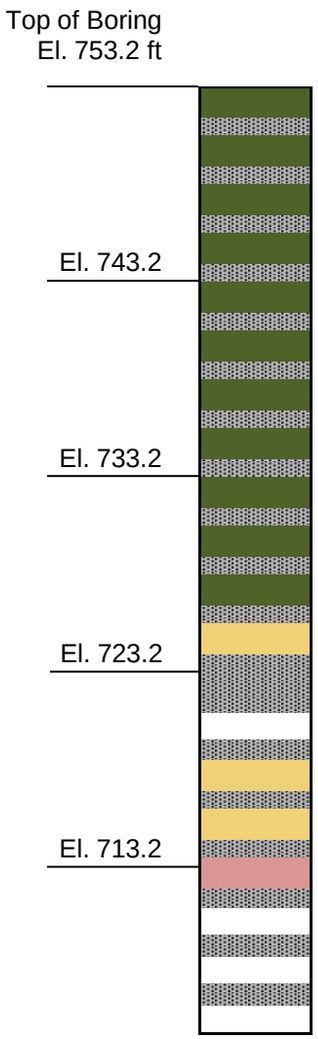
752.2	1.0	128	0.06	0.00	0.06	39	89.8	1.004	1.30	1.00	1.70	1.50	76	130	100	SC	41.4
749.7	3.5	128	0.22	0.00	0.22	24	89.8	1.004	1.30	1.00	1.50	1.50	47	71	100	SC	41.4
747.2	6.0	128	0.38	0.00	0.38	13	89.8	1.004	1.30	1.00	1.35	1.50	25	34	93	SC	41.4
744.7	8.5	128	0.54	0.00	0.54	32	89.8	1.004	1.30	1.00	1.19	1.50	63	74	100	SC	41.4
742.2	11.0	128	0.70	0.00	0.70	7	89.8	1.004	1.14	1.00	1.20	1.50	12	14	66	SC	29.7
739.7	13.5	128	0.86	0.00	0.86	22	89.8	1.004	1.30	1.00	1.05	1.50	43	45	100	SC	29.7
737.2	16.0	128	1.02	0.00	1.02	6	89.8	1.004	1.10	1.00	1.02	1.50	10	10	58	SC	29.7
734.7	18.5	128	1.18	0.00	1.18	5	89.8	1.004	1.10	1.00	0.95	1.50	8	8	54	CL	57.1
732.2	21.0	128	1.34	0.00	1.34	2	89.8	1.004	1.10	1.00	0.87	1.50	3	3	43	CL	57.1
729.7	23.5	128	1.50	0.00	1.50	2	89.8	1.004	1.10	1.00	0.82	1.50	3	3	43	CL	57.1
727.2	26.0	128	1.66	0.00	1.66	3	89.8	1.004	1.10	1.00	0.78	1.50	5	4	45	CL	57.1
724.7	28.5	126	1.82	0.00	1.82	3	89.8	1.004	1.10	1.00	0.74	1.50	5	4	45	SM	49
720.2	33.0	126	2.11	0.00	2.11	7	89.8	1.004	1.10	1.00	0.71	1.50	12	8	55	SM	49
717.7	35.5	126	2.26	0.00	2.26	6	89.8	1.004	1.10	1.00	0.67	1.50	10	7	50	SM	23
715.2	38.0	126	2.42	0.00	2.42	5	89.8	1.004	1.10	1.00	0.64	1.50	8	5	49	SM	38.4
712.7	40.5	126	2.58	0.00	2.58	3	89.8	1.004	1.10	1.00	0.61	1.50	5	3	43	SM	39.4
710.2	43.0	126	2.74	0.00	2.74	8	89.8	1.004	1.10	1.00	0.62	1.50	13	8	55	SM	39.4
707.7	45.5	131	2.90	0.00	2.90	19	89.8	1.004	1.24	1.00	0.69	1.50	36	24	79	SM	19
705.2	48.0	131	3.06	0.00	3.06	20	89.8	1.004	1.25	1.00	0.67	1.50	38	25	79	GM	15

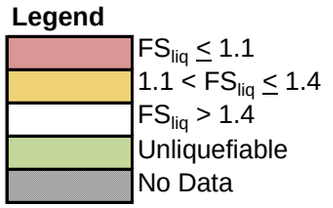
KIF TDEC Seismic Stability, Boring ID: KIF-B13
Liquefaction Potential Evaluations
For Coarse Grained Soils

Depth of Mid. Pt. of Sample (ft.) z	Clean Sand Correction $\Delta(N_1)_{60cs}$	Equivalent Clean Sand N-Value $(N_1)_{60cs}$	Sample Screened for: Clay-like	High Blow Count $(N_1)_{60cs} \geq 32$	Unsaturated	Factor of Safety FS_{liq}	Material (optional)
ft			*Note: A factor of safety shown as "N/A" implies that the soil type is not appropriately evaluated using this methodology. This applies to clay-like soils (typically CL, CH, CL-ML and MH material type), samples with high blow counts, and unsaturated samples.*				
ft *(relative to ground surface during SPT)*							
pcf							
tsf							
1.0	5.59	135	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**
3.5	5.59	76	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**
6.0	5.59	40	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**
8.5	5.59	80	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**
11.0	5.35	20	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
13.5	5.35	51	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**
16.0	5.35	15	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
18.5	5.61	13	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
21.0	5.61	9	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
23.5	5.61	8	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
26.0	5.61	9	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
28.5	5.61	9	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**
33.0	5.61	14	FALSE	FALSE	FALSE	**1.7**	**Subunit 2**
35.5	4.88	12	FALSE	FALSE	FALSE	**1.4**	**Subunit 2**
38.0	5.56	11	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**
40.5	5.57	9	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**
43.0	5.57	14	FALSE	FALSE	FALSE	**1.6**	**Subunit 2**
45.5	4.30	29	FALSE	FALSE	FALSE	**8.5**	**Subunit 3**
48.0	3.26	29	FALSE	FALSE	FALSE	**8.2**	**Subunit 3**

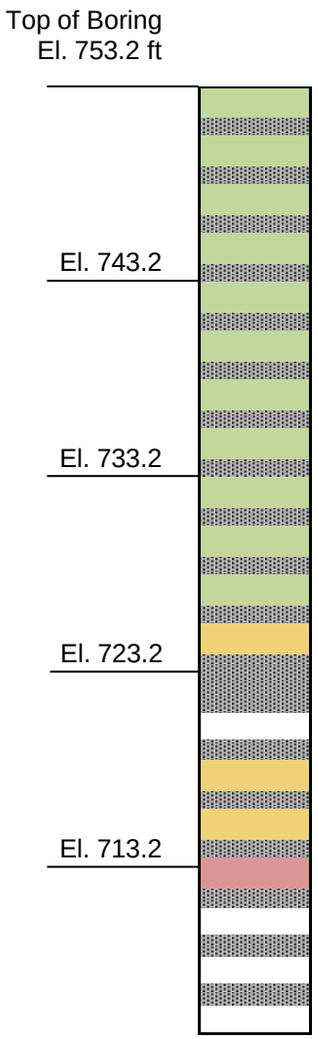


KIF-B13, Liquefaction Triggering Results

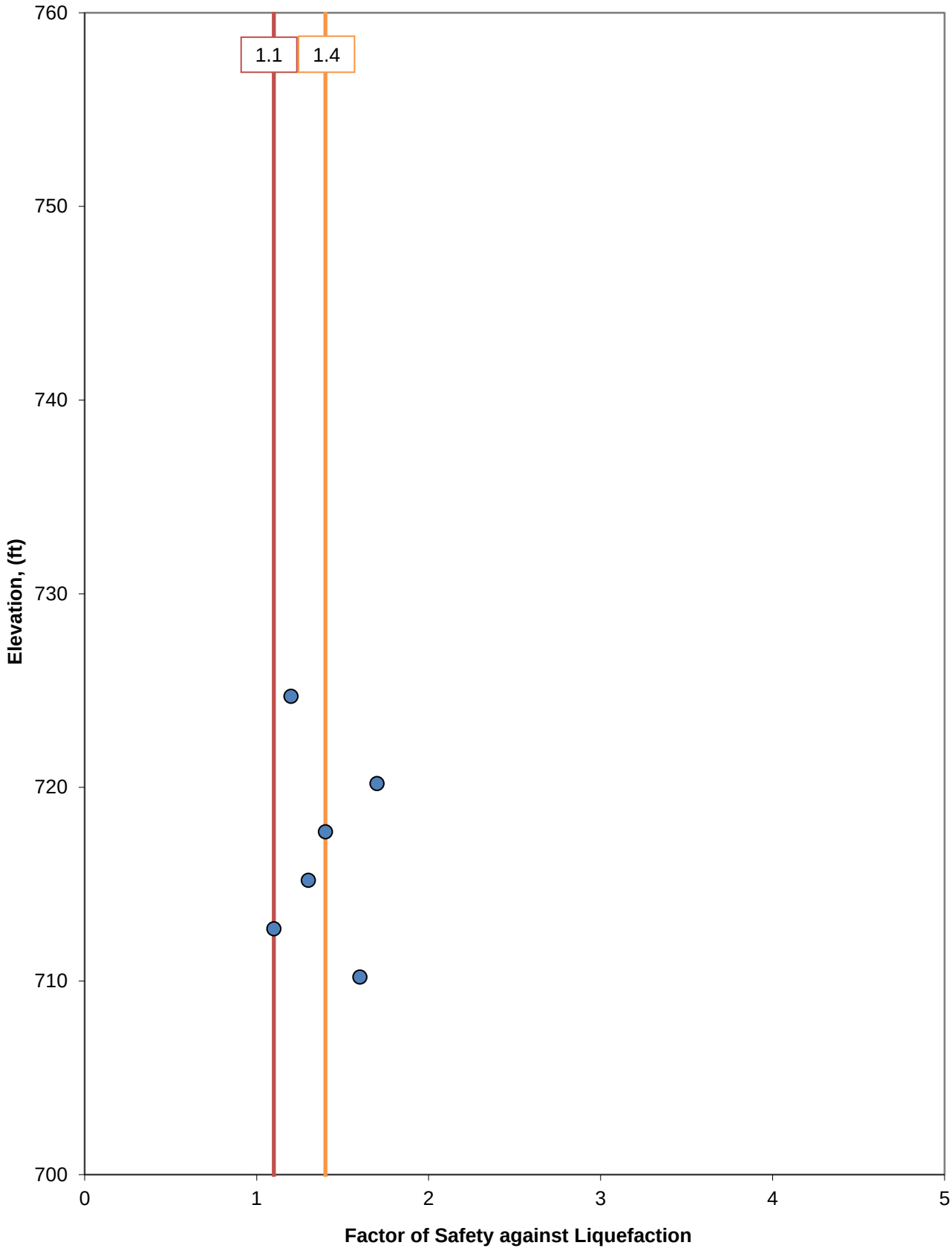




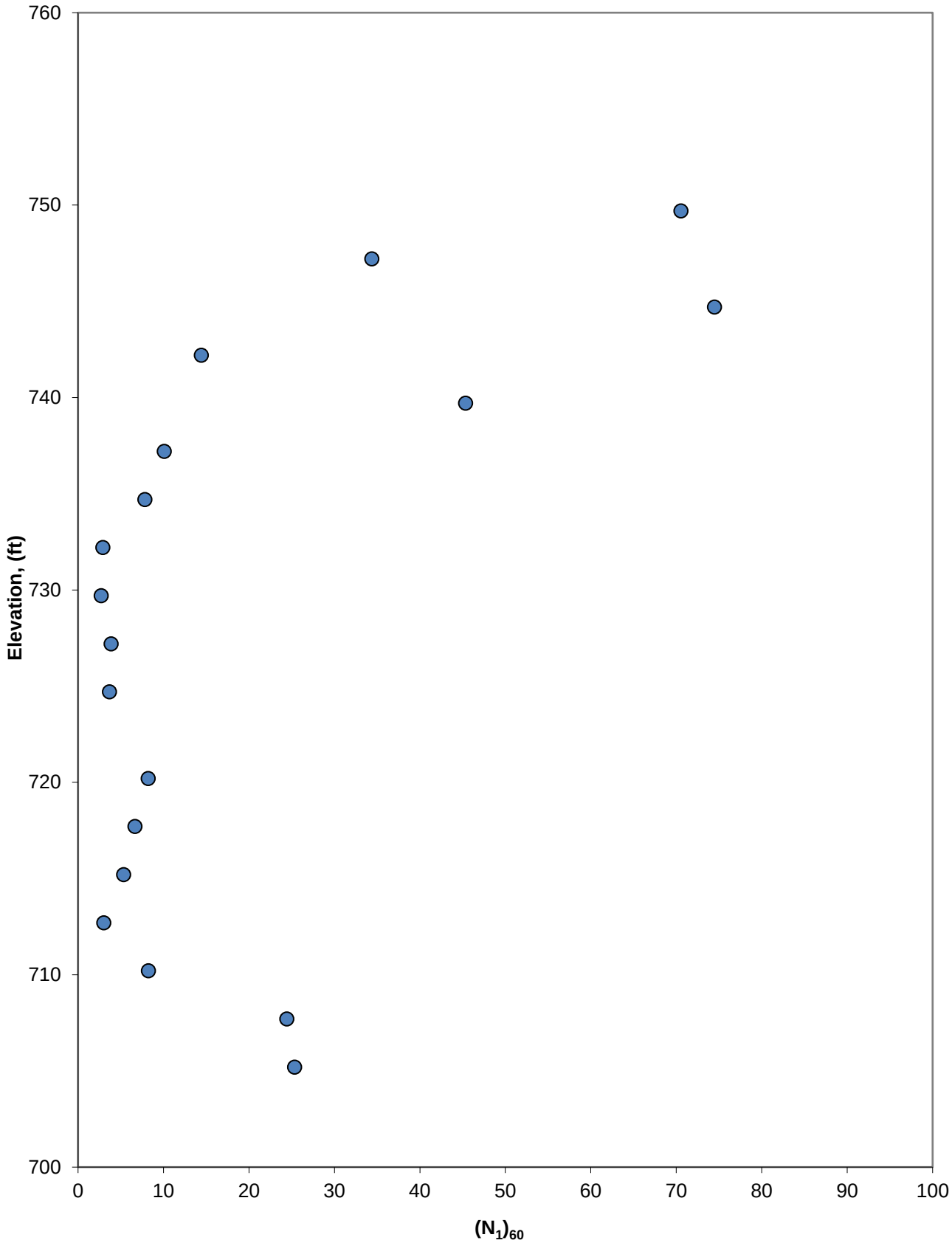
KIF-B13, Liquefaction Triggering Results



KIF TDEC Seismic Stability, Boring ID: KIF-B13, Source = 1 Hz, Mw = 7.6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



KIF TDEC Seismic Stability, Boring ID: KIF-B13, Source = 1 Hz, Mw = 7.6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



Project Name = KIF TDEC Seismic Stability
Boring ID = KIF-B14

Boring Location

Northing =
Easting =

OR

Baseline Station =
Offset (+ Right) =

Drilling Information

Boring Inner Diameter (ID) =	5.875	inches	
Top of Hole Elevation	731	feet	
Water Depth during SPT (negative for U/S borings)=	-4.4	feet	
Depth Sampling Began	0	feet	
Total Unit Wt. above 1st SPT =	62.4	pcf	
Assumed Rod Stickup =	5	feet	*(Typ assume 5ft)*
E_m Measurement based on Fv method? =	1	(1: Yes, 0: No)	
SPT Sampler w/ Liners? =	0	(1: Yes, 0: No)	*(Typ. no)*

During EQ Information

Water Depth during EQ (relative to SPT TOH, negative for U/S borings) =	-6.4	feet
Final Grade Elevation during EQ	731	feet
Average Total Unit Wt. of Cut/Fill		pcf

Fines Content Correction

Fines content correction for samples with blow counts of zero? 1 (1: Yes, 0: No)

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile? 0 (1: Yes, 0: No)
If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile: olishingPond, KIF-B14_NOR
Alpha at each sample depth known? 1 (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (α vs. depth curve)
If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_α will be one.

m4:
m3:
m2:
m1:
m0:

Associated ground response profile: ishing_Pond, KIF-B14_NOR
Get CSR from shear stress envelope? 0 (1: Yes, 0: No)
If previous answer is No, then CSR will be calculated using a_{max} and r_d
Max. Shear Stress at each sample depth known? (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4:
m3:
m2:
m1:

Earthquake Information

EQ Source (e.g., New Madrid)	1 Hz
Event (e.g., MCE, 10KEQ, OBE)	Design EQ
a_{max} (g) (top of ground surface)	0.12
EQ Mag (Mw)	7.6

Inputs

Depth of Sample Midpoint (ft.)	SPT N Value	Hammer Efficiency, E_m (%)	Unified Soil Classification	Fines Content (%)	Total Unit Weight (pcf)	Material (optional)	Clay-like / Sand-like Override (optional)	Clay-like Susceptibility (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure during SPT (psf)	Static Pore Water Pressure during EQ (psf)
1.1	0	89.8	CL	52	111	Sediment	Sand-like			0.748			
3.3	2	89.8	CL	52	111	Sediment	Sand-like			0.357			
5.6	2	89.8	SM	42.1	126	Subunit 2	Sand-like			0.256			
8.1	6	89.8	SM	42.1	126	Subunit 2	Sand-like			0.212			
10.6	14	89.8	SM	40.4	126	Subunit 2	Sand-like			0.184			
13.1	2	89.8	SM	40.4	126	Subunit 2	Sand-like			0.166			
15.6	3	89.8	SM	22.1	131	Subunit 3	Sand-like			0.154			
18.1	4	89.8	SM	22.1	131	Subunit 3	Sand-like			0.147			
20.6	7	89.8	SM	22.1	131	Subunit 3	Sand-like			0.140			
23.1	45	89.8	SM	18.2	138	Gravel Residuum	Sand-like			0.135			
25.6	71	89.8	SM	18.2	138	Gravel Residuum	Sand-like			0.131			
28.1	74	89.8	SM	18.2	138	Gravel Residuum	Sand-like			0.137			

KIF TDEC Seismic Stability, Boring ID: KIF-B14

Liquefaction Potential Evaluations

For Coarse Grained Soils

Elev. Of Mid. Pt. of Sample (ft)	Depth of Mid. Pt. of Sample (ft.)	Unit Weight (pcf)	Vert. Total Stress during SPT (tsf)	Static Pore Pressure during SPT (tsf)	Vert. Eff. Stress during SPT (tsf)	SPT N Value	Hammer Efficiency (%)	Borehole Diameter Correction	Sampler Correction	Rod Length Correction	Overburden Stress Correction Factor	Hammer Energy Correction Factor	Corrected Blow Count	Normalized Blow Count	Relative Density (%)	Unified Soil Classification	Fines Content (%)
	z	γ_T	σ_v	u	σ'_v	N	E_m	C_B	C_s	C_R	C_N	C_E	N_{60}	$(N_1)_{60}$	D_r		

Top of Hole Elevation (ft) = 731.0 | Boring ID = **KIF-B14**

begin sampling (depth-ft) = 0.0 | Boring Inner Dia. (in) = 5.875

total unit wt. above 1st SPT (pcf) = 62

water elevation during SPT (ft) = 735.4 ft *(relative to ground surface during SPT)* | Assumed Rod Stickup = 5.0 feet

water depth during SPT (ft) = -4.4 | E_m Measurement? = 1 (1: Yes, 0: No)

water elevation during EQ (ft) = 737.4 ft *(relative to ground surface during SPT)* | SPT Sampler w/ Liners? = 0 (1: Yes, 0: No)

water during EQ (depth-ft) = -6.4 | u-top | effstr-top

vert. total stress above 1st SPT (tsf) = **0.14** | **0.14** | 0.00

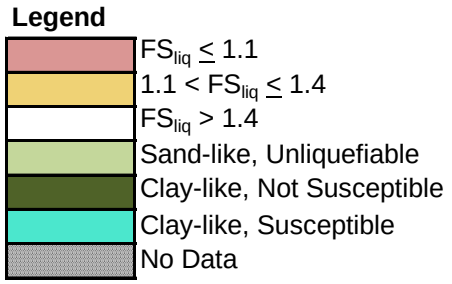
729.9	1.1	111	0.20	0.17	0.03	0	89.8	1.046	1.10	1.00	1.70	1.50	0	0	36	CL	52
727.7	3.3	111	0.32	0.24	0.08	2	89.8	1.046	1.10	1.00	1.70	1.50	3	6	50	CL	52
725.4	5.6	126	0.46	0.31	0.14	2	89.8	1.046	1.10	1.00	1.70	1.50	3	6	50	SM	42.1
722.9	8.1	126	0.61	0.39	0.22	6	89.8	1.046	1.19	1.00	1.70	1.50	11	19	73	SM	42.1
720.4	10.6	126	0.77	0.47	0.30	14	89.8	1.046	1.30	1.00	1.40	1.50	28	40	99	SM	40.4
717.9	13.1	126	0.93	0.55	0.38	2	89.8	1.046	1.10	1.00	1.70	1.50	3	6	50	SM	40.4
715.4	15.6	131	1.09	0.62	0.47	3	89.8	1.046	1.10	1.00	1.52	1.50	5	8	52	SM	22.1
712.9	18.1	131	1.25	0.70	0.55	4	89.8	1.046	1.10	1.00	1.38	1.50	7	9	56	SM	22.1
710.4	20.6	131	1.42	0.78	0.64	7	89.8	1.046	1.16	1.00	1.25	1.50	13	16	67	SM	22.1
707.9	23.1	138	1.59	0.86	0.73	45	89.8	1.046	1.30	1.00	1.10	1.50	92	101	100	SM	18.2
705.4	25.6	138	1.76	0.94	0.82	71	89.8	1.046	1.30	1.00	1.07	1.50	144	154	100	SM	18.2
702.9	28.1	138	1.93	1.01	0.92	74	89.8	1.046	1.30	1.00	1.04	1.50	151	156	100	SM	18.2

KIF TDEC Seismic Stability, Boring ID: KIF-B14
Liquefaction Potential Evaluations
For Coarse Grained Soils

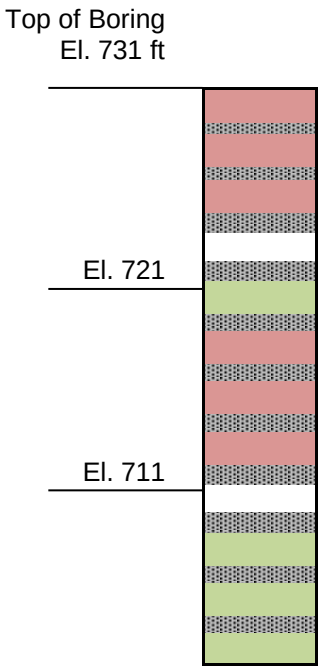
Depth of Mid. Pt. of Sample (ft.) z	Clean Sand Correction $\Delta(N_1)_{60cs}$	Equivalent Clean Sand N-Value $(N_1)_{60cs}$	Sample Screened for: Clay-like	High Blow Count $(N_1)_{60cs} \geq 32$	Unsaturated	Factor of Safety FS_{liq}	Material (optional)
ft							
ft *(relative to ground surface during SPT)*							
pcf							
tsf							

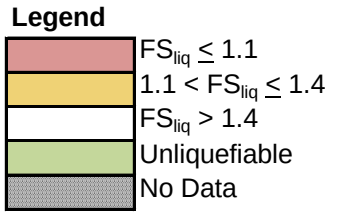
Note: A factor of safety shown as "N/A" implies that the soil type is not appropriately evaluated using this methodology. This applies to clay-like soils (typically CL, CH, CL-ML and MH material type), during samples with high blow counts, and unsaturated samples.

1.1	5.61	6	FALSE	FALSE	FALSE	**0.1**	**Sediment**
3.3	5.61	11	FALSE	FALSE	FALSE	**0.5**	**Sediment**
5.6	5.59	11	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**
8.1	5.59	25	FALSE	FALSE	FALSE	**3.0**	**Subunit 2**
10.6	5.58	45	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**
13.1	5.58	11	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**
15.6	4.78	13	FALSE	FALSE	FALSE	**0.8**	**Subunit 3**
18.1	4.78	14	FALSE	FALSE	FALSE	**1.0**	**Subunit 3**
20.6	4.78	21	FALSE	FALSE	FALSE	**1.9**	**Subunit 3**
23.1	4.13	105	FALSE	TRUE	FALSE	**N/A**	**Gravel Residuum**
25.6	4.13	159	FALSE	TRUE	FALSE	**N/A**	**Gravel Residuum**
28.1	4.13	161	FALSE	TRUE	FALSE	**N/A**	**Gravel Residuum**

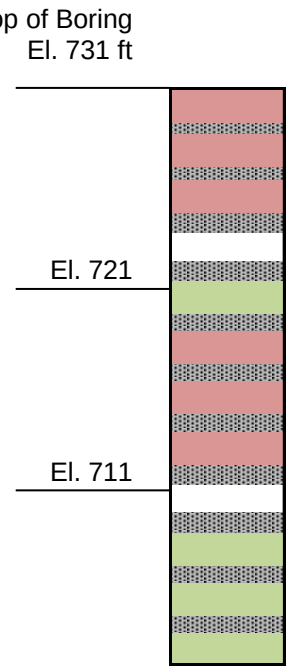


KIF-B14, Liquefaction Triggering Results

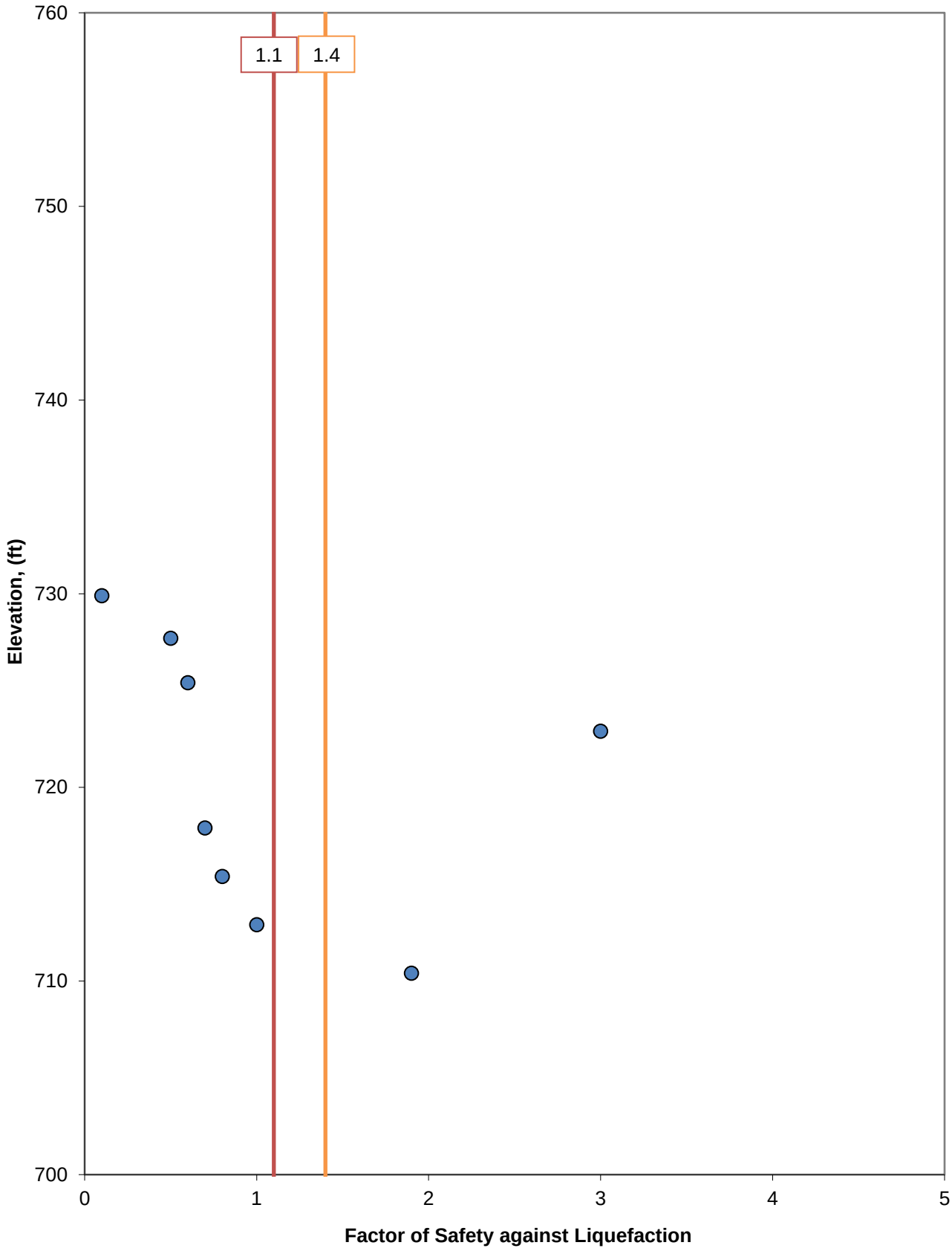




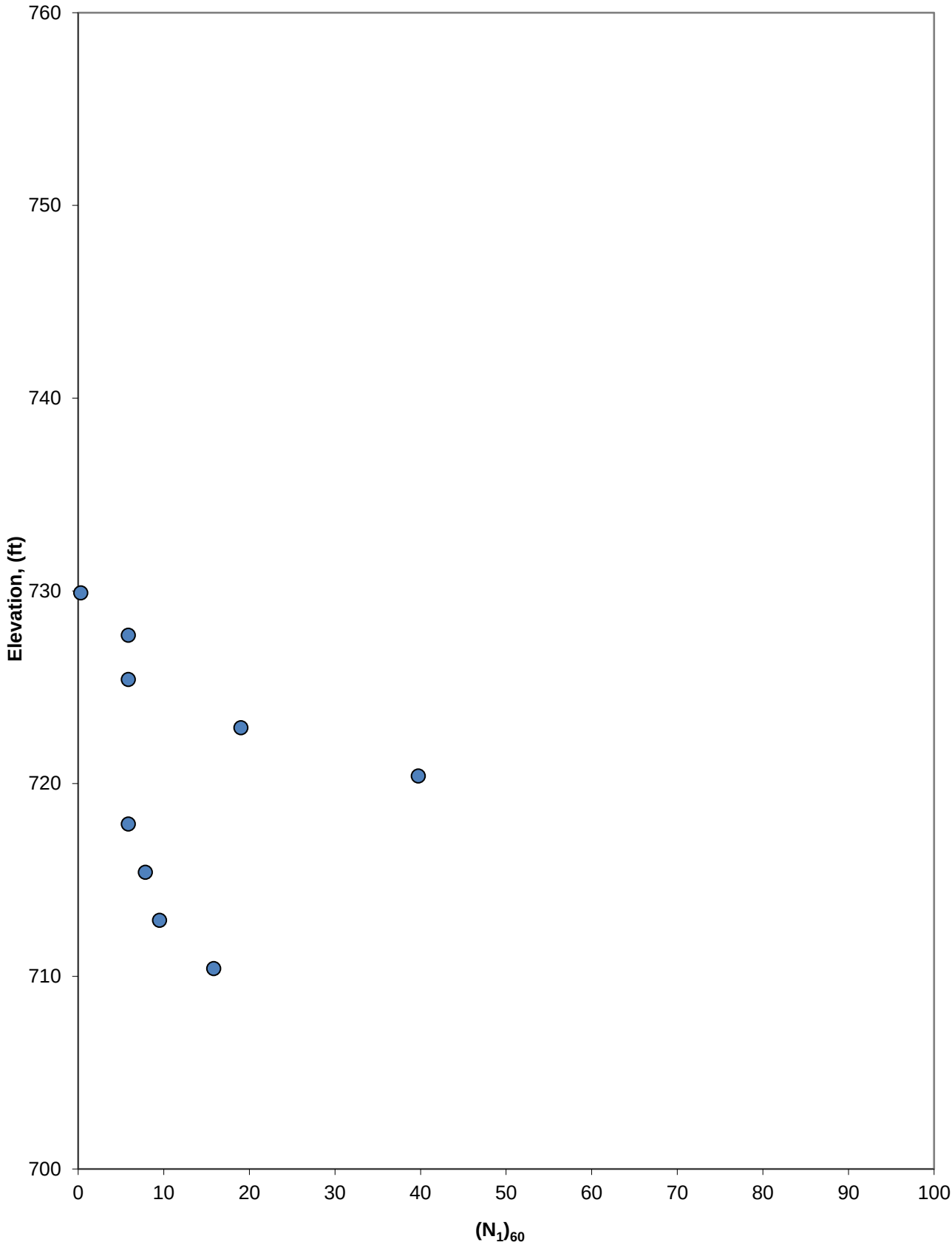
KIF-B14, Liquefaction Triggering Results



KIF TDEC Seismic Stability, Boring ID: KIF-B14, Source = 1 Hz, Mw = 7.6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



KIF TDEC Seismic Stability, Boring ID: KIF-B14, Source = 1 Hz, Mw = 7.6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



Project Name = KIF TDEC Seismic Stability
Boring ID = KIF-B15

Boring Location

Northing =
Easting =

OR

Baseline Station =
Offset (+ Right) =

Drilling Information

Boring Inner Diameter (ID) = 5.875 inches
Top of Hole Elevation 727.6 feet
Water Depth during SPT (negative for U/S borings)= -8.6 feet
Depth Sampling Began 0 feet
Total Unit Wt. above 1st SPT = 62.4 pcf
Assumed Rod Stickup = 5 feet *(Typ assume 5ft)*
E_m Measurement based on Fv method? = 1 (1: Yes, 0: No)
SPT Sampler w/ Liners? = 0 (1: Yes, 0: No) *(Typ. no)*

During EQ Information

Water Depth during EQ (relative to SPT TOH, negative for U/S borings) = -9.8 feet
Final Grade Elevation during EQ 727.6 feet
Average Total Unit Wt. of Cut/Fill pcf

Fines Content Correction

Fines content correction for samples with blow counts of zero? 1 (1: Yes, 0: No)

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile? 0 (1: Yes, 0: No)
If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile: olishingPond, KIF-B15_NOR
Alpha at each sample depth known? 1 (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (α vs. depth curve)
If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_α will be one.

m4:
m3:
m2:
m1:
m0:

Associated ground response profile: ishing_Pond, KIF-B15_NOR
Get CSR from shear stress envelope? 0 (1: Yes, 0: No)
If previous answer is No, then CSR will be calculated using a_{max} and r_d
Max. Shear Stress at each sample depth known? (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4:
m3:
m2:
m1:

Earthquake Information

EQ Source (e.g., New Madrid) 1 Hz
Event (e.g., MCE, 10KEQ, OBE) Design EQ
a_{max} (g) (top of ground surface) 0.12
EQ Mag (Mw) 7.6

Inputs

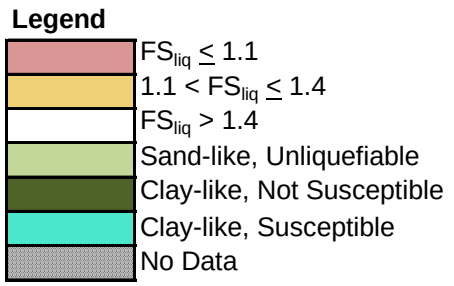
Depth of Sample Midpoint (ft.)	SPT N Value	Hammer Efficiency, E_m (%)	Unified Soil Classification	Fines Content (%)	Total Unit Weight (pcf)	Material (optional)	Clay-like / Sand-like Override (optional)	Clay-like Susceptibility (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure during SPT (psf)	Static Pore Water Pressure during EQ (psf)
1.5	0	89.8	CL	52	111	Sediment	Sand-like			0.074			
6.0	6	89.8	SM	32.9	126	Subunit 2	Sand-like			0.055			
8.5	7	89.8	SM	32.9	126	Subunit 2	Sand-like			0.056			
11.0	2	89.8	SM	32.9	126	Subunit 2	Sand-like			0.057			
13.5	2	89.8	SM	21.3	131	Subunit 3	Sand-like			0.059			
16.0	5	89.8	SM	13.3	131	Subunit 3	Sand-like			0.060			
18.5	48	89.8	SM	13.3	131	Subunit 3	Sand-like			0.062			

KIF TDEC Seismic Stability, Boring ID: KIF-B15

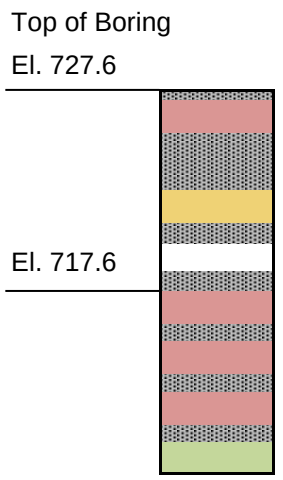
Liquefaction Potential Evaluations

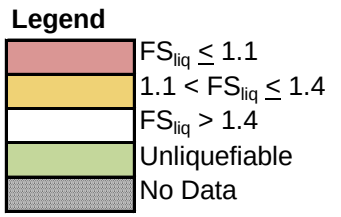
For Coarse Grained Soils

Elev. Of Mid. Pt. of Sample (ft)	Depth of Mid. Pt. of Sample (ft.)	Unit Weight (pcf)	Vert. Total Stress during SPT (tsf)	Static Pore Pressure during SPT (tsf)	Vert. Eff. Stress during SPT (tsf)	SPT N Value	Hammer Efficiency (%)	Borehole Diameter Correction	Sampler Correction	Rod Length Correction	Overburden Stress Correction Factor	Hammer Energy Correction Factor	Corrected Blow Count	Normalized Blow Count	Relative Density (%)	Unified Soil Classification	Fines Content (%)
	z	γ_T	σ_v	u	σ'_v	N	E_m	C_B	C_s	C_R	C_N	C_E	N_{60}	$(N_1)_{60}$	D_r		

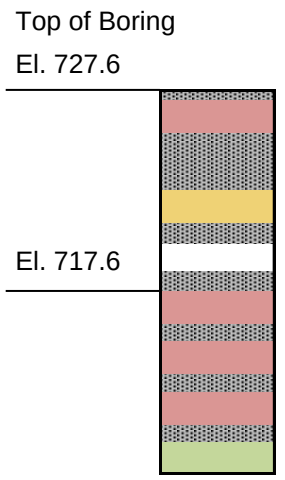


KIF-B15, Liquefaction Triggering Results





KIF-B15, Liquefaction Triggering Results



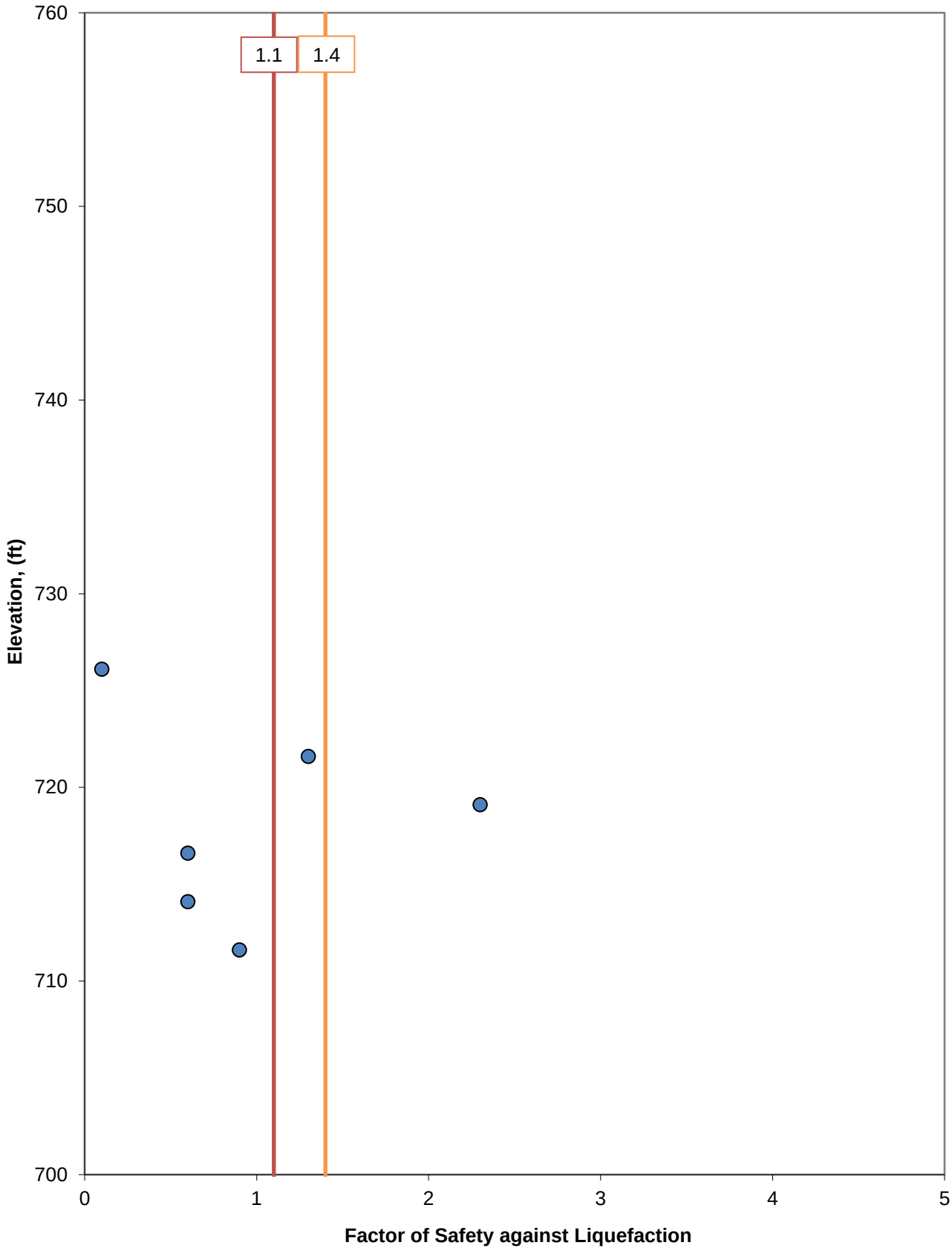
KIF TDEC Seismic Stability, Boring ID: KIF-B15
Liquefaction Potential Evaluations
For Coarse Grained Soils

Depth of Mid. Pt. of Sample (ft.) z	Clean Sand Correction $\Delta(N_1)_{60cs}$	Equivalent Clean Sand N-Value $(N_1)_{60cs}$	Sample Screened for: Clay-like	High Blow Count $(N_1)_{60cs} \geq 32$	Unsaturated	Factor of Safety FS_{liq}	Material (optional)
	ft						
	ft *(relative to ground surface during SPT)*						
	pcf						
	tsf						

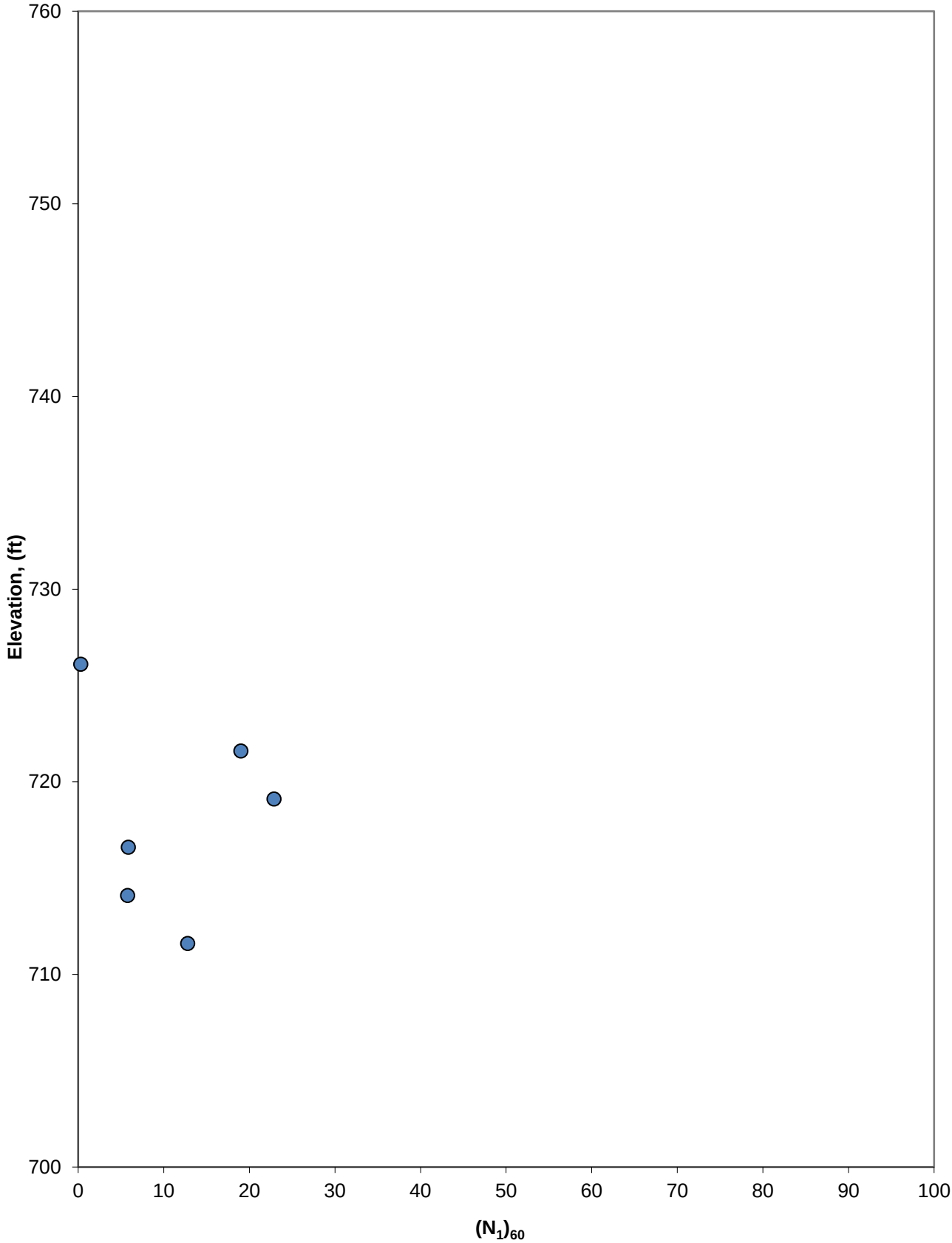
Note: A factor of safety shown as "N/A" implies that the soil type is not appropriately evaluated using this methodology. This applies to clay-like soils (typically CL, CH, CL-ML and MH material type), samples with high blow counts, and unsaturated samples.

1.5	5.61	6	FALSE	FALSE	FALSE	**0.1**	**Sediment**
6.0	5.46	24	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**
8.5	5.46	28	FALSE	FALSE	FALSE	**2.3**	**Subunit 2**
11.0	5.46	11	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**
13.5	4.68	10	FALSE	FALSE	FALSE	**0.6**	**Subunit 3**
16.0	2.63	15	FALSE	FALSE	FALSE	**0.9**	**Subunit 3**
18.5	2.63	117	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**

KIF TDEC Seismic Stability, Boring ID: KIF-B15, Source = 1 Hz, Mw = 7.6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



KIF TDEC Seismic Stability, Boring ID: KIF-B15, Source = 1 Hz, Mw = 7.6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



Project Name = KIF TDEC Seismic Stability
Boring ID = KIF-B16

Boring Location

Northing =
Easting =

OR

Baseline Station =
Offset (+ Right) =

Drilling Information

Boring Inner Diameter (ID) =	5.875	inches	
Top of Hole Elevation	726.5	feet	
Water Depth during SPT (negative for U/S borings)=	-9.1	feet	
Depth Sampling Began	0	feet	
Total Unit Wt. above 1st SPT =	62.4	pcf	
Assumed Rod Stickup =	5	feet	*(Typ assume 5ft)*
E_m Measurement based on Fv method? =	1	(1: Yes, 0: No)	
SPT Sampler w/ Liners? =	0	(1: Yes, 0: No)	*(Typ. no)*

During EQ Information

Water Depth during EQ (relative to SPT TOH, negative for U/S borings) =	-10.9	feet
Final Grade Elevation during EQ	726.5	feet
Average Total Unit Wt. of Cut/Fill		pcf

Fines Content Correction

Fines content correction for samples with blow counts of zero? 1 (1: Yes, 0: No)

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile? 0 (1: Yes, 0: No)
If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile: olishingPond, KIF-B16_NOR
Alpha at each sample depth known? 1 (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (α vs. depth curve)
If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_α will be one.

m4:
m3:
m2:
m1:
m0:

Associated ground response profile: ishing_Pond, KIF-B16_NOR
Get CSR from shear stress envelope? 0 (1: Yes, 0: No)
If previous answer is No, then CSR will be calculated using a_{max} and r_d
Max. Shear Stress at each sample depth known? (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4:
m3:
m2:
m1:

Earthquake Information

EQ Source (e.g., New Madrid)	1 Hz
Event (e.g., MCE, 10KEQ, OBE)	Design EQ
a_{max} (g) (top of ground surface)	0.12
EQ Mag (Mw)	7.6

Inputs

Depth of Sample Midpoint (ft.)	SPT N Value	Hammer Efficiency, E_m (%)	Unified Soil Classification	Fines Content (%)	Total Unit Weight (pcf)	Material (optional)	Clay-like / Sand-like Override (optional)	Clay-like Susceptibility (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure during SPT (psf)	Static Pore Water Pressure during EQ (psf)
1.0	0	89.8	CL	52	111	Sediment	Sand-like			0.093			
5.5	3	89.8	SM	39.8	126	Subunit 2				0.036			
8.0	7	89.8	SM	29.2	126	Subunit 2				0.034			
10.5	2	89.8	SM	29.3	131	Subunit 3				0.034			
13.0	4	89.8	SM	17.1	131	Subunit 3				0.041			
15.5	4	89.8	SM	17.1	131	Subunit 3				0.036			

KIF TDEC Seismic Stability, Boring ID: KIF-B16

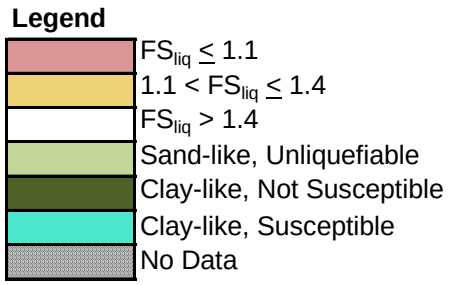
Liquefaction Potential Evaluations

For Coarse Grained Soils

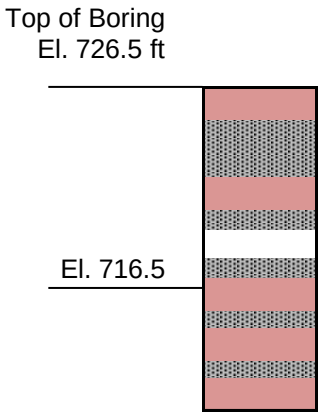
Elev. Of Mid. Pt. of Sample (ft)	Depth of Mid. Pt. of Sample (ft.)	Unit Weight (pcf)	Vert. Total Stress during SPT (tsf)	Static Pore Pressure during SPT (tsf)	Vert. Eff. Stress during SPT (tsf)	SPT N Value	Hammer Efficiency (%)	Borehole Diameter Correction	Sampler Correction	Rod Length Correction	Overburden Stress Correction Factor	Hammer Energy Correction Factor	Corrected Blow Count	Normalized Blow Count	Relative Density (%)	Unified Soil Classification	Fines Content (%)
	z	γ_T	σ_v	u	σ'_v	N	E_m	C_B	C_s	C_R	C_N	C_E	N_{60}	$(N_1)_{60}$	D_r		
		Top of Hole Elevation (ft)	726.5				Boring ID =	**KIF-B16**									
		begin sampling (depth-ft)	0.0				Boring Inner Dia. (in) =	5.875									
		total unit wt. above 1st SPT (pcf) =	62														
		water elevation during SPT (ft) =	735.6	ft *(relative to ground surface during SPT)*					Assumed Rod Stickup =	5.0	feet						
		water depth during SPT (ft) =	-9.1						E_m Measurement? =	1	(1: Yes, 0: No)						
		water elevation during EQ (ft) =	737.4	ft *(relative to ground surface during SPT)*					SPT Sampler w/ Liners? =	0	(1: Yes, 0: No)						
		water during EQ (depth-ft) =	-10.9	u-top	effstr-top												
		vert. total stress above 1st SPT (tsf) =	**0.28**	**0.28**	0.00												
725.5	1.0	111	0.34	0.32	0.02	0	89.8	1.046	1.10	1.00	1.70	1.50	0	0	36	CL	52
721.0	5.5	126	0.61	0.46	0.15	3	89.8	1.046	1.10	1.00	1.70	1.50	5	9	56	SM	39.8
718.5	8.0	126	0.76	0.53	0.23	7	89.8	1.046	1.23	1.00	1.70	1.50	13	23	78	SM	29.2
716.0	10.5	131	0.92	0.61	0.31	2	89.8	1.046	1.10	1.00	1.70	1.50	3	6	49	SM	29.3
713.5	13.0	131	1.09	0.69	0.40	4	89.8	1.046	1.11	1.00	1.61	1.50	7	11	57	SM	17.1
711.0	15.5	131	1.25	0.77	0.48	4	89.8	1.046	1.10	1.00	1.47	1.50	7	10	55	SM	17.1

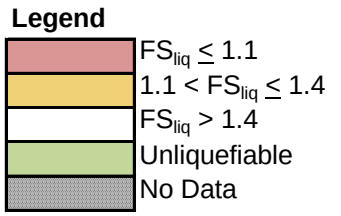
KIF TDEC Seismic Stability, Boring ID: KIF-B16
Liquefaction Potential Evaluations
For Coarse Grained Soils

Depth of Mid. Pt. of Sample (ft.) z	Clean Sand Correction $\Delta(N_1)_{60cs}$	Equivalent Clean Sand N-Value $(N_1)_{60cs}$	Sample Screened for: Clay-like	High Blow Count $(N_1)_{60cs} \geq 32$	Unsaturated	Factor of Safety FS_{liq}	Material (optional)
			Note: A factor of safety shown as "N/A" implies that the soil type is not appropriately evaluated using this methodology. This applies to clay-like soils (typically CL, CH, CL-ML and MH material type), samples with high blow counts, and unsaturated samples.				
ft							
ft *(relative to ground surface during SPT)*							
pcf							
tsf							
1.0	5.61	6	FALSE	FALSE	FALSE	**0.1**	**Sediment**
5.5	5.57	14	FALSE	FALSE	FALSE	**0.5**	**Subunit 2**
8.0	5.33	28	FALSE	FALSE	FALSE	**1.8**	**Subunit 2**
10.5	5.33	11	FALSE	FALSE	FALSE	**0.6**	**Subunit 3**
13.0	3.88	15	FALSE	FALSE	FALSE	**0.8**	**Subunit 3**
15.5	3.88	14	FALSE	FALSE	FALSE	**0.8**	**Subunit 3**

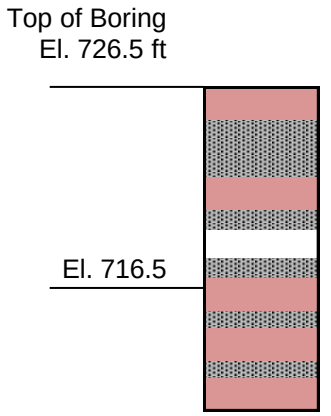


KIF-B16, Liquefaction Triggering Results

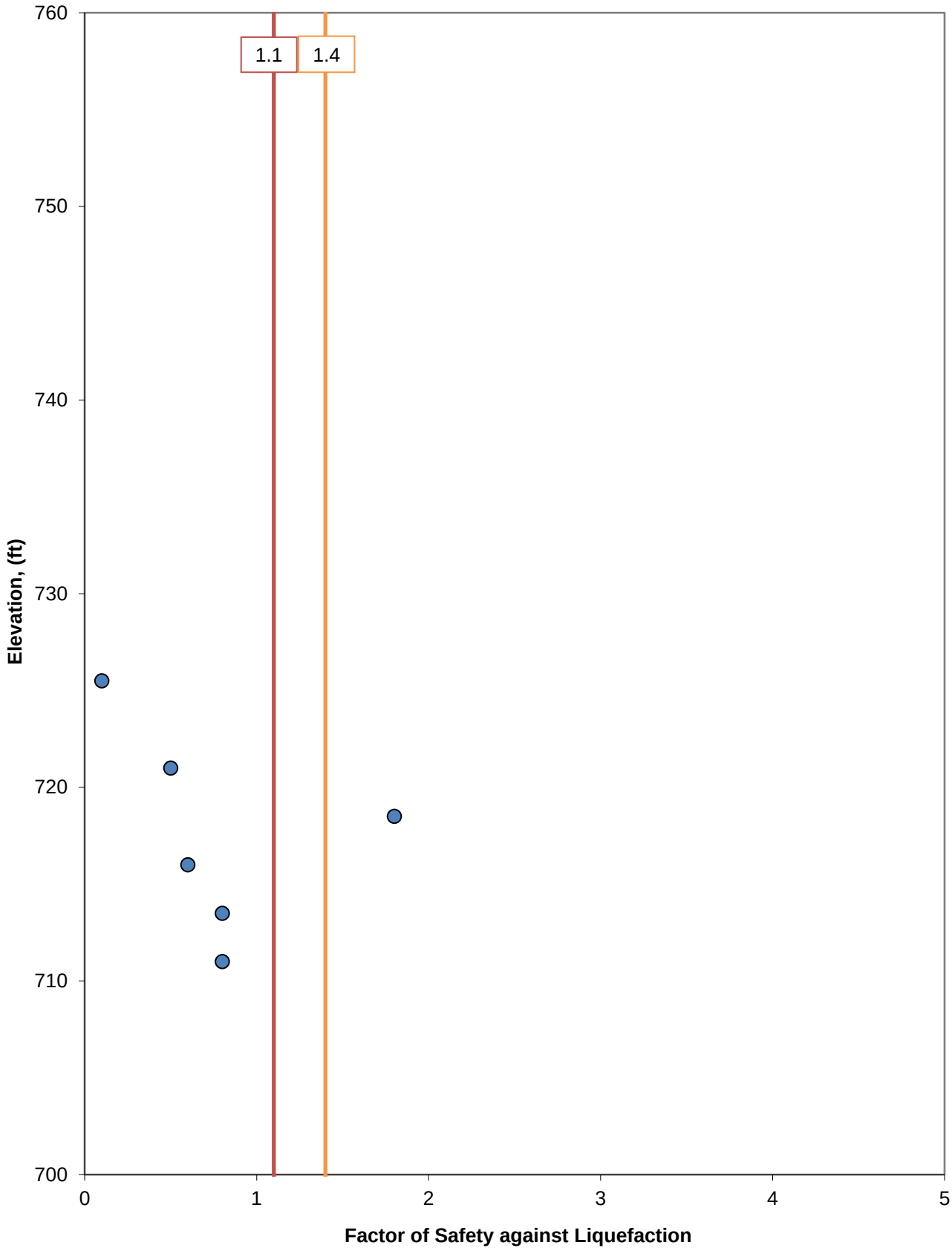




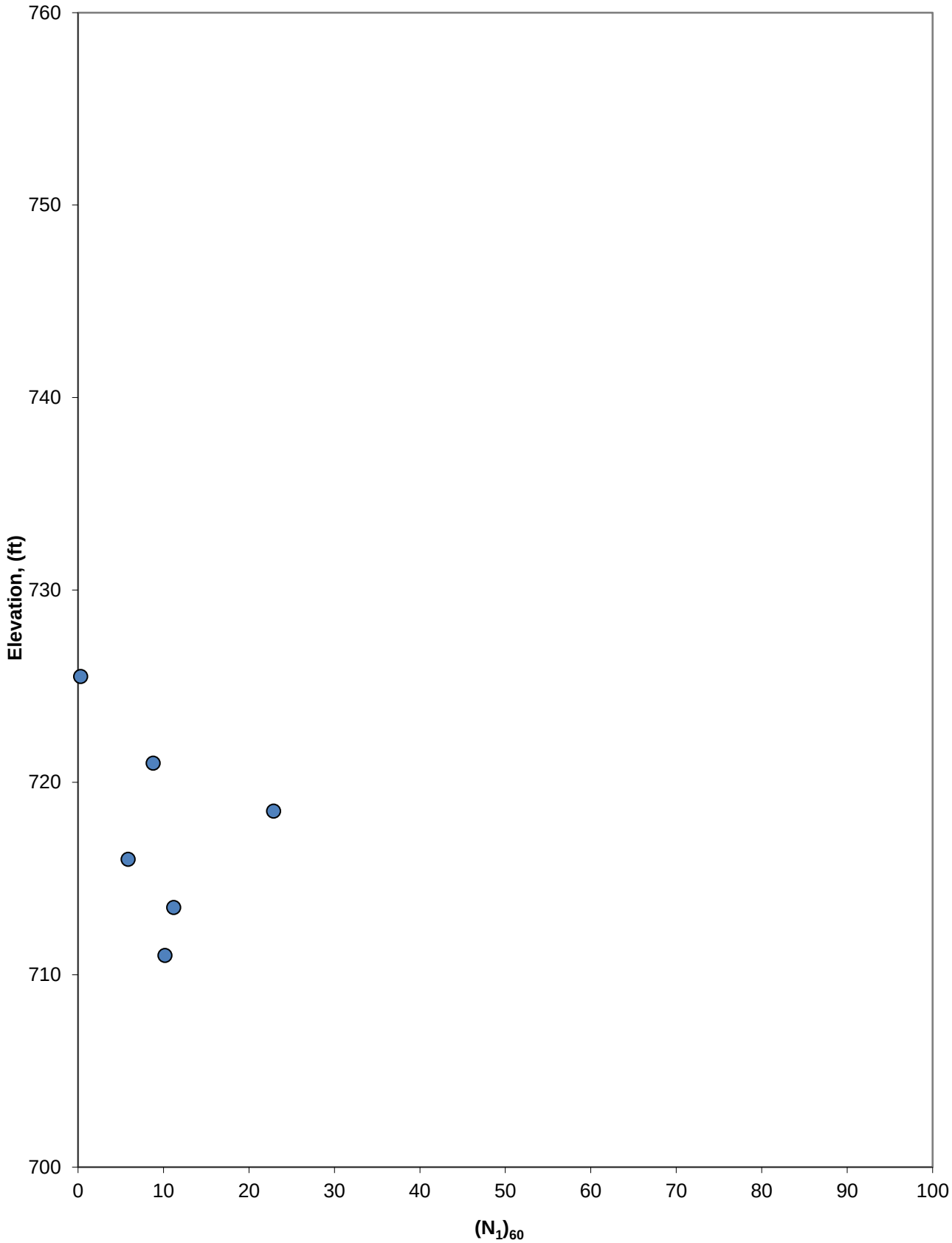
KIF-B16, Liquefaction Triggering Results



KIF TDEC Seismic Stability, Boring ID: KIF-B16, Source = 1 Hz, Mw = 7.6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



KIF TDEC Seismic Stability, Boring ID: KIF-B16, Source = 1 Hz, Mw = 7.6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



Project Name = KIF TDEC Stability
Boring ID = KIF-A1

Boring Location

Northing = 553306.7
Easting = 2439676.7

OR

Baseline Station =
Offset (+ Right) =

Drilling Information

Boring Inner Diameter (ID) = 3.25 inches
Top of Hole Elevation 757 feet
Water Depth during SPT (negative for U/S borings)= 15.5 feet
Depth Sampling Began 0 feet
Total Unit Wt. above 1st SPT = 120 pcf
Assumed Rod Stickup = 5 feet *(Typ assume 5ft)*
E_m Measurement based on Fv method? = 1 (1: Yes, 0: No)
SPT Sampler w/ Liners? = 0 (1: Yes, 0: No) *(Typ. no)*

During EQ Information

Water Depth during EQ (relative to SPT TOH, negative for U/S borings) = 11.7 feet
Final Grade Elevation during EQ 762.7 feet
Average Total Unit Wt. of Cut/Fill 121 pcf

Fines Content Correction

Fines content correction for samples with blow counts of zero? 1 (1: Yes, 0: No)

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile? 0 (1: Yes, 0: No)
If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile: Section_AA, KIF-A1_NOR
Alpha at each sample depth known? 1 (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (α vs. depth curve)
If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_α will be one.

m4:
m3:
m2:
m1:
m0:

Associated ground response profile: Section_AA, KIF-A1_NOR
Get CSR from shear stress envelope? 0 (1: Yes, 0: No)
If previous answer is No, then CSR will be calculated using a_{max} and r_d
Max. Shear Stress at each sample depth known? (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4:
m3:
m2:
m1:

Earthquake Information

EQ Source (e.g., New Madrid) 1 Hz
Event (e.g., MCE, 10KEQ, OBE) Design EQ
a_{max} (g) (top of ground surface) 0.10
EQ Mag (Mw) 7.6

Inputs

Depth of Sample Midpoint (ft.)	SPT N Value	Hammer Efficiency, E_m (%)	Unified Soil Classification	Fines Content (%)	Total Unit Weight (pcf)	Material (optional)	Clay-like / Sand-like Override (optional)	Clay-like Susceptibility (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure during SPT (psf)	Static Pore Water Pressure during EQ (psf)
1.0	5	80	CL	50	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.042			
2.5	5	80	CL	50	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.047			
4.0	20	80	SM	16	119	Bottom Ash	Sand-like			0.052			
5.5	11	80	SM	16	119	Bottom Ash	Sand-like			0.056			
7.0	7	80	SM	16	119	Bottom Ash	Sand-like			0.058			
8.5	30	80	SM	16	119	Bottom Ash	Sand-like			0.060			
10.0	30	80	SM	16	119	Bottom Ash	Sand-like			0.062			
11.5	24	80	SM	16	119	Bottom Ash	Sand-like			0.064			
13.0	20	80	SM	16	119	Bottom Ash	Sand-like			0.070			
14.5	20	80	SM	16	119	Bottom Ash	Sand-like			0.068			
16.0	8	80	SM	16	119	Bottom Ash	Sand-like			0.066			
28.0	9	80	ML	97	112	Fly Ash	Sand-like		Do Not Correct for FC	0.072			
29.5	0	80	ML	97	112	Fly Ash	Sand-like		Do Not Correct for FC	0.074			
31.0	0	80	ML	97	112	Fly Ash	Sand-like		Do Not Correct for FC	0.073			
32.5	0	80	CL	85	127	Subunit 1	Clay-like	Not Susceptible		0.072			
36.0	2	80	CL	85	127	Subunit 1	Clay-like	Not Susceptible		0.071			
37.5	15	80	CL	85	127	Subunit 1	Clay-like	Not Susceptible		0.071			
39.0	12	80	CL	85	127	Subunit 1	Clay-like	Not Susceptible		0.071			
40.5	8	80	CL	85	127	Subunit 1	Clay-like	Not Susceptible		0.070			
42.0	7	80	SM	42	126	Subunit 2	Sand-like			0.070			
43.5	7	80	SM	42	126	Subunit 2	Sand-like			0.069			
45.0	11	80	SM	42	126	Subunit 2	Sand-like			0.069			
46.5	0	80	SM	42	126	Subunit 2	Sand-like			0.068			
48.0	0	80	SM	42	126	Subunit 2	Sand-like			0.068			
50.5	2	80	SM	42	126	Subunit 2	Sand-like			0.067			
52.0	20	80	SM	42	126	Subunit 2	Sand-like			0.067			
53.5	79	80	SM	30	131	Subunit 3	Sand-like			0.069			

KIF TDEC Stability, Boring ID: KIF-A1
Liquefaction Potential Evaluations
For Coarse Grained Soils

Elev. Of Mid. Pt. of Sample (ft)	Depth of Mid. Pt. of Sample (ft.) z	Unit Weight (pcf) γ_T	Vert. Total Stress during SPT (tsf) σ_v	Static Pore Pressure during SPT (tsf) u	Vert. Eff. Stress during SPT (tsf) σ'_v	SPT N Value N	Hammer Efficiency (%) E_m	Borehole Diameter Correction C_B	Sampler Correction C_S	Rod Length Correction C_R	Overburden Stress Correction Factor C_N	Hammer Energy Correction Factor C_E	Corrected Blow Count N_{60}	Normalized Blow Count $(N_1)_{60}$	Relative Density (%) D_r	Unified Soil Classification	Fines Content (%)	Relative State Parameter Index ξ_R	Static Shear Stress Ratio α

Top of Hole Elevation (ft) = 757.0 | Boring ID = KIF-A1
begin sampling (depth-ft) = 0.0 | Boring Inner Dia. (in) = 3.25
total unit wt. above 1st SPT (pcf) = 120
water elevation during SPT (ft) = 741.5 ft *(relative to ground surface during SPT)* | Assumed Rod Stickup = 5.0 feet
water depth during SPT (ft) = 15.5 | E_m Measurement? = 1 (1: Yes, 0: No)
water elevation during EQ (ft) = 745.3 ft *(relative to ground surface during SPT)* | SPT Sampler w/ Liners? = 0 (1: Yes, 0: No)
water during EQ (depth-ft) = 11.7 u-top effstr-top
vert. total stress above 1st SPT (tsf) = **0.00** **0.00** 0.00

756.0	1.0	120	0.06	0.00	0.06	5	80.0	1.000	1.13	1.00	1.70	1.33	8	13	63	CL	50	-0.48	0.042
754.5	2.5	120	0.15	0.00	0.15	5	80.0	1.000	1.13	1.00	1.70	1.33	8	13	63	CL	50	-0.48	0.047
753.0	4.0	119	0.24	0.00	0.24	20	80.0	1.000	1.30	1.00	1.48	1.33	35	51	100	SM	16	-0.60	0.052
751.5	5.5	119	0.33	0.00	0.33	11	80.0	1.000	1.28	1.00	1.51	1.33	19	28	83	SM	16	-0.60	0.056
750.0	7.0	119	0.42	0.00	0.42	7	80.0	1.000	1.16	1.00	1.51	1.33	11	16	66	SM	16	-0.50	0.058
748.5	8.5	119	0.51	0.00	0.51	30	80.0	1.000	1.30	1.00	1.21	1.33	52	63	100	SM	16	-0.60	0.060
747.0	10.0	119	0.60	0.00	0.60	30	80.0	1.000	1.30	1.00	1.16	1.33	52	60	100	SM	16	-0.60	0.062
745.5	11.5	119	0.69	0.00	0.69	24	80.0	1.000	1.30	1.00	1.12	1.33	42	47	100	SM	16	-0.60	0.064
744.0	13.0	119	0.78	0.00	0.78	20	80.0	1.000	1.30	1.00	1.09	1.33	35	38	95	SM	16	-0.60	0.070
742.5	14.5	119	0.86	0.00	0.86	20	80.0	1.000	1.30	1.00	1.06	1.33	35	37	94	SM	16	-0.60	0.068
741.0	16.0	119	0.95	0.02	0.94	8	80.0	1.000	1.13	1.00	1.06	1.33	12	13	60	SM	16	-0.42	0.066
729.0	28.0	112	1.65	0.39	1.26	9	80.0	1.000	1.12	1.00	0.92	1.33	13	12	52	ML	97	-0.33	0.072
727.5	29.5	112	1.73	0.44	1.29	0	80.0	1.000	1.10	1.00	0.86	1.33	0	0	5	ML	97	0.10	0.074
726.0	31.0	112	1.81	0.48	1.33	0	80.0	1.000	1.10	1.00	0.84	1.33	0	0	5	ML	97	0.10	0.073
724.5	32.5	127	1.90	0.53	1.37	0	80.0	1.000	1.10	1.00	0.85	1.33	0	0	35	CL	85	-0.16	0.072
721.0	36.0	127	2.13	0.64	1.49	2	80.0	1.000	1.10	1.00	0.82	1.33	3	2	42	CL	85	-0.23	0.071
719.5	37.5	127	2.22	0.69	1.54	15	80.0	1.000	1.21	1.00	0.87	1.33	24	21	76	CL	85	-0.57	0.071
718.0	39.0	127	2.32	0.73	1.58	12	80.0	1.000	1.16	1.00	0.84	1.33	18	16	68	CL	85	-0.49	0.071
716.5	40.5	127	2.41	0.78	1.63	8	80.0	1.000	1.10	1.00	0.81	1.33	12	10	57	CL	85	-0.38	0.070
715.0	42.0	126	2.51	0.83	1.68	7	80.0	1.000	1.10	1.00	0.79	1.33	10	8	55	SM	42	-0.35	0.070
713.5	43.5	126	2.60	0.87	1.73	7	80.0	1.000	1.10	1.00	0.78	1.33	10	8	54	SM	42	-0.35	0.069
712.0	45.0	126	2.70	0.92	1.78	11	80.0	1.000	1.13	1.00	0.79	1.33	17	13	64	SM	42	-0.44	0.069
710.5	46.5	126	2.79	0.97	1.82	0	80.0	1.000	1.10	1.00	0.72	1.33	0	0	35	SM	42	-0.16	0.068
709.0	48.0	126	2.89	1.01	1.87	0	80.0	1.000	1.10	1.00	0.71	1.33	0	0	35	SM	42	-0.16	0.068
706.5	50.5	126	3.04	1.09	1.95	2	80.0	1.000	1.10	1.00	0.70	1.33	3	2	41	SM	42	-0.21	0.067
705.0	52.0	126	3.14	1.14	2.00	20	80.0	1.000	1.27	1.00	0.80	1.33	34	27	85	SM	42	-0.60	0.067
703.5	53.5	131	3.23	1.19	2.05	79	80.0	1.000	1.30	1.00	0.84	1.33	137	115	100	SM	30	-0.60	0.069

KIF TDEC Stability, Boring ID: KIF-A1
Liquefaction Potential Evaluations
For Coarse Grained Soils

EQ Source	a max (g)	EQ Mag (Mw)	Event
1 Hz	0.10	7.6	Design EQ

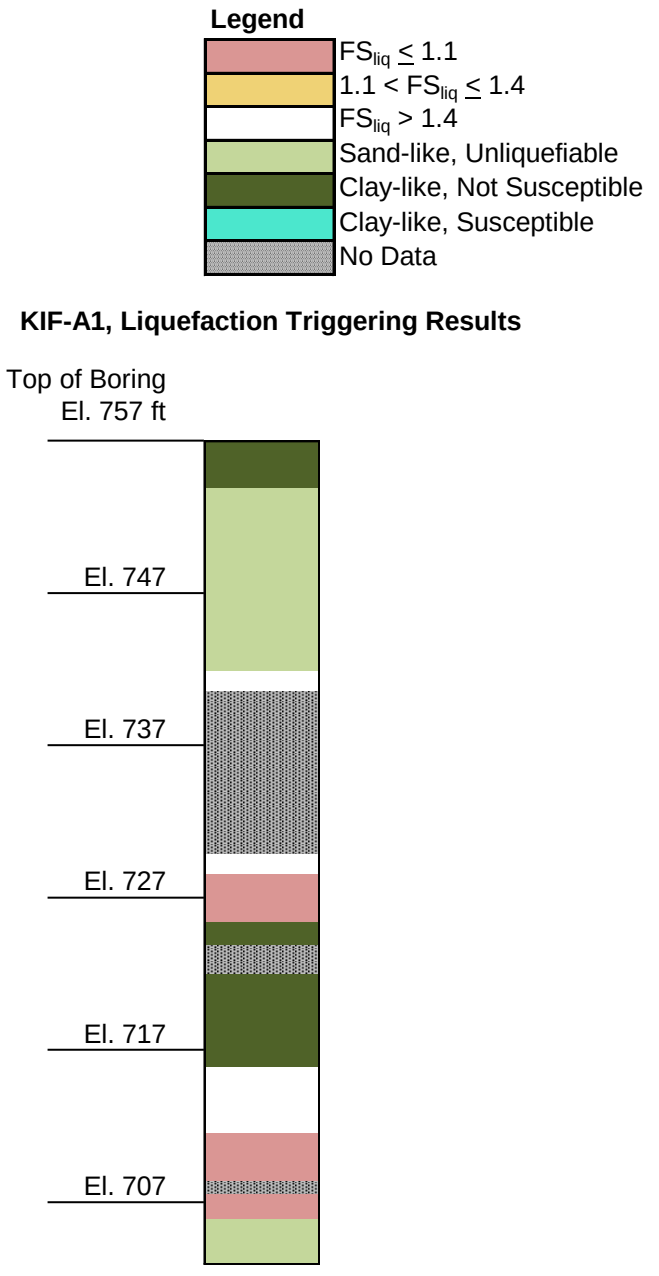
Shear Stress Curve Fit Parameters
m4: 0
m3: 0
m2: 0
m1: 0

Boring ID: **KIF-A1**
Top of Fill Elevation: 762.7 ft
Fill Height: 5.7 ft *(relative to ground surface during SPT)*
Fill Total Unit Weight: 121 pcf
Fill Total Stress: 0.34 tsf

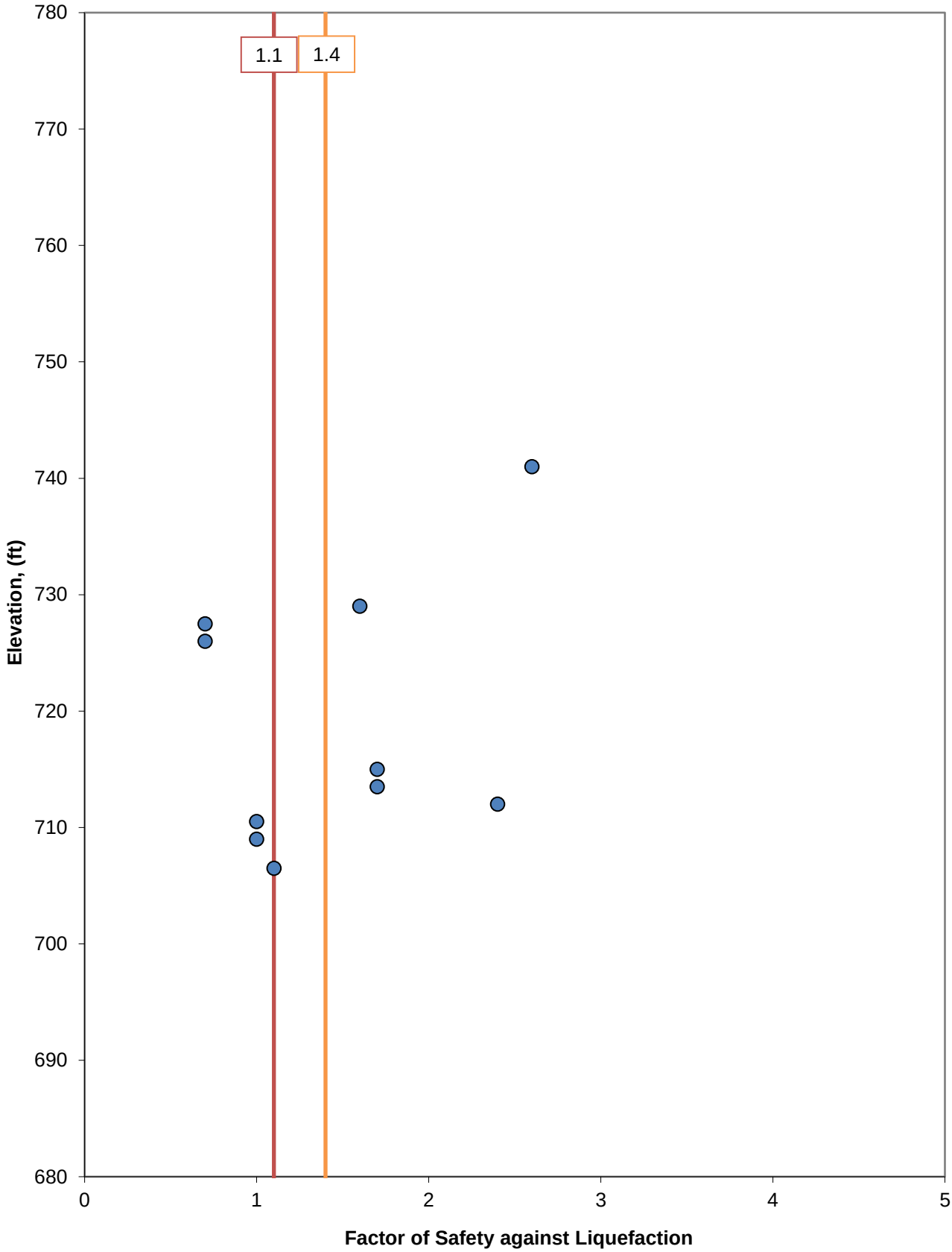
totstr-top **0.34** | u-top 0.00 | effstr-top 0.34

Note: A factor of safety shown as "N/A" implies that the soil type is not appropriately evaluated using this methodology. This applies to clay-like soils (typically CL, CH, CL-ML and MH material type), samples with high blow counts, and unsaturated samples.

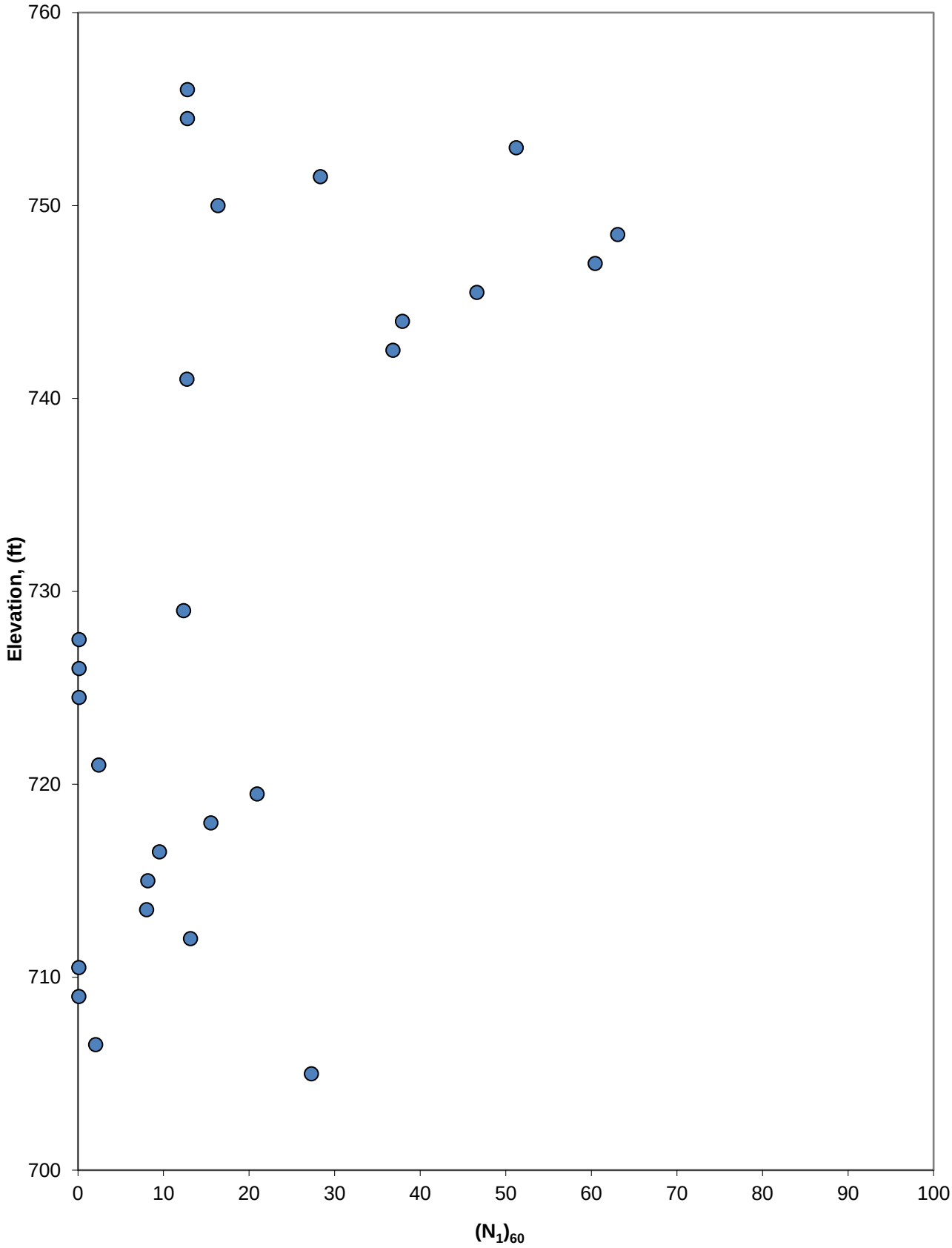
Depth of Mid. Pt. of Sample (ft.) z	Vert. Total Stress during EQ w/ Fill (tsf) $\sigma_{v\ with\ fill}$	Static Pore Pressure during EQ (tsf) u	Vert. Eff. Stress during EQ w/ Fill (tsf) $\sigma'_{v\ with\ fill}$	Clean Sand Correction $\Delta(N_1)_{60cs}$	Equivalent Clean Sand N-Value $(N_1)_{60cs}$	Cyclic Resistance Ratio CRR7.5	Overburden Correction Factor K_σ	Static Shear Stress Correction K_α	Mag. Scaling Factor (MSF)	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Max. Induced Shear Stress (psf)	From Ground Response: Avg. Cyclic Shear Stress (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Blow Count $(N_1)_{60cs} \geq 32$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)
1.0	0.40	0.00	0.40	5.61	18	N/A	N/A	N/A	0.99	N/A	0.992	0	0	0.063	TRUE	FALSE	TRUE	N/A	**Clay Fill (irrelevant)**
2.5	0.49	0.00	0.49	5.61	18	N/A	N/A	N/A	0.99	N/A	0.988	0	0	0.063	TRUE	FALSE	TRUE	N/A	**Clay Fill (irrelevant)**
4.0	0.58	0.00	0.58	3.58	55	N/A	N/A	N/A	N/A	N/A	0.984	0	0	0.063	FALSE	TRUE	TRUE	N/A	**Bottom Ash**
5.5	0.67	0.00	0.67	3.58	32	N/A	N/A	N/A	N/A	N/A	0.980	0	0	0.063	FALSE	TRUE	TRUE	N/A	**Bottom Ash**
7.0	0.76	0.00	0.76	3.58	20	0.205	1.044	1.141	0.98	0.240	0.975	0	0	0.062	FALSE	FALSE	TRUE	N/A	**Bottom Ash**
8.5	0.85	0.00	0.85	3.58	67	N/A	N/A	N/A	N/A	N/A	0.971	0	0	0.062	FALSE	TRUE	TRUE	N/A	**Bottom Ash**
10.0	0.94	0.00	0.94	3.58	64	N/A	N/A	N/A	N/A	N/A	0.966	0	0	0.062	FALSE	TRUE	TRUE	N/A	**Bottom Ash**
11.5	1.03	0.00	1.03	3.58	50	N/A	N/A	N/A	N/A	N/A	0.961	0	0	0.061	FALSE	TRUE	TRUE	N/A	**Bottom Ash**
13.0	1.12	0.04	1.08	3.58	42	N/A	N/A	N/A	N/A	N/A	0.956	0	0	0.063	FALSE	TRUE	FALSE	N/A	**Bottom Ash**
14.5	1.21	0.09	1.12	3.58	40	N/A	N/A	N/A	N/A	N/A	0.951	0	0	0.066	FALSE	TRUE	FALSE	N/A	**Bottom Ash**
16.0	1.30	0.13	1.16	3.58	16	0.167	0.989	1.053	0.99	0.172	0.946	0	0	0.067	FALSE	FALSE	FALSE	2.6	**Bottom Ash**
28.0	1.99	0.51	1.48	0.00	12	0.135	0.966	0.978	0.99	0.126	0.899	0	0	0.077	FALSE	FALSE	FALSE	1.6	**Fly Ash**
29.5	2.08	0.56	1.52	0.00	0	0.061	0.980	0.873	1.00	0.052	0.893	0	0	0.078	FALSE	FALSE	FALSE	0.7	**Fly Ash**
31.0	2.16	0.60	1.56	0.00	0	0.061	0.979	0.875	1.00	0.052	0.887	0	0	0.079	FALSE	FALSE	FALSE	0.7	**Fly Ash**
32.5	2.25	0.65	1.60	5.53	6	N/A	N/A	N/A	1.00	N/A	0.881	0	0	0.079	TRUE	FALSE	FALSE	N/A	**Subunit 1**
36.0	2.47	0.76	1.71	5.53	8	N/A	N/A	N/A	0.99	N/A	0.866	0	0	0.080	TRUE	FALSE	FALSE	N/A	**Subunit 1**
37.5	2.57	0.80	1.76	5.53	26	N/A	N/A	N/A	0.97	N/A	0.859	0	0	0.080	TRUE	FALSE	FALSE	N/A	**Subunit 1**
39.0	2.66	0.85	1.81	5.53	21	N/A	N/A	N/A	0.98	N/A	0.853	0	0	0.080	TRUE	FALSE	FALSE	N/A	**Subunit 1**
40.5	2.76	0.90	1.86	5.53	15	N/A	N/A	N/A	0.99	N/A	0.846	0	0	0.080	TRUE	FALSE	FALSE	N/A	**Subunit 1**
42.0	2.85	0.95	1.91	5.59	14	0.146	0.938	0.992	0.99	0.134	0.840	0	0	0.080	FALSE	FALSE	FALSE	1.7	**Subunit 2**
43.5	2.95	0.99	1.95	5.59	14	0.145	0.935	0.989	0.99	0.133	0.833	0	0	0.080	FALSE	FALSE	FALSE	1.7	**Subunit 2**
45.0	3.04	1.04	2.00	5.59	19	0.191	0.919	1.089	0.99	0.189	0.827	0	0	0.080	FALSE	FALSE	FALSE	2.4	**Subunit 2**
46.5	3.14	1.09	2.05	5.59	6	0.090	0.948	0.906	1.00	0.077	0.820	0	0	0.080	FALSE	FALSE	FALSE	1.0	**Subunit 2**
48.0	3.23	1.13	2.10	5.59	6	0.090	0.947	0.907	1.00	0.077	0.814	0	0	0.080	FALSE	FALSE	FALSE	1.0	**Subunit 2**
50.5	3.39	1.21	2.18	5.59	8	0.102	0.939	0.921	1.00	0.088	0.803	0	0	0.080	FALSE	FALSE	FALSE	1.1	**Subunit 2**
52.0	3.48	1.26	2.22	5.59	33	N/A	N/A	N/A	N/A	N/A	0.796	0	0	0.080	FALSE	TRUE	FALSE	N/A	**Subunit 2**
53.5	3.58	1.30	2.27	5.36	120	N/A	N/A	N/A	N/A	N/A	0.790	0	0	0.079	FALSE	TRUE	FALSE	N/A	**Subunit 3**


Legend
FS$_{liq}$ ≤ 1.1
1.1 < FS$_{liq}$ ≤ 1.4
FS$_{liq}$ > 1.4
Sand-like, Unliquefiable
Clay-like, Not Susceptible
Clay-like, Susceptible
No Data
KIF-A1, Liquefaction Triggering Results
Top of Boring
El. 757 ft
El. 747
El. 737
El. 727
El. 717
El. 707

KIF TDEC Stability, Boring ID: KIF-A1, Source = 1 Hz, Mw = 7.6, Event = Design EQ,
SPT Data, Simplified Stress-Based Approach



KIF TDEC Stability, Boring ID: KIF-A1, Source = 1 Hz, Mw = 7.6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



Project Name = KIF TDEC Stability

Boring ID = KIF-A2

Boring Location

Northing =

Easting =

OR

Baseline Station =

Offset (+ Right) =

Drilling Information

Boring Inner Diameter (ID) =	3.25	inches	
Top of Hole Elevation	755	feet	
Water Depth during SPT (negative for U/S borings)=	13	feet	
Depth Sampling Began	0	feet	
Total Unit Wt. above 1st SPT =	120	pcf	
Assumed Rod Stickup =	5	feet	*(Typ assume 5ft)*
E_m Measurement based on Fv method? =	1	(1: Yes, 0: No)	
SPT Sampler w/ Liners? =	0	(1: Yes, 0: No)	*(Typ. no)*

During EQ Information

Water Depth during EQ (relative to SPT TOH, negative for U/S borings) =	5.9	feet
Final Grade Elevation during EQ	755.3	feet
Average Total Unit Wt. of Cut/Fill	120	pcf

Fines Content Correction

Fines content correction for samples with blow counts of zero? 1 (1: Yes, 0: No)

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile? 0 (1: Yes, 0: No)

If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile: SectionAA, KIF-A2_NOR

Alpha at each sample depth known? 1 (1: Yes, 0: No)

If previous answer is No, then enter curve fit parameters below (α vs. depth curve)

If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_α will be one.

m4: m3: m2: m1: m0:

Associated ground response profile: Section_AA, KIF-A2_NOR

Get CSR from shear stress envelope? 0 (1: Yes, 0: No)

If previous answer is No, then CSR will be calculated using a_{max} and r_d

Max. Shear Stress at each sample depth known? (1: Yes, 0: No)

If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4: m3: m2: m1:

Earthquake Information

EQ Source (e.g., New Madrid)	1 Hz
Event (e.g., MCE, 10KEQ, OBE)	Design EQ
a_{max} (g) (top of ground surface)	0.10
EQ Mag (Mw)	7.6

Inputs

Depth of Sample Midpoint (ft.)	SPT N Value	Hammer Efficiency, E_m (%)	Unified Soil Classification	Fines Content (%)	Total Unit Weight (pcf)	Material (optional)	Clay-like / Sand-like Override (optional)	Clay-like Susceptibility (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure during SPT (psf)	Static Pore Water Pressure during EQ (psf)
1.0	28	80	CL	60	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.018			
2.5	20	80	SM	38	119	Bottom Ash	Sand-like			0.038			
4.0	10	80	MH	68	128	Embankment Fill	Clay-like	Not Susceptible		0.055			
5.5	15	80		68	128	Embankment Fill	Clay-like	Not Susceptible		0.070			
7.0	14	80		68	128	Embankment Fill	Clay-like	Not Susceptible		0.080			
8.5	17	80		68	128	Embankment Fill	Clay-like	Not Susceptible		0.087			
10.0	20	80		68	128	Embankment Fill	Clay-like	Not Susceptible		0.093			
11.5	12	80		68	128	Embankment Fill	Clay-like	Not Susceptible		0.098			
13.0	25	80		68	128	Embankment Fill	Clay-like	Not Susceptible		0.102			
14.5	20	80		68	128	Embankment Fill	Clay-like	Not Susceptible		0.106			
16.0	5	80		68	128	Embankment Fill	Clay-like	Not Susceptible		0.109			
17.5	1	80		68	128	Embankment Fill	Clay-like	Not Susceptible		0.113			
19.0	3	80		68	128	Embankment Fill	Clay-like	Not Susceptible		0.106			
20.5	0	80		68	128	Embankment Fill	Clay-like	Not Susceptible		0.115			
22.0	0	80		68	128	Embankment Fill	Clay-like	Not Susceptible		0.120			
23.5	0	80		68	128	Embankment Fill	Clay-like	Not Susceptible		0.119			
25.0	1	80		68	128	Embankment Fill	Clay-like	Not Susceptible		0.122			
26.5	2	80		68	128	Embankment Fill	Clay-like	Not Susceptible		0.124			
28.0	0	80		68	128	Embankment Fill	Clay-like	Not Susceptible		0.125			
29.5	3	80		68	128	Embankment Fill	Clay-like	Not Susceptible		0.127			
31.0	1	80		68	128	Embankment Fill	Clay-like	Not Susceptible		0.129			
32.5	0	80		95	127	Subunit 1	Clay-like	Not Susceptible		0.133			
34.0	0	80		95	127	Subunit 1	Clay-like	Not Susceptible		0.134			
35.5	0	80		95	127	Subunit 1	Clay-like	Not Susceptible		0.136			
37.0	9	80		95	127	Subunit 1	Clay-like	Not Susceptible		0.136			
38.5	10	80		95	127	Subunit 1	Clay-like	Not Susceptible		0.137			
40.0	10	80		95	127	Subunit 1	Clay-like	Not Susceptible		0.139			
41.5	9	80		95	127	Subunit 1	Clay-like	Not Susceptible		0.138			
43.0	5	80		46	126	Subunit 2	Sand-like			0.137			
44.5	0	80		46	126	Subunit 2	Sand-like			0.140			
46.0	3	80		22	131	Subunit 3	Sand-like			0.137			
47.5	9	80		22	131	Subunit 3	Sand-like			0.137			
49.0	34	80		22	131	Subunit 3	Sand-like			0.134			

KIF TDEC Stability, Boring ID: KIF-A2

Liquefaction Potential Evaluations

For Coarse Grained Soils

Elev. Of Mid. Pt. of Sample (ft)	Depth of Mid. Pt. of Sample (ft.)	Unit Weight (pcf)	Vert. Total Stress during SPT (tsf)	Static Pore Pressure during SPT (tsf)	Vert. Eff. Stress during SPT (tsf)	SPT N Value	Hammer Efficiency (%)	Borehole Diameter Correction	Sampler Correction	Rod Length Correction	Overburden Stress Correction Factor	Hammer Energy Correction Factor	Corrected Blow Count	Normalized Blow Count	Relative Density (%)	Unified Soil Classification	Fines Content (%)
	z	γ_T	σ_v	u	σ'_v	N	E_m	C_B	C_s	C_R	C_N	C_E	N_{60}	$(N_1)_{60}$	D_r		

Top of Hole Elevation (ft) = 755.0 | Boring ID = KIF-A2

begin sampling (depth-ft) = 0.0 | Boring Inner Dia. (in) = 3.25

total unit wt. above 1st SPT (pcf) = 120

water elevation during SPT (ft) = 742.0 ft *(relative to ground surface during SPT)* | Assumed Rod Stickup = 5.0 feet

water depth during SPT (ft) = 13.0 | E_m Measurement? = 1 (1: Yes, 0: No)

water elevation during EQ (ft) = 749.1 ft *(relative to ground surface during SPT)* | SPT Sampler w/ Liners? = 0 (1: Yes, 0: No)

	u-top	effstr-top
water during EQ (depth-ft) =	5.9	
vert. total stress above 1st SPT (tsf) =	**0.00**	0.00

754.0	1.0	120	0.06	0.00	0.06	28	80.0	1.000	1.30	1.00	1.70	1.33	49	83	100	CL	60
752.5	2.5	119	0.15	0.00	0.15	20	80.0	1.000	1.30	1.00	1.67	1.33	35	58	100	SM	38
751.0	4.0	128	0.24	0.00	0.24	10	80.0	1.000	1.28	1.00	1.65	1.33	17	28	86	MH	68
749.5	5.5	128	0.34	0.00	0.34	15	80.0	1.000	1.30	1.00	1.39	1.33	26	36	95	0	68
748.0	7.0	128	0.43	0.00	0.43	14	80.0	1.000	1.30	1.00	1.32	1.33	24	32	90	0	68
746.5	8.5	128	0.53	0.00	0.53	17	80.0	1.000	1.30	1.00	1.22	1.33	29	36	95	0	68
745.0	10.0	128	0.63	0.00	0.63	20	80.0	1.000	1.30	1.00	1.15	1.33	35	40	99	0	68
743.5	11.5	128	0.72	0.00	0.72	12	80.0	1.000	1.23	1.00	1.15	1.33	20	23	78	0	68
742.0	13.0	128	0.82	0.00	0.82	25	80.0	1.000	1.30	1.00	1.07	1.33	43	46	100	0	68
740.5	14.5	128	0.91	0.05	0.87	20	80.0	1.000	1.30	1.00	1.06	1.33	35	37	96	0	68
739.0	16.0	128	1.01	0.09	0.92	5	80.0	1.000	1.10	1.00	1.07	1.33	7	8	54	0	68
737.5	17.5	128	1.11	0.14	0.97	1	80.0	1.000	1.10	1.00	1.05	1.33	1	2	39	0	68
736.0	19.0	128	1.20	0.19	1.02	3	80.0	1.000	1.10	1.00	1.02	1.33	4	4	47	0	68
734.5	20.5	128	1.30	0.23	1.06	0	80.0	1.000	1.10	1.00	1.00	1.33	0	0	35	0	68
733.0	22.0	128	1.39	0.28	1.11	0	80.0	1.000	1.10	1.00	0.97	1.33	0	0	35	0	68
731.5	23.5	128	1.49	0.33	1.16	0	80.0	1.000	1.10	1.00	0.94	1.33	0	0	35	0	68
730.0	25.0	128	1.59	0.37	1.21	1	80.0	1.000	1.10	1.00	0.92	1.33	1	1	39	0	68
728.5	26.5	128	1.68	0.42	1.26	2	80.0	1.000	1.10	1.00	0.91	1.33	3	3	42	0	68
727.0	28.0	128	1.78	0.47	1.31	0	80.0	1.000	1.10	1.00	0.88	1.33	0	0	35	0	68
725.5	29.5	128	1.87	0.51	1.36	3	80.0	1.000	1.10	1.00	0.87	1.33	4	4	45	0	68
724.0	31.0	128	1.97	0.56	1.41	1	80.0	1.000	1.10	1.00	0.85	1.33	1	1	39	0	68
722.5	32.5	127	2.07	0.61	1.46	0	80.0	1.000	1.10	1.00	0.82	1.33	0	0	35	0	95
721.0	34.0	127	2.16	0.66	1.51	0	80.0	1.000	1.10	1.00	0.81	1.33	0	0	35	0	95
719.5	35.5	127	2.26	0.70	1.55	0	80.0	1.000	1.10	1.00	0.79	1.33	0	0	35	0	95
718.0	37.0	127	2.35	0.75	1.60	9	80.0	1.000	1.11	1.00	0.82	1.33	13	11	60	0	95
716.5	38.5	127	2.45	0.80	1.65	10	80.0	1.000	1.12	1.00	0.81	1.33	15	12	62	0	95
715.0	40.0	127	2.54	0.84	1.70	10	80.0	1.000	1.12	1.00	0.80	1.33	15	12	62	0	95
713.5	41.5	127	2.64	0.89	1.75	9	80.0	1.000	1.10	1.00	0.79	1.33	13	10	59	0	95
712.0	43.0	126	2.73	0.94	1.80	5	80.0	1.000	1.10	1.00	0.76	1.33	7	6	49	0	46
710.5	44.5	126	2.83	0.98	1.84	0	80.0	1.000	1.10	1.00	0.72	1.33	0	0	35	0	46
709.0	46.0	131	2.92	1.03	1.89	3	80.0	1.000	1.10	1.00	0.72	1.33	4	3	42	0	22
707.5	47.5	131	3.02	1.08	1.94	9	80.0	1.000	1.10	1.00	0.74	1.33	13	10	56	0	22
706.0	49.0	131	3.12	1.12	2.00	34	80.0	1.000	1.30	1.00	0.85	1.33	59	50	100	0	22

KIF TDEC Stability, Boring ID: KIF-A2
Liquefaction Potential Evaluations
For Coarse Grained Soils

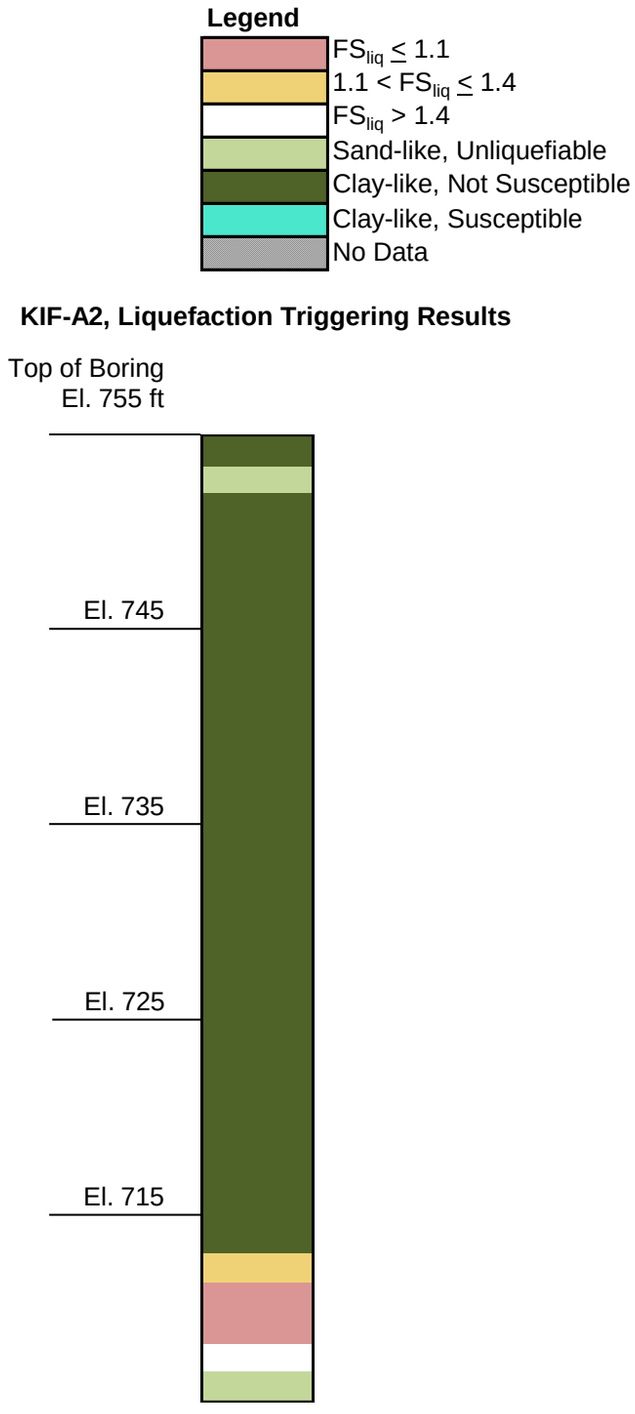
Depth of Mid. Pt. of Sample (ft.) z	Clean Sand Correction $\Delta(N_1)_{60cs}$	Equivalent Clean Sand N-Value $(N_1)_{60cs}$	Sample Screened for: Clay-like	High Blow Count $(N_1)_{60cs} \geq 32$	Unsaturated	Factor of Safety FS_{liq}	Material (optional)
ft							
ft	*(relative to ground surface during SPT)*						
pcf							
tsf							

Note: A factor of safety shown as "N/A" implies that the soil type is not appropriately evaluated using this methodology. This applies to clay-like soils (typically CL, CH, CL-ML and MH material type), samples with high blow counts, and unsaturated samples.

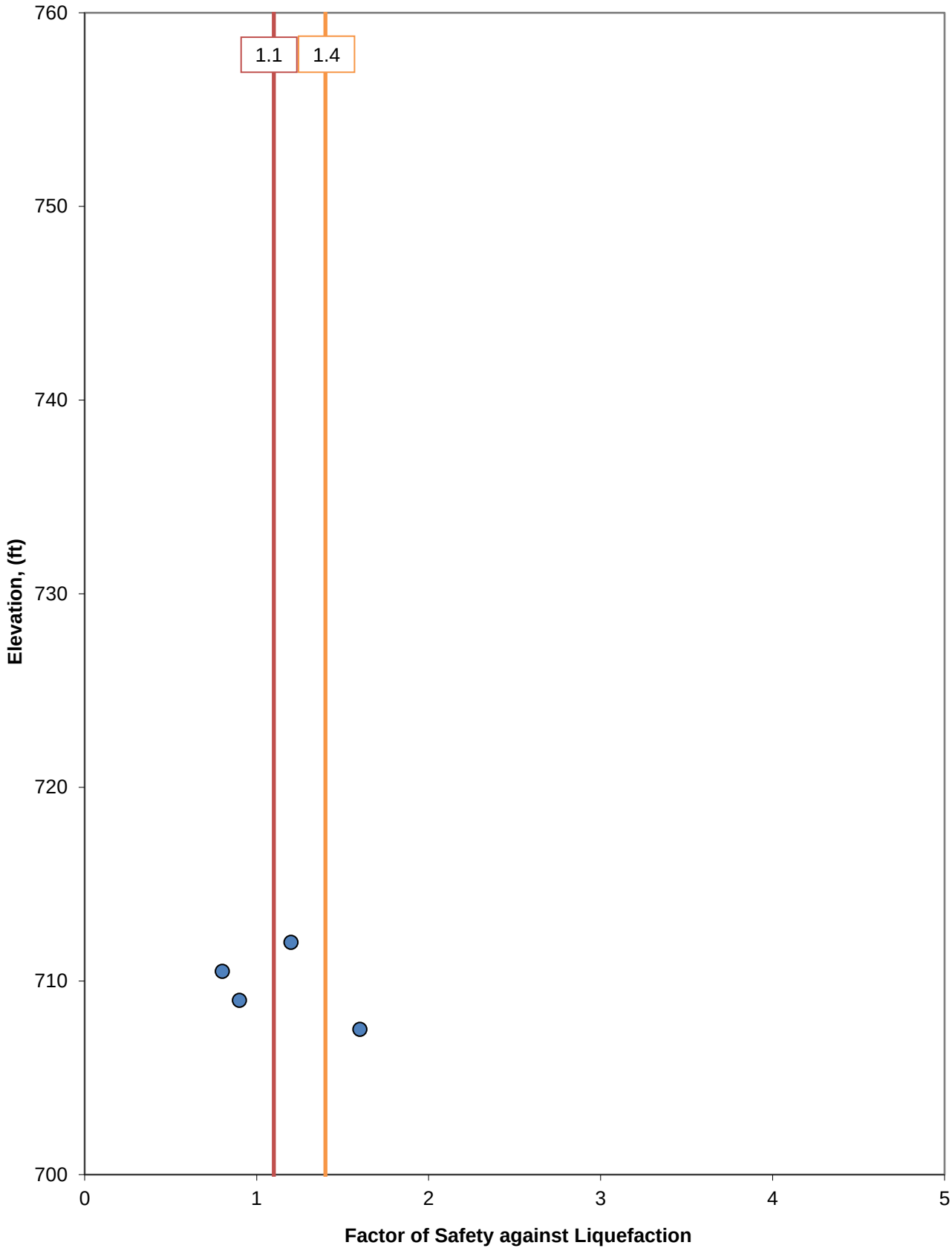
1.0	5.60	88	TRUE	TRUE	TRUE	**N/A**	**Clay Fill (irrelevant)**
2.5	5.55	64	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**
4.0	5.58	34	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**
5.5	5.58	42	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**
7.0	5.58	38	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**
8.5	5.58	42	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**
10.0	5.58	45	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**
11.5	5.58	28	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
13.0	5.58	52	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**
14.5	5.58	42	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**
16.0	5.58	13	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
17.5	5.58	7	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
19.0	5.58	10	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
20.5	5.58	6	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
22.0	5.58	6	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
23.5	5.58	6	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
25.0	5.58	7	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
26.5	5.58	8	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
28.0	5.58	6	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
29.5	5.58	9	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
31.0	5.58	7	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
32.5	5.50	6	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
34.0	5.50	6	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**

KIF TDEC Stability, Boring ID: KIF-A2
Liquefaction Potential Evaluations
For Coarse Grained Soils

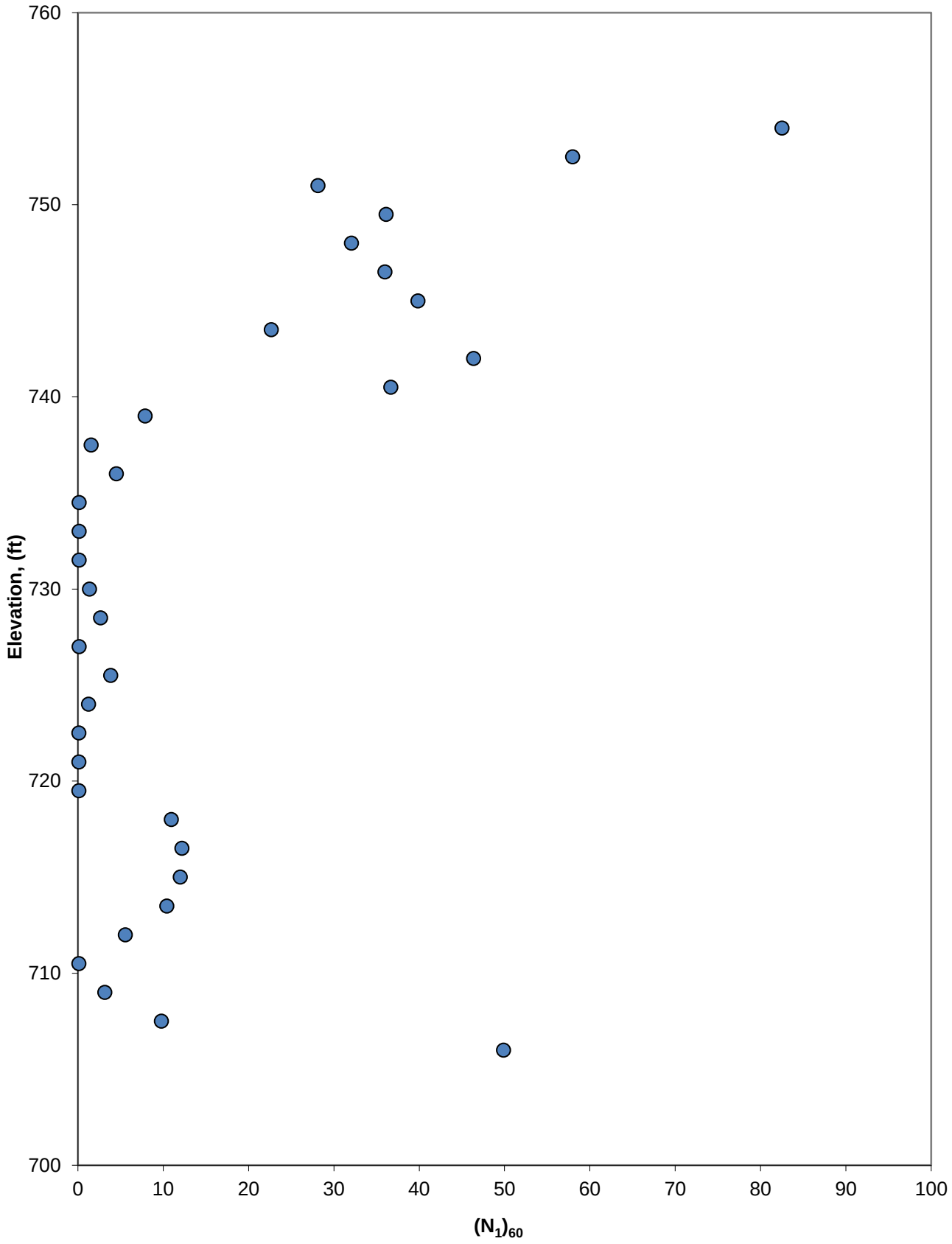
Depth of Mid. Pt. of Sample (ft.) z	Clean Sand Correction $\Delta(N_1)_{60cs}$	Equivalent Clean Sand N-Value $(N_1)_{60cs}$	Sample Screened for: Clay-like	High Blow Count $(N_1)_{60cs} \geq 32$	Unsaturated	Factor of Safety FS_{liq}	Material (optional)
35.5	5.50	6	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
37.0	5.50	16	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
38.5	5.50	18	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
40.0	5.50	17	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
41.5	5.50	16	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
43.0	5.61	11	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**
44.5	5.61	6	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**
46.0	4.77	8	FALSE	FALSE	FALSE	**0.9**	**Subunit 3**
47.5	4.77	15	FALSE	FALSE	FALSE	**1.6**	**Subunit 3**
49.0	4.77	55	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**


Legend
FS$_{liq}$ ≤ 1.1
1.1 < FS$_{liq}$ ≤ 1.4
FS$_{liq}$ > 1.4
Sand-like, Unliquefiable
Clay-like, Not Susceptible
Clay-like, Susceptible
No Data
KIF-A2, Liquefaction Triggering Results
Top of Boring
El. 755 ft
El. 745
El. 735
El. 725
El. 715

KIF TDEC Stability, Boring ID: KIF-A2, Source = 1 Hz, Mw = 7.6, Event = Design EQ,
SPT Data, Simplified Stress-Based Approach



KIF TDEC Stability, Boring ID: KIF-A2, Source = 1 Hz, Mw = 7.6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



Project Name = KIF TDEC Stability
Boring ID = KIF-A3

Boring Location

Northing =
Easting =

OR

Baseline Station =
Offset (+ Right) =

Drilling Information

Boring Inner Diameter (ID) =	3.25	inches	
Top of Hole Elevation	747	feet	
Water Depth during SPT (negative for U/S borings)=	0	feet	
Depth Sampling Began	0	feet	
Total Unit Wt. above 1st SPT =	120	pcf	
Assumed Rod Stickup =	5	feet	*(Typ assume 5ft)*
E_m Measurement based on Fv method? =	1	(1: Yes, 0: No)	
SPT Sampler w/ Liners? =	0	(1: Yes, 0: No)	*(Typ. no)*

During EQ Information

Water Depth during EQ (relative to SPT TOH, negative for U/S borings) =	6	feet
Final Grade Elevation during EQ	753.3	feet
Average Total Unit Wt. of Cut/Fill	120	pcf

Fines Content Correction

Fines content correction for samples with blow counts of zero? 1 (1: Yes, 0: No)

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile? 0 (1: Yes, 0: No)
If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile: SectionAA, KIF-A3_NOR
Alpha at each sample depth known? 1 (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (α vs. depth curve)
If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_α will be one.

m4:
m3:
m2:
m1:
m0:

Associated ground response profile: Section_AA, KIF-A3_NOR
Get CSR from shear stress envelope? 0 (1: Yes, 0: No)
If previous answer is No, then CSR will be calculated using a_{max} and r_d
Max. Shear Stress at each sample depth known? (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4:
m3:
m2:
m1:

Earthquake Information

EQ Source (e.g., New Madrid)	1 Hz
Event (e.g., MCE, 10KEQ, OBE)	Design EQ
a_{max} (g) (top of ground surface)	0.10
EQ Mag (Mw)	7.6

Inputs

Depth of Sample Midpoint (ft.)	SPT N Value	Hammer Efficiency, E_m (%)	Unified Soil Classification	Fines Content (%)	Total Unit Weight (pcf)	Material (optional)	Clay-like / Sand-like Override (optional)	Clay-like Susceptibility (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure during SPT (psf)	Static Pore Water Pressure during EQ (psf)
1.0	3	80	CL	52	128	Embankment Fill	Clay-like	Not Susceptible		0.055			
2.5	8	80		52	128	Embankment Fill	Clay-like	Not Susceptible		0.069			
4.0	8	80		52	128	Embankment Fill	Clay-like	Not Susceptible		0.080			
5.5	15	80		52	128	Embankment Fill	Clay-like	Not Susceptible		0.090			
7.0	16	80		52	128	Embankment Fill	Clay-like	Not Susceptible		0.098			
8.5	4	80		52	128	Embankment Fill	Clay-like	Not Susceptible		0.106			
10.0	1	80		52	128	Embankment Fill	Clay-like	Not Susceptible		0.114			
13.5	0	80		52	128	Embankment Fill	Clay-like	Not Susceptible		0.128			
15.0	0	80		52	128	Embankment Fill	Clay-like	Not Susceptible		0.139			
16.5	0	80		52	128	Embankment Fill	Clay-like	Not Susceptible		0.146			
18.0	0	80		52	128	Embankment Fill	Clay-like	Not Susceptible		0.151			
19.5	0	80		52	128	Embankment Fill	Clay-like	Not Susceptible		0.156			
21.0	2	80		52	128	Embankment Fill	Clay-like	Not Susceptible		0.161			
22.5	0	80		52	128	Embankment Fill	Clay-like	Not Susceptible		0.165			
24.0	0	80		52	128	Embankment Fill	Clay-like	Not Susceptible		0.169			
25.5	0	80		90	127	Subunit 1	Clay-like	Not Susceptible		0.172			
27.0	2	80		90	127	Subunit 1	Clay-like	Not Susceptible		0.175			
28.5	6	80		90	127	Subunit 1	Clay-like	Not Susceptible		0.177			
30.0	13	80		90	127	Subunit 1	Clay-like			0.180			
31.5	14	80		90	127	Subunit 1	Clay-like			0.183			
33.0	8	80		90	127	Subunit 1	Clay-like			0.184			
34.5	9	80		46	126	Subunit 2	Sand-like			0.185			
36.0	0	80		46	126	Subunit 2	Sand-like			0.184			
37.5	0	80		46	126	Subunit 2	Sand-like			0.186			
39.0	0	80		46	126	Subunit 2	Sand-like			0.186			
40.5	0	80		22	131	Subunit 3	Sand-like			0.185			
42.0	13	80		22	131	Subunit 3	Sand-like			0.184			
43.5	24	80		22	131	Subunit 3	Sand-like			0.183			

KIF TDEC Stability, Boring ID: KIF-A3

Liquefaction Potential Evaluations

For Coarse Grained Soils

Elev. Of Mid. Pt. of Sample (ft)	Depth of Mid. Pt. of Sample (ft.)	Unit Weight (pcf)	Vert. Total Stress during SPT (tsf)	Static Pore Pressure during SPT (tsf)	Vert. Eff. Stress during SPT (tsf)	SPT N Value	Hammer Efficiency (%)	Borehole Diameter Correction	Sampler Correction	Rod Length Correction	Overburden Stress Correction Factor	Hammer Energy Correction Factor	Corrected Blow Count	Normalized Blow Count	Relative Density (%)	Unified Soil Classification	Fines Content (%)
	z	γ_T	σ_v	u	σ'_v	N	E_m	C_B	C_s	C_R	C_N	C_E	N_{60}	$(N_1)_{60}$	D_r		

Top of Hole Elevation (ft) = 747.0 | Boring ID = KIF-A3

begin sampling (depth-ft) = 0.0 | Boring Inner Dia. (in) = 3.25

total unit wt. above 1st SPT (pcf) = 120

water elevation during SPT (ft) = 747.0 ft *(relative to ground surface during SPT)* | Assumed Rod Stickup = 5.0 feet

water depth during SPT (ft) = 0.0 | E_m Measurement? = 1 (1: Yes, 0: No)

water elevation during EQ (ft) = 741.0 ft *(relative to ground surface during SPT)* | SPT Sampler w/ Liners? = 0 (1: Yes, 0: No)

	u-top	effstr-top
water during EQ (depth-ft) =	6.0	
vert. total stress above 1st SPT (tsf) =	**0.00**	0.00

746.0	1.0	128	0.06	0.03	0.03	3	80.0	1.000	1.10	1.00	1.70	1.33	4	7	53	CL	52
744.5	2.5	128	0.16	0.08	0.08	8	80.0	1.000	1.22	1.00	1.70	1.33	13	22	78	0	52
743.0	4.0	128	0.26	0.12	0.13	8	80.0	1.000	1.22	1.00	1.70	1.33	13	22	78	0	52
741.5	5.5	128	0.35	0.17	0.18	15	80.0	1.000	1.30	1.00	1.59	1.33	26	41	100	0	52
740.0	7.0	128	0.45	0.22	0.23	16	80.0	1.000	1.30	1.00	1.49	1.33	28	41	100	0	52
738.5	8.5	128	0.54	0.27	0.28	4	80.0	1.000	1.10	1.00	1.70	1.33	6	10	58	0	52
737.0	10.0	128	0.64	0.31	0.33	1	80.0	1.000	1.10	1.00	1.70	1.33	1	2	42	0	52
733.5	13.5	128	0.86	0.42	0.44	0	80.0	1.000	1.10	1.00	1.68	1.33	0	0	36	0	52
732.0	15.0	128	0.96	0.47	0.49	0	80.0	1.000	1.10	1.00	1.58	1.33	0	0	36	0	52
730.5	16.5	128	1.06	0.51	0.54	0	80.0	1.000	1.10	1.00	1.49	1.33	0	0	36	0	52
729.0	18.0	128	1.15	0.56	0.59	0	80.0	1.000	1.10	1.00	1.42	1.33	0	0	36	0	52
727.5	19.5	128	1.25	0.61	0.64	0	80.0	1.000	1.10	1.00	1.35	1.33	0	0	36	0	52
726.0	21.0	128	1.34	0.66	0.69	2	80.0	1.000	1.10	1.00	1.27	1.33	3	4	45	0	52
724.5	22.5	128	1.44	0.70	0.74	0	80.0	1.000	1.10	1.00	1.24	1.33	0	0	35	0	52
723.0	24.0	128	1.54	0.75	0.79	0	80.0	1.000	1.10	1.00	1.19	1.33	0	0	35	0	52
721.5	25.5	127	1.63	0.80	0.84	0	80.0	1.000	1.10	1.00	1.15	1.33	0	0	35	0	90
720.0	27.0	127	1.73	0.84	0.88	2	80.0	1.000	1.10	1.00	1.10	1.33	3	3	44	0	90
718.5	28.5	127	1.82	0.89	0.93	6	80.0	1.000	1.10	1.00	1.06	1.33	9	9	57	0	90
717.0	30.0	127	1.92	0.94	0.98	13	80.0	1.000	1.22	1.00	1.03	1.33	21	22	77	0	90
715.5	31.5	127	2.01	0.98	1.03	14	80.0	1.000	1.23	1.00	1.01	1.33	23	23	79	0	90
714.0	33.0	127	2.11	1.03	1.08	8	80.0	1.000	1.12	1.00	0.99	1.33	12	12	61	0	90
712.5	34.5	126	2.20	1.08	1.13	9	80.0	1.000	1.13	1.00	0.97	1.33	14	13	64	0	46
711.0	36.0	126	2.30	1.12	1.17	0	80.0	1.000	1.10	1.00	0.94	1.33	0	0	35	0	46
709.5	37.5	126	2.39	1.17	1.22	0	80.0	1.000	1.10	1.00	0.92	1.33	0	0	35	0	46
708.0	39.0	126	2.49	1.22	1.27	0	80.0	1.000	1.10	1.00	0.90	1.33	0	0	35	0	46
706.5	40.5	131	2.58	1.26	1.32	0	80.0	1.000	1.10	1.00	0.87	1.33	0	0	33	0	22
705.0	42.0	131	2.68	1.31	1.37	13	80.0	1.000	1.18	1.00	0.90	1.33	21	18	71	0	22
703.5	43.5	131	2.78	1.36	1.42	24	80.0	1.000	1.30	1.00	0.92	1.33	42	38	97	0	22

KIF TDEC Stability, Boring ID: KIF-A3
Liquefaction Potential Evaluations
For Coarse Grained Soils

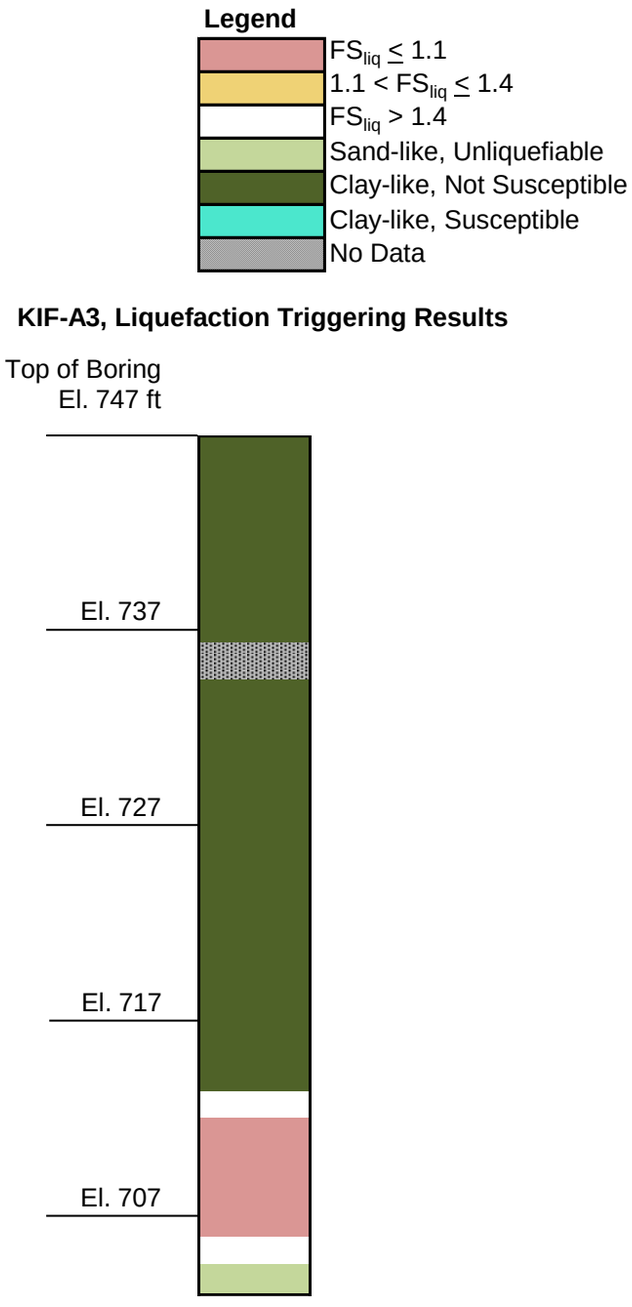
Depth of Mid. Pt. of Sample (ft.) z	Clean Sand Correction $\Delta(N_1)_{60cs}$	Equivalent Clean Sand N-Value $(N_1)_{60cs}$	Sample Screened for: Clay-like	High Blow Count $(N_1)_{60cs} \geq 32$	Unsaturated	Factor of Safety FS_{liq}	Material (optional)
ft							
ft *(relative to ground surface during SPT)*							
pcf							
tsf							

Note: A factor of safety shown as "N/A" implies that the soil type is not appropriately evaluated using this methodology. This applies to clay-like soils (typically CL, CH, CL-ML and MH material type), samples with high blow counts, and unsaturated samples.

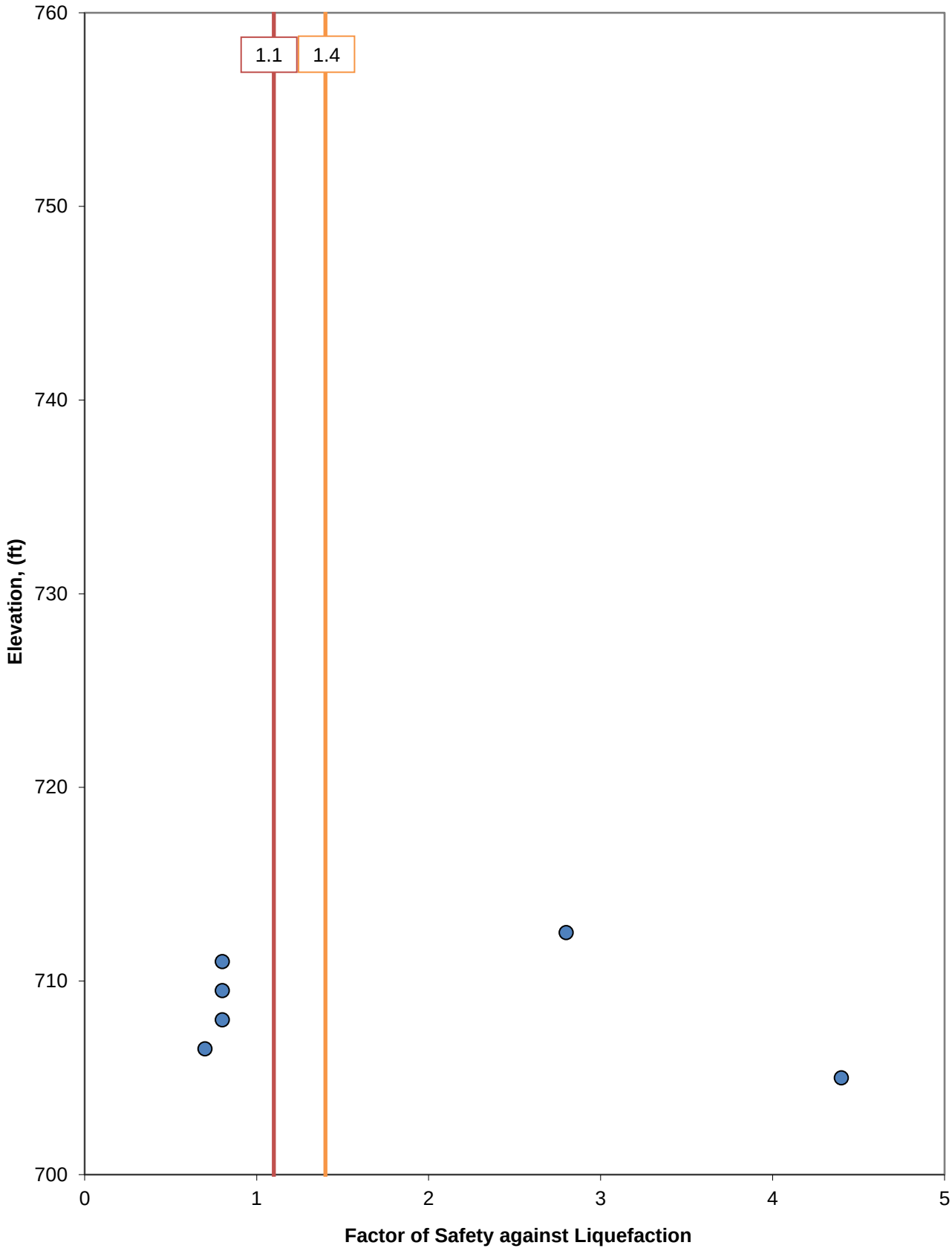
1.0	5.61	13	TRUE	FALSE	TRUE	**N/A**	**Embankment Fill**
2.5	5.61	28	TRUE	FALSE	TRUE	**N/A**	**Embankment Fill**
4.0	5.61	28	TRUE	FALSE	TRUE	**N/A**	**Embankment Fill**
5.5	5.61	47	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**
7.0	5.61	47	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**
8.5	5.61	16	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
10.0	5.61	8	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
13.5	5.61	6	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
15.0	5.61	6	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
16.5	5.61	6	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
18.0	5.61	6	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
19.5	5.61	6	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
21.0	5.61	9	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
22.5	5.61	6	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
24.0	5.61	6	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
25.5	5.51	6	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
27.0	5.51	9	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
28.5	5.51	15	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
30.0	5.51	27	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
31.5	5.51	29	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
33.0	5.51	17	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
34.5	5.61	19	FALSE	FALSE	FALSE	**2.8**	**Subunit 2**
36.0	5.61	6	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**

KIF TDEC Stability, Boring ID: KIF-A3
Liquefaction Potential Evaluations
For Coarse Grained Soils

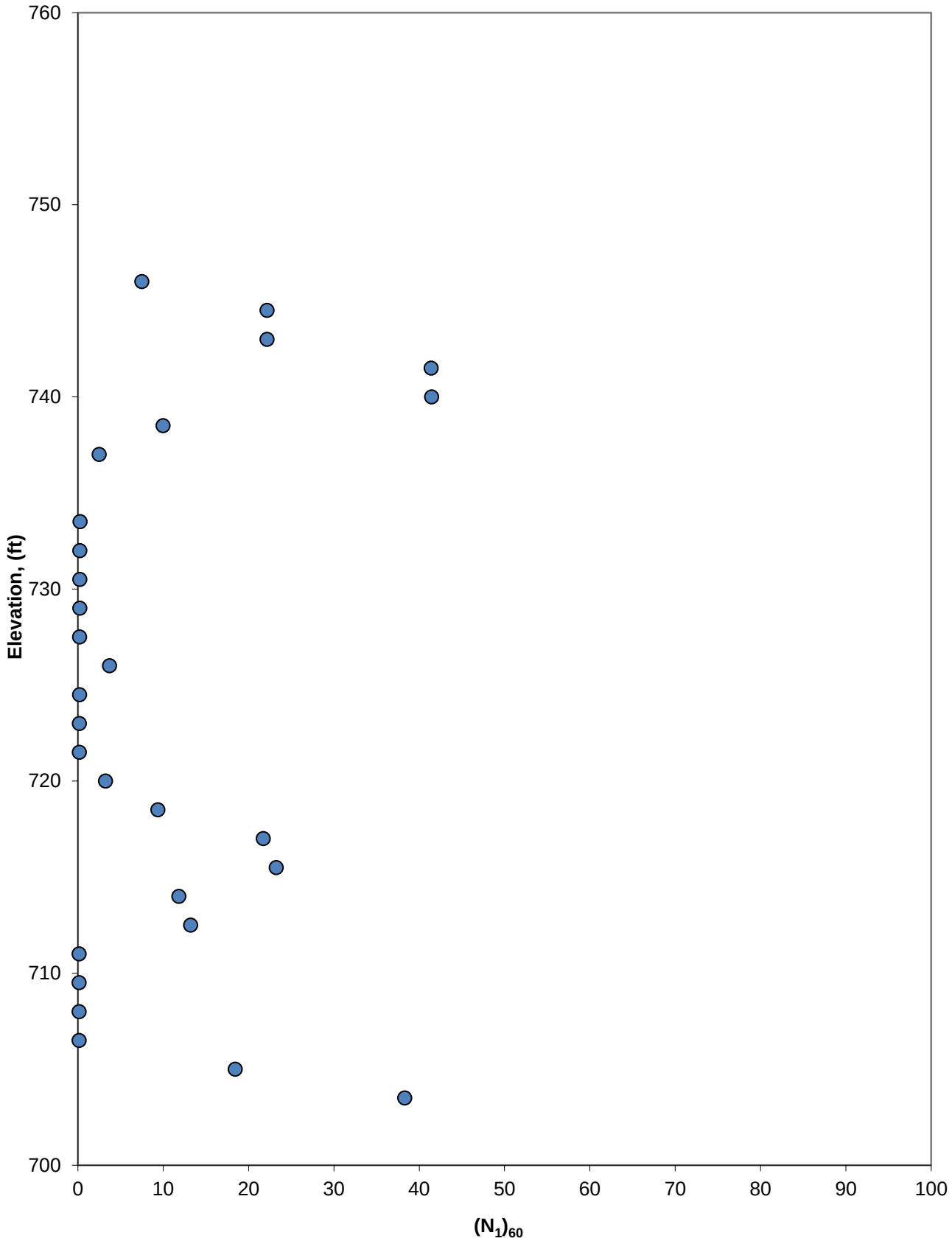
Depth of Mid. Pt. of Sample (ft.) z	Clean Sand Correction $\Delta(N_1)_{60cs}$	Equivalent Clean Sand N-Value $(N_1)_{60cs}$	Sample Screened for: Clay-like	High Blow Count $(N_1)_{60cs} \geq 32$	Unsaturated	Factor of Safety FS_{liq}	Material (optional)
37.5	5.61	6	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**
39.0	5.61	6	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**
40.5	4.77	5	FALSE	FALSE	FALSE	**0.7**	**Subunit 3**
42.0	4.77	23	FALSE	FALSE	FALSE	**4.4**	**Subunit 3**
43.5	4.77	43	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**


Legend
FS$_{liq}$ ≤ 1.1
1.1 < FS$_{liq}$ ≤ 1.4
FS$_{liq}$ > 1.4
Sand-like, Unliquefiable
Clay-like, Not Susceptible
Clay-like, Susceptible
No Data
KIF-A3, Liquefaction Triggering Results
Top of Boring
El. 747 ft
El. 737
El. 727
El. 717
El. 707

KIF TDEC Stability, Boring ID: KIF-A3, Source = 1 Hz, Mw = 7.6, Event = Design EQ,
SPT Data, Simplified Stress-Based Approach



KIF TDEC Stability, Boring ID: KIF-A3, Source = 1 Hz, Mw = 7.6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



Project Name = KIF TDEC Stability
Boring ID = KIF-B1

Boring Location

Northing = 553531.6
Easting = 2439911.3

OR

Baseline Station =
Offset (+ Right) =

Drilling Information

Boring Inner Diameter (ID) = 3.25 inches
Top of Hole Elevation = 759 feet
Water Depth during SPT (negative for U/S borings)= 15.5 feet
Depth Sampling Began = 0 feet
Total Unit Wt. above 1st SPT = pcf
Assumed Rod Stickup = 5 feet *(Typ assume 5ft)*
E_m Measurement based on Fv method? = 1 (1: Yes, 0: No)
SPT Sampler w/ Liners? = 0 (1: Yes, 0: No) *(Typ. no)*

During EQ Information

Water Depth during EQ (relative to SPT TOH, negative for U/S borings) = 14.3 feet
Final Grade Elevation during EQ = 763.1 feet
Average Total Unit Wt. of Cut/Fill = 121 pcf

Fines Content Correction

Fines content correction for samples with blow counts of zero? = 1 (1: Yes, 0: No)

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile? = 0 (1: Yes, 0: No)
If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile: ng_Pond_Section, KIF-B1_NOR
Alpha at each sample depth known? = 1 (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (α vs. depth curve)
If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_α will be one.

m4:
m3:
m2:
m1:
m0:

Associated ground response profile: shing_Pond_Section, KIF-B1
Get CSR from shear stress envelope? = 0 (1: Yes, 0: No)
If previous answer is No, then CSR will be calculated using a_{max} and r_d
Max. Shear Stress at each sample depth known? = (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4:
m3:
m2:
m1:

Earthquake Information

EQ Source (e.g., New Madrid) = 1 Hz
Event (e.g., MCE, 10KEQ, OBE) = Design EQ
a_{max} (g) (top of ground surface) = 0.10
EQ Mag (Mw) = 7.6

Inputs

Depth of Sample Midpoint (ft.)	SPT N Value	Hammer Efficiency, E_m (%)	Unified Soil Classification	Fines Content (%)	Total Unit Weight (pcf)	Material (optional)	Clay-like / Sand-like Override (optional)	Clay-like Susceptibility (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure during SPT (psf)	Static Pore Water Pressure during EQ (psf)
1.0	5	80	SM	38	119	Bottom Ash	Sand-like			0.072			
2.5	21	80		38	119	Bottom Ash	Sand-like			0.077			
4.0	15	80		38	119	Bottom Ash	Sand-like			0.083			
5.5	20	80		38	119	Bottom Ash	Sand-like			0.087			
7.0	27	80		38	119	Bottom Ash	Sand-like			0.095			
8.5	16	80		38	119	Bottom Ash	Sand-like			0.086			
10.0	13	80		38	119	Bottom Ash	Sand-like			0.097			
11.5	12	80		38	119	Bottom Ash	Sand-like			0.100			
13.0	18	80		38	119	Bottom Ash	Sand-like			0.100			
14.5	4	80		38	119	Bottom Ash	Sand-like			0.100			
16.0	9	80		62	119	Bottom Ash	Sand-like			0.100			
17.5	7	80		62	112	Fly Ash	Sand-like		Do Not Correct for FC	0.100			
25.0	10	80		62	112	Fly Ash	Sand-like		Do Not Correct for FC	0.103			
26.5	0	80		62	112	Fly Ash	Sand-like		Do Not Correct for FC	0.102			
28.0	2	80		62	112	Fly Ash	Sand-like		Do Not Correct for FC	0.101			
29.5	0	80		41	126	Subunit 2	Sand-like			0.100			
31.0	9	80		41	126	Subunit 2	Sand-like			0.099			
32.5	4	80		41	126	Subunit 2	Sand-like			0.098			
34.0	5	80		41	126	Subunit 2	Sand-like			0.096			
35.5	4	80		41	126	Subunit 2	Sand-like			0.095			
37.0	5	80		41	126	Subunit 2	Sand-like			0.094			
38.5	3	80		41	126	Subunit 2	Sand-like			0.092			
40.0	9	80		41	126	Subunit 2	Sand-like			0.092			
41.5	2	80		41	126	Subunit 2	Sand-like			0.091			
43.0	1	80		41	126	Subunit 2	Sand-like			0.090			
44.5	6	80		41	126	Subunit 2	Sand-like			0.089			
46.0	6	80		30	131	Subunit 3	Sand-like			0.089			

KIF TDEC Stability, Boring ID: KIF-B1
Liquefaction Potential Evaluations
For Coarse Grained Soils

Top of Hole Elevation (ft) =	759.0			Boring ID =	KIF-B1													
begin sampling (depth-ft) =	0.0			Boring Inner Dia. (in) =	3.25													
total unit wt. above 1st SPT (pcf) =	0																	
water elevation during SPT (ft) =	743.5	ft *(relative to ground surface during SPT)*				Assumed Rod Stickup =	5.0	feet										
water depth during SPT (ft) =	15.5					E_m Measurement? =	1	(1: Yes, 0: No)										
water elevation during EQ (ft) =	744.7	ft *(relative to ground surface during SPT)*				SPT Sampler w/ Liners? =	0	(1: Yes, 0: No)										
water during EQ (depth-ft) =	14.3	u-top	effstr-top															
vert. total stress above 1st SPT (tsf) =	**0.00**	**0.00**	0.00															

Elev. Of Mid. Pt. of Sample (ft)	Depth of Mid. Pt. of Sample (ft.) z	Unit Weight (pcf) γ_T	Vert. Total Stress during SPT (tsf) σ_v	Static Pore Pressure during SPT (tsf) u	Vert. Eff. Stress during SPT (tsf) σ'_v	SPT N Value N	Hammer Efficiency (%) E_m	Borehole Diameter Correction C_B	Sampler Correction C_s	Rod Length Correction C_R	Overburden Stress Correction Factor C_N	Hammer Energy Correction Factor C_E	Corrected Blow Count N_{60}	Normalized Blow Count $(N_1)_{60}$	Relative Density (%) D_r	Unified Soil Classification	Fines Content (%)	Relative State Parameter Index ξ_R	Static Shear Stress Ratio α
758.0	1.0	119	0.06	0.00	0.06	5	80.0	1.000	1.13	1.00	1.70	1.33	8	13	63	SM	38	-0.49	0.072
756.5	2.5	119	0.15	0.00	0.15	21	80.0	1.000	1.30	1.00	1.68	1.33	36	61	100	0	38	-0.60	0.077
755.0	4.0	119	0.24	0.00	0.24	15	80.0	1.000	1.30	1.00	1.50	1.33	26	39	98	0	38	-0.60	0.083
753.5	5.5	119	0.33	0.00	0.33	20	80.0	1.000	1.30	1.00	1.36	1.33	35	47	100	0	38	-0.60	0.087
752.0	7.0	119	0.42	0.00	0.42	27	80.0	1.000	1.30	1.00	1.28	1.33	47	60	100	0	38	-0.60	0.095
750.5	8.5	119	0.51	0.00	0.51	16	80.0	1.000	1.30	1.00	1.25	1.33	28	35	93	0	38	-0.60	0.086
749.0	10.0	119	0.60	0.00	0.60	13	80.0	1.000	1.27	1.00	1.22	1.33	22	27	84	0	38	-0.60	0.097
747.5	11.5	119	0.68	0.00	0.68	12	80.0	1.000	1.23	1.00	1.18	1.33	20	23	79	0	38	-0.60	0.100
746.0	13.0	119	0.77	0.00	0.77	18	80.0	1.000	1.30	1.00	1.10	1.33	31	34	93	0	38	-0.60	0.100
744.5	14.5	119	0.86	0.00	0.86	4	80.0	1.000	1.10	1.00	1.11	1.33	6	7	51	0	38	-0.34	0.100
743.0	16.0	119	0.95	0.02	0.94	9	80.0	1.000	1.14	1.00	1.06	1.33	14	14	66	0	62	-0.49	0.100
741.5	17.5	112	1.04	0.06	0.98	7	80.0	1.000	1.11	1.00	1.04	1.33	10	11	48	0	62	-0.31	0.100
734.0	25.0	112	1.46	0.30	1.16	10	80.0	1.000	1.15	1.00	0.95	1.33	15	15	56	0	62	-0.38	0.103
732.5	26.5	112	1.54	0.34	1.20	0	80.0	1.000	1.10	1.00	0.91	1.33	0	0	5	0	62	0.10	0.102
731.0	28.0	112	1.63	0.39	1.24	2	80.0	1.000	1.10	1.00	0.90	1.33	3	3	24	0	62	-0.06	0.101
729.5	29.5	126	1.72	0.44	1.28	0	80.0	1.000	1.10	1.00	0.89	1.33	0	0	35	0	41	-0.17	0.100
728.0	31.0	126	1.81	0.48	1.33	9	80.0	1.000	1.12	1.00	0.90	1.33	13	12	62	0	41	-0.44	0.099
726.5	32.5	126	1.90	0.53	1.37	4	80.0	1.000	1.10	1.00	0.87	1.33	6	5	48	0	41	-0.30	0.098
725.0	34.0	126	2.00	0.58	1.42	5	80.0	1.000	1.10	1.00	0.86	1.33	7	6	51	0	41	-0.32	0.096
723.5	35.5	126	2.09	0.62	1.47	4	80.0	1.000	1.10	1.00	0.84	1.33	6	5	48	0	41	-0.29	0.095
722.0	37.0	126	2.19	0.67	1.52	5	80.0	1.000	1.10	1.00	0.83	1.33	7	6	50	0	41	-0.32	0.094
720.5	38.5	126	2.28	0.72	1.57	3	80.0	1.000	1.10	1.00	0.81	1.33	4	4	45	0	41	-0.26	0.092
719.0	40.0	126	2.38	0.76	1.61	9	80.0	1.000	1.11	1.00	0.82	1.33	13	11	60	0	41	-0.41	0.092
717.5	41.5	126	2.47	0.81	1.66	2	80.0	1.000	1.10	1.00	0.77	1.33	3	2	41	0	41	-0.22	0.091
716.0	43.0	126	2.57	0.86	1.71	1	80.0	1.000	1.10	1.00	0.76	1.33	1	1	38	0	41	-0.19	0.090
714.5	44.5	126	2.66	0.90	1.76	6	80.0	1.000	1.10	1.00	0.77	1.33	9	7	52	0	41	-0.33	0.089
713.0	46.0	131	2.76	0.95	1.81	6	80.0	1.000	1.10	1.00	0.76	1.33	9	7	51	0	30	-0.32	0.089

KIF TDEC Stability, Boring ID: KIF-B1
Liquefaction Potential Evaluations
For Coarse Grained Soils

EQ Source	a max (g)	EQ Mag (Mw)	Event
1 Hz	0.10	7.6	Design EQ

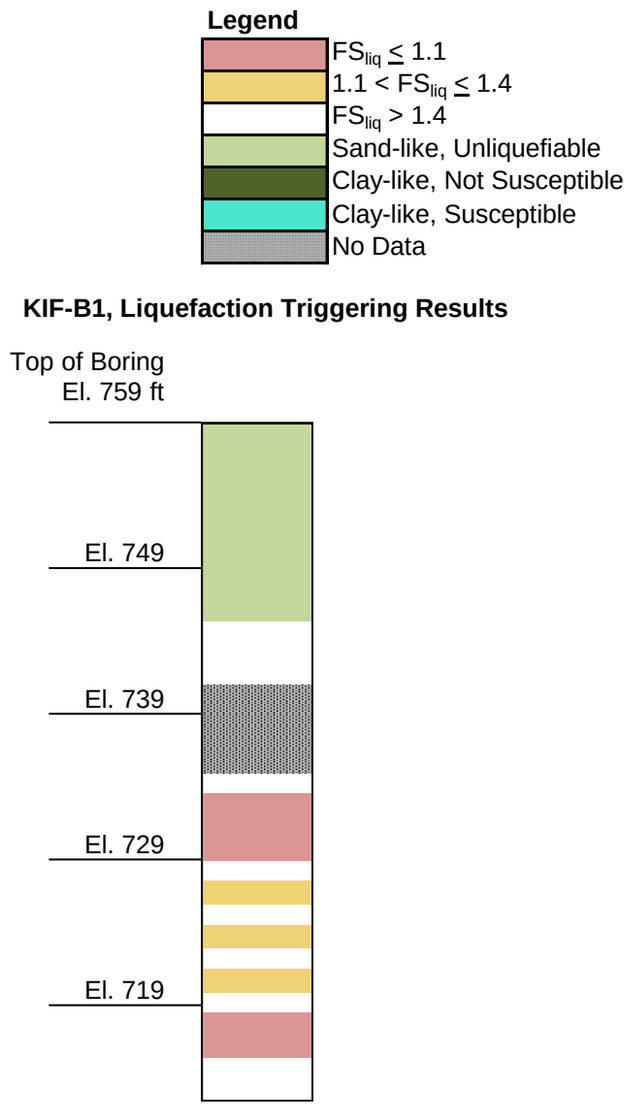
Shear Stress Curve Fit Parameters
m4: 0
m3: 0
m2: 0
m1: 0

Boring ID: **KIF-B1**
Top of Fill Elevation: 763.1 ft
Fill Height: 4.1 ft *(relative to ground surface during SPT)*
Fill Total Unit Weight: 121 pcf
Fill Total Stress: 0.25 tsf

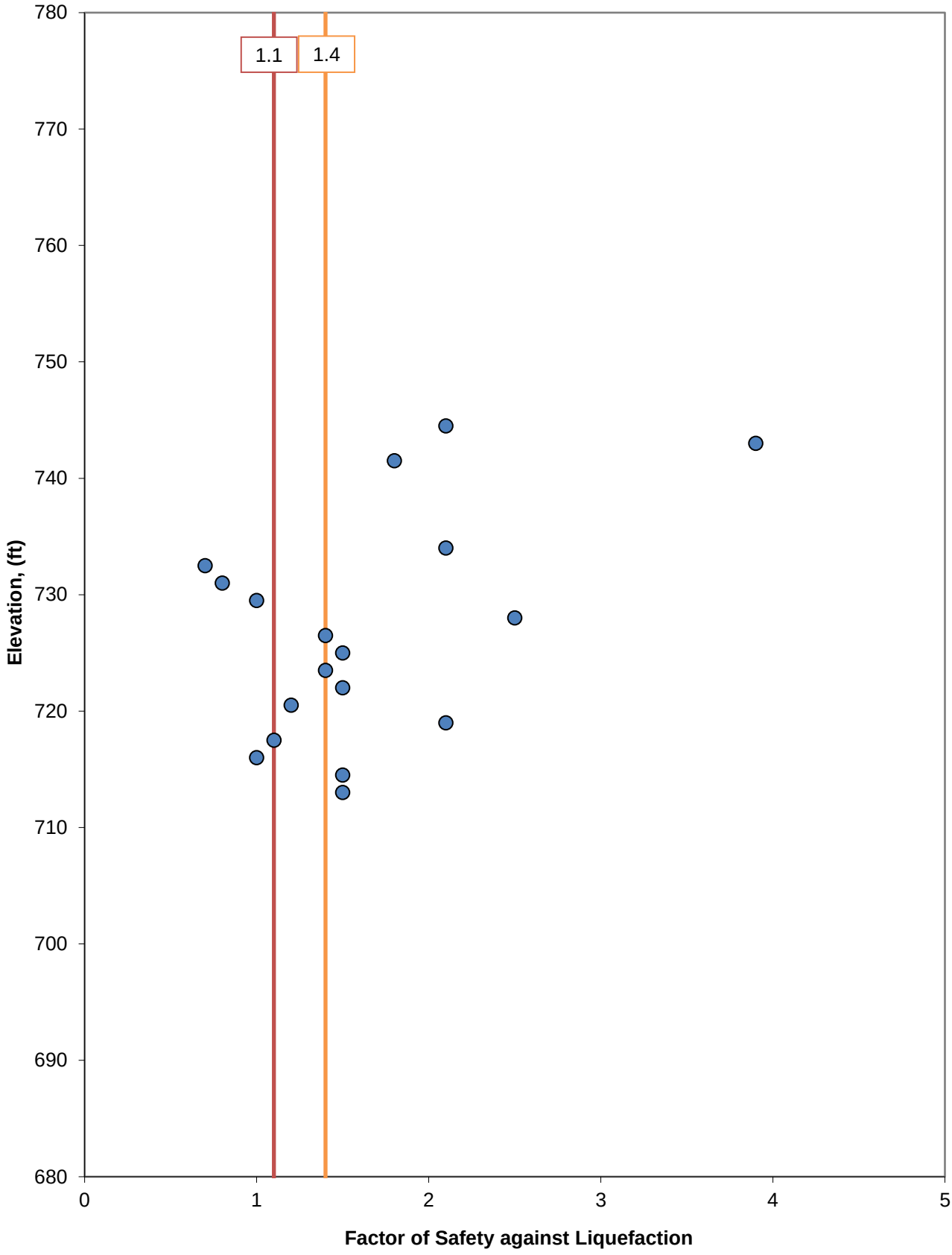
totstr-top **0.25** | u-top 0.00 | effstr-top 0.25

Note: A factor of safety shown as "N/A" implies that the soil type is not appropriately evaluated using this methodology. This applies to clay-like soils (typically CL, CH, CL-ML and MH material type), samples with high blow counts, and unsaturated samples.

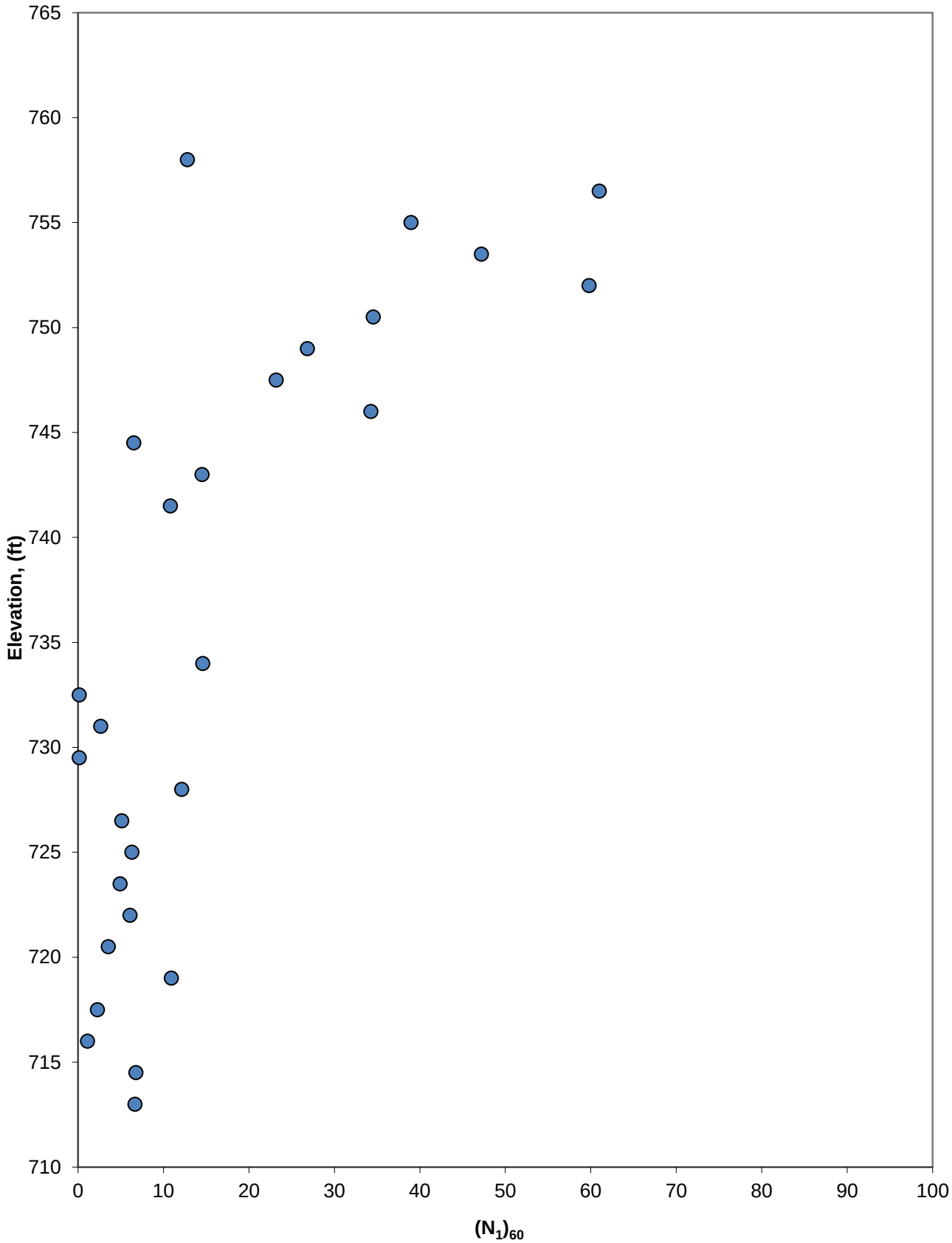
Depth of Mid. Pt. of Sample (ft.) z	Vert. Total Stress during EQ w/ Fill (tsf) $\sigma_{v\ with\ fill}$	Static Pore Pressure during EQ (tsf) u	Vert. Eff. Stress during EQ w/ Fill (tsf) $\sigma'_{v\ with\ fill}$	Clean Sand Correction $\Delta(N_1)_{60cs}$	Equivalent Clean Sand N-Value $(N_1)_{60cs}$	Cyclic Resistance Ratio CRR7.5	Overburden Correction Factor K_σ	Static Shear Stress Correction K_α	Mag. Scaling Factor (MSF)	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Max. Induced Shear Stress (psf)	From Ground Response: Avg. Cyclic Shear Stress (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Blow Count $(N_1)_{60cs} \geq 32$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)
1.0	0.31	0.00	0.31	5.55	18	0.187	1.100	1.174	0.99	0.238	0.995	0	0	0.065	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**
2.5	0.40	0.00	0.40	5.55	67	N/A	N/A	N/A	N/A	N/A	0.992	0	0	0.064	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**
4.0	0.49	0.00	0.49	5.55	45	N/A	N/A	N/A	N/A	N/A	0.988	0	0	0.064	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**
5.5	0.58	0.00	0.58	5.55	53	N/A	N/A	N/A	N/A	N/A	0.984	0	0	0.064	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**
7.0	0.66	0.00	0.66	5.55	65	N/A	N/A	N/A	N/A	N/A	0.980	0	0	0.064	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**
8.5	0.75	0.00	0.75	5.55	40	N/A	N/A	N/A	N/A	N/A	0.976	0	0	0.063	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**
10.0	0.84	0.00	0.84	5.55	32	N/A	N/A	N/A	N/A	N/A	0.971	0	0	0.063	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**
11.5	0.93	0.00	0.93	5.55	29	0.416	1.024	1.744	0.97	0.720	0.966	0	0	0.063	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**
13.0	1.02	0.00	1.02	5.55	40	N/A	N/A	N/A	N/A	N/A	0.961	0	0	0.062	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**
14.5	1.11	0.01	1.10	5.55	12	0.133	0.996	0.991	0.99	0.130	0.956	0	0	0.062	FALSE	FALSE	FALSE	**2.1**	**Bottom Ash**
16.0	1.20	0.05	1.15	5.60	20	0.207	0.989	1.262	0.98	0.254	0.951	0	0	0.065	FALSE	FALSE	FALSE	**3.9**	**Bottom Ash**
17.5	1.29	0.10	1.19	0.00	11	0.124	0.989	0.961	0.99	0.117	0.946	0	0	0.067	FALSE	FALSE	FALSE	**1.8**	**Fly Ash**
25.0	1.71	0.33	1.37	0.00	15	0.153	0.972	1.050	0.99	0.154	0.918	0	0	0.074	FALSE	FALSE	FALSE	**2.1**	**Fly Ash**
26.5	1.79	0.38	1.41	0.00	0	0.061	0.984	0.831	1.00	0.050	0.912	0	0	0.075	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**
28.0	1.87	0.43	1.45	0.00	3	0.073	0.979	0.849	1.00	0.061	0.906	0	0	0.076	FALSE	FALSE	FALSE	**0.8**	**Fly Ash**
29.5	1.96	0.47	1.49	5.58	6	0.090	0.973	0.879	1.00	0.077	0.900	0	0	0.077	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**
31.0	2.06	0.52	1.54	5.58	18	0.181	0.954	1.137	0.99	0.194	0.894	0	0	0.078	FALSE	FALSE	FALSE	**2.5**	**Subunit 2**
32.5	2.15	0.57	1.59	5.58	11	0.123	0.962	0.951	0.99	0.112	0.887	0	0	0.078	FALSE	FALSE	FALSE	**1.4**	**Subunit 2**
34.0	2.25	0.61	1.63	5.58	12	0.132	0.957	0.973	0.99	0.122	0.881	0	0	0.079	FALSE	FALSE	FALSE	**1.5**	**Subunit 2**
35.5	2.34	0.66	1.68	5.58	11	0.122	0.956	0.947	0.99	0.109	0.875	0	0	0.079	FALSE	FALSE	FALSE	**1.4**	**Subunit 2**
37.0	2.44	0.71	1.73	5.58	12	0.130	0.952	0.966	0.99	0.119	0.868	0	0	0.079	FALSE	FALSE	FALSE	**1.5**	**Subunit 2**
38.5	2.53	0.76	1.78	5.58	9	0.112	0.954	0.924	0.99	0.098	0.862	0	0	0.080	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**
40.0	2.63	0.80	1.82	5.58	16	0.169	0.936	1.075	0.99	0.168	0.855	0	0	0.080	FALSE	FALSE	FALSE	**2.1**	**Subunit 2**
41.5	2.72	0.85	1.87	5.58	8	0.104	0.951	0.908	1.00	0.089	0.849	0	0	0.080	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**
43.0	2.81	0.90	1.92	5.58	7	0.096	0.952	0.895	1.00	0.082	0.842	0	0	0.080	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**
44.5	2.91	0.94	1.97	5.58	12	0.135	0.938	0.974	0.99	0.123	0.836	0	0	0.080	FALSE	FALSE	FALSE	**1.5**	**Subunit 2**
46.0	3.01	0.99	2.02	5.36	12	0.133	0.936	0.968	0.99	0.119	0.829	0	0	0.080	FALSE	FALSE	FALSE	**1.5**	**Subunit 3**


Legend
$FS_{liq} \leq 1.1$
$1.1 < FS_{liq} \leq 1.4$
$FS_{liq} > 1.4$
Sand-like, Unliquefiable
Clay-like, Not Susceptible
Clay-like, Susceptible
No Data
KIF-B1, Liquefaction Triggering Results
Top of Boring
El. 759 ft
El. 749
El. 739
El. 729
El. 719

KIF TDEC Stability, Boring ID: KIF-B1, Source = 1 Hz, Mw = 7.6, Event = Design EQ,
SPT Data, Simplified Stress-Based Approach



KIF TDEC Stability, Boring ID: KIF-B1, Source = 1 Hz, Mw = 7.6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



Project Name = KIF TDEC Stability
Boring ID = KIF-B2

Boring Location

Northing =
Easting =

OR

Baseline Station =
Offset (+ Right) =

Drilling Information

Boring Inner Diameter (ID) =	3.25	inches	
Top of Hole Elevation	753.02	feet	
Water Depth during SPT (negative for U/S borings)=	15.5	feet	
Depth Sampling Began	0	feet	
Total Unit Wt. above 1st SPT =	120	pcf	
Assumed Rod Stickup =	5	feet	*(Typ assume 5ft)*
E_m Measurement based on Fv method? =	1	(1: Yes, 0: No)	
SPT Sampler w/ Liners? =	0	(1: Yes, 0: No)	*(Typ. no)*

During EQ Information

Water Depth during EQ (relative to SPT TOH, negative for U/S borings) =	4.6	feet
Final Grade Elevation during EQ	752.2	feet
Average Total Unit Wt. of Cut/Fill	120	pcf

Fines Content Correction

Fines content correction for samples with blow counts of zero? 1 (1: Yes, 0: No)

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile? 0 (1: Yes, 0: No)
If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile: olishingPond, KIF-B2_NOR
Alpha at each sample depth known? 1 (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (α vs. depth curve)
If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_α will be one.

m4:
m3:
m2:
m1:
m0:

Associated ground response profile: olishing_Pond, KIF-B2_NOR
Get CSR from shear stress envelope? 0 (1: Yes, 0: No)
If previous answer is No, then CSR will be calculated using a_{max} and r_d
Max. Shear Stress at each sample depth known? (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4:
m3:
m2:
m1:

Earthquake Information

EQ Source (e.g., New Madrid)	1 Hz
Event (e.g., MCE, 10KEQ, OBE)	Design EQ
a_{max} (g) (top of ground surface)	0.10
EQ Mag (Mw)	7.6

Inputs

Depth of Sample Midpoint (ft.)	SPT N Value	Hammer Efficiency, E_m (%)	Unified Soil Classification	Fines Content (%)	Total Unit Weight (pcf)	Material (optional)	Clay-like / Sand-like Override (optional)	Clay-like Susceptibility (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure during SPT (psf)	Static Pore Water Pressure during EQ (psf)
1.0	5	80	CL	53	128	Embankment Fill	Clay-like	Not Susceptible		0.062			
2.5	21	80		53	128	Embankment Fill	Clay-like	Not Susceptible		0.037			
4.0	15	80		53	128	Embankment Fill	Clay-like	Not Susceptible		0.049			
5.5	20	80		53	128	Embankment Fill	Clay-like	Not Susceptible		0.035			
8.5	21	80		53	128	Embankment Fill	Clay-like	Not Susceptible		0.012			
10.0	22	80		27	128	Embankment Fill	Clay-like	Not Susceptible		0.006			
11.5	17	80		53	128	Embankment Fill	Clay-like	Not Susceptible		0.018			
13.0	15	80		53	128	Embankment Fill	Clay-like	Not Susceptible		0.028			
14.5	13	80		53	128	Embankment Fill	Clay-like	Not Susceptible		0.034			
16.0	5	80		53	128	Embankment Fill	Clay-like	Not Susceptible		0.040			
17.5	5	80		53	128	Embankment Fill	Clay-like	Not Susceptible		0.045			
19.0	3	80		53	128	Embankment Fill	Clay-like	Not Susceptible		0.052			
20.5	2	80		53	128	Embankment Fill	Clay-like	Not Susceptible		0.061			
22.0	3	80		53	128	Embankment Fill	Clay-like	Not Susceptible		0.067			
23.5	3	80		53	128	Embankment Fill	Clay-like	Not Susceptible		0.074			
25.0	0	80		53	128	Embankment Fill	Clay-like	Not Susceptible		0.081			
26.5	0	80		41	126	Subunit 2	Sand-like			0.086			
28.0	1	80		41	126	Subunit 2	Sand-like			0.092			
29.5	2	80		41	126	Subunit 2	Sand-like			0.097			
31.0	2	80		41	126	Subunit 2	Sand-like			0.102			
32.5	3	80		41	126	Subunit 2	Sand-like			0.107			
34.0	6	80		41	126	Subunit 2	Sand-like			0.111			
35.5	7	80		41	126	Subunit 2	Sand-like			0.114			
37.0	6	80		41	126	Subunit 2	Sand-like			0.118			
38.5	5	80		41	126	Subunit 2	Sand-like			0.121			
40.0	2	80		22	131	Subunit 3	Sand-like			0.124			
41.5	12	80		22	131	Subunit 3	Sand-like			0.126			
43.0	48	80		22	131	Subunit 3	Sand-like			0.128			
44.5	76	80		22	131	Subunit 3	Sand-like			0.130			
46.0	63	80		22	131	Subunit 3	Sand-like			0.132			
47.5	76	80		22	131	Subunit 3	Sand-like			0.133			

KIF TDEC Stability, Boring ID: KIF-B2

Liquefaction Potential Evaluations

For Coarse Grained Soils

Elev. Of Mid. Pt. of Sample (ft)	Depth of Mid. Pt. of Sample (ft.)	Unit Weight (pcf)	Vert. Total Stress during SPT (tsf)	Static Pore Pressure during SPT (tsf)	Vert. Eff. Stress during SPT (tsf)	SPT N Value	Hammer Efficiency (%)	Borehole Diameter Correction	Sampler Correction	Rod Length Correction	Overburden Stress Correction Factor	Hammer Energy Correction Factor	Corrected Blow Count	Normalized Blow Count	Relative Density (%)	Unified Soil Classification	Fines Content (%)
	z	γ_T	σ_v	u	σ'_v	N	E_m	C_B	C_s	C_R	C_N	C_E	N_{60}	$(N_1)_{60}$	D_r		

Top of Hole Elevation (ft) = 753.0 | Boring ID = **KIF-B2**

begin sampling (depth-ft) = 0.0 | Boring Inner Dia. (in) = 3.25

total unit wt. above 1st SPT (pcf) = 120

water elevation during SPT (ft) = 737.5 ft *(relative to ground surface during SPT)* | Assumed Rod Stickup = 5.0 feet

water depth during SPT (ft) = 15.5 | E_m Measurement? = 1 (1: Yes, 0: No)

water elevation during EQ (ft) = 748.4 ft *(relative to ground surface during SPT)* | SPT Sampler w/ Liners? = 0 (1: Yes, 0: No)

	u-top	effstr-top
water during EQ (depth-ft) =	4.6	
vert. total stress above 1st SPT (tsf) =	**0.00**	**0.00**	0.00

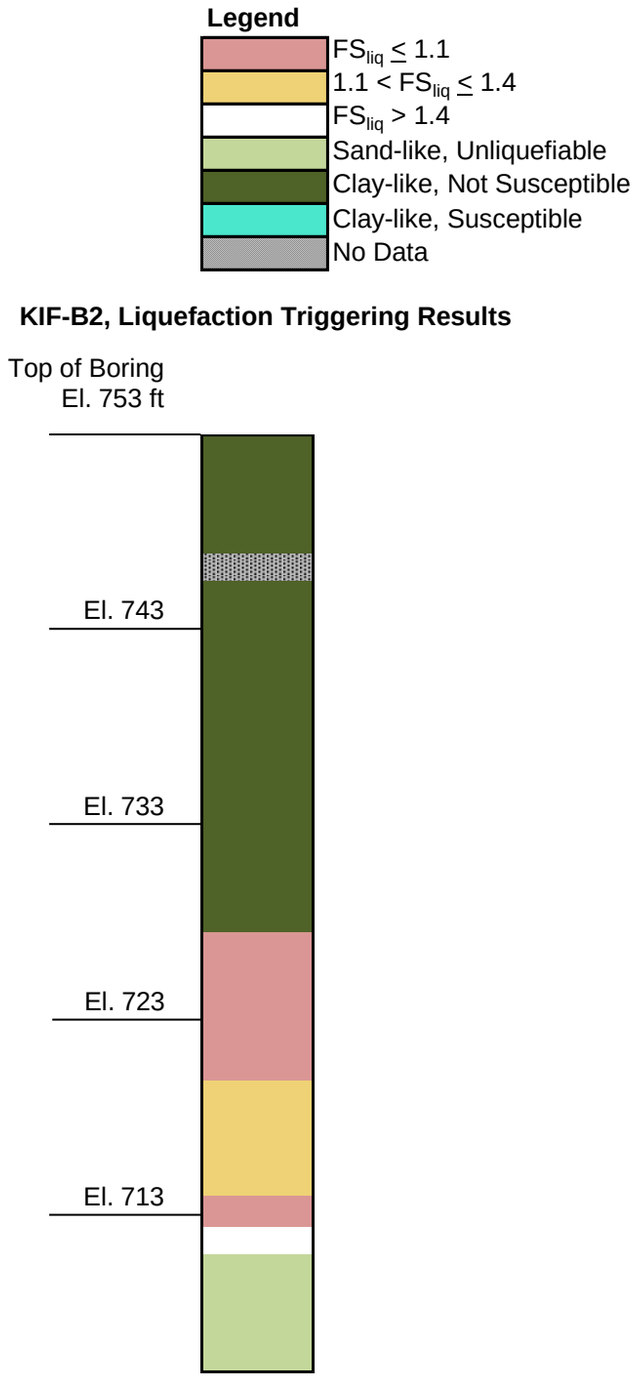
752.0	1.0	128	0.06	0.00	0.06	5	80.0	1.000	1.13	1.00	1.70	1.33	8	13	63	CL	53
750.5	2.5	128	0.16	0.00	0.16	21	80.0	1.000	1.30	1.00	1.64	1.33	36	60	100	0	53
749.0	4.0	128	0.26	0.00	0.26	15	80.0	1.000	1.30	1.00	1.48	1.33	26	38	98	0	53
747.5	5.5	128	0.35	0.00	0.35	20	80.0	1.000	1.30	1.00	1.34	1.33	35	46	100	0	53
744.5	8.5	128	0.54	0.00	0.54	21	80.0	1.000	1.30	1.00	1.19	1.33	36	43	100	0	53
743.0	10.0	128	0.64	0.00	0.64	22	80.0	1.000	1.30	1.00	1.14	1.33	38	44	100	0	27
741.5	11.5	128	0.74	0.00	0.74	17	80.0	1.000	1.30	1.00	1.12	1.33	29	33	92	0	53
740.0	13.0	128	0.83	0.00	0.83	15	80.0	1.000	1.28	1.00	1.09	1.33	26	28	85	0	53
738.5	14.5	128	0.93	0.00	0.93	13	80.0	1.000	1.22	1.00	1.05	1.33	21	22	78	0	53
737.0	16.0	128	1.02	0.02	1.01	5	80.0	1.000	1.10	1.00	1.02	1.33	7	8	53	0	53
735.5	17.5	128	1.12	0.06	1.06	5	80.0	1.000	1.10	1.00	1.00	1.33	7	7	53	0	53
734.0	19.0	128	1.22	0.11	1.11	3	80.0	1.000	1.10	1.00	0.98	1.33	4	4	46	0	53
732.5	20.5	128	1.31	0.16	1.16	2	80.0	1.000	1.10	1.00	0.95	1.33	3	3	43	0	53
731.0	22.0	128	1.41	0.20	1.21	3	80.0	1.000	1.10	1.00	0.93	1.33	4	4	46	0	53
729.5	23.5	128	1.50	0.25	1.25	3	80.0	1.000	1.10	1.00	0.91	1.33	4	4	46	0	53
728.0	25.0	128	1.60	0.30	1.30	0	80.0	1.000	1.10	1.00	0.88	1.33	0	0	35	0	53
726.5	26.5	126	1.70	0.34	1.35	0	80.0	1.000	1.10	1.00	0.86	1.33	0	0	35	0	41
725.0	28.0	126	1.79	0.39	1.40	1	80.0	1.000	1.10	1.00	0.85	1.33	1	1	39	0	41
723.5	29.5	126	1.88	0.44	1.45	2	80.0	1.000	1.10	1.00	0.84	1.33	3	2	42	0	41
722.0	31.0	126	1.98	0.48	1.50	2	80.0	1.000	1.10	1.00	0.82	1.33	3	2	42	0	41
720.5	32.5	126	2.07	0.53	1.54	3	80.0	1.000	1.10	1.00	0.81	1.33	4	4	45	0	41
719.0	34.0	126	2.17	0.58	1.59	6	80.0	1.000	1.10	1.00	0.81	1.33	9	7	53	0	41
717.5	35.5	126	2.26	0.62	1.64	7	80.0	1.000	1.10	1.00	0.80	1.33	10	8	55	0	41
716.0	37.0	126	2.36	0.67	1.69	6	80.0	1.000	1.10	1.00	0.79	1.33	9	7	52	0	41
714.5	38.5	126	2.45	0.72	1.73	5	80.0	1.000	1.10	1.00	0.77	1.33	7	6	49	0	41
713.0	40.0	131	2.55	0.76	1.78	2	80.0	1.000	1.10	1.00	0.74	1.33	3	2	39	0	22
711.5	41.5	131	2.65	0.81	1.83	12	80.0	1.000	1.14	1.00	0.78	1.33	18	14	64	0	22
710.0	43.0	131	2.74	0.86	1.89	48	80.0	1.000	1.30	1.00	0.86	1.33	83	71	100	0	22
708.5	44.5	131	2.84	0.90	1.94	76	80.0	1.000	1.30	1.00	0.85	1.33	132	112	100	0	22
707.0	46.0	131	2.94	0.95	1.99	63	80.0	1.000	1.30	1.00	0.85	1.33	109	92	100	0	22
705.5	47.5	131	3.04	1.00	2.04	76	80.0	1.000	1.30	1.00	0.84	1.33	132	111	100	0	22

KIF TDEC Stability, Boring ID: KIF-B2
Liquefaction Potential Evaluations
For Coarse Grained Soils

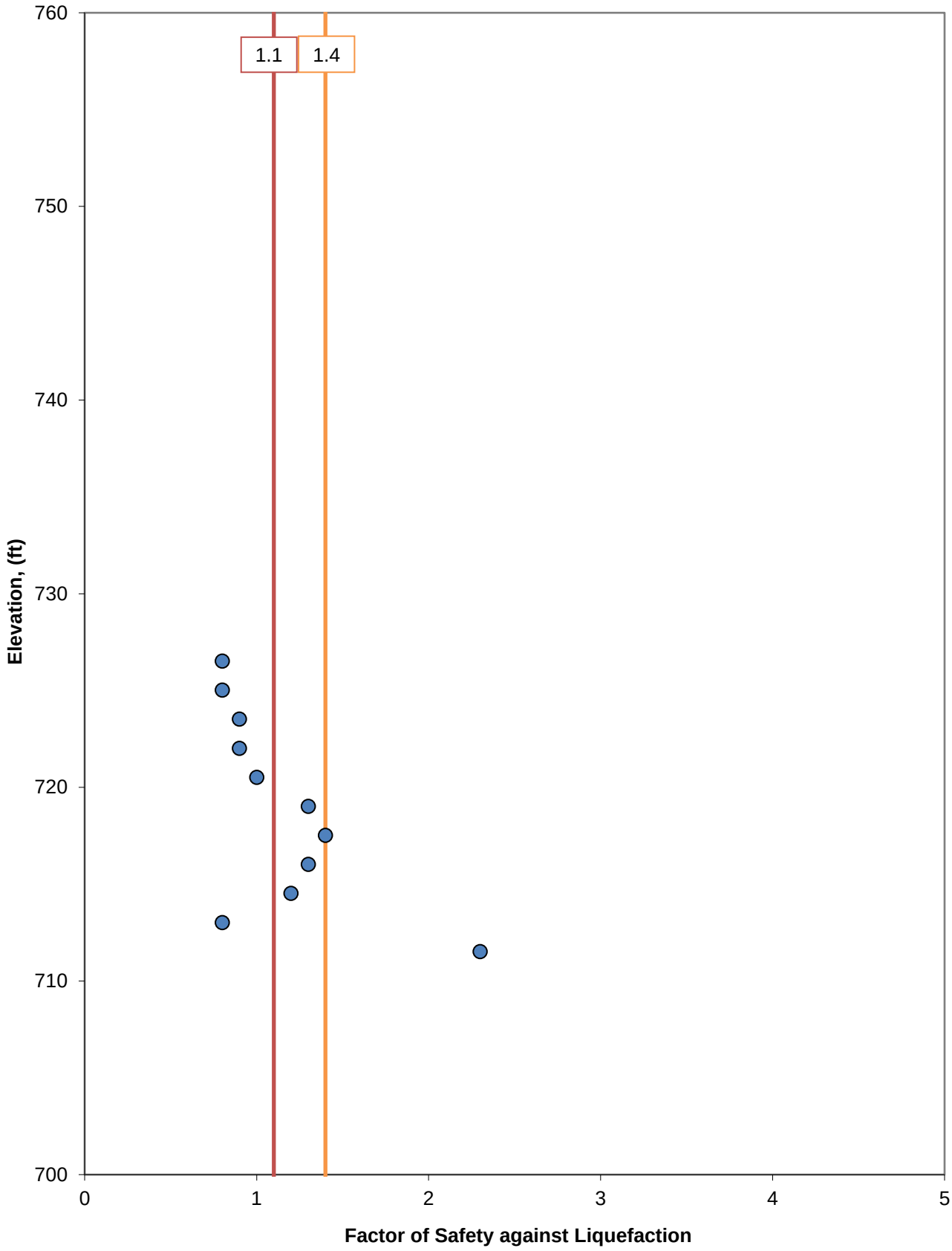
Depth of Mid. Pt. of Sample (ft.) z	Clean Sand Correction $\Delta(N_1)_{60cs}$	Equivalent Clean Sand N-Value $(N_1)_{60cs}$	Sample Screened for: Clay-like	High Blow Count $(N_1)_{60cs} \geq 32$	Unsaturated	Factor of Safety FS_{liq}	Material (optional)
ft			*Note: A factor of safety shown as "N/A" implies that the soil type is not appropriately evaluated using this methodology. This applies to clay-like soils (typically CL, CH, CL-ML and MH material type), samples with high blow counts, and unsaturated samples.*				
ft *(relative to ground surface during SPT)*							
pcf							
tsf							
1.0	5.61	18	TRUE	FALSE	TRUE	**N/A**	**Embankment Fill**
2.5	5.61	65	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**
4.0	5.61	44	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**
5.5	5.61	52	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**
8.5	5.61	49	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**
10.0	5.21	49	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**
11.5	5.61	39	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**
13.0	5.61	33	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**
14.5	5.61	28	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
16.0	5.61	13	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
17.5	5.61	13	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
19.0	5.61	10	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
20.5	5.61	8	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
22.0	5.61	10	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
23.5	5.61	10	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
25.0	5.61	6	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
26.5	5.58	6	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**
28.0	5.58	7	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**
29.5	5.58	8	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**
31.0	5.58	8	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**
32.5	5.58	9	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**
34.0	5.58	13	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**
35.5	5.58	14	FALSE	FALSE	FALSE	**1.4**	**Subunit 2**

KIF TDEC Stability, Boring ID: KIF-B2
Liquefaction Potential Evaluations
For Coarse Grained Soils

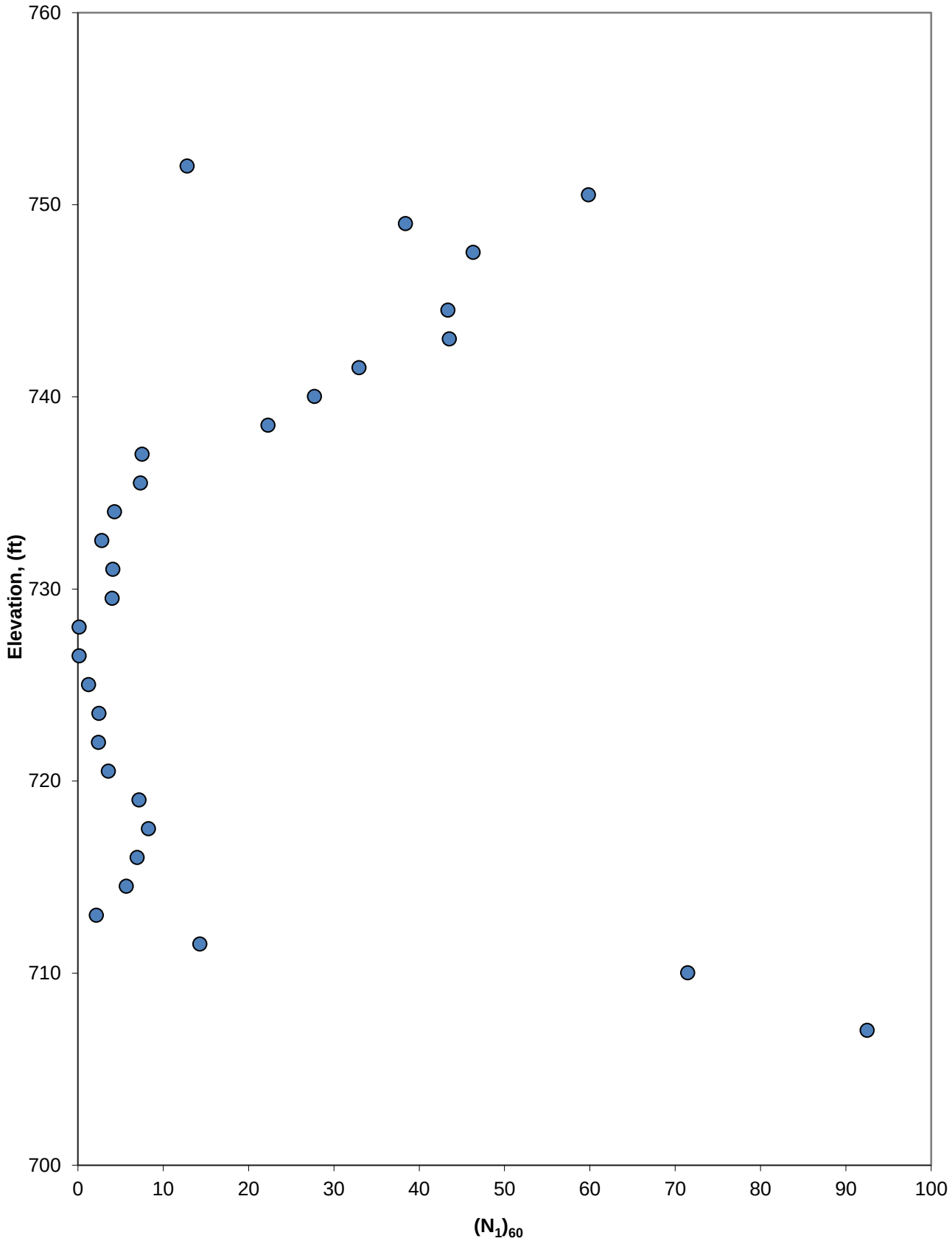
Depth of Mid. Pt. of Sample (ft.) z	Clean Sand Correction $\Delta(N_1)_{60cs}$	Equivalent Clean Sand N-Value $(N_1)_{60cs}$	Sample Screened for: Clay-like	High Blow Count $(N_1)_{60cs} \geq 32$	Unsaturated	Factor of Safety FS_{liq}	Material (optional)
37.0	5.58	13	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**
38.5	5.58	11	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**
40.0	4.77	7	FALSE	FALSE	FALSE	**0.8**	**Subunit 3**
41.5	4.77	19	FALSE	FALSE	FALSE	**2.3**	**Subunit 3**
43.0	4.77	76	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**
44.5	4.77	117	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**
46.0	4.77	97	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**
47.5	4.77	116	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**


Legend
FS$_{liq}$ ≤ 1.1
1.1 < FS$_{liq}$ ≤ 1.4
FS$_{liq}$ > 1.4
Sand-like, Unliquefiable
Clay-like, Not Susceptible
Clay-like, Susceptible
No Data
KIF-B2, Liquefaction Triggering Results
Top of Boring
El. 753 ft
El. 743
El. 733
El. 723
El. 713

KIF TDEC Stability, Boring ID: KIF-B2, Source = 1 Hz, Mw = 7.6, Event = Design EQ,
SPT Data, Simplified Stress-Based Approach



KIF TDEC Stability, Boring ID: KIF-B2, Source = 1 Hz, Mw = 7.6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



Project Name = KIF TDEC Stability
Boring ID = KIF-B3

Boring Location

Northing =
Easting =

OR

Baseline Station =
Offset (+ Right) =

Drilling Information

Boring Inner Diameter (ID) =	3.25	inches	
Top of Hole Elevation	748	feet	
Water Depth during SPT (negative for U/S borings)=	5	feet	
Depth Sampling Began	0	feet	
Total Unit Wt. above 1st SPT =	120	pcf	
Assumed Rod Stickup =	5	feet	*(Typ assume 5ft)*
E_m Measurement based on Fv method? =	1	(1: Yes, 0: No)	
SPT Sampler w/ Liners? =	0	(1: Yes, 0: No)	*(Typ. no)*

During EQ Information

Water Depth during EQ (relative to SPT TOH, negative for U/S borings) =	8.9	feet
Final Grade Elevation during EQ	750.5	feet
Average Total Unit Wt. of Cut/Fill	120	pcf

Fines Content Correction

Fines content correction for samples with blow counts of zero? 1 (1: Yes, 0: No)

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile? 0 (1: Yes, 0: No)
If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile: olishingPond, KIF-B3_NOR
Alpha at each sample depth known? 1 (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (α vs. depth curve)
If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_α will be one.

m4:
m3:
m2:
m1:
m0:

Associated ground response profile: olishing_Pond, KIF-B3_NOR
Get CSR from shear stress envelope? 0 (1: Yes, 0: No)
If previous answer is No, then CSR will be calculated using a_{max} and r_d
Max. Shear Stress at each sample depth known? (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4:
m3:
m2:
m1:

Earthquake Information

EQ Source (e.g., New Madrid)	1 Hz
Event (e.g., MCE, 10KEQ, OBE)	Design EQ
a_{max} (g) (top of ground surface)	0.10
EQ Mag (Mw)	7.6

Inputs

Depth of Sample Midpoint (ft.)	SPT N Value	Hammer Efficiency, E_m (%)	Unified Soil Classification	Fines Content (%)	Total Unit Weight (pcf)	Material (optional)	Clay-like / Sand-like Override (optional)	Clay-like Susceptibility (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure during SPT (psf)	Static Pore Water Pressure during EQ (psf)
1.0	2	80	CL	53	128	Embankment Fill	Clay-like	Not Susceptible		0.015			
2.5	21	80		53	128	Embankment Fill	Clay-like	Not Susceptible		0.017			
4.0	15	80		53	128	Embankment Fill	Clay-like	Not Susceptible		0.022			
5.5	21	80		53	128	Embankment Fill	Clay-like	Not Susceptible		0.044			
7.0	19	80		53	128	Embankment Fill	Clay-like	Not Susceptible		0.067			
8.5	27	80		53	128	Embankment Fill	Clay-like	Not Susceptible		0.073			
10.0	28	80		53	128	Embankment Fill	Clay-like	Not Susceptible		0.093			
11.5	15	80		53	128	Embankment Fill	Clay-like	Not Susceptible		0.103			
13.0	11	80		53	128	Embankment Fill	Clay-like	Not Susceptible		0.113			
14.5	8	80		53	128	Embankment Fill	Clay-like	Not Susceptible		0.123			
16.0	5	80		53	128	Embankment Fill	Clay-like	Not Susceptible		0.134			
17.5	3	80		53	128	Embankment Fill	Clay-like	Not Susceptible		0.141			
19.0	3	80		53	128	Embankment Fill	Clay-like	Not Susceptible		0.147			
20.5	5	80		36	128	Embankment Fill	Clay-like	Not Susceptible		0.149			
22.0	4	80		53	128	Embankment Fill	Clay-like	Not Susceptible		0.151			
23.5	3	80		47	126	Subunit 2	Sand-like			0.153			
27.0	11	80		47	126	Subunit 2	Sand-like			0.155			
28.5	14	80		47	126	Subunit 2	Sand-like			0.156			
30.0	13	80		47	126	Subunit 2	Sand-like			0.154			
31.5	8	80		47	126	Subunit 2	Sand-like			0.155			
33.0	2	80		47	126	Subunit 2	Sand-like			0.155			
34.5	8	80		47	126	Subunit 2	Sand-like			0.155			
36.0	7	80		28	131	Subunit 3	Sand-like			0.155			
37.5	39	80		28	131	Subunit 3	Sand-like			0.155			
39.0	51	80		28	131	Subunit 3	Sand-like			0.155			

KIF TDEC Stability, Boring ID: KIF-B3

Liquefaction Potential Evaluations

For Coarse Grained Soils

Elev. Of Mid. Pt. of Sample (ft)	Depth of Mid. Pt. of Sample (ft.)	Unit Weight (pcf)	Vert. Total Stress during SPT (tsf)	Static Pore Pressure during SPT (tsf)	Vert. Eff. Stress during SPT (tsf)	SPT N Value	Hammer Efficiency (%)	Borehole Diameter Correction	Sampler Correction	Rod Length Correction	Overburden Stress Correction Factor	Hammer Energy Correction Factor	Corrected Blow Count	Normalized Blow Count	Relative Density (%)	Unified Soil Classification	Fines Content (%)
	z	γ_T	σ_v	u	σ'_v	N	E_m	C_B	C_s	C_R	C_N	C_E	N_{60}	$(N_1)_{60}$	D_r		

Top of Hole Elevation (ft) = 748.0 | Boring ID = **KIF-B3**

begin sampling (depth-ft) = 0.0 | Boring Inner Dia. (in) = 3.25

total unit wt. above 1st SPT (pcf) = 120

water elevation during SPT (ft) = 743.0 ft *(relative to ground surface during SPT)* | Assumed Rod Stickup = 5.0 feet

water depth during SPT (ft) = 5.0 | E_m Measurement? = 1 (1: Yes, 0: No)

water elevation during EQ (ft) = 739.1 ft *(relative to ground surface during SPT)* | SPT Sampler w/ Liners? = 0 (1: Yes, 0: No)

	u-top	effstr-top
water during EQ (depth-ft) =	8.9	
vert. total stress above 1st SPT (tsf) =	**0.00**	0.00

747.0	1.0	128	0.06	0.00	0.06	2	80.0	1.000	1.10	1.00	1.70	1.33	3	5	48	CL	53
745.5	2.5	128	0.16	0.00	0.16	21	80.0	1.000	1.30	1.00	1.64	1.33	36	60	100	0	53
744.0	4.0	128	0.26	0.00	0.26	15	80.0	1.000	1.30	1.00	1.48	1.33	26	38	98	0	53
742.5	5.5	128	0.35	0.02	0.34	21	80.0	1.000	1.30	1.00	1.35	1.33	36	49	100	0	53
741.0	7.0	128	0.45	0.06	0.39	19	80.0	1.000	1.30	1.00	1.30	1.33	33	43	100	0	53
739.5	8.5	128	0.54	0.11	0.43	27	80.0	1.000	1.30	1.00	1.26	1.33	47	59	100	0	53
738.0	10.0	128	0.64	0.16	0.48	28	80.0	1.000	1.30	1.00	1.23	1.33	49	60	100	0	53
736.5	11.5	128	0.74	0.20	0.53	15	80.0	1.000	1.30	1.00	1.24	1.33	26	32	91	0	53
735.0	13.0	128	0.83	0.25	0.58	11	80.0	1.000	1.22	1.00	1.25	1.33	18	22	78	0	53
733.5	14.5	128	0.93	0.30	0.63	8	80.0	1.000	1.15	1.00	1.25	1.33	12	15	68	0	53
732.0	16.0	128	1.02	0.34	0.68	5	80.0	1.000	1.10	1.00	1.24	1.33	7	9	57	0	53
730.5	17.5	128	1.12	0.39	0.73	3	80.0	1.000	1.10	1.00	1.22	1.33	4	5	49	0	53
729.0	19.0	128	1.22	0.44	0.78	3	80.0	1.000	1.10	1.00	1.18	1.33	4	5	48	0	53
727.5	20.5	128	1.31	0.48	0.83	5	80.0	1.000	1.10	1.00	1.13	1.33	7	8	55	0	36
726.0	22.0	128	1.41	0.53	0.88	4	80.0	1.000	1.10	1.00	1.10	1.33	6	6	51	0	53
724.5	23.5	126	1.50	0.58	0.93	3	80.0	1.000	1.10	1.00	1.07	1.33	4	5	47	0	47
721.0	27.0	126	1.72	0.69	1.04	11	80.0	1.000	1.17	1.00	1.01	1.33	17	17	71	0	47
719.5	28.5	126	1.82	0.73	1.09	14	80.0	1.000	1.23	1.00	0.99	1.33	23	23	78	0	47
718.0	30.0	126	1.91	0.78	1.13	13	80.0	1.000	1.20	1.00	0.97	1.33	21	20	75	0	47
716.5	31.5	126	2.01	0.83	1.18	8	80.0	1.000	1.11	1.00	0.95	1.33	12	11	61	0	47
715.0	33.0	126	2.10	0.87	1.23	2	80.0	1.000	1.10	1.00	0.92	1.33	3	3	42	0	47
713.5	34.5	126	2.20	0.92	1.28	8	80.0	1.000	1.11	1.00	0.92	1.33	12	11	60	0	47
712.0	36.0	131	2.29	0.97	1.33	7	80.0	1.000	1.10	1.00	0.90	1.33	10	9	56	0	28
710.5	37.5	131	2.39	1.01	1.38	39	80.0	1.000	1.30	1.00	0.93	1.33	68	63	100	0	28
709.0	39.0	131	2.49	1.06	1.43	51	80.0	1.000	1.30	1.00	0.92	1.33	88	82	100	0	28

KIF TDEC Stability, Boring ID: KIF-B3
Liquefaction Potential Evaluations
For Coarse Grained Soils

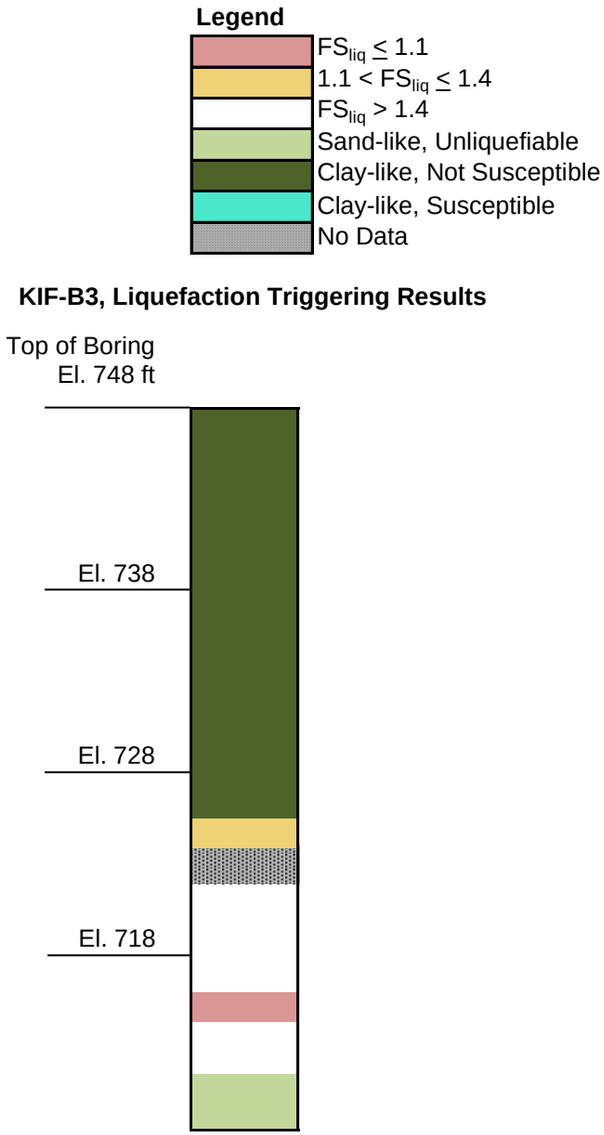
Depth of Mid. Pt. of Sample (ft.) z	Clean Sand Correction $\Delta(N_1)_{60cs}$	Equivalent Clean Sand N-Value $(N_1)_{60cs}$	Sample Screened for: Clay-like	High Blow Count $(N_1)_{60cs} \geq 32$	Unsaturated	Factor of Safety FS_{liq}	Material (optional)
ft							
ft *(relative to ground surface during SPT)*							
pcf							
tsf							

Note: A factor of safety shown as "N/A" implies that the soil type is not appropriately evaluated using this methodology. This applies to clay-like soils (typically CL, CH, CL-ML and MH material type), samples with high blow counts, and unsaturated samples.

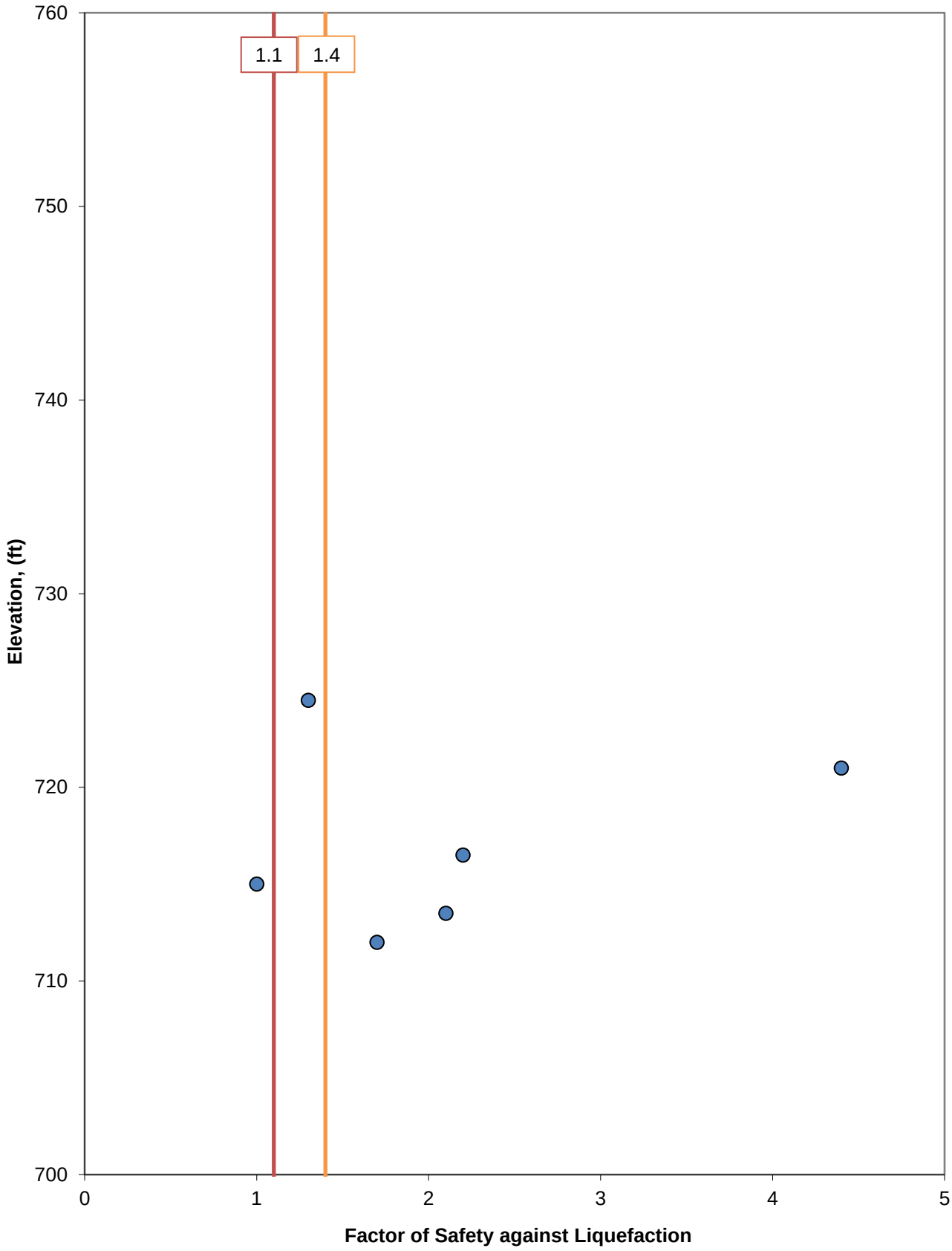
1.0	5.61	11	TRUE	FALSE	TRUE	**N/A**	**Embankment Fill**
2.5	5.61	65	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**
4.0	5.61	44	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**
5.5	5.61	55	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**
7.0	5.61	49	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**
8.5	5.61	65	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**
10.0	5.61	65	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**
11.5	5.61	38	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**
13.0	5.61	28	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
14.5	5.61	21	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
16.0	5.61	15	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
17.5	5.61	11	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
19.0	5.61	11	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
20.5	5.52	14	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
22.0	5.61	12	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
23.5	5.61	10	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**
27.0	5.61	23	FALSE	FALSE	FALSE	**4.4**	**Subunit 2**
28.5	5.61	28	FALSE	FALSE	FALSE	**8.8**	**Subunit 2**
30.0	5.61	26	FALSE	FALSE	FALSE	**6.2**	**Subunit 2**
31.5	5.61	17	FALSE	FALSE	FALSE	**2.2**	**Subunit 2**
33.0	5.61	8	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**
34.5	5.61	16	FALSE	FALSE	FALSE	**2.1**	**Subunit 2**
36.0	5.27	14	FALSE	FALSE	FALSE	**1.7**	**Subunit 3**

KIF TDEC Stability, Boring ID: KIF-B3
Liquefaction Potential Evaluations
For Coarse Grained Soils

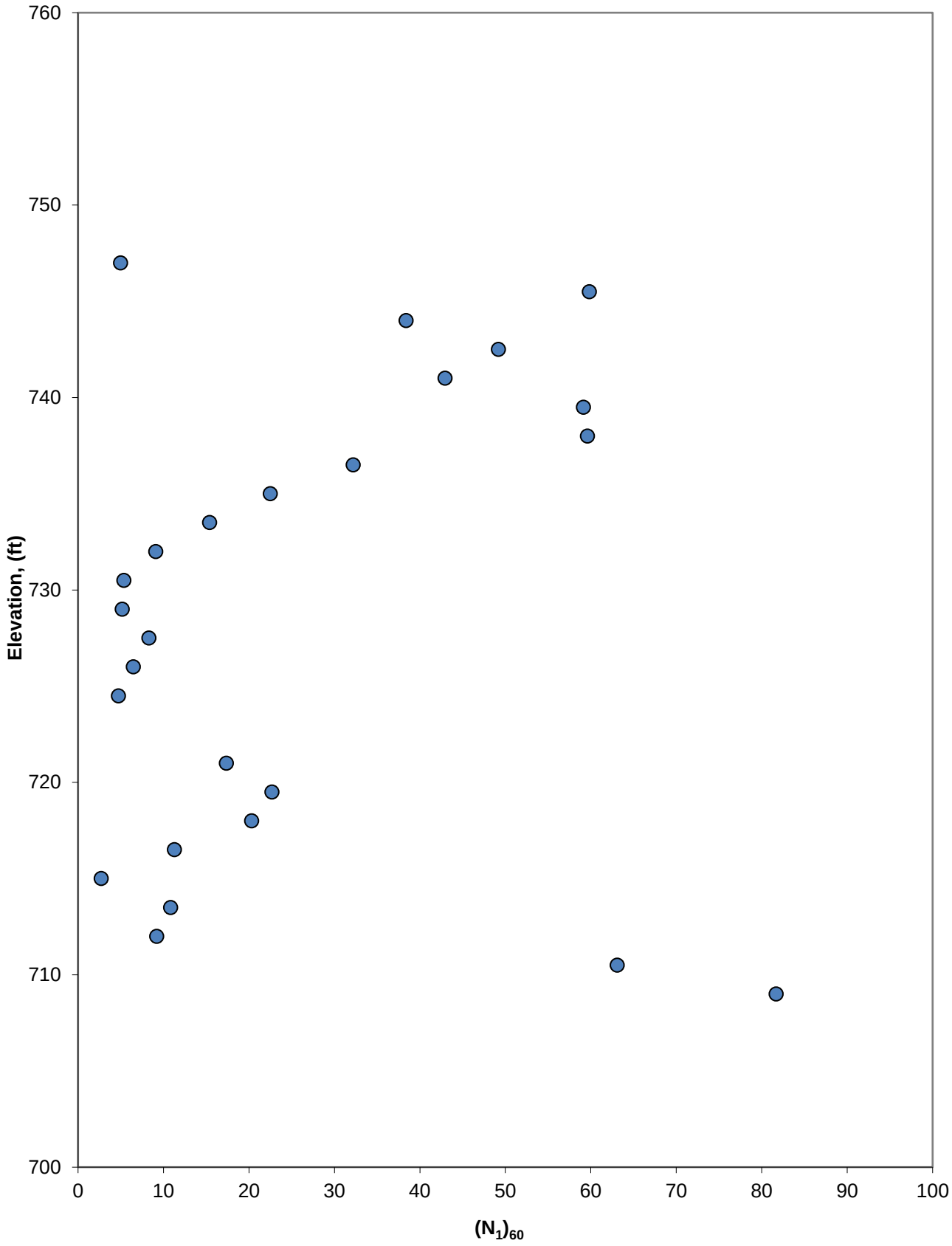
Depth of Mid. Pt. of Sample (ft.) z	Clean Sand Correction $\Delta(N_1)_{60cs}$	Equivalent Clean Sand N-Value $(N_1)_{60cs}$	Sample Screened for: Clay-like	High Blow Count $(N_1)_{60cs} \geq 32$	Unsaturated	Factor of Safety FS_{liq}	Material (optional)
37.5	5.27	68	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**
39.0	5.27	87	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**


Legend
$FS_{liq} \leq 1.1$
$1.1 < FS_{liq} \leq 1.4$
$FS_{liq} > 1.4$
Sand-like, Unliquefiable
Clay-like, Not Susceptible
Clay-like, Susceptible
No Data
KIF-B3, Liquefaction Triggering Results
Top of Boring
El. 748 ft
El. 738
El. 728
El. 718

KIF TDEC Stability, Boring ID: KIF-B3, Source = 1 Hz, Mw = 7.6, Event = Design EQ,
SPT Data, Simplified Stress-Based Approach



KIF TDEC Stability, Boring ID: KIF-B3, Source = 1 Hz, Mw = 7.6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



Project Name = KIF TDEC Stability
Boring ID = KIF-B35

Boring Location

Northing =
Easting =

OR

Baseline Station =
Offset (+ Right) =

Drilling Information

Boring Inner Diameter (ID) =	3.25	inches	
Top of Hole Elevation	766.1	feet	
Water Depth during SPT (negative for U/S borings)=	8.5	feet	
Depth Sampling Began	0	feet	
Total Unit Wt. above 1st SPT =	120	pcf	
Assumed Rod Stickup =	5	feet	*(Typ assume 5ft)*
E_m Measurement based on Fv method? =	1	(1: Yes, 0: No)	
SPT Sampler w/ Liners? =	0	(1: Yes, 0: No)	*(Typ. no)*

During EQ Information

Water Depth during EQ (relative to SPT TOH, negative for U/S borings) =	7	feet
Final Grade Elevation during EQ	763	feet
Average Total Unit Wt. of Cut/Fill	120	pcf

Fines Content Correction

Fines content correction for samples with blow counts of zero? 1 (1: Yes, 0: No)

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile? 0 (1: Yes, 0: No)
If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile: ng_Pond_Section, KIF-B1_NOR
Alpha at each sample depth known? 1 (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (α vs. depth curve)
If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_α will be one.

m4:
m3:
m2:
m1:
m0:

Associated ground response profile: shing_Pond_Section, KIF-B35
Get CSR from shear stress envelope? 0 (1: Yes, 0: No)
If previous answer is No, then CSR will be calculated using a_{max} and r_d
Max. Shear Stress at each sample depth known? (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4:
m3:
m2:
m1:

Earthquake Information

EQ Source (e.g., New Madrid)	1 Hz
Event (e.g., MCE, 10KEQ, OBE)	Design EQ
a_{max} (g) (top of ground surface)	0.10
EQ Mag (Mw)	7.6

Inputs

Depth of Sample Midpoint (ft.)	SPT N Value	Hammer Efficiency, E_m (%)	Unified Soil Classification	Fines Content (%)	Total Unit Weight (pcf)	Material (optional)	Clay-like / Sand-like Override (optional)	Clay-like Susceptibility (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure during SPT (psf)	Static Pore Water Pressure during EQ (psf)
2.5	28	80	ML	53	112	Fly Ash	Sand-like		Do Not Correct for FC	0.056			
7.0	10	80		53	112	Fly Ash	Sand-like		Do Not Correct for FC	0.070			
8.5	5	80		53	112	Fly Ash	Sand-like		Do Not Correct for FC	0.073			
10.0	7	80		53	112	Fly Ash	Sand-like		Do Not Correct for FC	0.078			
15.0	3	80		53	112	Fly Ash	Sand-like		Do Not Correct for FC	0.093			
20.0	23	80		15	119	Bottom Ash	Sand-like			0.100			
25.0	11	80		15	119	Bottom Ash	Sand-like			0.100			
30.0	3	80		15	119	Bottom Ash	Sand-like			0.104			
35.0	0	80		79	127	Subunit 1	Clay-like	Not Susceptible		0.102			
40.0	7	80		79	127	Subunit 1	Clay-like	Not Susceptible		0.097			
45.0	2	80		48	126	Subunit 2	Sand-like			0.093			
50.0	1	80		28	131	Subunit 3	Sand-like			0.090			
55.0	0	80		28	131	Subunit 3	Sand-like			0.091			

KIF TDEC Stability, Boring ID: KIF-B35

Liquefaction Potential Evaluations

For Coarse Grained Soils

Elev. Of Mid. Pt. of Sample (ft)	Depth of Mid. Pt. of Sample (ft.)	Unit Weight (pcf)	Vert. Total Stress during SPT (tsf)	Static Pore Pressure during SPT (tsf)	Vert. Eff. Stress during SPT (tsf)	SPT N Value	Hammer Efficiency (%)	Borehole Diameter Correction	Sampler Correction	Rod Length Correction	Overburden Stress Correction Factor	Hammer Energy Correction Factor	Corrected Blow Count	Normalized Blow Count	Relative Density (%)	Unified Soil Classification	Fines Content (%)	Relative State Parameter Index	Static Shear Stress Ratio
	z	γ_T	σ_v	u	σ'_v	N	E_m	C_B	C_s	C_R	C_N	C_E	N_{60}	$(N_1)_{60}$	D_r			ξ_R	α

	Top of Hole Elevation (ft)		766.1				Boring ID =	KIF-B35											
	begin sampling (depth-ft)		0.0				Boring Inner Dia. (in) =	3.25											
	total unit wt. above 1st SPT (pcf) =		120																
	water elevation during SPT (ft) =		757.6	ft *(relative to ground surface during SPT)*							Assumed Rod Stickup =	5.0	feet						
	water depth during SPT (ft) =		8.5								E_m Measurement? =	1	(1: Yes, 0: No)						
	water elevation during EQ (ft) =		759.1	ft *(relative to ground surface during SPT)*							SPT Sampler w/ Liners? =	0	(1: Yes, 0: No)						
	water during EQ (depth-ft) =		7.0	u-top	effstr-top														
	vert. total stress above 1st SPT (tsf) =		**0.00**	**0.00**	0.00														
763.6	2.5	112	0.14	0.00	0.14	28	80.0	1.000	1.30	1.00	1.70	1.33	49	83	100	ML	53	#NUM!	0.056
759.1	7.0	112	0.39	0.00	0.39	10	80.0	1.000	1.25	1.00	1.49	1.33	17	25	73	0	53	-0.60	0.070
757.6	8.5	112	0.48	0.00	0.48	5	80.0	1.000	1.11	1.00	1.52	1.33	7	11	50	0	53	-0.36	0.073
756.1	10.0	112	0.56	0.05	0.51	7	80.0	1.000	1.15	1.00	1.42	1.33	11	15	58	0	53	-0.44	0.078
751.1	15.0	112	0.84	0.20	0.64	3	80.0	1.000	1.10	1.00	1.35	1.33	4	6	36	0	53	-0.21	0.093
746.1	20.0	119	1.13	0.36	0.77	23	80.0	1.000	1.30	1.00	1.09	1.33	40	43	100	0	15	-0.60	0.100
741.1	25.0	119	1.43	0.51	0.91	11	80.0	1.000	1.19	1.00	1.07	1.33	17	19	69	0	15	-0.53	0.100
736.1	30.0	119	1.72	0.67	1.05	3	80.0	1.000	1.10	1.00	1.00	1.33	4	4	41	0	15	-0.24	0.104
731.1	35.0	127	2.03	0.83	1.20	0	80.0	1.000	1.10	1.00	0.93	1.33	0	0	35	0	79	-0.18	0.102
726.1	40.0	127	2.35	0.98	1.37	7	80.0	1.000	1.10	1.00	0.88	1.33	10	9	56	0	79	-0.39	0.097
721.1	45.0	126	2.67	1.14	1.53	2	80.0	1.000	1.10	1.00	0.81	1.33	3	2	42	0	48	-0.24	0.093
716.1	50.0	131	2.99	1.29	1.69	1	80.0	1.000	1.10	1.00	0.76	1.33	1	1	37	0	28	-0.19	0.090
711.1	55.0	131	3.31	1.45	1.86	0	80.0	1.000	1.10	1.00	0.71	1.33	0	0	34	0	28	-0.16	0.091

KIF TDEC Stability, Boring ID: KIF-B35
Liquefaction Potential Evaluations
For Coarse Grained Soils

EQ Source	a max (g)	EQ Mag (Mw)	Event
1 Hz	0.10	7.6	Design EQ

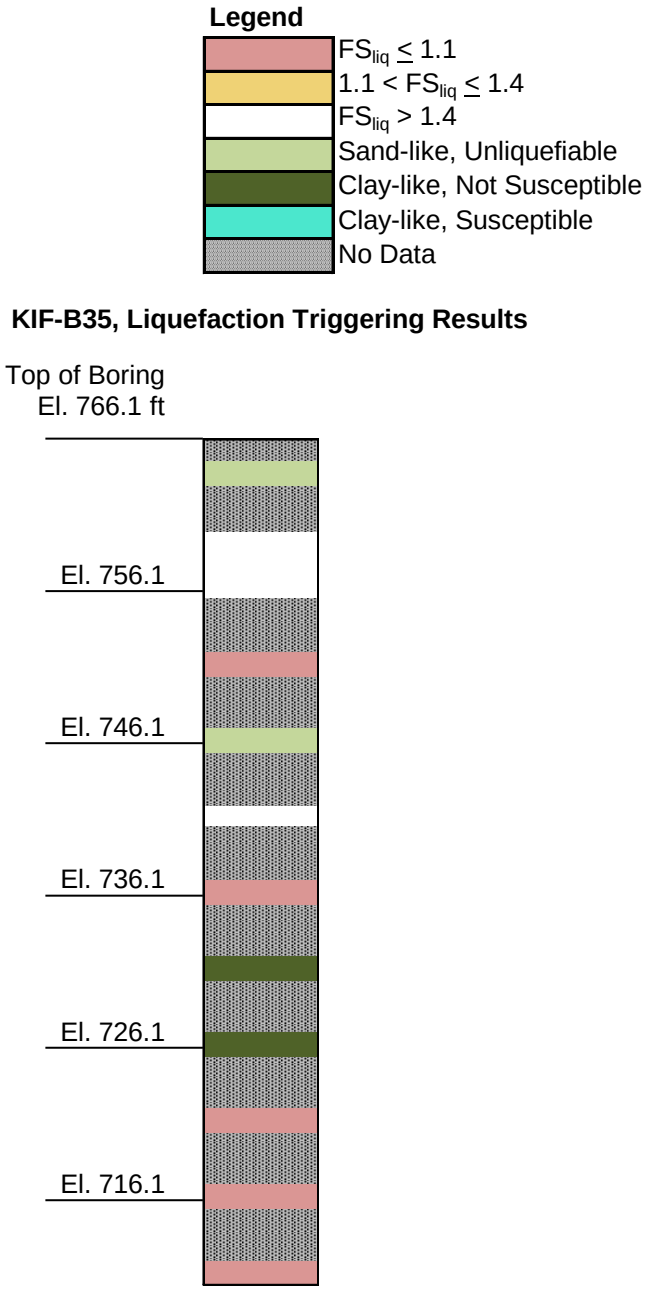
Shear Stress Curve Fit Parameters
m4: 0
m3: 0
m2: 0
m1: 0

Boring ID: **KIF-B35**
Top of Fill Elevation: 763.0 ft
Fill Height: -3.1 ft *(relative to ground surface during SPT)*
Fill Total Unit Weight: 120 pcf
Fill Total Stress: -0.19 tsf

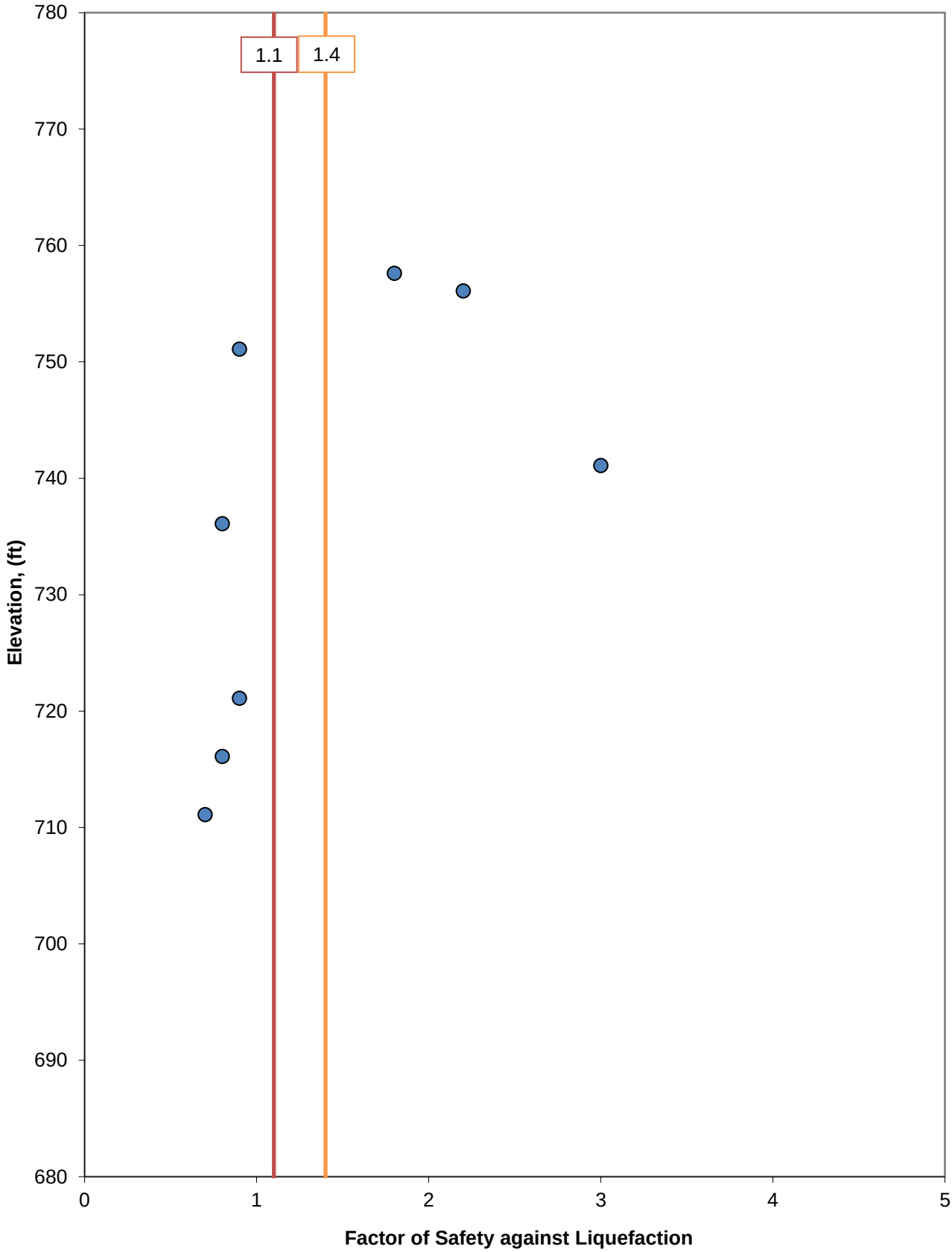
totstr-top	u-top	effstr-top
-0.19	0.00	-0.19

Note: A factor of safety shown as "N/A" implies that the soil type is not appropriately evaluated using this methodology. This applies to clay-like soils (typically CL, CH, CL-ML and MH material type), samples with high blow counts, and unsaturated samples.

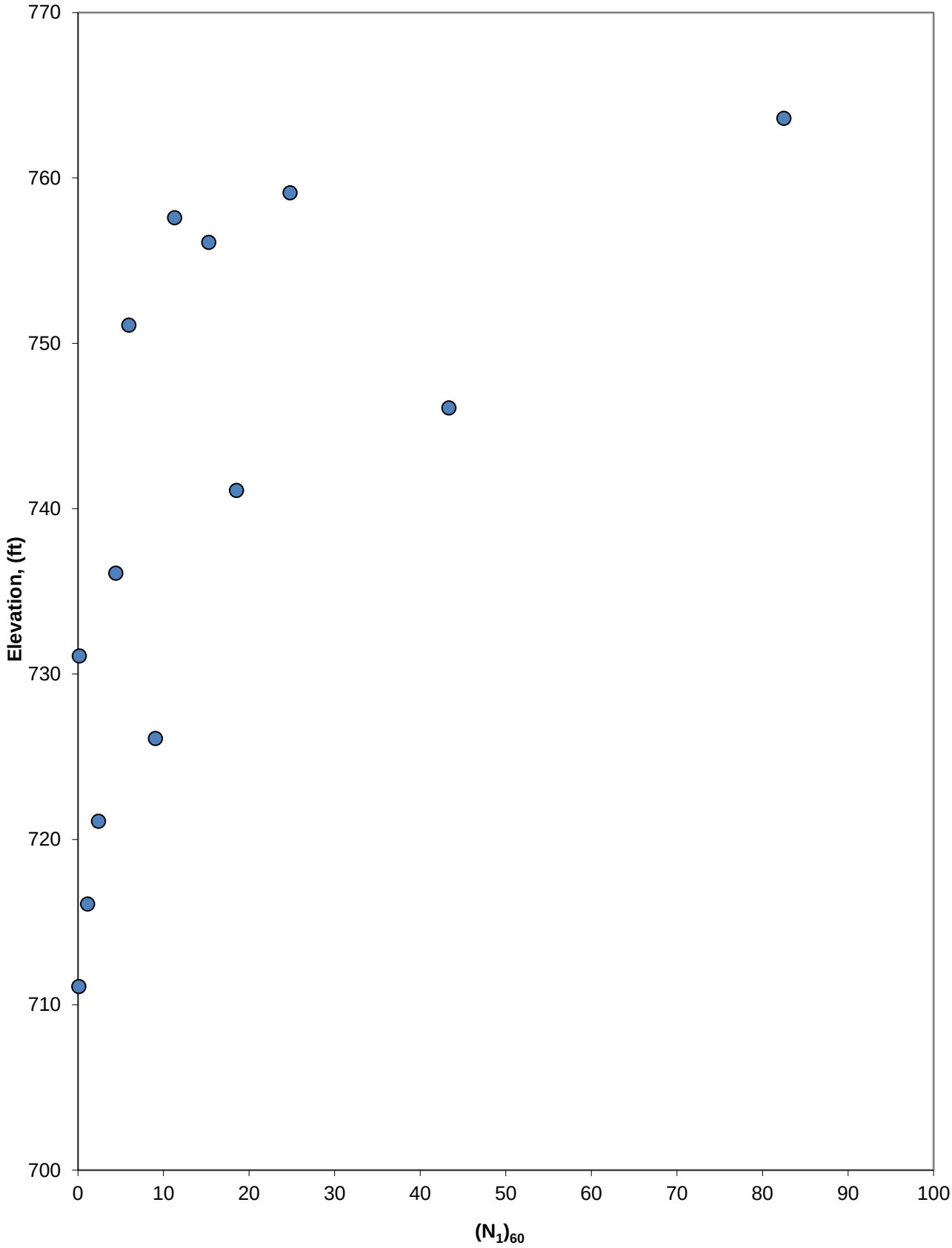
Depth of Mid. Pt. of Sample (ft.) z	Vert. Total Stress during EQ w/ Fill (tsf) $\sigma_{v\ with\ fill}$	Static Pore Pressure during EQ (tsf) u	Vert. Eff. Stress during EQ w/ Fill (tsf) $\sigma'_{v\ with\ fill}$	Clean Sand Correction $\Delta(N_1)_{60cs}$	Equivalent Clean Sand N-Value $(N_1)_{60cs}$	Cyclic Resistance Ratio CRR7.5	Overburden Correction Factor K_σ	Static Shear Stress Correction K_α	Mag. Scaling Factor (MSF)	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Max. Induced Shear Stress (psf)	From Ground Response: Avg. Cyclic Shear Stress (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Blow Count $(N_1)_{60cs} \geq 32$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)
2.5	-0.05	0.00	-0.05	0.00	83	N/A	N/A	N/A	N/A	N/A	1.000	0	0	0.065	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**
7.0	0.21	0.00	0.21	0.00	25	0.285	1.100	1.498	0.98	0.459	0.998	0	0	0.065	FALSE	FALSE	FALSE	**7.1**	**Fly Ash**
8.5	0.29	0.05	0.24	0.00	11	0.127	1.100	0.996	0.99	0.138	0.995	0	0	0.077	FALSE	FALSE	FALSE	**1.8**	**Fly Ash**
10.0	0.37	0.09	0.28	0.00	15	0.158	1.100	1.095	0.99	0.189	0.991	0	0	0.086	FALSE	FALSE	FALSE	**2.2**	**Fly Ash**
15.0	0.65	0.25	0.40	0.00	6	0.092	1.076	0.902	1.00	0.089	0.978	0	0	0.102	FALSE	FALSE	FALSE	**0.9**	**Fly Ash**
20.0	0.94	0.41	0.54	3.26	47	N/A	N/A	N/A	N/A	N/A	0.962	0	0	0.109	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**
25.0	1.24	0.56	0.68	3.26	22	0.230	1.063	1.399	0.98	0.335	0.945	0	0	0.112	FALSE	FALSE	FALSE	**3.0**	**Bottom Ash**
30.0	1.54	0.72	0.82	3.26	8	0.102	1.022	0.912	1.00	0.095	0.926	0	0	0.112	FALSE	FALSE	FALSE	**0.8**	**Bottom Ash**
35.0	1.85	0.87	0.97	5.55	6	N/A	N/A	N/A	1.00	N/A	0.907	0	0	0.112	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
40.0	2.16	1.03	1.13	5.55	15	N/A	N/A	N/A	0.99	N/A	0.886	0	0	0.110	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
45.0	2.48	1.19	1.29	5.61	8	0.105	0.983	0.914	0.99	0.093	0.865	0	0	0.107	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**
50.0	2.80	1.34	1.46	5.27	6	0.094	0.974	0.895	1.00	0.082	0.843	0	0	0.105	FALSE	FALSE	FALSE	**0.8**	**Subunit 3**
55.0	3.13	1.50	1.63	5.27	5	0.088	0.967	0.883	1.00	0.075	0.821	0	0	0.102	FALSE	FALSE	FALSE	**0.7**	**Subunit 3**


Legend
FS$_{liq}$ ≤ 1.1
1.1 < FS$_{liq}$ ≤ 1.4
FS$_{liq}$ > 1.4
Sand-like, Unliquefiable
Clay-like, Not Susceptible
Clay-like, Susceptible
No Data
KIF-B35, Liquefaction Triggering Results
Top of Boring
El. 766.1 ft
El. 756.1
El. 746.1
El. 736.1
El. 726.1
El. 716.1

KIF TDEC Stability, Boring ID: KIF-B35, Source = 1 Hz, Mw = 7.6, Event = Design EQ,
SPT Data, Simplified Stress-Based Approach



KIF TDEC Stability, Boring ID: KIF-B35, Source = 1 Hz, Mw = 7.6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



Project Name = KIF TDEC Stability
Boring ID = KIF-B39

Boring Location

Northing =
Easting =

OR

Baseline Station =
Offset (+ Right) =

Drilling Information

Boring Inner Diameter (ID) =	3.25	inches	
Top of Hole Elevation	769.1	feet	
Water Depth during SPT (negative for U/S borings)=	17.5	feet	
Depth Sampling Began	0	feet	
Total Unit Wt. above 1st SPT =	120	pcf	
Assumed Rod Stickup =	5	feet	*(Typ assume 5ft)*
E_m Measurement based on Fv method? =	1	(1: Yes, 0: No)	
SPT Sampler w/ Liners? =	0	(1: Yes, 0: No)	*(Typ. no)*

During EQ Information

Water Depth during EQ (relative to SPT TOH, negative for U/S borings) =	17.5	feet
Final Grade Elevation during EQ	769.1	feet
Average Total Unit Wt. of Cut/Fill	120	pcf

Fines Content Correction

Fines content correction for samples with blow counts of zero? 1 (1: Yes, 0: No)

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile? 0 (1: Yes, 0: No)
If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile: ng_Pond_Section, KIF-B1_NOR
Alpha at each sample depth known? 1 (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (α vs. depth curve)
If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_α will be one.

m4:
m3:
m2:
m1:
m0:

Associated ground response profile: ection_AA, KIF-B39_NOR
Get CSR from shear stress envelope? 0 (1: Yes, 0: No)
If previous answer is No, then CSR will be calculated using a_{max} and r_d
Max. Shear Stress at each sample depth known? (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4:
m3:
m2:
m1:

Earthquake Information

EQ Source (e.g., New Madrid)	1 Hz
Event (e.g., MCE, 10KEQ, OBE)	Design EQ
a_{max} (g) (top of ground surface)	0.09
EQ Mag (Mw)	7.6

Inputs

Depth of Sample Midpoint (ft.)	SPT N Value	Hammer Efficiency, E_m (%)	Unified Soil Classification	Fines Content (%)	Total Unit Weight (pcf)	Material (optional)	Clay-like / Sand-like Override (optional)	Clay-like Susceptibility (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure during SPT (psf)	Static Pore Water Pressure during EQ (psf)
3.5	32	80	ML	76	112	Fly Ash	Sand-like		Do Not Correct for FC	0.069			
7.0	13	80		76	112	Fly Ash	Sand-like		Do Not Correct for FC	0.079			
10.5	26	80		76	112	Fly Ash	Sand-like		Do Not Correct for FC	0.090			
15.0	1	80		15	119	Bottom Ash	Sand-like			0.100			
20.0	4	80		15	119	Bottom Ash	Sand-like			0.100			
25.0	9	80		15	119	Bottom Ash	Sand-like			0.101			
30.0	11	80		15	119	Bottom Ash	Sand-like			0.102			
35.0	5	80		15	119	Bottom Ash	Sand-like			0.099			
40.0	6	80		76	112	Fly Ash	Sand-like		Do Not Correct for FC	0.094			
45.0	0	80		76	112	Fly Ash	Sand-like		Do Not Correct for FC	0.091			
50.0	6	80		79	127	Subunit 1	Clay-like	Not Susceptible		0.089			
57.0	4	80		24	126	Subunit 2	Sand-like			0.084			
62.0	3	80		24	126	Subunit 2	Sand-like			0.078			
65.0	52	80		24	131	Subunit 3	Sand-like			0.076			

KIF TDEC Stability, Boring ID: KIF-B39

Liquefaction Potential Evaluations

For Coarse Grained Soils

Elev. Of Mid. Pt. of Sample (ft)	Depth of Mid. Pt. of Sample (ft.)	Unit Weight (pcf)	Vert. Total Stress during SPT (tsf)	Static Pore Pressure during SPT (tsf)	Vert. Eff. Stress during SPT (tsf)	SPT N Value	Hammer Efficiency (%)	Borehole Diameter Correction	Sampler Correction	Rod Length Correction	Overburden Stress Correction Factor	Hammer Energy Correction Factor	Corrected Blow Count	Normalized Blow Count	Relative Density (%)	Unified Soil Classification	Fines Content (%)	Relative State Parameter Index	Static Shear Stress Ratio
	z	γ_T	σ_v	u	σ'_v	N	E_m	C_B	C_s	C_R	C_N	C_E	N_{60}	$(N_1)_{60}$	D_r			ξ_R	α

			Top of Hole Elevation (ft)	769.1				Boring ID =	KIF-B39										
			begin sampling (depth-ft)	0.0				Boring Inner Dia. (in) =	3.25										
			total unit wt. above 1st SPT (pcf) =	120															
			water elevation during SPT (ft) =	751.6	ft *(relative to ground surface during SPT)*			Assumed Rod Stickup =	5.0	feet									
			water depth during SPT (ft) =	17.5				E_m Measurement? =	1	(1: Yes, 0: No)									
			water elevation during EQ (ft) =	751.6	ft *(relative to ground surface during SPT)*			SPT Sampler w/ Liners? =	0	(1: Yes, 0: No)									
			water during EQ (depth-ft) =	17.5	u-top	effstr-top													
			vert. total stress above 1st SPT (tsf) =	**0.00**	**0.00**	0.00													
765.6	3.5	112		0.20	0.00	0.20	32	80.0	1.000	1.30	1.00	1.56	1.33	55	86	100	ML	76	-0.60	0.069
762.1	7.0	112		0.39	0.00	0.39	13	80.0	1.000	1.30	1.00	1.42	1.33	23	32	83	0	76	-0.60	0.079
758.6	10.5	112		0.59	0.00	0.59	26	80.0	1.000	1.30	1.00	1.17	1.33	45	53	100	0	76	-0.60	0.090
754.1	15.0	119		0.85	0.00	0.85	1	80.0	1.000	1.10	1.00	1.15	1.33	1	2	33	0	15	-0.16	0.100
749.1	20.0	119		1.15	0.08	1.07	4	80.0	1.000	1.10	1.00	1.00	1.33	6	6	44	0	15	-0.27	0.100
744.1	25.0	119		1.44	0.23	1.21	9	80.0	1.000	1.13	1.00	0.94	1.33	14	13	59	0	15	-0.41	0.101
739.1	30.0	119		1.74	0.39	1.35	11	80.0	1.000	1.15	1.00	0.89	1.33	17	15	63	0	15	-0.45	0.102
734.1	35.0	119		2.04	0.55	1.49	5	80.0	1.000	1.10	1.00	0.83	1.33	7	6	45	0	15	-0.27	0.099
729.1	40.0	112		2.33	0.70	1.62	6	80.0	1.000	1.10	1.00	0.78	1.33	9	7	39	0	76	-0.20	0.094
724.1	45.0	112		2.61	0.86	1.75	0	80.0	1.000	1.10	1.00	0.68	1.33	0	0	5	0	76	0.10	0.091
719.1	50.0	127		2.91	1.01	1.89	6	80.0	1.000	1.10	1.00	0.74	1.33	9	7	51	0	79	-0.32	0.089
712.1	57.0	126		3.35	1.23	2.12	4	80.0	1.000	1.10	1.00	0.68	1.33	6	4	44	0	24	-0.25	0.084
707.1	62.0	126		3.66	1.39	2.27	3	80.0	1.000	1.10	1.00	0.65	1.33	4	3	41	0	24	-0.21	0.078
704.1	65.0	131		3.86	1.48	2.37	52	80.0	1.000	1.30	1.00	0.81	1.33	90	73	100	0	24	-0.60	0.076

KIF TDEC Stability, Boring ID: KIF-B39
Liquefaction Potential Evaluations
For Coarse Grained Soils

EQ Source	a max (g)	EQ Mag (Mw)	Event
1 Hz	0.09	7.6	Design EQ

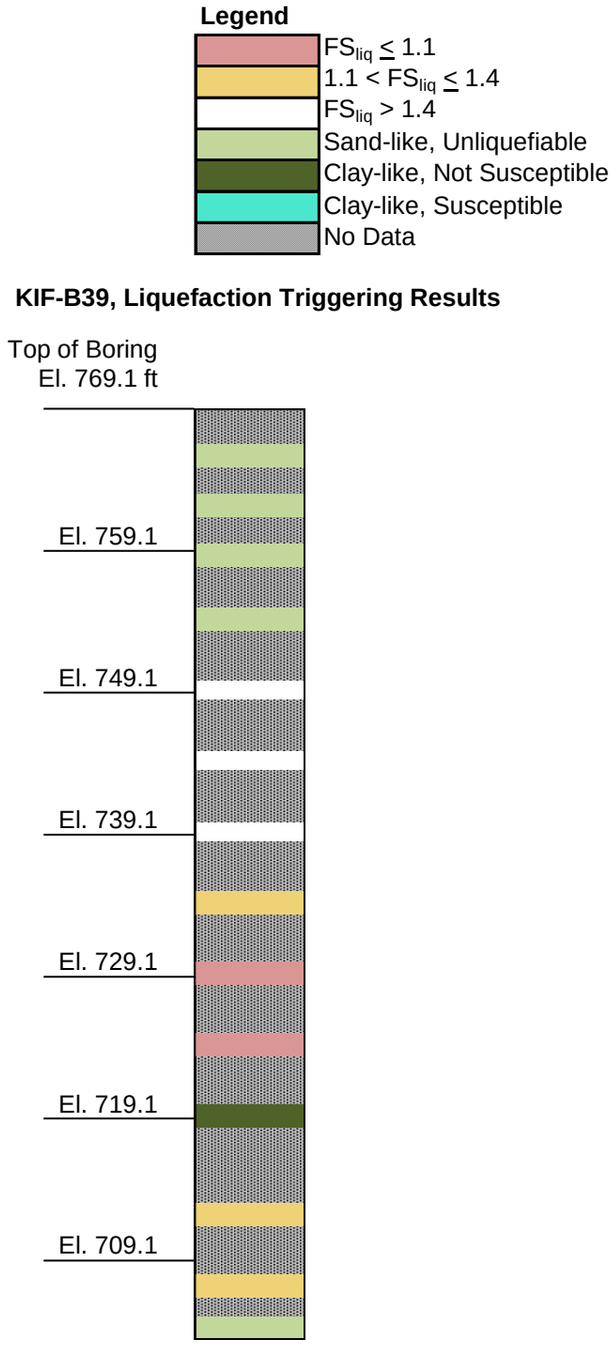
Shear Stress Curve Fit Parameters
m4: 0
m3: 0
m2: 0
m1: 0

Boring ID: **KIF-B39**
Top of Fill Elevation: 769.1 ft
Fill Height: 0.0 ft *(relative to ground surface during SPT)*
Fill Total Unit Weight: 120 pcf
Fill Total Stress: 0.00 tsf

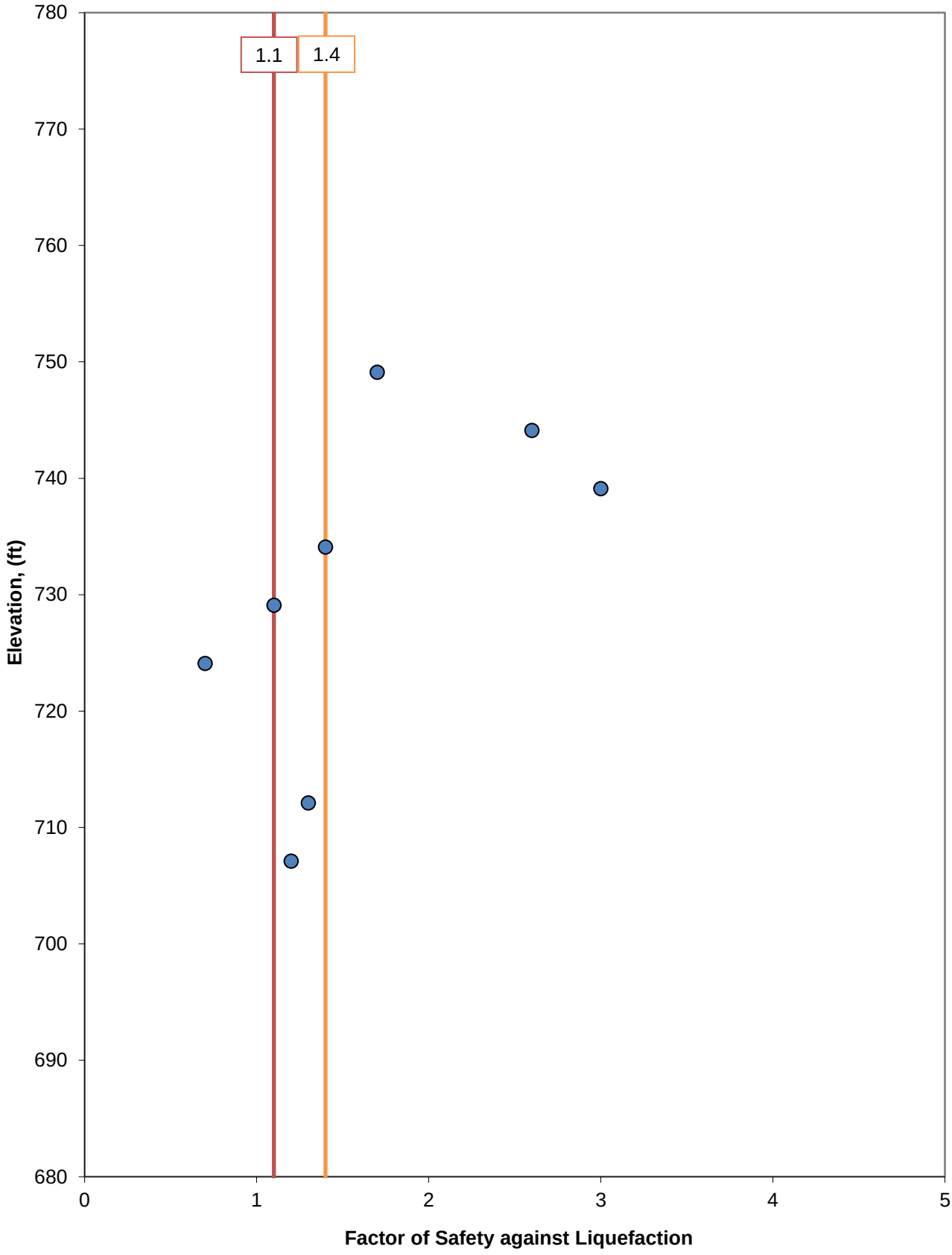
totstr-top	u-top	effstr-top
0.00	0.00	0.00

Note: A factor of safety shown as "N/A" implies that the soil type is not appropriately evaluated using this methodology. This applies to clay-like soils (typically CL, CH, CL-ML and MH material type), samples with high blow counts, and unsaturated samples.

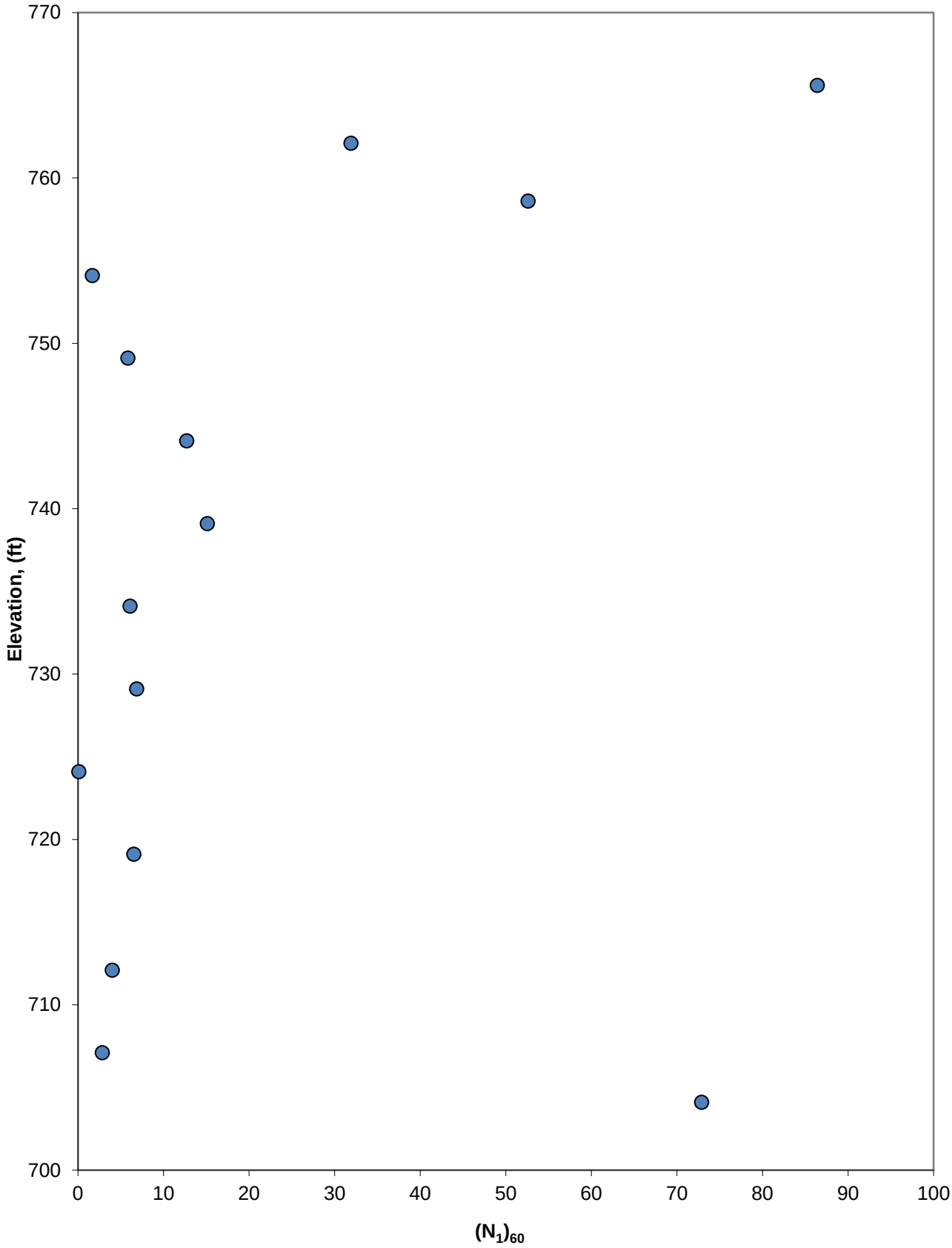
Depth of Mid. Pt. of Sample (ft.) z	Vert. Total Stress during EQ w/ Fill (tsf) $\sigma_{v\ with\ fill}$	Static Pore Pressure during EQ (tsf) u	Vert. Eff. Stress during EQ w/ Fill (tsf) $\sigma'_{v\ with\ fill}$	Clean Sand Correction $\Delta(N_1)_{60cs}$	Equivalent Clean Sand N-Value $(N_1)_{60cs}$	Cyclic Resistance Ratio CRR7.5	Overburden Correction Factor K_σ	Static Shear Stress Correction K_α	Mag. Scaling Factor (MSF)	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Max. Induced Shear Stress (psf)	From Ground Response: Avg. Cyclic Shear Stress (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Blow Count $(N_1)_{60cs} \geq 32$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)
3.5	0.20	0.00	0.20	0.00	86	N/A	N/A	N/A	N/A	N/A	0.999	0	0	0.060	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**
7.0	0.39	0.00	0.39	0.00	32	N/A	N/A	N/A	N/A	N/A	0.991	0	0	0.059	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**
10.5	0.59	0.00	0.59	0.00	53	N/A	N/A	N/A	N/A	N/A	0.982	0	0	0.059	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**
15.0	0.85	0.00	0.85	3.26	5	0.086	1.017	0.877	1.00	0.076	0.968	0	0	0.058	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**
20.0	1.15	0.08	1.07	3.26	9	0.112	0.999	0.932	0.99	0.104	0.952	0	0	0.061	FALSE	FALSE	FALSE	**1.7**	**Bottom Ash**
25.0	1.44	0.23	1.21	3.26	16	0.164	0.985	1.097	0.99	0.175	0.934	0	0	0.067	FALSE	FALSE	FALSE	**2.6**	**Bottom Ash**
30.0	1.74	0.39	1.35	3.26	18	0.188	0.969	1.180	0.99	0.211	0.914	0	0	0.071	FALSE	FALSE	FALSE	**3.0**	**Bottom Ash**
35.0	2.04	0.55	1.49	3.26	9	0.113	0.969	0.929	0.99	0.102	0.894	0	0	0.073	FALSE	FALSE	FALSE	**1.4**	**Bottom Ash**
40.0	2.33	0.70	1.62	0.00	7	0.097	0.965	0.896	1.00	0.084	0.873	0	0	0.075	FALSE	FALSE	FALSE	**1.1**	**Fly Ash**
45.0	2.61	0.86	1.75	0.00	0	0.061	0.972	0.847	1.00	0.050	0.851	0	0	0.076	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**
50.0	2.91	1.01	1.89	5.55	12	N/A	N/A	N/A	0.99	N/A	0.830	0	0	0.076	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
57.0	3.35	1.23	2.12	4.98	9	0.111	0.938	0.923	0.99	0.096	0.799	0	0	0.076	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**
62.0	3.66	1.39	2.27	4.98	8	0.103	0.935	0.913	1.00	0.088	0.778	0	0	0.075	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**
65.0	3.86	1.48	2.37	4.98	78	N/A	N/A	N/A	N/A	N/A	0.766	0	0	0.075	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**


Legend
FS$_{liq}$ ≤ 1.1
1.1 < FS$_{liq}$ ≤ 1.4
FS$_{liq}$ > 1.4
Sand-like, Unliquefiable
Clay-like, Not Susceptible
Clay-like, Susceptible
No Data
KIF-B39, Liquefaction Triggering Results
Top of Boring
El. 769.1 ft
El. 759.1
El. 749.1
El. 739.1
El. 729.1
El. 719.1
El. 709.1

KIF TDEC Stability, Boring ID: KIF-B39, Source = 1 Hz, Mw = 7.6, Event = Design EQ,
SPT Data, Simplified Stress-Based Approach



KIF TDEC Stability, Boring ID: KIF-B39, Source = 1 Hz, Mw = 7.6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



Project Name = KIF TDEC Stability
Boring ID = KIF-BF-SPT2

Boring Location

Northing =
Easting =

OR

Baseline Station =
Offset (+ Right) =

Drilling Information

Boring Inner Diameter (ID) =	3.25	inches	
Top of Hole Elevation	768	feet	
Water Depth during SPT (negative for U/S borings)=	18.5	feet	
Depth Sampling Began	1	feet	
Total Unit Wt. above 1st SPT =	120	pcf	
Assumed Rod Stickup =	5	feet	*(Typ assume 5ft)*
E_m Measurement based on Fv method? =	1	(1: Yes, 0: No)	
SPT Sampler w/ Liners? =	0	(1: Yes, 0: No)	*(Typ. no)*

During EQ Information

Water Depth during EQ (relative to SPT TOH, negative for U/S borings) =	17	feet
Final Grade Elevation during EQ	772.2	feet
Average Total Unit Wt. of Cut/Fill	120	pcf

Fines Content Correction

Fines content correction for samples with blow counts of zero? 1 (1: Yes, 0: No)

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile? 0 (1: Yes, 0: No)
If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile: Pond_Section, KIF-BF-SPT2_NOR
Alpha at each sample depth known? 1 (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (α vs. depth curve)
If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_α will be one.

m4:
m3:
m2:
m1:
m0:

Associated ground response profile: ng_Pond_Section, KIF-BF-SPT2
Get CSR from shear stress envelope? 0 (1: Yes, 0: No)
If previous answer is No, then CSR will be calculated using a_{max} and r_d
Max. Shear Stress at each sample depth known? (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4:
m3:
m2:
m1:

Earthquake Information

EQ Source (e.g., New Madrid)	1 Hz
Event (e.g., MCE, 10KEQ, OBE)	Design EQ
a_{max} (g) (top of ground surface)	0.10
EQ Mag (Mw)	7.6

Inputs

Depth of Sample Midpoint (ft.)	SPT N Value	Hammer Efficiency, E_m (%)	Unified Soil Classification	Fines Content (%)	Total Unit Weight (pcf)	Material (optional)	Clay-like / Sand-like Override (optional)	Clay-like Susceptibility (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure during SPT (psf)	Static Pore Water Pressure during EQ (psf)
2.0	15	80	SM	38	119	Bottom Ash	Sand-like			0.021			
4.5	18	80		38	119	Bottom Ash	Sand-like			0.018			
9.5	57	80		38	119	Bottom Ash	Sand-like			0.012			
14.5	18	80		38	119	Bottom Ash	Sand-like			0.009			
19.5	38	80		38	119	Bottom Ash	Sand-like			0.007			
24.5	7	80		25	112	Fly Ash	Sand-like		Do Not Correct for FC	0.008			
29.5	5	80		35	112	Fly Ash	Sand-like		Do Not Correct for FC	0.013			
34.5	6	80		35	112	Fly Ash	Sand-like		Do Not Correct for FC	0.021			
39.5	5	80		44	126	Subunit 2	Sand-like			0.030			
44.5	7	80		44	126	Subunit 2	Sand-like			0.038			
49.5	2	80		44	126	Subunit 2	Sand-like			0.045			
54.5	5	80		30	131	Subunit 3	Sand-like			0.049			
59.5	8	80		30	131	Subunit 3	Sand-like			0.050			

KIF TDEC Stability, Boring ID: KIF-BF-SPT2

Liquefaction Potential Evaluations

For Coarse Grained Soils

Elev. Of Mid. Pt. of Sample (ft)	Depth of Mid. Pt. of Sample (ft.)	Unit Weight (pcf)	Vert. Total Stress during SPT (tsf)	Static Pore Pressure during SPT (tsf)	Vert. Eff. Stress during SPT (tsf)	SPT N Value	Hammer Efficiency (%)	Borehole Diameter Correction	Sampler Correction	Rod Length Correction	Overburden Stress Correction Factor	Hammer Energy Correction Factor	Corrected Blow Count	Normalized Blow Count	Relative Density (%)	Unified Soil Classification	Fines Content (%)	Relative State Parameter Index	Static Shear Stress Ratio
	z	γ_T	σ_v	u	σ'_v	N	E_m	C_B	C_s	C_R	C_N	C_E	N_{60}	$(N_1)_{60}$	D_r			ξ_R	α

Top of Hole Elevation (ft) = 768.0 — Boring ID = **KIF-BF-SPT2**

begin sampling (depth-ft) = 1.0 — Boring Inner Dia. (in) = 3.25

total unit wt. above 1st SPT (pcf) = 120

water elevation during SPT (ft) = 749.5 ft *(relative to ground surface during SPT)* — Assumed Rod Stickup = 5.0 feet

water depth during SPT (ft) = 18.5 — E_m Measurement? = 1 (1: Yes, 0: No)

water elevation during EQ (ft) = 751.0 ft *(relative to ground surface during SPT)* — SPT Sampler w/ Liners? = 0 (1: Yes, 0: No)

water during EQ (depth-ft) = 17.0

	u-top	effstr-top
vert. total stress above 1st SPT (tsf) =	**0.06**	**0.00**	0.06

766.0	2.0	119	0.12	0.00	0.12	15	80.0	1.000	1.30	1.00	1.70	1.33	26	44	100	SM	38	-0.60	0.021
763.5	4.5	119	0.27	0.00	0.27	18	80.0	1.000	1.30	1.00	1.43	1.33	31	45	100	0	38	-0.60	0.018
758.5	9.5	119	0.57	0.00	0.57	57	80.0	1.000	1.30	1.00	1.18	1.33	99	116	100	0	38	-0.60	0.012
753.5	14.5	119	0.86	0.00	0.86	18	80.0	1.000	1.30	1.00	1.06	1.33	31	33	92	0	38	-0.60	0.009
748.5	19.5	119	1.16	0.03	1.13	38	80.0	1.000	1.30	1.00	0.98	1.33	66	65	100	0	38	-0.60	0.007
743.5	24.5	112	1.45	0.19	1.26	7	80.0	1.000	1.10	1.00	0.91	1.33	10	9	45	0	25	-0.27	0.008
738.5	29.5	112	1.73	0.34	1.39	5	80.0	1.000	1.10	1.00	0.85	1.33	7	6	37	0	35	-0.18	0.013
733.5	34.5	112	2.01	0.50	1.51	6	80.0	1.000	1.10	1.00	0.81	1.33	9	7	39	0	35	-0.21	0.021
728.5	39.5	126	2.31	0.66	1.65	5	80.0	1.000	1.10	1.00	0.79	1.33	7	6	50	0	44	-0.31	0.030
723.5	44.5	126	2.62	0.81	1.81	7	80.0	1.000	1.10	1.00	0.76	1.33	10	8	54	0	44	-0.35	0.038
718.5	49.5	126	2.94	0.97	1.97	2	80.0	1.000	1.10	1.00	0.70	1.33	3	2	41	0	44	-0.21	0.045
713.5	54.5	131	3.26	1.12	2.14	5	80.0	1.000	1.10	1.00	0.69	1.33	7	5	48	0	30	-0.28	0.049
708.5	59.5	131	3.59	1.28	2.31	8	80.0	1.000	1.10	1.00	0.68	1.33	12	8	54	0	30	-0.33	0.050

KIF TDEC Stability, Boring ID: KIF-BF-SPT2
Liquefaction Potential Evaluations
For Coarse Grained Soils

EQ Source	a max (g)	EQ Mag (Mw)	Event
1 Hz	0.10	7.6	Design EQ

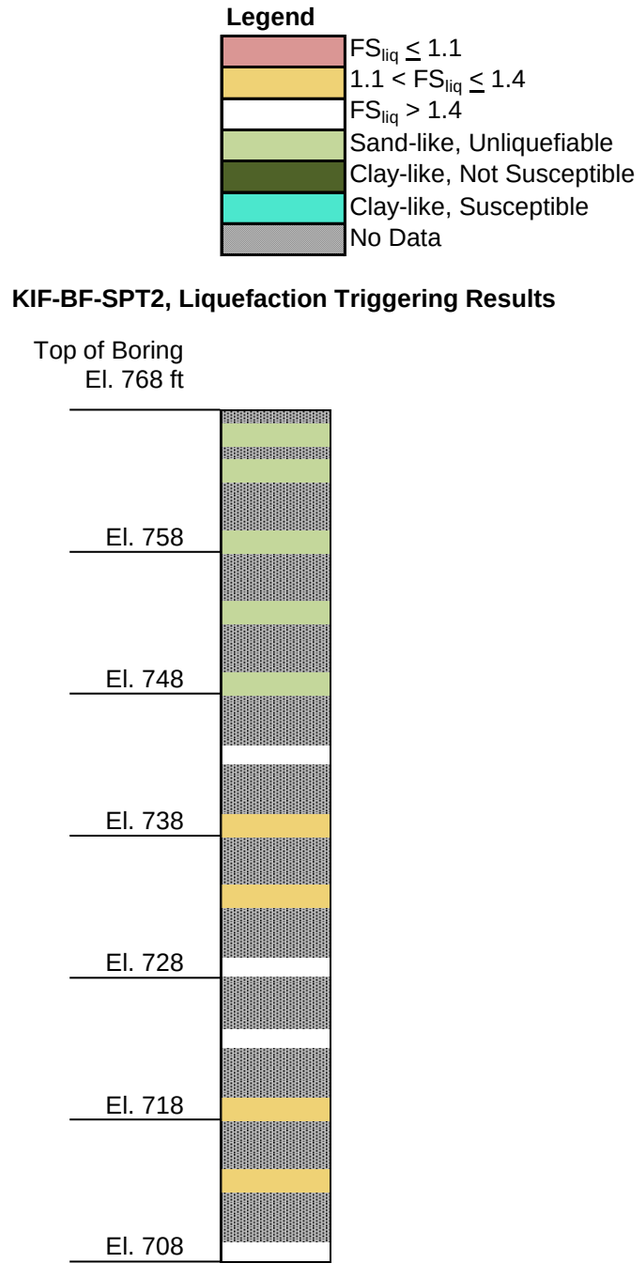
Shear Stress Curve Fit Parameters
m4: 0
m3: 0
m2: 0
m1: 0

Boring ID: **KIF-BF-SPT2**
Top of Fill Elevation: 772.2 ft
Fill Height: 4.2 ft *(relative to ground surface during SPT)*
Fill Total Unit Weight: 120 pcf
Fill Total Stress: 0.25 tsf

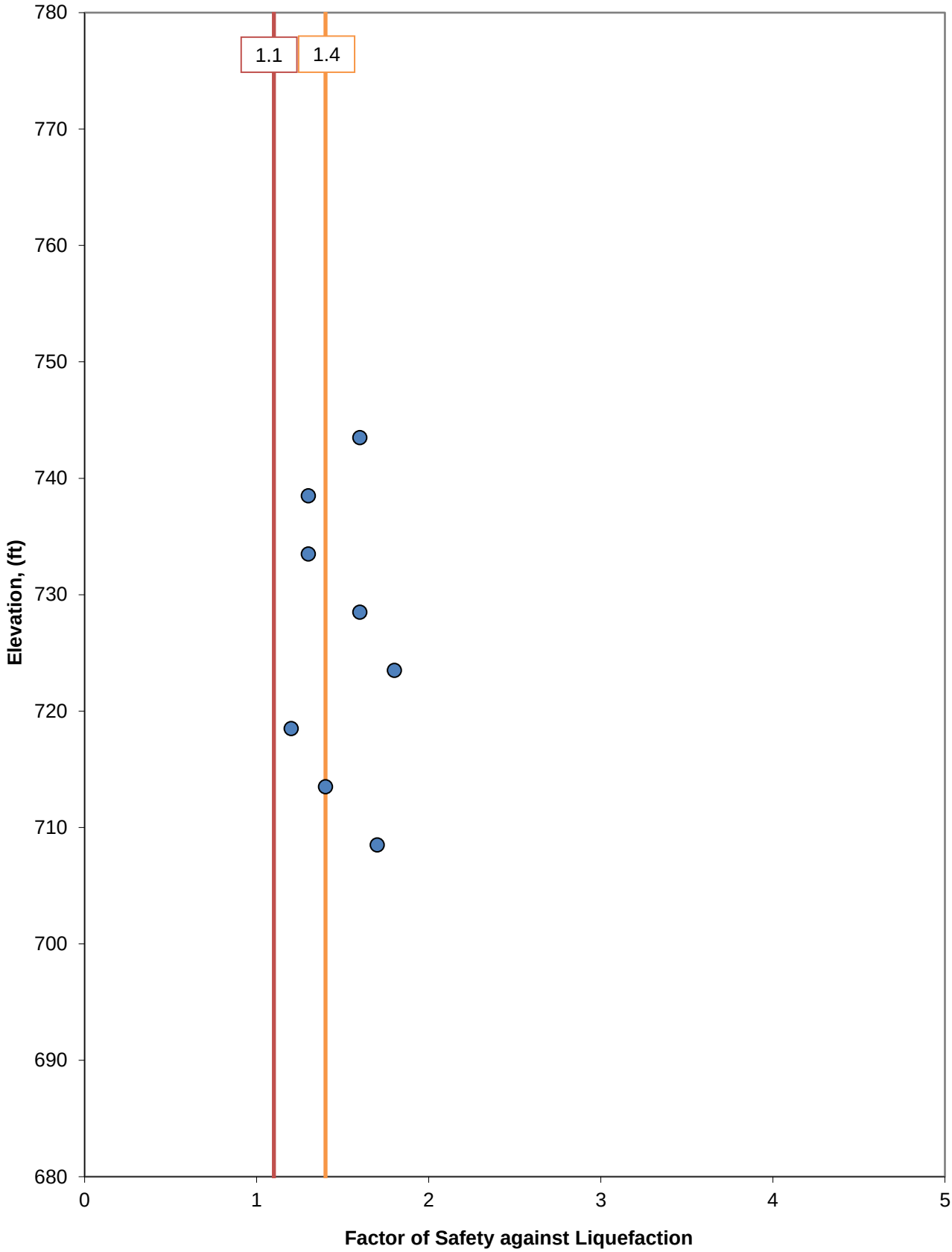
totstr-top	u-top	effstr-top
0.31	0.00	0.31

Note: A factor of safety shown as "N/A" implies that the soil type is not appropriately evaluated using this methodology. This applies to clay-like soils (typically CL, CH, CL-ML and MH material type), samples with high blow counts, and unsaturated samples.

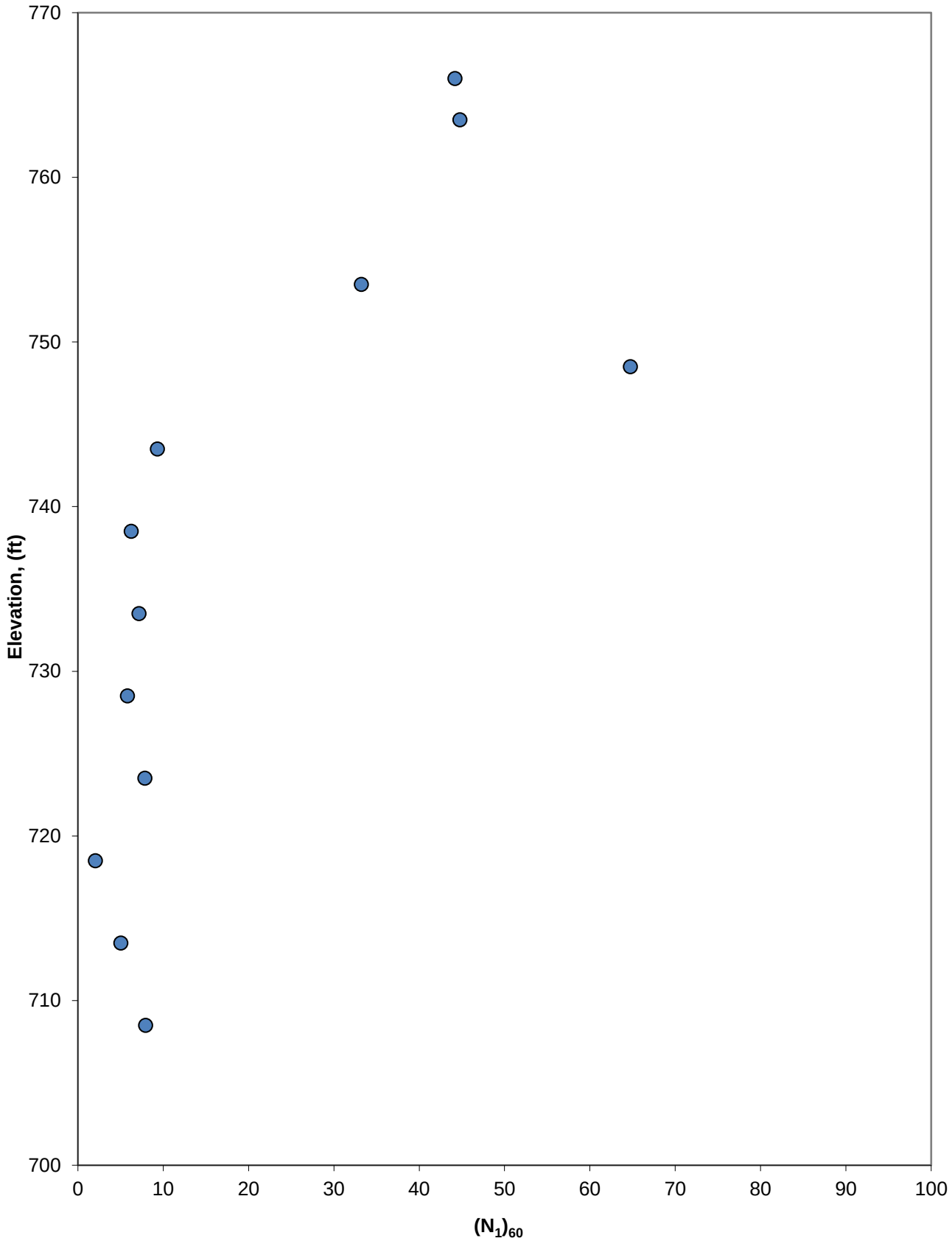
Depth of Mid. Pt. of Sample (ft.) z	Vert. Total Stress during EQ w/ Fill (tsf) $\sigma_{v\ with\ fill}$	Static Pore Pressure during EQ (tsf) u	Vert. Eff. Stress during EQ w/ Fill (tsf) $\sigma'_{v\ with\ fill}$	Clean Sand Correction $\Delta(N_1)_{60cs}$	Equivalent Clean Sand N-Value $(N_1)_{60cs}$	Cyclic Resistance Ratio CRR7.5	Overburden Correction Factor K_σ	Static Shear Stress Correction K_α	Mag. Scaling Factor (MSF)	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Max. Induced Shear Stress (psf)	From Ground Response: Avg. Cyclic Shear Stress (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Blow Count $(N_1)_{60cs} \geq 32$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)
2.0	0.37	0.00	0.37	5.55	50	N/A	N/A	N/A	N/A	N/A	0.993	0	0	0.061	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**
4.5	0.52	0.00	0.52	5.55	50	N/A	N/A	N/A	N/A	N/A	0.986	0	0	0.061	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**
9.5	0.82	0.00	0.82	5.55	122	N/A	N/A	N/A	N/A	N/A	0.972	0	0	0.060	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**
14.5	1.12	0.00	1.12	5.55	39	N/A	N/A	N/A	N/A	N/A	0.956	0	0	0.059	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**
19.5	1.41	0.08	1.33	5.55	70	N/A	N/A	N/A	N/A	N/A	0.938	0	0	0.061	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**
24.5	1.70	0.23	1.47	0.00	9	0.113	0.971	0.989	0.99	0.108	0.919	0	0	0.066	FALSE	FALSE	FALSE	**1.6**	**Fly Ash**
29.5	1.98	0.39	1.59	0.00	6	0.094	0.967	0.979	1.00	0.088	0.899	0	0	0.069	FALSE	FALSE	FALSE	**1.3**	**Fly Ash**
34.5	2.26	0.55	1.72	0.00	7	0.099	0.960	0.968	1.00	0.092	0.878	0	0	0.072	FALSE	FALSE	FALSE	**1.3**	**Fly Ash**
39.5	2.56	0.70	1.86	5.60	11	0.128	0.945	0.972	0.99	0.117	0.857	0	0	0.073	FALSE	FALSE	FALSE	**1.6**	**Subunit 2**
44.5	2.87	0.86	2.02	5.60	13	0.143	0.932	0.981	0.99	0.130	0.835	0	0	0.074	FALSE	FALSE	FALSE	**1.8**	**Subunit 2**
49.5	3.19	1.01	2.18	5.60	8	0.102	0.939	0.941	1.00	0.090	0.814	0	0	0.074	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**
54.5	3.51	1.17	2.34	5.36	10	0.121	0.926	0.953	0.99	0.106	0.792	0	0	0.073	FALSE	FALSE	FALSE	**1.4**	**Subunit 3**
59.5	3.84	1.33	2.51	5.36	13	0.142	0.910	0.975	0.99	0.125	0.771	0	0	0.073	FALSE	FALSE	FALSE	**1.7**	**Subunit 3**


Legend
FS_liq ≤ 1.1
1.1 < FS_liq ≤ 1.4
FS_liq > 1.4
Sand-like, Unliquefiable
Clay-like, Not Susceptible
Clay-like, Susceptible
No Data
KIF-BF-SPT2, Liquefaction Triggering Results
Top of Boring
El. 768 ft
El. 758
El. 748
El. 738
El. 728
El. 718
El. 708

KIF TDEC Stability, Boring ID: KIF-BF-SPT2, Source = 1 Hz, Mw = 7.6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



KIF TDEC Stability, Boring ID: KIF-BF-SPT2, Source = 1 Hz, Mw = 7.6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



Project Name = KIF TDEC Stability
Boring ID = KIF-BF-SPT3

Boring Location

Northing =
Easting =

OR

Baseline Station =
Offset (+ Right) =

Drilling Information

Boring Inner Diameter (ID) =	3.25	inches	
Top of Hole Elevation	754	feet	
Water Depth during SPT (negative for U/S borings)=	18.5	feet	
Depth Sampling Began	1	feet	
Total Unit Wt. above 1st SPT =	120	pcf	
Assumed Rod Stickup =	5	feet	*(Typ assume 5ft)*
E_m Measurement based on Fv method? =	1	(1: Yes, 0: No)	
SPT Sampler w/ Liners? =	0	(1: Yes, 0: No)	*(Typ. no)*

During EQ Information

Water Depth during EQ (relative to SPT TOH, negative for U/S borings) =	5	feet
Final Grade Elevation during EQ	753	feet
Average Total Unit Wt. of Cut/Fill	120	pcf

Fines Content Correction

Fines content correction for samples with blow counts of zero? 1 (1: Yes, 0: No)

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile? 0 (1: Yes, 0: No)
If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile: olishingPond, KIF-B2_NOR
Alpha at each sample depth known? 1 (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (α vs. depth curve)
If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_α will be one.

m4:
m3:
m2:
m1:
m0:

Associated ground response profile: olishing_Pond, KIF-B2_NOR
Get CSR from shear stress envelope? 0 (1: Yes, 0: No)
If previous answer is No, then CSR will be calculated using a_{max} and r_d
Max. Shear Stress at each sample depth known? (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4:
m3:
m2:
m1:

Earthquake Information

EQ Source (e.g., New Madrid)	1 Hz
Event (e.g., MCE, 10KEQ, OBE)	Design EQ
a_{max} (g) (top of ground surface)	0.10
EQ Mag (Mw)	7.6

Inputs

Depth of Sample Midpoint (ft.)	SPT N Value	Hammer Efficiency, E_m (%)	Unified Soil Classification	Fines Content (%)	Total Unit Weight (pcf)	Material (optional)	Clay-like / Sand-like Override (optional)	Clay-like Susceptibility (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure during SPT (psf)	Static Pore Water Pressure during EQ (psf)
2.0	41	80	ML	46	112	Fly Ash	Sand-like		Do Not Correct for FC	0.054			
4.5	15	80		54	112	Fly Ash	Sand-like		Do Not Correct for FC	0.040			
7.0	57	80		27	128	Embankment Fill	Clay-like	Not Susceptible		0.032			
9.5	19	80		52	128	Embankment Fill	Clay-like	Not Susceptible		0.003			
14.5	12	80		52	128	Embankment Fill	Clay-like	Not Susceptible		0.033			
19.5	5	80		52	128	Embankment Fill	Clay-like	Not Susceptible		0.056			
24.5	5	80		44	126	Subunit 2	Sand-like			0.078			
29.5	8	80		44	126	Subunit 2	Sand-like			0.097			
34.5	3	80		44	126	Subunit 2	Sand-like			0.111			
39.5	5	80		22	131	Subunit 3	Sand-like			0.123			
44.5	19	80		22	131	Subunit 3	Sand-like			0.130			

KIF TDEC Stability, Boring ID: KIF-BF-SPT3

Liquefaction Potential Evaluations

For Coarse Grained Soils

Top of Hole Elevation (ft) =	754.0			Boring ID =	KIF-BF-SPT3											
begin sampling (depth-ft) =	1.0			Boring Inner Dia. (in) =	3.25											
total unit wt. above 1st SPT (pcf) =	120															
water elevation during SPT (ft) =	735.5	ft *(relative to ground surface during SPT)*						Assumed Rod Stickup =	5.0	feet						
water depth during SPT (ft) =	18.5							E_m Measurement? =	1	(1: Yes, 0: No)						
water elevation during EQ (ft) =	749.0	ft *(relative to ground surface during SPT)*						SPT Sampler w/ Liners? =	0	(1: Yes, 0: No)						
water during EQ (depth-ft) =	5.0	u-top	effstr-top													
vert. total stress above 1st SPT (tsf) =	**0.06**	**0.00**	0.06													

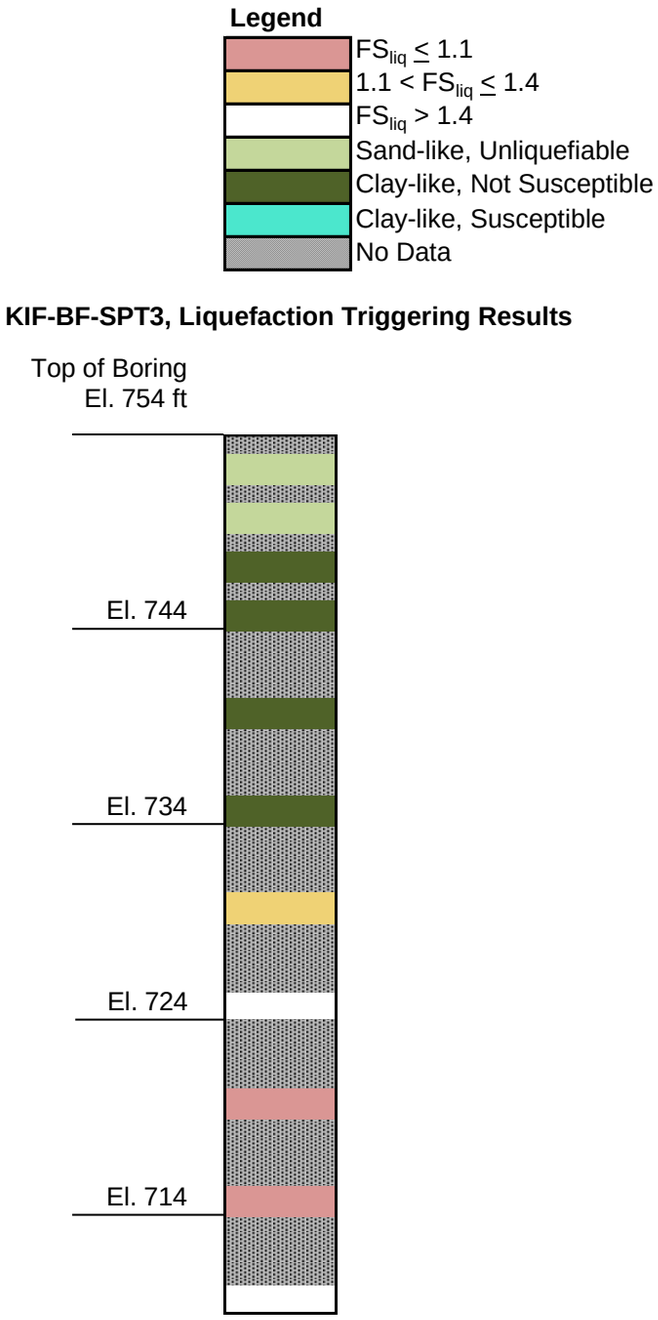
Elev. Of Mid. Pt. of Sample (ft)	Depth of Mid. Pt. of Sample (ft.) z	Unit Weight (pcf) γ_T	Vert. Total Stress during SPT (tsf) σ_v	Static Pore Pressure during SPT (tsf) u	Vert. Eff. Stress during SPT (tsf) σ'_v	SPT N Value N	Hammer Efficiency (%) E_m	Borehole Diameter Correction C_B	Sampler Correction C_s	Rod Length Correction C_R	Overburden Stress Correction Factor C_N	Hammer Energy Correction Factor C_E	Corrected Blow Count N_{60}	Normalized Blow Count $(N_1)_{60}$	Relative Density (%) D_r	Unified Soil Classification	Fines Content (%)
752.0	2.0	112	0.12	0.00	0.12	41	80.0	1.000	1.30	1.00	1.70	1.33	71	121	100	ML	46
749.5	4.5	112	0.26	0.00	0.26	15	80.0	1.000	1.30	1.00	1.53	1.33	26	40	93	0	54
747.0	7.0	128	0.41	0.00	0.41	57	80.0	1.000	1.30	1.00	1.29	1.33	99	127	100	0	27
744.5	9.5	128	0.57	0.00	0.57	19	80.0	1.000	1.30	1.00	1.18	1.33	33	39	98	0	52
739.5	14.5	128	0.89	0.00	0.89	12	80.0	1.000	1.21	1.00	1.07	1.33	19	21	76	0	52
734.5	19.5	128	1.21	0.03	1.17	5	80.0	1.000	1.10	1.00	0.95	1.33	7	7	52	0	52
729.5	24.5	126	1.52	0.19	1.34	5	80.0	1.000	1.10	1.00	0.89	1.33	7	6	51	0	44
724.5	29.5	126	1.84	0.34	1.50	8	80.0	1.000	1.10	1.00	0.85	1.33	12	10	58	0	44
719.5	34.5	126	2.15	0.50	1.65	3	80.0	1.000	1.10	1.00	0.78	1.33	4	3	44	0	44
714.5	39.5	131	2.47	0.66	1.82	5	80.0	1.000	1.10	1.00	0.75	1.33	7	5	47	0	22
709.5	44.5	131	2.80	0.81	1.99	19	80.0	1.000	1.25	1.00	0.79	1.33	32	25	81	0	22

KIF TDEC Stability, Boring ID: KIF-BF-SPT3
Liquefaction Potential Evaluations
For Coarse Grained Soils

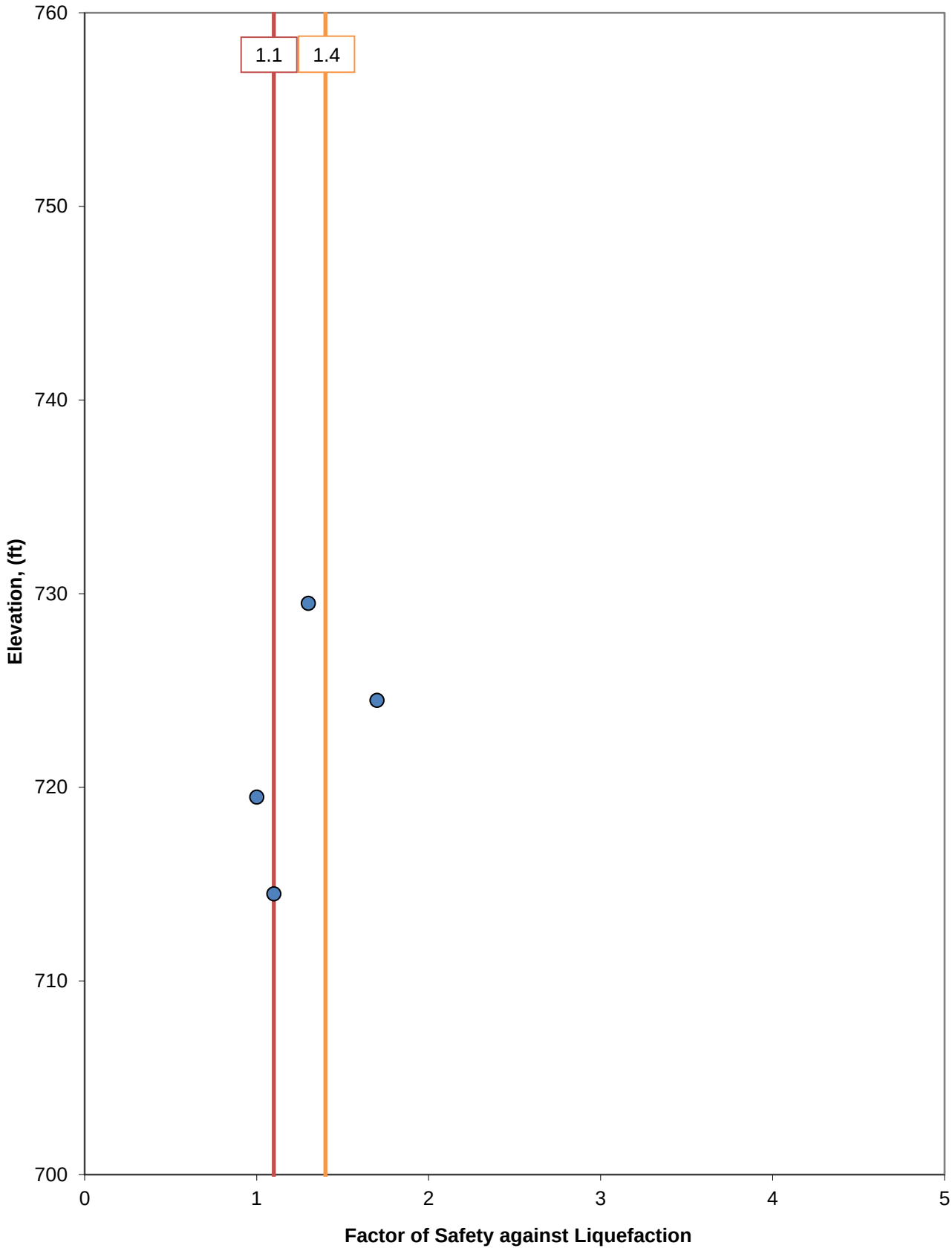
Depth of Mid. Pt. of Sample (ft.) z	Clean Sand Correction $\Delta(N_1)_{60cs}$	Equivalent Clean Sand N-Value $(N_1)_{60cs}$	Sample Screened for: Clay-like	High Blow Count $(N_1)_{60cs} \geq 32$	Unsaturated	Factor of Safety FS_{liq}	Material (optional)
ft							
ft	*(relative to ground surface during SPT)*						
pcf							
tsf							

Note: A factor of safety shown as "N/A" implies that the soil type is not appropriately evaluated using this methodology. This applies to clay-like soils (typically CL, CH, CL-ML and MH material type), samples with high blow counts, and unsaturated samples.

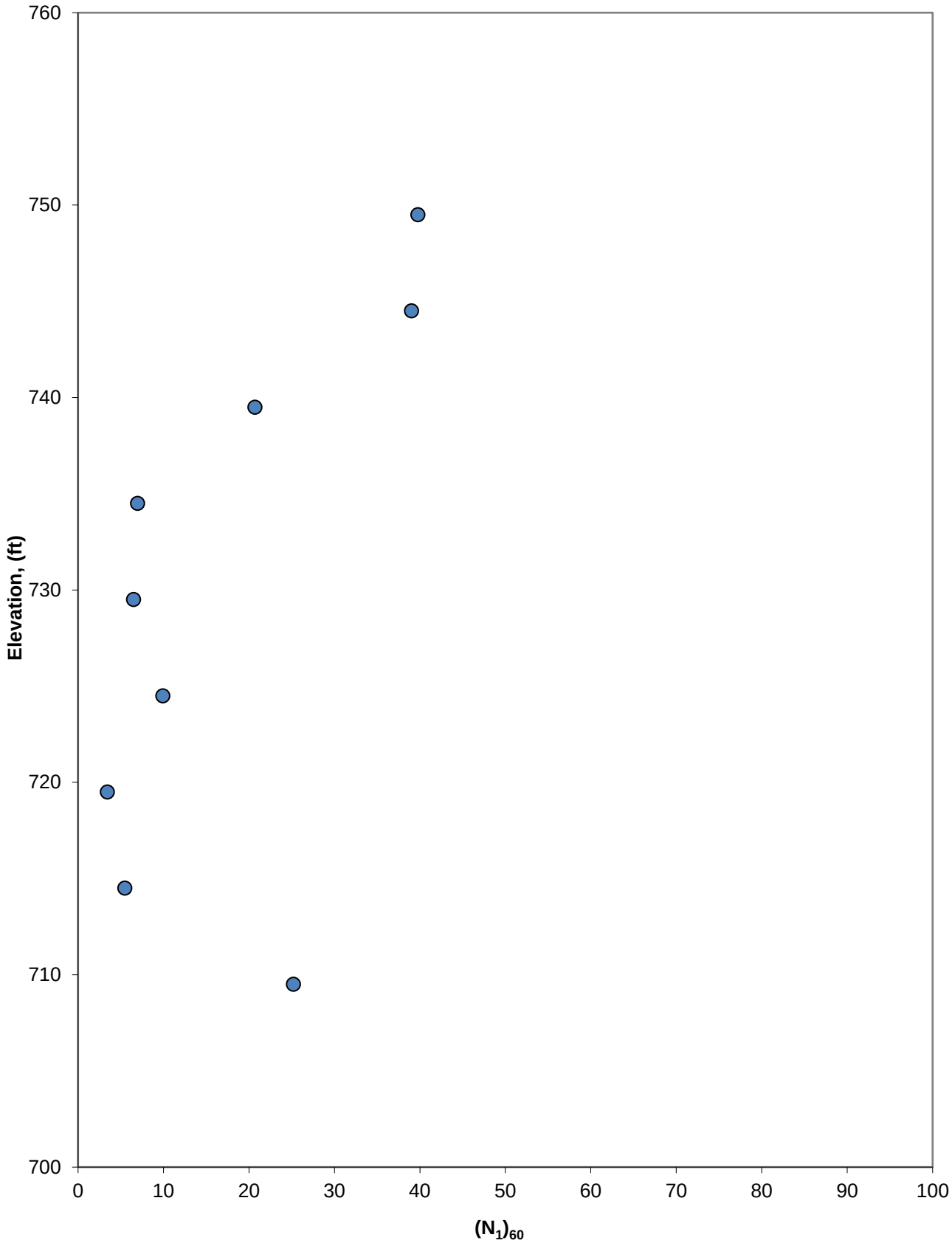
2.0	0.00	121	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**
4.5	0.00	40	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**
7.0	5.21	132	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**
9.5	5.61	45	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**
14.5	5.61	26	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
19.5	5.61	13	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
24.5	5.60	12	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**
29.5	5.60	16	FALSE	FALSE	FALSE	**1.7**	**Subunit 2**
34.5	5.60	9	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**
39.5	4.77	10	FALSE	FALSE	FALSE	**1.1**	**Subunit 3**
44.5	4.77	30	FALSE	FALSE	FALSE	**8.5**	**Subunit 3**


Legend
FS$_{liq}$ ≤ 1.1
1.1 < FS$_{liq}$ ≤ 1.4
FS$_{liq}$ > 1.4
Sand-like, Unliquefiable
Clay-like, Not Susceptible
Clay-like, Susceptible
No Data
KIF-BF-SPT3, Liquefaction Triggering Results
Top of Boring
El. 754 ft
El. 744
El. 734
El. 724
El. 714

KIF TDEC Stability, Boring ID: KIF-BF-SPT3, Source = 1 Hz, Mw = 7.6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



KIF TDEC Stability, Boring ID: KIF-BF-SPT3, Source = 1 Hz, Mw = 7.6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



Project Name = KIF TDEC Stability
Boring ID = KIF-BF-SPT5

Boring Location

Northing =
Easting =

OR

Baseline Station =
Offset (+ Right) =

Drilling Information

Boring Inner Diameter (ID) =	3.25	inches	
Top of Hole Elevation	770	feet	
Water Depth during SPT (negative for U/S borings)=	11	feet	
Depth Sampling Began	1	feet	
Total Unit Wt. above 1st SPT =	122	pcf	
Assumed Rod Stickup =	5	feet	*(Typ assume 5ft)*
E_m Measurement based on Fv method? =	1	(1: Yes, 0: No)	
SPT Sampler w/ Liners? =	0	(1: Yes, 0: No)	*(Typ. no)*

During EQ Information

Water Depth during EQ (relative to SPT TOH, negative for U/S borings) =	7.8	feet
Final Grade Elevation during EQ	762.8	feet
Average Total Unit Wt. of Cut/Fill	120	pcf

Fines Content Correction

Fines content correction for samples with blow counts of zero? 1 (1: Yes, 0: No)

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile? 0 (1: Yes, 0: No)
If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile: Pond_Section, KIF-BF-SPT5_NOR
Alpha at each sample depth known? 1 (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (α vs. depth curve)
If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_α will be one.

m4:
m3:
m2:
m1:
m0:

Associated ground response profile: ng_Pond_Section, KIF-BF-SPT5
Get CSR from shear stress envelope? 0 (1: Yes, 0: No)
If previous answer is No, then CSR will be calculated using a_{max} and r_d
Max. Shear Stress at each sample depth known? (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4:
m3:
m2:
m1:

Earthquake Information

EQ Source (e.g., New Madrid)	1 Hz
Event (e.g., MCE, 10KEQ, OBE)	Design EQ
a_{max} (g) (top of ground surface)	0.10
EQ Mag (Mw)	7.6

Inputs

Depth of Sample Midpoint (ft.)	SPT N Value	Hammer Efficiency, E_m (%)	Unified Soil Classification	Fines Content (%)	Total Unit Weight (pcf)	Material (optional)	Clay-like / Sand-like Override (optional)	Clay-like Susceptibility (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure during SPT (psf)	Static Pore Water Pressure during EQ (psf)
2.0	12	80	SM	38	119	Bottom Ash	Sand-like			-0.012			
4.5	25	80		38	119	Bottom Ash	Sand-like			-0.005			
7.0	17	80		38	119	Bottom Ash	Sand-like			0.003			
9.5	13	80		38	119	Bottom Ash	Sand-like			0.009			
14.5	10	80		38	119	Bottom Ash	Sand-like			0.006			
19.5	4	80		38	119	Bottom Ash	Sand-like			0.004			
24.5	17	80		38	119	Bottom Ash	Sand-like			0.006			
31.0	4	80		58	112	Fly Ash	Sand-like		Do Not Correct for FC	0.005			
34.5	5	80		58	112	Fly Ash	Sand-like		Do Not Correct for FC	0.016			
39.5	2	80		44	127	Subunit 2	Sand-like			0.030			
43.0	3	80		44	127	Subunit 2	Sand-like			0.037			
50.5	3	80		44	127	Subunit 2	Sand-like			0.039			
54.5	2	80		44	127	Subunit 2	Sand-like			0.036			
59.5	4	80		26	131	Subunit 3	Sand-like			0.032			

KIF TDEC Stability, Boring ID: KIF-BF-SPT5

Liquefaction Potential Evaluations

For Coarse Grained Soils

Elev. Of Mid. Pt. of Sample (ft)	Depth of Mid. Pt. of Sample (ft.)	Unit Weight (pcf)	Vert. Total Stress during SPT (tsf)	Static Pore Pressure during SPT (tsf)	Vert. Eff. Stress during SPT (tsf)	SPT N Value	Hammer Efficiency (%)	Borehole Diameter Correction	Sampler Correction	Rod Length Correction	Overburden Stress Correction Factor	Hammer Energy Correction Factor	Corrected Blow Count	Normalized Blow Count	Relative Density (%)	Unified Soil Classification	Fines Content (%)	Relative State Parameter Index	Static Shear Stress Ratio
	z	γ_T	σ_v	u	σ'_v	N	E_m	C_B	C_s	C_R	C_N	C_E	N_{60}	$(N_1)_{60}$	D_r			ξ_R	α

Top of Hole Elevation (ft) = 770.0 | Boring ID = **KIF-BF-SPT5**

begin sampling (depth-ft) = 1.0 | Boring Inner Dia. (in) = 3.25

total unit wt. above 1st SPT (pcf) = 122

water elevation during SPT (ft) = 759.0 ft *(relative to ground surface during SPT)* | Assumed Rod Stickup = 5.0 feet

water depth during SPT (ft) = 11.0 | E_m Measurement? = 1 (1: Yes, 0: No)

water elevation during EQ (ft) = 762.2 ft *(relative to ground surface during SPT)* | SPT Sampler w/ Liners? = 0 (1: Yes, 0: No)

water during EQ (depth-ft) = 7.8 | u-top | effstr-top

vert. total stress above 1st SPT (tsf) = **0.06** | **0.00** | 0.06

768.0	2.0	119	0.12	0.00	0.12	12	80.0	1.000	1.30	1.00	1.70	1.33	21	35	94	SM	38	#NUM!	0.000
765.5	4.5	119	0.27	0.00	0.27	25	80.0	1.000	1.30	1.00	1.43	1.33	43	62	100	0	38	#NUM!	0.000
763.0	7.0	119	0.42	0.00	0.42	17	80.0	1.000	1.30	1.00	1.29	1.33	29	38	97	0	38	#NUM!	0.003
760.5	9.5	119	0.57	0.00	0.57	13	80.0	1.000	1.27	1.00	1.24	1.33	22	27	85	0	38	-0.60	0.009
755.5	14.5	119	0.86	0.11	0.76	10	80.0	1.000	1.18	1.00	1.15	1.33	16	18	72	0	38	-0.58	0.006
750.5	19.5	119	1.16	0.27	0.90	4	80.0	1.000	1.10	1.00	1.09	1.33	6	6	51	0	38	-0.36	0.004
745.5	24.5	119	1.46	0.42	1.04	17	80.0	1.000	1.30	1.00	1.01	1.33	29	30	87	0	38	-0.60	0.006
739.0	31.0	112	1.83	0.62	1.21	4	80.0	1.000	1.10	1.00	0.92	1.33	6	5	34	0	58	-0.18	0.005
735.5	34.5	112	2.03	0.73	1.30	5	80.0	1.000	1.10	1.00	0.89	1.33	7	7	38	0	58	-0.21	0.016
730.5	39.5	127	2.33	0.89	1.44	2	80.0	1.000	1.10	1.00	0.84	1.33	3	2	42	0	44	-0.25	0.030
727.0	43.0	127	2.55	1.00	1.55	3	80.0	1.000	1.10	1.00	0.81	1.33	4	4	45	0	44	-0.27	0.037
719.5	50.5	127	3.03	1.23	1.80	3	80.0	1.000	1.10	1.00	0.75	1.33	4	3	44	0	44	-0.26	0.039
715.5	54.5	127	3.28	1.36	1.92	2	80.0	1.000	1.10	1.00	0.71	1.33	3	2	41	0	44	-0.23	0.036
710.5	59.5	131	3.60	1.51	2.09	4	80.0	1.000	1.10	1.00	0.69	1.33	6	4	45	0	26	-0.26	0.032

KIF TDEC Stability, Boring ID: KIF-BF-SPT5
Liquefaction Potential Evaluations
For Coarse Grained Soils

EQ Source	a max (g)	EQ Mag (Mw)	Event
1 Hz	0.10	7.6	Design EQ

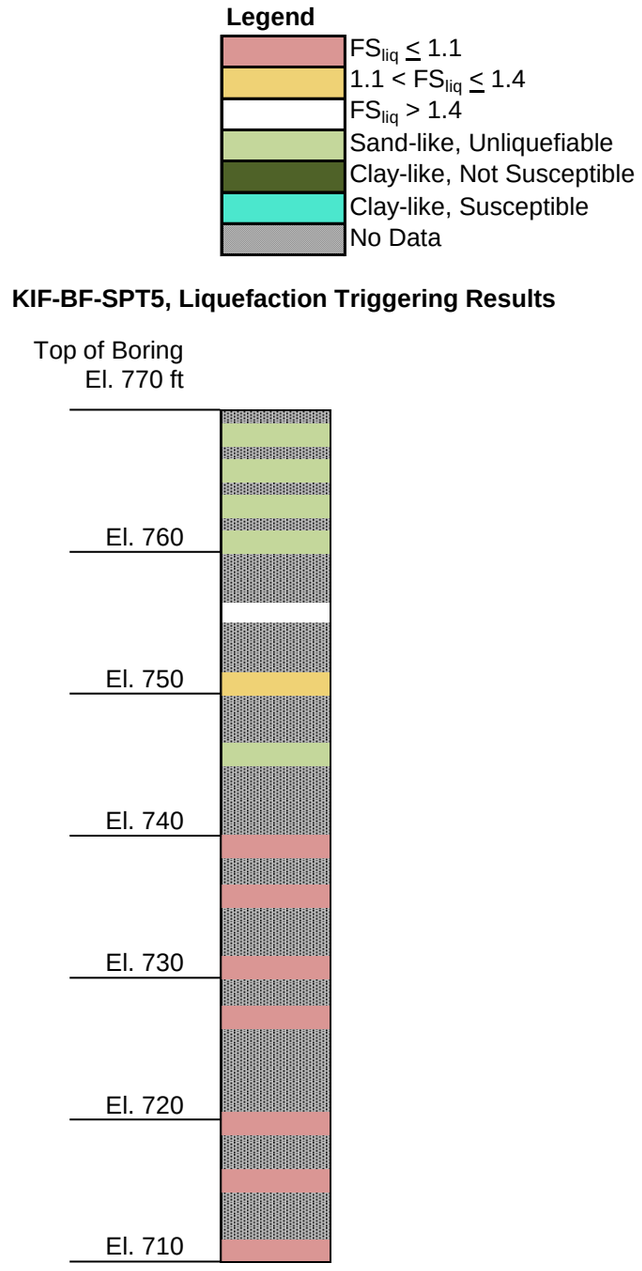
Shear Stress Curve Fit Parameters
m4: 0
m3: 0
m2: 0
m1: 0

Boring ID: **KIF-BF-SPT5**
Top of Fill Elevation: 762.8 ft
Fill Height: -7.2 ft *(relative to ground surface during SPT)*
Fill Total Unit Weight: 120 pcf
Fill Total Stress: -0.43 tsf

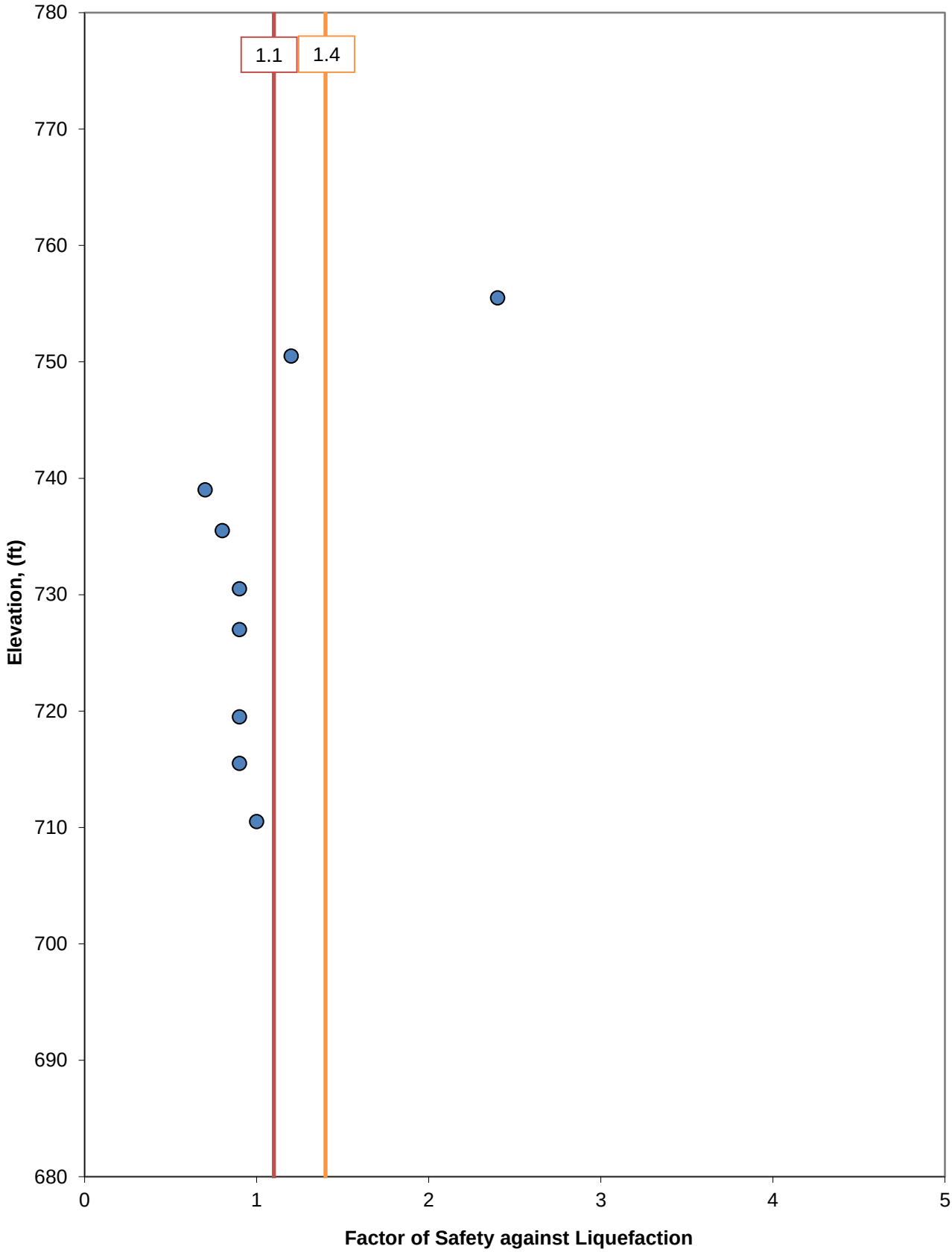
totstr-top	u-top	effstr-top
-0.37	0.00	-0.37

Note: A factor of safety shown as "N/A" implies that the soil type is not appropriately evaluated using this methodology. This applies to clay-like soils (typically CL, CH, CL-ML and MH material type), samples with high blow counts, and unsaturated samples.

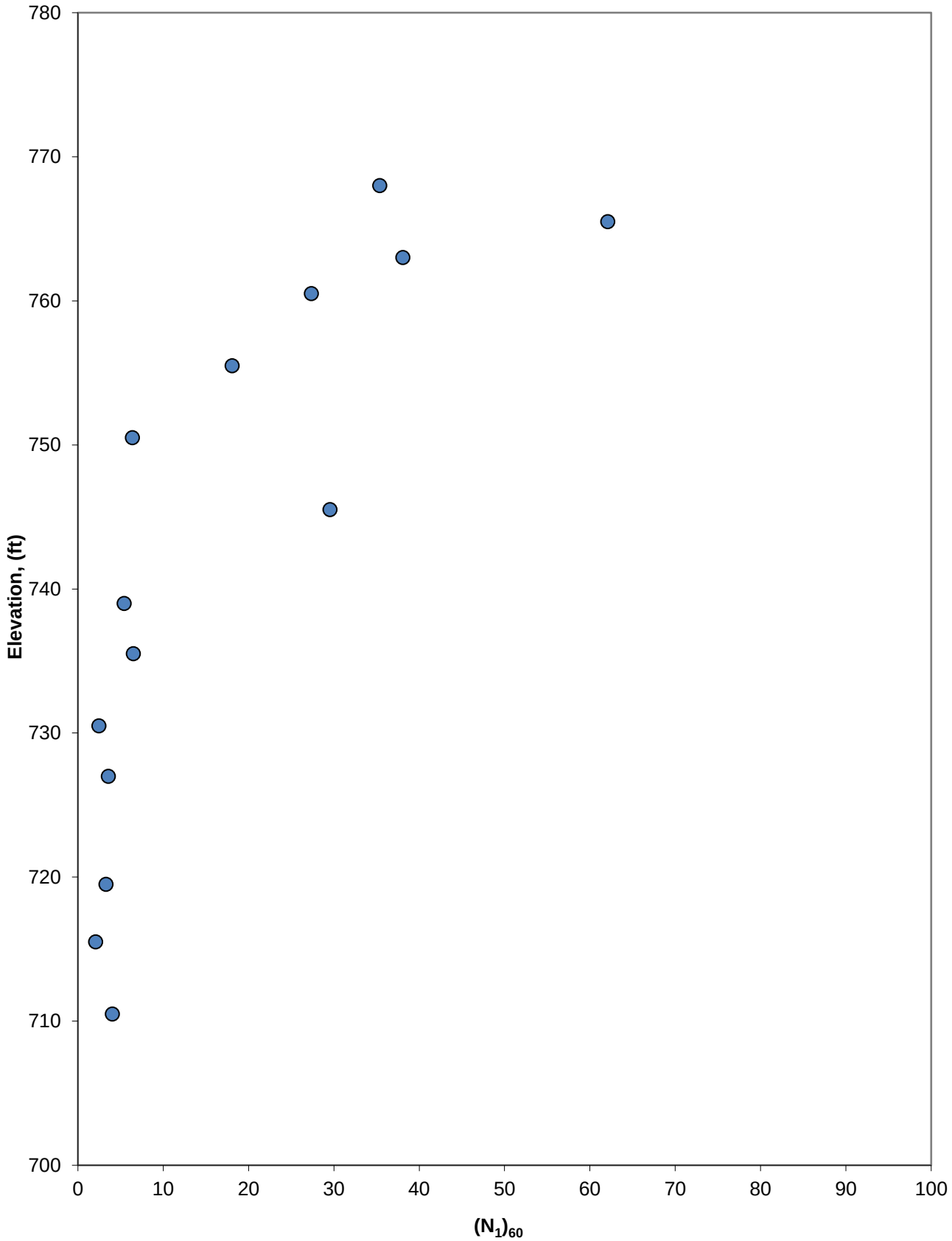
Depth of Mid. Pt. of Sample (ft.) z	Vert. Total Stress during EQ w/ Fill (tsf) $\sigma_{v\ with\ fill}$	Static Pore Pressure during EQ (tsf) u	Vert. Eff. Stress during EQ w/ Fill (tsf) $\sigma'_{v\ with\ fill}$	Clean Sand Correction $\Delta(N_1)_{60cs}$	Equivalent Clean Sand N-Value $(N_1)_{60cs}$	Cyclic Resistance Ratio CRR7.5	Overburden Correction Factor K_σ	Static Shear Stress Correction K_α	Mag. Scaling Factor (MSF)	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Max. Induced Shear Stress (psf)	From Ground Response: Avg. Cyclic Shear Stress (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Blow Count $(N_1)_{60cs} \geq 32$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)
2.0	-0.31	0.00	-0.31	5.55	41	N/A	N/A	N/A	N/A	N/A	1.000	0	0	0.063	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**
4.5	-0.16	0.00	-0.16	5.55	68	N/A	N/A	N/A	N/A	N/A	1.000	0	0	0.063	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**
7.0	-0.01	0.00	-0.01	5.55	44	N/A	N/A	N/A	N/A	N/A	1.000	0	0	0.063	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**
9.5	0.13	0.05	0.08	5.55	33	N/A	N/A	N/A	N/A	N/A	1.000	0	0	0.103	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**
14.5	0.43	0.21	0.22	5.55	24	0.261	1.100	1.016	0.98	0.286	0.990	0	0	0.120	FALSE	FALSE	FALSE	**2.4**	**Bottom Ash**
19.5	0.73	0.37	0.36	5.55	12	0.132	1.100	0.995	0.99	0.143	0.976	0	0	0.122	FALSE	FALSE	FALSE	**1.2**	**Bottom Ash**
24.5	1.03	0.52	0.51	5.55	35	N/A	N/A	N/A	N/A	N/A	0.961	0	0	0.122	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**
31.0	1.40	0.72	0.68	0.00	5	0.089	1.034	0.991	1.00	0.090	0.938	0	0	0.121	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**
34.5	1.60	0.83	0.77	0.00	7	0.095	1.026	0.976	1.00	0.095	0.925	0	0	0.121	FALSE	FALSE	FALSE	**0.8**	**Fly Ash**
39.5	1.90	0.99	0.91	5.60	8	0.105	1.013	0.962	0.99	0.102	0.905	0	0	0.118	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**
43.0	2.12	1.10	1.02	5.60	9	0.112	1.003	0.961	0.99	0.108	0.891	0	0	0.116	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**
50.5	2.60	1.33	1.26	5.60	9	0.110	0.984	0.957	0.99	0.103	0.859	0	0	0.110	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**
54.5	2.85	1.46	1.39	5.60	8	0.103	0.977	0.953	1.00	0.095	0.841	0	0	0.108	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**
59.5	3.17	1.61	1.56	5.15	9	0.112	0.965	0.963	0.99	0.104	0.820	0	0	0.104	FALSE	FALSE	FALSE	**1.0**	**Subunit 3**


Legend
FS$_{liq}$ ≤ 1.1
1.1 < FS$_{liq}$ ≤ 1.4
FS$_{liq}$ > 1.4
Sand-like, Unliquefiable
Clay-like, Not Susceptible
Clay-like, Susceptible
No Data
KIF-BF-SPT5, Liquefaction Triggering Results
Top of Boring
El. 770 ft
El. 760
El. 750
El. 740
El. 730
El. 720
El. 710

KIF TDEC Stability, Boring ID: KIF-BF-SPT5, Source = 1 Hz, Mw = 7.6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



KIF TDEC Stability, Boring ID: KIF-BF-SPT5, Source = 1 Hz, Mw = 7.6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



Project Name = KIF TDEC Stability
Boring ID = KIF-C1

Boring Location

Northing =
Easting =

OR

Baseline Station =
Offset (+ Right) =

Drilling Information

Boring Inner Diameter (ID) =	3.25	inches	
Top of Hole Elevation	748.4	feet	
Water Depth during SPT (negative for U/S borings)=	2.3	feet	
Depth Sampling Began	1	feet	
Total Unit Wt. above 1st SPT =	120	pcf	
Assumed Rod Stickup =	5	feet	*(Typ assume 5ft)*
E_m Measurement based on Fv method? =	1	(1: Yes, 0: No)	
SPT Sampler w/ Liners? =	0	(1: Yes, 0: No)	*(Typ. no)*

During EQ Information

Water Depth during EQ (relative to SPT TOH, negative for U/S borings) =	2.3	feet
Final Grade Elevation during EQ	748.4	feet
Average Total Unit Wt. of Cut/Fill	120	pcf

Fines Content Correction

Fines content correction for samples with blow counts of zero? 1 (1: Yes, 0: No)

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile? 0 (1: Yes, 0: No)
If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile: ng_Pond_Section, KIF-C1_NOR
Alpha at each sample depth known? 1 (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (α vs. depth curve)
If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_α will be one.

m4:
m3:
m2:
m1:
m0:

Associated ground response profile: shing_Pond_Section, KIF-C1
Get CSR from shear stress envelope? 0 (1: Yes, 0: No)
If previous answer is No, then CSR will be calculated using a_{max} and r_d
Max. Shear Stress at each sample depth known? (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4:
m3:
m2:
m1:

Earthquake Information

EQ Source (e.g., New Madrid)	1 Hz
Event (e.g., MCE, 10KEQ, OBE)	Design EQ
a_{max} (g) (top of ground surface)	0.10
EQ Mag (Mw)	7.6

Inputs

Depth of Sample Midpoint (ft.)	SPT N Value	Hammer Efficiency, E_m (%)	Unified Soil Classification	Fines Content (%)	Total Unit Weight (pcf)	Material (optional)	Clay-like / Sand-like Override (optional)	Clay-like Susceptibility (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure during SPT (psf)	Static Pore Water Pressure during EQ (psf)
2.0	1	80	CL	49	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.256			
3.5	2	80		49	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.245			
5.0	15	80		49	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.242			
6.5	16	80		49	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.236			
8.0	3	80		49	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.234			
9.5	4	80		49	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.231			
11.0	1	80		49	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.229			
12.5	1	80		34	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.224			
14.0	0	80		34	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.219			
15.5	10	80		73	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.215			
17.0	2	80		73	127	Subunit 1	Clay-like	Not Susceptible		0.212			
18.5	3	80		73	127	Subunit 1	Clay-like	Not Susceptible		0.209			
20.0	3	80		74	127	Subunit 1	Clay-like	Not Susceptible		0.207			
21.5	4	80		74	127	Subunit 1	Clay-like	Not Susceptible		0.206			
23.0	5	80		74	127	Subunit 1	Clay-like	Not Susceptible		0.206			
24.5	5	80		74	127	Subunit 1	Clay-like	Not Susceptible		0.205			
26.0	4	80		74	127	Subunit 1	Clay-like	Not Susceptible		0.206			
27.5	4	80		74	127	Subunit 1	Clay-like	Not Susceptible		0.207			
29.0	2	80		74	127	Subunit 1	Clay-like	Not Susceptible		0.209			
30.5	8	80		74	127	Subunit 1	Clay-like	Not Susceptible		0.210			
32.0	4	80		33	131	Subunit 3	Sand-like			0.212			
33.5	3	80		33	131	Subunit 3	Sand-like			0.213			
35.0	5	80		33	131	Subunit 3	Sand-like			0.214			
36.5	4	80		33	131	Subunit 3	Sand-like			0.214			
38.0	1	80		33	131	Subunit 3	Sand-like			0.212			
39.5	4	80		33	131	Subunit 3	Sand-like			0.210			
41.0	0	80		33	131	Subunit 3	Sand-like			0.209			
42.5	3	80		33	131	Subunit 3	Sand-like			0.206			
44.0	4	80		33	131	Subunit 3	Sand-like			0.204			
45.5	28	80		33	131	Subunit 3	Sand-like			0.202			

KIF TDEC Stability, Boring ID: KIF-C1

Liquefaction Potential Evaluations

For Coarse Grained Soils

Top of Hole Elevation (ft) =			748.4				Boring ID =		KIF-C1										
begin sampling (depth-ft) =			1.0				Boring Inner Dia. (in) =		3.25										
total unit wt. above 1st SPT (pcf) =			120																
water elevation during SPT (ft) =			746.1	ft *(relative to ground surface during SPT)*					Assumed Rod Stickup =	5.0	feet								
water depth during SPT (ft) =			2.3						E_m Measurement? =	1	(1: Yes, 0: No)								
water elevation during EQ (ft) =			746.1	ft *(relative to ground surface during SPT)*					SPT Sampler w/ Liners? =	0	(1: Yes, 0: No)								
water during EQ (depth-ft) =			2.3	u-top	effstr-top														
vert. total stress above 1st SPT (tsf) =			**0.06**	**0.00**	0.06														
Elev. Of Mid. Pt. of Sample (ft)	Depth of Mid. Pt. of Sample (ft.) z	Unit Weight (pcf) γ_T	Vert. Total Stress during SPT (tsf) σ_v	Static Pore Pressure during SPT (tsf) u	Vert. Eff. Stress during SPT (tsf) σ'_v	SPT N Value N	Hammer Efficiency (%) E_m	Borehole Diameter Correction C_B	Sampler Correction C_s	Rod Length Correction C_R	Overburden Stress Correction Factor C_N	Hammer Energy Correction Factor C_E	Corrected Blow Count N_{60}	Normalized Blow Count $(N_1)_{60}$	Relative Density (%) D_r	Unified Soil Classification	Fines Content (%)	Relative State Parameter Index ξ_R	Static Shear Stress Ratio α
746.4	2.0	120	0.12	0.00	0.12	1	80.0	1.000	1.10	1.00	1.70	1.33	1	2	42	CL	49	-0.29	0.256
744.9	3.5	120	0.21	0.04	0.17	2	80.0	1.000	1.10	1.00	1.70	1.33	3	5	48	0	49	-0.35	0.245
743.4	5.0	120	0.30	0.08	0.22	15	80.0	1.000	1.30	1.00	1.53	1.33	26	40	99	0	49	-0.60	0.242
741.9	6.5	120	0.39	0.13	0.26	16	80.0	1.000	1.30	1.00	1.45	1.33	28	40	100	0	49	-0.60	0.236
740.4	8.0	120	0.48	0.18	0.30	3	80.0	1.000	1.10	1.00	1.70	1.33	4	7	53	0	49	-0.39	0.234
738.9	9.5	120	0.57	0.22	0.35	4	80.0	1.000	1.10	1.00	1.70	1.33	6	10	58	0	49	-0.44	0.231
737.4	11.0	120	0.66	0.27	0.39	1	80.0	1.000	1.10	1.00	1.70	1.33	1	2	42	0	49	-0.27	0.229
735.9	12.5	120	0.75	0.32	0.43	1	80.0	1.000	1.10	1.00	1.66	1.33	1	2	42	0	34	-0.27	0.224
734.4	14.0	120	0.84	0.37	0.47	0	80.0	1.000	1.10	1.00	1.62	1.33	0	0	35	0	34	-0.20	0.219
732.9	15.5	120	0.93	0.41	0.52	10	80.0	1.000	1.21	1.00	1.32	1.33	16	21	76	0	73	-0.60	0.215
731.4	17.0	127	1.02	0.46	0.56	2	80.0	1.000	1.10	1.00	1.41	1.33	3	4	46	0	73	-0.30	0.212
729.9	18.5	127	1.12	0.51	0.61	3	80.0	1.000	1.10	1.00	1.33	1.33	4	6	50	0	73	-0.34	0.209
728.4	20.0	127	1.21	0.55	0.66	3	80.0	1.000	1.10	1.00	1.28	1.33	4	6	49	0	74	-0.33	0.207
726.9	21.5	127	1.31	0.60	0.71	4	80.0	1.000	1.10	1.00	1.23	1.33	6	7	53	0	74	-0.37	0.206
725.4	23.0	127	1.40	0.65	0.76	5	80.0	1.000	1.10	1.00	1.18	1.33	7	9	56	0	74	-0.39	0.206
723.9	24.5	127	1.50	0.69	0.81	5	80.0	1.000	1.10	1.00	1.14	1.33	7	8	55	0	74	-0.39	0.205
722.4	26.0	127	1.59	0.74	0.85	4	80.0	1.000	1.10	1.00	1.12	1.33	6	7	51	0	74	-0.35	0.206
720.9	27.5	127	1.69	0.79	0.90	4	80.0	1.000	1.10	1.00	1.09	1.33	6	6	51	0	74	-0.34	0.207
719.4	29.0	127	1.78	0.83	0.95	2	80.0	1.000	1.10	1.00	1.06	1.33	3	3	43	0	74	-0.26	0.209
717.9	30.5	127	1.88	0.88	1.00	8	80.0	1.000	1.12	1.00	1.03	1.33	12	12	62	0	74	-0.45	0.210
716.4	32.0	131	1.98	0.93	1.05	4	80.0	1.000	1.10	1.00	1.00	1.33	6	6	50	0	33	-0.32	0.212
714.9	33.5	131	2.07	0.97	1.10	3	80.0	1.000	1.10	1.00	0.98	1.33	4	4	46	0	33	-0.29	0.213
713.4	35.0	131	2.17	1.02	1.15	5	80.0	1.000	1.10	1.00	0.96	1.33	7	7	52	0	33	-0.35	0.214
711.9	36.5	131	2.27	1.07	1.20	4	80.0	1.000	1.10	1.00	0.93	1.33	6	5	49	0	33	-0.31	0.214
710.4	38.0	131	2.37	1.11	1.26	1	80.0	1.000	1.10	1.00	0.90	1.33	1	1	38	0	33	-0.21	0.212
708.9	39.5	131	2.47	1.16	1.31	4	80.0	1.000	1.10	1.00	0.89	1.33	6	5	48	0	33	-0.30	0.210
707.4	41.0	131	2.57	1.21	1.36	0	80.0	1.000	1.10	1.00	0.86	1.33	0	0	35	0	33	-0.17	0.209
705.9	42.5	131	2.66	1.25	1.41	3	80.0	1.000	1.10	1.00	0.85	1.33	4	4	45	0	33	-0.27	0.206
704.4	44.0	131	2.76	1.30	1.46	4	80.0	1.000	1.10	1.00	0.84	1.33	6	5	48	0	33	-0.29	0.204
702.9	45.5	131	2.86	1.35	1.51	28	80.0	1.000	1.30	1.00	0.91	1.33	49	44	100	0	33	-0.60	0.202

KIF TDEC Stability, Boring ID: KIF-C1
Liquefaction Potential Evaluations
For Coarse Grained Soils

EQ Source	a max (g)	EQ Mag (Mw)	Event
1 Hz	0.10	7.6	Design EQ

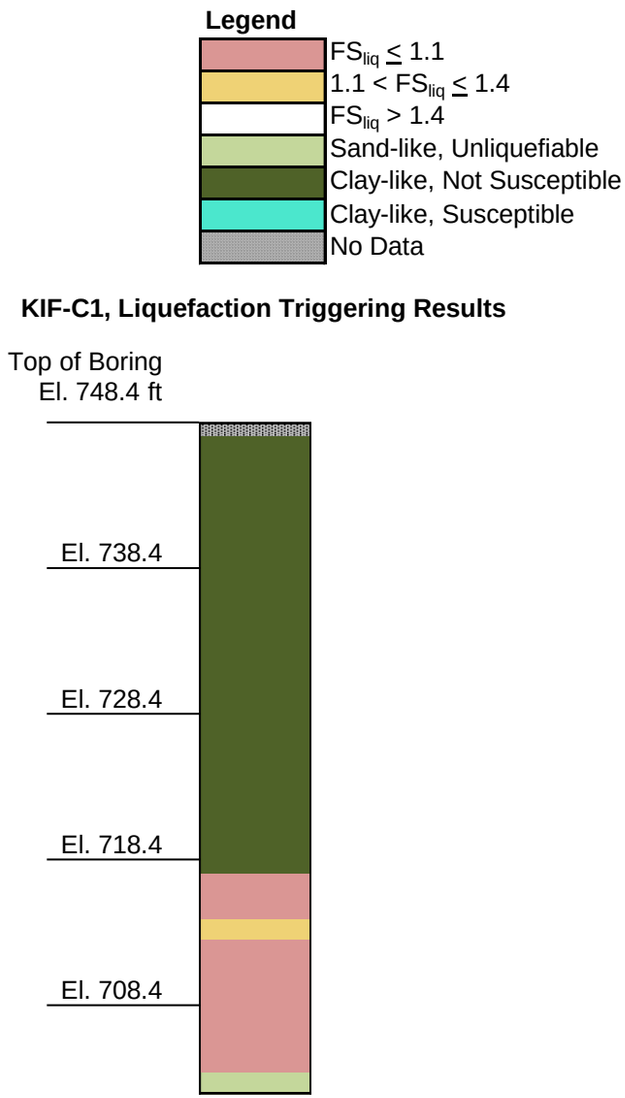
Shear Stress Curve Fit Parameters
m4: 0
m3: 0
m2: 0
m1: 0

Boring ID: **KIF-C1**
Top of Fill Elevation: 748.4 ft
Fill Height: 0.0 ft *(relative to ground surface during SPT)*
Fill Total Unit Weight: 120 pcf
Fill Total Stress: 0.00 tsf

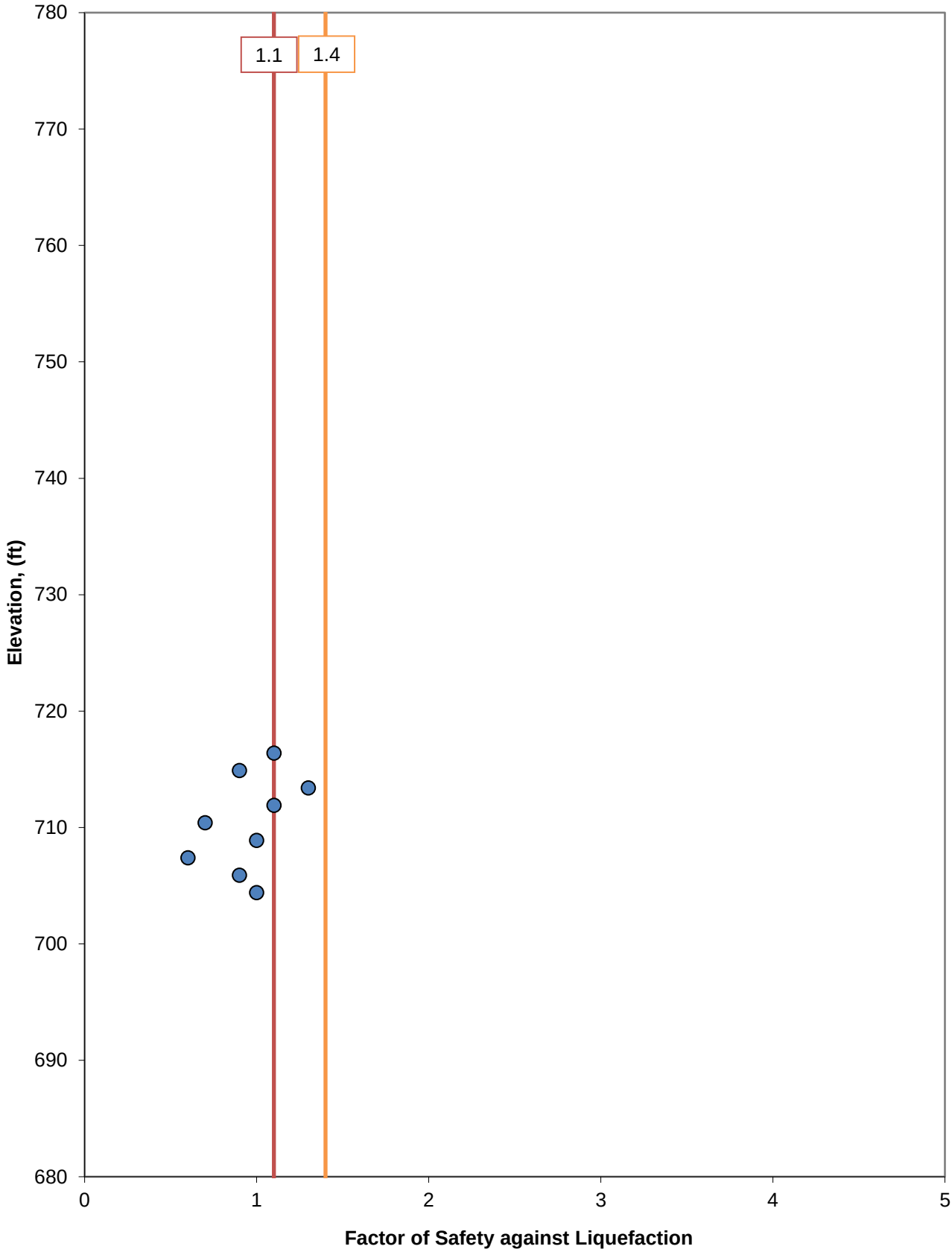
totstr-top **0.06** | u-top 0.00 | effstr-top 0.06

Note: A factor of safety shown as "N/A" implies that the soil type is not appropriately evaluated using this methodology. This applies to clay-like soils (typically CL, CH, CL-ML and MH material type), samples with high blow counts, and unsaturated samples.

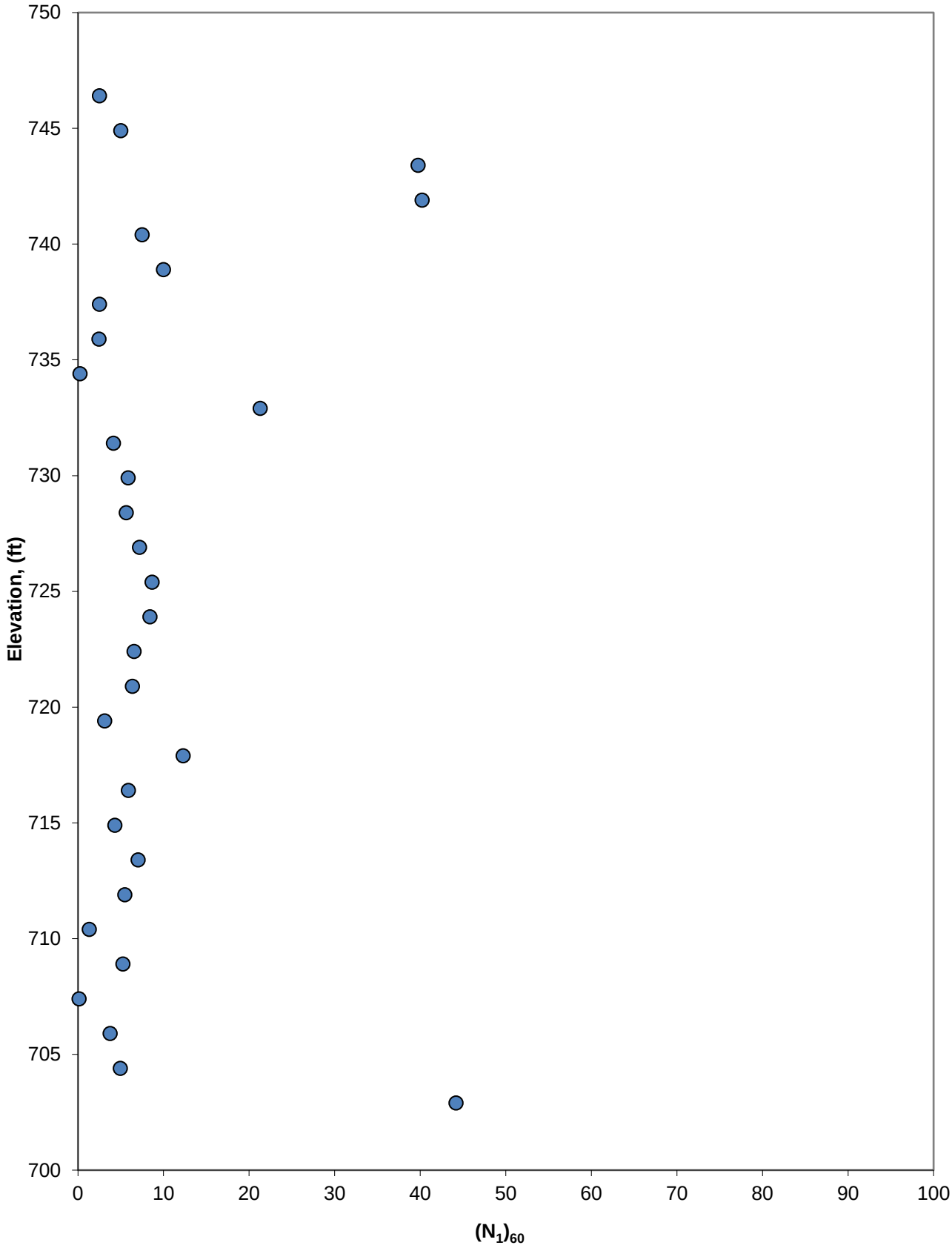
Depth of Mid. Pt. of Sample (ft.) z	Vert. Total Stress during EQ w/ Fill (tsf) $\sigma_{v\ with\ fill}$	Static Pore Pressure during EQ (tsf) u	Vert. Eff. Stress during EQ w/ Fill (tsf) $\sigma'_{v\ with\ fill}$	Clean Sand Correction $\Delta(N_1)_{60cs}$	Equivalent Clean Sand N-Value $(N_1)_{60cs}$	Cyclic Resistance Ratio CRR7.5	Overburden Correction Factor K_σ	Static Shear Stress Correction K_α	Mag. Scaling Factor (MSF)	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Max. Induced Shear Stress (psf)	From Ground Response: Avg. Cyclic Shear Stress (psf)	Cyclic Stress Ratio CSR	Sample Screened for: High Clay-like	High Blow Count $(N_1)_{60cs} \geq 32$	Unsaturated	Factor of Safety FS_{liq}	Material (optional)
2.0	0.12	0.00	0.12	5.61	8	N/A	N/A	N/A	0.99	N/A	1.000	0	0	0.068	TRUE	FALSE	TRUE	N/A	**Clay Fill (irrelevant)**
3.5	0.21	0.04	0.17	5.61	11	N/A	N/A	N/A	0.99	N/A	0.999	0	0	0.083	TRUE	FALSE	FALSE	N/A	**Clay Fill (irrelevant)**
5.0	0.30	0.08	0.22	5.61	45	N/A	N/A	N/A	N/A	N/A	0.996	0	0	0.094	TRUE	TRUE	FALSE	N/A	**Clay Fill (irrelevant)**
6.5	0.39	0.13	0.26	5.61	46	N/A	N/A	N/A	N/A	N/A	0.992	0	0	0.102	TRUE	TRUE	FALSE	N/A	**Clay Fill (irrelevant)**
8.0	0.48	0.18	0.30	5.61	13	N/A	N/A	N/A	0.99	N/A	0.988	0	0	0.107	TRUE	FALSE	FALSE	N/A	**Clay Fill (irrelevant)**
9.5	0.57	0.22	0.35	5.61	16	N/A	N/A	N/A	0.99	N/A	0.984	0	0	0.110	TRUE	FALSE	FALSE	N/A	**Clay Fill (irrelevant)**
11.0	0.66	0.27	0.39	5.61	8	N/A	N/A	N/A	0.99	N/A	0.980	0	0	0.113	TRUE	FALSE	FALSE	N/A	**Clay Fill (irrelevant)**
12.5	0.75	0.32	0.43	5.49	8	N/A	N/A	N/A	0.99	N/A	0.976	0	0	0.115	TRUE	FALSE	FALSE	N/A	**Clay Fill (irrelevant)**
14.0	0.84	0.37	0.47	5.49	6	N/A	N/A	N/A	1.00	N/A	0.971	0	0	0.117	TRUE	FALSE	FALSE	N/A	**Clay Fill (irrelevant)**
15.5	0.93	0.41	0.52	5.57	27	N/A	N/A	N/A	0.97	N/A	0.967	0	0	0.118	TRUE	FALSE	FALSE	N/A	**Clay Fill (irrelevant)**
17.0	1.02	0.46	0.56	5.57	10	N/A	N/A	N/A	0.99	N/A	0.962	0	0	0.119	TRUE	FALSE	FALSE	N/A	**Subunit 1**
18.5	1.12	0.51	0.61	5.57	11	N/A	N/A	N/A	0.99	N/A	0.957	0	0	0.119	TRUE	FALSE	FALSE	N/A	**Subunit 1**
20.0	1.21	0.55	0.66	5.56	11	N/A	N/A	N/A	0.99	N/A	0.952	0	0	0.119	TRUE	FALSE	FALSE	N/A	**Subunit 1**
21.5	1.31	0.60	0.71	5.56	13	N/A	N/A	N/A	0.99	N/A	0.946	0	0	0.119	TRUE	FALSE	FALSE	N/A	**Subunit 1**
23.0	1.40	0.65	0.76	5.56	14	N/A	N/A	N/A	0.99	N/A	0.941	0	0	0.119	TRUE	FALSE	FALSE	N/A	**Subunit 1**
24.5	1.50	0.69	0.81	5.56	14	N/A	N/A	N/A	0.99	N/A	0.935	0	0	0.118	TRUE	FALSE	FALSE	N/A	**Subunit 1**
26.0	1.59	0.74	0.85	5.56	12	N/A	N/A	N/A	0.99	N/A	0.930	0	0	0.118	TRUE	FALSE	FALSE	N/A	**Subunit 1**
27.5	1.69	0.79	0.90	5.56	12	N/A	N/A	N/A	0.99	N/A	0.924	0	0	0.118	TRUE	FALSE	FALSE	N/A	**Subunit 1**
29.0	1.78	0.83	0.95	5.56	9	N/A	N/A	N/A	0.99	N/A	0.918	0	0	0.117	TRUE	FALSE	FALSE	N/A	**Subunit 1**
30.5	1.88	0.88	1.00	5.56	18	N/A	N/A	N/A	0.99	N/A	0.912	0	0	0.117	TRUE	FALSE	FALSE	N/A	**Subunit 1**
32.0	1.98	0.93	1.05	5.46	11	0.128	1.001	1.020	0.99	0.129	0.906	0	0	0.116	FALSE	FALSE	FALSE	**1.1**	**Subunit 3**
33.5	2.07	0.97	1.10	5.46	10	0.116	0.996	0.945	0.99	0.109	0.900	0	0	0.115	FALSE	FALSE	FALSE	**0.9**	**Subunit 3**
35.0	2.17	1.02	1.15	5.46	12	0.136	0.991	1.071	0.99	0.143	0.894	0	0	0.115	FALSE	FALSE	FALSE	**1.3**	**Subunit 3**
36.5	2.27	1.07	1.20	5.46	11	0.125	0.988	0.992	0.99	0.121	0.888	0	0	0.114	FALSE	FALSE	FALSE	**1.1**	**Subunit 3**
38.0	2.37	1.11	1.26	5.46	7	0.097	0.986	0.825	1.00	0.078	0.881	0	0	0.113	FALSE	FALSE	FALSE	**0.7**	**Subunit 3**
39.5	2.47	1.16	1.31	5.46	11	0.123	0.980	0.976	0.99	0.117	0.875	0	0	0.112	FALSE	FALSE	FALSE	**1.0**	**Subunit 3**
41.0	2.57	1.21	1.36	5.46	6	0.090	0.981	0.788	1.00	0.069	0.869	0	0	0.112	FALSE	FALSE	FALSE	**0.6**	**Subunit 3**
42.5	2.66	1.25	1.41	5.46	9	0.113	0.974	0.911	0.99	0.099	0.862	0	0	0.111	FALSE	FALSE	FALSE	**0.9**	**Subunit 3**
44.0	2.76	1.30	1.46	5.46	10	0.121	0.970	0.956	0.99	0.111	0.856	0	0	0.110	FALSE	FALSE	FALSE	**1.0**	**Subunit 3**
45.5	2.86	1.35	1.51	5.46	50	N/A	N/A	N/A	N/A	N/A	0.849	0	0	0.109	FALSE	TRUE	FALSE	N/A	**Subunit 3**


Legend
$FS_{liq} \leq 1.1$
$1.1 < FS_{liq} \leq 1.4$
$FS_{liq} > 1.4$
Sand-like, Unliquefiable
Clay-like, Not Susceptible
Clay-like, Susceptible
No Data
KIF-C1, Liquefaction Triggering Results
Top of Boring
El. 748.4 ft
El. 738.4
El. 728.4
El. 718.4
El. 708.4

KIF TDEC Stability, Boring ID: KIF-C1, Source = 1 Hz, Mw = 7.6, Event = Design EQ,
SPT Data, Simplified Stress-Based Approach



KIF TDEC Stability, Boring ID: KIF-C1, Source = 1 Hz, Mw = 7.6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



Project Name = KIF TDEC Stability
Boring ID = KIF-C2

Boring Location

Northing =
Easting =

OR

Baseline Station =
Offset (+ Right) =

Drilling Information

Boring Inner Diameter (ID) =	3.25	inches	
Top of Hole Elevation	743.9	feet	
Water Depth during SPT (negative for U/S borings)=	2.3	feet	
Depth Sampling Began	1.5	feet	
Total Unit Wt. above 1st SPT =	120	pcf	
Assumed Rod Stickup =	5	feet	*(Typ assume 5ft)*
E_m Measurement based on Fv method? =	1	(1: Yes, 0: No)	
SPT Sampler w/ Liners? =	0	(1: Yes, 0: No)	*(Typ. no)*

During EQ Information

Water Depth during EQ (relative to SPT TOH, negative for U/S borings) =	2.3	feet
Final Grade Elevation during EQ	743.9	feet
Average Total Unit Wt. of Cut/Fill	120	pcf

Fines Content Correction

Fines content correction for samples with blow counts of zero? 1 (1: Yes, 0: No)

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile? 0 (1: Yes, 0: No)
If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile: ng_Pond_Section, KIF-C2_NOR
Alpha at each sample depth known? 1 (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (α vs. depth curve)
If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_α will be one.

m4:
m3:
m2:
m1:
m0:

Associated ground response profile: shing_Pond_Section, KIF-C2
Get CSR from shear stress envelope? 0 (1: Yes, 0: No)
If previous answer is No, then CSR will be calculated using a_{max} and r_d
Max. Shear Stress at each sample depth known? (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4:
m3:
m2:
m1:

Earthquake Information

EQ Source (e.g., New Madrid)	1 Hz
Event (e.g., MCE, 10KEQ, OBE)	Design EQ
a_{max} (g) (top of ground surface)	0.10
EQ Mag (Mw)	7.6

Inputs

Depth of Sample Midpoint (ft.)	SPT N Value	Hammer Efficiency, E_m (%)	Unified Soil Classification	Fines Content (%)	Total Unit Weight (pcf)	Material (optional)	Clay-like / Sand-like Override (optional)	Clay-like Susceptibility (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure during SPT (psf)	Static Pore Water Pressure during EQ (psf)
2.5	7	80	CL	47	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.334			
4.0	9	80		47	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.314			
5.5	4	80		30	131	Subunit 3	Sand-like			0.299			
7.0	6	80		30	131	Subunit 3	Sand-like			0.290			
8.5	2	80		30	131	Subunit 3	Sand-like			0.283			
10.0	1	80		30	131	Subunit 3	Sand-like			0.276			
11.5	1	80		65	127	Subunit 1	Clay-like	Not Susceptible		0.270			
13.0	0	80		65	127	Subunit 1	Clay-like	Not Susceptible		0.265			
14.5	0	80		65	127	Subunit 1	Clay-like	Not Susceptible		0.260			
16.0	10	80		65	127	Subunit 1	Clay-like	Not Susceptible		0.256			
17.5	7	80		65	127	Subunit 1	Clay-like	Not Susceptible		0.252			
19.0	6	80		65	127	Subunit 1	Clay-like	Not Susceptible		0.247			
20.5	8	80		65	127	Subunit 1	Clay-like	Not Susceptible		0.241			
22.0	7	80		65	127	Subunit 1	Clay-like	Not Susceptible		0.235			
23.5	3	80		65	127	Subunit 1	Clay-like	Not Susceptible		0.229			
25.0	2	80		65	127	Subunit 1	Clay-like	Not Susceptible		0.224			
26.5	0	80		49	126	Subunit 2	Sand-like			0.218			
28.0	1	80		49	126	Subunit 2	Sand-like			0.213			
29.5	0	80		49	126	Subunit 2	Sand-like			0.208			
31.0	3	80		49	126	Subunit 2	Sand-like			0.204			
32.5	11	80		49	126	Subunit 2	Sand-like			0.200			
34.0	5	80		49	126	Subunit 2	Sand-like			0.195			
35.5	6	80		49	126	Subunit 2	Sand-like			0.191			
37.0	7	80		49	126	Subunit 2	Sand-like			0.187			
38.5	7	80		49	126	Subunit 2	Sand-like			0.184			
40.0	34	80		30	131	Subunit 3	Sand-like			0.182			
41.5	14	80		30	131	Subunit 3	Sand-like			0.181			

KIF TDEC Stability, Boring ID: KIF-C2

Liquefaction Potential Evaluations

For Coarse Grained Soils

Top of Hole Elevation (ft) =			743.9				Boring ID =		KIF-C2										
begin sampling (depth-ft) =			1.5				Boring Inner Dia. (in) =		3.25										
total unit wt. above 1st SPT (pcf) =			120																
water elevation during SPT (ft) =			741.6	ft *(relative to ground surface during SPT)*					Assumed Rod Stickup =	5.0	feet								
water depth during SPT (ft) =			2.3						E_m Measurement? =	1	(1: Yes, 0: No)								
water elevation during EQ (ft) =			741.6	ft *(relative to ground surface during SPT)*					SPT Sampler w/ Liners? =	0	(1: Yes, 0: No)								
water during EQ (depth-ft) =			2.3	u-top	effstr-top														
vert. total stress above 1st SPT (tsf) =			**0.09**	**0.00**	0.09														
Elev. Of Mid. Pt. of Sample (ft)	Depth of Mid. Pt. of Sample (ft.) z	Unit Weight (pcf) γ_T	Vert. Total Stress during SPT (tsf) σ_v	Static Pore Pressure during SPT (tsf) u	Vert. Eff. Stress during SPT (tsf) σ'_v	SPT N Value N	Hammer Efficiency (%) E_m	Borehole Diameter Correction C_B	Sampler Correction C_s	Rod Length Correction C_R	Overburden Stress Correction Factor C_N	Hammer Energy Correction Factor C_E	Corrected Blow Count N_{60}	Normalized Blow Count $(N_1)_{60}$	Relative Density (%) D_r	Unified Soil Classification	Fines Content (%)	Relative State Parameter Index ξ_R	Static Shear Stress Ratio α
741.4	2.5	120	0.15	0.01	0.14	7	80.0	1.000	1.19	1.00	1.70	1.33	11	19	73	CL	47	-0.60	0.334
739.9	4.0	120	0.24	0.05	0.19	9	80.0	1.000	1.26	1.00	1.70	1.33	15	26	82	0	47	-0.60	0.314
738.4	5.5	131	0.33	0.10	0.23	4	80.0	1.000	1.10	1.00	1.70	1.33	6	10	58	0	30	-0.44	0.299
736.9	7.0	131	0.43	0.15	0.29	6	80.0	1.000	1.16	1.00	1.70	1.33	9	16	68	0	30	-0.54	0.290
735.4	8.5	131	0.53	0.19	0.34	2	80.0	1.000	1.10	1.00	1.70	1.33	3	5	47	0	30	-0.33	0.283
733.9	10.0	131	0.63	0.24	0.39	1	80.0	1.000	1.10	1.00	1.70	1.33	1	2	41	0	30	-0.27	0.276
732.4	11.5	127	0.73	0.29	0.44	1	80.0	1.000	1.10	1.00	1.65	1.33	1	2	42	0	65	-0.27	0.270
730.9	13.0	127	0.82	0.33	0.49	0	80.0	1.000	1.10	1.00	1.59	1.33	0	0	36	0	65	-0.20	0.265
729.4	14.5	127	0.92	0.38	0.54	0	80.0	1.000	1.10	1.00	1.50	1.33	0	0	36	0	65	-0.20	0.260
727.9	16.0	127	1.01	0.43	0.58	10	80.0	1.000	1.20	1.00	1.26	1.33	16	20	75	0	65	-0.59	0.256
726.4	17.5	127	1.11	0.47	0.63	7	80.0	1.000	1.13	1.00	1.26	1.33	11	13	64	0	65	-0.48	0.252
724.9	19.0	127	1.20	0.52	0.68	6	80.0	1.000	1.11	1.00	1.23	1.33	9	11	60	0	65	-0.44	0.247
723.4	20.5	127	1.30	0.57	0.73	8	80.0	1.000	1.14	1.00	1.18	1.33	12	14	66	0	65	-0.50	0.241
721.9	22.0	127	1.39	0.61	0.78	7	80.0	1.000	1.12	1.00	1.15	1.33	10	12	62	0	65	-0.46	0.235
720.4	23.5	127	1.49	0.66	0.83	3	80.0	1.000	1.10	1.00	1.14	1.33	4	5	48	0	65	-0.31	0.229
718.9	25.0	127	1.58	0.71	0.87	2	80.0	1.000	1.10	1.00	1.11	1.33	3	3	44	0	65	-0.27	0.224
717.4	26.5	126	1.68	0.76	0.92	0	80.0	1.000	1.10	1.00	1.09	1.33	0	0	35	0	49	-0.19	0.218
715.9	28.0	126	1.77	0.80	0.97	1	80.0	1.000	1.10	1.00	1.05	1.33	1	2	39	0	49	-0.22	0.213
714.4	29.5	126	1.87	0.85	1.02	0	80.0	1.000	1.10	1.00	1.02	1.33	0	0	35	0	49	-0.18	0.208
712.9	31.0	126	1.96	0.90	1.07	3	80.0	1.000	1.10	1.00	1.00	1.33	4	4	47	0	49	-0.29	0.204
711.4	32.5	126	2.06	0.94	1.11	11	80.0	1.000	1.17	1.00	0.98	1.33	17	17	70	0	49	-0.52	0.200
709.9	34.0	126	2.15	0.99	1.16	5	80.0	1.000	1.10	1.00	0.95	1.33	7	7	52	0	49	-0.35	0.195
708.4	35.5	126	2.24	1.04	1.21	6	80.0	1.000	1.10	1.00	0.94	1.33	9	8	55	0	49	-0.37	0.191
706.9	37.0	126	2.34	1.08	1.26	7	80.0	1.000	1.10	1.00	0.92	1.33	10	9	57	0	49	-0.39	0.187
705.4	38.5	126	2.43	1.13	1.30	7	80.0	1.000	1.10	1.00	0.90	1.33	10	9	57	0	49	-0.39	0.184
703.9	40.0	131	2.53	1.18	1.35	34	80.0	1.000	1.30	1.00	0.94	1.33	59	55	100	0	30	-0.60	0.182
702.4	41.5	131	2.63	1.22	1.41	14	80.0	1.000	1.20	1.00	0.89	1.33	22	20	74	0	30	-0.56	0.181

KIF TDEC Stability, Boring ID: KIF-C2
Liquefaction Potential Evaluations
For Coarse Grained Soils

EQ Source	a max (g)	EQ Mag (Mw)	Event
1 Hz	0.10	7.6	Design EQ

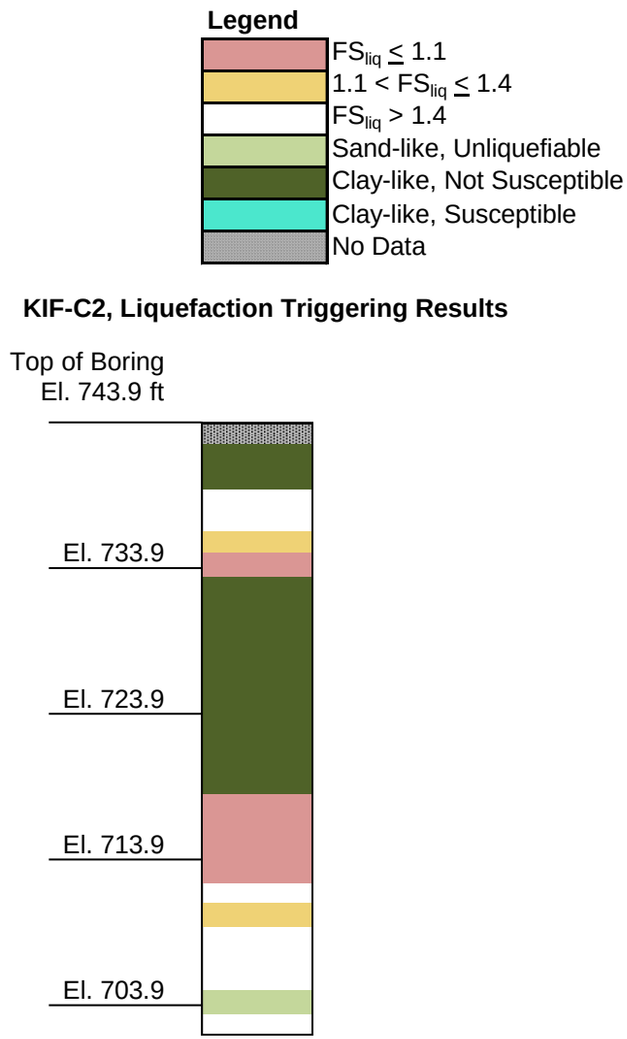
Shear Stress Curve Fit Parameters
m4: 0
m3: 0
m2: 0
m1: 0

Boring ID: **KIF-C2**
Top of Fill Elevation: 743.9 ft
Fill Height: 0.0 ft *(relative to ground surface during SPT)*
Fill Total Unit Weight: 120 pcf
Fill Total Stress: 0.00 tsf

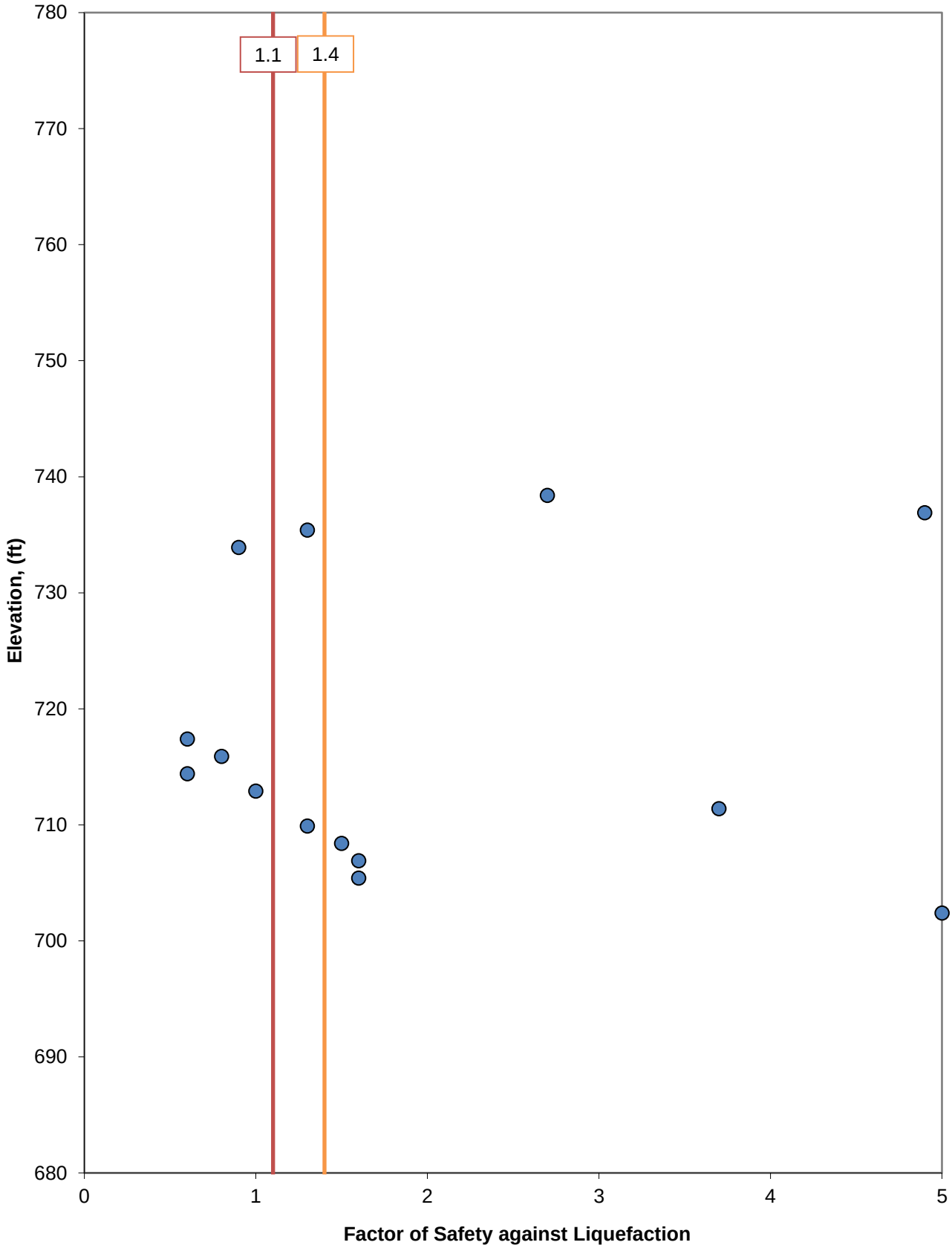
totstr-top **0.09** | u-top 0.00 | effstr-top 0.09

Note: A factor of safety shown as "N/A" implies that the soil type is not appropriately evaluated using this methodology. This applies to clay-like soils (typically CL, CH, CL-ML and MH material type), samples with high blow counts, and unsaturated samples.

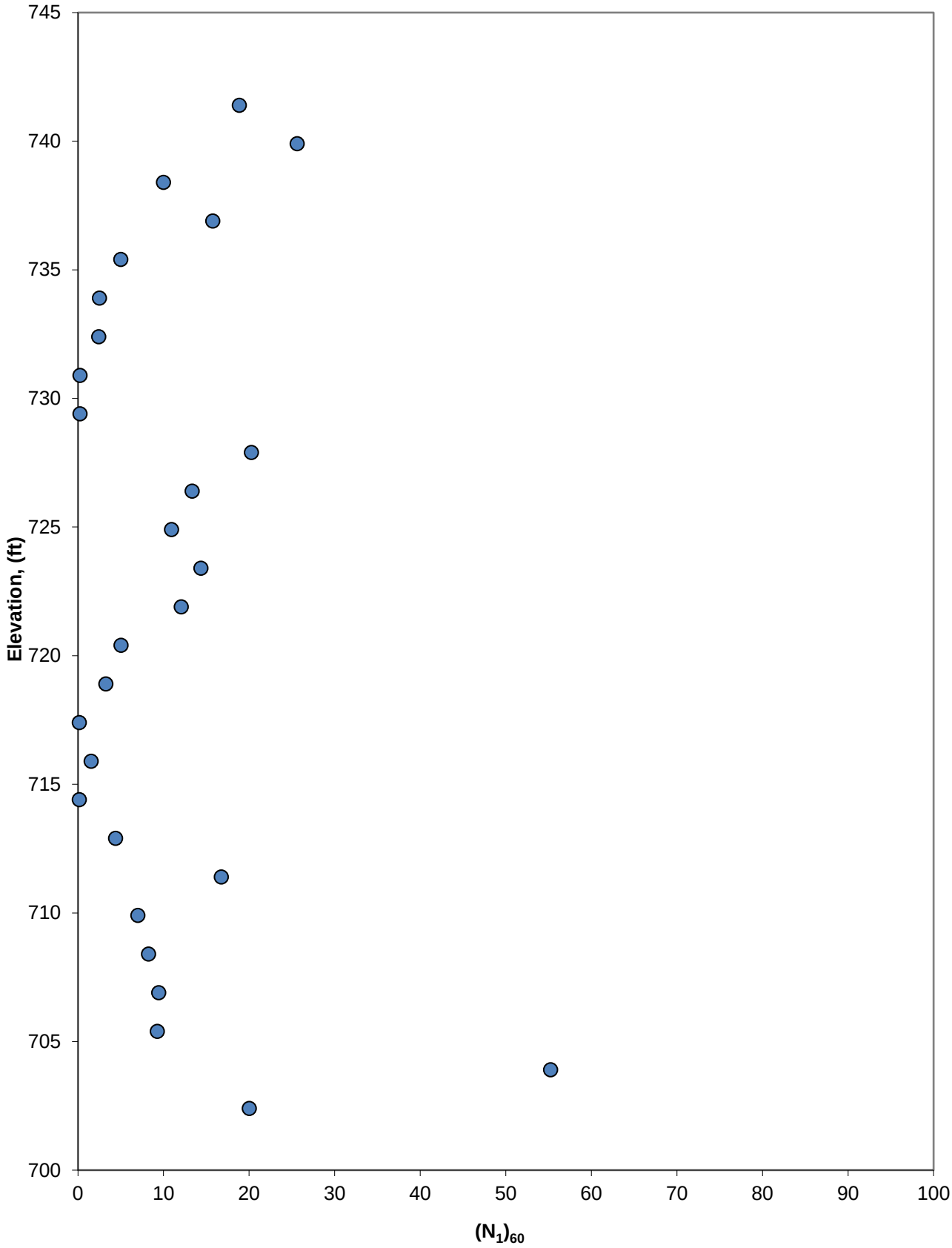
Depth of Mid. Pt. of Sample (ft.) z	Vert. Total Stress during EQ w/ Fill (tsf) $\sigma_{v\ with\ fill}$	Static Pore Pressure during EQ (tsf) u	Vert. Eff. Stress during EQ w/ Fill (tsf) $\sigma'_{v\ with\ fill}$	Clean Sand Correction $\Delta(N_1)_{60cs}$	Equivalent Clean Sand N-Value $(N_1)_{60cs}$	Cyclic Resistance Ratio CRR7.5	Overburden Correction Factor K_σ	Static Shear Stress Correction K_α	Mag. Scaling Factor (MSF)	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Max. Induced Shear Stress (psf)	From Ground Response: Avg. Cyclic Shear Stress (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Blow Count $(N_1)_{60cs} \geq 32$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)
2.5	0.15	0.01	0.14	5.61	24	N/A	N/A	N/A	0.98	N/A	1.000	0	0	0.070	TRUE	FALSE	FALSE	**N/A**	**Clay Fill (irrelevant)**
4.0	0.24	0.05	0.19	5.61	31	N/A	N/A	N/A	0.96	N/A	0.998	0	0	0.085	TRUE	FALSE	FALSE	**N/A**	**Clay Fill (irrelevant)**
5.5	0.33	0.10	0.23	5.36	15	0.159	1.100	1.486	0.99	0.257	0.994	0	0	0.095	FALSE	FALSE	FALSE	**2.7**	**Subunit 3**
7.0	0.43	0.15	0.29	5.36	21	0.220	1.100	2.071	0.98	0.492	0.991	0	0	0.100	FALSE	FALSE	FALSE	**4.9**	**Subunit 3**
8.5	0.53	0.19	0.34	5.36	10	0.121	1.100	1.034	0.99	0.136	0.987	0	0	0.104	FALSE	FALSE	FALSE	**1.3**	**Subunit 3**
10.0	0.63	0.24	0.39	5.36	8	0.104	1.085	0.869	1.00	0.097	0.983	0	0	0.106	FALSE	FALSE	FALSE	**0.9**	**Subunit 3**
11.5	0.73	0.29	0.44	5.59	8	N/A	N/A	N/A	0.99	N/A	0.979	0	0	0.108	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
13.0	0.82	0.33	0.49	5.59	6	N/A	N/A	N/A	1.00	N/A	0.974	0	0	0.109	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
14.5	0.92	0.38	0.54	5.59	6	N/A	N/A	N/A	1.00	N/A	0.970	0	0	0.111	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
16.0	1.01	0.43	0.58	5.59	26	N/A	N/A	N/A	0.98	N/A	0.965	0	0	0.111	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
17.5	1.11	0.47	0.63	5.59	19	N/A	N/A	N/A	0.99	N/A	0.960	0	0	0.112	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
19.0	1.20	0.52	0.68	5.59	17	N/A	N/A	N/A	0.99	N/A	0.955	0	0	0.112	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
20.5	1.30	0.57	0.73	5.59	20	N/A	N/A	N/A	0.98	N/A	0.950	0	0	0.113	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
22.0	1.39	0.61	0.78	5.59	18	N/A	N/A	N/A	0.99	N/A	0.945	0	0	0.113	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
23.5	1.49	0.66	0.83	5.59	11	N/A	N/A	N/A	0.99	N/A	0.939	0	0	0.113	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
25.0	1.58	0.71	0.87	5.59	9	N/A	N/A	N/A	0.99	N/A	0.934	0	0	0.113	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
26.5	1.68	0.76	0.92	5.61	6	0.091	1.011	0.796	1.00	0.073	0.928	0	0	0.112	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**
28.0	1.77	0.80	0.97	5.61	7	0.099	1.007	0.847	1.00	0.084	0.922	0	0	0.112	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**
29.5	1.87	0.85	1.02	5.61	6	0.091	1.003	0.803	1.00	0.073	0.916	0	0	0.112	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**
31.0	1.96	0.90	1.07	5.61	10	0.118	0.999	0.957	0.99	0.112	0.910	0	0	0.112	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**
32.5	2.06	0.94	1.11	5.61	22	0.239	0.993	1.772	0.98	0.412	0.904	0	0	0.111	FALSE	FALSE	FALSE	**3.7**	**Subunit 2**
34.0	2.15	0.99	1.16	5.61	13	0.137	0.991	1.068	0.99	0.144	0.898	0	0	0.111	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**
35.5	2.24	1.04	1.21	5.61	14	0.147	0.986	1.124	0.99	0.161	0.892	0	0	0.110	FALSE	FALSE	FALSE	**1.5**	**Subunit 2**
37.0	2.34	1.08	1.26	5.61	15	0.157	0.981	1.181	0.99	0.180	0.886	0	0	0.110	FALSE	FALSE	FALSE	**1.6**	**Subunit 2**
38.5	2.43	1.13	1.30	5.61	15	0.155	0.977	1.165	0.99	0.175	0.879	0	0	0.109	FALSE	FALSE	FALSE	**1.6**	**Subunit 2**
40.0	2.53	1.18	1.35	5.36	61	N/A	N/A	N/A	N/A	N/A	0.873	0	0	0.109	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**
41.5	2.63	1.22	1.41	5.36	25	0.299	0.953	1.960	0.98	0.545	0.866	0	0	0.108	FALSE	FALSE	FALSE	**5.0**	**Subunit 3**


Legend
$FS_{liq} \leq 1.1$
$1.1 < FS_{liq} \leq 1.4$
$FS_{liq} > 1.4$
Sand-like, Unliquefiable
Clay-like, Not Susceptible
Clay-like, Susceptible
No Data
KIF-C2, Liquefaction Triggering Results
Top of Boring
El. 743.9 ft
El. 733.9
El. 723.9
El. 713.9
El. 703.9

KIF TDEC Stability, Boring ID: KIF-C2, Source = 1 Hz, Mw = 7.6, Event = Design EQ,
SPT Data, Simplified Stress-Based Approach



KIF TDEC Stability, Boring ID: KIF-C2, Source = 1 Hz, Mw = 7.6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



Project Name = KIF TDEC Stability
Boring ID = KIF-D1

Boring Location

Northing =
Easting =

OR

Baseline Station =
Offset (+ Right) =

Drilling Information

Boring Inner Diameter (ID) =	3.25	inches	
Top of Hole Elevation	748.7	feet	
Water Depth during SPT (negative for U/S borings)=	3	feet	
Depth Sampling Began	0	feet	
Total Unit Wt. above 1st SPT =	120	pcf	
Assumed Rod Stickup =	5	feet	*(Typ assume 5ft)*
E_m Measurement based on Fv method? =	1	(1: Yes, 0: No)	
SPT Sampler w/ Liners? =	0	(1: Yes, 0: No)	*(Typ. no)*

During EQ Information

Water Depth during EQ (relative to SPT TOH, negative for U/S borings) =	3	feet
Final Grade Elevation during EQ	748.7	feet
Average Total Unit Wt. of Cut/Fill	120	pcf

Fines Content Correction

Fines content correction for samples with blow counts of zero? 1 (1: Yes, 0: No)

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile? 0 (1: Yes, 0: No)
If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile: ng_Pond_Section, KIF-D1_NOR
Alpha at each sample depth known? 1 (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (α vs. depth curve)
If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_α will be one.

m4:
m3:
m2:
m1:
m0:

Associated ground response profile: shing_Pond_Section, KIF-D1
Get CSR from shear stress envelope? 0 (1: Yes, 0: No)
If previous answer is No, then CSR will be calculated using a_{max} and r_d
Max. Shear Stress at each sample depth known? (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4:
m3:
m2:
m1:

Earthquake Information

EQ Source (e.g., New Madrid)	1 Hz
Event (e.g., MCE, 10KEQ, OBE)	Design EQ
a_{max} (g) (top of ground surface)	0.10
EQ Mag (Mw)	7.6

Inputs

Depth of Sample Midpoint (ft.)	SPT N Value	Hammer Efficiency, E_m (%)	Unified Soil Classification	Fines Content (%)	Total Unit Weight (pcf)	Material (optional)	Clay-like / Sand-like Override (optional)	Clay-like Susceptibility (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure during SPT (psf)	Static Pore Water Pressure during EQ (psf)
1.0	16	80	CL	34	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.264			
2.5	13	80		34	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.250			
4.0	7	80		34	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.244			
5.5	5	80		34	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.239			
7.0	12	80		34	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.235			
8.5	3	80		34	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.233			
10.0	7	80		34	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.231			
11.5	4	80		34	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.228			
13.0	4	80		34	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.223			
14.5	2	80		34	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.218			
16.0	1	80		82	127	Subunit 1	Clay-like	Not Susceptible		0.214			
17.5	0	80		82	127	Subunit 1	Clay-like	Not Susceptible		0.211			
19.0	0	80		82	127	Subunit 1	Clay-like	Not Susceptible		0.208			
20.5	11	80		82	127	Subunit 1	Clay-like	Not Susceptible		0.207			
22.0	20	80		82	127	Subunit 1	Clay-like	Not Susceptible		0.206			
23.5	9	80		82	127	Subunit 1	Clay-like	Not Susceptible		0.206			
25.0	8	80		82	127	Subunit 1	Clay-like	Not Susceptible		0.205			
26.5	8	80		82	127	Subunit 1	Clay-like	Not Susceptible		0.206			
28.0	11	80		49	126	Subunit 2	Sand-like			0.207			
29.5	7	80		49	126	Subunit 2	Sand-like			0.209			
31.0	4	80		49	126	Subunit 2	Sand-like			0.211			
32.5	0	80		49	126	Subunit 2	Sand-like			0.212			
34.0	0	80		33	131	Subunit 3	Sand-like			0.213			
35.5	0	80		33	131	Subunit 3	Sand-like			0.214			
37.0	0	80		33	131	Subunit 3	Sand-like			0.213			
38.5	1	80		49	126	Subunit 2	Sand-like			0.212			
40.0	1	80		49	126	Subunit 2	Sand-like			0.210			
41.5	1	80		49	126	Subunit 2	Sand-like			0.208			
43.0	11	80		49	126	Subunit 2	Sand-like			0.206			
44.5	38	80		49	126	Subunit 2	Sand-like			0.203			
46.0	34	80		49	126	Subunit 2	Sand-like			0.201			
47.5	45	80		49	126	Subunit 2	Sand-like			0.199			
49.0	45	80		49	126	Subunit 2	Sand-like			0.196			
50.5	22	80		49	126	Subunit 2	Sand-like			0.193			

KIF TDEC Stability, Boring ID: KIF-D1

Liquefaction Potential Evaluations

For Coarse Grained Soils

Top of Hole Elevation (ft) =			748.7				Boring ID =		KIF-D1										
begin sampling (depth-ft) =			0.0				Boring Inner Dia. (in) =		3.25										
total unit wt. above 1st SPT (pcf) =			120																
water elevation during SPT (ft) =			745.7	ft *(relative to ground surface during SPT)*					Assumed Rod Stickup =	5.0	feet								
water depth during SPT (ft) =			3.0						E_m Measurement? =	1	(1: Yes, 0: No)								
water elevation during EQ (ft) =			745.7	ft *(relative to ground surface during SPT)*					SPT Sampler w/ Liners? =	0	(1: Yes, 0: No)								
water during EQ (depth-ft) =			3.0	u-top	effstr-top														
vert. total stress above 1st SPT (tsf) =			**0.00**	**0.00**	0.00														
Elev. Of Mid. Pt. of Sample (ft)	Depth of Mid. Pt. of Sample (ft.) z	Unit Weight (pcf) γ_T	Vert. Total Stress during SPT (tsf) σ_v	Static Pore Pressure during SPT (tsf) u	Vert. Eff. Stress during SPT (tsf) σ'_v	SPT N Value N	Hammer Efficiency (%) E_m	Borehole Diameter Correction C_B	Sampler Correction C_S	Rod Length Correction C_R	Overburden Stress Correction Factor C_N	Hammer Energy Correction Factor C_E	Corrected Blow Count N_{60}	Normalized Blow Count $(N_1)_{60}$	Relative Density (%) D_r	Unified Soil Classification	Fines Content (%)	Relative State Parameter Index ξ_R	Static Shear Stress Ratio α
747.7	1.0	120	0.06	0.00	0.06	16	80.0	1.000	1.30	1.00	1.70	1.33	28	47	100	CL	34	-0.60	0.264
746.2	2.5	120	0.15	0.00	0.15	13	80.0	1.000	1.30	1.00	1.70	1.33	23	38	98	0	34	-0.60	0.250
744.7	4.0	120	0.24	0.03	0.21	7	80.0	1.000	1.19	1.00	1.70	1.33	11	19	73	0	34	-0.59	0.244
743.2	5.5	120	0.33	0.08	0.25	5	80.0	1.000	1.13	1.00	1.70	1.33	8	13	63	0	34	-0.49	0.239
741.7	7.0	120	0.42	0.12	0.30	12	80.0	1.000	1.30	1.00	1.50	1.33	21	31	89	0	34	-0.60	0.235
740.2	8.5	120	0.51	0.17	0.34	3	80.0	1.000	1.10	1.00	1.70	1.33	4	7	53	0	34	-0.39	0.233
738.7	10.0	120	0.60	0.22	0.38	7	80.0	1.000	1.17	1.00	1.54	1.33	11	17	70	0	34	-0.55	0.231
737.2	11.5	120	0.69	0.27	0.42	4	80.0	1.000	1.10	1.00	1.56	1.33	6	9	56	0	34	-0.42	0.228
735.7	13.0	120	0.78	0.31	0.47	4	80.0	1.000	1.10	1.00	1.50	1.33	6	9	56	0	34	-0.41	0.223
734.2	14.5	120	0.87	0.36	0.51	2	80.0	1.000	1.10	1.00	1.48	1.33	3	4	46	0	34	-0.31	0.218
732.7	16.0	127	0.96	0.41	0.56	1	80.0	1.000	1.10	1.00	1.44	1.33	1	2	41	0	82	-0.25	0.214
731.2	17.5	127	1.06	0.45	0.61	0	80.0	1.000	1.10	1.00	1.40	1.33	0	0	35	0	82	-0.20	0.211
729.7	19.0	127	1.15	0.50	0.65	0	80.0	1.000	1.10	1.00	1.33	1.33	0	0	35	0	82	-0.19	0.208
728.2	20.5	127	1.25	0.55	0.70	11	80.0	1.000	1.21	1.00	1.17	1.33	18	21	76	0	82	-0.60	0.207
726.7	22.0	127	1.34	0.59	0.75	20	80.0	1.000	1.30	1.00	1.10	1.33	35	38	97	0	82	-0.60	0.206
725.2	23.5	127	1.44	0.64	0.80	9	80.0	1.000	1.16	1.00	1.13	1.33	14	16	68	0	82	-0.51	0.206
723.7	25.0	127	1.53	0.69	0.85	8	80.0	1.000	1.13	1.00	1.10	1.33	12	13	64	0	82	-0.47	0.205
722.2	26.5	127	1.63	0.73	0.90	8	80.0	1.000	1.13	1.00	1.08	1.33	12	13	63	0	82	-0.47	0.206
720.7	28.0	126	1.72	0.78	0.94	11	80.0	1.000	1.18	1.00	1.05	1.33	17	18	72	0	49	-0.55	0.207
719.2	29.5	126	1.82	0.83	0.99	7	80.0	1.000	1.11	1.00	1.03	1.33	10	11	59	0	49	-0.42	0.209
717.7	31.0	126	1.91	0.87	1.04	4	80.0	1.000	1.10	1.00	1.01	1.33	6	6	50	0	49	-0.33	0.211
716.2	32.5	126	2.01	0.92	1.09	0	80.0	1.000	1.10	1.00	0.98	1.33	0	0	35	0	49	-0.18	0.212
714.7	34.0	131	2.10	0.97	1.14	0	80.0	1.000	1.10	1.00	0.96	1.33	0	0	35	0	33	-0.17	0.213
713.2	35.5	131	2.20	1.01	1.19	0	80.0	1.000	1.10	1.00	0.93	1.33	0	0	35	0	33	-0.17	0.214
711.7	37.0	131	2.30	1.06	1.24	0	80.0	1.000	1.10	1.00	0.91	1.33	0	0	35	0	33	-0.17	0.213
710.2	38.5	126	2.40	1.11	1.29	1	80.0	1.000	1.10	1.00	0.89	1.33	1	1	39	0	49	-0.21	0.212
708.7	40.0	126	2.49	1.15	1.34	1	80.0	1.000	1.10	1.00	0.87	1.33	1	1	39	0	49	-0.21	0.210
707.2	41.5	126	2.59	1.20	1.38	1	80.0	1.000	1.10	1.00	0.85	1.33	1	1	39	0	49	-0.21	0.208
705.7	43.0	126	2.68	1.25	1.43	11	80.0	1.000	1.15	1.00	0.88	1.33	17	15	67	0	49	-0.48	0.206
704.2	44.5	126	2.78	1.29	1.48	38	80.0	1.000	1.30	1.00	0.92	1.33	66	60	100	0	49	-0.60	0.203
702.7	46.0	126	2.87	1.34	1.53	34	80.0	1.000	1.30	1.00	0.91	1.33	59	54	100	0	49	-0.60	0.201
701.2	47.5	126	2.96	1.39	1.58	45	80.0	1.000	1.30	1.00	0.90	1.33	78	70	100	0	49	-0.60	0.199
699.7	49.0	126	3.06	1.44	1.62	45	80.0	1.000	1.30	1.00	0.89	1.33	78	70	100	0	49	-0.60	0.196
698.2	50.5	126	3.15	1.48	1.67	22	80.0	1.000	1.30	1.00	0.87	1.33	38	33	92	0	49	-0.60	0.193

KIF TDEC Stability, Boring ID: KIF-D1
Liquefaction Potential Evaluations
For Coarse Grained Soils

EQ Source	a max (g)	EQ Mag (Mw)	Event
1 Hz	0.10	7.6	Design EQ

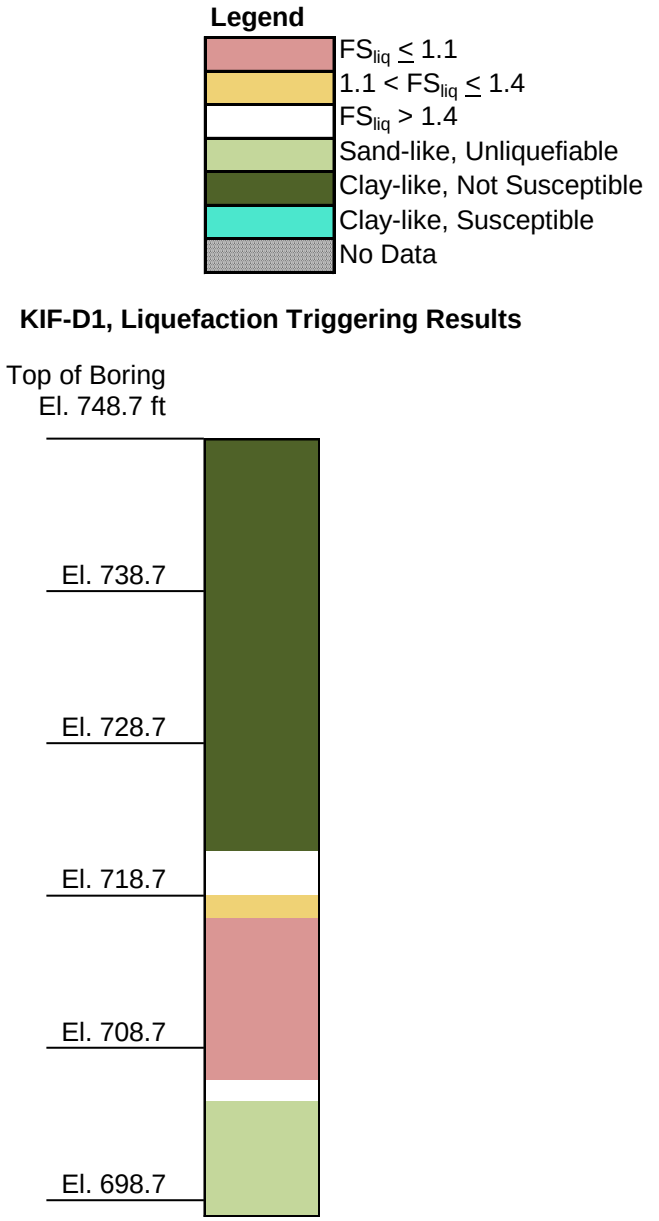
Shear Stress Curve Fit Parameters
m4: 0
m3: 0
m2: 0
m1: 0

Boring ID: **KIF-D1**
Top of Fill Elevation: 748.7 ft
Fill Height: 0.0 ft *(relative to ground surface during SPT)*
Fill Total Unit Weight: 120 pcf
Fill Total Stress: 0.00 tsf

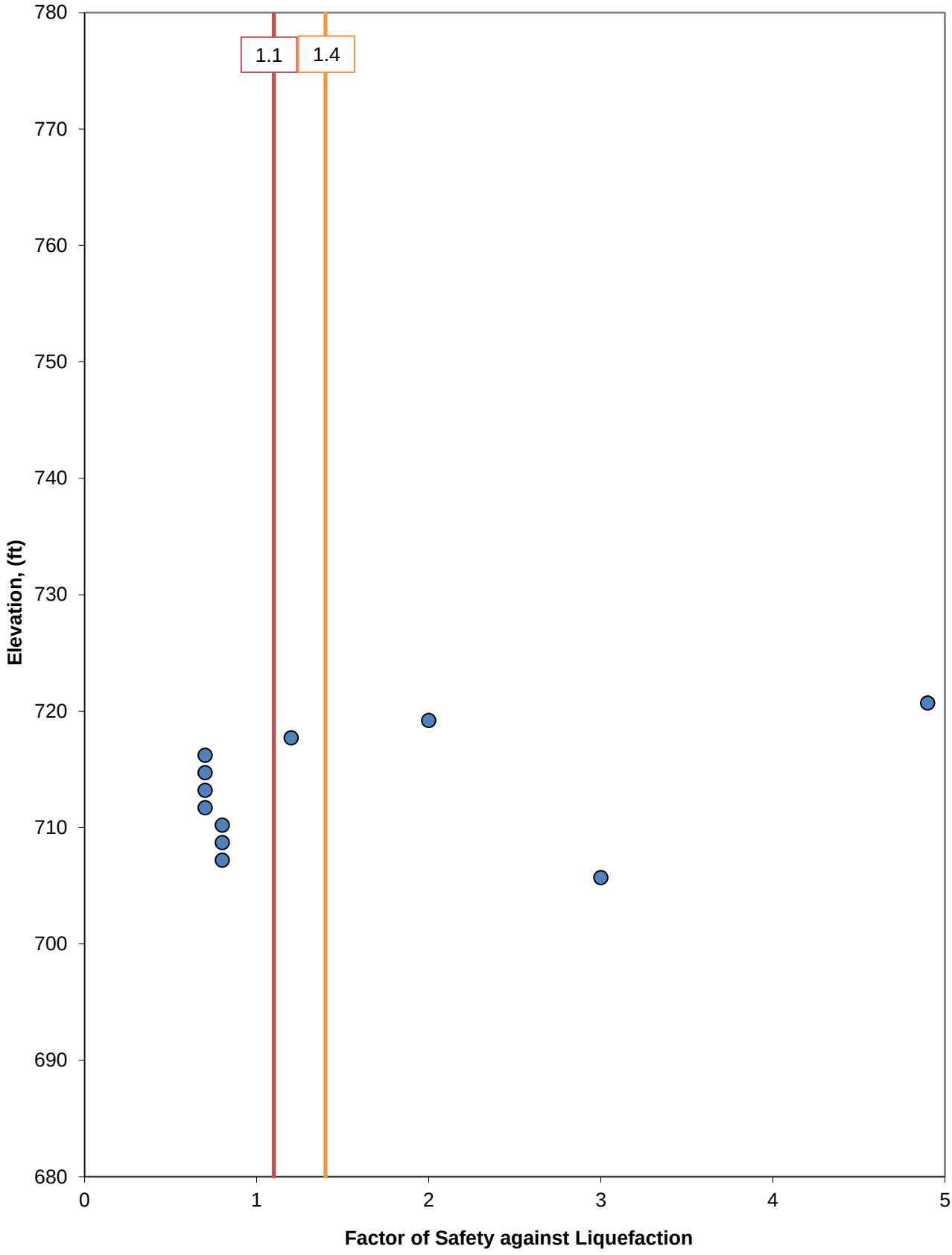
totstr-top	u-top	effstr-top
0.00	0.00	0.00

Note: A factor of safety shown as "N/A" implies that the soil type is not appropriately evaluated using this methodology. This applies to clay-like soils (typically CL, CH, CL-ML and MH material type), samples with high blow counts, and unsaturated samples.

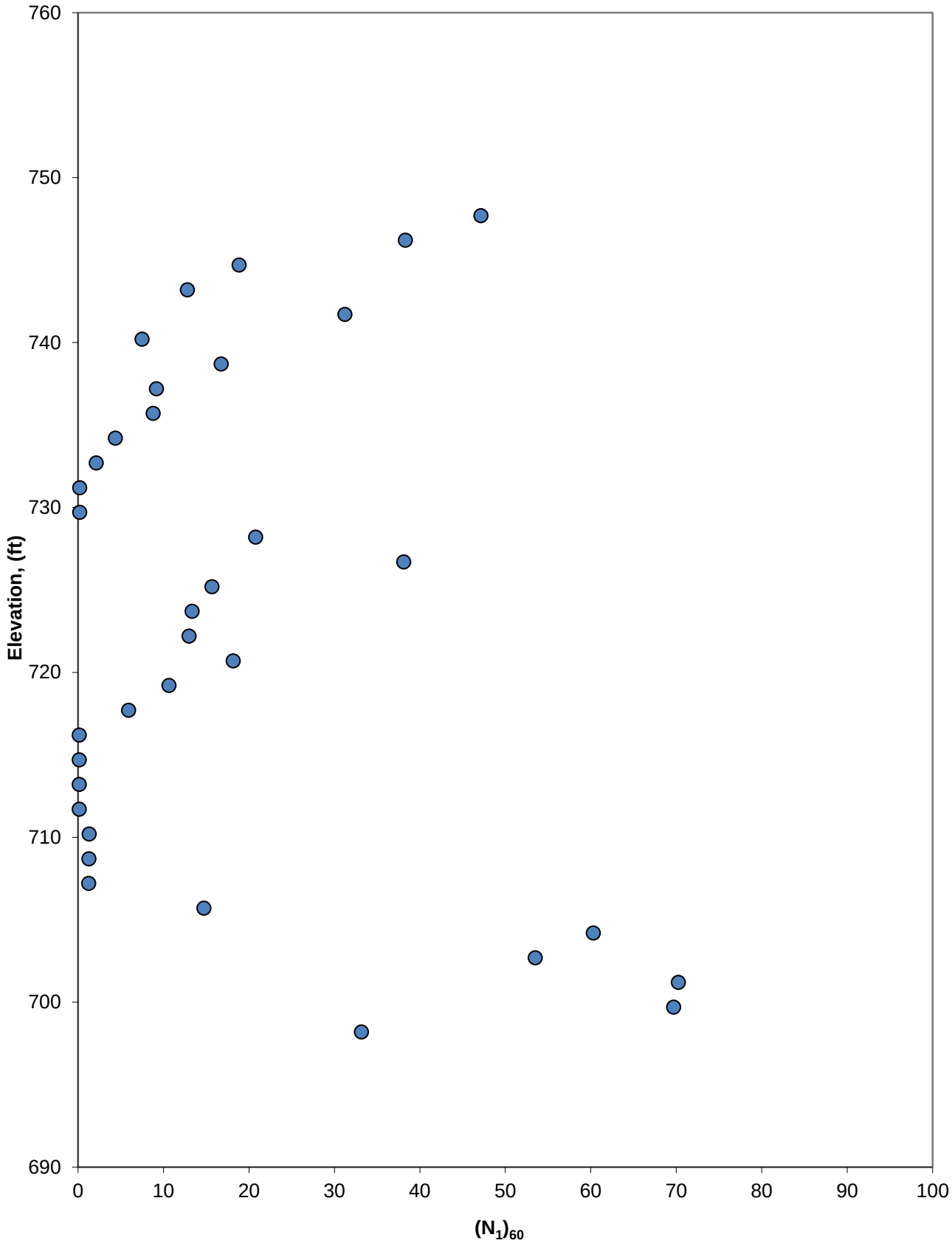
Depth of Mid. Pt. of Sample (ft.) z	Vert. Total Stress during EQ w/ Fill (tsf) $\sigma_{v\ with\ fill}$	Static Pore Pressure during EQ (tsf) u	Vert. Eff. Stress during EQ w/ Fill (tsf) $\sigma'_{v\ with\ fill}$	Clean Sand Correction $\Delta(N_1)_{60cs}$	Equivalent Clean Sand N-Value $(N_1)_{60cs}$	Cyclic Resistance Ratio CRR7.5	Overburden Correction Factor K_σ	Static Shear Stress Correction K_α	Mag. Scaling Factor (MSF)	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Max. Induced Shear Stress (psf)	From Ground Response: Avg. Cyclic Shear Stress (psf)	Cyclic Stress Ratio CSR	Sample Screened for: High Clay-like	High Blow Count $(N_1)_{60cs} \geq 32$	High Unsaturated	Factor of Safety FS_{liq}	Material (optional)
1.0	0.06	0.00	0.06	5.49	53	N/A	N/A	N/A	N/A	N/A	1.000	0	0	0.063	TRUE	TRUE	TRUE	**N/A**	**Clay Fill (irrelevant)**
2.5	0.15	0.00	0.15	5.49	44	N/A	N/A	N/A	N/A	N/A	1.000	0	0	0.063	TRUE	TRUE	TRUE	**N/A**	**Clay Fill (irrelevant)**
4.0	0.24	0.03	0.21	5.49	24	N/A	N/A	N/A	0.98	N/A	0.998	0	0	0.073	TRUE	FALSE	FALSE	**N/A**	**Clay Fill (irrelevant)**
5.5	0.33	0.08	0.25	5.49	18	N/A	N/A	N/A	0.99	N/A	0.994	0	0	0.082	TRUE	FALSE	FALSE	**N/A**	**Clay Fill (irrelevant)**
7.0	0.42	0.12	0.30	5.49	37	N/A	N/A	N/A	N/A	N/A	0.991	0	0	0.089	TRUE	TRUE	FALSE	**N/A**	**Clay Fill (irrelevant)**
8.5	0.51	0.17	0.34	5.49	13	N/A	N/A	N/A	0.99	N/A	0.987	0	0	0.094	TRUE	FALSE	FALSE	**N/A**	**Clay Fill (irrelevant)**
10.0	0.60	0.22	0.38	5.49	22	N/A	N/A	N/A	0.98	N/A	0.983	0	0	0.098	TRUE	FALSE	FALSE	**N/A**	**Clay Fill (irrelevant)**
11.5	0.69	0.27	0.42	5.49	15	N/A	N/A	N/A	0.99	N/A	0.979	0	0	0.101	TRUE	FALSE	FALSE	**N/A**	**Clay Fill (irrelevant)**
13.0	0.78	0.31	0.47	5.49	14	N/A	N/A	N/A	0.99	N/A	0.974	0	0	0.103	TRUE	FALSE	FALSE	**N/A**	**Clay Fill (irrelevant)**
14.5	0.87	0.36	0.51	5.49	10	N/A	N/A	N/A	0.99	N/A	0.970	0	0	0.104	TRUE	FALSE	FALSE	**N/A**	**Clay Fill (irrelevant)**
16.0	0.96	0.41	0.56	5.54	8	N/A	N/A	N/A	1.00	N/A	0.965	0	0	0.106	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
17.5	1.06	0.45	0.61	5.54	6	N/A	N/A	N/A	1.00	N/A	0.960	0	0	0.106	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
19.0	1.15	0.50	0.65	5.54	6	N/A	N/A	N/A	1.00	N/A	0.955	0	0	0.107	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
20.5	1.25	0.55	0.70	5.54	26	N/A	N/A	N/A	0.97	N/A	0.950	0	0	0.107	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
22.0	1.34	0.59	0.75	5.54	44	N/A	N/A	N/A	N/A	N/A	0.945	0	0	0.107	TRUE	TRUE	FALSE	**N/A**	**Subunit 1**
23.5	1.44	0.64	0.80	5.54	21	N/A	N/A	N/A	0.98	N/A	0.939	0	0	0.107	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
25.0	1.53	0.69	0.85	5.54	19	N/A	N/A	N/A	0.99	N/A	0.934	0	0	0.107	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
26.5	1.63	0.73	0.90	5.54	19	N/A	N/A	N/A	0.99	N/A	0.928	0	0	0.107	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
28.0	1.72	0.78	0.94	5.61	24	0.264	1.018	1.970	0.98	0.517	0.922	0	0	0.107	FALSE	FALSE	FALSE	**4.9**	**Subunit 2**
29.5	1.82	0.83	0.99	5.61	16	0.167	1.007	1.308	0.99	0.218	0.916	0	0	0.106	FALSE	FALSE	FALSE	**2.0**	**Subunit 2**
31.0	1.91	0.87	1.04	5.61	12	0.129	1.002	1.030	0.99	0.132	0.910	0	0	0.106	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**
32.5	2.01	0.92	1.09	5.61	6	0.091	0.998	0.796	1.00	0.072	0.904	0	0	0.106	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**
34.0	2.10	0.97	1.14	5.46	6	0.090	0.994	0.789	1.00	0.070	0.898	0	0	0.105	FALSE	FALSE	FALSE	**0.7**	**Subunit 3**
35.5	2.20	1.01	1.19	5.46	6	0.090	0.991	0.786	1.00	0.070	0.892	0	0	0.105	FALSE	FALSE	FALSE	**0.7**	**Subunit 3**
37.0	2.30	1.06	1.24	5.46	6	0.090	0.988	0.786	1.00	0.069	0.886	0	0	0.104	FALSE	FALSE	FALSE	**0.7**	**Subunit 3**
38.5	2.40	1.11	1.29	5.61	7	0.098	0.984	0.829	1.00	0.079	0.879	0	0	0.103	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**
40.0	2.49	1.15	1.34	5.61	7	0.098	0.981	0.828	1.00	0.079	0.873	0	0	0.103	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**
41.5	2.59	1.20	1.38	5.61	7	0.097	0.978	0.828	1.00	0.078	0.866	0	0	0.102	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**
43.0	2.68	1.25	1.43	5.61	20	0.210	0.959	1.560	0.98	0.309	0.860	0	0	0.102	FALSE	FALSE	FALSE	**3.0**	**Subunit 2**
44.5	2.78	1.29	1.48	5.61	66	N/A	N/A	N/A	N/A	N/A	0.854	0	0	0.101	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**
46.0	2.87	1.34	1.53	5.61	59	N/A	N/A	N/A	N/A	N/A	0.847	0	0	0.101	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**
47.5	2.96	1.39	1.58	5.61	76	N/A	N/A	N/A	N/A	N/A	0.840	0	0	0.100	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**
49.0	3.06	1.44	1.62	5.61	75	N/A	N/A	N/A	N/A	N/A	0.834	0	0	0.099	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**
50.5	3.15	1.48	1.67	5.61	39	N/A	N/A	N/A	N/A	N/A	0.827	0	0	0.099	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**


Legend
FS$_{liq}$ ≤ 1.1
1.1 < FS$_{liq}$ ≤ 1.4
FS$_{liq}$ > 1.4
Sand-like, Unliquefiable
Clay-like, Not Susceptible
Clay-like, Susceptible
No Data
KIF-D1, Liquefaction Triggering Results
Top of Boring
El. 748.7 ft
El. 738.7
El. 728.7
El. 718.7
El. 708.7
El. 698.7

KIF TDEC Stability, Boring ID: KIF-D1, Source = 1 Hz, Mw = 7.6, Event = Design EQ,
SPT Data, Simplified Stress-Based Approach



KIF TDEC Stability, Boring ID: KIF-D1, Source = 1 Hz, Mw = 7.6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



Project Name = KIF TDEC Stability
Boring ID = KIF-D2

Boring Location

Northing =
Easting =

OR

Baseline Station =
Offset (+ Right) =

Drilling Information

Boring Inner Diameter (ID) =	3.25	inches	
Top of Hole Elevation	743.3	feet	
Water Depth during SPT (negative for U/S borings)=	6.4	feet	
Depth Sampling Began	1	feet	
Total Unit Wt. above 1st SPT =	120	pcf	
Assumed Rod Stickup =	5	feet	*(Typ assume 5ft)*
E_m Measurement based on Fv method? =	1	(1: Yes, 0: No)	
SPT Sampler w/ Liners? =	0	(1: Yes, 0: No)	*(Typ. no)*

During EQ Information

Water Depth during EQ (relative to SPT TOH, negative for U/S borings) =	6.4	feet
Final Grade Elevation during EQ	743.3	feet
Average Total Unit Wt. of Cut/Fill	120	pcf

Fines Content Correction

Fines content correction for samples with blow counts of zero? 1 (1: Yes, 0: No)

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile? 0 (1: Yes, 0: No)
If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile: ng_Pond_Section, KIF-D2_NOR
Alpha at each sample depth known? 1 (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (α vs. depth curve)
If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_α will be one.

m4:
m3:
m2:
m1:
m0:

Associated ground response profile: shing_Pond_Section, KIF-D2
Get CSR from shear stress envelope? 0 (1: Yes, 0: No)
If previous answer is No, then CSR will be calculated using a_{max} and r_d
Max. Shear Stress at each sample depth known? (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4:
m3:
m2:
m1:

Earthquake Information

EQ Source (e.g., New Madrid)	1 Hz
Event (e.g., MCE, 10KEQ, OBE)	Design EQ
a_{max} (g) (top of ground surface)	0.10
EQ Mag (Mw)	7.6

Inputs

Depth of Sample Midpoint (ft.)	SPT N Value	Hammer Efficiency, E_m (%)	Unified Soil Classification	Fines Content (%)	Total Unit Weight (pcf)	Material (optional)	Clay-like / Sand-like Override (optional)	Clay-like Susceptibility (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure during SPT (psf)	Static Pore Water Pressure during EQ (psf)
2.0	3	80	CL	39	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.342			
3.5	3	80		39	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.321			
5.0	5	80		39	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.303			
6.5	6	80		39	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.293			
8.0	5	80		39	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.285			
9.5	2	80		39	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.279			
11.0	1	80		84	126	Subunit 2	Sand-like			0.272			
12.5	5	80		84	126	Subunit 2	Sand-like			0.267			
14.0	5	80		84	126	Subunit 2	Sand-like			0.262			
15.5	11	80		84	126	Subunit 2	Sand-like			0.257			
17.0	5	80		30	131	Subunit 3	Sand-like			0.253			
18.5	5	80		30	131	Subunit 3	Sand-like			0.248			
20.0	5	80		30	131	Subunit 3	Sand-like			0.243			
21.5	2	80		30	131	Subunit 3	Sand-like			0.237			
23.0	4	80		30	131	Subunit 3	Sand-like			0.231			
24.5	1	80		30	131	Subunit 3	Sand-like			0.225			
26.0	1	80		30	131	Subunit 3	Sand-like			0.220			
27.5	0	80		30	131	Subunit 3	Sand-like			0.215			
29.0	0	80		30	131	Subunit 3	Sand-like			0.210			
30.5	0	80		30	131	Subunit 3	Sand-like			0.205			
32.0	1	80		30	131	Subunit 3	Sand-like			0.202			
33.5	2	80		30	131	Subunit 3	Sand-like			0.197			
35.0	3	80		30	131	Subunit 3	Sand-like			0.192			
36.5	2	80		30	131	Subunit 3	Sand-like			0.188			
38.0	21	80		30	131	Subunit 3	Sand-like			0.185			
39.5	18	80		30	131	Subunit 3	Sand-like			0.183			
41.0	35	80		30	131	Subunit 3	Sand-like			0.181			
42.5	11	80		30	131	Subunit 3	Sand-like			0.180			
44.0	88	80		30	131	Subunit 3	Sand-like			0.179			

KIF TDEC Stability, Boring ID: KIF-D2

Liquefaction Potential Evaluations

For Coarse Grained Soils

Top of Hole Elevation (ft) =			743.3				Boring ID =		KIF-D2										
begin sampling (depth-ft) =			1.0				Boring Inner Dia. (in) =		3.25										
total unit wt. above 1st SPT (pcf) =			120																
water elevation during SPT (ft) =			736.9	ft *(relative to ground surface during SPT)*					Assumed Rod Stickup =	5.0	feet								
water depth during SPT (ft) =			6.4						E_m Measurement? =	1	(1: Yes, 0: No)								
water elevation during EQ (ft) =			736.9	ft *(relative to ground surface during SPT)*					SPT Sampler w/ Liners? =	0	(1: Yes, 0: No)								
water during EQ (depth-ft) =			6.4	u-top	effstr-top														
vert. total stress above 1st SPT (tsf) =			**0.06**	**0.00**	0.06														
Elev. Of Mid. Pt. of Sample (ft)	Depth of Mid. Pt. of Sample (ft.) z	Unit Weight (pcf) γ_T	Vert. Total Stress during SPT (tsf) σ_v	Static Pore Pressure during SPT (tsf) u	Vert. Eff. Stress during SPT (tsf) σ'_v	SPT N Value N	Hammer Efficiency (%) E_m	Borehole Diameter Correction C_B	Sampler Correction C_s	Rod Length Correction C_R	Overburden Stress Correction Factor C_N	Hammer Energy Correction Factor C_E	Corrected Blow Count N_{60}	Normalized Blow Count $(N_1)_{60}$	Relative Density (%) D_r	Unified Soil Classification	Fines Content (%)	Relative State Parameter Index ξ_R	Static Shear Stress Ratio α
741.3	2.0	120	0.12	0.00	0.12	3	80.0	1.000	1.10	1.00	1.70	1.33	4	7	53	CL	39	-0.41	0.342
739.8	3.5	120	0.21	0.00	0.21	3	80.0	1.000	1.10	1.00	1.70	1.33	4	7	53	0	39	-0.40	0.321
738.3	5.0	120	0.30	0.00	0.30	5	80.0	1.000	1.13	1.00	1.70	1.33	8	13	63	0	39	-0.49	0.303
736.8	6.5	120	0.39	0.00	0.39	6	80.0	1.000	1.14	1.00	1.56	1.33	9	14	66	0	39	-0.51	0.293
735.3	8.0	120	0.48	0.05	0.43	5	80.0	1.000	1.11	1.00	1.52	1.33	7	11	61	0	39	-0.46	0.285
733.8	9.5	120	0.57	0.10	0.47	2	80.0	1.000	1.10	1.00	1.54	1.33	3	5	47	0	39	-0.32	0.279
732.3	11.0	126	0.66	0.14	0.52	1	80.0	1.000	1.10	1.00	1.50	1.33	1	2	41	0	84	-0.26	0.272
730.8	12.5	126	0.76	0.19	0.57	5	80.0	1.000	1.10	1.00	1.35	1.33	7	10	58	0	84	-0.42	0.267
729.3	14.0	126	0.85	0.24	0.61	5	80.0	1.000	1.10	1.00	1.30	1.33	7	10	57	0	84	-0.41	0.262
727.8	15.5	126	0.95	0.28	0.66	11	80.0	1.000	1.21	1.00	1.20	1.33	18	21	76	0	84	-0.60	0.257
726.3	17.0	131	1.04	0.33	0.71	5	80.0	1.000	1.10	1.00	1.22	1.33	7	9	56	0	30	-0.40	0.253
724.8	18.5	131	1.14	0.38	0.76	5	80.0	1.000	1.10	1.00	1.18	1.33	7	9	55	0	30	-0.39	0.248
723.3	20.0	131	1.24	0.42	0.81	5	80.0	1.000	1.10	1.00	1.14	1.33	7	8	55	0	30	-0.38	0.243
721.8	21.5	131	1.34	0.47	0.87	2	80.0	1.000	1.10	1.00	1.12	1.33	3	3	43	0	30	-0.27	0.237
720.3	23.0	131	1.44	0.52	0.92	4	80.0	1.000	1.10	1.00	1.08	1.33	6	6	50	0	30	-0.34	0.231
718.8	24.5	131	1.53	0.56	0.97	1	80.0	1.000	1.10	1.00	1.05	1.33	1	2	39	0	30	-0.22	0.225
717.3	26.0	131	1.63	0.61	1.02	1	80.0	1.000	1.10	1.00	1.02	1.33	1	1	39	0	30	-0.21	0.220
715.8	27.5	131	1.73	0.66	1.07	0	80.0	1.000	1.10	1.00	0.99	1.33	0	0	35	0	30	-0.17	0.215
714.3	29.0	131	1.83	0.71	1.12	0	80.0	1.000	1.10	1.00	0.96	1.33	0	0	35	0	30	-0.17	0.210
712.8	30.5	131	1.93	0.75	1.17	0	80.0	1.000	1.10	1.00	0.94	1.33	0	0	35	0	30	-0.17	0.205
711.3	32.0	131	2.02	0.80	1.23	1	80.0	1.000	1.10	1.00	0.92	1.33	1	1	38	0	30	-0.20	0.202
709.8	33.5	131	2.12	0.85	1.28	2	80.0	1.000	1.10	1.00	0.90	1.33	3	3	42	0	30	-0.24	0.197
708.3	35.0	131	2.22	0.89	1.33	3	80.0	1.000	1.10	1.00	0.88	1.33	4	4	45	0	30	-0.27	0.192
706.8	36.5	131	2.32	0.94	1.38	2	80.0	1.000	1.10	1.00	0.86	1.33	3	3	41	0	30	-0.23	0.188
705.3	38.0	131	2.42	0.99	1.43	21	80.0	1.000	1.30	1.00	0.91	1.33	36	33	92	0	30	-0.60	0.185
703.8	39.5	131	2.52	1.03	1.48	18	80.0	1.000	1.27	1.00	0.89	1.33	31	27	84	0	30	-0.60	0.183
702.3	41.0	131	2.61	1.08	1.53	35	80.0	1.000	1.30	1.00	0.91	1.33	61	55	100	0	30	-0.60	0.181
700.8	42.5	131	2.71	1.13	1.59	11	80.0	1.000	1.14	1.00	0.83	1.33	17	14	65	0	30	-0.46	0.180
699.3	44.0	131	2.81	1.17	1.64	88	80.0	1.000	1.30	1.00	0.89	1.33	153	136	100	0	30	-0.60	0.179

KIF TDEC Stability, Boring ID: KIF-D2
Liquefaction Potential Evaluations
For Coarse Grained Soils

EQ Source	a max (g)	EQ Mag (Mw)	Event
1 Hz	0.10	7.6	Design EQ

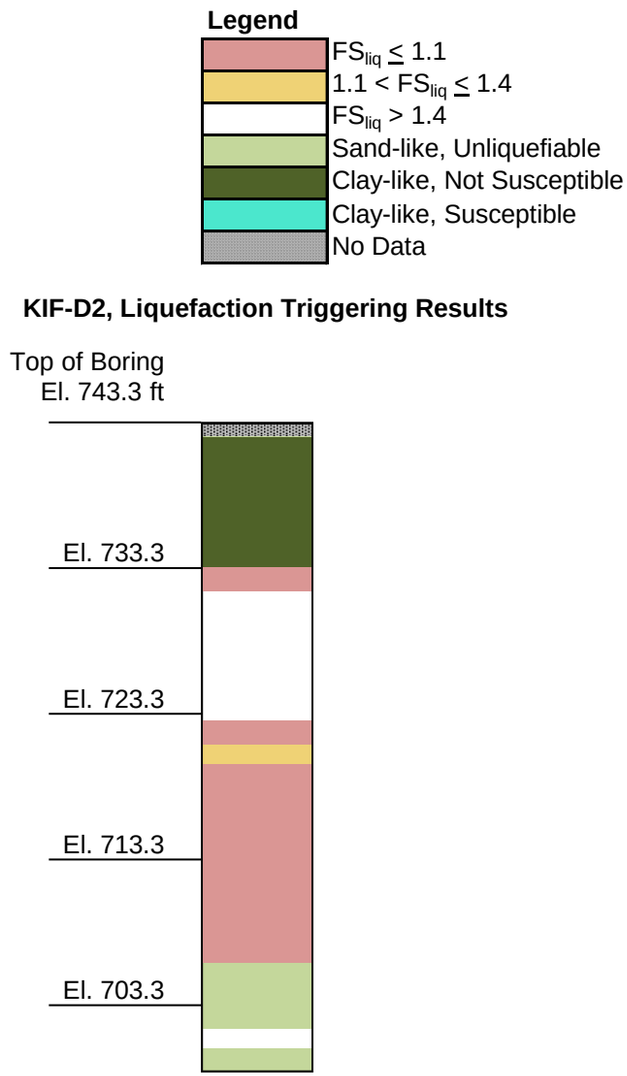
Shear Stress Curve Fit Parameters
m4: 0
m3: 0
m2: 0
m1: 0

Boring ID: **KIF-D2**
Top of Fill Elevation: 743.3 ft
Fill Height: 0.0 ft *(relative to ground surface during SPT)*
Fill Total Unit Weight: 120 pcf
Fill Total Stress: 0.00 tsf

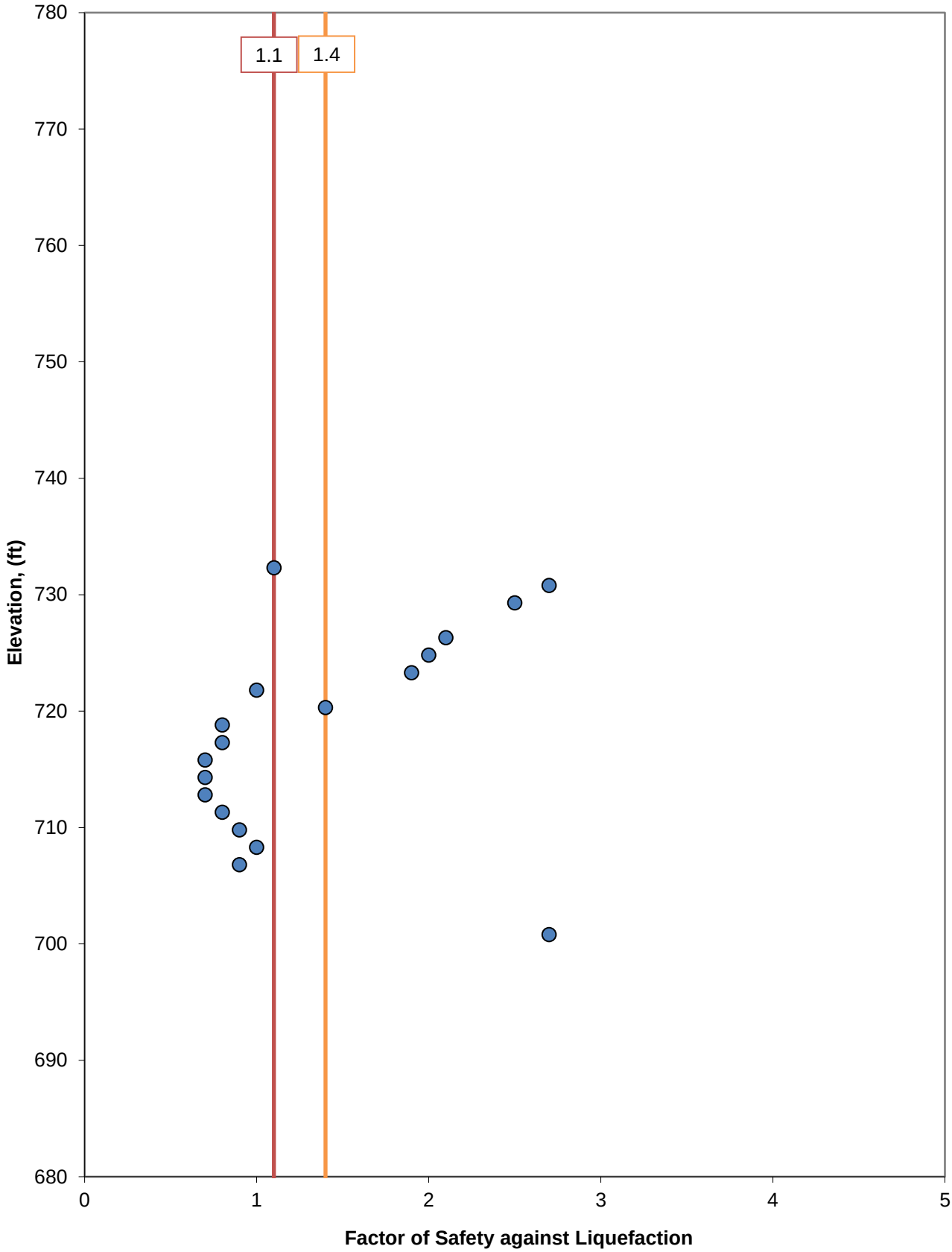
totstr-top	u-top	effstr-top
0.06	0.00	0.06

Note: A factor of safety shown as "N/A" implies that the soil type is not appropriately evaluated using this methodology. This applies to clay-like soils (typically CL, CH, CL-ML and MH material type), samples with high blow counts, and unsaturated samples.

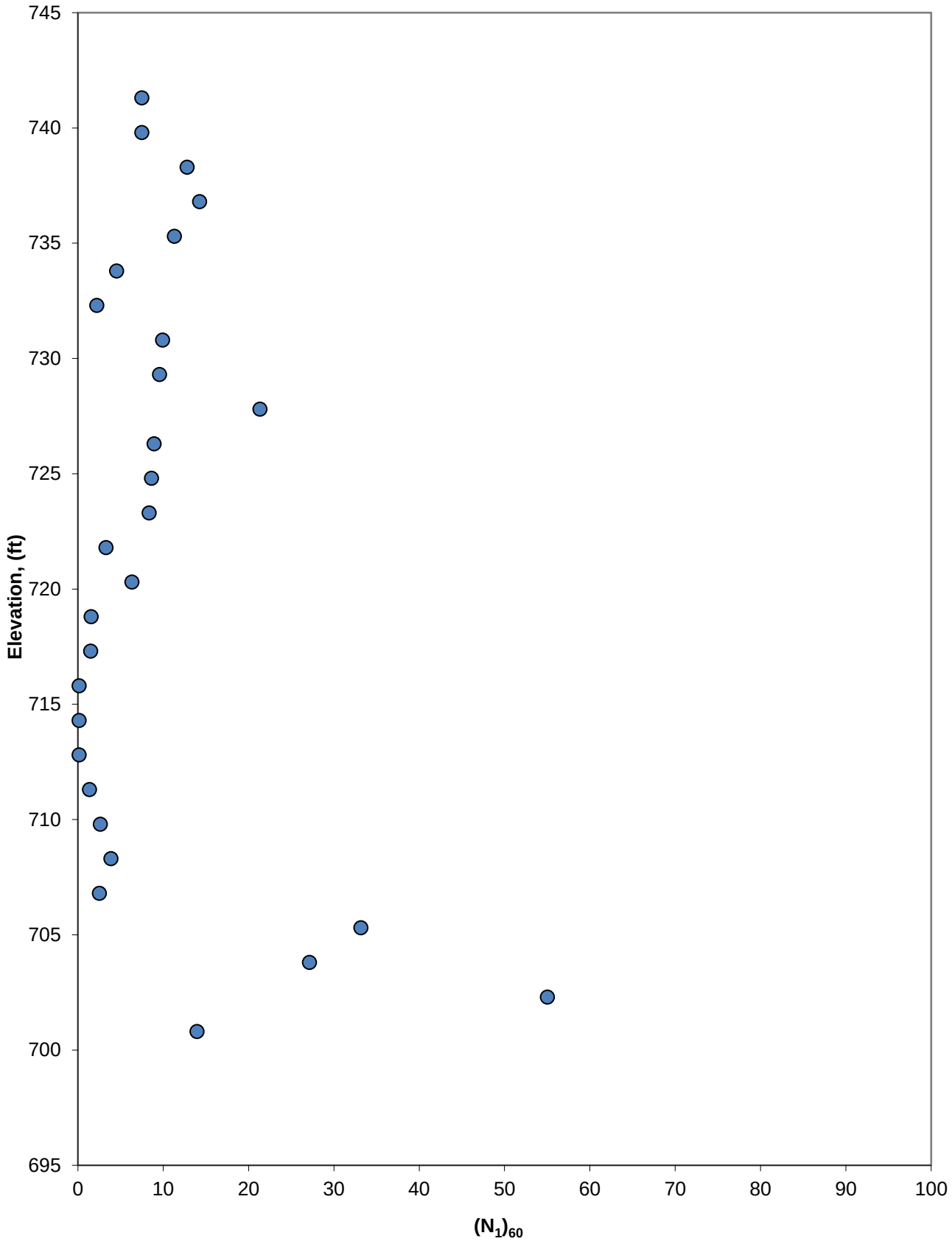
Depth of Mid. Pt. of Sample (ft.) z	Vert. Total Stress during EQ w/ Fill (tsf) $\sigma_{v\ with\ fill}$	Static Pore Pressure during EQ (tsf) u	Vert. Eff. Stress during EQ w/ Fill (tsf) $\sigma'_{v\ with\ fill}$	Clean Sand Correction $\Delta(N_1)_{60cs}$	Equivalent Clean Sand N-Value $(N_1)_{60cs}$	Cyclic Resistance Ratio CRR7.5	Overburden Correction Factor K_σ	Static Shear Stress Correction K_α	Mag. Scaling Factor (MSF)	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Max. Induced Shear Stress (psf)	From Ground Response: Avg. Cyclic Shear Stress (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Blow Count $(N_1)_{60cs} \geq 32$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)
2.0	0.12	0.00	0.12	5.57	13	N/A	N/A	N/A	0.99	N/A	1.000	0	0	0.065	TRUE	FALSE	TRUE	**N/A**	**Clay Fill (irrelevant)**
3.5	0.21	0.00	0.21	5.57	13	N/A	N/A	N/A	0.99	N/A	0.999	0	0	0.065	TRUE	FALSE	TRUE	**N/A**	**Clay Fill (irrelevant)**
5.0	0.30	0.00	0.30	5.57	18	N/A	N/A	N/A	0.99	N/A	0.996	0	0	0.065	TRUE	FALSE	TRUE	**N/A**	**Clay Fill (irrelevant)**
6.5	0.39	0.00	0.39	5.57	20	N/A	N/A	N/A	0.98	N/A	0.992	0	0	0.065	TRUE	FALSE	FALSE	**N/A**	**Clay Fill (irrelevant)**
8.0	0.48	0.05	0.43	5.57	17	N/A	N/A	N/A	0.99	N/A	0.988	0	0	0.072	TRUE	FALSE	FALSE	**N/A**	**Clay Fill (irrelevant)**
9.5	0.57	0.10	0.47	5.57	10	N/A	N/A	N/A	0.99	N/A	0.984	0	0	0.077	TRUE	FALSE	FALSE	**N/A**	**Clay Fill (irrelevant)**
11.0	0.66	0.14	0.52	5.53	8	0.103	1.060	0.852	1.00	0.092	0.980	0	0	0.082	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**
12.5	0.76	0.19	0.57	5.53	15	0.160	1.070	1.372	0.99	0.232	0.976	0	0	0.085	FALSE	FALSE	FALSE	**2.7**	**Subunit 2**
14.0	0.85	0.24	0.61	5.53	15	0.157	1.060	1.330	0.99	0.219	0.971	0	0	0.088	FALSE	FALSE	FALSE	**2.5**	**Subunit 2**
15.5	0.95	0.28	0.66	5.53	27	0.342	1.083	2.541	0.97	0.915	0.967	0	0	0.090	FALSE	FALSE	FALSE	**10.2**	**Subunit 2**
17.0	1.04	0.33	0.71	5.36	14	0.150	1.043	1.248	0.99	0.194	0.962	0	0	0.092	FALSE	FALSE	FALSE	**2.1**	**Subunit 3**
18.5	1.14	0.38	0.76	5.36	14	0.148	1.035	1.217	0.99	0.184	0.957	0	0	0.093	FALSE	FALSE	FALSE	**2.0**	**Subunit 3**
20.0	1.24	0.42	0.81	5.36	14	0.146	1.028	1.189	0.99	0.176	0.952	0	0	0.094	FALSE	FALSE	FALSE	**1.9**	**Subunit 3**
21.5	1.34	0.47	0.87	5.36	9	0.109	1.018	0.899	0.99	0.099	0.946	0	0	0.095	FALSE	FALSE	FALSE	**1.0**	**Subunit 3**
23.0	1.44	0.52	0.92	5.36	12	0.130	1.014	1.051	0.99	0.138	0.941	0	0	0.096	FALSE	FALSE	FALSE	**1.4**	**Subunit 3**
24.5	1.53	0.56	0.97	5.36	7	0.098	1.007	0.828	1.00	0.081	0.935	0	0	0.097	FALSE	FALSE	FALSE	**0.8**	**Subunit 3**
26.0	1.63	0.61	1.02	5.36	7	0.097	1.003	0.829	1.00	0.081	0.930	0	0	0.097	FALSE	FALSE	FALSE	**0.8**	**Subunit 3**
27.5	1.73	0.66	1.07	5.36	6	0.089	0.999	0.786	1.00	0.070	0.924	0	0	0.097	FALSE	FALSE	FALSE	**0.7**	**Subunit 3**
29.0	1.83	0.71	1.12	5.36	6	0.089	0.995	0.790	1.00	0.070	0.918	0	0	0.097	FALSE	FALSE	FALSE	**0.7**	**Subunit 3**
30.5	1.93	0.75	1.17	5.36	6	0.089	0.992	0.793	1.00	0.070	0.912	0	0	0.098	FALSE	FALSE	FALSE	**0.7**	**Subunit 3**
32.0	2.02	0.80	1.23	5.36	7	0.096	0.988	0.832	1.00	0.079	0.906	0	0	0.098	FALSE	FALSE	FALSE	**0.8**	**Subunit 3**
33.5	2.12	0.85	1.28	5.36	8	0.105	0.984	0.875	0.99	0.090	0.900	0	0	0.098	FALSE	FALSE	FALSE	**0.9**	**Subunit 3**
35.0	2.22	0.89	1.33	5.36	9	0.113	0.980	0.918	0.99	0.101	0.894	0	0	0.097	FALSE	FALSE	FALSE	**1.0**	**Subunit 3**
36.5	2.32	0.94	1.38	5.36	8	0.104	0.977	0.873	1.00	0.088	0.888	0	0	0.097	FALSE	FALSE	FALSE	**0.9**	**Subunit 3**
38.0	2.42	0.99	1.43	5.36	39	N/A	N/A	N/A	N/A	N/A	0.881	0	0	0.097	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**
39.5	2.52	1.03	1.48	5.36	33	N/A	N/A	N/A	N/A	N/A	0.875	0	0	0.097	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**
41.0	2.61	1.08	1.53	5.36	60	N/A	N/A	N/A	N/A	N/A	0.869	0	0	0.096	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**
42.5	2.71	1.13	1.59	5.36	19	0.198	0.947	1.407	0.98	0.260	0.862	0	0	0.096	FALSE	FALSE	FALSE	**2.7**	**Subunit 3**
44.0	2.81	1.17	1.64	5.36	141	N/A	N/A	N/A	N/A	N/A	0.856	0	0	0.096	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**


Legend
$FS_{liq} \leq 1.1$
$1.1 < FS_{liq} \leq 1.4$
$FS_{liq} > 1.4$
Sand-like, Unliquefiable
Clay-like, Not Susceptible
Clay-like, Susceptible
No Data
KIF-D2, Liquefaction Triggering Results
Top of Boring
El. 743.3 ft
El. 733.3
El. 723.3
El. 713.3
El. 703.3

KIF TDEC Stability, Boring ID: KIF-D2, Source = 1 Hz, Mw = 7.6, Event = Design EQ,
SPT Data, Simplified Stress-Based Approach



KIF TDEC Stability, Boring ID: KIF-D2, Source = 1 Hz, Mw = 7.6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



Project Name = KIF TDEC Stability
Boring ID = KIF-STN50

Boring Location

Northing =
Easting =

OR

Baseline Station =
Offset (+ Right) =

Drilling Information

Boring Inner Diameter (ID) =	3.25	inches	
Top of Hole Elevation	741.6	feet	
Water Depth during SPT (negative for U/S borings)=	4.6	feet	
Depth Sampling Began	0	feet	
Total Unit Wt. above 1st SPT =	120	pcf	
Assumed Rod Stickup =	5	feet	*(Typ assume 5ft)*
E_m Measurement based on Fv method? =	1	(1: Yes, 0: No)	
SPT Sampler w/ Liners? =	0	(1: Yes, 0: No)	*(Typ. no)*

During EQ Information

Water Depth during EQ (relative to SPT TOH, negative for U/S borings) =	4.6	feet
Final Grade Elevation during EQ	741.6	feet
Average Total Unit Wt. of Cut/Fill	120	pcf

Fines Content Correction

Fines content correction for samples with blow counts of zero? 1 (1: Yes, 0: No)

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile? 0 (1: Yes, 0: No)
If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile: _Pond_Section, KIF-STN50_NOR
Alpha at each sample depth known? 1 (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (α vs. depth curve)
If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_α will be one.

m4:
m3:
m2:
m1:
m0:

Associated ground response profile: ling_Pond_Section, KIF-STN50
Get CSR from shear stress envelope? 0 (1: Yes, 0: No)
If previous answer is No, then CSR will be calculated using a_{max} and r_d
Max. Shear Stress at each sample depth known? (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4:
m3:
m2:
m1:

Earthquake Information

EQ Source (e.g., New Madrid)	1 Hz
Event (e.g., MCE, 10KEQ, OBE)	Design EQ
a_{max} (g) (top of ground surface)	0.11
EQ Mag (Mw)	7.6

Inputs

Depth of Sample Midpoint (ft.)	SPT N Value	Hammer Efficiency, E_m (%)	Unified Soil Classification	Fines Content (%)	Total Unit Weight (pcf)	Material (optional)	Clay-like / Sand-like Override (optional)	Clay-like Susceptibility (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure during SPT (psf)	Static Pore Water Pressure during EQ (psf)
1.0	10	80	CL	62	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.689			
2.5	5	80		62	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.475			
4.0	5	80		62	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.379			
5.5	7	80		62	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.350			
7.0	6	80		62	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.327			
8.5	0	80		62	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.300			
12.0	0	80		62	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.266			
13.5	7	80		62	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.256			
15.0	2	80		62	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.249			
16.5	0	80		62	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.243			
18.0	9	80		62	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.237			
19.5	3	80		59	126	Subunit 1	Clay-like	Not Susceptible		0.232			
23.0	6	80		59	126	Subunit 1	Clay-like	Not Susceptible		0.221			
24.5	0	80		39	131	Subunit 3	Sand-like			0.216			
26.0	0	80		39	131	Subunit 3	Sand-like			0.212			
27.5	2	80		39	131	Subunit 3	Sand-like			0.207			
29.0	9	80		39	131	Subunit 3	Sand-like			0.203			
30.5	11	80		39	131	Subunit 3	Sand-like			0.198			
32.0	12	80		39	131	Subunit 3	Sand-like			0.191			
33.5	6	80		39	131	Subunit 3	Sand-like			0.185			
35.0	8	80		39	131	Subunit 3	Sand-like			0.180			
36.5	30	80		39	131	Subunit 3	Sand-like			0.175			

KIF TDEC Stability, Boring ID: KIF-STN50

Liquefaction Potential Evaluations

For Coarse Grained Soils

Elev. Of Mid. Pt. of Sample (ft)	Depth of Mid. Pt. of Sample (ft.)	Unit Weight (pcf)	Vert. Total Stress during SPT (tsf)	Static Pore Pressure during SPT (tsf)	Vert. Eff. Stress during SPT (tsf)	SPT N Value	Hammer Efficiency (%)	Borehole Diameter Correction	Sampler Correction	Rod Length Correction	Overburden Stress Correction Factor	Hammer Energy Correction Factor	Corrected Blow Count	Normalized Blow Count	Relative Density (%)	Unified Soil Classification	Fines Content (%)	Relative State Parameter Index	Static Shear Stress Ratio
	z	γ_T	σ_v	u	σ'_v	N	E_m	C_B	C_S	C_R	C_N	C_E	N_{60}	$(N_1)_{60}$	D_r			ξ_R	α
	Top of Hole Elevation (ft)	741.6			Boring ID =	KIF-STN50													
	begin sampling (depth-ft)	0.0			Boring Inner Dia. (in) =	3.25													
	total unit wt. above 1st SPT (pcf) =	120																	
	water elevation during SPT (ft) =	737.0	ft *(relative to ground surface during SPT)*		Assumed Rod Stickup =	5.0	feet												
	water depth during SPT (ft) =	4.6			E_m Measurement? =	1	(1: Yes, 0: No)												
	water elevation during EQ (ft) =	737.0	ft *(relative to ground surface during SPT)*		SPT Sampler w/ Liners? =	0	(1: Yes, 0: No)												
	water during EQ (depth-ft) =	4.6	u-top	effstr-top															
	vert. total stress above 1st SPT (tsf) =	**0.00**	**0.00**	0.00															
740.6	1.0	120	0.06	0.00	0.06	10	80.0	1.000	1.29	1.00	1.70	1.33	17	29	87	CL	62	-0.60	0.350
739.1	2.5	120	0.15	0.00	0.15	5	80.0	1.000	1.13	1.00	1.70	1.33	8	13	63	0	62	-0.50	0.350
737.6	4.0	120	0.24	0.00	0.24	5	80.0	1.000	1.13	1.00	1.70	1.33	8	13	63	0	62	-0.49	0.350
736.1	5.5	120	0.33	0.03	0.30	7	80.0	1.000	1.18	1.00	1.67	1.33	11	18	72	0	62	-0.58	0.350
734.6	7.0	120	0.42	0.07	0.35	6	80.0	1.000	1.15	1.00	1.63	1.33	9	15	67	0	62	-0.52	0.327
733.1	8.5	120	0.51	0.12	0.39	0	80.0	1.000	1.10	1.00	1.70	1.33	0	0	36	0	62	-0.21	0.300
729.6	12.0	120	0.72	0.23	0.49	0	80.0	1.000	1.10	1.00	1.59	1.33	0	0	36	0	62	-0.20	0.266
728.1	13.5	120	0.81	0.28	0.53	7	80.0	1.000	1.14	1.00	1.35	1.33	11	14	66	0	62	-0.51	0.256
726.6	15.0	120	0.90	0.32	0.58	2	80.0	1.000	1.10	1.00	1.39	1.33	3	4	46	0	62	-0.30	0.249
725.1	16.5	120	0.99	0.37	0.62	0	80.0	1.000	1.10	1.00	1.38	1.33	0	0	36	0	62	-0.20	0.243
723.6	18.0	120	1.08	0.42	0.66	9	80.0	1.000	1.17	1.00	1.22	1.33	14	17	70	0	62	-0.54	0.237
722.1	19.5	126	1.17	0.46	0.71	3	80.0	1.000	1.10	1.00	1.24	1.33	4	5	49	0	59	-0.33	0.232
718.6	23.0	126	1.39	0.57	0.82	6	80.0	1.000	1.10	1.00	1.13	1.33	9	10	58	0	59	-0.42	0.221
717.1	24.5	131	1.49	0.62	0.87	0	80.0	1.000	1.10	1.00	1.13	1.33	0	0	35	0	39	-0.19	0.216
715.6	26.0	131	1.59	0.67	0.92	0	80.0	1.000	1.10	1.00	1.09	1.33	0	0	35	0	39	-0.18	0.212
714.1	27.5	131	1.69	0.71	0.97	2	80.0	1.000	1.10	1.00	1.05	1.33	3	3	43	0	39	-0.26	0.207
712.6	29.0	131	1.78	0.76	1.02	9	80.0	1.000	1.14	1.00	1.02	1.33	14	14	65	0	39	-0.48	0.203
711.1	30.5	131	1.88	0.81	1.07	11	80.0	1.000	1.17	1.00	0.99	1.33	17	17	70	0	39	-0.53	0.198
709.6	32.0	131	1.98	0.85	1.13	12	80.0	1.000	1.18	1.00	0.98	1.33	19	18	72	0	39	-0.55	0.191
708.1	33.5	131	2.08	0.90	1.18	6	80.0	1.000	1.10	1.00	0.95	1.33	9	8	55	0	39	-0.37	0.185
706.6	35.0	131	2.18	0.95	1.23	8	80.0	1.000	1.11	1.00	0.93	1.33	12	11	60	0	39	-0.42	0.180
705.1	36.5	131	2.28	1.00	1.28	30	80.0	1.000	1.30	1.00	0.95	1.33	52	49	100	0	39	-0.60	0.175

KIF TDEC Stability, Boring ID: KIF-STN50
Liquefaction Potential Evaluations
For Coarse Grained Soils

EQ Source	a max (g)	EQ Mag (Mw)	Event
1 Hz	0.11	7.6	Design EQ

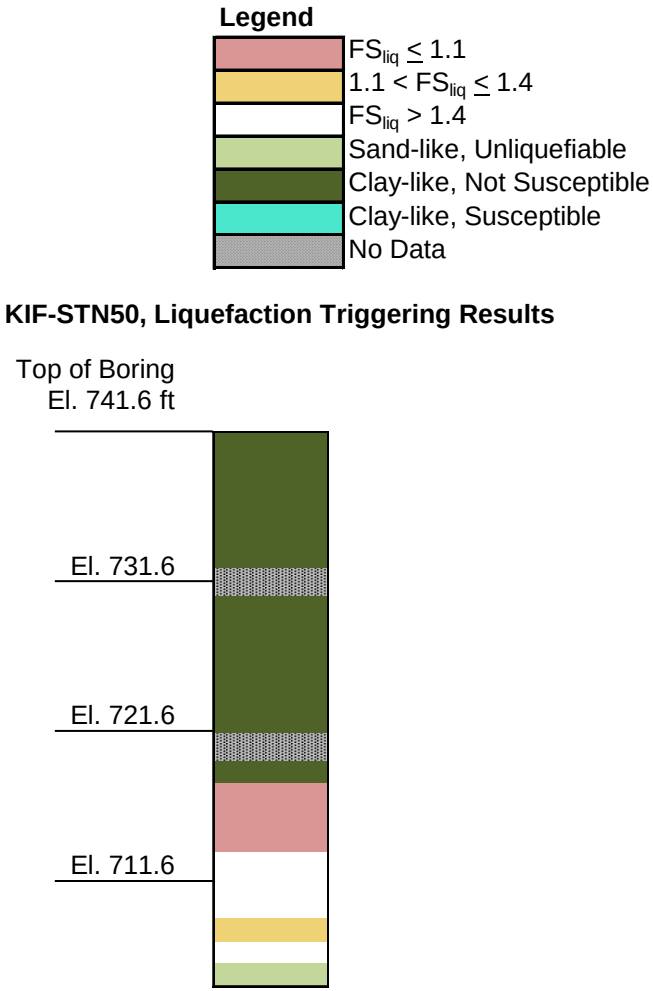
Shear Stress Curve Fit Parameters
m4: 0
m3: 0
m2: 0
m1: 0

Boring ID: **KIF-STN50**
Top of Fill Elevation: 741.6 ft
Fill Height: 0.0 ft *(relative to ground surface during SPT)*
Fill Total Unit Weight: 120 pcf
Fill Total Stress: 0.00 tsf

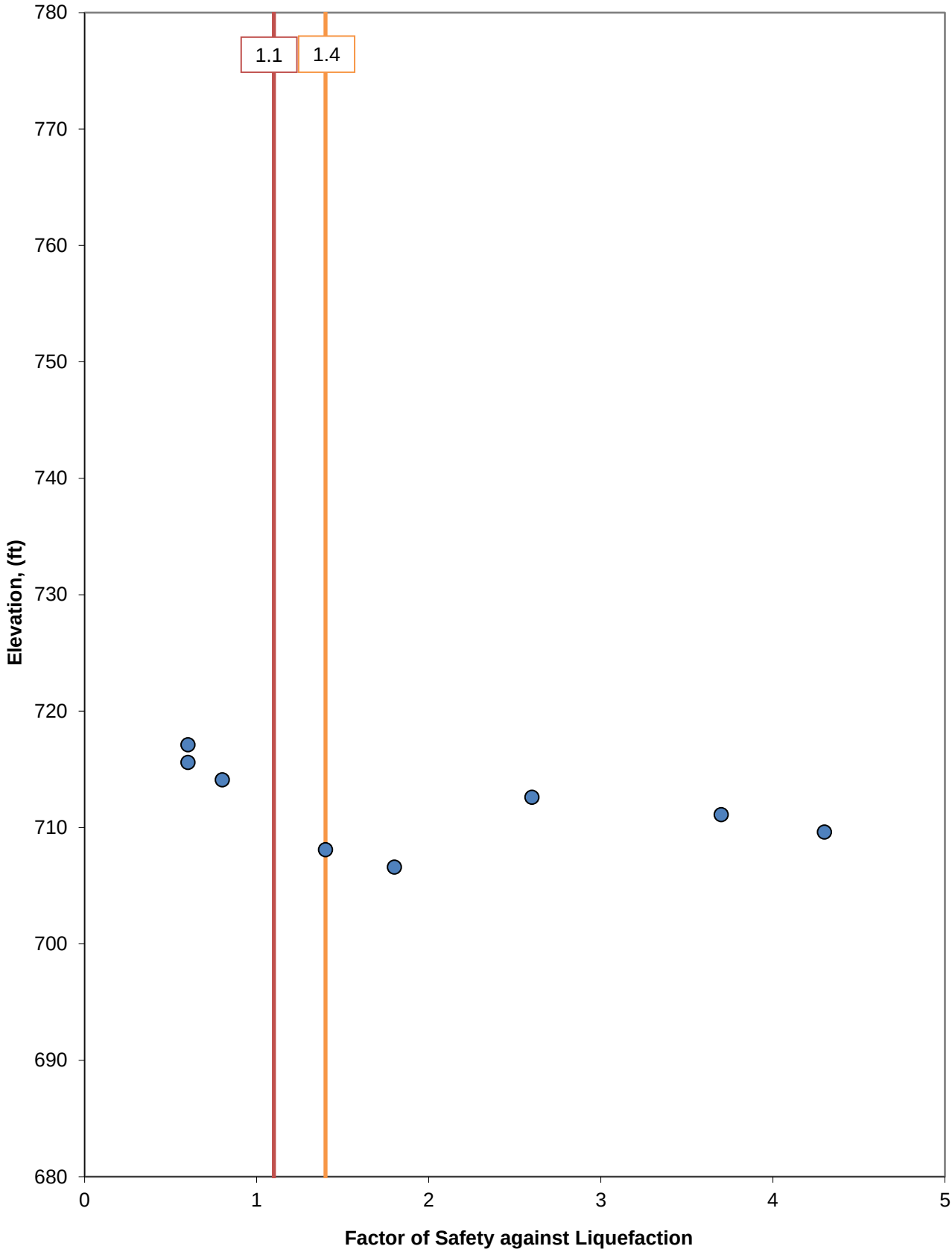
totstr-top	u-top	effstr-top
0.00	0.00	0.00

Note: A factor of safety shown as "N/A" implies that the soil type is not appropriately evaluated using this methodology. This applies to clay-like soils (typically CL, CH, CL-ML and MH material type), samples with high blow counts, and unsaturated samples.

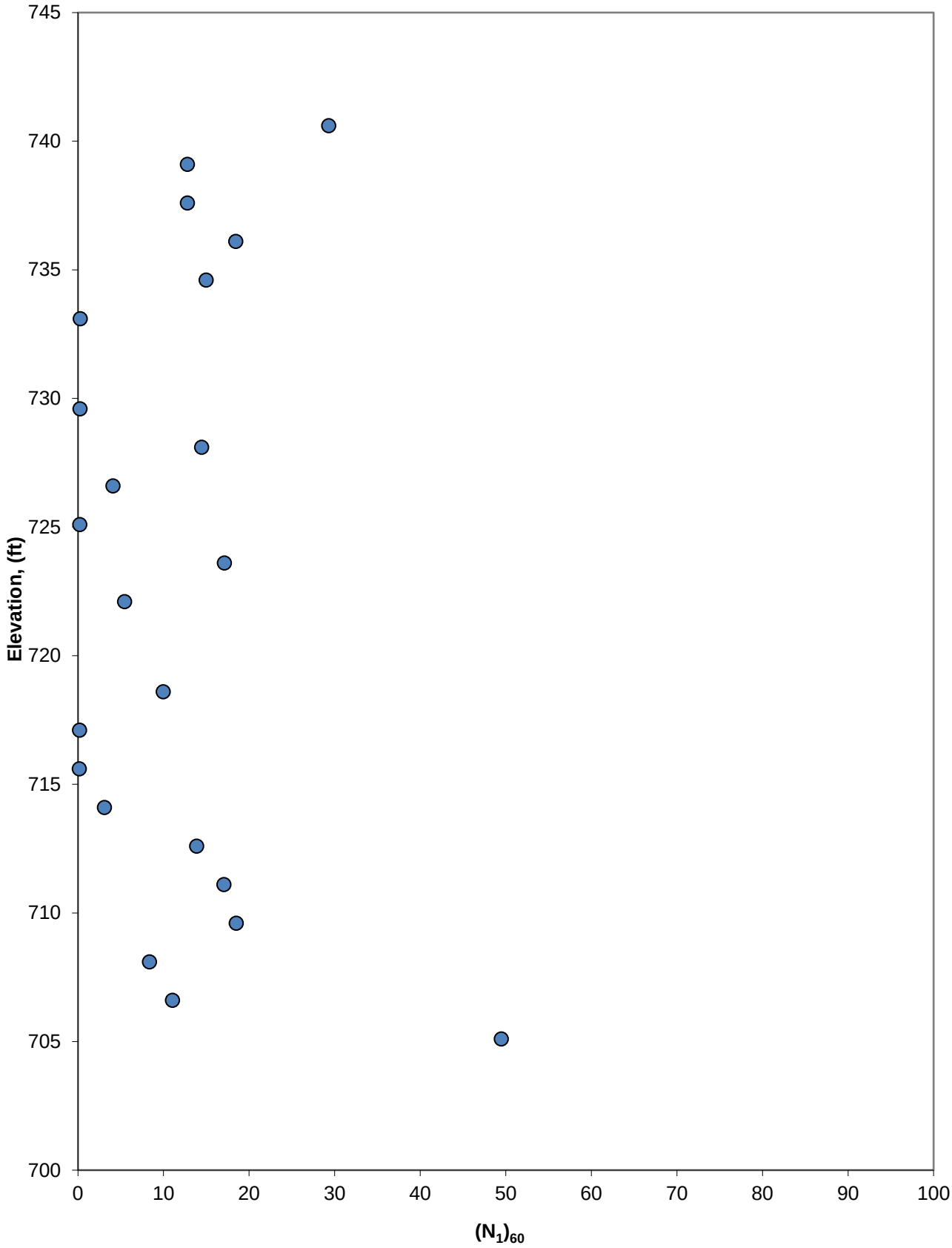
Depth of Mid. Pt. of Sample (ft.) z	Vert. Total Stress during EQ w/ Fill (tsf) $\sigma_{v\ with\ fill}$	Static Pore Pressure during EQ (tsf) u	Vert. Eff. Stress during EQ w/ Fill (tsf) $\sigma'_{v\ with\ fill}$	Clean Sand Correction $\Delta(N_1)_{60cs}$	Equivalent Clean Sand N-Value $(N_1)_{60cs}$	Cyclic Resistance Ratio CRR7.5	Overburden Correction Factor K_σ	Static Shear Stress Correction K_α	Mag. Scaling Factor (MSF)	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Max. Induced Shear Stress (psf)	From Ground Response: Avg. Cyclic Shear Stress (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Blow Count $(N_1)_{60cs} \geq 32$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)
1.0	0.06	0.00	0.06	5.60	35	N/A	N/A	N/A	N/A	N/A	1.000	0	0	0.073	TRUE	TRUE	TRUE	**N/A**	**Clay Fill (irrelevant)**
2.5	0.15	0.00	0.15	5.60	18	N/A	N/A	N/A	0.99	N/A	1.000	0	0	0.073	TRUE	FALSE	TRUE	**N/A**	**Clay Fill (irrelevant)**
4.0	0.24	0.00	0.24	5.60	18	N/A	N/A	N/A	0.99	N/A	0.998	0	0	0.073	TRUE	FALSE	TRUE	**N/A**	**Clay Fill (irrelevant)**
5.5	0.33	0.03	0.30	5.60	24	N/A	N/A	N/A	0.98	N/A	0.994	0	0	0.079	TRUE	FALSE	FALSE	**N/A**	**Clay Fill (irrelevant)**
7.0	0.42	0.07	0.35	5.60	21	N/A	N/A	N/A	0.98	N/A	0.991	0	0	0.088	TRUE	FALSE	FALSE	**N/A**	**Clay Fill (irrelevant)**
8.5	0.51	0.12	0.39	5.60	6	N/A	N/A	N/A	1.00	N/A	0.987	0	0	0.095	TRUE	FALSE	FALSE	**N/A**	**Clay Fill (irrelevant)**
12.0	0.72	0.23	0.49	5.60	6	N/A	N/A	N/A	1.00	N/A	0.977	0	0	0.105	TRUE	FALSE	FALSE	**N/A**	**Clay Fill (irrelevant)**
13.5	0.81	0.28	0.53	5.60	20	N/A	N/A	N/A	0.98	N/A	0.973	0	0	0.108	TRUE	FALSE	FALSE	**N/A**	**Clay Fill (irrelevant)**
15.0	0.90	0.32	0.58	5.60	10	N/A	N/A	N/A	0.99	N/A	0.968	0	0	0.110	TRUE	FALSE	FALSE	**N/A**	**Clay Fill (irrelevant)**
16.5	0.99	0.37	0.62	5.60	6	N/A	N/A	N/A	1.00	N/A	0.963	0	0	0.112	TRUE	FALSE	FALSE	**N/A**	**Clay Fill (irrelevant)**
18.0	1.08	0.42	0.66	5.60	23	N/A	N/A	N/A	0.98	N/A	0.959	0	0	0.114	TRUE	FALSE	FALSE	**N/A**	**Clay Fill (irrelevant)**
19.5	1.17	0.46	0.71	5.60	11	N/A	N/A	N/A	0.99	N/A	0.953	0	0	0.115	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
23.0	1.39	0.57	0.82	5.60	16	N/A	N/A	N/A	0.99	N/A	0.941	0	0	0.117	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
24.5	1.49	0.62	0.87	5.57	6	0.090	1.015	0.798	1.00	0.073	0.935	0	0	0.117	FALSE	FALSE	FALSE	**0.6**	**Subunit 3**
26.0	1.59	0.67	0.92	5.57	6	0.090	1.011	0.801	1.00	0.073	0.930	0	0	0.117	FALSE	FALSE	FALSE	**0.6**	**Subunit 3**
27.5	1.69	0.71	0.97	5.57	9	0.109	1.008	0.906	0.99	0.099	0.924	0	0	0.117	FALSE	FALSE	FALSE	**0.8**	**Subunit 3**
29.0	1.78	0.76	1.02	5.57	19	0.199	1.004	1.531	0.98	0.302	0.918	0	0	0.117	FALSE	FALSE	FALSE	**2.6**	**Subunit 3**
30.5	1.88	0.81	1.07	5.57	23	0.243	0.998	1.796	0.98	0.427	0.912	0	0	0.117	FALSE	FALSE	FALSE	**3.7**	**Subunit 3**
32.0	1.98	0.85	1.13	5.57	24	0.269	0.990	1.910	0.98	0.498	0.906	0	0	0.116	FALSE	FALSE	FALSE	**4.3**	**Subunit 3**
33.5	2.08	0.90	1.18	5.57	14	0.147	0.989	1.124	0.99	0.162	0.900	0	0	0.116	FALSE	FALSE	FALSE	**1.4**	**Subunit 3**
35.0	2.18	0.95	1.23	5.57	17	0.170	0.982	1.262	0.99	0.209	0.894	0	0	0.116	FALSE	FALSE	FALSE	**1.8**	**Subunit 3**
36.5	2.28	1.00	1.28	5.57	55	N/A	N/A	N/A	N/A	N/A	0.888	0	0	0.115	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**


Legend
$FS_{liq} \leq 1.1$
$1.1 < FS_{liq} \leq 1.4$
$FS_{liq} > 1.4$
Sand-like, Unliquefiable
Clay-like, Not Susceptible
Clay-like, Susceptible
No Data
KIF-STN50, Liquefaction Triggering Results
Top of Boring
El. 741.6 ft
El. 731.6
El. 721.6
El. 711.6

KIF TDEC Stability, Boring ID: KIF-STN50, Source = 1 Hz, Mw = 7.6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



KIF TDEC Stability, Boring ID: KIF-STN50, Source = 1 Hz, Mw = 7.6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



Project Name = KIF TDEC Stability
Boring ID = KIF-STN51

Boring Location

Northing =
Easting =

OR

Baseline Station =
Offset (+ Right) =

Drilling Information

Boring Inner Diameter (ID) =	3.25	inches	
Top of Hole Elevation	750.4	feet	
Water Depth during SPT (negative for U/S borings)=	-1	feet	
Depth Sampling Began	0	feet	
Total Unit Wt. above 1st SPT =	120	pcf	
Assumed Rod Stickup =	5	feet	*(Typ assume 5ft)*
E_m Measurement based on Fv method? =	1	(1: Yes, 0: No)	
SPT Sampler w/ Liners? =	0	(1: Yes, 0: No)	*(Typ. no)*

During EQ Information

Water Depth during EQ (relative to SPT TOH, negative for U/S borings) =	-1	feet
Final Grade Elevation during EQ	750.4	feet
Average Total Unit Wt. of Cut/Fill	120	pcf

Fines Content Correction

Fines content correction for samples with blow counts of zero? 1 (1: Yes, 0: No)

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile? 0 (1: Yes, 0: No)
If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile: Pond_Section, KIF-STN51_NOR
Alpha at each sample depth known? 1 (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (α vs. depth curve)
If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_α will be one.

m4:
m3:
m2:
m1:
m0:

Associated ground response profile: ling_Pond_Section, KIF-STN51
Get CSR from shear stress envelope? 0 (1: Yes, 0: No)
If previous answer is No, then CSR will be calculated using a_{max} and r_d
Max. Shear Stress at each sample depth known? (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4:
m3:
m2:
m1:

Earthquake Information

EQ Source (e.g., New Madrid)	1 Hz
Event (e.g., MCE, 10KEQ, OBE)	Design EQ
a_{max} (g) (top of ground surface)	0.10
EQ Mag (Mw)	7.6

Inputs

Depth of Sample Midpoint (ft.)	SPT N Value	Hammer Efficiency, E_m (%)	Unified Soil Classification	Fines Content (%)	Total Unit Weight (pcf)	Material (optional)	Clay-like / Sand-like Override (optional)	Clay-like Susceptibility (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure during SPT (psf)	Static Pore Water Pressure during EQ (psf)
1.0	5	80	GP	20	120	Gravel Fill (Irrelevant)	Sand-like			0.179			
2.5	13	80		62	120	Clay Fill (irrelvenant)	Clay-like	Not Susceptible		0.167			
4.0	12	80		62	120	Clay Fill (irrelvenant)	Clay-like	Not Susceptible		0.156			
5.5	6	80		62	120	Clay Fill (irrelvenant)	Clay-like	Not Susceptible		0.149			
7.0	10	80		62	120	Clay Fill (irrelvenant)	Clay-like	Not Susceptible		0.148			
8.5	7	80		62	120	Clay Fill (irrelvenant)	Clay-like	Not Susceptible		0.145			
10.0	14	80		62	120	Clay Fill (irrelvenant)	Clay-like	Not Susceptible		0.143			
11.5	11	80		62	120	Clay Fill (irrelvenant)	Clay-like	Not Susceptible		0.142			
14.5	7	80		62	120	Clay Fill (irrelvenant)	Clay-like	Not Susceptible		0.145			
16.0	7	80		62	120	Clay Fill (irrelvenant)	Clay-like	Not Susceptible		0.149			
17.5	17	80		62	120	Clay Fill (irrelvenant)	Clay-like	Not Susceptible		0.154			
21.0	6	80		62	120	Clay Fill (irrelvenant)	Clay-like	Not Susceptible		0.167			
22.5	14	80		62	120	Clay Fill (irrelvenant)	Clay-like	Not Susceptible		0.172			
26.0	5	80		62	120	Clay Fill (irrelvenant)	Clay-like	Not Susceptible		0.184			
27.5	9	80		85	126	Subunit 1	Clay-like	Not Susceptible		0.188			
29.0	6	80		85	126	Subunit 1	Clay-like	Not Susceptible		0.193			
30.5	9	80		11	131	Subunit 3	Sand-like			0.196			
32.0	4	80		11	131	Subunit 3	Sand-like			0.198			
33.5	0	80		11	131	Subunit 3	Sand-like			0.200			
35.0	3	80		11	131	Subunit 3	Sand-like			0.201			
36.5	0	80		11	131	Subunit 3	Sand-like			0.202			
38.0	0	80		11	131	Subunit 3	Sand-like			0.202			
39.5	0	80		11	131	Subunit 3	Sand-like			0.201			
41.0	14	80		11	131	Subunit 3	Sand-like			0.199			
42.5	6	80		11	131	Subunit 3	Sand-like			0.196			
44.0	14	80		11	131	Subunit 3	Sand-like			0.194			
45.5	38	80		11	131	Subunit 3	Sand-like			0.191			
47.0	5	80		11	131	Subunit 3	Sand-like			0.189			
48.5	50	80		11	131	Subunit 3	Sand-like			0.186			

KIF TDEC Stability, Boring ID: KIF-STN51

Liquefaction Potential Evaluations

For Coarse Grained Soils

Elev. Of Mid. Pt. of Sample (ft)	Depth of Mid. Pt. of Sample (ft.)	Unit Weight (pcf)	Vert. Total Stress during SPT (tsf)	Static Pore Pressure during SPT (tsf)	Vert. Eff. Stress during SPT (tsf)	SPT N Value	Hammer Efficiency (%)	Borehole Diameter Correction	Sampler Correction	Rod Length Correction	Overburden Stress Correction Factor	Hammer Energy Correction Factor	Corrected Blow Count	Normalized Blow Count	Relative Density (%)	Unified Soil Classification	Fines Content (%)	Relative State Parameter Index	Static Shear Stress Ratio
	z	γ_T	σ_v	u	σ'_v	N	E_m	C_B	C_s	C_R	C_N	C_E	N_{60}	$(N_1)_{60}$	D_r			ξ_R	α

Top of Hole Elevation (ft) = 750.4 | Boring ID = KIF-STN51

begin sampling (depth-ft) = 0.0 | Boring Inner Dia. (in) = 3.25

total unit wt. above 1st SPT (pcf) = 120

water elevation during SPT (ft) = 751.4 ft *(relative to ground surface during SPT)* | Assumed Rod Stickup = 5.0 feet

water depth during SPT (ft) = -1.0 | E_m Measurement? = 1 (1: Yes, 0: No)

water elevation during EQ (ft) = 751.4 ft *(relative to ground surface during SPT)* | SPT Sampler w/ Liners? = 0 (1: Yes, 0: No)

water during EQ (depth-ft) = -1.0 | u-top | effstr-top

vert. total stress above 1st SPT (tsf) = **0.03** | **0.03** | 0.00

749.4	1.0	120	0.09	0.06	0.03	5	80.0	1.000	1.13	1.00	1.70	1.33	8	13	61	GP	20	-0.51	0.179
747.9	2.5	120	0.18	0.11	0.07	13	80.0	1.000	1.30	1.00	1.70	1.33	23	38	98	0	62	-0.60	0.167
746.4	4.0	120	0.27	0.16	0.12	12	80.0	1.000	1.30	1.00	1.70	1.33	21	35	94	0	62	-0.60	0.156
744.9	5.5	120	0.36	0.20	0.16	6	80.0	1.000	1.16	1.00	1.70	1.33	9	16	68	0	62	-0.55	0.149
743.4	7.0	120	0.45	0.25	0.20	10	80.0	1.000	1.29	1.00	1.70	1.33	17	29	87	0	62	-0.60	0.148
741.9	8.5	120	0.54	0.30	0.24	7	80.0	1.000	1.19	1.00	1.70	1.33	11	19	73	0	62	-0.59	0.145
740.4	10.0	120	0.63	0.34	0.29	14	80.0	1.000	1.30	1.00	1.46	1.33	24	35	94	0	62	-0.60	0.143
738.9	11.5	120	0.72	0.39	0.33	11	80.0	1.000	1.28	1.00	1.48	1.33	19	28	85	0	62	-0.60	0.142
735.9	14.5	120	0.90	0.48	0.42	7	80.0	1.000	1.16	1.00	1.49	1.33	11	16	69	0	62	-0.54	0.145
734.4	16.0	120	0.99	0.53	0.46	7	80.0	1.000	1.15	1.00	1.43	1.33	11	15	68	0	62	-0.53	0.149
732.9	17.5	120	1.08	0.58	0.50	17	80.0	1.000	1.30	1.00	1.24	1.33	29	36	96	0	62	-0.60	0.154
729.4	21.0	120	1.29	0.69	0.60	6	80.0	1.000	1.12	1.00	1.30	1.33	9	12	61	0	62	-0.45	0.167
727.9	22.5	120	1.38	0.73	0.65	14	80.0	1.000	1.28	1.00	1.18	1.33	24	28	86	0	62	-0.60	0.172
724.4	26.0	120	1.59	0.84	0.75	5	80.0	1.000	1.10	1.00	1.19	1.33	7	9	56	0	62	-0.39	0.184
722.9	27.5	126	1.68	0.89	0.79	9	80.0	1.000	1.16	1.00	1.13	1.33	14	16	68	0	85	-0.52	0.188
721.4	29.0	126	1.78	0.94	0.84	6	80.0	1.000	1.10	1.00	1.12	1.33	9	10	58	0	85	-0.41	0.193
719.9	30.5	131	1.87	0.98	0.89	9	80.0	1.000	1.15	1.00	1.08	1.33	14	15	60	0	11	-0.43	0.196
718.4	32.0	131	1.97	1.03	0.94	4	80.0	1.000	1.10	1.00	1.07	1.33	6	6	41	0	11	-0.24	0.198
716.9	33.5	131	2.07	1.08	0.99	0	80.0	1.000	1.10	1.00	1.04	1.33	0	0	20	0	11	-0.03	0.200
715.4	35.0	131	2.17	1.12	1.05	3	80.0	1.000	1.10	1.00	1.01	1.33	4	4	36	0	11	-0.19	0.201
713.9	36.5	131	2.27	1.17	1.10	0	80.0	1.000	1.10	1.00	0.98	1.33	0	0	20	0	11	-0.02	0.202
712.4	38.0	131	2.37	1.22	1.15	0	80.0	1.000	1.10	1.00	0.95	1.33	0	0	20	0	11	-0.02	0.202
710.9	39.5	131	2.46	1.26	1.20	0	80.0	1.000	1.10	1.00	0.92	1.33	0	0	19	0	11	-0.02	0.201
709.4	41.0	131	2.56	1.31	1.25	14	80.0	1.000	1.21	1.00	0.93	1.33	23	21	70	0	11	-0.52	0.199
707.9	42.5	131	2.66	1.36	1.30	6	80.0	1.000	1.10	1.00	0.89	1.33	9	8	45	0	11	-0.27	0.196
706.4	44.0	131	2.76	1.40	1.35	14	80.0	1.000	1.20	1.00	0.90	1.33	22	20	69	0	11	-0.51	0.194
704.9	45.5	131	2.86	1.45	1.41	38	80.0	1.000	1.30	1.00	0.93	1.33	66	61	100	0	11	-0.60	0.191
703.4	47.0	131	2.96	1.50	1.46	5	80.0	1.000	1.10	1.00	0.83	1.33	7	6	41	0	11	-0.23	0.189
701.9	48.5	131	3.05	1.54	1.51	50	80.0	1.000	1.30	1.00	0.91	1.33	87	79	100	0	11	-0.60	0.186

KIF TDEC Stability, Boring ID: KIF-STN51
Liquefaction Potential Evaluations
For Coarse Grained Soils

EQ Source	a max (g)	EQ Mag (Mw)	Event
1 Hz	0.10	7.6	Design EQ

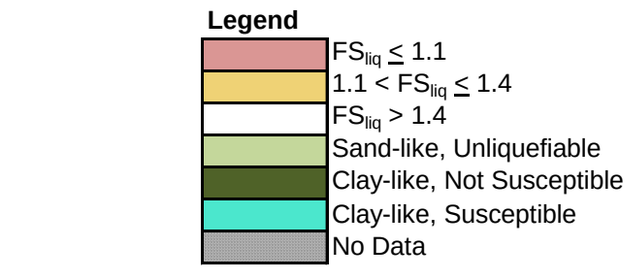
Shear Stress Curve Fit Parameters
m4: 0
m3: 0
m2: 0
m1: 0

Boring ID: **KIF-STN51**
Top of Fill Elevation: 750.4 ft
Fill Height: 0.0 ft *(relative to ground surface during SPT)*
Fill Total Unit Weight: 120 pcf
Fill Total Stress: 0.00 tsf

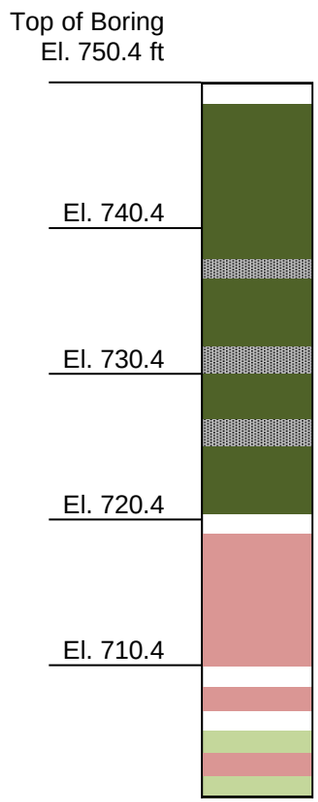
totstr-top	u-top	effstr-top
0.03	0.03	0.00

Note: A factor of safety shown as "N/A" implies that the soil type is not appropriately evaluated using this methodology. This applies to clay-like soils (typically CL, CH, CL-ML and MH material type), samples with high blow counts, and unsaturated samples.

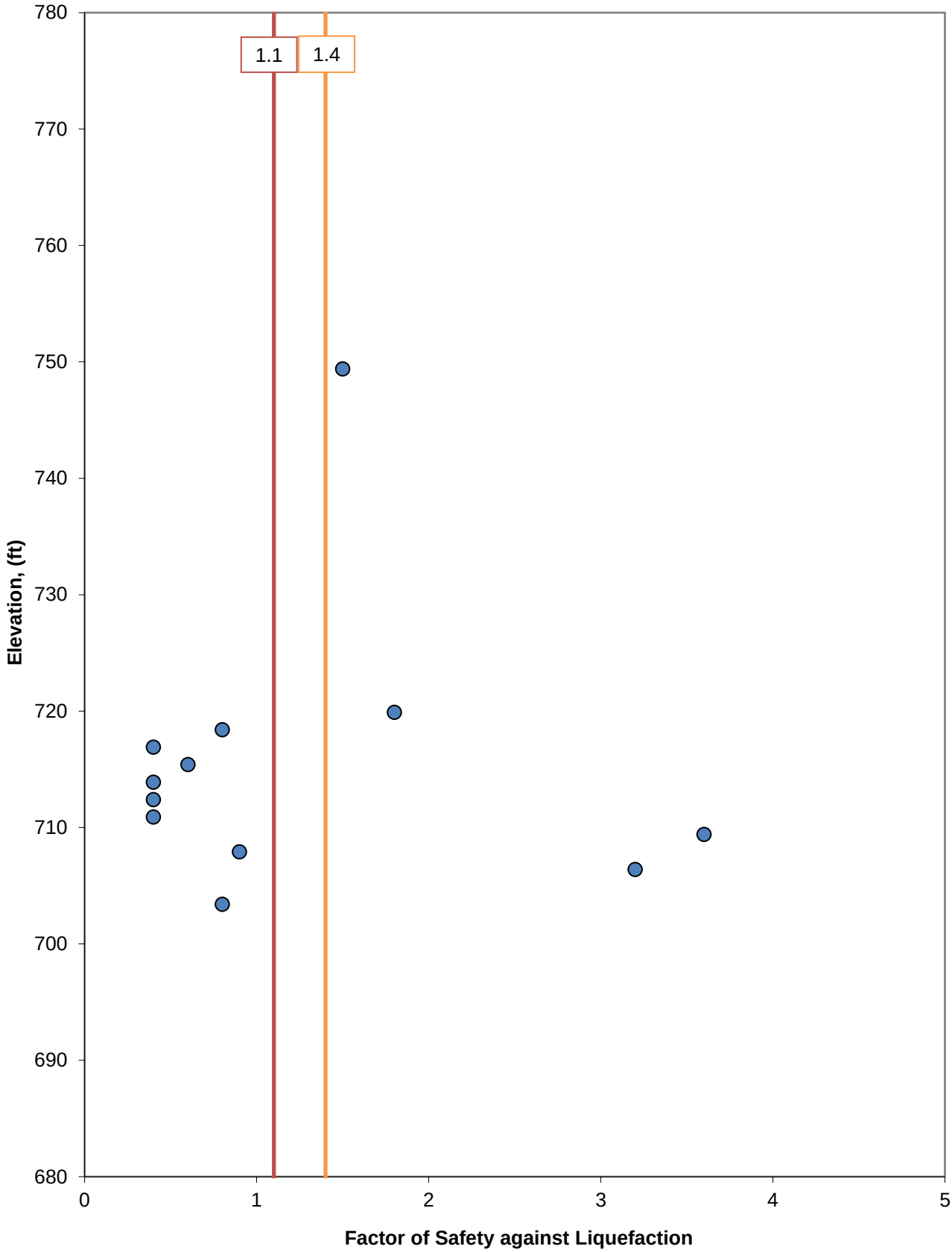
Depth of Mid. Pt. of Sample (ft.) z	Vert. Total Stress during EQ w/ Fill (tsf) $\sigma_{v\ with\ fill}$	Static Pore Pressure during EQ (tsf) u	Vert. Eff. Stress during EQ w/ Fill (tsf) $\sigma'_{v\ with\ fill}$	Clean Sand Correction $\Delta(N_1)_{60cs}$	Equivalent Clean Sand N-Value $(N_1)_{60cs}$	Cyclic Resistance Ratio CRR7.5	Overburden Correction Factor K_σ	Static Shear Stress Correction K_α	Mag. Scaling Factor (MSF)	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Max. Induced Shear Stress (psf)	From Ground Response: Avg. Cyclic Shear Stress (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Blow Count $(N_1)_{60cs} \geq 32$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)
1.0	0.09	0.06	0.03	4.48	17	0.176	1.100	1.610	0.99	0.308	1.000	0	0	0.203	FALSE	FALSE	FALSE	**1.5**	**Gravel Fill (Irrelevant)**
2.5	0.18	0.11	0.07	5.60	44	N/A	N/A	N/A	N/A	N/A	1.000	0	0	0.162	TRUE	TRUE	FALSE	**N/A**	**Clay Fill (irrelvenant)**
4.0	0.27	0.16	0.12	5.60	41	N/A	N/A	N/A	N/A	N/A	0.998	0	0	0.151	TRUE	TRUE	FALSE	**N/A**	**Clay Fill (irrelvenant)**
5.5	0.36	0.20	0.16	5.60	21	N/A	N/A	N/A	0.98	N/A	0.994	0	0	0.146	TRUE	FALSE	FALSE	**N/A**	**Clay Fill (irrelvenant)**
7.0	0.45	0.25	0.20	5.60	35	N/A	N/A	N/A	N/A	N/A	0.991	0	0	0.143	TRUE	TRUE	FALSE	**N/A**	**Clay Fill (irrelvenant)**
8.5	0.54	0.30	0.24	5.60	24	N/A	N/A	N/A	0.98	N/A	0.987	0	0	0.140	TRUE	FALSE	FALSE	**N/A**	**Clay Fill (irrelvenant)**
10.0	0.63	0.34	0.29	5.60	41	N/A	N/A	N/A	N/A	N/A	0.983	0	0	0.138	TRUE	TRUE	FALSE	**N/A**	**Clay Fill (irrelvenant)**
11.5	0.72	0.39	0.33	5.60	33	N/A	N/A	N/A	N/A	N/A	0.979	0	0	0.137	TRUE	TRUE	FALSE	**N/A**	**Clay Fill (irrelvenant)**
14.5	0.90	0.48	0.42	5.60	22	N/A	N/A	N/A	0.98	N/A	0.970	0	0	0.134	TRUE	FALSE	FALSE	**N/A**	**Clay Fill (irrelvenant)**
16.0	0.99	0.53	0.46	5.60	21	N/A	N/A	N/A	0.98	N/A	0.965	0	0	0.133	TRUE	FALSE	FALSE	**N/A**	**Clay Fill (irrelvenant)**
17.5	1.08	0.58	0.50	5.60	42	N/A	N/A	N/A	N/A	N/A	0.960	0	0	0.132	TRUE	TRUE	FALSE	**N/A**	**Clay Fill (irrelvenant)**
21.0	1.29	0.69	0.60	5.60	17	N/A	N/A	N/A	0.99	N/A	0.948	0	0	0.130	TRUE	FALSE	FALSE	**N/A**	**Clay Fill (irrelvenant)**
22.5	1.38	0.73	0.65	5.60	34	N/A	N/A	N/A	N/A	N/A	0.943	0	0	0.129	TRUE	TRUE	FALSE	**N/A**	**Clay Fill (irrelvenant)**
26.0	1.59	0.84	0.75	5.60	14	N/A	N/A	N/A	0.99	N/A	0.930	0	0	0.127	TRUE	FALSE	FALSE	**N/A**	**Clay Fill (irrelvenant)**
27.5	1.68	0.89	0.79	5.53	21	N/A	N/A	N/A	0.98	N/A	0.924	0	0	0.126	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
29.0	1.78	0.94	0.84	5.53	15	N/A	N/A	N/A	0.99	N/A	0.918	0	0	0.125	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
30.5	1.87	0.98	0.89	1.61	17	0.170	1.020	1.319	0.99	0.226	0.912	0	0	0.123	FALSE	FALSE	FALSE	**1.8**	**Subunit 3**
32.0	1.97	1.03	0.94	1.61	8	0.104	1.010	0.882	1.00	0.092	0.906	0	0	0.122	FALSE	FALSE	FALSE	**0.8**	**Subunit 3**
33.5	2.07	1.08	0.99	1.61	2	0.069	1.004	0.707	1.00	0.049	0.900	0	0	0.120	FALSE	FALSE	FALSE	**0.4**	**Subunit 3**
35.0	2.17	1.12	1.05	1.61	6	0.092	1.001	0.817	1.00	0.075	0.894	0	0	0.119	FALSE	FALSE	FALSE	**0.6**	**Subunit 3**
36.5	2.27	1.17	1.10	1.61	2	0.069	0.998	0.704	1.00	0.048	0.888	0	0	0.118	FALSE	FALSE	FALSE	**0.4**	**Subunit 3**
38.0	2.37	1.22	1.15	1.61	2	0.069	0.995	0.703	1.00	0.048	0.881	0	0	0.117	FALSE	FALSE	FALSE	**0.4**	**Subunit 3**
39.5	2.46	1.26	1.20	1.61	2	0.069	0.992	0.704	1.00	0.048	0.875	0	0	0.115	FALSE	FALSE	FALSE	**0.4**	**Subunit 3**
41.0	2.56	1.31	1.25	1.61	23	0.244	0.975	1.775	0.98	0.414	0.869	0	0	0.114	FALSE	FALSE	FALSE	**3.6**	**Subunit 3**
42.5	2.66	1.36	1.30	1.61	9	0.114	0.981	0.927	0.99	0.103	0.862	0	0	0.113	FALSE	FALSE	FALSE	**0.9**	**Subunit 3**
44.0	2.76	1.40	1.35	1.61	22	0.230	0.965	1.665	0.98	0.363	0.856	0	0	0.112	FALSE	FALSE	FALSE	**3.2**	**Subunit 3**
45.5	2.86	1.45	1.41	1.61	63	N/A	N/A	N/A	N/A	N/A	0.849	0	0	0.111	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**
47.0	2.96	1.50	1.46	1.61	8	0.103	0.973	0.865	1.00	0.086	0.843	0	0	0.110	FALSE	FALSE	FALSE	**0.8**	**Subunit 3**
48.5	3.05	1.54	1.51	1.61	81	N/A	N/A	N/A	N/A	N/A	0.836	0	0	0.109	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**



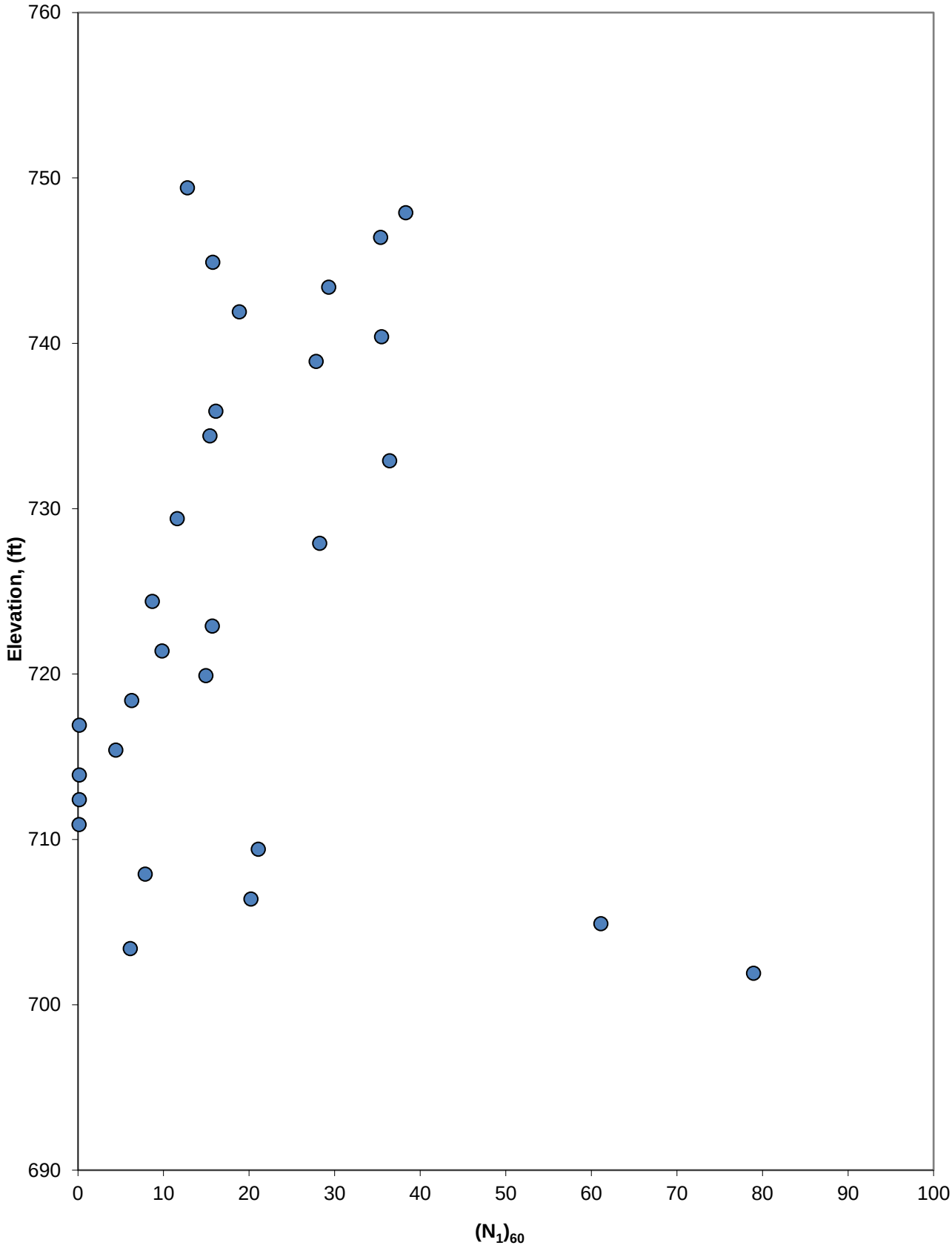
KIF-STN51, Liquefaction Triggering Results



KIF TDEC Stability, Boring ID: KIF-STN51, Source = 1 Hz, Mw = 7.6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



KIF TDEC Stability, Boring ID: KIF-STN51, Source = 1 Hz, Mw = 7.6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



3.3.2 10 Hz Design Earthquake

Project Name = KIF TDEC Seismic Stability

Boring ID = KIF-B05

Boring Location

Northing =

Easting =

OR

Baseline Station =

Offset (+ Right) =

Drilling Information

Boring Inner Diameter (ID) =	4.625	inches	
Top of Hole Elevation	756.5	feet	
Water Depth during SPT (negative for U/S borings)=	52	feet	
Depth Sampling Began	0	feet	
Total Unit Wt. above 1st SPT =		pcf	
Assumed Rod Stickup =	5	feet	*(Typ assume 5ft)*
E_m Measurement based on Fv method? =	1	(1: Yes, 0: No)	
SPT Sampler w/ Liners? =	0	(1: Yes, 0: No)	*(Typ. no)*

During EQ Information

Water Depth during EQ (relative to SPT TOH, negative for U/S borings) =	5.9	feet
Final Grade Elevation during EQ	756.5	feet
Average Total Unit Wt. of Cut/Fill		pcf

Fines Content Correction

Fines content correction for samples with blow counts of zero? 1 (1: Yes, 0: No)

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile? 0 (1: Yes, 0: No)

If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile: SectionAA, KIF-B09_NOR

Alpha at each sample depth known? 1 (1: Yes, 0: No)

If previous answer is No, then enter curve fit parameters below (α vs. depth curve)

If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_α will be one.

m4:
m3:
m2:
m1:
m0:

Associated ground response profile: Alternate, KIF-B05_NOR

Get CSR from shear stress envelope? 0 (1: Yes, 0: No)

If previous answer is No, then CSR will be calculated using a_{max} and r_d

Max. Shear Stress at each sample depth known? (1: Yes, 0: No)

If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4:
m3:
m2:
m1:

Earthquake Information

EQ Source (e.g., New Madrid)	10 Hz
Event (e.g., MCE, 10KEQ, OBE)	Design EQ
a_{max} (g) (top of ground surface)	0.21
EQ Mag (Mw)	6

Inputs

Depth of Sample Midpoint (ft.)	SPT N Value	Hammer Efficiency, E_m (%)	Unified Soil Classification	Fines Content (%)	Total Unit Weight (pcf)	Material (optional)	Clay-like / Sand-like Override (optional)	Clay-like Susceptibility (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure during SPT (psf)	Static Pore Water Pressure during EQ (psf)
1.0	25	89.8	CL	51.1	128	Embankment Fill	Clay-like	Not Susceptible		0.011			
3.5	18	89.8	CL	51.1	128	Embankment Fill	Clay-like	Not Susceptible		0.028			
6.0	3	89.8	CL	51.1	128	Embankment Fill	Clay-like	Not Susceptible		0.005			
8.5	14	89.8	CL	51.1	128	Embankment Fill	Clay-like	Not Susceptible		0.021			
11.0	8	89.8	CL	51.1	128	Embankment Fill	Clay-like	Not Susceptible		0.055			
13.5	31	89.8	SC	20.2	128	Embankment Fill	Clay-like	Not Susceptible		0.076			
16.0	19	89.8	SC	20.2	128	Embankment Fill	Clay-like	Not Susceptible		0.091			
18.5	13	89.8	SC	20.2	128	Embankment Fill	Clay-like	Not Susceptible		0.109			
20.0	6	89.8	SC	20.2	128	Embankment Fill	Clay-like	Not Susceptible		0.113			
21.5	7	89.8	SM	36.3	128	Embankment Fill	Clay-like	Not Susceptible		0.122			
24.0	2	89.8	SM	36.3	128	Embankment Fill	Clay-like	Not Susceptible		0.129			
26.5	0	89.8	SM	36.3	128	Embankment Fill	Clay-like	Not Susceptible		0.132			
29.0	3	89.8	SM	36.3	128	Embankment Fill	Clay-like	Not Susceptible		0.137			
31.5	5	89.8	SM	36.3	128	Embankment Fill	Clay-like	Not Susceptible		0.142			
34.0	0	89.8	CL	60.1	127	Subunit 1				0.145			
39.0	14	89.8	CL	93.3	127	Subunit 1				0.150			
41.5	4	89.8	CL	93.3	127	Subunit 1				0.151			
44.0	15	89.8	CL	78.7	127	Subunit 1				0.154			
46.5	5	89.8	CL	84.9	127	Subunit 1				0.155			

KIF TDEC Seismic Stability, Boring ID: KIF-B05

Liquefaction Potential Evaluations

For Coarse Grained Soils

Top of Hole Elevation (ft) =	756.5					Boring ID =	KIF-B05										
begin sampling (depth-ft) =	0.0					Boring Inner Dia. (in) =	4.625										
total unit wt. above 1st SPT (pcf) =	0																
water elevation during SPT (ft) =	704.5	ft *(relative to ground surface during SPT)*					Assumed Rod Stickup =	5.0	feet								
water depth during SPT (ft) =	52.0						E_m Measurement? =	1	(1: Yes, 0: No)								
water elevation during EQ (ft) =	750.6	ft *(relative to ground surface during SPT)*					SPT Sampler w/ Liners? =	0	(1: Yes, 0: No)								
water during EQ (depth-ft) =	5.9	u-top	effstr-top														
vert. total stress above 1st SPT (tsf) =	**0.00**	**0.00**	0.00														

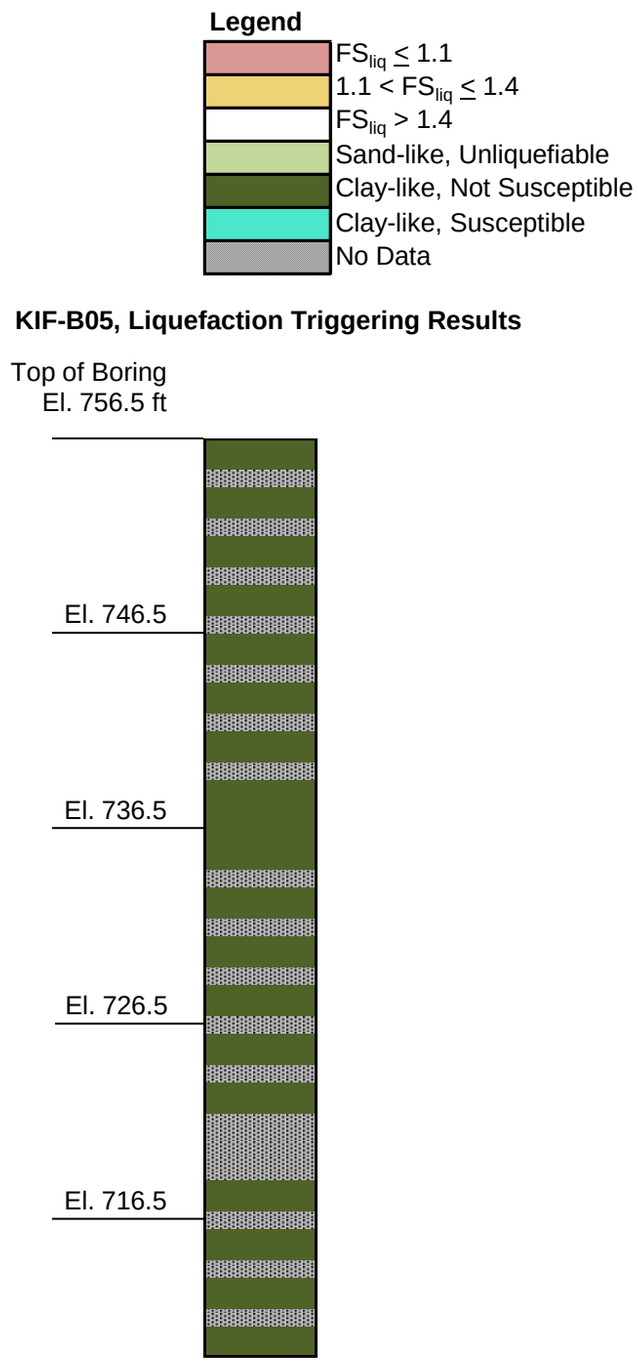
Elev. Of Mid. Pt. of Sample (ft)	Depth of Mid. Pt. of Sample (ft.) z	Unit Weight (pcf) γ_T	Vert. Total Stress during SPT (tsf) σ_v	Static Pore Pressure during SPT (tsf) u	Vert. Eff. Stress during SPT (tsf) σ'_v	SPT N Value N	Hammer Efficiency (%) E_m	Borehole Diameter Correction C_B	Sampler Correction C_s	Rod Length Correction C_R	Overburden Stress Correction Factor C_N	Hammer Energy Correction Factor C_E	Corrected Blow Count N_{60}	Normalized Blow Count $(N_1)_{60}$	Relative Density (%) D_r	Unified Soil Classification	Fines Content (%)
755.5	1.0	128	0.06	0.00	0.06	25	89.8	1.004	1.30	1.00	1.70	1.50	49	83	100	CL	51.1
753.0	3.5	128	0.22	0.00	0.22	18	89.8	1.004	1.30	1.00	1.50	1.50	35	53	100	CL	51.1
750.5	6.0	128	0.38	0.00	0.38	3	89.8	1.004	1.10	1.00	1.66	1.50	5	8	55	CL	51.1
748.0	8.5	128	0.54	0.00	0.54	14	89.8	1.004	1.30	1.00	1.22	1.50	27	33	92	CL	51.1
745.5	11.0	128	0.70	0.00	0.70	8	89.8	1.004	1.17	1.00	1.19	1.50	14	17	70	CL	51.1
743.0	13.5	128	0.86	0.00	0.86	31	89.8	1.004	1.30	1.00	1.05	1.50	61	64	100	SC	20.2
740.5	16.0	128	1.02	0.00	1.02	19	89.8	1.004	1.30	1.00	1.01	1.50	37	37	96	SC	20.2
738.0	18.5	128	1.18	0.00	1.18	13	89.8	1.004	1.23	1.00	0.96	1.50	24	23	77	SC	20.2
736.5	20.0	128	1.28	0.00	1.28	6	89.8	1.004	1.10	1.00	0.91	1.50	10	9	54	SC	20.2
735.0	21.5	128	1.38	0.00	1.38	7	89.8	1.004	1.10	1.00	0.88	1.50	12	10	59	SM	36.3
732.5	24.0	128	1.54	0.00	1.54	2	89.8	1.004	1.10	1.00	0.81	1.50	3	3	42	SM	36.3
730.0	26.5	128	1.70	0.00	1.70	0	89.8	1.004	1.10	1.00	0.75	1.50	0	0	35	SM	36.3
727.5	29.0	128	1.86	0.00	1.86	3	89.8	1.004	1.10	1.00	0.73	1.50	5	4	45	SM	36.3
725.0	31.5	128	2.02	0.00	2.02	5	89.8	1.004	1.10	1.00	0.71	1.50	8	6	50	SM	36.3
722.5	34.0	127	2.18	0.00	2.18	0	89.8	1.004	1.10	1.00	0.65	1.50	0	0	35	CL	60.1
717.5	39.0	127	2.49	0.00	2.49	14	89.8	1.004	1.17	1.00	0.70	1.50	25	17	70	CL	93.3
715.0	41.5	127	2.65	0.00	2.65	4	89.8	1.004	1.10	1.00	0.60	1.50	7	4	45	CL	93.3
712.5	44.0	127	2.81	0.00	2.81	15	89.8	1.004	1.18	1.00	0.67	1.50	27	18	71	CL	78.7
710.0	46.5	127	2.97	0.00	2.97	5	89.8	1.004	1.10	1.00	0.57	1.50	8	5	47	CL	84.9

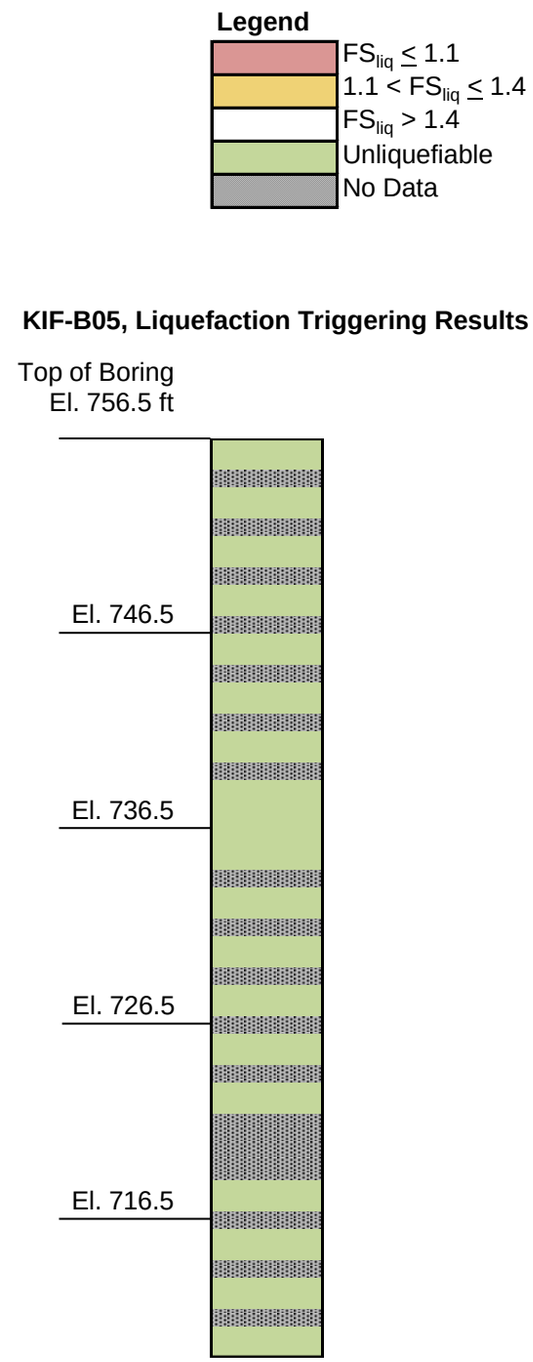
KIF TDEC Seismic Stability, Boring ID: KIF-B05
Liquefaction Potential Evaluations
For Coarse Grained Soils

Depth of Mid. Pt. of Sample (ft.) z	Clean Sand Correction $\Delta(N_1)_{60cs}$	Equivalent Clean Sand N-Value $(N_1)_{60cs}$	Sample Screened for: Clay-like	High Blow Count $(N_1)_{60cs} \geq 32$	Unsaturated	Factor of Safety FS_{liq}	Material (optional)
ft							
ft	*(relative to ground surface during SPT)*						
pcf							
tsf							

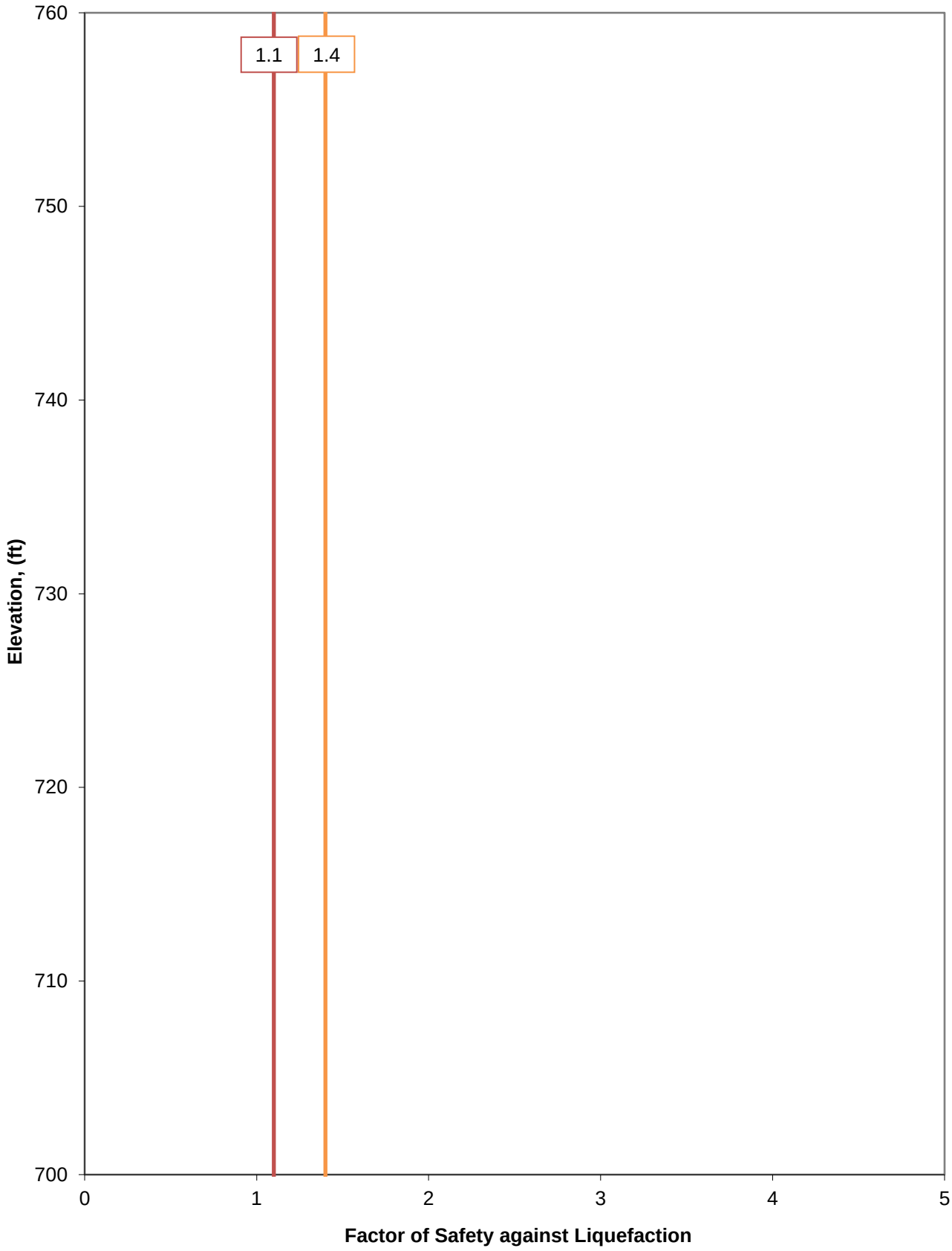
Note: A factor of safety shown as "N/A" implies that the soil type is not appropriately evaluated using this methodology. This applies to clay-like soils (typically CL, CH, CL-ML and MH material type), samples with high blow counts, and unsaturated samples.

1.0	5.61	89	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**
3.5	5.61	59	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**
6.0	5.61	14	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
8.5	5.61	39	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**
11.0	5.61	22	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
13.5	4.51	68	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**
16.0	4.51	42	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**
18.5	4.51	28	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
20.0	4.51	14	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
21.5	5.53	16	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
24.0	5.53	8	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
26.5	5.53	6	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
29.0	5.53	9	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
31.5	5.53	11	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
34.0	5.60	6	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
39.0	5.50	23	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
41.5	5.50	10	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
44.0	5.55	23	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
46.5	5.53	10	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**

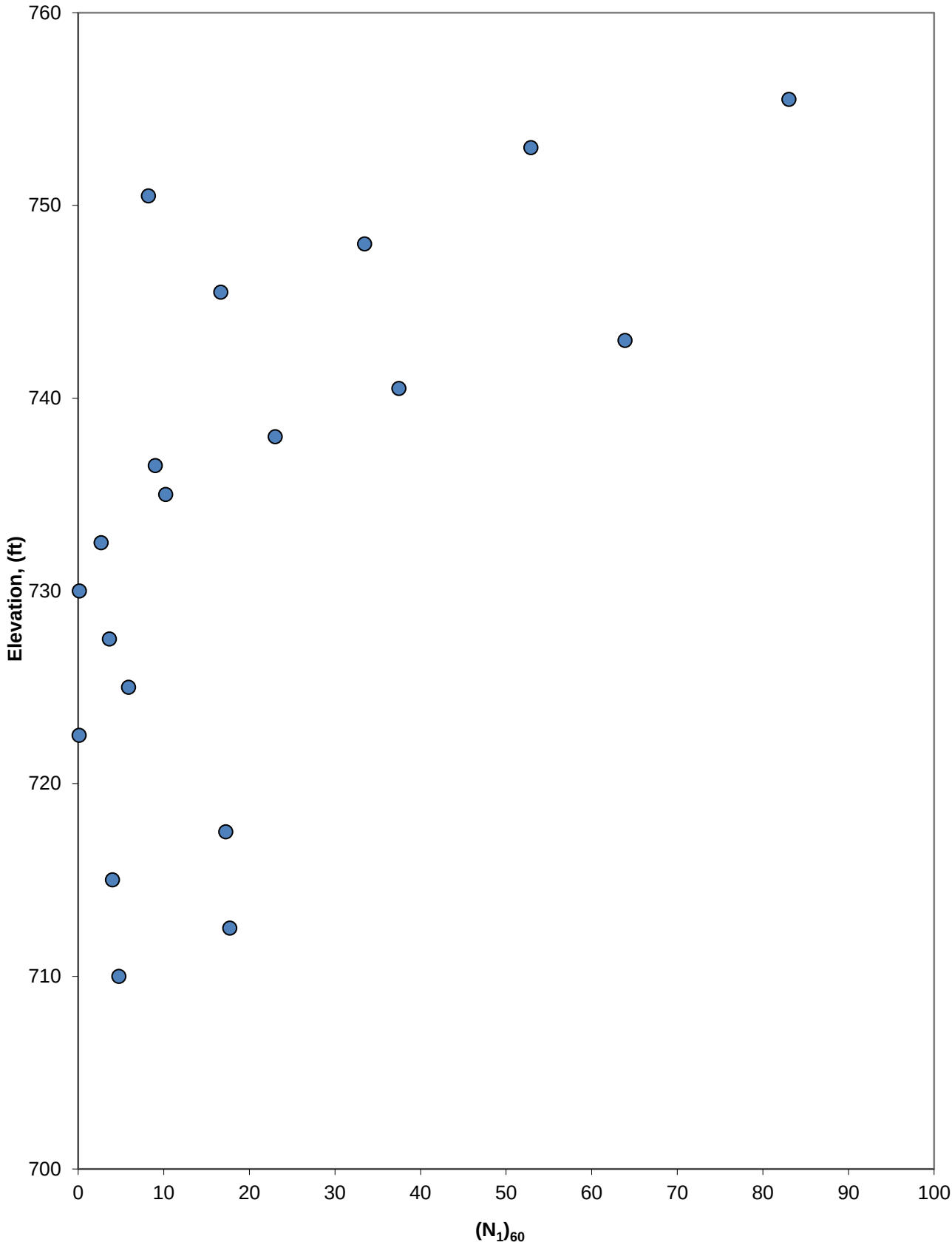

Legend
FSliq ≤ 1.1
1.1 < FSliq ≤ 1.4
FSliq > 1.4
Sand-like, Unliquefiable
Clay-like, Not Susceptible
Clay-like, Susceptible
No Data
KIF-B05, Liquefaction Triggering Results
Top of Boring
El. 756.5 ft
El. 746.5
El. 736.5
El. 726.5
El. 716.5


Legend
FSliq ≤ 1.1
1.1 < FSliq ≤ 1.4
FSliq > 1.4
Unliquefiable
No Data
KIF-B05, Liquefaction Triggering Results
Top of Boring
El. 756.5 ft
El. 746.5
El. 736.5
El. 726.5
El. 716.5

KIF TDEC Seismic Stability, Boring ID: KIF-B05, Source = 10 Hz, Mw = 6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



KIF TDEC Seismic Stability, Boring ID: KIF-B05, Source = 10 Hz, Mw = 6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



Project Name = KIF TDEC Seismic Stability

Boring ID = KIF-B06

Boring Location

Northing =

Easting =

OR

Baseline Station =

Offset (+ Right) =

Drilling Information

Boring Inner Diameter (ID) = 5.875 inches

Top of Hole Elevation = 733.9 feet

Water Depth during SPT (negative for U/S borings)= -2.8 feet

Depth Sampling Began = 0 feet

Total Unit Wt. above 1st SPT = 62.4 pcf

Assumed Rod Stickup = 5 feet *(Typ assume 5ft)*

E_m Measurement based on Fv method? = 1 (1: Yes, 0: No)

SPT Sampler w/ Liners? = 0 (1: Yes, 0: No) *(Typ. no)*

During EQ Information

Water Depth during EQ (relative to SPT TOH, negative for U/S borings) = -3.5 feet

Final Grade Elevation during EQ = 733.9 feet

Average Total Unit Wt. of Cut/Fill = pcf

Fines Content Correction

Fines content correction for samples with blow counts of zero? = 1 (1: Yes, 0: No)

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile? = 0 (1: Yes, 0: No)

If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile: Alternate, KIF-B06_NOR

Alpha at each sample depth known? = 1 (1: Yes, 0: No)

If previous answer is No, then enter curve fit parameters below (α vs. depth curve)

If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_α will be one.

m4:
m3:
m2:
m1:
m0:

Associated ground response profile: Alternate, KIF-B06_NOR

Get CSR from shear stress envelope? = 0 (1: Yes, 0: No)

If previous answer is No, then CSR will be calculated using a_{max} and r_d

Max. Shear Stress at each sample depth known? = (1: Yes, 0: No)

If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4:
m3:
m2:
m1:

Earthquake Information

EQ Source (e.g., New Madrid) = 10 Hz

Event (e.g., MCE, 10KEQ, OBE) = Design EQ

a_{max} (g) (top of ground surface) = 0.19

EQ Mag (Mw) = 6

Inputs

Depth of Sample Midpoint (ft.)	SPT N Value	Hammer Efficiency, E_m (%)	Unified Soil Classification	Fines Content (%)	Total Unit Weight (pcf)	Material (optional)	Clay-like / Sand-like Override (optional)	Clay-like Susceptibility (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure during SPT (psf)	Static Pore Water Pressure during EQ (psf)
1.0	0	89.8	CL	52	111	Sediment	Sand-like			1.153			
3.5	0	89.8	CL	52	111	Sediment	Sand-like			0.472			
6.0	0	89.8	CL	52	111	Sediment	Sand-like			0.340			
8.5	0	89.8	SM	46	128	Embankment Fill	Clay-like	Not Susceptible		0.306			
11.0	0	89.8	SM	46	128	Embankment Fill	Clay-like	Not Susceptible		0.276			
13.5	0	89.8	CL	86.2	127	Subunit 1				0.257			
16.0	0	89.8	CL	68.2	127	Subunit 1				0.243			
18.5	3	89.8	CL	68.2	127	Subunit 1				0.233			
21.0	5	89.8	ML	55.6	126	Subunit 2	Sand-like			0.224			
23.5	2	89.8	ML	55.6	126	Subunit 2	Sand-like			0.216			
26.0	4	89.8	SM	19	131	Subunit 3	Sand-like			0.208			

KIF TDEC Seismic Stability, Boring ID: KIF-B06

Liquefaction Potential Evaluations

For Coarse Grained Soils

Elev. Of Mid. Pt. of Sample (ft)	Depth of Mid. Pt. of Sample (ft.)	Unit Weight (pcf)	Vert. Total Stress during SPT (tsf)	Static Pore Pressure during SPT (tsf)	Vert. Eff. Stress during SPT (tsf)	SPT N Value	Hammer Efficiency (%)	Borehole Diameter Correction	Sampler Correction	Rod Length Correction	Overburden Stress Correction Factor	Hammer Energy Correction Factor	Corrected Blow Count	Normalized Blow Count	Relative Density (%)	Unified Soil Classification	Fines Content (%)
	z	γ_T	σ_v	u	σ'_v	N	E_m	C_B	C_s	C_R	C_N	C_E	N_{60}	$(N_1)_{60}$	D_r		

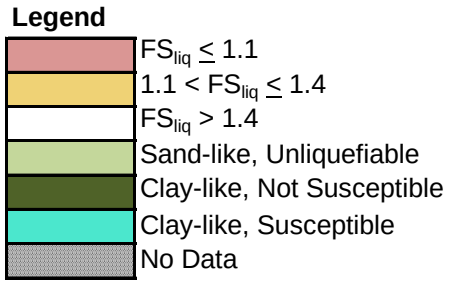
			Top of Hole Elevation (ft) =	733.9				Boring ID =	KIF-B06								
			begin sampling (depth-ft) =	0.0				Boring Inner Dia. (in) =	5.875								
			total unit wt. above 1st SPT (pcf) =	62													
			water elevation during SPT (ft) =	736.7	ft *(relative to ground surface during SPT)*				Assumed Rod Stickup =	5.0	feet						
			water depth during SPT (ft) =	-2.8					E_m Measurement? =	1	(1: Yes, 0: No)						
			water elevation during EQ (ft) =	737.4	ft *(relative to ground surface during SPT)*				SPT Sampler w/ Liners? =	0	(1: Yes, 0: No)						
			water during EQ (depth-ft) =	-3.5	u-top	effstr-top											
			vert. total stress above 1st SPT (tsf) =	**0.09**	**0.09**	0.00											
732.9	1.0	111		0.14	0.12	0.02	0	89.8	1.046	1.10	1.00	1.70	1.50	0	0	36	CL	52
730.4	3.5	111		0.28	0.20	0.09	0	89.8	1.046	1.10	1.00	1.70	1.50	0	0	36	CL	52
727.9	6.0	111		0.42	0.27	0.15	0	89.8	1.046	1.10	1.00	1.70	1.50	0	0	36	CL	52
725.4	8.5	128		0.57	0.35	0.22	0	89.8	1.046	1.10	1.00	1.70	1.50	0	0	36	SM	46
722.9	11.0	128		0.73	0.43	0.30	0	89.8	1.046	1.10	1.00	1.70	1.50	0	0	36	SM	46
720.4	13.5	127		0.89	0.51	0.38	0	89.8	1.046	1.10	1.00	1.70	1.50	0	0	36	CL	86.2
717.9	16.0	127		1.05	0.59	0.46	0	89.8	1.046	1.10	1.00	1.64	1.50	0	0	36	CL	68.2
715.4	18.5	127		1.21	0.66	0.54	3	89.8	1.046	1.10	1.00	1.41	1.50	5	7	53	CL	68.2
712.9	21.0	126		1.36	0.74	0.62	5	89.8	1.046	1.11	1.00	1.28	1.50	9	11	60	ML	55.6
710.4	23.5	126		1.52	0.82	0.70	2	89.8	1.046	1.10	1.00	1.25	1.50	3	4	46	ML	55.6
707.9	26.0	131		1.68	0.90	0.78	4	89.8	1.046	1.10	1.00	1.17	1.50	7	8	52	SM	19

KIF TDEC Seismic Stability, Boring ID: KIF-B06
Liquefaction Potential Evaluations
For Coarse Grained Soils

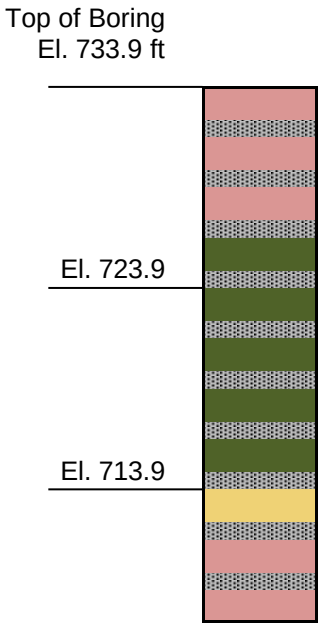
Depth of Mid. Pt. of Sample (ft.) z	Clean Sand Correction $\Delta(N_1)_{60cs}$	Equivalent Clean Sand N-Value $(N_1)_{60cs}$	Sample Screened for: Clay-like	High Blow Count $(N_1)_{60cs} \geq 32$	Unsaturated	Factor of Safety FS_{liq}	Material (optional)
	ft						
	ft	*(relative to ground surface during SPT)*					
	pcf						
	tsf						

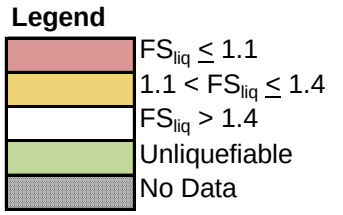
Note: A factor of safety shown as "N/A" implies that the soil type is not appropriately evaluated using this methodology. This applies to clay-like soils (typically CL, CH, CL-ML and MH material type), samples with high blow counts, and unsaturated samples.

1.0	5.61	6	FALSE	FALSE	FALSE	**0.1**	**Sediment**
3.5	5.61	6	FALSE	FALSE	FALSE	**0.2**	**Sediment**
6.0	5.61	6	FALSE	FALSE	FALSE	**0.2**	**Sediment**
8.5	5.61	6	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
11.0	5.61	6	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
13.5	5.53	6	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
16.0	5.58	6	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
18.5	5.58	13	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
21.0	5.61	17	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**
23.5	5.61	10	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**
26.0	4.30	12	FALSE	FALSE	FALSE	**0.8**	**Subunit 3**

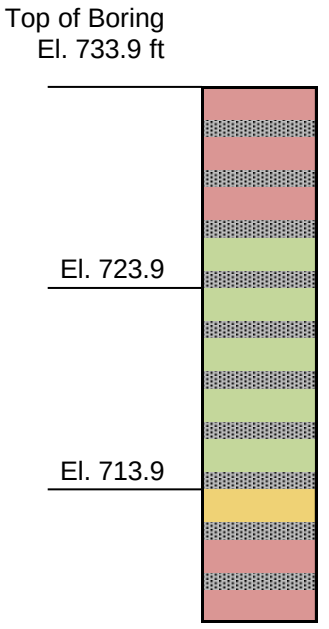


KIF-B06, Liquefaction Triggering Results

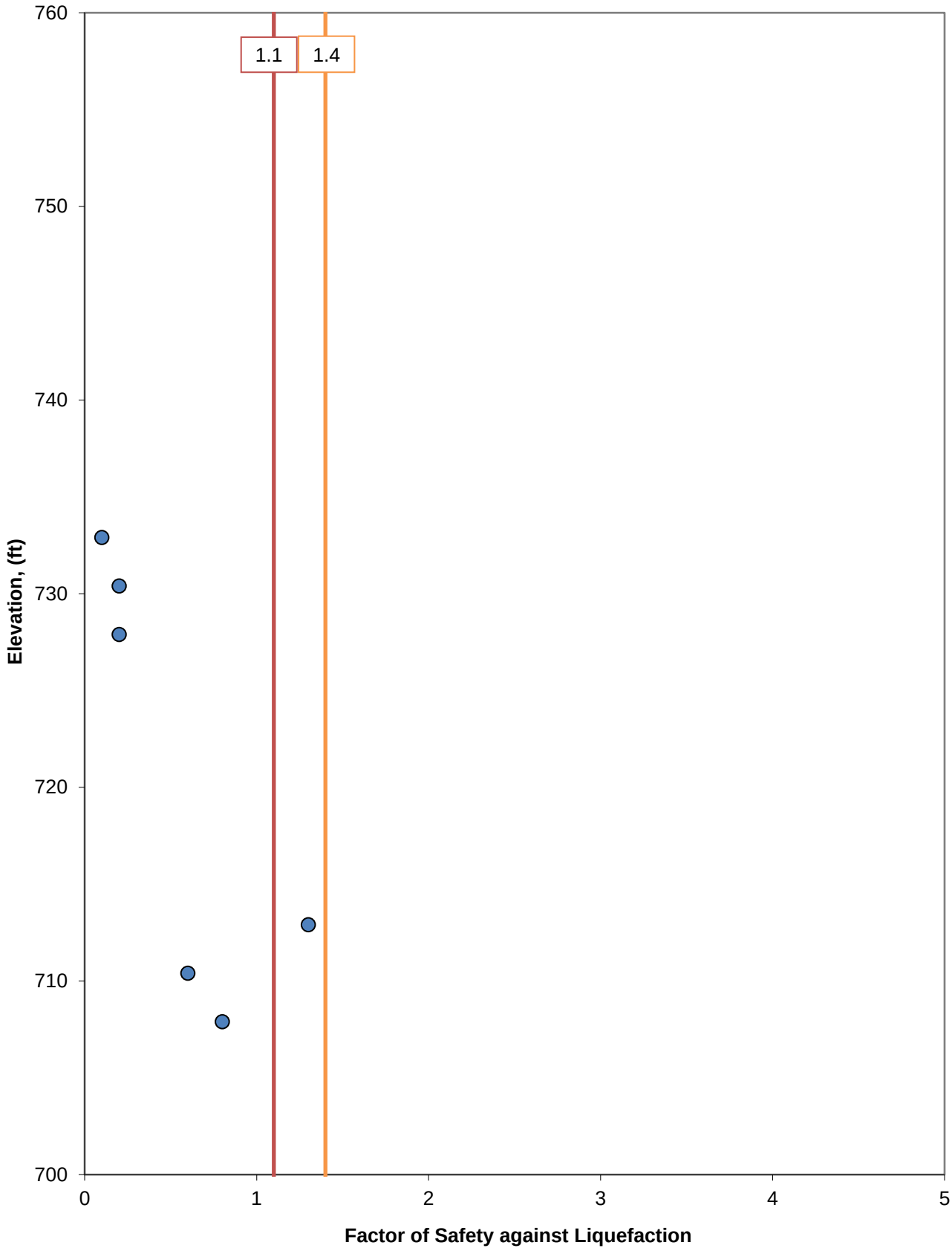




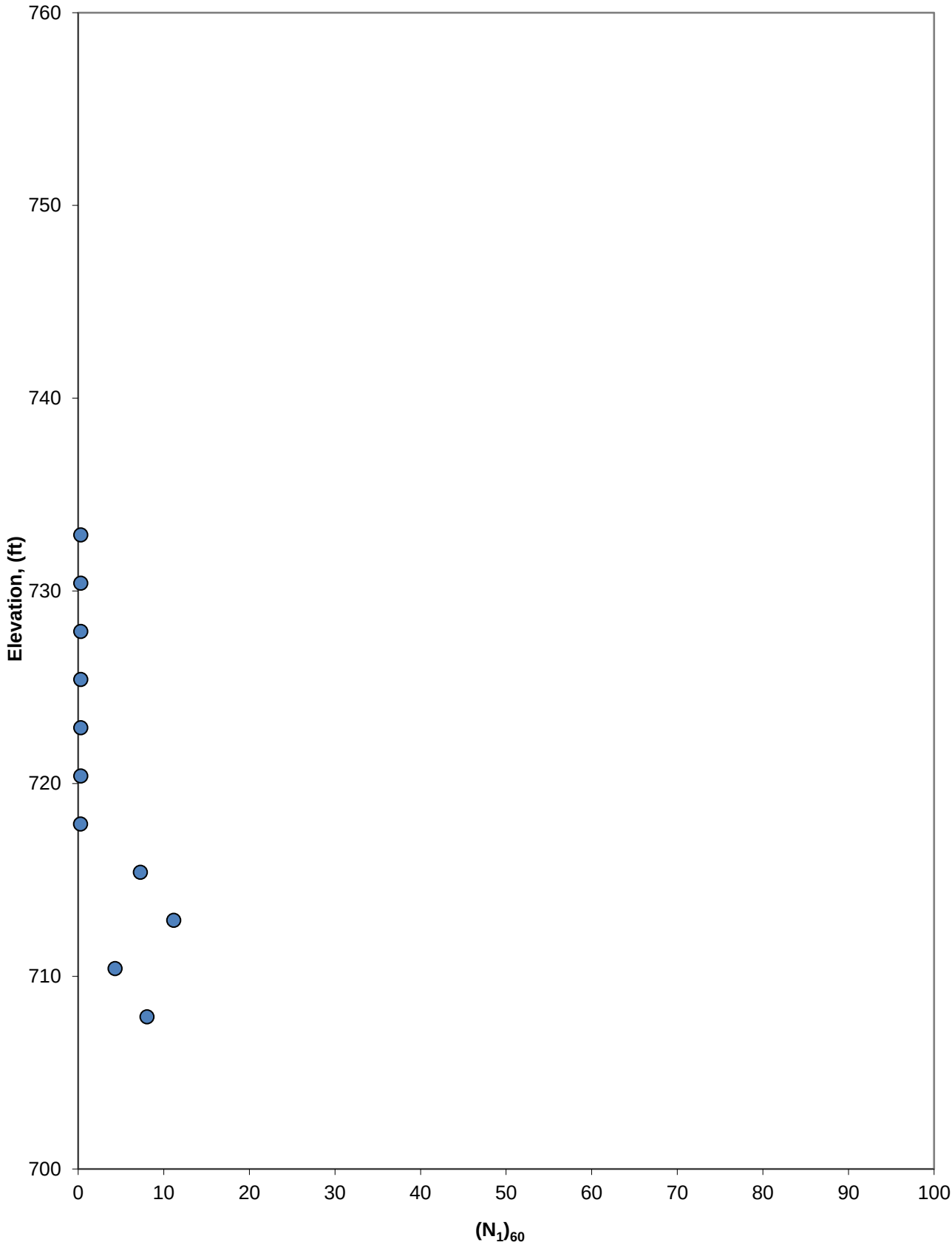
KIF-B06, Liquefaction Triggering Results



KIF TDEC Seismic Stability, Boring ID: KIF-B06, Source = 10 Hz, Mw = 6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



KIF TDEC Seismic Stability, Boring ID: KIF-B06, Source = 10 Hz, Mw = 6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



Project Name = KIF TDEC Seismic Stability

Boring ID = KIF-B07

Boring Location

Northing =

Easting =

OR

Baseline Station =

Offset (+ Right) =

Drilling Information

Boring Inner Diameter (ID) = 5.875 inches

Top of Hole Elevation = 731.6 feet

Water Depth during SPT (negative for U/S borings)= -5.3 feet

Depth Sampling Began = 0 feet

Total Unit Wt. above 1st SPT = 62.4 pcf

Assumed Rod Stickup = 5 feet *(Typ assume 5ft)*

E_m Measurement based on Fv method? = 1 (1: Yes, 0: No)

SPT Sampler w/ Liners? = 0 (1: Yes, 0: No) *(Typ. no)*

During EQ Information

Water Depth during EQ (relative to SPT TOH, negative for U/S borings) = -5.8 feet

Final Grade Elevation during EQ = 731.6 feet

Average Total Unit Wt. of Cut/Fill = pcf

Fines Content Correction

Fines content correction for samples with blow counts of zero? = 1 (1: Yes, 0: No)

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile? = 0 (1: Yes, 0: No)

If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile: SectionAA, KIF-B11_NOR

Alpha at each sample depth known? = 1 (1: Yes, 0: No)

If previous answer is No, then enter curve fit parameters below (α vs. depth curve)

If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_α will be one.

m4:
m3:
m2:
m1:
m0:

Associated ground response profile: Alternate, KIF-B07_NOR

Get CSR from shear stress envelope? = 0 (1: Yes, 0: No)

If previous answer is No, then CSR will be calculated using a_{max} and r_d

Max. Shear Stress at each sample depth known? = (1: Yes, 0: No)

If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4:
m3:
m2:
m1:

Earthquake Information

EQ Source (e.g., New Madrid) = 10 Hz

Event (e.g., MCE, 10KEQ, OBE) = Design EQ

a_{max} (g) (top of ground surface) = 0.15

EQ Mag (Mw) = 6

Inputs

Depth of Sample Midpoint (ft.)	SPT N Value	Hammer Efficiency, E_m (%)	Unified Soil Classification	Fines Content (%)	Total Unit Weight (pcf)	Material (optional)	Clay-like / Sand-like Override (optional)	Clay-like Susceptibility (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure during SPT (psf)	Static Pore Water Pressure during EQ (psf)
1.0	0	89.8	CL	52	111	Sediment	Sand-like			0.696			
3.7	0	89.8	CL	52	111	Sediment	Sand-like			0.273			
6.7	0	89.8	CL	52	111	Sediment	Sand-like			0.186			
9.2	0	89.8	CL	52	111	Sediment	Sand-like			0.162			
11.7	2	89.8	CL-ML	79.5	127	Subunit 1				0.149			
14.2	7	89.8	CL	79.5	126	Subunit 2	Sand-like			0.133			
18.7	8	89.8	SC-SM	43.7	126	Subunit 2	Sand-like			0.121			
21.2	4	89.8	SC-SM	43.7	126	Subunit 2	Sand-like			0.115			
23.7	14	89.8	SM	19	131	Subunit 3	Sand-like			0.112			

KIF TDEC Seismic Stability, Boring ID: KIF-B07

Liquefaction Potential Evaluations

For Coarse Grained Soils

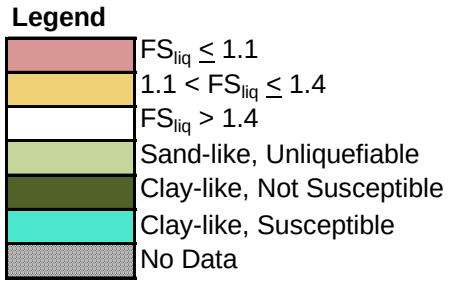
Elev. Of Mid. Pt. of Sample (ft)	Depth of Mid. Pt. of Sample (ft.)	Unit Weight (pcf)	Vert. Total Stress during SPT (tsf)	Static Pore Pressure during SPT (tsf)	Vert. Eff. Stress during SPT (tsf)	SPT N Value	Hammer Efficiency (%)	Borehole Diameter Correction	Sampler Correction	Rod Length Correction	Overburden Stress Correction Factor	Hammer Energy Correction Factor	Corrected Blow Count	Normalized Blow Count	Relative Density (%)	Unified Soil Classification	Fines Content (%)
	z	γ_T	σ_v	u	σ'_v	N	E_m	C_B	C_s	C_R	C_N	C_E	N_{60}	$(N_1)_{60}$	D_r		

KIF TDEC Seismic Stability, Boring ID: KIF-B07
Liquefaction Potential Evaluations
For Coarse Grained Soils

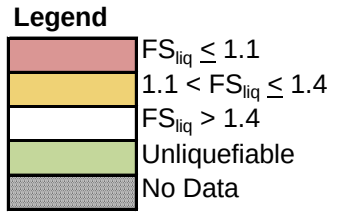
Depth of Mid. Pt. of Sample (ft.) z	Clean Sand Correction $\Delta(N_1)_{60cs}$	Equivalent Clean Sand N-Value $(N_1)_{60cs}$	Sample Screened for: Clay-like	High Blow Count $(N_1)_{60cs} \geq 32$	Unsaturated	Factor of Safety FS_{liq}	Material (optional)
	ft						
	ft *(relative to ground surface during SPT)*						
	pcf						
	tsf						

Note: A factor of safety shown as "N/A" implies that the soil type is not appropriately evaluated using this methodology. This applies to clay-like soils (typically CL, CH, CL-ML and MH material type), samples with high blow counts, and unsaturated samples.

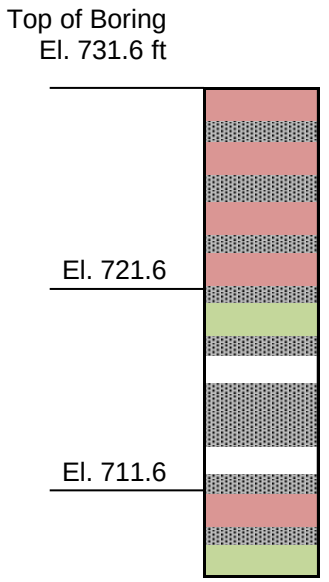
1.0	5.61	6	FALSE	FALSE	FALSE	**0.1**	**Sediment**
3.7	5.61	6	FALSE	FALSE	FALSE	**0.2**	**Sediment**
6.7	5.61	6	FALSE	FALSE	FALSE	**0.3**	**Sediment**
9.2	5.61	6	FALSE	FALSE	FALSE	**0.3**	**Sediment**
11.7	5.55	11	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
14.2	5.55	25	FALSE	FALSE	FALSE	**3.9**	**Subunit 2**
18.7	5.60	26	FALSE	FALSE	FALSE	**4.1**	**Subunit 2**
21.2	5.60	15	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**
23.7	4.30	37	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**



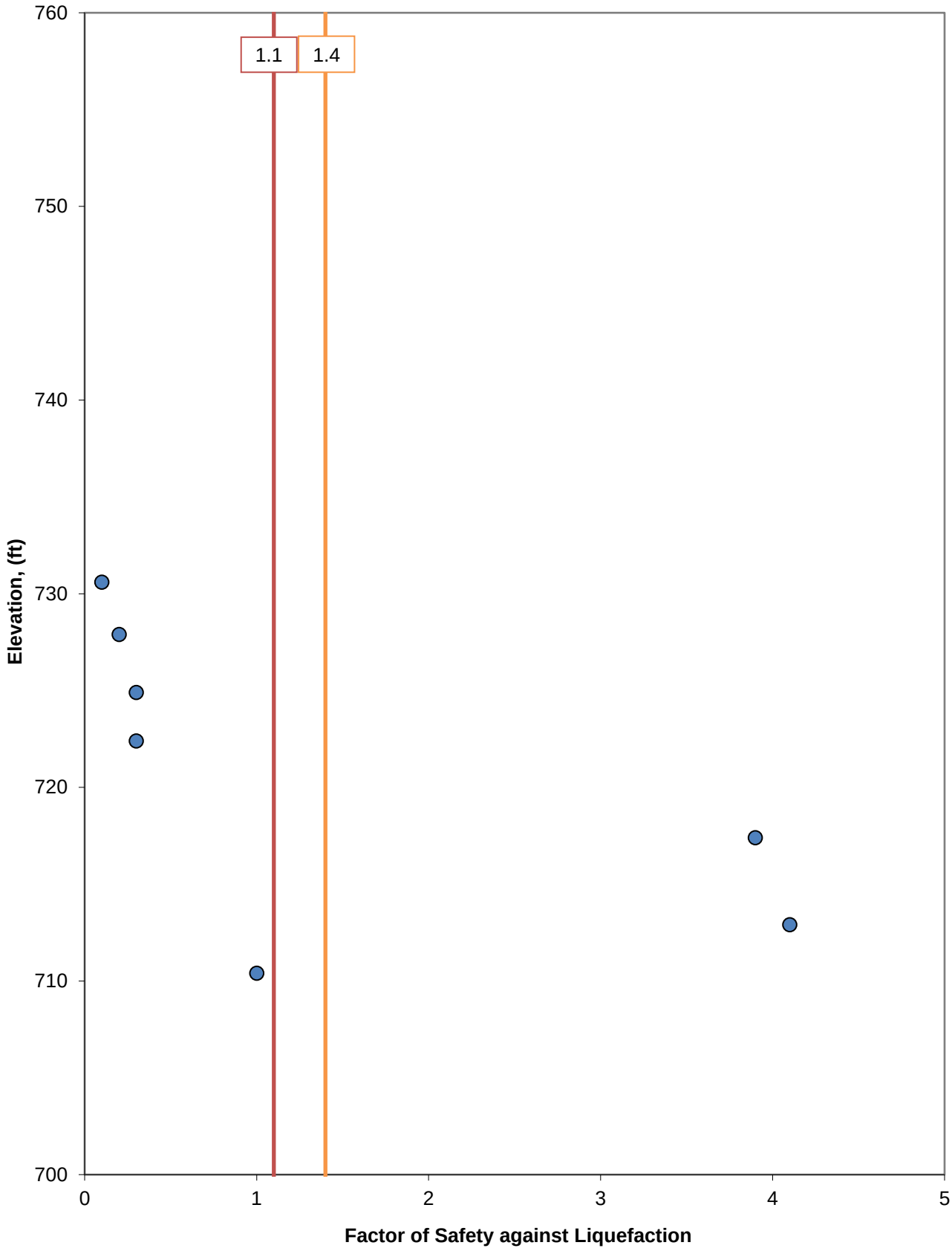
KIF-B07, Liquefaction Triggering Results



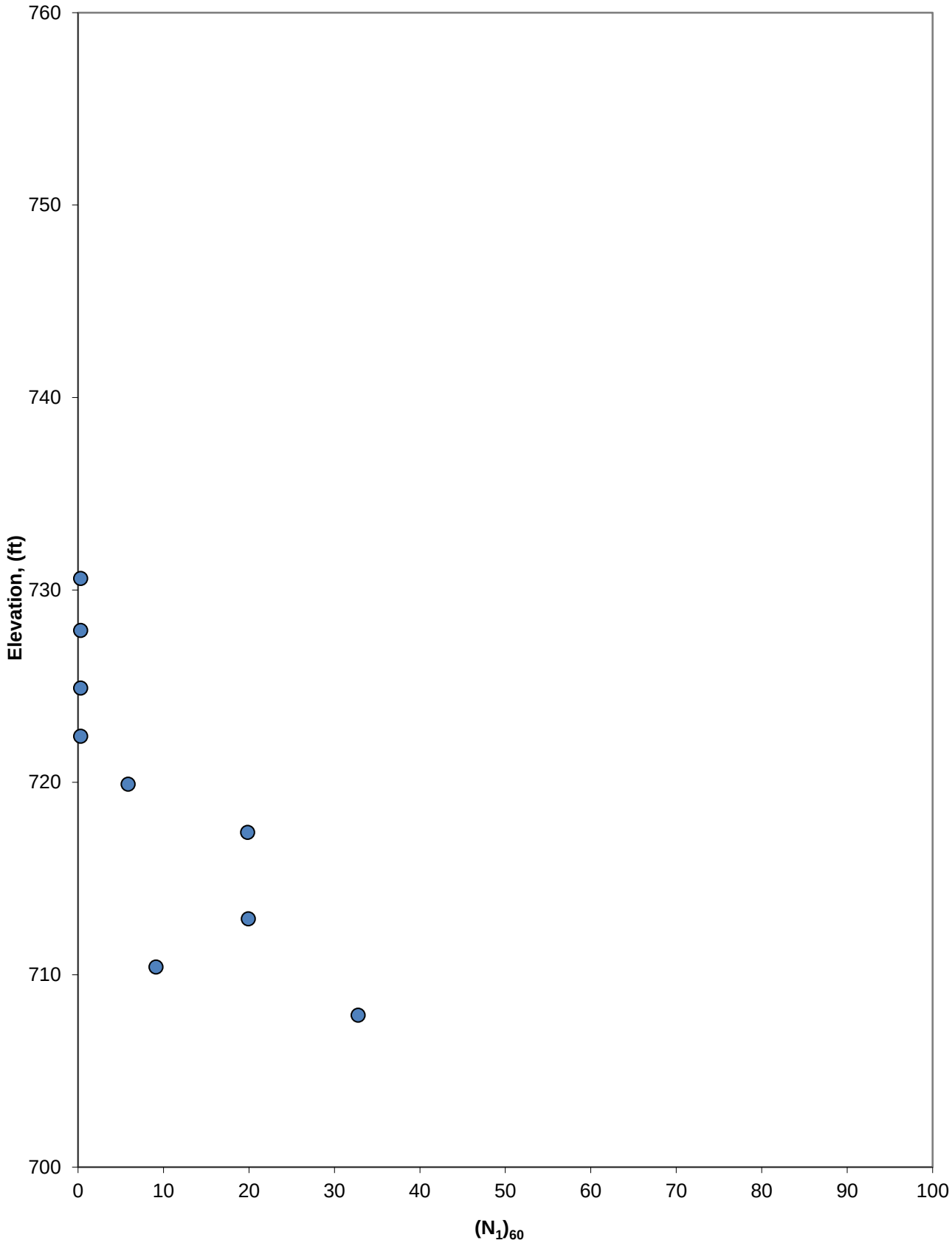
KIF-B07, Liquefaction Triggering Results



KIF TDEC Seismic Stability, Boring ID: KIF-B07, Source = 10 Hz, Mw = 6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



KIF TDEC Seismic Stability, Boring ID: KIF-B07, Source = 10 Hz, Mw = 6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



Project Name = KIF TDEC Seismic Stability

Boring ID = KIF-B08

Boring Location

Northing =

Easting =

OR

Baseline Station =

Offset (+ Right) =

Drilling Information

Boring Inner Diameter (ID) =	5.875	inches	
Top of Hole Elevation	730.8	feet	
Water Depth during SPT (negative for U/S borings)=	-5.5	feet	
Depth Sampling Began	0	feet	
Total Unit Wt. above 1st SPT =	62.4	pcf	
Assumed Rod Stickup =	5	feet	*(Typ assume 5ft)*
E_m Measurement based on Fv method? =	1	(1: Yes, 0: No)	
SPT Sampler w/ Liners? =	0	(1: Yes, 0: No)	*(Typ. no)*

During EQ Information

Water Depth during EQ (relative to SPT TOH, negative for U/S borings) =	-6.6	feet
Final Grade Elevation during EQ	730.8	feet
Average Total Unit Wt. of Cut/Fill		pcf

Fines Content Correction

Fines content correction for samples with blow counts of zero? 1 (1: Yes, 0: No)

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile? 0 (1: Yes, 0: No)

If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile: SectionAA, KIF-B12_NOR

Alpha at each sample depth known? 1 (1: Yes, 0: No)

If previous answer is No, then enter curve fit parameters below (α vs. depth curve)

If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_α will be one.

m4:
m3:
m2:
m1:
m0:

Associated ground response profile: Alternate, KIF-B08_NOR

Get CSR from shear stress envelope? 0 (1: Yes, 0: No)

If previous answer is No, then CSR will be calculated using a_{max} and r_d

Max. Shear Stress at each sample depth known? (1: Yes, 0: No)

If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4:
m3:
m2:
m1:

Earthquake Information

EQ Source (e.g., New Madrid)	10 Hz
Event (e.g., MCE, 10KEQ, OBE)	Design EQ
a_{max} (g) (top of ground surface)	0.13
EQ Mag (Mw)	6

Inputs

Depth of Sample Midpoint (ft.)	SPT N Value	Hammer Efficiency, E_m (%)	Unified Soil Classification	Fines Content (%)	Total Unit Weight (pcf)	Material (optional)	Clay-like / Sand-like Override (optional)	Clay-like Susceptibility (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure during SPT (psf)	Static Pore Water Pressure during EQ (psf)
1.0	0	89.8	CL	52	111	Sediment	Sand-like			0.251			
3.5	2	89.8	CL	52	111	Sediment	Sand-like			0.124			
6.5	2	89.8	CL	52	111	Sediment	Sand-like			0.092			
9.0	0	89.8	CL	52	111	Sediment	Sand-like			0.085			
11.5	0	89.8	CL	52	111	Sediment	Sand-like			0.081			
17.0	14	89.8	CL-ML	72.4	127	Subunit 1				0.078			
19.5	2	89.8	CL-ML	73.6	127	Subunit 1				0.074			
22.0	5	89.8	SM	44.5	126	Subunit 2	Sand-like			0.070			
24.5	13	89.8	SM	30.6	131	Subunit 3	Sand-like			0.066			

KIF TDEC Seismic Stability, Boring ID: KIF-B08

Liquefaction Potential Evaluations

For Coarse Grained Soils

Top of Hole Elevation (ft) =	730.8			Boring ID =	KIF-B08											
begin sampling (depth-ft) =	0.0			Boring Inner Dia. (in) =	5.875											
total unit wt. above 1st SPT (pcf) =	62															
water elevation during SPT (ft) =	736.3	ft *(relative to ground surface during SPT)*				Assumed Rod Stickup =	5.0	feet								
water depth during SPT (ft) =	-5.5					E_m Measurement? =	1	(1: Yes, 0: No)								
water elevation during EQ (ft) =	737.4	ft *(relative to ground surface during SPT)*				SPT Sampler w/ Liners? =	0	(1: Yes, 0: No)								
water during EQ (depth-ft) =	-6.6	u-top	effstr-top													
vert. total stress above 1st SPT (tsf) =	**0.17**	**0.17**	0.00													

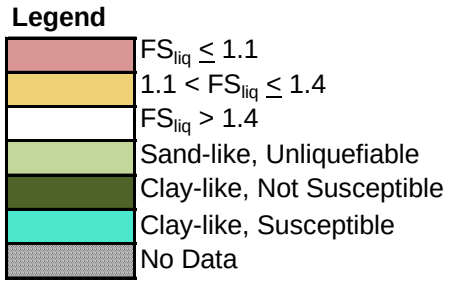
Elev. Of Mid. Pt. of Sample (ft)	Depth of Mid. Pt. of Sample (ft.) z	Unit Weight (pcf) γ_T	Vert. Total Stress during SPT (tsf) σ_v	Static Pore Pressure during SPT (tsf) u	Vert. Eff. Stress during SPT (tsf) σ'_v	SPT N Value N	Hammer Efficiency (%) E_m	Borehole Diameter Correction C_B	Sampler Correction C_s	Rod Length Correction C_R	Overburden Stress Correction Factor C_N	Hammer Energy Correction Factor C_E	Corrected Blow Count N_{60}	Normalized Blow Count $(N_1)_{60}$	Relative Density (%) D_r	Unified Soil Classification	Fines Content (%)
729.8	1.0	111	0.23	0.20	0.02	0	89.8	1.046	1.10	1.00	1.70	1.50	0	0	36	CL	52
727.3	3.5	111	0.37	0.28	0.09	2	89.8	1.046	1.10	1.00	1.70	1.50	3	6	50	CL	52
724.3	6.5	111	0.53	0.37	0.16	2	89.8	1.046	1.10	1.00	1.70	1.50	3	6	50	CL	52
721.8	9.0	111	0.67	0.45	0.22	0	89.8	1.046	1.10	1.00	1.70	1.50	0	0	36	CL	52
719.3	11.5	111	0.81	0.53	0.28	0	89.8	1.046	1.10	1.00	1.70	1.50	0	0	36	CL	52
713.8	17.0	127	1.14	0.70	0.44	14	89.8	1.046	1.30	1.00	1.29	1.50	28	37	96	CL-ML	72.4
711.3	19.5	127	1.30	0.78	0.52	2	89.8	1.046	1.10	1.00	1.47	1.50	3	5	48	CL-ML	73.6
708.8	22.0	126	1.45	0.86	0.60	5	89.8	1.046	1.11	1.00	1.31	1.50	9	11	61	SM	44.5
706.3	24.5	131	1.61	0.94	0.68	13	89.8	1.046	1.30	1.00	1.15	1.50	26	31	88	SM	30.6

KIF TDEC Seismic Stability, Boring ID: KIF-B08
Liquefaction Potential Evaluations
For Coarse Grained Soils

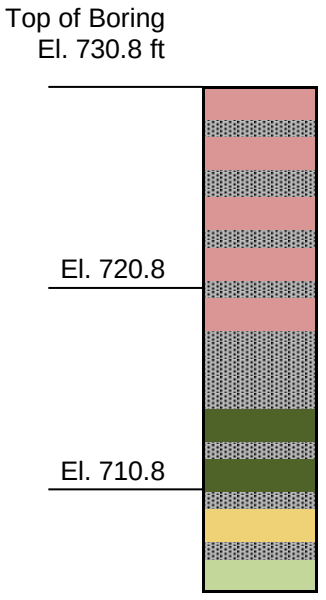
Depth of Mid. Pt. of Sample (ft.) z	Clean Sand Correction $\Delta(N_1)_{60cs}$	Equivalent Clean Sand N-Value $(N_1)_{60cs}$	Sample Screened for: Clay-like	High Blow Count $(N_1)_{60cs} \geq 32$	Unsaturated	Factor of Safety FS_{liq}	Material (optional)
	ft						
	ft	*(relative to ground surface during SPT)*					
	pcf						
	tsf						

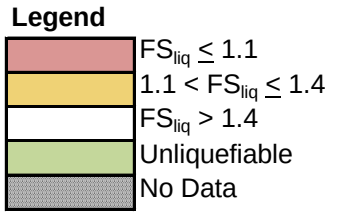
Note: A factor of safety shown as "N/A" implies that the soil type is not appropriately evaluated using this methodology. This applies to clay-like soils (typically CL, CH, CL-ML and MH material type), samples with high blow counts, and unsaturated samples.

1.0	5.61	6	FALSE	FALSE	FALSE	**0.1**	**Sediment**
3.5	5.61	11	FALSE	FALSE	FALSE	**0.4**	**Sediment**
6.5	5.61	11	FALSE	FALSE	FALSE	**0.5**	**Sediment**
9.0	5.61	6	FALSE	FALSE	FALSE	**0.4**	**Sediment**
11.5	5.61	6	FALSE	FALSE	FALSE	**0.4**	**Sediment**
17.0	5.57	42	TRUE	TRUE	FALSE	**N/A**	**Subunit 1**
19.5	5.56	11	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
22.0	5.60	17	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**
24.5	5.39	36	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**

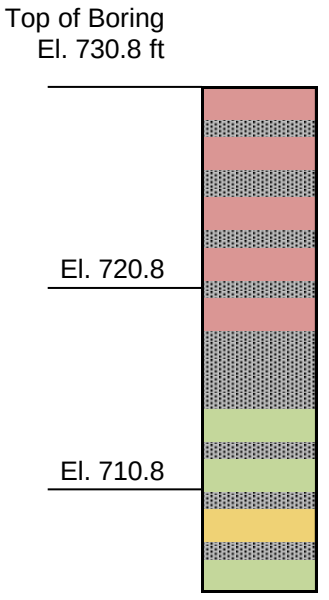


KIF-B08, Liquefaction Triggering Results

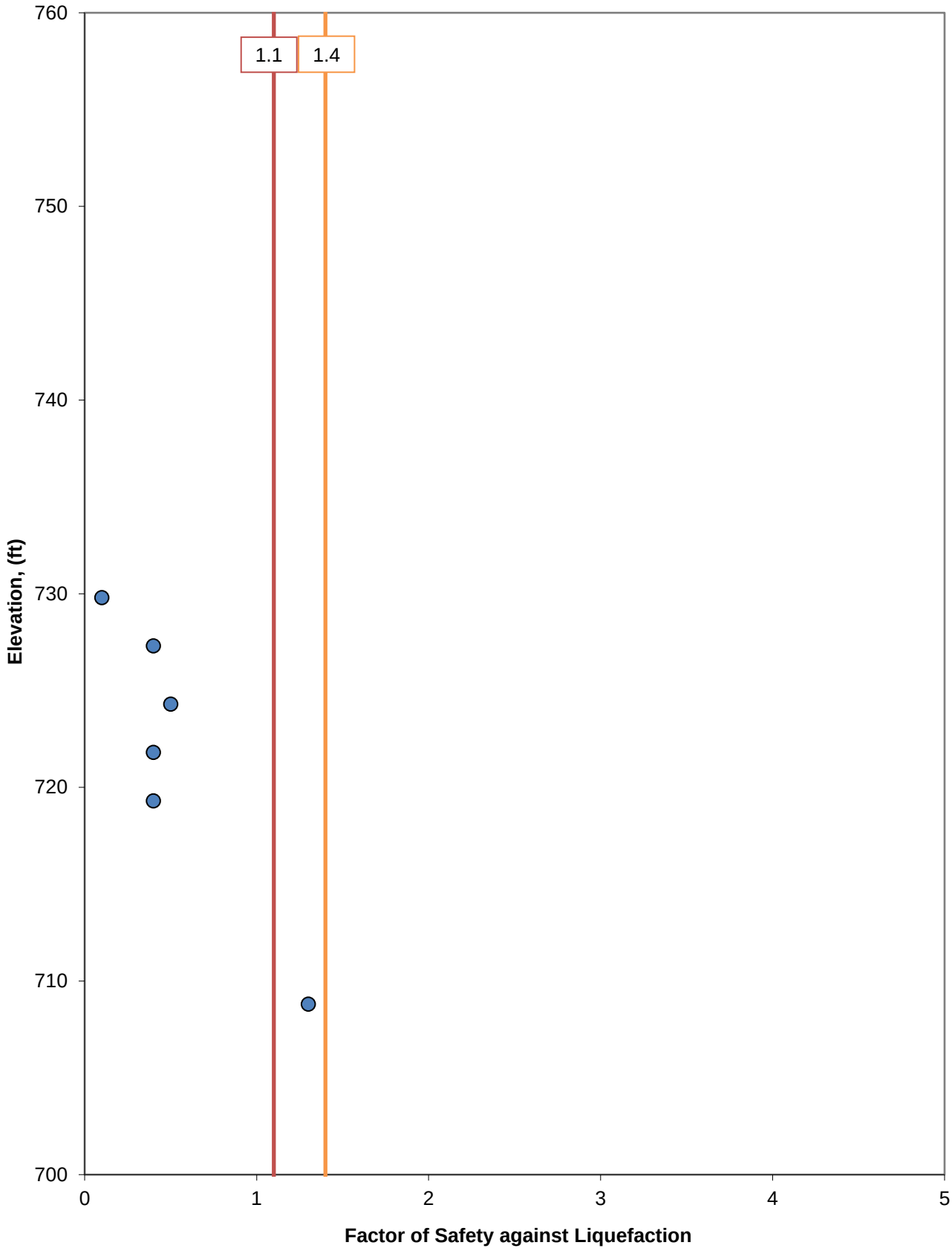




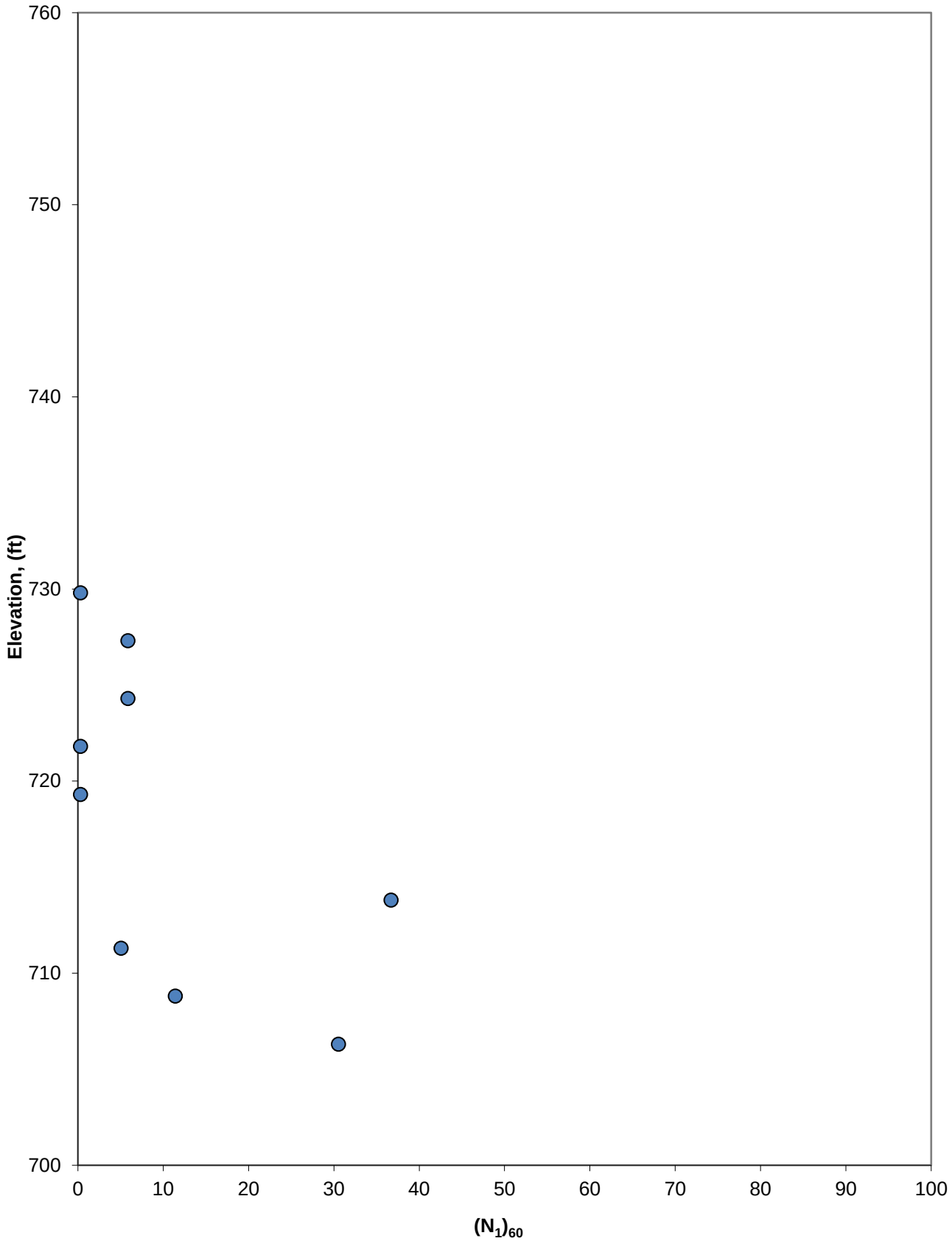
KIF-B08, Liquefaction Triggering Results



KIF TDEC Seismic Stability, Boring ID: KIF-B08, Source = 10 Hz, Mw = 6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



KIF TDEC Seismic Stability, Boring ID: KIF-B08, Source = 10 Hz, Mw = 6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



Project Name = KIF TDEC Seismic Stability
Boring ID = KIF-B09

Boring Location

Northing =
Easting =

OR

Baseline Station =
Offset (+ Right) =

Drilling Information

Boring Inner Diameter (ID) = 4.625 inches
Top of Hole Elevation = 754.5 feet
Water Depth during SPT (negative for U/S borings)= 52 feet
Depth Sampling Began = 0 feet
Total Unit Wt. above 1st SPT = pcf
Assumed Rod Stickup = 5 feet *(Typ assume 5ft)*
E_m Measurement based on Fv method? = 1 (1: Yes, 0: No)
SPT Sampler w/ Liners? = 0 (1: Yes, 0: No) *(Typ. no)*

During EQ Information

Water Depth during EQ (relative to SPT TOH, negative for U/S borings) = 5.9 feet
Final Grade Elevation during EQ = 754.5 feet
Average Total Unit Wt. of Cut/Fill = pcf

Fines Content Correction

Fines content correction for samples with blow counts of zero? = 1 (1: Yes, 0: No)

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile? = 0 (1: Yes, 0: No)
If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile: SectionAA, KIF-B09_NOR
Alpha at each sample depth known? = 1 (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (α vs. depth curve)
If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_α will be one.

m4:
m3:
m2:
m1:
m0:

Associated ground response profile: Section_AA, KIF-B09_NOR
Get CSR from shear stress envelope? = 0 (1: Yes, 0: No)
If previous answer is No, then CSR will be calculated using a_{max} and r_d
Max. Shear Stress at each sample depth known? = (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4:
m3:
m2:
m1:

Earthquake Information

EQ Source (e.g., New Madrid) = 10 Hz
Event (e.g., MCE, 10KEQ, OBE) = Design EQ
a_{max} (g) (top of ground surface) = 0.20
EQ Mag (Mw) = 6

Inputs

Depth of Sample Midpoint (ft.)	SPT N Value	Hammer Efficiency, E_m (%)	Unified Soil Classification	Fines Content (%)	Total Unit Weight (pcf)	Material (optional)	Clay-like / Sand-like Override (optional)	Clay-like Susceptibility (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure during SPT (psf)	Static Pore Water Pressure during EQ (psf)
1.0	17	89.8	SM	37.9	128	Embankment Fill	Clay-like	Not Susceptible		0.011			
3.5	26	89.8	SM	37.9	128	Embankment Fill	Clay-like	Not Susceptible		0.028			
6.0	22	89.8	SM	37.9	128	Embankment Fill	Clay-like	Not Susceptible		0.005			
8.5	11	89.8	SM	37.9	128	Embankment Fill	Clay-like	Not Susceptible		0.021			
11.0	37	89.8	GM	13.8	128	Embankment Fill	Clay-like	Not Susceptible		0.055			
13.5	33	89.8	SC	48.9	128	Embankment Fill	Clay-like	Not Susceptible		0.076			
16.0	17	89.8	SC	48.9	128	Embankment Fill	Clay-like	Not Susceptible		0.091			
18.5	0	89.8	SC	48.9	128	Embankment Fill	Clay-like	Not Susceptible		0.109			
21.0	0	89.8	SC	48.9	128	Embankment Fill	Clay-like	Not Susceptible		0.121			
23.5	0	89.8	ML	61.4	128	Embankment Fill	Clay-like	Not Susceptible		0.127			
26.0	0	89.8	ML	61.4	128	Embankment Fill	Clay-like	Not Susceptible		0.132			
28.5	0	89.8	ML	61.4	128	Embankment Fill	Clay-like	Not Susceptible		0.136			
31.0	1	89.8	ML	61.4	128	Embankment Fill	Clay-like	Not Susceptible		0.141			
33.5	0	89.8	ML	93.6	127	Subunit 1				0.144			
36.0	0	89.8	CL	82	127	Subunit 1				0.147			
40.5	16	89.8	CL	89.3	127	Subunit 1				0.151			
45.0	8	89.8	ML	79.6	126	Subunit 2	Sand-like			0.154			
47.5	2	89.8	SM	45.7	126	Subunit 2	Sand-like			0.154			
50.0	18	89.8	SP-SM	11.2	131	Subunit 3	Sand-like			0.153			

KIF TDEC Seismic Stability, Boring ID: KIF-B09

Liquefaction Potential Evaluations

For Coarse Grained Soils

Elev. Of Mid. Pt. of Sample (ft)	Depth of Mid. Pt. of Sample (ft.)	Unit Weight (pcf)	Vert. Total Stress during SPT (tsf)	Static Pore Pressure during SPT (tsf)	Vert. Eff. Stress during SPT (tsf)	SPT N Value	Hammer Efficiency (%)	Borehole Diameter Correction	Sampler Correction	Rod Length Correction	Overburden Stress Correction Factor	Hammer Energy Correction Factor	Corrected Blow Count	Normalized Blow Count	Relative Density (%)	Unified Soil Classification	Fines Content (%)
	z	γ_T	σ_v	u	σ'_v	N	E_m	C_B	C_s	C_R	C_N	C_E	N_{60}	$(N_1)_{60}$	D_r		

Top of Hole Elevation (ft) = 754.5 | Boring ID = KIF-B09

begin sampling (depth-ft) = 0.0 | Boring Inner Dia. (in) = 4.625

total unit wt. above 1st SPT (pcf) = 0

water elevation during SPT (ft) = 702.5 ft *(relative to ground surface during SPT)* | Assumed Rod Stickup = 5.0 feet

water depth during SPT (ft) = 52.0 | E_m Measurement? = 1 (1: Yes, 0: No)

water elevation during EQ (ft) = 748.6 ft *(relative to ground surface during SPT)* | SPT Sampler w/ Liners? = 0 (1: Yes, 0: No)

water during EQ (depth-ft) = 5.9 | u-top | effstr-top

vert. total stress above 1st SPT (tsf) = **0.00** | **0.00** | 0.00

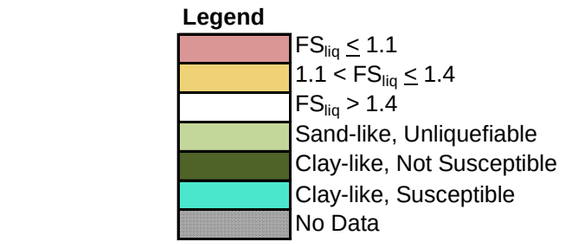
753.5	1.0	128	0.06	0.00	0.06	17	89.8	1.004	1.30	1.00	1.70	1.50	33	56	100	SM	37.9
751.0	3.5	128	0.22	0.00	0.22	26	89.8	1.004	1.30	1.00	1.50	1.50	51	76	100	SM	37.9
748.5	6.0	128	0.38	0.00	0.38	22	89.8	1.004	1.30	1.00	1.31	1.50	43	56	100	SM	37.9
746.0	8.5	128	0.54	0.00	0.54	11	89.8	1.004	1.26	1.00	1.26	1.50	21	26	83	SM	37.9
743.5	11.0	128	0.70	0.00	0.70	37	89.8	1.004	1.30	1.00	1.11	1.50	72	80	100	GM	13.8
741.0	13.5	128	0.86	0.00	0.86	33	89.8	1.004	1.30	1.00	1.05	1.50	64	68	100	SC	48.9
738.5	16.0	128	1.02	0.00	1.02	17	89.8	1.004	1.30	1.00	1.01	1.50	33	34	92	SC	48.9
736.0	18.5	128	1.18	0.00	1.18	0	89.8	1.004	1.10	1.00	0.93	1.50	0	0	35	SC	48.9
733.5	21.0	128	1.34	0.00	1.34	0	89.8	1.004	1.10	1.00	0.87	1.50	0	0	35	SC	48.9
731.0	23.5	128	1.50	0.00	1.50	0	89.8	1.004	1.10	1.00	0.81	1.50	0	0	35	ML	61.4
728.5	26.0	128	1.66	0.00	1.66	0	89.8	1.004	1.10	1.00	0.76	1.50	0	0	35	ML	61.4
726.0	28.5	128	1.82	0.00	1.82	0	89.8	1.004	1.10	1.00	0.72	1.50	0	0	35	ML	61.4
723.5	31.0	128	1.98	0.00	1.98	1	89.8	1.004	1.10	1.00	0.69	1.50	2	1	38	ML	61.4
721.0	33.5	127	2.14	0.00	2.14	0	89.8	1.004	1.10	1.00	0.65	1.50	0	0	35	ML	93.6
718.5	36.0	127	2.30	0.00	2.30	0	89.8	1.004	1.10	1.00	0.63	1.50	0	0	35	CL	82
714.0	40.5	127	2.59	0.00	2.59	16	89.8	1.004	1.20	1.00	0.70	1.50	29	20	75	CL	89.3
709.5	45.0	126	2.87	0.00	2.87	8	89.8	1.004	1.10	1.00	0.61	1.50	13	8	54	ML	79.6
707.0	47.5	126	3.03	0.00	3.03	2	89.8	1.004	1.10	1.00	0.55	1.50	3	2	40	SM	45.7
704.5	50.0	131	3.19	0.00	3.19	18	89.8	1.004	1.20	1.00	0.63	1.50	33	20	69	SP-SM	11.2

KIF TDEC Seismic Stability, Boring ID: KIF-B09
Liquefaction Potential Evaluations
For Coarse Grained Soils

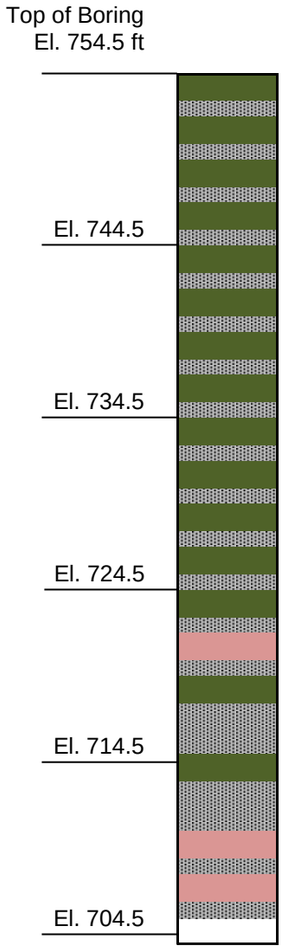
Depth of Mid. Pt. of Sample (ft.) z	Clean Sand Correction $\Delta(N_1)_{60cs}$	Equivalent Clean Sand N-Value $(N_1)_{60cs}$	Sample Screened for: Clay-like	High Blow Count $(N_1)_{60cs} \geq 32$	Unsaturated	Factor of Safety FS_{liq}	Material (optional)
ft							
ft *(relative to ground surface during SPT)*							
pcf							
tsf							

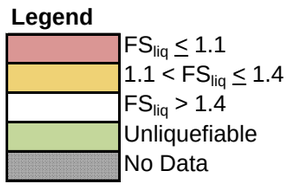
Note: A factor of safety shown as "N/A" implies that the soil type is not appropriately evaluated using this methodology. This applies to clay-like soils (typically CL, CH, CL-ML and MH material type), samples with high blow counts, and unsaturated samples.

1.0	5.55	62	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**
3.5	5.55	82	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**
6.0	5.55	62	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**
8.5	5.55	32	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**
11.0	2.83	83	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**
13.5	5.61	74	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**
16.0	5.61	39	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**
18.5	5.61	6	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
21.0	5.61	6	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
23.5	5.60	6	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
26.0	5.60	6	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
28.5	5.60	6	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
31.0	5.60	7	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
33.5	5.50	6	FALSE	FALSE	FALSE	**0.5**	**Subunit 1**
36.0	5.54	6	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
40.5	5.52	26	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
45.0	5.55	14	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**
47.5	5.61	7	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**
50.0	1.71	22	FALSE	FALSE	FALSE	**2.9**	**Subunit 3**

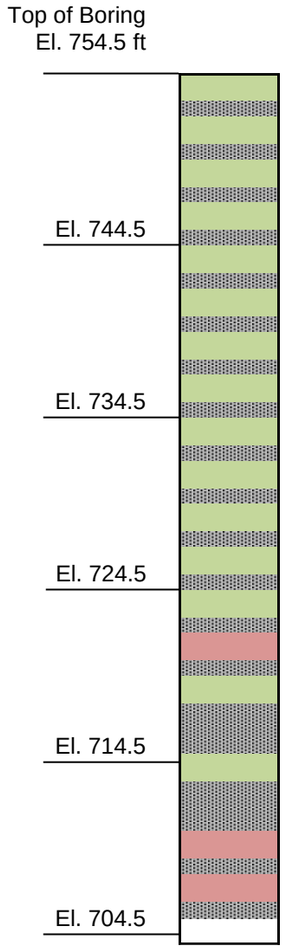


KIF-B09, Liquefaction Triggering Results

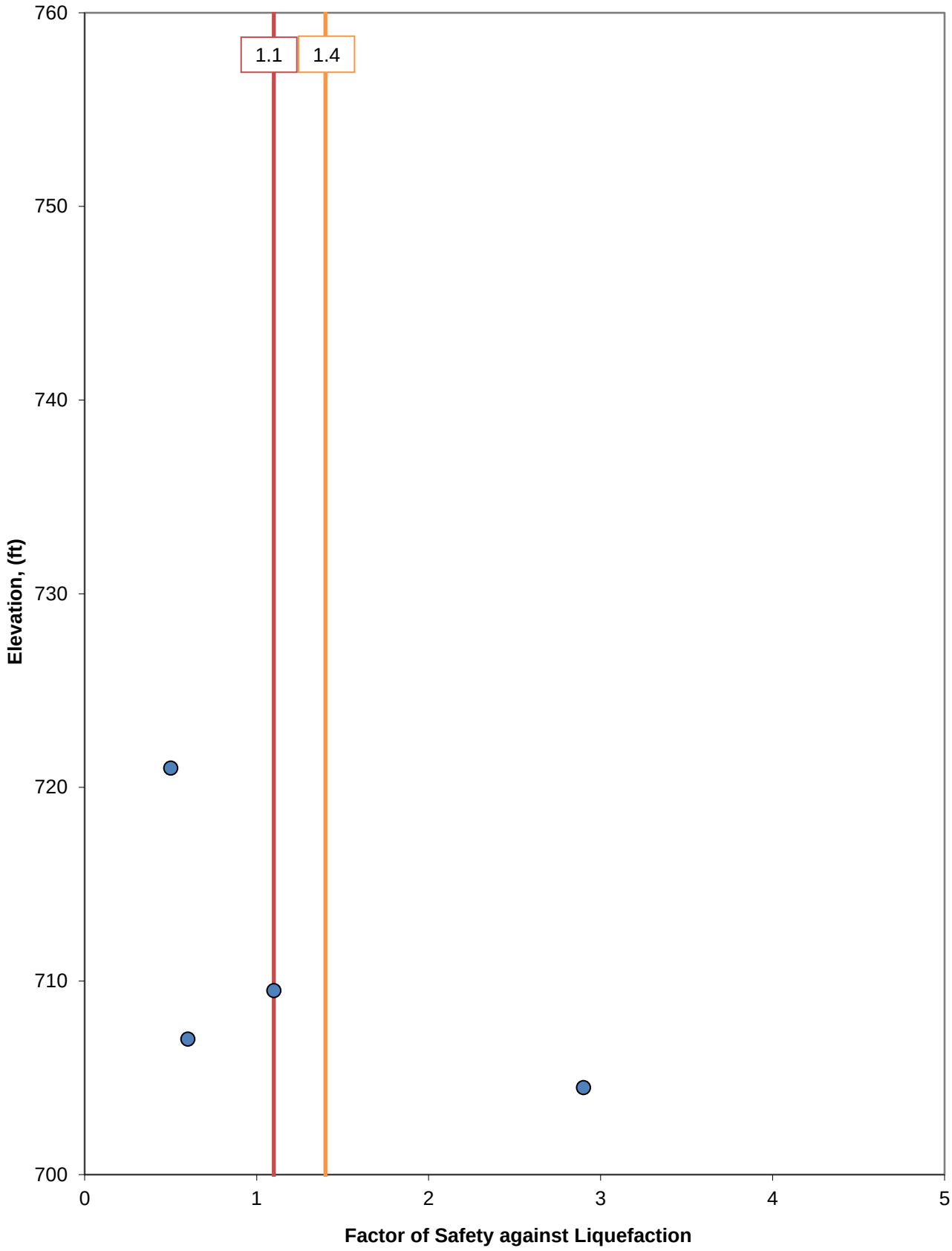




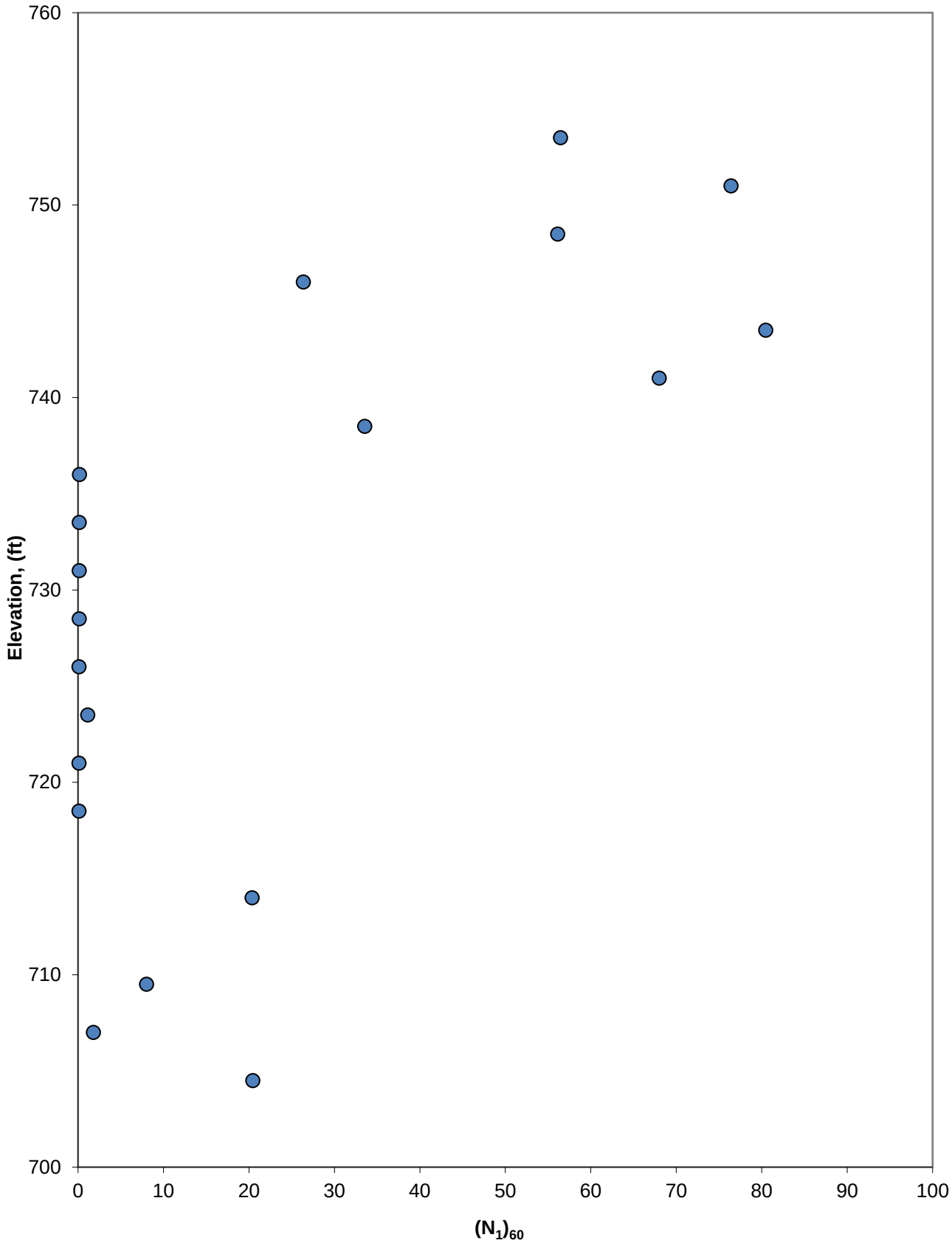
KIF-B09, Liquefaction Triggering Results



KIF TDEC Seismic Stability, Boring ID: KIF-B09, Source = 10 Hz, Mw = 6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



KIF TDEC Seismic Stability, Boring ID: KIF-B09, Source = 10 Hz, Mw = 6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



Project Name = KIF TDEC Seismic Stability
Boring ID = KIF-B10

Boring Location

Northing =
Easting =

OR

Baseline Station =
Offset (+ Right) =

Drilling Information

Boring Inner Diameter (ID) =	5.875	inches	
Top of Hole Elevation	732.02	feet	
Water Depth during SPT (negative for U/S borings)=	-4.2	feet	
Depth Sampling Began	0	feet	
Total Unit Wt. above 1st SPT =	62.4	pcf	
Assumed Rod Stickup =	5	feet	*(Typ assume 5ft)*
E_m Measurement based on Fv method? =	1	(1: Yes, 0: No)	
SPT Sampler w/ Liners? =	0	(1: Yes, 0: No)	*(Typ. no)*

During EQ Information

Water Depth during EQ (relative to SPT TOH, negative for U/S borings) =	-5.4	feet
Final Grade Elevation during EQ	732.02	feet
Average Total Unit Wt. of Cut/Fill		pcf

Fines Content Correction

Fines content correction for samples with blow counts of zero? 1 (1: Yes, 0: No)

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile? 0 (1: Yes, 0: No)
If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile: SectionAA, KIF-B10_NOR
Alpha at each sample depth known? 1 (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (α vs. depth curve)
If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_α will be one.

m4:
m3:
m2:
m1:
m0:

Associated ground response profile: Section_AA, KIF-B10_NOR
Get CSR from shear stress envelope? 0 (1: Yes, 0: No)
If previous answer is No, then CSR will be calculated using a_{max} and r_d
Max. Shear Stress at each sample depth known? (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4:
m3:
m2:
m1:

Earthquake Information

EQ Source (e.g., New Madrid)	10 Hz
Event (e.g., MCE, 10KEQ, OBE)	Design EQ
a_{max} (g) (top of ground surface)	0.20
EQ Mag (Mw)	6

Inputs

Depth of Sample Midpoint (ft.)	SPT N Value	Hammer Efficiency, E_m (%)	Unified Soil Classification	Fines Content (%)	Total Unit Weight (pcf)	Material (optional)	Clay-like / Sand-like Override (optional)	Clay-like Susceptibility (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure during SPT (psf)	Static Pore Water Pressure during EQ (psf)
1.0	3	89.8	CL	52	111	Sediment	Sand-like			0.794			
3.5	0	89.8	CL	52	111	Sediment	Sand-like			0.404			
6.0	0	89.8	CL	52	111	Sediment	Sand-like			0.306			
8.5	0	89.8	ML	91	127	Subunit 1				0.243			
11.0	1	89.8	ML	80.5	127	Subunit 1				0.227			
13.5	8	89.8	ML	80.5	127	Subunit 1				0.203			
16.0	11	89.8	CL	89.5	127	Subunit 1				0.191			
18.5	8	89.8	CL	89.5	127	Subunit 1				0.187			
21.0	0	89.8	SM	45.7	126	Subunit 2	Sand-like			0.181			
23.5	0	89.8	SM	24.6	131	Subunit 3	Sand-like			0.175			
26.0	1	89.8	SP-SM	10.9	131	Subunit 3	Sand-like			0.171			

KIF TDEC Seismic Stability, Boring ID: KIF-B10

Liquefaction Potential Evaluations

For Coarse Grained Soils

Elev. Of Mid. Pt. of Sample (ft)	Depth of Mid. Pt. of Sample (ft.)	Unit Weight (pcf)	Vert. Total Stress during SPT (tsf)	Static Pore Pressure during SPT (tsf)	Vert. Eff. Stress during SPT (tsf)	SPT N Value	Hammer Efficiency (%)	Borehole Diameter Correction	Sampler Correction	Rod Length Correction	Overburden Stress Correction Factor	Hammer Energy Correction Factor	Corrected Blow Count	Normalized Blow Count	Relative Density (%)	Unified Soil Classification	Fines Content (%)
	z	γ_T	σ_v	u	σ'_v	N	E_m	C_B	C_s	C_R	C_N	C_E	N_{60}	$(N_1)_{60}$	D_r		

Top of Hole Elevation (ft) = 732.0 | Boring ID = **KIF-B10**

begin sampling (depth-ft) = 0.0 | Boring Inner Dia. (in) = 5.875

total unit wt. above 1st SPT (pcf) = 62

water elevation during SPT (ft) = 736.2 ft *(relative to ground surface during SPT)* | Assumed Rod Stickup = 5.0 feet

water depth during SPT (ft) = -4.2 | E_m Measurement? = 1 (1: Yes, 0: No)

water elevation during EQ (ft) = 737.4 ft *(relative to ground surface during SPT)* | SPT Sampler w/ Liners? = 0 (1: Yes, 0: No)

	u-top	effstr-top
water during EQ (depth-ft) =	-5.4	
vert. total stress above 1st SPT (tsf) =	**0.13**	**0.13**	0.00

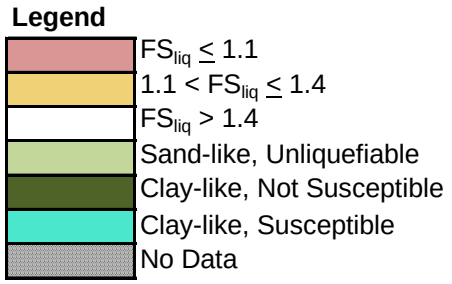
731.0	1.0	111	0.19	0.16	0.02	3	89.8	1.046	1.10	1.00	1.70	1.50	5	9	56	CL	52
728.5	3.5	111	0.33	0.24	0.09	0	89.8	1.046	1.10	1.00	1.70	1.50	0	0	36	CL	52
726.0	6.0	111	0.46	0.32	0.15	0	89.8	1.046	1.10	1.00	1.70	1.50	0	0	36	CL	52
723.5	8.5	127	0.61	0.40	0.22	0	89.8	1.046	1.10	1.00	1.70	1.50	0	0	36	ML	91
721.0	11.0	127	0.77	0.47	0.30	1	89.8	1.046	1.10	1.00	1.70	1.50	2	3	43	ML	80.5
718.5	13.5	127	0.93	0.55	0.38	8	89.8	1.046	1.23	1.00	1.47	1.50	15	23	78	ML	80.5
716.0	16.0	127	1.09	0.63	0.46	11	89.8	1.046	1.29	1.00	1.32	1.50	22	29	87	CL	89.5
713.5	18.5	127	1.25	0.71	0.54	8	89.8	1.046	1.20	1.00	1.31	1.50	15	20	74	CL	89.5
711.0	21.0	126	1.41	0.79	0.62	0	89.8	1.046	1.10	1.00	1.38	1.50	0	0	36	SM	45.7
708.5	23.5	131	1.57	0.86	0.70	0	89.8	1.046	1.10	1.00	1.28	1.50	0	0	34	SM	24.6
706.0	26.0	131	1.73	0.94	0.79	1	89.8	1.046	1.10	1.00	1.21	1.50	2	2	28	SP-SM	10.9

KIF TDEC Seismic Stability, Boring ID: KIF-B10
Liquefaction Potential Evaluations
For Coarse Grained Soils

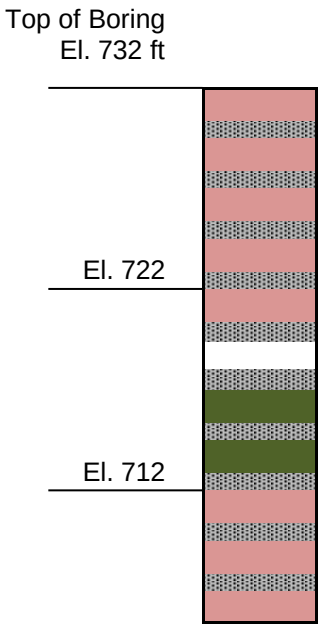
Depth of Mid. Pt. of Sample (ft.) z	Clean Sand Correction $\Delta(N_1)_{60cs}$	Equivalent Clean Sand N-Value $(N_1)_{60cs}$	Sample Screened for: Clay-like	High Blow Count $(N_1)_{60cs} \geq 32$	Unsaturated	Factor of Safety FS_{liq}	Material (optional)
	ft						
	ft *(relative to ground surface during SPT)*						
	pcf						
	tsf						

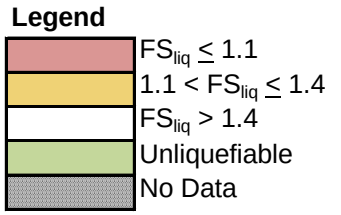
Note: A factor of safety shown as "N/A" implies that the soil type is not appropriately evaluated using this methodology. This applies to clay-like soils (typically CL, CH, CL-ML and MH material type), samples with high blow counts, and unsaturated samples.

1.0	5.61	14	FALSE	FALSE	FALSE	**0.3**	**Sediment**
3.5	5.61	6	FALSE	FALSE	FALSE	**0.1**	**Sediment**
6.0	5.61	6	FALSE	FALSE	FALSE	**0.2**	**Sediment**
8.5	5.51	6	FALSE	FALSE	FALSE	**0.2**	**Subunit 1**
11.0	5.54	8	FALSE	FALSE	FALSE	**0.4**	**Subunit 1**
13.5	5.54	28	FALSE	FALSE	FALSE	**5.0**	**Subunit 1**
16.0	5.52	35	TRUE	TRUE	FALSE	**N/A**	**Subunit 1**
18.5	5.52	25	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
21.0	5.61	6	FALSE	FALSE	FALSE	**0.3**	**Subunit 2**
23.5	5.04	5	FALSE	FALSE	FALSE	**0.3**	**Subunit 3**
26.0	1.57	4	FALSE	FALSE	FALSE	**0.3**	**Subunit 3**

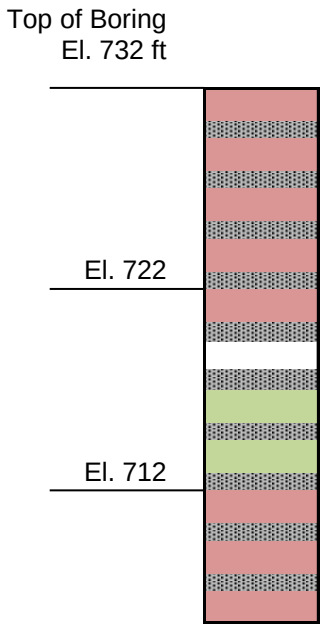


KIF-B10, Liquefaction Triggering Results

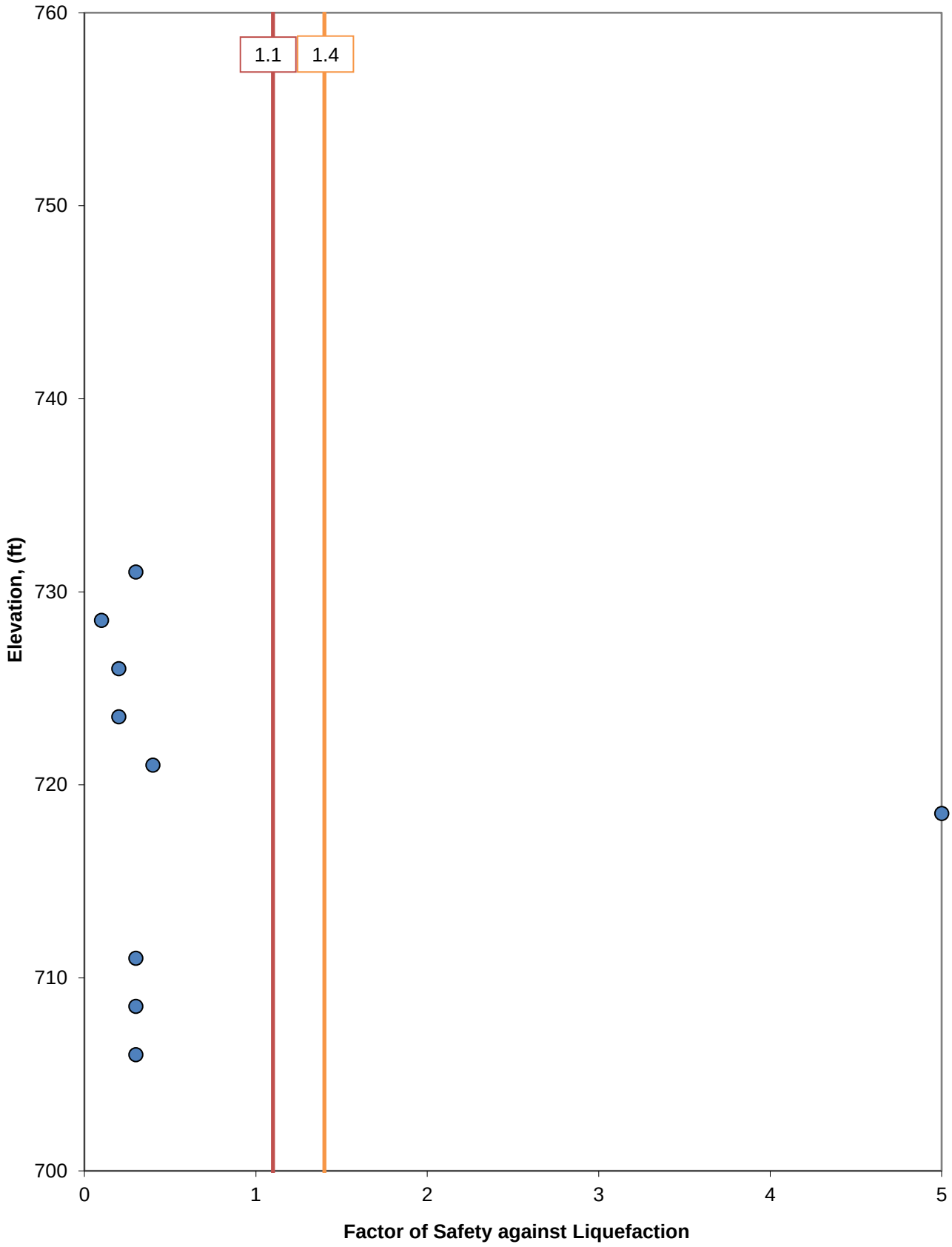




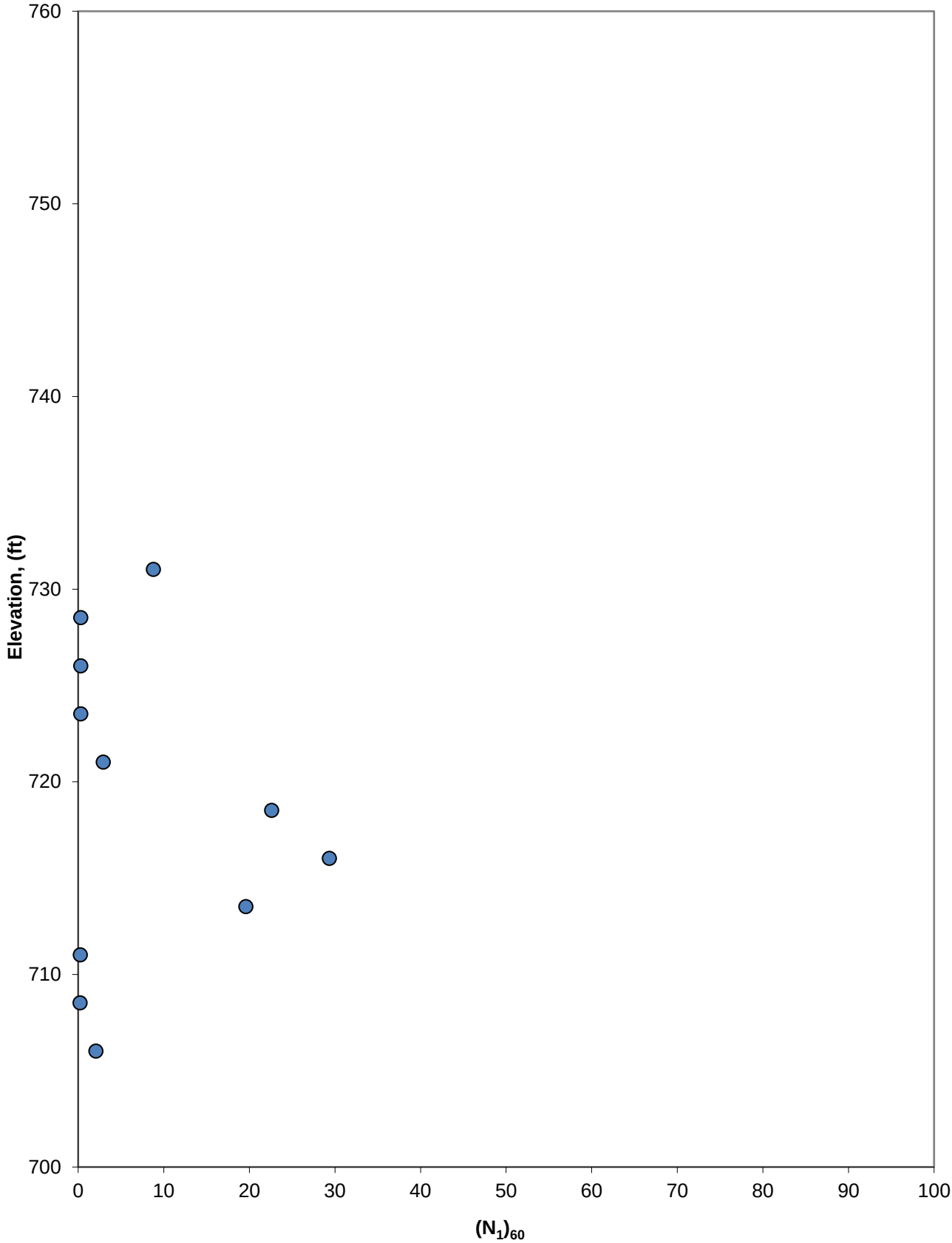
KIF-B10, Liquefaction Triggering Results



KIF TDEC Seismic Stability, Boring ID: KIF-B10, Source = 10 Hz, Mw = 6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



KIF TDEC Seismic Stability, Boring ID: KIF-B10, Source = 10 Hz, Mw = 6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



Project Name = KIF TDEC Seismic Stability
Boring ID = KIF-B11

Boring Location

Northing =
Easting =

OR

Baseline Station =
Offset (+ Right) =

Drilling Information

Boring Inner Diameter (ID) =	5.875	inches	
Top of Hole Elevation	727.3	feet	
Water Depth during SPT (negative for U/S borings)=	-9.1	feet	
Depth Sampling Began	0	feet	
Total Unit Wt. above 1st SPT =	62.4	pcf	
Assumed Rod Stickup =	5	feet	*(Typ assume 5ft)*
E_m Measurement based on Fv method? =	1	(1: Yes, 0: No)	
SPT Sampler w/ Liners? =	0	(1: Yes, 0: No)	*(Typ. no)*

During EQ Information

Water Depth during EQ (relative to SPT TOH, negative for U/S borings) =	-10.1	feet
Final Grade Elevation during EQ	727.3	feet
Average Total Unit Wt. of Cut/Fill		pcf

Fines Content Correction

Fines content correction for samples with blow counts of zero? 1 (1: Yes, 0: No)

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile? 0 (1: Yes, 0: No)
If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile: SectionAA, KIF-B11_NOR
Alpha at each sample depth known? 1 (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (α vs. depth curve)
If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_α will be one.

m4:
m3:
m2:
m1:
m0:

Associated ground response profile: Section_AA, KIF-B11_NOR
Get CSR from shear stress envelope? 0 (1: Yes, 0: No)
If previous answer is No, then CSR will be calculated using a_{max} and r_d
Max. Shear Stress at each sample depth known? (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4:
m3:
m2:
m1:

Earthquake Information

EQ Source (e.g., New Madrid)	10 Hz
Event (e.g., MCE, 10KEQ, OBE)	Design EQ
a_{max} (g) (top of ground surface)	0.31
EQ Mag (Mw)	6

Inputs

Depth of Sample Midpoint (ft.)	SPT N Value	Hammer Efficiency, E_m (%)	Unified Soil Classification	Fines Content (%)	Total Unit Weight (pcf)	Material (optional)	Clay-like / Sand-like Override (optional)	Clay-like Susceptibility (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure during SPT (psf)	Static Pore Water Pressure during EQ (psf)
1.0	0	89.8	CL	52	111	Sediment	Sand-like			0.696			
3.6	0	89.8	CL	89.9	127	Subunit 1				0.279			
6.1	3	89.8	CL	94.1	127	Subunit 1				0.195			
12.6	11	89.8	CL	86.6	127	Subunit 1				0.141			
15.1	0	89.8	CL	63.8	127	Subunit 1				0.129			
17.6	0	89.8	SM	46	126	Subunit 2	Sand-like			0.124			
20.1	1	89.8	SM	16.7	131	Subunit 3	Sand-like			0.118			
22.6	17	89.8	SM	15.9	131	Subunit 3	Sand-like			0.113			

KIF TDEC Seismic Stability, Boring ID: KIF-B11

Liquefaction Potential Evaluations

For Coarse Grained Soils

Elev. Of Mid. Pt. of Sample (ft)	Depth of Mid. Pt. of Sample (ft.)	Unit Weight (pcf)	Vert. Total Stress during SPT (tsf)	Static Pore Pressure during SPT (tsf)	Vert. Eff. Stress during SPT (tsf)	SPT N Value	Hammer Efficiency (%)	Borehole Diameter Correction	Sampler Correction	Rod Length Correction	Overburden Stress Correction Factor	Hammer Energy Correction Factor	Corrected Blow Count	Normalized Blow Count	Relative Density (%)	Unified Soil Classification	Fines Content (%)
	z	γ_T	σ_v	u	σ'_v	N	E_m	C_B	C_s	C_R	C_N	C_E	N_{60}	$(N_1)_{60}$	D_r		

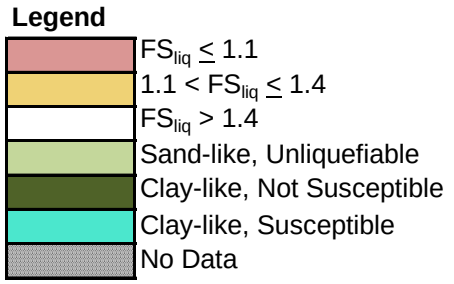
			Top of Hole Elevation (ft) =	727.3				Boring ID =	KIF-B11								
			begin sampling (depth-ft) =	0.0				Boring Inner Dia. (in) =	5.875								
			total unit wt. above 1st SPT (pcf) =	62													
			water elevation during SPT (ft) =	736.4	ft *(relative to ground surface during SPT)*			Assumed Rod Stickup =	5.0	feet							
			water depth during SPT (ft) =	-9.1				E_m Measurement? =	1	(1: Yes, 0: No)							
			water elevation during EQ (ft) =	737.4	ft *(relative to ground surface during SPT)*			SPT Sampler w/ Liners? =	0	(1: Yes, 0: No)							
			water during EQ (depth-ft) =	-10.1	u-top	effstr-top											
			vert. total stress above 1st SPT (tsf) =	**0.28**	**0.28**	0.00											
726.3	1.0	111	0.34	0.32	0.02	0	89.8	1.046	1.10	1.00	1.70	1.50	0	0	36	CL	52
723.7	3.6	127	0.49	0.40	0.10	0	89.8	1.046	1.10	1.00	1.70	1.50	0	0	36	CL	89.9
721.2	6.1	127	0.65	0.47	0.18	3	89.8	1.046	1.10	1.00	1.70	1.50	5	9	56	CL	94.1
714.7	12.6	127	1.07	0.68	0.39	11	89.8	1.046	1.30	1.00	1.38	1.50	22	31	89	CL	86.6
712.2	15.1	127	1.22	0.76	0.47	0	89.8	1.046	1.10	1.00	1.63	1.50	0	0	36	CL	63.8
709.7	17.6	126	1.38	0.83	0.55	0	89.8	1.046	1.10	1.00	1.48	1.50	0	0	36	SM	46
707.2	20.1	131	1.54	0.91	0.63	1	89.8	1.046	1.10	1.00	1.36	1.50	2	2	36	SM	16.7
704.7	22.6	131	1.71	0.99	0.72	17	89.8	1.046	1.30	1.00	1.12	1.50	35	39	96	SM	15.9

KIF TDEC Seismic Stability, Boring ID: KIF-B11
Liquefaction Potential Evaluations
For Coarse Grained Soils

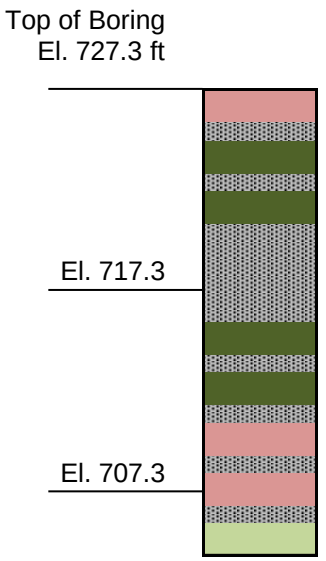
Depth of Mid. Pt. of Sample (ft.) z	Clean Sand Correction $\Delta(N_1)_{60cs}$	Equivalent Clean Sand N-Value $(N_1)_{60cs}$	Sample Screened for: Clay-like	High Blow Count $(N_1)_{60cs} \geq 32$	Unsaturated	Factor of Safety FS_{liq}	Material (optional)
	ft						
	ft	*(relative to ground surface during SPT)*					
	pcf						
	tsf						

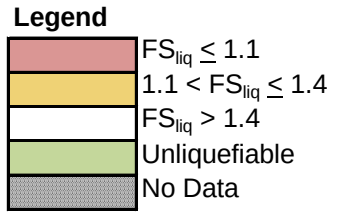
Note: A factor of safety shown as "N/A" implies that the soil type is not appropriately evaluated using this methodology. This applies to clay-like soils (typically CL, CH, CL-ML and MH material type), samples with high blow counts, and unsaturated samples.

1.0	5.61	6	FALSE	FALSE	FALSE	**0.0**	**Sediment**
3.6	5.51	6	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
6.1	5.50	14	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
12.6	5.52	36	TRUE	TRUE	FALSE	**N/A**	**Subunit 1**
15.1	5.59	6	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
17.6	5.61	6	FALSE	FALSE	FALSE	**0.2**	**Subunit 2**
20.1	3.77	6	FALSE	FALSE	FALSE	**0.2**	**Subunit 3**
22.6	3.55	42	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**

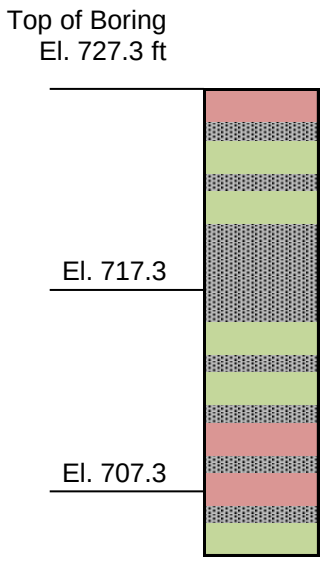


KIF-B11, Liquefaction Triggering Results

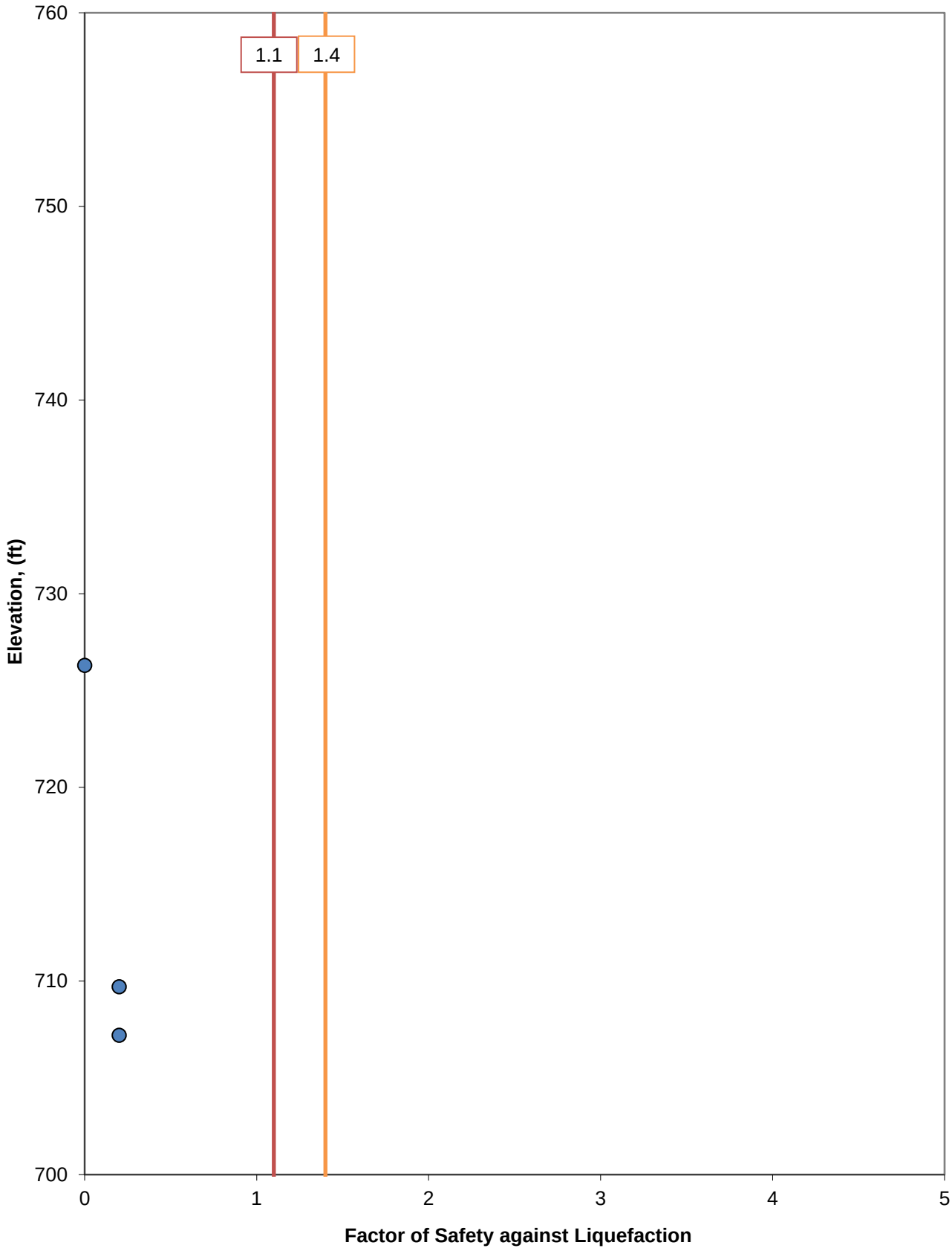




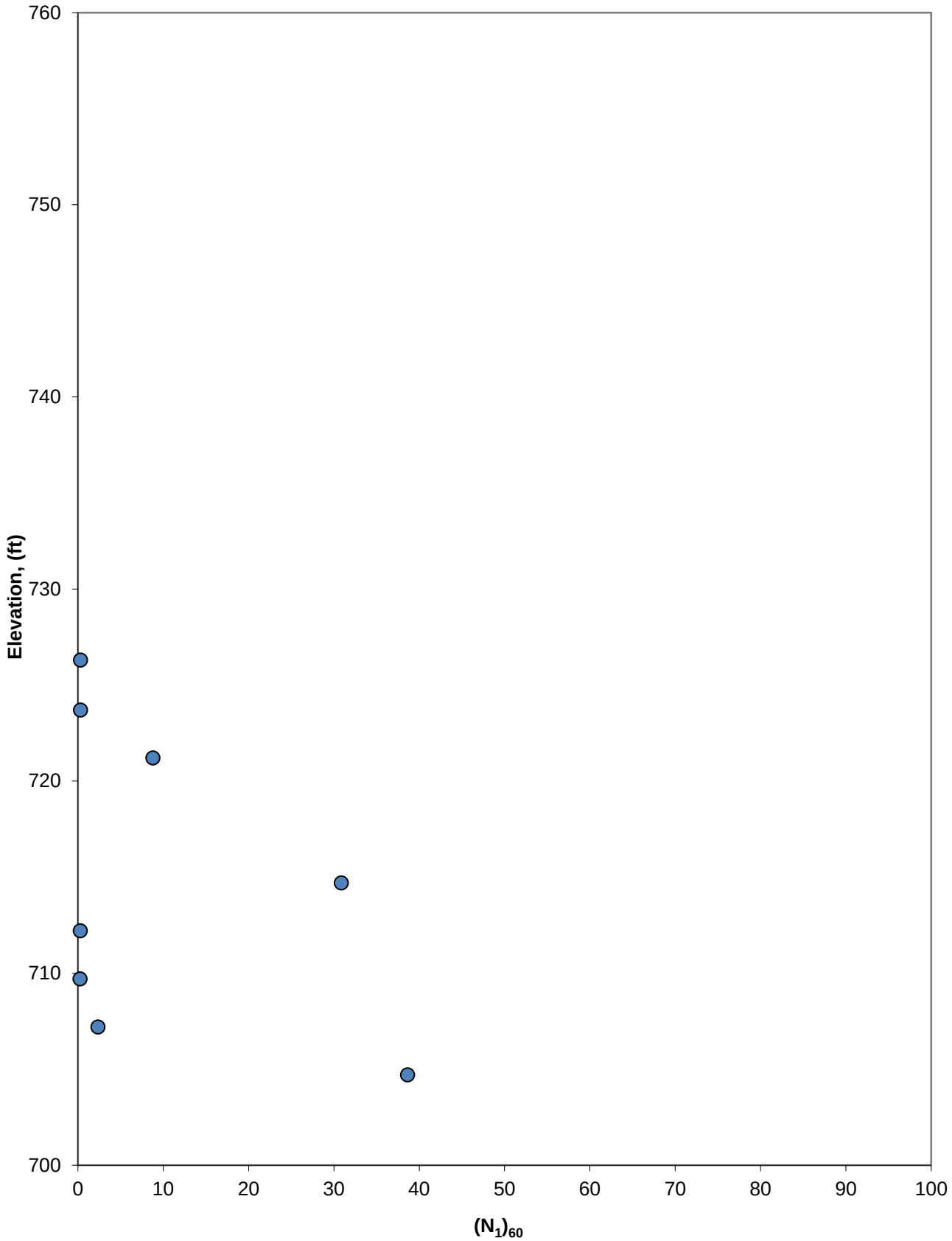
KIF-B11, Liquefaction Triggering Results



KIF TDEC Seismic Stability, Boring ID: KIF-B11, Source = 10 Hz, Mw = 6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



KIF TDEC Seismic Stability, Boring ID: KIF-B11, Source = 10 Hz, Mw = 6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



Project Name = KIF TDEC Seismic Stability
Boring ID = KIF-B12

Boring Location

Northing =
Easting =

OR

Baseline Station =
Offset (+ Right) =

Drilling Information

Boring Inner Diameter (ID) =	5.875	inches	
Top of Hole Elevation	725.6	feet	
Water Depth during SPT (negative for U/S borings)=	-10.8	feet	
Depth Sampling Began	0	feet	
Total Unit Wt. above 1st SPT =	62.4	pcf	
Assumed Rod Stickup =	5	feet	*(Typ assume 5ft)*
E_m Measurement based on Fv method? =	1	(1: Yes, 0: No)	
SPT Sampler w/ Liners? =	0	(1: Yes, 0: No)	*(Typ. no)*

During EQ Information

Water Depth during EQ (relative to SPT TOH, negative for U/S borings) =	-11.8	feet
Final Grade Elevation during EQ	725.6	feet
Average Total Unit Wt. of Cut/Fill		pcf

Fines Content Correction

Fines content correction for samples with blow counts of zero? 1 (1: Yes, 0: No)

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile? 0 (1: Yes, 0: No)
If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile: SectionAA, KIF-B12_NOR
Alpha at each sample depth known? 1 (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (α vs. depth curve)
If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_α will be one.

m4:
m3:
m2:
m1:
m0:

Associated ground response profile: Section_AA, KIF-B12_NOR
Get CSR from shear stress envelope? 0 (1: Yes, 0: No)
If previous answer is No, then CSR will be calculated using a_{max} and r_d
Max. Shear Stress at each sample depth known? (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4:
m3:
m2:
m1:

Earthquake Information

EQ Source (e.g., New Madrid)	10 Hz
Event (e.g., MCE, 10KEQ, OBE)	Design EQ
a_{max} (g) (top of ground surface)	0.24
EQ Mag (Mw)	6

Inputs

Depth of Sample Midpoint (ft.)	SPT N Value	Hammer Efficiency, E_m (%)	Unified Soil Classification	Fines Content (%)	Total Unit Weight (pcf)	Material (optional)	Clay-like / Sand-like Override (optional)	Clay-like Susceptibility (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure during SPT (psf)	Static Pore Water Pressure during EQ (psf)
1.0	0	89.8	CL	82.8	127	Subunit 1				0.251			
3.4	0	89.8	CL	82.8	127	Subunit 1				0.128			
10.7	12	89.8	CL	82.8	127	Subunit 1				0.081			
15.2	0	89.8	SM	47.9	126	Subunit 2	Sand-like			0.078			
17.7	0	89.8	SM	28.2	131	Subunit 3	Sand-like			0.074			
20.2	26	89.8	SP-SM	10.5	131	Subunit 3	Sand-like			0.073			

KIF TDEC Seismic Stability, Boring ID: KIF-B12

Liquefaction Potential Evaluations

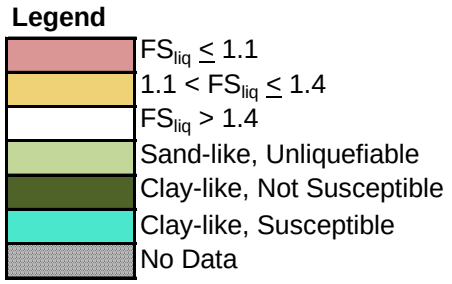
For Coarse Grained Soils

Top of Hole Elevation (ft) =	725.6			Boring ID =	KIF-B12			Assumed Rod Stickup =	5.0	feet
begin sampling (depth-ft) =	0.0			Boring Inner Dia. (in) =	5.875			E_m Measurement? =	1	(1: Yes, 0: No)
total unit wt. above 1st SPT (pcf) =	62							SPT Sampler w/ Liners? =	0	(1: Yes, 0: No)
water elevation during SPT (ft) =	736.4	ft *(relative to ground surface during SPT)*								
water depth during SPT (ft) =	-10.8									
water elevation during EQ (ft) =	737.4	ft *(relative to ground surface during SPT)*								
water during EQ (depth-ft) =	-11.8	u-top	effstr-top							
vert. total stress above 1st SPT (tsf) =	**0.34**	**0.34**	0.00							

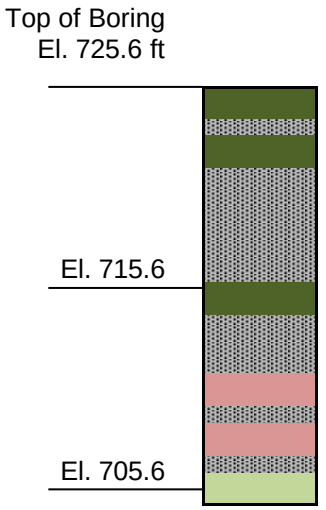
Elev. Of Mid. Pt. of Sample (ft)	Depth of Mid. Pt. of Sample (ft.) z	Unit Weight (pcf) γ_T	Vert. Total Stress during SPT (tsf) σ_v	Static Pore Pressure during SPT (tsf) u	Vert. Eff. Stress during SPT (tsf) σ'_v	SPT N Value N	Hammer Efficiency (%) E_m	Borehole Diameter Correction C_B	Sampler Correction C_s	Rod Length Correction C_R	Overburden Stress Correction Factor C_N	Hammer Energy Correction Factor C_E	Corrected Blow Count N_{60}	Normalized Blow Count $(N_1)_{60}$	Relative Density (%) D_r	Unified Soil Classification	Fines Content (%)
724.6	1.0	127	0.40	0.37	0.03	0	89.8	1.046	1.10	1.00	1.70	1.50	0	0	36	CL	82.8
722.2	3.4	127	0.55	0.44	0.11	0	89.8	1.046	1.10	1.00	1.70	1.50	0	0	36	CL	82.8
714.9	10.7	127	1.02	0.67	0.35	12	89.8	1.046	1.30	1.00	1.40	1.50	24	34	93	CL	82.8
710.4	15.2	126	1.30	0.81	0.49	0	89.8	1.046	1.10	1.00	1.58	1.50	0	0	36	SM	47.9
707.9	17.7	131	1.46	0.89	0.57	0	89.8	1.046	1.10	1.00	1.45	1.50	0	0	35	SM	28.2
705.4	20.2	131	1.63	0.97	0.66	26	89.8	1.046	1.30	1.00	1.13	1.50	53	60	100	SP-SM	10.5

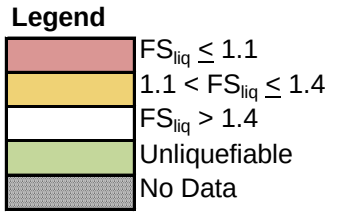
KIF TDEC Seismic Stability, Boring ID: KIF-B12
Liquefaction Potential Evaluations
For Coarse Grained Soils

Depth of Mid. Pt. of Sample (ft.) z	Clean Sand Correction $\Delta(N_1)_{60cs}$	Equivalent Clean Sand N-Value $(N_1)_{60cs}$	Sample Screened for: Clay-like	High Blow Count $(N_1)_{60cs} \geq 32$	Unsaturated	Factor of Safety FS_{liq}	Material (optional)
	ft		*Note: A factor of safety shown as "N/A" implies that the soil type is not appropriately evaluated using this methodology. This applies to clay-like soils (typically CL, CH, CL-ML and MH material type), samples with high blow counts, and unsaturated samples.*				
	ft *(relative to ground surface during SPT)*						
	pcf						
	tsf						
1.0	5.54	6	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
3.4	5.54	6	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
10.7	5.54	40	TRUE	TRUE	FALSE	**N/A**	**Subunit 1**
15.2	5.61	6	FALSE	FALSE	FALSE	**0.2**	**Subunit 2**
17.7	5.28	6	FALSE	FALSE	FALSE	**0.2**	**Subunit 3**
20.2	1.38	61	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**

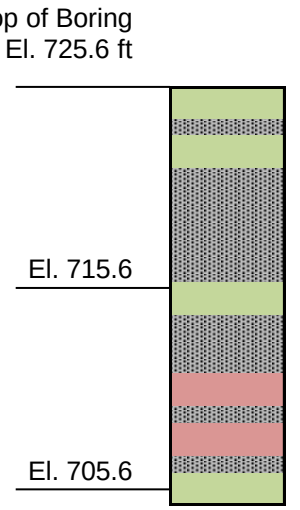


KIF-B12, Liquefaction Triggering Results

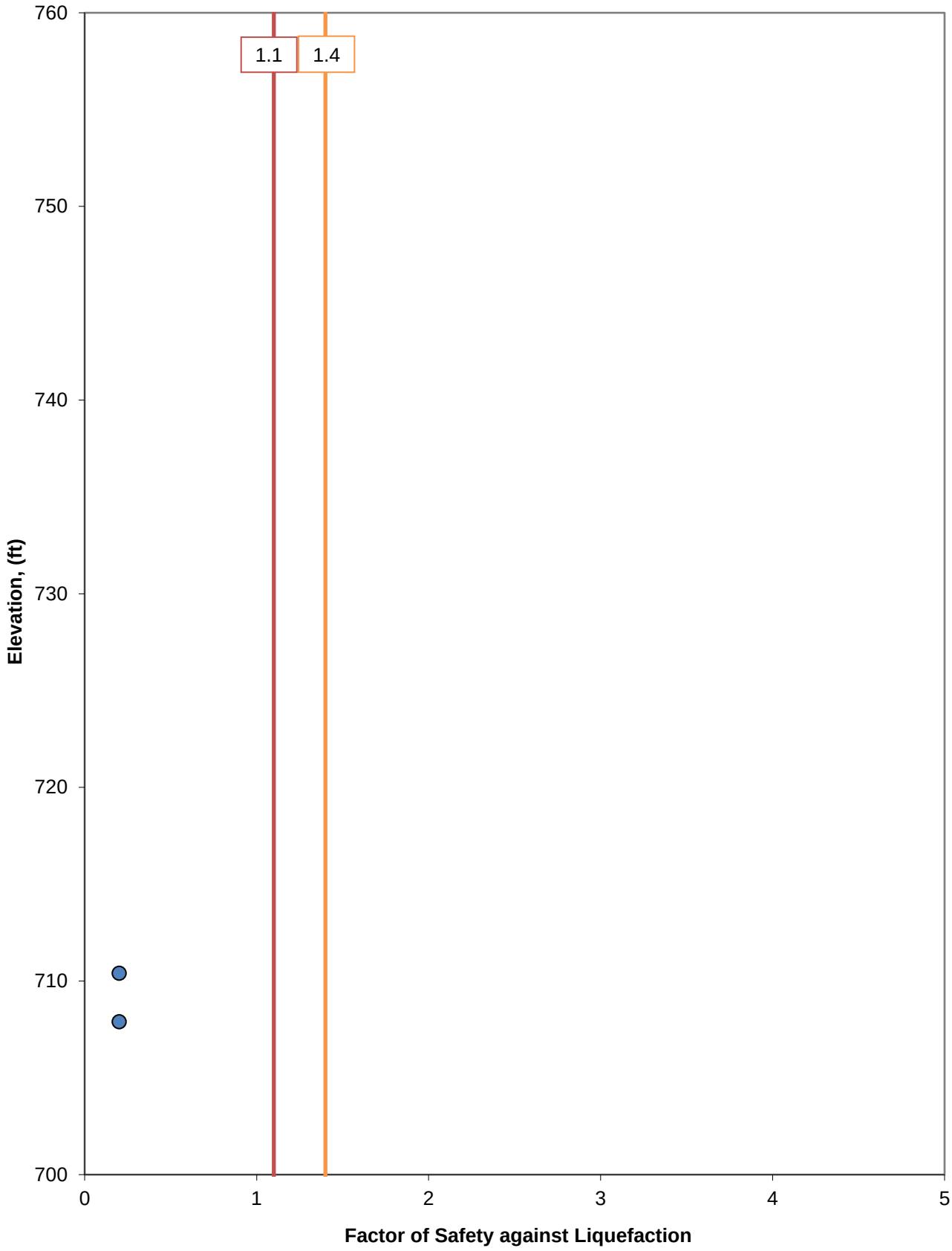




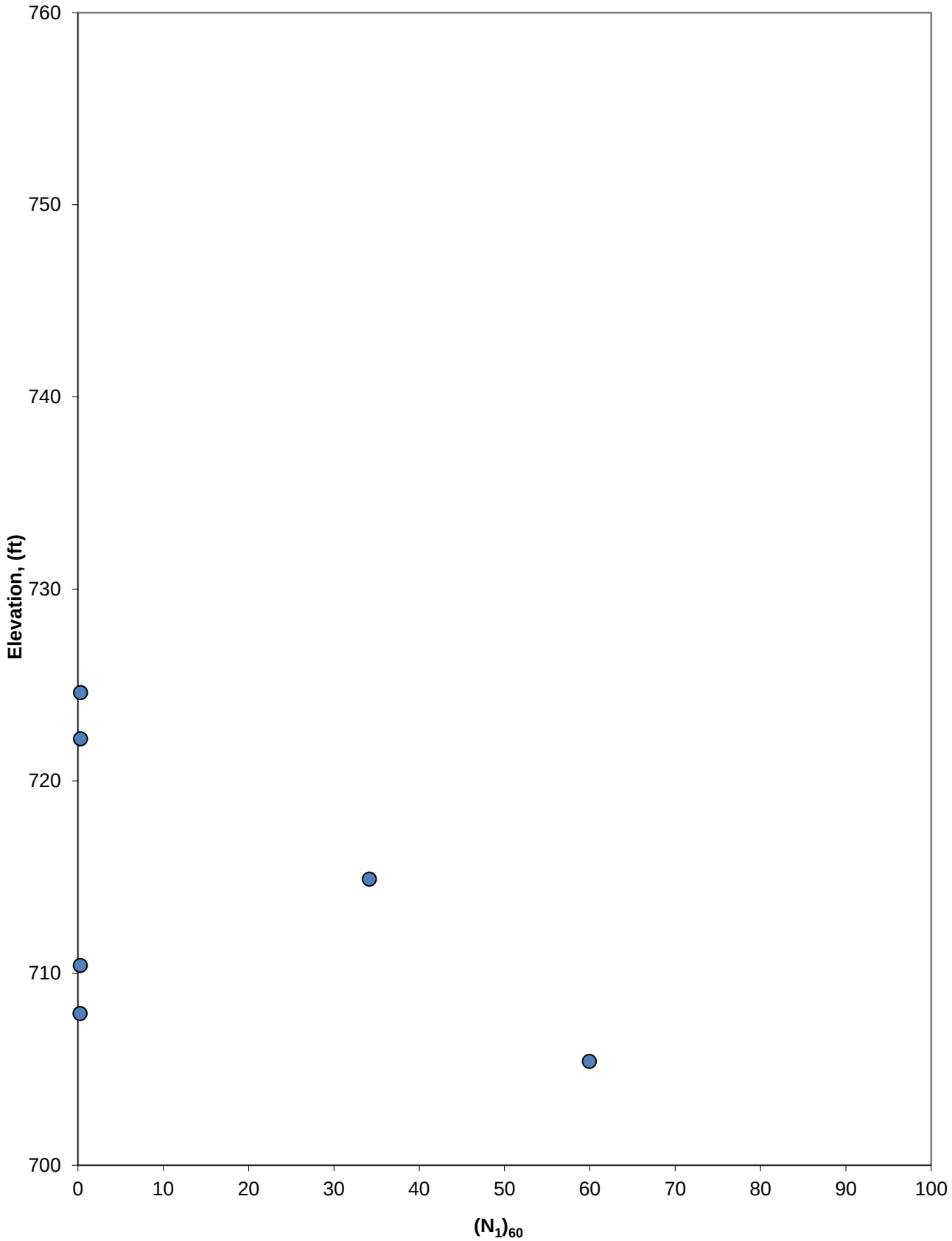
KIF-B12, Liquefaction Triggering Results



KIF TDEC Seismic Stability, Boring ID: KIF-B12, Source = 10 Hz, Mw = 6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



KIF TDEC Seismic Stability, Boring ID: KIF-B12, Source = 10 Hz, Mw = 6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



Project Name = KIF TDEC Seismic Stability

Boring ID = KIF-B13

Boring Location

Northing =

Easting =

OR

Baseline Station =

Offset (+ Right) =

Drilling Information

Boring Inner Diameter (ID) = 4.625 inches

Top of Hole Elevation = 753.2 feet

Water Depth during SPT (negative for U/S borings)= 52 feet

Depth Sampling Began = 0 feet

Total Unit Wt. above 1st SPT = pcf

Assumed Rod Stickup = 5 feet *(Typ assume 5ft)*

E_m Measurement based on Fv method? = 1 (1: Yes, 0: No)

SPT Sampler w/ Liners? = 0 (1: Yes, 0: No) *(Typ. no)*

During EQ Information

Water Depth during EQ (relative to SPT TOH, negative for U/S borings) = 6.1 feet

Final Grade Elevation during EQ = 753.2 feet

Average Total Unit Wt. of Cut/Fill = pcf

Fines Content Correction

Fines content correction for samples with blow counts of zero? = 1 (1: Yes, 0: No)

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile? = 0 (1: Yes, 0: No)

If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile: lishingPond, KIF-B13_NOR

Alpha at each sample depth known? = 1 (1: Yes, 0: No)

If previous answer is No, then enter curve fit parameters below (α vs. depth curve)

If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_α will be one.

m4:
m3:
m2:
m1:
m0:

Associated ground response profile: ishing_Pond, KIF-B13_NOR

Get CSR from shear stress envelope? = 0 (1: Yes, 0: No)

If previous answer is No, then CSR will be calculated using a_{max} and r_d

Max. Shear Stress at each sample depth known? = (1: Yes, 0: No)

If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4:
m3:
m2:
m1:

Earthquake Information

EQ Source (e.g., New Madrid) = 10 Hz

Event (e.g., MCE, 10KEQ, OBE) = Design EQ

a_{max} (g) (top of ground surface) = 0.19

EQ Mag (Mw) = 6

Inputs

Depth of Sample Midpoint (ft.)	SPT N Value	Hammer Efficiency, E_m (%)	Unified Soil Classification	Fines Content (%)	Total Unit Weight (pcf)	Material (optional)	Clay-like / Sand-like Override (optional)	Clay-like Susceptibility (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure during SPT (psf)	Static Pore Water Pressure during EQ (psf)
1.0	39	89.8	SC	41.4	128	Embankment Fill	Clay-like	Not Susceptible		0.014			
3.5	24	89.8	SC	41.4	128	Embankment Fill	Clay-like	Not Susceptible		0.018			
6.0	13	89.8	SC	41.4	128	Embankment Fill	Clay-like	Not Susceptible		0.033			
8.5	32	89.8	SC	41.4	128	Embankment Fill	Clay-like	Not Susceptible		0.046			
11.0	7	89.8	SC	29.7	128	Embankment Fill	Clay-like	Not Susceptible		0.060			
13.5	22	89.8	SC	29.7	128	Embankment Fill	Clay-like	Not Susceptible		0.071			
16.0	6	89.8	SC	29.7	128	Embankment Fill	Clay-like	Not Susceptible		0.083			
18.5	5	89.8	CL	57.1	128	Embankment Fill	Clay-like	Not Susceptible		0.091			
21.0	2	89.8	CL	57.1	128	Embankment Fill	Clay-like	Not Susceptible		0.098			
23.5	2	89.8	CL	57.1	128	Embankment Fill	Clay-like	Not Susceptible		0.106			
26.0	3	89.8	CL	57.1	128	Embankment Fill	Clay-like	Not Susceptible		0.116			
28.5	3	89.8	SM	49	126	Subunit 2	Sand-like			0.123			
33.0	7	89.8	SM	49	126	Subunit 2	Sand-like			0.133			
35.5	6	89.8	SM	23	126	Subunit 2	Sand-like			0.136			
38.0	5	89.8	SM	38.4	126	Subunit 2	Sand-like			0.139			
40.5	3	89.8	SM	39.4	126	Subunit 2	Sand-like			0.141			
43.0	8	89.8	SM	39.4	126	Subunit 2	Sand-like			0.141			
45.5	19	89.8	SM	19	131	Subunit 3	Sand-like			0.142			
48.0	20	89.8	GM	15	131	Subunit 3	Sand-like			0.137			

KIF TDEC Seismic Stability, Boring ID: KIF-B13

Liquefaction Potential Evaluations

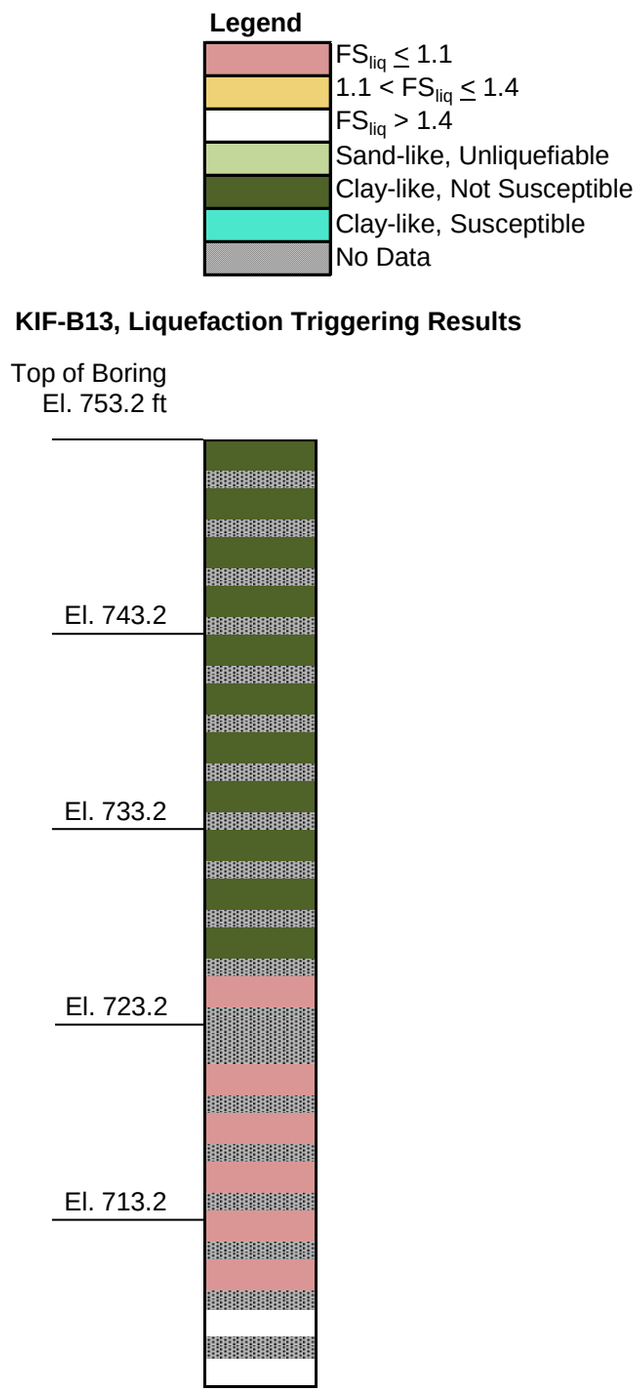
For Coarse Grained Soils

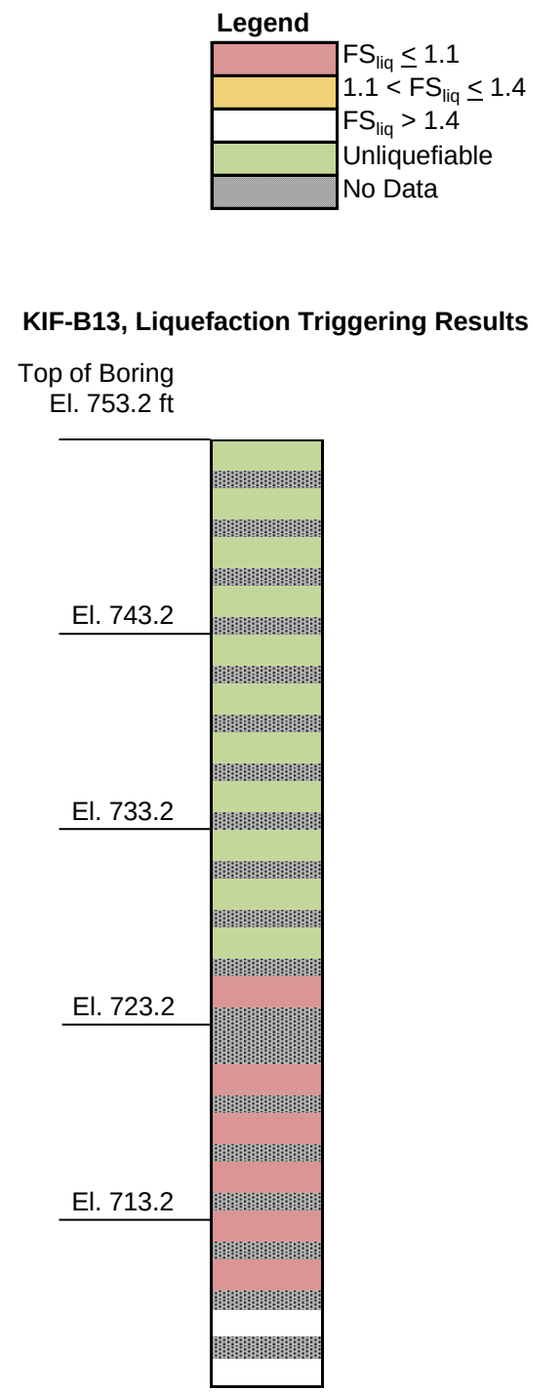
Top of Hole Elevation (ft) =	753.2					Boring ID =	KIF-B13										
begin sampling (depth-ft) =	0.0					Boring Inner Dia. (in) =	4.625										
total unit wt. above 1st SPT (pcf) =	0																
water elevation during SPT (ft) =	701.2	ft *(relative to ground surface during SPT)*							Assumed Rod Stickup =	5.0	feet						
water depth during SPT (ft) =	52.0								E_m Measurement? =	1	(1: Yes, 0: No)						
water elevation during EQ (ft) =	747.1	ft *(relative to ground surface during SPT)*							SPT Sampler w/ Liners? =	0	(1: Yes, 0: No)						
water during EQ (depth-ft) =	6.1	u-top	effstr-top														
vert. total stress above 1st SPT (tsf) =	**0.00**	**0.00**	0.00														

Elev. Of Mid. Pt. of Sample (ft)	Depth of Mid. Pt. of Sample (ft.) z	Unit Weight (pcf) γ_T	Vert. Total Stress during SPT (tsf) σ_v	Static Pore Pressure during SPT (tsf) u	Vert. Eff. Stress during SPT (tsf) σ'_v	SPT N Value N	Hammer Efficiency (%) E_m	Borehole Diameter Correction C_B	Sampler Correction C_s	Rod Length Correction C_R	Overburden Stress Correction Factor C_N	Hammer Energy Correction Factor C_E	Corrected Blow Count N_{60}	Normalized Blow Count $(N_1)_{60}$	Relative Density (%) D_r	Unified Soil Classification	Fines Content (%)
752.2	1.0	128	0.06	0.00	0.06	39	89.8	1.004	1.30	1.00	1.70	1.50	76	130	100	SC	41.4
749.7	3.5	128	0.22	0.00	0.22	24	89.8	1.004	1.30	1.00	1.50	1.50	47	71	100	SC	41.4
747.2	6.0	128	0.38	0.00	0.38	13	89.8	1.004	1.30	1.00	1.35	1.50	25	34	93	SC	41.4
744.7	8.5	128	0.54	0.00	0.54	32	89.8	1.004	1.30	1.00	1.19	1.50	63	74	100	SC	41.4
742.2	11.0	128	0.70	0.00	0.70	7	89.8	1.004	1.14	1.00	1.20	1.50	12	14	66	SC	29.7
739.7	13.5	128	0.86	0.00	0.86	22	89.8	1.004	1.30	1.00	1.05	1.50	43	45	100	SC	29.7
737.2	16.0	128	1.02	0.00	1.02	6	89.8	1.004	1.10	1.00	1.02	1.50	10	10	58	SC	29.7
734.7	18.5	128	1.18	0.00	1.18	5	89.8	1.004	1.10	1.00	0.95	1.50	8	8	54	CL	57.1
732.2	21.0	128	1.34	0.00	1.34	2	89.8	1.004	1.10	1.00	0.87	1.50	3	3	43	CL	57.1
729.7	23.5	128	1.50	0.00	1.50	2	89.8	1.004	1.10	1.00	0.82	1.50	3	3	43	CL	57.1
727.2	26.0	128	1.66	0.00	1.66	3	89.8	1.004	1.10	1.00	0.78	1.50	5	4	45	CL	57.1
724.7	28.5	126	1.82	0.00	1.82	3	89.8	1.004	1.10	1.00	0.74	1.50	5	4	45	SM	49
720.2	33.0	126	2.11	0.00	2.11	7	89.8	1.004	1.10	1.00	0.71	1.50	12	8	55	SM	49
717.7	35.5	126	2.26	0.00	2.26	6	89.8	1.004	1.10	1.00	0.67	1.50	10	7	50	SM	23
715.2	38.0	126	2.42	0.00	2.42	5	89.8	1.004	1.10	1.00	0.64	1.50	8	5	49	SM	38.4
712.7	40.5	126	2.58	0.00	2.58	3	89.8	1.004	1.10	1.00	0.61	1.50	5	3	43	SM	39.4
710.2	43.0	126	2.74	0.00	2.74	8	89.8	1.004	1.10	1.00	0.62	1.50	13	8	55	SM	39.4
707.7	45.5	131	2.90	0.00	2.90	19	89.8	1.004	1.24	1.00	0.69	1.50	36	24	79	SM	19
705.2	48.0	131	3.06	0.00	3.06	20	89.8	1.004	1.25	1.00	0.67	1.50	38	25	79	GM	15

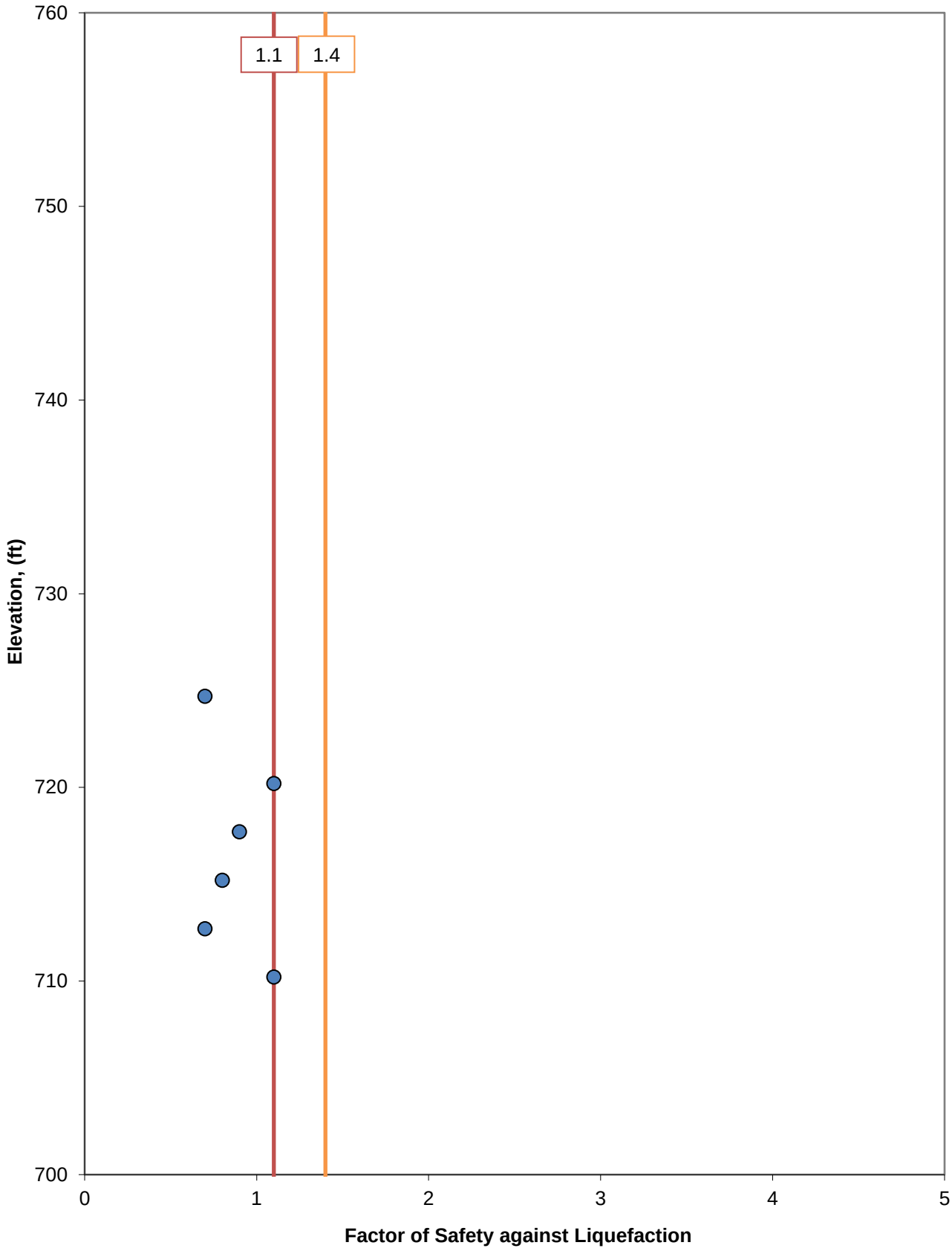
KIF TDEC Seismic Stability, Boring ID: KIF-B13
Liquefaction Potential Evaluations
For Coarse Grained Soils

Depth of Mid. Pt. of Sample (ft.) z	Clean Sand Correction $\Delta(N_1)_{60cs}$	Equivalent Clean Sand N-Value $(N_1)_{60cs}$	Sample Screened for: Clay-like	High Blow Count $(N_1)_{60cs} \geq 32$	Unsaturated	Factor of Safety FS_{liq}	Material (optional)
ft			*Note: A factor of safety shown as "N/A" implies that the soil type is not appropriately evaluated using this methodology. This applies to clay-like soils (typically CL, CH, CL-ML and MH material type), samples with high blow counts, and unsaturated samples.*				
ft	*(relative to ground surface during SPT)*						
pcf							
tsf							
1.0	5.59	135	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**
3.5	5.59	76	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**
6.0	5.59	40	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**
8.5	5.59	80	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**
11.0	5.35	20	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
13.5	5.35	51	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**
16.0	5.35	15	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
18.5	5.61	13	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
21.0	5.61	9	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
23.5	5.61	8	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
26.0	5.61	9	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
28.5	5.61	9	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**
33.0	5.61	14	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**
35.5	4.88	12	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**
38.0	5.56	11	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**
40.5	5.57	9	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**
43.0	5.57	14	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**
45.5	4.30	29	FALSE	FALSE	FALSE	**7.9**	**Subunit 3**
48.0	3.26	29	FALSE	FALSE	FALSE	**7.7**	**Subunit 3**

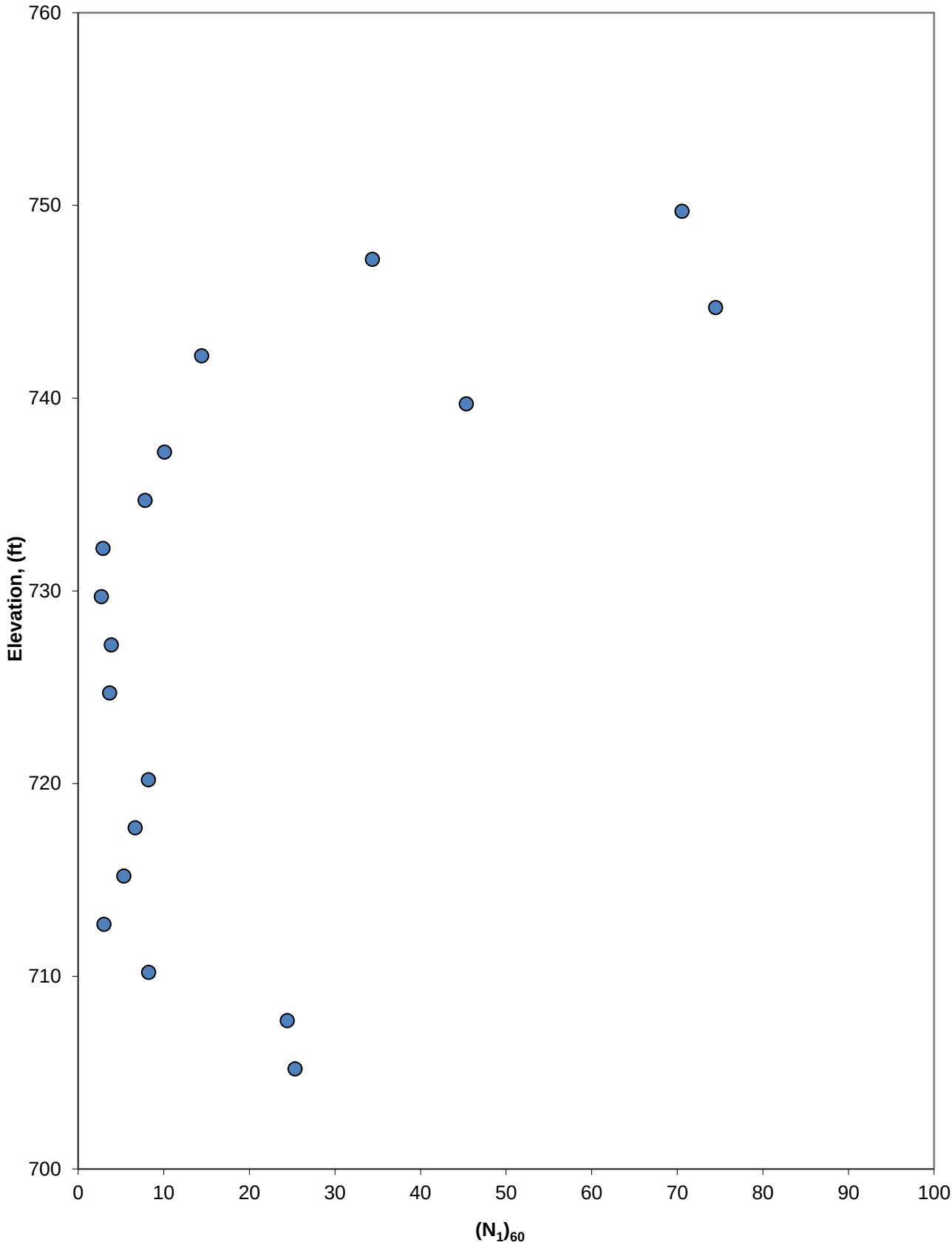

Legend
FSliq ≤ 1.1
1.1 < FSliq ≤ 1.4
FSliq > 1.4
Sand-like, Unliquefiable
Clay-like, Not Susceptible
Clay-like, Susceptible
No Data
KIF-B13, Liquefaction Triggering Results
Top of Boring
El. 753.2 ft
El. 743.2
El. 733.2
El. 723.2
El. 713.2


Legend
FSliq ≤ 1.1
1.1 < FSliq ≤ 1.4
FSliq > 1.4
Unliquefiable
No Data
KIF-B13, Liquefaction Triggering Results
Top of Boring
El. 753.2 ft
El. 743.2
El. 733.2
El. 723.2
El. 713.2

KIF TDEC Seismic Stability, Boring ID: KIF-B13, Source = 10 Hz, Mw = 6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



KIF TDEC Seismic Stability, Boring ID: KIF-B13, Source = 10 Hz, Mw = 6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



Project Name = KIF TDEC Seismic Stability

Boring ID = KIF-B14

Boring Location

Northing =

Easting =

OR

Baseline Station =

Offset (+ Right) =

Drilling Information

Boring Inner Diameter (ID) =	5.875	inches	
Top of Hole Elevation	731	feet	
Water Depth during SPT (negative for U/S borings)=	-4.4	feet	
Depth Sampling Began	0	feet	
Total Unit Wt. above 1st SPT =	62.4	pcf	
Assumed Rod Stickup =	5	feet	*(Typ assume 5ft)*
E_m Measurement based on Fv method? =	1	(1: Yes, 0: No)	
SPT Sampler w/ Liners? =	0	(1: Yes, 0: No)	*(Typ. no)*

During EQ Information

Water Depth during EQ (relative to SPT TOH, negative for U/S borings) =	-6.4	feet
Final Grade Elevation during EQ	731	feet
Average Total Unit Wt. of Cut/Fill		pcf

Fines Content Correction

Fines content correction for samples with blow counts of zero? 1 (1: Yes, 0: No)

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile? 0 (1: Yes, 0: No)

If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile: olishingPond, KIF-B14_NOR

Alpha at each sample depth known? 1 (1: Yes, 0: No)

If previous answer is No, then enter curve fit parameters below (α vs. depth curve)

If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_α will be one.

m4:
m3:
m2:
m1:
m0:

Associated ground response profile: ishing_Pond, KIF-B14_NOR

Get CSR from shear stress envelope? 0 (1: Yes, 0: No)

If previous answer is No, then CSR will be calculated using a_{max} and r_d

Max. Shear Stress at each sample depth known? (1: Yes, 0: No)

If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4:
m3:
m2:
m1:

Earthquake Information

EQ Source (e.g., New Madrid)	10 Hz
Event (e.g., MCE, 10KEQ, OBE)	Design EQ
a_{max} (g) (top of ground surface)	0.31
EQ Mag (Mw)	6

Inputs

Depth of Sample Midpoint (ft.)	SPT N Value	Hammer Efficiency, E_m (%)	Unified Soil Classification	Fines Content (%)	Total Unit Weight (pcf)	Material (optional)	Clay-like / Sand-like Override (optional)	Clay-like Susceptibility (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure during SPT (psf)	Static Pore Water Pressure during EQ (psf)
1.1	0	89.8	CL	52	111	Sediment	Sand-like			0.748			
3.3	2	89.8	CL	52	111	Sediment	Sand-like			0.357			
5.6	2	89.8	SM	42.1	126	Subunit 2	Sand-like			0.256			
8.1	6	89.8	SM	42.1	126	Subunit 2	Sand-like			0.212			
10.6	14	89.8	SM	40.4	126	Subunit 2	Sand-like			0.184			
13.1	2	89.8	SM	40.4	126	Subunit 2	Sand-like			0.166			
15.6	3	89.8	SM	22.1	131	Subunit 3	Sand-like			0.154			
18.1	4	89.8	SM	22.1	131	Subunit 3	Sand-like			0.147			
20.6	7	89.8	SM	22.1	131	Subunit 3	Sand-like			0.140			
23.1	45	89.8	SM	18.2	138	Gravel Residuum	Sand-like			0.135			
25.6	71	89.8	SM	18.2	138	Gravel Residuum	Sand-like			0.131			
28.1	74	89.8	SM	18.2	138	Gravel Residuum	Sand-like			0.137			

KIF TDEC Seismic Stability, Boring ID: KIF-B14

Liquefaction Potential Evaluations

For Coarse Grained Soils

Elev. Of Mid. Pt. of Sample (ft)	Depth of Mid. Pt. of Sample (ft.)	Unit Weight (pcf)	Vert. Total Stress during SPT (tsf)	Static Pore Pressure during SPT (tsf)	Vert. Eff. Stress during SPT (tsf)	SPT N Value	Hammer Efficiency (%)	Borehole Diameter Correction	Sampler Correction	Rod Length Correction	Overburden Stress Correction Factor	Hammer Energy Correction Factor	Corrected Blow Count	Normalized Blow Count	Relative Density (%)	Unified Soil Classification	Fines Content (%)
	z	γ_T	σ_v	u	σ'_v	N	E_m	C_B	C_s	C_R	C_N	C_E	N_{60}	$(N_1)_{60}$	D_r		

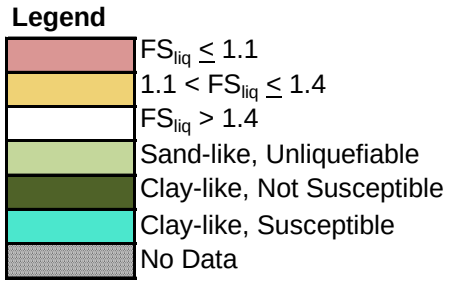
			Top of Hole Elevation (ft)	731.0				Boring ID =	KIF-B14								
			begin sampling (depth-ft)	0.0				Boring Inner Dia. (in) =	5.875								
			total unit wt. above 1st SPT (pcf) =	62													
			water elevation during SPT (ft) =	735.4	ft *(relative to ground surface during SPT)*				Assumed Rod Stickup =	5.0	feet						
			water depth during SPT (ft) =	-4.4					E_m Measurement? =	1	(1: Yes, 0: No)						
			water elevation during EQ (ft) =	737.4	ft *(relative to ground surface during SPT)*				SPT Sampler w/ Liners? =	0	(1: Yes, 0: No)						
			water during EQ (depth-ft) =	-6.4	u-top	effstr-top											
			vert. total stress above 1st SPT (tsf) =	**0.14**	**0.14**	0.00											
729.9	1.1	111		0.20	0.17	0.03	0	89.8	1.046	1.10	1.00	1.70	1.50	0	0	36	CL	52
727.7	3.3	111		0.32	0.24	0.08	2	89.8	1.046	1.10	1.00	1.70	1.50	3	6	50	CL	52
725.4	5.6	126		0.46	0.31	0.14	2	89.8	1.046	1.10	1.00	1.70	1.50	3	6	50	SM	42.1
722.9	8.1	126		0.61	0.39	0.22	6	89.8	1.046	1.19	1.00	1.70	1.50	11	19	73	SM	42.1
720.4	10.6	126		0.77	0.47	0.30	14	89.8	1.046	1.30	1.00	1.40	1.50	28	40	99	SM	40.4
717.9	13.1	126		0.93	0.55	0.38	2	89.8	1.046	1.10	1.00	1.70	1.50	3	6	50	SM	40.4
715.4	15.6	131		1.09	0.62	0.47	3	89.8	1.046	1.10	1.00	1.52	1.50	5	8	52	SM	22.1
712.9	18.1	131		1.25	0.70	0.55	4	89.8	1.046	1.10	1.00	1.38	1.50	7	9	56	SM	22.1
710.4	20.6	131		1.42	0.78	0.64	7	89.8	1.046	1.16	1.00	1.25	1.50	13	16	67	SM	22.1
707.9	23.1	138		1.59	0.86	0.73	45	89.8	1.046	1.30	1.00	1.10	1.50	92	101	100	SM	18.2
705.4	25.6	138		1.76	0.94	0.82	71	89.8	1.046	1.30	1.00	1.07	1.50	144	154	100	SM	18.2
702.9	28.1	138		1.93	1.01	0.92	74	89.8	1.046	1.30	1.00	1.04	1.50	151	156	100	SM	18.2

KIF TDEC Seismic Stability, Boring ID: KIF-B14
Liquefaction Potential Evaluations
For Coarse Grained Soils

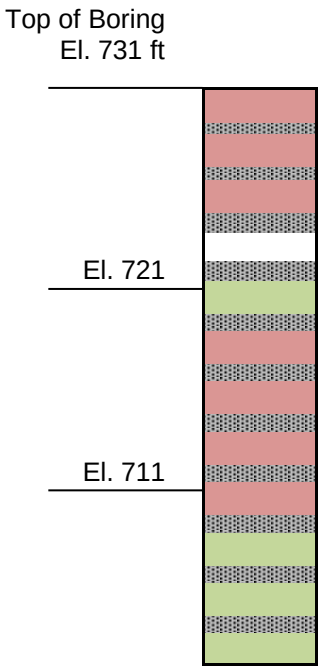
Depth of Mid. Pt. of Sample (ft.) z	Clean Sand Correction $\Delta(N_1)_{60cs}$	Equivalent Clean Sand N-Value $(N_1)_{60cs}$	Sample Screened for: Clay-like	High Blow Count $(N_1)_{60cs} \geq 32$	Unsaturated	Factor of Safety FS_{liq}	Material (optional)
ft							
ft	*(relative to ground surface during SPT)*						
pcf							
tsf							

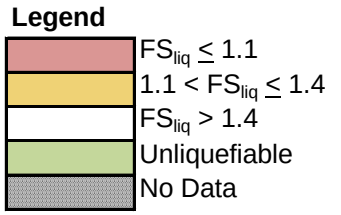
Note: A factor of safety shown as "N/A" implies that the soil type is not appropriately evaluated using this methodology. This applies to clay-like soils (typically CL, CH, CL-ML and MH material type), samples with high blow counts, and unsaturated samples.

1.1	5.61	6	FALSE	FALSE	FALSE	**0.0**	**Sediment**
3.3	5.61	11	FALSE	FALSE	FALSE	**0.2**	**Sediment**
5.6	5.59	11	FALSE	FALSE	FALSE	**0.3**	**Subunit 2**
8.1	5.59	25	FALSE	FALSE	FALSE	**1.7**	**Subunit 2**
10.6	5.58	45	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**
13.1	5.58	11	FALSE	FALSE	FALSE	**0.3**	**Subunit 2**
15.6	4.78	13	FALSE	FALSE	FALSE	**0.4**	**Subunit 3**
18.1	4.78	14	FALSE	FALSE	FALSE	**0.5**	**Subunit 3**
20.6	4.78	21	FALSE	FALSE	FALSE	**1.1**	**Subunit 3**
23.1	4.13	105	FALSE	TRUE	FALSE	**N/A**	**Gravel Residuum**
25.6	4.13	159	FALSE	TRUE	FALSE	**N/A**	**Gravel Residuum**
28.1	4.13	161	FALSE	TRUE	FALSE	**N/A**	**Gravel Residuum**

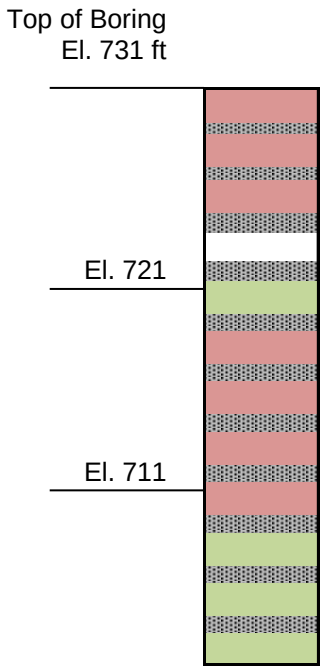


KIF-B14, Liquefaction Triggering Results

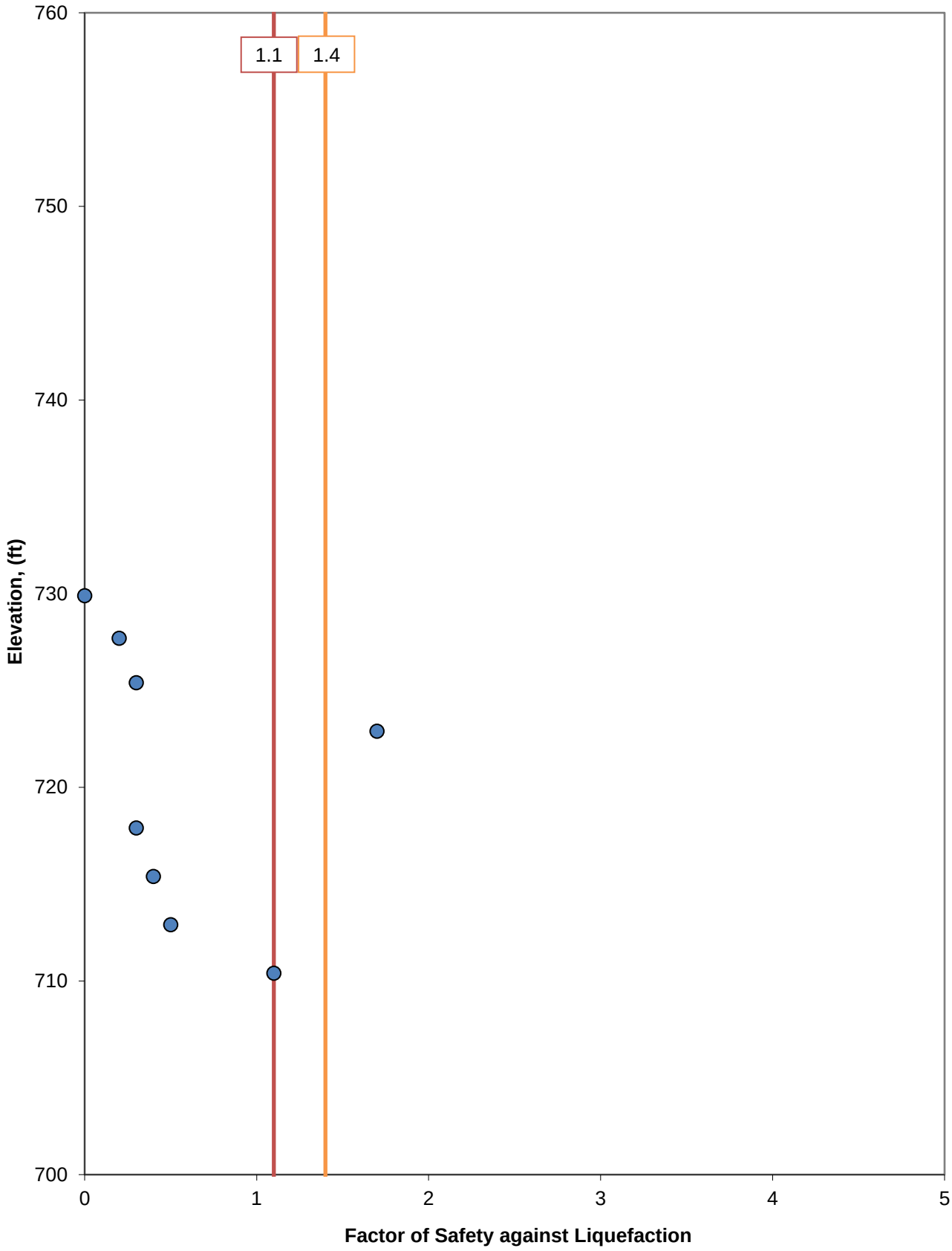




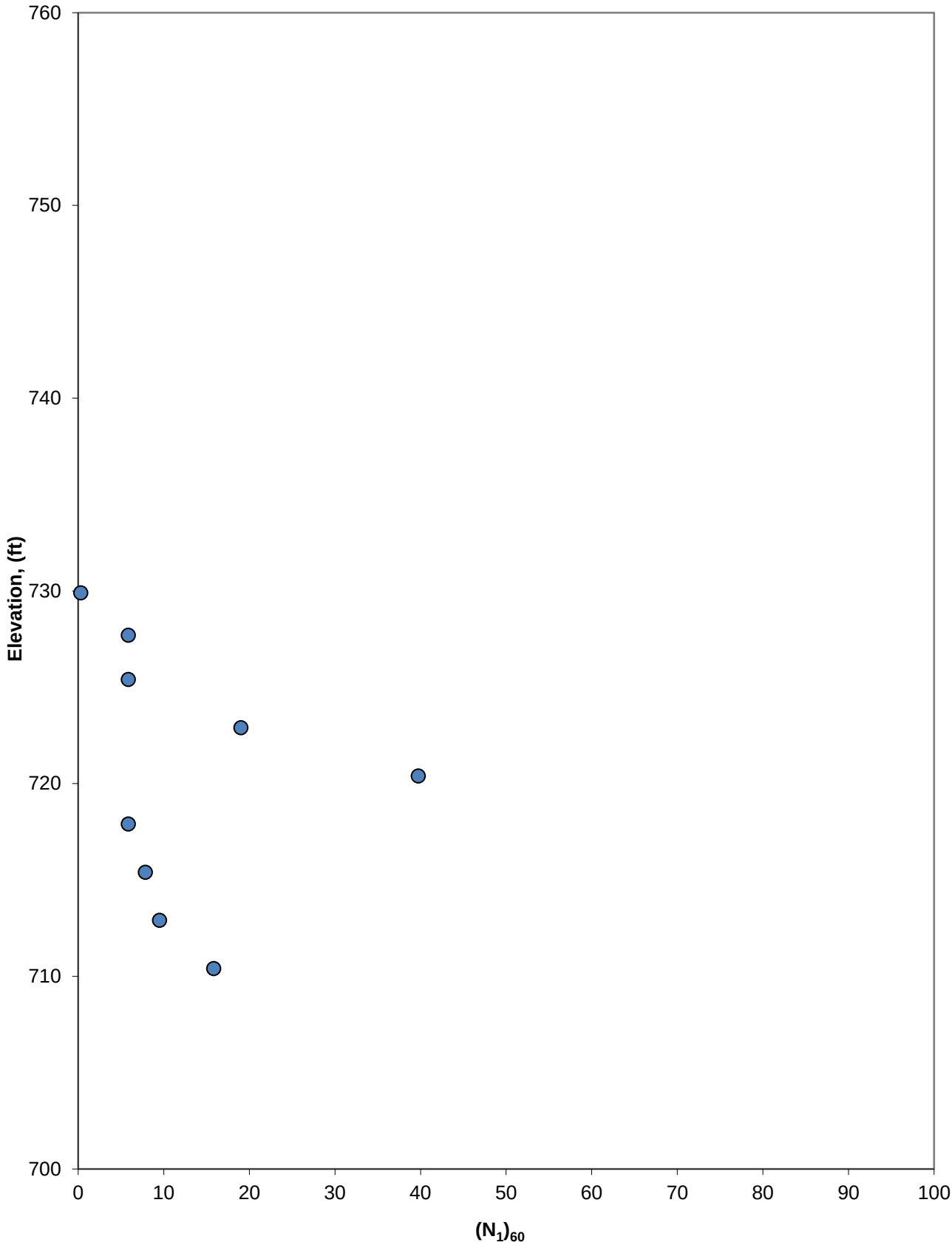
KIF-B14, Liquefaction Triggering Results



KIF TDEC Seismic Stability, Boring ID: KIF-B14, Source = 10 Hz, Mw = 6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



KIF TDEC Seismic Stability, Boring ID: KIF-B14, Source = 10 Hz, Mw = 6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



Project Name = KIF TDEC Seismic Stability
Boring ID = KIF-B15

Boring Location

Northing =
Easting =

OR

Baseline Station =
Offset (+ Right) =

Drilling Information

Boring Inner Diameter (ID) = 5.875 inches
Top of Hole Elevation 727.6 feet
Water Depth during SPT (negative for U/S borings)= -8.6 feet
Depth Sampling Began 0 feet
Total Unit Wt. above 1st SPT = 62.4 pcf
Assumed Rod Stickup = 5 feet *(Typ assume 5ft)*
E_m Measurement based on Fv method? = 1 (1: Yes, 0: No)
SPT Sampler w/ Liners? = 0 (1: Yes, 0: No) *(Typ. no)*

During EQ Information

Water Depth during EQ (relative to SPT TOH, negative for U/S borings) = -9.8 feet
Final Grade Elevation during EQ 727.6 feet
Average Total Unit Wt. of Cut/Fill pcf

Fines Content Correction

Fines content correction for samples with blow counts of zero? 1 (1: Yes, 0: No)

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile? 0 (1: Yes, 0: No)
If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile: olishingPond, KIF-B15_NOR
Alpha at each sample depth known? 1 (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (α vs. depth curve)
If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_α will be one.

m4:
m3:
m2:
m1:
m0:

Associated ground response profile: ishing_Pond, KIF-B15_NOR
Get CSR from shear stress envelope? 0 (1: Yes, 0: No)
If previous answer is No, then CSR will be calculated using a_{max} and r_d
Max. Shear Stress at each sample depth known? (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4:
m3:
m2:
m1:

Earthquake Information

EQ Source (e.g., New Madrid) 10 Hz
Event (e.g., MCE, 10KEQ, OBE) Design EQ
a_{max} (g) (top of ground surface) 0.32
EQ Mag (Mw) 6

Inputs

Depth of Sample Midpoint (ft.)	SPT N Value	Hammer Efficiency, E_m (%)	Unified Soil Classification	Fines Content (%)	Total Unit Weight (pcf)	Material (optional)	Clay-like / Sand-like Override (optional)	Clay-like Susceptibility (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure during SPT (psf)	Static Pore Water Pressure during EQ (psf)
1.5	0	89.8	CL	52	111	Sediment	Sand-like			0.074			
6.0	6	89.8	SM	32.9	126	Subunit 2	Sand-like			0.055			
8.5	7	89.8	SM	32.9	126	Subunit 2	Sand-like			0.056			
11.0	2	89.8	SM	32.9	126	Subunit 2	Sand-like			0.057			
13.5	2	89.8	SM	21.3	131	Subunit 3	Sand-like			0.059			
16.0	5	89.8	SM	13.3	131	Subunit 3	Sand-like			0.060			
18.5	48	89.8	SM	13.3	131	Subunit 3	Sand-like			0.062			

KIF TDEC Seismic Stability, Boring ID: KIF-B15

Liquefaction Potential Evaluations

For Coarse Grained Soils

Elev. Of Mid. Pt. of Sample (ft)	Depth of Mid. Pt. of Sample (ft.)	Unit Weight (pcf)	Vert. Total Stress during SPT (tsf)	Static Pore Pressure during SPT (tsf)	Vert. Eff. Stress during SPT (tsf)	SPT N Value	Hammer Efficiency (%)	Borehole Diameter Correction	Sampler Correction	Rod Length Correction	Overburden Stress Correction Factor	Hammer Energy Correction Factor	Corrected Blow Count	Normalized Blow Count	Relative Density (%)	Unified Soil Classification	Fines Content (%)
	z	γ_T	σ_v	u	σ'_v	N	E_m	C_B	C_s	C_R	C_N	C_E	N_{60}	$(N_1)_{60}$	D_r		

Top of Hole Elevation (ft)	727.6		Boring ID =	**KIF-B15**	
begin sampling (depth-ft)	0.0		Boring Inner Dia. (in) =	5.875	
total unit wt. above 1st SPT (pcf) =	62				
water elevation during SPT (ft) =	736.2	ft *(relative to ground surface during SPT)*	Assumed Rod Stickup =	5.0	feet
water depth during SPT (ft) =	-8.6		E_m Measurement? =	1	(1: Yes, 0: No)
water elevation during EQ (ft) =	737.4	ft *(relative to ground surface during SPT)*	SPT Sampler w/ Liners? =	0	(1: Yes, 0: No)
water during EQ (depth-ft) =	-9.8	u-top / effstr-top			
vert. total stress above 1st SPT (tsf) =	**0.27**	**0.27** / 0.00			

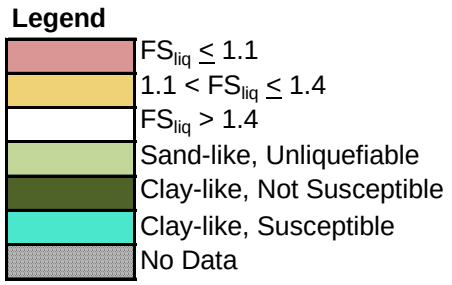
726.1	1.5	111	0.35	0.32	0.04	0	89.8	1.046	1.10	1.00	1.70	1.50	0	0	36	CL	52
721.6	6.0	126	0.62	0.46	0.16	6	89.8	1.046	1.19	1.00	1.70	1.50	11	19	73	SM	32.9
719.1	8.5	126	0.78	0.53	0.24	7	89.8	1.046	1.23	1.00	1.70	1.50	13	23	79	SM	32.9
716.6	11.0	126	0.93	0.61	0.32	2	89.8	1.046	1.10	1.00	1.70	1.50	3	6	50	SM	32.9
714.1	13.5	131	1.09	0.69	0.40	2	89.8	1.046	1.10	1.00	1.67	1.50	3	6	48	SM	21.3
711.6	16.0	131	1.26	0.77	0.49	5	89.8	1.046	1.13	1.00	1.45	1.50	9	13	58	SM	13.3
709.1	18.5	131	1.42	0.85	0.58	48	89.8	1.046	1.30	1.00	1.17	1.50	98	115	100	SM	13.3

KIF TDEC Seismic Stability, Boring ID: KIF-B15
Liquefaction Potential Evaluations
For Coarse Grained Soils

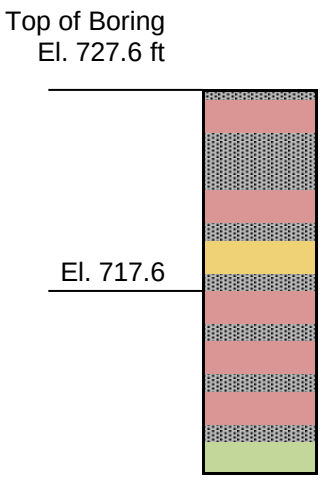
Depth of Mid. Pt. of Sample (ft.) z	Clean Sand Correction $\Delta(N_1)_{60cs}$	Equivalent Clean Sand N-Value $(N_1)_{60cs}$	Sample Screened for: Clay-like	High Blow Count $(N_1)_{60cs} \geq 32$	Unsaturated	Factor of Safety FS_{liq}	Material (optional)
	ft						
	ft	*(relative to ground surface during SPT)*					
	pcf						
	tsf						

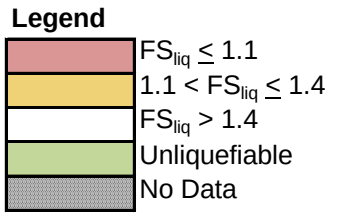
Note: A factor of safety shown as "N/A" implies that the soil type is not appropriately evaluated using this methodology. This applies to clay-like soils (typically CL, CH, CL-ML and MH material type), samples with high blow counts, and unsaturated samples.

1.5	5.61	6	FALSE	FALSE	FALSE	**0.0**	**Sediment**
6.0	5.46	24	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**
8.5	5.46	28	FALSE	FALSE	FALSE	**1.4**	**Subunit 2**
11.0	5.46	11	FALSE	FALSE	FALSE	**0.3**	**Subunit 2**
13.5	4.68	10	FALSE	FALSE	FALSE	**0.3**	**Subunit 3**
16.0	2.63	15	FALSE	FALSE	FALSE	**0.4**	**Subunit 3**
18.5	2.63	117	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**

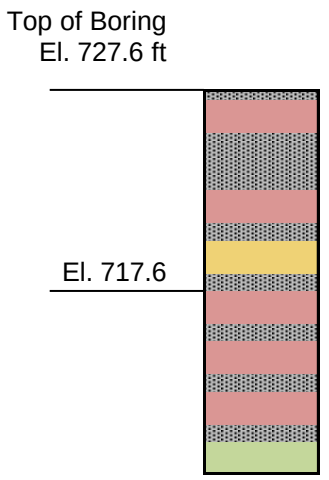


KIF-B15, Liquefaction Triggering Results

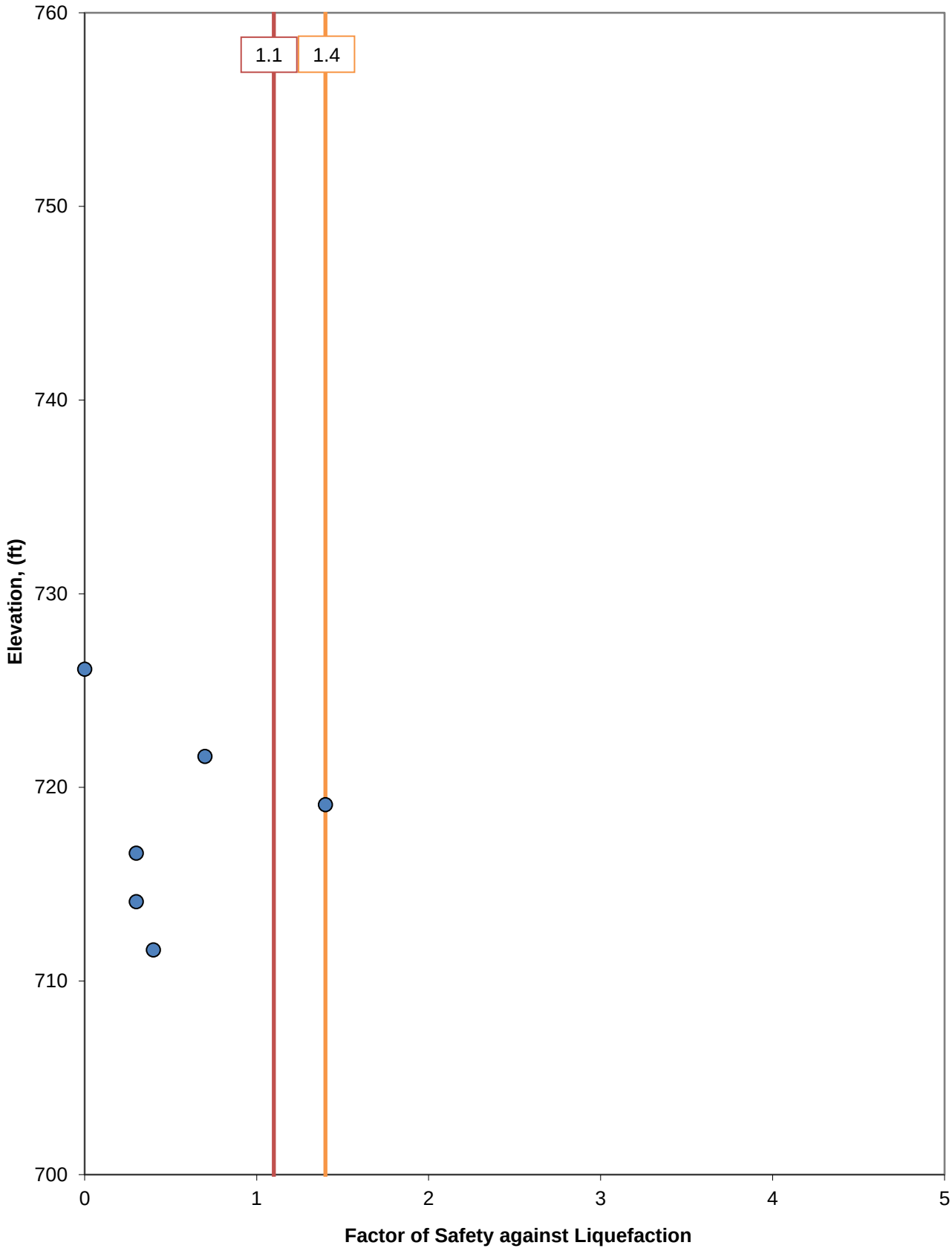




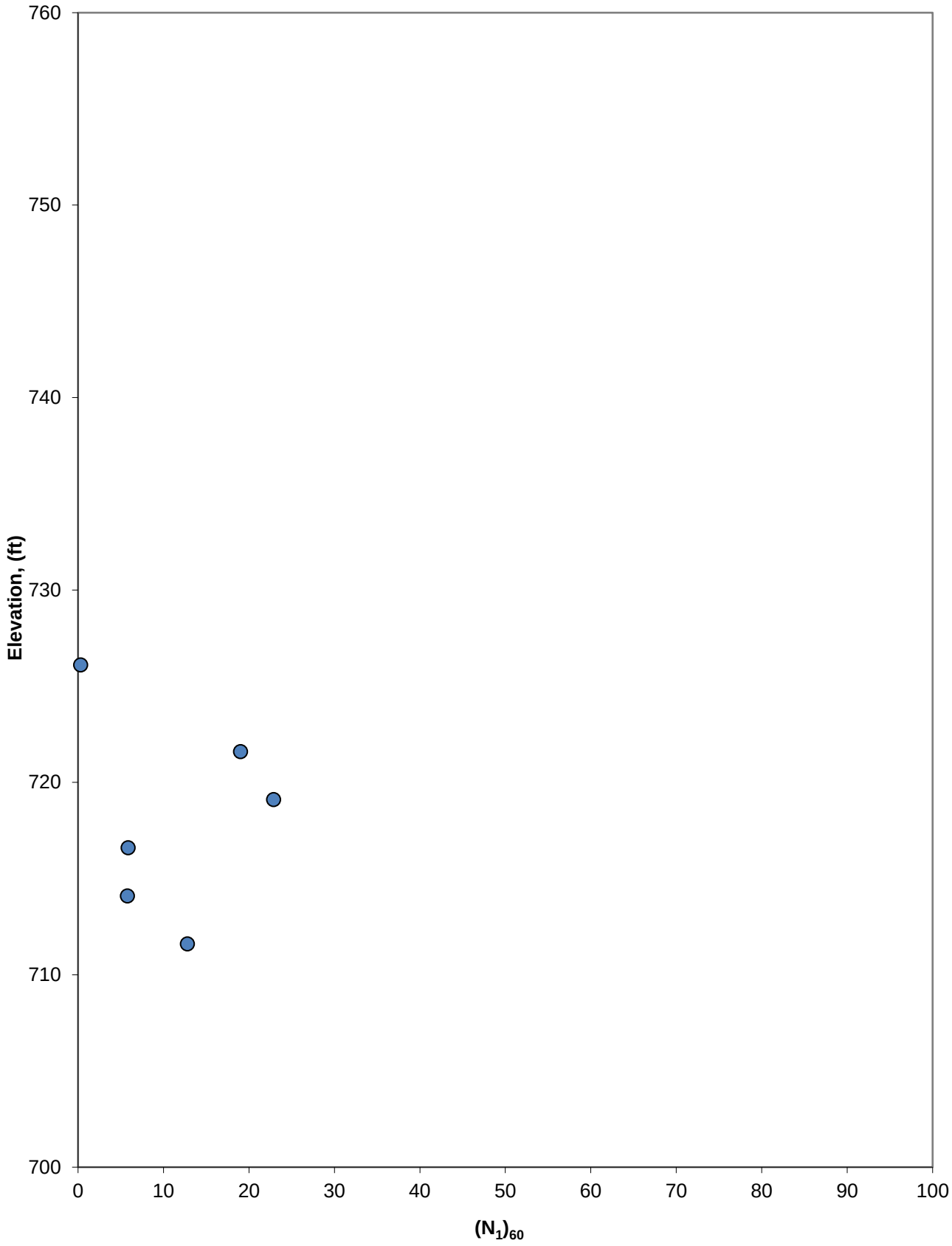
KIF-B15, Liquefaction Triggering Results



KIF TDEC Seismic Stability, Boring ID: KIF-B15, Source = 10 Hz, Mw = 6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



KIF TDEC Seismic Stability, Boring ID: KIF-B15, Source = 10 Hz, Mw = 6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



Project Name = KIF TDEC Seismic Stability
Boring ID = KIF-B16

Boring Location

Northing =
Easting =

OR

Baseline Station =
Offset (+ Right) =

Drilling Information

Boring Inner Diameter (ID) =	5.875	inches	
Top of Hole Elevation	726.5	feet	
Water Depth during SPT (negative for U/S borings)=	-9.1	feet	
Depth Sampling Began	0	feet	
Total Unit Wt. above 1st SPT =	62.4	pcf	
Assumed Rod Stickup =	5	feet	*(Typ assume 5ft)*
E_m Measurement based on Fv method? =	1	(1: Yes, 0: No)	
SPT Sampler w/ Liners? =	0	(1: Yes, 0: No)	*(Typ. no)*

During EQ Information

Water Depth during EQ (relative to SPT TOH, negative for U/S borings) =	-10.9	feet
Final Grade Elevation during EQ	726.5	feet
Average Total Unit Wt. of Cut/Fill		pcf

Fines Content Correction

Fines content correction for samples with blow counts of zero? 1 (1: Yes, 0: No)

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile? 0 (1: Yes, 0: No)
If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile: olishingPond, KIF-B16_NOR
Alpha at each sample depth known? 1 (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (α vs. depth curve)
If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_α will be one.

m4:
m3:
m2:
m1:
m0:

Associated ground response profile: ishing_Pond, KIF-B16_NOR
Get CSR from shear stress envelope? 0 (1: Yes, 0: No)
If previous answer is No, then CSR will be calculated using a_{max} and r_d
Max. Shear Stress at each sample depth known? (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4:
m3:
m2:
m1:

Earthquake Information

EQ Source (e.g., New Madrid)	10 Hz
Event (e.g., MCE, 10KEQ, OBE)	Design EQ
a_{max} (g) (top of ground surface)	0.31
EQ Mag (Mw)	6

Inputs

Depth of Sample Midpoint (ft.)	SPT N Value	Hammer Efficiency, E_m (%)	Unified Soil Classification	Fines Content (%)	Total Unit Weight (pcf)	Material (optional)	Clay-like / Sand-like Override (optional)	Clay-like Susceptibility (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure during SPT (psf)	Static Pore Water Pressure during EQ (psf)
1.0	0	89.8	CL	52	111	Sediment	Sand-like			0.093			
5.5	3	89.8	SM	39.8	126	Subunit 2				0.036			
8.0	7	89.8	SM	29.2	126	Subunit 2				0.034			
10.5	2	89.8	SM	29.3	131	Subunit 3				0.034			
13.0	4	89.8	SM	17.1	131	Subunit 3				0.041			
15.5	4	89.8	SM	17.1	131	Subunit 3				0.036			

KIF TDEC Seismic Stability, Boring ID: KIF-B16

Liquefaction Potential Evaluations

For Coarse Grained Soils

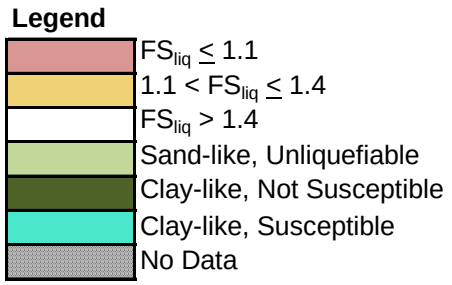
Top of Hole Elevation (ft)			726.5					Boring ID =	KIF-B16								
begin sampling (depth-ft)			0.0					Boring Inner Dia. (in) =	5.875								
total unit wt. above 1st SPT (pcf) =			62														
water elevation during SPT (ft) =			735.6	ft *(relative to ground surface during SPT)*						Assumed Rod Stickup =	5.0	feet					
water depth during SPT (ft) =			-9.1							E_m Measurement? =	1	(1: Yes, 0: No)					
water elevation during EQ (ft) =			737.4	ft *(relative to ground surface during SPT)*						SPT Sampler w/ Liners? =	0	(1: Yes, 0: No)					
water during EQ (depth-ft) =			-10.9	u-top	effstr-top												
vert. total stress above 1st SPT (tsf) =			**0.28**	**0.28**	0.00												
Elev. Of Mid. Pt. of Sample (ft)	Depth of Mid. Pt. of Sample (ft.) z	Unit Weight (pcf) γ_T	Vert. Total Stress during SPT (tsf) σ_v	Static Pore Pressure during SPT (tsf) u	Vert. Eff. Stress during SPT (tsf) σ'_v	SPT N Value N	Hammer Efficiency (%) E_m	Borehole Diameter Correction C_B	Sampler Correction C_s	Rod Length Correction C_R	Overburden Stress Correction Factor C_N	Hammer Energy Correction Factor C_E	Corrected Blow Count N_{60}	Normalized Blow Count $(N_1)_{60}$	Relative Density (%) D_r	Unified Soil Classification	Fines Content (%)
725.5	1.0	111	0.34	0.32	0.02	0	89.8	1.046	1.10	1.00	1.70	1.50	0	0	36	CL	52
721.0	5.5	126	0.61	0.46	0.15	3	89.8	1.046	1.10	1.00	1.70	1.50	5	9	56	SM	39.8
718.5	8.0	126	0.76	0.53	0.23	7	89.8	1.046	1.23	1.00	1.70	1.50	13	23	78	SM	29.2
716.0	10.5	131	0.92	0.61	0.31	2	89.8	1.046	1.10	1.00	1.70	1.50	3	6	49	SM	29.3
713.5	13.0	131	1.09	0.69	0.40	4	89.8	1.046	1.11	1.00	1.61	1.50	7	11	57	SM	17.1
711.0	15.5	131	1.25	0.77	0.48	4	89.8	1.046	1.10	1.00	1.47	1.50	7	10	55	SM	17.1

KIF TDEC Seismic Stability, Boring ID: KIF-B16
Liquefaction Potential Evaluations
For Coarse Grained Soils

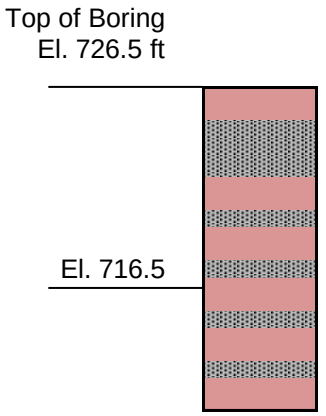
Depth of Mid. Pt. of Sample (ft.) z	Clean Sand Correction $\Delta(N_1)_{60cs}$	Equivalent Clean Sand N-Value $(N_1)_{60cs}$	Sample Screened for: Clay-like	High Blow Count $(N_1)_{60cs} \geq 32$	Unsaturated	Factor of Safety FS_{liq}	Material (optional)
	ft						
	ft *(relative to ground surface during SPT)*						
	pcf						
	tsf						

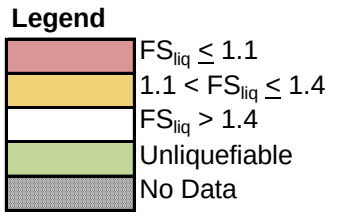
Note: A factor of safety shown as "N/A" implies that the soil type is not appropriately evaluated using this methodology. This applies to clay-like soils (typically CL, CH, CL-ML and MH material type), samples with high blow counts, and unsaturated samples.

1.0	5.61	6	FALSE	FALSE	FALSE	**0.0**	**Sediment**
5.5	5.57	14	FALSE	FALSE	FALSE	**0.2**	**Subunit 2**
8.0	5.33	28	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**
10.5	5.33	11	FALSE	FALSE	FALSE	**0.3**	**Subunit 3**
13.0	3.88	15	FALSE	FALSE	FALSE	**0.4**	**Subunit 3**
15.5	3.88	14	FALSE	FALSE	FALSE	**0.4**	**Subunit 3**

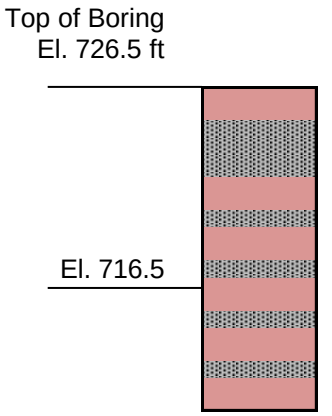


KIF-B16, Liquefaction Triggering Results

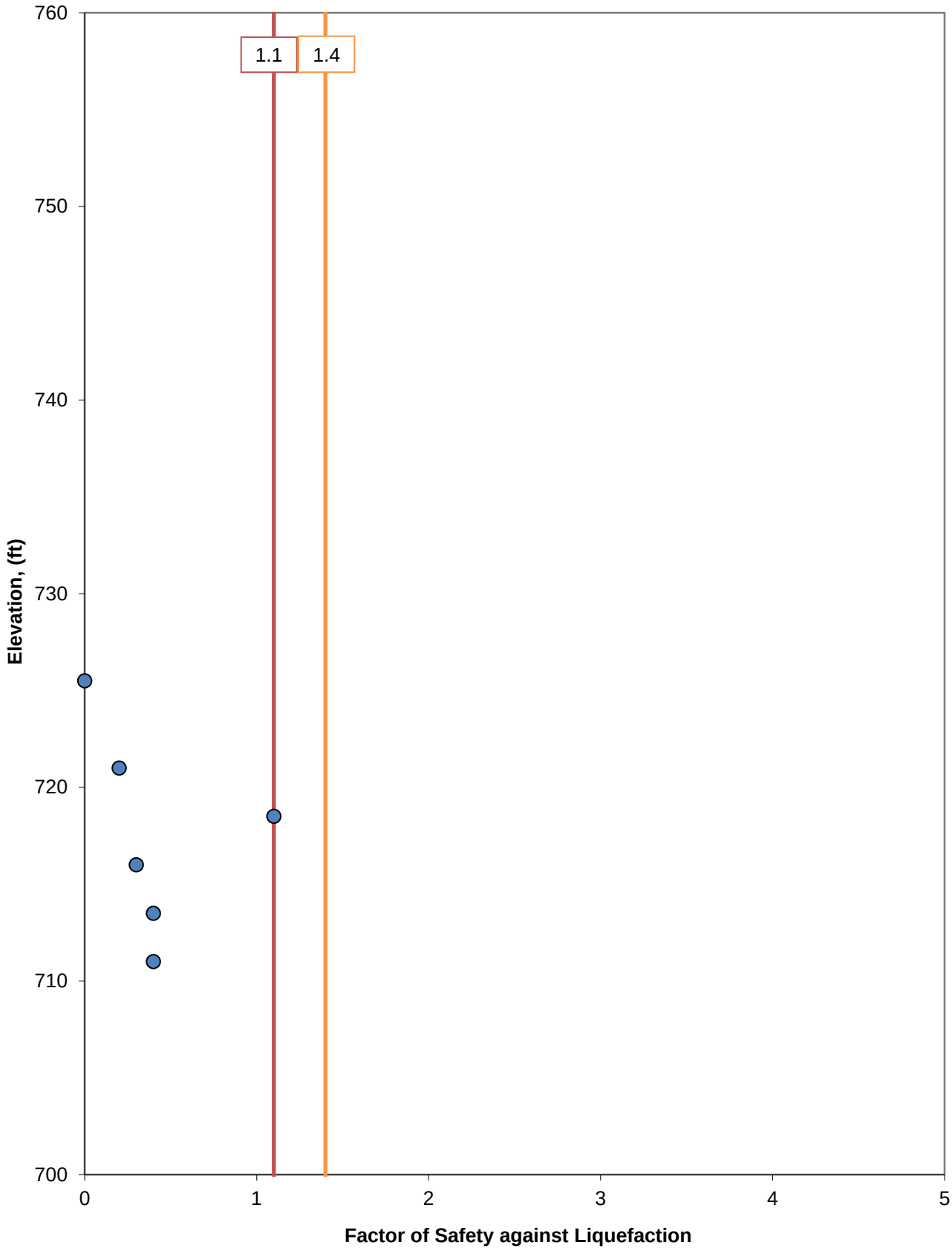




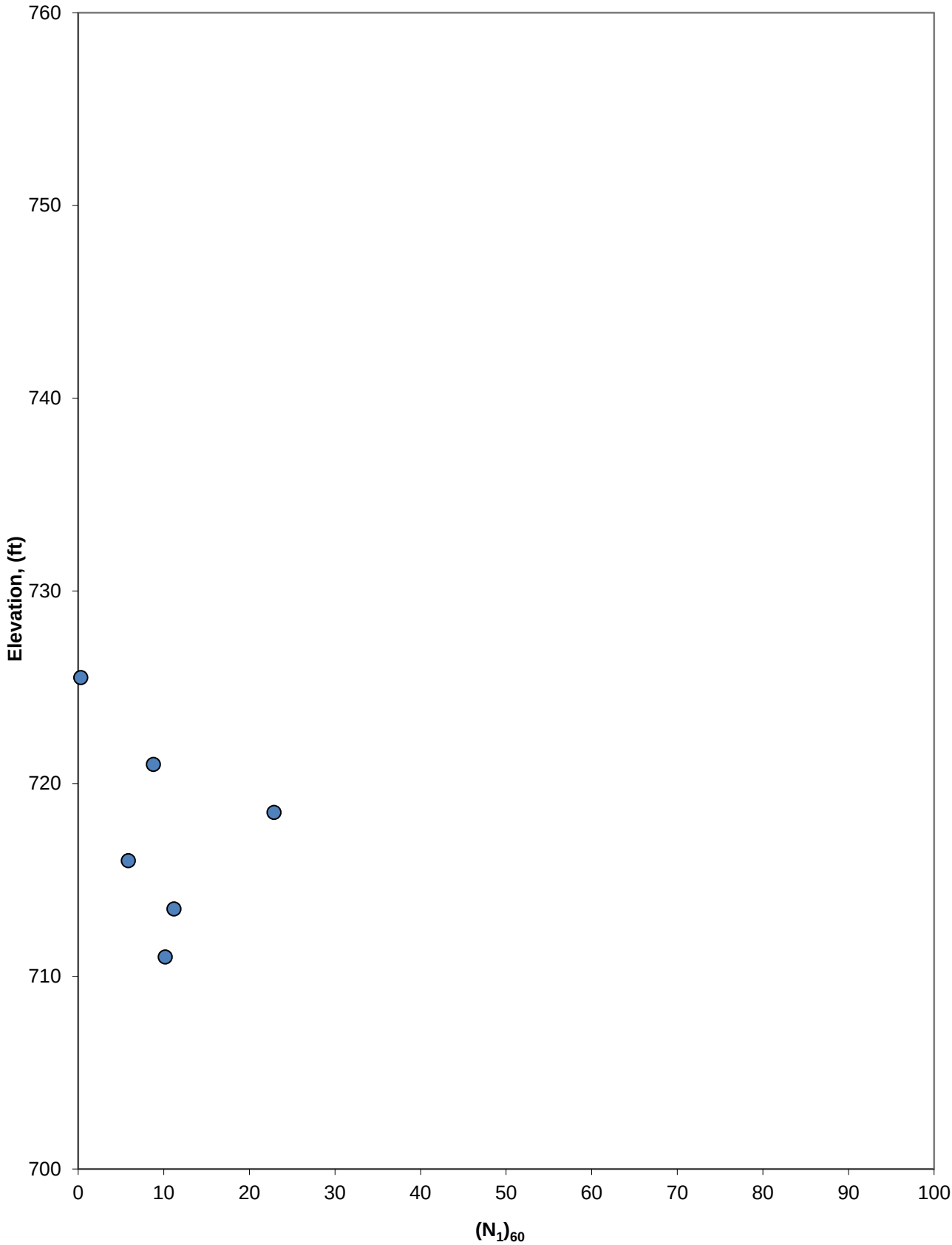
KIF-B16, Liquefaction Triggering Results



KIF TDEC Seismic Stability, Boring ID: KIF-B16, Source = 10 Hz, Mw = 6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



KIF TDEC Seismic Stability, Boring ID: KIF-B16, Source = 10 Hz, Mw = 6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



Project Name = KIF TDEC Stability
Boring ID = KIF-A1

Boring Location

Northing = 553306.7
Easting = 2439676.7

OR

Baseline Station =
Offset (+ Right) =

Drilling Information

Boring Inner Diameter (ID) = 3.25 inches
Top of Hole Elevation 757 feet
Water Depth during SPT (negative for U/S borings)= 15.5 feet
Depth Sampling Began 0 feet
Total Unit Wt. above 1st SPT = 120 pcf
Assumed Rod Stickup = 5 feet *(Typ assume 5ft)*
E_m Measurement based on Fv method? = 1 (1: Yes, 0: No)
SPT Sampler w/ Liners? = 0 (1: Yes, 0: No) *(Typ. no)*

During EQ Information

Water Depth during EQ (relative to SPT TOH, negative for U/S borings) = 11.7 feet
Final Grade Elevation during EQ 762.7 feet
Average Total Unit Wt. of Cut/Fill 121 pcf

Fines Content Correction

Fines content correction for samples with blow counts of zero? 1 (1: Yes, 0: No)

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile? 0 (1: Yes, 0: No)
If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile: Section_AA, KIF-A1_NOR
Alpha at each sample depth known? 1 (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (α vs. depth curve)
If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_α will be one.

m4:
m3:
m2:
m1:
m0:

Associated ground response profile: Section_AA, KIF-A1_NOR
Get CSR from shear stress envelope? 0 (1: Yes, 0: No)
If previous answer is No, then CSR will be calculated using a_{max} and r_d
Max. Shear Stress at each sample depth known? (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4:
m3:
m2:
m1:

Earthquake Information

EQ Source (e.g., New Madrid) 10 Hz
Event (e.g., MCE, 10KEQ, OBE) Design EQ
a_{max} (g) (top of ground surface) 0.20
EQ Mag (Mw) 6

Inputs

Depth of Sample Midpoint (ft.)	SPT N Value	Hammer Efficiency, E_m (%)	Unified Soil Classification	Fines Content (%)	Total Unit Weight (pcf)	Material (optional)	Clay-like / Sand-like Override (optional)	Clay-like Susceptibility (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure during SPT (psf)	Static Pore Water Pressure during EQ (psf)
1.0	5	80	CL	50	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.042			
2.5	5	80	CL	50	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.047			
4.0	20	80	SM	16	119	Bottom Ash	Sand-like			0.052			
5.5	11	80	SM	16	119	Bottom Ash	Sand-like			0.056			
7.0	7	80	SM	16	119	Bottom Ash	Sand-like			0.058			
8.5	30	80	SM	16	119	Bottom Ash	Sand-like			0.060			
10.0	30	80	SM	16	119	Bottom Ash	Sand-like			0.062			
11.5	24	80	SM	16	119	Bottom Ash	Sand-like			0.064			
13.0	20	80	SM	16	119	Bottom Ash	Sand-like			0.070			
14.5	20	80	SM	16	119	Bottom Ash	Sand-like			0.068			
16.0	8	80	SM	16	119	Bottom Ash	Sand-like			0.066			
28.0	9	80	ML	97	112	Fly Ash	Sand-like		Do Not Correct for FC	0.072			
29.5	0	80	ML	97	112	Fly Ash	Sand-like		Do Not Correct for FC	0.074			
31.0	0	80	ML	97	112	Fly Ash	Sand-like		Do Not Correct for FC	0.073			
32.5	0	80	CL	85	127	Subunit 1	Clay-like	Not Susceptible		0.072			
36.0	2	80	CL	85	127	Subunit 1	Clay-like	Not Susceptible		0.071			
37.5	15	80	CL	85	127	Subunit 1	Clay-like	Not Susceptible		0.071			
39.0	12	80	CL	85	127	Subunit 1	Clay-like	Not Susceptible		0.071			
40.5	8	80	CL	85	127	Subunit 1	Clay-like	Not Susceptible		0.070			
42.0	7	80	SM	42	126	Subunit 2	Sand-like			0.070			
43.5	7	80	SM	42	126	Subunit 2	Sand-like			0.069			
45.0	11	80	SM	42	126	Subunit 2	Sand-like			0.069			
46.5	0	80	SM	42	126	Subunit 2	Sand-like			0.068			
48.0	0	80	SM	42	126	Subunit 2	Sand-like			0.068			
50.5	2	80	SM	42	126	Subunit 2	Sand-like			0.067			
52.0	20	80	SM	42	126	Subunit 2	Sand-like			0.067			
53.5	79	80	SM	30	131	Subunit 3	Sand-like			0.069			

KIF TDEC Stability, Boring ID: KIF-A1

Liquefaction Potential Evaluations

For Coarse Grained Soils

Elev. Of Mid. Pt. of Sample (ft)	Depth of Mid. Pt. of Sample (ft.)	Unit Weight (pcf)	Vert. Total Stress during SPT (tsf)	Static Pore Pressure during SPT (tsf)	Vert. Eff. Stress during SPT (tsf)	SPT N Value	Hammer Efficiency (%)	Borehole Diameter Correction	Sampler Correction	Rod Length Correction	Overburden Stress Correction Factor	Hammer Energy Correction Factor	Corrected Blow Count	Normalized Blow Count	Relative Density (%)	Unified Soil Classification	Fines Content (%)	Relative State Parameter Index	Static Shear Stress Ratio
	z	γ_T	σ_v	u	σ'_v	N	E_m	C_B	C_s	C_R	C_N	C_E	N_{60}	$(N_1)_{60}$	D_r			ξ_R	α

Top of Hole Elevation (ft) = 757.0 | Boring ID = KIF-A1

begin sampling (depth-ft) = 0.0 | Boring Inner Dia. (in) = 3.25

total unit wt. above 1st SPT (pcf) = 120

water elevation during SPT (ft) = 741.5 ft *(relative to ground surface during SPT)* | Assumed Rod Stickup = 5.0 feet

water depth during SPT (ft) = 15.5 | E_m Measurement? = 1 (1: Yes, 0: No)

water elevation during EQ (ft) = 745.3 ft *(relative to ground surface during SPT)* | SPT Sampler w/ Liners? = 0 (1: Yes, 0: No)

water during EQ (depth-ft) = 11.7

vert. total stress above 1st SPT (tsf) = **0.00**

u-top	effstr-top
0.00	0.00

756.0	1.0	120	0.06	0.00	0.06	5	80.0	1.000	1.13	1.00	1.70	1.33	8	13	63	CL	50	-0.48	0.042
754.5	2.5	120	0.15	0.00	0.15	5	80.0	1.000	1.13	1.00	1.70	1.33	8	13	63	CL	50	-0.48	0.047
753.0	4.0	119	0.24	0.00	0.24	20	80.0	1.000	1.30	1.00	1.48	1.33	35	51	100	SM	16	-0.60	0.052
751.5	5.5	119	0.33	0.00	0.33	11	80.0	1.000	1.28	1.00	1.51	1.33	19	28	83	SM	16	-0.60	0.056
750.0	7.0	119	0.42	0.00	0.42	7	80.0	1.000	1.16	1.00	1.51	1.33	11	16	66	SM	16	-0.50	0.058
748.5	8.5	119	0.51	0.00	0.51	30	80.0	1.000	1.30	1.00	1.21	1.33	52	63	100	SM	16	-0.60	0.060
747.0	10.0	119	0.60	0.00	0.60	30	80.0	1.000	1.30	1.00	1.16	1.33	52	60	100	SM	16	-0.60	0.062
745.5	11.5	119	0.69	0.00	0.69	24	80.0	1.000	1.30	1.00	1.12	1.33	42	47	100	SM	16	-0.60	0.064
744.0	13.0	119	0.78	0.00	0.78	20	80.0	1.000	1.30	1.00	1.09	1.33	35	38	95	SM	16	-0.60	0.070
742.5	14.5	119	0.86	0.00	0.86	20	80.0	1.000	1.30	1.00	1.06	1.33	35	37	94	SM	16	-0.60	0.068
741.0	16.0	119	0.95	0.02	0.94	8	80.0	1.000	1.13	1.00	1.06	1.33	12	13	60	SM	16	-0.42	0.066
729.0	28.0	112	1.65	0.39	1.26	9	80.0	1.000	1.12	1.00	0.92	1.33	13	12	52	ML	97	-0.33	0.072
727.5	29.5	112	1.73	0.44	1.29	0	80.0	1.000	1.10	1.00	0.86	1.33	0	0	5	ML	97	0.10	0.074
726.0	31.0	112	1.81	0.48	1.33	0	80.0	1.000	1.10	1.00	0.84	1.33	0	0	5	ML	97	0.10	0.073
724.5	32.5	127	1.90	0.53	1.37	0	80.0	1.000	1.10	1.00	0.85	1.33	0	0	35	CL	85	-0.16	0.072
721.0	36.0	127	2.13	0.64	1.49	2	80.0	1.000	1.10	1.00	0.82	1.33	3	2	42	CL	85	-0.23	0.071
719.5	37.5	127	2.22	0.69	1.54	15	80.0	1.000	1.21	1.00	0.87	1.33	24	21	76	CL	85	-0.57	0.071
718.0	39.0	127	2.32	0.73	1.58	12	80.0	1.000	1.16	1.00	0.84	1.33	18	16	68	CL	85	-0.49	0.071
716.5	40.5	127	2.41	0.78	1.63	8	80.0	1.000	1.10	1.00	0.81	1.33	12	10	57	CL	85	-0.38	0.070
715.0	42.0	126	2.51	0.83	1.68	7	80.0	1.000	1.10	1.00	0.79	1.33	10	8	55	SM	42	-0.35	0.070
713.5	43.5	126	2.60	0.87	1.73	7	80.0	1.000	1.10	1.00	0.78	1.33	10	8	54	SM	42	-0.35	0.069
712.0	45.0	126	2.70	0.92	1.78	11	80.0	1.000	1.13	1.00	0.79	1.33	17	13	64	SM	42	-0.44	0.069
710.5	46.5	126	2.79	0.97	1.82	0	80.0	1.000	1.10	1.00	0.72	1.33	0	0	35	SM	42	-0.16	0.068
709.0	48.0	126	2.89	1.01	1.87	0	80.0	1.000	1.10	1.00	0.71	1.33	0	0	35	SM	42	-0.16	0.068
706.5	50.5	126	3.04	1.09	1.95	2	80.0	1.000	1.10	1.00	0.70	1.33	3	2	41	SM	42	-0.21	0.067
705.0	52.0	126	3.14	1.14	2.00	20	80.0	1.000	1.27	1.00	0.80	1.33	34	27	85	SM	42	-0.60	0.067
703.5	53.5	131	3.23	1.19	2.05	79	80.0	1.000	1.30	1.00	0.84	1.33	137	115	100	SM	30	-0.60	0.069

KIF TDEC Stability, Boring ID: KIF-A1
Liquefaction Potential Evaluations
For Coarse Grained Soils

EQ Source	a max (g)	EQ Mag (Mw)	Event
10 Hz	0.20	6	Design EQ

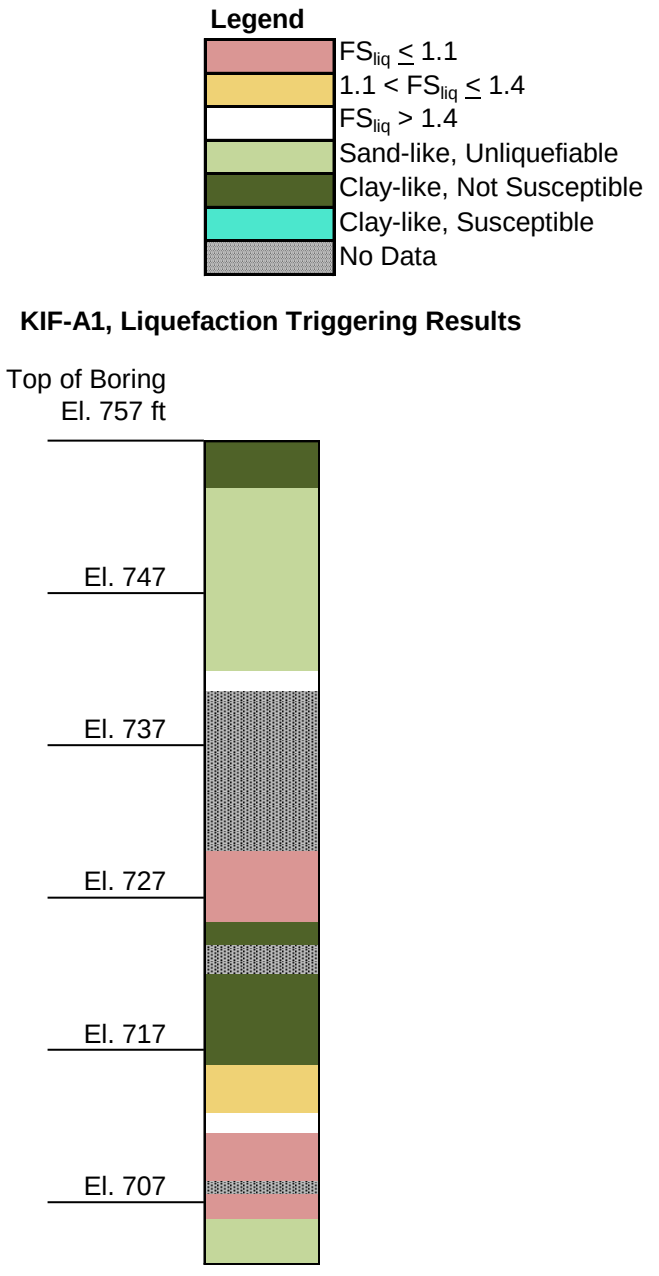
Shear Stress Curve Fit Parameters
m4: 0
m3: 0
m2: 0
m1: 0

Boring ID: KIF-A1
Top of Fill Elevation: 762.7 ft
Fill Height: 5.7 ft *(relative to ground surface during SPT)*
Fill Total Unit Weight: 121 pcf
Fill Total Stress: 0.34 tsf

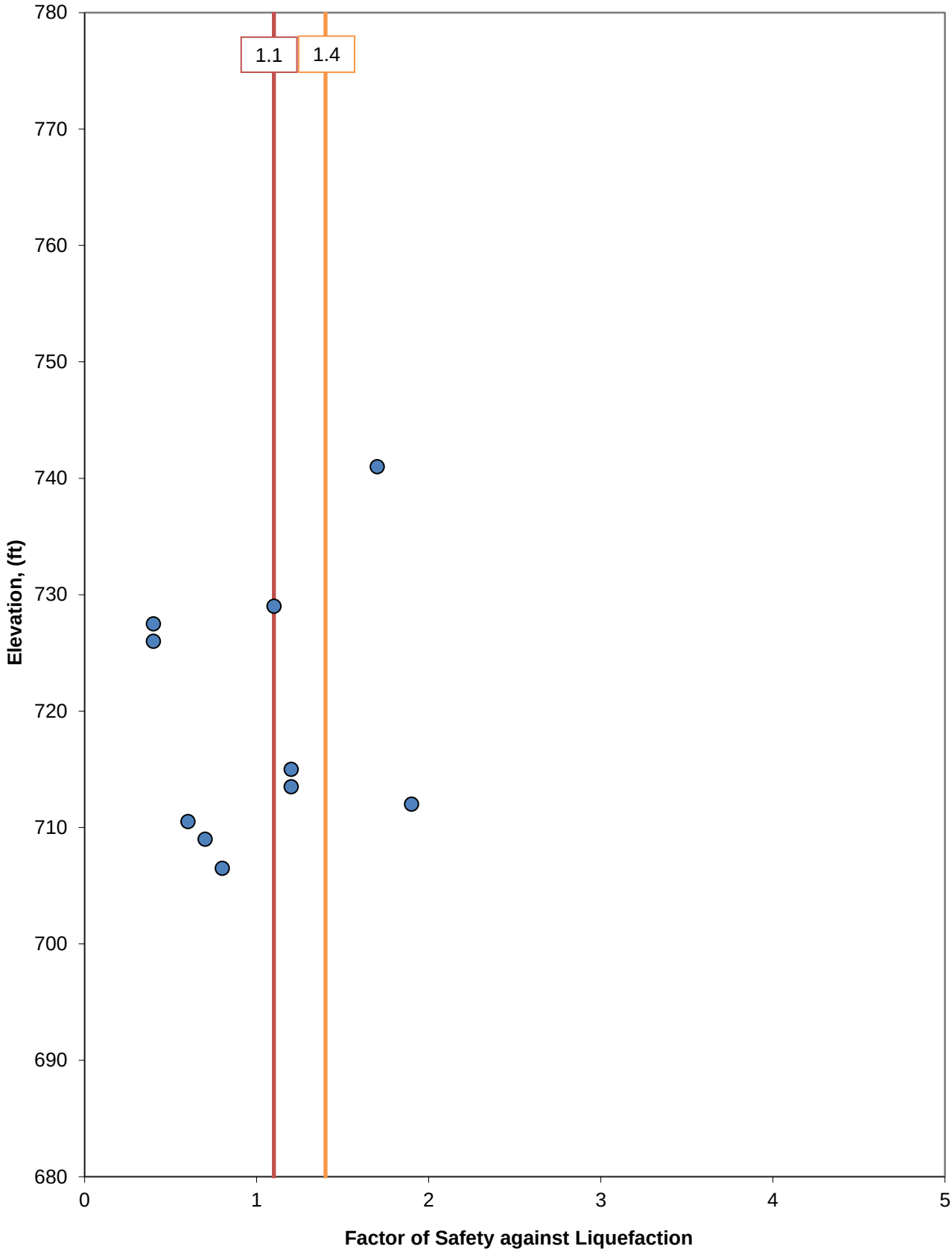
totstr-top **0.34** | u-top 0.00 | effstr-top 0.34

Note: A factor of safety shown as "N/A" implies that the soil type is not appropriately evaluated using this methodology. This applies to clay-like soils (typically CL, CH, CL-ML and MH material type), samples with high blow counts, and unsaturated samples.

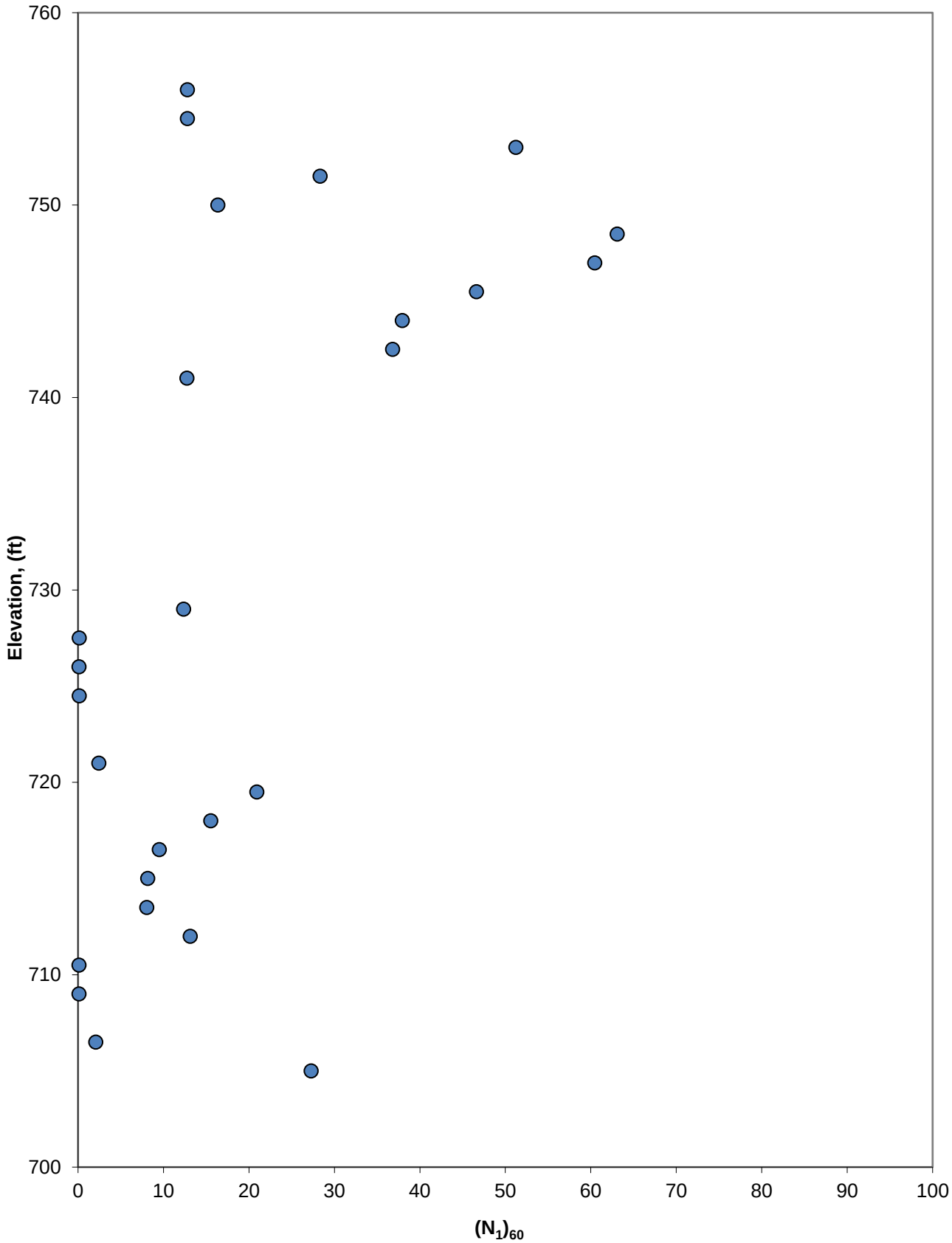
Depth of Mid. Pt. of Sample (ft.) z	Vert. Total Stress during EQ w/ Fill (tsf) $\sigma_{v\ with\ fill}$	Static Pore Pressure during EQ (tsf) u	Vert. Eff. Stress during EQ w/ Fill (tsf) $\sigma'_{v\ with\ fill}$	Clean Sand Correction $\Delta(N_1)_{60cs}$	Equivalent Clean Sand N-Value $(N_1)_{60cs}$	Cyclic Resistance Ratio CRR7.5	Overburden Correction Factor K_σ	Static Shear Stress Correction K_α	Mag. Scaling Factor (MSF)	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Max. Induced Shear Stress (psf)	From Ground Response: Avg. Cyclic Shear Stress (psf)	Cyclic Stress Ratio CSR	Sample Screened for: High Clay-like	High Blow Count $(N_1)_{60cs} \geq 32$	Unsaturated	Factor of Safety FS_{liq}	Material (optional)
1.0	0.40	0.00	0.40	5.61	18	N/A	N/A	N/A	1.26	N/A	0.977	0	0	0.124	TRUE	FALSE	TRUE	N/A	**Clay Fill (irrelevant)**
2.5	0.49	0.00	0.49	5.61	18	N/A	N/A	N/A	1.26	N/A	0.969	0	0	0.123	TRUE	FALSE	TRUE	N/A	**Clay Fill (irrelevant)**
4.0	0.58	0.00	0.58	3.58	55	N/A	N/A	N/A	N/A	N/A	0.960	0	0	0.122	FALSE	TRUE	TRUE	N/A	**Bottom Ash**
5.5	0.67	0.00	0.67	3.58	32	N/A	N/A	N/A	N/A	N/A	0.951	0	0	0.121	FALSE	TRUE	TRUE	N/A	**Bottom Ash**
7.0	0.76	0.00	0.76	3.58	20	0.205	1.044	1.141	1.30	0.316	0.942	0	0	0.120	FALSE	FALSE	TRUE	N/A	**Bottom Ash**
8.5	0.85	0.00	0.85	3.58	67	N/A	N/A	N/A	N/A	N/A	0.933	0	0	0.119	FALSE	TRUE	TRUE	N/A	**Bottom Ash**
10.0	0.94	0.00	0.94	3.58	64	N/A	N/A	N/A	N/A	N/A	0.923	0	0	0.117	FALSE	TRUE	TRUE	N/A	**Bottom Ash**
11.5	1.03	0.00	1.03	3.58	50	N/A	N/A	N/A	N/A	N/A	0.913	0	0	0.116	FALSE	TRUE	TRUE	N/A	**Bottom Ash**
13.0	1.12	0.04	1.08	3.58	42	N/A	N/A	N/A	N/A	N/A	0.903	0	0	0.119	FALSE	TRUE	FALSE	N/A	**Bottom Ash**
14.5	1.21	0.09	1.12	3.58	40	N/A	N/A	N/A	N/A	N/A	0.892	0	0	0.122	FALSE	TRUE	FALSE	N/A	**Bottom Ash**
16.0	1.30	0.13	1.16	3.58	16	0.167	0.989	1.053	1.22	0.212	0.882	0	0	0.125	FALSE	FALSE	FALSE	1.7	**Bottom Ash**
28.0	1.99	0.51	1.48	0.00	12	0.135	0.966	0.978	1.15	0.146	0.792	0	0	0.135	FALSE	FALSE	FALSE	1.1	**Fly Ash**
29.5	2.08	0.56	1.52	0.00	0	0.061	0.980	0.873	1.05	0.055	0.781	0	0	0.136	FALSE	FALSE	FALSE	0.4	**Fly Ash**
31.0	2.16	0.60	1.56	0.00	0	0.061	0.979	0.875	1.05	0.055	0.770	0	0	0.136	FALSE	FALSE	FALSE	0.4	**Fly Ash**
32.5	2.25	0.65	1.60	5.53	6	N/A	N/A	N/A	1.07	N/A	0.759	0	0	0.136	TRUE	FALSE	FALSE	N/A	**Subunit 1**
36.0	2.47	0.76	1.71	5.53	8	N/A	N/A	N/A	1.09	N/A	0.733	0	0	0.134	TRUE	FALSE	FALSE	N/A	**Subunit 1**
37.5	2.57	0.80	1.76	5.53	26	N/A	N/A	N/A	1.48	N/A	0.722	0	0	0.134	TRUE	FALSE	FALSE	N/A	**Subunit 1**
39.0	2.66	0.85	1.81	5.53	21	N/A	N/A	N/A	1.32	N/A	0.711	0	0	0.133	TRUE	FALSE	FALSE	N/A	**Subunit 1**
40.5	2.76	0.90	1.86	5.53	15	N/A	N/A	N/A	1.19	N/A	0.700	0	0	0.132	TRUE	FALSE	FALSE	N/A	**Subunit 1**
42.0	2.85	0.95	1.91	5.59	14	0.146	0.938	0.992	1.17	0.159	0.689	0	0	0.131	FALSE	FALSE	FALSE	1.2	**Subunit 2**
43.5	2.95	0.99	1.95	5.59	14	0.145	0.935	0.989	1.17	0.156	0.679	0	0	0.130	FALSE	FALSE	FALSE	1.2	**Subunit 2**
45.0	3.04	1.04	2.00	5.59	19	0.191	0.919	1.089	1.27	0.243	0.668	0	0	0.129	FALSE	FALSE	FALSE	1.9	**Subunit 2**
46.5	3.14	1.09	2.05	5.59	6	0.090	0.948	0.906	1.07	0.083	0.658	0	0	0.128	FALSE	FALSE	FALSE	0.6	**Subunit 2**
48.0	3.23	1.13	2.10	5.59	6	0.090	0.947	0.907	1.07	0.083	0.648	0	0	0.127	FALSE	FALSE	FALSE	0.7	**Subunit 2**
50.5	3.39	1.21	2.18	5.59	8	0.102	0.939	0.921	1.09	0.096	0.632	0	0	0.125	FALSE	FALSE	FALSE	0.8	**Subunit 2**
52.0	3.48	1.26	2.22	5.59	33	N/A	N/A	N/A	N/A	N/A	0.623	0	0	0.124	FALSE	TRUE	FALSE	N/A	**Subunit 2**
53.5	3.58	1.30	2.27	5.36	120	N/A	N/A	N/A	N/A	N/A	0.613	0	0	0.123	FALSE	TRUE	FALSE	N/A	**Subunit 3**


Legend
FSliq ≤ 1.1
1.1 < FSliq ≤ 1.4
FSliq > 1.4
Sand-like, Unliquefiable
Clay-like, Not Susceptible
Clay-like, Susceptible
No Data
KIF-A1, Liquefaction Triggering Results
Top of Boring
El. 757 ft
El. 747
El. 737
El. 727
El. 717
El. 707

KIF TDEC Stability, Boring ID: KIF-A1, Source = 10 Hz, Mw = 6, Event = Design EQ,
SPT Data, Simplified Stress-Based Approach



KIF TDEC Stability, Boring ID: KIF-A1, Source = 10 Hz, Mw = 6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



Project Name = KIF TDEC Stability

Boring ID = KIF-A2

Boring Location

Northing =

Easting =

OR

Baseline Station =

Offset (+ Right) =

Drilling Information

Boring Inner Diameter (ID) =	3.25	inches	
Top of Hole Elevation	755	feet	
Water Depth during SPT (negative for U/S borings)=	13	feet	
Depth Sampling Began	0	feet	
Total Unit Wt. above 1st SPT =	120	pcf	
Assumed Rod Stickup =	5	feet	*(Typ assume 5ft)*
E_m Measurement based on Fv method? =	1	(1: Yes, 0: No)	
SPT Sampler w/ Liners? =	0	(1: Yes, 0: No)	*(Typ. no)*

During EQ Information

Water Depth during EQ (relative to SPT TOH, negative for U/S borings) =	5.9	feet
Final Grade Elevation during EQ	755.3	feet
Average Total Unit Wt. of Cut/Fill	120	pcf

Fines Content Correction

Fines content correction for samples with blow counts of zero? 1 (1: Yes, 0: No)

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile? 0 (1: Yes, 0: No)

If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile: SectionAA, KIF-A2_NOR

Alpha at each sample depth known? 1 (1: Yes, 0: No)

If previous answer is No, then enter curve fit parameters below (α vs. depth curve)

If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_α will be one.

m4:
m3:
m2:
m1:
m0:

Associated ground response profile: Section_AA, KIF-A2_NOR

Get CSR from shear stress envelope? 0 (1: Yes, 0: No)

If previous answer is No, then CSR will be calculated using a_{max} and r_d

Max. Shear Stress at each sample depth known? (1: Yes, 0: No)

If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4:
m3:
m2:
m1:

Earthquake Information

EQ Source (e.g., New Madrid)	10 Hz
Event (e.g., MCE, 10KEQ, OBE)	Design EQ
a_{max} (g) (top of ground surface)	0.22
EQ Mag (Mw)	6

Inputs

Depth of Sample Midpoint (ft.)	SPT N Value	Hammer Efficiency, E_m (%)	Unified Soil Classification	Fines Content (%)	Total Unit Weight (pcf)	Material (optional)	Clay-like / Sand-like Override (optional)	Clay-like Susceptibility (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure during SPT (psf)	Static Pore Water Pressure during EQ (psf)
1.0	28	80	CL	60	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.018			
2.5	20	80	SM	38	119	Bottom Ash	Sand-like			0.038			
4.0	10	80	MH	68	128	Embankment Fill	Clay-like	Not Susceptible		0.055			
5.5	15	80		68	128	Embankment Fill	Clay-like	Not Susceptible		0.070			
7.0	14	80		68	128	Embankment Fill	Clay-like	Not Susceptible		0.080			
8.5	17	80		68	128	Embankment Fill	Clay-like	Not Susceptible		0.087			
10.0	20	80		68	128	Embankment Fill	Clay-like	Not Susceptible		0.093			
11.5	12	80		68	128	Embankment Fill	Clay-like	Not Susceptible		0.098			
13.0	25	80		68	128	Embankment Fill	Clay-like	Not Susceptible		0.102			
14.5	20	80		68	128	Embankment Fill	Clay-like	Not Susceptible		0.106			
16.0	5	80		68	128	Embankment Fill	Clay-like	Not Susceptible		0.109			
17.5	1	80		68	128	Embankment Fill	Clay-like	Not Susceptible		0.113			
19.0	3	80		68	128	Embankment Fill	Clay-like	Not Susceptible		0.106			
20.5	0	80		68	128	Embankment Fill	Clay-like	Not Susceptible		0.115			
22.0	0	80		68	128	Embankment Fill	Clay-like	Not Susceptible		0.120			
23.5	0	80		68	128	Embankment Fill	Clay-like	Not Susceptible		0.119			
25.0	1	80		68	128	Embankment Fill	Clay-like	Not Susceptible		0.122			
26.5	2	80		68	128	Embankment Fill	Clay-like	Not Susceptible		0.124			
28.0	0	80		68	128	Embankment Fill	Clay-like	Not Susceptible		0.125			
29.5	3	80		68	128	Embankment Fill	Clay-like	Not Susceptible		0.127			
31.0	1	80		68	128	Embankment Fill	Clay-like	Not Susceptible		0.129			
32.5	0	80		95	127	Subunit 1	Clay-like	Not Susceptible		0.133			
34.0	0	80		95	127	Subunit 1	Clay-like	Not Susceptible		0.134			
35.5	0	80		95	127	Subunit 1	Clay-like	Not Susceptible		0.136			
37.0	9	80		95	127	Subunit 1	Clay-like	Not Susceptible		0.136			
38.5	10	80		95	127	Subunit 1	Clay-like	Not Susceptible		0.137			
40.0	10	80		95	127	Subunit 1	Clay-like	Not Susceptible		0.139			
41.5	9	80		95	127	Subunit 1	Clay-like	Not Susceptible		0.138			
43.0	5	80		46	126	Subunit 2	Sand-like			0.137			
44.5	0	80		46	126	Subunit 2	Sand-like			0.140			
46.0	3	80		22	131	Subunit 3	Sand-like			0.137			
47.5	9	80		22	131	Subunit 3	Sand-like			0.137			
49.0	34	80		22	131	Subunit 3	Sand-like			0.134			

KIF TDEC Stability, Boring ID: KIF-A2

Liquefaction Potential Evaluations

For Coarse Grained Soils

Elev. Of Mid. Pt. of Sample (ft)	Depth of Mid. Pt. of Sample (ft.)	Unit Weight (pcf)	Vert. Total Stress during SPT (tsf)	Static Pore Pressure during SPT (tsf)	Vert. Eff. Stress during SPT (tsf)	SPT N Value	Hammer Efficiency (%)	Borehole Diameter Correction	Sampler Correction	Rod Length Correction	Overburden Stress Correction Factor	Hammer Energy Correction Factor	Corrected Blow Count	Normalized Blow Count	Relative Density (%)	Unified Soil Classification	Fines Content (%)
	z	γ_T	σ_v	u	σ'_v	N	E_m	C_B	C_s	C_R	C_N	C_E	N_{60}	$(N_1)_{60}$	D_r		

Top of Hole Elevation (ft) = 755.0 | Boring ID = KIF-A2

begin sampling (depth-ft) = 0.0 | Boring Inner Dia. (in) = 3.25

total unit wt. above 1st SPT (pcf) = 120

water elevation during SPT (ft) = 742.0 ft *(relative to ground surface during SPT)* | Assumed Rod Stickup = 5.0 feet

water depth during SPT (ft) = 13.0 | E_m Measurement? = 1 (1: Yes, 0: No)

water elevation during EQ (ft) = 749.1 ft *(relative to ground surface during SPT)* | SPT Sampler w/ Liners? = 0 (1: Yes, 0: No)

	u-top	effstr-top
water during EQ (depth-ft) =	5.9	
vert. total stress above 1st SPT (tsf) =	**0.00**	0.00

754.0	1.0	120	0.06	0.00	0.06	28	80.0	1.000	1.30	1.00	1.70	1.33	49	83	100	CL	60
752.5	2.5	119	0.15	0.00	0.15	20	80.0	1.000	1.30	1.00	1.67	1.33	35	58	100	SM	38
751.0	4.0	128	0.24	0.00	0.24	10	80.0	1.000	1.28	1.00	1.65	1.33	17	28	86	MH	68
749.5	5.5	128	0.34	0.00	0.34	15	80.0	1.000	1.30	1.00	1.39	1.33	26	36	95	0	68
748.0	7.0	128	0.43	0.00	0.43	14	80.0	1.000	1.30	1.00	1.32	1.33	24	32	90	0	68
746.5	8.5	128	0.53	0.00	0.53	17	80.0	1.000	1.30	1.00	1.22	1.33	29	36	95	0	68
745.0	10.0	128	0.63	0.00	0.63	20	80.0	1.000	1.30	1.00	1.15	1.33	35	40	99	0	68
743.5	11.5	128	0.72	0.00	0.72	12	80.0	1.000	1.23	1.00	1.15	1.33	20	23	78	0	68
742.0	13.0	128	0.82	0.00	0.82	25	80.0	1.000	1.30	1.00	1.07	1.33	43	46	100	0	68
740.5	14.5	128	0.91	0.05	0.87	20	80.0	1.000	1.30	1.00	1.06	1.33	35	37	96	0	68
739.0	16.0	128	1.01	0.09	0.92	5	80.0	1.000	1.10	1.00	1.07	1.33	7	8	54	0	68
737.5	17.5	128	1.11	0.14	0.97	1	80.0	1.000	1.10	1.00	1.05	1.33	1	2	39	0	68
736.0	19.0	128	1.20	0.19	1.02	3	80.0	1.000	1.10	1.00	1.02	1.33	4	4	47	0	68
734.5	20.5	128	1.30	0.23	1.06	0	80.0	1.000	1.10	1.00	1.00	1.33	0	0	35	0	68
733.0	22.0	128	1.39	0.28	1.11	0	80.0	1.000	1.10	1.00	0.97	1.33	0	0	35	0	68
731.5	23.5	128	1.49	0.33	1.16	0	80.0	1.000	1.10	1.00	0.94	1.33	0	0	35	0	68
730.0	25.0	128	1.59	0.37	1.21	1	80.0	1.000	1.10	1.00	0.92	1.33	1	1	39	0	68
728.5	26.5	128	1.68	0.42	1.26	2	80.0	1.000	1.10	1.00	0.91	1.33	3	3	42	0	68
727.0	28.0	128	1.78	0.47	1.31	0	80.0	1.000	1.10	1.00	0.88	1.33	0	0	35	0	68
725.5	29.5	128	1.87	0.51	1.36	3	80.0	1.000	1.10	1.00	0.87	1.33	4	4	45	0	68
724.0	31.0	128	1.97	0.56	1.41	1	80.0	1.000	1.10	1.00	0.85	1.33	1	1	39	0	68
722.5	32.5	127	2.07	0.61	1.46	0	80.0	1.000	1.10	1.00	0.82	1.33	0	0	35	0	95
721.0	34.0	127	2.16	0.66	1.51	0	80.0	1.000	1.10	1.00	0.81	1.33	0	0	35	0	95
719.5	35.5	127	2.26	0.70	1.55	0	80.0	1.000	1.10	1.00	0.79	1.33	0	0	35	0	95
718.0	37.0	127	2.35	0.75	1.60	9	80.0	1.000	1.11	1.00	0.82	1.33	13	11	60	0	95
716.5	38.5	127	2.45	0.80	1.65	10	80.0	1.000	1.12	1.00	0.81	1.33	15	12	62	0	95
715.0	40.0	127	2.54	0.84	1.70	10	80.0	1.000	1.12	1.00	0.80	1.33	15	12	62	0	95
713.5	41.5	127	2.64	0.89	1.75	9	80.0	1.000	1.10	1.00	0.79	1.33	13	10	59	0	95
712.0	43.0	126	2.73	0.94	1.80	5	80.0	1.000	1.10	1.00	0.76	1.33	7	6	49	0	46
710.5	44.5	126	2.83	0.98	1.84	0	80.0	1.000	1.10	1.00	0.72	1.33	0	0	35	0	46
709.0	46.0	131	2.92	1.03	1.89	3	80.0	1.000	1.10	1.00	0.72	1.33	4	3	42	0	22
707.5	47.5	131	3.02	1.08	1.94	9	80.0	1.000	1.10	1.00	0.74	1.33	13	10	56	0	22
706.0	49.0	131	3.12	1.12	2.00	34	80.0	1.000	1.30	1.00	0.85	1.33	59	50	100	0	22

KIF TDEC Stability, Boring ID: KIF-A2
Liquefaction Potential Evaluations
For Coarse Grained Soils

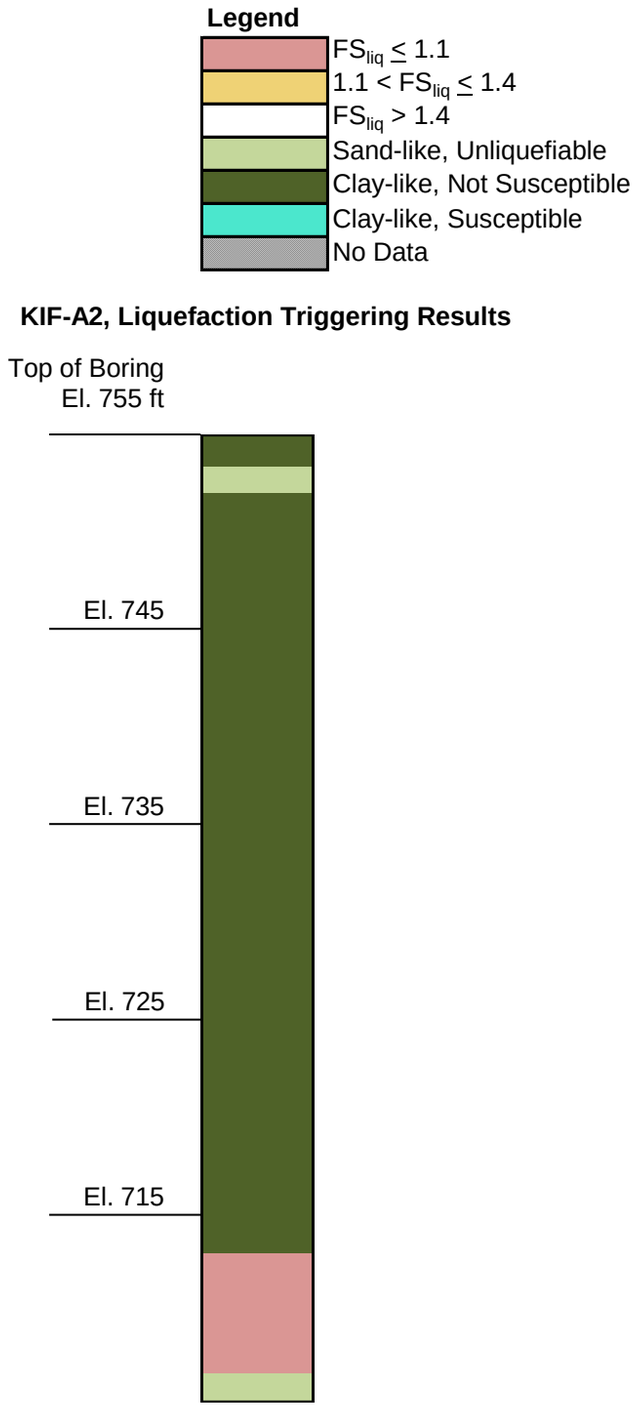
Depth of Mid. Pt. of Sample (ft.) z	Clean Sand Correction $\Delta(N_1)_{60cs}$	Equivalent Clean Sand N-Value $(N_1)_{60cs}$	Sample Screened for: Clay-like	High Blow Count $(N_1)_{60cs} \geq 32$	Unsaturated	Factor of Safety FS_{liq}	Material (optional)
ft							
ft	*(relative to ground surface during SPT)*						
pcf							
tsf							

Note: A factor of safety shown as "N/A" implies that the soil type is not appropriately evaluated using this methodology. This applies to clay-like soils (typically CL, CH, CL-ML and MH material type), samples with high blow counts, and unsaturated samples.

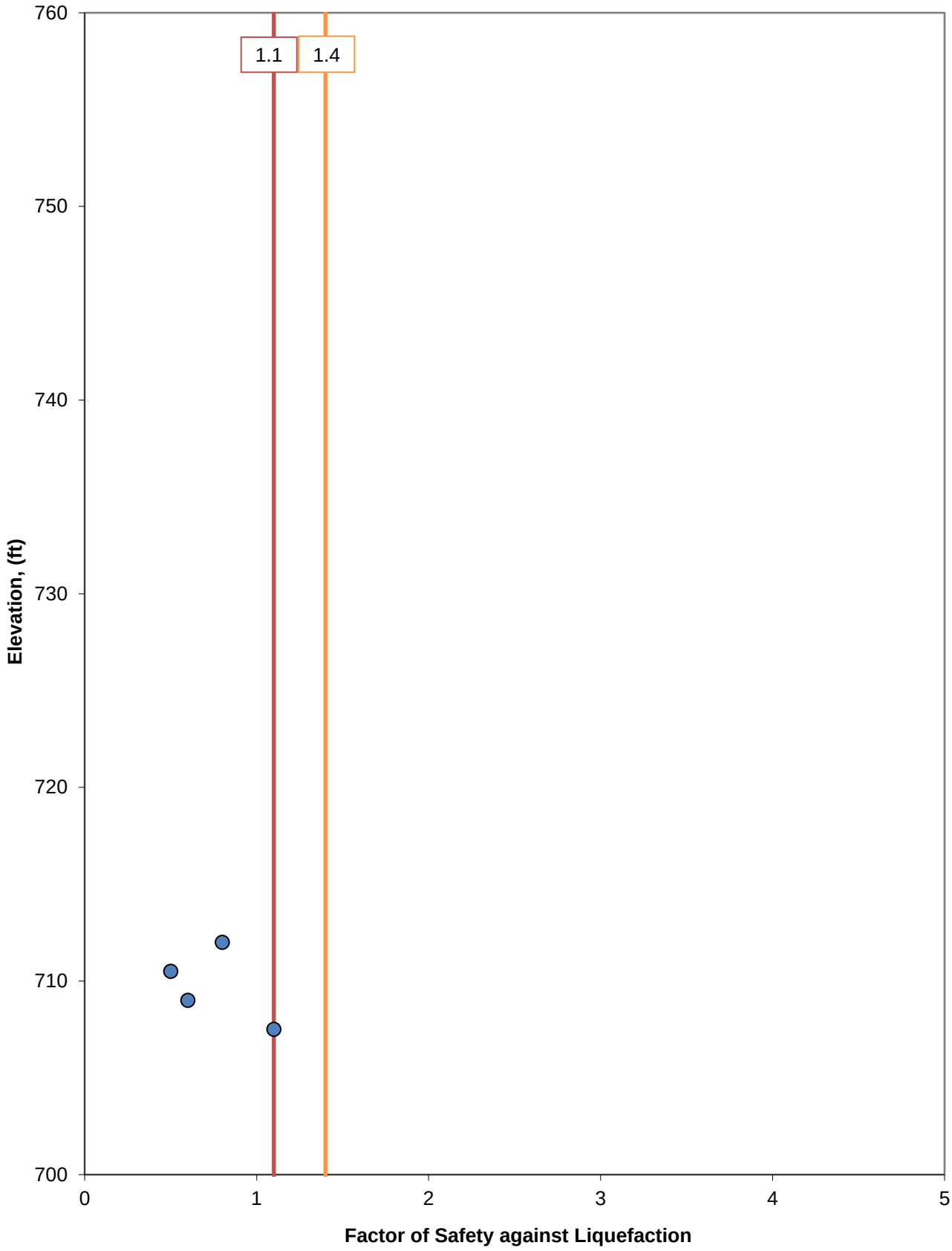
1.0	5.60	88	TRUE	TRUE	TRUE	**N/A**	**Clay Fill (irrelevant)**
2.5	5.55	64	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**
4.0	5.58	34	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**
5.5	5.58	42	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**
7.0	5.58	38	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**
8.5	5.58	42	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**
10.0	5.58	45	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**
11.5	5.58	28	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
13.0	5.58	52	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**
14.5	5.58	42	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**
16.0	5.58	13	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
17.5	5.58	7	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
19.0	5.58	10	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
20.5	5.58	6	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
22.0	5.58	6	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
23.5	5.58	6	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
25.0	5.58	7	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
26.5	5.58	8	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
28.0	5.58	6	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
29.5	5.58	9	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
31.0	5.58	7	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
32.5	5.50	6	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
34.0	5.50	6	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**

KIF TDEC Stability, Boring ID: KIF-A2
Liquefaction Potential Evaluations
For Coarse Grained Soils

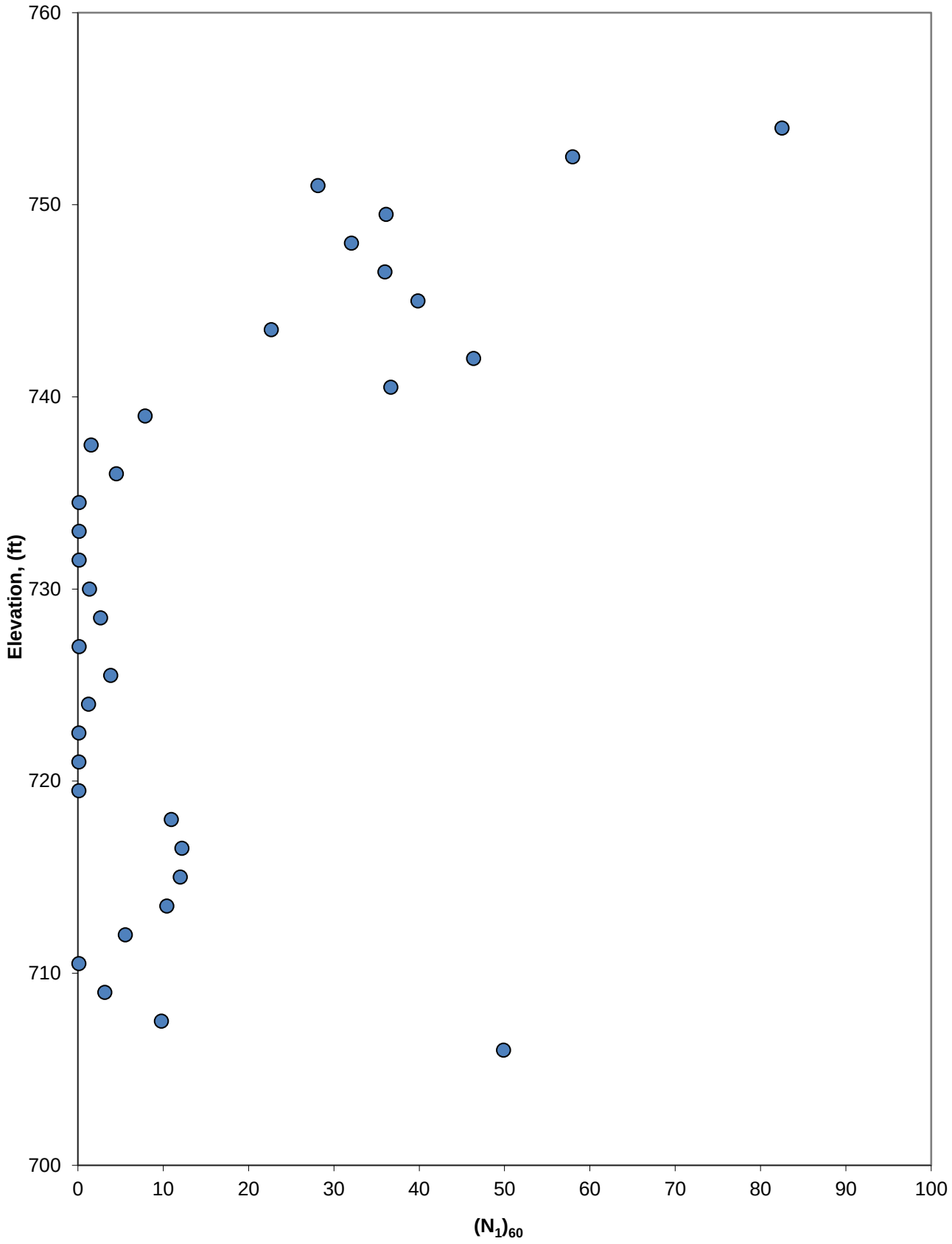
Depth of Mid. Pt. of Sample (ft.) z	Clean Sand Correction $\Delta(N_1)_{60cs}$	Equivalent Clean Sand N-Value $(N_1)_{60cs}$	Sample Screened for: Clay-like	High Blow Count $(N_1)_{60cs} \geq 32$	Unsaturated	Factor of Safety FS_{liq}	Material (optional)
35.5	5.50	6	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
37.0	5.50	16	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
38.5	5.50	18	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
40.0	5.50	17	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
41.5	5.50	16	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
43.0	5.61	11	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**
44.5	5.61	6	FALSE	FALSE	FALSE	**0.5**	**Subunit 2**
46.0	4.77	8	FALSE	FALSE	FALSE	**0.6**	**Subunit 3**
47.5	4.77	15	FALSE	FALSE	FALSE	**1.1**	**Subunit 3**
49.0	4.77	55	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**


Legend
FSliq ≤ 1.1
1.1 < FSliq ≤ 1.4
FSliq > 1.4
Sand-like, Unliquefiable
Clay-like, Not Susceptible
Clay-like, Susceptible
No Data
KIF-A2, Liquefaction Triggering Results
Top of Boring
El. 755 ft
El. 745
El. 735
El. 725
El. 715

KIF TDEC Stability, Boring ID: KIF-A2, Source = 10 Hz, Mw = 6, Event = Design EQ,
SPT Data, Simplified Stress-Based Approach



KIF TDEC Stability, Boring ID: KIF-A2, Source = 10 Hz, Mw = 6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



Project Name = KIF TDEC Stability
Boring ID = KIF-A3

Boring Location

Northing =
Easting =

OR

Baseline Station =
Offset (+ Right) =

Drilling Information

Boring Inner Diameter (ID) =	3.25	inches	
Top of Hole Elevation	747	feet	
Water Depth during SPT (negative for U/S borings)=	0	feet	
Depth Sampling Began	0	feet	
Total Unit Wt. above 1st SPT =	120	pcf	
Assumed Rod Stickup =	5	feet	*(Typ assume 5ft)*
E_m Measurement based on Fv method? =	1	(1: Yes, 0: No)	
SPT Sampler w/ Liners? =	0	(1: Yes, 0: No)	*(Typ. no)*

During EQ Information

Water Depth during EQ (relative to SPT TOH, negative for U/S borings) =	6	feet
Final Grade Elevation during EQ	753.3	feet
Average Total Unit Wt. of Cut/Fill	120	pcf

Fines Content Correction

Fines content correction for samples with blow counts of zero? 1 (1: Yes, 0: No)

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile? 0 (1: Yes, 0: No)
If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile: SectionAA, KIF-A3_NOR
Alpha at each sample depth known? 1 (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (α vs. depth curve)
If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_α will be one.

m4:
m3:
m2:
m1:
m0:

Associated ground response profile: Section_AA, KIF-A3_NOR
Get CSR from shear stress envelope? 0 (1: Yes, 0: No)
If previous answer is No, then CSR will be calculated using a_{max} and r_d
Max. Shear Stress at each sample depth known? (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4:
m3:
m2:
m1:

Earthquake Information

EQ Source (e.g., New Madrid)	10 Hz
Event (e.g., MCE, 10KEQ, OBE)	Design EQ
a_{max} (g) (top of ground surface)	0.22
EQ Mag (Mw)	6

Inputs

Depth of Sample Midpoint (ft.)	SPT N Value	Hammer Efficiency, E_m (%)	Unified Soil Classification	Fines Content (%)	Total Unit Weight (pcf)	Material (optional)	Clay-like / Sand-like Override (optional)	Clay-like Susceptibility (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure during SPT (psf)	Static Pore Water Pressure during EQ (psf)
1.0	3	80	CL	52	128	Embankment Fill	Clay-like	Not Susceptible		0.055			
2.5	8	80		52	128	Embankment Fill	Clay-like	Not Susceptible		0.069			
4.0	8	80		52	128	Embankment Fill	Clay-like	Not Susceptible		0.080			
5.5	15	80		52	128	Embankment Fill	Clay-like	Not Susceptible		0.090			
7.0	16	80		52	128	Embankment Fill	Clay-like	Not Susceptible		0.098			
8.5	4	80		52	128	Embankment Fill	Clay-like	Not Susceptible		0.106			
10.0	1	80		52	128	Embankment Fill	Clay-like	Not Susceptible		0.114			
13.5	0	80		52	128	Embankment Fill	Clay-like	Not Susceptible		0.128			
15.0	0	80		52	128	Embankment Fill	Clay-like	Not Susceptible		0.139			
16.5	0	80		52	128	Embankment Fill	Clay-like	Not Susceptible		0.146			
18.0	0	80		52	128	Embankment Fill	Clay-like	Not Susceptible		0.151			
19.5	0	80		52	128	Embankment Fill	Clay-like	Not Susceptible		0.156			
21.0	2	80		52	128	Embankment Fill	Clay-like	Not Susceptible		0.161			
22.5	0	80		52	128	Embankment Fill	Clay-like	Not Susceptible		0.165			
24.0	0	80		52	128	Embankment Fill	Clay-like	Not Susceptible		0.169			
25.5	0	80		90	127	Subunit 1	Clay-like	Not Susceptible		0.172			
27.0	2	80		90	127	Subunit 1	Clay-like	Not Susceptible		0.175			
28.5	6	80		90	127	Subunit 1	Clay-like	Not Susceptible		0.177			
30.0	13	80		90	127	Subunit 1	Clay-like			0.180			
31.5	14	80		90	127	Subunit 1	Clay-like			0.183			
33.0	8	80		90	127	Subunit 1	Clay-like			0.184			
34.5	9	80		46	126	Subunit 2	Sand-like			0.185			
36.0	0	80		46	126	Subunit 2	Sand-like			0.184			
37.5	0	80		46	126	Subunit 2	Sand-like			0.186			
39.0	0	80		46	126	Subunit 2	Sand-like			0.186			
40.5	0	80		22	131	Subunit 3	Sand-like			0.185			
42.0	13	80		22	131	Subunit 3	Sand-like			0.184			
43.5	24	80		22	131	Subunit 3	Sand-like			0.183			

KIF TDEC Stability, Boring ID: KIF-A3

Liquefaction Potential Evaluations

For Coarse Grained Soils

Elev. Of Mid. Pt. of Sample (ft)	Depth of Mid. Pt. of Sample (ft.)	Unit Weight (pcf)	Vert. Total Stress during SPT (tsf)	Static Pore Pressure during SPT (tsf)	Vert. Eff. Stress during SPT (tsf)	SPT N Value	Hammer Efficiency (%)	Borehole Diameter Correction	Sampler Correction	Rod Length Correction	Overburden Stress Correction Factor	Hammer Energy Correction Factor	Corrected Blow Count	Normalized Blow Count	Relative Density (%)	Unified Soil Classification	Fines Content (%)
	z	γ_T	σ_v	u	σ'_v	N	E_m	C_B	C_s	C_R	C_N	C_E	N_{60}	$(N_1)_{60}$	D_r		

Top of Hole Elevation (ft) = 747.0 | Boring ID = KIF-A3

begin sampling (depth-ft) = 0.0 | Boring Inner Dia. (in) = 3.25

total unit wt. above 1st SPT (pcf) = 120

water elevation during SPT (ft) = 747.0 ft *(relative to ground surface during SPT)* | Assumed Rod Stickup = 5.0 feet

water depth during SPT (ft) = 0.0 | E_m Measurement? = 1 (1: Yes, 0: No)

water elevation during EQ (ft) = 741.0 ft *(relative to ground surface during SPT)* | SPT Sampler w/ Liners? = 0 (1: Yes, 0: No)

	u-top	effstr-top
water during EQ (depth-ft) =	6.0	
vert. total stress above 1st SPT (tsf) =	**0.00**	0.00

746.0	1.0	128	0.06	0.03	0.03	3	80.0	1.000	1.10	1.00	1.70	1.33	4	7	53	CL	52
744.5	2.5	128	0.16	0.08	0.08	8	80.0	1.000	1.22	1.00	1.70	1.33	13	22	78	0	52
743.0	4.0	128	0.26	0.12	0.13	8	80.0	1.000	1.22	1.00	1.70	1.33	13	22	78	0	52
741.5	5.5	128	0.35	0.17	0.18	15	80.0	1.000	1.30	1.00	1.59	1.33	26	41	100	0	52
740.0	7.0	128	0.45	0.22	0.23	16	80.0	1.000	1.30	1.00	1.49	1.33	28	41	100	0	52
738.5	8.5	128	0.54	0.27	0.28	4	80.0	1.000	1.10	1.00	1.70	1.33	6	10	58	0	52
737.0	10.0	128	0.64	0.31	0.33	1	80.0	1.000	1.10	1.00	1.70	1.33	1	2	42	0	52
733.5	13.5	128	0.86	0.42	0.44	0	80.0	1.000	1.10	1.00	1.68	1.33	0	0	36	0	52
732.0	15.0	128	0.96	0.47	0.49	0	80.0	1.000	1.10	1.00	1.58	1.33	0	0	36	0	52
730.5	16.5	128	1.06	0.51	0.54	0	80.0	1.000	1.10	1.00	1.49	1.33	0	0	36	0	52
729.0	18.0	128	1.15	0.56	0.59	0	80.0	1.000	1.10	1.00	1.42	1.33	0	0	36	0	52
727.5	19.5	128	1.25	0.61	0.64	0	80.0	1.000	1.10	1.00	1.35	1.33	0	0	36	0	52
726.0	21.0	128	1.34	0.66	0.69	2	80.0	1.000	1.10	1.00	1.27	1.33	3	4	45	0	52
724.5	22.5	128	1.44	0.70	0.74	0	80.0	1.000	1.10	1.00	1.24	1.33	0	0	35	0	52
723.0	24.0	128	1.54	0.75	0.79	0	80.0	1.000	1.10	1.00	1.19	1.33	0	0	35	0	52
721.5	25.5	127	1.63	0.80	0.84	0	80.0	1.000	1.10	1.00	1.15	1.33	0	0	35	0	90
720.0	27.0	127	1.73	0.84	0.88	2	80.0	1.000	1.10	1.00	1.10	1.33	3	3	44	0	90
718.5	28.5	127	1.82	0.89	0.93	6	80.0	1.000	1.10	1.00	1.06	1.33	9	9	57	0	90
717.0	30.0	127	1.92	0.94	0.98	13	80.0	1.000	1.22	1.00	1.03	1.33	21	22	77	0	90
715.5	31.5	127	2.01	0.98	1.03	14	80.0	1.000	1.23	1.00	1.01	1.33	23	23	79	0	90
714.0	33.0	127	2.11	1.03	1.08	8	80.0	1.000	1.12	1.00	0.99	1.33	12	12	61	0	90
712.5	34.5	126	2.20	1.08	1.13	9	80.0	1.000	1.13	1.00	0.97	1.33	14	13	64	0	46
711.0	36.0	126	2.30	1.12	1.17	0	80.0	1.000	1.10	1.00	0.94	1.33	0	0	35	0	46
709.5	37.5	126	2.39	1.17	1.22	0	80.0	1.000	1.10	1.00	0.92	1.33	0	0	35	0	46
708.0	39.0	126	2.49	1.22	1.27	0	80.0	1.000	1.10	1.00	0.90	1.33	0	0	35	0	46
706.5	40.5	131	2.58	1.26	1.32	0	80.0	1.000	1.10	1.00	0.87	1.33	0	0	33	0	22
705.0	42.0	131	2.68	1.31	1.37	13	80.0	1.000	1.18	1.00	0.90	1.33	21	18	71	0	22
703.5	43.5	131	2.78	1.36	1.42	24	80.0	1.000	1.30	1.00	0.92	1.33	42	38	97	0	22

KIF TDEC Stability, Boring ID: KIF-A3
Liquefaction Potential Evaluations
For Coarse Grained Soils

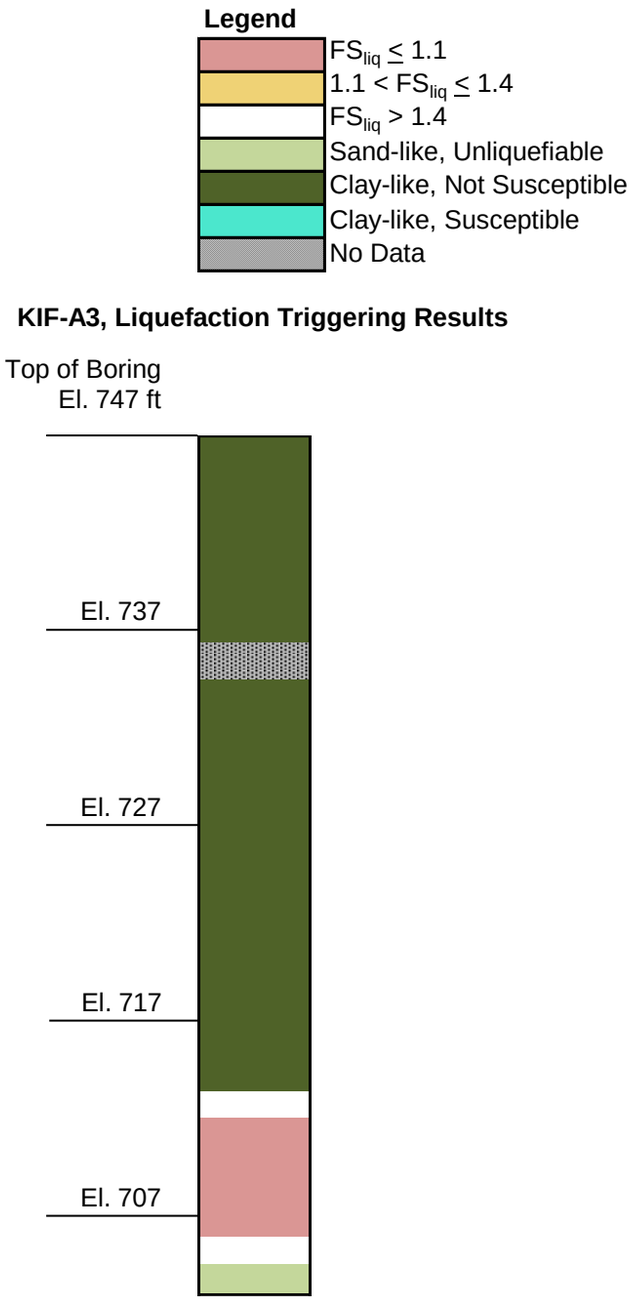
Depth of Mid. Pt. of Sample (ft.) z	Clean Sand Correction $\Delta(N_1)_{60cs}$	Equivalent Clean Sand N-Value $(N_1)_{60cs}$	Sample Screened for: Clay-like	High Blow Count $(N_1)_{60cs} \geq 32$	Unsaturated	Factor of Safety FS_{liq}	Material (optional)
ft							
ft	*(relative to ground surface during SPT)*						
pcf							
tsf							

Note: A factor of safety shown as "N/A" implies that the soil type is not appropriately evaluated using this methodology. This applies to clay-like soils (typically CL, CH, CL-ML and MH material type), samples with high blow counts, and unsaturated samples.

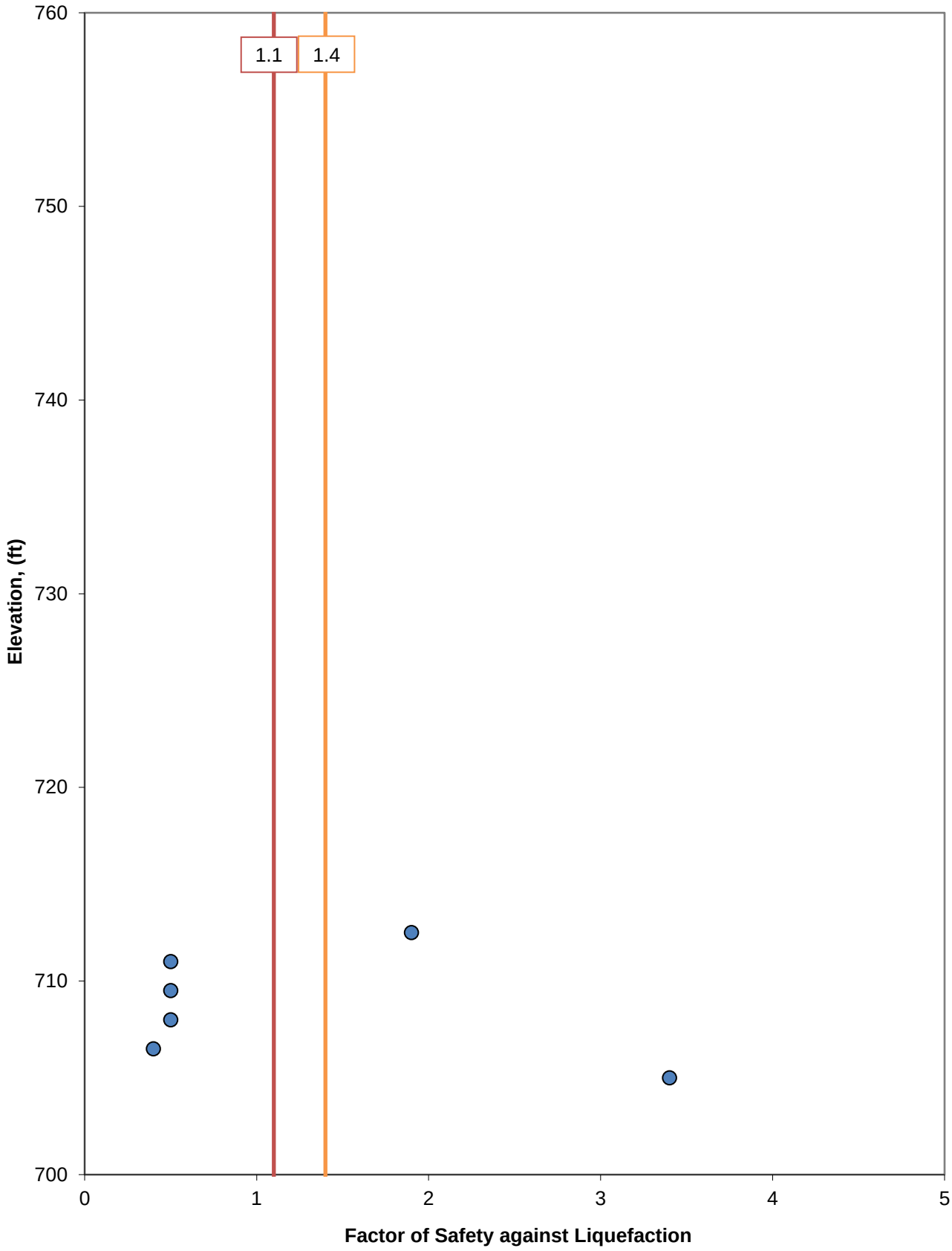
1.0	5.61	13	TRUE	FALSE	TRUE	**N/A**	**Embankment Fill**
2.5	5.61	28	TRUE	FALSE	TRUE	**N/A**	**Embankment Fill**
4.0	5.61	28	TRUE	FALSE	TRUE	**N/A**	**Embankment Fill**
5.5	5.61	47	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**
7.0	5.61	47	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**
8.5	5.61	16	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
10.0	5.61	8	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
13.5	5.61	6	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
15.0	5.61	6	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
16.5	5.61	6	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
18.0	5.61	6	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
19.5	5.61	6	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
21.0	5.61	9	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
22.5	5.61	6	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
24.0	5.61	6	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
25.5	5.51	6	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
27.0	5.51	9	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
28.5	5.51	15	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
30.0	5.51	27	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
31.5	5.51	29	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
33.0	5.51	17	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
34.5	5.61	19	FALSE	FALSE	FALSE	**1.9**	**Subunit 2**
36.0	5.61	6	FALSE	FALSE	FALSE	**0.5**	**Subunit 2**

KIF TDEC Stability, Boring ID: KIF-A3
Liquefaction Potential Evaluations
For Coarse Grained Soils

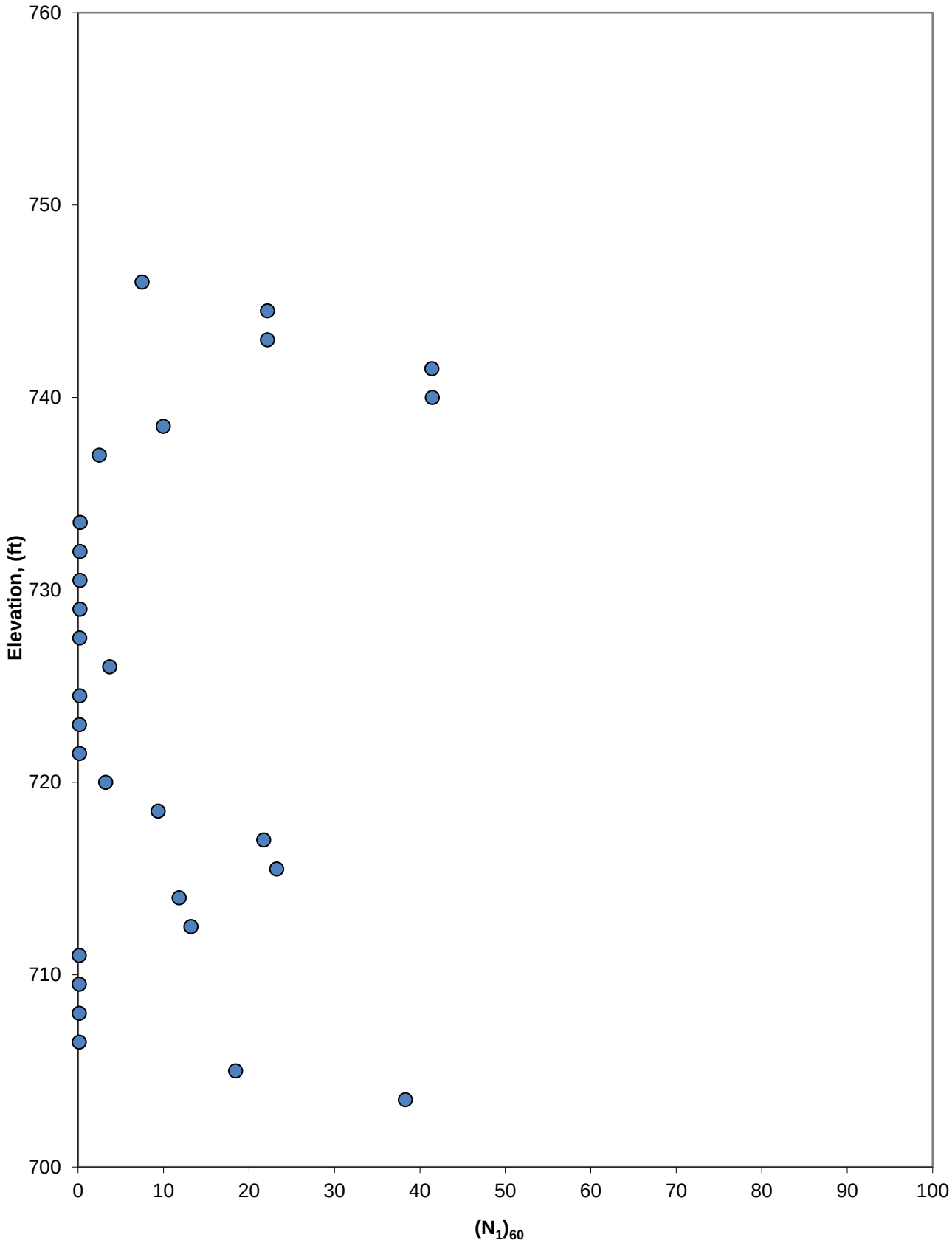
Depth of Mid. Pt. of Sample (ft.) z	Clean Sand Correction $\Delta(N_1)_{60cs}$	Equivalent Clean Sand N-Value $(N_1)_{60cs}$	Sample Screened for: Clay-like	High Blow Count $(N_1)_{60cs} \geq 32$	Unsaturated	Factor of Safety FS_{liq}	Material (optional)
37.5	5.61	6	FALSE	FALSE	FALSE	**0.5**	**Subunit 2**
39.0	5.61	6	FALSE	FALSE	FALSE	**0.5**	**Subunit 2**
40.5	4.77	5	FALSE	FALSE	FALSE	**0.4**	**Subunit 3**
42.0	4.77	23	FALSE	FALSE	FALSE	**3.4**	**Subunit 3**
43.5	4.77	43	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**


Legend
FS$_{liq}$ ≤ 1.1
1.1 < FS$_{liq}$ ≤ 1.4
FS$_{liq}$ > 1.4
Sand-like, Unliquefiable
Clay-like, Not Susceptible
Clay-like, Susceptible
No Data
KIF-A3, Liquefaction Triggering Results
Top of Boring
El. 747 ft
El. 737
El. 727
El. 717
El. 707

KIF TDEC Stability, Boring ID: KIF-A3, Source = 10 Hz, Mw = 6, Event = Design EQ,
SPT Data, Simplified Stress-Based Approach



KIF TDEC Stability, Boring ID: KIF-A3, Source = 10 Hz, Mw = 6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



Project Name = KIF TDEC Stability
Boring ID = KIF-B1

Boring Location

Northing = 553531.6
Easting = 2439911.3

OR

Baseline Station =
Offset (+ Right) =

Drilling Information

Boring Inner Diameter (ID) = 3.25 inches
Top of Hole Elevation = 759 feet
Water Depth during SPT (negative for U/S borings)= 15.5 feet
Depth Sampling Began = 0 feet
Total Unit Wt. above 1st SPT = pcf
Assumed Rod Stickup = 5 feet *(Typ assume 5ft)*
E_m Measurement based on Fv method? = 1 (1: Yes, 0: No)
SPT Sampler w/ Liners? = 0 (1: Yes, 0: No) *(Typ. no)*

During EQ Information

Water Depth during EQ (relative to SPT TOH, negative for U/S borings) = 14.3 feet
Final Grade Elevation during EQ = 763.1 feet
Average Total Unit Wt. of Cut/Fill = 121 pcf

Fines Content Correction

Fines content correction for samples with blow counts of zero? = 1 (1: Yes, 0: No)

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile? = 0 (1: Yes, 0: No)
If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile: ng_Pond_Section, KIF-B1_NOR
Alpha at each sample depth known? = 1 (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (α vs. depth curve)
If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_α will be one.

m4:
m3:
m2:
m1:
m0:

Associated ground response profile: shing_Pond_Section, KIF-B1
Get CSR from shear stress envelope? = 0 (1: Yes, 0: No)
If previous answer is No, then CSR will be calculated using a_{max} and r_d
Max. Shear Stress at each sample depth known? (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4:
m3:
m2:
m1:

Earthquake Information

EQ Source (e.g., New Madrid) = 10 Hz
Event (e.g., MCE, 10KEQ, OBE) = Design EQ
a_{max} (g) (top of ground surface) = 0.20
EQ Mag (Mw) = 6

Inputs

Depth of Sample Midpoint (ft.)	SPT N Value	Hammer Efficiency, E_m (%)	Unified Soil Classification	Fines Content (%)	Total Unit Weight (pcf)	Material (optional)	Clay-like / Sand-like Override (optional)	Clay-like Susceptibility (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure during SPT (psf)	Static Pore Water Pressure during EQ (psf)
1.0	5	80	SM	38	119	Bottom Ash	Sand-like			0.072			
2.5	21	80		38	119	Bottom Ash	Sand-like			0.077			
4.0	15	80		38	119	Bottom Ash	Sand-like			0.083			
5.5	20	80		38	119	Bottom Ash	Sand-like			0.087			
7.0	27	80		38	119	Bottom Ash	Sand-like			0.095			
8.5	16	80		38	119	Bottom Ash	Sand-like			0.086			
10.0	13	80		38	119	Bottom Ash	Sand-like			0.097			
11.5	12	80		38	119	Bottom Ash	Sand-like			0.100			
13.0	18	80		38	119	Bottom Ash	Sand-like			0.100			
14.5	4	80		38	119	Bottom Ash	Sand-like			0.100			
16.0	9	80		62	119	Bottom Ash	Sand-like			0.100			
17.5	7	80		62	112	Fly Ash	Sand-like		Do Not Correct for FC	0.100			
25.0	10	80		62	112	Fly Ash	Sand-like		Do Not Correct for FC	0.103			
26.5	0	80		62	112	Fly Ash	Sand-like		Do Not Correct for FC	0.102			
28.0	2	80		62	112	Fly Ash	Sand-like		Do Not Correct for FC	0.101			
29.5	0	80		41	126	Subunit 2	Sand-like			0.100			
31.0	9	80		41	126	Subunit 2	Sand-like			0.099			
32.5	4	80		41	126	Subunit 2	Sand-like			0.098			
34.0	5	80		41	126	Subunit 2	Sand-like			0.096			
35.5	4	80		41	126	Subunit 2	Sand-like			0.095			
37.0	5	80		41	126	Subunit 2	Sand-like			0.094			
38.5	3	80		41	126	Subunit 2	Sand-like			0.092			
40.0	9	80		41	126	Subunit 2	Sand-like			0.092			
41.5	2	80		41	126	Subunit 2	Sand-like			0.091			
43.0	1	80		41	126	Subunit 2	Sand-like			0.090			
44.5	6	80		41	126	Subunit 2	Sand-like			0.089			
46.0	6	80		30	131	Subunit 3	Sand-like			0.089			

KIF TDEC Stability, Boring ID: KIF-B1

Liquefaction Potential Evaluations

For Coarse Grained Soils

Top of Hole Elevation (ft) =			759.0				Boring ID =		KIF-B1										
begin sampling (depth-ft) =			0.0				Boring Inner Dia. (in) =		3.25										
total unit wt. above 1st SPT (pcf) =			0																
water elevation during SPT (ft) =			743.5	ft *(relative to ground surface during SPT)*					Assumed Rod Stickup =	5.0	feet								
water depth during SPT (ft) =			15.5						E_m Measurement? =	1	(1: Yes, 0: No)								
water elevation during EQ (ft) =			744.7	ft *(relative to ground surface during SPT)*					SPT Sampler w/ Liners? =	0	(1: Yes, 0: No)								
water during EQ (depth-ft) =			14.3	u-top	effstr-top														
vert. total stress above 1st SPT (tsf) =			**0.00**	**0.00**	0.00														
Elev. Of Mid. Pt. of Sample (ft)	Depth of Mid. Pt. of Sample (ft.) z	Unit Weight (pcf) γ_T	Vert. Total Stress during SPT (tsf) σ_v	Static Pore Pressure during SPT (tsf) u	Vert. Eff. Stress during SPT (tsf) σ'_v	SPT N Value N	Hammer Efficiency (%) E_m	Borehole Diameter Correction C_B	Sampler Correction C_s	Rod Length Correction C_R	Overburden Stress Correction Factor C_N	Hammer Energy Correction Factor C_E	Corrected Blow Count N_{60}	Normalized Blow Count $(N_1)_{60}$	Relative Density (%) D_r	Unified Soil Classification	Fines Content (%)	Relative State Parameter Index ξ_R	Static Shear Stress Ratio α
758.0	1.0	119	0.06	0.00	0.06	5	80.0	1.000	1.13	1.00	1.70	1.33	8	13	63	SM	38	-0.49	0.072
756.5	2.5	119	0.15	0.00	0.15	21	80.0	1.000	1.30	1.00	1.68	1.33	36	61	100	0	38	-0.60	0.077
755.0	4.0	119	0.24	0.00	0.24	15	80.0	1.000	1.30	1.00	1.50	1.33	26	39	98	0	38	-0.60	0.083
753.5	5.5	119	0.33	0.00	0.33	20	80.0	1.000	1.30	1.00	1.36	1.33	35	47	100	0	38	-0.60	0.087
752.0	7.0	119	0.42	0.00	0.42	27	80.0	1.000	1.30	1.00	1.28	1.33	47	60	100	0	38	-0.60	0.095
750.5	8.5	119	0.51	0.00	0.51	16	80.0	1.000	1.30	1.00	1.25	1.33	28	35	93	0	38	-0.60	0.086
749.0	10.0	119	0.60	0.00	0.60	13	80.0	1.000	1.27	1.00	1.22	1.33	22	27	84	0	38	-0.60	0.097
747.5	11.5	119	0.68	0.00	0.68	12	80.0	1.000	1.23	1.00	1.18	1.33	20	23	79	0	38	-0.60	0.100
746.0	13.0	119	0.77	0.00	0.77	18	80.0	1.000	1.30	1.00	1.10	1.33	31	34	93	0	38	-0.60	0.100
744.5	14.5	119	0.86	0.00	0.86	4	80.0	1.000	1.10	1.00	1.11	1.33	6	7	51	0	38	-0.34	0.100
743.0	16.0	119	0.95	0.02	0.94	9	80.0	1.000	1.14	1.00	1.06	1.33	14	14	66	0	62	-0.49	0.100
741.5	17.5	112	1.04	0.06	0.98	7	80.0	1.000	1.11	1.00	1.04	1.33	10	11	48	0	62	-0.31	0.100
734.0	25.0	112	1.46	0.30	1.16	10	80.0	1.000	1.15	1.00	0.95	1.33	15	15	56	0	62	-0.38	0.103
732.5	26.5	112	1.54	0.34	1.20	0	80.0	1.000	1.10	1.00	0.91	1.33	0	0	5	0	62	0.10	0.102
731.0	28.0	112	1.63	0.39	1.24	2	80.0	1.000	1.10	1.00	0.90	1.33	3	3	24	0	62	-0.06	0.101
729.5	29.5	126	1.72	0.44	1.28	0	80.0	1.000	1.10	1.00	0.89	1.33	0	0	35	0	41	-0.17	0.100
728.0	31.0	126	1.81	0.48	1.33	9	80.0	1.000	1.12	1.00	0.90	1.33	13	12	62	0	41	-0.44	0.099
726.5	32.5	126	1.90	0.53	1.37	4	80.0	1.000	1.10	1.00	0.87	1.33	6	5	48	0	41	-0.30	0.098
725.0	34.0	126	2.00	0.58	1.42	5	80.0	1.000	1.10	1.00	0.86	1.33	7	6	51	0	41	-0.32	0.096
723.5	35.5	126	2.09	0.62	1.47	4	80.0	1.000	1.10	1.00	0.84	1.33	6	5	48	0	41	-0.29	0.095
722.0	37.0	126	2.19	0.67	1.52	5	80.0	1.000	1.10	1.00	0.83	1.33	7	6	50	0	41	-0.32	0.094
720.5	38.5	126	2.28	0.72	1.57	3	80.0	1.000	1.10	1.00	0.81	1.33	4	4	45	0	41	-0.26	0.092
719.0	40.0	126	2.38	0.76	1.61	9	80.0	1.000	1.11	1.00	0.82	1.33	13	11	60	0	41	-0.41	0.092
717.5	41.5	126	2.47	0.81	1.66	2	80.0	1.000	1.10	1.00	0.77	1.33	3	2	41	0	41	-0.22	0.091
716.0	43.0	126	2.57	0.86	1.71	1	80.0	1.000	1.10	1.00	0.76	1.33	1	1	38	0	41	-0.19	0.090
714.5	44.5	126	2.66	0.90	1.76	6	80.0	1.000	1.10	1.00	0.77	1.33	9	7	52	0	41	-0.33	0.089
713.0	46.0	131	2.76	0.95	1.81	6	80.0	1.000	1.10	1.00	0.76	1.33	9	7	51	0	30	-0.32	0.089

KIF TDEC Stability, Boring ID: KIF-B1
Liquefaction Potential Evaluations
For Coarse Grained Soils

EQ Source	a max (g)	EQ Mag (Mw)	Event
10 Hz	0.20	6	Design EQ

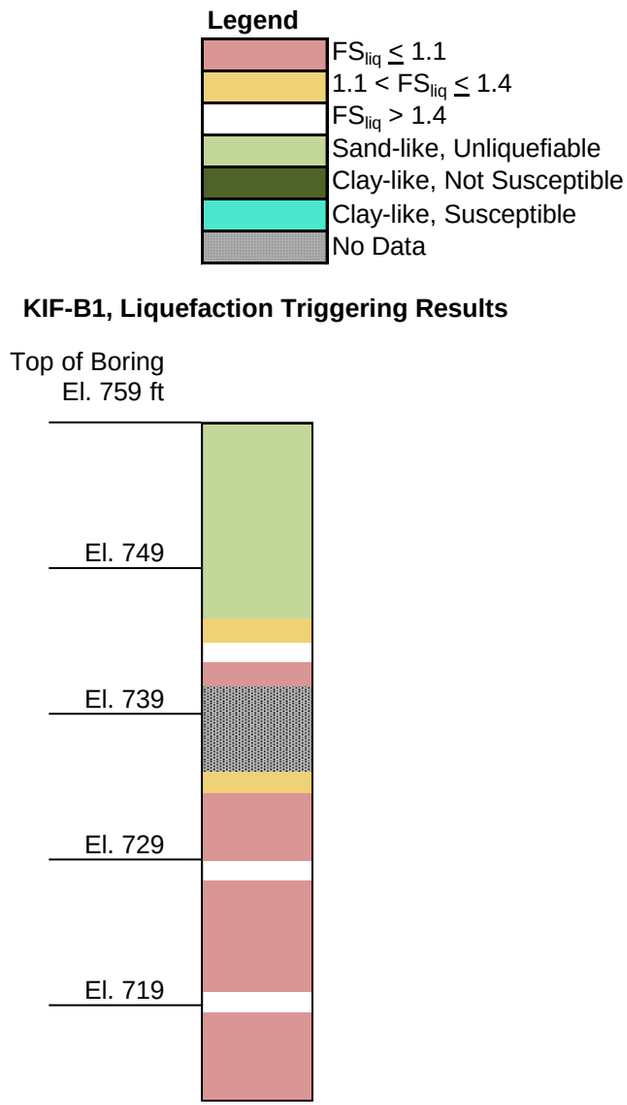
Shear Stress Curve Fit Parameters
m4: 0
m3: 0
m2: 0
m1: 0

Boring ID: **KIF-B1**
Top of Fill Elevation: 763.1 ft
Fill Height: 4.1 ft *(relative to ground surface during SPT)*
Fill Total Unit Weight: 121 pcf
Fill Total Stress: 0.25 tsf

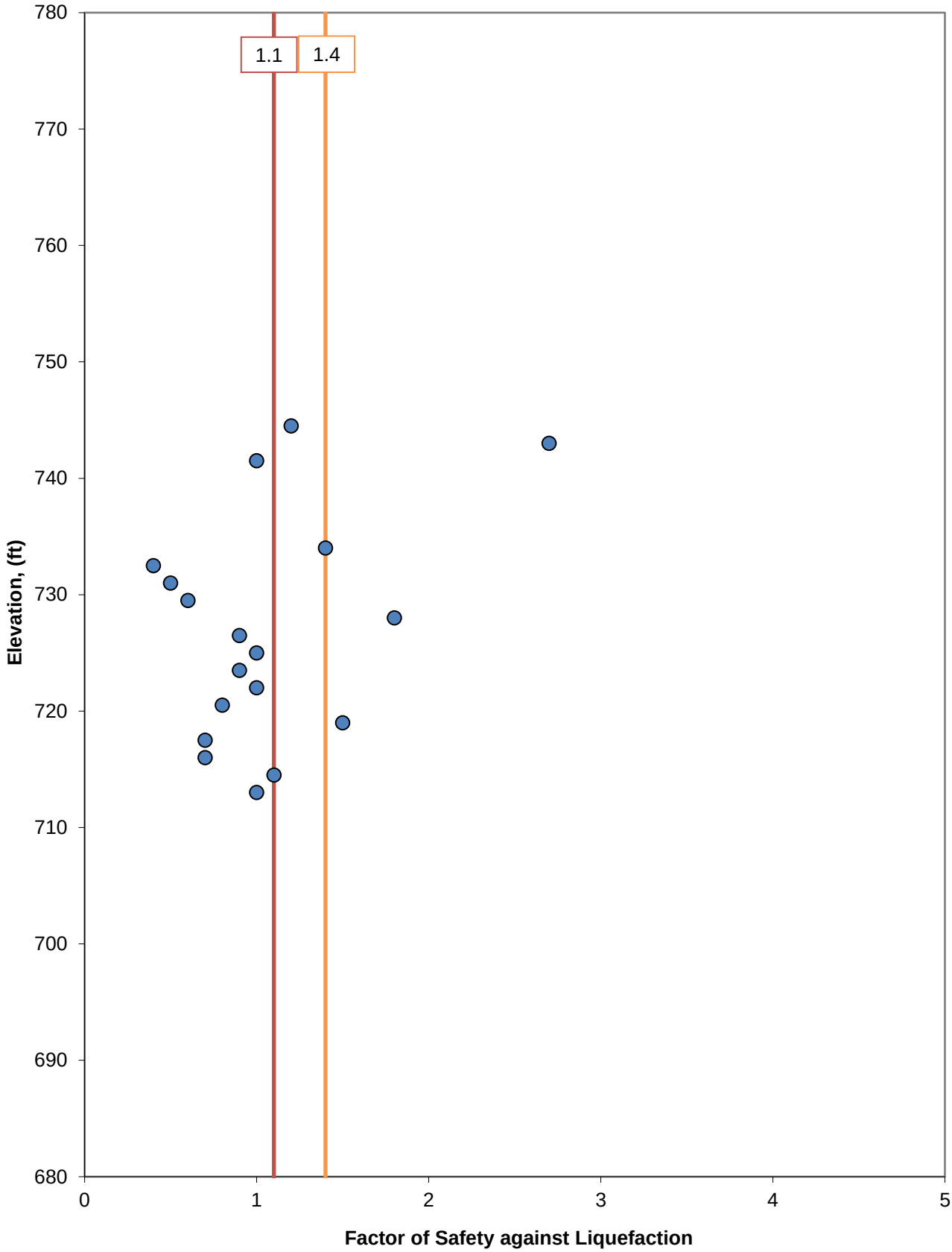
totstr-top **0.25** | u-top 0.00 | effstr-top 0.25

Note: A factor of safety shown as "N/A" implies that the soil type is not appropriately evaluated using this methodology. This applies to clay-like soils (typically CL, CH, CL-ML and MH material type), samples with high blow counts, and unsaturated samples.

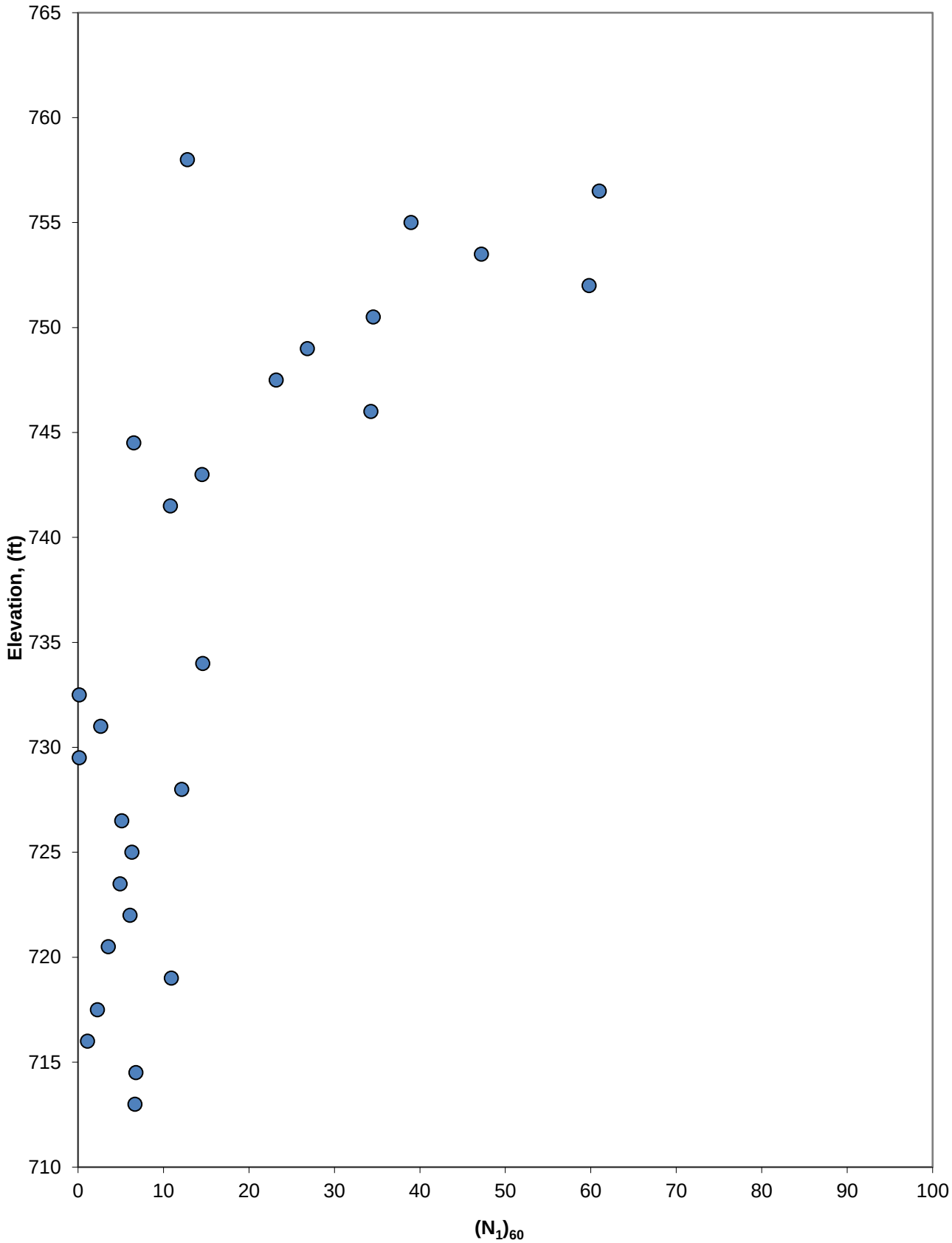
Depth of Mid. Pt. of Sample (ft.) z	Vert. Total Stress during EQ w/ Fill (tsf) $\sigma_{v\ with\ fill}$	Static Pore Pressure during EQ (tsf) u	Vert. Eff. Stress during EQ w/ Fill (tsf) $\sigma'_{v\ with\ fill}$	Clean Sand Correction $\Delta(N_1)_{60cs}$	Equivalent Clean Sand N-Value $(N_1)_{60cs}$	Cyclic Resistance Ratio CRR7.5	Overburden Correction Factor K_σ	Static Shear Stress Correction K_α	Mag. Scaling Factor (MSF)	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Max. Induced Shear Stress (psf)	From Ground Response: Avg. Cyclic Shear Stress (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Blow Count $(N_1)_{60cs} \geq 32$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)
1.0	0.31	0.00	0.31	5.55	18	0.187	1.100	1.174	1.26	0.304	0.985	0	0	0.130	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**
2.5	0.40	0.00	0.40	5.55	67	N/A	N/A	N/A	N/A	N/A	0.977	0	0	0.129	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**
4.0	0.49	0.00	0.49	5.55	45	N/A	N/A	N/A	N/A	N/A	0.969	0	0	0.128	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**
5.5	0.58	0.00	0.58	5.55	53	N/A	N/A	N/A	N/A	N/A	0.961	0	0	0.127	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**
7.0	0.66	0.00	0.66	5.55	65	N/A	N/A	N/A	N/A	N/A	0.952	0	0	0.126	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**
8.5	0.75	0.00	0.75	5.55	40	N/A	N/A	N/A	N/A	N/A	0.943	0	0	0.125	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**
10.0	0.84	0.00	0.84	5.55	32	N/A	N/A	N/A	N/A	N/A	0.933	0	0	0.124	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**
11.5	0.93	0.00	0.93	5.55	29	0.416	1.024	1.744	1.56	1.156	0.924	0	0	0.122	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**
13.0	1.02	0.00	1.02	5.55	40	N/A	N/A	N/A	N/A	N/A	0.914	0	0	0.121	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**
14.5	1.11	0.01	1.10	5.55	12	0.133	0.996	0.991	1.14	0.150	0.903	0	0	0.120	FALSE	FALSE	FALSE	**1.2**	**Bottom Ash**
16.0	1.20	0.05	1.15	5.60	20	0.207	0.989	1.262	1.30	0.336	0.893	0	0	0.124	FALSE	FALSE	FALSE	**2.7**	**Bottom Ash**
17.5	1.29	0.10	1.19	0.00	11	0.124	0.989	0.961	1.13	0.132	0.882	0	0	0.127	FALSE	FALSE	FALSE	**1.0**	**Fly Ash**
25.0	1.71	0.33	1.37	0.00	15	0.153	0.972	1.050	1.18	0.184	0.827	0	0	0.136	FALSE	FALSE	FALSE	**1.4**	**Fly Ash**
26.5	1.79	0.38	1.41	0.00	0	0.061	0.984	0.831	1.05	0.053	0.816	0	0	0.137	FALSE	FALSE	FALSE	**0.4**	**Fly Ash**
28.0	1.87	0.43	1.45	0.00	3	0.073	0.979	0.849	1.06	0.064	0.805	0	0	0.138	FALSE	FALSE	FALSE	**0.5**	**Fly Ash**
29.5	1.96	0.47	1.49	5.58	6	0.090	0.973	0.879	1.07	0.083	0.793	0	0	0.138	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**
31.0	2.06	0.52	1.54	5.58	18	0.181	0.954	1.137	1.24	0.244	0.782	0	0	0.139	FALSE	FALSE	FALSE	**1.8**	**Subunit 2**
32.5	2.15	0.57	1.59	5.58	11	0.123	0.962	0.951	1.12	0.126	0.771	0	0	0.139	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**
34.0	2.25	0.61	1.63	5.58	12	0.132	0.957	0.973	1.14	0.140	0.759	0	0	0.138	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**
35.5	2.34	0.66	1.68	5.58	11	0.122	0.956	0.947	1.12	0.123	0.748	0	0	0.138	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**
37.0	2.44	0.71	1.73	5.58	12	0.130	0.952	0.966	1.14	0.136	0.737	0	0	0.138	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**
38.5	2.53	0.76	1.78	5.58	9	0.112	0.954	0.924	1.10	0.109	0.726	0	0	0.137	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**
40.0	2.63	0.80	1.82	5.58	16	0.169	0.936	1.075	1.22	0.208	0.715	0	0	0.136	FALSE	FALSE	FALSE	**1.5**	**Subunit 2**
41.5	2.72	0.85	1.87	5.58	8	0.104	0.951	0.908	1.09	0.098	0.704	0	0	0.136	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**
43.0	2.81	0.90	1.92	5.58	7	0.096	0.952	0.895	1.08	0.089	0.693	0	0	0.135	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**
44.5	2.91	0.94	1.97	5.58	12	0.135	0.938	0.974	1.15	0.142	0.683	0	0	0.134	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**
46.0	3.01	0.99	2.02	5.36	12	0.133	0.936	0.968	1.14	0.137	0.673	0	0	0.133	FALSE	FALSE	FALSE	**1.0**	**Subunit 3**


Legend
$FS_{liq} \leq 1.1$
$1.1 < FS_{liq} \leq 1.4$
$FS_{liq} > 1.4$
Sand-like, Unliquefiable
Clay-like, Not Susceptible
Clay-like, Susceptible
No Data
KIF-B1, Liquefaction Triggering Results
Top of Boring
El. 759 ft
El. 749
El. 739
El. 729
El. 719

KIF TDEC Stability, Boring ID: KIF-B1, Source = 10 Hz, Mw = 6, Event = Design EQ,
SPT Data, Simplified Stress-Based Approach



KIF TDEC Stability, Boring ID: KIF-B1, Source = 10 Hz, Mw = 6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



Project Name = KIF TDEC Stability
Boring ID = KIF-B2

Boring Location

Northing =
Easting =

OR

Baseline Station =
Offset (+ Right) =

Drilling Information

Boring Inner Diameter (ID) =	3.25	inches	
Top of Hole Elevation	753.02	feet	
Water Depth during SPT (negative for U/S borings)=	15.5	feet	
Depth Sampling Began	0	feet	
Total Unit Wt. above 1st SPT =	120	pcf	
Assumed Rod Stickup =	5	feet	*(Typ assume 5ft)*
E_m Measurement based on Fv method? =	1	(1: Yes, 0: No)	
SPT Sampler w/ Liners? =	0	(1: Yes, 0: No)	*(Typ. no)*

During EQ Information

Water Depth during EQ (relative to SPT TOH, negative for U/S borings) =	4.6	feet
Final Grade Elevation during EQ	752.2	feet
Average Total Unit Wt. of Cut/Fill	120	pcf

Fines Content Correction

Fines content correction for samples with blow counts of zero? 1 (1: Yes, 0: No)

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile? 0 (1: Yes, 0: No)
If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile: olishingPond, KIF-B2_NOR
Alpha at each sample depth known? 1 (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (α vs. depth curve)
If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_α will be one.

m4:
m3:
m2:
m1:
m0:

Associated ground response profile: olishing_Pond, KIF-B2_NOR
Get CSR from shear stress envelope? 0 (1: Yes, 0: No)
If previous answer is No, then CSR will be calculated using a_{max} and r_d
Max. Shear Stress at each sample depth known? (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4:
m3:
m2:
m1:

Earthquake Information

EQ Source (e.g., New Madrid)	10 Hz
Event (e.g., MCE, 10KEQ, OBE)	Design EQ
a_{max} (g) (top of ground surface)	0.21
EQ Mag (Mw)	6

Inputs

Depth of Sample Midpoint (ft.)	SPT N Value	Hammer Efficiency, E_m (%)	Unified Soil Classification	Fines Content (%)	Total Unit Weight (pcf)	Material (optional)	Clay-like / Sand-like Override (optional)	Clay-like Susceptibility (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure during SPT (psf)	Static Pore Water Pressure during EQ (psf)
1.0	5	80	CL	53	128	Embankment Fill	Clay-like	Not Susceptible		0.062			
2.5	21	80		53	128	Embankment Fill	Clay-like	Not Susceptible		0.037			
4.0	15	80		53	128	Embankment Fill	Clay-like	Not Susceptible		0.049			
5.5	20	80		53	128	Embankment Fill	Clay-like	Not Susceptible		0.035			
8.5	21	80		53	128	Embankment Fill	Clay-like	Not Susceptible		0.012			
10.0	22	80		27	128	Embankment Fill	Clay-like	Not Susceptible		0.006			
11.5	17	80		53	128	Embankment Fill	Clay-like	Not Susceptible		0.018			
13.0	15	80		53	128	Embankment Fill	Clay-like	Not Susceptible		0.028			
14.5	13	80		53	128	Embankment Fill	Clay-like	Not Susceptible		0.034			
16.0	5	80		53	128	Embankment Fill	Clay-like	Not Susceptible		0.040			
17.5	5	80		53	128	Embankment Fill	Clay-like	Not Susceptible		0.045			
19.0	3	80		53	128	Embankment Fill	Clay-like	Not Susceptible		0.052			
20.5	2	80		53	128	Embankment Fill	Clay-like	Not Susceptible		0.061			
22.0	3	80		53	128	Embankment Fill	Clay-like	Not Susceptible		0.067			
23.5	3	80		53	128	Embankment Fill	Clay-like	Not Susceptible		0.074			
25.0	0	80		53	128	Embankment Fill	Clay-like	Not Susceptible		0.081			
26.5	0	80		41	126	Subunit 2	Sand-like			0.086			
28.0	1	80		41	126	Subunit 2	Sand-like			0.092			
29.5	2	80		41	126	Subunit 2	Sand-like			0.097			
31.0	2	80		41	126	Subunit 2	Sand-like			0.102			
32.5	3	80		41	126	Subunit 2	Sand-like			0.107			
34.0	6	80		41	126	Subunit 2	Sand-like			0.111			
35.5	7	80		41	126	Subunit 2	Sand-like			0.114			
37.0	6	80		41	126	Subunit 2	Sand-like			0.118			
38.5	5	80		41	126	Subunit 2	Sand-like			0.121			
40.0	2	80		22	131	Subunit 3	Sand-like			0.124			
41.5	12	80		22	131	Subunit 3	Sand-like			0.126			
43.0	48	80		22	131	Subunit 3	Sand-like			0.128			
44.5	76	80		22	131	Subunit 3	Sand-like			0.130			
46.0	63	80		22	131	Subunit 3	Sand-like			0.132			
47.5	76	80		22	131	Subunit 3	Sand-like			0.133			

KIF TDEC Stability, Boring ID: KIF-B2

Liquefaction Potential Evaluations

For Coarse Grained Soils

Elev. Of Mid. Pt. of Sample (ft)	Depth of Mid. Pt. of Sample (ft.)	Unit Weight (pcf)	Vert. Total Stress during SPT (tsf)	Static Pore Pressure during SPT (tsf)	Vert. Eff. Stress during SPT (tsf)	SPT N Value	Hammer Efficiency (%)	Borehole Diameter Correction	Sampler Correction	Rod Length Correction	Overburden Stress Correction Factor	Hammer Energy Correction Factor	Corrected Blow Count	Normalized Blow Count	Relative Density (%)	Unified Soil Classification	Fines Content (%)
	z	γ_T	σ_v	u	σ'_v	N	E_m	C_B	C_s	C_R	C_N	C_E	N_{60}	$(N_1)_{60}$	D_r		

Top of Hole Elevation (ft) = 753.0 | Boring ID = **KIF-B2**

begin sampling (depth-ft) = 0.0 | Boring Inner Dia. (in) = 3.25

total unit wt. above 1st SPT (pcf) = 120

water elevation during SPT (ft) = 737.5 ft *(relative to ground surface during SPT)* | Assumed Rod Stickup = 5.0 feet

water depth during SPT (ft) = 15.5 | E_m Measurement? = 1 (1: Yes, 0: No)

water elevation during EQ (ft) = 748.4 ft *(relative to ground surface during SPT)* | SPT Sampler w/ Liners? = 0 (1: Yes, 0: No)

	u-top	effstr-top
water during EQ (depth-ft) =	4.6	
vert. total stress above 1st SPT (tsf) =	**0.00**	**0.00**	0.00

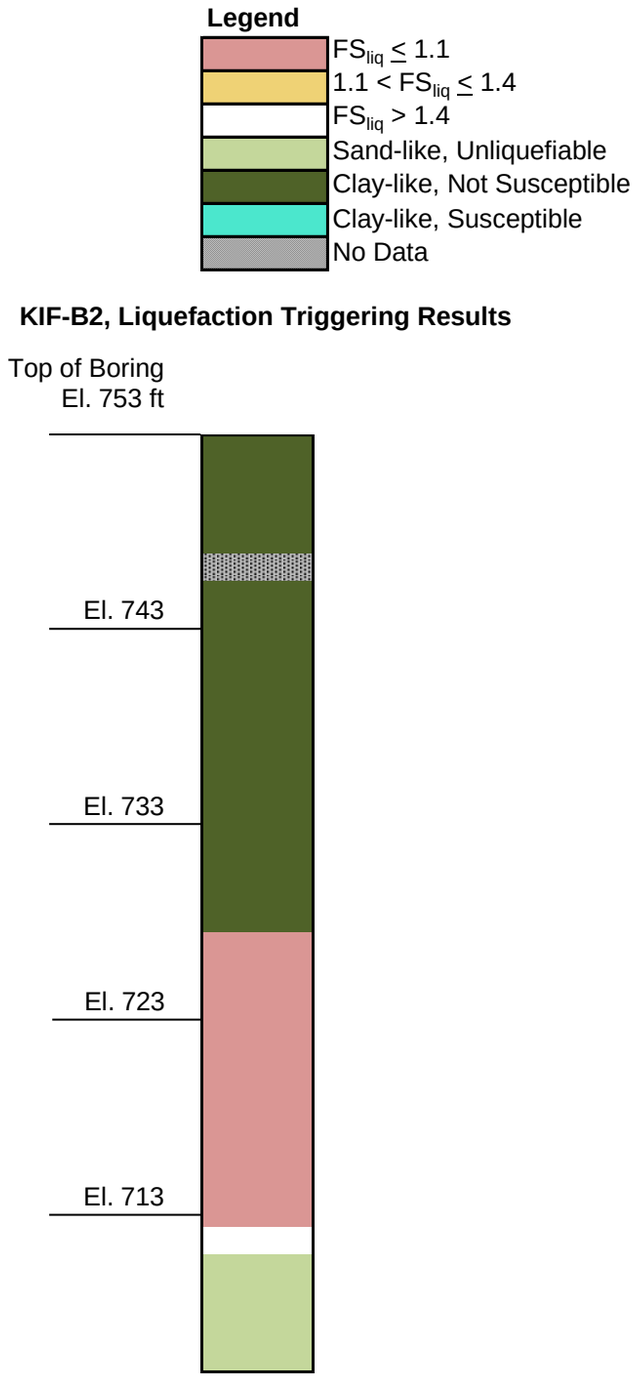
752.0	1.0	128	0.06	0.00	0.06	5	80.0	1.000	1.13	1.00	1.70	1.33	8	13	63	CL	53
750.5	2.5	128	0.16	0.00	0.16	21	80.0	1.000	1.30	1.00	1.64	1.33	36	60	100	0	53
749.0	4.0	128	0.26	0.00	0.26	15	80.0	1.000	1.30	1.00	1.48	1.33	26	38	98	0	53
747.5	5.5	128	0.35	0.00	0.35	20	80.0	1.000	1.30	1.00	1.34	1.33	35	46	100	0	53
744.5	8.5	128	0.54	0.00	0.54	21	80.0	1.000	1.30	1.00	1.19	1.33	36	43	100	0	53
743.0	10.0	128	0.64	0.00	0.64	22	80.0	1.000	1.30	1.00	1.14	1.33	38	44	100	0	27
741.5	11.5	128	0.74	0.00	0.74	17	80.0	1.000	1.30	1.00	1.12	1.33	29	33	92	0	53
740.0	13.0	128	0.83	0.00	0.83	15	80.0	1.000	1.28	1.00	1.09	1.33	26	28	85	0	53
738.5	14.5	128	0.93	0.00	0.93	13	80.0	1.000	1.22	1.00	1.05	1.33	21	22	78	0	53
737.0	16.0	128	1.02	0.02	1.01	5	80.0	1.000	1.10	1.00	1.02	1.33	7	8	53	0	53
735.5	17.5	128	1.12	0.06	1.06	5	80.0	1.000	1.10	1.00	1.00	1.33	7	7	53	0	53
734.0	19.0	128	1.22	0.11	1.11	3	80.0	1.000	1.10	1.00	0.98	1.33	4	4	46	0	53
732.5	20.5	128	1.31	0.16	1.16	2	80.0	1.000	1.10	1.00	0.95	1.33	3	3	43	0	53
731.0	22.0	128	1.41	0.20	1.21	3	80.0	1.000	1.10	1.00	0.93	1.33	4	4	46	0	53
729.5	23.5	128	1.50	0.25	1.25	3	80.0	1.000	1.10	1.00	0.91	1.33	4	4	46	0	53
728.0	25.0	128	1.60	0.30	1.30	0	80.0	1.000	1.10	1.00	0.88	1.33	0	0	35	0	53
726.5	26.5	126	1.70	0.34	1.35	0	80.0	1.000	1.10	1.00	0.86	1.33	0	0	35	0	41
725.0	28.0	126	1.79	0.39	1.40	1	80.0	1.000	1.10	1.00	0.85	1.33	1	1	39	0	41
723.5	29.5	126	1.88	0.44	1.45	2	80.0	1.000	1.10	1.00	0.84	1.33	3	2	42	0	41
722.0	31.0	126	1.98	0.48	1.50	2	80.0	1.000	1.10	1.00	0.82	1.33	3	2	42	0	41
720.5	32.5	126	2.07	0.53	1.54	3	80.0	1.000	1.10	1.00	0.81	1.33	4	4	45	0	41
719.0	34.0	126	2.17	0.58	1.59	6	80.0	1.000	1.10	1.00	0.81	1.33	9	7	53	0	41
717.5	35.5	126	2.26	0.62	1.64	7	80.0	1.000	1.10	1.00	0.80	1.33	10	8	55	0	41
716.0	37.0	126	2.36	0.67	1.69	6	80.0	1.000	1.10	1.00	0.79	1.33	9	7	52	0	41
714.5	38.5	126	2.45	0.72	1.73	5	80.0	1.000	1.10	1.00	0.77	1.33	7	6	49	0	41
713.0	40.0	131	2.55	0.76	1.78	2	80.0	1.000	1.10	1.00	0.74	1.33	3	2	39	0	22
711.5	41.5	131	2.65	0.81	1.83	12	80.0	1.000	1.14	1.00	0.78	1.33	18	14	64	0	22
710.0	43.0	131	2.74	0.86	1.89	48	80.0	1.000	1.30	1.00	0.86	1.33	83	71	100	0	22
708.5	44.5	131	2.84	0.90	1.94	76	80.0	1.000	1.30	1.00	0.85	1.33	132	112	100	0	22
707.0	46.0	131	2.94	0.95	1.99	63	80.0	1.000	1.30	1.00	0.85	1.33	109	92	100	0	22
705.5	47.5	131	3.04	1.00	2.04	76	80.0	1.000	1.30	1.00	0.84	1.33	132	111	100	0	22

KIF TDEC Stability, Boring ID: KIF-B2
Liquefaction Potential Evaluations
For Coarse Grained Soils

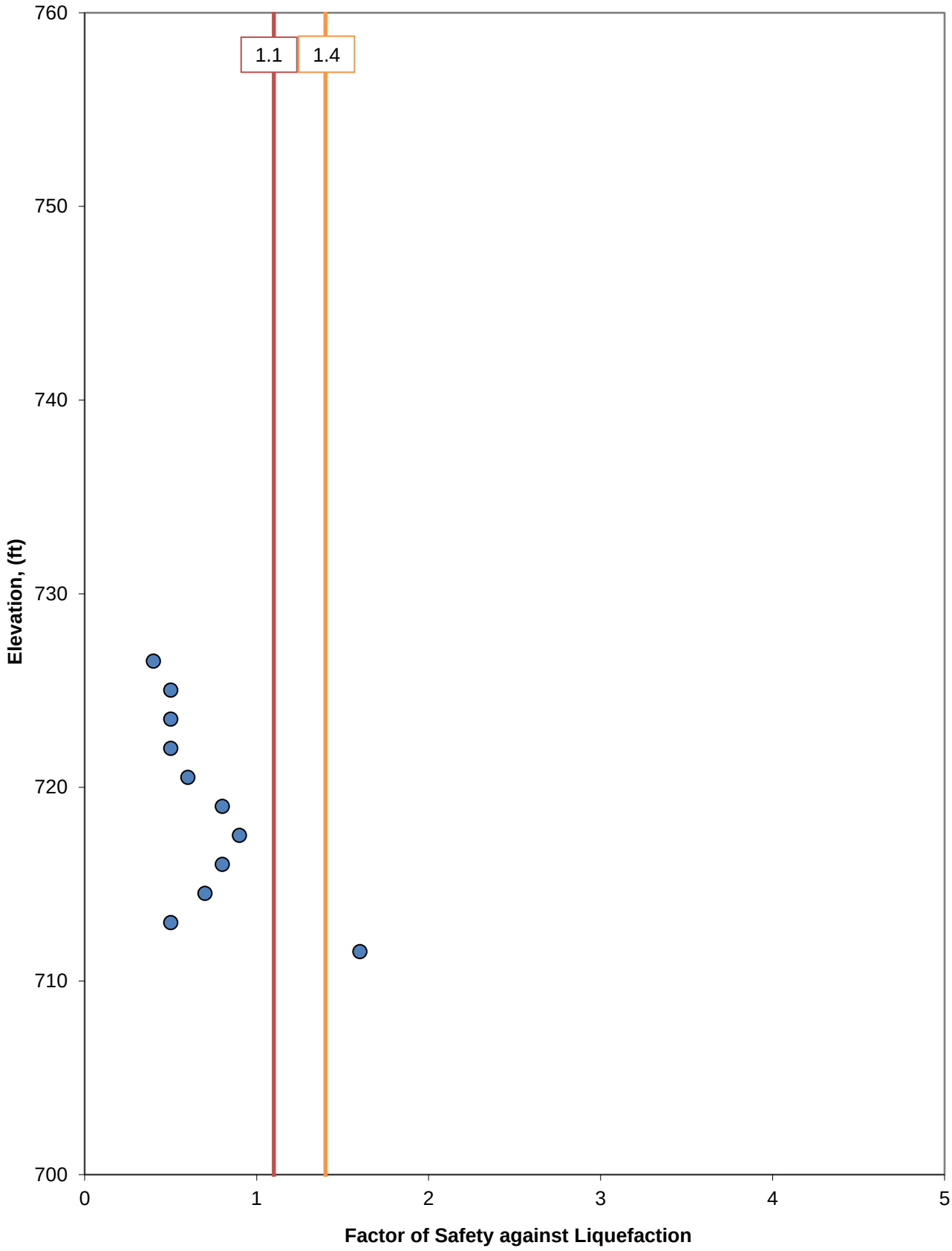
Depth of Mid. Pt. of Sample (ft.) z	Clean Sand Correction $\Delta(N_1)_{60cs}$	Equivalent Clean Sand N-Value $(N_1)_{60cs}$	Sample Screened for: Clay-like	High Blow Count $(N_1)_{60cs} \geq 32$	Unsaturated	Factor of Safety FS_{liq}	Material (optional)
ft			*Note: A factor of safety shown as "N/A" implies that the soil type is not appropriately evaluated using this methodology. This applies to clay-like soils (typically CL, CH, CL-ML and MH material type), samples with high blow counts, and unsaturated samples.*				
ft *(relative to ground surface during SPT)*							
pcf							
tsf							
1.0	5.61	18	TRUE	FALSE	TRUE	**N/A**	**Embankment Fill**
2.5	5.61	65	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**
4.0	5.61	44	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**
5.5	5.61	52	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**
8.5	5.61	49	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**
10.0	5.21	49	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**
11.5	5.61	39	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**
13.0	5.61	33	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**
14.5	5.61	28	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
16.0	5.61	13	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
17.5	5.61	13	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
19.0	5.61	10	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
20.5	5.61	8	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
22.0	5.61	10	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
23.5	5.61	10	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
25.0	5.61	6	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
26.5	5.58	6	FALSE	FALSE	FALSE	**0.4**	**Subunit 2**
28.0	5.58	7	FALSE	FALSE	FALSE	**0.5**	**Subunit 2**
29.5	5.58	8	FALSE	FALSE	FALSE	**0.5**	**Subunit 2**
31.0	5.58	8	FALSE	FALSE	FALSE	**0.5**	**Subunit 2**
32.5	5.58	9	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**
34.0	5.58	13	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**
35.5	5.58	14	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**

KIF TDEC Stability, Boring ID: KIF-B2
Liquefaction Potential Evaluations
For Coarse Grained Soils

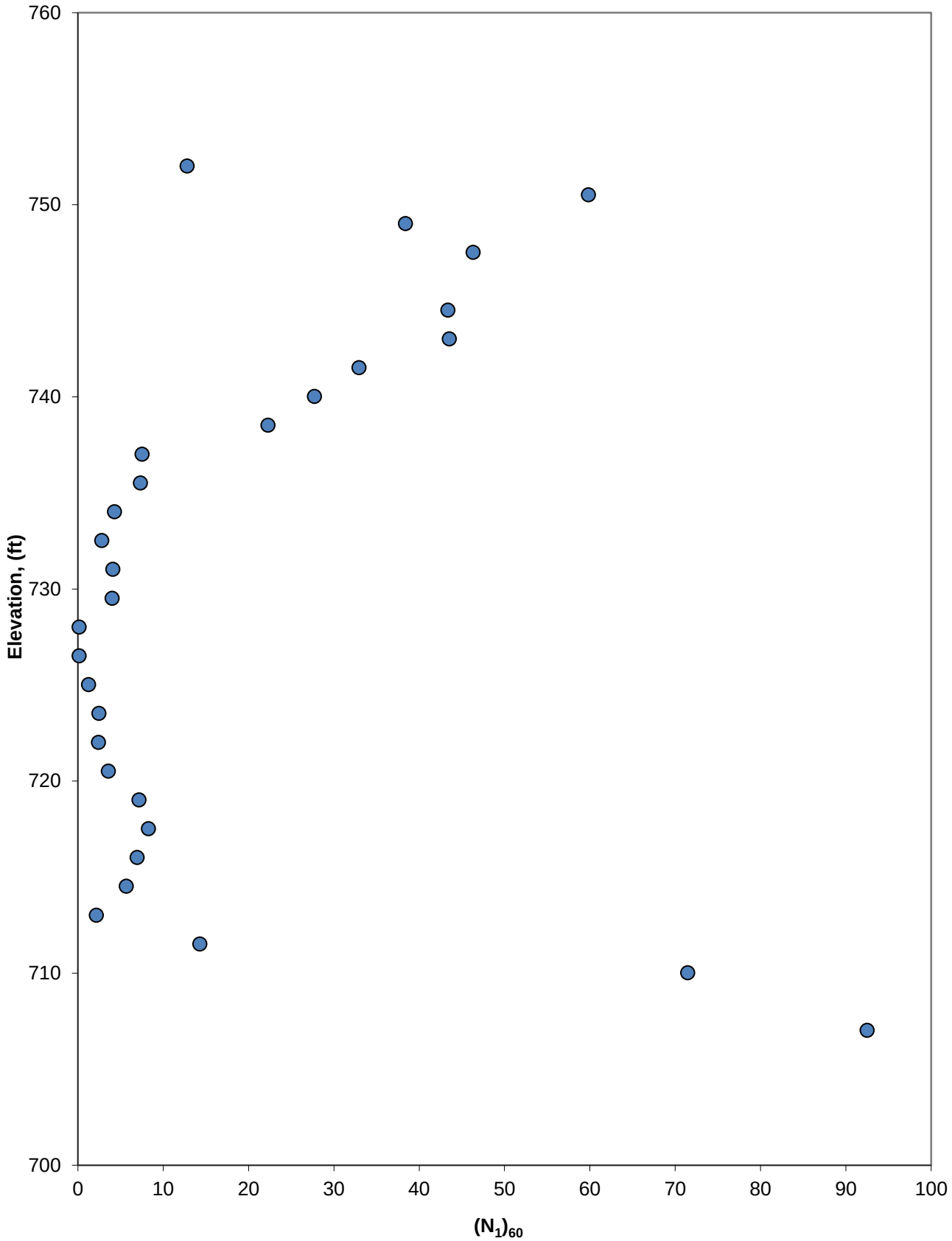
Depth of Mid. Pt. of Sample (ft.) z	Clean Sand Correction $\Delta(N_1)_{60cs}$	Equivalent Clean Sand N-Value $(N_1)_{60cs}$	Sample Screened for: Clay-like	High Blow Count $(N_1)_{60cs} \geq 32$	Unsaturated	Factor of Safety FS_{liq}	Material (optional)
37.0	5.58	13	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**
38.5	5.58	11	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**
40.0	4.77	7	FALSE	FALSE	FALSE	**0.5**	**Subunit 3**
41.5	4.77	19	FALSE	FALSE	FALSE	**1.6**	**Subunit 3**
43.0	4.77	76	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**
44.5	4.77	117	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**
46.0	4.77	97	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**
47.5	4.77	116	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**


Legend
FS$_{liq}$ ≤ 1.1
1.1 < FS$_{liq}$ ≤ 1.4
FS$_{liq}$ > 1.4
Sand-like, Unliquefiable
Clay-like, Not Susceptible
Clay-like, Susceptible
No Data
KIF-B2, Liquefaction Triggering Results
Top of Boring
El. 753 ft
El. 743
El. 733
El. 723
El. 713

KIF TDEC Stability, Boring ID: KIF-B2, Source = 10 Hz, Mw = 6, Event = Design EQ,
SPT Data, Simplified Stress-Based Approach



KIF TDEC Stability, Boring ID: KIF-B2, Source = 10 Hz, Mw = 6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



Project Name = KIF TDEC Stability
Boring ID = KIF-B3

Boring Location

Northing =
Easting =

OR

Baseline Station =
Offset (+ Right) =

Drilling Information

Boring Inner Diameter (ID) =	3.25	inches	
Top of Hole Elevation	748	feet	
Water Depth during SPT (negative for U/S borings)=	5	feet	
Depth Sampling Began	0	feet	
Total Unit Wt. above 1st SPT =	120	pcf	
Assumed Rod Stickup =	5	feet	*(Typ assume 5ft)*
E_m Measurement based on Fv method? =	1	(1: Yes, 0: No)	
SPT Sampler w/ Liners? =	0	(1: Yes, 0: No)	*(Typ. no)*

During EQ Information

Water Depth during EQ (relative to SPT TOH, negative for U/S borings) =	8.9	feet
Final Grade Elevation during EQ	750.5	feet
Average Total Unit Wt. of Cut/Fill	120	pcf

Fines Content Correction

Fines content correction for samples with blow counts of zero? 1 (1: Yes, 0: No)

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile? 0 (1: Yes, 0: No)
If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile: olishingPond, KIF-B3_NOR
Alpha at each sample depth known? 1 (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (α vs. depth curve)
If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_α will be one.

m4:
m3:
m2:
m1:
m0:

Associated ground response profile: olishing_Pond, KIF-B3_NOR
Get CSR from shear stress envelope? 0 (1: Yes, 0: No)
If previous answer is No, then CSR will be calculated using a_{max} and r_d
Max. Shear Stress at each sample depth known? (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4:
m3:
m2:
m1:

Earthquake Information

EQ Source (e.g., New Madrid)	10 Hz
Event (e.g., MCE, 10KEQ, OBE)	Design EQ
a_{max} (g) (top of ground surface)	0.23
EQ Mag (Mw)	6

Inputs

Depth of Sample Midpoint (ft.)	SPT N Value	Hammer Efficiency, E_m (%)	Unified Soil Classification	Fines Content (%)	Total Unit Weight (pcf)	Material (optional)	Clay-like / Sand-like Override (optional)	Clay-like Susceptibility (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure during SPT (psf)	Static Pore Water Pressure during EQ (psf)
1.0	2	80	CL	53	128	Embankment Fill	Clay-like	Not Susceptible		0.015			
2.5	21	80		53	128	Embankment Fill	Clay-like	Not Susceptible		0.017			
4.0	15	80		53	128	Embankment Fill	Clay-like	Not Susceptible		0.022			
5.5	21	80		53	128	Embankment Fill	Clay-like	Not Susceptible		0.044			
7.0	19	80		53	128	Embankment Fill	Clay-like	Not Susceptible		0.067			
8.5	27	80		53	128	Embankment Fill	Clay-like	Not Susceptible		0.073			
10.0	28	80		53	128	Embankment Fill	Clay-like	Not Susceptible		0.093			
11.5	15	80		53	128	Embankment Fill	Clay-like	Not Susceptible		0.103			
13.0	11	80		53	128	Embankment Fill	Clay-like	Not Susceptible		0.113			
14.5	8	80		53	128	Embankment Fill	Clay-like	Not Susceptible		0.123			
16.0	5	80		53	128	Embankment Fill	Clay-like	Not Susceptible		0.134			
17.5	3	80		53	128	Embankment Fill	Clay-like	Not Susceptible		0.141			
19.0	3	80		53	128	Embankment Fill	Clay-like	Not Susceptible		0.147			
20.5	5	80		36	128	Embankment Fill	Clay-like	Not Susceptible		0.149			
22.0	4	80		53	128	Embankment Fill	Clay-like	Not Susceptible		0.151			
23.5	3	80		47	126	Subunit 2	Sand-like			0.153			
27.0	11	80		47	126	Subunit 2	Sand-like			0.155			
28.5	14	80		47	126	Subunit 2	Sand-like			0.156			
30.0	13	80		47	126	Subunit 2	Sand-like			0.154			
31.5	8	80		47	126	Subunit 2	Sand-like			0.155			
33.0	2	80		47	126	Subunit 2	Sand-like			0.155			
34.5	8	80		47	126	Subunit 2	Sand-like			0.155			
36.0	7	80		28	131	Subunit 3	Sand-like			0.155			
37.5	39	80		28	131	Subunit 3	Sand-like			0.155			
39.0	51	80		28	131	Subunit 3	Sand-like			0.155			

KIF TDEC Stability, Boring ID: KIF-B3

Liquefaction Potential Evaluations

For Coarse Grained Soils

Elev. Of Mid. Pt. of Sample (ft)	Depth of Mid. Pt. of Sample (ft.)	Unit Weight (pcf)	Vert. Total Stress during SPT (tsf)	Static Pore Pressure during SPT (tsf)	Vert. Eff. Stress during SPT (tsf)	SPT N Value	Hammer Efficiency (%)	Borehole Diameter Correction	Sampler Correction	Rod Length Correction	Overburden Stress Correction Factor	Hammer Energy Correction Factor	Corrected Blow Count	Normalized Blow Count	Relative Density (%)	Unified Soil Classification	Fines Content (%)
	z	γ_T	σ_v	u	σ'_v	N	E_m	C_B	C_s	C_R	C_N	C_E	N_{60}	$(N_1)_{60}$	D_r		

Top of Hole Elevation (ft) = 748.0 | Boring ID = KIF-B3

begin sampling (depth-ft) = 0.0 | Boring Inner Dia. (in) = 3.25

total unit wt. above 1st SPT (pcf) = 120

water elevation during SPT (ft) = 743.0 ft *(relative to ground surface during SPT)* | Assumed Rod Stickup = 5.0 feet

water depth during SPT (ft) = 5.0 | E_m Measurement? = 1 (1: Yes, 0: No)

water elevation during EQ (ft) = 739.1 ft *(relative to ground surface during SPT)* | SPT Sampler w/ Liners? = 0 (1: Yes, 0: No)

	u-top	effstr-top
water during EQ (depth-ft) =	8.9	
vert. total stress above 1st SPT (tsf) =	**0.00**	0.00

747.0	1.0	128	0.06	0.00	0.06	2	80.0	1.000	1.10	1.00	1.70	1.33	3	5	48	CL	53
745.5	2.5	128	0.16	0.00	0.16	21	80.0	1.000	1.30	1.00	1.64	1.33	36	60	100	0	53
744.0	4.0	128	0.26	0.00	0.26	15	80.0	1.000	1.30	1.00	1.48	1.33	26	38	98	0	53
742.5	5.5	128	0.35	0.02	0.34	21	80.0	1.000	1.30	1.00	1.35	1.33	36	49	100	0	53
741.0	7.0	128	0.45	0.06	0.39	19	80.0	1.000	1.30	1.00	1.30	1.33	33	43	100	0	53
739.5	8.5	128	0.54	0.11	0.43	27	80.0	1.000	1.30	1.00	1.26	1.33	47	59	100	0	53
738.0	10.0	128	0.64	0.16	0.48	28	80.0	1.000	1.30	1.00	1.23	1.33	49	60	100	0	53
736.5	11.5	128	0.74	0.20	0.53	15	80.0	1.000	1.30	1.00	1.24	1.33	26	32	91	0	53
735.0	13.0	128	0.83	0.25	0.58	11	80.0	1.000	1.22	1.00	1.25	1.33	18	22	78	0	53
733.5	14.5	128	0.93	0.30	0.63	8	80.0	1.000	1.15	1.00	1.25	1.33	12	15	68	0	53
732.0	16.0	128	1.02	0.34	0.68	5	80.0	1.000	1.10	1.00	1.24	1.33	7	9	57	0	53
730.5	17.5	128	1.12	0.39	0.73	3	80.0	1.000	1.10	1.00	1.22	1.33	4	5	49	0	53
729.0	19.0	128	1.22	0.44	0.78	3	80.0	1.000	1.10	1.00	1.18	1.33	4	5	48	0	53
727.5	20.5	128	1.31	0.48	0.83	5	80.0	1.000	1.10	1.00	1.13	1.33	7	8	55	0	36
726.0	22.0	128	1.41	0.53	0.88	4	80.0	1.000	1.10	1.00	1.10	1.33	6	6	51	0	53
724.5	23.5	126	1.50	0.58	0.93	3	80.0	1.000	1.10	1.00	1.07	1.33	4	5	47	0	47
721.0	27.0	126	1.72	0.69	1.04	11	80.0	1.000	1.17	1.00	1.01	1.33	17	17	71	0	47
719.5	28.5	126	1.82	0.73	1.09	14	80.0	1.000	1.23	1.00	0.99	1.33	23	23	78	0	47
718.0	30.0	126	1.91	0.78	1.13	13	80.0	1.000	1.20	1.00	0.97	1.33	21	20	75	0	47
716.5	31.5	126	2.01	0.83	1.18	8	80.0	1.000	1.11	1.00	0.95	1.33	12	11	61	0	47
715.0	33.0	126	2.10	0.87	1.23	2	80.0	1.000	1.10	1.00	0.92	1.33	3	3	42	0	47
713.5	34.5	126	2.20	0.92	1.28	8	80.0	1.000	1.11	1.00	0.92	1.33	12	11	60	0	47
712.0	36.0	131	2.29	0.97	1.33	7	80.0	1.000	1.10	1.00	0.90	1.33	10	9	56	0	28
710.5	37.5	131	2.39	1.01	1.38	39	80.0	1.000	1.30	1.00	0.93	1.33	68	63	100	0	28
709.0	39.0	131	2.49	1.06	1.43	51	80.0	1.000	1.30	1.00	0.92	1.33	88	82	100	0	28

KIF TDEC Stability, Boring ID: KIF-B3
Liquefaction Potential Evaluations
For Coarse Grained Soils

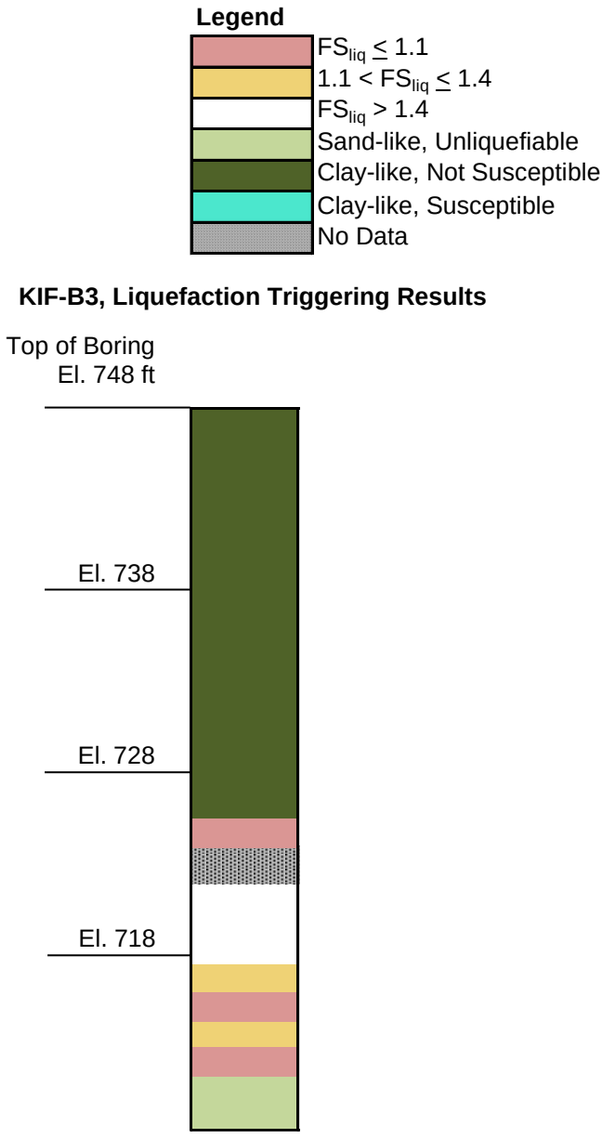
Depth of Mid. Pt. of Sample (ft.) z	Clean Sand Correction $\Delta(N_1)_{60cs}$	Equivalent Clean Sand N-Value $(N_1)_{60cs}$	Sample Screened for: Clay-like	High Blow Count $(N_1)_{60cs} \geq 32$	Unsaturated	Factor of Safety FS_{liq}	Material (optional)
ft							
ft *(relative to ground surface during SPT)*							
pcf							
tsf							

Note: A factor of safety shown as "N/A" implies that the soil type is not appropriately evaluated using this methodology. This applies to clay-like soils (typically CL, CH, CL-ML and MH material type), samples with high blow counts, and unsaturated samples.

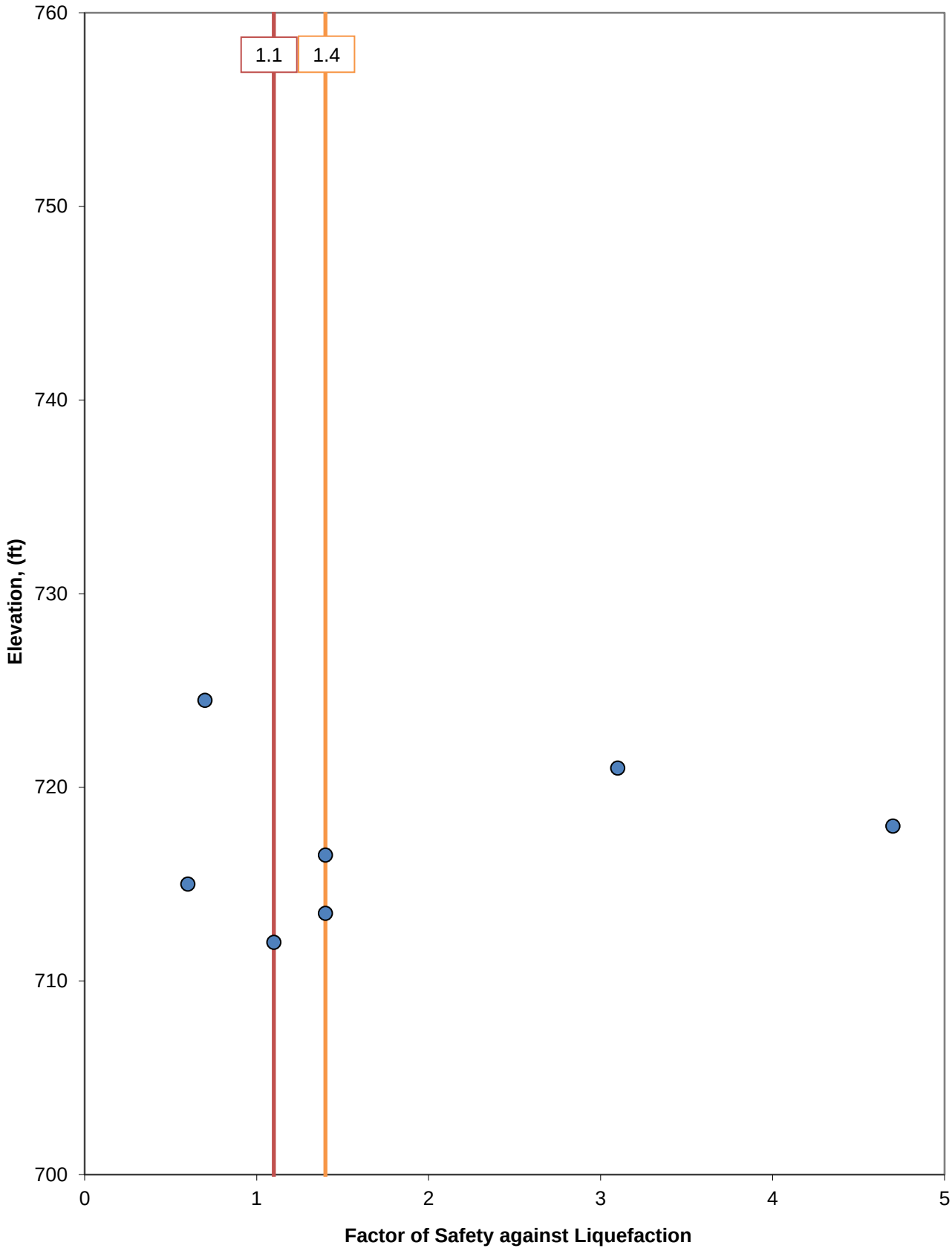
1.0	5.61	11	TRUE	FALSE	TRUE	**N/A**	**Embankment Fill**
2.5	5.61	65	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**
4.0	5.61	44	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**
5.5	5.61	55	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**
7.0	5.61	49	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**
8.5	5.61	65	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**
10.0	5.61	65	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**
11.5	5.61	38	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**
13.0	5.61	28	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
14.5	5.61	21	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
16.0	5.61	15	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
17.5	5.61	11	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
19.0	5.61	11	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
20.5	5.52	14	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
22.0	5.61	12	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
23.5	5.61	10	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**
27.0	5.61	23	FALSE	FALSE	FALSE	**3.1**	**Subunit 2**
28.5	5.61	28	FALSE	FALSE	FALSE	**7.1**	**Subunit 2**
30.0	5.61	26	FALSE	FALSE	FALSE	**4.7**	**Subunit 2**
31.5	5.61	17	FALSE	FALSE	FALSE	**1.4**	**Subunit 2**
33.0	5.61	8	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**
34.5	5.61	16	FALSE	FALSE	FALSE	**1.4**	**Subunit 2**
36.0	5.27	14	FALSE	FALSE	FALSE	**1.1**	**Subunit 3**

KIF TDEC Stability, Boring ID: KIF-B3
Liquefaction Potential Evaluations
For Coarse Grained Soils

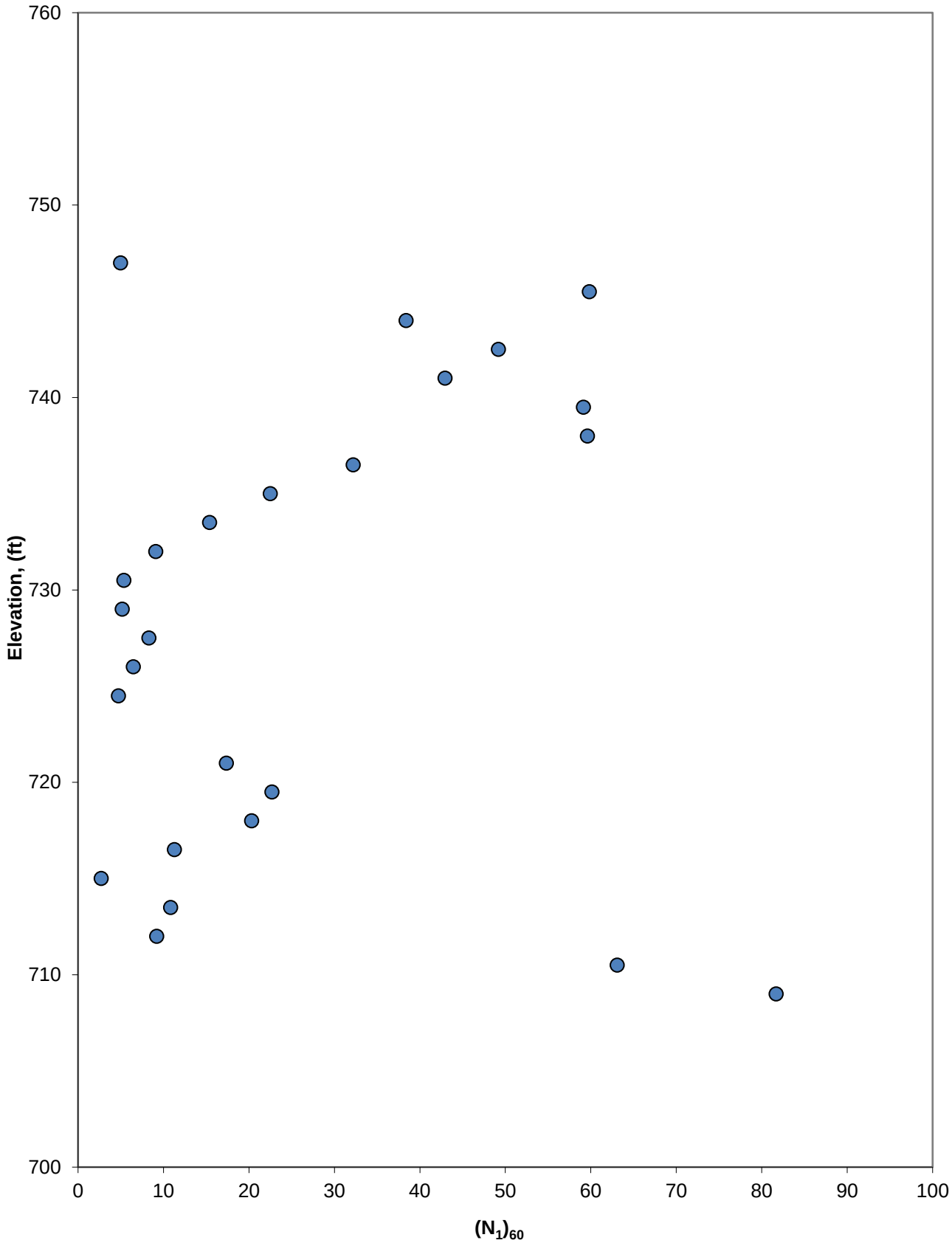
Depth of Mid. Pt. of Sample (ft.) z	Clean Sand Correction $\Delta(N_1)_{60cs}$	Equivalent Clean Sand N-Value $(N_1)_{60cs}$	Sample Screened for: Clay-like	High Blow Count $(N_1)_{60cs} \geq 32$	Unsaturated	Factor of Safety FS_{liq}	Material (optional)
37.5	5.27	68	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**
39.0	5.27	87	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**


Legend
$FS_{liq} \leq 1.1$
$1.1 < FS_{liq} \leq 1.4$
$FS_{liq} > 1.4$
Sand-like, Unliquefiable
Clay-like, Not Susceptible
Clay-like, Susceptible
No Data
KIF-B3, Liquefaction Triggering Results
Top of Boring
El. 748 ft
El. 738
El. 728
El. 718

KIF TDEC Stability, Boring ID: KIF-B3, Source = 10 Hz, Mw = 6, Event = Design EQ,
SPT Data, Simplified Stress-Based Approach



KIF TDEC Stability, Boring ID: KIF-B3, Source = 10 Hz, Mw = 6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



Project Name = KIF TDEC Stability
Boring ID = KIF-B35

Boring Location

Northing =
Easting =

OR

Baseline Station =
Offset (+ Right) =

Drilling Information

Boring Inner Diameter (ID) =	3.25	inches	
Top of Hole Elevation	766.1	feet	
Water Depth during SPT (negative for U/S borings)=	8.5	feet	
Depth Sampling Began	0	feet	
Total Unit Wt. above 1st SPT =	120	pcf	
Assumed Rod Stickup =	5	feet	*(Typ assume 5ft)*
E_m Measurement based on Fv method? =	1	(1: Yes, 0: No)	
SPT Sampler w/ Liners? =	0	(1: Yes, 0: No)	*(Typ. no)*

During EQ Information

Water Depth during EQ (relative to SPT TOH, negative for U/S borings) =	7	feet
Final Grade Elevation during EQ	763	feet
Average Total Unit Wt. of Cut/Fill	120	pcf

Fines Content Correction

Fines content correction for samples with blow counts of zero? 1 (1: Yes, 0: No)

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile? 0 (1: Yes, 0: No)
If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile: ng_Pond_Section, KIF-B1_NOR
Alpha at each sample depth known? 1 (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (α vs. depth curve)
If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_α will be one.

m4:
m3:
m2:
m1:
m0:

Associated ground response profile: shing_Pond_Section, KIF-B35
Get CSR from shear stress envelope? 0 (1: Yes, 0: No)
If previous answer is No, then CSR will be calculated using a_{max} and r_d
Max. Shear Stress at each sample depth known? (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4:
m3:
m2:
m1:

Earthquake Information

EQ Source (e.g., New Madrid)	10 Hz
Event (e.g., MCE, 10KEQ, OBE)	Design EQ
a_{max} (g) (top of ground surface)	0.20
EQ Mag (Mw)	6

Inputs

Depth of Sample Midpoint (ft.)	SPT N Value	Hammer Efficiency, E_m (%)	Unified Soil Classification	Fines Content (%)	Total Unit Weight (pcf)	Material (optional)	Clay-like / Sand-like Override (optional)	Clay-like Susceptibility (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure during SPT (psf)	Static Pore Water Pressure during EQ (psf)
2.5	28	80	ML	53	112	Fly Ash	Sand-like		Do Not Correct for FC	0.056			
7.0	10	80		53	112	Fly Ash	Sand-like		Do Not Correct for FC	0.070			
8.5	5	80		53	112	Fly Ash	Sand-like		Do Not Correct for FC	0.073			
10.0	7	80		53	112	Fly Ash	Sand-like		Do Not Correct for FC	0.078			
15.0	3	80		53	112	Fly Ash	Sand-like		Do Not Correct for FC	0.093			
20.0	23	80		15	119	Bottom Ash	Sand-like			0.100			
25.0	11	80		15	119	Bottom Ash	Sand-like			0.100			
30.0	3	80		15	119	Bottom Ash	Sand-like			0.104			
35.0	0	80		79	127	Subunit 1	Clay-like	Not Susceptible		0.102			
40.0	7	80		79	127	Subunit 1	Clay-like	Not Susceptible		0.097			
45.0	2	80		48	126	Subunit 2	Sand-like			0.093			
50.0	1	80		28	131	Subunit 3	Sand-like			0.090			
55.0	0	80		28	131	Subunit 3	Sand-like			0.091			

KIF TDEC Stability, Boring ID: KIF-B35

Liquefaction Potential Evaluations

For Coarse Grained Soils

Elev. Of Mid. Pt. of Sample (ft)	Depth of Mid. Pt. of Sample (ft.)	Unit Weight (pcf)	Vert. Total Stress during SPT (tsf)	Static Pore Pressure during SPT (tsf)	Vert. Eff. Stress during SPT (tsf)	SPT N Value	Hammer Efficiency (%)	Borehole Diameter Correction	Sampler Correction	Rod Length Correction	Overburden Stress Correction Factor	Hammer Energy Correction Factor	Corrected Blow Count	Normalized Blow Count	Relative Density (%)	Unified Soil Classification	Fines Content (%)	Relative State Parameter Index	Static Shear Stress Ratio
	z	γ_T	σ_v	u	σ'_v	N	E_m	C_B	C_s	C_R	C_N	C_E	N_{60}	$(N_1)_{60}$	D_r			ξ_R	α

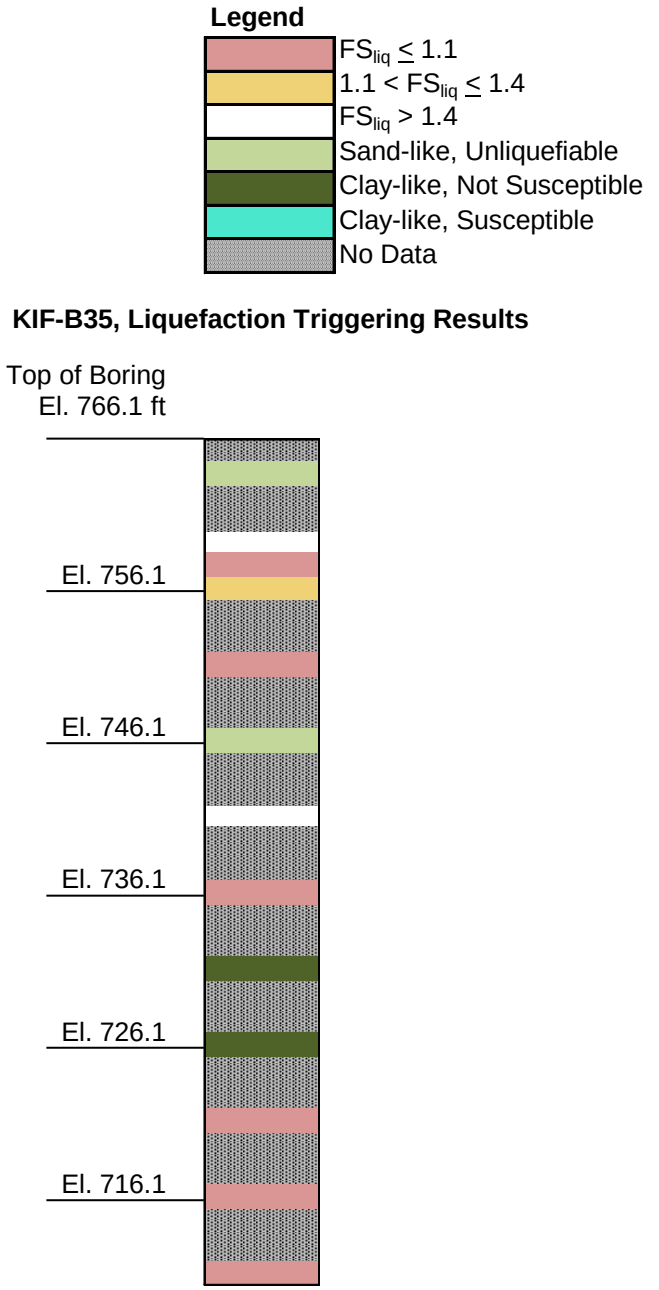
KIF TDEC Stability, Boring ID: KIF-B35
Liquefaction Potential Evaluations
For Coarse Grained Soils

EQ Source	a max (g)	EQ Mag (Mw)	Event
10 Hz	0.20	6	Design EQ

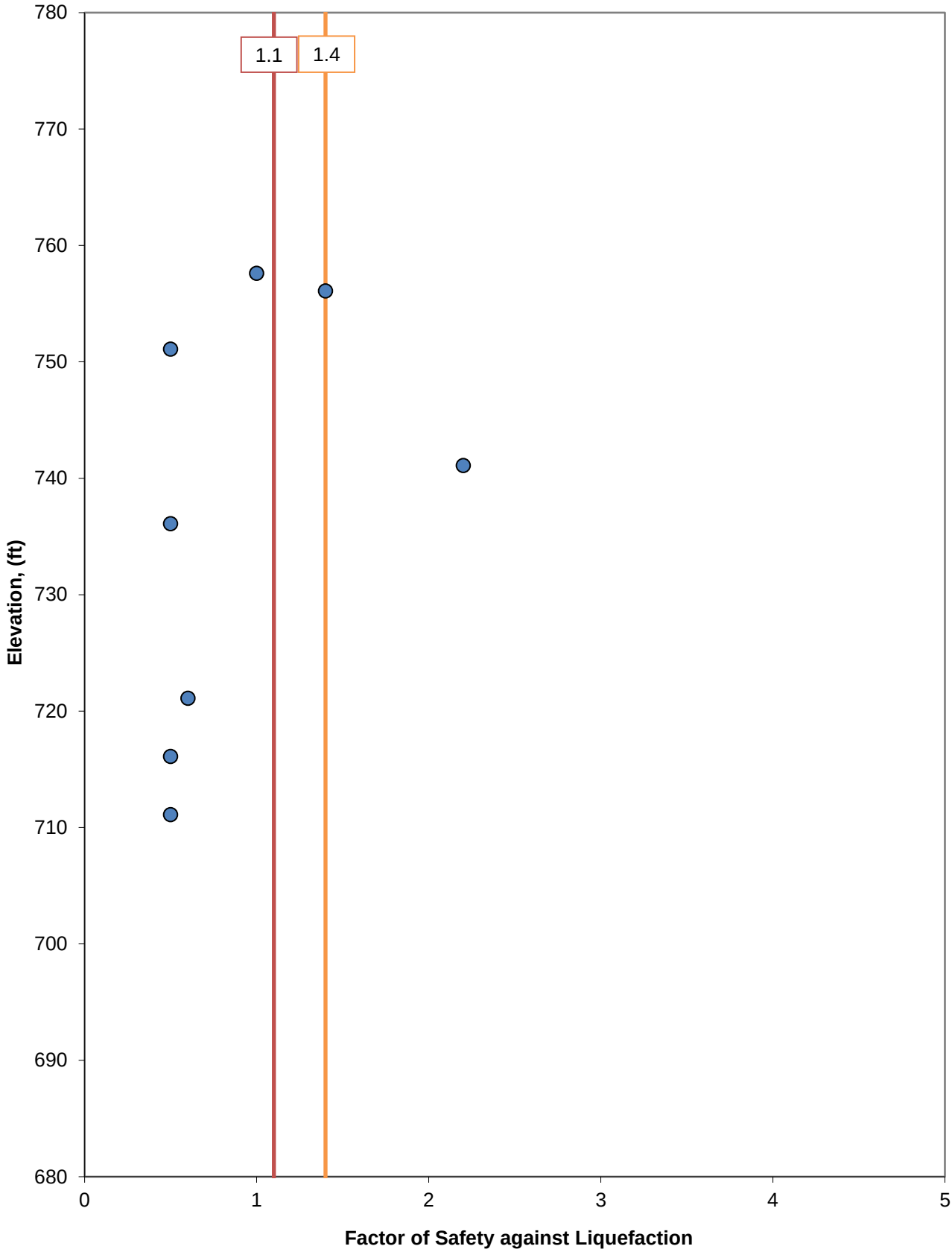
Shear Stress Curve Fit Parameters
m4: 0
m3: 0
m2: 0
m1: 0

Depth of Mid. Pt. of Sample (ft.) z	Vert. Total Stress during EQ w/ Fill (tsf) $\sigma_{v\ with\ fill}$	Static Pore Pressure during EQ (tsf) u	Vert. Eff. Stress during EQ w/ Fill (tsf) $\sigma'_{v\ with\ fill}$	Clean Sand Correction $\Delta(N_1)_{60cs}$	Equivalent Clean Sand N-Value $(N_1)_{60cs}$	Cyclic Resistance Ratio CRR7.5	Overburden Correction Factor K_σ	Static Shear Stress Correction K_α	Mag. Scaling Factor (MSF)	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Max. Induced Shear Stress (psf)	From Ground Response: Avg. Cyclic Shear Stress (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Blow Count $(N_1)_{60cs} \geq 32$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)
		Boring ID:	**KIF-B35**																
		Top of Fill Elevation:	763.0	ft															
		Fill Height:	-3.1	ft *(relative to ground surface during SPT)*															
		Fill Total Unit Weight:	120	pcf															
		Fill Total Stress:	-0.19	tsf															
	totstr-top	u-top	effstr-top																
	-0.19	0.00	-0.19																
2.5	-0.05	0.00	-0.05	0.00	83	N/A	N/A	N/A	N/A	N/A	1.000	0	0	0.130	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**
7.0	0.21	0.00	0.21	0.00	25	0.285	1.100	1.498	1.43	0.671	0.991	0	0	0.129	FALSE	FALSE	FALSE	**5.2**	**Fly Ash**
8.5	0.29	0.05	0.24	0.00	11	0.127	1.100	0.996	1.13	0.158	0.984	0	0	0.152	FALSE	FALSE	FALSE	**1.0**	**Fly Ash**
10.0	0.37	0.09	0.28	0.00	15	0.158	1.100	1.095	1.20	0.228	0.976	0	0	0.169	FALSE	FALSE	FALSE	**1.4**	**Fly Ash**
15.0	0.65	0.25	0.40	0.00	6	0.092	1.076	0.902	1.08	0.096	0.947	0	0	0.199	FALSE	FALSE	FALSE	**0.5**	**Fly Ash**
20.0	0.94	0.41	0.54	3.26	47	N/A	N/A	N/A	N/A	N/A	0.915	0	0	0.209	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**
25.0	1.24	0.56	0.68	3.26	22	0.230	1.063	1.399	1.34	0.459	0.880	0	0	0.209	FALSE	FALSE	FALSE	**2.2**	**Bottom Ash**
30.0	1.54	0.72	0.82	3.26	8	0.102	1.022	0.912	1.09	0.104	0.844	0	0	0.205	FALSE	FALSE	FALSE	**0.5**	**Bottom Ash**
35.0	1.85	0.87	0.97	5.55	6	N/A	N/A	N/A	1.07	N/A	0.806	0	0	0.199	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
40.0	2.16	1.03	1.13	5.55	15	N/A	N/A	N/A	1.18	N/A	0.768	0	0	0.190	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
45.0	2.48	1.19	1.29	5.61	8	0.105	0.983	0.914	1.09	0.103	0.731	0	0	0.182	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**
50.0	2.80	1.34	1.46	5.27	6	0.094	0.974	0.895	1.08	0.089	0.695	0	0	0.173	FALSE	FALSE	FALSE	**0.5**	**Subunit 3**
55.0	3.13	1.50	1.63	5.27	5	0.088	0.967	0.883	1.07	0.081	0.660	0	0	0.165	FALSE	FALSE	FALSE	**0.5**	**Subunit 3**

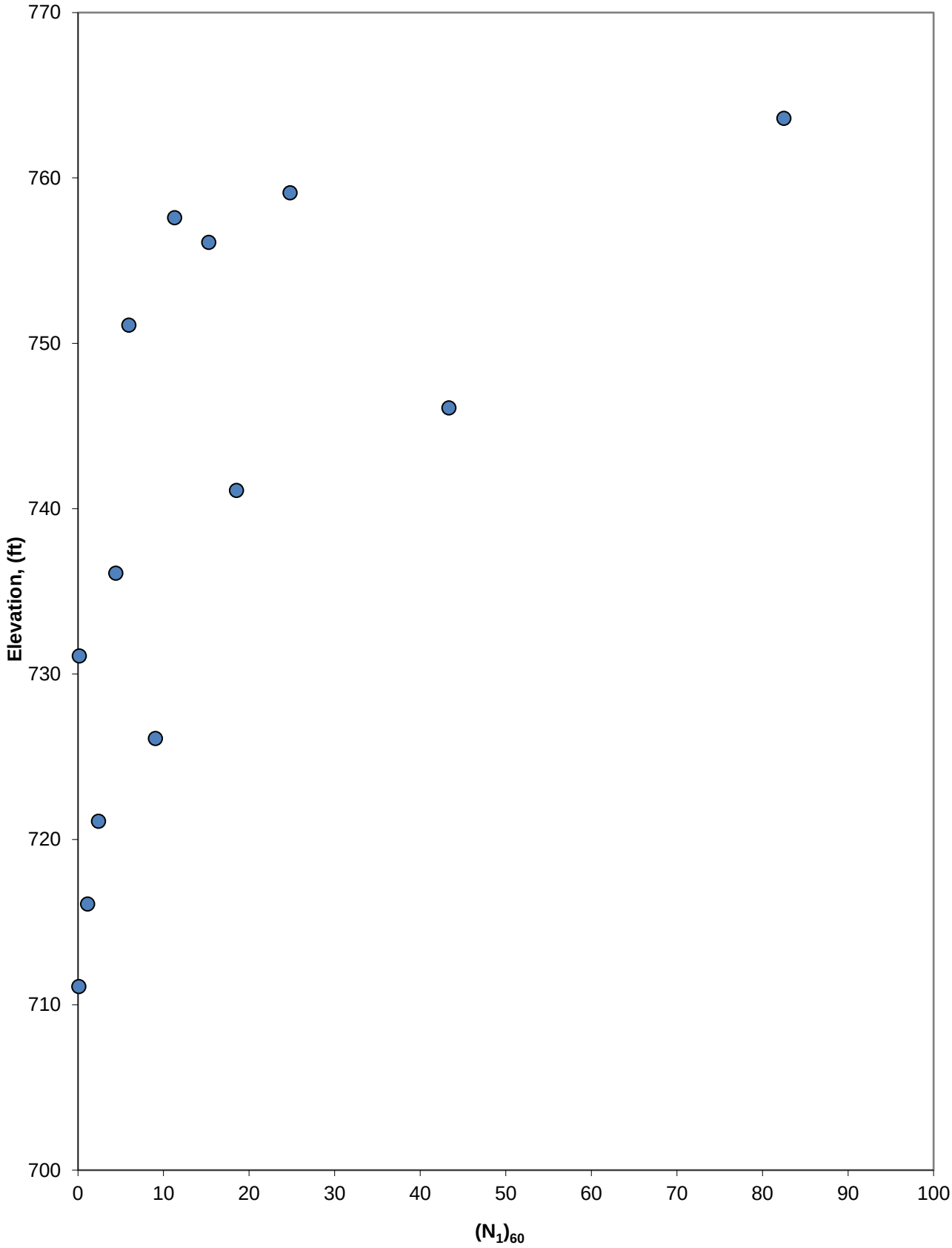
Note: A factor of safety shown as "N/A" implies that the soil type is not appropriately evaluated using this methodology. This applies to clay-like soils (typically CL, CH, CL-ML and MH material type), samples with high blow counts, and unsaturated samples.


Legend
FS$_{liq}$ ≤ 1.1
1.1 < FS$_{liq}$ ≤ 1.4
FS$_{liq}$ > 1.4
Sand-like, Unliquefiable
Clay-like, Not Susceptible
Clay-like, Susceptible
No Data
KIF-B35, Liquefaction Triggering Results
Top of Boring
El. 766.1 ft
El. 756.1
El. 746.1
El. 736.1
El. 726.1
El. 716.1

KIF TDEC Stability, Boring ID: KIF-B35, Source = 10 Hz, Mw = 6, Event = Design EQ,
SPT Data, Simplified Stress-Based Approach



KIF TDEC Stability, Boring ID: KIF-B35, Source = 10 Hz, Mw = 6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



Project Name = KIF TDEC Stability
Boring ID = KIF-B39

Boring Location

Northing =
Easting =

OR

Baseline Station =
Offset (+ Right) =

Drilling Information

Boring Inner Diameter (ID) =	3.25	inches	
Top of Hole Elevation	769.1	feet	
Water Depth during SPT (negative for U/S borings)=	17.5	feet	
Depth Sampling Began	0	feet	
Total Unit Wt. above 1st SPT =	120	pcf	
Assumed Rod Stickup =	5	feet	*(Typ assume 5ft)*
E_m Measurement based on Fv method? =	1	(1: Yes, 0: No)	
SPT Sampler w/ Liners? =	0	(1: Yes, 0: No)	*(Typ. no)*

During EQ Information

Water Depth during EQ (relative to SPT TOH, negative for U/S borings) =	17.5	feet
Final Grade Elevation during EQ	769.1	feet
Average Total Unit Wt. of Cut/Fill	120	pcf

Fines Content Correction

Fines content correction for samples with blow counts of zero? 1 (1: Yes, 0: No)

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile? 0 (1: Yes, 0: No)
If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile: ng_Pond_Section, KIF-B1_NOR
Alpha at each sample depth known? 1 (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (α vs. depth curve)
If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_α will be one.

m4:
m3:
m2:
m1:
m0:

Associated ground response profile: ection_AA, KIF-B39_NOR
Get CSR from shear stress envelope? 0 (1: Yes, 0: No)
If previous answer is No, then CSR will be calculated using a_{max} and r_d
Max. Shear Stress at each sample depth known? (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4:
m3:
m2:
m1:

Earthquake Information

EQ Source (e.g., New Madrid)	10 Hz
Event (e.g., MCE, 10KEQ, OBE)	Design EQ
a_{max} (g) (top of ground surface)	0.18
EQ Mag (Mw)	6

Inputs

Depth of Sample Midpoint (ft.)	SPT N Value	Hammer Efficiency, E_m (%)	Unified Soil Classification	Fines Content (%)	Total Unit Weight (pcf)	Material (optional)	Clay-like / Sand-like Override (optional)	Clay-like Susceptibility (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure during SPT (psf)	Static Pore Water Pressure during EQ (psf)
3.5	32	80	ML	76	112	Fly Ash	Sand-like		Do Not Correct for FC	0.069			
7.0	13	80		76	112	Fly Ash	Sand-like		Do Not Correct for FC	0.079			
10.5	26	80		76	112	Fly Ash	Sand-like		Do Not Correct for FC	0.090			
15.0	1	80		15	119	Bottom Ash	Sand-like			0.100			
20.0	4	80		15	119	Bottom Ash	Sand-like			0.100			
25.0	9	80		15	119	Bottom Ash	Sand-like			0.101			
30.0	11	80		15	119	Bottom Ash	Sand-like			0.102			
35.0	5	80		15	119	Bottom Ash	Sand-like			0.099			
40.0	6	80		76	112	Fly Ash	Sand-like		Do Not Correct for FC	0.094			
45.0	0	80		76	112	Fly Ash	Sand-like		Do Not Correct for FC	0.091			
50.0	6	80		79	127	Subunit 1	Clay-like	Not Susceptible		0.089			
57.0	4	80		24	126	Subunit 2	Sand-like			0.084			
62.0	3	80		24	126	Subunit 2	Sand-like			0.078			
65.0	52	80		24	131	Subunit 3	Sand-like			0.076			

KIF TDEC Stability, Boring ID: KIF-B39

Liquefaction Potential Evaluations

For Coarse Grained Soils

Elev. Of Mid. Pt. of Sample (ft)	Depth of Mid. Pt. of Sample (ft.)	Unit Weight (pcf)	Vert. Total Stress during SPT (tsf)	Static Pore Pressure during SPT (tsf)	Vert. Eff. Stress during SPT (tsf)	SPT N Value	Hammer Efficiency (%)	Borehole Diameter Correction	Sampler Correction	Rod Length Correction	Overburden Stress Correction Factor	Hammer Energy Correction Factor	Corrected Blow Count	Normalized Blow Count	Relative Density (%)	Unified Soil Classification	Fines Content (%)	Relative State Parameter Index	Static Shear Stress Ratio
	z	γ_T	σ_v	u	σ'_v	N	E_m	C_B	C_s	C_R	C_N	C_E	N_{60}	$(N_1)_{60}$	D_r			ξ_R	α

		Top of Hole Elevation (ft)	769.1				Boring ID =	KIF-B39												
		begin sampling (depth-ft)	0.0				Boring Inner Dia. (in) =	3.25												
		total unit wt. above 1st SPT (pcf) =	120																	
		water elevation during SPT (ft) =	751.6	ft *(relative to ground surface during SPT)*					Assumed Rod Stickup =	5.0	feet									
		water depth during SPT (ft) =	17.5						E_m Measurement? =	1	(1: Yes, 0: No)									
		water elevation during EQ (ft) =	751.6	ft *(relative to ground surface during SPT)*					SPT Sampler w/ Liners? =	0	(1: Yes, 0: No)									
		water during EQ (depth-ft) =	17.5	u-top	effstr-top															
		vert. total stress above 1st SPT (tsf) =	**0.00**	**0.00**	0.00															
765.6	3.5	112	0.20	0.00	0.20	32	80.0	1.000	1.30	1.00	1.56	1.33	55	86	100	ML	76	-0.60	0.069	
762.1	7.0	112	0.39	0.00	0.39	13	80.0	1.000	1.30	1.00	1.42	1.33	23	32	83	0	76	-0.60	0.079	
758.6	10.5	112	0.59	0.00	0.59	26	80.0	1.000	1.30	1.00	1.17	1.33	45	53	100	0	76	-0.60	0.090	
754.1	15.0	119	0.85	0.00	0.85	1	80.0	1.000	1.10	1.00	1.15	1.33	1	2	33	0	15	-0.16	0.100	
749.1	20.0	119	1.15	0.08	1.07	4	80.0	1.000	1.10	1.00	1.00	1.33	6	6	44	0	15	-0.27	0.100	
744.1	25.0	119	1.44	0.23	1.21	9	80.0	1.000	1.13	1.00	0.94	1.33	14	13	59	0	15	-0.41	0.101	
739.1	30.0	119	1.74	0.39	1.35	11	80.0	1.000	1.15	1.00	0.89	1.33	17	15	63	0	15	-0.45	0.102	
734.1	35.0	119	2.04	0.55	1.49	5	80.0	1.000	1.10	1.00	0.83	1.33	7	6	45	0	15	-0.27	0.099	
729.1	40.0	112	2.33	0.70	1.62	6	80.0	1.000	1.10	1.00	0.78	1.33	9	7	39	0	76	-0.20	0.094	
724.1	45.0	112	2.61	0.86	1.75	0	80.0	1.000	1.10	1.00	0.68	1.33	0	0	5	0	76	0.10	0.091	
719.1	50.0	127	2.91	1.01	1.89	6	80.0	1.000	1.10	1.00	0.74	1.33	9	7	51	0	79	-0.32	0.089	
712.1	57.0	126	3.35	1.23	2.12	4	80.0	1.000	1.10	1.00	0.68	1.33	6	4	44	0	24	-0.25	0.084	
707.1	62.0	126	3.66	1.39	2.27	3	80.0	1.000	1.10	1.00	0.65	1.33	4	3	41	0	24	-0.21	0.078	
704.1	65.0	131	3.86	1.48	2.37	52	80.0	1.000	1.30	1.00	0.81	1.33	90	73	100	0	24	-0.60	0.076	

KIF TDEC Stability, Boring ID: KIF-B39
Liquefaction Potential Evaluations
For Coarse Grained Soils

EQ Source	a max (g)	EQ Mag (Mw)	Event
10 Hz	0.18	6	Design EQ

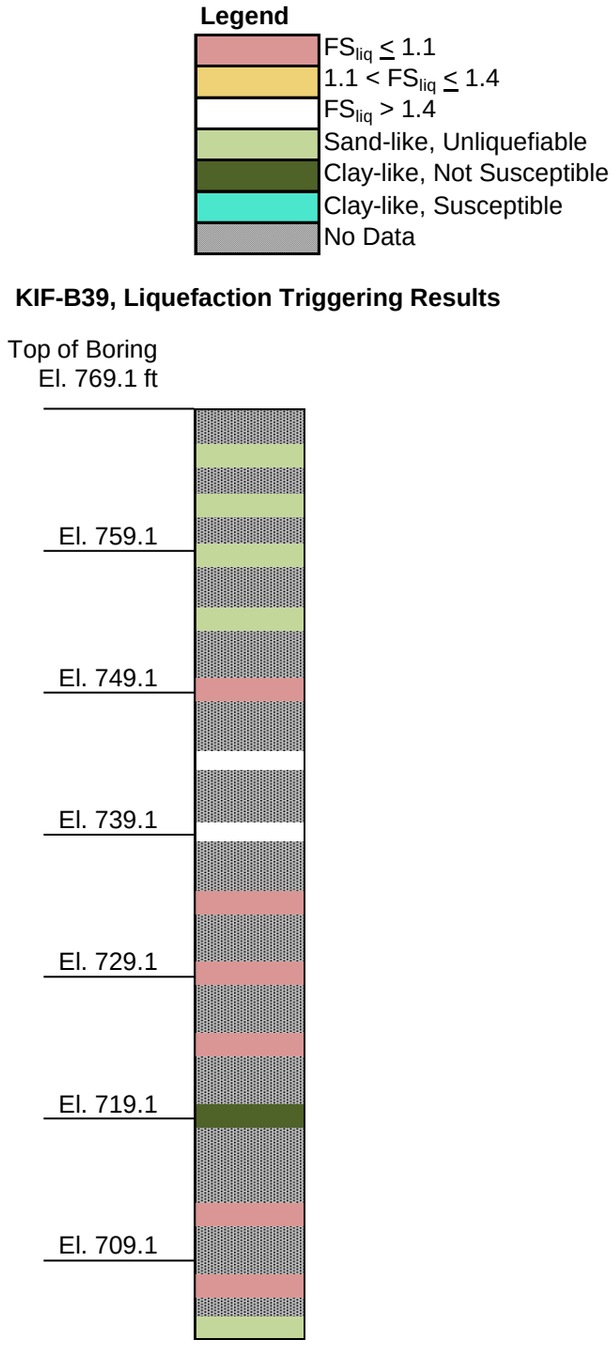
Shear Stress Curve Fit Parameters
m4: 0
m3: 0
m2: 0
m1: 0

Boring ID: **KIF-B39**
Top of Fill Elevation: 769.1 ft
Fill Height: 0.0 ft *(relative to ground surface during SPT)*
Fill Total Unit Weight: 120 pcf
Fill Total Stress: 0.00 tsf

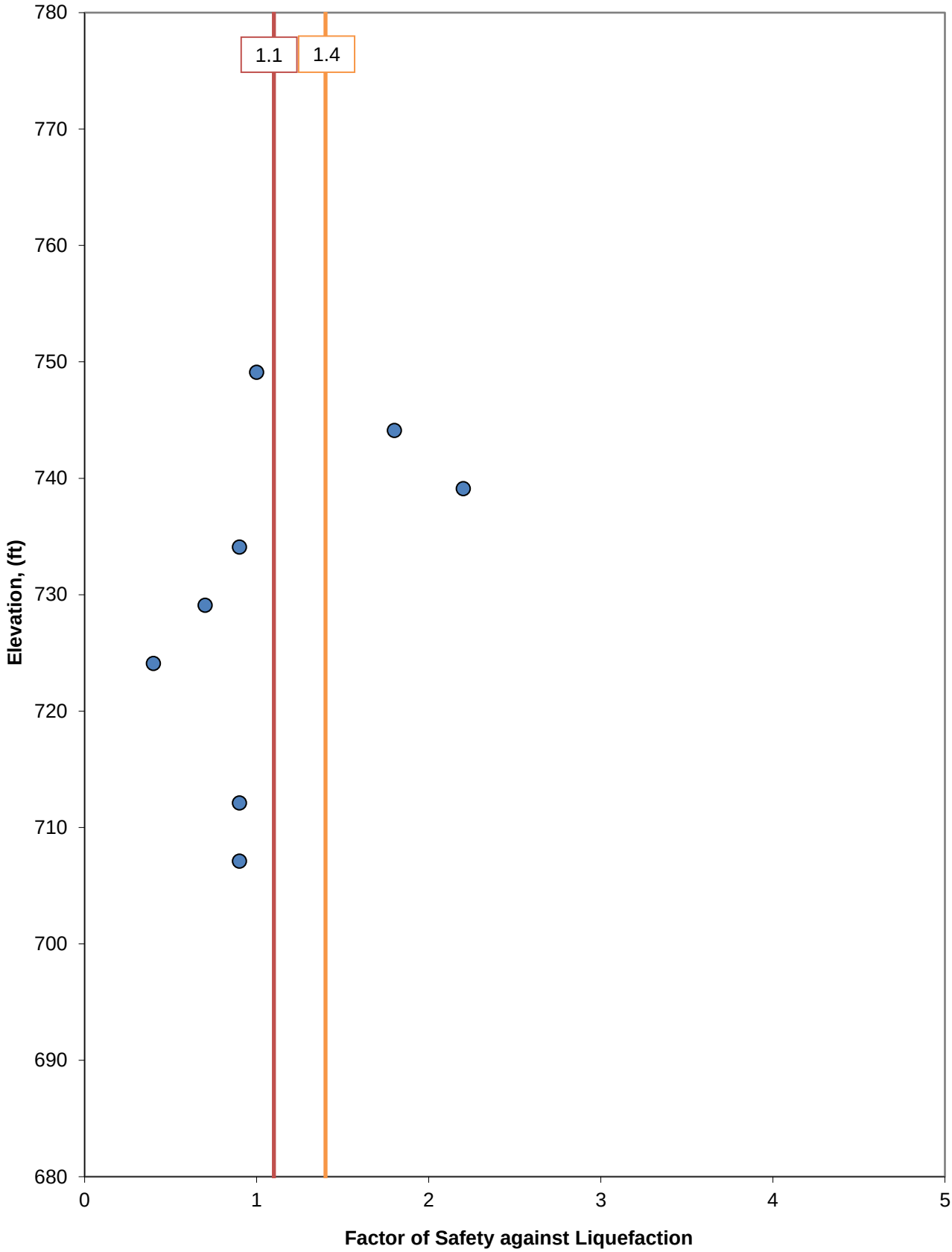
totstr-top	u-top	effstr-top
0.00	0.00	0.00

Note: A factor of safety shown as "N/A" implies that the soil type is not appropriately evaluated using this methodology. This applies to clay-like soils (typically CL, CH, CL-ML and MH material type), samples with high blow counts, and unsaturated samples.

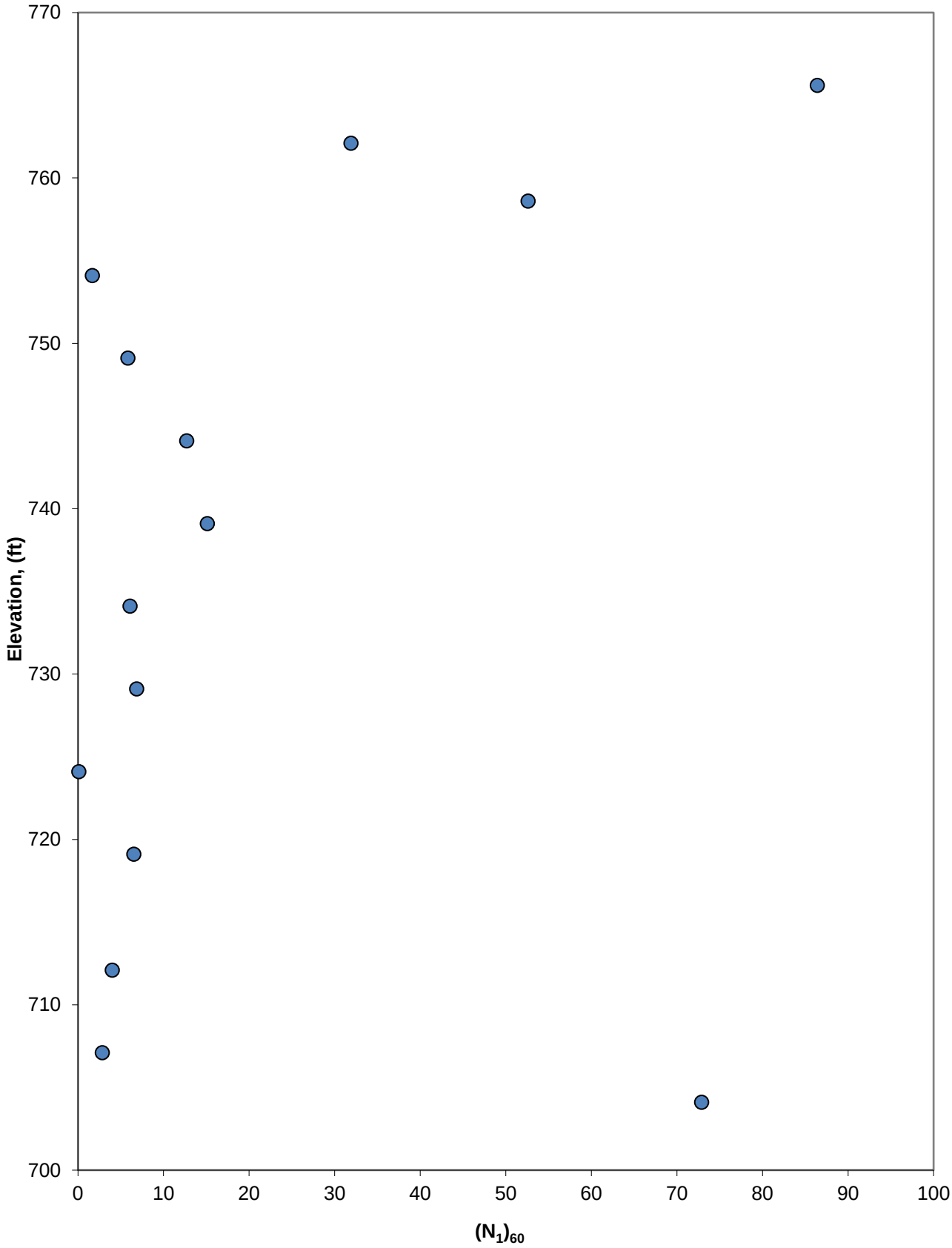
Depth of Mid. Pt. of Sample (ft.) z	Vert. Total Stress during EQ w/ Fill (tsf) $\sigma_{v\ with\ fill}$	Static Pore Pressure during EQ (tsf) u	Vert. Eff. Stress during EQ w/ Fill (tsf) $\sigma'_{v\ with\ fill}$	Clean Sand Correction $\Delta(N_1)_{60cs}$	Equivalent Clean Sand N-Value $(N_1)_{60cs}$	Cyclic Resistance Ratio CRR7.5	Overburden Correction Factor K_σ	Static Shear Stress Correction K_α	Mag. Scaling Factor (MSF)	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Max. Induced Shear Stress (psf)	From Ground Response: Avg. Cyclic Shear Stress (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Blow Count $(N_1)_{60cs} \geq 32$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)
3.5	0.20	0.00	0.20	0.00	86	N/A	N/A	N/A	N/A	N/A	0.993	0	0	0.116	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**
7.0	0.39	0.00	0.39	0.00	32	N/A	N/A	N/A	N/A	N/A	0.975	0	0	0.114	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**
10.5	0.59	0.00	0.59	0.00	53	N/A	N/A	N/A	N/A	N/A	0.956	0	0	0.112	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**
15.0	0.85	0.00	0.85	3.26	5	0.086	1.017	0.877	1.07	0.082	0.928	0	0	0.109	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**
20.0	1.15	0.08	1.07	3.26	9	0.112	0.999	0.932	1.10	0.115	0.894	0	0	0.112	FALSE	FALSE	FALSE	**1.0**	**Bottom Ash**
25.0	1.44	0.23	1.21	3.26	16	0.164	0.985	1.097	1.21	0.215	0.858	0	0	0.120	FALSE	FALSE	FALSE	**1.8**	**Bottom Ash**
30.0	1.74	0.39	1.35	3.26	18	0.188	0.969	1.180	1.26	0.270	0.820	0	0	0.124	FALSE	FALSE	FALSE	**2.2**	**Bottom Ash**
35.0	2.04	0.55	1.49	3.26	9	0.113	0.969	0.929	1.11	0.113	0.783	0	0	0.125	FALSE	FALSE	FALSE	**0.9**	**Bottom Ash**
40.0	2.33	0.70	1.62	0.00	7	0.097	0.965	0.896	1.08	0.091	0.745	0	0	0.125	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**
45.0	2.61	0.86	1.75	0.00	0	0.061	0.972	0.847	1.05	0.053	0.708	0	0	0.124	FALSE	FALSE	FALSE	**0.4**	**Fly Ash**
50.0	2.91	1.01	1.89	5.55	12	N/A	N/A	N/A	1.14	N/A	0.673	0	0	0.121	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
57.0	3.35	1.23	2.12	4.98	9	0.111	0.938	0.923	1.10	0.106	0.627	0	0	0.116	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**
62.0	3.66	1.39	2.27	4.98	8	0.103	0.935	0.913	1.09	0.096	0.597	0	0	0.112	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**
65.0	3.86	1.48	2.37	4.98	78	N/A	N/A	N/A	N/A	N/A	0.580	0	0	0.110	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**


Legend
FS$_{liq}$ ≤ 1.1
1.1 < FS$_{liq}$ ≤ 1.4
FS$_{liq}$ > 1.4
Sand-like, Unliquefiable
Clay-like, Not Susceptible
Clay-like, Susceptible
No Data
KIF-B39, Liquefaction Triggering Results
Top of Boring
El. 769.1 ft
El. 759.1
El. 749.1
El. 739.1
El. 729.1
El. 719.1
El. 709.1

KIF TDEC Stability, Boring ID: KIF-B39, Source = 10 Hz, Mw = 6, Event = Design EQ,
SPT Data, Simplified Stress-Based Approach



KIF TDEC Stability, Boring ID: KIF-B39, Source = 10 Hz, Mw = 6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



Project Name = KIF TDEC Stability
Boring ID = KIF-BF-SPT2

Boring Location

Northing =
Easting =

OR

Baseline Station =
Offset (+ Right) =

Drilling Information

Boring Inner Diameter (ID) =	3.25	inches	
Top of Hole Elevation	768	feet	
Water Depth during SPT (negative for U/S borings)=	18.5	feet	
Depth Sampling Began	1	feet	
Total Unit Wt. above 1st SPT =	120	pcf	
Assumed Rod Stickup =	5	feet	*(Typ assume 5ft)*
E_m Measurement based on Fv method? =	1	(1: Yes, 0: No)	
SPT Sampler w/ Liners? =	0	(1: Yes, 0: No)	*(Typ. no)*

During EQ Information

Water Depth during EQ (relative to SPT TOH, negative for U/S borings) =	17	feet
Final Grade Elevation during EQ	772.2	feet
Average Total Unit Wt. of Cut/Fill	120	pcf

Fines Content Correction

Fines content correction for samples with blow counts of zero? 1 (1: Yes, 0: No)

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile? 0 (1: Yes, 0: No)
If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile: Pond_Section, KIF-BF-SPT2_NOR
Alpha at each sample depth known? 1 (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (α vs. depth curve)
If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_α will be one.

m4:
m3:
m2:
m1:
m0:

Associated ground response profile: ng_Pond_Section, KIF-BF-SPT2
Get CSR from shear stress envelope? 0 (1: Yes, 0: No)
If previous answer is No, then CSR will be calculated using a_{max} and r_d
Max. Shear Stress at each sample depth known? (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4:
m3:
m2:
m1:

Earthquake Information

EQ Source (e.g., New Madrid)	10 Hz
Event (e.g., MCE, 10KEQ, OBE)	Design EQ
a_{max} (g) (top of ground surface)	0.19
EQ Mag (Mw)	6

Inputs

Depth of Sample Midpoint (ft.)	SPT N Value	Hammer Efficiency, E_m (%)	Unified Soil Classification	Fines Content (%)	Total Unit Weight (pcf)	Material (optional)	Clay-like / Sand-like Override (optional)	Clay-like Susceptibility (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure during SPT (psf)	Static Pore Water Pressure during EQ (psf)
2.0	15	80	SM	38	119	Bottom Ash	Sand-like			0.021			
4.5	18	80		38	119	Bottom Ash	Sand-like			0.018			
9.5	57	80		38	119	Bottom Ash	Sand-like			0.012			
14.5	18	80		38	119	Bottom Ash	Sand-like			0.009			
19.5	38	80		38	119	Bottom Ash	Sand-like			0.007			
24.5	7	80		25	112	Fly Ash	Sand-like		Do Not Correct for FC	0.008			
29.5	5	80		35	112	Fly Ash	Sand-like		Do Not Correct for FC	0.013			
34.5	6	80		35	112	Fly Ash	Sand-like		Do Not Correct for FC	0.021			
39.5	5	80		44	126	Subunit 2	Sand-like			0.030			
44.5	7	80		44	126	Subunit 2	Sand-like			0.038			
49.5	2	80		44	126	Subunit 2	Sand-like			0.045			
54.5	5	80		30	131	Subunit 3	Sand-like			0.049			
59.5	8	80		30	131	Subunit 3	Sand-like			0.050			

KIF TDEC Stability, Boring ID: KIF-BF-SPT2

Liquefaction Potential Evaluations

For Coarse Grained Soils

Elev. Of Mid. Pt. of Sample (ft)	Depth of Mid. Pt. of Sample (ft.)	Unit Weight (pcf)	Vert. Total Stress during SPT (tsf)	Static Pore Pressure during SPT (tsf)	Vert. Eff. Stress during SPT (tsf)	SPT N Value	Hammer Efficiency (%)	Borehole Diameter Correction	Sampler Correction	Rod Length Correction	Overburden Stress Correction Factor	Hammer Energy Correction Factor	Corrected Blow Count	Normalized Blow Count	Relative Density (%)	Unified Soil Classification	Fines Content (%)	Relative State Parameter Index	Static Shear Stress Ratio
	z	γ_T	σ_v	u	σ'_v	N	E_m	C_B	C_s	C_R	C_N	C_E	N_{60}	$(N_1)_{60}$	D_r			ξ_R	α

Top of Hole Elevation (ft) = 768.0 — Boring ID = **KIF-BF-SPT2**

begin sampling (depth-ft) = 1.0 — Boring Inner Dia. (in) = 3.25

total unit wt. above 1st SPT (pcf) = 120

water elevation during SPT (ft) = 749.5 ft *(relative to ground surface during SPT)* — Assumed Rod Stickup = 5.0 feet

water depth during SPT (ft) = 18.5 — E_m Measurement? = 1 (1: Yes, 0: No)

water elevation during EQ (ft) = 751.0 ft *(relative to ground surface during SPT)* — SPT Sampler w/ Liners? = 0 (1: Yes, 0: No)

water during EQ (depth-ft) = 17.0

	u-top	effstr-top
vert. total stress above 1st SPT (tsf) =	**0.00**	0.06

766.0	2.0	119	0.12	0.00	0.12	15	80.0	1.000	1.30	1.00	1.70	1.33	26	44	100	SM	38	-0.60	0.021
763.5	4.5	119	0.27	0.00	0.27	18	80.0	1.000	1.30	1.00	1.43	1.33	31	45	100	0	38	-0.60	0.018
758.5	9.5	119	0.57	0.00	0.57	57	80.0	1.000	1.30	1.00	1.18	1.33	99	116	100	0	38	-0.60	0.012
753.5	14.5	119	0.86	0.00	0.86	18	80.0	1.000	1.30	1.00	1.06	1.33	31	33	92	0	38	-0.60	0.009
748.5	19.5	119	1.16	0.03	1.13	38	80.0	1.000	1.30	1.00	0.98	1.33	66	65	100	0	38	-0.60	0.007
743.5	24.5	112	1.45	0.19	1.26	7	80.0	1.000	1.10	1.00	0.91	1.33	10	9	45	0	25	-0.27	0.008
738.5	29.5	112	1.73	0.34	1.39	5	80.0	1.000	1.10	1.00	0.85	1.33	7	6	37	0	35	-0.18	0.013
733.5	34.5	112	2.01	0.50	1.51	6	80.0	1.000	1.10	1.00	0.81	1.33	9	7	39	0	35	-0.21	0.021
728.5	39.5	126	2.31	0.66	1.65	5	80.0	1.000	1.10	1.00	0.79	1.33	7	6	50	0	44	-0.31	0.030
723.5	44.5	126	2.62	0.81	1.81	7	80.0	1.000	1.10	1.00	0.76	1.33	10	8	54	0	44	-0.35	0.038
718.5	49.5	126	2.94	0.97	1.97	2	80.0	1.000	1.10	1.00	0.70	1.33	3	2	41	0	44	-0.21	0.045
713.5	54.5	131	3.26	1.12	2.14	5	80.0	1.000	1.10	1.00	0.69	1.33	7	5	48	0	30	-0.28	0.049
708.5	59.5	131	3.59	1.28	2.31	8	80.0	1.000	1.10	1.00	0.68	1.33	12	8	54	0	30	-0.33	0.050

KIF TDEC Stability, Boring ID: KIF-BF-SPT2
Liquefaction Potential Evaluations
For Coarse Grained Soils

EQ Source	a max (g)	EQ Mag (Mw)	Event
10 Hz	0.19	6	Design EQ

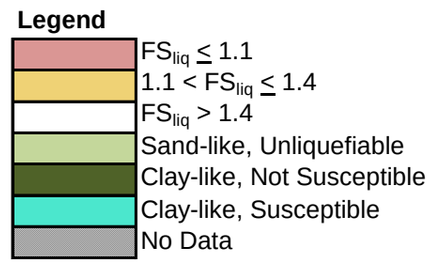
Shear Stress Curve Fit Parameters
m4: 0
m3: 0
m2: 0
m1: 0

Boring ID: **KIF-BF-SPT2**
Top of Fill Elevation: 772.2 ft
Fill Height: 4.2 ft *(relative to ground surface during SPT)*
Fill Total Unit Weight: 120 pcf
Fill Total Stress: 0.25 tsf

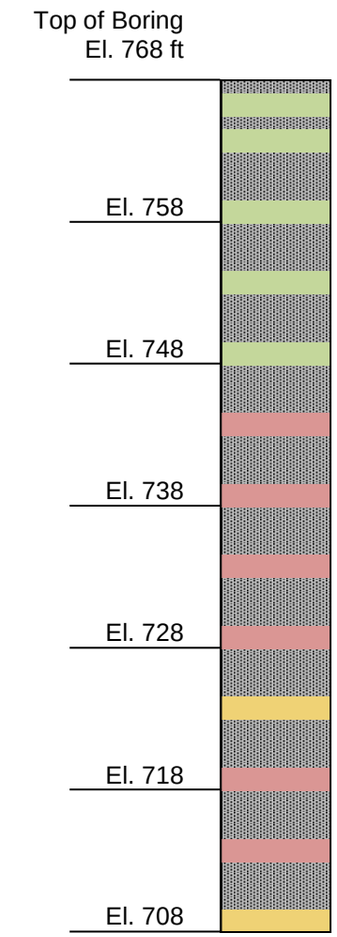
totstr-top	u-top	effstr-top
0.31	0.00	0.31

Note: A factor of safety shown as "N/A" implies that the soil type is not appropriately evaluated using this methodology. This applies to clay-like soils (typically CL, CH, CL-ML and MH material type), samples with high blow counts, and unsaturated samples.

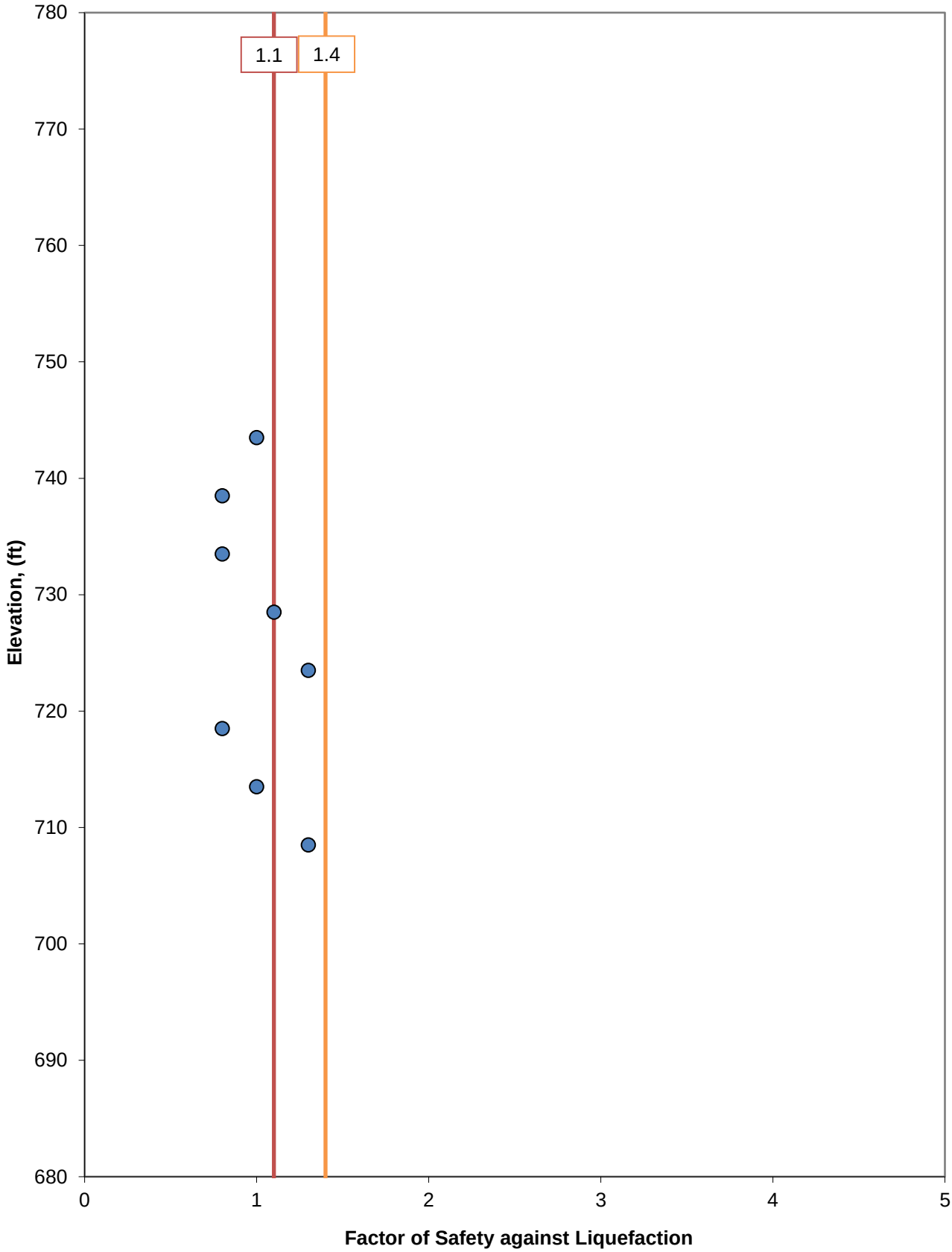
Depth of Mid. Pt. of Sample (ft.) z	Vert. Total Stress during EQ w/ Fill (tsf) $\sigma_{v\ with\ fill}$	Static Pore Pressure during EQ (tsf) u	Vert. Eff. Stress during EQ w/ Fill (tsf) $\sigma'_{v\ with\ fill}$	Clean Sand Correction $\Delta(N_1)_{60cs}$	Equivalent Clean Sand N-Value $(N_1)_{60cs}$	Cyclic Resistance Ratio CRR7.5	Overburden Correction Factor K_σ	Static Shear Stress Correction K_α	Mag. Scaling Factor (MSF)	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Max. Induced Shear Stress (psf)	From Ground Response: Avg. Cyclic Shear Stress (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Blow Count $(N_1)_{60cs} \geq 32$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)
2.0	0.37	0.00	0.37	5.55	50	N/A	N/A	N/A	N/A	N/A	0.980	0	0	0.120	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**
4.5	0.52	0.00	0.52	5.55	50	N/A	N/A	N/A	N/A	N/A	0.966	0	0	0.119	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**
9.5	0.82	0.00	0.82	5.55	122	N/A	N/A	N/A	N/A	N/A	0.936	0	0	0.115	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**
14.5	1.12	0.00	1.12	5.55	39	N/A	N/A	N/A	N/A	N/A	0.903	0	0	0.111	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**
19.5	1.41	0.08	1.33	5.55	70	N/A	N/A	N/A	N/A	N/A	0.867	0	0	0.113	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**
24.5	1.70	0.23	1.47	0.00	9	0.113	0.971	0.989	1.11	0.120	0.830	0	0	0.118	FALSE	FALSE	FALSE	**1.0**	**Fly Ash**
29.5	1.98	0.39	1.59	0.00	6	0.094	0.967	0.979	1.08	0.096	0.792	0	0	0.121	FALSE	FALSE	FALSE	**0.8**	**Fly Ash**
34.5	2.26	0.55	1.72	0.00	7	0.099	0.960	0.968	1.09	0.100	0.755	0	0	0.122	FALSE	FALSE	FALSE	**0.8**	**Fly Ash**
39.5	2.56	0.70	1.86	5.60	11	0.128	0.945	0.972	1.13	0.133	0.718	0	0	0.122	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**
44.5	2.87	0.86	2.02	5.60	13	0.143	0.932	0.981	1.16	0.153	0.682	0	0	0.120	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**
49.5	3.19	1.01	2.18	5.60	8	0.102	0.939	0.941	1.09	0.099	0.648	0	0	0.117	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**
54.5	3.51	1.17	2.34	5.36	10	0.121	0.926	0.953	1.12	0.119	0.616	0	0	0.114	FALSE	FALSE	FALSE	**1.0**	**Subunit 3**
59.5	3.84	1.33	2.51	5.36	13	0.142	0.910	0.975	1.16	0.147	0.587	0	0	0.110	FALSE	FALSE	FALSE	**1.3**	**Subunit 3**



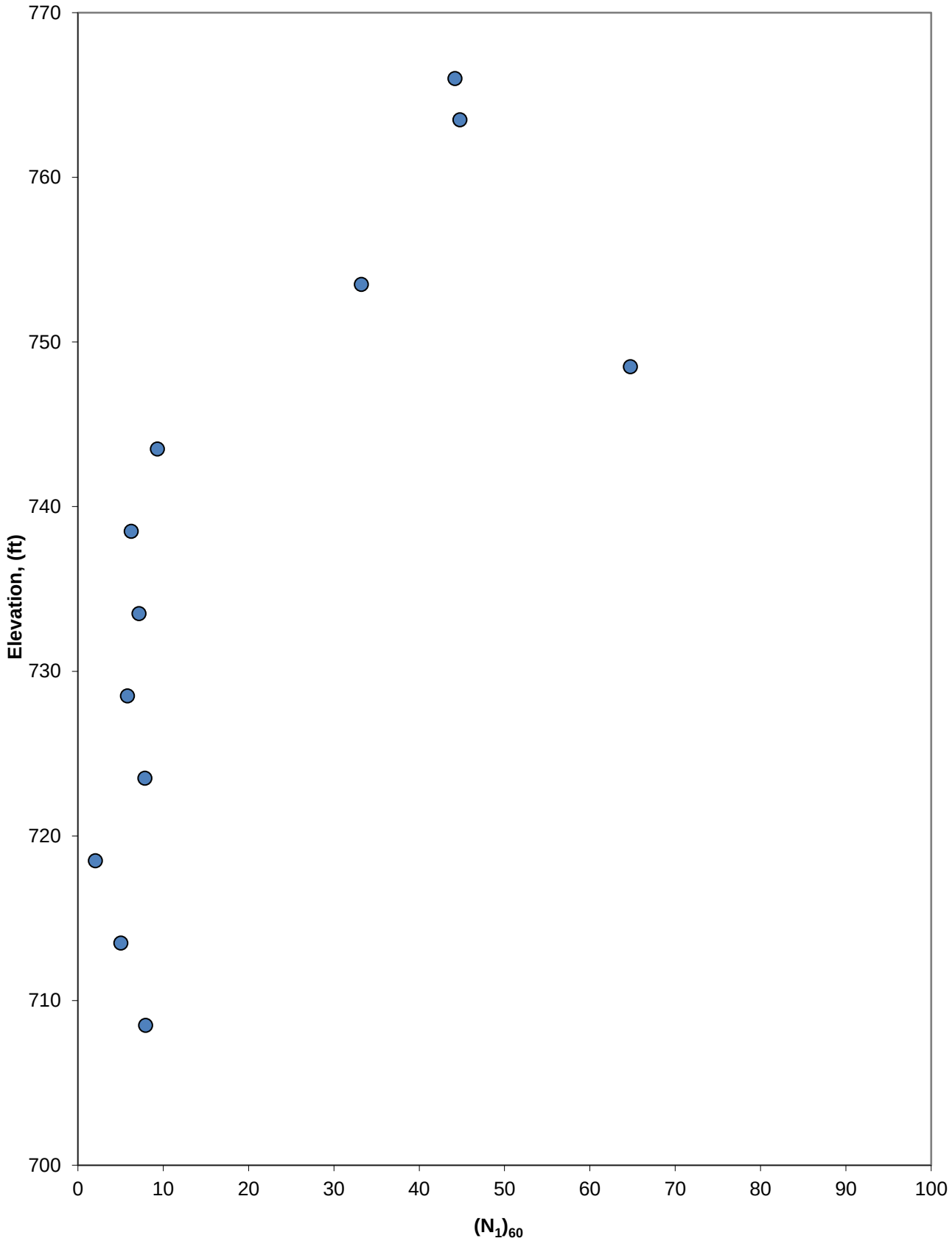
KIF-BF-SPT2, Liquefaction Triggering Results



KIF TDEC Stability, Boring ID: KIF-BF-SPT2, Source = 10 Hz, Mw = 6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



KIF TDEC Stability, Boring ID: KIF-BF-SPT2, Source = 10 Hz, Mw = 6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



Project Name = KIF TDEC Stability
Boring ID = KIF-BF-SPT3

Boring Location

Northing =
Easting =

OR

Baseline Station =
Offset (+ Right) =

Drilling Information

Boring Inner Diameter (ID) =	3.25	inches	
Top of Hole Elevation	754	feet	
Water Depth during SPT (negative for U/S borings)=	18.5	feet	
Depth Sampling Began	1	feet	
Total Unit Wt. above 1st SPT =	120	pcf	
Assumed Rod Stickup =	5	feet	*(Typ assume 5ft)*
E_m Measurement based on Fv method? =	1	(1: Yes, 0: No)	
SPT Sampler w/ Liners? =	0	(1: Yes, 0: No)	*(Typ. no)*

During EQ Information

Water Depth during EQ (relative to SPT TOH, negative for U/S borings) =	5	feet
Final Grade Elevation during EQ	753	feet
Average Total Unit Wt. of Cut/Fill	120	pcf

Fines Content Correction

Fines content correction for samples with blow counts of zero? 1 (1: Yes, 0: No)

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile? 0 (1: Yes, 0: No)
If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile: olishingPond, KIF-B2_NOR
Alpha at each sample depth known? 1 (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (α vs. depth curve)
If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_α will be one.

m4:
m3:
m2:
m1:
m0:

Associated ground response profile: olishing_Pond, KIF-B2_NOR
Get CSR from shear stress envelope? 0 (1: Yes, 0: No)
If previous answer is No, then CSR will be calculated using a_{max} and r_d
Max. Shear Stress at each sample depth known? (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4:
m3:
m2:
m1:

Earthquake Information

EQ Source (e.g., New Madrid)	10 Hz
Event (e.g., MCE, 10KEQ, OBE)	Design EQ
a_{max} (g) (top of ground surface)	0.21
EQ Mag (Mw)	6

Inputs

Depth of Sample Midpoint (ft.)	SPT N Value	Hammer Efficiency, E_m (%)	Unified Soil Classification	Fines Content (%)	Total Unit Weight (pcf)	Material (optional)	Clay-like / Sand-like Override (optional)	Clay-like Susceptibility (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure during SPT (psf)	Static Pore Water Pressure during EQ (psf)
2.0	41	80	ML	46	112	Fly Ash	Sand-like		Do Not Correct for FC	0.054			
4.5	15	80		54	112	Fly Ash	Sand-like		Do Not Correct for FC	0.040			
7.0	57	80		27	128	Embankment Fill	Clay-like	Not Susceptible		0.032			
9.5	19	80		52	128	Embankment Fill	Clay-like	Not Susceptible		0.003			
14.5	12	80		52	128	Embankment Fill	Clay-like	Not Susceptible		0.033			
19.5	5	80		52	128	Embankment Fill	Clay-like	Not Susceptible		0.056			
24.5	5	80		44	126	Subunit 2	Sand-like			0.078			
29.5	8	80		44	126	Subunit 2	Sand-like			0.097			
34.5	3	80		44	126	Subunit 2	Sand-like			0.111			
39.5	5	80		22	131	Subunit 3	Sand-like			0.123			
44.5	19	80		22	131	Subunit 3	Sand-like			0.130			

KIF TDEC Stability, Boring ID: KIF-BF-SPT3

Liquefaction Potential Evaluations

For Coarse Grained Soils

Top of Hole Elevation (ft) =	754.0			Boring ID =	KIF-BF-SPT3
begin sampling (depth-ft) =	1.0			Boring Inner Dia. (in) =	3.25
total unit wt. above 1st SPT (pcf) =	120				
water elevation during SPT (ft) =	735.5	ft *(relative to ground surface during SPT)*		Assumed Rod Stickup =	5.0 feet
water depth during SPT (ft) =	18.5			E_m Measurement? =	1 (1: Yes, 0: No)
water elevation during EQ (ft) =	749.0	ft *(relative to ground surface during SPT)*		SPT Sampler w/ Liners? =	0 (1: Yes, 0: No)
water during EQ (depth-ft) =	5.0	u-top	effstr-top		
vert. total stress above 1st SPT (tsf) =	**0.06**	**0.00**	0.06		

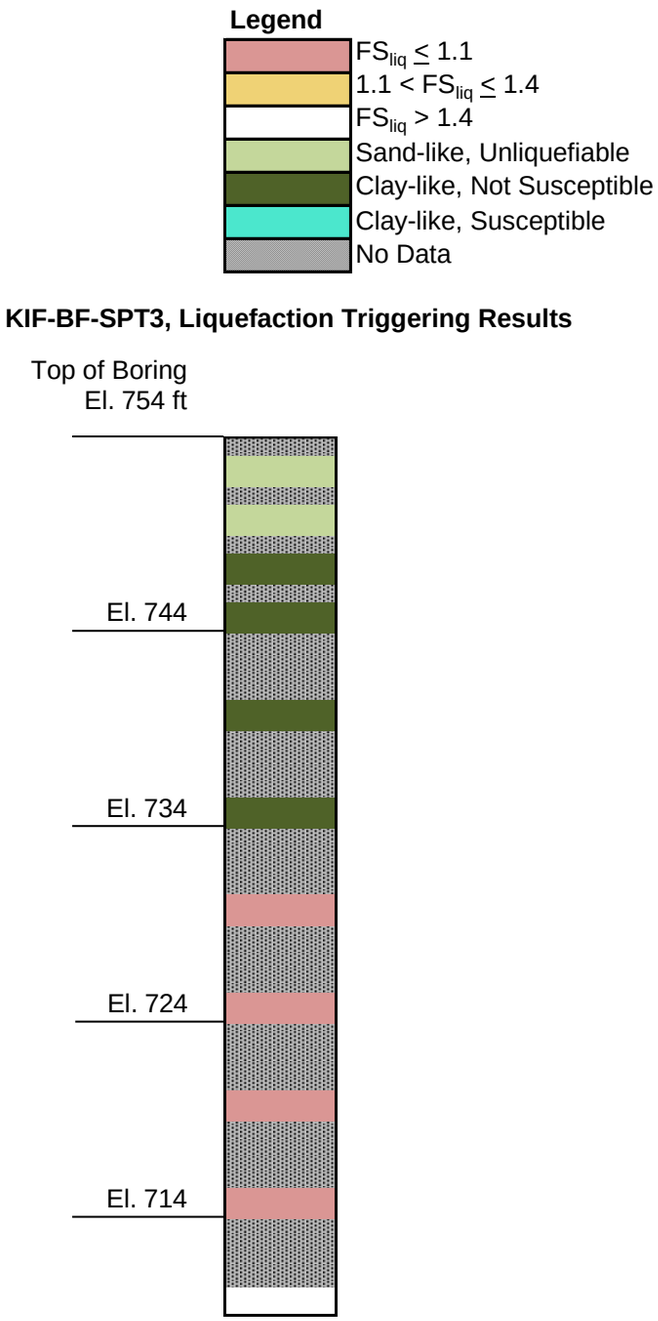
Elev. Of Mid. Pt. of Sample (ft)	Depth of Mid. Pt. of Sample (ft.) z	Unit Weight (pcf) γ_T	Vert. Total Stress during SPT (tsf) σ_v	Static Pore Pressure during SPT (tsf) u	Vert. Eff. Stress during SPT (tsf) σ'_v	SPT N Value N	Hammer Efficiency (%) E_m	Borehole Diameter Correction C_B	Sampler Correction C_s	Rod Length Correction C_R	Overburden Stress Correction Factor C_N	Hammer Energy Correction Factor C_E	Corrected Blow Count N_{60}	Normalized Blow Count $(N_1)_{60}$	Relative Density (%) D_r	Unified Soil Classification	Fines Content (%)
752.0	2.0	112	0.12	0.00	0.12	41	80.0	1.000	1.30	1.00	1.70	1.33	71	121	100	ML	46
749.5	4.5	112	0.26	0.00	0.26	15	80.0	1.000	1.30	1.00	1.53	1.33	26	40	93	0	54
747.0	7.0	128	0.41	0.00	0.41	57	80.0	1.000	1.30	1.00	1.29	1.33	99	127	100	0	27
744.5	9.5	128	0.57	0.00	0.57	19	80.0	1.000	1.30	1.00	1.18	1.33	33	39	98	0	52
739.5	14.5	128	0.89	0.00	0.89	12	80.0	1.000	1.21	1.00	1.07	1.33	19	21	76	0	52
734.5	19.5	128	1.21	0.03	1.17	5	80.0	1.000	1.10	1.00	0.95	1.33	7	7	52	0	52
729.5	24.5	126	1.52	0.19	1.34	5	80.0	1.000	1.10	1.00	0.89	1.33	7	6	51	0	44
724.5	29.5	126	1.84	0.34	1.50	8	80.0	1.000	1.10	1.00	0.85	1.33	12	10	58	0	44
719.5	34.5	126	2.15	0.50	1.65	3	80.0	1.000	1.10	1.00	0.78	1.33	4	3	44	0	44
714.5	39.5	131	2.47	0.66	1.82	5	80.0	1.000	1.10	1.00	0.75	1.33	7	5	47	0	22
709.5	44.5	131	2.80	0.81	1.99	19	80.0	1.000	1.25	1.00	0.79	1.33	32	25	81	0	22

KIF TDEC Stability, Boring ID: KIF-BF-SPT3
Liquefaction Potential Evaluations
For Coarse Grained Soils

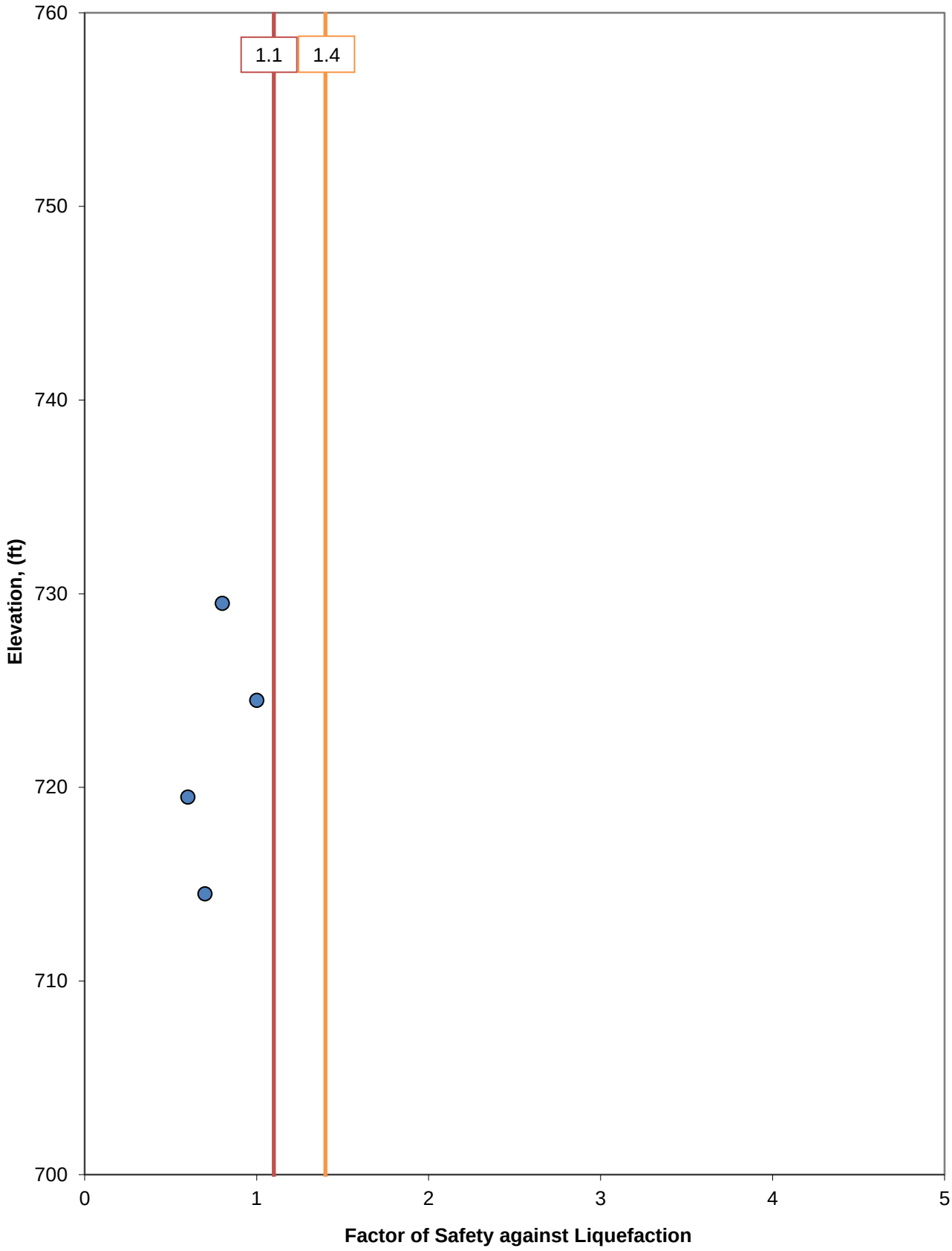
Depth of Mid. Pt. of Sample (ft.) z	Clean Sand Correction $\Delta(N_1)_{60cs}$	Equivalent Clean Sand N-Value $(N_1)_{60cs}$	Sample Screened for: Clay-like	High Blow Count $(N_1)_{60cs} \geq 32$	Unsaturated	Factor of Safety FS_{liq}	Material (optional)
	ft						
	ft	*(relative to ground surface during SPT)*					
	pcf						
	tsf						

Note: A factor of safety shown as "N/A" implies that the soil type is not appropriately evaluated using this methodology. This applies to clay-like soils (typically CL, CH, CL-ML and MH material type), samples with high blow counts, and unsaturated samples.

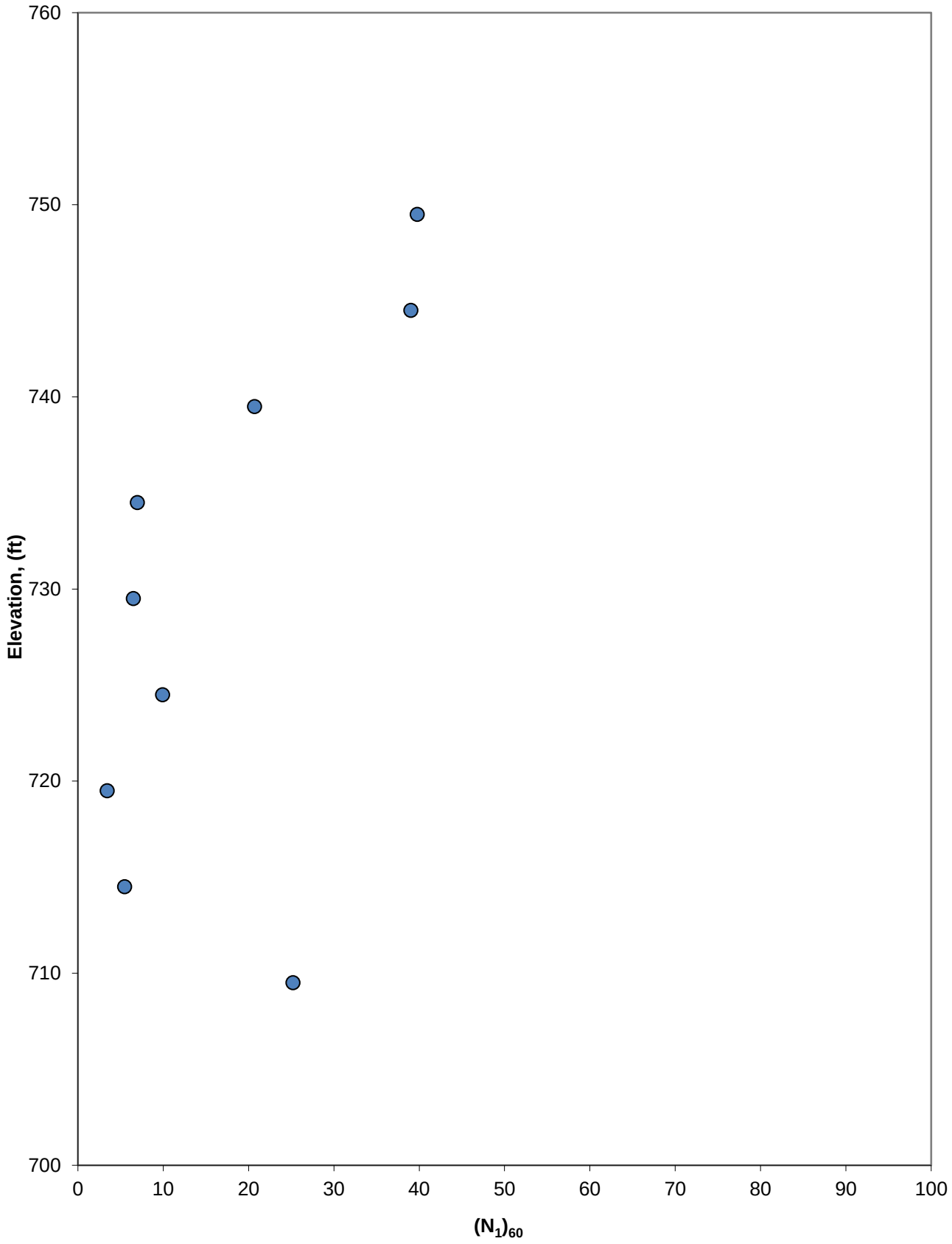
2.0	0.00	121	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**
4.5	0.00	40	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**
7.0	5.21	132	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**
9.5	5.61	45	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**
14.5	5.61	26	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
19.5	5.61	13	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**
24.5	5.60	12	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**
29.5	5.60	16	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**
34.5	5.60	9	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**
39.5	4.77	10	FALSE	FALSE	FALSE	**0.7**	**Subunit 3**
44.5	4.77	30	FALSE	FALSE	FALSE	**7.9**	**Subunit 3**


Legend
FS$_{liq}$ ≤ 1.1
1.1 < FS$_{liq}$ ≤ 1.4
FS$_{liq}$ > 1.4
Sand-like, Unliquefiable
Clay-like, Not Susceptible
Clay-like, Susceptible
No Data
KIF-BF-SPT3, Liquefaction Triggering Results
Top of Boring
El. 754 ft
El. 744
El. 734
El. 724
El. 714

KIF TDEC Stability, Boring ID: KIF-BF-SPT3, Source = 10 Hz, Mw = 6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



KIF TDEC Stability, Boring ID: KIF-BF-SPT3, Source = 10 Hz, Mw = 6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



Project Name = KIF TDEC Stability
Boring ID = KIF-BF-SPT5

Boring Location

Northing =
Easting =

OR

Baseline Station =
Offset (+ Right) =

Drilling Information

Boring Inner Diameter (ID) =	3.25	inches	
Top of Hole Elevation	770	feet	
Water Depth during SPT (negative for U/S borings)=	11	feet	
Depth Sampling Began	1	feet	
Total Unit Wt. above 1st SPT =	122	pcf	
Assumed Rod Stickup =	5	feet	*(Typ assume 5ft)*
E_m Measurement based on Fv method? =	1	(1: Yes, 0: No)	
SPT Sampler w/ Liners? =	0	(1: Yes, 0: No)	*(Typ. no)*

During EQ Information

Water Depth during EQ (relative to SPT TOH, negative for U/S borings) =	7.8	feet
Final Grade Elevation during EQ	762.8	feet
Average Total Unit Wt. of Cut/Fill	120	pcf

Fines Content Correction

Fines content correction for samples with blow counts of zero? 1 (1: Yes, 0: No)

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile? 0 (1: Yes, 0: No)
If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile: Pond_Section, KIF-BF-SPT5_NOR
Alpha at each sample depth known? 1 (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (α vs. depth curve)
If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_α will be one.

m4:
m3:
m2:
m1:
m0:

Associated ground response profile: ng_Pond_Section, KIF-BF-SPT5
Get CSR from shear stress envelope? 0 (1: Yes, 0: No)
If previous answer is No, then CSR will be calculated using a_{max} and r_d
Max. Shear Stress at each sample depth known? (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4:
m3:
m2:
m1:

Earthquake Information

EQ Source (e.g., New Madrid)	10 Hz
Event (e.g., MCE, 10KEQ, OBE)	Design EQ
a_{max} (g) (top of ground surface)	0.19
EQ Mag (Mw)	6

Inputs

Depth of Sample Midpoint (ft.)	SPT N Value	Hammer Efficiency, E_m (%)	Unified Soil Classification	Fines Content (%)	Total Unit Weight (pcf)	Material (optional)	Clay-like / Sand-like Override (optional)	Clay-like Susceptibility (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure during SPT (psf)	Static Pore Water Pressure during EQ (psf)
2.0	12	80	SM	38	119	Bottom Ash	Sand-like			-0.012			
4.5	25	80		38	119	Bottom Ash	Sand-like			-0.005			
7.0	17	80		38	119	Bottom Ash	Sand-like			0.003			
9.5	13	80		38	119	Bottom Ash	Sand-like			0.009			
14.5	10	80		38	119	Bottom Ash	Sand-like			0.006			
19.5	4	80		38	119	Bottom Ash	Sand-like			0.004			
24.5	17	80		38	119	Bottom Ash	Sand-like			0.006			
31.0	4	80		58	112	Fly Ash	Sand-like		Do Not Correct for FC	0.005			
34.5	5	80		58	112	Fly Ash	Sand-like		Do Not Correct for FC	0.016			
39.5	2	80		44	127	Subunit 2	Sand-like			0.030			
43.0	3	80		44	127	Subunit 2	Sand-like			0.037			
50.5	3	80		44	127	Subunit 2	Sand-like			0.039			
54.5	2	80		44	127	Subunit 2	Sand-like			0.036			
59.5	4	80		26	131	Subunit 3	Sand-like			0.032			

KIF TDEC Stability, Boring ID: KIF-BF-SPT5

Liquefaction Potential Evaluations

For Coarse Grained Soils

Elev. Of Mid. Pt. of Sample (ft)	Depth of Mid. Pt. of Sample (ft.)	Unit Weight (pcf)	Vert. Total Stress during SPT (tsf)	Static Pore Pressure during SPT (tsf)	Vert. Eff. Stress during SPT (tsf)	SPT N Value	Hammer Efficiency (%)	Borehole Diameter Correction	Sampler Correction	Rod Length Correction	Overburden Stress Correction Factor	Hammer Energy Correction Factor	Corrected Blow Count	Normalized Blow Count	Relative Density (%)	Unified Soil Classification	Fines Content (%)	Relative State Parameter Index	Static Shear Stress Ratio
	z	γ_T	σ_v	u	σ'_v	N	E_m	C_B	C_s	C_R	C_N	C_E	N_{60}	$(N_1)_{60}$	D_r			ξ_R	α

Top of Hole Elevation (ft) = 770.0 | Boring ID = **KIF-BF-SPT5**

begin sampling (depth-ft) = 1.0 | Boring Inner Dia. (in) = 3.25

total unit wt. above 1st SPT (pcf) = 122

water elevation during SPT (ft) = 759.0 ft *(relative to ground surface during SPT)* | Assumed Rod Stickup = 5.0 feet

water depth during SPT (ft) = 11.0 | E_m Measurement? = 1 (1: Yes, 0: No)

water elevation during EQ (ft) = 762.2 ft *(relative to ground surface during SPT)* | SPT Sampler w/ Liners? = 0 (1: Yes, 0: No)

water during EQ (depth-ft) = 7.8 | u-top | effstr-top

vert. total stress above 1st SPT (tsf) = **0.06** | **0.00** | 0.06

768.0	2.0	119	0.12	0.00	0.12	12	80.0	1.000	1.30	1.00	1.70	1.33	21	35	94	SM	38	#NUM!	0.000
765.5	4.5	119	0.27	0.00	0.27	25	80.0	1.000	1.30	1.00	1.43	1.33	43	62	100	0	38	#NUM!	0.000
763.0	7.0	119	0.42	0.00	0.42	17	80.0	1.000	1.30	1.00	1.29	1.33	29	38	97	0	38	#NUM!	0.003
760.5	9.5	119	0.57	0.00	0.57	13	80.0	1.000	1.27	1.00	1.24	1.33	22	27	85	0	38	-0.60	0.009
755.5	14.5	119	0.86	0.11	0.76	10	80.0	1.000	1.18	1.00	1.15	1.33	16	18	72	0	38	-0.58	0.006
750.5	19.5	119	1.16	0.27	0.90	4	80.0	1.000	1.10	1.00	1.09	1.33	6	6	51	0	38	-0.36	0.004
745.5	24.5	119	1.46	0.42	1.04	17	80.0	1.000	1.30	1.00	1.01	1.33	29	30	87	0	38	-0.60	0.006
739.0	31.0	112	1.83	0.62	1.21	4	80.0	1.000	1.10	1.00	0.92	1.33	6	5	34	0	58	-0.18	0.005
735.5	34.5	112	2.03	0.73	1.30	5	80.0	1.000	1.10	1.00	0.89	1.33	7	7	38	0	58	-0.21	0.016
730.5	39.5	127	2.33	0.89	1.44	2	80.0	1.000	1.10	1.00	0.84	1.33	3	2	42	0	44	-0.25	0.030
727.0	43.0	127	2.55	1.00	1.55	3	80.0	1.000	1.10	1.00	0.81	1.33	4	4	45	0	44	-0.27	0.037
719.5	50.5	127	3.03	1.23	1.80	3	80.0	1.000	1.10	1.00	0.75	1.33	4	3	44	0	44	-0.26	0.039
715.5	54.5	127	3.28	1.36	1.92	2	80.0	1.000	1.10	1.00	0.71	1.33	3	2	41	0	44	-0.23	0.036
710.5	59.5	131	3.60	1.51	2.09	4	80.0	1.000	1.10	1.00	0.69	1.33	6	4	45	0	26	-0.26	0.032

KIF TDEC Stability, Boring ID: KIF-BF-SPT5
Liquefaction Potential Evaluations
For Coarse Grained Soils

EQ Source	a max (g)	EQ Mag (Mw)	Event
10 Hz	0.19	6	Design EQ

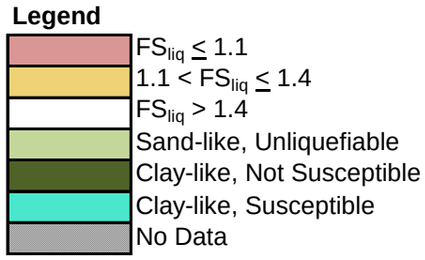
Shear Stress Curve Fit Parameters
m4: 0
m3: 0
m2: 0
m1: 0

Boring ID: **KIF-BF-SPT5**
Top of Fill Elevation: 762.8 ft
Fill Height: -7.2 ft *(relative to ground surface during SPT)*
Fill Total Unit Weight: 120 pcf
Fill Total Stress: -0.43 tsf

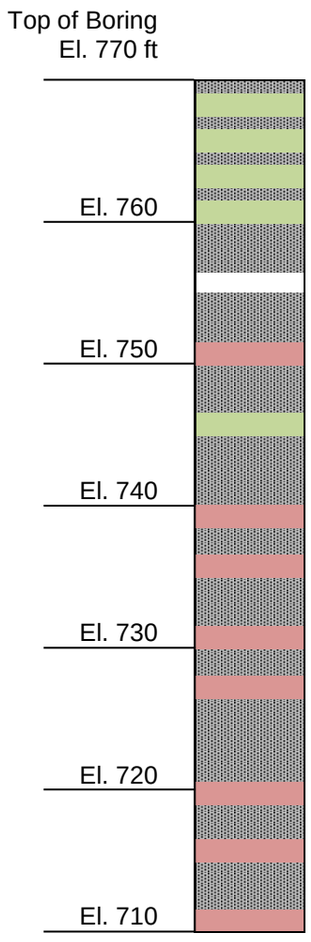
totstr-top	u-top	effstr-top
-0.37	0.00	-0.37

Note: A factor of safety shown as "N/A" implies that the soil type is not appropriately evaluated using this methodology. This applies to clay-like soils (typically CL, CH, CL-ML and MH material type), samples with high blow counts, and unsaturated samples.

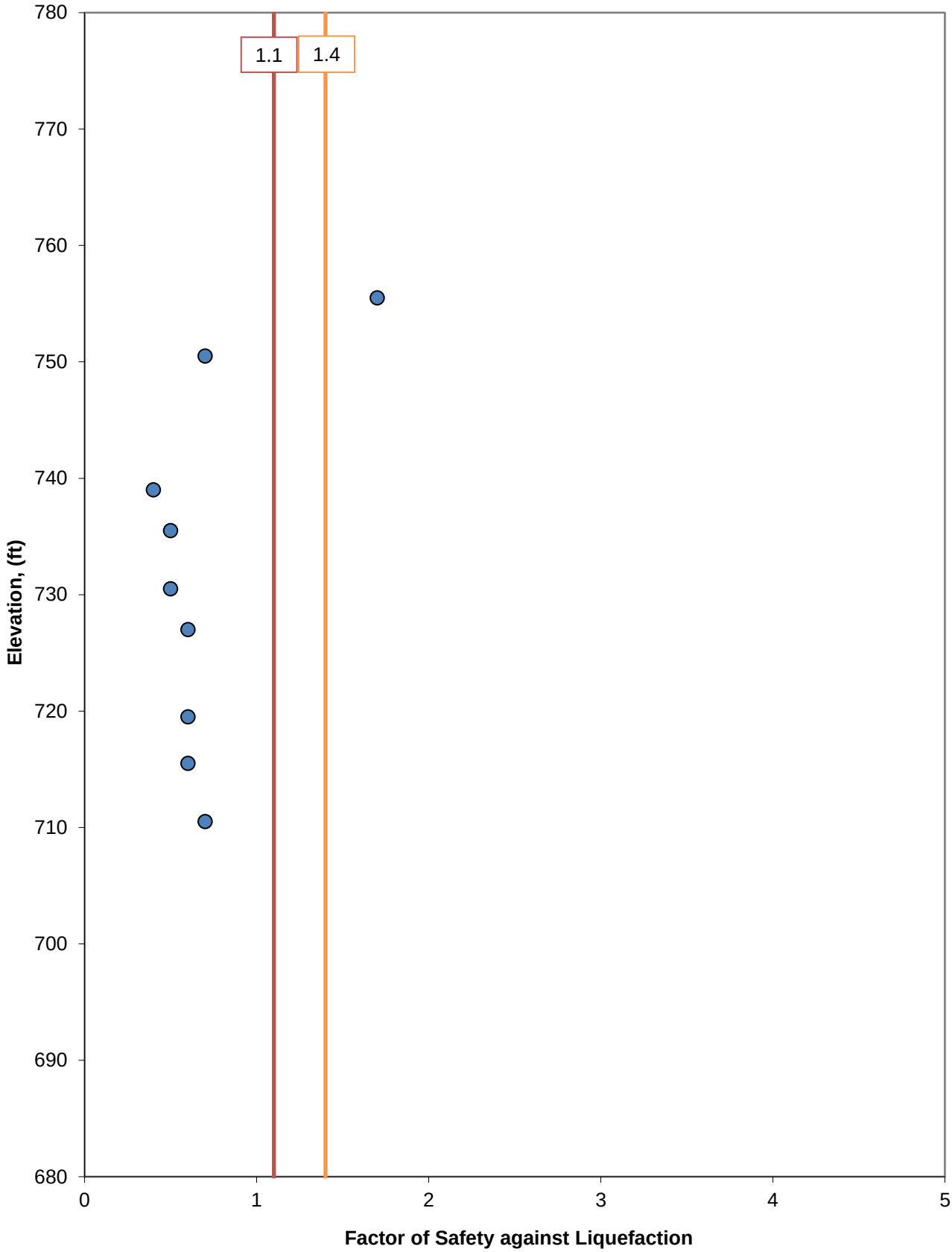
Depth of Mid. Pt. of Sample (ft.) z	Vert. Total Stress during EQ w/ Fill (tsf) $\sigma_{v\ with\ fill}$	Static Pore Pressure during EQ (tsf) u	Vert. Eff. Stress during EQ w/ Fill (tsf) $\sigma'_{v\ with\ fill}$	Clean Sand Correction $\Delta(N_1)_{60cs}$	Equivalent Clean Sand N-Value $(N_1)_{60cs}$	Cyclic Resistance Ratio CRR7.5	Overburden Correction Factor K_σ	Static Shear Stress Correction K_α	Mag. Scaling Factor (MSF)	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Max. Induced Shear Stress (psf)	From Ground Response: Avg. Cyclic Shear Stress (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Blow Count $(N_1)_{60cs} \geq 32$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)
2.0	-0.31	0.00	-0.31	5.55	41	N/A	N/A	N/A	N/A	N/A	1.000	0	0	0.124	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**
4.5	-0.16	0.00	-0.16	5.55	68	N/A	N/A	N/A	N/A	N/A	1.000	0	0	0.124	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**
7.0	-0.01	0.00	-0.01	5.55	44	N/A	N/A	N/A	N/A	N/A	1.000	0	0	0.124	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**
9.5	0.13	0.05	0.08	5.55	33	N/A	N/A	N/A	N/A	N/A	0.998	0	0	0.204	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**
14.5	0.43	0.21	0.22	5.55	24	0.261	1.100	1.016	1.39	0.407	0.974	0	0	0.234	FALSE	FALSE	FALSE	**1.7**	**Bottom Ash**
19.5	0.73	0.37	0.36	5.55	12	0.132	1.100	0.995	1.14	0.165	0.945	0	0	0.235	FALSE	FALSE	FALSE	**0.7**	**Bottom Ash**
24.5	1.03	0.52	0.51	5.55	35	N/A	N/A	N/A	N/A	N/A	0.912	0	0	0.230	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**
31.0	1.40	0.72	0.68	0.00	5	0.089	1.034	0.991	1.07	0.097	0.866	0	0	0.222	FALSE	FALSE	FALSE	**0.4**	**Fly Ash**
34.5	1.60	0.83	0.77	0.00	7	0.095	1.026	0.976	1.08	0.103	0.841	0	0	0.218	FALSE	FALSE	FALSE	**0.5**	**Fly Ash**
39.5	1.90	0.99	0.91	5.60	8	0.105	1.013	0.962	1.09	0.112	0.803	0	0	0.208	FALSE	FALSE	FALSE	**0.5**	**Subunit 2**
43.0	2.12	1.10	1.02	5.60	9	0.112	1.003	0.961	1.11	0.120	0.777	0	0	0.200	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**
50.5	2.60	1.33	1.26	5.60	9	0.110	0.984	0.957	1.10	0.115	0.721	0	0	0.184	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**
54.5	2.85	1.46	1.39	5.60	8	0.103	0.977	0.953	1.09	0.104	0.692	0	0	0.176	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**
59.5	3.17	1.61	1.56	5.15	9	0.112	0.965	0.963	1.11	0.115	0.658	0	0	0.166	FALSE	FALSE	FALSE	**0.7**	**Subunit 3**



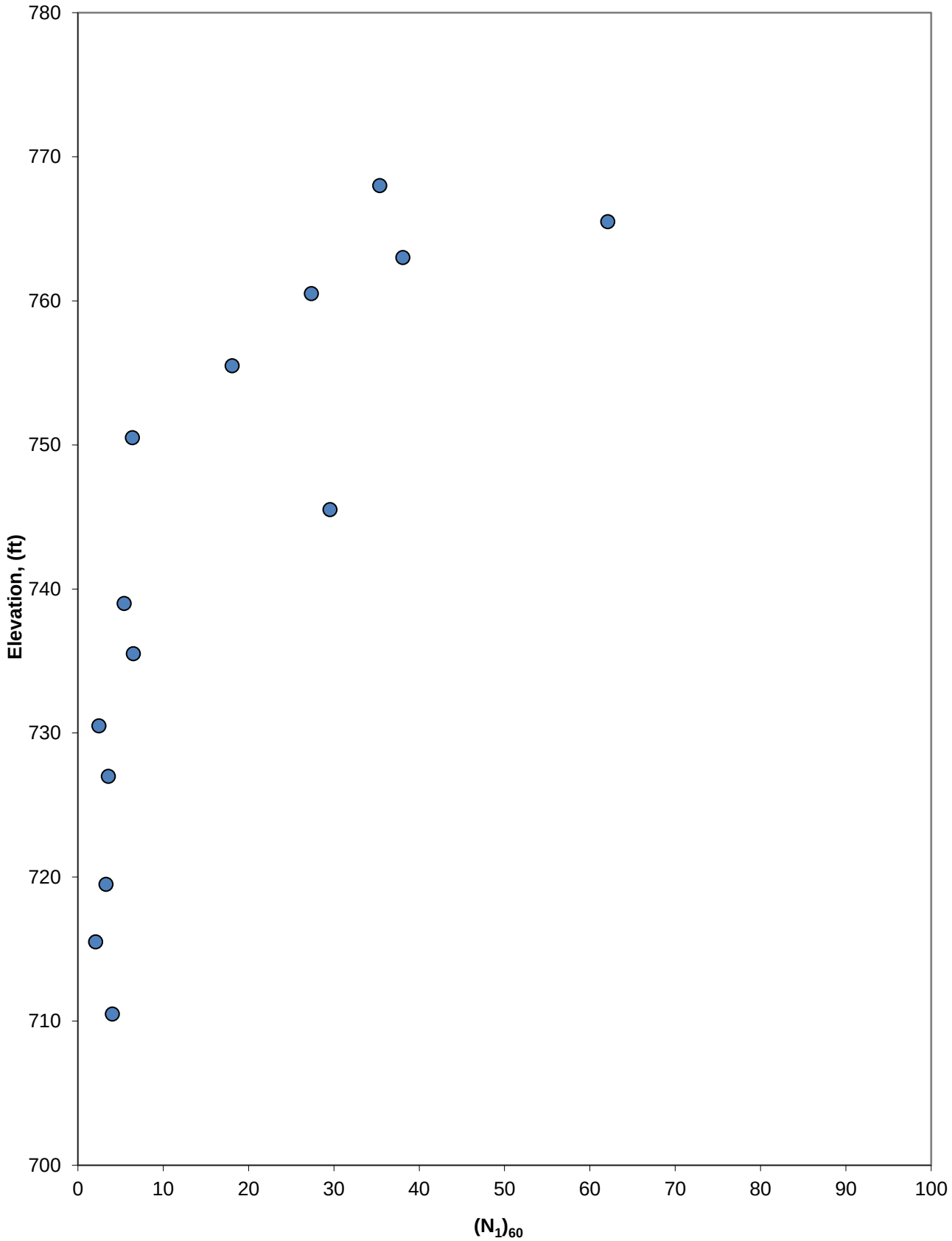
KIF-BF-SPT5, Liquefaction Triggering Results



KIF TDEC Stability, Boring ID: KIF-BF-SPT5, Source = 10 Hz, Mw = 6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



KIF TDEC Stability, Boring ID: KIF-BF-SPT5, Source = 10 Hz, Mw = 6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



Project Name = KIF TDEC Stability
Boring ID = KIF-C1

Boring Location

Northing =
Easting =

OR

Baseline Station =
Offset (+ Right) =

Drilling Information

Boring Inner Diameter (ID) =	3.25	inches	
Top of Hole Elevation	748.4	feet	
Water Depth during SPT (negative for U/S borings)=	2.3	feet	
Depth Sampling Began	1	feet	
Total Unit Wt. above 1st SPT =	120	pcf	
Assumed Rod Stickup =	5	feet	*(Typ assume 5ft)*
E_m Measurement based on Fv method? =	1	(1: Yes, 0: No)	
SPT Sampler w/ Liners? =	0	(1: Yes, 0: No)	*(Typ. no)*

During EQ Information

Water Depth during EQ (relative to SPT TOH, negative for U/S borings) =	2.3	feet
Final Grade Elevation during EQ	748.4	feet
Average Total Unit Wt. of Cut/Fill	120	pcf

Fines Content Correction

Fines content correction for samples with blow counts of zero? 1 (1: Yes, 0: No)

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile? 0 (1: Yes, 0: No)
If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile: ng_Pond_Section, KIF-C1_NOR
Alpha at each sample depth known? 1 (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (α vs. depth curve)
If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_α will be one.

m4:
m3:
m2:
m1:
m0:

Associated ground response profile: shing_Pond_Section, KIF-C1
Get CSR from shear stress envelope? 0 (1: Yes, 0: No)
If previous answer is No, then CSR will be calculated using a_{max} and r_d
Max. Shear Stress at each sample depth known? (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4:
m3:
m2:
m1:

Earthquake Information

EQ Source (e.g., New Madrid)	10 Hz
Event (e.g., MCE, 10KEQ, OBE)	Design EQ
a_{max} (g) (top of ground surface)	0.22
EQ Mag (Mw)	6

Inputs

Depth of Sample Midpoint (ft.)	SPT N Value	Hammer Efficiency, E_m (%)	Unified Soil Classification	Fines Content (%)	Total Unit Weight (pcf)	Material (optional)	Clay-like / Sand-like Override (optional)	Clay-like Susceptibility (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure during SPT (psf)	Static Pore Water Pressure during EQ (psf)
2.0	1	80	CL	49	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.256			
3.5	2	80		49	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.245			
5.0	15	80		49	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.242			
6.5	16	80		49	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.236			
8.0	3	80		49	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.234			
9.5	4	80		49	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.231			
11.0	1	80		49	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.229			
12.5	1	80		34	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.224			
14.0	0	80		34	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.219			
15.5	10	80		73	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.215			
17.0	2	80		73	127	Subunit 1	Clay-like	Not Susceptible		0.212			
18.5	3	80		73	127	Subunit 1	Clay-like	Not Susceptible		0.209			
20.0	3	80		74	127	Subunit 1	Clay-like	Not Susceptible		0.207			
21.5	4	80		74	127	Subunit 1	Clay-like	Not Susceptible		0.206			
23.0	5	80		74	127	Subunit 1	Clay-like	Not Susceptible		0.206			
24.5	5	80		74	127	Subunit 1	Clay-like	Not Susceptible		0.205			
26.0	4	80		74	127	Subunit 1	Clay-like	Not Susceptible		0.206			
27.5	4	80		74	127	Subunit 1	Clay-like	Not Susceptible		0.207			
29.0	2	80		74	127	Subunit 1	Clay-like	Not Susceptible		0.209			
30.5	8	80		74	127	Subunit 1	Clay-like	Not Susceptible		0.210			
32.0	4	80		33	131	Subunit 3	Sand-like			0.212			
33.5	3	80		33	131	Subunit 3	Sand-like			0.213			
35.0	5	80		33	131	Subunit 3	Sand-like			0.214			
36.5	4	80		33	131	Subunit 3	Sand-like			0.214			
38.0	1	80		33	131	Subunit 3	Sand-like			0.212			
39.5	4	80		33	131	Subunit 3	Sand-like			0.210			
41.0	0	80		33	131	Subunit 3	Sand-like			0.209			
42.5	3	80		33	131	Subunit 3	Sand-like			0.206			
44.0	4	80		33	131	Subunit 3	Sand-like			0.204			
45.5	28	80		33	131	Subunit 3	Sand-like			0.202			

KIF TDEC Stability, Boring ID: KIF-C1

Liquefaction Potential Evaluations

For Coarse Grained Soils

Top of Hole Elevation (ft) =			748.4				Boring ID =		KIF-C1											
begin sampling (depth-ft) =			1.0				Boring Inner Dia. (in) =		3.25											
total unit wt. above 1st SPT (pcf) =			120																	
water elevation during SPT (ft) =			746.1	ft *(relative to ground surface during SPT)*					Assumed Rod Stickup =	5.0	feet									
water depth during SPT (ft) =			2.3						E_m Measurement? =	1	(1: Yes, 0: No)									
water elevation during EQ (ft) =			746.1	ft *(relative to ground surface during SPT)*					SPT Sampler w/ Liners? =	0	(1: Yes, 0: No)									
water during EQ (depth-ft) =			2.3	u-top	effstr-top															
vert. total stress above 1st SPT (tsf) =			**0.06**	**0.00**	0.06															
Elev. Of Mid. Pt. of Sample (ft)	Depth of Mid. Pt. of Sample (ft.) z	Unit Weight (pcf) γ_T	Vert. Total Stress during SPT (tsf) σ_v	Static Pore Pressure during SPT (tsf) u	Vert. Eff. Stress during SPT (tsf) σ'_v	SPT N Value N	Hammer Efficiency (%) E_m	Borehole Diameter Correction C_B	Sampler Correction C_s	Rod Length Correction C_R	Overburden Stress Correction Factor C_N	Hammer Energy Correction Factor C_E	Corrected Blow Count N_{60}	Normalized Blow Count $(N_1)_{60}$	Relative Density (%) D_r	Unified Soil Classification	Fines Content (%)	Relative State Parameter Index ξ_R	Static Shear Stress Ratio α
746.4	2.0	120	0.12	0.00	0.12	1	80.0	1.000	1.10	1.00	1.70	1.33	1	2	42	CL	49	-0.29	0.256
744.9	3.5	120	0.21	0.04	0.17	2	80.0	1.000	1.10	1.00	1.70	1.33	3	5	48	0	49	-0.35	0.245
743.4	5.0	120	0.30	0.08	0.22	15	80.0	1.000	1.30	1.00	1.53	1.33	26	40	99	0	49	-0.60	0.242
741.9	6.5	120	0.39	0.13	0.26	16	80.0	1.000	1.30	1.00	1.45	1.33	28	40	100	0	49	-0.60	0.236
740.4	8.0	120	0.48	0.18	0.30	3	80.0	1.000	1.10	1.00	1.70	1.33	4	7	53	0	49	-0.39	0.234
738.9	9.5	120	0.57	0.22	0.35	4	80.0	1.000	1.10	1.00	1.70	1.33	6	10	58	0	49	-0.44	0.231
737.4	11.0	120	0.66	0.27	0.39	1	80.0	1.000	1.10	1.00	1.70	1.33	1	2	42	0	49	-0.27	0.229
735.9	12.5	120	0.75	0.32	0.43	1	80.0	1.000	1.10	1.00	1.66	1.33	1	2	42	0	34	-0.27	0.224
734.4	14.0	120	0.84	0.37	0.47	0	80.0	1.000	1.10	1.00	1.62	1.33	0	0	35	0	34	-0.20	0.219
732.9	15.5	120	0.93	0.41	0.52	10	80.0	1.000	1.21	1.00	1.32	1.33	16	21	76	0	73	-0.60	0.215
731.4	17.0	127	1.02	0.46	0.56	2	80.0	1.000	1.10	1.00	1.41	1.33	3	4	46	0	73	-0.30	0.212
729.9	18.5	127	1.12	0.51	0.61	3	80.0	1.000	1.10	1.00	1.33	1.33	4	6	50	0	73	-0.34	0.209
728.4	20.0	127	1.21	0.55	0.66	3	80.0	1.000	1.10	1.00	1.28	1.33	4	6	49	0	74	-0.33	0.207
726.9	21.5	127	1.31	0.60	0.71	4	80.0	1.000	1.10	1.00	1.23	1.33	6	7	53	0	74	-0.37	0.206
725.4	23.0	127	1.40	0.65	0.76	5	80.0	1.000	1.10	1.00	1.18	1.33	7	9	56	0	74	-0.39	0.206
723.9	24.5	127	1.50	0.69	0.81	5	80.0	1.000	1.10	1.00	1.14	1.33	7	8	55	0	74	-0.39	0.205
722.4	26.0	127	1.59	0.74	0.85	4	80.0	1.000	1.10	1.00	1.12	1.33	6	7	51	0	74	-0.35	0.206
720.9	27.5	127	1.69	0.79	0.90	4	80.0	1.000	1.10	1.00	1.09	1.33	6	6	51	0	74	-0.34	0.207
719.4	29.0	127	1.78	0.83	0.95	2	80.0	1.000	1.10	1.00	1.06	1.33	3	3	43	0	74	-0.26	0.209
717.9	30.5	127	1.88	0.88	1.00	8	80.0	1.000	1.12	1.00	1.03	1.33	12	12	62	0	74	-0.45	0.210
716.4	32.0	131	1.98	0.93	1.05	4	80.0	1.000	1.10	1.00	1.00	1.33	6	6	50	0	33	-0.32	0.212
714.9	33.5	131	2.07	0.97	1.10	3	80.0	1.000	1.10	1.00	0.98	1.33	4	4	46	0	33	-0.29	0.213
713.4	35.0	131	2.17	1.02	1.15	5	80.0	1.000	1.10	1.00	0.96	1.33	7	7	52	0	33	-0.35	0.214
711.9	36.5	131	2.27	1.07	1.20	4	80.0	1.000	1.10	1.00	0.93	1.33	6	5	49	0	33	-0.31	0.214
710.4	38.0	131	2.37	1.11	1.26	1	80.0	1.000	1.10	1.00	0.90	1.33	1	1	38	0	33	-0.21	0.212
708.9	39.5	131	2.47	1.16	1.31	4	80.0	1.000	1.10	1.00	0.89	1.33	6	5	48	0	33	-0.30	0.210
707.4	41.0	131	2.57	1.21	1.36	0	80.0	1.000	1.10	1.00	0.86	1.33	0	0	35	0	33	-0.17	0.209
705.9	42.5	131	2.66	1.25	1.41	3	80.0	1.000	1.10	1.00	0.85	1.33	4	4	45	0	33	-0.27	0.206
704.4	44.0	131	2.76	1.30	1.46	4	80.0	1.000	1.10	1.00	0.84	1.33	6	5	48	0	33	-0.29	0.204
702.9	45.5	131	2.86	1.35	1.51	28	80.0	1.000	1.30	1.00	0.91	1.33	49	44	100	0	33	-0.60	0.202

KIF TDEC Stability, Boring ID: KIF-C1
Liquefaction Potential Evaluations
For Coarse Grained Soils

EQ Source	a max (g)	EQ Mag (Mw)	Event
10 Hz	0.22	6	Design EQ

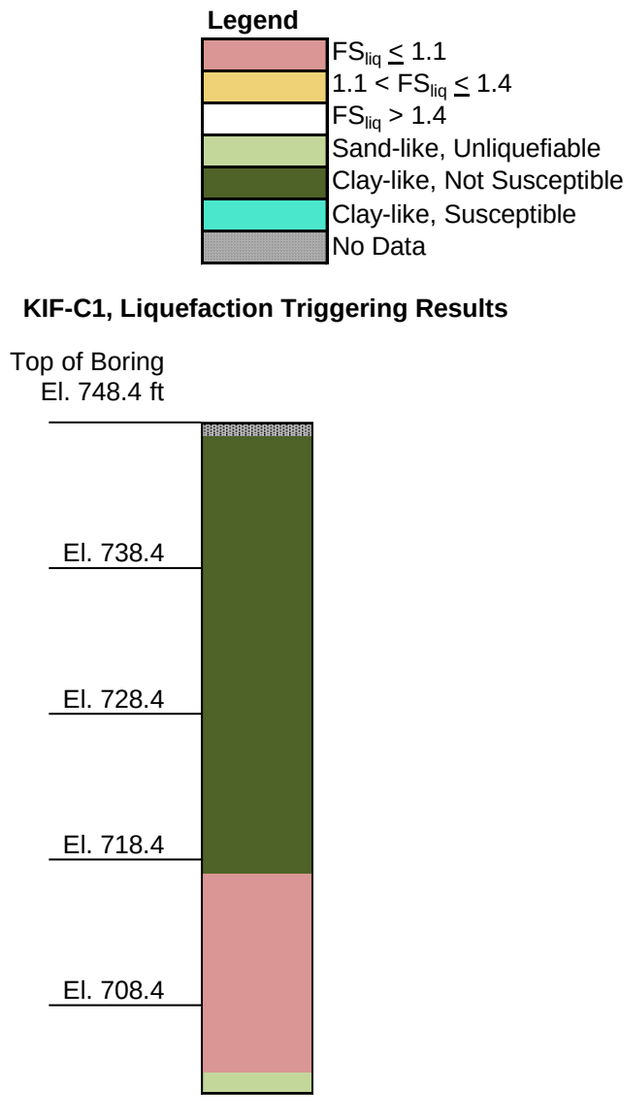
Shear Stress Curve Fit Parameters
m4: 0
m3: 0
m2: 0
m1: 0

Boring ID: **KIF-C1**
Top of Fill Elevation: 748.4 ft
Fill Height: 0.0 ft *(relative to ground surface during SPT)*
Fill Total Unit Weight: 120 pcf
Fill Total Stress: 0.00 tsf

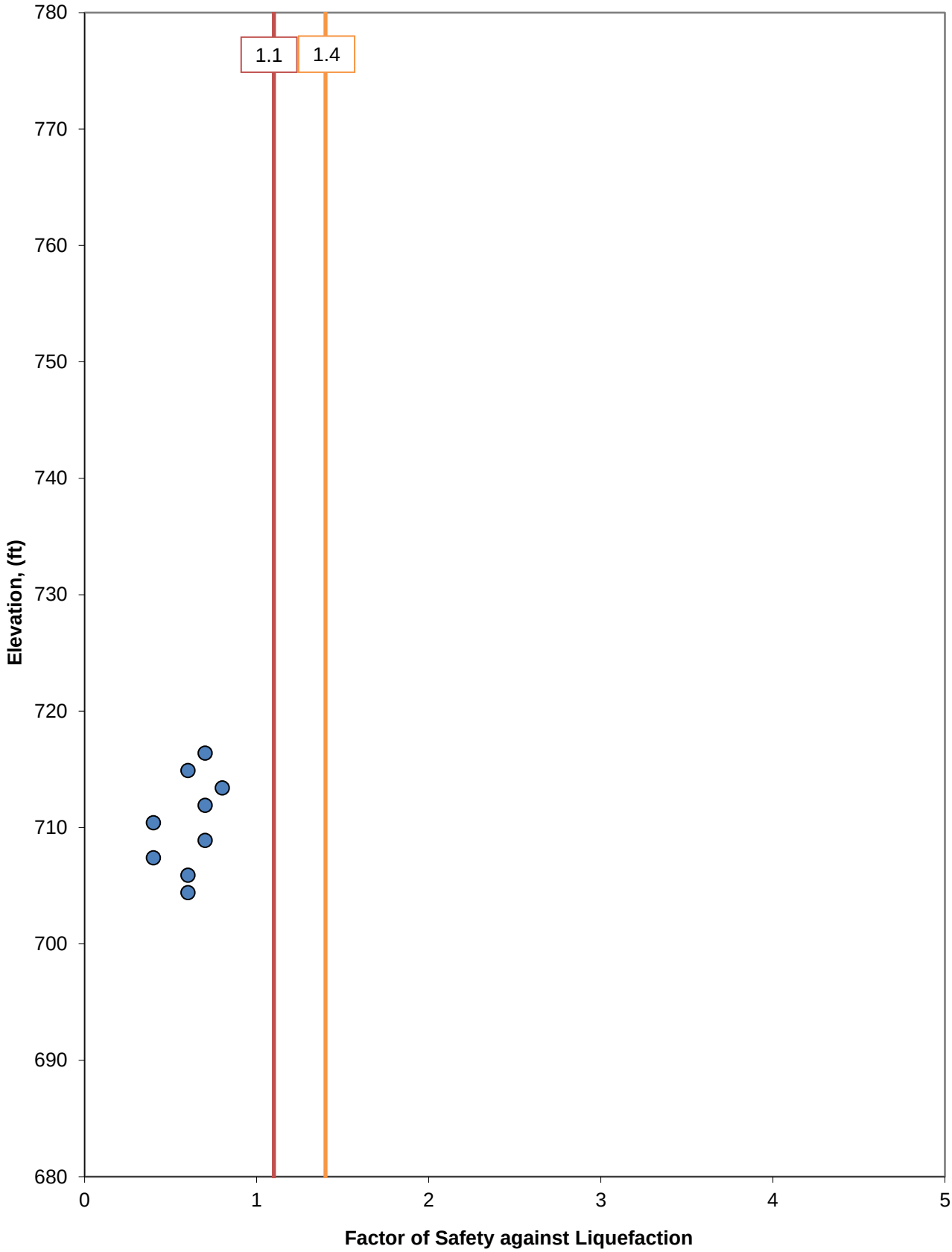
totstr-top	u-top	effstr-top
0.06	0.00	0.06

Note: A factor of safety shown as "N/A" implies that the soil type is not appropriately evaluated using this methodology. This applies to clay-like soils (typically CL, CH, CL-ML and MH material type), samples with high blow counts, and unsaturated samples.

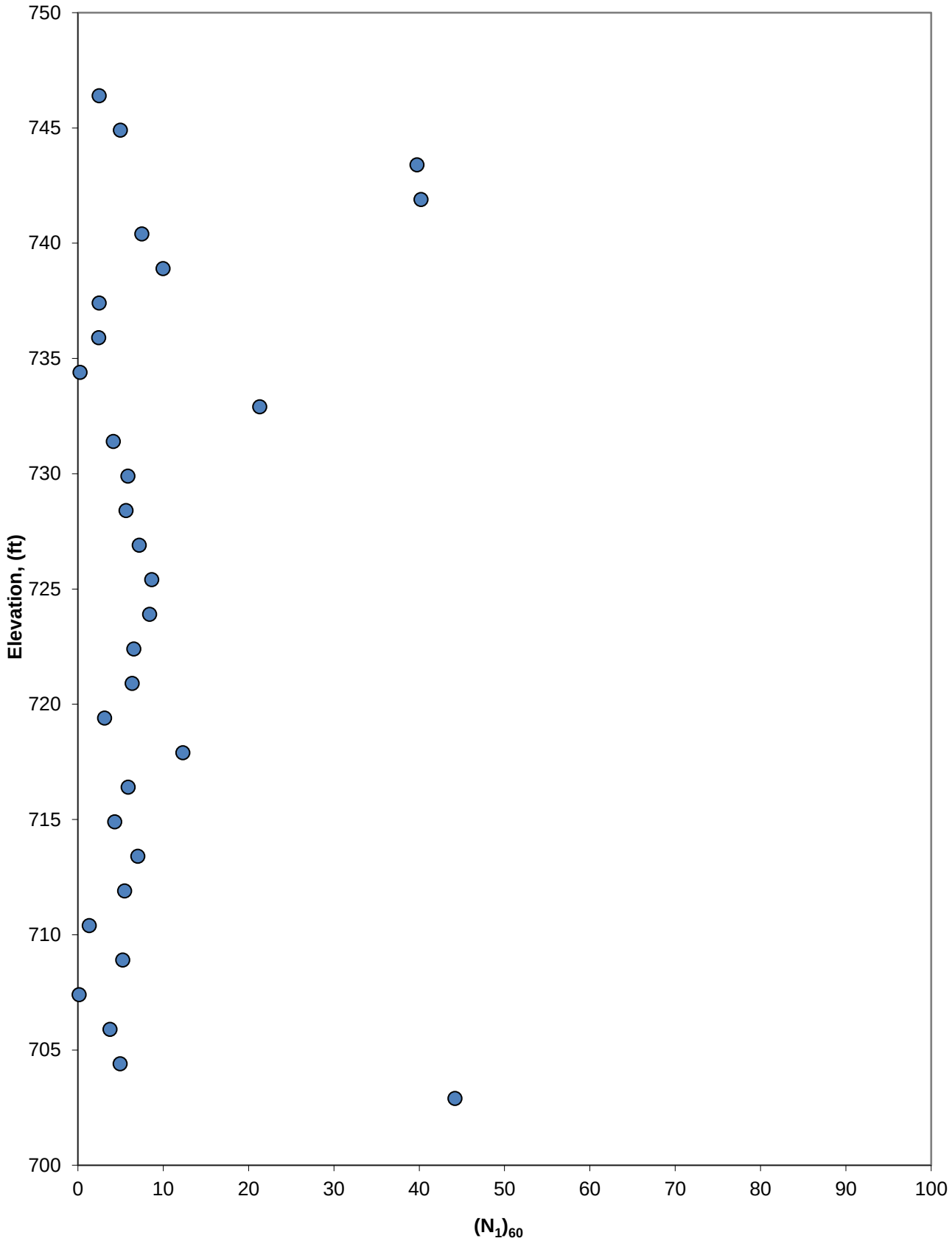
Depth of Mid. Pt. of Sample (ft.) z	Vert. Total Stress during EQ w/ Fill (tsf) $\sigma_{v\ with\ fill}$	Static Pore Pressure during EQ (tsf) u	Vert. Eff. Stress during EQ w/ Fill (tsf) $\sigma'_{v\ with\ fill}$	Clean Sand Correction $\Delta(N_1)_{60cs}$	Equivalent Clean Sand N-Value $(N_1)_{60cs}$	Cyclic Resistance Ratio CRR7.5	Overburden Correction Factor K_σ	Static Shear Stress Correction K_α	Mag. Scaling Factor (MSF)	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Max. Induced Shear Stress (psf)	From Ground Response: Avg. Cyclic Shear Stress (psf)	Cyclic Stress Ratio CSR	Sample Screened for: High Clay-like	High Blow Count $(N_1)_{60cs} \geq 32$	Unsaturated	Factor of Safety FS_{liq}	Material (optional)
2.0	0.12	0.00	0.12	5.61	8	N/A	N/A	N/A	1.09	N/A	1.000	0	0	0.143	TRUE	FALSE	TRUE	N/A	**Clay Fill (irrelevant)**
3.5	0.21	0.04	0.17	5.61	11	N/A	N/A	N/A	1.12	N/A	0.993	0	0	0.173	TRUE	FALSE	FALSE	N/A	**Clay Fill (irrelevant)**
5.0	0.30	0.08	0.22	5.61	45	N/A	N/A	N/A	N/A	N/A	0.986	0	0	0.196	TRUE	TRUE	FALSE	N/A	**Clay Fill (irrelevant)**
6.5	0.39	0.13	0.26	5.61	46	N/A	N/A	N/A	N/A	N/A	0.978	0	0	0.210	TRUE	TRUE	FALSE	N/A	**Clay Fill (irrelevant)**
8.0	0.48	0.18	0.30	5.61	13	N/A	N/A	N/A	1.16	N/A	0.970	0	0	0.220	TRUE	FALSE	FALSE	N/A	**Clay Fill (irrelevant)**
9.5	0.57	0.22	0.35	5.61	16	N/A	N/A	N/A	1.20	N/A	0.961	0	0	0.227	TRUE	FALSE	FALSE	N/A	**Clay Fill (irrelevant)**
11.0	0.66	0.27	0.39	5.61	8	N/A	N/A	N/A	1.09	N/A	0.953	0	0	0.231	TRUE	FALSE	FALSE	N/A	**Clay Fill (irrelevant)**
12.5	0.75	0.32	0.43	5.49	8	N/A	N/A	N/A	1.09	N/A	0.943	0	0	0.234	TRUE	FALSE	FALSE	N/A	**Clay Fill (irrelevant)**
14.0	0.84	0.37	0.47	5.49	6	N/A	N/A	N/A	1.07	N/A	0.934	0	0	0.236	TRUE	FALSE	FALSE	N/A	**Clay Fill (irrelevant)**
15.5	0.93	0.41	0.52	5.57	27	N/A	N/A	N/A	1.49	N/A	0.924	0	0	0.237	TRUE	FALSE	FALSE	N/A	**Clay Fill (irrelevant)**
17.0	1.02	0.46	0.56	5.57	10	N/A	N/A	N/A	1.11	N/A	0.914	0	0	0.237	TRUE	FALSE	FALSE	N/A	**Subunit 1**
18.5	1.12	0.51	0.61	5.57	11	N/A	N/A	N/A	1.13	N/A	0.904	0	0	0.236	TRUE	FALSE	FALSE	N/A	**Subunit 1**
20.0	1.21	0.55	0.66	5.56	11	N/A	N/A	N/A	1.13	N/A	0.894	0	0	0.234	TRUE	FALSE	FALSE	N/A	**Subunit 1**
21.5	1.31	0.60	0.71	5.56	13	N/A	N/A	N/A	1.15	N/A	0.883	0	0	0.233	TRUE	FALSE	FALSE	N/A	**Subunit 1**
23.0	1.40	0.65	0.76	5.56	14	N/A	N/A	N/A	1.18	N/A	0.872	0	0	0.231	TRUE	FALSE	FALSE	N/A	**Subunit 1**
24.5	1.50	0.69	0.81	5.56	14	N/A	N/A	N/A	1.17	N/A	0.861	0	0	0.229	TRUE	FALSE	FALSE	N/A	**Subunit 1**
26.0	1.59	0.74	0.85	5.56	12	N/A	N/A	N/A	1.14	N/A	0.850	0	0	0.227	TRUE	FALSE	FALSE	N/A	**Subunit 1**
27.5	1.69	0.79	0.90	5.56	12	N/A	N/A	N/A	1.14	N/A	0.839	0	0	0.224	TRUE	FALSE	FALSE	N/A	**Subunit 1**
29.0	1.78	0.83	0.95	5.56	9	N/A	N/A	N/A	1.10	N/A	0.828	0	0	0.222	TRUE	FALSE	FALSE	N/A	**Subunit 1**
30.5	1.88	0.88	1.00	5.56	18	N/A	N/A	N/A	1.25	N/A	0.817	0	0	0.219	TRUE	FALSE	FALSE	N/A	**Subunit 1**
32.0	1.98	0.93	1.05	5.46	11	0.128	1.001	1.020	1.13	0.148	0.805	0	0	0.217	FALSE	FALSE	FALSE	**0.7**	**Subunit 3**
33.5	2.07	0.97	1.10	5.46	10	0.116	0.996	0.945	1.11	0.122	0.794	0	0	0.214	FALSE	FALSE	FALSE	**0.6**	**Subunit 3**
35.0	2.17	1.02	1.15	5.46	12	0.136	0.991	1.071	1.15	0.166	0.783	0	0	0.211	FALSE	FALSE	FALSE	**0.8**	**Subunit 3**
36.5	2.27	1.07	1.20	5.46	11	0.125	0.988	0.992	1.13	0.138	0.771	0	0	0.208	FALSE	FALSE	FALSE	**0.7**	**Subunit 3**
38.0	2.37	1.11	1.26	5.46	7	0.097	0.986	0.825	1.08	0.085	0.760	0	0	0.205	FALSE	FALSE	FALSE	**0.4**	**Subunit 3**
39.5	2.47	1.16	1.31	5.46	11	0.123	0.980	0.976	1.12	0.132	0.749	0	0	0.202	FALSE	FALSE	FALSE	**0.7**	**Subunit 3**
41.0	2.57	1.21	1.36	5.46	6	0.090	0.981	0.788	1.07	0.074	0.738	0	0	0.199	FALSE	FALSE	FALSE	**0.4**	**Subunit 3**
42.5	2.66	1.25	1.41	5.46	9	0.113	0.974	0.911	1.11	0.111	0.727	0	0	0.196	FALSE	FALSE	FALSE	**0.6**	**Subunit 3**
44.0	2.76	1.30	1.46	5.46	10	0.121	0.970	0.956	1.12	0.125	0.716	0	0	0.193	FALSE	FALSE	FALSE	**0.6**	**Subunit 3**
45.5	2.86	1.35	1.51	5.46	50	N/A	N/A	N/A	N/A	N/A	0.705	0	0	0.190	FALSE	TRUE	FALSE	N/A	**Subunit 3**


Legend
$FS_{liq} \leq 1.1$
$1.1 < FS_{liq} \leq 1.4$
$FS_{liq} > 1.4$
Sand-like, Unliquefiable
Clay-like, Not Susceptible
Clay-like, Susceptible
No Data
KIF-C1, Liquefaction Triggering Results
Top of Boring
El. 748.4 ft
El. 738.4
El. 728.4
El. 718.4
El. 708.4

KIF TDEC Stability, Boring ID: KIF-C1, Source = 10 Hz, Mw = 6, Event = Design EQ,
SPT Data, Simplified Stress-Based Approach



KIF TDEC Stability, Boring ID: KIF-C1, Source = 10 Hz, Mw = 6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



Project Name = KIF TDEC Stability
Boring ID = KIF-C2

Boring Location

Northing =
Easting =

OR

Baseline Station =
Offset (+ Right) =

Drilling Information

Boring Inner Diameter (ID) =	3.25	inches	
Top of Hole Elevation	743.9	feet	
Water Depth during SPT (negative for U/S borings)=	2.3	feet	
Depth Sampling Began	1.5	feet	
Total Unit Wt. above 1st SPT =	120	pcf	
Assumed Rod Stickup =	5	feet	*(Typ assume 5ft)*
E_m Measurement based on Fv method? =	1	(1: Yes, 0: No)	
SPT Sampler w/ Liners? =	0	(1: Yes, 0: No)	*(Typ. no)*

During EQ Information

Water Depth during EQ (relative to SPT TOH, negative for U/S borings) =	2.3	feet
Final Grade Elevation during EQ	743.9	feet
Average Total Unit Wt. of Cut/Fill	120	pcf

Fines Content Correction

Fines content correction for samples with blow counts of zero? 1 (1: Yes, 0: No)

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile? 0 (1: Yes, 0: No)
If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile: ng_Pond_Section, KIF-C2_NOR
Alpha at each sample depth known? 1 (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (α vs. depth curve)
If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_α will be one.

m4:
m3:
m2:
m1:
m0:

Associated ground response profile: shing_Pond_Section, KIF-C2
Get CSR from shear stress envelope? 0 (1: Yes, 0: No)
If previous answer is No, then CSR will be calculated using a_{max} and r_d
Max. Shear Stress at each sample depth known? (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4:
m3:
m2:
m1:

Earthquake Information

EQ Source (e.g., New Madrid)	10 Hz
Event (e.g., MCE, 10KEQ, OBE)	Design EQ
a_{max} (g) (top of ground surface)	0.22
EQ Mag (Mw)	6

Inputs

Depth of Sample Midpoint (ft.)	SPT N Value	Hammer Efficiency, E_m (%)	Unified Soil Classification	Fines Content (%)	Total Unit Weight (pcf)	Material (optional)	Clay-like / Sand-like Override (optional)	Clay-like Susceptibility (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure during SPT (psf)	Static Pore Water Pressure during EQ (psf)
2.5	7	80	CL	47	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.334			
4.0	9	80		47	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.314			
5.5	4	80		30	131	Subunit 3	Sand-like			0.299			
7.0	6	80		30	131	Subunit 3	Sand-like			0.290			
8.5	2	80		30	131	Subunit 3	Sand-like			0.283			
10.0	1	80		30	131	Subunit 3	Sand-like			0.276			
11.5	1	80		65	127	Subunit 1	Clay-like	Not Susceptible		0.270			
13.0	0	80		65	127	Subunit 1	Clay-like	Not Susceptible		0.265			
14.5	0	80		65	127	Subunit 1	Clay-like	Not Susceptible		0.260			
16.0	10	80		65	127	Subunit 1	Clay-like	Not Susceptible		0.256			
17.5	7	80		65	127	Subunit 1	Clay-like	Not Susceptible		0.252			
19.0	6	80		65	127	Subunit 1	Clay-like	Not Susceptible		0.247			
20.5	8	80		65	127	Subunit 1	Clay-like	Not Susceptible		0.241			
22.0	7	80		65	127	Subunit 1	Clay-like	Not Susceptible		0.235			
23.5	3	80		65	127	Subunit 1	Clay-like	Not Susceptible		0.229			
25.0	2	80		65	127	Subunit 1	Clay-like	Not Susceptible		0.224			
26.5	0	80		49	126	Subunit 2	Sand-like			0.218			
28.0	1	80		49	126	Subunit 2	Sand-like			0.213			
29.5	0	80		49	126	Subunit 2	Sand-like			0.208			
31.0	3	80		49	126	Subunit 2	Sand-like			0.204			
32.5	11	80		49	126	Subunit 2	Sand-like			0.200			
34.0	5	80		49	126	Subunit 2	Sand-like			0.195			
35.5	6	80		49	126	Subunit 2	Sand-like			0.191			
37.0	7	80		49	126	Subunit 2	Sand-like			0.187			
38.5	7	80		49	126	Subunit 2	Sand-like			0.184			
40.0	34	80		30	131	Subunit 3	Sand-like			0.182			
41.5	14	80		30	131	Subunit 3	Sand-like			0.181			

KIF TDEC Stability, Boring ID: KIF-C2

Liquefaction Potential Evaluations

For Coarse Grained Soils

Elev. Of Mid. Pt. of Sample (ft)	Depth of Mid. Pt. of Sample (ft.) z	Unit Weight (pcf) γ_T	Vert. Total Stress during SPT (tsf) σ_v	Static Pore Pressure during SPT (tsf) u	Vert. Eff. Stress during SPT (tsf) σ'_v	SPT N Value N	Hammer Efficiency (%) E_m	Borehole Diameter Correction C_B	Sampler Correction C_S	Rod Length Correction C_R	Overburden Stress Correction Factor C_N	Hammer Energy Correction Factor C_E	Corrected Blow Count N_{60}	Normalized Blow Count $(N_1)_{60}$	Relative Density (%) D_r	Unified Soil Classification	Fines Content (%)	Relative State Parameter Index ξ_R	Static Shear Stress Ratio α
	Top of Hole Elevation (ft) =		743.9				Boring ID =		KIF-C2										
	begin sampling (depth-ft) =		1.5				Boring Inner Dia. (in) =		3.25										
	total unit wt. above 1st SPT (pcf) =		120																
	water elevation during SPT (ft) =		741.6	ft *(relative to ground surface during SPT)*			Assumed Rod Stickup =		5.0	feet									
	water depth during SPT (ft) =		2.3				E_m Measurement? =		1	(1: Yes, 0: No)									
	water elevation during EQ (ft) =		741.6	ft *(relative to ground surface during SPT)*			SPT Sampler w/ Liners? =		0	(1: Yes, 0: No)									
	water during EQ (depth-ft) =		2.3	u-top	effstr-top														
	vert. total stress above 1st SPT (tsf) =		**0.09**	**0.00**	0.09														
741.4	2.5	120	0.15	0.01	0.14	7	80.0	1.000	1.19	1.00	1.70	1.33	11	19	73	CL	47	-0.60	0.334
739.9	4.0	120	0.24	0.05	0.19	9	80.0	1.000	1.26	1.00	1.70	1.33	15	26	82	0	47	-0.60	0.314
738.4	5.5	131	0.33	0.10	0.23	4	80.0	1.000	1.10	1.00	1.70	1.33	6	10	58	0	30	-0.44	0.299
736.9	7.0	131	0.43	0.15	0.29	6	80.0	1.000	1.16	1.00	1.70	1.33	9	16	68	0	30	-0.54	0.290
735.4	8.5	131	0.53	0.19	0.34	2	80.0	1.000	1.10	1.00	1.70	1.33	3	5	47	0	30	-0.33	0.283
733.9	10.0	131	0.63	0.24	0.39	1	80.0	1.000	1.10	1.00	1.70	1.33	1	2	41	0	30	-0.27	0.276
732.4	11.5	127	0.73	0.29	0.44	1	80.0	1.000	1.10	1.00	1.65	1.33	1	2	42	0	65	-0.27	0.270
730.9	13.0	127	0.82	0.33	0.49	0	80.0	1.000	1.10	1.00	1.59	1.33	0	0	36	0	65	-0.20	0.265
729.4	14.5	127	0.92	0.38	0.54	0	80.0	1.000	1.10	1.00	1.50	1.33	0	0	36	0	65	-0.20	0.260
727.9	16.0	127	1.01	0.43	0.58	10	80.0	1.000	1.20	1.00	1.26	1.33	16	20	75	0	65	-0.59	0.256
726.4	17.5	127	1.11	0.47	0.63	7	80.0	1.000	1.13	1.00	1.26	1.33	11	13	64	0	65	-0.48	0.252
724.9	19.0	127	1.20	0.52	0.68	6	80.0	1.000	1.11	1.00	1.23	1.33	9	11	60	0	65	-0.44	0.247
723.4	20.5	127	1.30	0.57	0.73	8	80.0	1.000	1.14	1.00	1.18	1.33	12	14	66	0	65	-0.50	0.241
721.9	22.0	127	1.39	0.61	0.78	7	80.0	1.000	1.12	1.00	1.15	1.33	10	12	62	0	65	-0.46	0.235
720.4	23.5	127	1.49	0.66	0.83	3	80.0	1.000	1.10	1.00	1.14	1.33	4	5	48	0	65	-0.31	0.229
718.9	25.0	127	1.58	0.71	0.87	2	80.0	1.000	1.10	1.00	1.11	1.33	3	3	44	0	65	-0.27	0.224
717.4	26.5	126	1.68	0.76	0.92	0	80.0	1.000	1.10	1.00	1.09	1.33	0	0	35	0	49	-0.19	0.218
715.9	28.0	126	1.77	0.80	0.97	1	80.0	1.000	1.10	1.00	1.05	1.33	1	2	39	0	49	-0.22	0.213
714.4	29.5	126	1.87	0.85	1.02	0	80.0	1.000	1.10	1.00	1.02	1.33	0	0	35	0	49	-0.18	0.208
712.9	31.0	126	1.96	0.90	1.07	3	80.0	1.000	1.10	1.00	1.00	1.33	4	4	47	0	49	-0.29	0.204
711.4	32.5	126	2.06	0.94	1.11	11	80.0	1.000	1.17	1.00	0.98	1.33	17	17	70	0	49	-0.52	0.200
709.9	34.0	126	2.15	0.99	1.16	5	80.0	1.000	1.10	1.00	0.95	1.33	7	7	52	0	49	-0.35	0.195
708.4	35.5	126	2.24	1.04	1.21	6	80.0	1.000	1.10	1.00	0.94	1.33	9	8	55	0	49	-0.37	0.191
706.9	37.0	126	2.34	1.08	1.26	7	80.0	1.000	1.10	1.00	0.92	1.33	10	9	57	0	49	-0.39	0.187
705.4	38.5	126	2.43	1.13	1.30	7	80.0	1.000	1.10	1.00	0.90	1.33	10	9	57	0	49	-0.39	0.184
703.9	40.0	131	2.53	1.18	1.35	34	80.0	1.000	1.30	1.00	0.94	1.33	59	55	100	0	30	-0.60	0.182
702.4	41.5	131	2.63	1.22	1.41	14	80.0	1.000	1.20	1.00	0.89	1.33	22	20	74	0	30	-0.56	0.181

KIF TDEC Stability, Boring ID: KIF-C2
Liquefaction Potential Evaluations
For Coarse Grained Soils

EQ Source	a max (g)	EQ Mag (Mw)	Event
10 Hz	0.22	6	Design EQ

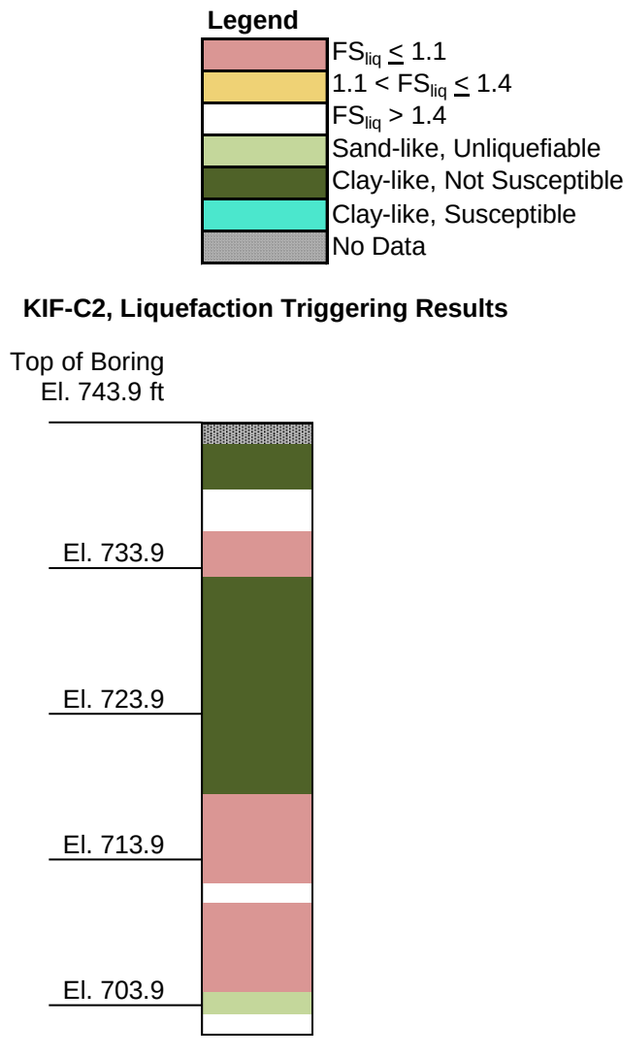
Shear Stress Curve Fit Parameters
m4: 0
m3: 0
m2: 0
m1: 0

Boring ID: **KIF-C2**
Top of Fill Elevation: 743.9 ft
Fill Height: 0.0 ft *(relative to ground surface during SPT)*
Fill Total Unit Weight: 120 pcf
Fill Total Stress: 0.00 tsf

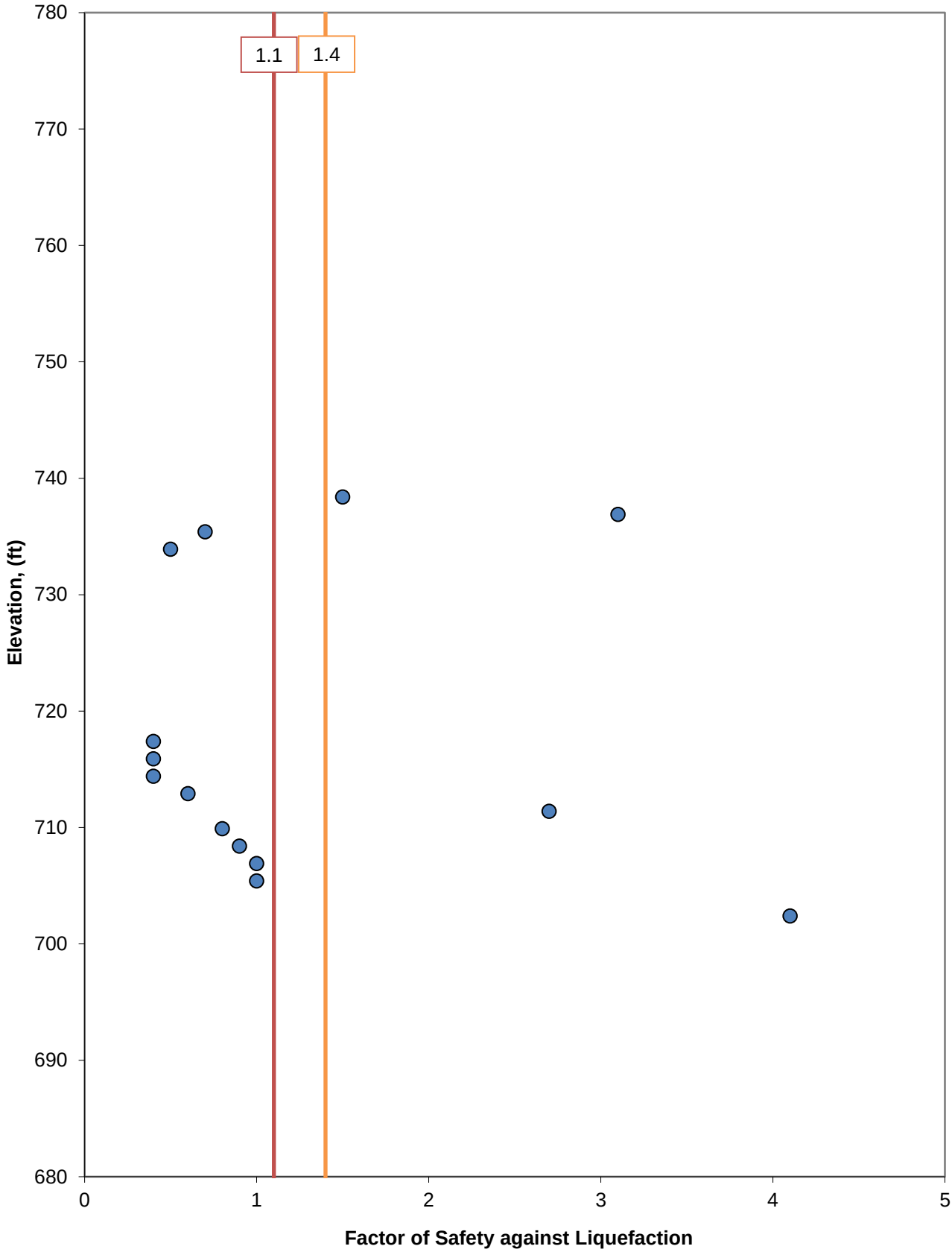
totstr-top **0.09** | u-top 0.00 | effstr-top 0.09

Note: A factor of safety shown as "N/A" implies that the soil type is not appropriately evaluated using this methodology. This applies to clay-like soils (typically CL, CH, CL-ML and MH material type), samples with high blow counts, and unsaturated samples.

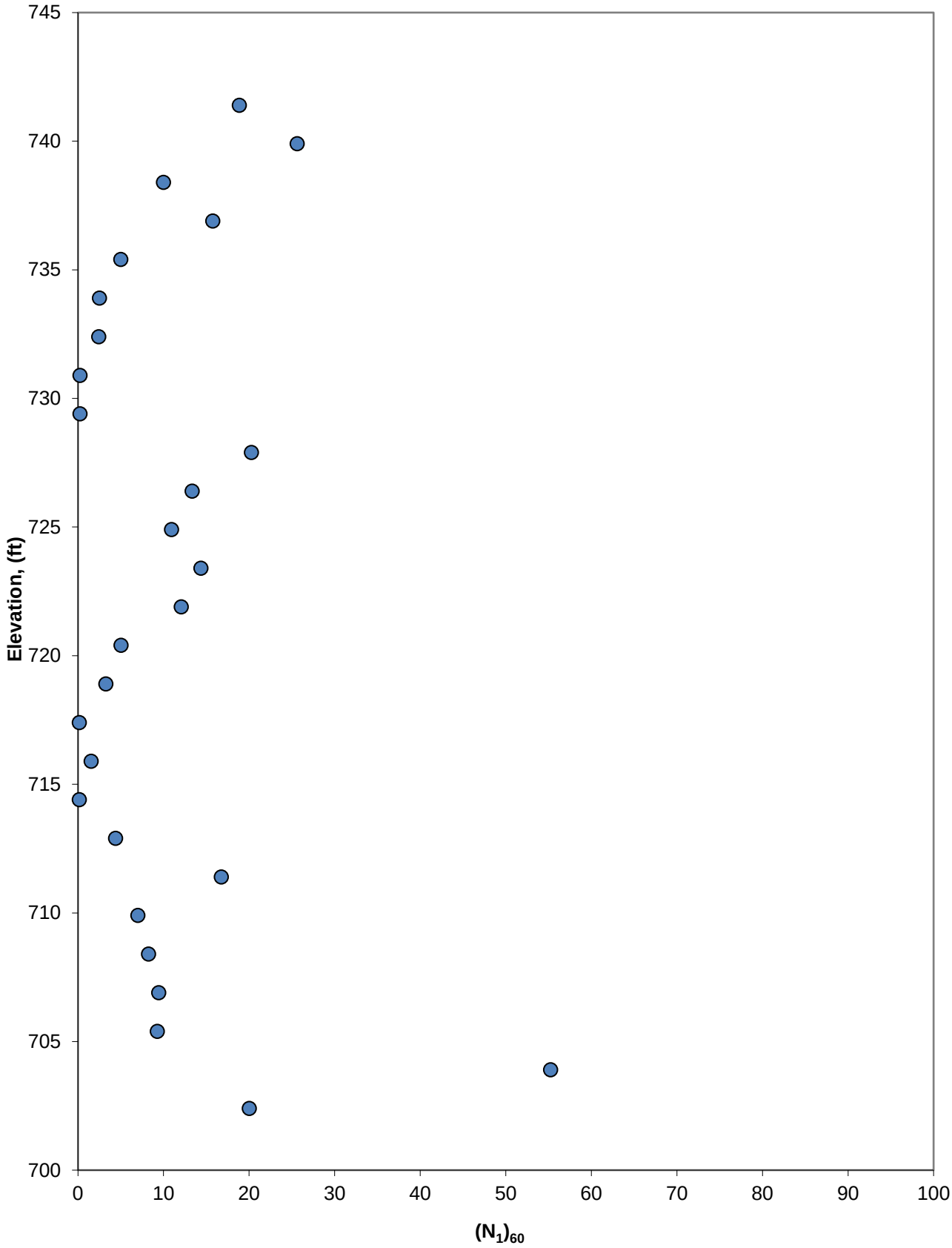
Depth of Mid. Pt. of Sample (ft.) z	Vert. Total Stress during EQ w/ Fill (tsf) $\sigma_{v\ with\ fill}$	Static Pore Pressure during EQ (tsf) u	Vert. Eff. Stress during EQ w/ Fill (tsf) $\sigma'_{v\ with\ fill}$	Clean Sand Correction $\Delta(N_1)_{60cs}$	Equivalent Clean Sand N-Value $(N_1)_{60cs}$	Cyclic Resistance Ratio CRR7.5	Overburden Correction Factor K_σ	Static Shear Stress Correction K_α	Mag. Scaling Factor (MSF)	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Max. Induced Shear Stress (psf)	From Ground Response: Avg. Cyclic Shear Stress (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Blow Count $(N_1)_{60cs} \geq 32$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)
2.5	0.15	0.01	0.14	5.61	24	N/A	N/A	N/A	1.42	N/A	0.998	0	0	0.151	TRUE	FALSE	FALSE	**N/A**	**Clay Fill (irrelevant)**
4.0	0.24	0.05	0.19	5.61	31	N/A	N/A	N/A	1.65	N/A	0.991	0	0	0.185	TRUE	FALSE	FALSE	**N/A**	**Clay Fill (irrelevant)**
5.5	0.33	0.10	0.23	5.36	15	0.159	1.100	1.486	1.20	0.311	0.983	0	0	0.204	FALSE	FALSE	FALSE	**1.5**	**Subunit 3**
7.0	0.43	0.15	0.29	5.36	21	0.220	1.100	2.071	1.32	0.664	0.975	0	0	0.214	FALSE	FALSE	FALSE	**3.1**	**Subunit 3**
8.5	0.53	0.19	0.34	5.36	10	0.121	1.100	1.034	1.12	0.153	0.967	0	0	0.221	FALSE	FALSE	FALSE	**0.7**	**Subunit 3**
10.0	0.63	0.24	0.39	5.36	8	0.104	1.085	0.869	1.09	0.107	0.959	0	0	0.225	FALSE	FALSE	FALSE	**0.5**	**Subunit 3**
11.5	0.73	0.29	0.44	5.59	8	N/A	N/A	N/A	1.09	N/A	0.950	0	0	0.228	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
13.0	0.82	0.33	0.49	5.59	6	N/A	N/A	N/A	1.07	N/A	0.940	0	0	0.230	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
14.5	0.92	0.38	0.54	5.59	6	N/A	N/A	N/A	1.07	N/A	0.931	0	0	0.231	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
16.0	1.01	0.43	0.58	5.59	26	N/A	N/A	N/A	1.46	N/A	0.921	0	0	0.232	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
17.5	1.11	0.47	0.63	5.59	19	N/A	N/A	N/A	1.27	N/A	0.911	0	0	0.232	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
19.0	1.20	0.52	0.68	5.59	17	N/A	N/A	N/A	1.22	N/A	0.901	0	0	0.231	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
20.5	1.30	0.57	0.73	5.59	20	N/A	N/A	N/A	1.30	N/A	0.890	0	0	0.230	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
22.0	1.39	0.61	0.78	5.59	18	N/A	N/A	N/A	1.24	N/A	0.880	0	0	0.229	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
23.5	1.49	0.66	0.83	5.59	11	N/A	N/A	N/A	1.12	N/A	0.869	0	0	0.227	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
25.0	1.58	0.71	0.87	5.59	9	N/A	N/A	N/A	1.10	N/A	0.858	0	0	0.226	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
26.5	1.68	0.76	0.92	5.61	6	0.091	1.011	0.796	1.07	0.078	0.847	0	0	0.224	FALSE	FALSE	FALSE	**0.4**	**Subunit 2**
28.0	1.77	0.80	0.97	5.61	7	0.099	1.007	0.847	1.09	0.092	0.835	0	0	0.222	FALSE	FALSE	FALSE	**0.4**	**Subunit 2**
29.5	1.87	0.85	1.02	5.61	6	0.091	1.003	0.803	1.07	0.078	0.824	0	0	0.220	FALSE	FALSE	FALSE	**0.4**	**Subunit 2**
31.0	1.96	0.90	1.07	5.61	10	0.118	0.999	0.957	1.11	0.126	0.813	0	0	0.217	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**
32.5	2.06	0.94	1.11	5.61	22	0.239	0.993	1.772	1.36	0.571	0.802	0	0	0.215	FALSE	FALSE	FALSE	**2.7**	**Subunit 2**
34.0	2.15	0.99	1.16	5.61	13	0.137	0.991	1.068	1.15	0.167	0.790	0	0	0.213	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**
35.5	2.24	1.04	1.21	5.61	14	0.147	0.986	1.124	1.17	0.190	0.779	0	0	0.210	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**
37.0	2.34	1.08	1.26	5.61	15	0.157	0.981	1.181	1.19	0.216	0.768	0	0	0.208	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**
38.5	2.43	1.13	1.30	5.61	15	0.155	0.977	1.165	1.19	0.210	0.756	0	0	0.205	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**
40.0	2.53	1.18	1.35	5.36	61	N/A	N/A	N/A	N/A	N/A	0.745	0	0	0.202	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**
41.5	2.63	1.22	1.41	5.36	25	0.299	0.953	1.960	1.45	0.808	0.734	0	0	0.200	FALSE	FALSE	FALSE	**4.1**	**Subunit 3**


Legend
FSliq ≤ 1.1
1.1 < FSliq ≤ 1.4
FSliq > 1.4
Sand-like, Unliquefiable
Clay-like, Not Susceptible
Clay-like, Susceptible
No Data
KIF-C2, Liquefaction Triggering Results
Top of Boring
El. 743.9 ft
El. 733.9
El. 723.9
El. 713.9
El. 703.9

KIF TDEC Stability, Boring ID: KIF-C2, Source = 10 Hz, Mw = 6, Event = Design EQ,
SPT Data, Simplified Stress-Based Approach



KIF TDEC Stability, Boring ID: KIF-C2, Source = 10 Hz, Mw = 6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



Project Name = KIF TDEC Stability
Boring ID = KIF-D1

Boring Location

Northing =
Easting =

OR

Baseline Station =
Offset (+ Right) =

Drilling Information

Boring Inner Diameter (ID) =	3.25	inches	
Top of Hole Elevation	748.7	feet	
Water Depth during SPT (negative for U/S borings)=	3	feet	
Depth Sampling Began	0	feet	
Total Unit Wt. above 1st SPT =	120	pcf	
Assumed Rod Stickup =	5	feet	*(Typ assume 5ft)*
E_m Measurement based on Fv method? =	1	(1: Yes, 0: No)	
SPT Sampler w/ Liners? =	0	(1: Yes, 0: No)	*(Typ. no)*

During EQ Information

Water Depth during EQ (relative to SPT TOH, negative for U/S borings) =	3	feet
Final Grade Elevation during EQ	748.7	feet
Average Total Unit Wt. of Cut/Fill	120	pcf

Fines Content Correction

Fines content correction for samples with blow counts of zero? 1 (1: Yes, 0: No)

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile? 0 (1: Yes, 0: No)
If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile: ng_Pond_Section, KIF-D1_NOR
Alpha at each sample depth known? 1 (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (α vs. depth curve)
If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_α will be one.

m4:
m3:
m2:
m1:
m0:

Associated ground response profile: shing_Pond_Section, KIF-D1
Get CSR from shear stress envelope? 0 (1: Yes, 0: No)
If previous answer is No, then CSR will be calculated using a_{max} and r_d
Max. Shear Stress at each sample depth known? (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4:
m3:
m2:
m1:

Earthquake Information

EQ Source (e.g., New Madrid)	10 Hz
Event (e.g., MCE, 10KEQ, OBE)	Design EQ
a_{max} (g) (top of ground surface)	0.21
EQ Mag (Mw)	6

Inputs

Depth of Sample Midpoint (ft.)	SPT N Value	Hammer Efficiency, E_m (%)	Unified Soil Classification	Fines Content (%)	Total Unit Weight (pcf)	Material (optional)	Clay-like / Sand-like Override (optional)	Clay-like Susceptibility (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure during SPT (psf)	Static Pore Water Pressure during EQ (psf)
1.0	16	80	CL	34	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.264			
2.5	13	80		34	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.250			
4.0	7	80		34	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.244			
5.5	5	80		34	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.239			
7.0	12	80		34	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.235			
8.5	3	80		34	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.233			
10.0	7	80		34	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.231			
11.5	4	80		34	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.228			
13.0	4	80		34	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.223			
14.5	2	80		34	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.218			
16.0	1	80		82	127	Subunit 1	Clay-like	Not Susceptible		0.214			
17.5	0	80		82	127	Subunit 1	Clay-like	Not Susceptible		0.211			
19.0	0	80		82	127	Subunit 1	Clay-like	Not Susceptible		0.208			
20.5	11	80		82	127	Subunit 1	Clay-like	Not Susceptible		0.207			
22.0	20	80		82	127	Subunit 1	Clay-like	Not Susceptible		0.206			
23.5	9	80		82	127	Subunit 1	Clay-like	Not Susceptible		0.206			
25.0	8	80		82	127	Subunit 1	Clay-like	Not Susceptible		0.205			
26.5	8	80		82	127	Subunit 1	Clay-like	Not Susceptible		0.206			
28.0	11	80		49	126	Subunit 2	Sand-like			0.207			
29.5	7	80		49	126	Subunit 2	Sand-like			0.209			
31.0	4	80		49	126	Subunit 2	Sand-like			0.211			
32.5	0	80		49	126	Subunit 2	Sand-like			0.212			
34.0	0	80		33	131	Subunit 3	Sand-like			0.213			
35.5	0	80		33	131	Subunit 3	Sand-like			0.214			
37.0	0	80		33	131	Subunit 3	Sand-like			0.213			
38.5	1	80		49	126	Subunit 2	Sand-like			0.212			
40.0	1	80		49	126	Subunit 2	Sand-like			0.210			
41.5	1	80		49	126	Subunit 2	Sand-like			0.208			
43.0	11	80		49	126	Subunit 2	Sand-like			0.206			
44.5	38	80		49	126	Subunit 2	Sand-like			0.203			
46.0	34	80		49	126	Subunit 2	Sand-like			0.201			
47.5	45	80		49	126	Subunit 2	Sand-like			0.199			
49.0	45	80		49	126	Subunit 2	Sand-like			0.196			
50.5	22	80		49	126	Subunit 2	Sand-like			0.193			

KIF TDEC Stability, Boring ID: KIF-D1

Liquefaction Potential Evaluations

For Coarse Grained Soils

Top of Hole Elevation (ft) =			748.7				Boring ID =		KIF-D1										
begin sampling (depth-ft) =			0.0				Boring Inner Dia. (in) =		3.25										
total unit wt. above 1st SPT (pcf) =			120																
water elevation during SPT (ft) =			745.7	ft *(relative to ground surface during SPT)*					Assumed Rod Stickup =	5.0	feet								
water depth during SPT (ft) =			3.0						E_m Measurement? =	1	(1: Yes, 0: No)								
water elevation during EQ (ft) =			745.7	ft *(relative to ground surface during SPT)*					SPT Sampler w/ Liners? =	0	(1: Yes, 0: No)								
water during EQ (depth-ft) =			3.0	u-top	effstr-top														
vert. total stress above 1st SPT (tsf) =			**0.00**	**0.00**	0.00														
Elev. Of Mid. Pt. of Sample (ft)	Depth of Mid. Pt. of Sample (ft.) z	Unit Weight (pcf) γ_T	Vert. Total Stress during SPT (tsf) σ_v	Static Pore Pressure during SPT (tsf) u	Vert. Eff. Stress during SPT (tsf) σ'_v	SPT N Value N	Hammer Efficiency (%) E_m	Borehole Diameter Correction C_B	Sampler Correction C_S	Rod Length Correction C_R	Overburden Stress Correction Factor C_N	Hammer Energy Correction Factor C_E	Corrected Blow Count N_{60}	Normalized Blow Count $(N_1)_{60}$	Relative Density (%) D_r	Unified Soil Classification	Fines Content (%)	Relative State Parameter Index ξ_R	Static Shear Stress Ratio α
747.7	1.0	120	0.06	0.00	0.06	16	80.0	1.000	1.30	1.00	1.70	1.33	28	47	100	CL	34	-0.60	0.264
746.2	2.5	120	0.15	0.00	0.15	13	80.0	1.000	1.30	1.00	1.70	1.33	23	38	98	0	34	-0.60	0.250
744.7	4.0	120	0.24	0.03	0.21	7	80.0	1.000	1.19	1.00	1.70	1.33	11	19	73	0	34	-0.59	0.244
743.2	5.5	120	0.33	0.08	0.25	5	80.0	1.000	1.13	1.00	1.70	1.33	8	13	63	0	34	-0.49	0.239
741.7	7.0	120	0.42	0.12	0.30	12	80.0	1.000	1.30	1.00	1.50	1.33	21	31	89	0	34	-0.60	0.235
740.2	8.5	120	0.51	0.17	0.34	3	80.0	1.000	1.10	1.00	1.70	1.33	4	7	53	0	34	-0.39	0.233
738.7	10.0	120	0.60	0.22	0.38	7	80.0	1.000	1.17	1.00	1.54	1.33	11	17	70	0	34	-0.55	0.231
737.2	11.5	120	0.69	0.27	0.42	4	80.0	1.000	1.10	1.00	1.56	1.33	6	9	56	0	34	-0.42	0.228
735.7	13.0	120	0.78	0.31	0.47	4	80.0	1.000	1.10	1.00	1.50	1.33	6	9	56	0	34	-0.41	0.223
734.2	14.5	120	0.87	0.36	0.51	2	80.0	1.000	1.10	1.00	1.48	1.33	3	4	46	0	34	-0.31	0.218
732.7	16.0	127	0.96	0.41	0.56	1	80.0	1.000	1.10	1.00	1.44	1.33	1	2	41	0	82	-0.25	0.214
731.2	17.5	127	1.06	0.45	0.61	0	80.0	1.000	1.10	1.00	1.40	1.33	0	0	35	0	82	-0.20	0.211
729.7	19.0	127	1.15	0.50	0.65	0	80.0	1.000	1.10	1.00	1.33	1.33	0	0	35	0	82	-0.19	0.208
728.2	20.5	127	1.25	0.55	0.70	11	80.0	1.000	1.21	1.00	1.17	1.33	18	21	76	0	82	-0.60	0.207
726.7	22.0	127	1.34	0.59	0.75	20	80.0	1.000	1.30	1.00	1.10	1.33	35	38	97	0	82	-0.60	0.206
725.2	23.5	127	1.44	0.64	0.80	9	80.0	1.000	1.16	1.00	1.13	1.33	14	16	68	0	82	-0.51	0.206
723.7	25.0	127	1.53	0.69	0.85	8	80.0	1.000	1.13	1.00	1.10	1.33	12	13	64	0	82	-0.47	0.205
722.2	26.5	127	1.63	0.73	0.90	8	80.0	1.000	1.13	1.00	1.08	1.33	12	13	63	0	82	-0.47	0.206
720.7	28.0	126	1.72	0.78	0.94	11	80.0	1.000	1.18	1.00	1.05	1.33	17	18	72	0	49	-0.55	0.207
719.2	29.5	126	1.82	0.83	0.99	7	80.0	1.000	1.11	1.00	1.03	1.33	10	11	59	0	49	-0.42	0.209
717.7	31.0	126	1.91	0.87	1.04	4	80.0	1.000	1.10	1.00	1.01	1.33	6	6	50	0	49	-0.33	0.211
716.2	32.5	126	2.01	0.92	1.09	0	80.0	1.000	1.10	1.00	0.98	1.33	0	0	35	0	49	-0.18	0.212
714.7	34.0	131	2.10	0.97	1.14	0	80.0	1.000	1.10	1.00	0.96	1.33	0	0	35	0	33	-0.17	0.213
713.2	35.5	131	2.20	1.01	1.19	0	80.0	1.000	1.10	1.00	0.93	1.33	0	0	35	0	33	-0.17	0.214
711.7	37.0	131	2.30	1.06	1.24	0	80.0	1.000	1.10	1.00	0.91	1.33	0	0	35	0	33	-0.17	0.213
710.2	38.5	126	2.40	1.11	1.29	1	80.0	1.000	1.10	1.00	0.89	1.33	1	1	39	0	49	-0.21	0.212
708.7	40.0	126	2.49	1.15	1.34	1	80.0	1.000	1.10	1.00	0.87	1.33	1	1	39	0	49	-0.21	0.210
707.2	41.5	126	2.59	1.20	1.38	1	80.0	1.000	1.10	1.00	0.85	1.33	1	1	39	0	49	-0.21	0.208
705.7	43.0	126	2.68	1.25	1.43	11	80.0	1.000	1.15	1.00	0.88	1.33	17	15	67	0	49	-0.48	0.206
704.2	44.5	126	2.78	1.29	1.48	38	80.0	1.000	1.30	1.00	0.92	1.33	66	60	100	0	49	-0.60	0.203
702.7	46.0	126	2.87	1.34	1.53	34	80.0	1.000	1.30	1.00	0.91	1.33	59	54	100	0	49	-0.60	0.201
701.2	47.5	126	2.96	1.39	1.58	45	80.0	1.000	1.30	1.00	0.90	1.33	78	70	100	0	49	-0.60	0.199
699.7	49.0	126	3.06	1.44	1.62	45	80.0	1.000	1.30	1.00	0.89	1.33	78	70	100	0	49	-0.60	0.196
698.2	50.5	126	3.15	1.48	1.67	22	80.0	1.000	1.30	1.00	0.87	1.33	38	33	92	0	49	-0.60	0.193

KIF TDEC Stability, Boring ID: KIF-D1
Liquefaction Potential Evaluations
For Coarse Grained Soils

EQ Source	a max (g)	EQ Mag (Mw)	Event
10 Hz	0.21	6	Design EQ

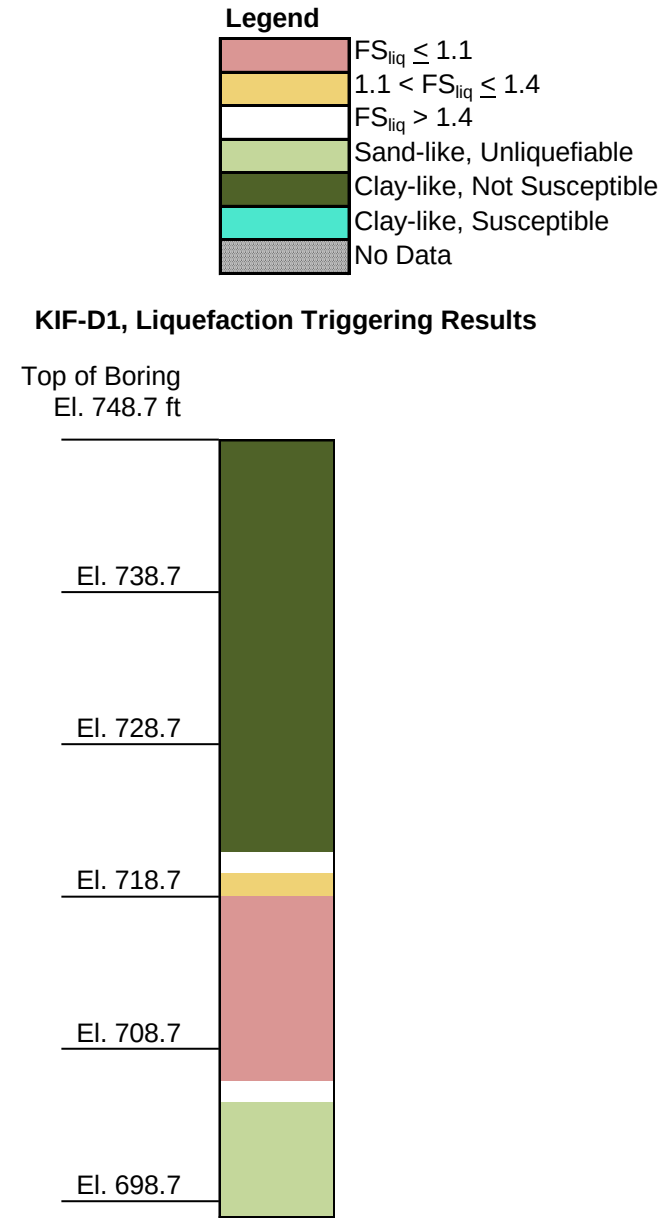
Shear Stress Curve Fit Parameters
m4: 0
m3: 0
m2: 0
m1: 0

Boring ID: **KIF-D1**
Top of Fill Elevation: 748.7 ft
Fill Height: 0.0 ft *(relative to ground surface during SPT)*
Fill Total Unit Weight: 120 pcf
Fill Total Stress: 0.00 tsf

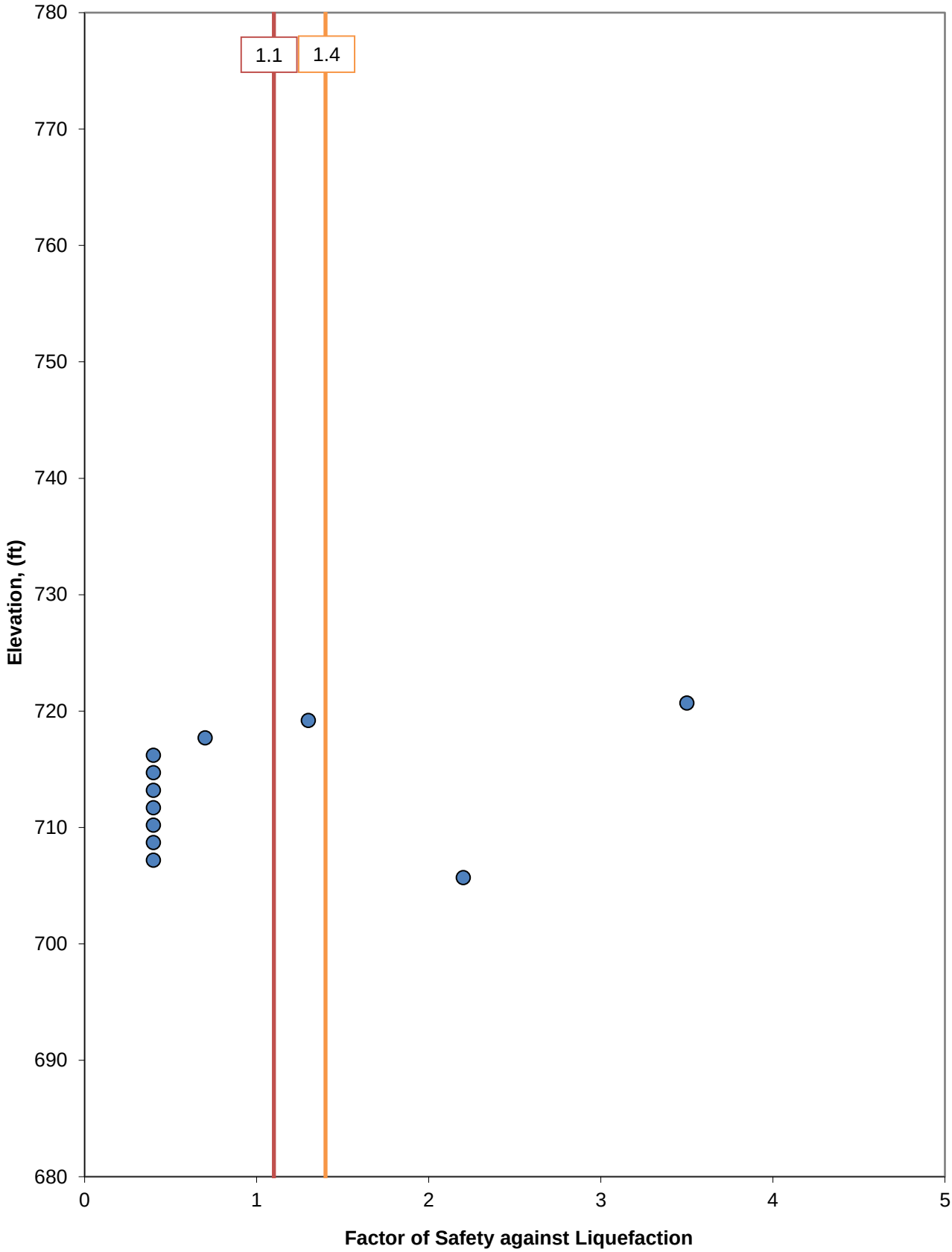
totstr-top	u-top	effstr-top
0.00	0.00	0.00

Note: A factor of safety shown as "N/A" implies that the soil type is not appropriately evaluated using this methodology. This applies to clay-like soils (typically CL, CH, CL-ML and MH material type), samples with high blow counts, and unsaturated samples.

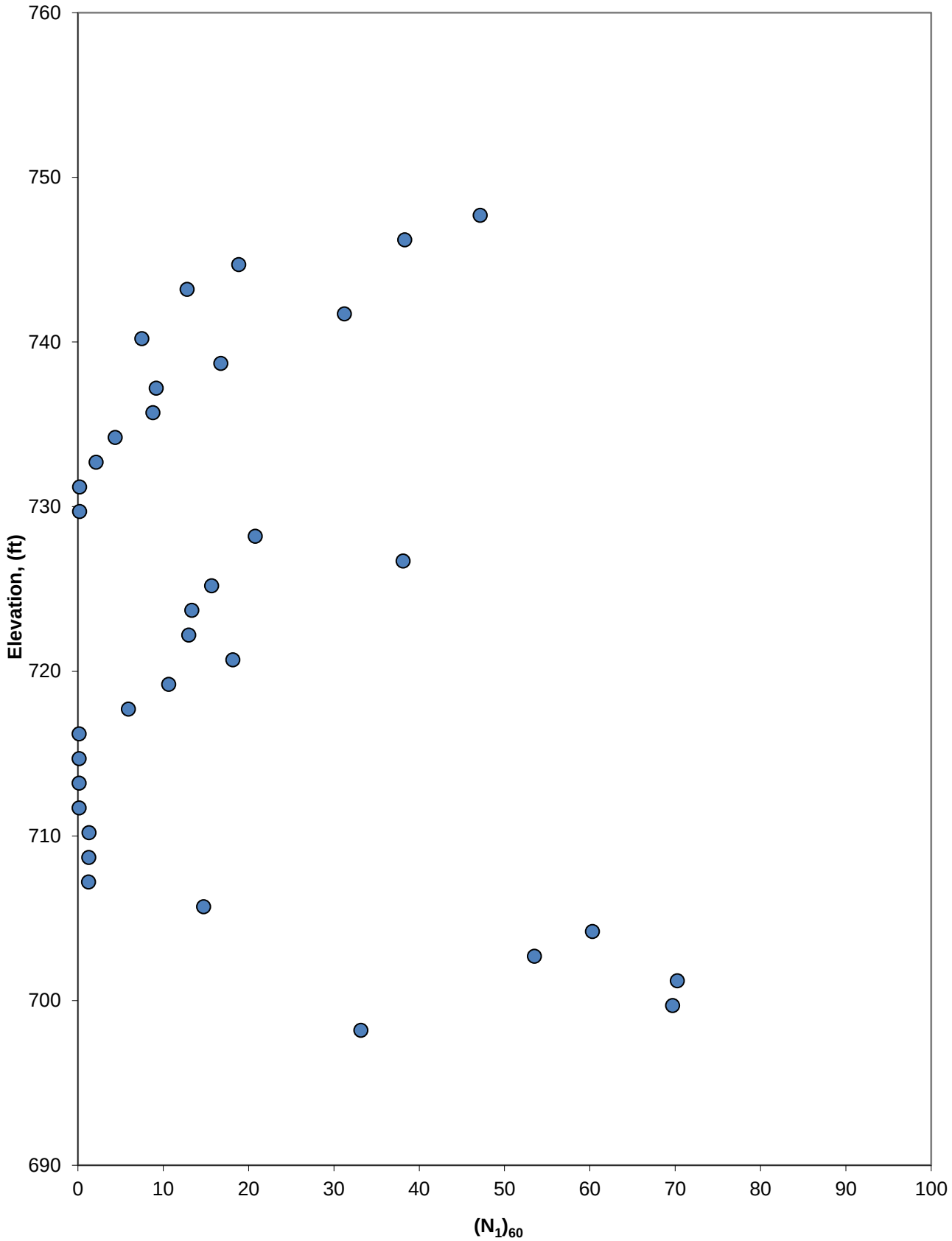
Depth of Mid. Pt. of Sample (ft.) z	Vert. Total Stress during EQ w/ Fill (tsf) $\sigma_{v\ with\ fill}$	Static Pore Pressure during EQ (tsf) u	Vert. Eff. Stress during EQ w/ Fill (tsf) $\sigma'_{v\ with\ fill}$	Clean Sand Correction $\Delta(N_1)_{60cs}$	Equivalent Clean Sand N-Value $(N_1)_{60cs}$	Cyclic Resistance Ratio CRR7.5	Overburden Correction Factor K_σ	Static Shear Stress Correction K_α	Mag. Scaling Factor (MSF)	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Max. Induced Shear Stress (psf)	From Ground Response: Avg. Cyclic Shear Stress (psf)	Cyclic Stress Ratio CSR	Sample Screened for: High Clay-like	High Blow Count $(N_1)_{60cs} \geq 32$	High Unsaturated	Factor of Safety FS_{liq}	Material (optional)
1.0	0.06	0.00	0.06	5.49	53	N/A	N/A	N/A	N/A	N/A	1.000	0	0	0.139	TRUE	TRUE	TRUE	**N/A**	**Clay Fill (irrelevant)**
2.5	0.15	0.00	0.15	5.49	44	N/A	N/A	N/A	N/A	N/A	0.998	0	0	0.138	TRUE	TRUE	TRUE	**N/A**	**Clay Fill (irrelevant)**
4.0	0.24	0.03	0.21	5.49	24	N/A	N/A	N/A	1.41	N/A	0.991	0	0	0.158	TRUE	FALSE	FALSE	**N/A**	**Clay Fill (irrelevant)**
5.5	0.33	0.08	0.25	5.49	18	N/A	N/A	N/A	1.26	N/A	0.983	0	0	0.178	TRUE	FALSE	FALSE	**N/A**	**Clay Fill (irrelevant)**
7.0	0.42	0.12	0.30	5.49	37	N/A	N/A	N/A	N/A	N/A	0.975	0	0	0.192	TRUE	TRUE	FALSE	**N/A**	**Clay Fill (irrelevant)**
8.5	0.51	0.17	0.34	5.49	13	N/A	N/A	N/A	1.16	N/A	0.967	0	0	0.202	TRUE	FALSE	FALSE	**N/A**	**Clay Fill (irrelevant)**
10.0	0.60	0.22	0.38	5.49	22	N/A	N/A	N/A	1.35	N/A	0.959	0	0	0.209	TRUE	FALSE	FALSE	**N/A**	**Clay Fill (irrelevant)**
11.5	0.69	0.27	0.42	5.49	15	N/A	N/A	N/A	1.18	N/A	0.950	0	0	0.214	TRUE	FALSE	FALSE	**N/A**	**Clay Fill (irrelevant)**
13.0	0.78	0.31	0.47	5.49	14	N/A	N/A	N/A	1.18	N/A	0.940	0	0	0.217	TRUE	FALSE	FALSE	**N/A**	**Clay Fill (irrelevant)**
14.5	0.87	0.36	0.51	5.49	10	N/A	N/A	N/A	1.11	N/A	0.931	0	0	0.220	TRUE	FALSE	FALSE	**N/A**	**Clay Fill (irrelevant)**
16.0	0.96	0.41	0.56	5.54	8	N/A	N/A	N/A	1.09	N/A	0.921	0	0	0.221	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
17.5	1.06	0.45	0.61	5.54	6	N/A	N/A	N/A	1.07	N/A	0.911	0	0	0.221	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
19.0	1.15	0.50	0.65	5.54	6	N/A	N/A	N/A	1.07	N/A	0.901	0	0	0.220	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
20.5	1.25	0.55	0.70	5.54	26	N/A	N/A	N/A	1.48	N/A	0.890	0	0	0.219	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
22.0	1.34	0.59	0.75	5.54	44	N/A	N/A	N/A	N/A	N/A	0.880	0	0	0.218	TRUE	TRUE	FALSE	**N/A**	**Subunit 1**
23.5	1.44	0.64	0.80	5.54	21	N/A	N/A	N/A	1.33	N/A	0.869	0	0	0.217	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
25.0	1.53	0.69	0.85	5.54	19	N/A	N/A	N/A	1.27	N/A	0.858	0	0	0.215	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
26.5	1.63	0.73	0.90	5.54	19	N/A	N/A	N/A	1.26	N/A	0.847	0	0	0.213	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
28.0	1.72	0.78	0.94	5.61	24	0.264	1.018	1.970	1.40	0.738	0.835	0	0	0.211	FALSE	FALSE	FALSE	**3.5**	**Subunit 2**
29.5	1.82	0.83	0.99	5.61	16	0.167	1.007	1.308	1.21	0.267	0.824	0	0	0.209	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**
31.0	1.91	0.87	1.04	5.61	12	0.129	1.002	1.030	1.14	0.151	0.813	0	0	0.207	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**
32.5	2.01	0.92	1.09	5.61	6	0.091	0.998	0.796	1.07	0.077	0.802	0	0	0.205	FALSE	FALSE	FALSE	**0.4**	**Subunit 2**
34.0	2.10	0.97	1.14	5.46	6	0.090	0.994	0.789	1.07	0.075	0.790	0	0	0.203	FALSE	FALSE	FALSE	**0.4**	**Subunit 3**
35.5	2.20	1.01	1.19	5.46	6	0.090	0.991	0.786	1.07	0.075	0.779	0	0	0.200	FALSE	FALSE	FALSE	**0.4**	**Subunit 3**
37.0	2.30	1.06	1.24	5.46	6	0.090	0.988	0.786	1.07	0.075	0.768	0	0	0.197	FALSE	FALSE	FALSE	**0.4**	**Subunit 3**
38.5	2.40	1.11	1.29	5.61	7	0.098	0.984	0.829	1.08	0.086	0.756	0	0	0.195	FALSE	FALSE	FALSE	**0.4**	**Subunit 2**
40.0	2.49	1.15	1.34	5.61	7	0.098	0.981	0.828	1.08	0.086	0.745	0	0	0.192	FALSE	FALSE	FALSE	**0.4**	**Subunit 2**
41.5	2.59	1.20	1.38	5.61	7	0.097	0.978	0.828	1.08	0.085	0.734	0	0	0.190	FALSE	FALSE	FALSE	**0.4**	**Subunit 2**
43.0	2.68	1.25	1.43	5.61	20	0.210	0.959	1.560	1.31	0.411	0.723	0	0	0.187	FALSE	FALSE	FALSE	**2.2**	**Subunit 2**
44.5	2.78	1.29	1.48	5.61	66	N/A	N/A	N/A	N/A	N/A	0.712	0	0	0.185	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**
46.0	2.87	1.34	1.53	5.61	59	N/A	N/A	N/A	N/A	N/A	0.701	0	0	0.183	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**
47.5	2.96	1.39	1.58	5.61	76	N/A	N/A	N/A	N/A	N/A	0.691	0	0	0.180	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**
49.0	3.06	1.44	1.62	5.61	75	N/A	N/A	N/A	N/A	N/A	0.680	0	0	0.178	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**
50.5	3.15	1.48	1.67	5.61	39	N/A	N/A	N/A	N/A	N/A	0.670	0	0	0.175	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**


Legend
FS$_{liq}$ ≤ 1.1
1.1 < FS$_{liq}$ ≤ 1.4
FS$_{liq}$ > 1.4
Sand-like, Unliquefiable
Clay-like, Not Susceptible
Clay-like, Susceptible
No Data
KIF-D1, Liquefaction Triggering Results
Top of Boring
El. 748.7 ft
El. 738.7
El. 728.7
El. 718.7
El. 708.7
El. 698.7

KIF TDEC Stability, Boring ID: KIF-D1, Source = 10 Hz, Mw = 6, Event = Design EQ,
SPT Data, Simplified Stress-Based Approach



KIF TDEC Stability, Boring ID: KIF-D1, Source = 10 Hz, Mw = 6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



Project Name = KIF TDEC Stability
Boring ID = KIF-D2

Boring Location

Northing =
Easting =

OR

Baseline Station =
Offset (+ Right) =

Drilling Information

Boring Inner Diameter (ID) =	3.25	inches	
Top of Hole Elevation	743.3	feet	
Water Depth during SPT (negative for U/S borings)=	6.4	feet	
Depth Sampling Began	1	feet	
Total Unit Wt. above 1st SPT =	120	pcf	
Assumed Rod Stickup =	5	feet	*(Typ assume 5ft)*
E_m Measurement based on Fv method? =	1	(1: Yes, 0: No)	
SPT Sampler w/ Liners? =	0	(1: Yes, 0: No)	*(Typ. no)*

During EQ Information

Water Depth during EQ (relative to SPT TOH, negative for U/S borings) =	6.4	feet
Final Grade Elevation during EQ	743.3	feet
Average Total Unit Wt. of Cut/Fill	120	pcf

Fines Content Correction

Fines content correction for samples with blow counts of zero? 1 (1: Yes, 0: No)

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile? 0 (1: Yes, 0: No)
If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile: ng_Pond_Section, KIF-D2_NOR
Alpha at each sample depth known? 1 (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (α vs. depth curve)
If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_α will be one.

m4:
m3:
m2:
m1:
m0:

Associated ground response profile: shing_Pond_Section, KIF-D2
Get CSR from shear stress envelope? 0 (1: Yes, 0: No)
If previous answer is No, then CSR will be calculated using a_{max} and r_d
Max. Shear Stress at each sample depth known? (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4:
m3:
m2:
m1:

Earthquake Information

EQ Source (e.g., New Madrid)	10 Hz
Event (e.g., MCE, 10KEQ, OBE)	Design EQ
a_{max} (g) (top of ground surface)	0.21
EQ Mag (Mw)	6

Inputs

Depth of Sample Midpoint (ft.)	SPT N Value	Hammer Efficiency, E_m (%)	Unified Soil Classification	Fines Content (%)	Total Unit Weight (pcf)	Material (optional)	Clay-like / Sand-like Override (optional)	Clay-like Susceptibility (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure during SPT (psf)	Static Pore Water Pressure during EQ (psf)
2.0	3	80	CL	39	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.342			
3.5	3	80		39	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.321			
5.0	5	80		39	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.303			
6.5	6	80		39	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.293			
8.0	5	80		39	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.285			
9.5	2	80		39	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.279			
11.0	1	80		84	126	Subunit 2	Sand-like			0.272			
12.5	5	80		84	126	Subunit 2	Sand-like			0.267			
14.0	5	80		84	126	Subunit 2	Sand-like			0.262			
15.5	11	80		84	126	Subunit 2	Sand-like			0.257			
17.0	5	80		30	131	Subunit 3	Sand-like			0.253			
18.5	5	80		30	131	Subunit 3	Sand-like			0.248			
20.0	5	80		30	131	Subunit 3	Sand-like			0.243			
21.5	2	80		30	131	Subunit 3	Sand-like			0.237			
23.0	4	80		30	131	Subunit 3	Sand-like			0.231			
24.5	1	80		30	131	Subunit 3	Sand-like			0.225			
26.0	1	80		30	131	Subunit 3	Sand-like			0.220			
27.5	0	80		30	131	Subunit 3	Sand-like			0.215			
29.0	0	80		30	131	Subunit 3	Sand-like			0.210			
30.5	0	80		30	131	Subunit 3	Sand-like			0.205			
32.0	1	80		30	131	Subunit 3	Sand-like			0.202			
33.5	2	80		30	131	Subunit 3	Sand-like			0.197			
35.0	3	80		30	131	Subunit 3	Sand-like			0.192			
36.5	2	80		30	131	Subunit 3	Sand-like			0.188			
38.0	21	80		30	131	Subunit 3	Sand-like			0.185			
39.5	18	80		30	131	Subunit 3	Sand-like			0.183			
41.0	35	80		30	131	Subunit 3	Sand-like			0.181			
42.5	11	80		30	131	Subunit 3	Sand-like			0.180			
44.0	88	80		30	131	Subunit 3	Sand-like			0.179			

KIF TDEC Stability, Boring ID: KIF-D2

Liquefaction Potential Evaluations

For Coarse Grained Soils

Top of Hole Elevation (ft) =			743.3				Boring ID =		KIF-D2										
begin sampling (depth-ft) =			1.0				Boring Inner Dia. (in) =		3.25										
total unit wt. above 1st SPT (pcf) =			120																
water elevation during SPT (ft) =			736.9	ft *(relative to ground surface during SPT)*					Assumed Rod Stickup =	5.0	feet								
water depth during SPT (ft) =			6.4						E_m Measurement? =	1	(1: Yes, 0: No)								
water elevation during EQ (ft) =			736.9	ft *(relative to ground surface during SPT)*					SPT Sampler w/ Liners? =	0	(1: Yes, 0: No)								
water during EQ (depth-ft) =			6.4	u-top	effstr-top														
vert. total stress above 1st SPT (tsf) =			**0.06**	**0.00**	0.06														
Elev. Of Mid. Pt. of Sample (ft)	Depth of Mid. Pt. of Sample (ft.) z	Unit Weight (pcf) γ_T	Vert. Total Stress during SPT (tsf) σ_v	Static Pore Pressure during SPT (tsf) u	Vert. Eff. Stress during SPT (tsf) σ'_v	SPT N Value N	Hammer Efficiency (%) E_m	Borehole Diameter Correction C_B	Sampler Correction C_s	Rod Length Correction C_R	Overburden Stress Correction Factor C_N	Hammer Energy Correction Factor C_E	Corrected Blow Count N_{60}	Normalized Blow Count $(N_1)_{60}$	Relative Density (%) D_r	Unified Soil Classification	Fines Content (%)	Relative State Parameter Index ξ_R	Static Shear Stress Ratio α
741.3	2.0	120	0.12	0.00	0.12	3	80.0	1.000	1.10	1.00	1.70	1.33	4	7	53	CL	39	-0.41	0.342
739.8	3.5	120	0.21	0.00	0.21	3	80.0	1.000	1.10	1.00	1.70	1.33	4	7	53	0	39	-0.40	0.321
738.3	5.0	120	0.30	0.00	0.30	5	80.0	1.000	1.13	1.00	1.70	1.33	8	13	63	0	39	-0.49	0.303
736.8	6.5	120	0.39	0.00	0.39	6	80.0	1.000	1.14	1.00	1.56	1.33	9	14	66	0	39	-0.51	0.293
735.3	8.0	120	0.48	0.05	0.43	5	80.0	1.000	1.11	1.00	1.52	1.33	7	11	61	0	39	-0.46	0.285
733.8	9.5	120	0.57	0.10	0.47	2	80.0	1.000	1.10	1.00	1.54	1.33	3	5	47	0	39	-0.32	0.279
732.3	11.0	126	0.66	0.14	0.52	1	80.0	1.000	1.10	1.00	1.50	1.33	1	2	41	0	84	-0.26	0.272
730.8	12.5	126	0.76	0.19	0.57	5	80.0	1.000	1.10	1.00	1.35	1.33	7	10	58	0	84	-0.42	0.267
729.3	14.0	126	0.85	0.24	0.61	5	80.0	1.000	1.10	1.00	1.30	1.33	7	10	57	0	84	-0.41	0.262
727.8	15.5	126	0.95	0.28	0.66	11	80.0	1.000	1.21	1.00	1.20	1.33	18	21	76	0	84	-0.60	0.257
726.3	17.0	131	1.04	0.33	0.71	5	80.0	1.000	1.10	1.00	1.22	1.33	7	9	56	0	30	-0.40	0.253
724.8	18.5	131	1.14	0.38	0.76	5	80.0	1.000	1.10	1.00	1.18	1.33	7	9	55	0	30	-0.39	0.248
723.3	20.0	131	1.24	0.42	0.81	5	80.0	1.000	1.10	1.00	1.14	1.33	7	8	55	0	30	-0.38	0.243
721.8	21.5	131	1.34	0.47	0.87	2	80.0	1.000	1.10	1.00	1.12	1.33	3	3	43	0	30	-0.27	0.237
720.3	23.0	131	1.44	0.52	0.92	4	80.0	1.000	1.10	1.00	1.08	1.33	6	6	50	0	30	-0.34	0.231
718.8	24.5	131	1.53	0.56	0.97	1	80.0	1.000	1.10	1.00	1.05	1.33	1	2	39	0	30	-0.22	0.225
717.3	26.0	131	1.63	0.61	1.02	1	80.0	1.000	1.10	1.00	1.02	1.33	1	1	39	0	30	-0.21	0.220
715.8	27.5	131	1.73	0.66	1.07	0	80.0	1.000	1.10	1.00	0.99	1.33	0	0	35	0	30	-0.17	0.215
714.3	29.0	131	1.83	0.71	1.12	0	80.0	1.000	1.10	1.00	0.96	1.33	0	0	35	0	30	-0.17	0.210
712.8	30.5	131	1.93	0.75	1.17	0	80.0	1.000	1.10	1.00	0.94	1.33	0	0	35	0	30	-0.17	0.205
711.3	32.0	131	2.02	0.80	1.23	1	80.0	1.000	1.10	1.00	0.92	1.33	1	1	38	0	30	-0.20	0.202
709.8	33.5	131	2.12	0.85	1.28	2	80.0	1.000	1.10	1.00	0.90	1.33	3	3	42	0	30	-0.24	0.197
708.3	35.0	131	2.22	0.89	1.33	3	80.0	1.000	1.10	1.00	0.88	1.33	4	4	45	0	30	-0.27	0.192
706.8	36.5	131	2.32	0.94	1.38	2	80.0	1.000	1.10	1.00	0.86	1.33	3	3	41	0	30	-0.23	0.188
705.3	38.0	131	2.42	0.99	1.43	21	80.0	1.000	1.30	1.00	0.91	1.33	36	33	92	0	30	-0.60	0.185
703.8	39.5	131	2.52	1.03	1.48	18	80.0	1.000	1.27	1.00	0.89	1.33	31	27	84	0	30	-0.60	0.183
702.3	41.0	131	2.61	1.08	1.53	35	80.0	1.000	1.30	1.00	0.91	1.33	61	55	100	0	30	-0.60	0.181
700.8	42.5	131	2.71	1.13	1.59	11	80.0	1.000	1.14	1.00	0.83	1.33	17	14	65	0	30	-0.46	0.180
699.3	44.0	131	2.81	1.17	1.64	88	80.0	1.000	1.30	1.00	0.89	1.33	153	136	100	0	30	-0.60	0.179

KIF TDEC Stability, Boring ID: KIF-D2
Liquefaction Potential Evaluations
For Coarse Grained Soils

EQ Source	a max (g)	EQ Mag (Mw)	Event
10 Hz	0.21	6	Design EQ

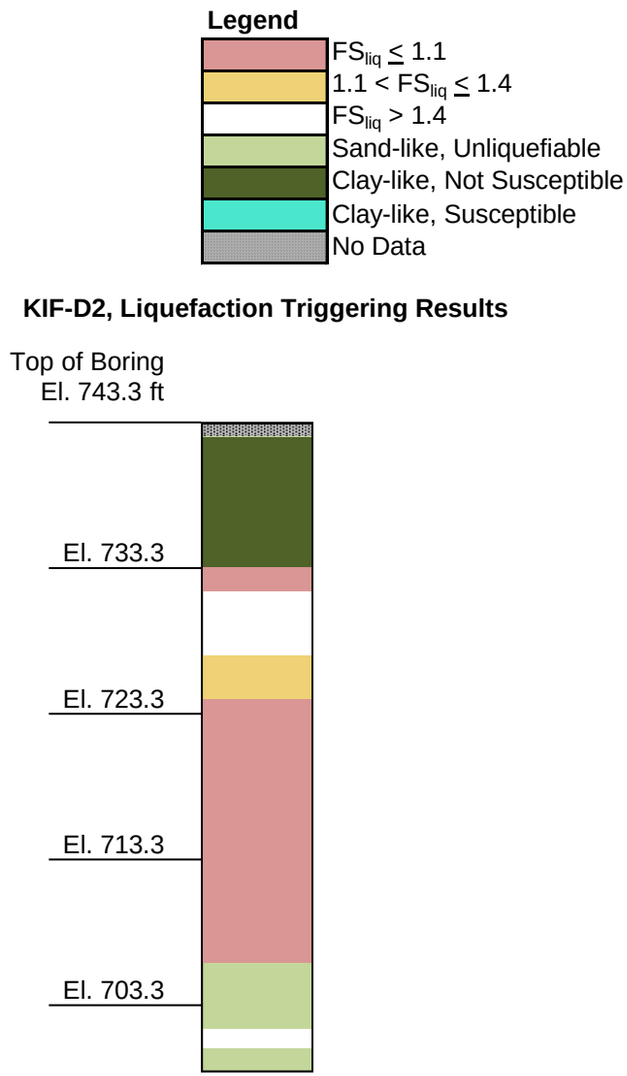
Shear Stress Curve Fit Parameters
m4: 0
m3: 0
m2: 0
m1: 0

Boring ID: **KIF-D2**
Top of Fill Elevation: 743.3 ft
Fill Height: 0.0 ft *(relative to ground surface during SPT)*
Fill Total Unit Weight: 120 pcf
Fill Total Stress: 0.00 tsf

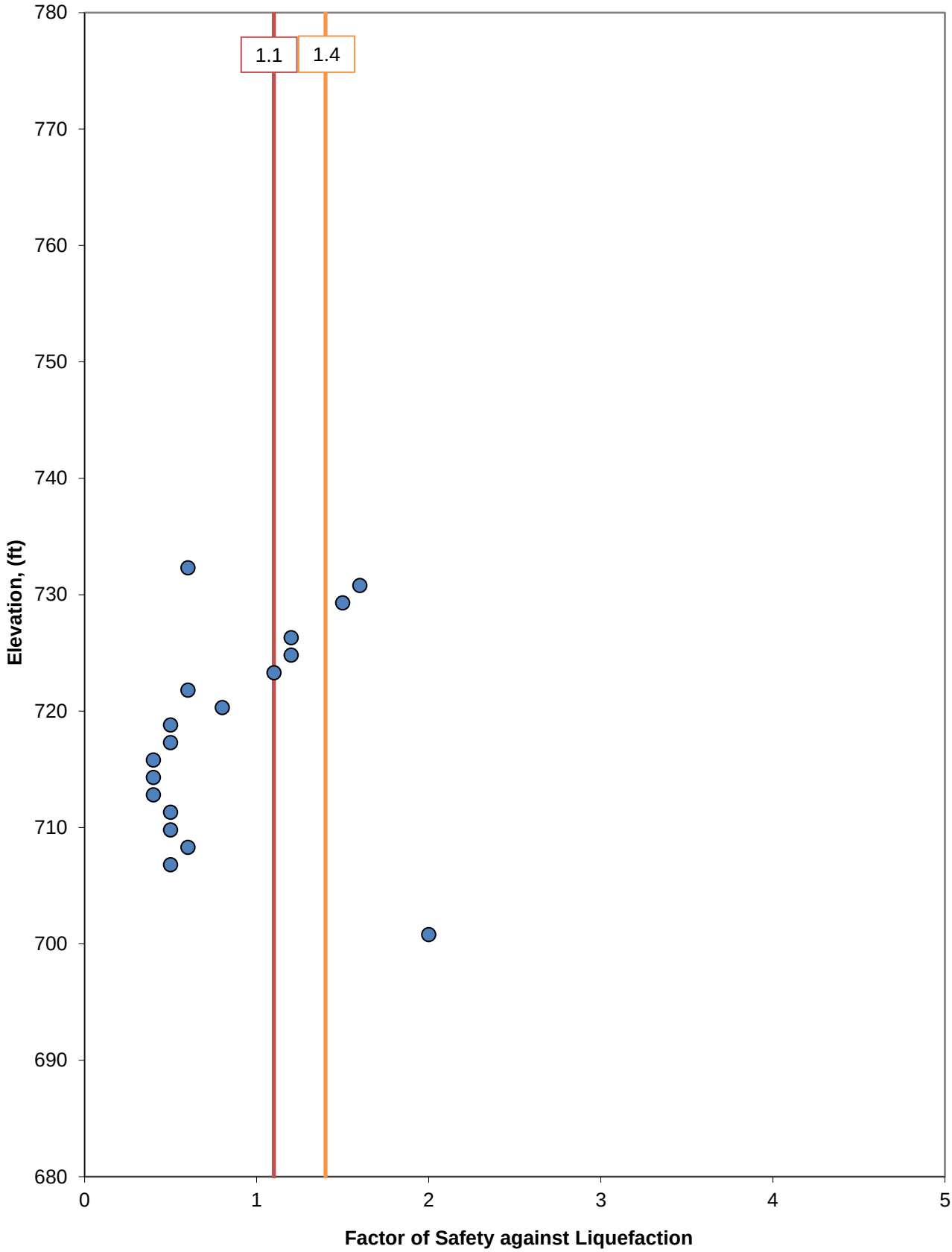
totstr-top	u-top	effstr-top
0.06	0.00	0.06

Note: A factor of safety shown as "N/A" implies that the soil type is not appropriately evaluated using this methodology. This applies to clay-like soils (typically CL, CH, CL-ML and MH material type), samples with high blow counts, and unsaturated samples.

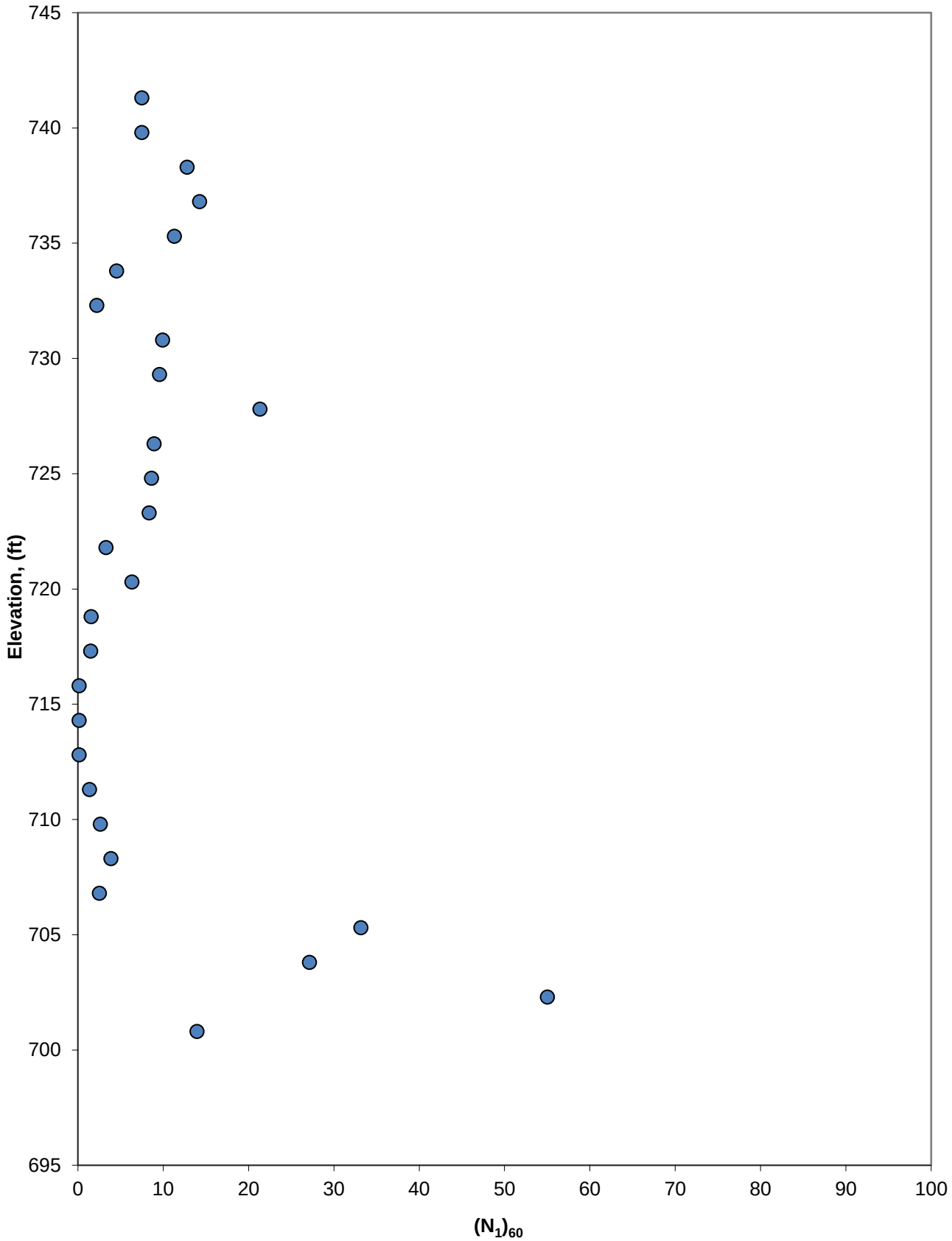
Depth of Mid. Pt. of Sample (ft.) z	Vert. Total Stress during EQ w/ Fill (tsf) $\sigma_{v\ with\ fill}$	Static Pore Pressure during EQ (tsf) u	Vert. Eff. Stress during EQ w/ Fill (tsf) $\sigma'_{v\ with\ fill}$	Clean Sand Correction $\Delta(N_1)_{60cs}$	Equivalent Clean Sand N-Value $(N_1)_{60cs}$	Cyclic Resistance Ratio CRR7.5	Overburden Correction Factor K_σ	Static Shear Stress Correction K_α	Mag. Scaling Factor (MSF)	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Max. Induced Shear Stress (psf)	From Ground Response: Avg. Cyclic Shear Stress (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Blow Count $(N_1)_{60cs} \geq 32$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)
2.0	0.12	0.00	0.12	5.57	13	N/A	N/A	N/A	1.16	N/A	1.000	0	0	0.138	TRUE	FALSE	TRUE	**N/A**	**Clay Fill (irrelevant)**
3.5	0.21	0.00	0.21	5.57	13	N/A	N/A	N/A	1.16	N/A	0.993	0	0	0.137	TRUE	FALSE	TRUE	**N/A**	**Clay Fill (irrelevant)**
5.0	0.30	0.00	0.30	5.57	18	N/A	N/A	N/A	1.26	N/A	0.986	0	0	0.136	TRUE	FALSE	TRUE	**N/A**	**Clay Fill (irrelevant)**
6.5	0.39	0.00	0.39	5.57	20	N/A	N/A	N/A	1.29	N/A	0.978	0	0	0.136	TRUE	FALSE	FALSE	**N/A**	**Clay Fill (irrelevant)**
8.0	0.48	0.05	0.43	5.57	17	N/A	N/A	N/A	1.23	N/A	0.970	0	0	0.149	TRUE	FALSE	FALSE	**N/A**	**Clay Fill (irrelevant)**
9.5	0.57	0.10	0.47	5.57	10	N/A	N/A	N/A	1.12	N/A	0.961	0	0	0.160	TRUE	FALSE	FALSE	**N/A**	**Clay Fill (irrelevant)**
11.0	0.66	0.14	0.52	5.53	8	0.103	1.060	0.852	1.09	0.101	0.953	0	0	0.168	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**
12.5	0.76	0.19	0.57	5.53	15	0.160	1.070	1.372	1.20	0.282	0.943	0	0	0.174	FALSE	FALSE	FALSE	**1.6**	**Subunit 2**
14.0	0.85	0.24	0.61	5.53	15	0.157	1.060	1.330	1.19	0.264	0.934	0	0	0.179	FALSE	FALSE	FALSE	**1.5**	**Subunit 2**
15.5	0.95	0.28	0.66	5.53	27	0.342	1.083	2.541	1.49	1.403	0.924	0	0	0.182	FALSE	FALSE	FALSE	**7.7**	**Subunit 2**
17.0	1.04	0.33	0.71	5.36	14	0.150	1.043	1.248	1.18	0.230	0.914	0	0	0.185	FALSE	FALSE	FALSE	**1.2**	**Subunit 3**
18.5	1.14	0.38	0.76	5.36	14	0.148	1.035	1.217	1.17	0.218	0.904	0	0	0.187	FALSE	FALSE	FALSE	**1.2**	**Subunit 3**
20.0	1.24	0.42	0.81	5.36	14	0.146	1.028	1.189	1.17	0.208	0.894	0	0	0.188	FALSE	FALSE	FALSE	**1.1**	**Subunit 3**
21.5	1.34	0.47	0.87	5.36	9	0.109	1.018	0.899	1.10	0.109	0.883	0	0	0.188	FALSE	FALSE	FALSE	**0.6**	**Subunit 3**
23.0	1.44	0.52	0.92	5.36	12	0.130	1.014	1.051	1.14	0.158	0.872	0	0	0.188	FALSE	FALSE	FALSE	**0.8**	**Subunit 3**
24.5	1.53	0.56	0.97	5.36	7	0.098	1.007	0.828	1.08	0.088	0.861	0	0	0.188	FALSE	FALSE	FALSE	**0.5**	**Subunit 3**
26.0	1.63	0.61	1.02	5.36	7	0.097	1.003	0.829	1.08	0.088	0.850	0	0	0.188	FALSE	FALSE	FALSE	**0.5**	**Subunit 3**
27.5	1.73	0.66	1.07	5.36	6	0.089	0.999	0.786	1.07	0.075	0.839	0	0	0.187	FALSE	FALSE	FALSE	**0.4**	**Subunit 3**
29.0	1.83	0.71	1.12	5.36	6	0.089	0.995	0.790	1.07	0.075	0.828	0	0	0.186	FALSE	FALSE	FALSE	**0.4**	**Subunit 3**
30.5	1.93	0.75	1.17	5.36	6	0.089	0.992	0.793	1.07	0.075	0.817	0	0	0.185	FALSE	FALSE	FALSE	**0.4**	**Subunit 3**
32.0	2.02	0.80	1.23	5.36	7	0.096	0.988	0.832	1.08	0.086	0.805	0	0	0.184	FALSE	FALSE	FALSE	**0.5**	**Subunit 3**
33.5	2.12	0.85	1.28	5.36	8	0.105	0.984	0.875	1.09	0.098	0.794	0	0	0.182	FALSE	FALSE	FALSE	**0.5**	**Subunit 3**
35.0	2.22	0.89	1.33	5.36	9	0.113	0.980	0.918	1.11	0.112	0.783	0	0	0.181	FALSE	FALSE	FALSE	**0.6**	**Subunit 3**
36.5	2.32	0.94	1.38	5.36	8	0.104	0.977	0.873	1.09	0.097	0.771	0	0	0.179	FALSE	FALSE	FALSE	**0.5**	**Subunit 3**
38.0	2.42	0.99	1.43	5.36	39	N/A	N/A	N/A	N/A	N/A	0.760	0	0	0.177	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**
39.5	2.52	1.03	1.48	5.36	33	N/A	N/A	N/A	N/A	N/A	0.749	0	0	0.175	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**
41.0	2.61	1.08	1.53	5.36	60	N/A	N/A	N/A	N/A	N/A	0.738	0	0	0.174	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**
42.5	2.71	1.13	1.59	5.36	19	0.198	0.947	1.407	1.28	0.338	0.727	0	0	0.172	FALSE	FALSE	FALSE	**2.0**	**Subunit 3**
44.0	2.81	1.17	1.64	5.36	141	N/A	N/A	N/A	N/A	N/A	0.716	0	0	0.170	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**


Legend
$FS_{liq} \leq 1.1$
$1.1 < FS_{liq} \leq 1.4$
$FS_{liq} > 1.4$
Sand-like, Unliquefiable
Clay-like, Not Susceptible
Clay-like, Susceptible
No Data
KIF-D2, Liquefaction Triggering Results
Top of Boring
El. 743.3 ft
El. 733.3
El. 723.3
El. 713.3
El. 703.3

KIF TDEC Stability, Boring ID: KIF-D2, Source = 10 Hz, Mw = 6, Event = Design EQ,
SPT Data, Simplified Stress-Based Approach



KIF TDEC Stability, Boring ID: KIF-D2, Source = 10 Hz, Mw = 6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



Project Name = KIF TDEC Stability
Boring ID = KIF-STN50

Boring Location

Northing =
Easting =

OR

Baseline Station =
Offset (+ Right) =

Drilling Information

Boring Inner Diameter (ID) =	3.25	inches	
Top of Hole Elevation	741.6	feet	
Water Depth during SPT (negative for U/S borings)=	4.6	feet	
Depth Sampling Began	0	feet	
Total Unit Wt. above 1st SPT =	120	pcf	
Assumed Rod Stickup =	5	feet	*(Typ assume 5ft)*
E_m Measurement based on Fv method? =	1	(1: Yes, 0: No)	
SPT Sampler w/ Liners? =	0	(1: Yes, 0: No)	*(Typ. no)*

During EQ Information

Water Depth during EQ (relative to SPT TOH, negative for U/S borings) =	4.6	feet
Final Grade Elevation during EQ	741.6	feet
Average Total Unit Wt. of Cut/Fill	120	pcf

Fines Content Correction

Fines content correction for samples with blow counts of zero? 1 (1: Yes, 0: No)

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile? 0 (1: Yes, 0: No)

If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile: _Pond_Section, KIF-STN50_NOR
Alpha at each sample depth known? 1 (1: Yes, 0: No)

If previous answer is No, then enter curve fit parameters below (α vs. depth curve)
If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_α will be one.

m4:
m3:
m2:
m1:
m0:

Associated ground response profile: ling_Pond_Section, KIF-STN50
Get CSR from shear stress envelope? 0 (1: Yes, 0: No)

If previous answer is No, then CSR will be calculated using a_{max} and r_d

Max. Shear Stress at each sample depth known? (1: Yes, 0: No)

If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4:
m3:
m2:
m1:

Earthquake Information

EQ Source (e.g., New Madrid)	10 Hz
Event (e.g., MCE, 10KEQ, OBE)	Design EQ
a_{max} (g) (top of ground surface)	0.24
EQ Mag (Mw)	6

Inputs

Depth of Sample Midpoint (ft.)	SPT N Value	Hammer Efficiency, E_m (%)	Unified Soil Classification	Fines Content (%)	Total Unit Weight (pcf)	Material (optional)	Clay-like / Sand-like Override (optional)	Clay-like Susceptibility (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure during SPT (psf)	Static Pore Water Pressure during EQ (psf)
1.0	10	80	CL	62	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.689			
2.5	5	80		62	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.475			
4.0	5	80		62	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.379			
5.5	7	80		62	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.350			
7.0	6	80		62	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.327			
8.5	0	80		62	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.300			
12.0	0	80		62	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.266			
13.5	7	80		62	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.256			
15.0	2	80		62	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.249			
16.5	0	80		62	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.243			
18.0	9	80		62	120	Clay Fill (irrelevant)	Clay-like	Not Susceptible		0.237			
19.5	3	80		59	126	Subunit 1	Clay-like	Not Susceptible		0.232			
23.0	6	80		59	126	Subunit 1	Clay-like	Not Susceptible		0.221			
24.5	0	80		39	131	Subunit 3	Sand-like			0.216			
26.0	0	80		39	131	Subunit 3	Sand-like			0.212			
27.5	2	80		39	131	Subunit 3	Sand-like			0.207			
29.0	9	80		39	131	Subunit 3	Sand-like			0.203			
30.5	11	80		39	131	Subunit 3	Sand-like			0.198			
32.0	12	80		39	131	Subunit 3	Sand-like			0.191			
33.5	6	80		39	131	Subunit 3	Sand-like			0.185			
35.0	8	80		39	131	Subunit 3	Sand-like			0.180			
36.5	30	80		39	131	Subunit 3	Sand-like			0.175			

KIF TDEC Stability, Boring ID: KIF-STN50

Liquefaction Potential Evaluations

For Coarse Grained Soils

Elev. Of Mid. Pt. of Sample (ft)	Depth of Mid. Pt. of Sample (ft.)	Unit Weight (pcf)	Vert. Total Stress during SPT (tsf)	Static Pore Pressure during SPT (tsf)	Vert. Eff. Stress during SPT (tsf)	SPT N Value	Hammer Efficiency (%)	Borehole Diameter Correction	Sampler Correction	Rod Length Correction	Overburden Stress Correction Factor	Hammer Energy Correction Factor	Corrected Blow Count	Normalized Blow Count	Relative Density (%)	Unified Soil Classification	Fines Content (%)	Relative State Parameter Index	Static Shear Stress Ratio
	z	γ_T	σ_v	u	σ'_v	N	E_m	C_B	C_s	C_R	C_N	C_E	N_{60}	$(N_1)_{60}$	D_r			ξ_R	α

Top of Hole Elevation (ft) = 741.6 | Boring ID = KIF-STN50

begin sampling (depth-ft) = 0.0 | Boring Inner Dia. (in) = 3.25

total unit wt. above 1st SPT (pcf) = 120

water elevation during SPT (ft) = 737.0 ft *(relative to ground surface during SPT)* | Assumed Rod Stickup = 5.0 feet

water depth during SPT (ft) = 4.6 | E_m Measurement? = 1 (1: Yes, 0: No)

water elevation during EQ (ft) = 737.0 ft *(relative to ground surface during SPT)* | SPT Sampler w/ Liners? = 0 (1: Yes, 0: No)

water during EQ (depth-ft) = 4.6 | u-top | effstr-top

vert. total stress above 1st SPT (tsf) = **0.00** | **0.00** | 0.00

740.6	1.0	120	0.06	0.00	0.06	10	80.0	1.000	1.29	1.00	1.70	1.33	17	29	87	CL	62	-0.60	0.350
739.1	2.5	120	0.15	0.00	0.15	5	80.0	1.000	1.13	1.00	1.70	1.33	8	13	63	0	62	-0.50	0.350
737.6	4.0	120	0.24	0.00	0.24	5	80.0	1.000	1.13	1.00	1.70	1.33	8	13	63	0	62	-0.49	0.350
736.1	5.5	120	0.33	0.03	0.30	7	80.0	1.000	1.18	1.00	1.67	1.33	11	18	72	0	62	-0.58	0.350
734.6	7.0	120	0.42	0.07	0.35	6	80.0	1.000	1.15	1.00	1.63	1.33	9	15	67	0	62	-0.52	0.327
733.1	8.5	120	0.51	0.12	0.39	0	80.0	1.000	1.10	1.00	1.70	1.33	0	0	36	0	62	-0.21	0.300
729.6	12.0	120	0.72	0.23	0.49	0	80.0	1.000	1.10	1.00	1.59	1.33	0	0	36	0	62	-0.20	0.266
728.1	13.5	120	0.81	0.28	0.53	7	80.0	1.000	1.14	1.00	1.35	1.33	11	14	66	0	62	-0.51	0.256
726.6	15.0	120	0.90	0.32	0.58	2	80.0	1.000	1.10	1.00	1.39	1.33	3	4	46	0	62	-0.30	0.249
725.1	16.5	120	0.99	0.37	0.62	0	80.0	1.000	1.10	1.00	1.38	1.33	0	0	36	0	62	-0.20	0.243
723.6	18.0	120	1.08	0.42	0.66	9	80.0	1.000	1.17	1.00	1.22	1.33	14	17	70	0	62	-0.54	0.237
722.1	19.5	126	1.17	0.46	0.71	3	80.0	1.000	1.10	1.00	1.24	1.33	4	5	49	0	59	-0.33	0.232
718.6	23.0	126	1.39	0.57	0.82	6	80.0	1.000	1.10	1.00	1.13	1.33	9	10	58	0	59	-0.42	0.221
717.1	24.5	131	1.49	0.62	0.87	0	80.0	1.000	1.10	1.00	1.13	1.33	0	0	35	0	39	-0.19	0.216
715.6	26.0	131	1.59	0.67	0.92	0	80.0	1.000	1.10	1.00	1.09	1.33	0	0	35	0	39	-0.18	0.212
714.1	27.5	131	1.69	0.71	0.97	2	80.0	1.000	1.10	1.00	1.05	1.33	3	3	43	0	39	-0.26	0.207
712.6	29.0	131	1.78	0.76	1.02	9	80.0	1.000	1.14	1.00	1.02	1.33	14	14	65	0	39	-0.48	0.203
711.1	30.5	131	1.88	0.81	1.07	11	80.0	1.000	1.17	1.00	0.99	1.33	17	17	70	0	39	-0.53	0.198
709.6	32.0	131	1.98	0.85	1.13	12	80.0	1.000	1.18	1.00	0.98	1.33	19	18	72	0	39	-0.55	0.191
708.1	33.5	131	2.08	0.90	1.18	6	80.0	1.000	1.10	1.00	0.95	1.33	9	8	55	0	39	-0.37	0.185
706.6	35.0	131	2.18	0.95	1.23	8	80.0	1.000	1.11	1.00	0.93	1.33	12	11	60	0	39	-0.42	0.180
705.1	36.5	131	2.28	1.00	1.28	30	80.0	1.000	1.30	1.00	0.95	1.33	52	49	100	0	39	-0.60	0.175

KIF TDEC Stability, Boring ID: KIF-STN50
Liquefaction Potential Evaluations
For Coarse Grained Soils

EQ Source	a max (g)	EQ Mag (Mw)	Event
10 Hz	0.24	6	Design EQ

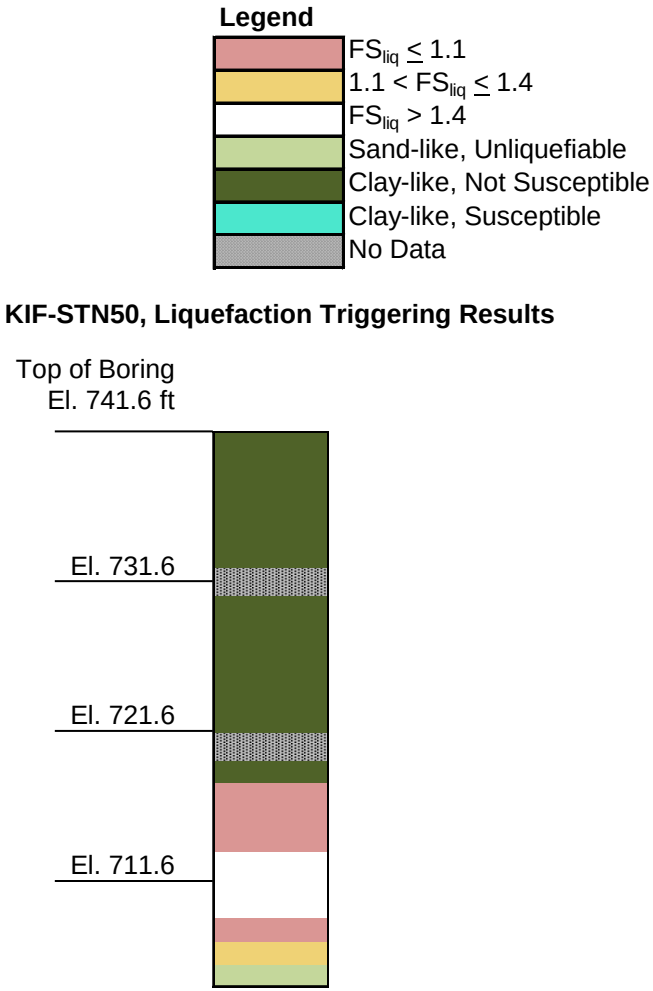
Shear Stress Curve Fit Parameters
m4: 0
m3: 0
m2: 0
m1: 0

Boring ID: **KIF-STN50**
Top of Fill Elevation: 741.6 ft
Fill Height: 0.0 ft *(relative to ground surface during SPT)*
Fill Total Unit Weight: 120 pcf
Fill Total Stress: 0.00 tsf

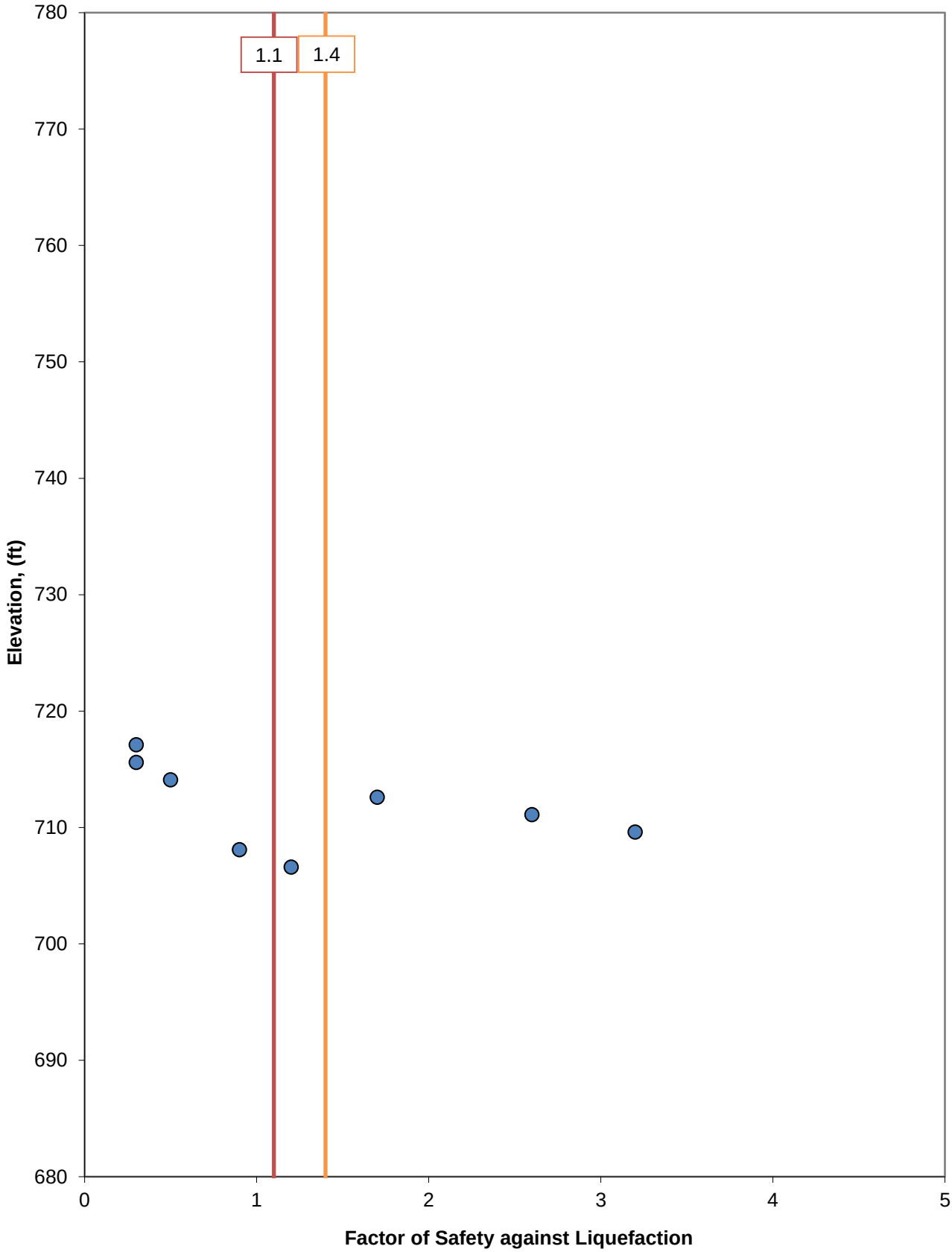
totstr-top **0.00** | u-top 0.00 | effstr-top 0.00

Note: A factor of safety shown as "N/A" implies that the soil type is not appropriately evaluated using this methodology. This applies to clay-like soils (typically CL, CH, CL-ML and MH material type), samples with high blow counts, and unsaturated samples.

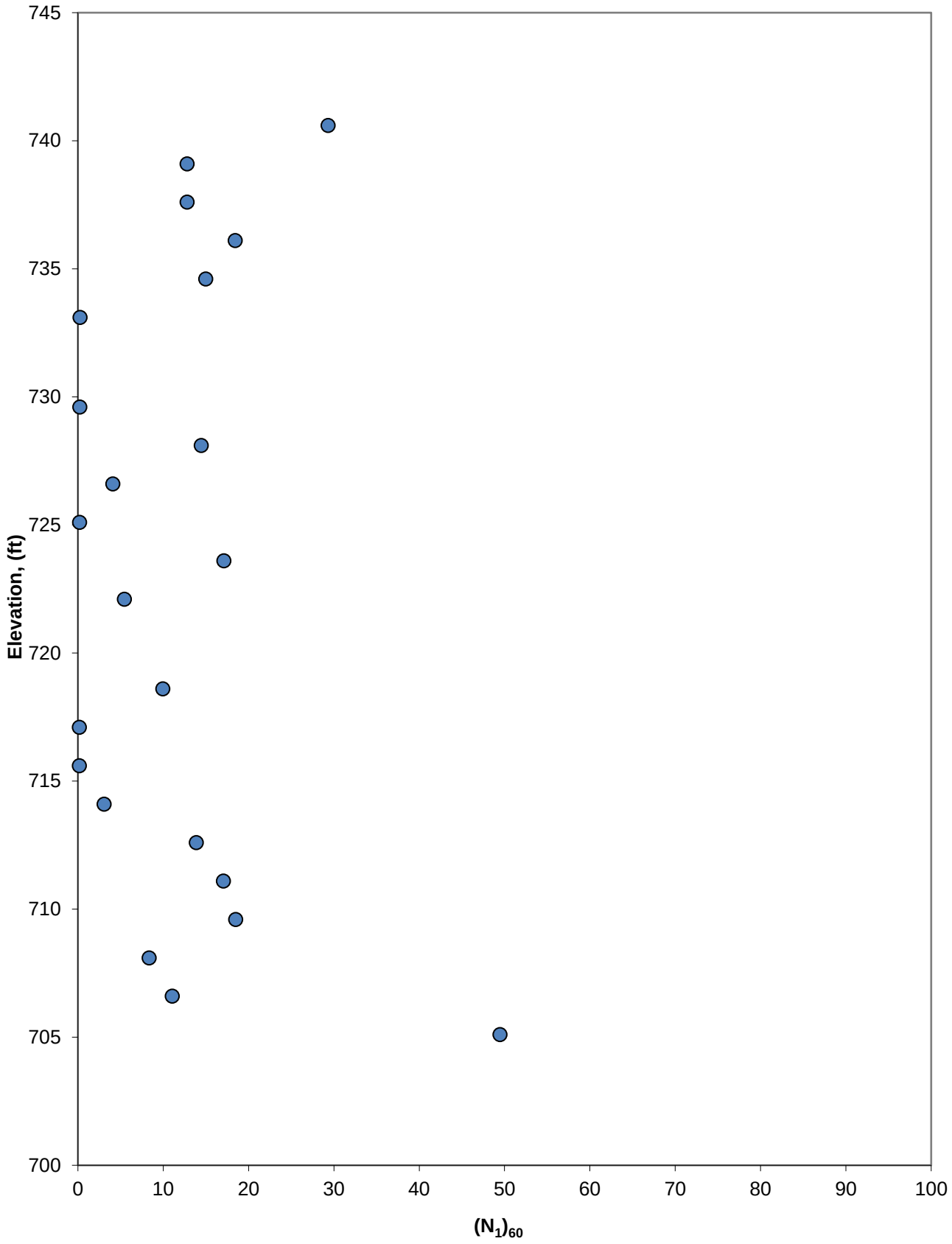
Depth of Mid. Pt. of Sample (ft.) z	Vert. Total Stress during EQ w/ Fill (tsf) $\sigma_{v\ with\ fill}$	Static Pore Pressure during EQ (tsf) u	Vert. Eff. Stress during EQ w/ Fill (tsf) $\sigma'_{v\ with\ fill}$	Clean Sand Correction $\Delta(N_1)_{60cs}$	Equivalent Clean Sand N-Value $(N_1)_{60cs}$	Cyclic Resistance Ratio CRR7.5	Overburden Correction Factor K_σ	Static Shear Stress Correction K_α	Mag. Scaling Factor (MSF)	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Max. Induced Shear Stress (psf)	From Ground Response: Avg. Cyclic Shear Stress (psf)	Cyclic Stress Ratio CSR	Sample Screened for: High Clay-like	High Blow Count $(N_1)_{60cs} \geq 32$	High Unsaturated	Factor of Safety FS_{liq}	Material (optional)
1.0	0.06	0.00	0.06	5.60	35	N/A	N/A	N/A	N/A	N/A	1.000	0	0	0.158	TRUE	TRUE	TRUE	N/A	Clay Fill (irrelevant)
2.5	0.15	0.00	0.15	5.60	18	N/A	N/A	N/A	1.26	N/A	0.998	0	0	0.158	TRUE	FALSE	TRUE	N/A	Clay Fill (irrelevant)
4.0	0.24	0.00	0.24	5.60	18	N/A	N/A	N/A	1.26	N/A	0.991	0	0	0.157	TRUE	FALSE	TRUE	N/A	Clay Fill (irrelevant)
5.5	0.33	0.03	0.30	5.60	24	N/A	N/A	N/A	1.40	N/A	0.983	0	0	0.170	TRUE	FALSE	FALSE	N/A	Clay Fill (irrelevant)
7.0	0.42	0.07	0.35	5.60	21	N/A	N/A	N/A	1.31	N/A	0.975	0	0	0.188	TRUE	FALSE	FALSE	N/A	Clay Fill (irrelevant)
8.5	0.51	0.12	0.39	5.60	6	N/A	N/A	N/A	1.08	N/A	0.967	0	0	0.201	TRUE	FALSE	FALSE	N/A	Clay Fill (irrelevant)
12.0	0.72	0.23	0.49	5.60	6	N/A	N/A	N/A	1.07	N/A	0.947	0	0	0.220	TRUE	FALSE	FALSE	N/A	Clay Fill (irrelevant)
13.5	0.81	0.28	0.53	5.60	20	N/A	N/A	N/A	1.30	N/A	0.937	0	0	0.226	TRUE	FALSE	FALSE	N/A	Clay Fill (irrelevant)
15.0	0.90	0.32	0.58	5.60	10	N/A	N/A	N/A	1.11	N/A	0.928	0	0	0.230	TRUE	FALSE	FALSE	N/A	Clay Fill (irrelevant)
16.5	0.99	0.37	0.62	5.60	6	N/A	N/A	N/A	1.07	N/A	0.918	0	0	0.232	TRUE	FALSE	FALSE	N/A	Clay Fill (irrelevant)
18.0	1.08	0.42	0.66	5.60	23	N/A	N/A	N/A	1.37	N/A	0.908	0	0	0.234	TRUE	FALSE	FALSE	N/A	Clay Fill (irrelevant)
19.5	1.17	0.46	0.71	5.60	11	N/A	N/A	N/A	1.13	N/A	0.897	0	0	0.235	TRUE	FALSE	FALSE	N/A	Subunit 1
23.0	1.39	0.57	0.82	5.60	16	N/A	N/A	N/A	1.20	N/A	0.872	0	0	0.235	TRUE	FALSE	FALSE	N/A	Subunit 1
24.5	1.49	0.62	0.87	5.57	6	0.090	1.015	0.798	1.07	0.079	0.861	0	0	0.234	FALSE	FALSE	FALSE	0.3	Subunit 3
26.0	1.59	0.67	0.92	5.57	6	0.090	1.011	0.801	1.07	0.079	0.850	0	0	0.232	FALSE	FALSE	FALSE	0.3	Subunit 3
27.5	1.69	0.71	0.97	5.57	9	0.109	1.008	0.906	1.10	0.109	0.839	0	0	0.230	FALSE	FALSE	FALSE	0.5	Subunit 3
29.0	1.78	0.76	1.02	5.57	19	0.199	1.004	1.531	1.28	0.393	0.828	0	0	0.229	FALSE	FALSE	FALSE	1.7	Subunit 3
30.5	1.88	0.81	1.07	5.57	23	0.243	0.998	1.796	1.37	0.595	0.817	0	0	0.226	FALSE	FALSE	FALSE	2.6	Subunit 3
32.0	1.98	0.85	1.13	5.57	24	0.269	0.990	1.910	1.41	0.716	0.805	0	0	0.224	FALSE	FALSE	FALSE	3.2	Subunit 3
33.5	2.08	0.90	1.18	5.57	14	0.147	0.989	1.124	1.17	0.192	0.794	0	0	0.222	FALSE	FALSE	FALSE	0.9	Subunit 3
35.0	2.18	0.95	1.23	5.57	17	0.170	0.982	1.262	1.22	0.258	0.783	0	0	0.219	FALSE	FALSE	FALSE	1.2	Subunit 3
36.5	2.28	1.00	1.28	5.57	55	N/A	N/A	N/A	N/A	N/A	0.771	0	0	0.217	FALSE	TRUE	FALSE	N/A	Subunit 3


Legend
$FS_{liq} \leq 1.1$
$1.1 < FS_{liq} \leq 1.4$
$FS_{liq} > 1.4$
Sand-like, Unliquefiable
Clay-like, Not Susceptible
Clay-like, Susceptible
No Data
KIF-STN50, Liquefaction Triggering Results
Top of Boring
El. 741.6 ft
El. 731.6
El. 721.6
El. 711.6

KIF TDEC Stability, Boring ID: KIF-STN50, Source = 10 Hz, Mw = 6, Event = Design EQ,
SPT Data, Simplified Stress-Based Approach



KIF TDEC Stability, Boring ID: KIF-STN50, Source = 10 Hz, Mw = 6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



Project Name = KIF TDEC Stability
Boring ID = KIF-STN51

Boring Location

Northing =
Easting =

OR

Baseline Station =
Offset (+ Right) =

Drilling Information

Boring Inner Diameter (ID) =	3.25	inches
Top of Hole Elevation	750.4	feet
Water Depth during SPT (negative for U/S borings)=	-1	feet
Depth Sampling Began	0	feet
Total Unit Wt. above 1st SPT =	120	pcf
Assumed Rod Stickup =	5	feet *(Typ assume 5ft)*
E_m Measurement based on Fv method? =	1	(1: Yes, 0: No)
SPT Sampler w/ Liners? =	0	(1: Yes, 0: No) *(Typ. no)*

During EQ Information

Water Depth during EQ (relative to SPT TOH, negative for U/S borings) =	-1	feet
Final Grade Elevation during EQ	750.4	feet
Average Total Unit Wt. of Cut/Fill	120	pcf

Fines Content Correction

Fines content correction for samples with blow counts of zero? 1 (1: Yes, 0: No)

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile? 0 (1: Yes, 0: No)
If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile: Pond_Section, KIF-STN51_NOR
Alpha at each sample depth known? 1 (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (α vs. depth curve)
If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_α will be one.

m4:
m3:
m2:
m1:
m0:

Associated ground response profile: ling_Pond_Section, KIF-STN51
Get CSR from shear stress envelope? 0 (1: Yes, 0: No)
If previous answer is No, then CSR will be calculated using a_{max} and r_d
Max. Shear Stress at each sample depth known? (1: Yes, 0: No)
If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4:
m3:
m2:
m1:

Earthquake Information

EQ Source (e.g., New Madrid)	10 Hz
Event (e.g., MCE, 10KEQ, OBE)	Design EQ
a_{max} (g) (top of ground surface)	0.21
EQ Mag (Mw)	6

Inputs

Depth of Sample Midpoint (ft.)	SPT N Value	Hammer Efficiency, E_m (%)	Unified Soil Classification	Fines Content (%)	Total Unit Weight (pcf)	Material (optional)	Clay-like / Sand-like Override (optional)	Clay-like Susceptibility (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure during SPT (psf)	Static Pore Water Pressure during EQ (psf)
1.0	5	80	GP	20	120	Gravel Fill (Irrelevant)	Sand-like			0.179			
2.5	13	80		62	120	Clay Fill (irrelvenant)	Clay-like	Not Susceptible		0.167			
4.0	12	80		62	120	Clay Fill (irrelvenant)	Clay-like	Not Susceptible		0.156			
5.5	6	80		62	120	Clay Fill (irrelvenant)	Clay-like	Not Susceptible		0.149			
7.0	10	80		62	120	Clay Fill (irrelvenant)	Clay-like	Not Susceptible		0.148			
8.5	7	80		62	120	Clay Fill (irrelvenant)	Clay-like	Not Susceptible		0.145			
10.0	14	80		62	120	Clay Fill (irrelvenant)	Clay-like	Not Susceptible		0.143			
11.5	11	80		62	120	Clay Fill (irrelvenant)	Clay-like	Not Susceptible		0.142			
14.5	7	80		62	120	Clay Fill (irrelvenant)	Clay-like	Not Susceptible		0.145			
16.0	7	80		62	120	Clay Fill (irrelvenant)	Clay-like	Not Susceptible		0.149			
17.5	17	80		62	120	Clay Fill (irrelvenant)	Clay-like	Not Susceptible		0.154			
21.0	6	80		62	120	Clay Fill (irrelvenant)	Clay-like	Not Susceptible		0.167			
22.5	14	80		62	120	Clay Fill (irrelvenant)	Clay-like	Not Susceptible		0.172			
26.0	5	80		62	120	Clay Fill (irrelvenant)	Clay-like	Not Susceptible		0.184			
27.5	9	80		85	126	Subunit 1	Clay-like	Not Susceptible		0.188			
29.0	6	80		85	126	Subunit 1	Clay-like	Not Susceptible		0.193			
30.5	9	80		11	131	Subunit 3	Sand-like			0.196			
32.0	4	80		11	131	Subunit 3	Sand-like			0.198			
33.5	0	80		11	131	Subunit 3	Sand-like			0.200			
35.0	3	80		11	131	Subunit 3	Sand-like			0.201			
36.5	0	80		11	131	Subunit 3	Sand-like			0.202			
38.0	0	80		11	131	Subunit 3	Sand-like			0.202			
39.5	0	80		11	131	Subunit 3	Sand-like			0.201			
41.0	14	80		11	131	Subunit 3	Sand-like			0.199			
42.5	6	80		11	131	Subunit 3	Sand-like			0.196			
44.0	14	80		11	131	Subunit 3	Sand-like			0.194			
45.5	38	80		11	131	Subunit 3	Sand-like			0.191			
47.0	5	80		11	131	Subunit 3	Sand-like			0.189			
48.5	50	80		11	131	Subunit 3	Sand-like			0.186			

KIF TDEC Stability, Boring ID: KIF-STN51

Liquefaction Potential Evaluations

For Coarse Grained Soils

Top of Hole Elevation (ft)			750.4					Boring ID =	KIF-STN51											
begin sampling (depth-ft)			0.0					Boring Inner Dia. (in) =	3.25											
total unit wt. above 1st SPT (pcf) =			120																	
water elevation during SPT (ft) =			751.4	ft *(relative to ground surface during SPT)*				Assumed Rod Stickup =	5.0	feet										
water depth during SPT (ft) =			-1.0					E_m Measurement? =	1	(1: Yes, 0: No)										
water elevation during EQ (ft) =			751.4	ft *(relative to ground surface during SPT)*				SPT Sampler w/ Liners? =	0	(1: Yes, 0: No)										
water during EQ (depth-ft) =			-1.0	u-top	effstr-top															
vert. total stress above 1st SPT (tsf) =			**0.03**	**0.03**	0.00															
Elev. Of Mid. Pt. of Sample (ft)	Depth of Mid. Pt. of Sample (ft.) z	Unit Weight (pcf) γ_T	Vert. Total Stress during SPT (tsf) σ_v	Static Pore Pressure during SPT (tsf) u	Vert. Eff. Stress during SPT (tsf) σ'_v	SPT N Value N	Hammer Efficiency (%) E_m	Borehole Diameter Correction C_B	Sampler Correction C_S	Rod Length Correction C_R	Overburden Stress Correction Factor C_N	Hammer Energy Correction Factor C_E	Corrected Blow Count N_{60}	Normalized Blow Count $(N_1)_{60}$	Relative Density (%) D_r	Unified Soil Classification	Fines Content (%)	Relative State Parameter Index ξ_R	Static Shear Stress Ratio α
749.4	1.0	120	0.09	0.06	0.03	5	80.0	1.000	1.13	1.00	1.70	1.33	8	13	61	GP	20	-0.51	0.179
747.9	2.5	120	0.18	0.11	0.07	13	80.0	1.000	1.30	1.00	1.70	1.33	23	38	98	0	62	-0.60	0.167
746.4	4.0	120	0.27	0.16	0.12	12	80.0	1.000	1.30	1.00	1.70	1.33	21	35	94	0	62	-0.60	0.156
744.9	5.5	120	0.36	0.20	0.16	6	80.0	1.000	1.16	1.00	1.70	1.33	9	16	68	0	62	-0.55	0.149
743.4	7.0	120	0.45	0.25	0.20	10	80.0	1.000	1.29	1.00	1.70	1.33	17	29	87	0	62	-0.60	0.148
741.9	8.5	120	0.54	0.30	0.24	7	80.0	1.000	1.19	1.00	1.70	1.33	11	19	73	0	62	-0.59	0.145
740.4	10.0	120	0.63	0.34	0.29	14	80.0	1.000	1.30	1.00	1.46	1.33	24	35	94	0	62	-0.60	0.143
738.9	11.5	120	0.72	0.39	0.33	11	80.0	1.000	1.28	1.00	1.48	1.33	19	28	85	0	62	-0.60	0.142
735.9	14.5	120	0.90	0.48	0.42	7	80.0	1.000	1.16	1.00	1.49	1.33	11	16	69	0	62	-0.54	0.145
734.4	16.0	120	0.99	0.53	0.46	7	80.0	1.000	1.15	1.00	1.43	1.33	11	15	68	0	62	-0.53	0.149
732.9	17.5	120	1.08	0.58	0.50	17	80.0	1.000	1.30	1.00	1.24	1.33	29	36	96	0	62	-0.60	0.154
729.4	21.0	120	1.29	0.69	0.60	6	80.0	1.000	1.12	1.00	1.30	1.33	9	12	61	0	62	-0.45	0.167
727.9	22.5	120	1.38	0.73	0.65	14	80.0	1.000	1.28	1.00	1.18	1.33	24	28	86	0	62	-0.60	0.172
724.4	26.0	120	1.59	0.84	0.75	5	80.0	1.000	1.10	1.00	1.19	1.33	7	9	56	0	62	-0.39	0.184
722.9	27.5	126	1.68	0.89	0.79	9	80.0	1.000	1.16	1.00	1.13	1.33	14	16	68	0	85	-0.52	0.188
721.4	29.0	126	1.78	0.94	0.84	6	80.0	1.000	1.10	1.00	1.12	1.33	9	10	58	0	85	-0.41	0.193
719.9	30.5	131	1.87	0.98	0.89	9	80.0	1.000	1.15	1.00	1.08	1.33	14	15	60	0	11	-0.43	0.196
718.4	32.0	131	1.97	1.03	0.94	4	80.0	1.000	1.10	1.00	1.07	1.33	6	6	41	0	11	-0.24	0.198
716.9	33.5	131	2.07	1.08	0.99	0	80.0	1.000	1.10	1.00	1.04	1.33	0	0	20	0	11	-0.03	0.200
715.4	35.0	131	2.17	1.12	1.05	3	80.0	1.000	1.10	1.00	1.01	1.33	4	4	36	0	11	-0.19	0.201
713.9	36.5	131	2.27	1.17	1.10	0	80.0	1.000	1.10	1.00	0.98	1.33	0	0	20	0	11	-0.02	0.202
712.4	38.0	131	2.37	1.22	1.15	0	80.0	1.000	1.10	1.00	0.95	1.33	0	0	20	0	11	-0.02	0.202
710.9	39.5	131	2.46	1.26	1.20	0	80.0	1.000	1.10	1.00	0.92	1.33	0	0	19	0	11	-0.02	0.201
709.4	41.0	131	2.56	1.31	1.25	14	80.0	1.000	1.21	1.00	0.93	1.33	23	21	70	0	11	-0.52	0.199
707.9	42.5	131	2.66	1.36	1.30	6	80.0	1.000	1.10	1.00	0.89	1.33	9	8	45	0	11	-0.27	0.196
706.4	44.0	131	2.76	1.40	1.35	14	80.0	1.000	1.20	1.00	0.90	1.33	22	20	69	0	11	-0.51	0.194
704.9	45.5	131	2.86	1.45	1.41	38	80.0	1.000	1.30	1.00	0.93	1.33	66	61	100	0	11	-0.60	0.191
703.4	47.0	131	2.96	1.50	1.46	5	80.0	1.000	1.10	1.00	0.83	1.33	7	6	41	0	11	-0.23	0.189
701.9	48.5	131	3.05	1.54	1.51	50	80.0	1.000	1.30	1.00	0.91	1.33	87	79	100	0	11	-0.60	0.186

KIF TDEC Stability, Boring ID: KIF-STN51
Liquefaction Potential Evaluations
For Coarse Grained Soils

EQ Source	a max (g)	EQ Mag (Mw)	Event
10 Hz	0.21	6	Design EQ

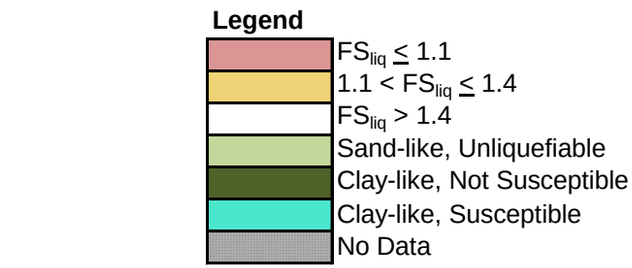
Shear Stress Curve Fit Parameters
m4: 0
m3: 0
m2: 0
m1: 0

Boring ID: **KIF-STN51**
Top of Fill Elevation: 750.4 ft
Fill Height: 0.0 ft *(relative to ground surface during SPT)*
Fill Total Unit Weight: 120 pcf
Fill Total Stress: 0.00 tsf

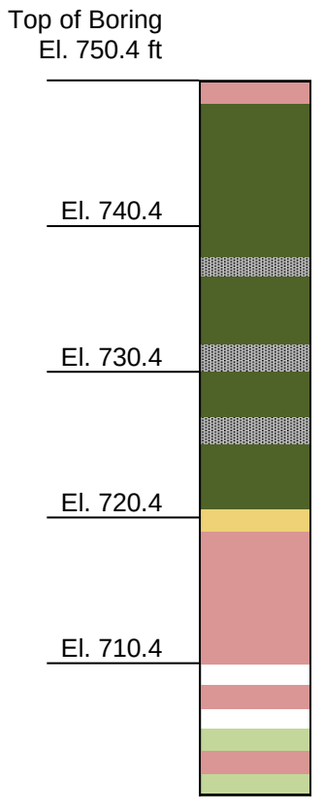
totstr-top	u-top	effstr-top
0.03	0.03	0.00

Note: A factor of safety shown as "N/A" implies that the soil type is not appropriately evaluated using this methodology. This applies to clay-like soils (typically CL, CH, CL-ML and MH material type), samples with high blow counts, and unsaturated samples.

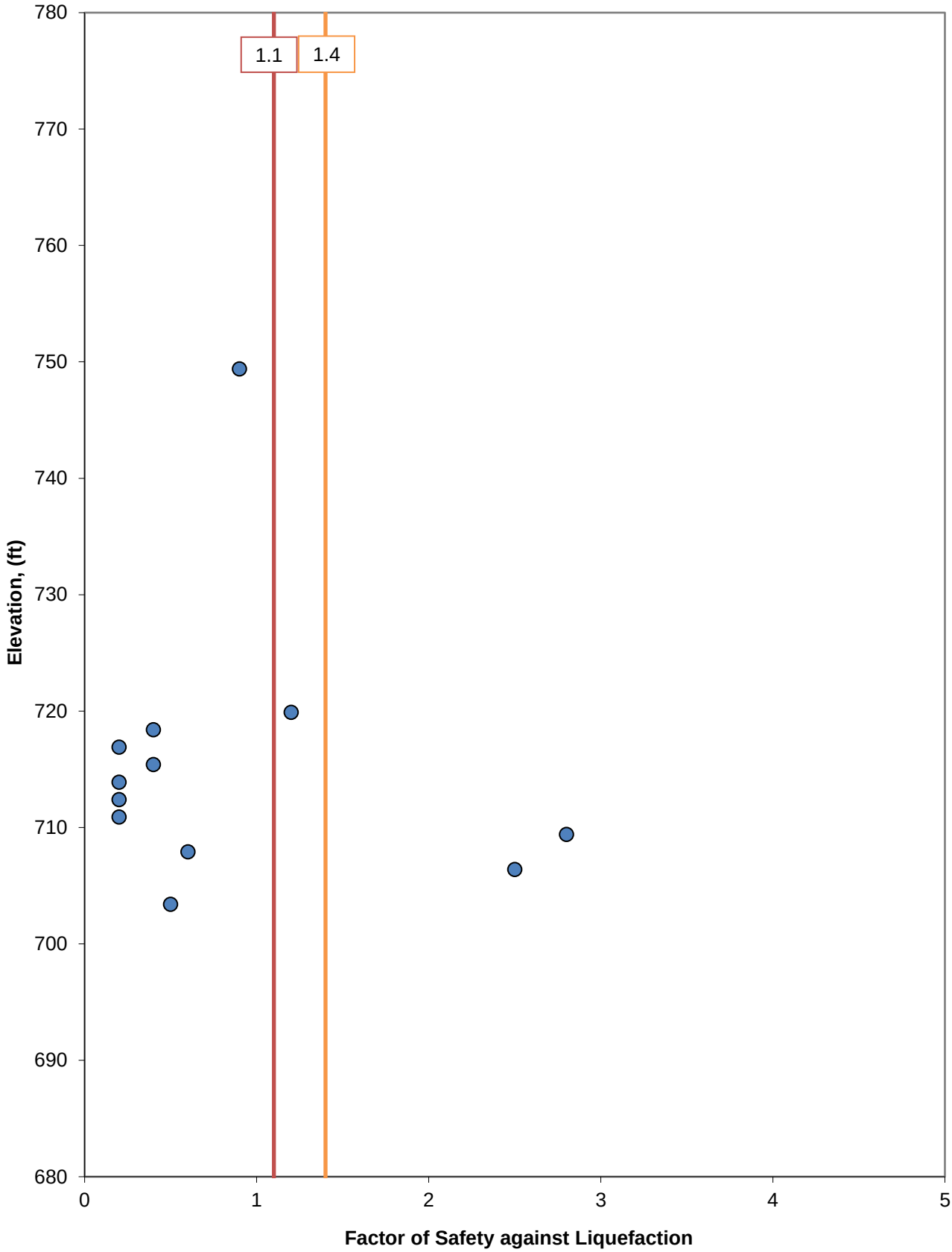
Depth of Mid. Pt. of Sample (ft.) z	Vert. Total Stress during EQ w/ Fill (tsf) $\sigma_{v\ with\ fill}$	Static Pore Pressure during EQ (tsf) u	Vert. Eff. Stress during EQ w/ Fill (tsf) $\sigma'_{v\ with\ fill}$	Clean Sand Correction $\Delta(N_1)_{60cs}$	Equivalent Clean Sand N-Value $(N_1)_{60cs}$	Cyclic Resistance Ratio CRR7.5	Overburden Correction Factor K_σ	Static Shear Stress Correction K_α	Mag. Scaling Factor (MSF)	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Max. Induced Shear Stress (psf)	From Ground Response: Avg. Cyclic Shear Stress (psf)	Cyclic Stress Ratio CSR	Sample Screened for: High Clay-like	Sample Screened for: High Blow Count $(N_1)_{60cs} \geq 32$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)
1.0	0.09	0.06	0.03	4.48	17	0.176	1.100	1.610	1.24	0.386	1.000	0	0	0.438	FALSE	FALSE	FALSE	**0.9**	**Gravel Fill (Irrelevant)**
2.5	0.18	0.11	0.07	5.60	44	N/A	N/A	N/A	N/A	N/A	0.998	0	0	0.348	TRUE	TRUE	FALSE	**N/A**	**Clay Fill (irrelvenant)**
4.0	0.27	0.16	0.12	5.60	41	N/A	N/A	N/A	N/A	N/A	0.991	0	0	0.323	TRUE	TRUE	FALSE	**N/A**	**Clay Fill (irrelvenant)**
5.5	0.36	0.20	0.16	5.60	21	N/A	N/A	N/A	1.33	N/A	0.983	0	0	0.310	TRUE	FALSE	FALSE	**N/A**	**Clay Fill (irrelvenant)**
7.0	0.45	0.25	0.20	5.60	35	N/A	N/A	N/A	N/A	N/A	0.975	0	0	0.302	TRUE	TRUE	FALSE	**N/A**	**Clay Fill (irrelvenant)**
8.5	0.54	0.30	0.24	5.60	24	N/A	N/A	N/A	1.42	N/A	0.967	0	0	0.296	TRUE	FALSE	FALSE	**N/A**	**Clay Fill (irrelvenant)**
10.0	0.63	0.34	0.29	5.60	41	N/A	N/A	N/A	N/A	N/A	0.959	0	0	0.291	TRUE	TRUE	FALSE	**N/A**	**Clay Fill (irrelvenant)**
11.5	0.72	0.39	0.33	5.60	33	N/A	N/A	N/A	N/A	N/A	0.950	0	0	0.286	TRUE	TRUE	FALSE	**N/A**	**Clay Fill (irrelvenant)**
14.5	0.90	0.48	0.42	5.60	22	N/A	N/A	N/A	1.34	N/A	0.931	0	0	0.278	TRUE	FALSE	FALSE	**N/A**	**Clay Fill (irrelvenant)**
16.0	0.99	0.53	0.46	5.60	21	N/A	N/A	N/A	1.32	N/A	0.921	0	0	0.274	TRUE	FALSE	FALSE	**N/A**	**Clay Fill (irrelvenant)**
17.5	1.08	0.58	0.50	5.60	42	N/A	N/A	N/A	N/A	N/A	0.911	0	0	0.271	TRUE	TRUE	FALSE	**N/A**	**Clay Fill (irrelvenant)**
21.0	1.29	0.69	0.60	5.60	17	N/A	N/A	N/A	1.23	N/A	0.887	0	0	0.262	TRUE	FALSE	FALSE	**N/A**	**Clay Fill (irrelvenant)**
22.5	1.38	0.73	0.65	5.60	34	N/A	N/A	N/A	N/A	N/A	0.876	0	0	0.258	TRUE	TRUE	FALSE	**N/A**	**Clay Fill (irrelvenant)**
26.0	1.59	0.84	0.75	5.60	14	N/A	N/A	N/A	1.18	N/A	0.850	0	0	0.250	TRUE	FALSE	FALSE	**N/A**	**Clay Fill (irrelvenant)**
27.5	1.68	0.89	0.79	5.53	21	N/A	N/A	N/A	1.33	N/A	0.839	0	0	0.246	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
29.0	1.78	0.94	0.84	5.53	15	N/A	N/A	N/A	1.20	N/A	0.828	0	0	0.242	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**
30.5	1.87	0.98	0.89	1.61	17	0.170	1.020	1.319	1.22	0.279	0.817	0	0	0.238	FALSE	FALSE	FALSE	**1.2**	**Subunit 3**
32.0	1.97	1.03	0.94	1.61	8	0.104	1.010	0.882	1.09	0.101	0.805	0	0	0.233	FALSE	FALSE	FALSE	**0.4**	**Subunit 3**
33.5	2.07	1.08	0.99	1.61	2	0.069	1.004	0.707	1.06	0.052	0.794	0	0	0.229	FALSE	FALSE	FALSE	**0.2**	**Subunit 3**
35.0	2.17	1.12	1.05	1.61	6	0.092	1.001	0.817	1.08	0.081	0.783	0	0	0.225	FALSE	FALSE	FALSE	**0.4**	**Subunit 3**
36.5	2.27	1.17	1.10	1.61	2	0.069	0.998	0.704	1.06	0.051	0.771	0	0	0.221	FALSE	FALSE	FALSE	**0.2**	**Subunit 3**
38.0	2.37	1.22	1.15	1.61	2	0.069	0.995	0.703	1.06	0.051	0.760	0	0	0.217	FALSE	FALSE	FALSE	**0.2**	**Subunit 3**
39.5	2.46	1.26	1.20	1.61	2	0.069	0.992	0.704	1.06	0.051	0.749	0	0	0.213	FALSE	FALSE	FALSE	**0.2**	**Subunit 3**
41.0	2.56	1.31	1.25	1.61	23	0.244	0.975	1.775	1.37	0.577	0.738	0	0	0.209	FALSE	FALSE	FALSE	**2.8**	**Subunit 3**
42.5	2.66	1.36	1.30	1.61	9	0.114	0.981	0.927	1.11	0.115	0.727	0	0	0.205	FALSE	FALSE	FALSE	**0.6**	**Subunit 3**
44.0	2.76	1.40	1.35	1.61	22	0.230	0.965	1.665	1.34	0.497	0.716	0	0	0.202	FALSE	FALSE	FALSE	**2.5**	**Subunit 3**
45.5	2.86	1.45	1.41	1.61	63	N/A	N/A	N/A	N/A	N/A	0.705	0	0	0.198	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**
47.0	2.96	1.50	1.46	1.61	8	0.103	0.973	0.865	1.09	0.094	0.694	0	0	0.195	FALSE	FALSE	FALSE	**0.5**	**Subunit 3**
48.5	3.05	1.54	1.51	1.61	81	N/A	N/A	N/A	N/A	N/A	0.684	0	0	0.192	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**



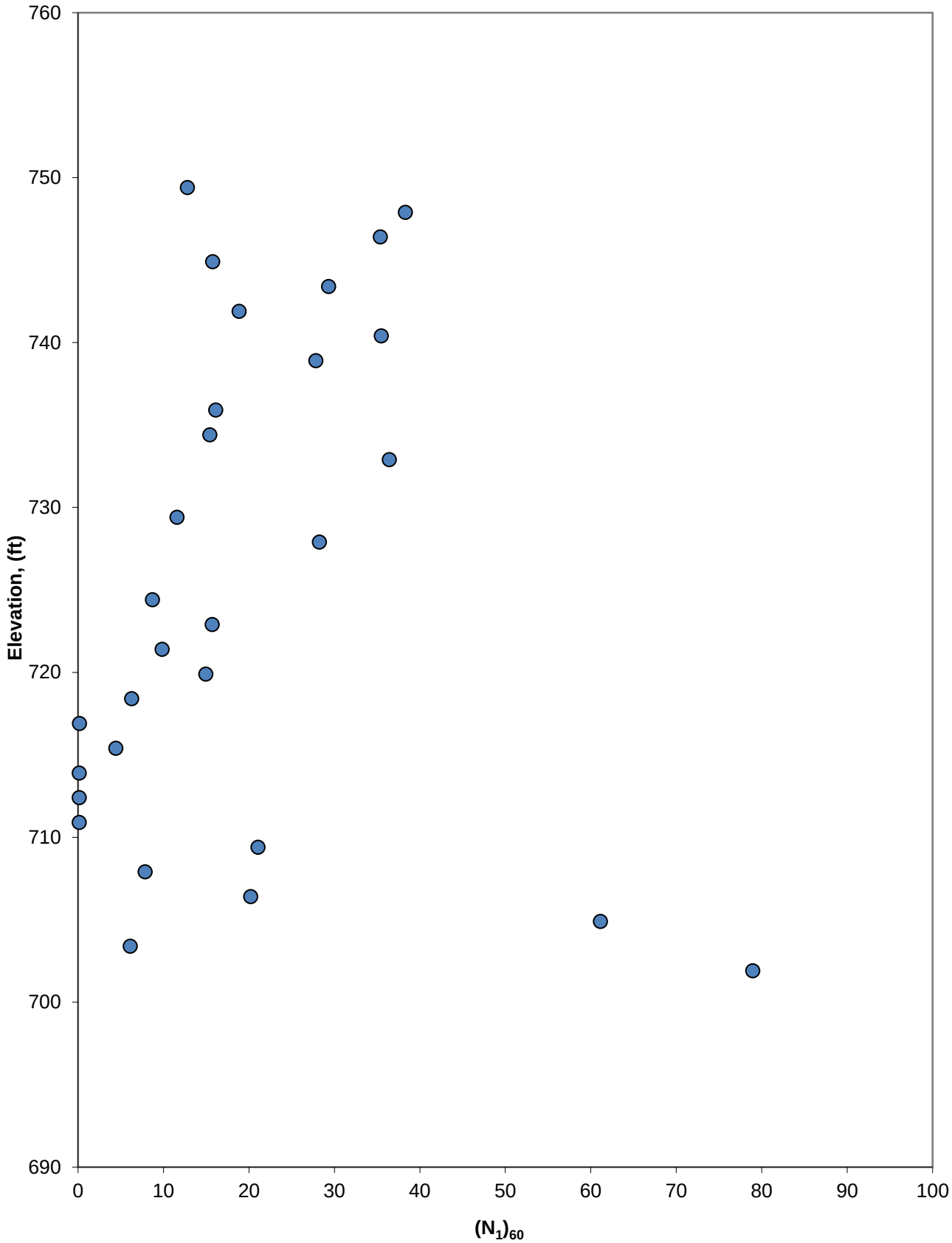
KIF-STN51, Liquefaction Triggering Results



KIF TDEC Stability, Boring ID: KIF-STN51, Source = 10 Hz, Mw = 6, Event = Design EQ,
SPT Data, Simplified Stress-Based Approach



KIF TDEC Stability, Boring ID: KIF-STN51, Source = 10 Hz, Mw = 6, Event = Design EQ, SPT Data, Simplified Stress-Based Approach



3.4 CPT-BASED LIQUEFACTION ASSESSMENT FOR SAND-LIKE SOILS

3.4.1 1 Hz Design Earthquake

Project Information

Stantec Project Number =	175668043
Project Name =	KIF TDEC Stability
CPT ID =	CPT-01B

Boring Location (optional)

Northing =	
Easting =	

OR

Baseline Station =	
Offset (+ Right) =	

Using qt (corrected for u2 PWP) or qc (backcalculated uncorrected field tip)

Cone ID (optional) =	AD184	
Use qc instead of qt?	0	(1: Yes, 0: No)
Cone Area Ratio (a) =	0.80	

Drilling Information

Top of Hole Elevation =	755.0	feet
Water Depth during CPT (negative for U/S borings) =	3.0	feet
Depth data collection began =	0.16	feet
Avg. Total Unit Wt. Above 1st Sample =	120.00	pcf

During Earthquake Information

Water Depth during EQ (relative to CPT TOH, negative for U/S borings) =	5.9	feet
Final Grade Elevation during EQ =	755.3	feet
Avg. Total Unit Wt. of Cut/Fill =	120	pcf

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile?	0	(1: Yes, 0: No)

If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile:	Section_AA, KIF-A2_NOR	
α at each Sample Depth known?	1	(1: Yes, 0: No)

If previous answer is No, then enter curve fit parameters below (α vs. depth curve)
If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_α will be one.

m4:	
m3:	
m2:	
m1:	
m0:	

Associated ground response profile:	Section_AA, KIF-A2_NOR	
Get CSR from shear stress envelope?	0	(1: Yes, 0: No)

If previous answer is No, then CSR will be calculated using a_{max} and r_d

Max. Shear Stress at each sample depth known?		(1: Yes, 0: No)

If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4:	
m3:	
m2:	
m1:	

Earthquake Information

EQ Source (e.g., New Madrid)	1 Hz
Event (e.g., MCE, OBE)	Design EQ
a_{max} (g) (top of ground surface)	0.09
EQ Mag (Mw)	7.6

Inputs

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
0.164	88.969	0.130	120	Clay Fill (irrelevant)	Clay-like		0.002			
0.328	160.211	0.385	120	Clay Fill (irrelevant)	Clay-like		0.001			
0.492	189.295	0.926	120	Clay Fill (irrelevant)	Clay-like		0.000			
0.656	129.389	1.029	120	Clay Fill (irrelevant)	Clay-like		0.003			
0.820	260.216	1.229	120	Clay Fill (irrelevant)	Clay-like		0.005			
0.984	254.916	1.247	120	Clay Fill (irrelevant)	Clay-like		0.008			
1.148	276.126	1.376	120	Clay Fill (irrelevant)	Clay-like		0.011			
1.312	318.196	1.795	120	Clay Fill (irrelevant)	Clay-like		0.014			
1.476	310.323	2.259	120	Clay Fill (irrelevant)	Clay-like		0.017			
1.640	249.632	2.112	119	Bottom Ash	Sand-like		0.017			
1.804	201.828	2.091	119	Bottom Ash	Sand-like		0.016			
1.968	153.270	2.034	119	Bottom Ash	Sand-like		0.015			
2.133	117.632	1.502	119	Bottom Ash	Sand-like		0.014			
2.297	76.819	1.251	119	Bottom Ash	Sand-like		0.013			
2.461	46.992	1.208	119	Bottom Ash	Sand-like		0.013			
2.625	31.230	1.267	119	Bottom Ash	Sand-like		0.015			
2.789	28.340	1.322	119	Bottom Ash	Sand-like		0.016			
2.953	22.897	1.260	119	Bottom Ash	Sand-like		0.018			
3.117	23.085	1.022	119	Bottom Ash	Sand-like		0.019			
3.281	24.177	0.952	119	Bottom Ash	Sand-like		0.020			
3.445	23.802	0.940	119	Bottom Ash	Sand-like		0.021			
3.609	24.054	0.949	128	Embankment Fill	Clay-like		0.022			
3.773	23.418	0.957	128	Embankment Fill	Clay-like		0.023			
3.937	25.668	0.945	128	Embankment Fill	Clay-like		0.024			
4.101	23.592	0.936	128	Embankment Fill	Clay-like		0.025			
4.265	19.766	0.904	128	Embankment Fill	Clay-like		0.026			
4.429	18.474	0.930	128	Embankment Fill	Clay-like		0.027			
4.593	25.216	1.425	128	Embankment Fill	Clay-like		0.029			
4.757	68.151	1.985	128	Embankment Fill	Clay-like		0.030			
4.921	100.806	1.852	128	Embankment Fill	Clay-like		0.032			
5.085	126.317	2.363	128	Embankment Fill	Clay-like		0.035			
5.249	102.408	2.396	128	Embankment Fill	Clay-like		0.037			
5.413	54.593	2.205	128	Embankment Fill	Clay-like		0.039			
5.577	71.072	1.575	128	Embankment Fill	Clay-like		0.041			
5.741	337.961	1.809	128	Embankment Fill	Clay-like		0.042			
5.905	420.084	2.530	128	Embankment Fill	Clay-like		0.043			
6.069	465.042	2.608	128	Embankment Fill	Clay-like		0.044			
6.234	536.124	2.395	128	Embankment Fill	Clay-like		0.045			
6.398	485.173	1.375	128	Embankment Fill	Clay-like		0.046			
6.562	416.597	1.562	128	Embankment Fill	Clay-like		0.047			
6.726	372.316	1.650	128	Embankment Fill	Clay-like		0.048			
6.890	316.937	1.613	128	Embankment Fill	Clay-like		0.049			
7.054	284.756	1.308	128	Embankment Fill	Clay-like		0.051			
7.218	280.841	1.081	128	Embankment Fill	Clay-like		0.052			
7.382	236.891	0.904	128	Embankment Fill	Clay-like		0.053			
7.546	164.930	1.271	128	Embankment Fill	Clay-like		0.055			
7.710	124.648	1.591	128	Embankment Fill	Clay-like		0.056			
7.874	72.990	1.990	128	Embankment Fill	Clay-like		0.057			
8.038	44.393	2.212	128	Embankment Fill	Clay-like		0.058			
8.202	36.209	1.884	128	Embankment Fill	Clay-like		0.059			
8.366	28.709	2.171	128	Embankment Fill	Clay-like		0.059			
8.530	35.044	3.400	128	Embankment Fill	Clay-like		0.060			
8.694	399.820	10.333	128	Embankment Fill	Clay-like		0.061			
8.858	432.322	6.256	128	Embankment Fill	Clay-like		0.061			
9.022	324.642	5.573	128	Embankment Fill	Clay-like		0.062			
9.186	106.471	3.866	128	Embankment Fill	Clay-like		0.063			
9.350	52.510	4.022	128	Embankment Fill	Clay-like		0.064			
9.514	49.314	4.014	128	Embankment Fill	Clay-like		0.065			
9.678	42.805	2.076	128	Embankment Fill	Clay-like		0.066			
9.842	39.860	2.090	128	Embankment Fill	Clay-like		0.067			
10.006	48.173	2.264	128	Embankment Fill	Clay-like		0.068			
10.170	47.802	2.254	128	Embankment Fill	Clay-like		0.068			
10.335	36.557	2.152	128	Embankment Fill	Clay-like		0.069			

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
10.499	29.872	1.865	128	Embankment Fill	Clay-like		0.070			
10.663	34.388	1.862	128	Embankment Fill	Clay-like		0.070			
10.827	42.176	2.065	128	Embankment Fill	Clay-like		0.071			
10.991	52.562	2.510	128	Embankment Fill	Clay-like		0.071			
11.155	58.835	3.734	128	Embankment Fill	Clay-like		0.072			
11.319	70.139	0.010	128	Embankment Fill	Clay-like		0.072			
11.483	426.751	0.010	128	Embankment Fill	Clay-like		0.073			

LIQUEFACTION POTENTIAL ASSESSMENT FOR COARSE GRAINED SOILS USING CONE PENETRATION TEST DATA

Facility: KIF TDEC Stability
Project No.: 175668043
CPT ID: CPT-01B

Water Elevation during CPT:	752.0	ft
Depth to Water during CPT:	3.0	ft *(relative to ground surface during CPT)*
Water Elevation during Earthquake:	749.1	ft
Depth to Water during Earthquake:	5.9	ft *(relative to ground surface during CPT)*
Final Grade Elevation during EQ:	755.3	ft *(if no fill, then set this equal to top of CPT hole elev.)*
Height of Final Grade above CPT TOH:	0.3	ft *(relative to ground surface during CPT, + Fill, - Cut)*
Unit Weight of Cut/Fill to Achieve Final Grade	120	pcf
Cut/Fill Total Stress (+ Fill, - Cut):	0.02	tsf

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
755.0				Vertical Stresses above 1st CPT:			**0.01**	**0.03**	**0.00**	**0.00**	**0.01**	**0.03**
754.8	0.164	88.97	0.13	120	**0.16**	0.09	0.01	0.03	0.00	0.00	0.01	0.03
754.7	0.328	160.21	0.39	120	0.25	0.16	0.02	0.04	0.00	0.00	0.02	0.04
754.5	0.492	189.30	0.93	120	0.41	0.16	0.03	0.05	0.00	0.00	0.03	0.05
754.3	0.656	129.39	1.03	120	0.57	0.16	0.04	0.06	0.00	0.00	0.04	0.06
754.2	0.820	260.22	1.23	120	0.74	0.16	0.05	0.07	0.00	0.00	0.05	0.07
754.0	0.984	254.92	1.25	120	0.90	0.16	0.06	0.08	0.00	0.00	0.06	0.08
753.9	1.148	276.13	1.38	120	1.07	0.16	0.07	0.09	0.00	0.00	0.07	0.09
753.7	1.312	318.20	1.80	120	1.23	0.16	0.08	0.10	0.00	0.00	0.08	0.10
753.5	1.476	310.32	2.26	120	1.39	0.16	0.09	0.11	0.00	0.00	0.09	0.11
753.4	1.640	249.63	2.11	119	1.56	0.16	0.10	0.12	0.00	0.00	0.10	0.12
753.2	1.804	201.83	2.09	119	1.72	0.16	0.11	0.13	0.00	0.00	0.11	0.13
753.0	1.968	153.27	2.03	119	1.89	0.16	0.12	0.14	0.00	0.00	0.12	0.14
752.9	2.133	117.63	1.50	119	2.05	0.16	0.13	0.15	0.00	0.00	0.13	0.15
752.7	2.297	76.82	1.25	119	2.21	0.16	0.14	0.16	0.00	0.00	0.14	0.16
752.5	2.461	46.99	1.21	119	2.38	0.16	0.15	0.17	0.00	0.00	0.15	0.17
752.4	2.625	31.23	1.27	119	2.54	0.16	0.16	0.17	0.00	0.00	0.16	0.17
752.2	2.789	28.34	1.32	119	2.71	0.16	0.17	0.18	0.00	0.00	0.17	0.18
752.0	2.953	22.90	1.26	119	2.87	0.16	0.18	0.19	0.00	0.00	0.18	0.19
751.9	3.117	23.09	1.02	119	3.03	0.16	0.19	0.20	0.00	0.00	0.18	0.20
751.7	3.281	24.18	0.95	119	3.20	0.16	0.20	0.21	0.01	0.00	0.19	0.21
751.6	3.445	23.80	0.94	119	3.36	0.16	0.21	0.22	0.01	0.00	0.19	0.22
751.4	3.609	24.05	0.95	128	3.53	0.16	0.22	0.23	0.02	0.00	0.20	0.23
751.2	3.773	23.42	0.96	128	3.69	0.16	0.23	0.24	0.02	0.00	0.20	0.24
751.1	3.937	25.67	0.95	128	3.85	0.16	0.24	0.25	0.03	0.00	0.21	0.25
750.9	4.101	23.59	0.94	128	4.02	0.16	0.25	0.27	0.03	0.00	0.21	0.27
750.7	4.265	19.77	0.90	128	4.18	0.16	0.26	0.28	0.04	0.00	0.22	0.28
750.6	4.429	18.47	0.93	128	4.35	0.16	0.27	0.29	0.04	0.00	0.22	0.29
750.4	4.593	25.22	1.43	128	4.51	0.16	0.28	0.30	0.05	0.00	0.23	0.30
750.2	4.757	68.15	1.99	128	4.68	0.16	0.29	0.31	0.05	0.00	0.23	0.31
750.1	4.921	100.81	1.85	128	4.84	0.16	0.30	0.32	0.06	0.00	0.24	0.32
749.9	5.085	126.32	2.36	128	5.00	0.16	0.31	0.33	0.07	0.00	0.25	0.33
749.8	5.249	102.41	2.40	128	5.17	0.16	0.32	0.34	0.07	0.00	0.25	0.34
749.6	5.413	54.59	2.21	128	5.33	0.16	0.33	0.35	0.08	0.00	0.26	0.35
749.4	5.577	71.07	1.58	128	5.50	0.16	0.34	0.36	0.08	0.00	0.26	0.36
749.3	5.741	337.96	1.81	128	5.66	0.16	0.35	0.37	0.09	0.00	0.27	0.37
749.1	5.905	420.08	2.53	128	5.82	0.16	0.36	0.38	0.09	0.00	0.27	0.38
748.9	6.069	465.04	2.61	128	5.99	0.16	0.37	0.39	0.10	0.01	0.28	0.39
748.8	6.234	536.12	2.40	128	6.15	0.16	0.38	0.40	0.10	0.01	0.28	0.39
748.6	6.398	485.17	1.38	128	6.32	0.16	0.39	0.41	0.11	0.02	0.29	0.40
748.4	6.562	416.60	1.56	128	6.48	0.16	0.40	0.42	0.11	0.02	0.29	0.40
748.3	6.726	372.32	1.65	128	6.64	0.16	0.42	0.43	0.12	0.03	0.30	0.41
748.1	6.890	316.94	1.61	128	6.81	0.16	0.43	0.44	0.12	0.03	0.30	0.41
747.9	7.054	284.76	1.31	128	6.97	0.16	0.44	0.45	0.13	0.04	0.31	0.42
747.8	7.218	280.84	1.08	128	7.14	0.16	0.45	0.46	0.13	0.04	0.32	0.42
747.6	7.382	236.89	0.90	128	7.30	0.16	0.46	0.48	0.14	0.05	0.32	0.43
747.5	7.546	164.93	1.27	128	7.46	0.16	0.47	0.49	0.14	0.05	0.33	0.43
747.3	7.710	124.65	1.59	128	7.63	0.16	0.48	0.50	0.15	0.06	0.33	0.44
747.1	7.874	72.99	1.99	128	7.79	0.16	0.49	0.51	0.15	0.06	0.34	0.45
747.0	8.038	44.39	2.21	128	7.96	0.16	0.50	0.52	0.16	0.07	0.34	0.45
746.8	8.202	36.21	1.88	128	8.12	0.16	0.51	0.53	0.16	0.07	0.35	0.46
746.6	8.366	28.71	2.17	128	8.28	0.16	0.52	0.54	0.17	0.08	0.35	0.46
746.5	8.530	35.04	3.40	128	8.45	0.16	0.53	0.55	0.17	0.08	0.36	0.47
746.3	8.694	399.82	10.33	128	8.61	0.16	0.54	0.56	0.18	0.09	0.36	0.47
746.1	8.858	432.32	6.26	128	8.78	0.16	0.55	0.57	0.18	0.09	0.37	0.48
746.0	9.022	324.64	5.57	128	8.94	0.16	0.56	0.58	0.19	0.10	0.37	0.48
745.8	9.186	106.47	3.87	128	9.10	0.16	0.57	0.59	0.19	0.10	0.38	0.49
745.6	9.350	52.51	4.02	128	9.27	0.16	0.58	0.60	0.20	0.11	0.39	0.49
745.5	9.514	49.31	4.01	128	9.43	0.16	0.59	0.61	0.20	0.11	0.39	0.50

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
745.3	9.678	42.80	2.08	128	9.60	0.16	0.60	0.62	0.21	0.12	0.40	0.50
745.2	9.842	39.86	2.09	128	9.76	0.16	0.61	0.63	0.21	0.12	0.40	0.51
745.0	10.006	48.17	2.26	128	9.92	0.16	0.63	0.64	0.22	0.13	0.41	0.52
744.8	10.170	47.80	2.25	128	10.09	0.16	0.64	0.65	0.22	0.13	0.41	0.52
744.7	10.335	36.56	2.15	128	10.25	0.16	0.65	0.66	0.23	0.14	0.42	0.53
744.5	10.499	29.87	1.87	128	10.42	0.16	0.66	0.67	0.23	0.14	0.42	0.53
744.3	10.663	34.39	1.86	128	10.58	0.16	0.67	0.69	0.24	0.15	0.43	0.54
744.2	10.827	42.18	2.07	128	10.74	0.16	0.68	0.70	0.24	0.15	0.43	0.54
744.0	10.991	52.56	2.51	128	10.91	0.16	0.69	0.71	0.25	0.16	0.44	0.55
743.8	11.155	58.83	3.73	128	11.07	0.16	0.70	0.72	0.25	0.16	0.44	0.55
743.7	11.319	70.14	0.01	128	11.24	0.16	0.71	0.73	0.26	0.17	0.45	0.56
743.5	11.483	426.75	0.01	128	11.40	0.08	0.72	0.74	0.26	0.17	0.46	0.56

LIQUEFACTION POTENTIAL ASSESSMENT FOR COARSE GRAINED SOILS USING CONE PENETRATION TEST DATA

Project Site: KIF TDEC Stability
Project No.: 175668043
CPT ID: CPT-01B

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
755.0												
754.8	0.164	871.76	0.15	0.66	0.5	1.70	142.96	0	0.00	142.96	0.002	-0.600
754.7	0.328	1110.02	0.24	0.74	0.5	1.70	257.43	0	0.00	257.43	0.001	-0.600
754.5	0.492	1070.82	0.49	1.01	0.5	1.70	304.16	0	0.00	304.16	0.000	-0.600
754.3	0.656	633.79	0.80	1.30	0.5	1.70	207.90	0	0.00	207.90	0.003	-0.600
754.2	0.820	1140.18	0.47	0.99	0.5	1.70	418.12	0	0.00	418.12	0.005	-0.600
754.0	0.984	1019.59	0.49	1.02	0.5	1.70	409.60	0	0.00	409.60	0.008	-0.600
753.9	1.148	1022.48	0.50	1.03	0.5	1.70	443.68	0	0.00	443.68	0.011	-0.600
753.7	1.312	1102.17	0.56	1.06	0.5	1.70	511.28	0	0.00	511.28	0.014	-0.600
753.5	1.476	1013.39	0.73	1.18	0.5	1.70	498.63	0	0.00	498.63	0.017	-0.600
753.4	1.640	773.44	0.85	1.29	0.5	1.70	401.11	0	0.00	401.11	0.017	-0.600
753.2	1.804	596.36	1.04	1.42	0.5	1.70	324.30	0	0.00	324.30	0.016	-0.600
753.0	1.968	433.63	1.33	1.58	0.5	1.70	246.27	0	0.00	246.27	0.015	-0.600
752.9	2.133	319.72	1.28	1.64	0.5	1.70	189.01	0	0.00	189.01	0.014	-0.600
752.7	2.297	201.10	1.63	1.85	0.5	1.70	123.43	11	10.81	134.24	0.013	-0.550
752.5	2.461	118.71	2.58	2.15	0.5	1.70	75.51	35	55.75	131.26	0.013	-0.539
752.4	2.625	76.26	4.08	2.42	0.5	1.70	50.18	57	61.82	112.00	0.015	-0.467
752.2	2.789	67.08	4.69	2.51	0.5	1.70	45.54	63	62.40	107.94	0.016	-0.450
752.0	2.953	75.23	5.55	2.53	0.7	1.70	36.79	65	60.35	97.14	0.018	-0.404
751.9	3.117	52.10	4.46	2.56	0.5	1.70	37.09	68	61.03	98.12	0.019	-0.407
751.7	3.281	53.88	3.97	2.52	0.5	1.70	38.85	64	60.70	99.54	0.020	-0.413
751.6	3.445	52.37	3.98	2.53	0.5	1.70	38.24	65	60.70	98.95	0.021	-0.409
751.4	3.609	52.23	3.98	2.53	0.5	1.70	38.65	65	60.83	99.48	0.022	-0.411
751.2	3.773	50.13	4.13	2.55	0.5	1.70	37.63	67	60.96	98.59	0.023	-0.406
751.1	3.937	54.26	3.72	2.49	0.5	1.70	41.24	62	60.93	102.17	0.024	-0.420
750.9	4.101	49.17	4.01	2.55	0.5	1.70	37.91	67	60.98	98.89	0.025	-0.406
750.7	4.265	55.64	4.63	2.56	0.7	1.70	31.76	67	59.36	91.12	0.026	-0.371
750.6	4.429	51.05	5.11	2.61	0.7	1.70	29.68	72	59.63	89.31	0.027	-0.361
750.4	4.593	68.77	5.71	2.56	0.7	1.70	40.52	68	62.03	102.55	0.029	-0.419
750.2	4.757	136.23	2.93	2.15	0.5	1.70	109.51	35	63.72	173.23	0.030	-0.600
750.1	4.921	199.49	1.84	1.89	0.5	1.68	159.94	14	25.35	185.29	0.032	-0.600
749.9	5.085	247.34	1.88	1.84	0.5	1.61	191.92	10	11.26	203.17	0.035	-0.600
749.8	5.249	198.23	2.35	1.98	0.5	1.60	154.76	21	47.53	202.29	0.037	-0.600
749.6	5.413	104.25	4.06	2.34	0.5	1.70	87.72	50	69.15	156.87	0.039	-0.600
749.4	5.577	134.48	2.23	2.06	0.5	1.69	113.23	28	55.30	168.53	0.041	-0.600
749.3	5.741	635.41	0.54	1.16	0.5	1.44	458.90	0	0.00	458.90	0.042	-0.600
749.1	5.905	782.11	0.60	1.15	0.5	1.43	567.43	0	0.00	567.43	0.043	-0.600
748.9	6.069	857.43	0.56	1.11	0.5	1.42	624.93	0	0.00	624.93	0.044	-0.600
748.8	6.234	979.14	0.45	0.99	0.5	1.41	716.82	0	0.00	716.82	0.045	-0.600
748.6	6.398	877.69	0.28	0.85	0.5	1.41	645.49	0	0.00	645.49	0.046	-0.600
748.4	6.562	746.58	0.38	0.99	0.5	1.40	551.57	0	0.00	551.57	0.047	-0.600
748.3	6.726	661.10	0.44	1.08	0.5	1.39	490.59	0	0.00	490.59	0.048	-0.600
748.1	6.890	557.65	0.51	1.18	0.5	1.39	415.67	0	0.00	415.67	0.049	-0.600
747.9	7.054	496.56	0.46	1.17	0.5	1.38	371.75	0	0.00	371.75	0.051	-0.600
747.8	7.218	485.51	0.39	1.12	0.5	1.37	364.98	0	0.00	364.98	0.052	-0.600
747.6	7.382	405.94	0.38	1.18	0.5	1.37	306.49	0	0.00	306.49	0.053	-0.600
747.5	7.546	280.03	0.77	1.51	0.5	1.42	222.09	0	0.00	222.09	0.055	-0.600
747.3	7.710	209.70	1.28	1.76	0.5	1.52	178.64	3	0.00	178.64	0.056	-0.600
747.1	7.874	121.46	2.74	2.16	0.5	1.53	105.65	36	63.68	169.33	0.057	-0.600
747.0	8.038	72.95	5.04	2.51	0.5	1.62	67.84	63	68.74	136.58	0.058	-0.538
746.8	8.202	58.87	5.28	2.58	0.5	1.65	56.46	70	66.96	123.42	0.059	-0.491
746.6	8.366	79.88	7.70	2.63	1.0	1.69	45.74	73	64.54	110.29	0.059	-0.441
746.5	8.530	96.33	9.85	2.67	1.0	1.63	54.09	76	67.59	121.68	0.060	-0.484
746.3	8.694	643.69	2.59	1.76	0.5	1.32	500.44	4	0.04	500.48	0.061	-0.600
746.1	8.858	690.98	1.45	1.52	0.5	1.32	539.03	0	0.00	539.03	0.061	-0.600
746.0	9.022	514.90	1.72	1.64	0.5	1.31	403.24	0	0.00	403.24	0.062	-0.600
745.8	9.186	167.06	3.65	2.18	0.5	1.38	138.84	37	72.49	211.33	0.063	-0.600
745.6	9.350	99.56	7.75	2.57	0.7	1.51	74.92	69	72.15	147.07	0.064	-0.570
745.5	9.514	92.51	8.24	2.61	0.7	1.51	70.55	72	71.60	142.15	0.065	-0.554
745.3	9.678	65.20	4.92	2.53	0.5	1.54	62.20	65	67.64	129.84	0.066	-0.512
745.2	9.842	60.23	5.33	2.58	0.5	1.54	58.05	69	67.36	125.40	0.067	-0.496

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
745.0	10.006	72.48	4.76	2.49	0.5	1.50	68.36	62	68.51	136.87	0.068	-0.536
744.8	10.170	71.43	4.78	2.49	0.5	1.50	67.56	63	68.40	135.96	0.068	-0.532
744.7	10.335	65.08	5.99	2.60	0.7	1.53	52.90	71	66.16	119.06	0.069	-0.472
744.5	10.499	52.47	6.38	2.68	0.7	1.55	43.82	77	64.68	108.50	0.070	-0.431
744.3	10.663	60.03	5.52	2.59	0.7	1.53	49.57	70	65.11	114.68	0.070	-0.455
744.2	10.827	61.27	4.98	2.55	0.5	1.49	59.23	67	67.21	126.44	0.071	-0.498
744.0	10.991	76.11	4.84	2.48	0.5	1.44	71.75	61	69.27	141.02	0.071	-0.548
743.8	11.155	84.79	6.42	2.55	0.5	1.42	78.70	67	72.75	151.45	0.072	-0.581
743.7	11.319	100.65	0.15	1.52	0.5	1.53	101.24	0	0.00	101.24	0.072	-0.400
743.5	11.483	613.94	0.15	0.79	0.5	1.25	503.54	0	0.00	503.54	0.073	-0.600

LIQUEFACTION POTENTIAL ASSESSMENT FOR COARSE GRAINED SOILS USING CONE PENETRATION TEST DATA

Project Site: **KIF TDEC Stability**
Stantec Project No.: **175668043**
CPT ID: **CPT-01B**

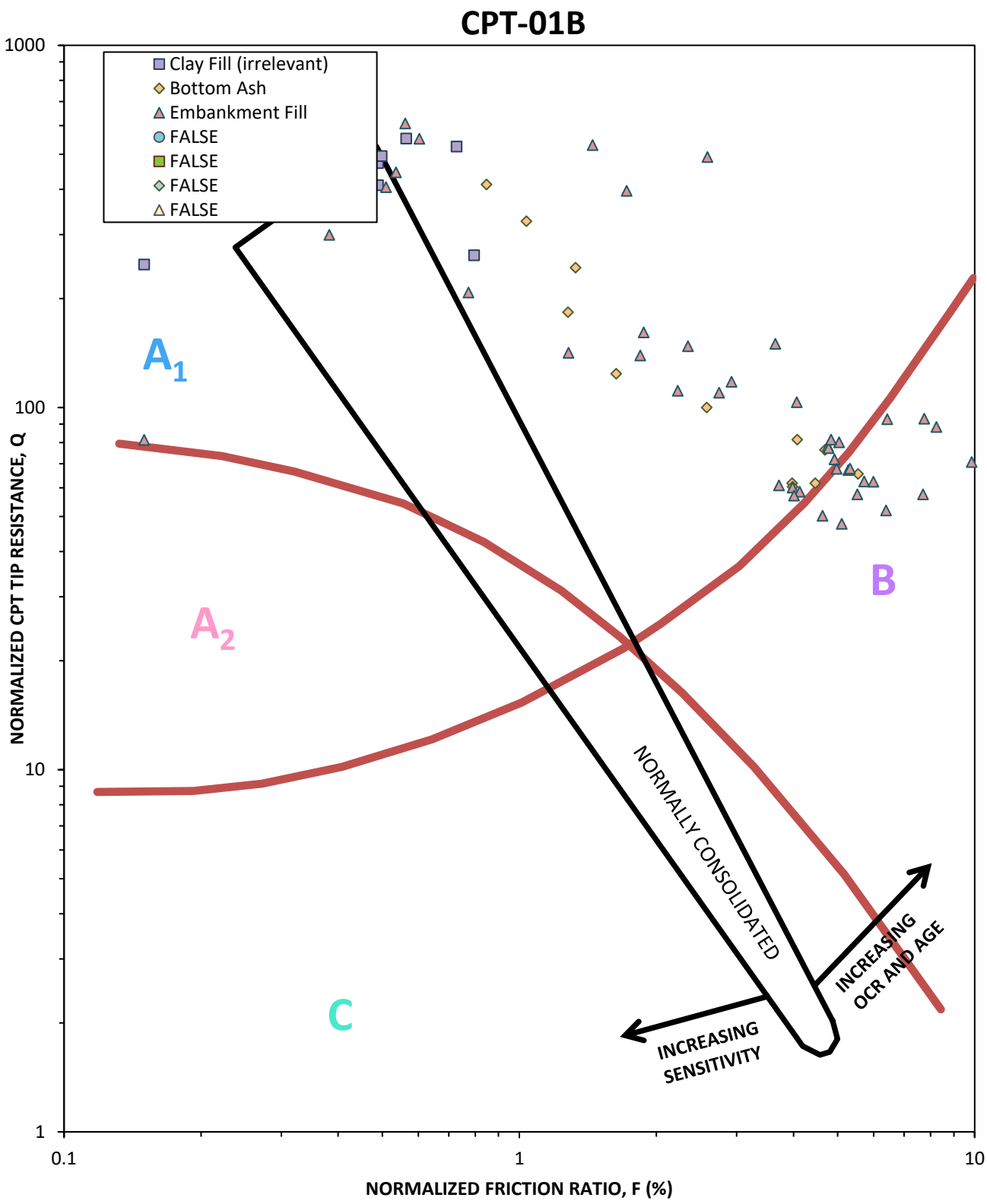
Depth to Water during Earthquake:	5.9	ft
Final Grade Elevation during EQ:	755.3	ft
Height of Final Grade above CPT TOH:	0.3	ft
Normalize K_σ to:	1.058	tsf
a_{max} at top of ground surface:	0.09	g
Earthquake Magnitude:	7.60	M_W
Earthquake File or Source Zone:	1	Hz

Shear Stress Fit Parameters

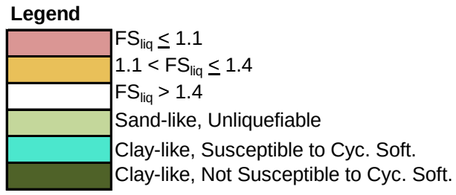
m4:	0
m3:	0
m2:	0
m1:	0

Elev. (ft)	Depth *z* (ft)	Cyclic Resistance Ratio *CRR 7.5*	Relative Density *D r* (%)	Correction for Overburden Pressure *K σ*	Correction for Sloping Ground *K α*	Magnitude Scaling Factor *MSF*	Cyclic Resistance Ratio *CRR*	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress *τ Max* (psf)	From Ground Response: Average Cyclic Shear Stress *τ Avg* (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. *(qc 1N) CS ≥ 175*	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
755.0																	
754.8	0.164	N/A	71	N/A	N/A	N/A	N/A	1.000	0	0	**0.058**	TRUE	FALSE	TRUE	**N/A**	**Clay Fill (irrelevant)**	**A1**
754.7	0.328	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.058**	TRUE	TRUE	TRUE	**N/A**	**Clay Fill (irrelevant)**	**A1**
754.5	0.492	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.058**	TRUE	TRUE	TRUE	**N/A**	**Clay Fill (irrelevant)**	**A1**
754.3	0.656	N/A	89	N/A	N/A	N/A	N/A	1.000	0	0	**0.058**	TRUE	TRUE	TRUE	**N/A**	**Clay Fill (irrelevant)**	**A1**
754.2	0.820	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.058**	TRUE	TRUE	TRUE	**N/A**	**Clay Fill (irrelevant)**	**A1**
754.0	0.984	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.058**	TRUE	TRUE	TRUE	**N/A**	**Clay Fill (irrelevant)**	**A1**
753.9	1.148	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.058**	TRUE	TRUE	TRUE	**N/A**	**Clay Fill (irrelevant)**	**A1**
753.7	1.312	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.058**	TRUE	TRUE	TRUE	**N/A**	**Clay Fill (irrelevant)**	**A1**
753.5	1.476	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.058**	TRUE	TRUE	TRUE	**N/A**	**Clay Fill (irrelevant)**	**A1**
753.4	1.640	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.058**	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**	**A1**
753.2	1.804	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.058**	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**	**A1**
753.0	1.968	N/A	98	N/A	N/A	N/A	N/A	1.000	0	0	**0.058**	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**	**A1**
752.9	2.133	N/A	84	N/A	N/A	N/A	N/A	1.000	0	0	**0.058**	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**	**A1**
752.7	2.297	0.211	68	1.100	N/A	0.98	N/A	1.000	0	0	**0.058**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**A1**
752.5	2.461	0.201	67	1.100	N/A	0.98	N/A	1.000	0	0	**0.058**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**A1**
752.4	2.625	0.155	60	1.100	N/A	0.99	N/A	1.000	0	0	**0.058**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**A1**
752.2	2.789	0.149	58	1.100	N/A	0.99	N/A	1.000	0	0	**0.058**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**A1**
752.0	2.953	0.134	54	1.100	N/A	0.99	N/A	1.000	0	0	**0.058**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**B**
751.9	3.117	0.135	54	1.100	N/A	0.99	N/A	0.999	0	0	**0.058**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**A1**
751.7	3.281	0.137	55	1.100	N/A	0.99	N/A	0.999	0	0	**0.058**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**A1**
751.6	3.445	0.136	55	1.100	N/A	0.99	N/A	0.999	0	0	**0.058**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**A1**
751.4	3.609	N/A	55	N/A	N/A	N/A	N/A	0.998	0	0	**0.058**	TRUE	FALSE	TRUE	**N/A**	**Embankment Fill**	**A1**
751.2	3.773	N/A	54	N/A	N/A	N/A	N/A	0.998	0	0	**0.058**	TRUE	FALSE	TRUE	**N/A**	**Embankment Fill**	**A1**
751.1	3.937	N/A	56	N/A	N/A	N/A	N/A	0.997	0	0	**0.058**	TRUE	FALSE	TRUE	**N/A**	**Embankment Fill**	**A1**
750.9	4.101	N/A	54	N/A	N/A	N/A	N/A	0.997	0	0	**0.058**	TRUE	FALSE	TRUE	**N/A**	**Embankment Fill**	**A1**
750.7	4.265	N/A	51	N/A	N/A	N/A	N/A	0.997	0	0	**0.058**	TRUE	FALSE	TRUE	**N/A**	**Embankment Fill**	**B**
750.6	4.429	N/A	50	N/A	N/A	N/A	N/A	0.996	0	0	**0.058**	TRUE	FALSE	TRUE	**N/A**	**Embankment Fill**	**B**
750.4	4.593	N/A	56	N/A	N/A	N/A	N/A	0.996	0	0	**0.058**	TRUE	FALSE	TRUE	**N/A**	**Embankment Fill**	**B**
750.2	4.757	N/A	80	N/A	N/A	N/A	N/A	0.996	0	0	**0.058**	TRUE	FALSE	TRUE	**N/A**	**Embankment Fill**	**A1**
750.1	4.921	N/A	83	N/A	N/A	N/A	N/A	0.995	0	0	**0.058**	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**	**A1**
749.9	5.085	N/A	88	N/A	N/A	N/A	N/A	0.995	0	0	**0.058**	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**	**A1**
749.8	5.249	N/A	88	N/A	N/A	N/A	N/A	0.994	0	0	**0.058**	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**	**A1**
749.6	5.413	N/A	75	N/A	N/A	N/A	N/A	0.994	0	0	**0.058**	TRUE	FALSE	TRUE	**N/A**	**Embankment Fill**	**A1**
749.4	5.577	N/A	79	N/A	N/A	N/A	N/A	0.994	0	0	**0.058**	TRUE	FALSE	TRUE	**N/A**	**Embankment Fill**	**A1**
749.3	5.741	N/A	100	N/A	N/A	N/A	N/A	0.993	0	0	**0.058**	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**	**A1**
749.1	5.905	N/A	100	N/A	N/A	N/A	N/A	0.993	0	0	**0.058**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
748.9	6.069	N/A	100	N/A	N/A	N/A	N/A	0.992	0	0	**0.058**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
748.8	6.234	N/A	100	N/A	N/A	N/A	N/A	0.992	0	0	**0.059**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
748.6	6.398	N/A	100	N/A	N/A	N/A	N/A	0.992	0	0	**0.060**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
748.4	6.562	N/A	100	N/A	N/A	N/A	N/A	0.991	0	0	**0.060**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
748.3	6.726	N/A	100	N/A	N/A	N/A	N/A	0.991	0	0	**0.061**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
748.1	6.890	N/A	100	N/A	N/A	N/A	N/A	0.990	0	0	**0.062**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
747.9	7.054	N/A	100	N/A	N/A	N/A	N/A	0.990	0	0	**0.062**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
747.8	7.218	N/A	100	N/A	N/A	N/A	N/A	0.990	0	0	**0.063**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**

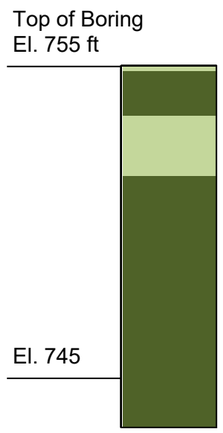
Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
747.6	7.382	N/A	100	N/A	N/A	N/A	N/A	0.989	0	0	**0.063**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
747.5	7.546	N/A	93	N/A	N/A	N/A	N/A	0.989	0	0	**0.064**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
747.3	7.710	N/A	82	N/A	N/A	N/A	N/A	0.988	0	0	**0.065**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
747.1	7.874	N/A	79	N/A	N/A	N/A	N/A	0.988	0	0	**0.065**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
747.0	8.038	N/A	69	N/A	N/A	N/A	N/A	0.987	0	0	**0.066**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
746.8	8.202	N/A	64	N/A	N/A	N/A	N/A	0.987	0	0	**0.066**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
746.6	8.366	N/A	59	N/A	N/A	N/A	N/A	0.987	0	0	**0.067**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
746.5	8.530	N/A	64	N/A	N/A	N/A	N/A	0.986	0	0	**0.067**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
746.3	8.694	N/A	100	N/A	N/A	N/A	N/A	0.986	0	0	**0.068**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
746.1	8.858	N/A	100	N/A	N/A	N/A	N/A	0.985	0	0	**0.068**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
746.0	9.022	N/A	100	N/A	N/A	N/A	N/A	0.985	0	0	**0.069**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
745.8	9.186	N/A	90	N/A	N/A	N/A	N/A	0.984	0	0	**0.069**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
745.6	9.350	N/A	72	N/A	N/A	N/A	N/A	0.984	0	0	**0.069**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
745.5	9.514	N/A	71	N/A	N/A	N/A	N/A	0.983	0	0	**0.070**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
745.3	9.678	N/A	66	N/A	N/A	N/A	N/A	0.983	0	0	**0.070**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
745.2	9.842	N/A	65	N/A	N/A	N/A	N/A	0.983	0	0	**0.071**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
745.0	10.006	N/A	69	N/A	N/A	N/A	N/A	0.982	0	0	**0.071**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
744.8	10.170	N/A	69	N/A	N/A	N/A	N/A	0.982	0	0	**0.071**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
744.7	10.335	N/A	63	N/A	N/A	N/A	N/A	0.981	0	0	**0.072**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
744.5	10.499	N/A	58	N/A	N/A	N/A	N/A	0.981	0	0	**0.072**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
744.3	10.663	N/A	61	N/A	N/A	N/A	N/A	0.980	0	0	**0.073**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
744.2	10.827	N/A	65	N/A	N/A	N/A	N/A	0.980	0	0	**0.073**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
744.0	10.991	N/A	70	N/A	N/A	N/A	N/A	0.979	0	0	**0.073**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
743.8	11.155	N/A	74	N/A	N/A	N/A	N/A	0.979	0	0	**0.074**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
743.7	11.319	N/A	55	N/A	N/A	N/A	N/A	0.978	0	0	**0.074**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
743.5	11.483	N/A	100	N/A	N/A	N/A	N/A	0.978	0	0	**0.074**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**

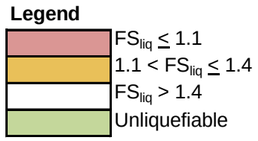


Adapted from "Discussion of 'Liquefaction Potential of Silts from CPTu'" (Robertson 2008). Zone A_1 and Zone A_2 samples are generally sand-like. Zone B samples are generally clay-like and not susceptible to cyclic softening. Zone C samples are generally clay-like and susceptible to cyclic softening. Note that the transition from clay-like to sand-like in this chart does not exactly match the liquefaction calculations herein; that is, some transitional samples in Zone B and Zone C will be treated as sand-like and analyzed for liquefaction if the calculations indicate as such.

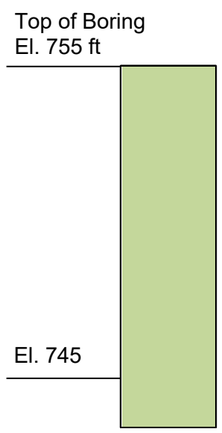


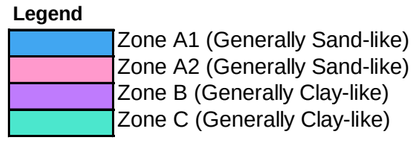
CPT-01B, Liquefaction Triggering Results



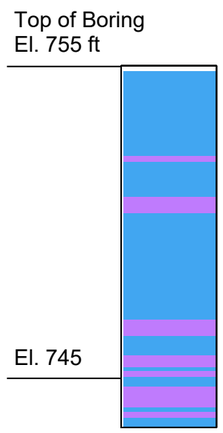


CPT-01B, Liquefaction Triggering Results

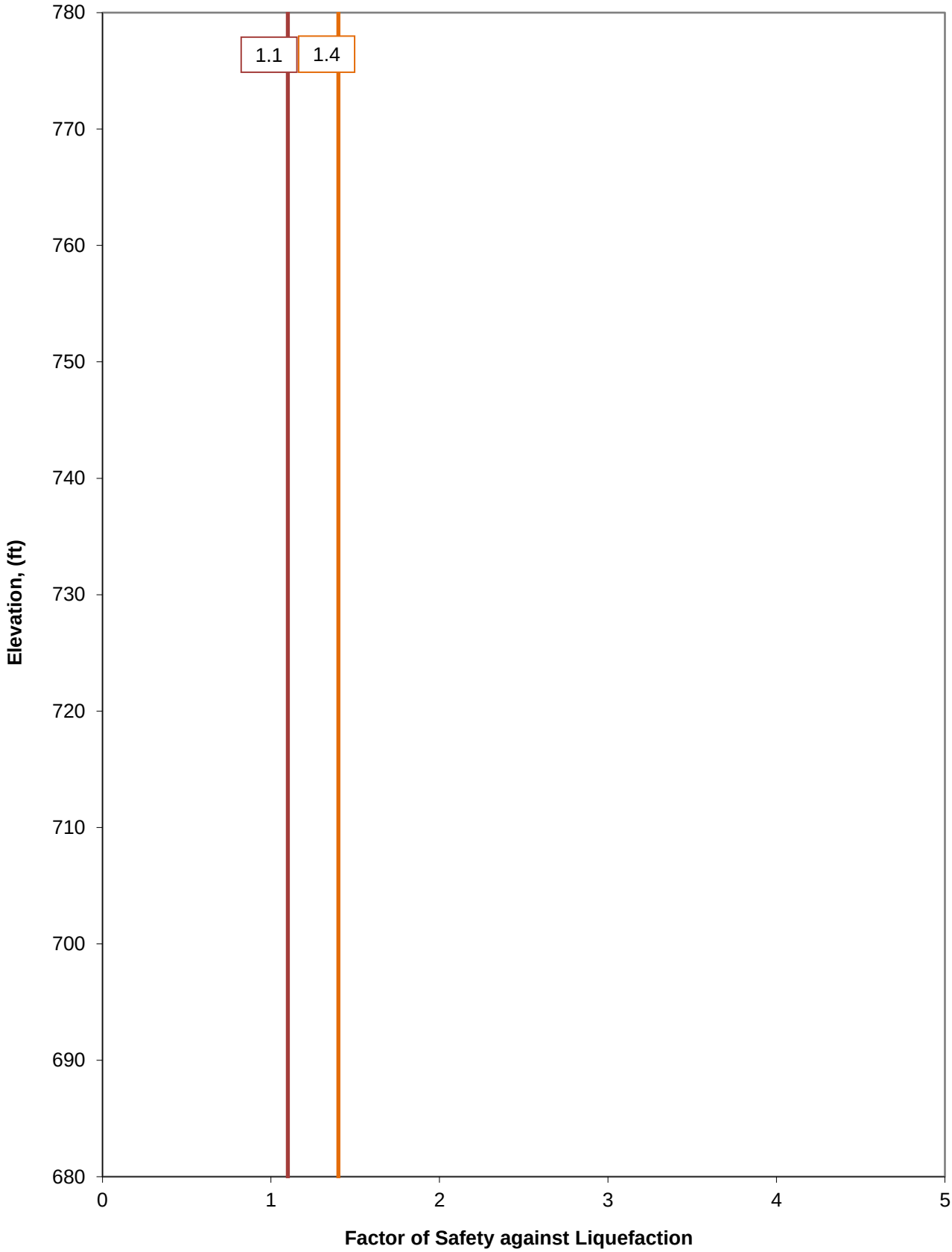




CPT-01B, Robertson Soil Type



KIF TDEC Stability, Boring = CPT-01B, Source = 1 Hz, Mw = 7.6, Event = Design EQ, CPT Data, Simplified Stress-Based Approach



Project Information

Stantec Project Number =	175668043
Project Name =	KIF TDEC Stability
CPT ID =	CPT-02D

Boring Location (optional)

Northing =	
Easting =	

OR

Baseline Station =	
Offset (+ Right) =	

Using qt (corrected for u2 PWP) or qc (backcalculated uncorrected field tip)

Cone ID (optional) =	AD184	
Use qc instead of qt?	0	(1: Yes, 0: No)
Cone Area Ratio (a) =	0.80	

Drilling Information

Top of Hole Elevation =	755.0	feet
Water Depth during CPT (negative for U/S borings) =	2.0	feet
Depth data collection began =	0.16	feet
Avg. Total Unit Wt. Above 1st Sample =	120.00	pcf

During Earthquake Information

Water Depth during EQ (relative to CPT TOH, negative for U/S borings) =	5.9	feet
Final Grade Elevation during EQ =	755.3	feet
Avg. Total Unit Wt. of Cut/Fill =	120	pcf

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile?	0	(1: Yes, 0: No)

If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile:	Section_AA, KIF-A2_NOR	
α at each Sample Depth known?	1	(1: Yes, 0: No)

If previous answer is No, then enter curve fit parameters below (α vs. depth curve)
If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_α will be one.

m4:	
m3:	
m2:	
m1:	
m0:	

Associated ground response profile:	Section_AA, KIF-A2_NOR	
Get CSR from shear stress envelope?	0	(1: Yes, 0: No)

If previous answer is No, then CSR will be calculated using a_{max} and r_d

Max. Shear Stress at each sample depth known?		(1: Yes, 0: No)

If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4:	
m3:	
m2:	
m1:	

Earthquake Information

EQ Source (e.g., New Madrid)	1 Hz
Event (e.g., MCE, OBE)	Design EQ
a_{max} (g) (top of ground surface)	0.09
EQ Mag (Mw)	7.6

Inputs

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
0.164	7.712	0.216	120	Clay Fill (irrelevant)	Clay-like		0.002			
0.328	103.424	0.643	120	Clay Fill (irrelevant)	Clay-like		0.001			
0.492	90.740	0.930	120	Clay Fill (irrelevant)	Clay-like		0.000			
0.656	135.224	1.443	120	Clay Fill (irrelevant)	Clay-like		0.003			
0.820	215.937	1.540	120	Clay Fill (irrelevant)	Clay-like		0.005			
0.984	278.495	1.643	120	Clay Fill (irrelevant)	Clay-like		0.008			
1.148	305.513	1.350	120	Clay Fill (irrelevant)	Clay-like		0.011			
1.312	366.806	1.940	120	Clay Fill (irrelevant)	Clay-like		0.014			
1.476	391.651	2.399	120	Clay Fill (irrelevant)	Clay-like		0.017			
1.640	300.890	2.659	119	Bottom Ash	Sand-like		0.017			
1.804	302.997	2.544	119	Bottom Ash	Sand-like		0.016			
1.968	306.466	2.163	119	Bottom Ash	Sand-like		0.015			
2.133	284.785	1.823	119	Bottom Ash	Sand-like		0.014			
2.297	223.345	1.564	119	Bottom Ash	Sand-like		0.013			
2.461	166.667	1.472	119	Bottom Ash	Sand-like		0.013			
2.625	102.425	1.442	119	Bottom Ash	Sand-like		0.015			
2.789	54.951	1.462	119	Bottom Ash	Sand-like		0.016			
2.953	37.954	1.420	119	Bottom Ash	Sand-like		0.018			
3.117	27.937	1.083	119	Bottom Ash	Sand-like		0.019			
3.281	28.022	1.154	119	Bottom Ash	Sand-like		0.020			
3.445	40.146	1.251	119	Bottom Ash	Sand-like		0.021			
3.609	30.465	1.338	128	Embankment Fill	Clay-like		0.022			
3.773	24.840	1.391	128	Embankment Fill	Clay-like		0.023			
3.937	21.814	1.266	128	Embankment Fill	Clay-like		0.024			
4.101	18.854	1.089	128	Embankment Fill	Clay-like		0.025			
4.265	21.430	1.039	128	Embankment Fill	Clay-like		0.026			
4.429	21.487	1.220	128	Embankment Fill	Clay-like		0.027			
4.593	161.282	1.679	128	Embankment Fill	Clay-like		0.029			
4.757	243.586	1.670	128	Embankment Fill	Clay-like		0.030			
4.921	239.290	1.221	128	Embankment Fill	Clay-like		0.032			
5.085	229.474	1.225	128	Embankment Fill	Clay-like		0.035			
5.249	169.190	1.308	128	Embankment Fill	Clay-like		0.037			
5.413	82.374	1.665	128	Embankment Fill	Clay-like		0.039			
5.577	59.819	1.744	128	Embankment Fill	Clay-like		0.041			
5.741	39.072	1.982	128	Embankment Fill	Clay-like		0.042			
5.905	39.185	2.131	128	Embankment Fill	Clay-like		0.043			
6.069	40.060	2.168	128	Embankment Fill	Clay-like		0.044			
6.234	43.697	2.128	128	Embankment Fill	Clay-like		0.045			
6.398	50.913	1.838	128	Embankment Fill	Clay-like		0.046			
6.562	50.454	2.258	128	Embankment Fill	Clay-like		0.047			
6.726	48.328	2.538	128	Embankment Fill	Clay-like		0.048			
6.890	56.047	2.821	128	Embankment Fill	Clay-like		0.049			
7.054	53.783	2.876	128	Embankment Fill	Clay-like		0.051			
7.218	50.315	2.375	128	Embankment Fill	Clay-like		0.052			
7.382	58.586	2.430	128	Embankment Fill	Clay-like		0.053			
7.546	47.595	1.966	128	Embankment Fill	Clay-like		0.055			
7.710	37.712	1.911	128	Embankment Fill	Clay-like		0.056			
7.874	36.009	1.607	128	Embankment Fill	Clay-like		0.057			
8.038	32.757	1.490	128	Embankment Fill	Clay-like		0.058			
8.202	31.026	1.451	128	Embankment Fill	Clay-like		0.059			
8.366	30.224	1.513	128	Embankment Fill	Clay-like		0.059			
8.530	32.222	1.581	128	Embankment Fill	Clay-like		0.060			
8.694	30.447	1.618	128	Embankment Fill	Clay-like		0.061			
8.858	47.258	1.893	128	Embankment Fill	Clay-like		0.061			
9.022	63.802	2.259	128	Embankment Fill	Clay-like		0.062			
9.186	72.738	3.121	128	Embankment Fill	Clay-like		0.063			
9.350	76.166	2.382	128	Embankment Fill	Clay-like		0.064			
9.514	88.291	2.712	128	Embankment Fill	Clay-like		0.065			
9.678	113.312	2.166	128	Embankment Fill	Clay-like		0.066			
9.842	75.277	2.282	128	Embankment Fill	Clay-like		0.067			
10.006	61.860	1.739	128	Embankment Fill	Clay-like		0.068			
10.170	73.412	2.188	128	Embankment Fill	Clay-like		0.068			
10.335	113.509	2.483	128	Embankment Fill	Clay-like		0.069			

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
10.499	106.958	3.082	128	Embankment Fill	Clay-like		0.070			
10.663	88.408	3.151	128	Embankment Fill	Clay-like		0.070			
10.827	108.157	4.034	128	Embankment Fill	Clay-like		0.071			
10.991	135.064	4.377	128	Embankment Fill	Clay-like		0.071			
11.155	178.150	3.144	128	Embankment Fill	Clay-like		0.072			
11.319	128.382	3.777	128	Embankment Fill	Clay-like		0.072			
11.483	135.018	3.605	128	Embankment Fill	Clay-like		0.073			
11.647	82.493	3.237	128	Embankment Fill	Clay-like		0.073			
11.811	63.833	2.855	128	Embankment Fill	Clay-like		0.074			
11.975	53.083	2.676	128	Embankment Fill	Clay-like		0.074			
12.139	58.353	2.534	128	Embankment Fill	Clay-like		0.075			
12.303	61.463	2.394	128	Embankment Fill	Clay-like		0.075			
12.467	65.852	2.631	128	Embankment Fill	Clay-like		0.076			
12.631	140.713	2.788	128	Embankment Fill	Clay-like		0.076			
12.795	175.443	2.494	128	Embankment Fill	Clay-like		0.077			
12.959	171.503	1.921	128	Embankment Fill	Clay-like		0.077			
13.123	117.301	2.048	128	Embankment Fill	Clay-like		0.077			
13.287	69.207	2.230	128	Embankment Fill	Clay-like		0.078			
13.451	59.818	2.573	128	Embankment Fill	Clay-like		0.078			
13.615	52.119	2.701	128	Embankment Fill	Clay-like		0.078			
13.779	40.530	2.521	128	Embankment Fill	Clay-like		0.079			
13.943	41.820	2.372	128	Embankment Fill	Clay-like		0.080			
14.107	45.090	2.343	128	Embankment Fill	Clay-like		0.080			
14.271	45.891	2.339	128	Embankment Fill	Clay-like		0.081			
14.436	30.079	2.009	128	Embankment Fill	Clay-like		0.081			
14.600	28.500	1.947	128	Embankment Fill	Clay-like		0.082			
14.764	26.460	1.804	128	Embankment Fill	Clay-like		0.083			
14.928	26.401	1.737	128	Embankment Fill	Clay-like		0.083			
15.092	26.081	1.674	128	Embankment Fill	Clay-like		0.084			
15.256	26.551	1.656	128	Embankment Fill	Clay-like		0.085			
15.420	26.041	1.597	128	Embankment Fill	Clay-like		0.085			
15.584	25.076	1.524	128	Embankment Fill	Clay-like		0.085			
15.748	25.895	1.456	128	Embankment Fill	Clay-like		0.085			
15.912	24.715	1.424	128	Embankment Fill	Clay-like		0.086			
16.076	25.985	1.029	128	Embankment Fill	Clay-like		0.086			
16.240	29.839	0.548	128	Embankment Fill	Clay-like		0.086			
16.404	94.624	0.668	128	Embankment Fill	Clay-like		0.086			
16.568	81.430	1.705	128	Embankment Fill	Clay-like		0.086			
16.732	49.200	2.097	128	Embankment Fill	Clay-like		0.085			
16.896	17.949	2.273	128	Embankment Fill	Clay-like		0.085			
17.060	16.861	0.991	128	Embankment Fill	Clay-like		0.085			
17.224	14.473	0.900	128	Embankment Fill	Clay-like		0.085			
17.388	16.182	0.935	128	Embankment Fill	Clay-like		0.085			
17.552	19.440	0.977	128	Embankment Fill	Clay-like		0.086			
17.716	25.198	1.105	128	Embankment Fill	Clay-like		0.087			
17.880	19.345	1.175	128	Embankment Fill	Clay-like		0.087			
18.044	17.990	1.159	128	Embankment Fill	Clay-like		0.088			
18.208	22.321	1.156	128	Embankment Fill	Clay-like		0.089			
18.372	31.450	1.284	128	Embankment Fill	Clay-like		0.090			
18.537	25.351	1.427	128	Embankment Fill	Clay-like		0.090			
18.701	27.631	1.414	128	Embankment Fill	Clay-like		0.090			
18.865	26.088	1.484	128	Embankment Fill	Clay-like		0.091			
19.029	35.098	1.579	128	Embankment Fill	Clay-like		0.091			
19.193	38.056	1.665	128	Embankment Fill	Clay-like		0.092			
19.357	29.044	1.748	128	Embankment Fill	Clay-like		0.092			
19.521	21.134	0.747	128	Embankment Fill	Clay-like		0.093			
19.685	12.363	0.686	128	Embankment Fill	Clay-like		0.093			
19.849	8.640	0.521	128	Embankment Fill	Clay-like		0.093			
20.013	9.639	0.554	128	Embankment Fill	Clay-like		0.094			
20.177	12.772	0.631	128	Embankment Fill	Clay-like		0.094			
20.341	13.771	0.614	128	Embankment Fill	Clay-like		0.095			
20.505	13.020	0.619	128	Embankment Fill	Clay-like		0.095			
20.669	10.900	0.579	128	Embankment Fill	Clay-like		0.095			
20.833	17.480	0.613	128	Embankment Fill	Clay-like		0.096			
20.997	17.530	0.564	128	Embankment Fill	Clay-like		0.096			
21.161	17.149	0.529	128	Embankment Fill	Clay-like		0.097			
21.325	17.969	0.361	128	Embankment Fill	Clay-like		0.097			
21.489	16.088	0.367	128	Embankment Fill	Clay-like		0.098			
21.653	8.069	0.382	128	Embankment Fill	Clay-like		0.098			
21.817	5.861	0.303	128	Embankment Fill	Clay-like		0.098			
21.981	14.130	0.360	128	Embankment Fill	Clay-like		0.099			
22.145	19.912	0.579	128	Embankment Fill	Clay-like		0.099			
22.309	13.692	0.585	128	Embankment Fill	Clay-like		0.099			
22.473	15.920	0.615	128	Embankment Fill	Clay-like		0.100			
22.638	13.140	0.481	128	Embankment Fill	Clay-like		0.100			

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
22.802	14.589	0.290	128	Embankment Fill	Clay-like		0.100			
22.966	10.219	0.356	128	Embankment Fill	Clay-like		0.101			
23.130	8.252	0.377	128	Embankment Fill	Clay-like		0.101			
23.294	7.073	0.285	128	Embankment Fill	Clay-like		0.101			
23.458	6.907	0.308	128	Embankment Fill	Clay-like		0.102			
23.622	9.445	0.310	128	Embankment Fill	Clay-like		0.102			
23.786	11.081	0.416	128	Embankment Fill	Clay-like		0.102			
23.950	9.066	0.432	128	Embankment Fill	Clay-like		0.102			
24.114	18.578	0.422	128	Embankment Fill	Clay-like		0.103			
24.278	22.798	0.595	128	Embankment Fill	Clay-like		0.103			
24.442	16.047	0.575	128	Embankment Fill	Clay-like		0.103			
24.606	10.446	0.361	128	Embankment Fill	Clay-like		0.103			
24.770	9.057	0.363	128	Embankment Fill	Clay-like		0.104			
24.934	5.927	0.363	128	Embankment Fill	Clay-like		0.104			
25.098	7.691	0.340	128	Embankment Fill	Clay-like		0.104			
25.262	7.691	0.344	128	Embankment Fill	Clay-like		0.104			
25.426	8.632	0.319	128	Embankment Fill	Clay-like		0.105			
25.590	7.171	0.277	128	Embankment Fill	Clay-like		0.105			
25.754	7.692	0.291	128	Embankment Fill	Clay-like		0.105			
25.918	6.795	0.300	128	Embankment Fill	Clay-like		0.105			
26.082	7.447	0.216	128	Embankment Fill	Clay-like		0.106			
26.246	6.999	0.273	128	Embankment Fill	Clay-like		0.106			
26.410	8.596	0.302	128	Embankment Fill	Clay-like		0.106			
26.574	7.325	0.311	128	Embankment Fill	Clay-like		0.106			
26.739	7.164	0.261	128	Embankment Fill	Clay-like		0.107			
26.903	7.357	0.265	128	Embankment Fill	Clay-like		0.107			
27.067	7.529	0.217	128	Embankment Fill	Clay-like		0.107			
27.231	8.601	0.242	128	Embankment Fill	Clay-like		0.107			
27.395	7.594	0.378	128	Embankment Fill	Clay-like		0.108			
27.559	9.797	0.316	128	Embankment Fill	Clay-like		0.108			
27.723	11.937	0.369	128	Embankment Fill	Clay-like		0.108			
27.887	11.938	0.500	128	Embankment Fill	Clay-like		0.108			
28.051	9.773	0.437	128	Embankment Fill	Clay-like		0.109			
28.215	15.387	0.445	128	Embankment Fill	Clay-like		0.109			
28.379	14.103	0.478	128	Embankment Fill	Clay-like		0.109			
28.543	11.539	0.501	128	Embankment Fill	Clay-like		0.109			
28.707	10.384	0.413	128	Embankment Fill	Clay-like		0.110			
28.871	9.923	0.344	128	Embankment Fill	Clay-like		0.110			
29.035	9.659	0.315	128	Embankment Fill	Clay-like		0.110			
29.199	8.068	0.267	128	Embankment Fill	Clay-like		0.110			
29.363	7.043	0.154	128	Embankment Fill	Clay-like		0.110			
29.527	6.280	0.271	128	Embankment Fill	Clay-like		0.111			
29.691	7.509	0.366	128	Embankment Fill	Clay-like		0.111			
29.855	10.723	0.355	128	Embankment Fill	Clay-like		0.111			
30.019	11.447	0.376	127	Subunit 1	Clay-like		0.111			
30.183	7.567	0.371	127	Subunit 1	Clay-like		0.112			
30.347	13.739	0.511	127	Subunit 1	Clay-like		0.112			
30.511	19.108	0.723	127	Subunit 1	Clay-like		0.112			
30.675	34.497	0.683	127	Subunit 1	Clay-like		0.112			
30.840	14.360	0.816	127	Subunit 1	Clay-like		0.113			
31.004	10.942	0.551	127	Subunit 1	Clay-like		0.113			
31.168	15.396	0.541	127	Subunit 1	Clay-like		0.113			
31.332	13.095	0.590	127	Subunit 1	Clay-like		0.113			
31.496	10.337	0.556	127	Subunit 1	Clay-like		0.113			
31.660	10.030	0.495	127	Subunit 1	Clay-like		0.113			
31.824	10.363	0.370	127	Subunit 1	Clay-like		0.114			
31.988	10.582	0.312	127	Subunit 1	Clay-like		0.114			
32.152	11.892	0.308	127	Subunit 1	Clay-like		0.114			
32.316	10.131	0.282	127	Subunit 1	Clay-like		0.114			
32.480	8.379	0.258	127	Subunit 1	Clay-like		0.114			
32.644	7.750	0.204	127	Subunit 1	Clay-like		0.114			
32.808	8.207	0.179	127	Subunit 1	Clay-like		0.114			
32.972	9.343	0.142	127	Subunit 1	Clay-like		0.114			
33.136	8.089	0.141	127	Subunit 1	Clay-like		0.115			
33.300	7.658	0.128	127	Subunit 1	Clay-like		0.115			
33.464	7.601	0.162	127	Subunit 1	Clay-like		0.115			
33.628	7.582	0.233	127	Subunit 1	Clay-like		0.115			
33.792	7.260	0.232	127	Subunit 1	Clay-like		0.115			
33.956	7.429	0.232	127	Subunit 1	Clay-like		0.116			
34.120	7.142	0.256	127	Subunit 1	Clay-like		0.118			
34.284	7.396	0.197	127	Subunit 1	Clay-like		0.118			
34.448	7.831	0.188	127	Subunit 1	Clay-like		0.118			
34.612	7.383	0.169	127	Subunit 1	Clay-like		0.118			
34.776	6.577	0.187	127	Subunit 1	Clay-like		0.118			
34.941	6.522	0.194	127	Subunit 1	Clay-like		0.118			

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
35.105	7.840	0.217	127	Subunit 1	Clay-like		0.118			
35.269	9.124	0.329	127	Subunit 1	Clay-like		0.119			
35.433	18.087	0.504	127	Subunit 1	Clay-like		0.119			
35.597	26.406	0.981	127	Subunit 1	Clay-like		0.119			
35.761	29.262	1.322	127	Subunit 1	Clay-like		0.119			
35.925	28.760	1.048	127	Subunit 1	Clay-like		0.119			
36.089	27.552	1.209	127	Subunit 1	Clay-like		0.119			
36.253	27.397	1.187	127	Subunit 1	Clay-like		0.120			
36.417	24.480	1.129	127	Subunit 1	Clay-like		0.120			
36.581	23.566	0.878	127	Subunit 1	Clay-like		0.120			
36.745	24.116	0.899	127	Subunit 1	Clay-like		0.120			
36.909	21.791	0.767	127	Subunit 1	Clay-like		0.120			
37.073	19.476	0.684	127	Subunit 1	Clay-like		0.120			
37.237	21.326	0.638	127	Subunit 1	Clay-like		0.121			
37.401	21.642	0.557	127	Subunit 1	Clay-like		0.121			
37.565	20.650	0.603	127	Subunit 1	Clay-like		0.121			
37.729	21.603	0.549	127	Subunit 1	Clay-like		0.121			
37.893	20.056	0.528	127	Subunit 1	Clay-like		0.122			
38.057	19.550	0.497	127	Subunit 1	Clay-like		0.122			
38.221	20.689	0.435	127	Subunit 1	Clay-like		0.122			
38.385	22.252	0.441	127	Subunit 1	Clay-like		0.122			
38.549	22.545	0.500	127	Subunit 1	Clay-like		0.123			
38.713	23.172	0.465	127	Subunit 1	Clay-like		0.123			
38.877	21.460	0.452	127	Subunit 1	Clay-like		0.123			
39.042	22.033	0.449	126	Subunit 2	Sand-like		0.124			
39.206	22.441	0.446	126	Subunit 2	Sand-like		0.124			
39.370	23.119	0.579	126	Subunit 2	Sand-like		0.124			
39.534	25.529	0.640	126	Subunit 2	Sand-like		0.124			
39.698	24.439	0.725	126	Subunit 2	Sand-like		0.124			
39.862	25.654	0.747	126	Subunit 2	Sand-like		0.125			
40.026	23.334	0.716	126	Subunit 2	Sand-like		0.125			
40.190	21.203	0.693	126	Subunit 2	Sand-like		0.125			
40.354	20.927	0.566	126	Subunit 2	Sand-like		0.125			
40.518	20.486	0.532	126	Subunit 2	Sand-like		0.125			
40.682	19.341	0.556	126	Subunit 2	Sand-like		0.125			
40.846	19.251	0.560	126	Subunit 2	Sand-like		0.125			
41.010	20.060	0.491	126	Subunit 2	Sand-like		0.125			
41.174	20.610	0.494	126	Subunit 2	Sand-like		0.125			
41.338	19.360	0.517	126	Subunit 2	Sand-like		0.125			
41.502	19.017	0.504	126	Subunit 2	Sand-like		0.125			
41.666	18.585	0.485	126	Subunit 2	Sand-like		0.126			
41.830	18.332	0.437	126	Subunit 2	Sand-like		0.126			
41.994	20.010	0.468	126	Subunit 2	Sand-like		0.126			
42.158	22.947	0.439	126	Subunit 2	Sand-like		0.126			
42.322	23.247	0.481	126	Subunit 2	Sand-like		0.127			
42.486	23.847	0.451	126	Subunit 2	Sand-like		0.127			
42.650	23.520	0.487	126	Subunit 2	Sand-like		0.127			
42.814	23.527	0.514	126	Subunit 2	Sand-like		0.127			
42.978	21.100	0.657	126	Subunit 2	Sand-like		0.128			
43.143	19.645	0.756	126	Subunit 2	Sand-like		0.128			
43.307	20.737	0.810	126	Subunit 2	Sand-like		0.128			
43.471	15.766	0.744	126	Subunit 2	Sand-like		0.128			
43.635	11.246	0.506	126	Subunit 2	Sand-like		0.128			
43.799	9.662	0.282	126	Subunit 2	Sand-like		0.128			
43.963	8.687	0.215	126	Subunit 2	Sand-like		0.128			
44.127	7.960	0.190	126	Subunit 2	Sand-like		0.128			
44.291	7.871	0.175	126	Subunit 2	Sand-like		0.128			
44.455	7.788	0.167	126	Subunit 2	Sand-like		0.128			
44.619	7.714	0.159	126	Subunit 2	Sand-like		0.128			
44.783	7.581	0.148	126	Subunit 2	Sand-like		0.128			
44.947	7.431	0.141	126	Subunit 2	Sand-like		0.129			
45.111	7.330	0.132	126	Subunit 2	Sand-like		0.129			
45.275	7.423	0.133	126	Subunit 2	Sand-like		0.129			
45.439	7.408	0.133	126	Subunit 2	Sand-like		0.129			
45.603	7.533	0.143	126	Subunit 2	Sand-like		0.129			
45.767	8.180	0.223	126	Subunit 2	Sand-like		0.129			
45.931	9.580	0.368	126	Subunit 2	Sand-like		0.129			
46.095	18.419	0.350	126	Subunit 2	Sand-like		0.130			
46.259	19.124	0.373	126	Subunit 2	Sand-like		0.130			
46.423	18.149	0.309	126	Subunit 2	Sand-like		0.130			
46.587	24.918	0.239	126	Subunit 2	Sand-like		0.130			
46.751	37.664	0.132	126	Subunit 2	Sand-like		0.131			
46.915	42.542	0.129	126	Subunit 2	Sand-like		0.131			
47.079	44.870	0.198	126	Subunit 2	Sand-like		0.131			
47.244	46.438	0.265	126	Subunit 2	Sand-like		0.131			

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
47.408	48.772	0.469	126	Subunit 2	Sand-like		0.131			
47.572	49.478	0.463	126	Subunit 2	Sand-like		0.131			
47.736	73.191	0.456	126	Subunit 2	Sand-like		0.131			
47.900	91.149	0.634	126	Subunit 2	Sand-like		0.131			
48.064	91.762	0.849	131	Subunit 3	Sand-like		0.131			
48.228	87.743	0.963	131	Subunit 3	Sand-like		0.131			
48.392	88.523	0.975	131	Subunit 3	Sand-like		0.131			
48.556	104.838	0.976	131	Subunit 3	Sand-like		0.131			
48.720	117.594	0.976	131	Subunit 3	Sand-like		0.130			
48.884	122.183	1.089	131	Subunit 3	Sand-like		0.130			
49.048	122.183	1.106	131	Subunit 3	Sand-like		0.130			
49.212	120.454	1.128	131	Subunit 3	Sand-like		0.129			
49.376	113.936	1.054	131	Subunit 3	Sand-like		0.129			
49.540	107.154	0.947	131	Subunit 3	Sand-like		0.128			
49.704	99.304	0.912	131	Subunit 3	Sand-like		0.128			
49.868	93.535	0.881	131	Subunit 3	Sand-like		0.127			
50.032	85.169	0.832	131	Subunit 3	Sand-like		0.127			
50.196	74.053	0.691	131	Subunit 3	Sand-like		0.127			
50.360	70.862	0.736	131	Subunit 3	Sand-like		0.126			
50.524	82.607	2.259	131	Subunit 3	Sand-like		0.126			
50.688	100.815	0.010	131	Subunit 3	Sand-like		0.126			
50.852	332.748	0.010	131	Subunit 3	Sand-like		0.126			

LIQUEFACTION POTENTIAL ASSESSMENT FOR COARSE GRAINED SOILS USING CONE PENETRATION TEST DATA

Facility: KIF TDEC Stability
Project No.: 175668043
CPT ID: CPT-02D

Water Elevation during CPT:	753.0	ft
Depth to Water during CPT:	2.0	ft *(relative to ground surface during CPT)*
Water Elevation during Earthquake:	749.1	ft
Depth to Water during Earthquake:	5.9	ft *(relative to ground surface during CPT)*
Final Grade Elevation during EQ:	755.3	ft *(if no fill, then set this equal to top of CPT hole elev.)*
Height of Final Grade above CPT TOH:	0.3	ft *(relative to ground surface during CPT, + Fill, - Cut)*
Unit Weight of Cut/Fill to Achieve Final Grade	120	pcf
Cut/Fill Total Stress (+ Fill, - Cut):	0.02	tsf

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
755.0				Vertical Stresses above 1st CPT:	**0.16**		**0.01**	**0.03**	**0.00**	**0.00**	**0.01**	**0.03**
754.8	0.164	7.71	0.22	120		0.08	0.01	0.03	0.00	0.00	0.01	0.03
754.7	0.328	103.42	0.64	120	0.25	0.16	0.02	0.04	0.00	0.00	0.02	0.04
754.5	0.492	90.74	0.93	120	0.41	0.16	0.03	0.05	0.00	0.00	0.03	0.05
754.3	0.656	135.22	1.44	120	0.57	0.16	0.04	0.06	0.00	0.00	0.04	0.06
754.2	0.820	215.94	1.54	120	0.74	0.16	0.05	0.07	0.00	0.00	0.05	0.07
754.0	0.984	278.50	1.64	120	0.90	0.16	0.06	0.08	0.00	0.00	0.06	0.08
753.9	1.148	305.51	1.35	120	1.07	0.16	0.07	0.09	0.00	0.00	0.07	0.09
753.7	1.312	366.81	1.94	120	1.23	0.16	0.08	0.10	0.00	0.00	0.08	0.10
753.5	1.476	391.65	2.40	120	1.39	0.16	0.09	0.11	0.00	0.00	0.09	0.11
753.4	1.640	300.89	2.66	119	1.56	0.16	0.10	0.12	0.00	0.00	0.10	0.12
753.2	1.804	303.00	2.54	119	1.72	0.16	0.11	0.13	0.00	0.00	0.11	0.13
753.0	1.968	306.47	2.16	119	1.89	0.16	0.12	0.14	0.00	0.00	0.12	0.14
752.9	2.133	284.78	1.82	119	2.05	0.16	0.13	0.15	0.00	0.00	0.12	0.15
752.7	2.297	223.35	1.56	119	2.21	0.16	0.14	0.16	0.01	0.00	0.13	0.16
752.5	2.461	166.67	1.47	119	2.38	0.16	0.15	0.17	0.01	0.00	0.13	0.17
752.4	2.625	102.42	1.44	119	2.54	0.16	0.16	0.17	0.02	0.00	0.14	0.17
752.2	2.789	54.95	1.46	119	2.71	0.16	0.17	0.18	0.02	0.00	0.14	0.18
752.0	2.953	37.95	1.42	119	2.87	0.16	0.18	0.19	0.03	0.00	0.15	0.19
751.9	3.117	27.94	1.08	119	3.03	0.16	0.19	0.20	0.03	0.00	0.15	0.20
751.7	3.281	28.02	1.15	119	3.20	0.16	0.20	0.21	0.04	0.00	0.16	0.21
751.6	3.445	40.15	1.25	119	3.36	0.16	0.21	0.22	0.05	0.00	0.16	0.22
751.4	3.609	30.46	1.34	128	3.53	0.16	0.22	0.23	0.05	0.00	0.17	0.23
751.2	3.773	24.84	1.39	128	3.69	0.16	0.23	0.24	0.06	0.00	0.17	0.24
751.1	3.937	21.81	1.27	128	3.85	0.16	0.24	0.25	0.06	0.00	0.18	0.25
750.9	4.101	18.85	1.09	128	4.02	0.16	0.25	0.27	0.07	0.00	0.18	0.27
750.7	4.265	21.43	1.04	128	4.18	0.16	0.26	0.28	0.07	0.00	0.19	0.28
750.6	4.429	21.49	1.22	128	4.35	0.16	0.27	0.29	0.08	0.00	0.19	0.29
750.4	4.593	161.28	1.68	128	4.51	0.16	0.28	0.30	0.08	0.00	0.20	0.30
750.2	4.757	243.59	1.67	128	4.68	0.16	0.29	0.31	0.09	0.00	0.20	0.31
750.1	4.921	239.29	1.22	128	4.84	0.16	0.30	0.32	0.09	0.00	0.21	0.32
749.9	5.085	229.47	1.23	128	5.00	0.16	0.31	0.33	0.10	0.00	0.21	0.33
749.8	5.249	169.19	1.31	128	5.17	0.16	0.32	0.34	0.10	0.00	0.22	0.34
749.6	5.413	82.37	1.67	128	5.33	0.16	0.33	0.35	0.11	0.00	0.22	0.35
749.4	5.577	59.82	1.74	128	5.50	0.16	0.34	0.36	0.11	0.00	0.23	0.36
749.3	5.741	39.07	1.98	128	5.66	0.16	0.35	0.37	0.12	0.00	0.24	0.37
749.1	5.905	39.18	2.13	128	5.82	0.16	0.36	0.38	0.12	0.00	0.24	0.38
748.9	6.069	40.06	2.17	128	5.99	0.16	0.37	0.39	0.13	0.01	0.25	0.39
748.8	6.234	43.70	2.13	128	6.15	0.16	0.38	0.40	0.13	0.01	0.25	0.39
748.6	6.398	50.91	1.84	128	6.32	0.16	0.39	0.41	0.14	0.02	0.26	0.40
748.4	6.562	50.45	2.26	128	6.48	0.16	0.40	0.42	0.14	0.02	0.26	0.40
748.3	6.726	48.33	2.54	128	6.64	0.16	0.42	0.43	0.15	0.03	0.27	0.41
748.1	6.890	56.05	2.82	128	6.81	0.16	0.43	0.44	0.15	0.03	0.27	0.41
747.9	7.054	53.78	2.88	128	6.97	0.16	0.44	0.45	0.16	0.04	0.28	0.42
747.8	7.218	50.31	2.38	128	7.14	0.16	0.45	0.46	0.16	0.04	0.28	0.42
747.6	7.382	58.59	2.43	128	7.30	0.16	0.46	0.48	0.17	0.05	0.29	0.43
747.5	7.546	47.59	1.97	128	7.46	0.16	0.47	0.49	0.17	0.05	0.29	0.43
747.3	7.710	37.71	1.91	128	7.63	0.16	0.48	0.50	0.18	0.06	0.30	0.44
747.1	7.874	36.01	1.61	128	7.79	0.16	0.49	0.51	0.18	0.06	0.31	0.45
747.0	8.038	32.76	1.49	128	7.96	0.16	0.50	0.52	0.19	0.07	0.31	0.45
746.8	8.202	31.03	1.45	128	8.12	0.16	0.51	0.53	0.19	0.07	0.32	0.46
746.6	8.366	30.22	1.51	128	8.28	0.16	0.52	0.54	0.20	0.08	0.32	0.46
746.5	8.530	32.22	1.58	128	8.45	0.16	0.53	0.55	0.20	0.08	0.33	0.47
746.3	8.694	30.45	1.62	128	8.61	0.16	0.54	0.56	0.21	0.09	0.33	0.47
746.1	8.858	47.26	1.89	128	8.78	0.16	0.55	0.57	0.21	0.09	0.34	0.48
746.0	9.022	63.80	2.26	128	8.94	0.16	0.56	0.58	0.22	0.10	0.34	0.48
745.8	9.186	72.74	3.12	128	9.10	0.16	0.57	0.59	0.22	0.10	0.35	0.49
745.6	9.350	76.17	2.38	128	9.27	0.16	0.58	0.60	0.23	0.11	0.35	0.49
745.5	9.514	88.29	2.71	128	9.43	0.16	0.59	0.61	0.23	0.11	0.36	0.50

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
745.3	9.678	113.31	2.17	128	9.60	0.16	0.60	0.62	0.24	0.12	0.36	0.50
745.2	9.842	75.28	2.28	128	9.76	0.16	0.61	0.63	0.24	0.12	0.37	0.51
745.0	10.006	61.86	1.74	128	9.92	0.16	0.63	0.64	0.25	0.13	0.38	0.52
744.8	10.170	73.41	2.19	128	10.09	0.16	0.64	0.65	0.25	0.13	0.38	0.52
744.7	10.335	113.51	2.48	128	10.25	0.16	0.65	0.66	0.26	0.14	0.39	0.53
744.5	10.499	106.96	3.08	128	10.42	0.16	0.66	0.67	0.27	0.14	0.39	0.53
744.3	10.663	88.41	3.15	128	10.58	0.16	0.67	0.69	0.27	0.15	0.40	0.54
744.2	10.827	108.16	4.03	128	10.74	0.16	0.68	0.70	0.28	0.15	0.40	0.54
744.0	10.991	135.06	4.38	128	10.91	0.16	0.69	0.71	0.28	0.16	0.41	0.55
743.8	11.155	178.15	3.14	128	11.07	0.16	0.70	0.72	0.29	0.16	0.41	0.55
743.7	11.319	128.38	3.78	128	11.24	0.16	0.71	0.73	0.29	0.17	0.42	0.56
743.5	11.483	135.02	3.61	128	11.40	0.16	0.72	0.74	0.30	0.17	0.42	0.56
743.4	11.647	82.49	3.24	128	11.56	0.16	0.73	0.75	0.30	0.18	0.43	0.57
743.2	11.811	63.83	2.86	128	11.73	0.16	0.74	0.76	0.31	0.18	0.43	0.57
743.0	11.975	53.08	2.68	128	11.89	0.16	0.75	0.77	0.31	0.19	0.44	0.58
742.9	12.139	58.35	2.53	128	12.06	0.16	0.76	0.78	0.32	0.19	0.45	0.59
742.7	12.303	61.46	2.39	128	12.22	0.16	0.77	0.79	0.32	0.20	0.45	0.59
742.5	12.467	65.85	2.63	128	12.39	0.16	0.78	0.80	0.33	0.20	0.46	0.60
742.4	12.631	140.71	2.79	128	12.55	0.16	0.79	0.81	0.33	0.21	0.46	0.60
742.2	12.795	175.44	2.49	128	12.71	0.16	0.80	0.82	0.34	0.22	0.47	0.61
742.0	12.959	171.50	1.92	128	12.88	0.16	0.81	0.83	0.34	0.22	0.47	0.61
741.9	13.123	117.30	2.05	128	13.04	0.16	0.82	0.84	0.35	0.23	0.48	0.62
741.7	13.287	69.21	2.23	128	13.21	0.16	0.84	0.85	0.35	0.23	0.48	0.62
741.5	13.451	59.82	2.57	128	13.37	0.16	0.85	0.86	0.36	0.24	0.49	0.63
741.4	13.615	52.12	2.70	128	13.53	0.16	0.86	0.87	0.36	0.24	0.49	0.63
741.2	13.779	40.53	2.52	128	13.70	0.16	0.87	0.88	0.37	0.25	0.50	0.64
741.1	13.943	41.82	2.37	128	13.86	0.16	0.88	0.90	0.37	0.25	0.50	0.64
740.9	14.107	45.09	2.34	128	14.03	0.16	0.89	0.91	0.38	0.26	0.51	0.65
740.7	14.271	45.89	2.34	128	14.19	0.16	0.90	0.92	0.38	0.26	0.52	0.66
740.6	14.436	30.08	2.01	128	14.35	0.16	0.91	0.93	0.39	0.27	0.52	0.66
740.4	14.600	28.50	1.95	128	14.52	0.16	0.92	0.94	0.39	0.27	0.53	0.67
740.2	14.764	26.46	1.80	128	14.68	0.16	0.93	0.95	0.40	0.28	0.53	0.67
740.1	14.928	26.40	1.74	128	14.85	0.16	0.94	0.96	0.40	0.28	0.54	0.68
739.9	15.092	26.08	1.67	128	15.01	0.16	0.95	0.97	0.41	0.29	0.54	0.68
739.7	15.256	26.55	1.66	128	15.17	0.16	0.96	0.98	0.41	0.29	0.55	0.69
739.6	15.420	26.04	1.60	128	15.34	0.16	0.97	0.99	0.42	0.30	0.55	0.69
739.4	15.584	25.08	1.52	128	15.50	0.16	0.98	1.00	0.42	0.30	0.56	0.70
739.3	15.748	25.89	1.46	128	15.67	0.16	0.99	1.01	0.43	0.31	0.56	0.70
739.1	15.912	24.71	1.42	128	15.83	0.16	1.00	1.02	0.43	0.31	0.57	0.71
738.9	16.076	25.98	1.03	128	15.99	0.16	1.01	1.03	0.44	0.32	0.57	0.71
738.8	16.240	29.84	0.55	128	16.16	0.16	1.02	1.04	0.44	0.32	0.58	0.72
738.6	16.404	94.62	0.67	128	16.32	0.16	1.03	1.05	0.45	0.33	0.59	0.73
738.4	16.568	81.43	1.71	128	16.49	0.16	1.05	1.06	0.45	0.33	0.59	0.73
738.3	16.732	49.20	2.10	128	16.65	0.16	1.06	1.07	0.46	0.34	0.60	0.74
738.1	16.896	17.95	2.27	128	16.81	0.16	1.07	1.08	0.46	0.34	0.60	0.74
737.9	17.060	16.86	0.99	128	16.98	0.16	1.08	1.09	0.47	0.35	0.61	0.75
737.8	17.224	14.47	0.90	128	17.14	0.16	1.09	1.11	0.47	0.35	0.61	0.75
737.6	17.388	16.18	0.94	128	17.31	0.16	1.10	1.12	0.48	0.36	0.62	0.76
737.4	17.552	19.44	0.98	128	17.47	0.16	1.11	1.13	0.49	0.36	0.62	0.76
737.3	17.716	25.20	1.11	128	17.63	0.16	1.12	1.14	0.49	0.37	0.63	0.77
737.1	17.880	19.34	1.18	128	17.80	0.16	1.13	1.15	0.50	0.37	0.63	0.77
737.0	18.044	17.99	1.16	128	17.96	0.16	1.14	1.16	0.50	0.38	0.64	0.78
736.8	18.208	22.32	1.16	128	18.13	0.16	1.15	1.17	0.51	0.38	0.64	0.78
736.6	18.372	31.45	1.28	128	18.29	0.16	1.16	1.18	0.51	0.39	0.65	0.79
736.5	18.537	25.35	1.43	128	18.45	0.16	1.17	1.19	0.52	0.39	0.66	0.79
736.3	18.701	27.63	1.41	128	18.62	0.16	1.18	1.20	0.52	0.40	0.66	0.80
736.1	18.865	26.09	1.48	128	18.78	0.16	1.19	1.21	0.53	0.40	0.67	0.81
736.0	19.029	35.10	1.58	128	18.95	0.16	1.20	1.22	0.53	0.41	0.67	0.81
735.8	19.193	38.06	1.67	128	19.11	0.16	1.21	1.23	0.54	0.41	0.68	0.82
735.6	19.357	29.04	1.75	128	19.27	0.16	1.22	1.24	0.54	0.42	0.68	0.82
735.5	19.521	21.13	0.75	128	19.44	0.16	1.23	1.25	0.55	0.42	0.69	0.83
735.3	19.685	12.36	0.69	128	19.60	0.16	1.24	1.26	0.55	0.43	0.69	0.83
735.2	19.849	8.64	0.52	128	19.77	0.16	1.26	1.27	0.56	0.44	0.70	0.84
735.0	20.013	9.64	0.55	128	19.93	0.16	1.27	1.28	0.56	0.44	0.70	0.84
734.8	20.177	12.77	0.63	128	20.09	0.16	1.28	1.29	0.57	0.45	0.71	0.85
734.7	20.341	13.77	0.61	128	20.26	0.16	1.29	1.30	0.57	0.45	0.71	0.85
734.5	20.505	13.02	0.62	128	20.42	0.16	1.30	1.32	0.58	0.46	0.72	0.86
734.3	20.669	10.90	0.58	128	20.59	0.16	1.31	1.33	0.58	0.46	0.73	0.86
734.2	20.833	17.48	0.61	128	20.75	0.16	1.32	1.34	0.59	0.47	0.73	0.87

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
734.0	20.997	17.53	0.56	128	20.92	0.16	1.33	1.35	0.59	0.47	0.74	0.88
733.8	21.161	17.15	0.53	128	21.08	0.16	1.34	1.36	0.60	0.48	0.74	0.88
733.7	21.325	17.97	0.36	128	21.24	0.16	1.35	1.37	0.60	0.48	0.75	0.89
733.5	21.489	16.09	0.37	128	21.41	0.16	1.36	1.38	0.61	0.49	0.75	0.89
733.3	21.653	8.07	0.38	128	21.57	0.16	1.37	1.39	0.61	0.49	0.76	0.90
733.2	21.817	5.86	0.30	128	21.74	0.16	1.38	1.40	0.62	0.50	0.76	0.90
733.0	21.981	14.13	0.36	128	21.90	0.16	1.39	1.41	0.62	0.50	0.77	0.91
732.9	22.145	19.91	0.58	128	22.06	0.16	1.40	1.42	0.63	0.51	0.77	0.91
732.7	22.309	13.69	0.59	128	22.23	0.16	1.41	1.43	0.63	0.51	0.78	0.92
732.5	22.473	15.92	0.62	128	22.39	0.16	1.42	1.44	0.64	0.52	0.78	0.92
732.4	22.638	13.14	0.48	128	22.56	0.16	1.43	1.45	0.64	0.52	0.79	0.93
732.2	22.802	14.59	0.29	128	22.72	0.16	1.44	1.46	0.65	0.53	0.80	0.93
732.0	22.966	10.22	0.36	128	22.88	0.16	1.45	1.47	0.65	0.53	0.80	0.94
731.9	23.130	8.25	0.38	128	23.05	0.16	1.47	1.48	0.66	0.54	0.81	0.95
731.7	23.294	7.07	0.29	128	23.21	0.16	1.48	1.49	0.66	0.54	0.81	0.95
731.5	23.458	6.91	0.31	128	23.38	0.16	1.49	1.50	0.67	0.55	0.82	0.96
731.4	23.622	9.44	0.31	128	23.54	0.16	1.50	1.51	0.67	0.55	0.82	0.96
731.2	23.786	11.08	0.42	128	23.70	0.16	1.51	1.53	0.68	0.56	0.83	0.97
731.1	23.950	9.07	0.43	128	23.87	0.16	1.52	1.54	0.68	0.56	0.83	0.97
730.9	24.114	18.58	0.42	128	24.03	0.16	1.53	1.55	0.69	0.57	0.84	0.98
730.7	24.278	22.80	0.60	128	24.20	0.16	1.54	1.56	0.70	0.57	0.84	0.98
730.6	24.442	16.05	0.58	128	24.36	0.16	1.55	1.57	0.70	0.58	0.85	0.99
730.4	24.606	10.45	0.36	128	24.52	0.16	1.56	1.58	0.71	0.58	0.85	0.99
730.2	24.770	9.06	0.36	128	24.69	0.16	1.57	1.59	0.71	0.59	0.86	1.00
730.1	24.934	5.93	0.36	128	24.85	0.16	1.58	1.60	0.72	0.59	0.87	1.00
729.9	25.098	7.69	0.34	128	25.02	0.16	1.59	1.61	0.72	0.60	0.87	1.01
729.7	25.262	7.69	0.34	128	25.18	0.16	1.60	1.62	0.73	0.60	0.88	1.02
729.6	25.426	8.63	0.32	128	25.34	0.16	1.61	1.63	0.73	0.61	0.88	1.02
729.4	25.590	7.17	0.28	128	25.51	0.16	1.62	1.64	0.74	0.61	0.89	1.03
729.2	25.754	7.69	0.29	128	25.67	0.16	1.63	1.65	0.74	0.62	0.89	1.03
729.1	25.918	6.79	0.30	128	25.84	0.16	1.64	1.66	0.75	0.62	0.90	1.04
728.9	26.082	7.45	0.22	128	26.00	0.16	1.65	1.67	0.75	0.63	0.90	1.04
728.8	26.246	7.00	0.27	128	26.16	0.16	1.66	1.68	0.76	0.63	0.91	1.05
728.6	26.410	8.60	0.30	128	26.33	0.16	1.68	1.69	0.76	0.64	0.91	1.05
728.4	26.574	7.33	0.31	128	26.49	0.16	1.69	1.70	0.77	0.65	0.92	1.06
728.3	26.739	7.16	0.26	128	26.66	0.16	1.70	1.71	0.77	0.65	0.92	1.06
728.1	26.903	7.36	0.27	128	26.82	0.16	1.71	1.72	0.78	0.66	0.93	1.07
727.9	27.067	7.53	0.22	128	26.98	0.16	1.72	1.74	0.78	0.66	0.94	1.07
727.8	27.231	8.60	0.24	128	27.15	0.16	1.73	1.75	0.79	0.67	0.94	1.08
727.6	27.395	7.59	0.38	128	27.31	0.16	1.74	1.76	0.79	0.67	0.95	1.09
727.4	27.559	9.80	0.32	128	27.48	0.16	1.75	1.77	0.80	0.68	0.95	1.09
727.3	27.723	11.94	0.37	128	27.64	0.16	1.76	1.78	0.80	0.68	0.96	1.10
727.1	27.887	11.94	0.50	128	27.80	0.16	1.77	1.79	0.81	0.69	0.96	1.10
726.9	28.051	9.77	0.44	128	27.97	0.16	1.78	1.80	0.81	0.69	0.97	1.11
726.8	28.215	15.39	0.45	128	28.13	0.16	1.79	1.81	0.82	0.70	0.97	1.11
726.6	28.379	14.10	0.48	128	28.30	0.16	1.80	1.82	0.82	0.70	0.98	1.12
726.5	28.543	11.54	0.50	128	28.46	0.16	1.81	1.83	0.83	0.71	0.98	1.12
726.3	28.707	10.38	0.41	128	28.62	0.16	1.82	1.84	0.83	0.71	0.99	1.13
726.1	28.871	9.92	0.34	128	28.79	0.16	1.83	1.85	0.84	0.72	0.99	1.13
726.0	29.035	9.66	0.32	128	28.95	0.16	1.84	1.86	0.84	0.72	1.00	1.14
725.8	29.199	8.07	0.27	128	29.12	0.16	1.85	1.87	0.85	0.73	1.01	1.14
725.6	29.363	7.04	0.15	128	29.28	0.16	1.86	1.88	0.85	0.73	1.01	1.15
725.5	29.527	6.28	0.27	128	29.45	0.16	1.87	1.89	0.86	0.74	1.02	1.16
725.3	29.691	7.51	0.37	128	29.61	0.16	1.89	1.90	0.86	0.74	1.02	1.16
725.1	29.855	10.72	0.36	128	29.77	0.16	1.90	1.91	0.87	0.75	1.03	1.17
725.0	30.019	11.45	0.38	127	29.94	0.16	1.91	1.92	0.87	0.75	1.03	1.17
724.8	30.183	7.57	0.37	127	30.10	0.16	1.92	1.93	0.88	0.76	1.04	1.18
724.7	30.347	13.74	0.51	127	30.27	0.16	1.93	1.94	0.88	0.76	1.04	1.18
724.5	30.511	19.11	0.72	127	30.43	0.16	1.94	1.96	0.89	0.77	1.05	1.19
724.3	30.675	34.50	0.68	127	30.59	0.16	1.95	1.97	0.89	0.77	1.05	1.19
724.2	30.840	14.36	0.82	127	30.76	0.16	1.96	1.98	0.90	0.78	1.06	1.20
724.0	31.004	10.94	0.55	127	30.92	0.16	1.97	1.99	0.90	0.78	1.06	1.20
723.8	31.168	15.40	0.54	127	31.09	0.16	1.98	2.00	0.91	0.79	1.07	1.21
723.7	31.332	13.10	0.59	127	31.25	0.16	1.99	2.01	0.92	0.79	1.07	1.21
723.5	31.496	10.34	0.56	127	31.41	0.16	2.00	2.02	0.92	0.80	1.08	1.22
723.3	31.660	10.03	0.50	127	31.58	0.16	2.01	2.03	0.93	0.80	1.08	1.22
723.2	31.824	10.36	0.37	127	31.74	0.16	2.02	2.04	0.93	0.81	1.09	1.23
723.0	31.988	10.58	0.31	127	31.91	0.16	2.03	2.05	0.94	0.81	1.10	1.24
722.8	32.152	11.89	0.31	127	32.07	0.16	2.04	2.06	0.94	0.82	1.10	1.24

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
722.7	32.316	10.13	0.28	127	32.23	0.16	2.05	2.07	0.95	0.82	1.11	1.25
722.5	32.480	8.38	0.26	127	32.40	0.16	2.06	2.08	0.95	0.83	1.11	1.25
722.4	32.644	7.75	0.20	127	32.56	0.16	2.07	2.09	0.96	0.83	1.12	1.26
722.2	32.808	8.21	0.18	127	32.73	0.16	2.08	2.10	0.96	0.84	1.12	1.26
722.0	32.972	9.34	0.14	127	32.89	0.16	2.09	2.11	0.97	0.84	1.13	1.27
721.9	33.136	8.09	0.14	127	33.05	0.16	2.10	2.12	0.97	0.85	1.13	1.27
721.7	33.300	7.66	0.13	127	33.22	0.16	2.11	2.13	0.98	0.85	1.14	1.28
721.5	33.464	7.60	0.16	127	33.38	0.16	2.12	2.14	0.98	0.86	1.14	1.28
721.4	33.628	7.58	0.23	127	33.55	0.16	2.14	2.15	0.99	0.87	1.15	1.29
721.2	33.792	7.26	0.23	127	33.71	0.16	2.15	2.16	0.99	0.87	1.15	1.29
721.0	33.956	7.43	0.23	127	33.87	0.16	2.16	2.17	1.00	0.88	1.16	1.30
720.9	34.120	7.14	0.26	127	34.04	0.16	2.17	2.18	1.00	0.88	1.16	1.30
720.7	34.284	7.40	0.20	127	34.20	0.16	2.18	2.19	1.01	0.89	1.17	1.31
720.6	34.448	7.83	0.19	127	34.37	0.16	2.19	2.21	1.01	0.89	1.17	1.31
720.4	34.612	7.38	0.17	127	34.53	0.16	2.20	2.22	1.02	0.90	1.18	1.32
720.2	34.776	6.58	0.19	127	34.69	0.16	2.21	2.23	1.02	0.90	1.19	1.33
720.1	34.941	6.52	0.19	127	34.86	0.16	2.22	2.24	1.03	0.91	1.19	1.33
719.9	35.105	7.84	0.22	127	35.02	0.16	2.23	2.25	1.03	0.91	1.20	1.34
719.7	35.269	9.12	0.33	127	35.19	0.16	2.24	2.26	1.04	0.92	1.20	1.34
719.6	35.433	18.09	0.50	127	35.35	0.16	2.25	2.27	1.04	0.92	1.21	1.35
719.4	35.597	26.41	0.98	127	35.51	0.16	2.26	2.28	1.05	0.93	1.21	1.35
719.2	35.761	29.26	1.32	127	35.68	0.16	2.27	2.29	1.05	0.93	1.22	1.36
719.1	35.925	28.76	1.05	127	35.84	0.16	2.28	2.30	1.06	0.94	1.22	1.36
718.9	36.089	27.55	1.21	127	36.01	0.16	2.29	2.31	1.06	0.94	1.23	1.37
718.7	36.253	27.40	1.19	127	36.17	0.16	2.30	2.32	1.07	0.95	1.23	1.37
718.6	36.417	24.48	1.13	127	36.33	0.16	2.31	2.33	1.07	0.95	1.24	1.38
718.4	36.581	23.57	0.88	127	36.50	0.16	2.32	2.34	1.08	0.96	1.24	1.38
718.3	36.745	24.12	0.90	127	36.66	0.16	2.33	2.35	1.08	0.96	1.25	1.39
718.1	36.909	21.79	0.77	127	36.83	0.16	2.34	2.36	1.09	0.97	1.25	1.39
717.9	37.073	19.48	0.68	127	36.99	0.16	2.35	2.37	1.09	0.97	1.26	1.40
717.8	37.237	21.33	0.64	127	37.16	0.16	2.36	2.38	1.10	0.98	1.27	1.40
717.6	37.401	21.64	0.56	127	37.32	0.16	2.37	2.39	1.10	0.98	1.27	1.41
717.4	37.565	20.65	0.60	127	37.48	0.16	2.39	2.40	1.11	0.99	1.28	1.42
717.3	37.729	21.60	0.55	127	37.65	0.16	2.40	2.41	1.11	0.99	1.28	1.42
717.1	37.893	20.06	0.53	127	37.81	0.16	2.41	2.42	1.12	1.00	1.29	1.43
716.9	38.057	19.55	0.50	127	37.98	0.16	2.42	2.43	1.12	1.00	1.29	1.43
716.8	38.221	20.69	0.44	127	38.14	0.16	2.43	2.44	1.13	1.01	1.30	1.44
716.6	38.385	22.25	0.44	127	38.30	0.16	2.44	2.46	1.14	1.01	1.30	1.44
716.5	38.549	22.55	0.50	127	38.47	0.16	2.45	2.47	1.14	1.02	1.31	1.45
716.3	38.713	23.17	0.47	127	38.63	0.16	2.46	2.48	1.15	1.02	1.31	1.45
716.1	38.877	21.46	0.45	127	38.80	0.16	2.47	2.49	1.15	1.03	1.32	1.46
716.0	39.042	22.03	0.45	126	38.96	0.16	2.48	2.50	1.16	1.03	1.32	1.46
715.8	39.206	22.44	0.45	126	39.12	0.16	2.49	2.51	1.16	1.04	1.33	1.47
715.6	39.370	23.12	0.58	126	39.29	0.16	2.50	2.52	1.17	1.04	1.33	1.47
715.5	39.534	25.53	0.64	126	39.45	0.16	2.51	2.53	1.17	1.05	1.34	1.48
715.3	39.698	24.44	0.73	126	39.62	0.16	2.52	2.54	1.18	1.05	1.34	1.48
715.1	39.862	25.65	0.75	126	39.78	0.16	2.53	2.55	1.18	1.06	1.35	1.49
715.0	40.026	23.33	0.72	126	39.94	0.16	2.54	2.56	1.19	1.06	1.35	1.49
714.8	40.190	21.20	0.69	126	40.11	0.16	2.55	2.57	1.19	1.07	1.36	1.50
714.6	40.354	20.93	0.57	126	40.27	0.16	2.56	2.58	1.20	1.07	1.37	1.50
714.5	40.518	20.49	0.53	126	40.44	0.16	2.57	2.59	1.20	1.08	1.37	1.51
714.3	40.682	19.34	0.56	126	40.60	0.16	2.58	2.60	1.21	1.09	1.38	1.52
714.2	40.846	19.25	0.56	126	40.76	0.16	2.59	2.61	1.21	1.09	1.38	1.52
714.0	41.010	20.06	0.49	126	40.93	0.16	2.60	2.62	1.22	1.10	1.39	1.53
713.8	41.174	20.61	0.49	126	41.09	0.16	2.61	2.63	1.22	1.10	1.39	1.53
713.7	41.338	19.36	0.52	126	41.26	0.16	2.62	2.64	1.23	1.11	1.40	1.54
713.5	41.502	19.02	0.50	126	41.42	0.16	2.63	2.65	1.23	1.11	1.40	1.54
713.3	41.666	18.59	0.49	126	41.58	0.16	2.64	2.66	1.24	1.12	1.41	1.55
713.2	41.830	18.33	0.44	126	41.75	0.16	2.65	2.67	1.24	1.12	1.41	1.55
713.0	41.994	20.01	0.47	126	41.91	0.16	2.66	2.68	1.25	1.13	1.42	1.56
712.8	42.158	22.95	0.44	126	42.08	0.16	2.68	2.69	1.25	1.13	1.42	1.56
712.7	42.322	23.25	0.48	126	42.24	0.16	2.69	2.70	1.26	1.14	1.43	1.57
712.5	42.486	23.85	0.45	126	42.40	0.16	2.70	2.71	1.26	1.14	1.43	1.57
712.3	42.650	23.52	0.49	126	42.57	0.16	2.71	2.72	1.27	1.15	1.44	1.58
712.2	42.814	23.53	0.51	126	42.73	0.16	2.72	2.73	1.27	1.15	1.44	1.58
712.0	42.978	21.10	0.66	126	42.90	0.16	2.73	2.75	1.28	1.16	1.45	1.59
711.9	43.143	19.65	0.76	126	43.06	0.16	2.74	2.76	1.28	1.16	1.45	1.59
711.7	43.307	20.74	0.81	126	43.22	0.16	2.75	2.77	1.29	1.17	1.46	1.60
711.5	43.471	15.77	0.74	126	43.39	0.16	2.76	2.78	1.29	1.17	1.46	1.60

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
711.4	43.635	11.25	0.51	126	43.55	0.16	2.77	2.79	1.30	1.18	1.47	1.61
711.2	43.799	9.66	0.28	126	43.72	0.16	2.78	2.80	1.30	1.18	1.47	1.61
711.0	43.963	8.69	0.22	126	43.88	0.16	2.79	2.81	1.31	1.19	1.48	1.62
710.9	44.127	7.96	0.19	126	44.04	0.16	2.80	2.82	1.31	1.19	1.48	1.62
710.7	44.291	7.87	0.18	126	44.21	0.16	2.81	2.83	1.32	1.20	1.49	1.63
710.5	44.455	7.79	0.17	126	44.37	0.16	2.82	2.84	1.32	1.20	1.50	1.64
710.4	44.619	7.71	0.16	126	44.54	0.16	2.83	2.85	1.33	1.21	1.50	1.64
710.2	44.783	7.58	0.15	126	44.70	0.16	2.84	2.86	1.33	1.21	1.51	1.65
710.1	44.947	7.43	0.14	126	44.86	0.16	2.85	2.87	1.34	1.22	1.51	1.65
709.9	45.111	7.33	0.13	126	45.03	0.16	2.86	2.88	1.35	1.22	1.52	1.66
709.7	45.275	7.42	0.13	126	45.19	0.16	2.87	2.89	1.35	1.23	1.52	1.66
709.6	45.439	7.41	0.13	126	45.36	0.16	2.88	2.90	1.36	1.23	1.53	1.67
709.4	45.603	7.53	0.14	126	45.52	0.16	2.89	2.91	1.36	1.24	1.53	1.67
709.2	45.767	8.18	0.22	126	45.69	0.16	2.90	2.92	1.37	1.24	1.54	1.68
709.1	45.931	9.58	0.37	126	45.85	0.16	2.91	2.93	1.37	1.25	1.54	1.68
708.9	46.095	18.42	0.35	126	46.01	0.16	2.92	2.94	1.38	1.25	1.55	1.69
708.7	46.259	19.12	0.37	126	46.18	0.16	2.93	2.95	1.38	1.26	1.55	1.69
708.6	46.423	18.15	0.31	126	46.34	0.16	2.94	2.96	1.39	1.26	1.56	1.70
708.4	46.587	24.92	0.24	126	46.51	0.16	2.95	2.97	1.39	1.27	1.56	1.70
708.2	46.751	37.66	0.13	126	46.67	0.16	2.96	2.98	1.40	1.27	1.57	1.71
708.1	46.915	42.54	0.13	126	46.83	0.16	2.98	2.99	1.40	1.28	1.57	1.71
707.9	47.079	44.87	0.20	126	47.00	0.16	2.99	3.00	1.41	1.28	1.58	1.72
707.8	47.244	46.44	0.27	126	47.16	0.16	3.00	3.01	1.41	1.29	1.58	1.72
707.6	47.408	48.77	0.47	126	47.33	0.16	3.01	3.02	1.42	1.30	1.59	1.73
707.4	47.572	49.48	0.46	126	47.49	0.16	3.02	3.03	1.42	1.30	1.59	1.73
707.3	47.736	73.19	0.46	126	47.65	0.16	3.03	3.04	1.43	1.31	1.60	1.74
707.1	47.900	91.15	0.63	126	47.82	0.16	3.04	3.06	1.43	1.31	1.60	1.74
706.9	48.064	91.76	0.85	131	47.98	0.16	3.05	3.07	1.44	1.32	1.61	1.75
706.8	48.228	87.74	0.96	131	48.15	0.16	3.06	3.08	1.44	1.32	1.62	1.76
706.6	48.392	88.52	0.98	131	48.31	0.16	3.07	3.09	1.45	1.33	1.62	1.76
706.4	48.556	104.84	0.98	131	48.47	0.16	3.08	3.10	1.45	1.33	1.63	1.77
706.3	48.720	117.59	0.98	131	48.64	0.16	3.09	3.11	1.46	1.34	1.63	1.77
706.1	48.884	122.18	1.09	131	48.80	0.16	3.10	3.12	1.46	1.34	1.64	1.78
706.0	49.048	122.18	1.11	131	48.97	0.16	3.11	3.13	1.47	1.35	1.64	1.78
705.8	49.212	120.45	1.13	131	49.13	0.16	3.12	3.14	1.47	1.35	1.65	1.79
705.6	49.376	113.94	1.05	131	49.29	0.16	3.13	3.15	1.48	1.36	1.66	1.80
705.5	49.540	107.15	0.95	131	49.46	0.16	3.14	3.16	1.48	1.36	1.66	1.80
705.3	49.704	99.30	0.91	131	49.62	0.16	3.16	3.17	1.49	1.37	1.67	1.81
705.1	49.868	93.54	0.88	131	49.79	0.16	3.17	3.18	1.49	1.37	1.67	1.81
705.0	50.032	85.17	0.83	131	49.95	0.16	3.18	3.19	1.50	1.38	1.68	1.82
704.8	50.196	74.05	0.69	131	50.11	0.16	3.19	3.21	1.50	1.38	1.68	1.82
704.6	50.360	70.86	0.74	131	50.28	0.16	3.20	3.22	1.51	1.39	1.69	1.83
704.5	50.524	82.61	2.26	131	50.44	0.16	3.21	3.23	1.51	1.39	1.69	1.83
704.3	50.688	100.81	0.01	131	50.61	0.16	3.22	3.24	1.52	1.40	1.70	1.84
704.1	50.852	332.75	0.01	131	50.77	0.08	3.23	3.25	1.52	1.40	1.71	1.85

LIQUEFACTION POTENTIAL ASSESSMENT FOR COARSE GRAINED SOILS USING CONE PENETRATION TEST DATA

Project Site: KIF TDEC Stability
Project No.: 175668043
CPT ID: CPT-02D

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
755.0												
754.8	0.164	75.47	2.80	2.31	0.5	1.70	12.39	47	48.36	60.75	0.002	-0.245
754.7	0.328	716.52	0.62	1.19	0.5	1.70	166.18	0	0.00	166.18	0.001	-0.600
754.5	0.492	513.22	1.03	1.45	0.5	1.70	145.80	0	0.00	145.80	0.000	-0.600
754.3	0.656	662.37	1.07	1.41	0.5	1.70	217.28	0	0.00	217.28	0.003	-0.600
754.2	0.820	946.13	0.71	1.18	0.5	1.70	346.97	0	0.00	346.97	0.005	-0.600
754.0	0.984	1113.93	0.59	1.08	0.5	1.70	447.49	0	0.00	447.49	0.008	-0.600
753.9	1.148	1131.33	0.44	0.96	0.5	1.70	490.90	0	0.00	490.90	0.011	-0.600
753.7	1.312	1270.59	0.53	1.01	0.5	1.70	589.39	0	0.00	589.39	0.014	-0.600
753.5	1.476	1279.05	0.61	1.07	0.5	1.70	629.31	0	0.00	629.31	0.017	-0.600
753.4	1.640	932.31	0.88	1.27	0.5	1.70	483.47	0	0.00	483.47	0.017	-0.600
753.2	1.804	895.45	0.84	1.26	0.5	1.70	486.86	0	0.00	486.86	0.016	-0.600
753.0	1.968	867.38	0.71	1.19	0.5	1.70	492.43	0	0.00	492.43	0.015	-0.600
752.9	2.133	787.40	0.64	1.18	0.5	1.70	457.59	0	0.00	457.59	0.014	-0.600
752.7	2.297	606.14	0.70	1.27	0.5	1.70	358.87	0	0.00	358.87	0.013	-0.600
752.5	2.461	444.22	0.88	1.43	0.5	1.70	267.80	0	0.00	267.80	0.013	-0.600
752.4	2.625	268.17	1.41	1.72	0.5	1.70	164.58	1	0.00	164.58	0.015	-0.600
752.2	2.789	141.29	2.67	2.11	0.5	1.70	88.30	32	55.41	143.71	0.016	-0.579
752.0	2.953	95.88	3.76	2.33	0.5	1.70	60.98	50	61.96	122.94	0.018	-0.507
751.9	3.117	69.34	3.90	2.44	0.5	1.70	44.89	58	60.68	105.57	0.019	-0.439
751.7	3.281	68.49	4.15	2.46	0.5	1.70	45.03	60	61.27	106.29	0.020	-0.441
751.6	3.445	96.87	3.13	2.27	0.5	1.70	64.51	44	60.31	124.81	0.021	-0.511
751.4	3.609	72.25	4.42	2.47	0.5	1.70	48.95	60	62.50	111.45	0.022	-0.460
751.2	3.773	83.30	5.65	2.51	0.7	1.70	39.91	64	60.85	100.76	0.023	-0.415
751.1	3.937	71.45	5.87	2.56	0.7	1.70	35.05	68	60.42	95.47	0.024	-0.392
750.9	4.101	60.33	5.85	2.61	0.7	1.70	30.29	72	59.75	90.05	0.025	-0.366
750.7	4.265	67.27	4.91	2.52	0.7	1.70	34.43	65	59.50	93.93	0.026	-0.383
750.6	4.429	66.09	5.75	2.58	0.7	1.70	34.52	69	60.51	95.03	0.027	-0.387
750.4	4.593	351.80	1.04	1.54	0.5	1.59	242.31	0	0.00	242.31	0.029	-0.600
750.2	4.757	524.54	0.69	1.30	0.5	1.54	355.26	0	0.00	355.26	0.030	-0.600
750.1	4.921	508.57	0.51	1.20	0.5	1.53	346.60	0	0.00	346.60	0.032	-0.600
749.9	5.085	481.49	0.53	1.23	0.5	1.52	330.17	0	0.00	330.17	0.035	-0.600
749.8	5.249	350.43	0.77	1.44	0.5	1.54	245.58	0	0.00	245.58	0.037	-0.600
749.6	5.413	168.20	2.03	1.97	0.5	1.70	132.36	21	42.99	175.35	0.039	-0.600
749.4	5.577	120.51	2.93	2.19	0.5	1.70	96.12	38	63.31	159.42	0.041	-0.600
749.3	5.741	77.55	5.12	2.49	0.5	1.70	62.78	63	67.05	129.83	0.042	-0.519
749.1	5.905	76.88	5.49	2.52	0.5	1.70	62.96	65	67.66	130.62	0.043	-0.521
748.9	6.069	77.73	5.46	2.52	0.5	1.70	64.37	64	67.96	132.33	0.044	-0.527
748.8	6.234	83.92	4.91	2.46	0.5	1.70	70.21	60	68.30	138.51	0.045	-0.547
748.6	6.398	96.85	3.64	2.32	0.5	1.70	81.81	48	66.90	148.71	0.046	-0.580
748.4	6.562	94.97	4.51	2.40	0.5	1.70	81.07	55	69.52	150.59	0.047	-0.586
748.3	6.726	89.99	5.30	2.47	0.5	1.70	77.65	60	70.55	148.21	0.048	-0.578
748.1	6.890	103.44	5.07	2.41	0.5	1.68	89.14	56	72.28	161.42	0.049	-0.600
747.9	7.054	98.25	5.39	2.45	0.5	1.68	85.54	59	72.30	157.84	0.051	-0.600
747.8	7.218	90.97	4.76	2.43	0.5	1.69	80.60	57	70.30	150.91	0.052	-0.586
747.6	7.382	105.04	4.18	2.34	0.5	1.65	91.13	50	70.35	161.48	0.053	-0.600
747.5	7.546	84.38	4.17	2.40	0.5	1.69	76.15	55	68.37	144.51	0.055	-0.565
747.3	7.710	66.07	5.13	2.54	0.5	1.70	60.60	66	67.38	127.97	0.056	-0.508
747.1	7.874	62.47	4.52	2.51	0.5	1.70	57.86	64	66.09	123.95	0.057	-0.494
747.0	8.038	56.24	4.62	2.55	0.5	1.70	52.63	67	65.31	117.95	0.058	-0.471
746.8	8.202	52.75	4.75	2.58	0.5	1.70	49.85	69	65.01	114.86	0.059	-0.459
746.6	8.366	64.60	5.09	2.54	0.7	1.70	48.56	66	63.99	112.56	0.059	-0.450
746.5	8.530	53.87	4.99	2.59	0.5	1.70	51.77	70	65.72	117.49	0.060	-0.469
746.3	8.694	63.56	5.41	2.57	0.7	1.70	48.92	68	64.53	113.46	0.061	-0.453
746.1	8.858	78.12	4.05	2.41	0.5	1.62	72.14	56	67.63	139.77	0.061	-0.547
746.0	9.022	104.94	3.57	2.29	0.5	1.54	92.95	46	68.55	161.50	0.062	-0.600
745.8	9.186	118.83	4.32	2.32	0.5	1.50	102.89	49	72.59	175.48	0.063	-0.600
745.6	9.350	123.50	3.15	2.20	0.5	1.49	107.31	39	67.18	174.49	0.064	-0.600
745.5	9.514	142.22	3.09	2.16	0.5	1.45	121.13	36	67.00	188.13	0.065	-0.600
745.3	9.678	181.43	1.92	1.93	0.5	1.44	154.13	17	36.35	190.48	0.066	-0.600
745.2	9.842	119.31	3.06	2.20	0.5	1.47	104.86	39	66.53	171.38	0.067	-0.600

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
745.0	10.006	97.15	2.84	2.24	0.5	1.51	88.30	42	64.59	152.89	0.068	-0.588
744.8	10.170	114.64	3.01	2.21	0.5	1.47	101.73	40	66.15	167.88	0.068	-0.600
744.7	10.335	176.54	2.20	1.98	0.5	1.40	149.78	22	48.54	198.32	0.069	-0.600
744.5	10.499	165.13	2.90	2.10	0.5	1.38	139.42	31	64.73	204.15	0.070	-0.600
744.3	10.663	135.37	3.59	2.22	0.5	1.40	117.19	41	70.92	188.12	0.070	-0.600
744.2	10.827	164.72	3.75	2.19	0.5	1.35	138.40	38	73.50	211.90	0.071	-0.600
744.0	10.991	204.58	3.26	2.08	0.5	1.31	167.31	30	68.84	236.15	0.071	-0.600
743.8	11.155	268.39	1.77	1.80	0.5	1.32	222.66	7	2.26	224.93	0.072	-0.600
743.7	11.319	191.86	2.96	2.07	0.5	1.32	159.90	28	64.72	224.62	0.072	-0.600
743.5	11.483	200.53	2.68	2.02	0.5	1.31	167.30	25	58.53	225.83	0.073	-0.600
743.4	11.647	121.32	3.96	2.29	0.5	1.38	107.59	46	72.11	179.71	0.073	-0.600
743.2	11.811	93.03	4.53	2.40	0.5	1.42	85.52	55	70.95	156.47	0.074	-0.596
743.0	11.975	76.69	5.11	2.50	0.5	1.44	72.27	63	69.80	142.07	0.074	-0.550
742.9	12.139	83.89	4.40	2.42	0.5	1.42	78.37	57	69.56	147.93	0.075	-0.569
742.7	12.303	87.87	3.94	2.37	0.5	1.41	81.82	53	68.93	150.75	0.075	-0.578
742.5	12.467	93.66	4.04	2.36	0.5	1.39	86.57	52	69.88	156.45	0.076	-0.595
742.4	12.631	200.22	1.99	1.92	0.5	1.30	173.27	16	34.36	207.63	0.076	-0.600
742.2	12.795	248.45	1.43	1.75	0.5	1.29	213.84	3	0.00	213.84	0.077	-0.600
742.0	12.959	241.45	1.13	1.67	0.5	1.29	209.28	0	0.00	209.28	0.077	-0.600
741.9	13.123	163.83	1.76	1.93	0.5	1.32	146.87	17	35.19	182.06	0.077	-0.600
741.7	13.287	95.63	3.26	2.29	0.5	1.36	88.98	46	67.33	156.30	0.078	-0.593
741.5	13.451	82.03	4.36	2.42	0.5	1.37	77.49	57	69.41	146.90	0.078	-0.564
741.4	13.615	70.92	5.27	2.53	0.5	1.38	68.06	65	69.30	137.35	0.078	-0.532
741.2	13.779	63.42	6.36	2.62	0.7	1.41	53.90	73	66.88	120.78	0.079	-0.473
741.1	13.943	64.97	5.79	2.58	0.7	1.40	55.26	70	66.66	121.92	0.080	-0.477
740.9	14.107	60.17	5.30	2.58	0.5	1.38	58.92	69	67.59	126.51	0.080	-0.494
740.7	14.271	60.93	5.20	2.57	0.5	1.37	59.63	68	67.62	127.24	0.081	-0.496
740.6	14.436	56.01	6.89	2.68	1.0	1.41	40.21	78	63.70	103.91	0.081	-0.407
740.4	14.600	52.42	7.06	2.71	1.0	1.41	38.05	80	63.38	101.43	0.082	-0.396
740.2	14.764	48.03	7.07	2.73	1.0	1.41	35.33	82	62.85	98.18	0.083	-0.382
740.1	14.928	47.42	6.82	2.73	1.0	1.41	35.09	81	62.69	97.78	0.083	-0.380
739.9	15.092	46.34	6.66	2.73	1.0	1.40	34.53	81	62.51	97.04	0.084	-0.377
739.7	15.256	46.72	6.47	2.71	1.0	1.39	34.96	80	62.50	97.46	0.085	-0.378
739.6	15.420	45.33	6.37	2.72	1.0	1.39	34.17	80	62.31	96.47	0.085	-0.374
739.4	15.584	43.14	6.33	2.73	1.0	1.38	32.82	81	62.04	94.86	0.085	-0.366
739.3	15.748	44.16	5.85	2.70	1.0	1.38	33.69	79	61.93	95.62	0.085	-0.370
739.1	15.912	41.66	6.01	2.72	1.0	1.37	32.08	81	61.75	93.83	0.086	-0.361
738.9	16.076	36.19	4.12	2.65	0.7	1.36	33.52	75	61.27	94.79	0.086	-0.366
738.8	16.240	36.78	1.90	2.42	0.5	1.35	38.21	57	58.53	96.74	0.086	-0.374
738.6	16.404	118.92	0.71	1.76	0.5	1.31	117.50	4	0.01	117.51	0.086	-0.458
738.4	16.568	101.68	2.12	2.13	0.5	1.26	96.80	33	58.95	155.75	0.086	-0.588
738.3	16.732	60.62	4.36	2.51	0.5	1.29	59.98	64	66.62	126.60	0.085	-0.491
738.1	16.896	28.07	13.46	3.10	1.0	1.35	22.95	100	61.06	84.01	0.085	-0.315
737.9	17.060	26.01	6.28	2.88	1.0	1.35	21.54	93	60.02	81.55	0.085	-0.302
737.8	17.224	21.86	6.72	2.95	1.0	1.35	18.49	99	59.62	78.11	0.085	-0.285
737.6	17.388	24.42	6.20	2.90	1.0	1.34	20.51	95	59.82	80.33	0.085	-0.296
737.4	17.552	29.42	5.33	2.79	1.0	1.33	24.38	86	60.13	84.51	0.086	-0.316
737.3	17.716	38.32	4.59	2.66	1.0	1.31	31.16	76	60.77	91.93	0.087	-0.351
737.1	17.880	28.74	6.45	2.86	1.0	1.31	24.04	92	60.60	84.64	0.087	-0.317
737.0	18.044	26.36	6.88	2.90	1.0	1.31	22.31	95	60.44	82.74	0.088	-0.307
736.8	18.208	32.85	5.46	2.77	1.0	1.30	27.37	84	60.77	88.14	0.089	-0.333
736.6	18.372	40.27	4.24	2.63	0.7	1.27	37.88	73	62.22	100.10	0.090	-0.386
736.5	18.537	36.90	5.90	2.75	1.0	1.28	30.67	83	61.66	92.32	0.090	-0.352
736.3	18.701	40.03	5.35	2.70	1.0	1.27	33.19	79	61.79	94.98	0.090	-0.363
736.1	18.865	37.38	5.96	2.75	1.0	1.27	31.27	83	61.83	93.10	0.091	-0.355
736.0	19.029	44.04	4.66	2.63	0.7	1.25	41.40	73	63.28	104.68	0.091	-0.404
735.8	19.193	47.61	4.52	2.59	0.7	1.24	44.57	71	63.70	108.27	0.092	-0.419
735.6	19.357	40.78	6.28	2.74	1.0	1.25	34.26	83	62.63	96.89	0.092	-0.371
735.5	19.521	28.94	3.75	2.69	1.0	1.26	25.15	78	59.33	84.48	0.093	-0.314
735.3	19.685	16.04	6.17	3.03	1.0	1.27	14.83	100	58.54	73.37	0.093	-0.257
735.2	19.849	10.57	7.05	3.20	1.0	1.27	10.39	100	57.16	67.55	0.093	-0.225
735.0	20.013	11.90	6.62	3.15	1.0	1.26	11.52	100	57.51	69.03	0.094	-0.233
734.8	20.177	16.21	5.49	2.99	1.0	1.25	15.12	100	58.63	73.75	0.094	-0.259
734.7	20.341	17.47	4.92	2.94	1.0	1.25	16.21	98	58.78	74.99	0.095	-0.265
734.5	20.505	16.28	5.28	2.98	1.0	1.24	15.28	100	58.68	73.96	0.095	-0.260
734.3	20.669	13.23	6.04	3.09	1.0	1.24	12.78	100	57.90	70.68	0.095	-0.242

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
734.2	20.833	22.12	3.79	2.78	1.0	1.23	20.24	86	58.80	79.04	0.096	-0.286
734.0	20.997	22.01	3.48	2.76	1.0	1.22	20.22	84	58.58	78.80	0.096	-0.284
733.8	21.161	21.32	3.35	2.76	1.0	1.22	19.71	84	58.43	78.14	0.097	-0.281
733.7	21.325	22.25	2.17	2.63	1.0	1.21	20.58	74	57.23	77.81	0.097	-0.279
733.5	21.489	19.58	2.49	2.71	1.0	1.21	18.39	80	57.52	75.91	0.098	-0.269
733.3	21.653	8.84	5.70	3.21	1.0	1.22	9.27	100	56.81	66.08	0.098	-0.215
733.2	21.817	5.87	6.76	3.39	1.0	1.21	6.73	100	56.02	62.75	0.098	-0.195
733.0	21.981	16.58	2.83	2.80	1.0	1.20	15.99	87	57.68	73.67	0.099	-0.257
732.9	22.145	23.92	3.13	2.70	1.0	1.19	22.31	79	58.61	80.92	0.099	-0.294
732.7	22.309	15.76	4.76	2.96	1.0	1.19	15.37	100	58.69	74.06	0.099	-0.258
732.5	22.473	18.48	4.24	2.88	1.0	1.18	17.76	93	58.82	76.59	0.100	-0.271
732.4	22.638	14.82	4.11	2.94	1.0	1.18	14.65	98	58.34	72.98	0.100	-0.252
732.2	22.802	16.53	2.21	2.74	1.0	1.17	16.20	82	57.17	73.36	0.100	-0.254
732.0	22.966	10.95	4.06	3.04	1.0	1.17	11.34	100	57.45	68.80	0.101	-0.229
731.9	23.130	8.42	5.55	3.21	1.0	1.17	9.15	100	56.77	65.92	0.101	-0.212
731.7	23.294	6.90	5.09	3.26	1.0	1.17	7.82	100	56.36	64.18	0.101	-0.202
731.5	23.458	6.64	5.68	3.30	1.0	1.17	7.61	100	56.29	63.90	0.102	-0.200
731.4	23.622	9.67	3.90	3.07	1.0	1.16	10.33	100	57.14	67.48	0.102	-0.221
731.2	23.786	11.57	4.35	3.04	1.0	1.15	12.06	100	57.68	69.74	0.102	-0.233
731.1	23.950	9.06	5.72	3.20	1.0	1.15	9.85	100	56.99	66.84	0.102	-0.217
730.9	24.114	20.34	2.48	2.70	1.0	1.14	19.97	79	57.83	77.80	0.103	-0.276
730.7	24.278	25.20	2.80	2.66	1.0	1.13	24.34	76	58.65	82.99	0.103	-0.302
730.6	24.442	17.08	3.97	2.88	1.0	1.13	17.14	94	58.69	75.84	0.103	-0.266
730.4	24.606	10.40	4.06	3.06	1.0	1.13	11.17	100	57.40	68.57	0.103	-0.226
730.2	24.770	8.71	4.85	3.17	1.0	1.13	9.66	100	56.93	66.59	0.104	-0.215
730.1	24.934	5.02	8.35	3.50	1.0	1.13	6.32	100	55.89	62.21	0.104	-0.189
729.9	25.098	7.01	5.57	3.28	1.0	1.12	8.15	100	56.46	64.62	0.104	-0.203
729.7	25.262	6.95	5.65	3.29	1.0	1.12	8.13	100	56.46	64.58	0.104	-0.203
729.6	25.426	7.97	4.54	3.18	1.0	1.11	9.08	100	56.75	65.83	0.105	-0.210
729.4	25.590	6.26	4.99	3.29	1.0	1.11	7.53	100	56.27	63.79	0.105	-0.198
729.2	25.754	6.79	4.80	3.25	1.0	1.11	8.04	100	56.43	64.47	0.105	-0.201
729.1	25.918	5.74	5.82	3.36	1.0	1.10	7.08	100	56.13	63.21	0.105	-0.194
728.9	26.082	6.42	3.73	3.21	1.0	1.10	7.73	100	56.33	64.06	0.106	-0.199
728.8	26.246	5.87	5.12	3.32	1.0	1.09	7.24	100	56.18	63.42	0.106	-0.195
728.6	26.410	7.58	4.36	3.19	1.0	1.09	8.85	100	56.68	65.54	0.106	-0.207
728.4	26.574	6.14	5.51	3.32	1.0	1.09	7.53	100	56.27	63.80	0.106	-0.197
728.3	26.739	5.92	4.77	3.30	1.0	1.08	7.34	100	56.21	63.55	0.107	-0.195
728.1	26.903	6.08	4.69	3.29	1.0	1.08	7.51	100	56.26	63.77	0.107	-0.196
727.9	27.067	6.22	3.73	3.22	1.0	1.08	7.66	100	56.31	63.97	0.107	-0.197
727.8	27.231	7.31	3.52	3.15	1.0	1.07	8.71	100	56.64	65.35	0.107	-0.205
727.6	27.395	6.19	6.46	3.36	1.0	1.07	7.67	100	56.31	63.98	0.108	-0.197
727.4	27.559	8.46	3.93	3.12	1.0	1.06	9.85	100	56.99	66.84	0.108	-0.214
727.3	27.723	10.64	3.63	3.02	1.0	1.06	11.95	100	57.64	69.60	0.108	-0.229
727.1	27.887	10.57	4.92	3.10	1.0	1.06	11.92	100	57.63	69.55	0.108	-0.229
726.9	28.051	8.26	5.47	3.22	1.0	1.05	9.73	100	56.95	66.69	0.109	-0.212
726.8	28.215	13.98	3.27	2.90	1.0	1.05	15.25	95	58.24	73.49	0.109	-0.250
726.6	28.379	12.58	3.89	2.98	1.0	1.05	13.94	100	58.26	72.20	0.109	-0.243
726.5	28.543	9.89	5.15	3.14	1.0	1.04	11.38	100	57.46	68.84	0.109	-0.224
726.3	28.707	8.66	4.82	3.17	1.0	1.04	10.21	100	57.10	67.31	0.110	-0.215
726.1	28.871	8.14	4.25	3.16	1.0	1.04	9.73	100	56.95	66.68	0.110	-0.211
726.0	29.035	7.82	4.03	3.16	1.0	1.03	9.44	100	56.86	66.30	0.110	-0.209
725.8	29.199	6.18	4.30	3.26	1.0	1.03	7.86	100	56.37	64.23	0.110	-0.197
725.6	29.363	5.13	2.97	3.24	1.0	1.03	6.84	100	56.06	62.90	0.110	-0.189
725.5	29.527	4.34	6.15	3.47	1.0	1.02	6.08	100	55.82	61.90	0.111	-0.183
725.3	29.691	5.51	6.51	3.40	1.0	1.02	7.25	100	56.18	63.43	0.111	-0.192
725.1	29.855	8.60	4.02	3.12	1.0	1.02	10.31	100	57.13	67.45	0.111	-0.215
725.0	30.019	9.25	3.94	3.09	1.0	1.01	10.98	100	57.34	68.32	0.111	-0.220
724.8	30.183	5.45	6.57	3.41	1.0	1.01	7.24	100	56.18	63.42	0.112	-0.191
724.7	30.347	11.33	4.33	3.05	1.0	1.01	13.10	100	58.00	71.09	0.112	-0.235
724.5	30.511	16.39	4.21	2.91	1.0	1.01	18.16	96	59.23	77.39	0.112	-0.268
724.3	30.675	30.84	2.10	2.51	0.5	1.00	32.68	64	58.83	91.51	0.112	-0.336
724.2	30.840	11.72	6.58	3.15	1.0	1.00	13.57	100	58.15	71.72	0.113	-0.238
724.0	31.004	8.44	6.14	3.24	1.0	1.00	10.31	100	57.13	67.44	0.113	-0.214
723.8	31.168	12.55	4.03	2.99	1.0	0.99	14.47	100	58.42	72.89	0.113	-0.244
723.7	31.332	10.34	5.31	3.13	1.0	0.99	12.27	100	57.74	70.01	0.113	-0.228
723.5	31.496	7.72	6.67	3.29	1.0	0.99	9.66	100	56.93	66.59	0.113	-0.209

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723.3	31.660	7.39	6.17	3.29	1.0	0.99	9.34	100	56.83	66.18	0.113	-0.206
723.2	31.824	7.65	4.43	3.19	1.0	0.98	9.63	100	56.92	66.55	0.114	-0.208
723.0	31.988	7.81	3.65	3.13	1.0	0.98	9.80	100	56.98	66.78	0.114	-0.209
722.8	32.152	8.95	3.13	3.05	1.0	0.98	10.99	100	57.34	68.33	0.114	-0.218
722.7	32.316	7.30	3.49	3.15	1.0	0.97	9.33	100	56.83	66.16	0.114	-0.206
722.5	32.480	5.68	4.08	3.28	1.0	0.97	7.69	100	56.32	64.01	0.114	-0.193
722.4	32.644	5.08	3.59	3.28	1.0	0.97	7.09	100	56.14	63.23	0.114	-0.188
722.2	32.808	5.46	2.92	3.21	1.0	0.97	7.49	100	56.26	63.75	0.114	-0.191
722.0	32.972	6.43	1.96	3.06	1.0	0.96	8.51	100	56.57	65.08	0.114	-0.199
721.9	33.136	5.28	2.36	3.18	1.0	0.96	7.34	100	56.21	63.56	0.115	-0.190
721.7	33.300	4.87	2.31	3.20	1.0	0.96	6.93	100	56.09	63.02	0.115	-0.186
721.5	33.464	4.79	2.96	3.26	1.0	0.96	6.86	100	56.06	62.92	0.115	-0.186
721.4	33.628	4.74	4.28	3.35	1.0	0.95	6.83	100	56.05	62.88	0.115	-0.185
721.2	33.792	4.43	4.54	3.39	1.0	0.95	6.52	100	55.96	62.47	0.115	-0.183
721.0	33.956	4.55	4.40	3.37	1.0	0.95	6.65	100	56.00	62.65	0.116	-0.184
720.9	34.120	4.27	5.15	3.43	1.0	0.94	6.38	100	55.91	62.29	0.118	-0.181
720.7	34.284	4.46	3.77	3.34	1.0	0.94	6.59	100	55.98	62.56	0.118	-0.183
720.6	34.448	4.80	3.33	3.29	1.0	0.94	6.96	100	56.09	63.05	0.118	-0.186
720.4	34.612	4.39	3.26	3.32	1.0	0.94	6.54	100	55.96	62.50	0.118	-0.182
720.2	34.776	3.68	4.28	3.44	1.0	0.93	5.81	100	55.74	61.54	0.118	-0.176
720.1	34.941	3.61	4.51	3.46	1.0	0.93	5.74	100	55.72	61.46	0.118	-0.176
719.9	35.105	4.69	3.87	3.33	1.0	0.93	6.89	100	56.07	62.96	0.118	-0.185
719.7	35.269	5.73	4.78	3.31	1.0	0.93	8.00	100	56.42	64.42	0.119	-0.193
719.6	35.433	13.12	3.18	2.92	1.0	0.93	15.88	96	58.54	74.42	0.119	-0.249
719.4	35.597	19.92	4.06	2.84	1.0	0.93	23.20	90	60.19	83.39	0.119	-0.294
719.2	35.761	22.17	4.90	2.86	1.0	0.93	25.68	92	61.10	86.78	0.119	-0.310
719.1	35.925	21.66	3.96	2.80	1.0	0.93	25.17	87	60.48	85.65	0.119	-0.305
718.9	36.089	20.57	4.79	2.87	1.0	0.92	24.05	93	60.74	84.80	0.119	-0.301
718.7	36.253	20.35	4.73	2.87	1.0	0.92	23.86	93	60.69	84.55	0.120	-0.299
718.6	36.417	17.90	5.09	2.94	1.0	0.92	21.25	98	60.36	81.60	0.120	-0.285
718.4	36.581	17.08	4.13	2.89	1.0	0.92	20.39	95	59.78	80.17	0.120	-0.277
718.3	36.745	17.44	4.13	2.89	1.0	0.91	20.83	94	59.85	80.68	0.120	-0.280
718.1	36.909	15.50	3.94	2.91	1.0	0.91	18.75	96	59.42	78.17	0.120	-0.267
717.9	37.073	13.59	3.99	2.96	1.0	0.91	16.70	100	59.12	75.82	0.120	-0.255
717.8	37.237	14.99	3.36	2.88	1.0	0.91	18.26	94	59.04	77.30	0.121	-0.262
717.6	37.401	15.17	2.89	2.84	1.0	0.90	18.49	90	58.76	77.25	0.121	-0.262
717.4	37.565	14.32	3.30	2.89	1.0	0.90	17.59	95	58.92	76.51	0.121	-0.258
717.3	37.729	14.99	2.86	2.84	1.0	0.90	18.37	90	58.73	77.10	0.121	-0.261
717.1	37.893	13.72	2.99	2.88	1.0	0.90	17.00	94	58.65	75.65	0.122	-0.253
716.9	38.057	13.27	2.90	2.89	1.0	0.89	16.53	94	58.54	75.07	0.122	-0.250
716.8	38.221	14.08	2.38	2.82	1.0	0.89	17.46	88	58.26	75.71	0.122	-0.253
716.6	38.385	15.22	2.23	2.77	1.0	0.89	18.75	85	58.24	76.99	0.122	-0.260
716.5	38.549	15.37	2.49	2.80	1.0	0.89	18.96	87	58.53	77.49	0.123	-0.262
716.3	38.713	15.78	2.24	2.76	1.0	0.89	19.44	84	58.35	77.80	0.123	-0.264
716.1	38.877	14.41	2.38	2.81	1.0	0.89	17.95	88	58.33	76.28	0.123	-0.256
716.0	39.042	14.78	2.30	2.79	1.0	0.88	18.40	86	58.31	76.70	0.124	-0.258
715.8	39.206	15.02	2.24	2.78	1.0	0.88	18.70	85	58.28	76.98	0.124	-0.259
715.6	39.370	15.46	2.81	2.83	1.0	0.88	19.24	89	58.87	78.10	0.124	-0.265
715.5	39.534	17.19	2.78	2.79	1.0	0.88	21.22	86	59.12	80.34	0.124	-0.276
715.3	39.698	16.31	3.31	2.85	1.0	0.88	20.27	91	59.39	79.65	0.124	-0.273
715.1	39.862	17.14	3.23	2.83	1.0	0.88	21.24	89	59.49	80.73	0.125	-0.278
715.0	40.026	15.35	3.44	2.88	1.0	0.87	19.26	94	59.33	78.58	0.125	-0.267
714.8	40.190	13.72	3.72	2.94	1.0	0.87	17.44	98	59.20	76.63	0.125	-0.257
714.6	40.354	13.45	3.08	2.90	1.0	0.87	17.17	95	58.81	75.98	0.125	-0.253
714.5	40.518	13.07	2.97	2.90	1.0	0.87	16.76	95	58.69	75.46	0.125	-0.250
714.3	40.682	12.18	3.32	2.95	1.0	0.86	15.78	99	58.76	74.54	0.125	-0.245
714.2	40.846	12.07	3.36	2.96	1.0	0.86	15.67	100	58.78	74.45	0.125	-0.245
714.0	41.010	12.60	2.81	2.90	1.0	0.86	16.30	95	58.55	74.85	0.125	-0.247
713.8	41.174	12.94	2.74	2.88	1.0	0.86	16.72	94	58.56	75.28	0.125	-0.249
713.7	41.338	11.99	3.09	2.94	1.0	0.86	15.66	98	58.64	74.30	0.125	-0.244
713.5	41.502	11.69	3.08	2.95	1.0	0.85	15.35	99	58.60	73.95	0.125	-0.242
713.3	41.666	11.33	3.04	2.96	1.0	0.85	14.96	99	58.53	73.50	0.126	-0.239
713.2	41.830	11.10	2.79	2.94	1.0	0.85	14.72	98	58.36	73.09	0.126	-0.237
713.0	41.994	12.24	2.70	2.90	1.0	0.85	16.06	95	58.47	74.53	0.126	-0.244
712.8	42.158	14.25	2.17	2.79	1.0	0.85	18.41	86	58.30	76.71	0.126	-0.256
712.7	42.322	14.40	2.34	2.81	1.0	0.85	18.62	87	58.50	77.11	0.127	-0.258

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
712.5	42.486	14.76	2.13	2.77	1.0	0.85	19.06	85	58.34	77.41	0.127	-0.259
712.3	42.650	14.47	2.34	2.80	1.0	0.84	18.76	87	58.53	77.29	0.127	-0.258
712.2	42.814	14.42	2.47	2.82	1.0	0.84	18.73	88	58.65	77.38	0.127	-0.259
712.0	42.978	12.68	3.58	2.96	1.0	0.84	16.74	100	59.10	75.84	0.128	-0.251
711.9	43.143	11.63	4.47	3.05	1.0	0.84	15.54	100	58.76	74.29	0.128	-0.242
711.7	43.307	12.33	4.50	3.03	1.0	0.84	16.38	100	59.02	75.40	0.128	-0.248
711.5	43.471	8.88	5.72	3.20	1.0	0.83	12.37	100	57.77	70.15	0.128	-0.220
711.4	43.635	5.77	5.97	3.36	1.0	0.82	8.77	100	56.65	65.42	0.128	-0.193
711.2	43.799	4.67	4.10	3.35	1.0	0.82	7.50	100	56.26	63.77	0.128	-0.183
711.0	43.963	3.99	3.65	3.38	1.0	0.82	6.73	100	56.02	62.75	0.128	-0.177
710.9	44.127	3.48	3.68	3.43	1.0	0.82	6.14	100	55.84	61.99	0.128	-0.172
710.7	44.291	3.40	3.46	3.43	1.0	0.81	6.06	100	55.82	61.88	0.128	-0.171
710.5	44.455	3.32	3.36	3.43	1.0	0.81	5.98	100	55.79	61.78	0.128	-0.171
710.4	44.619	3.25	3.26	3.43	1.0	0.81	5.92	100	55.77	61.69	0.128	-0.170
710.2	44.783	3.15	3.12	3.43	1.0	0.81	5.80	100	55.73	61.53	0.128	-0.169
710.1	44.947	3.03	3.08	3.44	1.0	0.81	5.67	100	55.69	61.37	0.129	-0.168
709.9	45.111	2.95	2.95	3.44	1.0	0.81	5.58	100	55.67	61.25	0.129	-0.167
709.7	45.275	2.99	2.92	3.44	1.0	0.80	5.64	100	55.69	61.33	0.129	-0.167
709.6	45.439	2.96	2.94	3.44	1.0	0.80	5.62	100	55.68	61.30	0.129	-0.167
709.4	45.603	3.03	3.08	3.44	1.0	0.80	5.70	100	55.70	61.41	0.129	-0.168
709.2	45.767	3.43	4.23	3.47	1.0	0.80	6.19	100	55.85	62.04	0.129	-0.171
709.1	45.931	4.32	5.52	3.45	1.0	0.80	7.24	100	56.18	63.42	0.129	-0.180
708.9	46.095	10.01	2.26	2.93	1.0	0.81	14.03	97	58.06	72.09	0.130	-0.229
708.7	46.259	10.43	2.30	2.92	1.0	0.80	14.55	96	58.15	72.70	0.130	-0.232
708.6	46.423	9.76	2.03	2.91	1.0	0.80	13.77	96	57.87	71.64	0.130	-0.226
708.4	46.587	14.05	1.09	2.64	1.0	0.80	18.95	74	56.85	75.80	0.130	-0.248
708.2	46.751	26.94	0.38	2.19	0.5	0.80	28.61	38	47.76	76.37	0.131	-0.251
708.1	46.915	30.66	0.33	2.11	0.5	0.80	32.25	32	43.89	76.14	0.131	-0.250
707.9	47.079	32.41	0.47	2.15	0.5	0.80	34.13	35	46.94	81.07	0.131	-0.275
707.8	47.244	33.56	0.61	2.19	0.5	0.81	35.38	38	49.24	84.63	0.131	-0.292
707.6	47.408	35.29	1.02	2.28	0.5	0.81	37.34	46	53.98	91.33	0.131	-0.323
707.4	47.572	35.77	1.00	2.27	0.5	0.81	37.83	45	53.66	91.48	0.131	-0.324
707.3	47.736	53.93	0.65	2.02	0.5	0.81	56.09	25	39.61	95.70	0.131	-0.342
707.1	47.900	67.62	0.72	1.96	0.5	0.82	70.22	20	32.89	103.10	0.131	-0.374
706.9	48.064	67.97	0.96	2.03	0.5	0.82	71.29	25	43.40	114.69	0.131	-0.420
706.8	48.228	64.76	1.14	2.09	0.5	0.82	68.24	30	49.59	117.83	0.131	-0.432
706.6	48.392	65.24	1.14	2.09	0.5	0.82	68.76	30	49.54	118.30	0.131	-0.434
706.4	48.556	77.55	0.96	1.99	0.5	0.82	81.41	22	38.48	119.90	0.131	-0.440
706.3	48.720	87.12	0.85	1.91	0.5	0.82	90.92	16	25.64	116.55	0.130	-0.427
706.1	48.884	90.44	0.91	1.92	0.5	0.82	94.76	17	27.32	122.08	0.130	-0.447
706.0	49.048	90.28	0.93	1.92	0.5	0.82	94.69	17	28.40	123.09	0.130	-0.451
705.8	49.212	88.81	0.96	1.94	0.5	0.82	93.35	18	31.49	124.83	0.129	-0.457
705.6	49.376	83.73	0.95	1.96	0.5	0.82	87.97	20	34.32	122.29	0.129	-0.448
705.5	49.540	78.46	0.91	1.97	0.5	0.81	82.29	20	35.58	117.87	0.128	-0.431
705.3	49.704	72.41	0.95	2.01	0.5	0.81	76.08	24	40.89	116.97	0.128	-0.428
705.1	49.868	67.94	0.97	2.04	0.5	0.81	71.45	26	44.05	115.50	0.127	-0.422
705.0	50.032	61.54	1.01	2.08	0.5	0.80	64.78	29	47.75	112.53	0.127	-0.411
704.8	50.196	53.10	0.98	2.12	0.5	0.80	55.85	33	49.58	105.43	0.127	-0.382
704.6	50.360	50.61	1.09	2.17	0.5	0.80	53.36	36	52.15	105.52	0.126	-0.382
704.5	50.524	59.29	2.85	2.38	0.5	0.81	63.41	54	64.33	127.75	0.126	-0.467
704.3	50.688	72.76	0.15	1.66	0.5	0.76	72.88	0	0.00	72.88	0.126	-0.230
704.1	50.852	245.27	0.15	1.15	0.5	0.88	277.37	0	0.00	277.37	0.126	-0.600

LIQUEFACTION POTENTIAL ASSESSMENT FOR COARSE GRAINED SOILS USING CONE PENETRATION TEST DATA

Project Site: KIF TDEC Stability
Stantec Project No.: 175668043
CPT ID: CPT-02D

Depth to Water during Earthquake:	5.9	ft
Final Grade Elevation during EQ:	755.3	ft
Height of Final Grade above CPT TOH:	0.3	ft
Normalize K_σ to:	1.058	tsf
a_{max} at top of ground surface:	0.09	g
Earthquake Magnitude:	7.60	M_W
Earthquake File or Source Zone:	1	Hz

Shear Stress Fit Parameters

m4:	0
m3:	0
m2:	0
m1:	0

Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
755.0																	
754.8	0.164	N/A	35	N/A	N/A	N/A	N/A	1.000	0	0	**0.058**	TRUE	FALSE	TRUE	**N/A**	**Clay Fill (irrelevant)**	**A1**
754.7	0.328	N/A	78	N/A	N/A	N/A	N/A	1.000	0	0	**0.058**	TRUE	FALSE	TRUE	**N/A**	**Clay Fill (irrelevant)**	**A1**
754.5	0.492	N/A	72	N/A	N/A	N/A	N/A	1.000	0	0	**0.058**	TRUE	FALSE	TRUE	**N/A**	**Clay Fill (irrelevant)**	**A1**
754.3	0.656	N/A	92	N/A	N/A	N/A	N/A	1.000	0	0	**0.058**	TRUE	TRUE	TRUE	**N/A**	**Clay Fill (irrelevant)**	**A1**
754.2	0.820	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.058**	TRUE	TRUE	TRUE	**N/A**	**Clay Fill (irrelevant)**	**A1**
754.0	0.984	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.058**	TRUE	TRUE	TRUE	**N/A**	**Clay Fill (irrelevant)**	**A1**
753.9	1.148	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.058**	TRUE	TRUE	TRUE	**N/A**	**Clay Fill (irrelevant)**	**A1**
753.7	1.312	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.058**	TRUE	TRUE	TRUE	**N/A**	**Clay Fill (irrelevant)**	**A1**
753.5	1.476	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.058**	TRUE	TRUE	TRUE	**N/A**	**Clay Fill (irrelevant)**	**A1**
753.4	1.640	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.058**	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**	**A1**
753.2	1.804	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.058**	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**	**A1**
753.0	1.968	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.058**	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**	**A1**
752.9	2.133	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.058**	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**	**A1**
752.7	2.297	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.058**	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**	**A1**
752.5	2.461	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.058**	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**	**A1**
752.4	2.625	0.424	78	1.100	N/A	0.97	N/A	1.000	0	0	**0.058**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**A1**
752.2	2.789	0.252	71	1.100	N/A	0.98	N/A	1.000	0	0	**0.058**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**A1**
752.0	2.953	0.178	64	1.100	N/A	0.99	N/A	1.000	0	0	**0.058**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**A1**
751.9	3.117	0.145	57	1.100	N/A	0.99	N/A	0.999	0	0	**0.058**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**A1**
751.7	3.281	0.146	58	1.100	N/A	0.99	N/A	0.999	0	0	**0.058**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**A1**
751.6	3.445	0.183	65	1.100	N/A	0.99	N/A	0.999	0	0	**0.058**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**A1**
751.4	3.609	N/A	60	N/A	N/A	N/A	N/A	0.998	0	0	**0.058**	TRUE	FALSE	TRUE	**N/A**	**Embankment Fill**	**A1**
751.2	3.773	N/A	55	N/A	N/A	N/A	N/A	0.998	0	0	**0.058**	TRUE	FALSE	TRUE	**N/A**	**Embankment Fill**	**B**
751.1	3.937	N/A	53	N/A	N/A	N/A	N/A	0.997	0	0	**0.058**	TRUE	FALSE	TRUE	**N/A**	**Embankment Fill**	**B**
750.9	4.101	N/A	51	N/A	N/A	N/A	N/A	0.997	0	0	**0.058**	TRUE	FALSE	TRUE	**N/A**	**Embankment Fill**	**B**
750.7	4.265	N/A	52	N/A	N/A	N/A	N/A	0.997	0	0	**0.058**	TRUE	FALSE	TRUE	**N/A**	**Embankment Fill**	**B**
750.6	4.429	N/A	53	N/A	N/A	N/A	N/A	0.996	0	0	**0.058**	TRUE	FALSE	TRUE	**N/A**	**Embankment Fill**	**B**
750.4	4.593	N/A	97	N/A	N/A	N/A	N/A	0.996	0	0	**0.058**	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**	**A1**
750.2	4.757	N/A	100	N/A	N/A	N/A	N/A	0.996	0	0	**0.058**	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**	**A1**
750.1	4.921	N/A	100	N/A	N/A	N/A	N/A	0.995	0	0	**0.058**	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**	**A1**
749.9	5.085	N/A	100	N/A	N/A	N/A	N/A	0.995	0	0	**0.058**	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**	**A1**
749.8	5.249	N/A	98	N/A	N/A	N/A	N/A	0.994	0	0	**0.058**	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**	**A1**
749.6	5.413	N/A	81	N/A	N/A	N/A	N/A	0.994	0	0	**0.058**	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**	**A1**
749.4	5.577	N/A	76	N/A	N/A	N/A	N/A	0.994	0	0	**0.058**	TRUE	FALSE	TRUE	**N/A**	**Embankment Fill**	**A1**
749.3	5.741	N/A	66	N/A	N/A	N/A	N/A	0.993	0	0	**0.058**	TRUE	FALSE	TRUE	**N/A**	**Embankment Fill**	**A1**
749.1	5.905	N/A	67	N/A	N/A	N/A	N/A	0.993	0	0	**0.058**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
748.9	6.069	N/A	67	N/A	N/A	N/A	N/A	0.992	0	0	**0.058**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
748.8	6.234	N/A	69	N/A	N/A	N/A	N/A	0.992	0	0	**0.059**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
748.6	6.398	N/A	73	N/A	N/A	N/A	N/A	0.992	0	0	**0.060**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
748.4	6.562	N/A	73	N/A	N/A	N/A	N/A	0.991	0	0	**0.060**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
748.3	6.726	N/A	73	N/A	N/A	N/A	N/A	0.991	0	0	**0.061**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
748.1	6.890	N/A	77	N/A	N/A	N/A	N/A	0.990	0	0	**0.062**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
747.9	7.054	N/A	76	N/A	N/A	N/A	N/A	0.990	0	0	**0.062**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
747.8	7.218	N/A	73	N/A	N/A	N/A	N/A	0.990	0	0	**0.063**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**

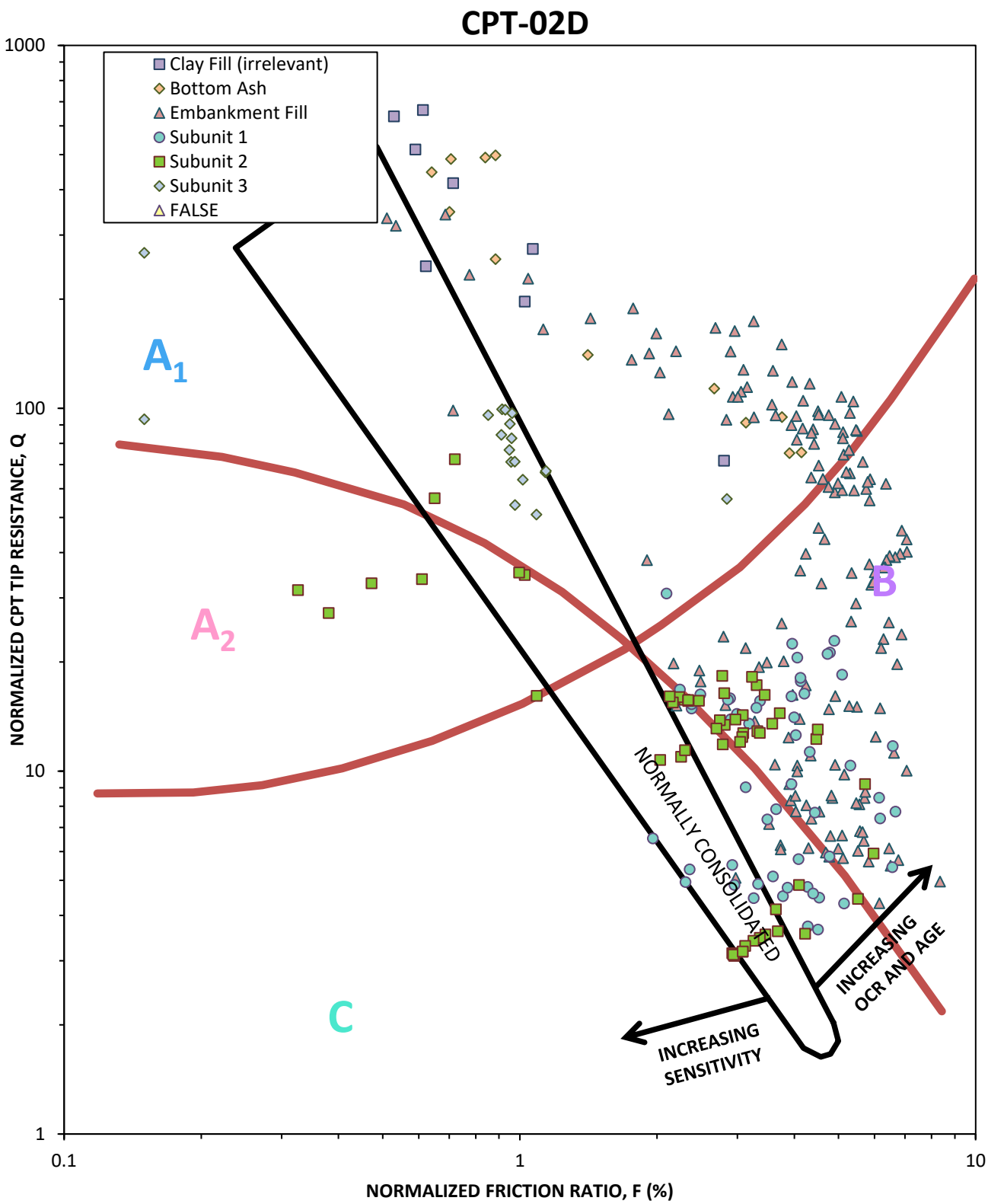
Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
747.6	7.382	N/A	77	N/A	N/A	N/A	N/A	0.989	0	0	**0.063**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
747.5	7.546	N/A	71	N/A	N/A	N/A	N/A	0.989	0	0	**0.064**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
747.3	7.710	N/A	66	N/A	N/A	N/A	N/A	0.988	0	0	**0.065**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
747.1	7.874	N/A	64	N/A	N/A	N/A	N/A	0.988	0	0	**0.065**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
747.0	8.038	N/A	62	N/A	N/A	N/A	N/A	0.987	0	0	**0.066**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
746.8	8.202	N/A	61	N/A	N/A	N/A	N/A	0.987	0	0	**0.066**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
746.6	8.366	N/A	60	N/A	N/A	N/A	N/A	0.987	0	0	**0.067**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
746.5	8.530	N/A	62	N/A	N/A	N/A	N/A	0.986	0	0	**0.067**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
746.3	8.694	N/A	60	N/A	N/A	N/A	N/A	0.986	0	0	**0.068**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
746.1	8.858	N/A	70	N/A	N/A	N/A	N/A	0.985	0	0	**0.068**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
746.0	9.022	N/A	77	N/A	N/A	N/A	N/A	0.985	0	0	**0.069**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
745.8	9.186	N/A	81	N/A	N/A	N/A	N/A	0.984	0	0	**0.069**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
745.6	9.350	N/A	80	N/A	N/A	N/A	N/A	0.984	0	0	**0.069**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
745.5	9.514	N/A	84	N/A	N/A	N/A	N/A	0.983	0	0	**0.070**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
745.3	9.678	N/A	85	N/A	N/A	N/A	N/A	0.983	0	0	**0.070**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
745.2	9.842	N/A	80	N/A	N/A	N/A	N/A	0.983	0	0	**0.071**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
745.0	10.006	N/A	74	N/A	N/A	N/A	N/A	0.982	0	0	**0.071**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
744.8	10.170	N/A	79	N/A	N/A	N/A	N/A	0.982	0	0	**0.071**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
744.7	10.335	N/A	87	N/A	N/A	N/A	N/A	0.981	0	0	**0.072**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
744.5	10.499	N/A	88	N/A	N/A	N/A	N/A	0.981	0	0	**0.072**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
744.3	10.663	N/A	84	N/A	N/A	N/A	N/A	0.980	0	0	**0.073**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
744.2	10.827	N/A	90	N/A	N/A	N/A	N/A	0.980	0	0	**0.073**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
744.0	10.991	N/A	96	N/A	N/A	N/A	N/A	0.979	0	0	**0.073**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
743.8	11.155	N/A	93	N/A	N/A	N/A	N/A	0.979	0	0	**0.074**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
743.7	11.319	N/A	93	N/A	N/A	N/A	N/A	0.978	0	0	**0.074**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
743.5	11.483	N/A	94	N/A	N/A	N/A	N/A	0.978	0	0	**0.074**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
743.4	11.647	N/A	82	N/A	N/A	N/A	N/A	0.977	0	0	**0.074**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
743.2	11.811	N/A	75	N/A	N/A	N/A	N/A	0.977	0	0	**0.075**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
743.0	11.975	N/A	71	N/A	N/A	N/A	N/A	0.976	0	0	**0.075**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
742.9	12.139	N/A	73	N/A	N/A	N/A	N/A	0.976	0	0	**0.075**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
742.7	12.303	N/A	73	N/A	N/A	N/A	N/A	0.976	0	0	**0.076**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
742.5	12.467	N/A	75	N/A	N/A	N/A	N/A	0.975	0	0	**0.076**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
742.4	12.631	N/A	89	N/A	N/A	N/A	N/A	0.975	0	0	**0.076**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
742.2	12.795	N/A	91	N/A	N/A	N/A	N/A	0.974	0	0	**0.076**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
742.0	12.959	N/A	90	N/A	N/A	N/A	N/A	0.974	0	0	**0.077**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
741.9	13.123	N/A	83	N/A	N/A	N/A	N/A	0.973	0	0	**0.077**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
741.7	13.287	N/A	75	N/A	N/A	N/A	N/A	0.973	0	0	**0.077**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
741.5	13.451	N/A	72	N/A	N/A	N/A	N/A	0.972	0	0	**0.077**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
741.4	13.615	N/A	69	N/A	N/A	N/A	N/A	0.972	0	0	**0.078**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
741.2	13.779	N/A	63	N/A	N/A	N/A	N/A	0.971	0	0	**0.078**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
741.1	13.943	N/A	64	N/A	N/A	N/A	N/A	0.971	0	0	**0.078**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
740.9	14.107	N/A	65	N/A	N/A	N/A	N/A	0.970	0	0	**0.078**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
740.7	14.271	N/A	66	N/A	N/A	N/A	N/A	0.970	0	0	**0.079**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
740.6	14.436	N/A	57	N/A	N/A	N/A	N/A	0.969	0	0	**0.079**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
740.4	14.600	N/A	56	N/A	N/A	N/A	N/A	0.969	0	0	**0.079**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
740.2	14.764	N/A	54	N/A	N/A	N/A	N/A	0.968	0	0	**0.079**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
740.1	14.928	N/A	54	N/A	N/A	N/A	N/A	0.968	0	0	**0.079**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
739.9	15.092	N/A	54	N/A	N/A	N/A	N/A	0.967	0	0	**0.080**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
739.7	15.256	N/A	54	N/A	N/A	N/A	N/A	0.966	0	0	**0.080**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
739.6	15.420	N/A	53	N/A	N/A	N/A	N/A	0.966	0	0	**0.080**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
739.4	15.584	N/A	53	N/A	N/A	N/A	N/A	0.965	0	0	**0.080**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
739.3	15.748	N/A	53	N/A	N/A	N/A	N/A	0.965	0	0	**0.080**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
739.1	15.912	N/A	52	N/A	N/A	N/A	N/A	0.964	0	0	**0.081**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
738.9	16.076	N/A	53	N/A	N/A	N/A	N/A	0.964	0	0	**0.081**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
738.8	16.240	N/A	54	N/A	N/A	N/A	N/A	0.963	0	0	**0.081**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**

Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
738.6	16.404	N/A	62	N/A	N/A	N/A	N/A	0.963	0	0	**0.081**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
738.4	16.568	N/A	75	N/A	N/A	N/A	N/A	0.962	0	0	**0.081**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
738.3	16.732	N/A	65	N/A	N/A	N/A	N/A	0.962	0	0	**0.081**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
738.1	16.896	N/A	48	N/A	N/A	N/A	N/A	0.961	0	0	**0.081**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
737.9	17.060	N/A	47	N/A	N/A	N/A	N/A	0.961	0	0	**0.082**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
737.8	17.224	N/A	45	N/A	N/A	N/A	N/A	0.960	0	0	**0.082**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
737.6	17.388	N/A	46	N/A	N/A	N/A	N/A	0.960	0	0	**0.082**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
737.4	17.552	N/A	48	N/A	N/A	N/A	N/A	0.959	0	0	**0.082**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
737.3	17.716	N/A	51	N/A	N/A	N/A	N/A	0.958	0	0	**0.082**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
737.1	17.880	N/A	48	N/A	N/A	N/A	N/A	0.958	0	0	**0.082**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
737.0	18.044	N/A	47	N/A	N/A	N/A	N/A	0.957	0	0	**0.082**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
736.8	18.208	N/A	50	N/A	N/A	N/A	N/A	0.957	0	0	**0.083**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
736.6	18.372	N/A	55	N/A	N/A	N/A	N/A	0.956	0	0	**0.083**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
736.5	18.537	N/A	52	N/A	N/A	N/A	N/A	0.956	0	0	**0.083**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
736.3	18.701	N/A	53	N/A	N/A	N/A	N/A	0.955	0	0	**0.083**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
736.1	18.865	N/A	52	N/A	N/A	N/A	N/A	0.955	0	0	**0.083**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
736.0	19.029	N/A	57	N/A	N/A	N/A	N/A	0.954	0	0	**0.083**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
735.8	19.193	N/A	58	N/A	N/A	N/A	N/A	0.953	0	0	**0.083**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
735.6	19.357	N/A	54	N/A	N/A	N/A	N/A	0.953	0	0	**0.083**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
735.5	19.521	N/A	48	N/A	N/A	N/A	N/A	0.952	0	0	**0.084**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
735.3	19.685	N/A	42	N/A	N/A	N/A	N/A	0.952	0	0	**0.084**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
735.2	19.849	N/A	39	N/A	N/A	N/A	N/A	0.951	0	0	**0.084**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
735.0	20.013	N/A	40	N/A	N/A	N/A	N/A	0.951	0	0	**0.084**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
734.8	20.177	N/A	43	N/A	N/A	N/A	N/A	0.950	0	0	**0.084**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
734.7	20.341	N/A	43	N/A	N/A	N/A	N/A	0.949	0	0	**0.084**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
734.5	20.505	N/A	43	N/A	N/A	N/A	N/A	0.949	0	0	**0.084**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
734.3	20.669	N/A	41	N/A	N/A	N/A	N/A	0.948	0	0	**0.084**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
734.2	20.833	N/A	45	N/A	N/A	N/A	N/A	0.948	0	0	**0.084**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
734.0	20.997	N/A	45	N/A	N/A	N/A	N/A	0.947	0	0	**0.084**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
733.8	21.161	N/A	45	N/A	N/A	N/A	N/A	0.947	0	0	**0.084**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
733.7	21.325	N/A	45	N/A	N/A	N/A	N/A	0.946	0	0	**0.085**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
733.5	21.489	N/A	44	N/A	N/A	N/A	N/A	0.945	0	0	**0.085**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
733.3	21.653	N/A	38	N/A	N/A	N/A	N/A	0.945	0	0	**0.085**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
733.2	21.817	N/A	36	N/A	N/A	N/A	N/A	0.944	0	0	**0.085**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
733.0	21.981	N/A	42	N/A	N/A	N/A	N/A	0.944	0	0	**0.085**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
732.9	22.145	N/A	46	N/A	N/A	N/A	N/A	0.943	0	0	**0.085**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
732.7	22.309	N/A	43	N/A	N/A	N/A	N/A	0.942	0	0	**0.085**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
732.5	22.473	N/A	44	N/A	N/A	N/A	N/A	0.942	0	0	**0.085**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
732.4	22.638	N/A	42	N/A	N/A	N/A	N/A	0.941	0	0	**0.085**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
732.2	22.802	N/A	42	N/A	N/A	N/A	N/A	0.941	0	0	**0.085**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**C**
732.0	22.966	N/A	40	N/A	N/A	N/A	N/A	0.940	0	0	**0.085**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
731.9	23.130	N/A	38	N/A	N/A	N/A	N/A	0.939	0	0	**0.085**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
731.7	23.294	N/A	37	N/A	N/A	N/A	N/A	0.939	0	0	**0.085**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
731.5	23.458	N/A	37	N/A	N/A	N/A	N/A	0.938	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
731.4	23.622	N/A	39	N/A	N/A	N/A	N/A	0.938	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
731.2	23.786	N/A	40	N/A	N/A	N/A	N/A	0.937	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
731.1	23.950	N/A	39	N/A	N/A	N/A	N/A	0.936	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
730.9	24.114	N/A	45	N/A	N/A	N/A	N/A	0.936	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
730.7	24.278	N/A	47	N/A	N/A	N/A	N/A	0.935	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
730.6	24.442	N/A	44	N/A	N/A	N/A	N/A	0.935	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
730.4	24.606	N/A	40	N/A	N/A	N/A	N/A	0.934	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
730.2	24.770	N/A	39	N/A	N/A	N/A	N/A	0.933	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
730.1	24.934	N/A	36	N/A	N/A	N/A	N/A	0.933	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
729.9	25.098	N/A	37	N/A	N/A	N/A	N/A	0.932	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
729.7	25.262	N/A	37	N/A	N/A	N/A	N/A	0.932	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**

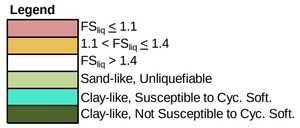
Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
729.6	25.426	N/A	38	N/A	N/A	N/A	N/A	0.931	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
729.4	25.590	N/A	37	N/A	N/A	N/A	N/A	0.930	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
729.2	25.754	N/A	37	N/A	N/A	N/A	N/A	0.930	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
729.1	25.918	N/A	37	N/A	N/A	N/A	N/A	0.929	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
728.9	26.082	N/A	37	N/A	N/A	N/A	N/A	0.928	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**C**
728.8	26.246	N/A	37	N/A	N/A	N/A	N/A	0.928	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
728.6	26.410	N/A	38	N/A	N/A	N/A	N/A	0.927	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
728.4	26.574	N/A	37	N/A	N/A	N/A	N/A	0.927	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
728.3	26.739	N/A	37	N/A	N/A	N/A	N/A	0.926	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
728.1	26.903	N/A	37	N/A	N/A	N/A	N/A	0.925	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
727.9	27.067	N/A	37	N/A	N/A	N/A	N/A	0.925	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**C**
727.8	27.231	N/A	38	N/A	N/A	N/A	N/A	0.924	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**C**
727.6	27.395	N/A	37	N/A	N/A	N/A	N/A	0.923	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
727.4	27.559	N/A	39	N/A	N/A	N/A	N/A	0.923	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
727.3	27.723	N/A	40	N/A	N/A	N/A	N/A	0.922	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
727.1	27.887	N/A	40	N/A	N/A	N/A	N/A	0.921	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
726.9	28.051	N/A	39	N/A	N/A	N/A	N/A	0.921	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
726.8	28.215	N/A	42	N/A	N/A	N/A	N/A	0.920	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
726.6	28.379	N/A	42	N/A	N/A	N/A	N/A	0.920	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
726.5	28.543	N/A	40	N/A	N/A	N/A	N/A	0.919	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
726.3	28.707	N/A	39	N/A	N/A	N/A	N/A	0.918	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
726.1	28.871	N/A	39	N/A	N/A	N/A	N/A	0.918	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
726.0	29.035	N/A	38	N/A	N/A	N/A	N/A	0.917	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
725.8	29.199	N/A	37	N/A	N/A	N/A	N/A	0.916	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**C**
725.6	29.363	N/A	36	N/A	N/A	N/A	N/A	0.916	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**C**
725.5	29.527	N/A	36	N/A	N/A	N/A	N/A	0.915	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
725.3	29.691	N/A	37	N/A	N/A	N/A	N/A	0.914	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
725.1	29.855	N/A	39	N/A	N/A	N/A	N/A	0.914	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
725.0	30.019	N/A	40	N/A	N/A	N/A	N/A	0.913	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**B**
724.8	30.183	N/A	37	N/A	N/A	N/A	N/A	0.912	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**B**
724.7	30.347	N/A	41	N/A	N/A	N/A	N/A	0.912	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**B**
724.5	30.511	N/A	44	N/A	N/A	N/A	N/A	0.911	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**B**
724.3	30.675	N/A	51	N/A	N/A	N/A	N/A	0.910	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**A1**
724.2	30.840	N/A	41	N/A	N/A	N/A	N/A	0.910	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**B**
724.0	31.004	N/A	39	N/A	N/A	N/A	N/A	0.909	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**B**
723.8	31.168	N/A	42	N/A	N/A	N/A	N/A	0.908	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**B**
723.7	31.332	N/A	40	N/A	N/A	N/A	N/A	0.908	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**B**
723.5	31.496	N/A	39	N/A	N/A	N/A	N/A	0.907	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**B**
723.3	31.660	N/A	38	N/A	N/A	N/A	N/A	0.906	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**B**
723.2	31.824	N/A	39	N/A	N/A	N/A	N/A	0.906	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**B**
723.0	31.988	N/A	39	N/A	N/A	N/A	N/A	0.905	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
722.8	32.152	N/A	40	N/A	N/A	N/A	N/A	0.904	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
722.7	32.316	N/A	38	N/A	N/A	N/A	N/A	0.904	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
722.5	32.480	N/A	37	N/A	N/A	N/A	N/A	0.903	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
722.4	32.644	N/A	37	N/A	N/A	N/A	N/A	0.902	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
722.2	32.808	N/A	37	N/A	N/A	N/A	N/A	0.902	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
722.0	32.972	N/A	38	N/A	N/A	N/A	N/A	0.901	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
721.9	33.136	N/A	37	N/A	N/A	N/A	N/A	0.900	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
721.7	33.300	N/A	36	N/A	N/A	N/A	N/A	0.900	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
721.5	33.464	N/A	36	N/A	N/A	N/A	N/A	0.899	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
721.4	33.628	N/A	36	N/A	N/A	N/A	N/A	0.898	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
721.2	33.792	N/A	36	N/A	N/A	N/A	N/A	0.898	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
721.0	33.956	N/A	36	N/A	N/A	N/A	N/A	0.897	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
720.9	34.120	N/A	36	N/A	N/A	N/A	N/A	0.896	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
720.7	34.284	N/A	36	N/A	N/A	N/A	N/A	0.896	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**

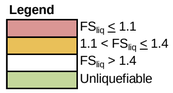
Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
720.6	34.448	N/A	36	N/A	N/A	N/A	N/A	0.895	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
720.4	34.612	N/A	36	N/A	N/A	N/A	N/A	0.894	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
720.2	34.776	N/A	36	N/A	N/A	N/A	N/A	0.894	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
720.1	34.941	N/A	36	N/A	N/A	N/A	N/A	0.893	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
719.9	35.105	N/A	36	N/A	N/A	N/A	N/A	0.892	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
719.7	35.269	N/A	37	N/A	N/A	N/A	N/A	0.892	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**B**
719.6	35.433	N/A	43	N/A	N/A	N/A	N/A	0.891	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**B**
719.4	35.597	N/A	47	N/A	N/A	N/A	N/A	0.890	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**B**
719.2	35.761	N/A	49	N/A	N/A	N/A	N/A	0.890	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**B**
719.1	35.925	N/A	49	N/A	N/A	N/A	N/A	0.889	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**B**
718.9	36.089	N/A	48	N/A	N/A	N/A	N/A	0.888	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**B**
718.7	36.253	N/A	48	N/A	N/A	N/A	N/A	0.887	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**B**
718.6	36.417	N/A	47	N/A	N/A	N/A	N/A	0.887	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**B**
718.4	36.581	N/A	46	N/A	N/A	N/A	N/A	0.886	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**B**
718.3	36.745	N/A	46	N/A	N/A	N/A	N/A	0.885	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**B**
718.1	36.909	N/A	45	N/A	N/A	N/A	N/A	0.885	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**B**
717.9	37.073	N/A	44	N/A	N/A	N/A	N/A	0.884	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**B**
717.8	37.237	N/A	44	N/A	N/A	N/A	N/A	0.883	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**B**
717.6	37.401	N/A	44	N/A	N/A	N/A	N/A	0.883	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**B**
717.4	37.565	N/A	44	N/A	N/A	N/A	N/A	0.882	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**B**
717.3	37.729	N/A	44	N/A	N/A	N/A	N/A	0.881	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**B**
717.1	37.893	N/A	44	N/A	N/A	N/A	N/A	0.881	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**B**
716.9	38.057	N/A	43	N/A	N/A	N/A	N/A	0.880	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**B**
716.8	38.221	N/A	44	N/A	N/A	N/A	N/A	0.879	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
716.6	38.385	N/A	44	N/A	N/A	N/A	N/A	0.878	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
716.5	38.549	N/A	44	N/A	N/A	N/A	N/A	0.878	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**B**
716.3	38.713	N/A	45	N/A	N/A	N/A	N/A	0.877	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**B**
716.1	38.877	N/A	44	N/A	N/A	N/A	N/A	0.876	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
716.0	39.042	0.113	44	0.971	0.917	0.99	0.100	0.876	0	0	**0.087**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**C**
715.8	39.206	0.113	44	0.971	0.918	0.99	0.100	0.875	0	0	**0.087**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**C**
715.6	39.370	0.114	45	0.970	0.923	0.99	0.102	0.874	0	0	**0.087**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**B**
715.5	39.534	0.116	46	0.969	0.933	0.99	0.104	0.874	0	0	**0.087**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**B**
715.3	39.698	0.115	46	0.969	0.930	0.99	0.103	0.873	0	0	**0.087**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**B**
715.1	39.862	0.116	46	0.969	0.934	0.99	0.105	0.872	0	0	**0.086**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**B**
715.0	40.026	0.115	45	0.969	0.924	0.99	0.102	0.871	0	0	**0.086**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**B**
714.8	40.190	0.113	44	0.969	0.916	0.99	0.100	0.871	0	0	**0.086**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**B**
714.6	40.354	0.112	44	0.969	0.913	0.99	0.099	0.870	0	0	**0.086**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**B**
714.5	40.518	0.112	43	0.969	0.911	0.99	0.098	0.869	0	0	**0.086**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**B**
714.3	40.682	0.111	43	0.969	0.907	0.99	0.097	0.869	0	0	**0.086**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**B**
714.2	40.846	0.111	43	0.968	0.906	0.99	0.097	0.868	0	0	**0.086**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**B**
714.0	41.010	0.111	43	0.968	0.908	0.99	0.097	0.867	0	0	**0.086**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**B**
713.8	41.174	0.112	43	0.968	0.909	0.99	0.098	0.867	0	0	**0.086**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**B**
713.7	41.338	0.111	43	0.968	0.905	0.99	0.097	0.866	0	0	**0.086**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**B**
713.5	41.502	0.111	43	0.967	0.904	0.99	0.096	0.865	0	0	**0.086**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**B**
713.3	41.666	0.110	42	0.967	0.902	0.99	0.096	0.864	0	0	**0.086**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**B**
713.2	41.830	0.110	42	0.967	0.900	0.99	0.095	0.864	0	0	**0.086**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**C**
713.0	41.994	0.111	43	0.966	0.905	0.99	0.097	0.863	0	0	**0.086**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**B**
712.8	42.158	0.113	44	0.965	0.914	0.99	0.099	0.862	0	0	**0.086**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**C**
712.7	42.322	0.113	44	0.965	0.916	0.99	0.100	0.862	0	0	**0.086**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**C**
712.5	42.486	0.113	44	0.965	0.917	0.99	0.100	0.861	0	0	**0.086**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**C**
712.3	42.650	0.113	44	0.964	0.917	0.99	0.100	0.860	0	0	**0.086**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**C**
712.2	42.814	0.113	44	0.964	0.917	0.99	0.100	0.859	0	0	**0.086**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**B**
712.0	42.978	0.112	44	0.964	0.910	0.99	0.098	0.859	0	0	**0.086**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**B**
711.9	43.143	0.111	43	0.964	0.903	0.99	0.096	0.858	0	0	**0.086**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**B**
711.7	43.307	0.112	43	0.964	0.908	0.99	0.097	0.857	0	0	**0.086**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**B**

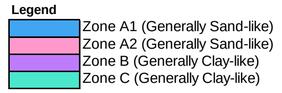
Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
711.5	43.471	0.107	41	0.965	0.887	1.00	0.091	0.857	0	0	**0.086**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**B**
711.4	43.635	0.104	38	0.966	0.870	1.00	0.087	0.856	0	0	**0.086**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**B**
711.2	43.799	0.102	37	0.966	0.864	1.00	0.085	0.855	0	0	**0.086**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
711.0	43.963	0.102	36	0.966	0.861	1.00	0.084	0.855	0	0	**0.086**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
710.9	44.127	0.101	36	0.966	0.859	1.00	0.083	0.854	0	0	**0.086**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
710.7	44.291	0.101	36	0.966	0.858	1.00	0.083	0.853	0	0	**0.086**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
710.5	44.455	0.101	36	0.966	0.858	1.00	0.083	0.852	0	0	**0.086**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
710.4	44.619	0.101	36	0.966	0.857	1.00	0.083	0.852	0	0	**0.086**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
710.2	44.783	0.101	36	0.965	0.857	1.00	0.083	0.851	0	0	**0.086**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
710.1	44.947	0.101	35	0.965	0.856	1.00	0.083	0.850	0	0	**0.086**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
709.9	45.111	0.100	35	0.965	0.856	1.00	0.083	0.850	0	0	**0.086**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
709.7	45.275	0.101	35	0.965	0.856	1.00	0.083	0.849	0	0	**0.086**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
709.6	45.439	0.100	35	0.964	0.855	1.00	0.083	0.848	0	0	**0.086**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
709.4	45.603	0.101	35	0.964	0.856	1.00	0.083	0.847	0	0	**0.085**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
709.2	45.767	0.101	36	0.964	0.857	1.00	0.083	0.847	0	0	**0.085**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
709.1	45.931	0.102	37	0.963	0.861	1.00	0.084	0.846	0	0	**0.085**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
708.9	46.095	0.109	42	0.960	0.892	0.99	0.093	0.845	0	0	**0.085**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**C**
708.7	46.259	0.109	42	0.960	0.894	0.99	0.093	0.845	0	0	**0.085**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**C**
708.6	46.423	0.109	41	0.960	0.890	0.99	0.092	0.844	0	0	**0.085**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**C**
708.4	46.587	0.112	44	0.958	0.907	0.99	0.097	0.843	0	0	**0.085**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**A2**
708.2	46.751	0.113	44	0.958	0.909	0.99	0.098	0.842	0	0	**0.085**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**A2**
708.1	46.915	0.112	44	0.957	0.908	0.99	0.097	0.842	0	0	**0.085**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**A2**
707.9	47.079	0.117	46	0.955	0.931	0.99	0.103	0.841	0	0	**0.085**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**A2**
707.8	47.244	0.120	48	0.954	0.949	0.99	0.108	0.840	0	0	**0.085**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**A2**
707.6	47.408	0.127	51	0.951	0.987	0.99	0.118	0.840	0	0	**0.085**	FALSE	FALSE	FALSE	**1.4**	**Subunit 2**	**A2**
707.4	47.572	0.127	51	0.951	0.988	0.99	0.119	0.839	0	0	**0.085**	FALSE	FALSE	FALSE	**1.4**	**Subunit 2**	**A2**
707.3	47.736	0.132	53	0.949	1.014	0.99	0.126	0.838	0	0	**0.085**	FALSE	FALSE	FALSE	**1.5**	**Subunit 2**	**A1**
707.1	47.900	0.141	56	0.945	1.067	0.99	0.141	0.837	0	0	**0.085**	FALSE	FALSE	FALSE	**1.7**	**Subunit 2**	**A1**
706.9	48.064	0.160	61	0.940	1.166	0.99	0.174	0.837	0	0	**0.085**	FALSE	FALSE	FALSE	**2.0**	**Subunit 3**	**A1**
706.8	48.228	0.167	62	0.938	1.196	0.99	0.185	0.836	0	0	**0.085**	FALSE	FALSE	FALSE	**2.2**	**Subunit 3**	**A1**
706.6	48.392	0.168	62	0.937	1.199	0.99	0.186	0.835	0	0	**0.085**	FALSE	FALSE	FALSE	**2.2**	**Subunit 3**	**A1**
706.4	48.556	0.171	63	0.936	1.215	0.99	0.192	0.835	0	0	**0.085**	FALSE	FALSE	FALSE	**2.3**	**Subunit 3**	**A1**
706.3	48.720	0.164	62	0.937	1.180	0.99	0.179	0.834	0	0	**0.085**	FALSE	FALSE	FALSE	**2.1**	**Subunit 3**	**A1**
706.1	48.884	0.176	64	0.934	1.235	0.99	0.200	0.833	0	0	**0.085**	FALSE	FALSE	FALSE	**2.4**	**Subunit 3**	**A1**
706.0	49.048	0.178	64	0.933	1.245	0.99	0.204	0.832	0	0	**0.085**	FALSE	FALSE	FALSE	**2.4**	**Subunit 3**	**A1**
705.8	49.212	0.183	65	0.932	1.262	0.99	0.212	0.832	0	0	**0.085**	FALSE	FALSE	FALSE	**2.5**	**Subunit 3**	**A1**
705.6	49.376	0.176	64	0.933	1.234	0.99	0.200	0.831	0	0	**0.085**	FALSE	FALSE	FALSE	**2.4**	**Subunit 3**	**A1**
705.5	49.540	0.167	62	0.935	1.188	0.99	0.183	0.830	0	0	**0.084**	FALSE	FALSE	FALSE	**2.2**	**Subunit 3**	**A1**
705.3	49.704	0.165	62	0.935	1.178	0.99	0.179	0.830	0	0	**0.084**	FALSE	FALSE	FALSE	**2.1**	**Subunit 3**	**A1**
705.1	49.868	0.162	61	0.935	1.163	0.99	0.174	0.829	0	0	**0.084**	FALSE	FALSE	FALSE	**2.1**	**Subunit 3**	**A1**
705.0	50.032	0.156	60	0.936	1.135	0.99	0.164	0.828	0	0	**0.084**	FALSE	FALSE	FALSE	**1.9**	**Subunit 3**	**A1**
704.8	50.196	0.145	57	0.940	1.077	0.99	0.145	0.827	0	0	**0.084**	FALSE	FALSE	FALSE	**1.7**	**Subunit 3**	**A1**
704.6	50.360	0.145	57	0.939	1.077	0.99	0.145	0.827	0	0	**0.084**	FALSE	FALSE	FALSE	**1.7**	**Subunit 3**	**A1**
704.5	50.524	0.191	66	0.927	1.284	0.99	0.224	0.826	0	0	**0.084**	FALSE	FALSE	FALSE	**2.7**	**Subunit 3**	**A1**
704.3	50.688	0.110	42	0.952	0.895	0.99	0.093	0.825	0	0	**0.084**	FALSE	FALSE	FALSE	**1.1**	**Subunit 3**	**A1**
704.1	50.852	N/A	100	N/A	N/A	N/A	N/A	0.825	0	0	**0.084**	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**	**A1**



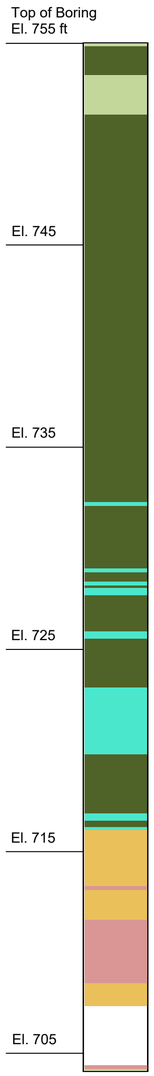
Adapted from "Discussion of 'Liquefaction Potential of Silts from CPTu'" (Robertson 2008). Zone A_1 and Zone A_2 samples are generally sand-like. Zone B samples are generally clay-like and not susceptible to cyclic softening. Zone C samples are generally clay-like and susceptible to cyclic softening. Note that the transition from clay-like to sand-like in this chart does not exactly match the liquefaction calculations herein; that is, some transitional samples in Zone B and Zone C will be treated as sand-like and analyzed for liquefaction if the calculations indicate as such.



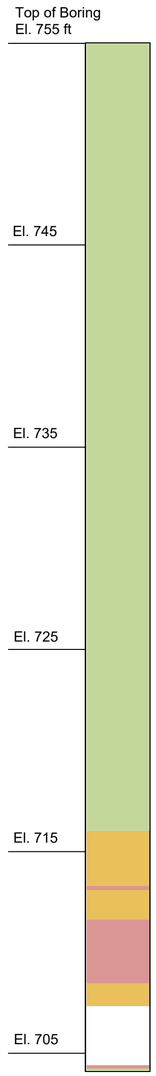




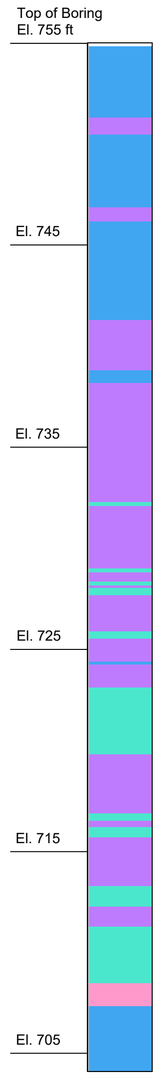
CPT-02D, Liquefaction Triggering Results



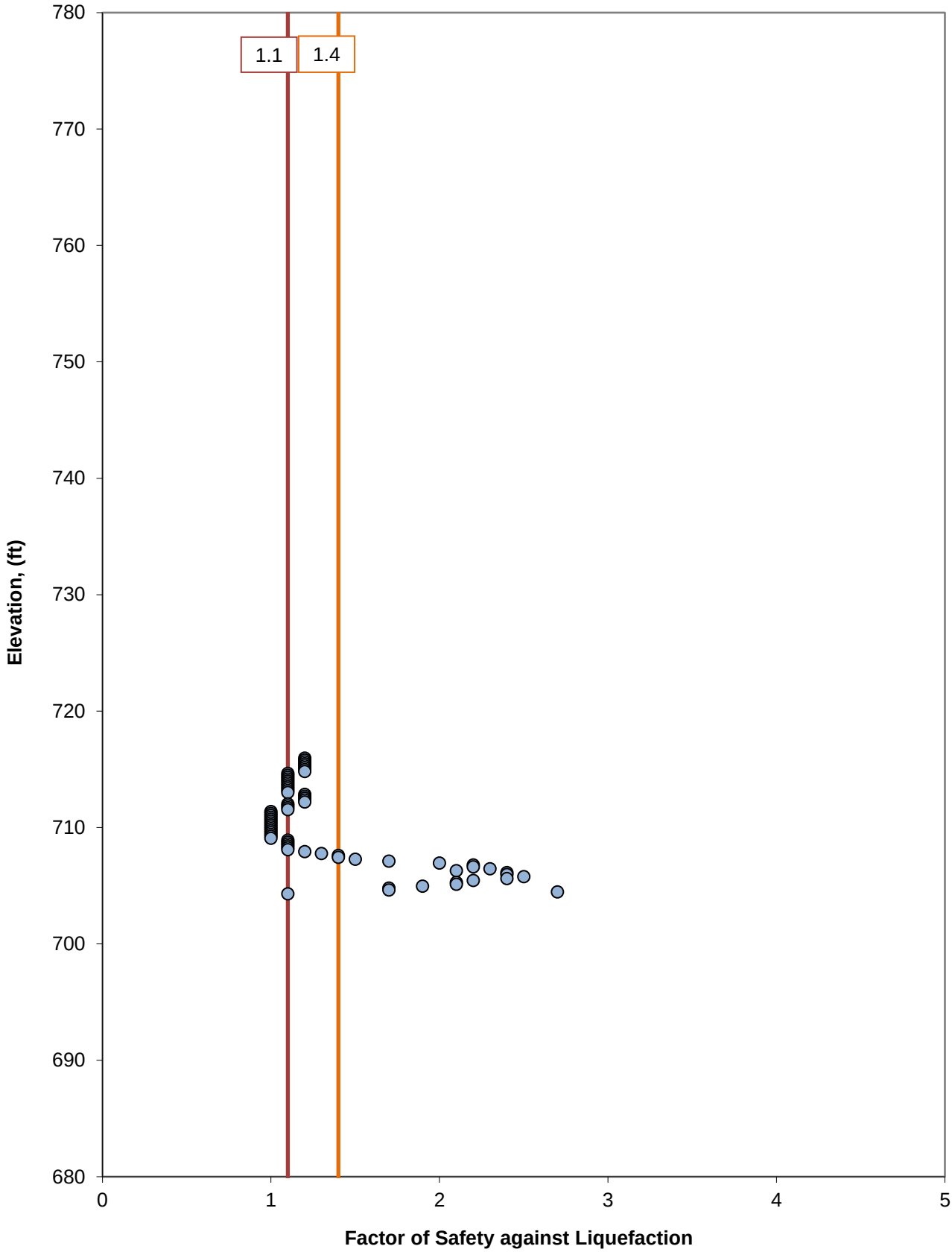
CPT-02D, Liquefaction Triggering Results



CPT-02D, Robertson Soil Type



KIF TDEC Stability, Boring = CPT-02D, Source = 1 Hz, Mw = 7.6, Event = Design EQ, CPT Data, Simplified Stress-Based Approach



Project Information

Stantec Project Number =	175668043
Project Name =	KIF TDEC Stability
CPT ID =	CPT-03C

Boring Location (optional)

Northing =	
Easting =	

OR

Baseline Station =	
Offset (+ Right) =	

Using qt (corrected for u2 PWP) or qc (backcalculated uncorrected field tip)

Cone ID (optional) =	AD184	
Use qc instead of qt?	0	(1: Yes, 0: No)
Cone Area Ratio (a) =	0.80	

Drilling Information

Top of Hole Elevation =	754.0	feet
Water Depth during CPT (negative for U/S borings) =	4.0	feet
Depth data collection began =	0.16	feet
Avg. Total Unit Wt. Above 1st Sample =	120.00	pcf

During Earthquake Information

Water Depth during EQ (relative to CPT TOH, negative for U/S borings) =	5.3	feet
Final Grade Elevation during EQ =	753.8	feet
Avg. Total Unit Wt. of Cut/Fill =	120	pcf

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile?	0	(1: Yes, 0: No)

If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile:	Section_AA, KIF-A2_NOR	
α at each Sample Depth known?	1	(1: Yes, 0: No)

If previous answer is No, then enter curve fit parameters below (α vs. depth curve)

If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_σ will be one.

m4:	
m3:	
m2:	
m1:	
m0:	

Associated ground response profile:	Section_AA, KIF-CPT03_NOR	
Get CSR from shear stress envelope?	0	(1: Yes, 0: No)

If previous answer is No, then CSR will be calculated using a_{max} and r_d

Max. Shear Stress at each sample depth known?		(1: Yes, 0: No)

If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4:	
m3:	
m2:	
m1:	

Earthquake Information

EQ Source (e.g., New Madrid)	1 Hz
Event (e.g., MCE, OBE)	Design EQ
a_{max} (g) (top of ground surface)	0.09
EQ Mag (Mw)	7.6

Inputs

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
0.164	47.035	0.059	120	Clay fill (irrelevant)	Clay-like		0.006			
0.328	76.574	0.115	120	Clay fill (irrelevant)	Clay-like		0.005			
0.492	113.920	0.098	120	Clay fill (irrelevant)	Clay-like		0.004			
0.656	127.401	0.238	120	Clay fill (irrelevant)	Clay-like		0.002			
0.820	142.974	0.283	120	Clay fill (irrelevant)	Clay-like		0.001			
0.984	269.243	0.524	128	Embankemnt Fill	Clay-like		0.000			
1.148	393.383	1.185	128	Embankemnt Fill	Clay-like		0.002			
1.312	333.624	1.916	128	Embankemnt Fill	Clay-like		0.005			
1.476	290.128	2.618	128	Embankemnt Fill	Clay-like		0.008			
1.640	281.234	3.813	128	Embankemnt Fill	Clay-like		0.011			
1.804	188.836	3.671	128	Embankemnt Fill	Clay-like		0.014			
1.968	224.017	3.004	128	Embankemnt Fill	Clay-like		0.017			
2.133	265.821	2.564	128	Embankemnt Fill	Clay-like		0.017			
2.297	295.342	2.183	128	Embankemnt Fill	Clay-like		0.016			
2.461	311.668	2.372	128	Embankemnt Fill	Clay-like		0.015			
2.625	277.489	2.009	128	Embankemnt Fill	Clay-like		0.014			
2.789	219.453	1.994	128	Embankemnt Fill	Clay-like		0.013			
2.953	159.383	1.606	128	Embankemnt Fill	Clay-like		0.013			
3.117	84.065	1.060	128	Embankemnt Fill	Clay-like		0.015			
3.281	46.785	1.551	128	Embankemnt Fill	Clay-like		0.016			
3.445	38.962	1.637	128	Embankemnt Fill	Clay-like		0.018			
3.609	36.177	1.936	128	Embankemnt Fill	Clay-like		0.019			
3.773	64.324	1.977	128	Embankemnt Fill	Clay-like		0.020			
3.937	46.722	2.112	128	Embankemnt Fill	Clay-like		0.021			
4.101	34.363	1.734	128	Embankemnt Fill	Clay-like		0.022			
4.265	119.984	2.741	128	Embankemnt Fill	Clay-like		0.023			
4.429	256.936	2.781	128	Embankemnt Fill	Clay-like		0.024			
4.593	282.149	2.768	128	Embankemnt Fill	Clay-like		0.025			
4.757	203.110	1.837	128	Embankemnt Fill	Clay-like		0.026			
4.921	123.985	1.778	128	Embankemnt Fill	Clay-like		0.027			
5.085	85.541	1.897	128	Embankemnt Fill	Clay-like		0.029			
5.249	44.831	2.087	128	Embankemnt Fill	Clay-like		0.030			
5.413	45.141	2.683	128	Embankemnt Fill	Clay-like		0.032			
5.577	48.282	2.762	128	Embankemnt Fill	Clay-like		0.035			
5.741	37.745	2.219	128	Embankemnt Fill	Clay-like		0.037			
5.905	71.939	1.823	128	Embankemnt Fill	Clay-like		0.039			
6.069	199.053	2.606	128	Embankemnt Fill	Clay-like		0.041			
6.234	162.048	2.860	128	Embankemnt Fill	Clay-like		0.042			
6.398	100.743	3.546	128	Embankemnt Fill	Clay-like		0.043			
6.562	69.788	4.928	128	Embankemnt Fill	Clay-like		0.044			
6.726	184.287	3.059	128	Embankemnt Fill	Clay-like		0.045			
6.890	218.926	4.286	128	Embankemnt Fill	Clay-like		0.046			
7.054	121.757	5.617	128	Embankemnt Fill	Clay-like		0.047			
7.218	82.002	6.543	128	Embankemnt Fill	Clay-like		0.048			
7.382	85.733	3.755	128	Embankemnt Fill	Clay-like		0.049			
7.546	163.038	4.460	128	Embankemnt Fill	Clay-like		0.051			
7.710	177.553	7.482	128	Embankemnt Fill	Clay-like		0.052			
7.874	216.443	5.150	128	Embankemnt Fill	Clay-like		0.053			
8.038	276.222	5.597	128	Embankemnt Fill	Clay-like		0.055			
8.202	203.355	5.073	128	Embankemnt Fill	Clay-like		0.056			
8.366	126.907	4.478	128	Embankemnt Fill	Clay-like		0.057			
8.530	98.891	4.080	128	Embankemnt Fill	Clay-like		0.058			
8.694	80.039	3.510	128	Embankemnt Fill	Clay-like		0.059			
8.858	66.775	4.226	128	Embankemnt Fill	Clay-like		0.059			
9.022	55.403	3.312	128	Embankemnt Fill	Clay-like		0.060			
9.186	45.023	2.984	128	Embankemnt Fill	Clay-like		0.061			
9.350	64.623	2.926	128	Embankemnt Fill	Clay-like		0.061			
9.514	58.551	5.504	128	Embankemnt Fill	Clay-like		0.062			
9.678	69.712	7.309	128	Embankemnt Fill	Clay-like		0.063			
9.842	304.048	7.652	128	Embankemnt Fill	Clay-like		0.064			
10.006	319.457	2.501	128	Embankemnt Fill	Clay-like		0.065			
10.170	252.355	3.957	128	Embankemnt Fill	Clay-like		0.066			
10.335	140.028	4.180	128	Embankemnt Fill	Clay-like		0.067			

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
10.499	121.192	5.040	128	Embankemnt Fill	Clay-like		0.068			
10.663	100.985	3.654	128	Embankemnt Fill	Clay-like		0.068			
10.827	129.292	2.470	128	Embankemnt Fill	Clay-like		0.069			
10.991	71.777	1.797	128	Embankemnt Fill	Clay-like		0.070			
11.155	64.490	1.453	128	Embankemnt Fill	Clay-like		0.070			
11.319	61.650	1.158	128	Embankemnt Fill	Clay-like		0.071			
11.483	50.205	1.216	128	Embankemnt Fill	Clay-like		0.071			
11.647	53.643	1.247	128	Embankemnt Fill	Clay-like		0.072			
11.811	39.970	1.235	128	Embankemnt Fill	Clay-like		0.072			
11.975	43.783	1.247	128	Embankemnt Fill	Clay-like		0.073			
12.139	49.680	2.303	128	Embankemnt Fill	Clay-like		0.073			
12.303	96.225	3.753	128	Embankemnt Fill	Clay-like		0.074			
12.467	255.099	3.856	128	Embankemnt Fill	Clay-like		0.074			
12.631	201.382	1.708	128	Embankemnt Fill	Clay-like		0.075			
12.795	186.977	2.126	128	Embankemnt Fill	Clay-like		0.075			
12.959	161.977	4.452	128	Embankemnt Fill	Clay-like		0.076			
13.123	164.536	3.292	128	Embankemnt Fill	Clay-like		0.076			
13.287	46.283	3.147	128	Embankemnt Fill	Clay-like		0.077			
13.451	41.482	1.930	128	Embankemnt Fill	Clay-like		0.077			
13.615	95.280	1.005	128	Embankemnt Fill	Clay-like		0.077			
13.779	34.691	1.251	128	Embankemnt Fill	Clay-like		0.078			
13.943	54.189	1.234	128	Embankemnt Fill	Clay-like		0.078			
14.107	54.968	1.085	128	Embankemnt Fill	Clay-like		0.078			
14.271	39.258	1.127	128	Embankemnt Fill	Clay-like		0.079			
14.436	61.209	1.299	128	Embankemnt Fill	Clay-like		0.080			
14.600	70.498	1.486	128	Embankemnt Fill	Clay-like		0.080			
14.764	56.047	1.536	128	Embankemnt Fill	Clay-like		0.081			
14.928	42.647	2.372	128	Embankemnt Fill	Clay-like		0.081			
15.092	39.818	2.712	128	Embankemnt Fill	Clay-like		0.082			
15.256	99.591	2.912	128	Embankemnt Fill	Clay-like		0.083			
15.420	88.460	3.172	128	Embankemnt Fill	Clay-like		0.083			
15.584	72.560	3.267	128	Embankemnt Fill	Clay-like		0.084			
15.748	48.731	2.964	128	Embankemnt Fill	Clay-like		0.085			
15.912	40.741	3.044	128	Embankemnt Fill	Clay-like		0.085			
16.076	51.302	2.831	128	Embankemnt Fill	Clay-like		0.085			
16.240	46.252	2.029	128	Embankemnt Fill	Clay-like		0.085			
16.404	33.393	1.890	128	Embankemnt Fill	Clay-like		0.086			
16.568	31.545	1.701	128	Embankemnt Fill	Clay-like		0.086			
16.732	27.498	1.541	128	Embankemnt Fill	Clay-like		0.086			
16.896	24.137	1.419	128	Embankemnt Fill	Clay-like		0.086			
17.060	18.246	1.360	128	Embankemnt Fill	Clay-like		0.086			
17.224	16.257	1.242	128	Embankemnt Fill	Clay-like		0.086			
17.388	18.669	1.108	128	Embankemnt Fill	Clay-like		0.085			
17.552	13.189	0.873	128	Embankemnt Fill	Clay-like		0.085			
17.716	9.160	0.645	128	Embankemnt Fill	Clay-like		0.085			
17.880	9.273	0.564	128	Embankemnt Fill	Clay-like		0.085			
18.044	12.016	0.641	128	Embankemnt Fill	Clay-like		0.086			
18.208	13.937	0.732	128	Embankemnt Fill	Clay-like		0.086			
18.372	13.208	0.721	128	Embankemnt Fill	Clay-like		0.087			
18.537	15.048	0.666	128	Embankemnt Fill	Clay-like		0.088			
18.701	12.089	0.611	128	Embankemnt Fill	Clay-like		0.089			
18.865	8.589	0.501	128	Embankemnt Fill	Clay-like		0.090			
19.029	11.141	0.418	128	Embankemnt Fill	Clay-like		0.090			
19.193	11.291	0.351	128	Embankemnt Fill	Clay-like		0.090			
19.357	8.453	0.252	128	Embankemnt Fill	Clay-like		0.091			
19.521	6.026	0.282	128	Embankemnt Fill	Clay-like		0.091			
19.685	5.026	0.314	128	Embankemnt Fill	Clay-like		0.092			
19.849	6.654	0.257	128	Embankemnt Fill	Clay-like		0.092			
20.013	5.153	0.273	128	Embankemnt Fill	Clay-like		0.093			
20.177	4.752	0.224	128	Embankemnt Fill	Clay-like		0.093			
20.341	6.176	0.198	128	Embankemnt Fill	Clay-like		0.093			
20.505	5.423	0.252	128	Embankemnt Fill	Clay-like		0.094			
20.669	6.174	0.239	128	Embankemnt Fill	Clay-like		0.094			
20.833	9.461	0.241	128	Embankemnt Fill	Clay-like		0.095			
20.997	8.585	0.236	128	Embankemnt Fill	Clay-like		0.095			
21.161	7.075	0.269	128	Embankemnt Fill	Clay-like		0.095			
21.325	5.934	0.233	128	Embankemnt Fill	Clay-like		0.096			
21.489	8.275	0.215	128	Embankemnt Fill	Clay-like		0.096			
21.653	6.831	0.221	128	Embankemnt Fill	Clay-like		0.097			
21.817	5.299	0.289	128	Embankemnt Fill	Clay-like		0.097			
21.981	7.333	0.228	128	Embankemnt Fill	Clay-like		0.098			
22.145	8.769	0.209	128	Embankemnt Fill	Clay-like		0.098			
22.309	7.495	0.325	128	Embankemnt Fill	Clay-like		0.098			
22.473	6.676	0.358	128	Embankemnt Fill	Clay-like		0.099			
22.638	7.370	0.350	128	Embankemnt Fill	Clay-like		0.099			

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
22.802	6.160	0.263	128	Embankemnt Fill	Clay-like		0.099			
22.966	7.252	0.455	128	Embankemnt Fill	Clay-like		0.100			
23.130	9.747	0.553	128	Embankemnt Fill	Clay-like		0.100			
23.294	9.498	0.565	128	Embankemnt Fill	Clay-like		0.100			
23.458	8.807	0.458	128	Embankemnt Fill	Clay-like		0.101			
23.622	10.230	0.432	128	Embankemnt Fill	Clay-like		0.101			
23.786	9.709	0.520	128	Embankemnt Fill	Clay-like		0.101			
23.950	8.041	0.525	128	Embankemnt Fill	Clay-like		0.102			
24.114	7.845	0.363	128	Embankemnt Fill	Clay-like		0.102			
24.278	6.646	0.285	128	Embankemnt Fill	Clay-like		0.102			
24.442	5.140	0.252	128	Embankemnt Fill	Clay-like		0.102			
24.606	5.984	0.313	128	Embankemnt Fill	Clay-like		0.103			
24.770	7.292	0.650	128	Embankemnt Fill	Clay-like		0.103			
24.934	26.935	1.429	128	Embankemnt Fill	Clay-like		0.103			
25.098	24.948	0.991	128	Embankemnt Fill	Clay-like		0.103			
25.262	95.003	1.006	128	Embankemnt Fill	Clay-like		0.104			
25.426	41.638	0.969	128	Embankemnt Fill	Clay-like		0.104			
25.590	32.047	1.024	128	Embankemnt Fill	Clay-like		0.104			
25.754	31.187	1.142	128	Embankemnt Fill	Clay-like		0.104			
25.918	17.836	1.029	128	Embankemnt Fill	Clay-like		0.105			
26.082	13.801	0.504	128	Embankemnt Fill	Clay-like		0.105			
26.246	10.688	0.458	128	Embankemnt Fill	Clay-like		0.105			
26.410	11.205	0.426	128	Embankemnt Fill	Clay-like		0.105			
26.574	9.107	0.459	128	Embankemnt Fill	Clay-like		0.106			
26.739	8.659	0.463	128	Embankemnt Fill	Clay-like		0.106			
26.903	12.106	0.406	128	Embankemnt Fill	Clay-like		0.106			
27.067	11.805	0.425	128	Embankemnt Fill	Clay-like		0.106			
27.231	9.618	0.452	128	Embankemnt Fill	Clay-like		0.107			
27.395	12.081	0.587	128	Embankemnt Fill	Clay-like		0.107			
27.559	12.155	0.583	128	Embankemnt Fill	Clay-like		0.107			
27.723	15.495	0.452	128	Embankemnt Fill	Clay-like		0.107			
27.887	14.361	0.453	128	Embankemnt Fill	Clay-like		0.108			
28.051	9.341	0.406	128	Embankemnt Fill	Clay-like		0.108			
28.215	10.448	0.420	128	Embankemnt Fill	Clay-like		0.108			
28.379	12.236	0.344	128	Embankemnt Fill	Clay-like		0.108			
28.543	12.587	0.367	128	Embankemnt Fill	Clay-like		0.109			
28.707	13.706	0.400	128	Embankemnt Fill	Clay-like		0.109			
28.871	10.358	0.402	128	Embankemnt Fill	Clay-like		0.109			
29.035	9.187	0.414	128	Embankemnt Fill	Clay-like		0.109			
29.199	7.640	0.380	128	Embankemnt Fill	Clay-like		0.110			
29.363	6.781	0.205	128	Embankemnt Fill	Clay-like		0.110			
29.527	6.847	0.241	128	Embankemnt Fill	Clay-like		0.110			
29.691	5.682	0.259	128	Embankemnt Fill	Clay-like		0.110			
29.855	5.176	0.247	128	Embankemnt Fill	Clay-like		0.110			
30.019	6.777	0.146	127	Subunit 1	Clay-like		0.111			
30.183	8.306	0.168	127	Subunit 1	Clay-like		0.111			
30.347	9.152	0.244	127	Subunit 1	Clay-like		0.111			
30.511	10.067	0.273	127	Subunit 1	Clay-like		0.111			
30.675	9.961	0.267	127	Subunit 1	Clay-like		0.112			
30.840	9.628	0.244	127	Subunit 1	Clay-like		0.112			
31.004	8.807	0.207	127	Subunit 1	Clay-like		0.112			
31.168	7.569	0.172	127	Subunit 1	Clay-like		0.112			
31.332	7.447	0.150	127	Subunit 1	Clay-like		0.113			
31.496	7.498	0.121	127	Subunit 1	Clay-like		0.113			
31.660	7.078	0.104	127	Subunit 1	Clay-like		0.113			
31.824	7.856	0.123	127	Subunit 1	Clay-like		0.113			
31.988	8.360	0.134	127	Subunit 1	Clay-like		0.113			
32.152	8.352	0.127	127	Subunit 1	Clay-like		0.113			
32.316	8.288	0.137	127	Subunit 1	Clay-like		0.114			
32.480	7.980	0.130	127	Subunit 1	Clay-like		0.114			
32.644	8.064	0.144	127	Subunit 1	Clay-like		0.114			
32.808	9.495	0.248	126	Subunit 2	Sand-like		0.114			
32.972	11.526	0.278	126	Subunit 2	Sand-like		0.114			
33.136	9.379	0.285	126	Subunit 2	Sand-like		0.114			
33.300	9.392	0.261	126	Subunit 2	Sand-like		0.114			
33.464	9.039	0.233	126	Subunit 2	Sand-like		0.114			
33.628	8.525	0.246	126	Subunit 2	Sand-like		0.115			
33.792	9.205	0.271	126	Subunit 2	Sand-like		0.115			
33.956	10.547	0.374	126	Subunit 2	Sand-like		0.115			
34.120	11.030	0.521	126	Subunit 2	Sand-like		0.115			
34.284	13.190	0.614	126	Subunit 2	Sand-like		0.115			
34.448	15.440	0.660	126	Subunit 2	Sand-like		0.116			
34.612	19.465	0.732	126	Subunit 2	Sand-like		0.118			
34.776	25.939	0.853	126	Subunit 2	Sand-like		0.118			
34.941	29.491	1.015	126	Subunit 2	Sand-like		0.118			

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
35.105	33.560	1.498	126	Subunit 2	Sand-like		0.118			
35.269	36.800	1.796	126	Subunit 2	Sand-like		0.118			
35.433	39.143	1.852	126	Subunit 2	Sand-like		0.118			
35.597	37.321	1.831	126	Subunit 2	Sand-like		0.118			
35.761	36.659	1.571	126	Subunit 2	Sand-like		0.119			
35.925	33.718	1.368	126	Subunit 2	Sand-like		0.119			
36.089	35.143	1.571	126	Subunit 2	Sand-like		0.119			
36.253	40.161	1.693	126	Subunit 2	Sand-like		0.119			
36.417	36.244	1.587	126	Subunit 2	Sand-like		0.119			
36.581	34.152	1.474	126	Subunit 2	Sand-like		0.119			
36.745	32.511	1.291	126	Subunit 2	Sand-like		0.120			
36.909	29.528	1.282	126	Subunit 2	Sand-like		0.120			
37.073	28.890	1.233	126	Subunit 2	Sand-like		0.120			
37.237	29.684	1.147	126	Subunit 2	Sand-like		0.120			
37.401	30.855	1.166	126	Subunit 2	Sand-like		0.120			
37.565	30.930	1.302	126	Subunit 2	Sand-like		0.120			
37.729	27.419	1.153	126	Subunit 2	Sand-like		0.121			
37.893	25.121	1.137	126	Subunit 2	Sand-like		0.121			
38.057	25.828	0.801	126	Subunit 2	Sand-like		0.121			
38.221	24.960	0.716	126	Subunit 2	Sand-like		0.121			
38.385	24.499	0.711	126	Subunit 2	Sand-like		0.122			
38.549	26.088	0.802	126	Subunit 2	Sand-like		0.122			
38.713	22.525	0.906	126	Subunit 2	Sand-like		0.122			
38.877	21.161	0.945	126	Subunit 2	Sand-like		0.122			
39.042	20.169	0.853	126	Subunit 2	Sand-like		0.123			
39.206	19.151	0.662	126	Subunit 2	Sand-like		0.123			
39.370	16.905	0.706	126	Subunit 2	Sand-like		0.123			
39.534	15.751	0.589	126	Subunit 2	Sand-like		0.124			
39.698	14.757	0.552	126	Subunit 2	Sand-like		0.124			
39.862	16.070	0.497	126	Subunit 2	Sand-like		0.124			
40.026	17.924	0.574	126	Subunit 2	Sand-like		0.124			
40.190	22.241	0.619	126	Subunit 2	Sand-like		0.124			
40.354	18.531	0.835	126	Subunit 2	Sand-like		0.125			
40.518	16.770	0.717	126	Subunit 2	Sand-like		0.125			
40.682	13.444	0.559	126	Subunit 2	Sand-like		0.125			
40.846	11.025	0.381	126	Subunit 2	Sand-like		0.125			
41.010	9.609	0.316	126	Subunit 2	Sand-like		0.125			
41.174	8.859	0.381	126	Subunit 2	Sand-like		0.125			
41.338	11.224	0.369	126	Subunit 2	Sand-like		0.125			
41.502	12.614	0.338	126	Subunit 2	Sand-like		0.125			
41.666	15.032	0.283	126	Subunit 2	Sand-like		0.125			
41.830	11.514	0.203	126	Subunit 2	Sand-like		0.125			
41.994	9.517	0.176	126	Subunit 2	Sand-like		0.125			
42.158	7.505	0.135	126	Subunit 2	Sand-like		0.126			
42.322	19.319	0.087	126	Subunit 2	Sand-like		0.126			
42.486	21.856	0.132	126	Subunit 2	Sand-like		0.126			
42.650	17.312	0.167	126	Subunit 2	Sand-like		0.126			
42.814	14.806	0.167	126	Subunit 2	Sand-like		0.127			
42.978	10.959	0.130	126	Subunit 2	Sand-like		0.127			
43.143	13.996	0.073	126	Subunit 2	Sand-like		0.127			
43.307	18.675	0.085	126	Subunit 2	Sand-like		0.127			
43.471	15.704	0.124	126	Subunit 2	Sand-like		0.128			
43.635	12.990	0.152	126	Subunit 2	Sand-like		0.128			
43.799	21.825	0.170	126	Subunit 2	Sand-like		0.128			
43.963	24.380	0.119	126	Subunit 2	Sand-like		0.128			
44.127	27.870	0.118	126	Subunit 2	Sand-like		0.128			
44.291	29.293	0.127	126	Subunit 2	Sand-like		0.128			
44.455	25.274	0.154	126	Subunit 2	Sand-like		0.128			
44.619	24.318	0.198	126	Subunit 2	Sand-like		0.128			
44.783	25.889	0.221	126	Subunit 2	Sand-like		0.128			
44.947	29.550	0.191	131	Subunit 3	Sand-like		0.128			
45.111	32.066	0.125	131	Subunit 3	Sand-like		0.128			
45.275	37.823	0.150	131	Subunit 3	Sand-like		0.128			
45.439	39.587	0.175	131	Subunit 3	Sand-like		0.129			
45.603	37.563	0.405	131	Subunit 3	Sand-like		0.129			
45.767	34.680	0.421	131	Subunit 3	Sand-like		0.129			
45.931	59.660	0.333	131	Subunit 3	Sand-like		0.129			
46.095	77.264	0.419	131	Subunit 3	Sand-like		0.129			
46.259	85.326	0.527	131	Subunit 3	Sand-like		0.129			
46.423	96.491	0.567	131	Subunit 3	Sand-like		0.129			
46.587	99.760	0.642	131	Subunit 3	Sand-like		0.130			
46.751	99.419	0.798	131	Subunit 3	Sand-like		0.130			
46.915	89.554	0.738	131	Subunit 3	Sand-like		0.130			
47.079	80.742	0.716	131	Subunit 3	Sand-like		0.130			
47.244	70.101	0.642	131	Subunit 3	Sand-like		0.131			

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
47.408	62.642	0.577	131	Subunit 3	Sand-like		0.131			
47.572	60.228	0.539	131	Subunit 3	Sand-like		0.131			
47.736	58.831	0.504	131	Subunit 3	Sand-like		0.131			
47.900	53.747	0.461	131	Subunit 3	Sand-like		0.131			
48.064	47.516	0.427	131	Subunit 3	Sand-like		0.131			
48.228	40.044	0.371	131	Subunit 3	Sand-like		0.131			
48.392	33.294	0.374	131	Subunit 3	Sand-like		0.131			
48.556	28.801	0.388	131	Subunit 3	Sand-like		0.131			
48.720	42.725	0.326	131	Subunit 3	Sand-like		0.131			
48.884	51.616	0.343	131	Subunit 3	Sand-like		0.131			
49.048	47.955	0.377	131	Subunit 3	Sand-like		0.131			
49.212	46.021	0.355	131	Subunit 3	Sand-like		0.130			
49.376	51.443	0.310	131	Subunit 3	Sand-like		0.130			
49.540	64.817	0.395	131	Subunit 3	Sand-like		0.130			
49.704	83.215	0.786	131	Subunit 3	Sand-like		0.129			
49.868	109.839	0.613	131	Subunit 3	Sand-like		0.129			
50.032	196.779	0.010	131	Subunit 3	Sand-like		0.128			
50.196	312.712	0.010	131	Subunit 3	Sand-like		0.128			

LIQUEFACTION POTENTIAL ASSESSMENT FOR COARSE GRAINED SOILS USING CONE PENETRATION TEST DATA

Facility: KIF TDEC Stability
Project No.: 175668043
CPT ID: CPT-03C

Water Elevation during CPT:	750.0	ft
Depth to Water during CPT:	4.0	ft *(relative to ground surface during CPT)*
Water Elevation during Earthquake:	748.7	ft
Depth to Water during Earthquake:	5.3	ft *(relative to ground surface during CPT)*
Final Grade Elevation during EQ:	753.8	ft *(if no fill, then set this equal to top of CPT hole elev.)*
Height of Final Grade above CPT TOH:	-0.2	ft *(relative to ground surface during CPT, + Fill, - Cut)*
Unit Weight of Cut/Fill to Achieve Final Grade	120	pcf
Cut/Fill Total Stress (+ Fill, - Cut):	-0.01	tsf

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
754.0				Vertical Stresses above 1st CPT:	**0.16**		**0.01**	**0.00**	**0.00**	**0.00**	**0.01**	**0.00**
753.8	0.164	47.04	0.06	120		0.09	0.01	0.00	0.00	0.00	0.01	0.00
753.7	0.328	76.57	0.12	120	0.25	0.16	0.02	0.01	0.00	0.00	0.02	0.01
753.5	0.492	113.92	0.10	120	0.41	0.16	0.03	0.02	0.00	0.00	0.03	0.02
753.3	0.656	127.40	0.24	120	0.57	0.16	0.04	0.03	0.00	0.00	0.04	0.03
753.2	0.820	142.97	0.28	120	0.74	0.16	0.05	0.04	0.00	0.00	0.05	0.04
753.0	0.984	269.24	0.52	128	0.90	0.16	0.06	0.05	0.00	0.00	0.06	0.05
752.9	1.148	393.38	1.19	128	1.07	0.16	0.07	0.06	0.00	0.00	0.07	0.06
752.7	1.312	333.62	1.92	128	1.23	0.16	0.08	0.07	0.00	0.00	0.08	0.07
752.5	1.476	290.13	2.62	128	1.39	0.16	0.09	0.08	0.00	0.00	0.09	0.08
752.4	1.640	281.23	3.81	128	1.56	0.16	0.10	0.09	0.00	0.00	0.10	0.09
752.2	1.804	188.84	3.67	128	1.72	0.16	0.11	0.10	0.00	0.00	0.11	0.10
752.0	1.968	224.02	3.00	128	1.89	0.16	0.12	0.11	0.00	0.00	0.12	0.11
751.9	2.133	265.82	2.56	128	2.05	0.16	0.13	0.12	0.00	0.00	0.13	0.12
751.7	2.297	295.34	2.18	128	2.21	0.16	0.14	0.13	0.00	0.00	0.14	0.13
751.5	2.461	311.67	2.37	128	2.38	0.16	0.15	0.14	0.00	0.00	0.15	0.14
751.4	2.625	277.49	2.01	128	2.54	0.16	0.16	0.15	0.00	0.00	0.16	0.15
751.2	2.789	219.45	1.99	128	2.71	0.16	0.17	0.16	0.00	0.00	0.17	0.16
751.0	2.953	159.38	1.61	128	2.87	0.16	0.19	0.17	0.00	0.00	0.19	0.17
750.9	3.117	84.07	1.06	128	3.03	0.16	0.20	0.18	0.00	0.00	0.20	0.18
750.7	3.281	46.78	1.55	128	3.20	0.16	0.21	0.19	0.00	0.00	0.21	0.19
750.6	3.445	38.96	1.64	128	3.36	0.16	0.22	0.20	0.00	0.00	0.22	0.20
750.4	3.609	36.18	1.94	128	3.53	0.16	0.23	0.22	0.00	0.00	0.23	0.22
750.2	3.773	64.32	1.98	128	3.69	0.16	0.24	0.23	0.00	0.00	0.24	0.23
750.1	3.937	46.72	2.11	128	3.85	0.16	0.25	0.24	0.00	0.00	0.25	0.24
749.9	4.101	34.36	1.73	128	4.02	0.16	0.26	0.25	0.00	0.00	0.26	0.25
749.7	4.265	119.98	2.74	128	4.18	0.16	0.27	0.26	0.01	0.00	0.26	0.26
749.6	4.429	256.94	2.78	128	4.35	0.16	0.28	0.27	0.01	0.00	0.27	0.27
749.4	4.593	282.15	2.77	128	4.51	0.16	0.29	0.28	0.02	0.00	0.27	0.28
749.2	4.757	203.11	1.84	128	4.68	0.16	0.30	0.29	0.02	0.00	0.28	0.29
749.1	4.921	123.99	1.78	128	4.84	0.16	0.31	0.30	0.03	0.00	0.28	0.30
748.9	5.085	85.54	1.90	128	5.00	0.16	0.32	0.31	0.03	0.00	0.29	0.31
748.8	5.249	44.83	2.09	128	5.17	0.16	0.33	0.32	0.04	0.00	0.29	0.32
748.6	5.413	45.14	2.68	128	5.33	0.16	0.34	0.33	0.04	0.00	0.30	0.33
748.4	5.577	48.28	2.76	128	5.50	0.16	0.35	0.34	0.05	0.01	0.30	0.33
748.3	5.741	37.75	2.22	128	5.66	0.16	0.36	0.35	0.05	0.01	0.31	0.34
748.1	5.905	71.94	1.82	128	5.82	0.16	0.37	0.36	0.06	0.02	0.31	0.34
747.9	6.069	199.05	2.61	128	5.99	0.16	0.38	0.37	0.06	0.02	0.32	0.35
747.8	6.234	162.05	2.86	128	6.15	0.16	0.40	0.38	0.07	0.03	0.33	0.35
747.6	6.398	100.74	3.55	128	6.32	0.16	0.41	0.39	0.07	0.03	0.33	0.36
747.4	6.562	69.79	4.93	128	6.48	0.16	0.42	0.40	0.08	0.04	0.34	0.36
747.3	6.726	184.29	3.06	128	6.64	0.16	0.43	0.41	0.09	0.04	0.34	0.37
747.1	6.890	218.93	4.29	128	6.81	0.16	0.44	0.43	0.09	0.05	0.35	0.38
746.9	7.054	121.76	5.62	128	6.97	0.16	0.45	0.44	0.10	0.05	0.35	0.38
746.8	7.218	82.00	6.54	128	7.14	0.16	0.46	0.45	0.10	0.06	0.36	0.39
746.6	7.382	85.73	3.76	128	7.30	0.16	0.47	0.46	0.11	0.06	0.36	0.39
746.5	7.546	163.04	4.46	128	7.46	0.16	0.48	0.47	0.11	0.07	0.37	0.40
746.3	7.710	177.55	7.48	128	7.63	0.16	0.49	0.48	0.12	0.08	0.37	0.40
746.1	7.874	216.44	5.15	128	7.79	0.16	0.50	0.49	0.12	0.08	0.38	0.41
746.0	8.038	276.22	5.60	128	7.96	0.16	0.51	0.50	0.13	0.09	0.38	0.41
745.8	8.202	203.36	5.07	128	8.12	0.16	0.52	0.51	0.13	0.09	0.39	0.42
745.6	8.366	126.91	4.48	128	8.28	0.16	0.53	0.52	0.14	0.10	0.40	0.42
745.5	8.530	98.89	4.08	128	8.45	0.16	0.54	0.53	0.14	0.10	0.40	0.43
745.3	8.694	80.04	3.51	128	8.61	0.16	0.55	0.54	0.15	0.11	0.41	0.43
745.1	8.858	66.78	4.23	128	8.78	0.16	0.56	0.55	0.15	0.11	0.41	0.44
745.0	9.022	55.40	3.31	128	8.94	0.16	0.57	0.56	0.16	0.12	0.42	0.45
744.8	9.186	45.02	2.98	128	9.10	0.16	0.58	0.57	0.16	0.12	0.42	0.45
744.6	9.350	64.62	2.93	128	9.27	0.16	0.59	0.58	0.17	0.13	0.43	0.46
744.5	9.514	58.55	5.50	128	9.43	0.16	0.61	0.59	0.17	0.13	0.43	0.46

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
744.3	9.678	69.71	7.31	128	9.60	0.16	0.62	0.60	0.18	0.14	0.44	0.47
744.2	9.842	304.05	7.65	128	9.76	0.16	0.63	0.61	0.18	0.14	0.44	0.47
744.0	10.006	319.46	2.50	128	9.92	0.16	0.64	0.62	0.19	0.15	0.45	0.48
743.8	10.170	252.35	3.96	128	10.09	0.16	0.65	0.64	0.19	0.15	0.45	0.48
743.7	10.335	140.03	4.18	128	10.25	0.16	0.66	0.65	0.20	0.16	0.46	0.49
743.5	10.499	121.19	5.04	128	10.42	0.16	0.67	0.66	0.20	0.16	0.47	0.49
743.3	10.663	100.98	3.65	128	10.58	0.16	0.68	0.67	0.21	0.17	0.47	0.50
743.2	10.827	129.29	2.47	128	10.74	0.16	0.69	0.68	0.21	0.17	0.48	0.50
743.0	10.991	71.78	1.80	128	10.91	0.16	0.70	0.69	0.22	0.18	0.48	0.51
742.8	11.155	64.49	1.45	128	11.07	0.16	0.71	0.70	0.22	0.18	0.49	0.52
742.7	11.319	61.65	1.16	128	11.24	0.16	0.72	0.71	0.23	0.19	0.49	0.52
742.5	11.483	50.20	1.22	128	11.40	0.16	0.73	0.72	0.23	0.19	0.50	0.53
742.4	11.647	53.64	1.25	128	11.56	0.16	0.74	0.73	0.24	0.20	0.50	0.53
742.2	11.811	39.97	1.24	128	11.73	0.16	0.75	0.74	0.24	0.20	0.51	0.54
742.0	11.975	43.78	1.25	128	11.89	0.16	0.76	0.75	0.25	0.21	0.51	0.54
741.9	12.139	49.68	2.30	128	12.06	0.16	0.77	0.76	0.25	0.21	0.52	0.55
741.7	12.303	96.22	3.75	128	12.22	0.16	0.78	0.77	0.26	0.22	0.52	0.55
741.5	12.467	255.10	3.86	128	12.39	0.16	0.79	0.78	0.26	0.22	0.53	0.56
741.4	12.631	201.38	1.71	128	12.55	0.16	0.80	0.79	0.27	0.23	0.54	0.56
741.2	12.795	186.98	2.13	128	12.71	0.16	0.82	0.80	0.27	0.23	0.54	0.57
741.0	12.959	161.98	4.45	128	12.88	0.16	0.83	0.81	0.28	0.24	0.55	0.57
740.9	13.123	164.54	3.29	128	13.04	0.16	0.84	0.82	0.28	0.24	0.55	0.58
740.7	13.287	46.28	3.15	128	13.21	0.16	0.85	0.83	0.29	0.25	0.56	0.59
740.5	13.451	41.48	1.93	128	13.37	0.16	0.86	0.85	0.29	0.25	0.56	0.59
740.4	13.615	95.28	1.01	128	13.53	0.16	0.87	0.86	0.30	0.26	0.57	0.60
740.2	13.779	34.69	1.25	128	13.70	0.16	0.88	0.87	0.31	0.26	0.57	0.60
740.1	13.943	54.19	1.23	128	13.86	0.16	0.89	0.88	0.31	0.27	0.58	0.61
739.9	14.107	54.97	1.09	128	14.03	0.16	0.90	0.89	0.32	0.27	0.58	0.61
739.7	14.271	39.26	1.13	128	14.19	0.16	0.91	0.90	0.32	0.28	0.59	0.62
739.6	14.436	61.21	1.30	128	14.35	0.16	0.92	0.91	0.33	0.29	0.59	0.62
739.4	14.600	70.50	1.49	128	14.52	0.16	0.93	0.92	0.33	0.29	0.60	0.63
739.2	14.764	56.05	1.54	128	14.68	0.16	0.94	0.93	0.34	0.30	0.61	0.63
739.1	14.928	42.65	2.37	128	14.85	0.16	0.95	0.94	0.34	0.30	0.61	0.64
738.9	15.092	39.82	2.71	128	15.01	0.16	0.96	0.95	0.35	0.31	0.62	0.64
738.7	15.256	99.59	2.91	128	15.17	0.16	0.97	0.96	0.35	0.31	0.62	0.65
738.6	15.420	88.46	3.17	128	15.34	0.16	0.98	0.97	0.36	0.32	0.63	0.66
738.4	15.584	72.56	3.27	128	15.50	0.16	0.99	0.98	0.36	0.32	0.63	0.66
738.3	15.748	48.73	2.96	128	15.67	0.16	1.00	0.99	0.37	0.33	0.64	0.67
738.1	15.912	40.74	3.04	128	15.83	0.16	1.01	1.00	0.37	0.33	0.64	0.67
737.9	16.076	51.30	2.83	128	15.99	0.16	1.03	1.01	0.38	0.34	0.65	0.68
737.8	16.240	46.25	2.03	128	16.16	0.16	1.04	1.02	0.38	0.34	0.65	0.68
737.6	16.404	33.39	1.89	128	16.32	0.16	1.05	1.03	0.39	0.35	0.66	0.69
737.4	16.568	31.55	1.70	128	16.49	0.16	1.06	1.04	0.39	0.35	0.66	0.69
737.3	16.732	27.50	1.54	128	16.65	0.16	1.07	1.06	0.40	0.36	0.67	0.70
737.1	16.896	24.14	1.42	128	16.81	0.16	1.08	1.07	0.40	0.36	0.68	0.70
736.9	17.060	18.25	1.36	128	16.98	0.16	1.09	1.08	0.41	0.37	0.68	0.71
736.8	17.224	16.26	1.24	128	17.14	0.16	1.10	1.09	0.41	0.37	0.69	0.71
736.6	17.388	18.67	1.11	128	17.31	0.16	1.11	1.10	0.42	0.38	0.69	0.72
736.4	17.552	13.19	0.87	128	17.47	0.16	1.12	1.11	0.42	0.38	0.70	0.73
736.3	17.716	9.16	0.65	128	17.63	0.16	1.13	1.12	0.43	0.39	0.70	0.73
736.1	17.880	9.27	0.56	128	17.80	0.16	1.14	1.13	0.43	0.39	0.71	0.74
736.0	18.044	12.02	0.64	128	17.96	0.16	1.15	1.14	0.44	0.40	0.71	0.74
735.8	18.208	13.94	0.73	128	18.13	0.16	1.16	1.15	0.44	0.40	0.72	0.75
735.6	18.372	13.21	0.72	128	18.29	0.16	1.17	1.16	0.45	0.41	0.72	0.75
735.5	18.537	15.05	0.67	128	18.45	0.16	1.18	1.17	0.45	0.41	0.73	0.76
735.3	18.701	12.09	0.61	128	18.62	0.16	1.19	1.18	0.46	0.42	0.73	0.76
735.1	18.865	8.59	0.50	128	18.78	0.16	1.20	1.19	0.46	0.42	0.74	0.77
735.0	19.029	11.14	0.42	128	18.95	0.16	1.21	1.20	0.47	0.43	0.75	0.77
734.8	19.193	11.29	0.35	128	19.11	0.16	1.22	1.21	0.47	0.43	0.75	0.78
734.6	19.357	8.45	0.25	128	19.27	0.16	1.24	1.22	0.48	0.44	0.76	0.78
734.5	19.521	6.03	0.28	128	19.44	0.16	1.25	1.23	0.48	0.44	0.76	0.79
734.3	19.685	5.03	0.31	128	19.60	0.16	1.26	1.24	0.49	0.45	0.77	0.80
734.2	19.849	6.65	0.26	128	19.77	0.16	1.27	1.25	0.49	0.45	0.77	0.80
734.0	20.013	5.15	0.27	128	19.93	0.16	1.28	1.27	0.50	0.46	0.78	0.81
733.8	20.177	4.75	0.22	128	20.09	0.16	1.29	1.28	0.50	0.46	0.78	0.81
733.7	20.341	6.18	0.20	128	20.26	0.16	1.30	1.29	0.51	0.47	0.79	0.82
733.5	20.505	5.42	0.25	128	20.42	0.16	1.31	1.30	0.51	0.47	0.79	0.82
733.3	20.669	6.17	0.24	128	20.59	0.16	1.32	1.31	0.52	0.48	0.80	0.83
733.2	20.833	9.46	0.24	128	20.75	0.16	1.33	1.32	0.53	0.48	0.80	0.83

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
733.0	20.997	8.58	0.24	128	20.92	0.16	1.34	1.33	0.53	0.49	0.81	0.84
732.8	21.161	7.08	0.27	128	21.08	0.16	1.35	1.34	0.54	0.49	0.82	0.84
732.7	21.325	5.93	0.23	128	21.24	0.16	1.36	1.35	0.54	0.50	0.82	0.85
732.5	21.489	8.27	0.22	128	21.41	0.16	1.37	1.36	0.55	0.51	0.83	0.85
732.3	21.653	6.83	0.22	128	21.57	0.16	1.38	1.37	0.55	0.51	0.83	0.86
732.2	21.817	5.30	0.29	128	21.74	0.16	1.39	1.38	0.56	0.52	0.84	0.87
732.0	21.981	7.33	0.23	128	21.90	0.16	1.40	1.39	0.56	0.52	0.84	0.87
731.9	22.145	8.77	0.21	128	22.06	0.16	1.41	1.40	0.57	0.53	0.85	0.88
731.7	22.309	7.49	0.33	128	22.23	0.16	1.42	1.41	0.57	0.53	0.85	0.88
731.5	22.473	6.68	0.36	128	22.39	0.16	1.43	1.42	0.58	0.54	0.86	0.89
731.4	22.638	7.37	0.35	128	22.56	0.16	1.45	1.43	0.58	0.54	0.86	0.89
731.2	22.802	6.16	0.26	128	22.72	0.16	1.46	1.44	0.59	0.55	0.87	0.90
731.0	22.966	7.25	0.46	128	22.88	0.16	1.47	1.45	0.59	0.55	0.87	0.90
730.9	23.130	9.75	0.55	128	23.05	0.16	1.48	1.46	0.60	0.56	0.88	0.91
730.7	23.294	9.50	0.57	128	23.21	0.16	1.49	1.48	0.60	0.56	0.89	0.91
730.5	23.458	8.81	0.46	128	23.38	0.16	1.50	1.49	0.61	0.57	0.89	0.92
730.4	23.622	10.23	0.43	128	23.54	0.16	1.51	1.50	0.61	0.57	0.90	0.92
730.2	23.786	9.71	0.52	128	23.70	0.16	1.52	1.51	0.62	0.58	0.90	0.93
730.1	23.950	8.04	0.53	128	23.87	0.16	1.53	1.52	0.62	0.58	0.91	0.94
729.9	24.114	7.84	0.36	128	24.03	0.16	1.54	1.53	0.63	0.59	0.91	0.94
729.7	24.278	6.65	0.29	128	24.20	0.16	1.55	1.54	0.63	0.59	0.92	0.95
729.6	24.442	5.14	0.25	128	24.36	0.16	1.56	1.55	0.64	0.60	0.92	0.95
729.4	24.606	5.98	0.31	128	24.52	0.16	1.57	1.56	0.64	0.60	0.93	0.96
729.2	24.770	7.29	0.65	128	24.69	0.16	1.58	1.57	0.65	0.61	0.93	0.96
729.1	24.934	26.94	1.43	128	24.85	0.16	1.59	1.58	0.65	0.61	0.94	0.97
728.9	25.098	24.95	0.99	128	25.02	0.16	1.60	1.59	0.66	0.62	0.94	0.97
728.7	25.262	95.00	1.01	128	25.18	0.16	1.61	1.60	0.66	0.62	0.95	0.98
728.6	25.426	41.64	0.97	128	25.34	0.16	1.62	1.61	0.67	0.63	0.96	0.98
728.4	25.590	32.05	1.02	128	25.51	0.16	1.63	1.62	0.67	0.63	0.96	0.99
728.2	25.754	31.19	1.14	128	25.67	0.16	1.64	1.63	0.68	0.64	0.97	0.99
728.1	25.918	17.84	1.03	128	25.84	0.16	1.66	1.64	0.68	0.64	0.97	1.00
727.9	26.082	13.80	0.50	128	26.00	0.16	1.67	1.65	0.69	0.65	0.98	1.01
727.8	26.246	10.69	0.46	128	26.16	0.16	1.68	1.66	0.69	0.65	0.98	1.01
727.6	26.410	11.20	0.43	128	26.33	0.16	1.69	1.67	0.70	0.66	0.99	1.02
727.4	26.574	9.11	0.46	128	26.49	0.16	1.70	1.69	0.70	0.66	0.99	1.02
727.3	26.739	8.66	0.46	128	26.66	0.16	1.71	1.70	0.71	0.67	1.00	1.03
727.1	26.903	12.11	0.41	128	26.82	0.16	1.72	1.71	0.71	0.67	1.00	1.03
726.9	27.067	11.81	0.43	128	26.98	0.16	1.73	1.72	0.72	0.68	1.01	1.04
726.8	27.231	9.62	0.45	128	27.15	0.16	1.74	1.73	0.72	0.68	1.01	1.04
726.6	27.395	12.08	0.59	128	27.31	0.16	1.75	1.74	0.73	0.69	1.02	1.05
726.4	27.559	12.15	0.58	128	27.48	0.16	1.76	1.75	0.74	0.69	1.03	1.05
726.3	27.723	15.49	0.45	128	27.64	0.16	1.77	1.76	0.74	0.70	1.03	1.06
726.1	27.887	14.36	0.45	128	27.80	0.16	1.78	1.77	0.75	0.70	1.04	1.06
725.9	28.051	9.34	0.41	128	27.97	0.16	1.79	1.78	0.75	0.71	1.04	1.07
725.8	28.215	10.45	0.42	128	28.13	0.16	1.80	1.79	0.76	0.71	1.05	1.08
725.6	28.379	12.24	0.34	128	28.30	0.16	1.81	1.80	0.76	0.72	1.05	1.08
725.5	28.543	12.59	0.37	128	28.46	0.16	1.82	1.81	0.77	0.73	1.06	1.09
725.3	28.707	13.71	0.40	128	28.62	0.16	1.83	1.82	0.77	0.73	1.06	1.09
725.1	28.871	10.36	0.40	128	28.79	0.16	1.84	1.83	0.78	0.74	1.07	1.10
725.0	29.035	9.19	0.41	128	28.95	0.16	1.85	1.84	0.78	0.74	1.07	1.10
724.8	29.199	7.64	0.38	128	29.12	0.16	1.87	1.85	0.79	0.75	1.08	1.11
724.6	29.363	6.78	0.21	128	29.28	0.16	1.88	1.86	0.79	0.75	1.08	1.11
724.5	29.527	6.85	0.24	128	29.45	0.16	1.89	1.87	0.80	0.76	1.09	1.12
724.3	29.691	5.68	0.26	128	29.61	0.16	1.90	1.88	0.80	0.76	1.10	1.12
724.1	29.855	5.18	0.25	128	29.77	0.16	1.91	1.90	0.81	0.77	1.10	1.13
724.0	30.019	6.78	0.15	127	29.94	0.16	1.92	1.91	0.81	0.77	1.11	1.13
723.8	30.183	8.31	0.17	127	30.10	0.16	1.93	1.92	0.82	0.78	1.11	1.14
723.7	30.347	9.15	0.24	127	30.27	0.16	1.94	1.93	0.82	0.78	1.12	1.14
723.5	30.511	10.07	0.27	127	30.43	0.16	1.95	1.94	0.83	0.79	1.12	1.15
723.3	30.675	9.96	0.27	127	30.59	0.16	1.96	1.95	0.83	0.79	1.13	1.16
723.2	30.840	9.63	0.24	127	30.76	0.16	1.97	1.96	0.84	0.80	1.13	1.16
723.0	31.004	8.81	0.21	127	30.92	0.16	1.98	1.97	0.84	0.80	1.14	1.17
722.8	31.168	7.57	0.17	127	31.09	0.16	1.99	1.98	0.85	0.81	1.14	1.17
722.7	31.332	7.45	0.15	127	31.25	0.16	2.00	1.99	0.85	0.81	1.15	1.18
722.5	31.496	7.50	0.12	127	31.41	0.16	2.01	2.00	0.86	0.82	1.15	1.18
722.3	31.660	7.08	0.10	127	31.58	0.16	2.02	2.01	0.86	0.82	1.16	1.19
722.2	31.824	7.86	0.12	127	31.74	0.16	2.03	2.02	0.87	0.83	1.16	1.19
722.0	31.988	8.36	0.13	127	31.91	0.16	2.04	2.03	0.87	0.83	1.17	1.20
721.8	32.152	8.35	0.13	127	32.07	0.16	2.05	2.04	0.88	0.84	1.17	1.20

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
721.7	32.316	8.29	0.14	127	32.23	0.16	2.06	2.05	0.88	0.84	1.18	1.21
721.5	32.480	7.98	0.13	127	32.40	0.16	2.07	2.06	0.89	0.85	1.19	1.21
721.4	32.644	8.06	0.14	127	32.56	0.16	2.08	2.07	0.89	0.85	1.19	1.22
721.2	32.808	9.50	0.25	126	32.73	0.16	2.09	2.08	0.90	0.86	1.20	1.22
721.0	32.972	11.53	0.28	126	32.89	0.16	2.10	2.09	0.90	0.86	1.20	1.23
720.9	33.136	9.38	0.29	126	33.05	0.16	2.12	2.10	0.91	0.87	1.21	1.23
720.7	33.300	9.39	0.26	126	33.22	0.16	2.13	2.11	0.91	0.87	1.21	1.24
720.5	33.464	9.04	0.23	126	33.38	0.16	2.14	2.12	0.92	0.88	1.22	1.25
720.4	33.628	8.52	0.25	126	33.55	0.16	2.15	2.13	0.92	0.88	1.22	1.25
720.2	33.792	9.20	0.27	126	33.71	0.16	2.16	2.14	0.93	0.89	1.23	1.26
720.0	33.956	10.55	0.37	126	33.87	0.16	2.17	2.15	0.93	0.89	1.23	1.26
719.9	34.120	11.03	0.52	126	34.04	0.16	2.18	2.17	0.94	0.90	1.24	1.27
719.7	34.284	13.19	0.61	126	34.20	0.16	2.19	2.18	0.94	0.90	1.24	1.27
719.6	34.448	15.44	0.66	126	34.37	0.16	2.20	2.19	0.95	0.91	1.25	1.28
719.4	34.612	19.46	0.73	126	34.53	0.16	2.21	2.20	0.96	0.91	1.25	1.28
719.2	34.776	25.94	0.85	126	34.69	0.16	2.22	2.21	0.96	0.92	1.26	1.29
719.1	34.941	29.49	1.02	126	34.86	0.16	2.23	2.22	0.97	0.92	1.26	1.29
718.9	35.105	33.56	1.50	126	35.02	0.16	2.24	2.23	0.97	0.93	1.27	1.30
718.7	35.269	36.80	1.80	126	35.19	0.16	2.25	2.24	0.98	0.94	1.27	1.30
718.6	35.433	39.14	1.85	126	35.35	0.16	2.26	2.25	0.98	0.94	1.28	1.31
718.4	35.597	37.32	1.83	126	35.51	0.16	2.27	2.26	0.99	0.95	1.28	1.31
718.2	35.761	36.66	1.57	126	35.68	0.16	2.28	2.27	0.99	0.95	1.29	1.32
718.1	35.925	33.72	1.37	126	35.84	0.16	2.29	2.28	1.00	0.96	1.29	1.32
717.9	36.089	35.14	1.57	126	36.01	0.16	2.30	2.29	1.00	0.96	1.30	1.33
717.7	36.253	40.16	1.69	126	36.17	0.16	2.31	2.30	1.01	0.97	1.31	1.33
717.6	36.417	36.24	1.59	126	36.33	0.16	2.32	2.31	1.01	0.97	1.31	1.34
717.4	36.581	34.15	1.47	126	36.50	0.16	2.33	2.32	1.02	0.98	1.32	1.34
717.3	36.745	32.51	1.29	126	36.66	0.16	2.34	2.33	1.02	0.98	1.32	1.35
717.1	36.909	29.53	1.28	126	36.83	0.16	2.35	2.34	1.03	0.99	1.33	1.35
716.9	37.073	28.89	1.23	126	36.99	0.16	2.36	2.35	1.03	0.99	1.33	1.36
716.8	37.237	29.68	1.15	126	37.16	0.16	2.37	2.36	1.04	1.00	1.34	1.37
716.6	37.401	30.86	1.17	126	37.32	0.16	2.38	2.37	1.04	1.00	1.34	1.37
716.4	37.565	30.93	1.30	126	37.48	0.16	2.39	2.38	1.05	1.01	1.35	1.38
716.3	37.729	27.42	1.15	126	37.65	0.16	2.40	2.39	1.05	1.01	1.35	1.38
716.1	37.893	25.12	1.14	126	37.81	0.16	2.41	2.40	1.06	1.02	1.36	1.39
715.9	38.057	25.83	0.80	126	37.98	0.16	2.43	2.41	1.06	1.02	1.36	1.39
715.8	38.221	24.96	0.72	126	38.14	0.16	2.44	2.42	1.07	1.03	1.37	1.40
715.6	38.385	24.50	0.71	126	38.30	0.16	2.45	2.43	1.07	1.03	1.37	1.40
715.5	38.549	26.09	0.80	126	38.47	0.16	2.46	2.44	1.08	1.04	1.38	1.41
715.3	38.713	22.52	0.91	126	38.63	0.16	2.47	2.45	1.08	1.04	1.38	1.41
715.1	38.877	21.16	0.95	126	38.80	0.16	2.48	2.47	1.09	1.05	1.39	1.42
715.0	39.042	20.17	0.85	126	38.96	0.16	2.49	2.48	1.09	1.05	1.39	1.42
714.8	39.206	19.15	0.66	126	39.12	0.16	2.50	2.49	1.10	1.06	1.40	1.43
714.6	39.370	16.90	0.71	126	39.29	0.16	2.51	2.50	1.10	1.06	1.40	1.43
714.5	39.534	15.75	0.59	126	39.45	0.16	2.52	2.51	1.11	1.07	1.41	1.44
714.3	39.698	14.76	0.55	126	39.62	0.16	2.53	2.52	1.11	1.07	1.41	1.44
714.1	39.862	16.07	0.50	126	39.78	0.16	2.54	2.53	1.12	1.08	1.42	1.45
714.0	40.026	17.92	0.57	126	39.94	0.16	2.55	2.54	1.12	1.08	1.43	1.45
713.8	40.190	22.24	0.62	126	40.11	0.16	2.56	2.55	1.13	1.09	1.43	1.46
713.6	40.354	18.53	0.84	126	40.27	0.16	2.57	2.56	1.13	1.09	1.44	1.46
713.5	40.518	16.77	0.72	126	40.44	0.16	2.58	2.57	1.14	1.10	1.44	1.47
713.3	40.682	13.44	0.56	126	40.60	0.16	2.59	2.58	1.14	1.10	1.45	1.47
713.2	40.846	11.03	0.38	126	40.76	0.16	2.60	2.59	1.15	1.11	1.45	1.48
713.0	41.010	9.61	0.32	126	40.93	0.16	2.61	2.60	1.15	1.11	1.46	1.49
712.8	41.174	8.86	0.38	126	41.09	0.16	2.62	2.61	1.16	1.12	1.46	1.49
712.7	41.338	11.22	0.37	126	41.26	0.16	2.63	2.62	1.16	1.12	1.47	1.50
712.5	41.502	12.61	0.34	126	41.42	0.16	2.64	2.63	1.17	1.13	1.47	1.50
712.3	41.666	15.03	0.28	126	41.58	0.16	2.65	2.64	1.18	1.13	1.48	1.51
712.2	41.830	11.51	0.20	126	41.75	0.16	2.66	2.65	1.18	1.14	1.48	1.51
712.0	41.994	9.52	0.18	126	41.91	0.16	2.67	2.66	1.19	1.14	1.49	1.52
711.8	42.158	7.51	0.14	126	42.08	0.16	2.68	2.67	1.19	1.15	1.49	1.52
711.7	42.322	19.32	0.09	126	42.24	0.16	2.69	2.68	1.20	1.16	1.50	1.53
711.5	42.486	21.86	0.13	126	42.40	0.16	2.70	2.69	1.20	1.16	1.50	1.53
711.3	42.650	17.31	0.17	126	42.57	0.16	2.71	2.70	1.21	1.17	1.51	1.54
711.2	42.814	14.81	0.17	126	42.73	0.16	2.73	2.71	1.21	1.17	1.51	1.54
711.0	42.978	10.96	0.13	126	42.90	0.16	2.74	2.72	1.22	1.18	1.52	1.55
710.9	43.143	14.00	0.07	126	43.06	0.16	2.75	2.73	1.22	1.18	1.52	1.55
710.7	43.307	18.68	0.09	126	43.22	0.16	2.76	2.74	1.23	1.19	1.53	1.56
710.5	43.471	15.70	0.12	126	43.39	0.16	2.77	2.75	1.23	1.19	1.53	1.56

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
710.4	43.635	12.99	0.15	126	43.55	0.16	2.78	2.76	1.24	1.20	1.54	1.57
710.2	43.799	21.83	0.17	126	43.72	0.16	2.79	2.78	1.24	1.20	1.55	1.57
710.0	43.963	24.38	0.12	126	43.88	0.16	2.80	2.79	1.25	1.21	1.55	1.58
709.9	44.127	27.87	0.12	126	44.04	0.16	2.81	2.80	1.25	1.21	1.56	1.58
709.7	44.291	29.29	0.13	126	44.21	0.16	2.82	2.81	1.26	1.22	1.56	1.59
709.5	44.455	25.27	0.15	126	44.37	0.16	2.83	2.82	1.26	1.22	1.57	1.59
709.4	44.619	24.32	0.20	126	44.54	0.16	2.84	2.83	1.27	1.23	1.57	1.60
709.2	44.783	25.89	0.22	126	44.70	0.16	2.85	2.84	1.27	1.23	1.58	1.61
709.1	44.947	29.55	0.19	131	44.86	0.16	2.86	2.85	1.28	1.24	1.58	1.61
708.9	45.111	32.07	0.13	131	45.03	0.16	2.87	2.86	1.28	1.24	1.59	1.62
708.7	45.275	37.82	0.15	131	45.19	0.16	2.88	2.87	1.29	1.25	1.59	1.62
708.6	45.439	39.59	0.18	131	45.36	0.16	2.89	2.88	1.29	1.25	1.60	1.63
708.4	45.603	37.56	0.41	131	45.52	0.16	2.90	2.89	1.30	1.26	1.60	1.63
708.2	45.767	34.68	0.42	131	45.69	0.16	2.91	2.90	1.30	1.26	1.61	1.64
708.1	45.931	59.66	0.33	131	45.85	0.16	2.92	2.91	1.31	1.27	1.62	1.64
707.9	46.095	77.26	0.42	131	46.01	0.16	2.93	2.92	1.31	1.27	1.62	1.65
707.7	46.259	85.33	0.53	131	46.18	0.16	2.95	2.93	1.32	1.28	1.63	1.66
707.6	46.423	96.49	0.57	131	46.34	0.16	2.96	2.94	1.32	1.28	1.63	1.66
707.4	46.587	99.76	0.64	131	46.51	0.16	2.97	2.96	1.33	1.29	1.64	1.67
707.2	46.751	99.42	0.80	131	46.67	0.16	2.98	2.97	1.33	1.29	1.64	1.67
707.1	46.915	89.55	0.74	131	46.83	0.16	2.99	2.98	1.34	1.30	1.65	1.68
706.9	47.079	80.74	0.72	131	47.00	0.16	3.00	2.99	1.34	1.30	1.66	1.68
706.8	47.244	70.10	0.64	131	47.16	0.16	3.01	3.00	1.35	1.31	1.66	1.69
706.6	47.408	62.64	0.58	131	47.33	0.16	3.02	3.01	1.35	1.31	1.67	1.69
706.4	47.572	60.23	0.54	131	47.49	0.16	3.03	3.02	1.36	1.32	1.67	1.70
706.3	47.736	58.83	0.50	131	47.65	0.16	3.04	3.03	1.36	1.32	1.68	1.71
706.1	47.900	53.75	0.46	131	47.82	0.16	3.05	3.04	1.37	1.33	1.68	1.71
705.9	48.064	47.52	0.43	131	47.98	0.16	3.06	3.05	1.37	1.33	1.69	1.72
705.8	48.228	40.04	0.37	131	48.15	0.16	3.07	3.06	1.38	1.34	1.69	1.72
705.6	48.392	33.29	0.37	131	48.31	0.16	3.09	3.07	1.39	1.34	1.70	1.73
705.4	48.556	28.80	0.39	131	48.47	0.16	3.10	3.08	1.39	1.35	1.71	1.73
705.3	48.720	42.72	0.33	131	48.64	0.16	3.11	3.09	1.40	1.35	1.71	1.74
705.1	48.884	51.62	0.34	131	48.80	0.16	3.12	3.11	1.40	1.36	1.72	1.75
705.0	49.048	47.95	0.38	131	48.97	0.16	3.13	3.12	1.41	1.36	1.72	1.75
704.8	49.212	46.02	0.36	131	49.13	0.16	3.14	3.13	1.41	1.37	1.73	1.76
704.6	49.376	51.44	0.31	131	49.29	0.16	3.15	3.14	1.42	1.38	1.73	1.76
704.5	49.540	64.82	0.40	131	49.46	0.16	3.16	3.15	1.42	1.38	1.74	1.77
704.3	49.704	83.22	0.79	131	49.62	0.16	3.17	3.16	1.43	1.39	1.75	1.77
704.1	49.868	109.84	0.61	131	49.79	0.16	3.18	3.17	1.43	1.39	1.75	1.78
704.0	50.032	196.78	0.01	131	49.95	0.16	3.19	3.18	1.44	1.40	1.76	1.79
703.8	50.196	312.71	0.01	131	50.11	0.08	3.20	3.19	1.44	1.40	1.76	1.79

LIQUEFACTION POTENTIAL ASSESSMENT FOR COARSE GRAINED SOILS USING CONE PENETRATION TEST DATA

Project Site: KIF TDEC Stability
Project No.: 175668043
CPT ID: CPT-03C

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
754.0												
753.8	0.164	460.83	0.15	0.90	0.5	1.70	75.58	0	0.00	75.58	0.006	#NUM!
753.7	0.328	530.47	0.15	0.84	0.5	1.70	123.04	0	0.00	123.04	0.005	-0.547
753.5	0.492	644.37	0.15	0.77	0.5	1.70	183.05	0	0.00	183.05	0.004	-0.600
753.3	0.656	624.04	0.19	0.83	0.5	1.70	204.71	0	0.00	204.71	0.002	-0.600
753.2	0.820	626.37	0.20	0.85	0.5	1.70	229.73	0	0.00	229.73	0.001	-0.600
753.0	0.984	1073.93	0.19	0.67	0.5	1.70	432.62	0	0.00	432.62	0.000	-0.600
752.9	1.148	1446.49	0.30	0.76	0.5	1.70	632.09	0	0.00	632.09	0.002	-0.600
752.7	1.312	1143.77	0.57	1.06	0.5	1.70	536.07	0	0.00	536.07	0.005	-0.600
752.5	1.476	935.37	0.90	1.28	0.5	1.70	466.18	0	0.00	466.18	0.008	-0.600
752.4	1.640	858.42	1.36	1.45	0.5	1.70	451.89	0	0.00	451.89	0.011	-0.600
752.2	1.804	548.55	1.95	1.68	0.5	1.70	303.42	0	0.00	303.42	0.014	-0.600
752.0	1.968	622.24	1.34	1.51	0.5	1.70	359.95	0	0.00	359.95	0.017	-0.600
751.9	2.133	708.62	0.97	1.35	0.5	1.70	427.12	0	0.00	427.12	0.017	-0.600
751.7	2.297	757.95	0.74	1.24	0.5	1.69	472.20	0	0.00	472.20	0.016	-0.600
751.5	2.461	772.07	0.76	1.25	0.5	1.66	489.13	0	0.00	489.13	0.015	-0.600
751.4	2.625	665.02	0.72	1.26	0.5	1.63	428.00	0	0.00	428.00	0.014	-0.600
751.2	2.789	509.80	0.91	1.40	0.5	1.61	333.01	0	0.00	333.01	0.013	-0.600
751.0	2.953	359.49	1.01	1.53	0.5	1.62	243.34	0	0.00	243.34	0.013	-0.600
750.9	3.117	184.24	1.26	1.79	0.5	1.70	135.08	6	0.73	135.81	0.015	-0.553
750.7	3.281	99.68	3.33	2.28	0.5	1.70	75.17	45	63.57	138.74	0.016	-0.562
750.6	3.445	80.89	4.23	2.42	0.5	1.70	62.60	56	65.12	127.72	0.018	-0.523
750.4	3.609	73.30	5.39	2.53	0.5	1.70	58.13	65	66.41	124.54	0.019	-0.511
750.2	3.773	127.75	3.08	2.19	0.5	1.70	103.36	38	65.09	168.44	0.020	-0.600
750.1	3.937	90.66	4.54	2.41	0.5	1.70	75.07	56	68.34	143.41	0.021	-0.574
749.9	4.101	65.57	5.08	2.54	0.5	1.70	55.22	66	65.81	121.03	0.022	-0.495
749.7	4.265	227.78	2.29	1.93	0.5	1.54	175.13	18	39.05	214.17	0.023	-0.600
749.6	4.429	483.38	1.08	1.48	0.5	1.44	349.01	0	0.00	349.01	0.024	-0.600
749.4	4.593	525.57	0.98	1.43	0.5	1.43	381.25	0	0.00	381.25	0.025	-0.600
749.2	4.757	374.48	0.91	1.48	0.5	1.42	273.04	0	0.00	273.04	0.026	-0.600
749.1	4.921	226.17	1.44	1.77	0.5	1.58	185.62	5	0.15	185.77	0.027	-0.600
748.9	5.085	154.39	2.23	2.02	0.5	1.59	128.38	25	52.52	180.90	0.029	-0.600
748.8	5.249	79.87	4.69	2.46	0.5	1.70	72.03	60	68.76	140.79	0.030	-0.559
748.6	5.413	79.68	5.99	2.54	0.5	1.69	72.09	66	70.69	142.78	0.032	-0.565
748.4	5.577	84.49	5.76	2.51	0.5	1.66	75.86	64	71.15	147.01	0.035	-0.579
748.3	5.741	65.32	5.94	2.59	0.5	1.70	60.65	70	68.34	128.99	0.037	-0.518
748.1	5.905	123.99	2.55	2.13	0.5	1.57	106.97	33	61.34	168.31	0.039	-0.600
747.9	6.069	341.29	1.31	1.63	0.5	1.37	257.62	0	0.00	257.62	0.041	-0.600
747.8	6.234	275.40	1.77	1.79	0.5	1.43	218.86	6	1.38	220.25	0.042	-0.600
747.6	6.398	169.54	3.53	2.16	0.5	1.45	137.72	36	70.90	208.63	0.043	-0.600
747.4	6.562	116.28	7.10	2.50	0.5	1.51	99.68	63	77.74	177.42	0.044	-0.600
747.3	6.726	305.75	1.66	1.75	0.5	1.37	239.08	3	0.00	239.08	0.045	-0.600
747.1	6.890	360.51	1.96	1.77	0.5	1.34	277.39	4	0.08	277.46	0.046	-0.600
746.9	7.054	198.63	4.63	2.22	0.5	1.36	156.94	41	80.38	237.32	0.047	-0.600
746.8	7.218	132.51	8.02	2.52	0.5	1.44	111.79	64	81.52	193.31	0.048	-0.600
746.6	7.382	137.53	4.40	2.29	0.5	1.44	116.63	46	74.68	191.31	0.049	-0.600
746.5	7.546	260.28	2.74	1.97	0.5	1.32	203.33	20	51.70	255.04	0.051	-0.600
746.3	7.710	281.45	4.23	2.11	0.5	1.31	220.59	32	83.28	303.87	0.052	-0.600
746.1	7.874	340.81	2.38	1.85	0.5	1.31	267.90	11	17.89	285.79	0.053	-0.600
746.0	8.038	432.09	2.03	1.74	0.5	1.30	340.63	2	0.00	340.63	0.055	-0.600
745.8	8.202	315.68	2.50	1.89	0.5	1.30	249.86	14	30.63	280.49	0.056	-0.600
745.6	8.366	195.34	3.54	2.13	0.5	1.33	159.39	33	72.33	231.72	0.057	-0.600
745.5	8.530	151.00	4.15	2.25	0.5	1.37	128.09	43	75.06	203.15	0.058	-0.600
745.3	8.694	121.23	4.42	2.32	0.5	1.41	106.42	49	73.60	180.02	0.059	-0.600
745.1	8.858	100.32	6.38	2.50	0.5	1.43	90.22	63	75.01	165.23	0.059	-0.600
745.0	9.022	82.53	6.04	2.53	0.5	1.46	76.39	66	71.79	148.18	0.060	-0.576
744.8	9.186	79.86	6.71	2.58	0.7	1.49	63.34	69	68.91	132.25	0.061	-0.523
744.6	9.350	95.16	4.57	2.40	0.5	1.42	86.91	55	71.24	158.15	0.061	-0.600
744.5	9.514	102.32	9.50	2.64	0.7	1.43	78.89	74	74.50	153.40	0.062	-0.592
744.3	9.678	120.96	10.58	2.64	0.7	1.39	91.42	74	78.20	169.61	0.063	-0.600
744.2	9.842	442.69	2.52	1.82	0.5	1.26	361.10	9	8.02	369.12	0.064	-0.600

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
744.0	10.006	462.37	0.78	1.37	0.5	1.25	378.20	0	0.00	378.20	0.065	-0.600
743.8	10.170	362.87	1.57	1.68	0.5	1.25	297.83	0	0.00	297.83	0.066	-0.600
743.7	10.335	199.74	3.00	2.06	0.5	1.27	168.04	28	65.52	233.56	0.067	-0.600
743.5	10.499	171.73	4.18	2.22	0.5	1.28	146.34	40	77.59	223.93	0.068	-0.600
743.3	10.663	142.10	3.64	2.22	0.5	1.31	124.94	40	72.29	197.23	0.068	-0.600
743.2	10.827	181.16	1.92	1.93	0.5	1.31	159.49	17	37.00	196.49	0.069	-0.600
743.0	10.991	99.56	2.53	2.19	0.5	1.36	92.50	38	62.84	155.34	0.070	-0.595
742.8	11.155	88.85	2.28	2.19	0.5	1.38	83.88	38	60.85	144.73	0.070	-0.562
742.7	11.319	84.41	1.90	2.15	0.5	1.38	80.55	35	57.25	137.80	0.071	-0.538
742.5	11.483	68.17	2.46	2.30	0.5	1.39	66.16	47	61.93	128.09	0.071	-0.505
742.4	11.647	72.50	2.36	2.26	0.5	1.38	70.03	44	61.51	131.54	0.072	-0.517
742.2	11.811	53.46	3.15	2.45	0.5	1.40	53.05	59	63.21	116.27	0.072	-0.461
742.0	11.975	58.34	2.90	2.39	0.5	1.39	57.48	55	63.04	120.53	0.073	-0.476
741.9	12.139	65.98	4.71	2.51	0.5	1.36	63.96	64	67.77	131.73	0.073	-0.516
741.7	12.303	128.09	3.93	2.27	0.5	1.27	115.75	45	73.32	189.07	0.074	-0.600
741.5	12.467	339.57	1.52	1.69	0.5	1.20	289.17	0	0.00	289.17	0.074	-0.600
741.4	12.631	266.48	0.85	1.55	0.5	1.22	231.73	0	0.00	231.73	0.075	-0.600
741.2	12.795	246.09	1.14	1.67	0.5	1.23	217.12	0	0.00	217.12	0.075	-0.600
741.0	12.959	211.98	2.76	2.02	0.5	1.20	183.54	24	60.62	244.16	0.076	-0.600
740.9	13.123	214.28	2.01	1.90	0.5	1.22	189.37	15	31.28	220.65	0.076	-0.600
740.7	13.287	67.29	6.93	2.63	0.7	1.33	58.16	74	68.33	126.49	0.077	-0.496
740.5	13.451	52.67	4.75	2.58	0.5	1.34	52.43	69	65.76	118.18	0.077	-0.466
740.4	13.615	121.81	1.06	1.86	0.5	1.31	117.89	12	14.69	132.58	0.077	-0.517
740.2	13.779	43.42	3.70	2.56	0.5	1.34	44.07	68	63.00	107.07	0.078	-0.422
740.1	13.943	68.13	2.32	2.28	0.5	1.30	66.83	45	61.33	128.16	0.078	-0.501
739.9	14.107	68.79	2.01	2.23	0.5	1.30	67.61	42	59.31	126.92	0.078	-0.497
739.7	14.271	48.57	2.94	2.46	0.5	1.32	48.96	59	62.29	111.25	0.079	-0.438
739.6	14.436	76.01	2.15	2.22	0.5	1.28	74.09	41	60.36	134.45	0.080	-0.523
739.4	14.600	87.31	2.14	2.18	0.5	1.26	84.20	37	59.93	144.12	0.080	-0.555
739.2	14.764	68.85	2.79	2.33	0.5	1.27	67.54	50	63.68	131.22	0.081	-0.511
739.1	14.928	57.89	5.69	2.61	0.7	1.29	51.90	72	66.12	118.02	0.081	-0.463
738.9	15.092	63.06	6.98	2.66	1.0	1.29	48.46	75	65.77	114.22	0.082	-0.448
738.7	15.256	121.61	2.95	2.19	0.5	1.21	113.69	38	67.42	181.11	0.083	-0.600
738.6	15.420	107.41	3.63	2.29	0.5	1.21	101.38	46	70.65	172.03	0.083	-0.600
738.4	15.584	87.50	4.56	2.42	0.5	1.23	84.02	57	71.14	155.15	0.084	-0.588
738.3	15.748	64.29	6.21	2.61	0.7	1.25	57.72	72	67.81	125.53	0.085	-0.490
738.1	15.912	61.77	7.66	2.69	1.0	1.26	48.57	78	66.30	114.87	0.085	-0.450
737.9	16.076	60.70	5.63	2.59	0.5	1.24	60.15	71	68.25	128.40	0.085	-0.500
737.8	16.240	54.36	4.49	2.55	0.5	1.25	54.44	67	65.85	120.28	0.085	-0.470
737.6	16.404	49.07	5.84	2.67	1.0	1.26	39.81	76	63.36	103.17	0.086	-0.402
737.4	16.568	45.87	5.58	2.67	1.0	1.26	37.56	77	62.76	100.32	0.086	-0.390
737.3	16.732	39.45	5.83	2.73	1.0	1.26	32.80	81	62.04	94.84	0.086	-0.366
737.1	16.896	34.14	6.15	2.79	1.0	1.26	28.81	86	61.46	90.27	0.086	-0.346
736.9	17.060	25.20	7.93	2.96	1.0	1.27	21.87	100	60.72	82.59	0.086	-0.309
736.8	17.224	22.09	8.19	3.01	1.0	1.27	19.47	100	59.98	79.45	0.086	-0.293
736.6	17.388	25.39	6.31	2.89	1.0	1.26	22.19	94	60.29	82.48	0.085	-0.308
736.4	17.552	17.32	7.23	3.05	1.0	1.26	15.75	100	58.82	74.57	0.085	-0.268
736.3	17.716	11.43	8.03	3.21	1.0	1.27	10.97	100	57.34	68.31	0.085	-0.233
736.1	17.880	11.49	6.94	3.17	1.0	1.26	11.06	100	57.37	68.42	0.085	-0.234
736.0	18.044	15.24	5.90	3.03	1.0	1.25	14.20	100	58.34	72.54	0.086	-0.256
735.8	18.208	17.78	5.73	2.97	1.0	1.24	16.35	100	59.01	75.36	0.086	-0.271
735.6	18.372	16.63	5.99	3.01	1.0	1.24	15.45	100	58.73	74.18	0.087	-0.265
735.5	18.537	19.01	4.80	2.90	1.0	1.23	17.49	95	58.93	76.42	0.088	-0.276
735.3	18.701	14.83	5.61	3.03	1.0	1.23	14.05	100	58.29	72.34	0.089	-0.254
735.1	18.865	9.98	6.78	3.21	1.0	1.23	10.00	100	57.04	67.03	0.090	-0.225
735.0	19.029	13.32	4.21	2.98	1.0	1.22	12.86	100	57.93	70.79	0.090	-0.245
734.8	19.193	13.41	3.49	2.93	1.0	1.22	12.98	98	57.76	70.74	0.090	-0.245
734.6	19.357	9.55	3.49	3.05	1.0	1.22	9.72	100	56.95	66.67	0.091	-0.222
734.5	19.521	6.28	5.90	3.33	1.0	1.22	6.93	100	56.08	63.01	0.091	-0.200
734.3	19.685	4.92	8.33	3.51	1.0	1.21	5.76	100	55.72	61.48	0.092	-0.191
734.2	19.849	6.98	4.77	3.24	1.0	1.20	7.58	100	56.29	63.86	0.092	-0.205
734.0	20.013	4.98	7.04	3.46	1.0	1.20	5.86	100	55.75	61.61	0.093	-0.191
733.8	20.177	4.42	6.47	3.48	1.0	1.20	5.38	100	55.60	60.99	0.093	-0.187
733.7	20.341	6.19	4.06	3.24	1.0	1.19	6.95	100	56.09	63.04	0.093	-0.200
733.5	20.505	5.18	6.12	3.41	1.0	1.19	6.09	100	55.82	61.91	0.094	-0.193
733.3	20.669	6.07	4.92	3.30	1.0	1.18	6.89	100	56.07	62.97	0.094	-0.199

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
733.2	20.833	10.11	2.96	2.99	1.0	1.17	10.48	100	57.19	67.67	0.095	-0.226
733.0	20.997	8.95	3.26	3.06	1.0	1.17	9.48	100	56.88	66.36	0.095	-0.218
732.8	21.161	7.02	4.70	3.23	1.0	1.17	7.80	100	56.35	64.15	0.095	-0.205
732.7	21.325	5.57	5.10	3.34	1.0	1.16	6.53	100	55.96	62.48	0.096	-0.195
732.5	21.489	8.36	3.11	3.07	1.0	1.16	9.04	100	56.74	65.78	0.096	-0.215
732.3	21.653	6.55	4.06	3.22	1.0	1.15	7.45	100	56.24	63.69	0.097	-0.202
732.2	21.817	4.67	7.40	3.49	1.0	1.15	5.76	100	55.72	61.49	0.097	-0.189
732.0	21.981	7.04	3.84	3.18	1.0	1.14	7.93	100	56.40	64.33	0.098	-0.206
731.9	22.145	8.68	2.84	3.03	1.0	1.14	9.43	100	56.86	66.30	0.098	-0.217
731.7	22.309	7.12	5.35	3.26	1.0	1.14	8.04	100	56.43	64.47	0.098	-0.206
731.5	22.473	6.11	6.83	3.38	1.0	1.13	7.14	100	56.15	63.29	0.099	-0.199
731.4	22.638	6.86	5.91	3.30	1.0	1.13	7.85	100	56.37	64.22	0.099	-0.204
731.2	22.802	5.41	5.59	3.37	1.0	1.12	6.55	100	55.97	62.51	0.099	-0.194
731.0	22.966	6.62	7.86	3.39	1.0	1.12	7.67	100	56.31	63.99	0.100	-0.202
730.9	23.130	9.40	6.69	3.23	1.0	1.11	10.25	100	57.12	67.37	0.100	-0.222
730.7	23.294	9.05	7.05	3.26	1.0	1.11	9.96	100	57.02	66.98	0.100	-0.220
730.5	23.458	8.21	6.27	3.26	1.0	1.11	9.21	100	56.79	66.00	0.101	-0.214
730.4	23.622	9.73	4.95	3.13	1.0	1.10	10.65	100	57.24	67.88	0.101	-0.224
730.2	23.786	9.09	6.35	3.22	1.0	1.10	10.07	100	57.06	67.13	0.101	-0.220
730.1	23.950	7.18	8.06	3.37	1.0	1.10	8.32	100	56.52	64.84	0.102	-0.207
729.9	24.114	6.91	5.76	3.29	1.0	1.09	8.09	100	56.45	64.54	0.102	-0.205
729.7	24.278	5.55	5.59	3.36	1.0	1.09	6.84	100	56.06	62.89	0.102	-0.195
729.6	24.442	3.88	7.04	3.55	1.0	1.09	5.27	100	55.57	60.84	0.102	-0.182
729.4	24.606	4.75	7.09	3.48	1.0	1.08	6.12	100	55.83	61.95	0.103	-0.189
729.2	24.770	6.12	11.38	3.52	1.0	1.08	7.42	100	56.24	63.66	0.103	-0.199
729.1	24.934	26.99	5.64	2.84	1.0	1.06	27.10	90	61.36	88.46	0.103	-0.328
728.9	25.098	24.72	4.24	2.78	1.0	1.06	25.05	85	60.22	85.27	0.103	-0.313
728.7	25.262	93.16	1.08	1.95	0.5	1.05	94.16	19	34.67	128.83	0.104	-0.491
728.6	25.426	39.80	2.42	2.46	0.5	1.05	41.39	60	60.35	101.74	0.104	-0.387
728.4	25.590	31.66	3.37	2.63	1.0	1.05	31.84	74	60.55	92.38	0.104	-0.346
728.2	25.754	30.58	3.87	2.68	1.0	1.05	30.90	78	60.93	91.83	0.104	-0.343
728.1	25.918	16.66	6.36	3.02	1.0	1.05	17.67	100	59.42	77.09	0.105	-0.272
727.9	26.082	12.43	4.15	3.00	1.0	1.05	13.65	100	58.17	71.82	0.105	-0.244
727.8	26.246	9.18	5.08	3.16	1.0	1.04	10.55	100	57.21	67.75	0.105	-0.221
727.6	26.410	9.64	4.48	3.11	1.0	1.04	11.02	100	57.35	68.38	0.105	-0.224
727.4	26.574	7.46	6.19	3.29	1.0	1.04	8.93	100	56.71	65.64	0.106	-0.209
727.3	26.739	6.96	6.66	3.33	1.0	1.03	8.47	100	56.56	65.03	0.106	-0.205
727.1	26.903	10.35	3.91	3.05	1.0	1.03	11.80	100	57.59	69.39	0.106	-0.230
726.9	27.067	9.99	4.22	3.08	1.0	1.03	11.47	100	57.49	68.96	0.106	-0.227
726.8	27.231	7.77	5.74	3.25	1.0	1.02	9.32	100	56.83	66.14	0.107	-0.211
726.6	27.395	10.13	5.68	3.16	1.0	1.02	11.66	100	57.55	69.22	0.107	-0.228
726.4	27.559	10.14	5.61	3.15	1.0	1.02	11.70	100	57.56	69.26	0.107	-0.228
726.3	27.723	13.32	3.29	2.92	1.0	1.01	14.86	97	58.25	73.12	0.107	-0.249
726.1	27.887	12.14	3.60	2.97	1.0	1.01	13.74	100	58.20	71.94	0.108	-0.243
725.9	28.051	7.25	5.38	3.26	1.0	1.01	8.91	100	56.70	65.61	0.108	-0.207
725.8	28.215	8.26	4.86	3.19	1.0	1.01	9.94	100	57.02	66.96	0.108	-0.215
725.6	28.379	9.91	3.30	3.02	1.0	1.00	11.60	100	57.54	69.14	0.108	-0.227
725.5	28.543	10.18	3.41	3.02	1.0	1.00	11.90	100	57.63	69.53	0.109	-0.229
725.3	28.707	11.17	3.37	2.99	1.0	1.00	12.92	100	57.94	70.87	0.109	-0.236
725.1	28.871	7.97	4.72	3.19	1.0	0.99	9.74	100	56.96	66.69	0.109	-0.213
725.0	29.035	6.83	5.65	3.29	1.0	0.99	8.61	100	56.61	65.21	0.109	-0.204
724.8	29.199	5.35	6.58	3.42	1.0	0.99	7.14	100	56.15	63.29	0.110	-0.192
724.6	29.363	4.52	4.18	3.36	1.0	0.99	6.32	100	55.89	62.21	0.110	-0.186
724.5	29.527	4.55	4.86	3.40	1.0	0.98	6.36	100	55.91	62.27	0.110	-0.186
724.3	29.691	3.46	6.84	3.58	1.0	0.98	5.26	100	55.57	60.83	0.110	-0.177
724.1	29.855	2.97	7.56	3.66	1.0	0.98	4.78	100	55.42	60.19	0.110	-0.173
724.0	30.019	4.39	3.00	3.30	1.0	0.97	6.24	100	55.87	62.11	0.111	-0.185
723.8	30.183	5.74	2.63	3.17	1.0	0.97	7.63	100	56.30	63.93	0.111	-0.195
723.7	30.347	6.46	3.38	3.18	1.0	0.97	8.38	100	56.54	64.92	0.111	-0.201
723.5	30.511	7.24	3.36	3.14	1.0	0.97	9.20	100	56.79	65.98	0.111	-0.207
723.3	30.675	7.10	3.34	3.15	1.0	0.96	9.07	100	56.75	65.82	0.112	-0.206
723.2	30.840	6.76	3.19	3.15	1.0	0.96	8.75	100	56.65	65.39	0.112	-0.203
723.0	31.004	6.00	3.03	3.18	1.0	0.96	7.98	100	56.41	64.38	0.112	-0.197
722.8	31.168	4.88	3.08	3.26	1.0	0.96	6.83	100	56.05	62.89	0.112	-0.188
722.7	31.332	4.74	2.75	3.25	1.0	0.95	6.70	100	56.01	62.72	0.113	-0.187
722.5	31.496	4.76	2.21	3.20	1.0	0.95	6.73	100	56.02	62.76	0.113	-0.187

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
722.3	31.660	4.36	2.06	3.22	1.0	0.95	6.34	100	55.90	62.24	0.113	-0.184
722.2	31.824	5.00	2.11	3.17	1.0	0.94	7.02	100	56.11	63.13	0.113	-0.189
722.0	31.988	5.40	2.12	3.14	1.0	0.94	7.45	100	56.25	63.69	0.113	-0.192
721.8	32.152	5.36	2.02	3.14	1.0	0.94	7.42	100	56.24	63.66	0.113	-0.192
721.7	32.316	5.27	2.20	3.16	1.0	0.94	7.34	100	56.21	63.56	0.114	-0.191
721.5	32.480	4.98	2.20	3.18	1.0	0.93	7.05	100	56.12	63.17	0.114	-0.189
721.4	32.644	5.02	2.41	3.20	1.0	0.93	7.11	100	56.14	63.25	0.114	-0.189
721.2	32.808	6.19	3.35	3.20	1.0	0.93	8.35	100	56.53	64.88	0.114	-0.199
721.0	32.972	7.84	2.95	3.08	1.0	0.93	10.12	100	57.07	67.19	0.114	-0.212
720.9	33.136	6.02	3.92	3.24	1.0	0.93	8.21	100	56.48	64.69	0.114	-0.197
720.7	33.300	6.00	3.59	3.22	1.0	0.92	8.20	100	56.48	64.67	0.114	-0.197
720.5	33.464	5.67	3.38	3.23	1.0	0.92	7.87	100	56.38	64.24	0.114	-0.194
720.4	33.628	5.22	3.86	3.29	1.0	0.92	7.40	100	56.23	63.63	0.115	-0.191
720.2	33.792	5.74	3.85	3.26	1.0	0.92	7.97	100	56.41	64.38	0.115	-0.195
720.0	33.956	6.80	4.46	3.23	1.0	0.91	9.12	100	56.76	65.88	0.115	-0.204
719.9	34.120	7.15	5.89	3.29	1.0	0.91	9.51	100	56.89	66.40	0.115	-0.206
719.7	34.284	8.85	5.58	3.20	1.0	0.91	11.36	100	57.46	68.82	0.115	-0.220
719.6	34.448	10.61	4.98	3.11	1.0	0.91	13.28	100	58.06	71.34	0.116	-0.234
719.4	34.612	13.77	4.24	2.97	1.0	0.91	16.74	100	59.13	75.87	0.118	-0.258
719.2	34.776	18.85	3.60	2.82	1.0	0.91	22.32	89	59.79	82.11	0.118	-0.289
719.1	34.941	21.57	3.72	2.79	1.0	0.91	25.37	86	60.39	85.75	0.118	-0.307
718.9	35.105	24.68	4.78	2.82	1.0	0.91	28.86	88	61.71	90.57	0.118	-0.329
718.7	35.269	27.12	5.20	2.81	1.0	0.91	31.63	88	62.50	94.13	0.118	-0.345
718.6	35.433	28.83	5.02	2.78	1.0	0.91	33.61	85	62.81	96.42	0.118	-0.355
718.4	35.597	27.29	5.22	2.81	1.0	0.91	31.95	88	62.60	94.55	0.118	-0.347
718.2	35.761	26.66	4.57	2.78	1.0	0.90	31.30	85	62.08	93.39	0.119	-0.342
718.1	35.925	24.27	4.35	2.79	1.0	0.90	28.69	86	61.45	90.14	0.119	-0.327
717.9	36.089	25.26	4.78	2.81	1.0	0.90	29.86	88	61.94	91.81	0.119	-0.334
717.7	36.253	29.00	4.47	2.74	1.0	0.90	34.14	83	62.59	96.73	0.119	-0.356
717.6	36.417	25.88	4.68	2.79	1.0	0.90	30.69	86	62.06	92.74	0.119	-0.338
717.4	36.581	24.18	4.63	2.81	1.0	0.89	28.82	88	61.67	90.49	0.119	-0.328
717.3	36.745	22.84	4.28	2.81	1.0	0.89	27.35	88	61.18	88.54	0.120	-0.319
717.1	36.909	20.49	4.72	2.87	1.0	0.89	24.75	93	60.94	85.69	0.120	-0.305
716.9	37.073	19.92	4.65	2.88	1.0	0.88	24.16	93	60.79	84.95	0.120	-0.301
716.8	37.237	20.43	4.20	2.84	1.0	0.88	24.78	90	60.68	85.45	0.120	-0.304
716.6	37.401	21.22	4.10	2.82	1.0	0.88	25.72	89	60.79	86.51	0.120	-0.309
716.4	37.565	21.18	4.56	2.85	1.0	0.88	25.73	91	61.07	86.80	0.120	-0.310
716.3	37.729	18.50	4.61	2.90	1.0	0.88	22.71	95	60.52	83.24	0.121	-0.293
716.1	37.893	16.73	5.01	2.96	1.0	0.87	20.74	99	60.32	81.06	0.121	-0.282
715.9	38.057	17.17	3.42	2.84	1.0	0.87	21.28	90	59.62	80.90	0.121	-0.281
715.8	38.221	16.47	3.18	2.84	1.0	0.87	20.50	90	59.34	79.85	0.121	-0.276
715.6	38.385	16.06	3.22	2.85	1.0	0.87	20.08	91	59.32	79.39	0.122	-0.273
715.5	38.549	17.14	3.39	2.84	1.0	0.87	21.36	90	59.63	80.99	0.122	-0.281
715.3	38.713	14.50	4.52	2.97	1.0	0.86	18.36	100	59.63	78.00	0.122	-0.266
715.1	38.877	13.45	5.06	3.03	1.0	0.86	17.20	100	59.27	76.47	0.122	-0.258
715.0	39.042	12.68	4.82	3.04	1.0	0.86	16.34	100	59.01	75.35	0.123	-0.252
714.8	39.206	11.90	3.98	3.01	1.0	0.85	15.47	100	58.74	74.21	0.123	-0.246
714.6	39.370	10.25	4.90	3.11	1.0	0.85	13.60	100	58.16	71.76	0.123	-0.232
714.5	39.534	9.39	4.45	3.12	1.0	0.85	12.63	100	57.86	70.49	0.124	-0.225
714.3	39.698	8.64	4.51	3.15	1.0	0.85	11.80	100	57.60	69.40	0.124	-0.219
714.1	39.862	9.53	3.67	3.06	1.0	0.85	12.84	100	57.92	70.76	0.124	-0.227
714.0	40.026	10.79	3.73	3.03	1.0	0.84	14.31	100	58.38	72.69	0.124	-0.237
713.8	40.190	13.76	3.15	2.90	1.0	0.85	17.78	95	58.98	76.77	0.124	-0.258
713.6	40.354	11.12	5.23	3.10	1.0	0.84	14.74	100	58.51	73.26	0.125	-0.240
713.5	40.518	9.85	5.05	3.14	1.0	0.84	13.29	100	58.06	71.35	0.125	-0.229
713.3	40.682	7.50	5.15	3.23	1.0	0.83	10.60	100	57.22	67.83	0.125	-0.210
713.2	40.846	5.80	4.52	3.29	1.0	0.83	8.66	100	56.62	65.28	0.125	-0.195
713.0	41.010	4.80	4.52	3.36	1.0	0.83	7.52	100	56.27	63.78	0.125	-0.186
712.8	41.174	4.27	6.11	3.48	1.0	0.83	6.91	100	56.08	62.99	0.125	-0.181
712.7	41.338	5.86	4.29	3.28	1.0	0.83	8.76	100	56.65	65.41	0.125	-0.195
712.5	41.502	6.77	3.39	3.17	1.0	0.82	9.84	100	56.99	66.82	0.125	-0.203
712.3	41.666	8.38	2.29	3.00	1.0	0.83	11.72	100	57.57	69.30	0.125	-0.217
712.2	41.830	5.97	2.29	3.12	1.0	0.82	8.93	100	56.71	65.64	0.125	-0.196
712.0	41.994	4.60	2.57	3.25	1.0	0.82	7.35	100	56.22	63.57	0.125	-0.184
711.8	42.158	3.23	2.80	3.40	1.0	0.81	5.77	100	55.72	61.50	0.126	-0.171
711.7	42.322	11.10	0.52	2.60	1.0	0.82	14.96	71	55.15	70.11	0.126	-0.221

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711.5	42.486	15.18	0.69	2.52	0.5	0.82	16.91	65	54.53	71.44	0.126	-0.228
711.3	42.650	9.67	1.14	2.79	1.0	0.82	13.35	87	56.80	70.15	0.126	-0.221
711.2	42.814	7.98	1.38	2.91	1.0	0.81	11.38	95	57.09	68.46	0.127	-0.212
711.0	42.978	5.41	1.58	3.08	1.0	0.81	8.37	100	56.53	64.90	0.127	-0.191
710.9	43.143	7.38	0.65	2.80	1.0	0.81	10.69	87	56.04	66.73	0.127	-0.202
710.7	43.307	10.41	0.53	2.63	1.0	0.81	14.28	73	55.33	69.62	0.127	-0.218
710.5	43.471	8.43	0.96	2.81	1.0	0.81	11.97	88	56.55	68.52	0.128	-0.212
710.4	43.635	6.63	1.49	2.99	1.0	0.80	9.87	100	57.00	66.86	0.128	-0.202
710.2	43.799	12.32	0.89	2.65	1.0	0.81	16.66	75	56.31	72.97	0.128	-0.236
710.0	43.963	16.85	0.55	2.44	0.5	0.81	18.55	58	53.47	72.02	0.128	-0.231
709.9	44.127	19.53	0.47	2.36	0.5	0.80	21.20	51	52.12	73.32	0.128	-0.237
709.7	44.291	20.60	0.48	2.34	0.5	0.80	22.26	50	51.88	74.14	0.128	-0.242
709.5	44.455	17.44	0.69	2.47	0.5	0.80	19.15	60	54.16	73.31	0.128	-0.237
709.4	44.619	13.67	0.92	2.62	1.0	0.80	18.42	72	56.40	74.82	0.128	-0.245
709.2	44.783	17.84	0.96	2.52	0.5	0.80	19.58	65	55.32	74.89	0.128	-0.245
709.1	44.947	20.63	0.72	2.41	0.5	0.80	22.33	56	53.80	76.13	0.128	-0.252
708.9	45.111	22.53	0.43	2.28	0.5	0.80	24.15	46	50.60	74.74	0.128	-0.244
708.7	45.275	26.91	0.43	2.21	0.5	0.80	28.51	40	48.74	77.24	0.128	-0.257
708.6	45.439	28.21	0.48	2.21	0.5	0.80	29.83	40	49.02	78.85	0.129	-0.265
708.4	45.603	26.60	1.17	2.42	0.5	0.80	28.41	56	55.66	84.07	0.129	-0.291
708.2	45.767	24.34	1.33	2.48	0.5	0.80	26.14	61	56.37	82.50	0.129	-0.283
708.1	45.931	43.39	0.59	2.08	0.5	0.80	45.19	30	43.96	89.16	0.129	-0.315
707.9	46.095	56.75	0.56	1.97	0.5	0.80	58.56	21	32.91	91.47	0.129	-0.325
707.7	46.259	62.79	0.64	1.96	0.5	0.80	64.91	20	32.14	97.05	0.129	-0.350
707.6	46.423	71.17	0.61	1.90	0.5	0.80	73.10	15	21.50	94.60	0.129	-0.339
707.4	46.587	73.52	0.66	1.91	0.5	0.80	75.82	16	23.73	99.54	0.130	-0.361
707.2	46.751	73.13	0.83	1.97	0.5	0.81	76.25	20	34.78	111.03	0.130	-0.408
707.1	46.915	65.53	0.85	2.01	0.5	0.81	68.46	24	40.77	109.23	0.130	-0.400
706.9	47.079	58.75	0.92	2.07	0.5	0.81	61.54	29	46.31	107.85	0.130	-0.395
706.8	47.244	50.61	0.96	2.14	0.5	0.80	53.10	34	49.93	103.02	0.131	-0.375
706.6	47.408	44.90	0.97	2.18	0.5	0.80	47.17	38	51.58	98.75	0.131	-0.357
706.4	47.572	43.00	0.94	2.19	0.5	0.79	45.18	38	51.65	96.84	0.131	-0.348
706.3	47.736	41.87	0.90	2.19	0.5	0.79	43.99	38	51.36	95.35	0.131	-0.342
706.1	47.900	37.99	0.91	2.23	0.5	0.79	39.99	41	52.32	92.31	0.131	-0.328
705.9	48.064	33.25	0.96	2.29	0.5	0.78	35.16	46	53.68	88.84	0.131	-0.312
705.8	48.228	27.61	1.00	2.37	0.5	0.78	29.42	52	54.69	84.11	0.131	-0.289
705.6	48.392	22.52	1.24	2.49	0.5	0.77	24.30	62	56.09	80.40	0.131	-0.271
705.4	48.556	15.07	1.51	2.69	1.0	0.77	20.95	78	57.98	78.93	0.131	-0.264
705.3	48.720	29.44	0.82	2.30	0.5	0.77	31.23	47	53.07	84.30	0.131	-0.290
705.1	48.884	35.98	0.71	2.19	0.5	0.78	37.82	38	50.02	87.83	0.131	-0.307
705.0	49.048	33.20	0.84	2.26	0.5	0.77	35.06	44	52.52	87.59	0.131	-0.305
704.8	49.212	31.71	0.83	2.27	0.5	0.77	33.54	45	52.68	86.22	0.130	-0.299
704.6	49.376	35.66	0.64	2.18	0.5	0.77	37.43	37	49.00	86.43	0.130	-0.300
704.5	49.540	45.45	0.64	2.08	0.5	0.77	47.39	30	44.48	91.87	0.130	-0.325
704.3	49.704	58.91	0.98	2.09	0.5	0.79	61.96	30	47.85	109.81	0.129	-0.401
704.1	49.868	78.37	0.57	1.86	0.5	0.77	79.96	11	11.00	90.96	0.129	-0.320
704.0	50.032	142.01	0.15	1.38	0.5	0.82	151.88	0	0.00	151.88	0.128	-0.548
703.8	50.196	226.68	0.15	1.18	0.5	0.87	258.46	0	0.00	258.46	0.128	-0.600

LIQUEFACTION POTENTIAL ASSESSMENT FOR COARSE GRAINED SOILS USING CONE PENETRATION TEST DATA

Project Site: **KIF TDEC Stability**
Stantec Project No.: **175668043**
CPT ID: **CPT-03C**

Depth to Water during Earthquake:	5.3	ft
Final Grade Elevation during EQ:	753.8	ft
Height of Final Grade above CPT TOH:	-0.2	ft
Normalize K_σ to:	1.058	tsf
a_{max} at top of ground surface:	0.09	g
Earthquake Magnitude:	7.60	M_W
Earthquake File or Source Zone:	1	Hz

Shear Stress Fit Parameters

m4:	0
m3:	0
m2:	0
m1:	0

Elev. (ft)	Depth *z* (ft)	Cyclic Resistance Ratio *CRR 7.5*	Relative Density *D r* (%)	Correction for Overburden Pressure *K σ*	Correction for Sloping Ground *K α*	Magnitude Scaling Factor *MSF*	Cyclic Resistance Ratio *CRR*	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress *τ Max* (psf)	From Ground Response: Average Cyclic Shear Stress *τ Avg* (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. *(qc 1N) CS ≥ 175*	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
754.0																	
753.8	0.164	N/A	43	N/A	N/A	N/A	N/A	1.000	0	0	**0.056**	TRUE	FALSE	TRUE	**N/A**	**Clay fill (irrelevant)**	**A1**
753.7	0.328	N/A	64	N/A	N/A	N/A	N/A	1.000	0	0	**0.056**	TRUE	FALSE	TRUE	**N/A**	**Clay fill (irrelevant)**	**A1**
753.5	0.492	N/A	83	N/A	N/A	N/A	N/A	1.000	0	0	**0.056**	TRUE	TRUE	TRUE	**N/A**	**Clay fill (irrelevant)**	**A1**
753.3	0.656	N/A	89	N/A	N/A	N/A	N/A	1.000	0	0	**0.056**	TRUE	TRUE	TRUE	**N/A**	**Clay fill (irrelevant)**	**A1**
753.2	0.820	N/A	95	N/A	N/A	N/A	N/A	1.000	0	0	**0.056**	TRUE	TRUE	TRUE	**N/A**	**Clay fill (irrelevant)**	**A1**
753.0	0.984	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.056**	TRUE	TRUE	TRUE	**N/A**	**Embankemnt Fill**	**A1**
752.9	1.148	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.056**	TRUE	TRUE	TRUE	**N/A**	**Embankemnt Fill**	**A1**
752.7	1.312	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.056**	TRUE	TRUE	TRUE	**N/A**	**Embankemnt Fill**	**A1**
752.5	1.476	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.056**	TRUE	TRUE	TRUE	**N/A**	**Embankemnt Fill**	**A1**
752.4	1.640	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.056**	TRUE	TRUE	TRUE	**N/A**	**Embankemnt Fill**	**A1**
752.2	1.804	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.056**	TRUE	TRUE	TRUE	**N/A**	**Embankemnt Fill**	**A1**
752.0	1.968	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.056**	TRUE	TRUE	TRUE	**N/A**	**Embankemnt Fill**	**A1**
751.9	2.133	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.056**	TRUE	TRUE	TRUE	**N/A**	**Embankemnt Fill**	**A1**
751.7	2.297	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.056**	TRUE	TRUE	TRUE	**N/A**	**Embankemnt Fill**	**A1**
751.5	2.461	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.056**	TRUE	TRUE	TRUE	**N/A**	**Embankemnt Fill**	**A1**
751.4	2.625	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.056**	TRUE	TRUE	TRUE	**N/A**	**Embankemnt Fill**	**A1**
751.2	2.789	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.056**	TRUE	TRUE	TRUE	**N/A**	**Embankemnt Fill**	**A1**
751.0	2.953	N/A	98	N/A	N/A	N/A	N/A	1.000	0	0	**0.056**	TRUE	TRUE	TRUE	**N/A**	**Embankemnt Fill**	**A1**
750.9	3.117	N/A	69	N/A	N/A	N/A	N/A	1.000	0	0	**0.056**	TRUE	FALSE	TRUE	**N/A**	**Embankemnt Fill**	**A1**
750.7	3.281	N/A	70	N/A	N/A	N/A	N/A	1.000	0	0	**0.056**	TRUE	FALSE	TRUE	**N/A**	**Embankemnt Fill**	**A1**
750.6	3.445	N/A	66	N/A	N/A	N/A	N/A	1.000	0	0	**0.056**	TRUE	FALSE	TRUE	**N/A**	**Embankemnt Fill**	**A1**
750.4	3.609	N/A	65	N/A	N/A	N/A	N/A	0.999	0	0	**0.056**	TRUE	FALSE	TRUE	**N/A**	**Embankemnt Fill**	**A1**
750.2	3.773	N/A	79	N/A	N/A	N/A	N/A	0.999	0	0	**0.056**	TRUE	FALSE	TRUE	**N/A**	**Embankemnt Fill**	**A1**
750.1	3.937	N/A	71	N/A	N/A	N/A	N/A	0.999	0	0	**0.056**	TRUE	FALSE	TRUE	**N/A**	**Embankemnt Fill**	**A1**
749.9	4.101	N/A	63	N/A	N/A	N/A	N/A	0.998	0	0	**0.056**	TRUE	FALSE	TRUE	**N/A**	**Embankemnt Fill**	**A1**
749.7	4.265	N/A	91	N/A	N/A	N/A	N/A	0.998	0	0	**0.056**	TRUE	TRUE	TRUE	**N/A**	**Embankemnt Fill**	**A1**
749.6	4.429	N/A	100	N/A	N/A	N/A	N/A	0.997	0	0	**0.056**	TRUE	TRUE	TRUE	**N/A**	**Embankemnt Fill**	**A1**
749.4	4.593	N/A	100	N/A	N/A	N/A	N/A	0.997	0	0	**0.056**	TRUE	TRUE	TRUE	**N/A**	**Embankemnt Fill**	**A1**
749.2	4.757	N/A	100	N/A	N/A	N/A	N/A	0.997	0	0	**0.056**	TRUE	TRUE	TRUE	**N/A**	**Embankemnt Fill**	**A1**
749.1	4.921	N/A	84	N/A	N/A	N/A	N/A	0.996	0	0	**0.056**	TRUE	TRUE	TRUE	**N/A**	**Embankemnt Fill**	**A1**
748.9	5.085	N/A	82	N/A	N/A	N/A	N/A	0.996	0	0	**0.056**	TRUE	TRUE	TRUE	**N/A**	**Embankemnt Fill**	**A1**
748.8	5.249	N/A	70	N/A	N/A	N/A	N/A	0.996	0	0	**0.056**	TRUE	FALSE	TRUE	**N/A**	**Embankemnt Fill**	**A1**
748.6	5.413	N/A	71	N/A	N/A	N/A	N/A	0.995	0	0	**0.056**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
748.4	5.577	N/A	72	N/A	N/A	N/A	N/A	0.995	0	0	**0.057**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
748.3	5.741	N/A	66	N/A	N/A	N/A	N/A	0.994	0	0	**0.058**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
748.1	5.905	N/A	79	N/A	N/A	N/A	N/A	0.994	0	0	**0.059**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
747.9	6.069	N/A	100	N/A	N/A	N/A	N/A	0.994	0	0	**0.059**	TRUE	TRUE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
747.8	6.234	N/A	92	N/A	N/A	N/A	N/A	0.993	0	0	**0.060**	TRUE	TRUE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
747.6	6.398	N/A	90	N/A	N/A	N/A	N/A	0.993	0	0	**0.061**	TRUE	TRUE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
747.4	6.562	N/A	81	N/A	N/A	N/A	N/A	0.992	0	0	**0.061**	TRUE	TRUE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
747.3	6.726	N/A	97	N/A	N/A	N/A	N/A	0.992	0	0	**0.062**	TRUE	TRUE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
747.1	6.890	N/A	100	N/A	N/A	N/A	N/A	0.992	0	0	**0.063**	TRUE	TRUE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
746.9	7.054	N/A	96	N/A	N/A	N/A	N/A	0.991	0	0	**0.063**	TRUE	TRUE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
746.8	7.218	N/A	86	N/A	N/A	N/A	N/A	0.991	0	0	**0.064**	TRUE	TRUE	FALSE	**N/A**	**Embankemnt Fill**	**B**

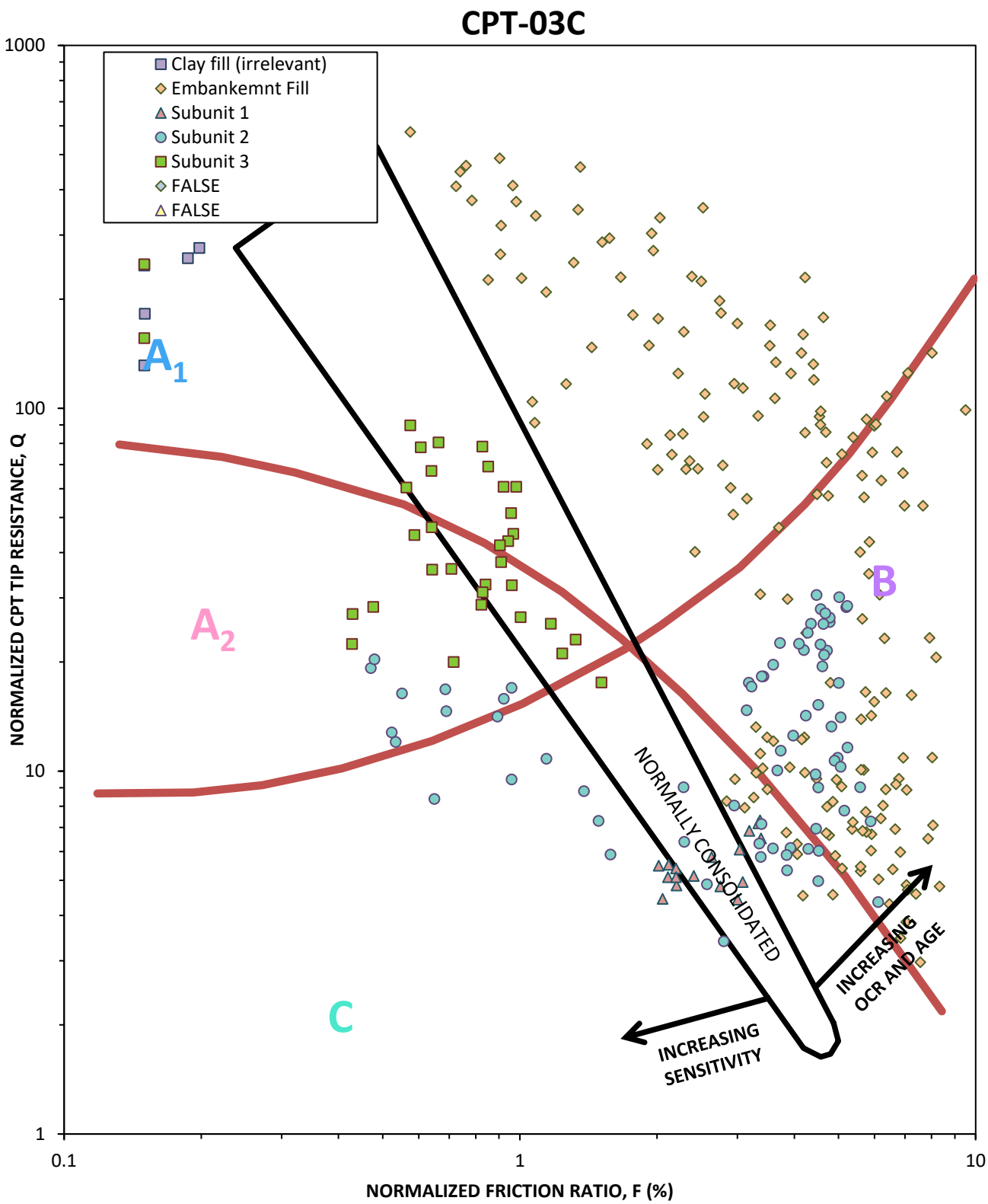
Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
746.6	7.382	N/A	85	N/A	N/A	N/A	N/A	0.990	0	0	**0.064**	TRUE	TRUE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
746.5	7.546	N/A	100	N/A	N/A	N/A	N/A	0.990	0	0	**0.065**	TRUE	TRUE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
746.3	7.710	N/A	100	N/A	N/A	N/A	N/A	0.990	0	0	**0.066**	TRUE	TRUE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
746.1	7.874	N/A	100	N/A	N/A	N/A	N/A	0.989	0	0	**0.066**	TRUE	TRUE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
746.0	8.038	N/A	100	N/A	N/A	N/A	N/A	0.989	0	0	**0.067**	TRUE	TRUE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
745.8	8.202	N/A	100	N/A	N/A	N/A	N/A	0.988	0	0	**0.067**	TRUE	TRUE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
745.6	8.366	N/A	95	N/A	N/A	N/A	N/A	0.988	0	0	**0.068**	TRUE	TRUE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
745.5	8.530	N/A	88	N/A	N/A	N/A	N/A	0.987	0	0	**0.068**	TRUE	TRUE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
745.3	8.694	N/A	82	N/A	N/A	N/A	N/A	0.987	0	0	**0.068**	TRUE	TRUE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
745.1	8.858	N/A	78	N/A	N/A	N/A	N/A	0.987	0	0	**0.069**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
745.0	9.022	N/A	73	N/A	N/A	N/A	N/A	0.986	0	0	**0.069**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
744.8	9.186	N/A	67	N/A	N/A	N/A	N/A	0.986	0	0	**0.070**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
744.6	9.350	N/A	76	N/A	N/A	N/A	N/A	0.985	0	0	**0.070**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
744.5	9.514	N/A	74	N/A	N/A	N/A	N/A	0.985	0	0	**0.071**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
744.3	9.678	N/A	79	N/A	N/A	N/A	N/A	0.984	0	0	**0.071**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
744.2	9.842	N/A	100	N/A	N/A	N/A	N/A	0.984	0	0	**0.071**	TRUE	TRUE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
744.0	10.006	N/A	100	N/A	N/A	N/A	N/A	0.983	0	0	**0.072**	TRUE	TRUE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
743.8	10.170	N/A	100	N/A	N/A	N/A	N/A	0.983	0	0	**0.072**	TRUE	TRUE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
743.7	10.335	N/A	95	N/A	N/A	N/A	N/A	0.983	0	0	**0.072**	TRUE	TRUE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
743.5	10.499	N/A	93	N/A	N/A	N/A	N/A	0.982	0	0	**0.073**	TRUE	TRUE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
743.3	10.663	N/A	87	N/A	N/A	N/A	N/A	0.982	0	0	**0.073**	TRUE	TRUE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
743.2	10.827	N/A	86	N/A	N/A	N/A	N/A	0.981	0	0	**0.073**	TRUE	TRUE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
743.0	10.991	N/A	75	N/A	N/A	N/A	N/A	0.981	0	0	**0.074**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
742.8	11.155	N/A	71	N/A	N/A	N/A	N/A	0.980	0	0	**0.074**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
742.7	11.319	N/A	69	N/A	N/A	N/A	N/A	0.980	0	0	**0.074**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
742.5	11.483	N/A	66	N/A	N/A	N/A	N/A	0.979	0	0	**0.075**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
742.4	11.647	N/A	67	N/A	N/A	N/A	N/A	0.979	0	0	**0.075**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
742.2	11.811	N/A	62	N/A	N/A	N/A	N/A	0.978	0	0	**0.075**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
742.0	11.975	N/A	63	N/A	N/A	N/A	N/A	0.978	0	0	**0.075**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
741.9	12.139	N/A	67	N/A	N/A	N/A	N/A	0.977	0	0	**0.076**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
741.7	12.303	N/A	84	N/A	N/A	N/A	N/A	0.977	0	0	**0.076**	TRUE	TRUE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
741.5	12.467	N/A	100	N/A	N/A	N/A	N/A	0.977	0	0	**0.076**	TRUE	TRUE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
741.4	12.631	N/A	95	N/A	N/A	N/A	N/A	0.976	0	0	**0.077**	TRUE	TRUE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
741.2	12.795	N/A	92	N/A	N/A	N/A	N/A	0.976	0	0	**0.077**	TRUE	TRUE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
741.0	12.959	N/A	98	N/A	N/A	N/A	N/A	0.975	0	0	**0.077**	TRUE	TRUE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
740.9	13.123	N/A	92	N/A	N/A	N/A	N/A	0.975	0	0	**0.077**	TRUE	TRUE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
740.7	13.287	N/A	65	N/A	N/A	N/A	N/A	0.974	0	0	**0.077**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
740.5	13.451	N/A	62	N/A	N/A	N/A	N/A	0.974	0	0	**0.078**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
740.4	13.615	N/A	67	N/A	N/A	N/A	N/A	0.973	0	0	**0.078**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
740.2	13.779	N/A	58	N/A	N/A	N/A	N/A	0.973	0	0	**0.078**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
740.1	13.943	N/A	66	N/A	N/A	N/A	N/A	0.972	0	0	**0.078**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
739.9	14.107	N/A	65	N/A	N/A	N/A	N/A	0.972	0	0	**0.079**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
739.7	14.271	N/A	60	N/A	N/A	N/A	N/A	0.971	0	0	**0.079**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
739.6	14.436	N/A	68	N/A	N/A	N/A	N/A	0.971	0	0	**0.079**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
739.4	14.600	N/A	71	N/A	N/A	N/A	N/A	0.970	0	0	**0.079**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
739.2	14.764	N/A	67	N/A	N/A	N/A	N/A	0.970	0	0	**0.079**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
739.1	14.928	N/A	62	N/A	N/A	N/A	N/A	0.969	0	0	**0.079**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
738.9	15.092	N/A	61	N/A	N/A	N/A	N/A	0.969	0	0	**0.080**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
738.7	15.256	N/A	82	N/A	N/A	N/A	N/A	0.968	0	0	**0.080**	TRUE	TRUE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
738.6	15.420	N/A	80	N/A	N/A	N/A	N/A	0.968	0	0	**0.080**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
738.4	15.584	N/A	75	N/A	N/A	N/A	N/A	0.967	0	0	**0.080**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
738.3	15.748	N/A	65	N/A	N/A	N/A	N/A	0.966	0	0	**0.080**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
738.1	15.912	N/A	61	N/A	N/A	N/A	N/A	0.966	0	0	**0.080**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
737.9	16.076	N/A	66	N/A	N/A	N/A	N/A	0.965	0	0	**0.081**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
737.8	16.240	N/A	63	N/A	N/A	N/A	N/A	0.965	0	0	**0.081**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**

Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
737.6	16.404	N/A	56	N/A	N/A	N/A	N/A	0.964	0	0	**0.081**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
737.4	16.568	N/A	55	N/A	N/A	N/A	N/A	0.964	0	0	**0.081**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
737.3	16.732	N/A	53	N/A	N/A	N/A	N/A	0.963	0	0	**0.081**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
737.1	16.896	N/A	51	N/A	N/A	N/A	N/A	0.963	0	0	**0.081**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
736.9	17.060	N/A	47	N/A	N/A	N/A	N/A	0.962	0	0	**0.081**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
736.8	17.224	N/A	45	N/A	N/A	N/A	N/A	0.962	0	0	**0.082**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
736.6	17.388	N/A	47	N/A	N/A	N/A	N/A	0.961	0	0	**0.082**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
736.4	17.552	N/A	43	N/A	N/A	N/A	N/A	0.961	0	0	**0.082**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
736.3	17.716	N/A	40	N/A	N/A	N/A	N/A	0.960	0	0	**0.082**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
736.1	17.880	N/A	40	N/A	N/A	N/A	N/A	0.960	0	0	**0.082**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
736.0	18.044	N/A	42	N/A	N/A	N/A	N/A	0.959	0	0	**0.082**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
735.8	18.208	N/A	43	N/A	N/A	N/A	N/A	0.958	0	0	**0.082**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
735.6	18.372	N/A	43	N/A	N/A	N/A	N/A	0.958	0	0	**0.082**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
735.5	18.537	N/A	44	N/A	N/A	N/A	N/A	0.957	0	0	**0.083**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
735.3	18.701	N/A	42	N/A	N/A	N/A	N/A	0.957	0	0	**0.083**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
735.1	18.865	N/A	39	N/A	N/A	N/A	N/A	0.956	0	0	**0.083**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
735.0	19.029	N/A	41	N/A	N/A	N/A	N/A	0.956	0	0	**0.083**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
734.8	19.193	N/A	41	N/A	N/A	N/A	N/A	0.955	0	0	**0.083**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
734.6	19.357	N/A	39	N/A	N/A	N/A	N/A	0.955	0	0	**0.083**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**C**
734.5	19.521	N/A	36	N/A	N/A	N/A	N/A	0.954	0	0	**0.083**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
734.3	19.685	N/A	36	N/A	N/A	N/A	N/A	0.953	0	0	**0.083**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
734.2	19.849	N/A	37	N/A	N/A	N/A	N/A	0.953	0	0	**0.083**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
734.0	20.013	N/A	36	N/A	N/A	N/A	N/A	0.952	0	0	**0.083**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
733.8	20.177	N/A	35	N/A	N/A	N/A	N/A	0.952	0	0	**0.083**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
733.7	20.341	N/A	36	N/A	N/A	N/A	N/A	0.951	0	0	**0.084**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**C**
733.5	20.505	N/A	36	N/A	N/A	N/A	N/A	0.951	0	0	**0.084**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
733.3	20.669	N/A	36	N/A	N/A	N/A	N/A	0.950	0	0	**0.084**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
733.2	20.833	N/A	39	N/A	N/A	N/A	N/A	0.949	0	0	**0.084**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**C**
733.0	20.997	N/A	38	N/A	N/A	N/A	N/A	0.949	0	0	**0.084**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**C**
732.8	21.161	N/A	37	N/A	N/A	N/A	N/A	0.948	0	0	**0.084**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
732.7	21.325	N/A	36	N/A	N/A	N/A	N/A	0.948	0	0	**0.084**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
732.5	21.489	N/A	38	N/A	N/A	N/A	N/A	0.947	0	0	**0.084**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**C**
732.3	21.653	N/A	37	N/A	N/A	N/A	N/A	0.947	0	0	**0.084**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**C**
732.2	21.817	N/A	36	N/A	N/A	N/A	N/A	0.946	0	0	**0.084**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
732.0	21.981	N/A	37	N/A	N/A	N/A	N/A	0.945	0	0	**0.084**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**C**
731.9	22.145	N/A	38	N/A	N/A	N/A	N/A	0.945	0	0	**0.084**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**C**
731.7	22.309	N/A	37	N/A	N/A	N/A	N/A	0.944	0	0	**0.084**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
731.5	22.473	N/A	37	N/A	N/A	N/A	N/A	0.944	0	0	**0.084**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
731.4	22.638	N/A	37	N/A	N/A	N/A	N/A	0.943	0	0	**0.085**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
731.2	22.802	N/A	36	N/A	N/A	N/A	N/A	0.942	0	0	**0.085**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
731.0	22.966	N/A	37	N/A	N/A	N/A	N/A	0.942	0	0	**0.085**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
730.9	23.130	N/A	39	N/A	N/A	N/A	N/A	0.941	0	0	**0.085**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
730.7	23.294	N/A	39	N/A	N/A	N/A	N/A	0.941	0	0	**0.085**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
730.5	23.458	N/A	38	N/A	N/A	N/A	N/A	0.940	0	0	**0.085**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
730.4	23.622	N/A	39	N/A	N/A	N/A	N/A	0.939	0	0	**0.085**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
730.2	23.786	N/A	39	N/A	N/A	N/A	N/A	0.939	0	0	**0.085**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
730.1	23.950	N/A	38	N/A	N/A	N/A	N/A	0.938	0	0	**0.085**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
729.9	24.114	N/A	37	N/A	N/A	N/A	N/A	0.938	0	0	**0.085**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
729.7	24.278	N/A	36	N/A	N/A	N/A	N/A	0.937	0	0	**0.085**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
729.6	24.442	N/A	35	N/A	N/A	N/A	N/A	0.936	0	0	**0.085**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
729.4	24.606	N/A	36	N/A	N/A	N/A	N/A	0.936	0	0	**0.085**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
729.2	24.770	N/A	37	N/A	N/A	N/A	N/A	0.935	0	0	**0.085**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
729.1	24.934	N/A	50	N/A	N/A	N/A	N/A	0.935	0	0	**0.085**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
728.9	25.098	N/A	48	N/A	N/A	N/A	N/A	0.934	0	0	**0.085**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
728.7	25.262	N/A	66	N/A	N/A	N/A	N/A	0.933	0	0	**0.085**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**A1**

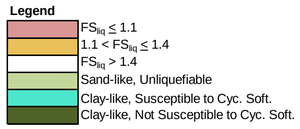
Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
728.6	25.426	N/A	56	N/A	N/A	N/A	N/A	0.933	0	0	**0.085**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
728.4	25.590	N/A	52	N/A	N/A	N/A	N/A	0.932	0	0	**0.085**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
728.2	25.754	N/A	51	N/A	N/A	N/A	N/A	0.932	0	0	**0.085**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
728.1	25.918	N/A	44	N/A	N/A	N/A	N/A	0.931	0	0	**0.085**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
727.9	26.082	N/A	41	N/A	N/A	N/A	N/A	0.930	0	0	**0.085**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
727.8	26.246	N/A	39	N/A	N/A	N/A	N/A	0.930	0	0	**0.085**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
727.6	26.410	N/A	40	N/A	N/A	N/A	N/A	0.929	0	0	**0.085**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
727.4	26.574	N/A	38	N/A	N/A	N/A	N/A	0.928	0	0	**0.085**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
727.3	26.739	N/A	38	N/A	N/A	N/A	N/A	0.928	0	0	**0.085**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
727.1	26.903	N/A	40	N/A	N/A	N/A	N/A	0.927	0	0	**0.085**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
726.9	27.067	N/A	40	N/A	N/A	N/A	N/A	0.927	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
726.8	27.231	N/A	38	N/A	N/A	N/A	N/A	0.926	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
726.6	27.395	N/A	40	N/A	N/A	N/A	N/A	0.925	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
726.4	27.559	N/A	40	N/A	N/A	N/A	N/A	0.925	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
726.3	27.723	N/A	42	N/A	N/A	N/A	N/A	0.924	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
726.1	27.887	N/A	42	N/A	N/A	N/A	N/A	0.923	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
725.9	28.051	N/A	38	N/A	N/A	N/A	N/A	0.923	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
725.8	28.215	N/A	39	N/A	N/A	N/A	N/A	0.922	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
725.6	28.379	N/A	40	N/A	N/A	N/A	N/A	0.921	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**C**
725.5	28.543	N/A	40	N/A	N/A	N/A	N/A	0.921	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
725.3	28.707	N/A	41	N/A	N/A	N/A	N/A	0.920	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
725.1	28.871	N/A	39	N/A	N/A	N/A	N/A	0.920	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
725.0	29.035	N/A	38	N/A	N/A	N/A	N/A	0.919	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
724.8	29.199	N/A	37	N/A	N/A	N/A	N/A	0.918	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
724.6	29.363	N/A	36	N/A	N/A	N/A	N/A	0.918	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**C**
724.5	29.527	N/A	36	N/A	N/A	N/A	N/A	0.917	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**C**
724.3	29.691	N/A	35	N/A	N/A	N/A	N/A	0.916	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
724.1	29.855	N/A	35	N/A	N/A	N/A	N/A	0.916	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
724.0	30.019	N/A	36	N/A	N/A	N/A	N/A	0.915	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
723.8	30.183	N/A	37	N/A	N/A	N/A	N/A	0.914	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
723.7	30.347	N/A	38	N/A	N/A	N/A	N/A	0.914	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
723.5	30.511	N/A	38	N/A	N/A	N/A	N/A	0.913	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
723.3	30.675	N/A	38	N/A	N/A	N/A	N/A	0.912	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
723.2	30.840	N/A	38	N/A	N/A	N/A	N/A	0.912	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
723.0	31.004	N/A	37	N/A	N/A	N/A	N/A	0.911	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
722.8	31.168	N/A	36	N/A	N/A	N/A	N/A	0.910	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
722.7	31.332	N/A	36	N/A	N/A	N/A	N/A	0.910	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
722.5	31.496	N/A	36	N/A	N/A	N/A	N/A	0.909	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
722.3	31.660	N/A	36	N/A	N/A	N/A	N/A	0.908	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
722.2	31.824	N/A	37	N/A	N/A	N/A	N/A	0.908	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
722.0	31.988	N/A	37	N/A	N/A	N/A	N/A	0.907	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
721.8	32.152	N/A	37	N/A	N/A	N/A	N/A	0.906	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
721.7	32.316	N/A	37	N/A	N/A	N/A	N/A	0.906	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
721.5	32.480	N/A	37	N/A	N/A	N/A	N/A	0.905	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
721.4	32.644	N/A	37	N/A	N/A	N/A	N/A	0.904	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
721.2	32.808	0.103	38	0.988	0.882	1.00	0.090	0.904	0	0	**0.086**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
721.0	32.972	0.105	39	0.988	0.889	1.00	0.092	0.903	0	0	**0.086**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**C**
720.9	33.136	0.103	37	0.988	0.881	1.00	0.089	0.902	0	0	**0.086**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
720.7	33.300	0.103	37	0.987	0.881	1.00	0.089	0.902	0	0	**0.086**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
720.5	33.464	0.103	37	0.987	0.880	1.00	0.089	0.901	0	0	**0.086**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
720.4	33.628	0.102	37	0.987	0.878	1.00	0.088	0.900	0	0	**0.086**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
720.2	33.792	0.103	37	0.986	0.880	1.00	0.089	0.900	0	0	**0.086**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
720.0	33.956	0.104	38	0.986	0.884	1.00	0.090	0.899	0	0	**0.086**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**B**
719.9	34.120	0.104	38	0.985	0.885	1.00	0.091	0.898	0	0	**0.086**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**B**
719.7	34.284	0.106	40	0.985	0.893	1.00	0.093	0.898	0	0	**0.086**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**B**

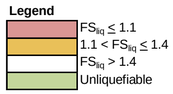
Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
719.6	34.448	0.108	41	0.984	0.901	1.00	0.096	0.897	0	0	**0.086**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**B**
719.4	34.612	0.112	44	0.983	0.918	0.99	0.101	0.896	0	0	**0.086**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**B**
719.2	34.776	0.118	47	0.982	0.946	0.99	0.109	0.896	0	0	**0.086**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**B**
719.1	34.941	0.121	49	0.981	0.963	0.99	0.114	0.895	0	0	**0.086**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**B**
718.9	35.105	0.126	51	0.980	0.989	0.99	0.121	0.894	0	0	**0.086**	FALSE	FALSE	FALSE	**1.4**	**Subunit 2**	**B**
718.7	35.269	0.130	52	0.979	1.010	0.99	0.128	0.894	0	0	**0.086**	FALSE	FALSE	FALSE	**1.5**	**Subunit 2**	**B**
718.6	35.433	0.133	53	0.978	1.024	0.99	0.132	0.893	0	0	**0.086**	FALSE	FALSE	FALSE	**1.5**	**Subunit 2**	**B**
718.4	35.597	0.131	53	0.978	1.012	0.99	0.128	0.892	0	0	**0.086**	FALSE	FALSE	FALSE	**1.5**	**Subunit 2**	**B**
718.2	35.761	0.129	52	0.978	1.005	0.99	0.126	0.892	0	0	**0.086**	FALSE	FALSE	FALSE	**1.5**	**Subunit 2**	**B**
718.1	35.925	0.126	51	0.978	0.986	0.99	0.120	0.891	0	0	**0.086**	FALSE	FALSE	FALSE	**1.4**	**Subunit 2**	**B**
717.9	36.089	0.128	51	0.977	0.996	0.99	0.123	0.890	0	0	**0.086**	FALSE	FALSE	FALSE	**1.4**	**Subunit 2**	**B**
717.7	36.253	0.133	54	0.976	1.026	0.99	0.132	0.890	0	0	**0.086**	FALSE	FALSE	FALSE	**1.5**	**Subunit 2**	**B**
717.6	36.417	0.129	52	0.976	1.001	0.99	0.125	0.889	0	0	**0.086**	FALSE	FALSE	FALSE	**1.5**	**Subunit 2**	**B**
717.4	36.581	0.126	51	0.976	0.988	0.99	0.121	0.888	0	0	**0.086**	FALSE	FALSE	FALSE	**1.4**	**Subunit 2**	**B**
717.3	36.745	0.124	50	0.976	0.977	0.99	0.117	0.887	0	0	**0.086**	FALSE	FALSE	FALSE	**1.4**	**Subunit 2**	**B**
717.1	36.909	0.121	49	0.976	0.962	0.99	0.113	0.887	0	0	**0.085**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**B**
716.9	37.073	0.120	48	0.976	0.958	0.99	0.112	0.886	0	0	**0.085**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**B**
716.8	37.237	0.121	48	0.976	0.960	0.99	0.113	0.885	0	0	**0.085**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**B**
716.6	37.401	0.122	49	0.975	0.966	0.99	0.114	0.885	0	0	**0.085**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**B**
716.4	37.565	0.122	49	0.975	0.967	0.99	0.114	0.884	0	0	**0.085**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**B**
716.3	37.729	0.119	47	0.975	0.949	0.99	0.109	0.883	0	0	**0.085**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**B**
716.1	37.893	0.117	46	0.975	0.938	0.99	0.106	0.883	0	0	**0.085**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**B**
715.9	38.057	0.117	46	0.975	0.937	0.99	0.106	0.882	0	0	**0.085**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**B**
715.8	38.221	0.116	46	0.975	0.932	0.99	0.105	0.881	0	0	**0.085**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**B**
715.6	38.385	0.115	45	0.975	0.930	0.99	0.104	0.881	0	0	**0.085**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**B**
715.5	38.549	0.117	46	0.974	0.938	0.99	0.106	0.880	0	0	**0.085**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**B**
715.3	38.713	0.114	45	0.974	0.924	0.99	0.102	0.879	0	0	**0.085**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**B**
715.1	38.877	0.113	44	0.974	0.917	0.99	0.100	0.878	0	0	**0.085**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**B**
715.0	39.042	0.112	43	0.974	0.912	0.99	0.099	0.878	0	0	**0.085**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**B**
714.8	39.206	0.111	43	0.974	0.907	0.99	0.097	0.877	0	0	**0.085**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**B**
714.6	39.370	0.109	41	0.974	0.897	0.99	0.095	0.876	0	0	**0.085**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**B**
714.5	39.534	0.108	41	0.974	0.892	1.00	0.093	0.876	0	0	**0.085**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**B**
714.3	39.698	0.107	40	0.974	0.888	1.00	0.092	0.875	0	0	**0.085**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**B**
714.1	39.862	0.108	41	0.973	0.893	1.00	0.093	0.874	0	0	**0.085**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**B**
714.0	40.026	0.109	42	0.973	0.900	0.99	0.095	0.874	0	0	**0.085**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**B**
713.8	40.190	0.113	44	0.971	0.917	0.99	0.100	0.873	0	0	**0.085**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**B**
713.6	40.354	0.110	42	0.972	0.902	0.99	0.096	0.872	0	0	**0.085**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**B**
713.5	40.518	0.108	41	0.972	0.895	1.00	0.094	0.872	0	0	**0.085**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**B**
713.3	40.682	0.106	39	0.973	0.882	1.00	0.090	0.871	0	0	**0.085**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**B**
713.2	40.846	0.104	38	0.973	0.873	1.00	0.088	0.870	0	0	**0.085**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
713.0	41.010	0.102	37	0.973	0.868	1.00	0.086	0.869	0	0	**0.085**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
712.8	41.174	0.102	36	0.973	0.866	1.00	0.085	0.869	0	0	**0.085**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**B**
712.7	41.338	0.104	38	0.972	0.873	1.00	0.088	0.868	0	0	**0.085**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
712.5	41.502	0.105	39	0.971	0.878	1.00	0.089	0.867	0	0	**0.085**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
712.3	41.666	0.107	40	0.970	0.887	1.00	0.091	0.867	0	0	**0.085**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**C**
712.2	41.830	0.104	38	0.971	0.874	1.00	0.088	0.866	0	0	**0.085**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
712.0	41.994	0.102	37	0.971	0.867	1.00	0.086	0.865	0	0	**0.085**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
711.8	42.158	0.101	36	0.971	0.860	1.00	0.084	0.864	0	0	**0.085**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
711.7	42.322	0.107	41	0.969	0.889	1.00	0.092	0.864	0	0	**0.085**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**A2**
711.5	42.486	0.108	41	0.969	0.894	1.00	0.093	0.863	0	0	**0.085**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**A2**
711.3	42.650	0.107	41	0.969	0.888	1.00	0.092	0.862	0	0	**0.085**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**C**
711.2	42.814	0.106	40	0.969	0.882	1.00	0.090	0.862	0	0	**0.085**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**C**
711.0	42.978	0.103	38	0.969	0.869	1.00	0.087	0.861	0	0	**0.085**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
710.9	43.143	0.105	39	0.969	0.875	1.00	0.088	0.860	0	0	**0.084**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
710.7	43.307	0.107	40	0.968	0.886	1.00	0.091	0.860	0	0	**0.084**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**A2**

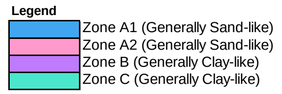
Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
710.5	43.471	0.106	40	0.968	0.882	1.00	0.090	0.859	0	0	**0.084**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**C**
710.4	43.635	0.105	39	0.968	0.876	1.00	0.088	0.858	0	0	**0.084**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
710.2	43.799	0.110	42	0.966	0.898	0.99	0.095	0.857	0	0	**0.084**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**C**
710.0	43.963	0.109	42	0.966	0.894	0.99	0.094	0.857	0	0	**0.084**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**A2**
709.9	44.127	0.110	42	0.965	0.899	0.99	0.095	0.856	0	0	**0.084**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**A2**
709.7	44.291	0.111	43	0.965	0.903	0.99	0.096	0.855	0	0	**0.084**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**A2**
709.5	44.455	0.110	42	0.965	0.899	0.99	0.095	0.855	0	0	**0.084**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**A2**
709.4	44.619	0.111	43	0.964	0.905	0.99	0.097	0.854	0	0	**0.084**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**A2**
709.2	44.783	0.111	43	0.964	0.906	0.99	0.097	0.853	0	0	**0.084**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**A2**
709.1	44.947	0.112	44	0.963	0.911	0.99	0.098	0.852	0	0	**0.084**	FALSE	FALSE	FALSE	**1.2**	**Subunit 3**	**A2**
708.9	45.111	0.111	43	0.963	0.905	0.99	0.096	0.852	0	0	**0.084**	FALSE	FALSE	FALSE	**1.1**	**Subunit 3**	**A2**
708.7	45.275	0.113	44	0.962	0.915	0.99	0.099	0.851	0	0	**0.084**	FALSE	FALSE	FALSE	**1.2**	**Subunit 3**	**A2**
708.6	45.439	0.115	45	0.961	0.922	0.99	0.101	0.850	0	0	**0.084**	FALSE	FALSE	FALSE	**1.2**	**Subunit 3**	**A2**
708.4	45.603	0.120	48	0.959	0.948	0.99	0.108	0.850	0	0	**0.084**	FALSE	FALSE	FALSE	**1.3**	**Subunit 3**	**A2**
708.2	45.767	0.118	47	0.959	0.940	0.99	0.106	0.849	0	0	**0.084**	FALSE	FALSE	FALSE	**1.3**	**Subunit 3**	**A2**
708.1	45.931	0.125	50	0.957	0.976	0.99	0.116	0.848	0	0	**0.084**	FALSE	FALSE	FALSE	**1.4**	**Subunit 3**	**A2**
707.9	46.095	0.127	51	0.956	0.989	0.99	0.119	0.847	0	0	**0.084**	FALSE	FALSE	FALSE	**1.4**	**Subunit 3**	**A1**
707.7	46.259	0.134	54	0.953	1.025	0.99	0.129	0.847	0	0	**0.084**	FALSE	FALSE	FALSE	**1.5**	**Subunit 3**	**A1**
707.6	46.423	0.131	53	0.954	1.009	0.99	0.125	0.846	0	0	**0.084**	FALSE	FALSE	FALSE	**1.5**	**Subunit 3**	**A1**
707.4	46.587	0.137	55	0.952	1.042	0.99	0.134	0.845	0	0	**0.084**	FALSE	FALSE	FALSE	**1.6**	**Subunit 3**	**A1**
707.2	46.751	0.154	59	0.947	1.134	0.99	0.163	0.845	0	0	**0.084**	FALSE	FALSE	FALSE	**2.0**	**Subunit 3**	**A1**
707.1	46.915	0.151	59	0.947	1.118	0.99	0.158	0.844	0	0	**0.084**	FALSE	FALSE	FALSE	**1.9**	**Subunit 3**	**A1**
706.9	47.079	0.149	58	0.947	1.106	0.99	0.154	0.843	0	0	**0.083**	FALSE	FALSE	FALSE	**1.8**	**Subunit 3**	**A1**
706.8	47.244	0.141	56	0.949	1.068	0.99	0.142	0.842	0	0	**0.083**	FALSE	FALSE	FALSE	**1.7**	**Subunit 3**	**A1**
706.6	47.408	0.136	54	0.950	1.036	0.99	0.133	0.842	0	0	**0.083**	FALSE	FALSE	FALSE	**1.6**	**Subunit 3**	**A1**
706.4	47.572	0.133	54	0.951	1.023	0.99	0.129	0.841	0	0	**0.083**	FALSE	FALSE	FALSE	**1.5**	**Subunit 3**	**A1**
706.3	47.736	0.132	53	0.951	1.013	0.99	0.126	0.840	0	0	**0.083**	FALSE	FALSE	FALSE	**1.5**	**Subunit 3**	**A1**
706.1	47.900	0.128	52	0.952	0.993	0.99	0.120	0.840	0	0	**0.083**	FALSE	FALSE	FALSE	**1.4**	**Subunit 3**	**A2**
705.9	48.064	0.124	50	0.953	0.972	0.99	0.114	0.839	0	0	**0.083**	FALSE	FALSE	FALSE	**1.4**	**Subunit 3**	**A2**
705.8	48.228	0.120	48	0.954	0.946	0.99	0.107	0.838	0	0	**0.083**	FALSE	FALSE	FALSE	**1.3**	**Subunit 3**	**A2**
705.6	48.392	0.116	46	0.955	0.927	0.99	0.102	0.837	0	0	**0.083**	FALSE	FALSE	FALSE	**1.2**	**Subunit 3**	**A2**
705.4	48.556	0.115	45	0.955	0.920	0.99	0.100	0.837	0	0	**0.083**	FALSE	FALSE	FALSE	**1.2**	**Subunit 3**	**C**
705.3	48.720	0.120	48	0.953	0.947	0.99	0.107	0.836	0	0	**0.083**	FALSE	FALSE	FALSE	**1.3**	**Subunit 3**	**A2**
705.1	48.884	0.123	50	0.952	0.966	0.99	0.113	0.835	0	0	**0.083**	FALSE	FALSE	FALSE	**1.4**	**Subunit 3**	**A2**
705.0	49.048	0.123	49	0.951	0.964	0.99	0.112	0.835	0	0	**0.083**	FALSE	FALSE	FALSE	**1.4**	**Subunit 3**	**A2**
704.8	49.212	0.122	49	0.952	0.957	0.99	0.110	0.834	0	0	**0.083**	FALSE	FALSE	FALSE	**1.3**	**Subunit 3**	**A2**
704.6	49.376	0.122	49	0.951	0.958	0.99	0.110	0.833	0	0	**0.083**	FALSE	FALSE	FALSE	**1.3**	**Subunit 3**	**A2**
704.5	49.540	0.128	51	0.949	0.988	0.99	0.119	0.833	0	0	**0.083**	FALSE	FALSE	FALSE	**1.4**	**Subunit 3**	**A2**
704.3	49.704	0.152	59	0.941	1.117	0.99	0.158	0.832	0	0	**0.083**	FALSE	FALSE	FALSE	**1.9**	**Subunit 3**	**A1**
704.1	49.868	0.127	51	0.948	0.982	0.99	0.117	0.831	0	0	**0.083**	FALSE	FALSE	FALSE	**1.4**	**Subunit 3**	**A1**
704.0	50.032	0.301	74	0.915	1.631	0.98	0.440	0.830	0	0	**0.083**	FALSE	FALSE	FALSE	**5.3**	**Subunit 3**	**A1**
703.8	50.196	N/A	100	N/A	N/A	N/A	N/A	0.830	0	0	**0.082**	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**	**A1**



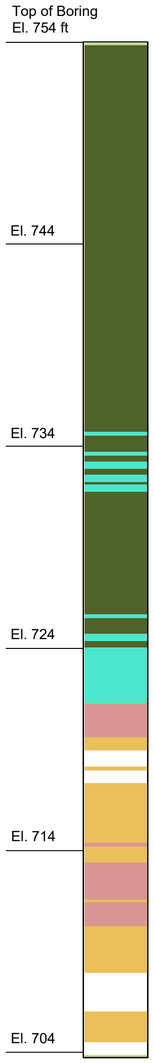
Adapted from "Discussion of 'Liquefaction Potential of Silts from CPTu'" (Robertson 2008). Zone A_1 and Zone A_2 samples are generally sand-like. Zone B samples are generally clay-like and not susceptible to cyclic softening. Zone C samples are generally clay-like and susceptible to cyclic softening. Note that the transition from clay-like to sand-like in this chart does not exactly match the liquefaction calculations herein; that is, some transitional samples in Zone B and Zone C will be treated as sand-like and analyzed for liquefaction if the calculations indicate as such.



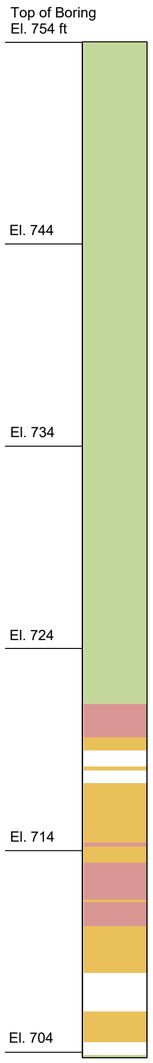




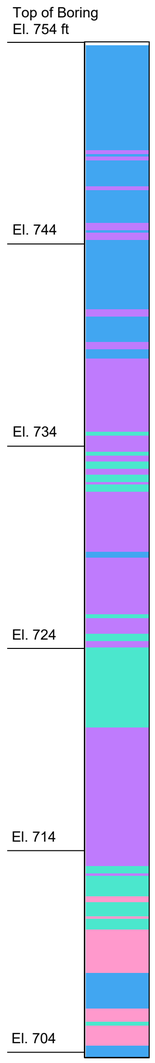
CPT-03C, Liquefaction Triggering Results



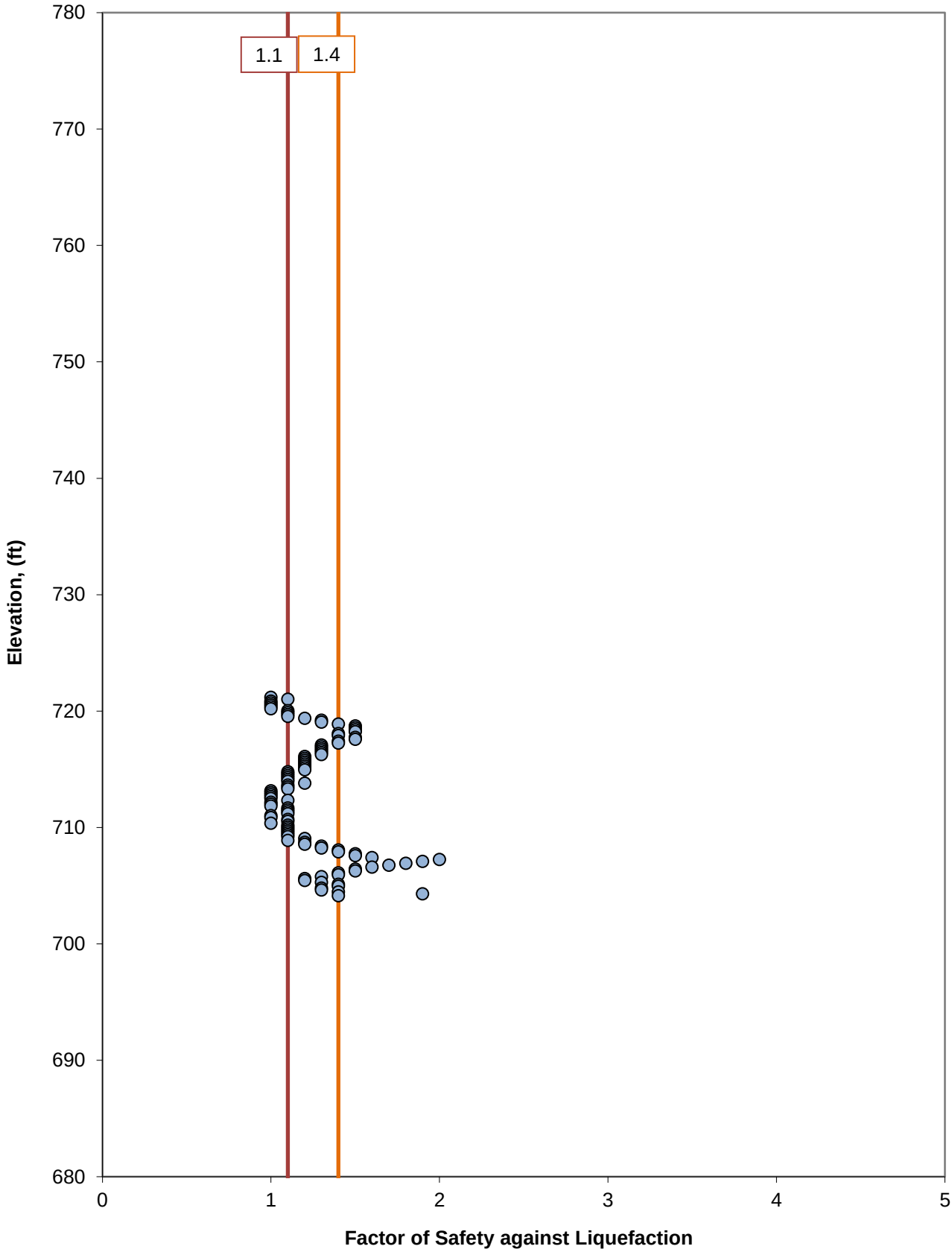
CPT-03C, Liquefaction Triggering Results



CPT-03C, Robertson Soil Type



KIF TDEC Stability, Boring = CPT-03C, Source = 1 Hz, Mw = 7.6, Event = Design EQ, CPT Data, Simplified Stress-Based Approach



Inputs

Project Information

Stantec Project Number =	175668043
Project Name =	KIF TDEC Stability
CPT ID =	CPT-04A

Boring Location (optional)

Northing =	
Easting =	
OR	
Baseline Station =	
Offset (+ Right) =	

Using qt (corrected for u2 PWP) or qc (backcalculated uncorrected field tip)

Cone ID (optional) =	AD184	
Use qc instead of qt?	0	(1: Yes, 0: No)
Cone Area Ratio (a) =	0.80	

Drilling Information

Top of Hole Elevation =	753.0	feet
Water Depth during CPT (negative for U/S borings) =	6.0	feet
Depth data collection began =	0.16	feet
Avg. Total Unit Wt. Above 1st Sample =	120.00	pcf

During Earthquake Information

Water Depth during EQ (relative to CPT TOH, negative for U/S borings) =	4.6	feet
Final Grade Elevation during EQ =	752.2	feet
Avg. Total Unit Wt. of Cut/Fill =	120	pcf

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile?	0	(1: Yes, 0: No)

If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile:	ng_Pond_Section, KIF-BF-SPT3_NOR	
α at each Sample Depth known?	1	(1: Yes, 0: No)

If previous answer is No, then enter curve fit parameters below (α vs. depth curve)

If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_α will be one.

m4:	
m3:	
m2:	
m1:	
m0:	

Associated ground response profile:	shing_Pond_Section, KIF-BF-SPT3	
Get CSR from shear stress envelope?	0	(1: Yes, 0: No)

If previous answer is No, then CSR will be calculated using a_{max} and r_d

Max. Shear Stress at each sample depth known?		(1: Yes, 0: No)

If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4:	
m3:	
m2:	
m1:	

Earthquake Information

EQ Source (e.g., New Madrid)	1 Hz
Event (e.g., MCE, OBE)	Design EQ
a_{max} (g) (top of ground surface)	0.09
EQ Mag (Mw)	7.6

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
0.164	204.327	0.150	128	Embankment Fill	Clay-like		0.054			
0.328	415.979	0.417	128	Embankment Fill	Clay-like		0.051			
0.492	366.540	1.110	128	Embankment Fill	Clay-like		0.048			
0.656	406.239	0.899	128	Embankment Fill	Clay-like		0.046			
0.820	283.260	0.811	128	Embankment Fill	Clay-like		0.043			
0.984	168.175	1.422	128	Embankment Fill	Clay-like		0.040			
1.148	120.542	1.880	128	Embankment Fill	Clay-like		0.038			
1.312	110.085	1.963	128	Embankment Fill	Clay-like		0.035			
1.476	207.460	1.901	128	Embankment Fill	Clay-like		0.032			
1.640	303.436	2.160	128	Embankment Fill	Clay-like		0.030			
1.804	246.907	2.514	128	Embankment Fill	Clay-like		0.027			
1.968	140.292	2.621	128	Embankment Fill	Clay-like		0.029			
2.133	84.507	2.014	128	Embankment Fill	Clay-like		0.031			
2.297	139.967	2.748	128	Embankment Fill	Clay-like		0.033			
2.461	123.102	2.557	128	Embankment Fill	Clay-like		0.036			
2.625	128.575	2.569	128	Embankment Fill	Clay-like		0.038			
2.789	291.489	3.104	128	Embankment Fill	Clay-like		0.040			
2.953	308.381	2.809	128	Embankment Fill	Clay-like		0.040			
3.117	322.096	1.801	128	Embankment Fill	Clay-like		0.039			
3.281	249.621	2.258	128	Embankment Fill	Clay-like		0.038			
3.445	160.349	2.530	128	Embankment Fill	Clay-like		0.037			
3.609	97.050	2.722	128	Embankment Fill	Clay-like		0.036			
3.773	60.885	2.271	128	Embankment Fill	Clay-like		0.034			
3.937	47.905	2.457	128	Embankment Fill	Clay-like		0.032			
4.101	42.150	2.463	128	Embankment Fill	Clay-like		0.029			
4.265	44.279	2.432	128	Embankment Fill	Clay-like		0.027			
4.429	70.444	1.907	128	Embankment Fill	Clay-like		0.024			
4.593	212.951	2.728	128	Embankment Fill	Clay-like		0.022			
4.757	169.490	3.094	128	Embankment Fill	Clay-like		0.019			
4.921	118.785	3.538	128	Embankment Fill	Clay-like		0.016			
5.085	105.301	3.925	128	Embankment Fill	Clay-like		0.012			
5.249	95.169	4.231	128	Embankment Fill	Clay-like		0.013			
5.413	98.445	4.641	128	Embankment Fill	Clay-like		0.014			
5.577	173.936	4.629	128	Embankment Fill	Clay-like		0.012			
5.741	170.025	3.961	128	Embankment Fill	Clay-like		0.010			
5.905	151.990	5.176	128	Embankment Fill	Clay-like		0.007			
6.069	143.533	4.256	128	Embankment Fill	Clay-like		0.005			
6.234	85.958	3.982	128	Embankment Fill	Clay-like		0.004			
6.398	154.155	4.270	128	Embankment Fill	Clay-like		0.003			
6.562	240.940	3.500	128	Embankment Fill	Clay-like		0.002			
6.726	197.746	3.624	128	Embankment Fill	Clay-like		0.001			
6.890	181.923	3.425	128	Embankment Fill	Clay-like		0.001			
7.054	160.839	3.602	128	Embankment Fill	Clay-like		0.001			
7.218	146.423	2.797	128	Embankment Fill	Clay-like		0.002			
7.382	153.571	2.579	128	Embankment Fill	Clay-like		0.003			
7.546	107.355	3.013	128	Embankment Fill	Clay-like		0.005			
7.710	76.290	2.634	128	Embankment Fill	Clay-like		0.006			
7.874	63.315	1.735	128	Embankment Fill	Clay-like		0.008			
8.038	54.137	1.683	128	Embankment Fill	Clay-like		0.009			
8.202	185.443	2.444	128	Embankment Fill	Clay-like		0.011			
8.366	195.650	3.477	128	Embankment Fill	Clay-like		0.011			
8.530	153.529	3.545	128	Embankment Fill	Clay-like		0.012			
8.694	92.129	3.821	128	Embankment Fill	Clay-like		0.013			
8.858	88.222	2.304	128	Embankment Fill	Clay-like		0.014			
9.022	86.269	2.986	128	Embankment Fill	Clay-like		0.015			
9.186	71.581	3.941	128	Embankment Fill	Clay-like		0.016			
9.350	170.554	3.863	128	Embankment Fill	Clay-like		0.017			
9.514	21.711	3.899	128	Embankment Fill	Clay-like		0.018			
9.678	33.097	2.711	128	Embankment Fill	Clay-like		0.019			
9.842	97.026	2.200	128	Embankment Fill	Clay-like		0.020			
10.006	106.982	2.007	128	Embankment Fill	Clay-like		0.021			
10.170	150.830	1.978	128	Embankment Fill	Clay-like		0.022			
10.335	167.568	1.577	128	Embankment Fill	Clay-like		0.024			

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
10.499	125.595	2.988	128	Embankment Fill	Clay-like		0.025			
10.663	108.377	1.720	128	Embankment Fill	Clay-like		0.026			
10.827	106.678	1.298	128	Embankment Fill	Clay-like		0.027			
10.991	84.657	1.509	128	Embankment Fill	Clay-like		0.028			
11.155	63.009	2.516	128	Embankment Fill	Clay-like		0.029			
11.319	64.205	3.084	128	Embankment Fill	Clay-like		0.030			
11.483	106.492	2.404	128	Embankment Fill	Clay-like		0.031			
11.647	145.446	2.287	128	Embankment Fill	Clay-like		0.032			
11.811	151.976	1.313	128	Embankment Fill	Clay-like		0.033			
11.975	125.986	0.805	128	Embankment Fill	Clay-like		0.034			
12.139	135.658	0.589	128	Embankment Fill	Clay-like		0.035			
12.303	136.838	0.833	128	Embankment Fill	Clay-like		0.035			
12.467	100.480	2.106	128	Embankment Fill	Clay-like		0.036			
12.631	73.919	2.225	128	Embankment Fill	Clay-like		0.037			
12.795	60.191	2.943	128	Embankment Fill	Clay-like		0.038			
12.959	111.227	2.597	128	Embankment Fill	Clay-like		0.039			
13.123	94.812	2.948	128	Embankment Fill	Clay-like		0.040			
13.287	78.934	3.232	128	Embankment Fill	Clay-like		0.040			
13.451	69.192	2.904	128	Embankment Fill	Clay-like		0.041			
13.615	78.481	3.037	128	Embankment Fill	Clay-like		0.041			
13.779	89.212	3.209	128	Embankment Fill	Clay-like		0.042			
13.943	81.982	3.175	128	Embankment Fill	Clay-like		0.043			
14.107	64.698	2.971	128	Embankment Fill	Clay-like		0.043			
14.271	62.628	2.485	128	Embankment Fill	Clay-like		0.044			
14.436	58.369	2.402	128	Embankment Fill	Clay-like		0.045			
14.600	53.720	2.229	128	Embankment Fill	Clay-like		0.046			
14.764	39.151	2.051	128	Embankment Fill	Clay-like		0.047			
14.928	31.921	1.589	128	Embankment Fill	Clay-like		0.047			
15.092	25.182	1.403	128	Embankment Fill	Clay-like		0.048			
15.256	21.172	1.446	128	Embankment Fill	Clay-like		0.049			
15.420	31.412	1.577	128	Embankment Fill	Clay-like		0.050			
15.584	35.642	1.625	128	Embankment Fill	Clay-like		0.051			
15.748	20.573	1.475	128	Embankment Fill	Clay-like		0.052			
15.912	21.200	0.886	128	Embankment Fill	Clay-like		0.053			
16.076	22.840	0.860	128	Embankment Fill	Clay-like		0.054			
16.240	22.831	0.631	128	Embankment Fill	Clay-like		0.054			
16.404	17.522	0.679	128	Embankment Fill	Clay-like		0.055			
16.568	20.537	0.749	128	Embankment Fill	Clay-like		0.056			
16.732	18.683	0.652	128	Embankment Fill	Clay-like		0.056			
16.896	14.592	0.538	128	Embankment Fill	Clay-like		0.056			
17.060	12.828	0.483	128	Embankment Fill	Clay-like		0.056			
17.224	8.857	0.346	128	Embankment Fill	Clay-like		0.056			
17.388	11.921	0.271	128	Embankment Fill	Clay-like		0.055			
17.552	13.002	0.259	128	Embankment Fill	Clay-like		0.055			
17.716	9.105	0.392	128	Embankment Fill	Clay-like		0.055			
17.880	10.103	0.399	128	Embankment Fill	Clay-like		0.055			
18.044	12.926	0.342	128	Embankment Fill	Clay-like		0.056			
18.208	12.474	0.440	128	Embankment Fill	Clay-like		0.058			
18.372	17.331	0.604	128	Embankment Fill	Clay-like		0.060			
18.537	23.158	0.837	128	Embankment Fill	Clay-like		0.061			
18.701	30.390	1.135	128	Embankment Fill	Clay-like		0.063			
18.865	31.383	1.016	128	Embankment Fill	Clay-like		0.064			
19.029	62.349	0.533	128	Embankment Fill	Clay-like		0.065			
19.193	61.713	0.855	128	Embankment Fill	Clay-like		0.066			
19.357	30.715	1.947	128	Embankment Fill	Clay-like		0.066			
19.521	42.296	2.193	128	Embankment Fill	Clay-like		0.067			
19.685	70.211	1.387	128	Embankment Fill	Clay-like		0.068			
19.849	20.481	0.792	128	Embankment Fill	Clay-like		0.069			
20.013	25.720	1.209	128	Embankment Fill	Clay-like		0.069			
20.177	45.593	0.692	128	Embankment Fill	Clay-like		0.070			
20.341	38.740	0.888	128	Embankment Fill	Clay-like		0.071			
20.505	27.156	0.791	128	Embankment Fill	Clay-like		0.071			
20.669	23.313	1.018	128	Embankment Fill	Clay-like		0.072			
20.833	73.726	1.839	128	Embankment Fill	Clay-like		0.073			
20.997	75.153	2.153	128	Embankment Fill	Clay-like		0.074			
21.161	43.915	2.329	128	Embankment Fill	Clay-like		0.074			
21.325	30.574	1.425	128	Embankment Fill	Clay-like		0.075			
21.489	24.239	0.995	128	Embankment Fill	Clay-like		0.076			
21.653	26.573	0.928	128	Embankment Fill	Clay-like		0.076			
21.817	36.923	1.042	128	Embankment Fill	Clay-like		0.077			
21.981	43.036	0.929	128	Embankment Fill	Clay-like		0.077			
22.145	28.676	0.772	128	Embankment Fill	Clay-like		0.078			
22.309	20.918	0.758	128	Embankment Fill	Clay-like		0.079			
22.473	15.873	0.495	128	Embankment Fill	Clay-like		0.080			
22.638	15.835	0.498	128	Embankment Fill	Clay-like		0.080			

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
22.802	12.218	0.373	128	Embankment Fill	Clay-like		0.081			
22.966	12.560	0.426	128	Embankment Fill	Clay-like		0.082			
23.130	23.264	0.400	128	Embankment Fill	Clay-like		0.082			
23.294	27.707	0.497	128	Embankment Fill	Clay-like		0.083			
23.458	16.492	0.490	128	Embankment Fill	Clay-like		0.084			
23.622	12.949	0.492	128	Embankment Fill	Clay-like		0.084			
23.786	9.784	0.429	128	Embankment Fill	Clay-like		0.085			
23.950	10.252	0.375	128	Embankment Fill	Clay-like		0.086			
24.114	7.365	0.259	128	Embankment Fill	Clay-like		0.086			
24.278	7.029	0.274	128	Embankment Fill	Clay-like		0.087			
24.442	6.499	0.280	128	Embankment Fill	Clay-like		0.088			
24.606	7.865	0.302	128	Embankment Fill	Clay-like		0.088			
24.770	8.154	0.353	128	Embankment Fill	Clay-like		0.089			
24.934	12.139	0.432	128	Embankment Fill	Clay-like		0.090			
25.098	12.020	0.466	128	Embankment Fill	Clay-like		0.090			
25.262	12.362	0.361	128	Embankment Fill	Clay-like		0.091			
25.426	8.811	0.242	128	Embankment Fill	Clay-like		0.092			
25.590	7.766	0.171	128	Embankment Fill	Clay-like		0.092			
25.754	5.865	0.113	128	Embankment Fill	Clay-like		0.093			
25.918	6.858	0.112	128	Embankment Fill	Clay-like		0.094			
26.082	6.836	0.162	126	Subunit 2	Sand-like		0.094			
26.246	5.911	0.166	126	Subunit 2	Sand-like		0.095			
26.410	8.183	0.132	126	Subunit 2	Sand-like		0.095			
26.574	8.047	0.101	126	Subunit 2	Sand-like		0.096			
26.739	7.381	0.082	126	Subunit 2	Sand-like		0.097			
26.903	6.418	0.076	126	Subunit 2	Sand-like		0.097			
27.067	6.379	0.073	126	Subunit 2	Sand-like		0.098			
27.231	6.598	0.077	126	Subunit 2	Sand-like		0.099			
27.395	6.493	0.082	126	Subunit 2	Sand-like		0.099			
27.559	6.430	0.092	126	Subunit 2	Sand-like		0.100			
27.723	6.799	0.091	126	Subunit 2	Sand-like		0.100			
27.887	6.287	0.095	126	Subunit 2	Sand-like		0.101			
28.051	5.943	0.118	126	Subunit 2	Sand-like		0.102			
28.215	6.445	0.139	126	Subunit 2	Sand-like		0.102			
28.379	6.874	0.143	126	Subunit 2	Sand-like		0.103			
28.543	6.470	0.134	126	Subunit 2	Sand-like		0.103			
28.707	6.466	0.127	126	Subunit 2	Sand-like		0.104			
28.871	6.910	0.133	126	Subunit 2	Sand-like		0.104			
29.035	7.720	0.165	126	Subunit 2	Sand-like		0.105			
29.199	8.910	0.180	126	Subunit 2	Sand-like		0.105			
29.363	9.106	0.248	126	Subunit 2	Sand-like		0.106			
29.527	8.370	0.321	126	Subunit 2	Sand-like		0.106			
29.691	10.791	0.293	126	Subunit 2	Sand-like		0.107			
29.855	9.623	0.268	126	Subunit 2	Sand-like		0.107			
30.019	9.641	0.181	126	Subunit 2	Sand-like		0.108			
30.183	12.309	0.382	126	Subunit 2	Sand-like		0.108			
30.347	14.990	0.365	126	Subunit 2	Sand-like		0.109			
30.511	23.250	0.378	126	Subunit 2	Sand-like		0.110			
30.675	28.617	0.393	126	Subunit 2	Sand-like		0.111			
30.840	30.417	0.287	126	Subunit 2	Sand-like		0.112			
31.004	36.854	0.168	126	Subunit 2	Sand-like		0.113			
31.168	44.469	0.174	126	Subunit 2	Sand-like		0.114			
31.332	57.324	0.268	126	Subunit 2	Sand-like		0.115			
31.496	75.421	0.513	126	Subunit 2	Sand-like		0.115			
31.660	80.956	0.661	126	Subunit 2	Sand-like		0.115			
31.824	83.088	0.782	126	Subunit 2	Sand-like		0.115			
31.988	82.073	0.774	126	Subunit 2	Sand-like		0.115			
32.152	77.346	0.825	126	Subunit 2	Sand-like		0.116			
32.316	68.923	0.933	126	Subunit 2	Sand-like		0.116			
32.480	72.001	0.875	126	Subunit 2	Sand-like		0.116			
32.644	77.585	0.622	126	Subunit 2	Sand-like		0.116			
32.808	78.287	0.348	126	Subunit 2	Sand-like		0.116			
32.972	75.591	0.326	126	Subunit 2	Sand-like		0.117			
33.136	80.350	0.371	126	Subunit 2	Sand-like		0.118			
33.300	89.348	0.525	126	Subunit 2	Sand-like		0.118			
33.464	100.212	0.667	126	Subunit 2	Sand-like		0.119			
33.628	98.632	0.791	126	Subunit 2	Sand-like		0.119			
33.792	91.064	0.656	126	Subunit 2	Sand-like		0.120			
33.956	69.182	0.733	126	Subunit 2	Sand-like		0.120			
34.120	48.107	0.941	126	Subunit 2	Sand-like		0.121			
34.284	41.582	1.107	126	Subunit 2	Sand-like		0.121			
34.448	41.506	0.728	126	Subunit 2	Sand-like		0.122			
34.612	35.012	0.693	126	Subunit 2	Sand-like		0.122			
34.776	30.746	0.706	126	Subunit 2	Sand-like		0.122			
34.941	34.667	1.097	126	Subunit 2	Sand-like		0.123			

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
35.105	39.395	1.105	126	Subunit 2	Sand-like		0.123			
35.269	47.206	0.792	126	Subunit 2	Sand-like		0.124			
35.433	54.056	0.643	126	Subunit 2	Sand-like		0.124			
35.597	49.145	0.354	126	Subunit 2	Sand-like		0.124			
35.761	39.709	0.463	126	Subunit 2	Sand-like		0.125			
35.925	30.944	0.400	126	Subunit 2	Sand-like		0.125			
36.089	27.152	0.302	126	Subunit 2	Sand-like		0.126			
36.253	26.757	0.333	126	Subunit 2	Sand-like		0.126			
36.417	23.583	0.223	126	Subunit 2	Sand-like		0.126			
36.581	21.781	0.137	126	Subunit 2	Sand-like		0.127			
36.745	16.925	0.106	126	Subunit 2	Sand-like		0.127			
36.909	14.163	0.070	126	Subunit 2	Sand-like		0.127			
37.073	12.494	0.080	126	Subunit 2	Sand-like		0.128			
37.237	16.976	0.051	126	Subunit 2	Sand-like		0.128			
37.401	23.097	0.053	126	Subunit 2	Sand-like		0.128			
37.565	23.216	0.138	126	Subunit 2	Sand-like		0.129			
37.729	23.081	0.196	126	Subunit 2	Sand-like		0.129			
37.893	29.324	0.189	126	Subunit 2	Sand-like		0.129			
38.057	36.686	0.138	126	Subunit 2	Sand-like		0.130			
38.221	36.444	0.113	126	Subunit 2	Sand-like		0.130			
38.385	34.617	0.247	126	Subunit 2	Sand-like		0.130			
38.549	32.975	0.510	126	Subunit 2	Sand-like		0.131			
38.713	32.260	0.584	126	Subunit 2	Sand-like		0.131			
38.877	35.917	0.387	126	Subunit 2	Sand-like		0.131			
39.042	26.603	0.337	126	Subunit 2	Sand-like		0.131			
39.206	27.283	0.461	126	Subunit 2	Sand-like		0.132			
39.370	33.126	0.234	126	Subunit 2	Sand-like		0.132			
39.534	43.712	0.269	131	Subunit 3	Sand-like		0.132			
39.698	44.343	0.253	131	Subunit 3	Sand-like		0.132			
39.862	38.765	0.312	131	Subunit 3	Sand-like		0.133			
40.026	31.532	0.286	131	Subunit 3	Sand-like		0.133			
40.190	38.886	0.319	131	Subunit 3	Sand-like		0.133			
40.354	55.731	0.506	131	Subunit 3	Sand-like		0.133			
40.518	74.142	0.613	131	Subunit 3	Sand-like		0.134			
40.682	89.899	0.945	131	Subunit 3	Sand-like		0.134			
40.846	99.308	0.862	131	Subunit 3	Sand-like		0.134			
41.010	97.125	0.847	131	Subunit 3	Sand-like		0.135			
41.174	94.463	0.822	131	Subunit 3	Sand-like		0.135			
41.338	99.543	0.753	131	Subunit 3	Sand-like		0.135			
41.502	109.610	0.762	131	Subunit 3	Sand-like		0.135			
41.666	113.817	0.996	131	Subunit 3	Sand-like		0.135			
41.830	120.754	1.150	131	Subunit 3	Sand-like		0.135			
41.994	127.832	1.277	131	Subunit 3	Sand-like		0.136			
42.158	137.053	1.287	131	Subunit 3	Sand-like		0.136			
42.322	144.521	1.275	131	Subunit 3	Sand-like		0.136			
42.486	150.503	1.017	131	Subunit 3	Sand-like		0.136			
42.650	150.726	1.057	131	Subunit 3	Sand-like		0.136			
42.814	145.668	1.097	131	Subunit 3	Sand-like		0.137			
42.978	144.281	1.190	131	Subunit 3	Sand-like		0.137			
43.143	134.775	1.302	131	Subunit 3	Sand-like		0.137			
43.307	118.775	1.866	131	Subunit 3	Sand-like		0.137			
43.471	115.897	2.300	131	Subunit 3	Sand-like		0.137			
43.635	177.323	1.159	131	Subunit 3	Sand-like		0.136			
43.799	302.608	0.010	131	Subunit 3	Sand-like		0.136			
43.963	488.180	0.010	131	Subunit 3	Sand-like		0.135			

LIQUEFACTION POTENTIAL ASSESSMENT FOR COARSE GRAINED SOILS USING CONE PENETRATION TEST DATA

Facility: KIF TDEC Stability
Project No.: 175668043
CPT ID: CPT-04A

Water Elevation during CPT:	747.0	ft
Depth to Water during CPT:	6.0	ft *(relative to ground surface during CPT)*
Water Elevation during Earthquake:	748.4	ft
Depth to Water during Earthquake:	4.6	ft *(relative to ground surface during CPT)*
Final Grade Elevation during EQ:	752.2	ft *(if no fill, then set this equal to top of CPT hole elev.)*
Height of Final Grade above CPT TOH:	-0.8	ft *(relative to ground surface during CPT, + Fill, - Cut)*
Unit Weight of Cut/Fill to Achieve Final Grade	120	pcf
Cut/Fill Total Stress (+ Fill, - Cut):	-0.05	tsf

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
753.0				Vertical Stresses above 1st CPT:			**0.01**	**-0.04**	**0.00**	**0.00**	**0.01**	**-0.04**
752.8	0.164	204.33	0.15	128	**0.16**	0.09	0.01	-0.04	0.00	0.00	0.01	-0.04
752.7	0.328	415.98	0.42	128	0.25	0.16	0.02	-0.03	0.00	0.00	0.02	-0.03
752.5	0.492	366.54	1.11	128	0.41	0.16	0.03	-0.02	0.00	0.00	0.03	-0.02
752.3	0.656	406.24	0.90	128	0.57	0.16	0.04	-0.01	0.00	0.00	0.04	-0.01
752.2	0.820	283.26	0.81	128	0.74	0.16	0.05	0.00	0.00	0.00	0.05	0.00
752.0	0.984	168.18	1.42	128	0.90	0.16	0.06	0.01	0.00	0.00	0.06	0.01
751.9	1.148	120.54	1.88	128	1.07	0.16	0.07	0.02	0.00	0.00	0.07	0.02
751.7	1.312	110.09	1.96	128	1.23	0.16	0.08	0.04	0.00	0.00	0.08	0.04
751.5	1.476	207.46	1.90	128	1.39	0.16	0.09	0.05	0.00	0.00	0.09	0.05
751.4	1.640	303.44	2.16	128	1.56	0.16	0.10	0.06	0.00	0.00	0.10	0.06
751.2	1.804	246.91	2.51	128	1.72	0.16	0.11	0.07	0.00	0.00	0.11	0.07
751.0	1.968	140.29	2.62	128	1.89	0.16	0.13	0.08	0.00	0.00	0.13	0.08
750.9	2.133	84.51	2.01	128	2.05	0.16	0.14	0.09	0.00	0.00	0.14	0.09
750.7	2.297	139.97	2.75	128	2.21	0.16	0.15	0.10	0.00	0.00	0.15	0.10
750.5	2.461	123.10	2.56	128	2.38	0.16	0.16	0.11	0.00	0.00	0.16	0.11
750.4	2.625	128.58	2.57	128	2.54	0.16	0.17	0.12	0.00	0.00	0.17	0.12
750.2	2.789	291.49	3.10	128	2.71	0.16	0.18	0.13	0.00	0.00	0.18	0.13
750.0	2.953	308.38	2.81	128	2.87	0.16	0.19	0.14	0.00	0.00	0.19	0.14
749.9	3.117	322.10	1.80	128	3.03	0.16	0.20	0.15	0.00	0.00	0.20	0.15
749.7	3.281	249.62	2.26	128	3.20	0.16	0.21	0.16	0.00	0.00	0.21	0.16
749.6	3.445	160.35	2.53	128	3.36	0.16	0.22	0.17	0.00	0.00	0.22	0.17
749.4	3.609	97.05	2.72	128	3.53	0.16	0.23	0.18	0.00	0.00	0.23	0.18
749.2	3.773	60.89	2.27	128	3.69	0.16	0.24	0.19	0.00	0.00	0.24	0.19
749.1	3.937	47.91	2.46	128	3.85	0.16	0.25	0.20	0.00	0.00	0.25	0.20
748.9	4.101	42.15	2.46	128	4.02	0.16	0.26	0.21	0.00	0.00	0.26	0.21
748.7	4.265	44.28	2.43	128	4.18	0.16	0.27	0.22	0.00	0.00	0.27	0.22
748.6	4.429	70.44	1.91	128	4.35	0.16	0.28	0.23	0.00	0.00	0.28	0.23
748.4	4.593	212.95	2.73	128	4.51	0.16	0.29	0.25	0.00	0.00	0.29	0.25
748.2	4.757	169.49	3.09	128	4.68	0.16	0.30	0.26	0.00	0.00	0.30	0.25
748.1	4.921	118.79	3.54	128	4.84	0.16	0.31	0.27	0.00	0.01	0.31	0.26
747.9	5.085	105.30	3.93	128	5.00	0.16	0.32	0.28	0.00	0.02	0.32	0.26
747.8	5.249	95.17	4.23	128	5.17	0.16	0.34	0.29	0.00	0.02	0.34	0.27
747.6	5.413	98.45	4.64	128	5.33	0.16	0.35	0.30	0.00	0.03	0.35	0.27
747.4	5.577	173.94	4.63	128	5.50	0.16	0.36	0.31	0.00	0.03	0.36	0.28
747.3	5.741	170.03	3.96	128	5.66	0.16	0.37	0.32	0.00	0.04	0.37	0.28
747.1	5.905	151.99	5.18	128	5.82	0.16	0.38	0.33	0.00	0.04	0.38	0.29
746.9	6.069	143.53	4.26	128	5.99	0.16	0.39	0.34	0.00	0.05	0.39	0.29
746.8	6.234	85.96	3.98	128	6.15	0.16	0.40	0.35	0.01	0.05	0.39	0.30
746.6	6.398	154.15	4.27	128	6.32	0.16	0.41	0.36	0.01	0.06	0.40	0.30
746.4	6.562	240.94	3.50	128	6.48	0.16	0.42	0.37	0.02	0.06	0.40	0.31
746.3	6.726	197.75	3.62	128	6.64	0.16	0.43	0.38	0.02	0.07	0.41	0.32
746.1	6.890	181.92	3.43	128	6.81	0.16	0.44	0.39	0.03	0.07	0.41	0.32
745.9	7.054	160.84	3.60	128	6.97	0.16	0.45	0.40	0.03	0.08	0.42	0.33
745.8	7.218	146.42	2.80	128	7.14	0.16	0.46	0.41	0.04	0.08	0.42	0.33
745.6	7.382	153.57	2.58	128	7.30	0.16	0.47	0.42	0.04	0.09	0.43	0.34
745.5	7.546	107.35	3.01	128	7.46	0.16	0.48	0.43	0.05	0.09	0.43	0.34
745.3	7.710	76.29	2.63	128	7.63	0.16	0.49	0.44	0.05	0.10	0.44	0.35
745.1	7.874	63.32	1.74	128	7.79	0.16	0.50	0.46	0.06	0.10	0.44	0.35
745.0	8.038	54.14	1.68	128	7.96	0.16	0.51	0.47	0.06	0.11	0.45	0.36
744.8	8.202	185.44	2.44	128	8.12	0.16	0.52	0.48	0.07	0.11	0.46	0.36
744.6	8.366	195.65	3.48	128	8.28	0.16	0.53	0.49	0.07	0.12	0.46	0.37
744.5	8.530	153.53	3.55	128	8.45	0.16	0.55	0.50	0.08	0.12	0.47	0.37
744.3	8.694	92.13	3.82	128	8.61	0.16	0.56	0.51	0.08	0.13	0.47	0.38
744.1	8.858	88.22	2.30	128	8.78	0.16	0.57	0.52	0.09	0.13	0.48	0.39
744.0	9.022	86.27	2.99	128	8.94	0.16	0.58	0.53	0.09	0.14	0.48	0.39
743.8	9.186	71.58	3.94	128	9.10	0.16	0.59	0.54	0.10	0.14	0.49	0.40
743.6	9.350	170.55	3.86	128	9.27	0.16	0.60	0.55	0.10	0.15	0.49	0.40
743.5	9.514	21.71	3.90	128	9.43	0.16	0.61	0.56	0.11	0.15	0.50	0.41

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
743.3	9.678	33.10	2.71	128	9.60	0.16	0.62	0.57	0.11	0.16	0.50	0.41
743.2	9.842	97.03	2.20	128	9.76	0.16	0.63	0.58	0.12	0.16	0.51	0.42
743.0	10.006	106.98	2.01	128	9.92	0.16	0.64	0.59	0.13	0.17	0.51	0.42
742.8	10.170	150.83	1.98	128	10.09	0.16	0.65	0.60	0.13	0.17	0.52	0.43
742.7	10.335	167.57	1.58	128	10.25	0.16	0.66	0.61	0.14	0.18	0.53	0.43
742.5	10.499	125.60	2.99	128	10.42	0.16	0.67	0.62	0.14	0.18	0.53	0.44
742.3	10.663	108.38	1.72	128	10.58	0.16	0.68	0.63	0.15	0.19	0.54	0.44
742.2	10.827	106.68	1.30	128	10.74	0.16	0.69	0.64	0.15	0.19	0.54	0.45
742.0	10.991	84.66	1.51	128	10.91	0.16	0.70	0.65	0.16	0.20	0.55	0.46
741.8	11.155	63.01	2.52	128	11.07	0.16	0.71	0.67	0.16	0.20	0.55	0.46
741.7	11.319	64.21	3.08	128	11.24	0.16	0.72	0.68	0.17	0.21	0.56	0.47
741.5	11.483	106.49	2.40	128	11.40	0.16	0.73	0.69	0.17	0.21	0.56	0.47
741.4	11.647	145.45	2.29	128	11.56	0.16	0.74	0.70	0.18	0.22	0.57	0.48
741.2	11.811	151.98	1.31	128	11.73	0.16	0.76	0.71	0.18	0.22	0.57	0.48
741.0	11.975	125.99	0.81	128	11.89	0.16	0.77	0.72	0.19	0.23	0.58	0.49
740.9	12.139	135.66	0.59	128	12.06	0.16	0.78	0.73	0.19	0.24	0.58	0.49
740.7	12.303	136.84	0.83	128	12.22	0.16	0.79	0.74	0.20	0.24	0.59	0.50
740.5	12.467	100.48	2.11	128	12.39	0.16	0.80	0.75	0.20	0.25	0.60	0.50
740.4	12.631	73.92	2.23	128	12.55	0.16	0.81	0.76	0.21	0.25	0.60	0.51
740.2	12.795	60.19	2.94	128	12.71	0.16	0.82	0.77	0.21	0.26	0.61	0.51
740.0	12.959	111.23	2.60	128	12.88	0.16	0.83	0.78	0.22	0.26	0.61	0.52
739.9	13.123	94.81	2.95	128	13.04	0.16	0.84	0.79	0.22	0.27	0.62	0.53
739.7	13.287	78.93	3.23	128	13.21	0.16	0.85	0.80	0.23	0.27	0.62	0.53
739.5	13.451	69.19	2.90	128	13.37	0.16	0.86	0.81	0.23	0.28	0.63	0.54
739.4	13.615	78.48	3.04	128	13.53	0.16	0.87	0.82	0.24	0.28	0.63	0.54
739.2	13.779	89.21	3.21	128	13.70	0.16	0.88	0.83	0.24	0.29	0.64	0.55
739.1	13.943	81.98	3.18	128	13.86	0.16	0.89	0.84	0.25	0.29	0.64	0.55
738.9	14.107	64.70	2.97	128	14.03	0.16	0.90	0.85	0.25	0.30	0.65	0.56
738.7	14.271	62.63	2.49	128	14.19	0.16	0.91	0.86	0.26	0.30	0.65	0.56
738.6	14.436	58.37	2.40	128	14.35	0.16	0.92	0.88	0.26	0.31	0.66	0.57
738.4	14.600	53.72	2.23	128	14.52	0.16	0.93	0.89	0.27	0.31	0.67	0.57
738.2	14.764	39.15	2.05	128	14.68	0.16	0.94	0.90	0.27	0.32	0.67	0.58
738.1	14.928	31.92	1.59	128	14.85	0.16	0.95	0.91	0.28	0.32	0.68	0.58
737.9	15.092	25.18	1.40	128	15.01	0.16	0.97	0.92	0.28	0.33	0.68	0.59
737.7	15.256	21.17	1.45	128	15.17	0.16	0.98	0.93	0.29	0.33	0.69	0.60
737.6	15.420	31.41	1.58	128	15.34	0.16	0.99	0.94	0.29	0.34	0.69	0.60
737.4	15.584	35.64	1.63	128	15.50	0.16	1.00	0.95	0.30	0.34	0.70	0.61
737.3	15.748	20.57	1.48	128	15.67	0.16	1.01	0.96	0.30	0.35	0.70	0.61
737.1	15.912	21.20	0.89	128	15.83	0.16	1.02	0.97	0.31	0.35	0.71	0.62
736.9	16.076	22.84	0.86	128	15.99	0.16	1.03	0.98	0.31	0.36	0.71	0.62
736.8	16.240	22.83	0.63	128	16.16	0.16	1.04	0.99	0.32	0.36	0.72	0.63
736.6	16.404	17.52	0.68	128	16.32	0.16	1.05	1.00	0.32	0.37	0.72	0.63
736.4	16.568	20.54	0.75	128	16.49	0.16	1.06	1.01	0.33	0.37	0.73	0.64
736.3	16.732	18.68	0.65	128	16.65	0.16	1.07	1.02	0.33	0.38	0.74	0.64
736.1	16.896	14.59	0.54	128	16.81	0.16	1.08	1.03	0.34	0.38	0.74	0.65
735.9	17.060	12.83	0.48	128	16.98	0.16	1.09	1.04	0.35	0.39	0.75	0.65
735.8	17.224	8.86	0.35	128	17.14	0.16	1.10	1.05	0.35	0.39	0.75	0.66
735.6	17.388	11.92	0.27	128	17.31	0.16	1.11	1.06	0.36	0.40	0.76	0.67
735.4	17.552	13.00	0.26	128	17.47	0.16	1.12	1.07	0.36	0.40	0.76	0.67
735.3	17.716	9.10	0.39	128	17.63	0.16	1.13	1.09	0.37	0.41	0.77	0.68
735.1	17.880	10.10	0.40	128	17.80	0.16	1.14	1.10	0.37	0.41	0.77	0.68
735.0	18.044	12.93	0.34	128	17.96	0.16	1.15	1.11	0.38	0.42	0.78	0.69
734.8	18.208	12.47	0.44	128	18.13	0.16	1.16	1.12	0.38	0.42	0.78	0.69
734.6	18.372	17.33	0.60	128	18.29	0.16	1.18	1.13	0.39	0.43	0.79	0.70
734.5	18.537	23.16	0.84	128	18.45	0.16	1.19	1.14	0.39	0.43	0.79	0.70
734.3	18.701	30.39	1.14	128	18.62	0.16	1.20	1.15	0.40	0.44	0.80	0.71
734.1	18.865	31.38	1.02	128	18.78	0.16	1.21	1.16	0.40	0.45	0.81	0.71
734.0	19.029	62.35	0.53	128	18.95	0.16	1.22	1.17	0.41	0.45	0.81	0.72
733.8	19.193	61.71	0.86	128	19.11	0.16	1.23	1.18	0.41	0.46	0.82	0.72
733.6	19.357	30.72	1.95	128	19.27	0.16	1.24	1.19	0.42	0.46	0.82	0.73
733.5	19.521	42.30	2.19	128	19.44	0.16	1.25	1.20	0.42	0.47	0.83	0.74
733.3	19.685	70.21	1.39	128	19.60	0.16	1.26	1.21	0.43	0.47	0.83	0.74
733.2	19.849	20.48	0.79	128	19.77	0.16	1.27	1.22	0.43	0.48	0.84	0.75
733.0	20.013	25.72	1.21	128	19.93	0.16	1.28	1.23	0.44	0.48	0.84	0.75
732.8	20.177	45.59	0.69	128	20.09	0.16	1.29	1.24	0.44	0.49	0.85	0.76
732.7	20.341	38.74	0.89	128	20.26	0.16	1.30	1.25	0.45	0.49	0.85	0.76
732.5	20.505	27.16	0.79	128	20.42	0.16	1.31	1.26	0.45	0.50	0.86	0.77
732.3	20.669	23.31	1.02	128	20.59	0.16	1.32	1.27	0.46	0.50	0.86	0.77
732.2	20.833	73.73	1.84	128	20.75	0.16	1.33	1.28	0.46	0.51	0.87	0.78

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
732.0	20.997	75.15	2.15	128	20.92	0.16	1.34	1.30	0.47	0.51	0.88	0.78
731.8	21.161	43.91	2.33	128	21.08	0.16	1.35	1.31	0.47	0.52	0.88	0.79
731.7	21.325	30.57	1.43	128	21.24	0.16	1.36	1.32	0.48	0.52	0.89	0.79
731.5	21.489	24.24	1.00	128	21.41	0.16	1.37	1.33	0.48	0.53	0.89	0.80
731.3	21.653	26.57	0.93	128	21.57	0.16	1.39	1.34	0.49	0.53	0.90	0.81
731.2	21.817	36.92	1.04	128	21.74	0.16	1.40	1.35	0.49	0.54	0.90	0.81
731.0	21.981	43.04	0.93	128	21.90	0.16	1.41	1.36	0.50	0.54	0.91	0.82
730.9	22.145	28.68	0.77	128	22.06	0.16	1.42	1.37	0.50	0.55	0.91	0.82
730.7	22.309	20.92	0.76	128	22.23	0.16	1.43	1.38	0.51	0.55	0.92	0.83
730.5	22.473	15.87	0.50	128	22.39	0.16	1.44	1.39	0.51	0.56	0.92	0.83
730.4	22.638	15.83	0.50	128	22.56	0.16	1.45	1.40	0.52	0.56	0.93	0.84
730.2	22.802	12.22	0.37	128	22.72	0.16	1.46	1.41	0.52	0.57	0.93	0.84
730.0	22.966	12.56	0.43	128	22.88	0.16	1.47	1.42	0.53	0.57	0.94	0.85
729.9	23.130	23.26	0.40	128	23.05	0.16	1.48	1.43	0.53	0.58	0.95	0.85
729.7	23.294	27.71	0.50	128	23.21	0.16	1.49	1.44	0.54	0.58	0.95	0.86
729.5	23.458	16.49	0.49	128	23.38	0.16	1.50	1.45	0.54	0.59	0.96	0.86
729.4	23.622	12.95	0.49	128	23.54	0.16	1.51	1.46	0.55	0.59	0.96	0.87
729.2	23.786	9.78	0.43	128	23.70	0.16	1.52	1.47	0.55	0.60	0.97	0.88
729.1	23.950	10.25	0.38	128	23.87	0.16	1.53	1.48	0.56	0.60	0.97	0.88
728.9	24.114	7.37	0.26	128	24.03	0.16	1.54	1.49	0.57	0.61	0.98	0.89
728.7	24.278	7.03	0.27	128	24.20	0.16	1.55	1.51	0.57	0.61	0.98	0.89
728.6	24.442	6.50	0.28	128	24.36	0.16	1.56	1.52	0.58	0.62	0.99	0.90
728.4	24.606	7.86	0.30	128	24.52	0.16	1.57	1.53	0.58	0.62	0.99	0.90
728.2	24.770	8.15	0.35	128	24.69	0.16	1.58	1.54	0.59	0.63	1.00	0.91
728.1	24.934	12.14	0.43	128	24.85	0.16	1.60	1.55	0.59	0.63	1.00	0.91
727.9	25.098	12.02	0.47	128	25.02	0.16	1.61	1.56	0.60	0.64	1.01	0.92
727.7	25.262	12.36	0.36	128	25.18	0.16	1.62	1.57	0.60	0.64	1.02	0.92
727.6	25.426	8.81	0.24	128	25.34	0.16	1.63	1.58	0.61	0.65	1.02	0.93
727.4	25.590	7.77	0.17	128	25.51	0.16	1.64	1.59	0.61	0.65	1.03	0.93
727.2	25.754	5.87	0.11	128	25.67	0.16	1.65	1.60	0.62	0.66	1.03	0.94
727.1	25.918	6.86	0.11	128	25.84	0.16	1.66	1.61	0.62	0.67	1.04	0.95
726.9	26.082	6.84	0.16	126	26.00	0.16	1.67	1.62	0.63	0.67	1.04	0.95
726.8	26.246	5.91	0.17	126	26.16	0.16	1.68	1.63	0.63	0.68	1.05	0.96
726.6	26.410	8.18	0.13	126	26.33	0.16	1.69	1.64	0.64	0.68	1.05	0.96
726.4	26.574	8.05	0.10	126	26.49	0.16	1.70	1.65	0.64	0.69	1.06	0.97
726.3	26.739	7.38	0.08	126	26.66	0.16	1.71	1.66	0.65	0.69	1.06	0.97
726.1	26.903	6.42	0.08	126	26.82	0.16	1.72	1.67	0.65	0.70	1.07	0.98
725.9	27.067	6.38	0.07	126	26.98	0.16	1.73	1.68	0.66	0.70	1.07	0.98
725.8	27.231	6.60	0.08	126	27.15	0.16	1.74	1.69	0.66	0.71	1.08	0.99
725.6	27.395	6.49	0.08	126	27.31	0.16	1.75	1.70	0.67	0.71	1.08	0.99
725.4	27.559	6.43	0.09	126	27.48	0.16	1.76	1.71	0.67	0.72	1.09	1.00
725.3	27.723	6.80	0.09	126	27.64	0.16	1.77	1.72	0.68	0.72	1.09	1.00
725.1	27.887	6.29	0.10	126	27.80	0.16	1.78	1.73	0.68	0.73	1.10	1.01
724.9	28.051	5.94	0.12	126	27.97	0.16	1.79	1.74	0.69	0.73	1.10	1.01
724.8	28.215	6.44	0.14	126	28.13	0.16	1.80	1.75	0.69	0.74	1.11	1.02
724.6	28.379	6.87	0.14	126	28.30	0.16	1.81	1.77	0.70	0.74	1.12	1.02
724.5	28.543	6.47	0.13	126	28.46	0.16	1.82	1.78	0.70	0.75	1.12	1.03
724.3	28.707	6.47	0.13	126	28.62	0.16	1.83	1.79	0.71	0.75	1.13	1.03
724.1	28.871	6.91	0.13	126	28.79	0.16	1.84	1.80	0.71	0.76	1.13	1.04
724.0	29.035	7.72	0.17	126	28.95	0.16	1.85	1.81	0.72	0.76	1.14	1.04
723.8	29.199	8.91	0.18	126	29.12	0.16	1.86	1.82	0.72	0.77	1.14	1.05
723.6	29.363	9.11	0.25	126	29.28	0.16	1.88	1.83	0.73	0.77	1.15	1.05
723.5	29.527	8.37	0.32	126	29.45	0.16	1.89	1.84	0.73	0.78	1.15	1.06
723.3	29.691	10.79	0.29	126	29.61	0.16	1.90	1.85	0.74	0.78	1.16	1.07
723.1	29.855	9.62	0.27	126	29.77	0.16	1.91	1.86	0.74	0.79	1.16	1.07
723.0	30.019	9.64	0.18	126	29.94	0.16	1.92	1.87	0.75	0.79	1.17	1.08
722.8	30.183	12.31	0.38	126	30.10	0.16	1.93	1.88	0.75	0.80	1.17	1.08
722.7	30.347	14.99	0.37	126	30.27	0.16	1.94	1.89	0.76	0.80	1.18	1.09
722.5	30.511	23.25	0.38	126	30.43	0.16	1.95	1.90	0.76	0.81	1.18	1.09
722.3	30.675	28.62	0.39	126	30.59	0.16	1.96	1.91	0.77	0.81	1.19	1.10
722.2	30.840	30.42	0.29	126	30.76	0.16	1.97	1.92	0.77	0.82	1.19	1.10
722.0	31.004	36.85	0.17	126	30.92	0.16	1.98	1.93	0.78	0.82	1.20	1.11
721.8	31.168	44.47	0.17	126	31.09	0.16	1.99	1.94	0.79	0.83	1.20	1.11
721.7	31.332	57.32	0.27	126	31.25	0.16	2.00	1.95	0.79	0.83	1.21	1.12
721.5	31.496	75.42	0.51	126	31.41	0.16	2.01	1.96	0.80	0.84	1.21	1.12
721.3	31.660	80.96	0.66	126	31.58	0.16	2.02	1.97	0.80	0.84	1.22	1.13
721.2	31.824	83.09	0.78	126	31.74	0.16	2.03	1.98	0.81	0.85	1.22	1.13
721.0	31.988	82.07	0.77	126	31.91	0.16	2.04	1.99	0.81	0.85	1.23	1.14
720.8	32.152	77.35	0.83	126	32.07	0.16	2.05	2.00	0.82	0.86	1.23	1.14

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
720.7	32.316	68.92	0.93	126	32.23	0.16	2.06	2.01	0.82	0.86	1.24	1.15
720.5	32.480	72.00	0.88	126	32.40	0.16	2.07	2.02	0.83	0.87	1.25	1.15
720.4	32.644	77.58	0.62	126	32.56	0.16	2.08	2.03	0.83	0.87	1.25	1.16
720.2	32.808	78.29	0.35	126	32.73	0.16	2.09	2.04	0.84	0.88	1.26	1.16
720.0	32.972	75.59	0.33	126	32.89	0.16	2.10	2.05	0.84	0.89	1.26	1.17
719.9	33.136	80.35	0.37	126	33.05	0.16	2.11	2.06	0.85	0.89	1.27	1.17
719.7	33.300	89.35	0.53	126	33.22	0.16	2.12	2.08	0.85	0.90	1.27	1.18
719.5	33.464	100.21	0.67	126	33.38	0.16	2.13	2.09	0.86	0.90	1.28	1.19
719.4	33.628	98.63	0.79	126	33.55	0.16	2.14	2.10	0.86	0.91	1.28	1.19
719.2	33.792	91.06	0.66	126	33.71	0.16	2.15	2.11	0.87	0.91	1.29	1.20
719.0	33.956	69.18	0.73	126	33.87	0.16	2.16	2.12	0.87	0.92	1.29	1.20
718.9	34.120	48.11	0.94	126	34.04	0.16	2.17	2.13	0.88	0.92	1.30	1.21
718.7	34.284	41.58	1.11	126	34.20	0.16	2.19	2.14	0.88	0.93	1.30	1.21
718.6	34.448	41.51	0.73	126	34.37	0.16	2.20	2.15	0.89	0.93	1.31	1.22
718.4	34.612	35.01	0.69	126	34.53	0.16	2.21	2.16	0.89	0.94	1.31	1.22
718.2	34.776	30.75	0.71	126	34.69	0.16	2.22	2.17	0.90	0.94	1.32	1.23
718.1	34.941	34.67	1.10	126	34.86	0.16	2.23	2.18	0.90	0.95	1.32	1.23
717.9	35.105	39.40	1.11	126	35.02	0.16	2.24	2.19	0.91	0.95	1.33	1.24
717.7	35.269	47.21	0.79	126	35.19	0.16	2.25	2.20	0.91	0.96	1.33	1.24
717.6	35.433	54.06	0.64	126	35.35	0.16	2.26	2.21	0.92	0.96	1.34	1.25
717.4	35.597	49.15	0.35	126	35.51	0.16	2.27	2.22	0.92	0.97	1.34	1.25
717.2	35.761	39.71	0.46	126	35.68	0.16	2.28	2.23	0.93	0.97	1.35	1.26
717.1	35.925	30.94	0.40	126	35.84	0.16	2.29	2.24	0.93	0.98	1.35	1.26
716.9	36.089	27.15	0.30	126	36.01	0.16	2.30	2.25	0.94	0.98	1.36	1.27
716.7	36.253	26.76	0.33	126	36.17	0.16	2.31	2.26	0.94	0.99	1.37	1.27
716.6	36.417	23.58	0.22	126	36.33	0.16	2.32	2.27	0.95	0.99	1.37	1.28
716.4	36.581	21.78	0.14	126	36.50	0.16	2.33	2.28	0.95	1.00	1.38	1.28
716.3	36.745	16.93	0.11	126	36.66	0.16	2.34	2.29	0.96	1.00	1.38	1.29
716.1	36.909	14.16	0.07	126	36.83	0.16	2.35	2.30	0.96	1.01	1.39	1.29
715.9	37.073	12.49	0.08	126	36.99	0.16	2.36	2.31	0.97	1.01	1.39	1.30
715.8	37.237	16.98	0.05	126	37.16	0.16	2.37	2.32	0.97	1.02	1.40	1.31
715.6	37.401	23.10	0.05	126	37.32	0.16	2.38	2.33	0.98	1.02	1.40	1.31
715.4	37.565	23.22	0.14	126	37.48	0.16	2.39	2.34	0.98	1.03	1.41	1.32
715.3	37.729	23.08	0.20	126	37.65	0.16	2.40	2.35	0.99	1.03	1.41	1.32
715.1	37.893	29.32	0.19	126	37.81	0.16	2.41	2.36	1.00	1.04	1.42	1.33
714.9	38.057	36.69	0.14	126	37.98	0.16	2.42	2.37	1.00	1.04	1.42	1.33
714.8	38.221	36.44	0.11	126	38.14	0.16	2.43	2.39	1.01	1.05	1.43	1.34
714.6	38.385	34.62	0.25	126	38.30	0.16	2.44	2.40	1.01	1.05	1.43	1.34
714.5	38.549	32.97	0.51	126	38.47	0.16	2.45	2.41	1.02	1.06	1.44	1.35
714.3	38.713	32.26	0.58	126	38.63	0.16	2.46	2.42	1.02	1.06	1.44	1.35
714.1	38.877	35.92	0.39	126	38.80	0.16	2.47	2.43	1.03	1.07	1.45	1.36
714.0	39.042	26.60	0.34	126	38.96	0.16	2.48	2.44	1.03	1.07	1.45	1.36
713.8	39.206	27.28	0.46	126	39.12	0.16	2.50	2.45	1.04	1.08	1.46	1.37
713.6	39.370	33.13	0.23	126	39.29	0.16	2.51	2.46	1.04	1.08	1.46	1.37
713.5	39.534	43.71	0.27	131	39.45	0.16	2.52	2.47	1.05	1.09	1.47	1.38
713.3	39.698	44.34	0.25	131	39.62	0.16	2.53	2.48	1.05	1.10	1.48	1.38
713.1	39.862	38.77	0.31	131	39.78	0.16	2.54	2.49	1.06	1.10	1.48	1.39
713.0	40.026	31.53	0.29	131	39.94	0.16	2.55	2.50	1.06	1.11	1.49	1.40
712.8	40.190	38.89	0.32	131	40.11	0.16	2.56	2.51	1.07	1.11	1.49	1.40
712.6	40.354	55.73	0.51	131	40.27	0.16	2.57	2.52	1.07	1.12	1.50	1.41
712.5	40.518	74.14	0.61	131	40.44	0.16	2.58	2.53	1.08	1.12	1.50	1.41
712.3	40.682	89.90	0.95	131	40.60	0.16	2.59	2.54	1.08	1.13	1.51	1.42
712.2	40.846	99.31	0.86	131	40.76	0.16	2.60	2.55	1.09	1.13	1.51	1.42
712.0	41.010	97.12	0.85	131	40.93	0.16	2.61	2.56	1.09	1.14	1.52	1.43
711.8	41.174	94.46	0.82	131	41.09	0.16	2.62	2.58	1.10	1.14	1.53	1.43
711.7	41.338	99.54	0.75	131	41.26	0.16	2.63	2.59	1.10	1.15	1.53	1.44
711.5	41.502	109.61	0.76	131	41.42	0.16	2.65	2.60	1.11	1.15	1.54	1.45
711.3	41.666	113.82	1.00	131	41.58	0.16	2.66	2.61	1.11	1.16	1.54	1.45
711.2	41.830	120.75	1.15	131	41.75	0.16	2.67	2.62	1.12	1.16	1.55	1.46
711.0	41.994	127.83	1.28	131	41.91	0.16	2.68	2.63	1.12	1.17	1.55	1.46
710.8	42.158	137.05	1.29	131	42.08	0.16	2.69	2.64	1.13	1.17	1.56	1.47
710.7	42.322	144.52	1.28	131	42.24	0.16	2.70	2.65	1.13	1.18	1.57	1.47
710.5	42.486	150.50	1.02	131	42.40	0.16	2.71	2.66	1.14	1.18	1.57	1.48
710.3	42.650	150.73	1.06	131	42.57	0.16	2.72	2.67	1.14	1.19	1.58	1.49
710.2	42.814	145.67	1.10	131	42.73	0.16	2.73	2.68	1.15	1.19	1.58	1.49
710.0	42.978	144.28	1.19	131	42.90	0.16	2.74	2.69	1.15	1.20	1.59	1.50
709.9	43.143	134.78	1.30	131	43.06	0.16	2.75	2.70	1.16	1.20	1.59	1.50
709.7	43.307	118.78	1.87	131	43.22	0.16	2.76	2.72	1.16	1.21	1.60	1.51
709.5	43.471	115.90	2.30	131	43.39	0.16	2.77	2.73	1.17	1.21	1.60	1.51

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
709.4	43.635	177.32	1.16	131	43.55	0.16	2.78	2.74	1.17	1.22	1.61	1.52
709.2	43.799	302.61	0.01	131	43.72	0.16	2.80	2.75	1.18	1.22	1.62	1.52
709.0	43.963	488.18	0.01	131	43.88	0.08	2.81	2.76	1.18	1.23	1.62	1.53

LIQUEFACTION POTENTIAL ASSESSMENT FOR COARSE GRAINED SOILS USING CONE PENETRATION TEST DATA

Project Site: KIF TDEC Stability
Project No.: 175668043
CPT ID: CPT-04A

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
753.0												
752.8	0.164	2000.58	0.15	0.43	0.5	1.70	328.31	0	0.00	328.31	0.054	#NUM!
752.7	0.328	2834.32	0.15	0.40	0.5	1.70	668.40	0	0.00	668.40	0.051	#NUM!
752.5	0.492	2028.50	0.30	0.72	0.5	1.70	588.96	0	0.00	588.96	0.048	#NUM!
752.3	0.656	1941.93	0.22	0.59	0.5	1.70	652.75	0	0.00	652.75	0.046	#NUM!
752.2	0.820	1209.14	0.29	0.78	0.5	1.70	455.14	0	0.00	455.14	0.043	-0.600
752.0	0.984	654.54	0.85	1.32	0.5	1.70	270.22	0	0.00	270.22	0.040	-0.600
751.9	1.148	433.93	1.56	1.64	0.5	1.70	193.69	0	0.00	193.69	0.038	-0.600
751.7	1.312	370.43	1.78	1.73	0.5	1.70	176.89	1	0.00	176.89	0.035	-0.600
751.5	1.476	658.09	0.92	1.35	0.5	1.70	333.35	0	0.00	333.35	0.032	-0.600
751.4	1.640	912.93	0.71	1.19	0.5	1.70	487.56	0	0.00	487.56	0.030	-0.600
751.2	1.804	708.00	1.02	1.38	0.5	1.70	396.73	0	0.00	396.73	0.027	-0.600
751.0	1.968	384.90	1.87	1.73	0.5	1.70	225.42	2	0.00	225.42	0.029	-0.600
750.9	2.133	222.55	2.39	1.95	0.5	1.70	135.79	19	39.63	175.42	0.031	-0.600
750.7	2.297	355.34	1.97	1.77	0.5	1.70	224.90	5	0.13	225.03	0.033	-0.600
750.5	2.461	301.82	2.08	1.83	0.5	1.70	197.80	9	8.12	205.92	0.036	-0.600
750.4	2.625	305.18	2.00	1.81	0.5	1.70	206.60	8	4.28	210.88	0.038	-0.600
750.2	2.789	671.59	1.07	1.40	0.5	1.60	440.37	0	0.00	440.37	0.040	-0.600
750.0	2.953	690.42	0.91	1.34	0.5	1.57	458.92	0	0.00	458.92	0.040	-0.600
749.9	3.117	701.83	0.56	1.15	0.5	1.55	472.54	0	0.00	472.54	0.039	-0.600
749.7	3.281	529.98	0.91	1.39	0.5	1.53	361.29	0	0.00	361.29	0.038	-0.600
749.6	3.445	332.04	1.58	1.71	0.5	1.56	236.52	0	0.00	236.52	0.037	-0.600
749.4	3.609	196.13	2.81	2.04	0.5	1.62	149.03	26	59.07	208.10	0.036	-0.600
749.2	3.773	120.14	3.74	2.27	0.5	1.70	97.83	45	68.78	166.61	0.034	-0.600
749.1	3.937	92.41	5.16	2.45	0.5	1.70	76.97	59	69.94	146.91	0.032	-0.588
748.9	4.101	79.59	5.88	2.53	0.5	1.70	67.73	66	69.31	137.04	0.029	-0.554
748.7	4.265	81.98	5.53	2.50	0.5	1.70	71.15	63	69.67	140.81	0.027	-0.566
748.6	4.429	128.26	2.72	2.14	0.5	1.63	108.42	34	62.76	171.17	0.024	-0.600
748.4	4.593	381.74	1.28	1.60	0.5	1.40	282.05	0	0.00	282.05	0.022	-0.600
748.2	4.757	298.41	1.83	1.79	0.5	1.44	230.06	6	0.73	230.79	0.019	-0.600
748.1	4.921	205.44	2.99	2.05	0.5	1.44	161.22	27	62.92	224.14	0.016	-0.600
747.9	5.085	179.07	3.74	2.17	0.5	1.44	143.23	36	72.76	215.99	0.012	-0.600
747.8	5.249	159.22	4.46	2.26	0.5	1.45	130.01	44	76.33	206.34	0.013	-0.600
747.6	5.413	162.18	4.73	2.28	0.5	1.42	132.41	45	77.91	210.31	0.014	-0.600
747.4	5.577	282.71	2.67	1.94	0.5	1.33	218.88	18	45.07	263.95	0.012	-0.600
747.3	5.741	272.34	2.33	1.90	0.5	1.33	214.51	15	31.16	245.67	0.010	-0.600
747.1	5.905	239.96	3.41	2.06	0.5	1.31	188.41	28	69.98	258.38	0.007	-0.600
746.9	6.069	224.10	2.97	2.03	0.5	1.32	179.44	25	62.38	241.82	0.005	-0.600
746.8	6.234	133.02	4.65	2.32	0.5	1.41	114.29	48	75.43	189.73	0.004	-0.600
746.6	6.398	237.41	2.78	1.99	0.5	1.31	190.24	22	56.26	246.50	0.003	-0.600
746.4	6.562	368.91	1.46	1.65	0.5	1.29	293.77	0	0.00	293.77	0.002	-0.600
746.3	6.726	300.63	1.84	1.79	0.5	1.30	243.00	6	0.73	243.74	0.001	-0.600
746.1	6.890	274.70	1.89	1.82	0.5	1.31	225.84	8	5.46	231.30	0.001	-0.600
745.9	7.054	241.20	2.25	1.91	0.5	1.31	198.44	16	35.00	233.44	0.001	-0.600
745.8	7.218	218.11	1.92	1.88	0.5	1.34	185.06	13	23.89	208.95	0.002	-0.600
745.6	7.382	227.33	1.68	1.83	0.5	1.34	194.92	9	7.04	201.96	0.003	-0.600
745.5	7.546	157.71	2.82	2.10	0.5	1.34	135.98	31	64.29	200.27	0.005	-0.600
745.3	7.710	111.16	3.48	2.26	0.5	1.39	100.04	44	69.10	169.14	0.006	-0.600
745.1	7.874	91.56	2.76	2.24	0.5	1.42	84.94	43	64.21	149.15	0.008	-0.584
745.0	8.038	77.70	3.14	2.33	0.5	1.43	73.38	50	65.27	138.65	0.009	-0.550
744.8	8.202	266.35	1.32	1.70	0.5	1.28	225.10	0	0.00	225.10	0.011	-0.600
744.6	8.366	279.39	1.78	1.79	0.5	1.27	234.22	6	1.33	235.54	0.011	-0.600
744.5	8.530	217.79	2.32	1.95	0.5	1.27	184.39	19	44.47	228.86	0.012	-0.600
744.3	8.694	129.62	4.17	2.29	0.5	1.32	114.96	46	74.05	189.01	0.013	-0.600
744.1	8.858	123.38	2.63	2.14	0.5	1.34	111.44	34	63.39	174.83	0.014	-0.600
744.0	9.022	119.94	3.48	2.25	0.5	1.33	108.12	43	70.03	178.15	0.015	-0.600
743.8	9.186	98.82	5.55	2.46	0.5	1.34	90.75	60	74.00	164.74	0.016	-0.600
743.6	9.350	235.27	2.27	1.92	0.5	1.24	199.79	17	38.49	238.28	0.017	-0.600
743.5	9.514	42.32	18.48	3.10	1.0	1.47	30.17	100	63.30	93.47	0.018	-0.373
743.3	9.678	64.44	8.35	2.71	1.0	1.42	44.54	80	65.32	109.87	0.019	-0.442
743.2	9.842	131.31	2.28	2.08	0.5	1.30	119.31	29	58.35	177.66	0.020	-0.600

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
743.0	10.006	144.10	1.89	1.99	0.5	1.30	131.04	22	46.70	177.75	0.021	-0.600
742.8	10.170	202.44	1.32	1.77	0.5	1.28	183.04	5	0.19	183.23	0.022	-0.600
742.7	10.335	223.84	0.94	1.64	0.5	1.26	199.47	0	0.00	199.47	0.024	-0.600
742.5	10.499	166.68	2.39	2.03	0.5	1.25	148.27	25	56.60	204.87	0.025	-0.600
742.3	10.663	142.97	1.60	1.94	0.5	1.29	132.14	18	35.58	167.72	0.026	-0.600
742.2	10.827	140.00	1.22	1.86	0.5	1.31	132.43	12	14.82	147.26	0.027	-0.573
742.0	10.991	110.35	1.80	2.05	0.5	1.30	103.72	27	52.07	155.79	0.028	-0.599
741.8	11.155	81.48	4.04	2.40	0.5	1.30	77.67	55	68.75	146.42	0.029	-0.570
741.7	11.319	82.63	4.86	2.46	0.5	1.30	78.59	60	70.65	149.25	0.030	-0.578
741.5	11.483	137.01	2.27	2.06	0.5	1.25	125.63	28	57.90	183.53	0.031	-0.600
741.4	11.647	186.57	1.58	1.86	0.5	1.24	170.61	12	15.62	186.23	0.032	-0.600
741.2	11.811	194.06	0.87	1.66	0.5	1.24	178.84	0	0.00	178.84	0.033	-0.600
741.0	11.975	159.94	0.64	1.63	0.5	1.27	151.54	0	0.00	151.54	0.034	-0.585
740.9	12.139	171.49	0.44	1.51	0.5	1.26	161.10	0	0.00	161.10	0.035	-0.600
740.7	12.303	172.19	0.61	1.59	0.5	1.25	161.82	0	0.00	161.82	0.035	-0.600
740.5	12.467	125.59	2.11	2.07	0.5	1.23	117.21	28	56.36	173.57	0.036	-0.600
740.4	12.631	91.70	3.04	2.27	0.5	1.25	87.43	45	66.42	153.85	0.037	-0.591
740.2	12.795	74.13	4.96	2.50	0.5	1.26	71.77	63	69.64	141.40	0.038	-0.551
740.0	12.959	137.24	2.35	2.08	0.5	1.21	127.15	29	59.61	186.76	0.039	-0.600
739.9	13.123	116.31	3.14	2.22	0.5	1.21	108.84	40	68.54	177.38	0.040	-0.600
739.7	13.287	96.23	4.14	2.36	0.5	1.23	91.40	52	71.19	162.59	0.040	-0.600
739.5	13.451	83.85	4.25	2.41	0.5	1.23	80.66	56	69.85	150.51	0.041	-0.579
739.4	13.615	94.83	3.91	2.35	0.5	1.22	90.41	51	70.37	160.78	0.041	-0.600
739.2	13.779	107.47	3.63	2.29	0.5	1.20	101.54	46	70.72	172.26	0.042	-0.600
739.1	13.943	98.25	3.92	2.34	0.5	1.21	93.57	50	70.84	164.41	0.043	-0.600
738.9	14.107	76.97	4.66	2.46	0.5	1.22	74.77	60	69.73	144.50	0.043	-0.559
738.7	14.271	74.16	4.03	2.43	0.5	1.22	72.38	57	68.06	140.44	0.044	-0.545
738.6	14.436	68.74	4.18	2.46	0.5	1.22	67.52	60	67.61	135.13	0.045	-0.527
738.4	14.600	62.91	4.22	2.49	0.5	1.23	62.24	62	66.81	129.05	0.046	-0.506
738.2	14.764	49.68	5.37	2.64	0.7	1.24	45.94	74	64.75	110.69	0.047	-0.437
738.1	14.928	45.80	5.13	2.65	1.0	1.25	37.69	75	62.45	100.15	0.047	-0.394
737.9	15.092	35.53	5.79	2.76	1.0	1.26	29.88	84	61.48	91.36	0.048	-0.355
737.7	15.256	29.40	7.16	2.88	1.0	1.26	25.15	94	61.15	86.31	0.049	-0.331
737.6	15.420	43.95	5.18	2.66	1.0	1.24	36.70	76	62.36	99.06	0.050	-0.389
737.4	15.584	43.83	4.69	2.63	0.7	1.23	41.27	73	63.29	104.56	0.051	-0.411
737.3	15.748	27.83	7.54	2.92	1.0	1.24	24.17	96	61.10	85.27	0.052	-0.326
737.1	15.912	28.49	4.39	2.74	1.0	1.24	24.82	83	59.79	84.61	0.053	-0.322
736.9	16.076	30.56	3.94	2.69	1.0	1.23	26.59	78	59.72	86.31	0.054	-0.330
736.8	16.240	30.30	2.90	2.60	1.0	1.23	26.51	71	58.58	85.09	0.054	-0.324
736.6	16.404	22.73	4.12	2.80	1.0	1.23	20.37	87	58.98	79.35	0.055	-0.296
736.4	16.568	26.68	3.85	2.73	1.0	1.22	23.70	81	59.27	82.97	0.056	-0.313
736.3	16.732	23.95	3.70	2.75	1.0	1.22	21.53	83	58.87	80.40	0.056	-0.301
736.1	16.896	18.24	3.98	2.86	1.0	1.22	16.83	92	58.43	75.26	0.056	-0.274
735.9	17.060	15.73	4.12	2.92	1.0	1.22	14.77	97	58.24	73.00	0.056	-0.262
735.8	17.224	10.32	4.46	3.09	1.0	1.22	10.21	100	57.10	67.32	0.056	-0.230
735.6	17.388	14.28	2.51	2.83	1.0	1.21	13.64	89	57.16	70.80	0.055	-0.249
735.4	17.552	15.58	2.18	2.76	1.0	1.20	14.81	84	56.92	71.73	0.055	-0.254
735.3	17.716	10.38	4.92	3.11	1.0	1.20	10.37	100	57.15	67.52	0.055	-0.231
735.1	17.880	11.59	4.45	3.05	1.0	1.20	11.44	100	57.49	68.93	0.055	-0.238
735.0	18.044	15.12	2.91	2.84	1.0	1.19	14.54	90	57.57	72.11	0.056	-0.256
734.8	18.208	14.43	3.89	2.94	1.0	1.19	13.98	98	58.09	72.07	0.058	-0.255
734.6	18.372	20.47	3.74	2.81	1.0	1.18	19.25	87	58.70	77.95	0.060	-0.286
734.5	18.537	27.65	3.81	2.71	1.0	1.16	25.49	80	59.65	85.14	0.061	-0.322
734.3	18.701	36.50	3.89	2.63	1.0	1.15	33.14	73	60.89	94.02	0.063	-0.362
734.1	18.865	34.53	3.37	2.60	0.7	1.15	34.08	71	60.81	94.89	0.064	-0.366
734.0	19.029	66.01	0.87	2.02	0.5	1.14	66.98	24	40.92	107.90	0.065	-0.421
733.8	19.193	65.09	1.41	2.15	0.5	1.13	65.68	35	53.77	119.45	0.066	-0.465
733.6	19.357	35.88	6.61	2.80	1.0	1.14	33.01	87	62.81	95.81	0.066	-0.369
733.5	19.521	49.64	5.34	2.63	1.0	1.12	44.97	74	64.44	109.41	0.067	-0.426
733.3	19.685	73.48	2.01	2.21	0.5	1.11	73.60	40	59.66	133.26	0.068	-0.514
733.2	19.849	22.94	4.12	2.80	1.0	1.13	21.97	87	59.44	81.41	0.069	-0.302
733.0	20.013	28.99	4.95	2.77	1.0	1.13	27.39	85	60.87	88.26	0.069	-0.335
732.8	20.177	46.76	1.56	2.29	0.5	1.11	47.98	46	56.96	104.94	0.070	-0.407
732.7	20.341	39.39	2.37	2.46	0.5	1.11	40.73	60	60.11	100.83	0.071	-0.390
732.5	20.505	30.08	3.06	2.62	1.0	1.12	28.63	73	59.46	88.09	0.071	-0.333
732.3	20.669	25.44	4.63	2.80	1.0	1.11	24.54	87	60.22	84.76	0.072	-0.317

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
732.2	20.833	75.46	2.54	2.27	0.5	1.09	75.67	45	63.44	139.11	0.073	-0.533
732.0	20.997	76.70	2.92	2.31	0.5	1.08	76.86	48	65.42	142.28	0.074	-0.543
731.8	21.161	48.33	5.47	2.65	1.0	1.09	45.30	75	64.76	110.06	0.074	-0.427
731.7	21.325	32.97	4.88	2.73	1.0	1.10	31.65	81	61.69	93.34	0.075	-0.356
731.5	21.489	25.65	4.35	2.78	1.0	1.10	25.10	85	60.19	85.28	0.076	-0.319
731.3	21.653	28.09	3.68	2.70	1.0	1.09	27.40	79	60.05	87.45	0.076	-0.329
731.2	21.817	36.36	2.93	2.55	0.5	1.08	37.80	67	60.97	98.77	0.077	-0.380
731.0	21.981	42.48	2.23	2.42	0.5	1.08	43.85	57	59.98	103.82	0.077	-0.401
730.9	22.145	29.86	2.83	2.60	1.0	1.08	29.28	71	59.38	88.66	0.078	-0.334
730.7	22.309	21.22	3.89	2.81	1.0	1.08	21.35	87	59.33	80.69	0.079	-0.295
730.5	22.473	15.63	3.43	2.87	1.0	1.08	16.19	93	58.33	74.52	0.080	-0.264
730.4	22.638	15.48	3.46	2.88	1.0	1.08	16.10	93	58.35	74.44	0.080	-0.263
730.2	22.802	11.51	3.47	2.98	1.0	1.07	12.40	100	57.78	70.18	0.081	-0.240
730.0	22.966	11.80	3.84	3.00	1.0	1.07	12.70	100	57.88	70.58	0.082	-0.242
729.9	23.130	21.78	1.84	2.60	0.5	1.06	23.38	71	57.57	80.95	0.082	-0.296
729.7	23.294	26.14	1.90	2.54	0.5	1.06	27.72	66	57.95	85.67	0.083	-0.319
729.5	23.458	15.68	3.27	2.86	1.0	1.06	16.50	92	58.32	74.81	0.084	-0.264
729.4	23.622	11.90	4.30	3.03	1.0	1.06	12.93	100	57.95	70.87	0.084	-0.243
729.2	23.786	8.55	5.19	3.19	1.0	1.05	9.75	100	56.96	66.71	0.085	-0.219
729.1	23.950	8.97	4.30	3.13	1.0	1.05	10.18	100	57.09	67.27	0.086	-0.222
728.9	24.114	5.96	4.45	3.28	1.0	1.05	7.30	100	56.20	63.49	0.086	-0.200
728.7	24.278	5.57	5.00	3.33	1.0	1.04	6.94	100	56.09	63.03	0.087	-0.197
728.6	24.442	4.99	5.67	3.40	1.0	1.04	6.40	100	55.92	62.32	0.088	-0.193
728.4	24.606	6.33	4.80	3.28	1.0	1.04	7.71	100	56.33	64.04	0.088	-0.203
728.2	24.770	6.58	5.37	3.29	1.0	1.03	7.97	100	56.41	64.38	0.089	-0.205
728.1	24.934	10.50	4.10	3.06	1.0	1.03	11.82	100	57.60	69.43	0.090	-0.233
727.9	25.098	10.31	4.47	3.09	1.0	1.03	11.67	100	57.56	69.23	0.090	-0.232
727.7	25.262	10.59	3.36	3.00	1.0	1.02	11.96	100	57.65	69.61	0.091	-0.234
727.6	25.426	7.04	3.37	3.15	1.0	1.02	8.51	100	56.57	65.08	0.092	-0.208
727.4	25.590	5.97	2.79	3.17	1.0	1.02	7.48	100	56.25	63.73	0.092	-0.200
727.2	25.754	4.09	2.68	3.30	1.0	1.02	5.63	100	55.68	61.31	0.093	-0.185
727.1	25.918	5.02	2.15	3.18	1.0	1.01	6.56	100	55.97	62.53	0.094	-0.193
726.9	26.082	4.96	3.14	3.26	1.0	1.01	6.52	100	55.96	62.48	0.094	-0.192
726.8	26.246	4.04	3.92	3.39	1.0	1.01	5.62	100	55.68	61.30	0.095	-0.185
726.6	26.410	6.17	2.03	3.08	1.0	1.00	7.76	100	56.34	64.10	0.095	-0.201
726.4	26.574	6.00	1.59	3.04	1.0	1.00	7.61	100	56.29	63.90	0.096	-0.200
726.3	26.739	5.34	1.45	3.07	1.0	1.00	6.96	100	56.09	63.05	0.097	-0.195
726.1	26.903	4.40	1.62	3.17	1.0	0.99	6.03	100	55.81	61.84	0.097	-0.187
725.9	27.067	4.33	1.57	3.17	1.0	0.99	5.98	100	55.79	61.77	0.098	-0.187
725.8	27.231	4.50	1.59	3.15	1.0	0.99	6.17	100	55.85	62.01	0.099	-0.188
725.6	27.395	4.38	1.73	3.18	1.0	0.99	6.05	100	55.81	61.86	0.099	-0.187
725.4	27.559	4.29	1.97	3.22	1.0	0.98	5.97	100	55.79	61.76	0.100	-0.186
725.3	27.723	4.59	1.81	3.17	1.0	0.98	6.30	100	55.89	62.19	0.100	-0.189
725.1	27.887	4.10	2.11	3.25	1.0	0.98	5.81	100	55.74	61.54	0.101	-0.185
724.9	28.051	3.76	2.84	3.34	1.0	0.97	5.47	100	55.63	61.11	0.102	-0.182
724.8	28.215	4.18	2.99	3.32	1.0	0.97	5.92	100	55.77	61.69	0.102	-0.185
724.6	28.379	4.54	2.83	3.27	1.0	0.97	6.30	100	55.89	62.18	0.103	-0.188
724.5	28.543	4.15	2.88	3.31	1.0	0.97	5.91	100	55.77	61.68	0.103	-0.185
724.3	28.707	4.12	2.74	3.30	1.0	0.96	5.89	100	55.76	61.65	0.104	-0.185
724.1	28.871	4.48	2.63	3.26	1.0	0.96	6.28	100	55.88	62.16	0.104	-0.188
724.0	29.035	5.16	2.81	3.22	1.0	0.96	7.00	100	56.10	63.10	0.105	-0.193
723.8	29.199	6.17	2.55	3.13	1.0	0.96	8.05	100	56.43	64.49	0.105	-0.201
723.6	29.363	6.31	3.43	3.20	1.0	0.95	8.21	100	56.48	64.69	0.106	-0.202
723.5	29.527	5.63	4.95	3.33	1.0	0.95	7.52	100	56.27	63.79	0.106	-0.197
723.3	29.691	7.69	3.29	3.11	1.0	0.95	9.68	100	56.94	66.62	0.107	-0.213
723.1	29.855	6.64	3.47	3.18	1.0	0.95	8.61	100	56.61	65.21	0.107	-0.205
723.0	30.019	6.62	2.34	3.09	1.0	0.94	8.60	100	56.60	65.21	0.108	-0.205
722.8	30.183	8.86	3.68	3.09	1.0	0.94	10.96	100	57.34	68.30	0.108	-0.222
722.7	30.347	11.08	2.80	2.94	1.0	0.94	13.33	98	57.94	71.27	0.109	-0.239
722.5	30.511	18.01	1.77	2.66	1.0	0.94	20.67	76	57.57	78.24	0.110	-0.275
722.3	30.675	23.78	1.47	2.51	0.5	0.94	25.41	64	56.79	82.20	0.111	-0.295
722.2	30.840	25.32	1.01	2.40	0.5	0.94	26.94	55	54.89	81.83	0.112	-0.293
722.0	31.004	30.97	0.48	2.18	0.5	0.93	32.55	37	47.83	80.38	0.113	-0.286
721.8	31.168	37.64	0.41	2.07	0.5	0.93	39.18	29	41.59	80.77	0.114	-0.287
721.7	31.332	48.92	0.48	2.00	0.5	0.93	50.48	23	35.49	85.98	0.115	-0.313
721.5	31.496	64.77	0.70	1.97	0.5	0.93	66.58	21	33.88	100.46	0.115	-0.377

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
721.3	31.660	69.50	0.84	1.99	0.5	0.93	71.50	22	37.56	109.06	0.115	-0.413
721.2	31.824	71.21	0.96	2.02	0.5	0.93	73.37	24	41.88	115.24	0.115	-0.437
721.0	31.988	70.16	0.97	2.02	0.5	0.93	72.32	25	42.49	114.80	0.115	-0.435
720.8	32.152	65.87	1.10	2.08	0.5	0.93	68.04	29	48.02	116.07	0.116	-0.440
720.7	32.316	58.37	1.40	2.18	0.5	0.93	60.50	38	54.80	115.30	0.116	-0.437
720.5	32.480	60.92	1.25	2.14	0.5	0.93	63.08	34	52.40	115.48	0.116	-0.437
720.4	32.644	65.64	0.82	2.01	0.5	0.92	67.65	23	39.38	107.02	0.116	-0.404
720.2	32.808	66.10	0.46	1.87	0.5	0.91	67.42	13	13.57	80.99	0.116	-0.287
720.0	32.972	63.62	0.44	1.88	0.5	0.91	64.93	13	15.37	80.30	0.117	-0.283
719.9	33.136	67.59	0.47	1.87	0.5	0.91	68.93	13	13.48	82.41	0.118	-0.294
719.7	33.300	75.20	0.60	1.88	0.5	0.91	76.86	14	16.80	93.66	0.118	-0.346
719.5	33.464	84.39	0.68	1.87	0.5	0.91	86.28	12	14.33	100.62	0.119	-0.376
719.4	33.628	82.85	0.82	1.92	0.5	0.91	85.14	17	26.73	111.87	0.119	-0.422
719.2	33.792	76.19	0.74	1.93	0.5	0.91	78.24	17	26.71	104.95	0.120	-0.394
719.0	33.956	57.31	1.09	2.12	0.5	0.91	59.44	33	50.51	109.96	0.120	-0.414
718.9	34.120	39.20	2.05	2.42	0.5	0.90	41.08	57	59.29	100.37	0.121	-0.375
718.7	34.284	33.56	2.81	2.56	0.5	0.90	35.37	68	60.51	95.88	0.121	-0.355
718.6	34.448	33.42	1.85	2.45	0.5	0.90	35.19	59	58.30	93.49	0.122	-0.345
718.4	34.612	27.83	2.11	2.55	0.5	0.89	29.54	67	58.58	88.13	0.122	-0.320
718.2	34.776	21.64	2.47	2.68	1.0	0.89	25.85	77	59.33	85.18	0.122	-0.306
718.1	34.941	24.51	3.38	2.72	1.0	0.89	29.16	80	60.81	89.97	0.123	-0.328
717.9	35.105	27.96	2.97	2.64	1.0	0.89	33.14	74	61.01	94.15	0.123	-0.347
717.7	35.269	37.84	1.76	2.39	0.5	0.89	39.71	54	58.17	97.88	0.124	-0.363
717.6	35.433	43.51	1.24	2.25	0.5	0.89	45.44	43	54.86	100.30	0.124	-0.373
717.4	35.597	39.30	0.76	2.17	0.5	0.88	41.02	37	49.69	90.71	0.124	-0.331
717.2	35.761	31.32	1.24	2.37	0.5	0.88	33.04	53	55.73	88.77	0.125	-0.322
717.1	35.925	23.93	1.40	2.50	0.5	0.87	25.59	63	56.56	82.15	0.125	-0.290
716.9	36.089	20.72	1.22	2.52	0.5	0.87	22.35	64	56.02	78.37	0.126	-0.271
716.7	36.253	20.34	1.36	2.55	0.5	0.87	21.98	67	56.46	78.44	0.126	-0.271
716.6	36.417	17.66	1.05	2.55	0.5	0.87	19.29	67	55.60	74.89	0.126	-0.253
716.4	36.581	16.12	0.70	2.50	0.5	0.86	17.74	63	54.42	72.16	0.127	-0.238
716.3	36.745	10.56	0.73	2.67	1.0	0.86	13.73	77	55.71	69.44	0.127	-0.223
716.1	36.909	8.52	0.59	2.73	1.0	0.85	11.44	81	55.59	67.03	0.127	-0.209
715.9	37.073	7.28	0.79	2.84	1.0	0.85	10.06	90	56.16	66.22	0.128	-0.205
715.8	37.237	12.01	0.35	2.51	0.5	0.85	13.65	64	53.39	67.04	0.128	-0.209
715.6	37.401	17.01	0.26	2.33	0.5	0.85	18.57	49	50.58	69.14	0.128	-0.221
715.4	37.565	17.07	0.66	2.47	0.5	0.85	18.68	60	54.06	72.74	0.129	-0.241
715.3	37.729	16.92	0.95	2.54	0.5	0.85	18.55	66	55.32	73.86	0.129	-0.246
715.1	37.893	21.97	0.70	2.38	0.5	0.85	23.57	53	53.44	77.01	0.129	-0.263
714.9	38.057	27.93	0.40	2.19	0.5	0.85	29.43	38	47.68	77.11	0.130	-0.263
714.8	38.221	27.67	0.33	2.16	0.5	0.85	29.14	36	46.13	75.27	0.130	-0.253
714.6	38.385	26.13	0.77	2.33	0.5	0.85	27.74	50	53.17	80.92	0.130	-0.282
714.5	38.549	24.74	1.67	2.53	0.5	0.85	26.44	65	57.38	83.81	0.131	-0.296
714.3	38.713	20.64	1.96	2.63	1.0	0.85	25.83	74	58.78	84.61	0.131	-0.300
714.1	38.877	27.01	1.16	2.41	0.5	0.85	28.69	56	55.55	84.24	0.131	-0.298
714.0	39.042	16.59	1.40	2.63	1.0	0.84	21.11	74	57.38	78.49	0.131	-0.269
713.8	39.206	16.99	1.86	2.69	1.0	0.84	21.63	78	58.24	79.88	0.132	-0.276
713.6	39.370	24.60	0.76	2.35	0.5	0.84	26.21	51	53.42	79.63	0.132	-0.275
713.5	39.534	33.03	0.65	2.21	0.5	0.84	34.67	40	50.09	84.76	0.132	-0.300
713.3	39.698	33.47	0.61	2.19	0.5	0.84	35.08	38	49.14	84.22	0.132	-0.297
713.1	39.862	28.94	0.86	2.32	0.5	0.84	30.60	48	53.46	84.06	0.133	-0.296
713.0	40.026	23.11	0.99	2.43	0.5	0.83	24.75	57	54.98	79.73	0.133	-0.275
712.8	40.190	28.91	0.88	2.32	0.5	0.83	30.58	49	53.60	84.18	0.133	-0.297
712.6	40.354	42.23	0.95	2.20	0.5	0.84	44.17	39	51.91	96.08	0.133	-0.351
712.5	40.518	56.74	0.86	2.07	0.5	0.84	59.03	28	45.28	104.31	0.134	-0.386
712.3	40.682	69.09	1.08	2.06	0.5	0.85	72.20	28	46.73	118.94	0.134	-0.444
712.2	40.846	76.39	0.89	1.97	0.5	0.85	79.42	21	35.85	115.27	0.134	-0.430
712.0	41.010	74.51	0.90	1.98	0.5	0.84	77.51	22	37.28	114.80	0.135	-0.428
711.8	41.174	72.27	0.90	1.99	0.5	0.84	75.20	22	38.60	113.80	0.135	-0.424
711.7	41.338	76.12	0.78	1.94	0.5	0.84	78.78	18	29.48	108.25	0.135	-0.402
711.5	41.502	83.87	0.71	1.88	0.5	0.83	86.29	14	17.62	103.91	0.135	-0.384
711.3	41.666	87.00	0.90	1.93	0.5	0.84	90.51	17	28.64	119.15	0.135	-0.444
711.2	41.830	92.25	0.97	1.93	0.5	0.84	96.35	17	29.79	126.14	0.135	-0.469
711.0	41.994	97.60	1.02	1.92	0.5	0.85	102.20	17	29.02	131.23	0.136	-0.487
710.8	42.158	104.59	0.96	1.88	0.5	0.84	109.21	14	19.52	128.73	0.136	-0.478
710.7	42.322	110.19	0.90	1.85	0.5	0.84	114.70	11	10.71	125.41	0.136	-0.466

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710.5	42.486	114.63	0.69	1.76	0.5	0.83	118.65	4	0.02	118.67	0.136	-0.441
710.3	42.650	114.59	0.71	1.77	0.5	0.83	118.64	5	0.13	118.77	0.136	-0.441
710.2	42.814	110.47	0.77	1.80	0.5	0.83	114.26	7	2.16	116.42	0.137	-0.432
710.0	42.978	109.19	0.84	1.83	0.5	0.83	113.34	10	7.10	120.44	0.137	-0.447
709.9	43.143	101.67	0.99	1.90	0.5	0.84	106.52	15	23.83	130.35	0.137	-0.483
709.7	43.307	89.18	1.61	2.08	0.5	0.85	95.00	30	54.19	149.19	0.137	-0.546
709.5	43.471	86.81	2.03	2.16	0.5	0.85	92.86	36	60.95	153.80	0.137	-0.560
709.4	43.635	133.71	0.66	1.70	0.5	0.84	140.57	0	0.00	140.57	0.136	-0.517
709.2	43.799	229.27	0.15	1.18	0.5	0.89	255.86	0	0.00	255.86	0.136	-0.600
709.0	43.963	370.53	0.15	0.98	0.5	0.89	412.38	0	0.00	412.38	0.135	-0.600

LIQUEFACTION POTENTIAL ASSESSMENT FOR COARSE GRAINED SOILS USING CONE PENETRATION TEST DATA

Project Site: **KIF TDEC Stability**
Stantec Project No.: **175668043**
CPT ID: **CPT-04A**

Depth to Water during Earthquake:	4.6	ft
Final Grade Elevation during EQ:	752.2	ft
Height of Final Grade above CPT TOH:	-0.8	ft
Normalize K_σ to:	1.058	tsf
a_{max} at top of ground surface:	0.09	g
Earthquake Magnitude:	7.60	M_W
Earthquake File or Source Zone:	1	Hz

Shear Stress Fit Parameters

m4:	0
m3:	0
m2:	0
m1:	0

Elev. (ft)	Depth *z* (ft)	Cyclic Resistance Ratio *CRR 7.5*	Relative Density *D r* (%)	Correction for Overburden Pressure *K σ*	Correction for Sloping Ground *K α*	Magnitude Scaling Factor *MSF*	Cyclic Resistance Ratio *CRR*	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress *τ Max* (psf)	From Ground Response: Average Cyclic Shear Stress *τ Avg* (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. *(qc 1N) CS ≥ 175*	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
753.0																	
752.8	0.164	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.059**	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**	**A1**
752.7	0.328	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.059**	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**	**A1**
752.5	0.492	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.059**	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**	**A1**
752.3	0.656	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.059**	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**	**A1**
752.2	0.820	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.059**	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**	**A1**
752.0	0.984	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.059**	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**	**A1**
751.9	1.148	N/A	86	N/A	N/A	N/A	N/A	1.000	0	0	**0.059**	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**	**A1**
751.7	1.312	N/A	81	N/A	N/A	N/A	N/A	1.000	0	0	**0.059**	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**	**A1**
751.5	1.476	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.059**	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**	**A1**
751.4	1.640	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.059**	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**	**A1**
751.2	1.804	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.059**	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**	**A1**
751.0	1.968	N/A	94	N/A	N/A	N/A	N/A	1.000	0	0	**0.059**	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**	**A1**
750.9	2.133	N/A	81	N/A	N/A	N/A	N/A	1.000	0	0	**0.059**	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**	**A1**
750.7	2.297	N/A	93	N/A	N/A	N/A	N/A	1.000	0	0	**0.059**	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**	**A1**
750.5	2.461	N/A	89	N/A	N/A	N/A	N/A	1.000	0	0	**0.059**	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**	**A1**
750.4	2.625	N/A	90	N/A	N/A	N/A	N/A	1.000	0	0	**0.059**	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**	**A1**
750.2	2.789	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.059**	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**	**A1**
750.0	2.953	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.059**	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**	**A1**
749.9	3.117	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.059**	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**	**A1**
749.7	3.281	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.059**	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**	**A1**
749.6	3.445	N/A	96	N/A	N/A	N/A	N/A	1.000	0	0	**0.059**	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**	**A1**
749.4	3.609	N/A	89	N/A	N/A	N/A	N/A	1.000	0	0	**0.059**	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**	**A1**
749.2	3.773	N/A	78	N/A	N/A	N/A	N/A	1.000	0	0	**0.059**	TRUE	FALSE	TRUE	**N/A**	**Embankment Fill**	**A1**
749.1	3.937	N/A	72	N/A	N/A	N/A	N/A	1.000	0	0	**0.059**	TRUE	FALSE	TRUE	**N/A**	**Embankment Fill**	**A1**
748.9	4.101	N/A	69	N/A	N/A	N/A	N/A	0.999	0	0	**0.059**	TRUE	FALSE	TRUE	**N/A**	**Embankment Fill**	**A1**
748.7	4.265	N/A	70	N/A	N/A	N/A	N/A	0.999	0	0	**0.059**	TRUE	FALSE	TRUE	**N/A**	**Embankment Fill**	**A1**
748.6	4.429	N/A	80	N/A	N/A	N/A	N/A	0.999	0	0	**0.059**	TRUE	FALSE	TRUE	**N/A**	**Embankment Fill**	**A1**
748.4	4.593	N/A	100	N/A	N/A	N/A	N/A	0.998	0	0	**0.059**	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**	**A1**
748.2	4.757	N/A	95	N/A	N/A	N/A	N/A	0.998	0	0	**0.060**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
748.1	4.921	N/A	93	N/A	N/A	N/A	N/A	0.998	0	0	**0.061**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
747.9	5.085	N/A	91	N/A	N/A	N/A	N/A	0.997	0	0	**0.062**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
747.8	5.249	N/A	89	N/A	N/A	N/A	N/A	0.997	0	0	**0.063**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
747.6	5.413	N/A	90	N/A	N/A	N/A	N/A	0.997	0	0	**0.064**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
747.4	5.577	N/A	100	N/A	N/A	N/A	N/A	0.996	0	0	**0.065**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
747.3	5.741	N/A	98	N/A	N/A	N/A	N/A	0.996	0	0	**0.066**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
747.1	5.905	N/A	100	N/A	N/A	N/A	N/A	0.995	0	0	**0.067**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
746.9	6.069	N/A	97	N/A	N/A	N/A	N/A	0.995	0	0	**0.068**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
746.8	6.234	N/A	85	N/A	N/A	N/A	N/A	0.995	0	0	**0.069**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
746.6	6.398	N/A	98	N/A	N/A	N/A	N/A	0.994	0	0	**0.069**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
746.4	6.562	N/A	100	N/A	N/A	N/A	N/A	0.994	0	0	**0.070**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
746.3	6.726	N/A	98	N/A	N/A	N/A	N/A	0.993	0	0	**0.071**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
746.1	6.890	N/A	95	N/A	N/A	N/A	N/A	0.993	0	0	**0.072**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
745.9	7.054	N/A	95	N/A	N/A	N/A	N/A	0.993	0	0	**0.072**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
745.8	7.218	N/A	90	N/A	N/A	N/A	N/A	0.992	0	0	**0.073**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**

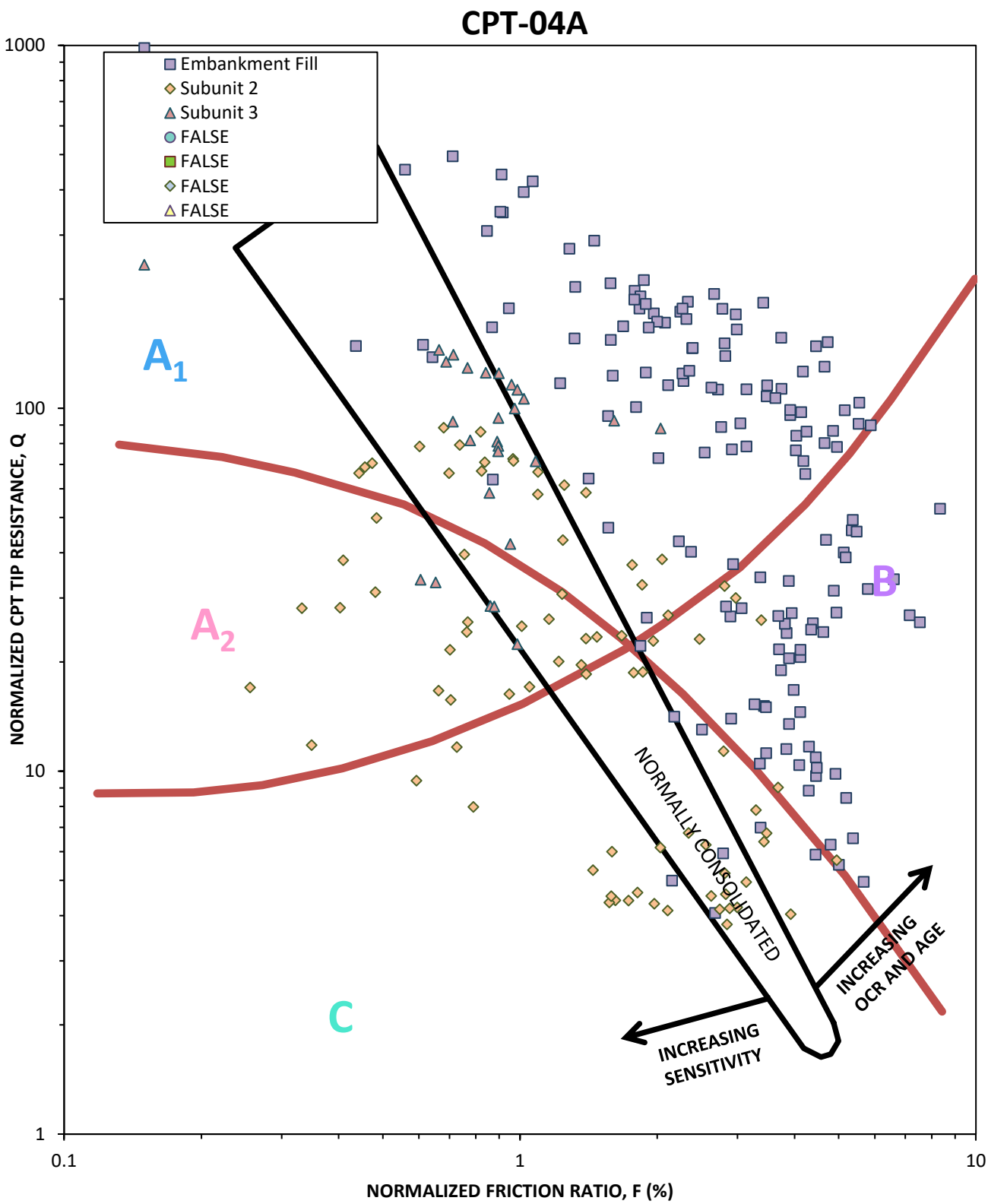
Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
745.6	7.382	N/A	88	N/A	N/A	N/A	N/A	0.992	0	0	**0.074**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
745.5	7.546	N/A	87	N/A	N/A	N/A	N/A	0.991	0	0	**0.074**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
745.3	7.710	N/A	79	N/A	N/A	N/A	N/A	0.991	0	0	**0.075**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
745.1	7.874	N/A	73	N/A	N/A	N/A	N/A	0.991	0	0	**0.075**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
745.0	8.038	N/A	69	N/A	N/A	N/A	N/A	0.990	0	0	**0.076**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
744.8	8.202	N/A	93	N/A	N/A	N/A	N/A	0.990	0	0	**0.076**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
744.6	8.366	N/A	96	N/A	N/A	N/A	N/A	0.989	0	0	**0.077**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
744.5	8.530	N/A	94	N/A	N/A	N/A	N/A	0.989	0	0	**0.077**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
744.3	8.694	N/A	84	N/A	N/A	N/A	N/A	0.989	0	0	**0.078**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
744.1	8.858	N/A	81	N/A	N/A	N/A	N/A	0.988	0	0	**0.078**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
744.0	9.022	N/A	82	N/A	N/A	N/A	N/A	0.988	0	0	**0.079**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
743.8	9.186	N/A	78	N/A	N/A	N/A	N/A	0.987	0	0	**0.079**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
743.6	9.350	N/A	97	N/A	N/A	N/A	N/A	0.987	0	0	**0.080**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
743.5	9.514	N/A	52	N/A	N/A	N/A	N/A	0.986	0	0	**0.080**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
743.3	9.678	N/A	59	N/A	N/A	N/A	N/A	0.986	0	0	**0.081**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
743.2	9.842	N/A	81	N/A	N/A	N/A	N/A	0.986	0	0	**0.081**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
743.0	10.006	N/A	81	N/A	N/A	N/A	N/A	0.985	0	0	**0.081**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
742.8	10.170	N/A	83	N/A	N/A	N/A	N/A	0.985	0	0	**0.082**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
742.7	10.335	N/A	87	N/A	N/A	N/A	N/A	0.984	0	0	**0.082**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
742.5	10.499	N/A	89	N/A	N/A	N/A	N/A	0.984	0	0	**0.082**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
742.3	10.663	N/A	79	N/A	N/A	N/A	N/A	0.983	0	0	**0.083**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
742.2	10.827	N/A	72	N/A	N/A	N/A	N/A	0.983	0	0	**0.083**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
742.0	10.991	N/A	75	N/A	N/A	N/A	N/A	0.982	0	0	**0.083**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
741.8	11.155	N/A	72	N/A	N/A	N/A	N/A	0.982	0	0	**0.084**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
741.7	11.319	N/A	73	N/A	N/A	N/A	N/A	0.982	0	0	**0.084**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
741.5	11.483	N/A	83	N/A	N/A	N/A	N/A	0.981	0	0	**0.084**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
741.4	11.647	N/A	84	N/A	N/A	N/A	N/A	0.981	0	0	**0.085**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
741.2	11.811	N/A	82	N/A	N/A	N/A	N/A	0.980	0	0	**0.085**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
741.0	11.975	N/A	74	N/A	N/A	N/A	N/A	0.980	0	0	**0.085**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
740.9	12.139	N/A	77	N/A	N/A	N/A	N/A	0.979	0	0	**0.085**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
740.7	12.303	N/A	77	N/A	N/A	N/A	N/A	0.979	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
740.5	12.467	N/A	80	N/A	N/A	N/A	N/A	0.978	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
740.4	12.631	N/A	74	N/A	N/A	N/A	N/A	0.978	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
740.2	12.795	N/A	70	N/A	N/A	N/A	N/A	0.977	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
740.0	12.959	N/A	84	N/A	N/A	N/A	N/A	0.977	0	0	**0.087**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
739.9	13.123	N/A	81	N/A	N/A	N/A	N/A	0.976	0	0	**0.087**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
739.7	13.287	N/A	77	N/A	N/A	N/A	N/A	0.976	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
739.5	13.451	N/A	73	N/A	N/A	N/A	N/A	0.975	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
739.4	13.615	N/A	77	N/A	N/A	N/A	N/A	0.975	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
739.2	13.779	N/A	80	N/A	N/A	N/A	N/A	0.974	0	0	**0.088**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
739.1	13.943	N/A	78	N/A	N/A	N/A	N/A	0.974	0	0	**0.088**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
738.9	14.107	N/A	71	N/A	N/A	N/A	N/A	0.973	0	0	**0.088**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
738.7	14.271	N/A	70	N/A	N/A	N/A	N/A	0.973	0	0	**0.088**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
738.6	14.436	N/A	68	N/A	N/A	N/A	N/A	0.972	0	0	**0.088**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
738.4	14.600	N/A	66	N/A	N/A	N/A	N/A	0.972	0	0	**0.089**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
738.2	14.764	N/A	59	N/A	N/A	N/A	N/A	0.971	0	0	**0.089**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
738.1	14.928	N/A	55	N/A	N/A	N/A	N/A	0.971	0	0	**0.089**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
737.9	15.092	N/A	51	N/A	N/A	N/A	N/A	0.970	0	0	**0.089**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
737.7	15.256	N/A	49	N/A	N/A	N/A	N/A	0.970	0	0	**0.089**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
737.6	15.420	N/A	55	N/A	N/A	N/A	N/A	0.969	0	0	**0.089**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
737.4	15.584	N/A	57	N/A	N/A	N/A	N/A	0.969	0	0	**0.090**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
737.3	15.748	N/A	48	N/A	N/A	N/A	N/A	0.968	0	0	**0.090**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
737.1	15.912	N/A	48	N/A	N/A	N/A	N/A	0.968	0	0	**0.090**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
736.9	16.076	N/A	49	N/A	N/A	N/A	N/A	0.967	0	0	**0.090**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
736.8	16.240	N/A	48	N/A	N/A	N/A	N/A	0.967	0	0	**0.090**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**

Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
736.6	16.404	N/A	45	N/A	N/A	N/A	N/A	0.966	0	0	**0.090**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
736.4	16.568	N/A	47	N/A	N/A	N/A	N/A	0.966	0	0	**0.090**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
736.3	16.732	N/A	46	N/A	N/A	N/A	N/A	0.965	0	0	**0.090**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
736.1	16.896	N/A	43	N/A	N/A	N/A	N/A	0.965	0	0	**0.091**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
735.9	17.060	N/A	42	N/A	N/A	N/A	N/A	0.964	0	0	**0.091**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
735.8	17.224	N/A	39	N/A	N/A	N/A	N/A	0.964	0	0	**0.091**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
735.6	17.388	N/A	41	N/A	N/A	N/A	N/A	0.963	0	0	**0.091**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**C**
735.4	17.552	N/A	41	N/A	N/A	N/A	N/A	0.963	0	0	**0.091**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**C**
735.3	17.716	N/A	39	N/A	N/A	N/A	N/A	0.962	0	0	**0.091**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
735.1	17.880	N/A	40	N/A	N/A	N/A	N/A	0.962	0	0	**0.091**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
735.0	18.044	N/A	42	N/A	N/A	N/A	N/A	0.961	0	0	**0.091**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
734.8	18.208	N/A	42	N/A	N/A	N/A	N/A	0.960	0	0	**0.091**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
734.6	18.372	N/A	45	N/A	N/A	N/A	N/A	0.960	0	0	**0.092**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
734.5	18.537	N/A	48	N/A	N/A	N/A	N/A	0.959	0	0	**0.092**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
734.3	18.701	N/A	52	N/A	N/A	N/A	N/A	0.959	0	0	**0.092**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
734.1	18.865	N/A	53	N/A	N/A	N/A	N/A	0.958	0	0	**0.092**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
734.0	19.029	N/A	58	N/A	N/A	N/A	N/A	0.958	0	0	**0.092**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
733.8	19.193	N/A	63	N/A	N/A	N/A	N/A	0.957	0	0	**0.092**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
733.6	19.357	N/A	53	N/A	N/A	N/A	N/A	0.957	0	0	**0.092**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
733.5	19.521	N/A	59	N/A	N/A	N/A	N/A	0.956	0	0	**0.092**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
733.3	19.685	N/A	68	N/A	N/A	N/A	N/A	0.956	0	0	**0.092**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
733.2	19.849	N/A	46	N/A	N/A	N/A	N/A	0.955	0	0	**0.092**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
733.0	20.013	N/A	50	N/A	N/A	N/A	N/A	0.954	0	0	**0.092**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
732.8	20.177	N/A	57	N/A	N/A	N/A	N/A	0.954	0	0	**0.092**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
732.7	20.341	N/A	55	N/A	N/A	N/A	N/A	0.953	0	0	**0.093**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
732.5	20.505	N/A	50	N/A	N/A	N/A	N/A	0.953	0	0	**0.093**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
732.3	20.669	N/A	48	N/A	N/A	N/A	N/A	0.952	0	0	**0.093**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
732.2	20.833	N/A	70	N/A	N/A	N/A	N/A	0.952	0	0	**0.093**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
732.0	20.997	N/A	71	N/A	N/A	N/A	N/A	0.951	0	0	**0.093**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
731.8	21.161	N/A	59	N/A	N/A	N/A	N/A	0.950	0	0	**0.093**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
731.7	21.325	N/A	52	N/A	N/A	N/A	N/A	0.950	0	0	**0.093**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
731.5	21.489	N/A	48	N/A	N/A	N/A	N/A	0.949	0	0	**0.093**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
731.3	21.653	N/A	49	N/A	N/A	N/A	N/A	0.949	0	0	**0.093**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
731.2	21.817	N/A	54	N/A	N/A	N/A	N/A	0.948	0	0	**0.093**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
731.0	21.981	N/A	57	N/A	N/A	N/A	N/A	0.948	0	0	**0.093**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
730.9	22.145	N/A	50	N/A	N/A	N/A	N/A	0.947	0	0	**0.093**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
730.7	22.309	N/A	46	N/A	N/A	N/A	N/A	0.946	0	0	**0.093**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
730.5	22.473	N/A	43	N/A	N/A	N/A	N/A	0.946	0	0	**0.093**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
730.4	22.638	N/A	43	N/A	N/A	N/A	N/A	0.945	0	0	**0.093**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
730.2	22.802	N/A	41	N/A	N/A	N/A	N/A	0.945	0	0	**0.093**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
730.0	22.966	N/A	41	N/A	N/A	N/A	N/A	0.944	0	0	**0.093**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
729.9	23.130	N/A	46	N/A	N/A	N/A	N/A	0.943	0	0	**0.093**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
729.7	23.294	N/A	49	N/A	N/A	N/A	N/A	0.943	0	0	**0.093**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
729.5	23.458	N/A	43	N/A	N/A	N/A	N/A	0.942	0	0	**0.093**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
729.4	23.622	N/A	41	N/A	N/A	N/A	N/A	0.942	0	0	**0.094**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
729.2	23.786	N/A	39	N/A	N/A	N/A	N/A	0.941	0	0	**0.094**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
729.1	23.950	N/A	39	N/A	N/A	N/A	N/A	0.940	0	0	**0.094**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
728.9	24.114	N/A	37	N/A	N/A	N/A	N/A	0.940	0	0	**0.094**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**C**
728.7	24.278	N/A	36	N/A	N/A	N/A	N/A	0.939	0	0	**0.094**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
728.6	24.442	N/A	36	N/A	N/A	N/A	N/A	0.939	0	0	**0.094**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
728.4	24.606	N/A	37	N/A	N/A	N/A	N/A	0.938	0	0	**0.094**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
728.2	24.770	N/A	37	N/A	N/A	N/A	N/A	0.937	0	0	**0.094**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
728.1	24.934	N/A	40	N/A	N/A	N/A	N/A	0.937	0	0	**0.094**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
727.9	25.098	N/A	40	N/A	N/A	N/A	N/A	0.936	0	0	**0.094**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
727.7	25.262	N/A	40	N/A	N/A	N/A	N/A	0.936	0	0	**0.094**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**

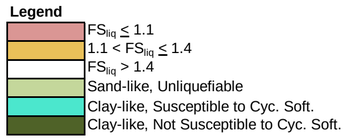
Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
727.6	25.426	N/A	38	N/A	N/A	N/A	N/A	0.935	0	0	**0.094**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**C**
727.4	25.590	N/A	37	N/A	N/A	N/A	N/A	0.934	0	0	**0.094**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**C**
727.2	25.754	N/A	35	N/A	N/A	N/A	N/A	0.934	0	0	**0.094**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**C**
727.1	25.918	N/A	36	N/A	N/A	N/A	N/A	0.933	0	0	**0.094**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**C**
726.9	26.082	0.101	36	1.008	0.893	1.00	0.091	0.933	0	0	**0.094**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
726.8	26.246	0.100	35	1.008	0.890	1.00	0.090	0.932	0	0	**0.094**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
726.6	26.410	0.103	37	1.008	0.896	1.00	0.092	0.931	0	0	**0.094**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
726.4	26.574	0.102	37	1.007	0.895	1.00	0.092	0.931	0	0	**0.094**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
726.3	26.739	0.102	36	1.007	0.892	1.00	0.091	0.930	0	0	**0.094**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
726.1	26.903	0.101	36	1.006	0.889	1.00	0.090	0.929	0	0	**0.094**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
725.9	27.067	0.101	36	1.006	0.888	1.00	0.090	0.929	0	0	**0.094**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
725.8	27.231	0.101	36	1.005	0.888	1.00	0.090	0.928	0	0	**0.094**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
725.6	27.395	0.101	36	1.005	0.887	1.00	0.090	0.928	0	0	**0.094**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
725.4	27.559	0.101	36	1.005	0.886	1.00	0.089	0.927	0	0	**0.094**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
725.3	27.723	0.101	36	1.004	0.887	1.00	0.090	0.926	0	0	**0.094**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
725.1	27.887	0.101	36	1.004	0.885	1.00	0.089	0.926	0	0	**0.094**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**C**
724.9	28.051	0.100	35	1.003	0.883	1.00	0.089	0.925	0	0	**0.094**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**C**
724.8	28.215	0.101	36	1.003	0.884	1.00	0.089	0.924	0	0	**0.094**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**C**
724.6	28.379	0.101	36	1.003	0.885	1.00	0.089	0.924	0	0	**0.094**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
724.5	28.543	0.101	36	1.002	0.883	1.00	0.089	0.923	0	0	**0.094**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**C**
724.3	28.707	0.101	36	1.002	0.883	1.00	0.089	0.923	0	0	**0.094**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**C**
724.1	28.871	0.101	36	1.001	0.883	1.00	0.089	0.922	0	0	**0.094**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**C**
724.0	29.035	0.102	37	1.001	0.885	1.00	0.090	0.921	0	0	**0.094**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
723.8	29.199	0.103	37	1.001	0.889	1.00	0.091	0.921	0	0	**0.094**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
723.6	29.363	0.103	37	1.000	0.889	1.00	0.091	0.920	0	0	**0.094**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
723.5	29.527	0.102	37	1.000	0.886	1.00	0.090	0.919	0	0	**0.094**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**B**
723.3	29.691	0.105	39	0.999	0.894	1.00	0.093	0.919	0	0	**0.094**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
723.1	29.855	0.103	38	0.999	0.889	1.00	0.092	0.918	0	0	**0.094**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
723.0	30.019	0.103	38	0.999	0.889	1.00	0.091	0.917	0	0	**0.094**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
722.8	30.183	0.106	40	0.998	0.898	1.00	0.094	0.917	0	0	**0.094**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**B**
722.7	30.347	0.108	41	0.998	0.907	1.00	0.098	0.916	0	0	**0.094**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
722.5	30.511	0.114	45	0.997	0.933	0.99	0.106	0.915	0	0	**0.094**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**C**
722.3	30.675	0.118	47	0.997	0.950	0.99	0.111	0.915	0	0	**0.094**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**A2**
722.2	30.840	0.117	47	0.996	0.948	0.99	0.110	0.914	0	0	**0.094**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**A2**
722.0	31.004	0.116	46	0.996	0.942	0.99	0.108	0.913	0	0	**0.094**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**A2**
721.8	31.168	0.116	46	0.995	0.943	0.99	0.109	0.913	0	0	**0.094**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**A2**
721.7	31.332	0.121	49	0.995	0.968	0.99	0.116	0.912	0	0	**0.094**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**A2**
721.5	31.496	0.138	55	0.994	1.055	0.99	0.143	0.912	0	0	**0.094**	FALSE	FALSE	FALSE	**1.5**	**Subunit 2**	**A1**
721.3	31.660	0.150	59	0.993	1.120	0.99	0.166	0.911	0	0	**0.094**	FALSE	FALSE	FALSE	**1.8**	**Subunit 2**	**A1**
721.2	31.824	0.161	61	0.992	1.174	0.99	0.186	0.910	0	0	**0.094**	FALSE	FALSE	FALSE	**2.0**	**Subunit 2**	**A1**
721.0	31.988	0.161	61	0.991	1.170	0.99	0.184	0.910	0	0	**0.094**	FALSE	FALSE	FALSE	**2.0**	**Subunit 2**	**A1**
720.8	32.152	0.163	61	0.991	1.181	0.99	0.188	0.909	0	0	**0.094**	FALSE	FALSE	FALSE	**2.0**	**Subunit 2**	**A1**
720.7	32.316	0.162	61	0.990	1.174	0.99	0.186	0.908	0	0	**0.094**	FALSE	FALSE	FALSE	**2.0**	**Subunit 2**	**A1**
720.5	32.480	0.162	61	0.990	1.175	0.99	0.186	0.908	0	0	**0.094**	FALSE	FALSE	FALSE	**2.0**	**Subunit 2**	**A1**
720.4	32.644	0.147	58	0.990	1.103	0.99	0.159	0.907	0	0	**0.094**	FALSE	FALSE	FALSE	**1.7**	**Subunit 2**	**A1**
720.2	32.808	0.117	46	0.991	0.943	0.99	0.108	0.906	0	0	**0.094**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**A1**
720.0	32.972	0.116	46	0.991	0.940	0.99	0.107	0.906	0	0	**0.094**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**A1**
719.9	33.136	0.118	47	0.990	0.950	0.99	0.110	0.905	0	0	**0.094**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**A1**
719.7	33.300	0.130	52	0.989	1.011	0.99	0.129	0.904	0	0	**0.094**	FALSE	FALSE	FALSE	**1.4**	**Subunit 2**	**A1**
719.5	33.464	0.138	55	0.988	1.058	0.99	0.143	0.904	0	0	**0.094**	FALSE	FALSE	FALSE	**1.5**	**Subunit 2**	**A1**
719.4	33.628	0.155	60	0.986	1.148	0.99	0.174	0.903	0	0	**0.094**	FALSE	FALSE	FALSE	**1.9**	**Subunit 2**	**A1**
719.2	33.792	0.144	57	0.986	1.091	0.99	0.154	0.902	0	0	**0.094**	FALSE	FALSE	FALSE	**1.6**	**Subunit 2**	**A1**
719.0	33.956	0.152	59	0.985	1.132	0.99	0.168	0.902	0	0	**0.094**	FALSE	FALSE	FALSE	**1.8**	**Subunit 2**	**A1**
718.9	34.120	0.138	55	0.986	1.057	0.99	0.142	0.901	0	0	**0.094**	FALSE	FALSE	FALSE	**1.5**	**Subunit 2**	**A1**
718.7	34.284	0.132	53	0.986	1.026	0.99	0.133	0.900	0	0	**0.094**	FALSE	FALSE	FALSE	**1.4**	**Subunit 2**	**B**

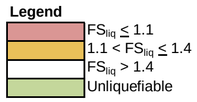
Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
718.6	34.448	0.129	52	0.986	1.011	0.99	0.128	0.900	0	0	**0.094**	FALSE	FALSE	FALSE	**1.4**	**Subunit 2**	**A1**
718.4	34.612	0.124	50	0.986	0.979	0.99	0.119	0.899	0	0	**0.094**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**A1**
718.2	34.776	0.121	48	0.986	0.963	0.99	0.114	0.898	0	0	**0.094**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**B**
718.1	34.941	0.126	51	0.985	0.990	0.99	0.122	0.897	0	0	**0.094**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**B**
717.9	35.105	0.130	52	0.984	1.016	0.99	0.129	0.897	0	0	**0.094**	FALSE	FALSE	FALSE	**1.4**	**Subunit 2**	**B**
717.7	35.269	0.135	54	0.983	1.041	0.99	0.137	0.896	0	0	**0.094**	FALSE	FALSE	FALSE	**1.5**	**Subunit 2**	**A1**
717.6	35.433	0.138	55	0.982	1.058	0.99	0.142	0.895	0	0	**0.094**	FALSE	FALSE	FALSE	**1.5**	**Subunit 2**	**A1**
717.4	35.597	0.126	51	0.983	0.994	0.99	0.123	0.895	0	0	**0.094**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**A2**
717.2	35.761	0.124	50	0.983	0.983	0.99	0.119	0.894	0	0	**0.094**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**A2**
717.1	35.925	0.118	47	0.984	0.947	0.99	0.109	0.893	0	0	**0.094**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**A2**
716.9	36.089	0.114	45	0.984	0.928	0.99	0.104	0.893	0	0	**0.094**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**A2**
716.7	36.253	0.114	45	0.983	0.928	0.99	0.104	0.892	0	0	**0.093**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**A2**
716.6	36.417	0.111	43	0.983	0.912	0.99	0.099	0.891	0	0	**0.093**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**A2**
716.4	36.581	0.109	42	0.983	0.900	0.99	0.096	0.891	0	0	**0.093**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**A2**
716.3	36.745	0.107	40	0.983	0.889	1.00	0.093	0.890	0	0	**0.093**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
716.1	36.909	0.105	39	0.983	0.880	1.00	0.090	0.889	0	0	**0.093**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
715.9	37.073	0.104	38	0.983	0.877	1.00	0.089	0.889	0	0	**0.093**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
715.8	37.237	0.105	39	0.983	0.880	1.00	0.090	0.888	0	0	**0.093**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**A2**
715.6	37.401	0.107	40	0.982	0.887	1.00	0.092	0.887	0	0	**0.093**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**A2**
715.4	37.565	0.110	42	0.981	0.902	0.99	0.096	0.887	0	0	**0.093**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**A2**
715.3	37.729	0.110	43	0.981	0.906	0.99	0.098	0.886	0	0	**0.093**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**A2**
715.1	37.893	0.113	44	0.980	0.920	0.99	0.101	0.885	0	0	**0.093**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**A2**
714.9	38.057	0.113	44	0.980	0.920	0.99	0.102	0.885	0	0	**0.093**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**A2**
714.8	38.221	0.112	43	0.980	0.912	0.99	0.099	0.884	0	0	**0.093**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**A2**
714.6	38.385	0.117	46	0.978	0.939	0.99	0.106	0.883	0	0	**0.093**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**A2**
714.5	38.549	0.119	48	0.977	0.954	0.99	0.111	0.882	0	0	**0.093**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**A1**
714.3	38.713	0.120	48	0.977	0.958	0.99	0.112	0.882	0	0	**0.093**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**B**
714.1	38.877	0.120	48	0.977	0.956	0.99	0.111	0.881	0	0	**0.093**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**A2**
714.0	39.042	0.114	45	0.977	0.926	0.99	0.103	0.880	0	0	**0.093**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**C**
713.8	39.206	0.116	46	0.977	0.933	0.99	0.105	0.880	0	0	**0.093**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**C**
713.6	39.370	0.115	46	0.976	0.931	0.99	0.104	0.879	0	0	**0.093**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**A2**
713.5	39.534	0.120	48	0.975	0.958	0.99	0.112	0.878	0	0	**0.093**	FALSE	FALSE	FALSE	**1.2**	**Subunit 3**	**A2**
713.3	39.698	0.120	48	0.975	0.955	0.99	0.111	0.878	0	0	**0.093**	FALSE	FALSE	FALSE	**1.2**	**Subunit 3**	**A2**
713.1	39.862	0.120	48	0.974	0.954	0.99	0.111	0.877	0	0	**0.093**	FALSE	FALSE	FALSE	**1.2**	**Subunit 3**	**A2**
713.0	40.026	0.116	46	0.975	0.931	0.99	0.104	0.876	0	0	**0.093**	FALSE	FALSE	FALSE	**1.1**	**Subunit 3**	**A2**
712.8	40.190	0.120	48	0.974	0.955	0.99	0.111	0.875	0	0	**0.093**	FALSE	FALSE	FALSE	**1.2**	**Subunit 3**	**A2**
712.6	40.354	0.132	53	0.971	1.030	0.99	0.131	0.875	0	0	**0.093**	FALSE	FALSE	FALSE	**1.4**	**Subunit 3**	**A1**
712.5	40.518	0.143	57	0.968	1.094	0.99	0.150	0.874	0	0	**0.093**	FALSE	FALSE	FALSE	**1.6**	**Subunit 3**	**A1**
712.3	40.682	0.169	63	0.964	1.233	0.99	0.198	0.873	0	0	**0.092**	FALSE	FALSE	FALSE	**2.1**	**Subunit 3**	**A1**
712.2	40.846	0.161	61	0.964	1.195	0.99	0.184	0.873	0	0	**0.092**	FALSE	FALSE	FALSE	**2.0**	**Subunit 3**	**A1**
712.0	41.010	0.161	61	0.964	1.190	0.99	0.182	0.872	0	0	**0.092**	FALSE	FALSE	FALSE	**2.0**	**Subunit 3**	**A1**
711.8	41.174	0.159	61	0.964	1.180	0.99	0.178	0.871	0	0	**0.092**	FALSE	FALSE	FALSE	**1.9**	**Subunit 3**	**A1**
711.7	41.338	0.149	58	0.965	1.128	0.99	0.161	0.871	0	0	**0.092**	FALSE	FALSE	FALSE	**1.7**	**Subunit 3**	**A1**
711.5	41.502	0.143	57	0.966	1.090	0.99	0.149	0.870	0	0	**0.092**	FALSE	FALSE	FALSE	**1.6**	**Subunit 3**	**A1**
711.3	41.666	0.169	63	0.961	1.236	0.99	0.199	0.869	0	0	**0.092**	FALSE	FALSE	FALSE	**2.2**	**Subunit 3**	**A1**
711.2	41.830	0.186	65	0.958	1.317	0.99	0.232	0.868	0	0	**0.092**	FALSE	FALSE	FALSE	**2.5**	**Subunit 3**	**A1**
711.0	41.994	0.201	67	0.956	1.382	0.98	0.262	0.868	0	0	**0.092**	FALSE	FALSE	FALSE	**2.8**	**Subunit 3**	**A1**
710.8	42.158	0.194	66	0.956	1.350	0.99	0.246	0.867	0	0	**0.092**	FALSE	FALSE	FALSE	**2.7**	**Subunit 3**	**A1**
710.7	42.322	0.184	65	0.957	1.309	0.99	0.228	0.866	0	0	**0.092**	FALSE	FALSE	FALSE	**2.5**	**Subunit 3**	**A1**
710.5	42.486	0.168	62	0.959	1.231	0.99	0.196	0.866	0	0	**0.092**	FALSE	FALSE	FALSE	**2.1**	**Subunit 3**	**A1**
710.3	42.650	0.169	62	0.958	1.233	0.99	0.197	0.865	0	0	**0.092**	FALSE	FALSE	FALSE	**2.1**	**Subunit 3**	**A1**
710.2	42.814	0.164	62	0.958	1.208	0.99	0.187	0.864	0	0	**0.092**	FALSE	FALSE	FALSE	**2.0**	**Subunit 3**	**A1**
710.0	42.978	0.172	63	0.957	1.251	0.99	0.204	0.864	0	0	**0.092**	FALSE	FALSE	FALSE	**2.2**	**Subunit 3**	**A1**
709.9	43.143	0.198	67	0.952	1.372	0.98	0.255	0.863	0	0	**0.092**	FALSE	FALSE	FALSE	**2.8**	**Subunit 3**	**A1**
709.7	43.307	0.283	73	0.944	1.659	0.98	0.434	0.862	0	0	**0.092**	FALSE	FALSE	FALSE	**4.7**	**Subunit 3**	**A1**

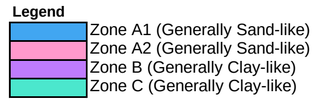
Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
709.5	43.471	0.316	74	0.941	1.741	0.98	0.505	0.861	0	0	**0.092**	FALSE	FALSE	FALSE	**5.5**	**Subunit 3**	**A1**
709.4	43.635	0.237	70	0.947	1.513	0.98	0.333	0.861	0	0	**0.092**	FALSE	FALSE	FALSE	**3.6**	**Subunit 3**	**A1**
709.2	43.799	N/A	100	N/A	N/A	N/A	N/A	0.860	0	0	**0.091**	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**	**A1**
709.0	43.963	N/A	100	N/A	N/A	N/A	N/A	0.859	0	0	**0.091**	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**	**A1**



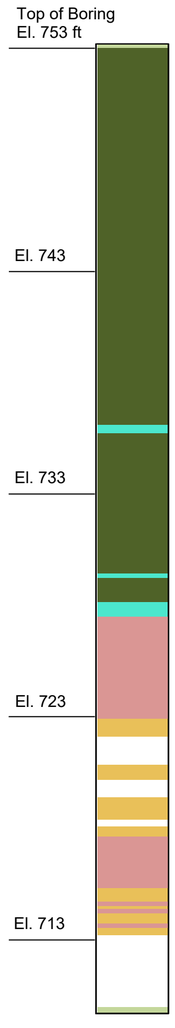
Adapted from "Discussion of 'Liquefaction Potential of Silts from CPTu'" (Robertson 2008). Zone A_1 and Zone A_2 samples are generally sand-like. Zone B samples are generally clay-like and not susceptible to cyclic softening. Zone C samples are generally clay-like and susceptible to cyclic softening. Note that the transition from clay-like to sand-like in this chart does not exactly match the liquefaction calculations herein; that is, some transitional samples in Zone B and Zone C will be treated as sand-like and analyzed for liquefaction if the calculations indicate as such.



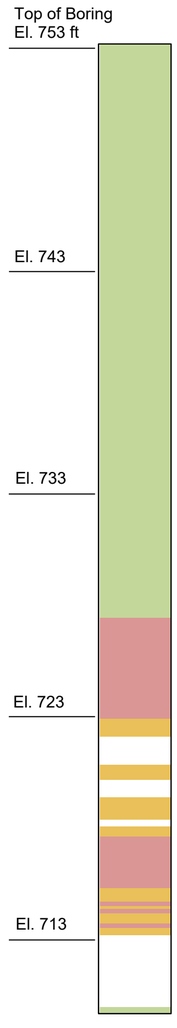




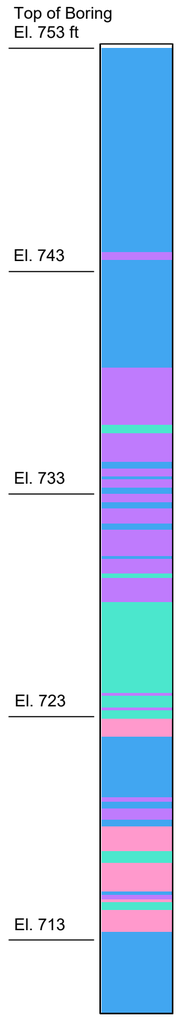
CPT-04A, Liquefaction Triggering Results



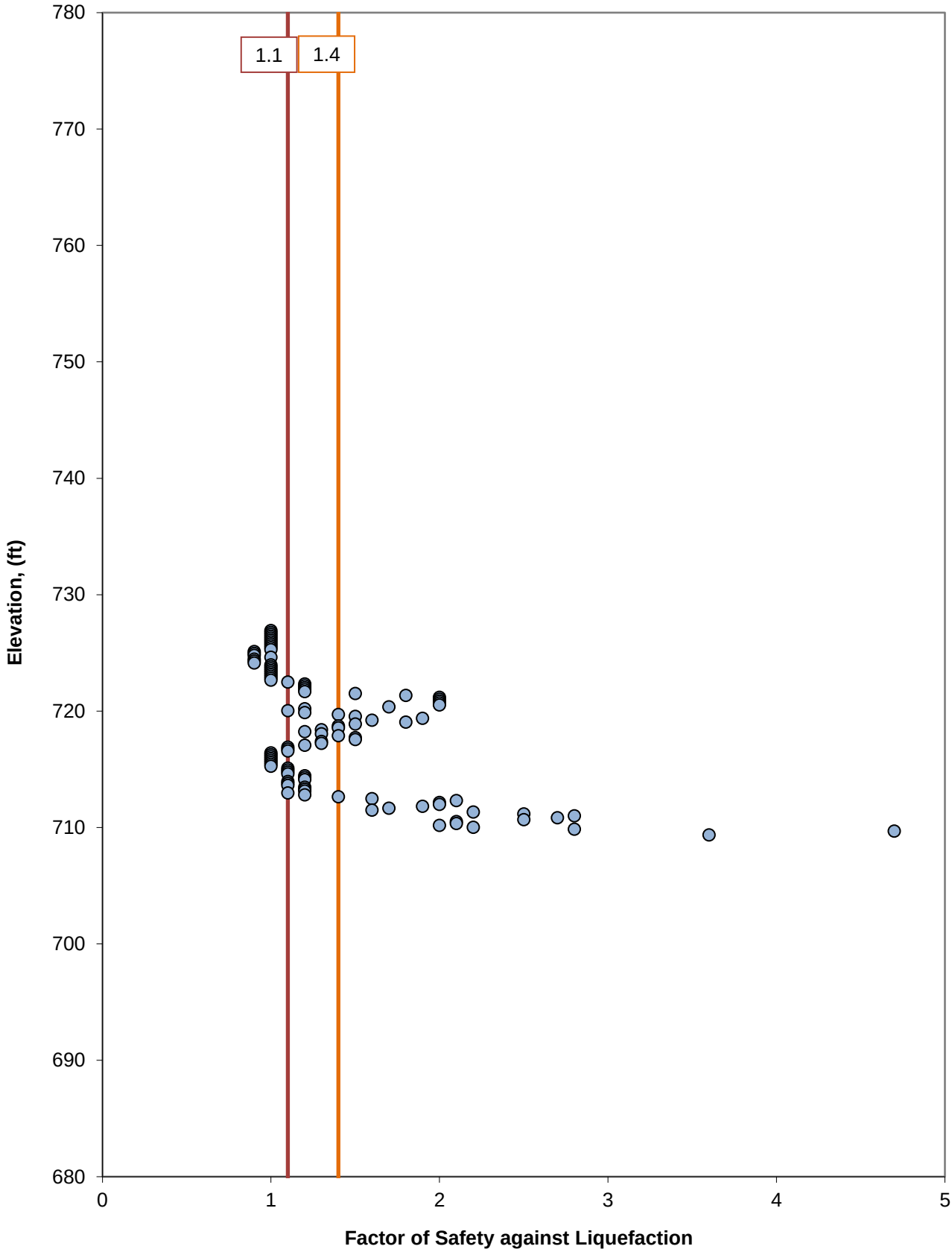
CPT-04A, Liquefaction Triggering Results



CPT-04A, Robertson Soil Type



KIF TDEC Stability, Boring = CPT-04A, Source = 1 Hz, Mw = 7.6, Event = Design EQ, CPT Data, Simplified Stress-Based Approach



Project Information

Stantec Project Number =	175668043
Project Name =	KIF TDEC Stability
CPT ID =	CPT-05A

Boring Location (optional)

Northing =	
Easting =	

OR

Baseline Station =	
Offset (+ Right) =	

Using qt (corrected for u2 PWP) or qc (backcalculated uncorrected field tip)

Cone ID (optional) =	AD184	
Use qc instead of qt?	0	(1: Yes, 0: No)
Cone Area Ratio (a) =	0.80	

Drilling Information

Top of Hole Elevation =	754.0	feet
Water Depth during CPT (negative for U/S borings) =	2.5	feet
Depth data collection began =	0.16	feet
Avg. Total Unit Wt. Above 1st Sample =	120.00	pcf

During Earthquake Information

Water Depth during EQ (relative to CPT TOH, negative for U/S borings) =	5.0	feet
Final Grade Elevation during EQ =	753.0	feet
Avg. Total Unit Wt. of Cut/Fill =	120	pcf

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile?	0	(1: Yes, 0: No)

If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile:	ng_Pond_Section, KIF-BF-SPT3_NOR	
α at each Sample Depth known?	1	(1: Yes, 0: No)

If previous answer is No, then enter curve fit parameters below (α vs. depth curve)

If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_α will be one.

m4:	
m3:	
m2:	
m1:	
m0:	

Associated ground response profile:	shing_Pond_Section, KIF-BF-SPT3	
Get CSR from shear stress envelope?	0	(1: Yes, 0: No)

If previous answer is No, then CSR will be calculated using a_{max} and r_d

Max. Shear Stress at each sample depth known?		(1: Yes, 0: No)

If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4:	
m3:	
m2:	
m1:	

Earthquake Information

EQ Source (e.g., New Madrid)	1 Hz
Event (e.g., MCE, OBE)	Design EQ
a_{max} (g) (top of ground surface)	0.09
EQ Mag (Mw)	7.6

Inputs

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
0.164	2.407	0.326	112	Fly Ash	Sand-like	Do Not Correct for FC	0.057			
0.328	145.342	0.372	112	Fly Ash	Sand-like	Do Not Correct for FC	0.054			
0.492	211.844	1.295	112	Fly Ash	Sand-like	Do Not Correct for FC	0.052			
0.656	262.259	1.359	112	Fly Ash	Sand-like	Do Not Correct for FC	0.049			
0.820	179.440	1.300	112	Fly Ash	Sand-like	Do Not Correct for FC	0.046			
0.984	121.328	1.556	112	Fly Ash	Sand-like	Do Not Correct for FC	0.044			
1.148	58.113	1.912	112	Fly Ash	Sand-like	Do Not Correct for FC	0.041			
1.312	93.512	2.269	112	Fly Ash	Sand-like	Do Not Correct for FC	0.038			
1.476	476.473	3.882	112	Fly Ash	Sand-like	Do Not Correct for FC	0.035			
1.640	381.349	4.760	112	Fly Ash	Sand-like	Do Not Correct for FC	0.033			
1.804	395.865	4.970	112	Fly Ash	Sand-like	Do Not Correct for FC	0.030			
1.968	391.744	3.464	112	Fly Ash	Sand-like	Do Not Correct for FC	0.027			
2.133	368.624	2.264	112	Fly Ash	Sand-like	Do Not Correct for FC	0.028			
2.297	295.028	2.037	112	Fly Ash	Sand-like	Do Not Correct for FC	0.031			
2.461	208.074	1.671	112	Fly Ash	Sand-like	Do Not Correct for FC	0.033			
2.625	124.134	2.137	112	Fly Ash	Sand-like	Do Not Correct for FC	0.035			
2.789	75.431	2.502	112	Fly Ash	Sand-like	Do Not Correct for FC	0.037			
2.953	54.290	2.395	112	Fly Ash	Sand-like	Do Not Correct for FC	0.040			
3.117	53.631	1.758	112	Fly Ash	Sand-like	Do Not Correct for FC	0.041			
3.281	237.383	2.138	112	Fly Ash	Sand-like	Do Not Correct for FC	0.039			
3.445	273.842	1.762	112	Fly Ash	Sand-like	Do Not Correct for FC	0.038			
3.609	374.483	2.331	112	Fly Ash	Sand-like	Do Not Correct for FC	0.037			
3.773	299.701	2.556	112	Fly Ash	Sand-like	Do Not Correct for FC	0.036			
3.937	200.481	3.304	112	Fly Ash	Sand-like	Do Not Correct for FC	0.035			
4.101	120.478	3.765	112	Fly Ash	Sand-like	Do Not Correct for FC	0.032			
4.265	82.661	3.901	112	Fly Ash	Sand-like	Do Not Correct for FC	0.030			
4.429	51.339	4.191	112	Fly Ash	Sand-like	Do Not Correct for FC	0.027			
4.593	67.918	2.917	112	Fly Ash	Sand-like	Do Not Correct for FC	0.025			
4.757	124.664	2.227	112	Fly Ash	Sand-like	Do Not Correct for FC	0.022			
4.921	142.843	2.587	112	Fly Ash	Sand-like	Do Not Correct for FC	0.020			
5.085	55.974	2.492	128	Embankment Fill	Clay-like		0.016			
5.249	252.808	3.095	128	Embankment Fill	Clay-like		0.013			
5.413	352.615	5.222	128	Embankment Fill	Clay-like		0.012			
5.577	335.337	2.956	128	Embankment Fill	Clay-like		0.015			
5.741	394.099	4.309	128	Embankment Fill	Clay-like		0.013			
5.905	365.287	5.551	128	Embankment Fill	Clay-like		0.010			
6.069	232.026	6.687	128	Embankment Fill	Clay-like		0.008			
6.234	208.755	7.280	128	Embankment Fill	Clay-like		0.006			
6.398	139.125	5.969	128	Embankment Fill	Clay-like		0.004			
6.562	136.096	5.391	128	Embankment Fill	Clay-like		0.003			
6.726	132.272	4.518	128	Embankment Fill	Clay-like		0.002			
6.890	211.126	4.383	128	Embankment Fill	Clay-like		0.001			
7.054	221.132	5.400	128	Embankment Fill	Clay-like		0.001			
7.218	228.743	4.798	128	Embankment Fill	Clay-like		0.001			
7.382	249.955	4.808	128	Embankment Fill	Clay-like		0.002			
7.546	257.928	4.374	128	Embankment Fill	Clay-like		0.003			
7.710	345.612	3.732	128	Embankment Fill	Clay-like		0.005			
7.874	371.470	4.527	128	Embankment Fill	Clay-like		0.006			
8.038	384.177	3.560	128	Embankment Fill	Clay-like		0.007			
8.202	423.782	5.362	128	Embankment Fill	Clay-like		0.009			
8.366	322.756	4.431	128	Embankment Fill	Clay-like		0.010			
8.530	206.499	4.614	128	Embankment Fill	Clay-like		0.011			
8.694	178.718	4.565	128	Embankment Fill	Clay-like		0.012			
8.858	91.407	3.795	128	Embankment Fill	Clay-like		0.013			
9.022	70.328	3.745	128	Embankment Fill	Clay-like		0.014			
9.186	61.511	2.676	128	Embankment Fill	Clay-like		0.015			
9.350	74.844	2.342	128	Embankment Fill	Clay-like		0.016			
9.514	74.492	2.255	128	Embankment Fill	Clay-like		0.017			
9.678	63.229	1.378	128	Embankment Fill	Clay-like		0.018			
9.842	43.357	1.626	128	Embankment Fill	Clay-like		0.019			
10.006	36.017	1.471	128	Embankment Fill	Clay-like		0.020			
10.170	68.331	1.432	128	Embankment Fill	Clay-like		0.021			
10.335	66.191	2.037	128	Embankment Fill	Clay-like		0.022			

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
10.499	60.808	2.118	128	Embankment Fill	Clay-like		0.023			
10.663	38.169	2.113	128	Embankment Fill	Clay-like		0.024			
10.827	36.968	2.067	128	Embankment Fill	Clay-like		0.026			
10.991	53.412	2.104	128	Embankment Fill	Clay-like		0.027			
11.155	60.174	2.150	128	Embankment Fill	Clay-like		0.028			
11.319	72.691	2.076	128	Embankment Fill	Clay-like		0.029			
11.483	112.388	1.916	128	Embankment Fill	Clay-like		0.030			
11.647	65.874	2.755	128	Embankment Fill	Clay-like		0.031			
11.811	59.006	2.846	128	Embankment Fill	Clay-like		0.032			
11.975	42.831	2.778	128	Embankment Fill	Clay-like		0.033			
12.139	42.167	2.252	128	Embankment Fill	Clay-like		0.034			
12.303	43.458	2.332	128	Embankment Fill	Clay-like		0.034			
12.467	84.811	2.668	128	Embankment Fill	Clay-like		0.035			
12.631	101.619	3.679	128	Embankment Fill	Clay-like		0.036			
12.795	108.920	3.849	128	Embankment Fill	Clay-like		0.037			
12.959	79.980	2.781	128	Embankment Fill	Clay-like		0.038			
13.123	54.346	2.333	128	Embankment Fill	Clay-like		0.039			
13.287	46.589	1.860	128	Embankment Fill	Clay-like		0.039			
13.451	33.778	1.412	128	Embankment Fill	Clay-like		0.040			
13.615	28.367	1.177	128	Embankment Fill	Clay-like		0.041			
13.779	42.087	0.793	128	Embankment Fill	Clay-like		0.041			
13.943	46.027	0.703	128	Embankment Fill	Clay-like		0.042			
14.107	42.506	0.507	128	Embankment Fill	Clay-like		0.043			
14.271	45.614	0.462	128	Embankment Fill	Clay-like		0.043			
14.436	46.963	0.535	128	Embankment Fill	Clay-like		0.044			
14.600	33.874	0.510	128	Embankment Fill	Clay-like		0.045			
14.764	34.705	0.617	128	Embankment Fill	Clay-like		0.046			
14.928	18.885	0.405	128	Embankment Fill	Clay-like		0.046			
15.092	16.019	0.145	128	Embankment Fill	Clay-like		0.047			
15.256	26.947	0.129	128	Embankment Fill	Clay-like		0.048			
15.420	34.838	0.163	128	Embankment Fill	Clay-like		0.049			
15.584	39.212	0.287	128	Embankment Fill	Clay-like		0.050			
15.748	43.160	0.277	128	Embankment Fill	Clay-like		0.051			
15.912	44.826	0.376	128	Embankment Fill	Clay-like		0.052			
16.076	46.258	0.611	128	Embankment Fill	Clay-like		0.052			
16.240	49.129	0.261	128	Embankment Fill	Clay-like		0.053			
16.404	39.864	0.233	128	Embankment Fill	Clay-like		0.054			
16.568	41.341	0.433	128	Embankment Fill	Clay-like		0.055			
16.732	41.253	0.196	128	Embankment Fill	Clay-like		0.056			
16.896	41.201	0.143	128	Embankment Fill	Clay-like		0.056			
17.060	41.377	0.167	128	Embankment Fill	Clay-like		0.056			
17.224	40.168	0.314	128	Embankment Fill	Clay-like		0.056			
17.388	47.681	0.760	128	Embankment Fill	Clay-like		0.056			
17.552	74.506	0.600	128	Embankment Fill	Clay-like		0.056			
17.716	83.753	1.531	128	Embankment Fill	Clay-like		0.055			
17.880	66.036	1.346	128	Embankment Fill	Clay-like		0.055			
18.044	46.891	1.411	128	Embankment Fill	Clay-like		0.055			
18.208	50.511	0.380	128	Embankment Fill	Clay-like		0.056			
18.372	42.744	0.299	128	Embankment Fill	Clay-like		0.058			
18.537	32.773	0.354	128	Embankment Fill	Clay-like		0.059			
18.701	27.472	0.581	128	Embankment Fill	Clay-like		0.061			
18.865	20.292	0.741	128	Embankment Fill	Clay-like		0.062			
19.029	25.196	0.833	128	Embankment Fill	Clay-like		0.064			
19.193	30.930	0.990	128	Embankment Fill	Clay-like		0.065			
19.357	32.069	1.093	128	Embankment Fill	Clay-like		0.065			
19.521	30.336	0.513	128	Embankment Fill	Clay-like		0.066			
19.685	26.771	0.801	128	Embankment Fill	Clay-like		0.067			
19.849	25.262	0.722	128	Embankment Fill	Clay-like		0.068			
20.013	25.372	0.753	128	Embankment Fill	Clay-like		0.068			
20.177	27.430	0.829	128	Embankment Fill	Clay-like		0.069			
20.341	28.425	0.623	128	Embankment Fill	Clay-like		0.070			
20.505	29.587	0.787	128	Embankment Fill	Clay-like		0.071			
20.669	23.365	0.479	128	Embankment Fill	Clay-like		0.071			
20.833	9.091	0.482	128	Embankment Fill	Clay-like		0.072			
20.997	14.141	0.394	128	Embankment Fill	Clay-like		0.073			
21.161	8.245	0.309	128	Embankment Fill	Clay-like		0.073			
21.325	6.870	0.229	128	Embankment Fill	Clay-like		0.074			
21.489	6.681	0.115	128	Embankment Fill	Clay-like		0.075			
21.653	6.110	0.084	128	Embankment Fill	Clay-like		0.075			
21.817	5.035	0.063	128	Embankment Fill	Clay-like		0.076			
21.981	5.254	0.054	128	Embankment Fill	Clay-like		0.077			
22.145	5.574	0.054	128	Embankment Fill	Clay-like		0.077			
22.309	5.782	0.070	128	Embankment Fill	Clay-like		0.078			
22.473	5.902	0.089	128	Embankment Fill	Clay-like		0.079			
22.638	6.326	0.088	128	Embankment Fill	Clay-like		0.079			

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
22.802	8.499	0.108	128	Embankment Fill	Clay-like		0.080			
22.966	9.049	0.255	128	Embankment Fill	Clay-like		0.081			
23.130	11.975	0.283	128	Embankment Fill	Clay-like		0.081			
23.294	12.874	0.320	128	Embankment Fill	Clay-like		0.082			
23.458	12.590	0.529	128	Embankment Fill	Clay-like		0.083			
23.622	11.215	0.985	126	Subunit 2	Sand-like		0.083			
23.786	23.640	0.713	126	Subunit 2	Sand-like		0.084			
23.950	6.945	0.677	126	Subunit 2	Sand-like		0.085			
24.114	12.109	0.226	126	Subunit 2	Sand-like		0.086			
24.278	11.799	0.176	126	Subunit 2	Sand-like		0.086			
24.442	10.457	0.169	126	Subunit 2	Sand-like		0.087			
24.606	12.628	0.162	126	Subunit 2	Sand-like		0.088			
24.770	13.008	0.161	126	Subunit 2	Sand-like		0.088			
24.934	13.042	0.220	126	Subunit 2	Sand-like		0.089			
25.098	14.460	0.216	126	Subunit 2	Sand-like		0.089			
25.262	17.054	0.355	126	Subunit 2	Sand-like		0.090			
25.426	23.965	0.607	126	Subunit 2	Sand-like		0.091			
25.590	33.997	0.711	126	Subunit 2	Sand-like		0.091			
25.754	30.950	0.712	126	Subunit 2	Sand-like		0.092			
25.918	25.192	0.575	126	Subunit 2	Sand-like		0.093			
26.082	21.985	0.992	126	Subunit 2	Sand-like		0.093			
26.246	19.876	1.142	126	Subunit 2	Sand-like		0.094			
26.410	29.563	1.234	126	Subunit 2	Sand-like		0.095			
26.574	26.664	0.972	126	Subunit 2	Sand-like		0.095			
26.739	25.433	0.869	126	Subunit 2	Sand-like		0.096			
26.903	24.870	0.803	126	Subunit 2	Sand-like		0.097			
27.067	24.848	0.838	126	Subunit 2	Sand-like		0.097			
27.231	25.412	0.859	126	Subunit 2	Sand-like		0.098			
27.395	25.491	0.922	126	Subunit 2	Sand-like		0.098			
27.559	24.937	1.003	126	Subunit 2	Sand-like		0.099			
27.723	24.679	1.087	126	Subunit 2	Sand-like		0.100			
27.887	27.065	1.164	126	Subunit 2	Sand-like		0.100			
28.051	27.028	1.234	126	Subunit 2	Sand-like		0.101			
28.215	27.593	1.185	126	Subunit 2	Sand-like		0.101			
28.379	26.598	1.117	126	Subunit 2	Sand-like		0.102			
28.543	25.861	1.071	126	Subunit 2	Sand-like		0.103			
28.707	25.037	1.071	126	Subunit 2	Sand-like		0.103			
28.871	24.635	1.004	126	Subunit 2	Sand-like		0.104			
29.035	24.635	1.013	126	Subunit 2	Sand-like		0.104			
29.199	25.625	1.064	126	Subunit 2	Sand-like		0.105			
29.363	27.507	1.060	126	Subunit 2	Sand-like		0.105			
29.527	30.050	1.864	126	Subunit 2	Sand-like		0.106			
29.691	37.858	1.403	126	Subunit 2	Sand-like		0.106			
29.855	32.118	1.881	126	Subunit 2	Sand-like		0.107			
30.019	42.790	2.335	126	Subunit 2	Sand-like		0.107			
30.183	37.782	2.214	126	Subunit 2	Sand-like		0.107			
30.347	44.362	2.080	126	Subunit 2	Sand-like		0.108			
30.511	31.547	1.774	126	Subunit 2	Sand-like		0.109			
30.675	25.321	1.212	126	Subunit 2	Sand-like		0.110			
30.840	22.278	0.624	126	Subunit 2	Sand-like		0.111			
31.004	22.452	0.648	126	Subunit 2	Sand-like		0.112			
31.168	25.276	0.718	126	Subunit 2	Sand-like		0.113			
31.332	29.999	0.840	126	Subunit 2	Sand-like		0.114			
31.496	35.562	0.719	126	Subunit 2	Sand-like		0.114			
31.660	51.563	0.466	126	Subunit 2	Sand-like		0.115			
31.824	51.319	0.319	126	Subunit 2	Sand-like		0.115			
31.988	46.880	0.246	126	Subunit 2	Sand-like		0.115			
32.152	38.437	0.234	126	Subunit 2	Sand-like		0.115			
32.316	23.816	0.253	126	Subunit 2	Sand-like		0.116			
32.480	17.197	0.248	126	Subunit 2	Sand-like		0.116			
32.644	14.550	0.256	126	Subunit 2	Sand-like		0.116			
32.808	13.166	0.185	126	Subunit 2	Sand-like		0.116			
32.972	12.315	0.208	126	Subunit 2	Sand-like		0.116			
33.136	14.022	0.249	126	Subunit 2	Sand-like		0.117			
33.300	19.231	0.262	126	Subunit 2	Sand-like		0.117			
33.464	18.960	0.198	126	Subunit 2	Sand-like		0.118			
33.628	18.892	0.170	126	Subunit 2	Sand-like		0.119			
33.792	12.530	0.122	126	Subunit 2	Sand-like		0.119			
33.956	9.410	0.136	126	Subunit 2	Sand-like		0.120			
34.120	8.714	0.194	126	Subunit 2	Sand-like		0.120			
34.284	12.067	0.163	126	Subunit 2	Sand-like		0.121			
34.448	15.311	0.240	126	Subunit 2	Sand-like		0.121			
34.612	22.679	0.277	126	Subunit 2	Sand-like		0.122			
34.776	39.390	0.303	126	Subunit 2	Sand-like		0.122			
34.941	42.750	0.326	126	Subunit 2	Sand-like		0.122			

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
35.105	47.867	0.295	131	Subunit 3	Sand-like		0.123			
35.269	51.769	0.267	131	Subunit 3	Sand-like		0.123			
35.433	50.368	0.311	131	Subunit 3	Sand-like		0.124			
35.597	40.759	0.453	131	Subunit 3	Sand-like		0.124			
35.761	29.398	1.363	131	Subunit 3	Sand-like		0.124			
35.925	25.716	1.506	131	Subunit 3	Sand-like		0.125			
36.089	101.028	2.419	131	Subunit 3	Sand-like		0.125			
36.253	96.233	1.758	131	Subunit 3	Sand-like		0.125			
36.417	48.198	1.403	131	Subunit 3	Sand-like		0.126			
36.581	49.612	0.517	131	Subunit 3	Sand-like		0.126			
36.745	43.255	0.491	131	Subunit 3	Sand-like		0.127			
36.909	39.036	0.490	131	Subunit 3	Sand-like		0.127			
37.073	30.465	0.504	131	Subunit 3	Sand-like		0.127			
37.237	24.638	0.460	131	Subunit 3	Sand-like		0.128			
37.401	14.067	0.369	131	Subunit 3	Sand-like		0.128			
37.565	12.200	0.216	131	Subunit 3	Sand-like		0.128			
37.729	18.086	0.076	131	Subunit 3	Sand-like		0.129			
37.893	27.387	0.222	131	Subunit 3	Sand-like		0.129			
38.057	36.078	0.198	131	Subunit 3	Sand-like		0.129			
38.221	39.120	0.230	131	Subunit 3	Sand-like		0.130			
38.385	40.955	0.180	131	Subunit 3	Sand-like		0.130			
38.549	40.009	0.239	131	Subunit 3	Sand-like		0.130			
38.713	34.747	0.247	131	Subunit 3	Sand-like		0.131			
38.877	27.849	0.265	131	Subunit 3	Sand-like		0.131			
39.042	20.863	0.339	131	Subunit 3	Sand-like		0.131			
39.206	22.666	0.337	131	Subunit 3	Sand-like		0.131			
39.370	36.237	0.300	131	Subunit 3	Sand-like		0.132			
39.534	42.779	0.237	131	Subunit 3	Sand-like		0.132			
39.698	35.100	0.412	131	Subunit 3	Sand-like		0.132			
39.862	17.159	0.379	131	Subunit 3	Sand-like		0.132			
40.026	12.185	0.267	131	Subunit 3	Sand-like		0.133			
40.190	13.149	0.084	131	Subunit 3	Sand-like		0.133			
40.354	12.410	0.137	131	Subunit 3	Sand-like		0.133			
40.518	20.986	0.102	131	Subunit 3	Sand-like		0.133			
40.682	22.738	0.074	131	Subunit 3	Sand-like		0.134			
40.846	19.852	0.041	131	Subunit 3	Sand-like		0.134			
41.010	11.093	0.137	131	Subunit 3	Sand-like		0.134			
41.174	8.970	0.313	131	Subunit 3	Sand-like		0.134			
41.338	55.245	0.283	131	Subunit 3	Sand-like		0.135			
41.502	96.740	0.240	131	Subunit 3	Sand-like		0.135			
41.666	111.055	0.476	131	Subunit 3	Sand-like		0.135			
41.830	108.387	0.639	131	Subunit 3	Sand-like		0.135			
41.994	114.268	0.699	131	Subunit 3	Sand-like		0.135			
42.158	120.751	0.724	131	Subunit 3	Sand-like		0.136			
42.322	104.180	0.601	131	Subunit 3	Sand-like		0.136			
42.486	93.936	0.574	131	Subunit 3	Sand-like		0.136			
42.650	83.091	0.569	131	Subunit 3	Sand-like		0.136			
42.814	75.629	0.547	131	Subunit 3	Sand-like		0.136			
42.978	72.662	0.537	131	Subunit 3	Sand-like		0.137			
43.143	69.153	0.514	131	Subunit 3	Sand-like		0.137			
43.307	63.476	0.844	131	Subunit 3	Sand-like		0.137			
43.471	63.320	1.387	131	Subunit 3	Sand-like		0.137			
43.635	95.308	4.301	131	Subunit 3	Sand-like		0.137			
43.799	164.725	2.084	131	Subunit 3	Sand-like		0.136			
43.963	167.339	2.075	131	Subunit 3	Sand-like		0.136			
44.127	138.334	1.274	131	Subunit 3	Sand-like		0.136			
44.291	122.455	1.485	131	Subunit 3	Sand-like		0.135			
44.455	92.499	1.098	131	Subunit 3	Sand-like		0.135			
44.619	58.567	0.557	131	Subunit 3	Sand-like		0.134			
44.783	49.602	0.434	131	Subunit 3	Sand-like		0.134			
44.947	44.768	0.466	131	Subunit 3	Sand-like		0.134			
45.111	46.317	0.348	131	Subunit 3	Sand-like		0.133			
45.275	53.766	0.328	131	Subunit 3	Sand-like		0.133			
45.439	60.496	0.418	131	Subunit 3	Sand-like		0.133			
45.603	79.837	0.587	131	Subunit 3	Sand-like		0.133			
45.767	110.849	0.297	131	Subunit 3	Sand-like		0.133			
45.931	127.592	0.365	131	Subunit 3	Sand-like		0.133			
46.095	121.183	0.492	131	Subunit 3	Sand-like		0.133			
46.259	116.024	0.938	131	Subunit 3	Sand-like		0.133			
46.423	142.473	1.728	131	Subunit 3	Sand-like		0.133			
46.587	238.170	0.010	131	Subunit 3	Sand-like		0.133			
46.751	379.449	0.010	131	Subunit 3	Sand-like		0.133			

LIQUEFACTION POTENTIAL ASSESSMENT FOR COARSE GRAINED SOILS USING CONE PENETRATION TEST DATA

Facility: KIF TDEC Stability
Project No.: 175668043
CPT ID: CPT-05A

Water Elevation during CPT:	751.5	ft
Depth to Water during CPT:	2.5	ft *(relative to ground surface during CPT)*
Water Elevation during Earthquake:	749.0	ft
Depth to Water during Earthquake:	5.0	ft *(relative to ground surface during CPT)*
Final Grade Elevation during EQ:	753	ft *(if no fill, then set this equal to top of CPT hole elev.)*
Height of Final Grade above CPT TOH:	-1.0	ft *(relative to ground surface during CPT, + Fill, - Cut)*
Unit Weight of Cut/Fill to Achieve Final Grade	120	pcf
Cut/Fill Total Stress (+ Fill, - Cut):	-0.06	tsf

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight γ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
754.0				Vertical Stresses above 1st CPT:			**0.01**	**-0.05**	**0.00**	**0.00**	**0.01**	**-0.05**
753.8	0.164	2.41	0.33	112	**0.16**	0.08	0.01	-0.05	0.00	0.00	0.01	-0.05
753.7	0.328	145.34	0.37	112	0.25	0.16	0.02	-0.04	0.00	0.00	0.02	-0.04
753.5	0.492	211.84	1.30	112	0.41	0.16	0.03	-0.03	0.00	0.00	0.03	-0.03
753.3	0.656	262.26	1.36	112	0.57	0.16	0.04	-0.02	0.00	0.00	0.04	-0.02
753.2	0.820	179.44	1.30	112	0.74	0.16	0.05	-0.01	0.00	0.00	0.05	-0.01
753.0	0.984	121.33	1.56	112	0.90	0.16	0.06	0.00	0.00	0.00	0.06	0.00
752.9	1.148	58.11	1.91	112	1.07	0.16	0.06	0.00	0.00	0.00	0.06	0.00
752.7	1.312	93.51	2.27	112	1.23	0.16	0.07	0.01	0.00	0.00	0.07	0.01
752.5	1.476	476.47	3.88	112	1.39	0.16	0.08	0.02	0.00	0.00	0.08	0.02
752.4	1.640	381.35	4.76	112	1.56	0.16	0.09	0.03	0.00	0.00	0.09	0.03
752.2	1.804	395.87	4.97	112	1.72	0.16	0.10	0.04	0.00	0.00	0.10	0.04
752.0	1.968	391.74	3.46	112	1.89	0.16	0.11	0.05	0.00	0.00	0.11	0.05
751.9	2.133	368.62	2.26	112	2.05	0.16	0.12	0.06	0.00	0.00	0.12	0.06
751.7	2.297	295.03	2.04	112	2.21	0.16	0.13	0.07	0.00	0.00	0.13	0.07
751.5	2.461	208.07	1.67	112	2.38	0.16	0.14	0.08	0.00	0.00	0.14	0.08
751.4	2.625	124.13	2.14	112	2.54	0.16	0.15	0.09	0.00	0.00	0.14	0.09
751.2	2.789	75.43	2.50	112	2.71	0.16	0.16	0.10	0.01	0.00	0.15	0.10
751.0	2.953	54.29	2.40	112	2.87	0.16	0.17	0.11	0.01	0.00	0.15	0.11
750.9	3.117	53.63	1.76	112	3.03	0.16	0.18	0.12	0.02	0.00	0.16	0.12
750.7	3.281	237.38	2.14	112	3.20	0.16	0.18	0.12	0.02	0.00	0.16	0.12
750.6	3.445	273.84	1.76	112	3.36	0.16	0.19	0.13	0.03	0.00	0.16	0.13
750.4	3.609	374.48	2.33	112	3.53	0.16	0.20	0.14	0.03	0.00	0.17	0.14
750.2	3.773	299.70	2.56	112	3.69	0.16	0.21	0.15	0.04	0.00	0.17	0.15
750.1	3.937	200.48	3.30	112	3.85	0.16	0.22	0.16	0.04	0.00	0.18	0.16
749.9	4.101	120.48	3.77	112	4.02	0.16	0.23	0.17	0.05	0.00	0.18	0.17
749.7	4.265	82.66	3.90	112	4.18	0.16	0.24	0.18	0.06	0.00	0.18	0.18
749.6	4.429	51.34	4.19	112	4.35	0.16	0.25	0.19	0.06	0.00	0.19	0.19
749.4	4.593	67.92	2.92	112	4.51	0.16	0.26	0.20	0.07	0.00	0.19	0.20
749.2	4.757	124.66	2.23	112	4.68	0.16	0.27	0.21	0.07	0.00	0.20	0.21
749.1	4.921	142.84	2.59	112	4.84	0.16	0.28	0.22	0.08	0.00	0.20	0.22
748.9	5.085	55.97	2.49	128	5.00	0.16	0.29	0.23	0.08	0.00	0.21	0.22
748.8	5.249	252.81	3.10	128	5.17	0.16	0.30	0.24	0.09	0.01	0.21	0.23
748.6	5.413	352.62	5.22	128	5.33	0.16	0.31	0.25	0.09	0.01	0.22	0.23
748.4	5.577	335.34	2.96	128	5.50	0.16	0.32	0.26	0.10	0.02	0.22	0.24
748.3	5.741	394.10	4.31	128	5.66	0.16	0.33	0.27	0.10	0.02	0.23	0.24
748.1	5.905	365.29	5.55	128	5.82	0.16	0.34	0.28	0.11	0.03	0.23	0.25
747.9	6.069	232.03	6.69	128	5.99	0.16	0.35	0.29	0.11	0.03	0.24	0.26
747.8	6.234	208.75	7.28	128	6.15	0.16	0.36	0.30	0.12	0.04	0.24	0.26
747.6	6.398	139.12	5.97	128	6.32	0.16	0.37	0.31	0.12	0.04	0.25	0.27
747.4	6.562	136.10	5.39	128	6.48	0.16	0.38	0.32	0.13	0.05	0.25	0.27
747.3	6.726	132.27	4.52	128	6.64	0.16	0.39	0.33	0.13	0.05	0.26	0.28
747.1	6.890	211.13	4.38	128	6.81	0.16	0.40	0.34	0.14	0.06	0.26	0.28
746.9	7.054	221.13	5.40	128	6.97	0.16	0.41	0.35	0.14	0.06	0.27	0.29
746.8	7.218	228.74	4.80	128	7.14	0.16	0.42	0.36	0.15	0.07	0.28	0.29
746.6	7.382	249.96	4.81	128	7.30	0.16	0.43	0.37	0.15	0.07	0.28	0.30
746.5	7.546	257.93	4.37	128	7.46	0.16	0.44	0.38	0.16	0.08	0.29	0.30
746.3	7.710	345.61	3.73	128	7.63	0.16	0.45	0.39	0.16	0.08	0.29	0.31
746.1	7.874	371.47	4.53	128	7.79	0.16	0.46	0.40	0.17	0.09	0.30	0.31
746.0	8.038	384.18	3.56	128	7.96	0.16	0.48	0.42	0.17	0.09	0.30	0.32
745.8	8.202	423.78	5.36	128	8.12	0.16	0.49	0.43	0.18	0.10	0.31	0.33
745.6	8.366	322.76	4.43	128	8.28	0.16	0.50	0.44	0.18	0.11	0.31	0.33
745.5	8.530	206.50	4.61	128	8.45	0.16	0.51	0.45	0.19	0.11	0.32	0.34
745.3	8.694	178.72	4.57	128	8.61	0.16	0.52	0.46	0.19	0.12	0.32	0.34
745.1	8.858	91.41	3.80	128	8.78	0.16	0.53	0.47	0.20	0.12	0.33	0.35
745.0	9.022	70.33	3.75	128	8.94	0.16	0.54	0.48	0.20	0.13	0.33	0.35
744.8	9.186	61.51	2.68	128	9.10	0.16	0.55	0.49	0.21	0.13	0.34	0.36
744.6	9.350	74.84	2.34	128	9.27	0.16	0.56	0.50	0.21	0.14	0.35	0.36
744.5	9.514	74.49	2.26	128	9.43	0.16	0.57	0.51	0.22	0.14	0.35	0.37

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
744.3	9.678	63.23	1.38	128	9.60	0.16	0.58	0.52	0.22	0.15	0.36	0.37
744.2	9.842	43.36	1.63	128	9.76	0.16	0.59	0.53	0.23	0.15	0.36	0.38
744.0	10.006	36.02	1.47	128	9.92	0.16	0.60	0.54	0.23	0.16	0.37	0.38
743.8	10.170	68.33	1.43	128	10.09	0.16	0.61	0.55	0.24	0.16	0.37	0.39
743.7	10.335	66.19	2.04	128	10.25	0.16	0.62	0.56	0.24	0.17	0.38	0.40
743.5	10.499	60.81	2.12	128	10.42	0.16	0.63	0.57	0.25	0.17	0.38	0.40
743.3	10.663	38.17	2.11	128	10.58	0.16	0.64	0.58	0.25	0.18	0.39	0.41
743.2	10.827	36.97	2.07	128	10.74	0.16	0.65	0.59	0.26	0.18	0.39	0.41
743.0	10.991	53.41	2.10	128	10.91	0.16	0.66	0.60	0.26	0.19	0.40	0.42
742.8	11.155	60.17	2.15	128	11.07	0.16	0.67	0.61	0.27	0.19	0.40	0.42
742.7	11.319	72.69	2.08	128	11.24	0.16	0.69	0.63	0.28	0.20	0.41	0.43
742.5	11.483	112.39	1.92	128	11.40	0.16	0.70	0.64	0.28	0.20	0.42	0.43
742.4	11.647	65.87	2.76	128	11.56	0.16	0.71	0.65	0.29	0.21	0.42	0.44
742.2	11.811	59.01	2.85	128	11.73	0.16	0.72	0.66	0.29	0.21	0.43	0.44
742.0	11.975	42.83	2.78	128	11.89	0.16	0.73	0.67	0.30	0.22	0.43	0.45
741.9	12.139	42.17	2.25	128	12.06	0.16	0.74	0.68	0.30	0.22	0.44	0.45
741.7	12.303	43.46	2.33	128	12.22	0.16	0.75	0.69	0.31	0.23	0.44	0.46
741.5	12.467	84.81	2.67	128	12.39	0.16	0.76	0.70	0.31	0.23	0.45	0.47
741.4	12.631	101.62	3.68	128	12.55	0.16	0.77	0.71	0.32	0.24	0.45	0.47
741.2	12.795	108.92	3.85	128	12.71	0.16	0.78	0.72	0.32	0.24	0.46	0.48
741.0	12.959	79.98	2.78	128	12.88	0.16	0.79	0.73	0.33	0.25	0.46	0.48
740.9	13.123	54.35	2.33	128	13.04	0.16	0.80	0.74	0.33	0.25	0.47	0.49
740.7	13.287	46.59	1.86	128	13.21	0.16	0.81	0.75	0.34	0.26	0.47	0.49
740.5	13.451	33.78	1.41	128	13.37	0.16	0.82	0.76	0.34	0.26	0.48	0.50
740.4	13.615	28.37	1.18	128	13.53	0.16	0.83	0.77	0.35	0.27	0.49	0.50
740.2	13.779	42.09	0.79	128	13.70	0.16	0.84	0.78	0.35	0.27	0.49	0.51
740.1	13.943	46.03	0.70	128	13.86	0.16	0.85	0.79	0.36	0.28	0.50	0.51
739.9	14.107	42.51	0.51	128	14.03	0.16	0.86	0.80	0.36	0.28	0.50	0.52
739.7	14.271	45.61	0.46	128	14.19	0.16	0.87	0.81	0.37	0.29	0.51	0.52
739.6	14.436	46.96	0.54	128	14.35	0.16	0.88	0.82	0.37	0.29	0.51	0.53
739.4	14.600	33.87	0.51	128	14.52	0.16	0.90	0.84	0.38	0.30	0.52	0.54
739.2	14.764	34.70	0.62	128	14.68	0.16	0.91	0.85	0.38	0.30	0.52	0.54
739.1	14.928	18.89	0.41	128	14.85	0.16	0.92	0.86	0.39	0.31	0.53	0.55
738.9	15.092	16.02	0.15	128	15.01	0.16	0.93	0.87	0.39	0.31	0.53	0.55
738.7	15.256	26.95	0.13	128	15.17	0.16	0.94	0.88	0.40	0.32	0.54	0.56
738.6	15.420	34.84	0.16	128	15.34	0.16	0.95	0.89	0.40	0.33	0.54	0.56
738.4	15.584	39.21	0.29	128	15.50	0.16	0.96	0.90	0.41	0.33	0.55	0.57
738.3	15.748	43.16	0.28	128	15.67	0.16	0.97	0.91	0.41	0.34	0.56	0.57
738.1	15.912	44.83	0.38	128	15.83	0.16	0.98	0.92	0.42	0.34	0.56	0.58
737.9	16.076	46.26	0.61	128	15.99	0.16	0.99	0.93	0.42	0.35	0.57	0.58
737.8	16.240	49.13	0.26	128	16.16	0.16	1.00	0.94	0.43	0.35	0.57	0.59
737.6	16.404	39.86	0.23	128	16.32	0.16	1.01	0.95	0.43	0.36	0.58	0.59
737.4	16.568	41.34	0.43	128	16.49	0.16	1.02	0.96	0.44	0.36	0.58	0.60
737.3	16.732	41.25	0.20	128	16.65	0.16	1.03	0.97	0.44	0.37	0.59	0.61
737.1	16.896	41.20	0.14	128	16.81	0.16	1.04	0.98	0.45	0.37	0.59	0.61
736.9	17.060	41.38	0.17	128	16.98	0.16	1.05	0.99	0.45	0.38	0.60	0.62
736.8	17.224	40.17	0.31	128	17.14	0.16	1.06	1.00	0.46	0.38	0.60	0.62
736.6	17.388	47.68	0.76	128	17.31	0.16	1.07	1.01	0.46	0.39	0.61	0.63
736.4	17.552	74.51	0.60	128	17.47	0.16	1.08	1.02	0.47	0.39	0.61	0.63
736.3	17.716	83.75	1.53	128	17.63	0.16	1.09	1.03	0.47	0.40	0.62	0.64
736.1	17.880	66.04	1.35	128	17.80	0.16	1.10	1.04	0.48	0.40	0.63	0.64
736.0	18.044	46.89	1.41	128	17.96	0.16	1.12	1.06	0.48	0.41	0.63	0.65
735.8	18.208	50.51	0.38	128	18.13	0.16	1.13	1.07	0.49	0.41	0.64	0.65
735.6	18.372	42.74	0.30	128	18.29	0.16	1.14	1.08	0.50	0.42	0.64	0.66
735.5	18.537	32.77	0.35	128	18.45	0.16	1.15	1.09	0.50	0.42	0.65	0.66
735.3	18.701	27.47	0.58	128	18.62	0.16	1.16	1.10	0.51	0.43	0.65	0.67
735.1	18.865	20.29	0.74	128	18.78	0.16	1.17	1.11	0.51	0.43	0.66	0.68
735.0	19.029	25.20	0.83	128	18.95	0.16	1.18	1.12	0.52	0.44	0.66	0.68
734.8	19.193	30.93	0.99	128	19.11	0.16	1.19	1.13	0.52	0.44	0.67	0.69
734.6	19.357	32.07	1.09	128	19.27	0.16	1.20	1.14	0.53	0.45	0.67	0.69
734.5	19.521	30.34	0.51	128	19.44	0.16	1.21	1.15	0.53	0.45	0.68	0.70
734.3	19.685	26.77	0.80	128	19.60	0.16	1.22	1.16	0.54	0.46	0.68	0.70
734.2	19.849	25.26	0.72	128	19.77	0.16	1.23	1.17	0.54	0.46	0.69	0.71
734.0	20.013	25.37	0.75	128	19.93	0.16	1.24	1.18	0.55	0.47	0.70	0.71
733.8	20.177	27.43	0.83	128	20.09	0.16	1.25	1.19	0.55	0.47	0.70	0.72
733.7	20.341	28.42	0.62	128	20.26	0.16	1.26	1.20	0.56	0.48	0.71	0.72
733.5	20.505	29.59	0.79	128	20.42	0.16	1.27	1.21	0.56	0.48	0.71	0.73
733.3	20.669	23.37	0.48	128	20.59	0.16	1.28	1.22	0.57	0.49	0.72	0.73
733.2	20.833	9.09	0.48	128	20.75	0.16	1.29	1.23	0.57	0.49	0.72	0.74

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
733.0	20.997	14.14	0.39	128	20.92	0.16	1.30	1.24	0.58	0.50	0.73	0.75
732.8	21.161	8.24	0.31	128	21.08	0.16	1.31	1.25	0.58	0.50	0.73	0.75
732.7	21.325	6.87	0.23	128	21.24	0.16	1.33	1.27	0.59	0.51	0.74	0.76
732.5	21.489	6.68	0.12	128	21.41	0.16	1.34	1.28	0.59	0.51	0.74	0.76
732.3	21.653	6.11	0.08	128	21.57	0.16	1.35	1.29	0.60	0.52	0.75	0.77
732.2	21.817	5.03	0.06	128	21.74	0.16	1.36	1.30	0.60	0.52	0.75	0.77
732.0	21.981	5.25	0.05	128	21.90	0.16	1.37	1.31	0.61	0.53	0.76	0.78
731.9	22.145	5.57	0.05	128	22.06	0.16	1.38	1.32	0.61	0.53	0.76	0.78
731.7	22.309	5.78	0.07	128	22.23	0.16	1.39	1.33	0.62	0.54	0.77	0.79
731.5	22.473	5.90	0.09	128	22.39	0.16	1.40	1.34	0.62	0.55	0.78	0.79
731.4	22.638	6.33	0.09	128	22.56	0.16	1.41	1.35	0.63	0.55	0.78	0.80
731.2	22.802	8.50	0.11	128	22.72	0.16	1.42	1.36	0.63	0.56	0.79	0.80
731.0	22.966	9.05	0.26	128	22.88	0.16	1.43	1.37	0.64	0.56	0.79	0.81
730.9	23.130	11.98	0.28	128	23.05	0.16	1.44	1.38	0.64	0.57	0.80	0.82
730.7	23.294	12.87	0.32	128	23.21	0.16	1.45	1.39	0.65	0.57	0.80	0.82
730.5	23.458	12.59	0.53	128	23.38	0.16	1.46	1.40	0.65	0.58	0.81	0.83
730.4	23.622	11.22	0.99	126	23.54	0.16	1.47	1.41	0.66	0.58	0.81	0.83
730.2	23.786	23.64	0.71	126	23.70	0.16	1.48	1.42	0.66	0.59	0.82	0.84
730.1	23.950	6.95	0.68	126	23.87	0.16	1.49	1.43	0.67	0.59	0.82	0.84
729.9	24.114	12.11	0.23	126	24.03	0.16	1.50	1.44	0.67	0.60	0.83	0.85
729.7	24.278	11.80	0.18	126	24.20	0.16	1.51	1.45	0.68	0.60	0.83	0.85
729.6	24.442	10.46	0.17	126	24.36	0.16	1.52	1.46	0.68	0.61	0.84	0.86
729.4	24.606	12.63	0.16	126	24.52	0.16	1.53	1.47	0.69	0.61	0.84	0.86
729.2	24.770	13.01	0.16	126	24.69	0.16	1.54	1.48	0.69	0.62	0.85	0.87
729.1	24.934	13.04	0.22	126	24.85	0.16	1.56	1.50	0.70	0.62	0.86	0.87
728.9	25.098	14.46	0.22	126	25.02	0.16	1.57	1.51	0.71	0.63	0.86	0.88
728.7	25.262	17.05	0.36	126	25.18	0.16	1.58	1.52	0.71	0.63	0.87	0.88
728.6	25.426	23.96	0.61	126	25.34	0.16	1.59	1.53	0.72	0.64	0.87	0.89
728.4	25.590	34.00	0.71	126	25.51	0.16	1.60	1.54	0.72	0.64	0.88	0.89
728.2	25.754	30.95	0.71	126	25.67	0.16	1.61	1.55	0.73	0.65	0.88	0.90
728.1	25.918	25.19	0.58	126	25.84	0.16	1.62	1.56	0.73	0.65	0.89	0.90
727.9	26.082	21.98	0.99	126	26.00	0.16	1.63	1.57	0.74	0.66	0.89	0.91
727.8	26.246	19.88	1.14	126	26.16	0.16	1.64	1.58	0.74	0.66	0.90	0.91
727.6	26.410	29.56	1.23	126	26.33	0.16	1.65	1.59	0.75	0.67	0.90	0.92
727.4	26.574	26.66	0.97	126	26.49	0.16	1.66	1.60	0.75	0.67	0.91	0.93
727.3	26.739	25.43	0.87	126	26.66	0.16	1.67	1.61	0.76	0.68	0.91	0.93
727.1	26.903	24.87	0.80	126	26.82	0.16	1.68	1.62	0.76	0.68	0.92	0.94
726.9	27.067	24.85	0.84	126	26.98	0.16	1.69	1.63	0.77	0.69	0.92	0.94
726.8	27.231	25.41	0.86	126	27.15	0.16	1.70	1.64	0.77	0.69	0.93	0.95
726.6	27.395	25.49	0.92	126	27.31	0.16	1.71	1.65	0.78	0.70	0.93	0.95
726.4	27.559	24.94	1.00	126	27.48	0.16	1.72	1.66	0.78	0.70	0.94	0.96
726.3	27.723	24.68	1.09	126	27.64	0.16	1.73	1.67	0.79	0.71	0.94	0.96
726.1	27.887	27.07	1.16	126	27.80	0.16	1.74	1.68	0.79	0.71	0.95	0.97
725.9	28.051	27.03	1.23	126	27.97	0.16	1.75	1.69	0.80	0.72	0.95	0.97
725.8	28.215	27.59	1.19	126	28.13	0.16	1.76	1.70	0.80	0.72	0.96	0.98
725.6	28.379	26.60	1.12	126	28.30	0.16	1.77	1.71	0.81	0.73	0.96	0.98
725.5	28.543	25.86	1.07	126	28.46	0.16	1.78	1.72	0.81	0.73	0.97	0.99
725.3	28.707	25.04	1.07	126	28.62	0.16	1.79	1.73	0.82	0.74	0.98	0.99
725.1	28.871	24.64	1.00	126	28.79	0.16	1.80	1.74	0.82	0.74	0.98	1.00
725.0	29.035	24.64	1.01	126	28.95	0.16	1.81	1.75	0.83	0.75	0.99	1.00
724.8	29.199	25.63	1.06	126	29.12	0.16	1.82	1.76	0.83	0.76	0.99	1.01
724.6	29.363	27.51	1.06	126	29.28	0.16	1.83	1.77	0.84	0.76	1.00	1.01
724.5	29.527	30.05	1.86	126	29.45	0.16	1.84	1.78	0.84	0.77	1.00	1.02
724.3	29.691	37.86	1.40	126	29.61	0.16	1.85	1.79	0.85	0.77	1.01	1.02
724.1	29.855	32.12	1.88	126	29.77	0.16	1.87	1.81	0.85	0.78	1.01	1.03
724.0	30.019	42.79	2.34	126	29.94	0.16	1.88	1.82	0.86	0.78	1.02	1.03
723.8	30.183	37.78	2.21	126	30.10	0.16	1.89	1.83	0.86	0.79	1.02	1.04
723.7	30.347	44.36	2.08	126	30.27	0.16	1.90	1.84	0.87	0.79	1.03	1.05
723.5	30.511	31.55	1.77	126	30.43	0.16	1.91	1.85	0.87	0.80	1.03	1.05
723.3	30.675	25.32	1.21	126	30.59	0.16	1.92	1.86	0.88	0.80	1.04	1.06
723.2	30.840	22.28	0.62	126	30.76	0.16	1.93	1.87	0.88	0.81	1.04	1.06
723.0	31.004	22.45	0.65	126	30.92	0.16	1.94	1.88	0.89	0.81	1.05	1.07
722.8	31.168	25.28	0.72	126	31.09	0.16	1.95	1.89	0.89	0.82	1.05	1.07
722.7	31.332	30.00	0.84	126	31.25	0.16	1.96	1.90	0.90	0.82	1.06	1.08
722.5	31.496	35.56	0.72	126	31.41	0.16	1.97	1.91	0.90	0.83	1.06	1.08
722.3	31.660	51.56	0.47	126	31.58	0.16	1.98	1.92	0.91	0.83	1.07	1.09
722.2	31.824	51.32	0.32	126	31.74	0.16	1.99	1.93	0.91	0.84	1.07	1.09
722.0	31.988	46.88	0.25	126	31.91	0.16	2.00	1.94	0.92	0.84	1.08	1.10
721.8	32.152	38.44	0.23	126	32.07	0.16	2.01	1.95	0.93	0.85	1.08	1.10

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
721.7	32.316	23.82	0.25	126	32.23	0.16	2.02	1.96	0.93	0.85	1.09	1.11
721.5	32.480	17.20	0.25	126	32.40	0.16	2.03	1.97	0.94	0.86	1.10	1.11
721.4	32.644	14.55	0.26	126	32.56	0.16	2.04	1.98	0.94	0.86	1.10	1.12
721.2	32.808	13.17	0.19	126	32.73	0.16	2.05	1.99	0.95	0.87	1.11	1.12
721.0	32.972	12.32	0.21	126	32.89	0.16	2.06	2.00	0.95	0.87	1.11	1.13
720.9	33.136	14.02	0.25	126	33.05	0.16	2.07	2.01	0.96	0.88	1.12	1.13
720.7	33.300	19.23	0.26	126	33.22	0.16	2.08	2.02	0.96	0.88	1.12	1.14
720.5	33.464	18.96	0.20	126	33.38	0.16	2.09	2.03	0.97	0.89	1.13	1.14
720.4	33.628	18.89	0.17	126	33.55	0.16	2.10	2.04	0.97	0.89	1.13	1.15
720.2	33.792	12.53	0.12	126	33.71	0.16	2.11	2.05	0.98	0.90	1.14	1.15
720.0	33.956	9.41	0.14	126	33.87	0.16	2.12	2.06	0.98	0.90	1.14	1.16
719.9	34.120	8.71	0.19	126	34.04	0.16	2.13	2.07	0.99	0.91	1.15	1.17
719.7	34.284	12.07	0.16	126	34.20	0.16	2.14	2.08	0.99	0.91	1.15	1.17
719.6	34.448	15.31	0.24	126	34.37	0.16	2.15	2.09	1.00	0.92	1.16	1.18
719.4	34.612	22.68	0.28	126	34.53	0.16	2.16	2.10	1.00	0.92	1.16	1.18
719.2	34.776	39.39	0.30	126	34.69	0.16	2.18	2.12	1.01	0.93	1.17	1.19
719.1	34.941	42.75	0.33	126	34.86	0.16	2.19	2.13	1.01	0.93	1.17	1.19
718.9	35.105	47.87	0.30	131	35.02	0.16	2.20	2.14	1.02	0.94	1.18	1.20
718.7	35.269	51.77	0.27	131	35.19	0.16	2.21	2.15	1.02	0.94	1.18	1.20
718.6	35.433	50.37	0.31	131	35.35	0.16	2.22	2.16	1.03	0.95	1.19	1.21
718.4	35.597	40.76	0.45	131	35.51	0.16	2.23	2.17	1.03	0.95	1.20	1.21
718.2	35.761	29.40	1.36	131	35.68	0.16	2.24	2.18	1.04	0.96	1.20	1.22
718.1	35.925	25.72	1.51	131	35.84	0.16	2.25	2.19	1.04	0.96	1.21	1.22
717.9	36.089	101.03	2.42	131	36.01	0.16	2.26	2.20	1.05	0.97	1.21	1.23
717.7	36.253	96.23	1.76	131	36.17	0.16	2.27	2.21	1.05	0.98	1.22	1.24
717.6	36.417	48.20	1.40	131	36.33	0.16	2.28	2.22	1.06	0.98	1.22	1.24
717.4	36.581	49.61	0.52	131	36.50	0.16	2.29	2.23	1.06	0.99	1.23	1.25
717.3	36.745	43.26	0.49	131	36.66	0.16	2.30	2.24	1.07	0.99	1.23	1.25
717.1	36.909	39.04	0.49	131	36.83	0.16	2.31	2.25	1.07	1.00	1.24	1.26
716.9	37.073	30.46	0.50	131	36.99	0.16	2.32	2.26	1.08	1.00	1.25	1.26
716.8	37.237	24.64	0.46	131	37.16	0.16	2.34	2.28	1.08	1.01	1.25	1.27
716.6	37.401	14.07	0.37	131	37.32	0.16	2.35	2.29	1.09	1.01	1.26	1.28
716.4	37.565	12.20	0.22	131	37.48	0.16	2.36	2.30	1.09	1.02	1.26	1.28
716.3	37.729	18.09	0.08	131	37.65	0.16	2.37	2.31	1.10	1.02	1.27	1.29
716.1	37.893	27.39	0.22	131	37.81	0.16	2.38	2.32	1.10	1.03	1.27	1.29
715.9	38.057	36.08	0.20	131	37.98	0.16	2.39	2.33	1.11	1.03	1.28	1.30
715.8	38.221	39.12	0.23	131	38.14	0.16	2.40	2.34	1.11	1.04	1.29	1.30
715.6	38.385	40.95	0.18	131	38.30	0.16	2.41	2.35	1.12	1.04	1.29	1.31
715.5	38.549	40.01	0.24	131	38.47	0.16	2.42	2.36	1.12	1.05	1.30	1.31
715.3	38.713	34.75	0.25	131	38.63	0.16	2.43	2.37	1.13	1.05	1.30	1.32
715.1	38.877	27.85	0.27	131	38.80	0.16	2.44	2.38	1.13	1.06	1.31	1.33
715.0	39.042	20.86	0.34	131	38.96	0.16	2.45	2.39	1.14	1.06	1.31	1.33
714.8	39.206	22.67	0.34	131	39.12	0.16	2.46	2.40	1.15	1.07	1.32	1.34
714.6	39.370	36.24	0.30	131	39.29	0.16	2.48	2.42	1.15	1.07	1.32	1.34
714.5	39.534	42.78	0.24	131	39.45	0.16	2.49	2.43	1.16	1.08	1.33	1.35
714.3	39.698	35.10	0.41	131	39.62	0.16	2.50	2.44	1.16	1.08	1.34	1.35
714.1	39.862	17.16	0.38	131	39.78	0.16	2.51	2.45	1.17	1.09	1.34	1.36
714.0	40.026	12.19	0.27	131	39.94	0.16	2.52	2.46	1.17	1.09	1.35	1.37
713.8	40.190	13.15	0.08	131	40.11	0.16	2.53	2.47	1.18	1.10	1.35	1.37
713.6	40.354	12.41	0.14	131	40.27	0.16	2.54	2.48	1.18	1.10	1.36	1.38
713.5	40.518	20.99	0.10	131	40.44	0.16	2.55	2.49	1.19	1.11	1.36	1.38
713.3	40.682	22.74	0.07	131	40.60	0.16	2.56	2.50	1.19	1.11	1.37	1.39
713.2	40.846	19.85	0.04	131	40.76	0.16	2.57	2.51	1.20	1.12	1.38	1.39
713.0	41.010	11.09	0.14	131	40.93	0.16	2.58	2.52	1.20	1.12	1.38	1.40
712.8	41.174	8.97	0.31	131	41.09	0.16	2.59	2.53	1.21	1.13	1.39	1.40
712.7	41.338	55.25	0.28	131	41.26	0.16	2.60	2.54	1.21	1.13	1.39	1.41
712.5	41.502	96.74	0.24	131	41.42	0.16	2.62	2.56	1.22	1.14	1.40	1.42
712.3	41.666	111.06	0.48	131	41.58	0.16	2.63	2.57	1.22	1.14	1.40	1.42
712.2	41.830	108.39	0.64	131	41.75	0.16	2.64	2.58	1.23	1.15	1.41	1.43
712.0	41.994	114.27	0.70	131	41.91	0.16	2.65	2.59	1.23	1.15	1.42	1.43
711.8	42.158	120.75	0.72	131	42.08	0.16	2.66	2.60	1.24	1.16	1.42	1.44
711.7	42.322	104.18	0.60	131	42.24	0.16	2.67	2.61	1.24	1.16	1.43	1.44
711.5	42.486	93.94	0.57	131	42.40	0.16	2.68	2.62	1.25	1.17	1.43	1.45
711.3	42.650	83.09	0.57	131	42.57	0.16	2.69	2.63	1.25	1.17	1.44	1.46
711.2	42.814	75.63	0.55	131	42.73	0.16	2.70	2.64	1.26	1.18	1.44	1.46
711.0	42.978	72.66	0.54	131	42.90	0.16	2.71	2.65	1.26	1.18	1.45	1.47
710.9	43.143	69.15	0.51	131	43.06	0.16	2.72	2.66	1.27	1.19	1.45	1.47
710.7	43.307	63.48	0.84	131	43.22	0.16	2.73	2.67	1.27	1.20	1.46	1.48
710.5	43.471	63.32	1.39	131	43.39	0.16	2.74	2.68	1.28	1.20	1.47	1.48

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
710.4	43.635	95.31	4.30	131	43.55	0.16	2.75	2.69	1.28	1.21	1.47	1.49
710.2	43.799	164.73	2.08	131	43.72	0.16	2.77	2.71	1.29	1.21	1.48	1.49
710.0	43.963	167.34	2.08	131	43.88	0.16	2.78	2.72	1.29	1.22	1.48	1.50
709.9	44.127	138.33	1.27	131	44.04	0.16	2.79	2.73	1.30	1.22	1.49	1.51
709.7	44.291	122.45	1.49	131	44.21	0.16	2.80	2.74	1.30	1.23	1.49	1.51
709.5	44.455	92.50	1.10	131	44.37	0.16	2.81	2.75	1.31	1.23	1.50	1.52
709.4	44.619	58.57	0.56	131	44.54	0.16	2.82	2.76	1.31	1.24	1.51	1.52
709.2	44.783	49.60	0.43	131	44.70	0.16	2.83	2.77	1.32	1.24	1.51	1.53
709.1	44.947	44.77	0.47	131	44.86	0.16	2.84	2.78	1.32	1.25	1.52	1.53
708.9	45.111	46.32	0.35	131	45.03	0.16	2.85	2.79	1.33	1.25	1.52	1.54
708.7	45.275	53.77	0.33	131	45.19	0.16	2.86	2.80	1.33	1.26	1.53	1.55
708.6	45.439	60.50	0.42	131	45.36	0.16	2.87	2.81	1.34	1.26	1.53	1.55
708.4	45.603	79.84	0.59	131	45.52	0.16	2.88	2.82	1.34	1.27	1.54	1.56
708.2	45.767	110.85	0.30	131	45.69	0.16	2.89	2.83	1.35	1.27	1.54	1.56
708.1	45.931	127.59	0.37	131	45.85	0.16	2.91	2.85	1.36	1.28	1.55	1.57
707.9	46.095	121.18	0.49	131	46.01	0.16	2.92	2.86	1.36	1.28	1.56	1.57
707.7	46.259	116.02	0.94	131	46.18	0.16	2.93	2.87	1.37	1.29	1.56	1.58
707.6	46.423	142.47	1.73	131	46.34	0.16	2.94	2.88	1.37	1.29	1.57	1.58
707.4	46.587	238.17	0.01	131	46.51	0.16	2.95	2.89	1.38	1.30	1.57	1.59
707.2	46.751	379.45	0.01	131	46.67	0.08	2.96	2.90	1.38	1.30	1.58	1.60

LIQUEFACTION POTENTIAL ASSESSMENT FOR COARSE GRAINED SOILS USING CONE PENETRATION TEST DATA

Project Site: KIF TDEC Stability
Project No.: 175668043
CPT ID: CPT-05A

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
754.0												
753.8	0.164	59.86	13.60	2.90	0.7	1.70	3.87	95	0.00	3.87	0.057	#NUM!
753.7	0.328	1024.21	0.26	0.78	0.5	1.70	233.54	0	0.00	233.54	0.054	#NUM!
753.5	0.492	1225.96	0.61	1.08	0.5	1.70	340.39	0	0.00	340.39	0.052	#NUM!
753.3	0.656	1318.21	0.52	1.00	0.5	1.70	421.40	0	0.00	421.40	0.049	#NUM!
753.2	0.820	808.03	0.72	1.22	0.5	1.70	288.32	0	0.00	288.32	0.046	#NUM!
753.0	0.984	499.24	1.28	1.54	0.5	1.70	194.95	0	0.00	194.95	0.044	#NUM!
752.9	1.148	221.42	3.29	2.07	0.5	1.70	93.38	29	0.00	93.38	0.041	-0.431
752.7	1.312	333.61	2.43	1.86	0.5	1.70	150.26	12	0.00	150.26	0.038	-0.600
752.5	1.476	1604.40	0.81	1.16	0.5	1.70	765.60	0	0.00	765.60	0.035	-0.600
752.4	1.640	1218.60	1.25	1.37	0.5	1.70	612.75	0	0.00	612.75	0.033	-0.600
752.2	1.804	1206.49	1.26	1.37	0.5	1.70	636.08	0	0.00	636.08	0.030	-0.600
752.0	1.968	1143.38	0.88	1.24	0.5	1.70	629.46	0	0.00	629.46	0.027	-0.600
751.9	2.133	1033.88	0.61	1.11	0.5	1.70	592.31	0	0.00	592.31	0.028	-0.600
751.7	2.297	797.43	0.69	1.20	0.5	1.70	474.05	0	0.00	474.05	0.031	-0.600
751.5	2.461	543.30	0.80	1.34	0.5	1.70	334.33	0	0.00	334.33	0.033	-0.600
751.4	2.625	317.93	1.72	1.75	0.5	1.70	199.46	3	0.00	199.46	0.035	-0.600
751.2	2.789	190.35	3.32	2.11	0.5	1.70	121.20	32	0.00	121.20	0.037	-0.512
751.0	2.953	135.02	4.43	2.30	0.5	1.70	87.23	47	0.00	87.23	0.040	-0.369
750.9	3.117	131.60	3.29	2.20	0.5	1.70	86.17	39	0.00	86.17	0.041	-0.363
750.7	3.281	576.48	0.90	1.37	0.5	1.64	368.73	0	0.00	368.73	0.039	-0.600
750.6	3.445	656.77	0.64	1.22	0.5	1.63	422.56	0	0.00	422.56	0.038	-0.600
750.4	3.609	887.36	0.62	1.14	0.5	1.62	574.15	0	0.00	574.15	0.037	-0.600
750.2	3.773	701.60	0.85	1.31	0.5	1.61	456.61	0	0.00	456.61	0.036	-0.600
750.1	3.937	463.70	1.65	1.65	0.5	1.60	303.58	0	0.00	303.58	0.035	-0.600
749.9	4.101	275.27	3.13	2.00	0.5	1.70	193.59	23	0.00	193.59	0.032	-0.600
749.7	4.265	186.59	4.73	2.24	0.5	1.70	132.82	42	0.00	132.82	0.030	-0.543
749.6	4.429	114.40	8.20	2.56	0.5	1.70	82.49	68	0.00	82.49	0.027	-0.337
749.4	4.593	149.90	4.31	2.26	0.5	1.70	109.13	44	0.00	109.13	0.025	-0.454
749.2	4.757	272.73	1.79	1.80	0.5	1.70	200.31	7	0.00	200.31	0.022	-0.600
749.1	4.921	309.39	1.81	1.77	0.5	1.65	222.40	5	0.00	222.40	0.020	-0.600
748.9	5.085	119.45	4.47	2.33	0.5	1.70	89.94	50	69.62	159.56	0.016	-0.600
748.8	5.249	534.68	1.23	1.50	0.5	1.53	365.23	0	0.00	365.23	0.013	-0.600
748.6	5.413	736.66	1.48	1.52	0.5	1.52	506.05	0	0.00	506.05	0.012	-0.600
748.4	5.577	691.95	0.88	1.32	0.5	1.51	478.15	0	0.00	478.15	0.015	-0.600
748.3	5.741	803.60	1.09	1.38	0.5	1.50	558.41	0	0.00	558.41	0.013	-0.600
748.1	5.905	736.10	1.52	1.53	0.5	1.49	514.40	0	0.00	514.40	0.010	-0.600
747.9	6.069	461.97	2.89	1.86	0.5	1.48	324.78	12	25.19	349.97	0.008	-0.600
747.8	6.234	410.92	3.49	1.96	0.5	1.47	290.49	20	61.96	352.45	0.006	-0.600
747.6	6.398	270.62	4.30	2.12	0.5	1.46	192.49	33	79.27	271.75	0.004	-0.600
747.4	6.562	261.88	3.97	2.10	0.5	1.46	187.24	31	75.18	262.41	0.003	-0.600
747.3	6.726	251.82	3.43	2.05	0.5	1.46	182.31	27	67.23	249.55	0.002	-0.600
747.1	6.890	398.26	2.08	1.77	0.5	1.44	287.31	4	0.08	287.39	0.001	-0.600
746.9	7.054	412.97	2.45	1.82	0.5	1.43	299.34	9	7.75	307.09	0.001	-0.600
746.8	7.218	423.00	2.10	1.76	0.5	1.42	308.04	4	0.01	308.05	0.001	-0.600
746.6	7.382	457.83	1.93	1.71	0.5	1.42	334.89	0	0.00	334.89	0.002	-0.600
746.5	7.546	467.98	1.70	1.66	0.5	1.41	343.85	0	0.00	343.85	0.003	-0.600
746.3	7.710	621.51	1.08	1.42	0.5	1.40	458.50	0	0.00	458.50	0.005	-0.600
746.1	7.874	661.97	1.22	1.46	0.5	1.40	490.44	0	0.00	490.44	0.006	-0.600
746.0	8.038	678.50	0.93	1.35	0.5	1.39	504.82	0	0.00	504.82	0.007	-0.600
745.8	8.202	741.94	1.27	1.45	0.5	1.38	554.29	0	0.00	554.29	0.009	-0.600
745.6	8.366	559.97	1.37	1.54	0.5	1.38	420.23	0	0.00	420.23	0.010	-0.600
745.5	8.530	354.90	2.24	1.82	0.5	1.37	267.66	9	6.85	274.51	0.011	-0.600
745.3	8.694	304.46	2.56	1.90	0.5	1.37	230.63	15	35.50	266.14	0.012	-0.600
745.1	8.858	153.99	4.18	2.24	0.5	1.47	126.62	42	74.54	201.16	0.013	-0.600
745.0	9.022	117.30	5.37	2.40	0.5	1.52	100.89	55	75.09	175.98	0.014	-0.600
744.8	9.186	101.65	4.39	2.37	0.5	1.55	90.02	52	71.01	161.03	0.015	-0.600
744.6	9.350	122.90	3.15	2.20	0.5	1.51	106.56	39	67.10	173.65	0.016	-0.600
744.5	9.514	121.36	3.05	2.20	0.5	1.50	105.73	39	66.37	172.10	0.017	-0.600
744.3	9.678	102.07	2.20	2.14	0.5	1.55	92.44	34	58.90	151.34	0.018	-0.590
744.2	9.842	69.16	3.80	2.43	0.5	1.59	65.36	57	66.16	131.52	0.019	-0.524

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
744.0	10.006	56.85	4.15	2.51	0.5	1.62	55.14	64	65.31	120.46	0.020	-0.484
743.8	10.170	107.91	2.11	2.11	0.5	1.51	97.55	32	57.37	154.92	0.021	-0.600
743.7	10.335	103.74	3.11	2.25	0.5	1.49	93.23	43	66.41	159.65	0.022	-0.600
743.5	10.499	94.53	3.52	2.31	0.5	1.50	85.99	48	67.82	153.81	0.023	-0.596
743.3	10.663	71.54	5.63	2.55	0.7	1.57	56.65	67	66.41	123.07	0.024	-0.492
743.2	10.827	68.56	5.69	2.56	0.7	1.57	54.76	68	66.15	120.90	0.026	-0.484
743.0	10.991	81.17	3.99	2.40	0.5	1.50	75.54	55	68.08	143.62	0.027	-0.563
742.8	11.155	90.95	3.61	2.33	0.5	1.47	83.57	50	67.98	151.54	0.028	-0.588
742.7	11.319	109.34	2.88	2.21	0.5	1.43	98.57	40	65.34	163.91	0.029	-0.600
742.5	11.483	168.51	1.72	1.91	0.5	1.40	148.40	16	30.96	179.37	0.030	-0.600
742.4	11.647	97.69	4.23	2.37	0.5	1.43	88.99	52	70.66	159.65	0.031	-0.600
742.2	11.811	86.82	4.88	2.45	0.5	1.44	80.31	59	70.82	151.13	0.032	-0.585
742.0	11.975	74.57	6.60	2.59	0.7	1.48	60.11	70	68.18	128.28	0.033	-0.509
741.9	12.139	60.94	5.44	2.58	0.5	1.48	59.00	69	67.70	126.70	0.034	-0.503
741.7	12.303	62.44	5.46	2.58	0.5	1.47	60.32	69	67.98	128.31	0.034	-0.509
741.5	12.467	122.15	3.17	2.21	0.5	1.36	109.31	40	68.03	177.33	0.035	-0.600
741.4	12.631	145.69	3.65	2.21	0.5	1.32	127.05	40	72.38	199.43	0.036	-0.600
741.2	12.795	155.30	3.56	2.18	0.5	1.31	134.55	38	72.27	206.82	0.037	-0.600
741.0	12.959	113.06	3.51	2.26	0.5	1.35	102.43	44	69.65	172.08	0.038	-0.600
740.9	13.123	76.01	4.36	2.45	0.5	1.41	72.19	59	68.52	140.71	0.039	-0.550
740.7	13.287	64.61	4.06	2.47	0.5	1.42	62.62	61	66.45	129.07	0.039	-0.510
740.5	13.451	46.25	4.28	2.59	0.5	1.46	46.48	70	64.13	110.61	0.040	-0.441
740.4	13.615	44.91	4.27	2.59	0.7	1.47	39.41	71	62.20	101.61	0.041	-0.404
740.2	13.779	57.25	1.92	2.28	0.5	1.43	56.86	45	58.82	115.68	0.041	-0.460
740.1	13.943	62.36	1.56	2.19	0.5	1.42	61.71	38	55.57	117.28	0.042	-0.466
739.9	14.107	57.18	1.22	2.15	0.5	1.43	57.38	35	52.17	109.54	0.043	-0.435
739.7	14.271	61.10	1.03	2.09	0.5	1.42	61.31	30	47.71	109.02	0.043	-0.433
739.6	14.436	62.60	1.16	2.11	0.5	1.41	62.49	32	49.93	112.42	0.044	-0.446
739.4	14.600	44.57	1.55	2.30	0.5	1.42	45.53	47	56.85	102.38	0.045	-0.405
739.2	14.764	45.44	1.83	2.34	0.5	1.41	46.25	50	58.37	104.62	0.046	-0.414
739.1	14.928	27.62	2.25	2.57	0.7	1.45	25.90	68	57.85	83.75	0.046	-0.321
738.9	15.092	20.09	0.96	2.48	0.5	1.46	22.10	61	55.23	77.33	0.047	-0.289
738.7	15.256	34.44	0.50	2.14	0.5	1.44	36.60	34	46.52	83.12	0.048	-0.318
738.6	15.420	44.66	0.48	2.03	0.5	1.42	46.84	26	39.14	85.98	0.049	-0.331
738.4	15.584	50.16	0.75	2.08	0.5	1.39	51.58	29	45.15	96.73	0.050	-0.380
738.3	15.748	55.05	0.66	2.02	0.5	1.39	56.59	24	39.02	95.61	0.051	-0.375
738.1	15.912	56.94	0.86	2.07	0.5	1.37	57.89	28	44.96	102.85	0.052	-0.405
737.9	16.076	58.50	1.35	2.17	0.5	1.34	58.71	37	53.77	112.48	0.052	-0.444
737.8	16.240	61.91	0.54	1.93	0.5	1.38	63.98	17	26.30	90.27	0.053	-0.350
737.6	16.404	49.74	0.60	2.03	0.5	1.37	51.54	26	40.36	91.90	0.054	-0.357
737.4	16.568	51.38	1.07	2.16	0.5	1.34	52.35	36	51.37	103.72	0.055	-0.408
737.3	16.732	51.02	0.49	1.98	0.5	1.36	53.20	22	33.76	86.96	0.056	-0.334
737.1	16.896	50.71	0.36	1.93	0.5	1.38	53.59	17	24.32	77.91	0.056	-0.289
736.9	17.060	50.69	0.41	1.95	0.5	1.36	53.20	19	29.19	82.39	0.056	-0.312
736.8	17.224	48.94	0.80	2.11	0.5	1.33	50.36	31	47.05	97.41	0.056	-0.381
736.6	17.388	58.07	1.63	2.23	0.5	1.29	58.29	41	56.79	115.09	0.056	-0.452
736.4	17.552	91.07	0.82	1.89	0.5	1.29	91.17	14	19.38	110.55	0.056	-0.435
736.3	17.716	102.08	1.85	2.09	0.5	1.24	97.95	30	54.88	152.83	0.055	-0.582
736.1	17.880	79.84	2.07	2.20	0.5	1.25	78.00	39	59.69	137.69	0.055	-0.533
736.0	18.044	56.05	3.08	2.43	0.5	1.27	56.14	57	63.54	119.68	0.055	-0.469
735.8	18.208	60.21	0.77	2.02	0.5	1.29	61.39	25	40.31	101.70	0.056	-0.398
735.6	18.372	50.51	0.72	2.07	0.5	1.29	52.06	28	44.06	96.12	0.058	-0.373
735.5	18.537	38.24	1.12	2.27	0.5	1.29	39.84	45	54.30	94.14	0.059	-0.365
735.3	18.701	31.68	2.21	2.51	0.5	1.28	33.32	64	59.09	92.41	0.061	-0.357
735.1	18.865	29.09	3.87	2.70	1.0	1.29	24.74	79	59.30	84.04	0.062	-0.317
735.0	19.029	31.49	3.47	2.64	0.7	1.27	30.36	74	60.25	90.61	0.064	-0.348
734.8	19.193	35.37	3.33	2.59	0.5	1.26	36.81	70	61.44	98.25	0.065	-0.382
734.6	19.357	40.02	3.54	2.57	0.7	1.25	37.97	69	61.44	99.41	0.065	-0.386
734.5	19.521	34.37	1.76	2.43	0.5	1.25	35.98	57	57.98	93.96	0.066	-0.362
734.3	19.685	32.76	3.13	2.60	0.7	1.25	31.69	71	60.05	91.74	0.067	-0.352
734.2	19.849	30.65	3.00	2.61	0.7	1.25	29.85	72	59.66	89.51	0.068	-0.342
734.0	20.013	30.61	3.12	2.62	0.7	1.24	29.85	73	59.82	89.67	0.068	-0.342
733.8	20.177	33.02	3.17	2.60	0.7	1.24	32.07	71	60.17	92.24	0.069	-0.354
733.7	20.341	31.43	2.29	2.53	0.5	1.23	33.09	65	59.27	92.36	0.070	-0.354
733.5	20.505	32.64	2.78	2.57	0.5	1.22	34.24	68	60.29	94.53	0.071	-0.364
733.3	20.669	25.36	2.17	2.59	0.5	1.23	27.16	70	58.51	85.68	0.071	-0.323

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733.2	20.833	10.80	6.18	3.16	1.0	1.25	10.72	100	57.26	67.98	0.072	-0.231
733.0	20.997	17.65	3.07	2.80	1.0	1.23	16.49	87	57.83	74.33	0.073	-0.266
732.8	21.161	9.46	4.46	3.12	1.0	1.24	9.65	100	56.93	66.58	0.073	-0.223
732.7	21.325	7.51	4.13	3.18	1.0	1.24	8.03	100	56.43	64.45	0.074	-0.210
732.5	21.489	7.19	2.15	3.04	1.0	1.23	7.78	100	56.35	64.12	0.075	-0.208
732.3	21.653	6.36	1.76	3.04	1.0	1.23	7.09	100	56.13	63.22	0.075	-0.202
732.2	21.817	4.88	1.71	3.14	1.0	1.22	5.83	100	55.74	61.57	0.076	-0.192
732.0	21.981	5.12	1.39	3.08	1.0	1.22	6.05	100	55.81	61.87	0.077	-0.194
731.9	22.145	5.48	1.29	3.04	1.0	1.21	6.39	100	55.92	62.31	0.077	-0.196
731.7	22.309	5.70	1.59	3.06	1.0	1.21	6.60	100	55.98	62.58	0.078	-0.198
731.5	22.473	5.80	1.98	3.10	1.0	1.20	6.71	100	56.02	62.73	0.079	-0.199
731.4	22.638	6.29	1.79	3.05	1.0	1.20	7.16	100	56.16	63.31	0.079	-0.202
731.2	22.802	9.00	1.53	2.88	1.0	1.19	9.55	93	56.34	65.90	0.080	-0.217
731.0	22.966	9.62	3.35	3.04	1.0	1.18	10.12	100	57.08	67.20	0.081	-0.224
730.9	23.130	13.21	2.69	2.87	1.0	1.18	13.30	93	57.41	70.72	0.081	-0.244
730.7	23.294	14.23	2.80	2.85	1.0	1.17	14.24	91	57.58	71.81	0.082	-0.249
730.5	23.458	13.77	4.75	3.01	1.0	1.17	13.87	100	58.24	72.10	0.083	-0.251
730.4	23.622	11.98	10.11	3.27	1.0	1.16	12.32	100	57.76	70.08	0.083	-0.240
730.2	23.786	27.07	3.22	2.67	1.0	1.15	25.62	77	59.21	84.83	0.084	-0.315
730.1	23.950	6.62	12.42	3.52	1.0	1.16	7.61	100	56.30	63.91	0.085	-0.204
729.9	24.114	12.79	2.13	2.83	1.0	1.15	13.16	89	57.01	70.17	0.086	-0.240
729.7	24.278	12.33	1.71	2.79	1.0	1.15	12.79	86	56.57	69.36	0.086	-0.235
729.6	24.442	10.64	1.89	2.87	1.0	1.14	11.30	92	56.76	68.06	0.087	-0.227
729.4	24.606	13.13	1.46	2.73	1.0	1.14	13.58	81	56.25	69.83	0.088	-0.237
729.2	24.770	13.49	1.40	2.71	1.0	1.13	13.94	80	56.17	70.11	0.088	-0.239
729.1	24.934	13.43	1.92	2.78	1.0	1.13	13.92	86	56.87	70.79	0.089	-0.242
728.9	25.098	14.99	1.68	2.71	1.0	1.12	15.37	80	56.60	71.97	0.089	-0.248
728.7	25.262	17.88	2.29	2.72	1.0	1.12	18.03	81	57.53	75.56	0.090	-0.267
728.6	25.426	25.70	2.71	2.64	1.0	1.11	25.14	74	58.69	83.83	0.091	-0.309
728.4	25.590	33.66	2.19	2.49	0.5	1.10	35.38	62	59.25	94.64	0.091	-0.359
728.2	25.754	30.39	2.43	2.55	0.5	1.10	32.15	67	59.46	91.61	0.092	-0.345
728.1	25.918	26.60	2.44	2.60	1.0	1.10	26.17	71	58.44	84.61	0.093	-0.312
727.9	26.082	22.83	4.87	2.85	1.0	1.10	22.78	91	60.12	82.91	0.093	-0.304
727.8	26.246	20.34	6.26	2.96	1.0	1.09	20.55	100	60.27	80.82	0.094	-0.293
727.6	26.410	30.95	4.42	2.72	1.0	1.09	30.34	81	61.19	91.53	0.095	-0.344
727.4	26.574	27.56	3.89	2.72	1.0	1.08	27.33	81	60.28	87.60	0.095	-0.326
727.3	26.739	26.04	3.66	2.72	1.0	1.08	26.00	81	59.89	85.89	0.096	-0.317
727.1	26.903	25.27	3.46	2.71	1.0	1.08	25.36	80	59.63	84.99	0.097	-0.313
726.9	27.067	25.09	3.62	2.73	1.0	1.08	25.26	81	59.77	85.03	0.097	-0.313
726.8	27.231	25.55	3.62	2.72	1.0	1.07	25.75	81	59.85	85.60	0.098	-0.316
726.6	27.395	25.48	3.88	2.74	1.0	1.07	25.75	83	60.07	85.82	0.098	-0.317
726.4	27.559	24.74	4.32	2.78	1.0	1.07	25.12	86	60.29	85.41	0.099	-0.314
726.3	27.723	24.32	4.74	2.82	1.0	1.06	24.79	88	60.49	85.27	0.100	-0.314
726.1	27.887	26.69	4.60	2.78	1.0	1.06	27.09	85	60.82	87.91	0.100	-0.326
725.9	28.051	26.49	4.88	2.80	1.0	1.06	26.97	87	60.98	87.95	0.101	-0.326
725.8	28.215	26.92	4.59	2.78	1.0	1.05	27.45	85	60.90	88.35	0.101	-0.328
725.6	28.379	25.74	4.50	2.78	1.0	1.05	26.40	86	60.66	87.06	0.102	-0.321
725.5	28.543	24.83	4.45	2.79	1.0	1.05	25.60	86	60.50	86.10	0.103	-0.317
725.3	28.707	23.84	4.61	2.82	1.0	1.04	24.72	88	60.45	85.16	0.103	-0.312
725.1	28.871	23.29	4.40	2.81	1.0	1.04	24.25	88	60.25	84.51	0.104	-0.309
725.0	29.035	23.16	4.44	2.81	1.0	1.04	24.19	88	60.27	84.46	0.104	-0.308
724.8	29.199	24.03	4.47	2.80	1.0	1.04	25.08	87	60.46	85.54	0.105	-0.313
724.6	29.363	25.78	4.13	2.76	1.0	1.03	26.84	84	60.55	87.39	0.105	-0.322
724.5	29.527	28.17	6.61	2.87	1.0	1.03	29.23	93	62.31	91.53	0.106	-0.341
724.3	29.691	35.78	3.90	2.64	1.0	1.03	36.69	74	62.03	98.72	0.106	-0.373
724.1	29.855	29.91	6.22	2.83	1.0	1.02	31.06	90	62.55	93.61	0.107	-0.350
724.0	30.019	40.24	5.71	2.72	1.0	1.02	41.23	80	64.42	105.66	0.107	-0.401
723.8	30.183	35.12	6.17	2.78	1.0	1.02	36.33	86	63.66	100.00	0.107	-0.378
723.7	30.347	41.34	4.90	2.66	1.0	1.01	42.53	76	64.10	106.63	0.108	-0.405
723.5	30.511	28.71	5.99	2.83	1.0	1.01	30.20	90	62.29	92.49	0.109	-0.345
723.3	30.675	22.55	5.18	2.87	1.0	1.01	24.18	92	60.73	84.91	0.110	-0.309
723.2	30.840	19.51	3.07	2.77	1.0	1.01	21.22	84	58.95	80.17	0.111	-0.286
723.0	31.004	19.57	3.16	2.78	1.0	1.01	21.33	85	59.05	80.38	0.112	-0.287
722.8	31.168	22.15	3.08	2.73	1.0	1.00	23.95	81	59.34	83.29	0.113	-0.301
722.7	31.332	26.49	3.00	2.66	1.0	1.00	28.35	76	59.86	88.21	0.114	-0.324
722.5	31.496	31.67	2.14	2.51	0.5	1.00	33.52	64	59.00	92.52	0.114	-0.344

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
722.3	31.660	46.63	0.94	2.16	0.5	0.99	48.49	36	50.62	99.11	0.115	-0.373
722.2	31.824	46.27	0.65	2.08	0.5	0.99	48.13	29	44.19	92.32	0.115	-0.343
722.0	31.988	42.00	0.55	2.08	0.5	0.99	43.85	29	43.57	87.42	0.115	-0.320
721.8	32.152	34.01	0.64	2.19	0.5	0.99	35.85	39	49.64	85.49	0.115	-0.311
721.7	32.316	20.30	1.16	2.52	0.5	0.98	22.15	64	55.92	78.06	0.116	-0.274
721.5	32.480	13.85	1.64	2.73	1.0	0.98	15.94	82	57.02	72.96	0.116	-0.247
721.4	32.644	11.37	2.05	2.86	1.0	0.98	13.45	92	57.37	70.82	0.116	-0.235
721.2	32.808	10.05	1.66	2.86	1.0	0.98	12.13	92	56.96	69.09	0.116	-0.225
721.0	32.972	9.23	2.03	2.93	1.0	0.97	11.32	98	57.26	68.57	0.116	-0.222
720.9	33.136	10.71	2.08	2.88	1.0	0.97	12.85	94	57.39	70.24	0.117	-0.232
720.7	33.300	15.30	1.53	2.68	1.0	0.97	17.60	78	56.95	74.55	0.117	-0.255
720.5	33.464	14.98	1.17	2.63	1.0	0.97	17.30	74	56.26	73.56	0.118	-0.249
720.4	33.628	14.84	1.01	2.60	1.0	0.96	17.19	71	55.87	73.06	0.119	-0.246
720.2	33.792	9.16	1.17	2.82	1.0	0.96	11.36	89	56.41	67.77	0.119	-0.217
720.0	33.956	6.38	1.87	3.05	1.0	0.96	8.50	100	56.57	65.08	0.120	-0.202
719.9	34.120	5.74	2.95	3.19	1.0	0.95	7.85	100	56.37	64.22	0.120	-0.196
719.7	34.284	8.61	1.64	2.91	1.0	0.95	10.85	96	56.97	67.83	0.121	-0.217
719.6	34.448	11.36	1.82	2.83	1.0	0.95	13.75	90	57.25	71.00	0.121	-0.235
719.4	34.612	17.64	1.35	2.60	1.0	0.95	20.34	71	56.74	77.08	0.122	-0.267
719.2	34.776	33.48	0.81	2.25	0.5	0.95	35.34	43	52.17	87.51	0.122	-0.318
719.1	34.941	36.41	0.80	2.22	0.5	0.95	38.28	40	51.32	89.60	0.122	-0.328
718.9	35.105	40.90	0.65	2.12	0.5	0.95	42.76	33	46.89	89.66	0.123	-0.328
718.7	35.269	44.28	0.54	2.06	0.5	0.94	46.11	28	41.75	87.87	0.123	-0.319
718.6	35.433	42.91	0.65	2.11	0.5	0.94	44.79	32	45.93	90.72	0.124	-0.332
718.4	35.597	34.26	1.18	2.33	0.5	0.94	36.16	49	55.21	91.38	0.124	-0.335
718.2	35.761	22.61	5.02	2.86	1.0	0.94	25.99	92	61.20	87.19	0.124	-0.316
718.1	35.925	19.44	6.42	2.98	1.0	0.93	22.65	100	60.96	83.61	0.125	-0.298
717.9	36.089	87.20	2.45	2.22	0.5	0.95	90.48	41	64.21	154.70	0.125	-0.569
717.7	36.253	82.77	1.87	2.15	0.5	0.94	85.83	35	58.54	144.37	0.125	-0.537
717.6	36.417	40.35	3.06	2.53	0.5	0.93	42.43	65	61.92	104.35	0.126	-0.391
717.4	36.581	41.49	1.09	2.24	0.5	0.93	43.48	42	53.71	97.18	0.126	-0.360
717.3	36.745	35.83	1.20	2.31	0.5	0.92	37.76	48	55.25	93.01	0.127	-0.342
717.1	36.909	32.05	1.33	2.38	0.5	0.92	33.96	53	56.26	90.23	0.127	-0.329
716.9	37.073	24.51	1.79	2.55	0.5	0.92	26.38	67	57.71	84.08	0.127	-0.300
716.8	37.237	17.82	2.06	2.70	1.0	0.91	21.24	79	58.22	79.46	0.128	-0.277
716.6	37.401	9.32	3.15	3.03	1.0	0.91	12.04	100	57.67	69.71	0.128	-0.225
716.4	37.565	7.79	2.19	3.01	1.0	0.90	10.40	100	57.16	67.57	0.128	-0.213
716.3	37.729	13.57	0.48	2.51	0.5	0.90	15.40	64	53.84	69.23	0.129	-0.222
716.1	37.893	21.54	0.89	2.44	0.5	0.90	23.36	58	54.69	78.06	0.129	-0.269
715.9	38.057	28.95	0.59	2.24	0.5	0.90	30.75	42	50.54	81.30	0.129	-0.285
715.8	38.221	31.49	0.63	2.22	0.5	0.90	33.30	40	50.25	83.56	0.130	-0.296
715.6	38.385	32.98	0.47	2.14	0.5	0.90	34.74	35	46.51	81.25	0.130	-0.285
715.5	38.549	32.09	0.64	2.21	0.5	0.90	33.91	40	50.19	84.11	0.130	-0.298
715.3	38.713	27.53	0.76	2.31	0.5	0.89	29.36	48	52.93	82.28	0.131	-0.289
715.1	38.877	21.60	1.04	2.47	0.5	0.89	23.43	60	55.41	78.84	0.131	-0.272
715.0	39.042	14.01	1.84	2.76	1.0	0.89	17.47	84	57.71	75.18	0.131	-0.253
714.8	39.206	15.31	1.67	2.70	1.0	0.88	18.95	79	57.58	76.53	0.131	-0.260
714.6	39.370	28.52	0.89	2.33	0.5	0.89	30.37	49	53.80	84.16	0.132	-0.298
714.5	39.534	33.96	0.59	2.18	0.5	0.88	35.77	37	48.68	84.45	0.132	-0.299
714.3	39.698	27.42	1.26	2.42	0.5	0.88	29.30	57	56.08	85.38	0.132	-0.304
714.1	39.862	10.92	2.59	2.93	1.0	0.87	14.17	97	58.11	72.28	0.132	-0.237
714.0	40.026	7.17	2.76	3.10	1.0	0.87	10.01	100	57.04	67.04	0.133	-0.208
713.8	40.190	7.85	0.79	2.81	1.0	0.87	10.77	88	56.13	66.90	0.133	-0.207
713.6	40.354	7.26	1.39	2.94	1.0	0.86	10.14	98	56.96	67.10	0.133	-0.208
713.5	40.518	15.34	0.55	2.48	0.5	0.86	17.16	61	53.84	70.99	0.133	-0.229
713.3	40.682	16.76	0.37	2.38	0.5	0.86	18.54	53	52.04	70.58	0.134	-0.227
713.2	40.846	14.32	0.24	2.39	0.5	0.86	16.12	54	51.64	67.75	0.134	-0.211
713.0	41.010	6.16	1.61	3.04	1.0	0.86	8.97	100	56.72	65.69	0.134	-0.199
712.8	41.174	4.60	4.91	3.40	1.0	0.85	7.22	100	56.18	63.40	0.134	-0.186
712.7	41.338	43.37	0.54	2.06	0.5	0.87	45.18	28	42.32	87.51	0.135	-0.312
712.5	41.502	77.39	0.25	1.70	0.5	0.86	78.44	0	0.00	78.44	0.135	-0.268
712.3	41.666	88.97	0.44	1.75	0.5	0.86	90.63	3	0.00	90.64	0.135	-0.327
712.2	41.830	86.60	0.60	1.83	0.5	0.86	88.50	9	5.98	94.48	0.135	-0.344
712.0	41.994	91.23	0.63	1.82	0.5	0.86	93.30	9	4.22	97.52	0.135	-0.357
711.8	42.158	96.33	0.61	1.80	0.5	0.86	98.54	7	1.15	99.69	0.136	-0.366
711.7	42.322	82.64	0.59	1.84	0.5	0.86	84.46	10	8.38	92.84	0.136	-0.336

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
711.5	42.486	74.14	0.63	1.90	0.5	0.86	76.19	15	20.30	96.49	0.136	-0.352
711.3	42.650	65.19	0.71	1.97	0.5	0.86	67.50	21	34.11	101.61	0.136	-0.374
711.2	42.814	59.02	0.75	2.02	0.5	0.86	61.32	25	40.45	101.78	0.136	-0.375
711.0	42.978	56.50	0.77	2.04	0.5	0.86	58.79	26	42.58	101.37	0.137	-0.373
710.9	43.143	53.55	0.77	2.06	0.5	0.85	55.79	28	44.33	100.13	0.137	-0.367
710.7	43.307	48.87	1.39	2.24	0.5	0.86	51.37	42	55.82	107.19	0.137	-0.396
710.5	43.471	48.65	2.29	2.38	0.5	0.86	51.32	54	61.01	112.33	0.137	-0.417
710.4	43.635	74.18	4.65	2.47	0.5	0.88	78.88	61	71.12	150.00	0.137	-0.549
710.2	43.799	129.57	1.29	1.90	0.5	0.88	137.09	15	26.20	163.29	0.136	-0.589
710.0	43.963	131.40	1.26	1.89	0.5	0.88	138.99	14	23.37	162.36	0.136	-0.586
709.9	44.127	108.02	0.94	1.87	0.5	0.86	112.48	12	15.49	127.98	0.136	-0.475
709.7	44.291	95.18	1.24	1.99	0.5	0.87	100.26	22	41.69	141.96	0.135	-0.522
709.5	44.455	71.21	1.22	2.08	0.5	0.86	74.79	29	49.69	124.48	0.135	-0.462
709.4	44.619	44.18	1.00	2.19	0.5	0.84	46.40	39	52.18	98.58	0.134	-0.360
709.2	44.783	37.00	0.93	2.24	0.5	0.83	39.00	42	52.73	91.74	0.134	-0.329
709.1	44.947	33.10	1.11	2.32	0.5	0.83	35.08	49	54.90	89.98	0.134	-0.321
708.9	45.111	34.25	0.80	2.24	0.5	0.83	36.16	42	51.83	88.00	0.133	-0.312
708.7	45.275	40.04	0.64	2.13	0.5	0.83	41.94	34	47.25	89.19	0.133	-0.317
708.6	45.439	45.24	0.73	2.11	0.5	0.83	47.31	32	46.89	94.20	0.133	-0.340
708.4	45.603	60.31	0.76	2.02	0.5	0.83	62.78	24	40.19	102.97	0.133	-0.377
708.2	45.767	84.45	0.28	1.68	0.5	0.82	85.70	0	0.00	85.70	0.133	-0.300
708.1	45.931	97.37	0.29	1.63	0.5	0.83	99.70	0	0.00	99.70	0.133	-0.363
707.9	46.095	92.19	0.42	1.72	0.5	0.82	94.05	1	0.00	94.05	0.133	-0.339
707.7	46.259	88.00	0.83	1.90	0.5	0.83	91.45	15	23.21	114.66	0.133	-0.424
707.6	46.423	108.37	1.24	1.95	0.5	0.85	114.98	19	35.26	150.24	0.133	-0.547
707.4	46.587	182.36	0.15	1.27	0.5	0.88	197.32	0	0.00	197.32	0.133	-0.600
707.2	46.751	291.36	0.15	1.08	0.5	0.90	322.84	0	0.00	322.84	0.133	-0.600

LIQUEFACTION POTENTIAL ASSESSMENT FOR COARSE GRAINED SOILS USING CONE PENETRATION TEST DATA

Project Site: **KIF TDEC Stability**
Stantec Project No.: **175668043**
CPT ID: **CPT-05A**

Depth to Water during Earthquake:	5.0	ft
Final Grade Elevation during EQ:	753.0	ft
Height of Final Grade above CPT TOH:	-1.0	ft
Normalize K_σ to:	1.058	tsf
a_{max} at top of ground surface:	0.09	g
Earthquake Magnitude:	7.60	M_W
Earthquake File or Source Zone:	1	Hz

Shear Stress Fit Parameters

m4:	0
m3:	0
m2:	0
m1:	0

Elev. (ft)	Depth *z* (ft)	Cyclic Resistance Ratio *CRR 7.5*	Relative Density *D r* (%)	Correction for Overburden Pressure *K σ*	Correction for Sloping Ground *K α*	Magnitude Scaling Factor *MSF*	Cyclic Resistance Ratio *CRR*	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress *τ Max* (psf)	From Ground Response: Average Cyclic Shear Stress *τ Avg* (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. *(qc 1N) CS ≥ 175*	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
754.0																	
753.8	0.164	0.063	0	#NUM!	N/A	1.00	N/A	1.000	0	0	**0.059**	FALSE	FALSE	TRUE	**N/A**	**Fly Ash**	**B**
753.7	0.328	N/A	95	N/A	N/A	N/A	N/A	1.000	0	0	**0.059**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
753.5	0.492	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.059**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
753.3	0.656	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.059**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
753.2	0.820	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.059**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
753.0	0.984	N/A	86	N/A	N/A	N/A	N/A	1.000	0	0	**0.059**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
752.9	1.148	0.129	52	1.100	N/A	0.99	N/A	1.000	0	0	**0.059**	FALSE	FALSE	TRUE	**N/A**	**Fly Ash**	**A1**
752.7	1.312	0.290	73	1.100	N/A	0.98	N/A	1.000	0	0	**0.059**	FALSE	FALSE	TRUE	**N/A**	**Fly Ash**	**A1**
752.5	1.476	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.059**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
752.4	1.640	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.059**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
752.2	1.804	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.059**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
752.0	1.968	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.059**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
751.9	2.133	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.059**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
751.7	2.297	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.059**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
751.5	2.461	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.059**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
751.4	2.625	N/A	87	N/A	N/A	N/A	N/A	1.000	0	0	**0.059**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
751.2	2.789	0.174	63	1.100	N/A	0.99	N/A	1.000	0	0	**0.059**	FALSE	FALSE	TRUE	**N/A**	**Fly Ash**	**A1**
751.0	2.953	0.123	49	1.100	N/A	0.99	N/A	1.000	0	0	**0.059**	FALSE	FALSE	TRUE	**N/A**	**Fly Ash**	**A1**
750.9	3.117	0.122	49	1.100	N/A	0.99	N/A	1.000	0	0	**0.059**	FALSE	FALSE	TRUE	**N/A**	**Fly Ash**	**A1**
750.7	3.281	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.059**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
750.6	3.445	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.059**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
750.4	3.609	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.059**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
750.2	3.773	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.059**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
750.1	3.937	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.059**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
749.9	4.101	N/A	86	N/A	N/A	N/A	N/A	1.000	0	0	**0.059**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
749.7	4.265	0.207	68	1.100	N/A	0.98	N/A	1.000	0	0	**0.059**	FALSE	FALSE	TRUE	**N/A**	**Fly Ash**	**A1**
749.6	4.429	0.118	47	1.100	N/A	0.99	N/A	0.999	0	0	**0.059**	FALSE	FALSE	TRUE	**N/A**	**Fly Ash**	**B**
749.4	4.593	0.151	59	1.100	N/A	0.99	N/A	0.999	0	0	**0.059**	FALSE	FALSE	TRUE	**N/A**	**Fly Ash**	**A1**
749.2	4.757	N/A	87	N/A	N/A	N/A	N/A	0.998	0	0	**0.059**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
749.1	4.921	N/A	93	N/A	N/A	N/A	N/A	0.998	0	0	**0.059**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
748.9	5.085	N/A	76	N/A	N/A	N/A	N/A	0.998	0	0	**0.060**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
748.8	5.249	N/A	100	N/A	N/A	N/A	N/A	0.997	0	0	**0.061**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
748.6	5.413	N/A	100	N/A	N/A	N/A	N/A	0.997	0	0	**0.062**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
748.4	5.577	N/A	100	N/A	N/A	N/A	N/A	0.997	0	0	**0.063**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
748.3	5.741	N/A	100	N/A	N/A	N/A	N/A	0.996	0	0	**0.064**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
748.1	5.905	N/A	100	N/A	N/A	N/A	N/A	0.996	0	0	**0.065**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
747.9	6.069	N/A	100	N/A	N/A	N/A	N/A	0.996	0	0	**0.066**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
747.8	6.234	N/A	100	N/A	N/A	N/A	N/A	0.995	0	0	**0.067**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
747.6	6.398	N/A	100	N/A	N/A	N/A	N/A	0.995	0	0	**0.068**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
747.4	6.562	N/A	100	N/A	N/A	N/A	N/A	0.994	0	0	**0.069**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
747.3	6.726	N/A	99	N/A	N/A	N/A	N/A	0.994	0	0	**0.070**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
747.1	6.890	N/A	100	N/A	N/A	N/A	N/A	0.994	0	0	**0.071**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
746.9	7.054	N/A	100	N/A	N/A	N/A	N/A	0.993	0	0	**0.072**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
746.8	7.218	N/A	100	N/A	N/A	N/A	N/A	0.993	0	0	**0.072**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**

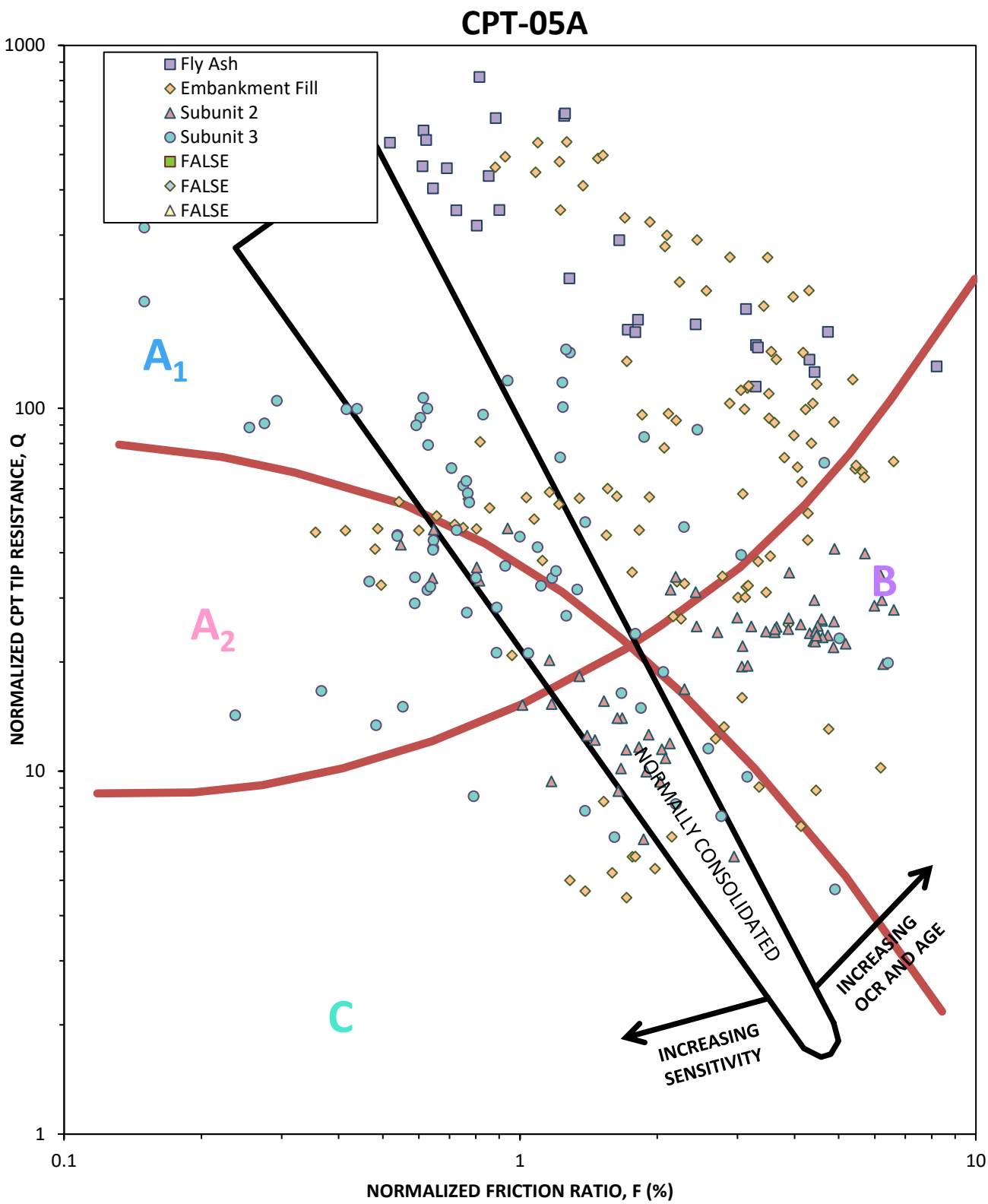
Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
746.6	7.382	N/A	100	N/A	N/A	N/A	N/A	0.992	0	0	**0.073**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
746.5	7.546	N/A	100	N/A	N/A	N/A	N/A	0.992	0	0	**0.074**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
746.3	7.710	N/A	100	N/A	N/A	N/A	N/A	0.992	0	0	**0.075**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
746.1	7.874	N/A	100	N/A	N/A	N/A	N/A	0.991	0	0	**0.075**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
746.0	8.038	N/A	100	N/A	N/A	N/A	N/A	0.991	0	0	**0.076**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
745.8	8.202	N/A	100	N/A	N/A	N/A	N/A	0.990	0	0	**0.076**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
745.6	8.366	N/A	100	N/A	N/A	N/A	N/A	0.990	0	0	**0.077**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
745.5	8.530	N/A	100	N/A	N/A	N/A	N/A	0.990	0	0	**0.078**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
745.3	8.694	N/A	100	N/A	N/A	N/A	N/A	0.989	0	0	**0.078**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
745.1	8.858	N/A	88	N/A	N/A	N/A	N/A	0.989	0	0	**0.079**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
745.0	9.022	N/A	81	N/A	N/A	N/A	N/A	0.988	0	0	**0.079**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
744.8	9.186	N/A	77	N/A	N/A	N/A	N/A	0.988	0	0	**0.080**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
744.6	9.350	N/A	80	N/A	N/A	N/A	N/A	0.987	0	0	**0.080**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
744.5	9.514	N/A	80	N/A	N/A	N/A	N/A	0.987	0	0	**0.081**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
744.3	9.678	N/A	74	N/A	N/A	N/A	N/A	0.987	0	0	**0.081**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
744.2	9.842	N/A	67	N/A	N/A	N/A	N/A	0.986	0	0	**0.081**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
744.0	10.006	N/A	63	N/A	N/A	N/A	N/A	0.986	0	0	**0.082**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
743.8	10.170	N/A	75	N/A	N/A	N/A	N/A	0.985	0	0	**0.082**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
743.7	10.335	N/A	76	N/A	N/A	N/A	N/A	0.985	0	0	**0.083**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
743.5	10.499	N/A	74	N/A	N/A	N/A	N/A	0.984	0	0	**0.083**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
743.3	10.663	N/A	64	N/A	N/A	N/A	N/A	0.984	0	0	**0.083**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
743.2	10.827	N/A	63	N/A	N/A	N/A	N/A	0.983	0	0	**0.084**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
743.0	10.991	N/A	71	N/A	N/A	N/A	N/A	0.983	0	0	**0.084**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
742.8	11.155	N/A	74	N/A	N/A	N/A	N/A	0.983	0	0	**0.084**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
742.7	11.319	N/A	77	N/A	N/A	N/A	N/A	0.982	0	0	**0.085**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
742.5	11.483	N/A	82	N/A	N/A	N/A	N/A	0.982	0	0	**0.085**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
742.4	11.647	N/A	76	N/A	N/A	N/A	N/A	0.981	0	0	**0.085**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
742.2	11.811	N/A	74	N/A	N/A	N/A	N/A	0.981	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
742.0	11.975	N/A	66	N/A	N/A	N/A	N/A	0.980	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
741.9	12.139	N/A	65	N/A	N/A	N/A	N/A	0.980	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
741.7	12.303	N/A	66	N/A	N/A	N/A	N/A	0.979	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
741.5	12.467	N/A	81	N/A	N/A	N/A	N/A	0.979	0	0	**0.087**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
741.4	12.631	N/A	87	N/A	N/A	N/A	N/A	0.978	0	0	**0.087**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
741.2	12.795	N/A	89	N/A	N/A	N/A	N/A	0.978	0	0	**0.087**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
741.0	12.959	N/A	80	N/A	N/A	N/A	N/A	0.977	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
740.9	13.123	N/A	70	N/A	N/A	N/A	N/A	0.977	0	0	**0.088**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
740.7	13.287	N/A	66	N/A	N/A	N/A	N/A	0.976	0	0	**0.088**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
740.5	13.451	N/A	59	N/A	N/A	N/A	N/A	0.976	0	0	**0.088**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
740.4	13.615	N/A	56	N/A	N/A	N/A	N/A	0.975	0	0	**0.088**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
740.2	13.779	N/A	61	N/A	N/A	N/A	N/A	0.975	0	0	**0.089**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
740.1	13.943	N/A	62	N/A	N/A	N/A	N/A	0.975	0	0	**0.089**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
739.9	14.107	N/A	59	N/A	N/A	N/A	N/A	0.974	0	0	**0.089**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
739.7	14.271	N/A	59	N/A	N/A	N/A	N/A	0.974	0	0	**0.089**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
739.6	14.436	N/A	60	N/A	N/A	N/A	N/A	0.973	0	0	**0.089**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
739.4	14.600	N/A	56	N/A	N/A	N/A	N/A	0.973	0	0	**0.090**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
739.2	14.764	N/A	57	N/A	N/A	N/A	N/A	0.972	0	0	**0.090**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
739.1	14.928	N/A	48	N/A	N/A	N/A	N/A	0.972	0	0	**0.090**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
738.9	15.092	N/A	44	N/A	N/A	N/A	N/A	0.971	0	0	**0.090**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A2**
738.7	15.256	N/A	47	N/A	N/A	N/A	N/A	0.971	0	0	**0.090**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A2**
738.6	15.420	N/A	49	N/A	N/A	N/A	N/A	0.970	0	0	**0.090**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A2**
738.4	15.584	N/A	54	N/A	N/A	N/A	N/A	0.970	0	0	**0.091**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
738.3	15.748	N/A	53	N/A	N/A	N/A	N/A	0.969	0	0	**0.091**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
738.1	15.912	N/A	56	N/A	N/A	N/A	N/A	0.968	0	0	**0.091**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
737.9	16.076	N/A	60	N/A	N/A	N/A	N/A	0.968	0	0	**0.091**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
737.8	16.240	N/A	51	N/A	N/A	N/A	N/A	0.967	0	0	**0.091**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**

Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
737.6	16.404	N/A	51	N/A	N/A	N/A	N/A	0.967	0	0	**0.091**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A2**
737.4	16.568	N/A	57	N/A	N/A	N/A	N/A	0.966	0	0	**0.091**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
737.3	16.732	N/A	49	N/A	N/A	N/A	N/A	0.966	0	0	**0.091**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A2**
737.1	16.896	N/A	45	N/A	N/A	N/A	N/A	0.965	0	0	**0.092**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A2**
736.9	17.060	N/A	47	N/A	N/A	N/A	N/A	0.965	0	0	**0.092**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A2**
736.8	17.224	N/A	54	N/A	N/A	N/A	N/A	0.964	0	0	**0.092**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
736.6	17.388	N/A	61	N/A	N/A	N/A	N/A	0.964	0	0	**0.092**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
736.4	17.552	N/A	59	N/A	N/A	N/A	N/A	0.963	0	0	**0.092**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
736.3	17.716	N/A	74	N/A	N/A	N/A	N/A	0.963	0	0	**0.092**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
736.1	17.880	N/A	69	N/A	N/A	N/A	N/A	0.962	0	0	**0.092**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
736.0	18.044	N/A	63	N/A	N/A	N/A	N/A	0.962	0	0	**0.092**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
735.8	18.208	N/A	56	N/A	N/A	N/A	N/A	0.961	0	0	**0.092**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
735.6	18.372	N/A	53	N/A	N/A	N/A	N/A	0.961	0	0	**0.093**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
735.5	18.537	N/A	52	N/A	N/A	N/A	N/A	0.960	0	0	**0.093**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
735.3	18.701	N/A	52	N/A	N/A	N/A	N/A	0.960	0	0	**0.093**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
735.1	18.865	N/A	48	N/A	N/A	N/A	N/A	0.959	0	0	**0.093**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
735.0	19.029	N/A	51	N/A	N/A	N/A	N/A	0.958	0	0	**0.093**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
734.8	19.193	N/A	54	N/A	N/A	N/A	N/A	0.958	0	0	**0.093**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
734.6	19.357	N/A	55	N/A	N/A	N/A	N/A	0.957	0	0	**0.093**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
734.5	19.521	N/A	52	N/A	N/A	N/A	N/A	0.957	0	0	**0.093**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
734.3	19.685	N/A	51	N/A	N/A	N/A	N/A	0.956	0	0	**0.093**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
734.2	19.849	N/A	50	N/A	N/A	N/A	N/A	0.956	0	0	**0.093**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
734.0	20.013	N/A	50	N/A	N/A	N/A	N/A	0.955	0	0	**0.093**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
733.8	20.177	N/A	52	N/A	N/A	N/A	N/A	0.955	0	0	**0.093**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
733.7	20.341	N/A	52	N/A	N/A	N/A	N/A	0.954	0	0	**0.094**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
733.5	20.505	N/A	53	N/A	N/A	N/A	N/A	0.953	0	0	**0.094**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
733.3	20.669	N/A	49	N/A	N/A	N/A	N/A	0.953	0	0	**0.094**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
733.2	20.833	N/A	39	N/A	N/A	N/A	N/A	0.952	0	0	**0.094**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
733.0	20.997	N/A	43	N/A	N/A	N/A	N/A	0.952	0	0	**0.094**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
732.8	21.161	N/A	39	N/A	N/A	N/A	N/A	0.951	0	0	**0.094**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
732.7	21.325	N/A	37	N/A	N/A	N/A	N/A	0.951	0	0	**0.094**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**C**
732.5	21.489	N/A	37	N/A	N/A	N/A	N/A	0.950	0	0	**0.094**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**C**
732.3	21.653	N/A	37	N/A	N/A	N/A	N/A	0.949	0	0	**0.094**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**C**
732.2	21.817	N/A	36	N/A	N/A	N/A	N/A	0.949	0	0	**0.094**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**C**
732.0	21.981	N/A	36	N/A	N/A	N/A	N/A	0.948	0	0	**0.094**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**C**
731.9	22.145	N/A	36	N/A	N/A	N/A	N/A	0.948	0	0	**0.094**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**C**
731.7	22.309	N/A	36	N/A	N/A	N/A	N/A	0.947	0	0	**0.094**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**C**
731.5	22.473	N/A	36	N/A	N/A	N/A	N/A	0.947	0	0	**0.094**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**C**
731.4	22.638	N/A	37	N/A	N/A	N/A	N/A	0.946	0	0	**0.094**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**C**
731.2	22.802	N/A	38	N/A	N/A	N/A	N/A	0.945	0	0	**0.094**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**C**
731.0	22.966	N/A	39	N/A	N/A	N/A	N/A	0.945	0	0	**0.094**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**C**
730.9	23.130	N/A	41	N/A	N/A	N/A	N/A	0.944	0	0	**0.094**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**C**
730.7	23.294	N/A	41	N/A	N/A	N/A	N/A	0.944	0	0	**0.094**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
730.5	23.458	N/A	42	N/A	N/A	N/A	N/A	0.943	0	0	**0.094**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
730.4	23.622	0.107	41	1.020	0.920	1.00	0.100	0.942	0	0	**0.095**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**B**
730.2	23.786	0.120	48	1.022	0.965	0.99	0.118	0.942	0	0	**0.095**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**B**
730.1	23.950	0.102	37	1.018	0.904	1.00	0.094	0.941	0	0	**0.095**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**B**
729.9	24.114	0.107	41	1.019	0.919	1.00	0.100	0.941	0	0	**0.095**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**C**
729.7	24.278	0.107	40	1.018	0.916	1.00	0.099	0.940	0	0	**0.095**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
729.6	24.442	0.106	39	1.017	0.912	1.00	0.098	0.939	0	0	**0.095**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
729.4	24.606	0.107	40	1.017	0.917	1.00	0.099	0.939	0	0	**0.095**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
729.2	24.770	0.107	41	1.017	0.917	1.00	0.100	0.938	0	0	**0.095**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**C**
729.1	24.934	0.108	41	1.016	0.918	1.00	0.100	0.938	0	0	**0.095**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**C**
728.9	25.098	0.109	42	1.016	0.921	0.99	0.101	0.937	0	0	**0.095**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**C**
728.7	25.262	0.112	43	1.016	0.932	0.99	0.105	0.936	0	0	**0.095**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**B**

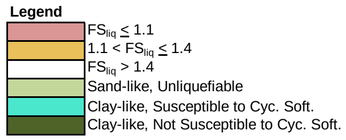
Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
728.6	25.426	0.119	48	1.016	0.961	0.99	0.116	0.936	0	0	**0.095**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**B**
728.4	25.590	0.131	53	1.017	1.009	0.99	0.133	0.935	0	0	**0.095**	FALSE	FALSE	FALSE	**1.4**	**Subunit 2**	**A1**
728.2	25.754	0.127	51	1.016	0.994	0.99	0.128	0.935	0	0	**0.095**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**A1**
728.1	25.918	0.120	48	1.015	0.964	0.99	0.117	0.934	0	0	**0.095**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**B**
727.9	26.082	0.118	47	1.014	0.957	0.99	0.114	0.933	0	0	**0.095**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**B**
727.8	26.246	0.117	46	1.013	0.949	0.99	0.111	0.933	0	0	**0.095**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**B**
727.6	26.410	0.127	51	1.014	0.994	0.99	0.127	0.932	0	0	**0.095**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**B**
727.4	26.574	0.123	49	1.013	0.976	0.99	0.121	0.931	0	0	**0.095**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**B**
727.3	26.739	0.121	49	1.012	0.969	0.99	0.118	0.931	0	0	**0.095**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**B**
727.1	26.903	0.120	48	1.012	0.965	0.99	0.117	0.930	0	0	**0.095**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**B**
726.9	27.067	0.121	48	1.011	0.965	0.99	0.117	0.930	0	0	**0.095**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**B**
726.8	27.231	0.121	48	1.011	0.968	0.99	0.118	0.929	0	0	**0.095**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**B**
726.6	27.395	0.121	49	1.010	0.968	0.99	0.118	0.928	0	0	**0.095**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**B**
726.4	27.559	0.121	48	1.010	0.967	0.99	0.117	0.928	0	0	**0.095**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**B**
726.3	27.723	0.121	48	1.009	0.966	0.99	0.117	0.927	0	0	**0.095**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**B**
726.1	27.887	0.123	50	1.009	0.978	0.99	0.121	0.926	0	0	**0.095**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**B**
725.9	28.051	0.123	50	1.008	0.978	0.99	0.121	0.926	0	0	**0.095**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**B**
725.8	28.215	0.124	50	1.008	0.980	0.99	0.122	0.925	0	0	**0.095**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**B**
725.6	28.379	0.123	49	1.007	0.974	0.99	0.119	0.925	0	0	**0.095**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**B**
725.5	28.543	0.122	49	1.007	0.970	0.99	0.118	0.924	0	0	**0.095**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**B**
725.3	28.707	0.121	48	1.006	0.965	0.99	0.116	0.923	0	0	**0.095**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**B**
725.1	28.871	0.120	48	1.005	0.962	0.99	0.115	0.923	0	0	**0.095**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**B**
725.0	29.035	0.120	48	1.005	0.962	0.99	0.115	0.922	0	0	**0.095**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**B**
724.8	29.199	0.121	48	1.005	0.967	0.99	0.117	0.921	0	0	**0.095**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**B**
724.6	29.363	0.123	49	1.004	0.976	0.99	0.120	0.921	0	0	**0.095**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**B**
724.5	29.527	0.127	51	1.004	0.997	0.99	0.126	0.920	0	0	**0.095**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**B**
724.3	29.691	0.136	54	1.003	1.039	0.99	0.140	0.919	0	0	**0.095**	FALSE	FALSE	FALSE	**1.5**	**Subunit 2**	**B**
724.1	29.855	0.130	52	1.003	1.009	0.99	0.130	0.919	0	0	**0.095**	FALSE	FALSE	FALSE	**1.4**	**Subunit 2**	**B**
724.0	30.019	0.145	57	1.002	1.086	0.99	0.157	0.918	0	0	**0.095**	FALSE	FALSE	FALSE	**1.6**	**Subunit 2**	**B**
723.8	30.183	0.137	55	1.002	1.048	0.99	0.143	0.918	0	0	**0.095**	FALSE	FALSE	FALSE	**1.5**	**Subunit 2**	**B**
723.7	30.347	0.147	58	1.001	1.094	0.99	0.159	0.917	0	0	**0.095**	FALSE	FALSE	FALSE	**1.7**	**Subunit 2**	**B**
723.5	30.511	0.128	52	1.001	1.003	0.99	0.128	0.916	0	0	**0.095**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**B**
723.3	30.675	0.120	48	1.000	0.964	0.99	0.115	0.916	0	0	**0.095**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**B**
723.2	30.840	0.116	46	1.000	0.942	0.99	0.109	0.915	0	0	**0.095**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**B**
723.0	31.004	0.116	46	0.999	0.943	0.99	0.109	0.914	0	0	**0.095**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**B**
722.8	31.168	0.119	47	0.999	0.956	0.99	0.113	0.914	0	0	**0.095**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**B**
722.7	31.332	0.124	50	0.998	0.981	0.99	0.120	0.913	0	0	**0.095**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**B**
722.5	31.496	0.128	52	0.998	1.006	0.99	0.128	0.912	0	0	**0.095**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**A1**
722.3	31.660	0.136	55	0.997	1.048	0.99	0.141	0.912	0	0	**0.095**	FALSE	FALSE	FALSE	**1.5**	**Subunit 2**	**A1**
722.2	31.824	0.128	52	0.997	1.004	0.99	0.127	0.911	0	0	**0.095**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**A2**
722.0	31.988	0.123	49	0.996	0.977	0.99	0.119	0.910	0	0	**0.095**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**A2**
721.8	32.152	0.121	48	0.996	0.967	0.99	0.116	0.910	0	0	**0.095**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**A2**
721.7	32.316	0.114	45	0.996	0.931	0.99	0.105	0.909	0	0	**0.095**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**A2**
721.5	32.480	0.110	42	0.996	0.911	0.99	0.099	0.908	0	0	**0.095**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
721.4	32.644	0.108	41	0.995	0.902	1.00	0.096	0.908	0	0	**0.095**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
721.2	32.808	0.107	40	0.995	0.896	1.00	0.095	0.907	0	0	**0.095**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
721.0	32.972	0.106	40	0.995	0.894	1.00	0.094	0.906	0	0	**0.095**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
720.9	33.136	0.107	41	0.994	0.900	1.00	0.096	0.906	0	0	**0.095**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
720.7	33.300	0.111	43	0.994	0.916	0.99	0.100	0.905	0	0	**0.095**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**C**
720.5	33.464	0.110	42	0.993	0.912	0.99	0.099	0.904	0	0	**0.095**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
720.4	33.628	0.110	42	0.993	0.909	0.99	0.099	0.904	0	0	**0.095**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
720.2	33.792	0.105	39	0.993	0.889	1.00	0.093	0.903	0	0	**0.095**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
720.0	33.956	0.103	38	0.993	0.880	1.00	0.090	0.902	0	0	**0.095**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**C**
719.9	34.120	0.103	37	0.992	0.877	1.00	0.089	0.902	0	0	**0.095**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**C**
719.7	34.284	0.106	39	0.992	0.889	1.00	0.093	0.901	0	0	**0.095**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**

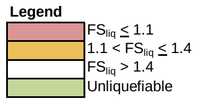
Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
719.6	34.448	0.108	41	0.991	0.900	1.00	0.096	0.900	0	0	**0.095**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
719.4	34.612	0.113	44	0.990	0.925	0.99	0.103	0.900	0	0	**0.095**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**C**
719.2	34.776	0.123	49	0.989	0.977	0.99	0.118	0.899	0	0	**0.095**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**A2**
719.1	34.941	0.125	50	0.988	0.989	0.99	0.121	0.898	0	0	**0.095**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**A2**
718.9	35.105	0.125	50	0.988	0.989	0.99	0.121	0.898	0	0	**0.095**	FALSE	FALSE	FALSE	**1.3**	**Subunit 3**	**A2**
718.7	35.269	0.123	50	0.988	0.979	0.99	0.118	0.897	0	0	**0.095**	FALSE	FALSE	FALSE	**1.3**	**Subunit 3**	**A2**
718.6	35.433	0.126	51	0.987	0.996	0.99	0.123	0.896	0	0	**0.094**	FALSE	FALSE	FALSE	**1.3**	**Subunit 3**	**A2**
718.4	35.597	0.127	51	0.986	1.000	0.99	0.124	0.896	0	0	**0.094**	FALSE	FALSE	FALSE	**1.3**	**Subunit 3**	**A1**
718.2	35.761	0.123	49	0.986	0.975	0.99	0.117	0.895	0	0	**0.094**	FALSE	FALSE	FALSE	**1.2**	**Subunit 3**	**B**
718.1	35.925	0.119	48	0.986	0.955	0.99	0.112	0.894	0	0	**0.094**	FALSE	FALSE	FALSE	**1.2**	**Subunit 3**	**B**
717.9	36.089	0.323	75	0.975	1.734	0.98	0.533	0.894	0	0	**0.094**	FALSE	FALSE	FALSE	**5.6**	**Subunit 3**	**A1**
717.7	36.253	0.255	71	0.976	1.558	0.98	0.381	0.893	0	0	**0.094**	FALSE	FALSE	FALSE	**4.0**	**Subunit 3**	**A1**
717.6	36.417	0.143	57	0.982	1.092	0.99	0.152	0.892	0	0	**0.094**	FALSE	FALSE	FALSE	**1.6**	**Subunit 3**	**A1**
717.4	36.581	0.134	54	0.983	1.038	0.99	0.135	0.892	0	0	**0.094**	FALSE	FALSE	FALSE	**1.4**	**Subunit 3**	**A1**
717.3	36.745	0.129	52	0.983	1.010	0.99	0.127	0.891	0	0	**0.094**	FALSE	FALSE	FALSE	**1.3**	**Subunit 3**	**A1**
717.1	36.909	0.126	51	0.983	0.992	0.99	0.122	0.890	0	0	**0.094**	FALSE	FALSE	FALSE	**1.3**	**Subunit 3**	**A1**
716.9	37.073	0.120	48	0.983	0.957	0.99	0.112	0.889	0	0	**0.094**	FALSE	FALSE	FALSE	**1.2**	**Subunit 3**	**A1**
716.8	37.237	0.115	45	0.983	0.933	0.99	0.105	0.889	0	0	**0.094**	FALSE	FALSE	FALSE	**1.1**	**Subunit 3**	**B**
716.6	37.401	0.107	40	0.984	0.890	1.00	0.093	0.888	0	0	**0.094**	FALSE	FALSE	FALSE	**1.0**	**Subunit 3**	**C**
716.4	37.565	0.105	39	0.984	0.882	1.00	0.091	0.887	0	0	**0.094**	FALSE	FALSE	FALSE	**1.0**	**Subunit 3**	**C**
716.3	37.729	0.107	40	0.984	0.888	1.00	0.093	0.887	0	0	**0.094**	FALSE	FALSE	FALSE	**1.0**	**Subunit 3**	**A2**
716.1	37.893	0.114	45	0.982	0.926	0.99	0.103	0.886	0	0	**0.094**	FALSE	FALSE	FALSE	**1.1**	**Subunit 3**	**A2**
715.9	38.057	0.117	46	0.981	0.942	0.99	0.107	0.885	0	0	**0.094**	FALSE	FALSE	FALSE	**1.1**	**Subunit 3**	**A2**
715.8	38.221	0.119	47	0.980	0.954	0.99	0.111	0.885	0	0	**0.094**	FALSE	FALSE	FALSE	**1.2**	**Subunit 3**	**A2**
715.6	38.385	0.117	46	0.980	0.941	0.99	0.107	0.884	0	0	**0.094**	FALSE	FALSE	FALSE	**1.1**	**Subunit 3**	**A2**
715.5	38.549	0.120	48	0.980	0.956	0.99	0.111	0.883	0	0	**0.094**	FALSE	FALSE	FALSE	**1.2**	**Subunit 3**	**A2**
715.3	38.713	0.118	47	0.979	0.946	0.99	0.109	0.883	0	0	**0.094**	FALSE	FALSE	FALSE	**1.2**	**Subunit 3**	**A2**
715.1	38.877	0.115	45	0.980	0.929	0.99	0.104	0.882	0	0	**0.094**	FALSE	FALSE	FALSE	**1.1**	**Subunit 3**	**A2**
715.0	39.042	0.112	43	0.980	0.911	0.99	0.099	0.881	0	0	**0.093**	FALSE	FALSE	FALSE	**1.1**	**Subunit 3**	**C**
714.8	39.206	0.113	44	0.979	0.917	0.99	0.101	0.880	0	0	**0.093**	FALSE	FALSE	FALSE	**1.1**	**Subunit 3**	**C**
714.6	39.370	0.120	48	0.978	0.956	0.99	0.111	0.880	0	0	**0.093**	FALSE	FALSE	FALSE	**1.2**	**Subunit 3**	**A2**
714.5	39.534	0.120	48	0.977	0.958	0.99	0.112	0.879	0	0	**0.093**	FALSE	FALSE	FALSE	**1.2**	**Subunit 3**	**A2**
714.3	39.698	0.121	48	0.977	0.963	0.99	0.113	0.878	0	0	**0.093**	FALSE	FALSE	FALSE	**1.2**	**Subunit 3**	**A2**
714.1	39.862	0.109	42	0.979	0.898	0.99	0.095	0.878	0	0	**0.093**	FALSE	FALSE	FALSE	**1.0**	**Subunit 3**	**C**
714.0	40.026	0.105	39	0.979	0.876	1.00	0.090	0.877	0	0	**0.093**	FALSE	FALSE	FALSE	**1.0**	**Subunit 3**	**C**
713.8	40.190	0.105	39	0.979	0.876	1.00	0.089	0.876	0	0	**0.093**	FALSE	FALSE	FALSE	**1.0**	**Subunit 3**	**C**
713.6	40.354	0.105	39	0.978	0.876	1.00	0.090	0.876	0	0	**0.093**	FALSE	FALSE	FALSE	**1.0**	**Subunit 3**	**C**
713.5	40.518	0.108	41	0.977	0.891	1.00	0.094	0.875	0	0	**0.093**	FALSE	FALSE	FALSE	**1.0**	**Subunit 3**	**A2**
713.3	40.682	0.108	41	0.977	0.889	1.00	0.093	0.874	0	0	**0.093**	FALSE	FALSE	FALSE	**1.0**	**Subunit 3**	**A2**
713.2	40.846	0.105	39	0.977	0.878	1.00	0.090	0.874	0	0	**0.093**	FALSE	FALSE	FALSE	**1.0**	**Subunit 3**	**A2**
713.0	41.010	0.104	38	0.977	0.870	1.00	0.088	0.873	0	0	**0.093**	FALSE	FALSE	FALSE	**0.9**	**Subunit 3**	**C**
712.8	41.174	0.102	37	0.977	0.861	1.00	0.086	0.872	0	0	**0.093**	FALSE	FALSE	FALSE	**0.9**	**Subunit 3**	**C**
712.7	41.338	0.123	49	0.972	0.974	0.99	0.116	0.871	0	0	**0.093**	FALSE	FALSE	FALSE	**1.2**	**Subunit 3**	**A2**
712.5	41.502	0.114	45	0.974	0.924	0.99	0.102	0.871	0	0	**0.093**	FALSE	FALSE	FALSE	**1.1**	**Subunit 3**	**A1**
712.3	41.666	0.126	51	0.971	0.994	0.99	0.121	0.870	0	0	**0.093**	FALSE	FALSE	FALSE	**1.3**	**Subunit 3**	**A1**
712.2	41.830	0.131	53	0.969	1.019	0.99	0.128	0.869	0	0	**0.093**	FALSE	FALSE	FALSE	**1.4**	**Subunit 3**	**A1**
712.0	41.994	0.134	54	0.968	1.041	0.99	0.134	0.869	0	0	**0.093**	FALSE	FALSE	FALSE	**1.4**	**Subunit 3**	**A1**
711.8	42.158	0.137	55	0.967	1.057	0.99	0.139	0.868	0	0	**0.093**	FALSE	FALSE	FALSE	**1.5**	**Subunit 3**	**A1**
711.7	42.322	0.129	52	0.969	1.008	0.99	0.125	0.867	0	0	**0.092**	FALSE	FALSE	FALSE	**1.3**	**Subunit 3**	**A1**
711.5	42.486	0.133	53	0.967	1.033	0.99	0.132	0.867	0	0	**0.092**	FALSE	FALSE	FALSE	**1.4**	**Subunit 3**	**A1**
711.3	42.650	0.139	56	0.966	1.072	0.99	0.143	0.866	0	0	**0.092**	FALSE	FALSE	FALSE	**1.5**	**Subunit 3**	**A1**
711.2	42.814	0.140	56	0.965	1.074	0.99	0.143	0.865	0	0	**0.092**	FALSE	FALSE	FALSE	**1.6**	**Subunit 3**	**A1**
711.0	42.978	0.139	56	0.965	1.070	0.99	0.142	0.864	0	0	**0.092**	FALSE	FALSE	FALSE	**1.5**	**Subunit 3**	**A1**
710.9	43.143	0.137	55	0.965	1.061	0.99	0.139	0.864	0	0	**0.092**	FALSE	FALSE	FALSE	**1.5**	**Subunit 3**	**A1**
710.7	43.307	0.147	58	0.962	1.120	0.99	0.157	0.863	0	0	**0.092**	FALSE	FALSE	FALSE	**1.7**	**Subunit 3**	**A1**

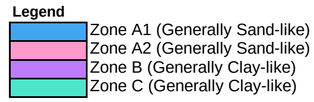
Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
710.5	43.471	0.156	60	0.960	1.167	0.99	0.173	0.862	0	0	**0.092**	FALSE	FALSE	FALSE	**1.9**	**Subunit 3**	**A1**
710.4	43.635	0.289	73	0.945	1.675	0.98	0.447	0.862	0	0	**0.092**	FALSE	FALSE	FALSE	**4.9**	**Subunit 3**	**A1**
710.2	43.799	0.408	77	0.938	1.932	0.97	0.719	0.861	0	0	**0.092**	FALSE	FALSE	FALSE	**7.8**	**Subunit 3**	**A1**
710.0	43.963	0.397	77	0.937	1.909	0.97	0.691	0.860	0	0	**0.092**	FALSE	FALSE	FALSE	**7.5**	**Subunit 3**	**A1**
709.9	44.127	0.191	66	0.953	1.337	0.99	0.240	0.859	0	0	**0.092**	FALSE	FALSE	FALSE	**2.6**	**Subunit 3**	**A1**
709.7	44.291	0.243	71	0.947	1.531	0.98	0.346	0.859	0	0	**0.092**	FALSE	FALSE	FALSE	**3.8**	**Subunit 3**	**A1**
709.5	44.455	0.182	65	0.953	1.291	0.99	0.221	0.858	0	0	**0.092**	FALSE	FALSE	FALSE	**2.4**	**Subunit 3**	**A1**
709.4	44.619	0.135	54	0.962	1.044	0.99	0.135	0.857	0	0	**0.092**	FALSE	FALSE	FALSE	**1.5**	**Subunit 3**	**A1**
709.2	44.783	0.127	51	0.963	0.997	0.99	0.121	0.857	0	0	**0.092**	FALSE	FALSE	FALSE	**1.3**	**Subunit 3**	**A2**
709.1	44.947	0.126	51	0.963	0.985	0.99	0.118	0.856	0	0	**0.092**	FALSE	FALSE	FALSE	**1.3**	**Subunit 3**	**A2**
708.9	45.111	0.123	50	0.964	0.973	0.99	0.115	0.855	0	0	**0.092**	FALSE	FALSE	FALSE	**1.3**	**Subunit 3**	**A2**
708.7	45.275	0.125	50	0.963	0.980	0.99	0.117	0.854	0	0	**0.091**	FALSE	FALSE	FALSE	**1.3**	**Subunit 3**	**A2**
708.6	45.439	0.130	52	0.961	1.011	0.99	0.126	0.854	0	0	**0.091**	FALSE	FALSE	FALSE	**1.4**	**Subunit 3**	**A2**
708.4	45.603	0.141	56	0.958	1.075	0.99	0.144	0.853	0	0	**0.091**	FALSE	FALSE	FALSE	**1.6**	**Subunit 3**	**A1**
708.2	45.767	0.121	49	0.963	0.959	0.99	0.111	0.852	0	0	**0.091**	FALSE	FALSE	FALSE	**1.2**	**Subunit 3**	**A1**
708.1	45.931	0.137	55	0.958	1.050	0.99	0.137	0.852	0	0	**0.091**	FALSE	FALSE	FALSE	**1.5**	**Subunit 3**	**A1**
707.9	46.095	0.130	52	0.960	1.010	0.99	0.125	0.851	0	0	**0.091**	FALSE	FALSE	FALSE	**1.4**	**Subunit 3**	**A1**
707.7	46.259	0.160	61	0.952	1.177	0.99	0.178	0.850	0	0	**0.091**	FALSE	FALSE	FALSE	**1.9**	**Subunit 3**	**A1**
707.6	46.423	0.290	73	0.935	1.650	0.98	0.438	0.850	0	0	**0.091**	FALSE	FALSE	FALSE	**4.8**	**Subunit 3**	**A1**
707.4	46.587	N/A	87	N/A	N/A	N/A	N/A	0.849	0	0	**0.091**	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**	**A1**
707.2	46.751	N/A	100	N/A	N/A	N/A	N/A	0.848	0	0	**0.091**	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**	**A1**



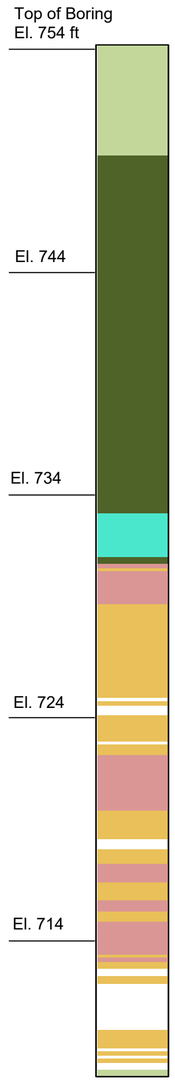
Adapted from "Discussion of 'Liquefaction Potential of Silts from CPTu'" (Robertson 2008). Zone A_1 and Zone A_2 samples are generally sand-like. Zone B samples are generally clay-like and not susceptible to cyclic softening. Zone C samples are generally clay-like and susceptible to cyclic softening. Note that the transition from clay-like to sand-like in this chart does not exactly match the liquefaction calculations herein; that is, some transitional samples in Zone B and Zone C will be treated as sand-like and analyzed for liquefaction if the calculations indicate as such.



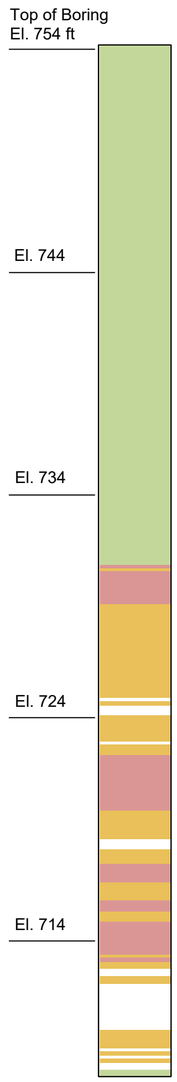




CPT-05A, Liquefaction Triggering Results

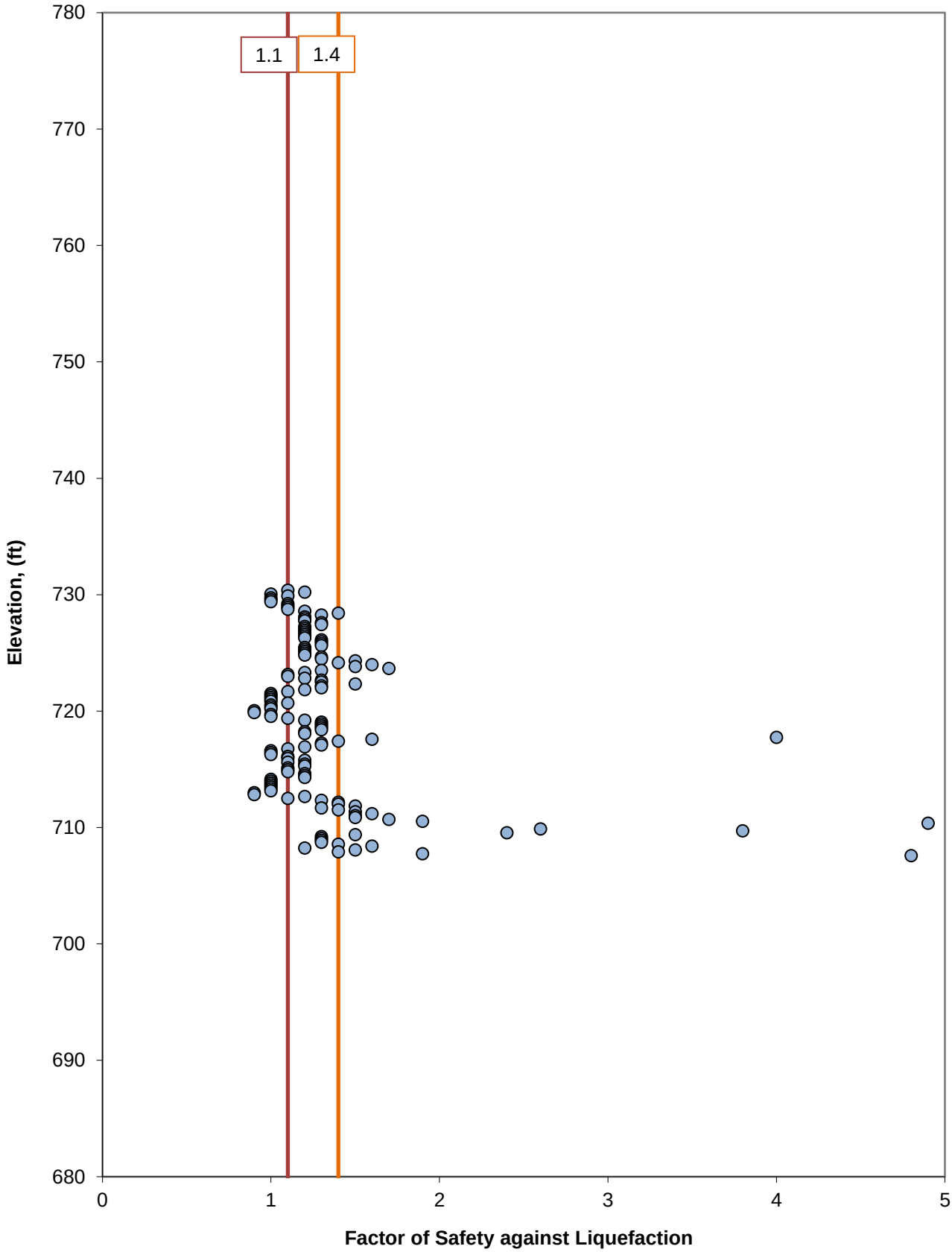


CPT-05A, Liquefaction Triggering Results



CPT-05A, Robertson Soil Type

KIF TDEC Stability, Boring = CPT-05A, Source = 1 Hz, Mw = 7.6, Event = Design EQ, CPT Data, Simplified Stress-Based Approach



Project Information

Stantec Project Number =	175668043
Project Name =	KIF TDEC Stability
CPT ID =	CPT-07

Boring Location (optional)

Northing =	
Easting =	

OR

Baseline Station =	
Offset (+ Right) =	

Using qt (corrected for u2 PWP) or qc (backcalculated uncorrected field tip)

Cone ID (optional) =	AD184	
Use qc instead of qt?	0	(1: Yes, 0: No)
Cone Area Ratio (a) =	0.80	

Drilling Information

Top of Hole Elevation =	754.0	feet
Water Depth during CPT (negative for U/S borings) =	6.0	feet
Depth data collection began =	0.16	feet
Avg. Total Unit Wt. Above 1st Sample =	120.00	pcf

During Earthquake Information

Water Depth during EQ (relative to CPT TOH, negative for U/S borings) =	5.0	feet
Final Grade Elevation during EQ =	753.0	feet
Avg. Total Unit Wt. of Cut/Fill =	120	pcf

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile?	0	(1: Yes, 0: No)

If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile:	ng_Pond_Section, KIF-BF-SPT3_NOR	
α at each Sample Depth known?	1	(1: Yes, 0: No)

If previous answer is No, then enter curve fit parameters below (α vs. depth curve)

If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_α will be one.

m4:	
m3:	
m2:	
m1:	
m0:	

Associated ground response profile:	shing_Pond_Section, KIF-BF-SPT3	
Get CSR from shear stress envelope?	0	(1: Yes, 0: No)

If previous answer is No, then CSR will be calculated using a_{max} and r_d

Max. Shear Stress at each sample depth known?		(1: Yes, 0: No)

If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4:	
m3:	
m2:	
m1:	

Earthquake Information

EQ Source (e.g., New Madrid)	1 Hz
Event (e.g., MCE, OBE)	Design EQ
a_{max} (g) (top of ground surface)	0.09
EQ Mag (Mw)	7.6

Inputs

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
0.164	86.411	0.020	112	Fly Ash	Sand-like	Do Not Correct for FC	0.057			
0.328	204.281	0.261	112	Fly Ash	Sand-like	Do Not Correct for FC	0.054			
0.492	201.240	0.302	112	Fly Ash	Sand-like	Do Not Correct for FC	0.052			
0.656	198.870	0.206	112	Fly Ash	Sand-like	Do Not Correct for FC	0.049			
0.820	206.036	0.144	112	Fly Ash	Sand-like	Do Not Correct for FC	0.046			
0.984	190.934	0.207	112	Fly Ash	Sand-like	Do Not Correct for FC	0.044			
1.148	183.782	0.149	112	Fly Ash	Sand-like	Do Not Correct for FC	0.041			
1.312	165.537	0.388	112	Fly Ash	Sand-like	Do Not Correct for FC	0.038			
1.476	153.835	0.448	112	Fly Ash	Sand-like	Do Not Correct for FC	0.035			
1.640	162.288	0.253	112	Fly Ash	Sand-like	Do Not Correct for FC	0.033			
1.804	215.621	0.365	112	Fly Ash	Sand-like	Do Not Correct for FC	0.030			
1.968	194.685	0.665	112	Fly Ash	Sand-like	Do Not Correct for FC	0.027			
2.133	179.875	0.995	112	Fly Ash	Sand-like	Do Not Correct for FC	0.028			
2.297	137.639	1.648	112	Fly Ash	Sand-like	Do Not Correct for FC	0.031			
2.461	98.314	1.622	112	Fly Ash	Sand-like	Do Not Correct for FC	0.033			
2.625	99.943	1.644	112	Fly Ash	Sand-like	Do Not Correct for FC	0.035			
2.789	123.064	1.427	112	Fly Ash	Sand-like	Do Not Correct for FC	0.037			
2.953	187.244	1.404	112	Fly Ash	Sand-like	Do Not Correct for FC	0.040			
3.117	166.973	0.718	112	Fly Ash	Sand-like	Do Not Correct for FC	0.041			
3.281	95.594	1.022	112	Fly Ash	Sand-like	Do Not Correct for FC	0.039			
3.445	56.660	1.213	112	Fly Ash	Sand-like	Do Not Correct for FC	0.038			
3.609	37.944	1.072	112	Fly Ash	Sand-like	Do Not Correct for FC	0.037			
3.773	33.569	0.952	112	Fly Ash	Sand-like	Do Not Correct for FC	0.036			
3.937	25.705	0.750	112	Fly Ash	Sand-like	Do Not Correct for FC	0.035			
4.101	22.416	0.586	112	Fly Ash	Sand-like	Do Not Correct for FC	0.032			
4.265	19.933	0.488	112	Fly Ash	Sand-like	Do Not Correct for FC	0.030			
4.429	18.120	0.460	112	Fly Ash	Sand-like	Do Not Correct for FC	0.027			
4.593	15.803	0.462	112	Fly Ash	Sand-like	Do Not Correct for FC	0.025			
4.757	14.629	0.411	112	Fly Ash	Sand-like	Do Not Correct for FC	0.022			
4.921	13.276	0.374	112	Fly Ash	Sand-like	Do Not Correct for FC	0.020			
5.085	32.844	0.304	128	Embankment Fill	Clay-like		0.016			
5.249	33.961	0.336	128	Embankment Fill	Clay-like		0.013			
5.413	27.805	0.472	128	Embankment Fill	Clay-like		0.012			
5.577	21.203	0.573	128	Embankment Fill	Clay-like		0.015			
5.741	13.693	0.538	128	Embankment Fill	Clay-like		0.013			
5.905	12.196	0.391	128	Embankment Fill	Clay-like		0.010			
6.069	12.323	0.312	128	Embankment Fill	Clay-like		0.008			
6.234	10.555	0.331	128	Embankment Fill	Clay-like		0.006			
6.398	10.871	0.343	128	Embankment Fill	Clay-like		0.004			
6.562	11.156	0.429	128	Embankment Fill	Clay-like		0.003			
6.726	11.092	0.438	128	Embankment Fill	Clay-like		0.002			
6.890	9.713	0.426	128	Embankment Fill	Clay-like		0.001			
7.054	9.168	0.382	128	Embankment Fill	Clay-like		0.001			
7.218	8.455	0.324	128	Embankment Fill	Clay-like		0.001			
7.382	9.297	0.309	128	Embankment Fill	Clay-like		0.002			
7.546	10.582	0.365	128	Embankment Fill	Clay-like		0.003			
7.710	10.842	0.293	128	Embankment Fill	Clay-like		0.005			
7.874	9.966	0.287	128	Embankment Fill	Clay-like		0.006			
8.038	10.543	0.290	128	Embankment Fill	Clay-like		0.007			
8.202	11.471	0.473	128	Embankment Fill	Clay-like		0.009			
8.366	19.223	0.589	128	Embankment Fill	Clay-like		0.010			
8.530	34.931	1.087	128	Embankment Fill	Clay-like		0.011			
8.694	34.568	1.358	128	Embankment Fill	Clay-like		0.012			
8.858	25.941	1.296	128	Embankment Fill	Clay-like		0.013			
9.022	27.558	1.167	128	Embankment Fill	Clay-like		0.014			
9.186	32.077	1.157	128	Embankment Fill	Clay-like		0.015			
9.350	40.269	1.050	128	Embankment Fill	Clay-like		0.016			
9.514	25.184	1.104	128	Embankment Fill	Clay-like		0.017			
9.678	49.399	0.403	128	Embankment Fill	Clay-like		0.018			
9.842	32.868	0.528	128	Embankment Fill	Clay-like		0.019			
10.006	40.065	0.174	128	Embankment Fill	Clay-like		0.020			
10.170	293.890	0.243	128	Embankment Fill	Clay-like		0.021			
10.335	205.353	3.344	128	Embankment Fill	Clay-like		0.022			

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
10.499	211.420	4.025	128	Embankment Fill	Clay-like		0.023			
10.663	100.807	3.437	128	Embankment Fill	Clay-like		0.024			
10.827	10.091	2.438	128	Embankment Fill	Clay-like		0.026			
10.991	10.228	0.309	128	Embankment Fill	Clay-like		0.027			
11.155	184.128	0.473	128	Embankment Fill	Clay-like		0.028			
11.319	167.307	0.428	128	Embankment Fill	Clay-like		0.029			
11.483	115.704	2.100	128	Embankment Fill	Clay-like		0.030			
11.647	24.622	1.981	128	Embankment Fill	Clay-like		0.031			
11.811	7.052	1.546	128	Embankment Fill	Clay-like		0.032			
11.975	11.186	0.281	128	Embankment Fill	Clay-like		0.033			
12.139	4.055	0.234	128	Embankment Fill	Clay-like		0.034			
12.303	4.617	0.199	128	Embankment Fill	Clay-like		0.034			
12.467	3.868	0.147	128	Embankment Fill	Clay-like		0.035			
12.631	5.726	0.138	128	Embankment Fill	Clay-like		0.036			
12.795	6.006	0.327	128	Embankment Fill	Clay-like		0.037			
12.959	6.027	0.595	128	Embankment Fill	Clay-like		0.038			
13.123	42.608	0.564	128	Embankment Fill	Clay-like		0.039			
13.287	6.539	0.856	128	Embankment Fill	Clay-like		0.039			
13.451	19.892	0.483	128	Embankment Fill	Clay-like		0.040			
13.615	19.986	0.051	128	Embankment Fill	Clay-like		0.041			
13.779	5.954	0.169	128	Embankment Fill	Clay-like		0.041			
13.943	5.623	0.211	128	Embankment Fill	Clay-like		0.042			
14.107	5.025	0.232	128	Embankment Fill	Clay-like		0.043			
14.271	10.278	0.179	128	Embankment Fill	Clay-like		0.043			
14.436	11.156	0.240	128	Embankment Fill	Clay-like		0.044			
14.600	12.710	0.300	128	Embankment Fill	Clay-like		0.045			
14.764	16.035	0.250	128	Embankment Fill	Clay-like		0.046			
14.928	15.396	0.356	128	Embankment Fill	Clay-like		0.046			
15.092	11.528	0.412	128	Embankment Fill	Clay-like		0.047			
15.256	16.966	0.551	128	Embankment Fill	Clay-like		0.048			
15.420	43.872	0.766	128	Embankment Fill	Clay-like		0.049			
15.584	40.315	0.679	128	Embankment Fill	Clay-like		0.050			
15.748	48.767	1.332	128	Embankment Fill	Clay-like		0.051			
15.912	45.458	0.134	128	Embankment Fill	Clay-like		0.052			
16.076	38.800	0.010	128	Embankment Fill	Clay-like		0.052			
16.240	304.232	0.010	128	Embankment Fill	Clay-like		0.053			

LIQUEFACTION POTENTIAL ASSESSMENT FOR COARSE GRAINED SOILS USING CONE PENETRATION TEST DATA

Facility: KIF TDEC Stability
Project No.: 175668043
CPT ID: CPT-07

Water Elevation during CPT:	748.0	ft
Depth to Water during CPT:	6.0	ft *(relative to ground surface during CPT)*
Water Elevation during Earthquake:	749.0	ft
Depth to Water during Earthquake:	5.0	ft *(relative to ground surface during CPT)*
Final Grade Elevation during EQ:	753	ft *(if no fill, then set this equal to top of CPT hole elev.)*
Height of Final Grade above CPT TOH:	-1.0	ft *(relative to ground surface during CPT, + Fill, - Cut)*
Unit Weight of Cut/Fill to Achieve Final Grade	120	pcf
Cut/Fill Total Stress (+ Fill, - Cut):	-0.06	tsf

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight γ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
754.0				Vertical Stresses above 1st CPT:			**0.01**	**-0.05**	**0.00**	**0.00**	**0.01**	**-0.05**
753.8	0.164	86.41	0.02	112	**0.16**	0.09	0.01	-0.05	0.00	0.00	0.01	-0.05
753.7	0.328	204.28	0.26	112	0.25	0.16	0.02	-0.04	0.00	0.00	0.02	-0.04
753.5	0.492	201.24	0.30	112	0.41	0.16	0.03	-0.03	0.00	0.00	0.03	-0.03
753.3	0.656	198.87	0.21	112	0.57	0.16	0.04	-0.02	0.00	0.00	0.04	-0.02
753.2	0.820	206.04	0.14	112	0.74	0.16	0.05	-0.01	0.00	0.00	0.05	-0.01
753.0	0.984	190.93	0.21	112	0.90	0.16	0.06	0.00	0.00	0.00	0.06	0.00
752.9	1.148	183.78	0.15	112	1.07	0.16	0.06	0.00	0.00	0.00	0.06	0.00
752.7	1.312	165.54	0.39	112	1.23	0.16	0.07	0.01	0.00	0.00	0.07	0.01
752.5	1.476	153.84	0.45	112	1.39	0.16	0.08	0.02	0.00	0.00	0.08	0.02
752.4	1.640	162.29	0.25	112	1.56	0.16	0.09	0.03	0.00	0.00	0.09	0.03
752.2	1.804	215.62	0.37	112	1.72	0.16	0.10	0.04	0.00	0.00	0.10	0.04
752.0	1.968	194.69	0.67	112	1.89	0.16	0.11	0.05	0.00	0.00	0.11	0.05
751.9	2.133	179.87	1.00	112	2.05	0.16	0.12	0.06	0.00	0.00	0.12	0.06
751.7	2.297	137.64	1.65	112	2.21	0.16	0.13	0.07	0.00	0.00	0.13	0.07
751.5	2.461	98.31	1.62	112	2.38	0.16	0.14	0.08	0.00	0.00	0.14	0.08
751.4	2.625	99.94	1.64	112	2.54	0.16	0.15	0.09	0.00	0.00	0.15	0.09
751.2	2.789	123.06	1.43	112	2.71	0.16	0.16	0.10	0.00	0.00	0.16	0.10
751.0	2.953	187.24	1.40	112	2.87	0.16	0.17	0.11	0.00	0.00	0.17	0.11
750.9	3.117	166.97	0.72	112	3.03	0.16	0.18	0.12	0.00	0.00	0.18	0.12
750.7	3.281	95.59	1.02	112	3.20	0.16	0.18	0.12	0.00	0.00	0.18	0.12
750.6	3.445	56.66	1.21	112	3.36	0.16	0.19	0.13	0.00	0.00	0.19	0.13
750.4	3.609	37.94	1.07	112	3.53	0.16	0.20	0.14	0.00	0.00	0.20	0.14
750.2	3.773	33.57	0.95	112	3.69	0.16	0.21	0.15	0.00	0.00	0.21	0.15
750.1	3.937	25.71	0.75	112	3.85	0.16	0.22	0.16	0.00	0.00	0.22	0.16
749.9	4.101	22.42	0.59	112	4.02	0.16	0.23	0.17	0.00	0.00	0.23	0.17
749.7	4.265	19.93	0.49	112	4.18	0.16	0.24	0.18	0.00	0.00	0.24	0.18
749.6	4.429	18.12	0.46	112	4.35	0.16	0.25	0.19	0.00	0.00	0.25	0.19
749.4	4.593	15.80	0.46	112	4.51	0.16	0.26	0.20	0.00	0.00	0.26	0.20
749.2	4.757	14.63	0.41	112	4.68	0.16	0.27	0.21	0.00	0.00	0.27	0.21
749.1	4.921	13.28	0.37	112	4.84	0.16	0.28	0.22	0.00	0.00	0.28	0.22
748.9	5.085	32.84	0.30	128	5.00	0.16	0.29	0.23	0.00	0.00	0.29	0.22
748.8	5.249	33.96	0.34	128	5.17	0.16	0.30	0.24	0.00	0.01	0.30	0.23
748.6	5.413	27.81	0.47	128	5.33	0.16	0.31	0.25	0.00	0.01	0.31	0.23
748.4	5.577	21.20	0.57	128	5.50	0.16	0.32	0.26	0.00	0.02	0.32	0.24
748.3	5.741	13.69	0.54	128	5.66	0.16	0.33	0.27	0.00	0.02	0.33	0.24
748.1	5.905	12.20	0.39	128	5.82	0.16	0.34	0.28	0.00	0.03	0.34	0.25
747.9	6.069	12.32	0.31	128	5.99	0.16	0.35	0.29	0.00	0.03	0.35	0.26
747.8	6.234	10.55	0.33	128	6.15	0.16	0.36	0.30	0.01	0.04	0.35	0.26
747.6	6.398	10.87	0.34	128	6.32	0.16	0.37	0.31	0.01	0.04	0.36	0.27
747.4	6.562	11.16	0.43	128	6.48	0.16	0.38	0.32	0.02	0.05	0.36	0.27
747.3	6.726	11.09	0.44	128	6.64	0.16	0.39	0.33	0.02	0.05	0.37	0.28
747.1	6.890	9.71	0.43	128	6.81	0.16	0.40	0.34	0.03	0.06	0.37	0.28
746.9	7.054	9.17	0.38	128	6.97	0.16	0.41	0.35	0.03	0.06	0.38	0.29
746.8	7.218	8.46	0.32	128	7.14	0.16	0.42	0.36	0.04	0.07	0.38	0.29
746.6	7.382	9.30	0.31	128	7.30	0.16	0.43	0.37	0.04	0.07	0.39	0.30
746.5	7.546	10.58	0.37	128	7.46	0.16	0.44	0.38	0.05	0.08	0.40	0.30
746.3	7.710	10.84	0.29	128	7.63	0.16	0.45	0.39	0.05	0.08	0.40	0.31
746.1	7.874	9.97	0.29	128	7.79	0.16	0.46	0.40	0.06	0.09	0.41	0.31
746.0	8.038	10.54	0.29	128	7.96	0.16	0.48	0.42	0.06	0.09	0.41	0.32
745.8	8.202	11.47	0.47	128	8.12	0.16	0.49	0.43	0.07	0.10	0.42	0.33
745.6	8.366	19.22	0.59	128	8.28	0.16	0.50	0.44	0.07	0.11	0.42	0.33
745.5	8.530	34.93	1.09	128	8.45	0.16	0.51	0.45	0.08	0.11	0.43	0.34
745.3	8.694	34.57	1.36	128	8.61	0.16	0.52	0.46	0.08	0.12	0.43	0.34
745.1	8.858	25.94	1.30	128	8.78	0.16	0.53	0.47	0.09	0.12	0.44	0.35
745.0	9.022	27.56	1.17	128	8.94	0.16	0.54	0.48	0.09	0.13	0.44	0.35
744.8	9.186	32.08	1.16	128	9.10	0.16	0.55	0.49	0.10	0.13	0.45	0.36
744.6	9.350	40.27	1.05	128	9.27	0.16	0.56	0.50	0.10	0.14	0.45	0.36
744.5	9.514	25.18	1.10	128	9.43	0.16	0.57	0.51	0.11	0.14	0.46	0.37

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
744.3	9.678	49.40	0.40	128	9.60	0.16	0.58	0.52	0.11	0.15	0.47	0.37
744.2	9.842	32.87	0.53	128	9.76	0.16	0.59	0.53	0.12	0.15	0.47	0.38
744.0	10.006	40.06	0.17	128	9.92	0.16	0.60	0.54	0.13	0.16	0.48	0.38
743.8	10.170	293.89	0.24	128	10.09	0.16	0.61	0.55	0.13	0.16	0.48	0.39
743.7	10.335	205.35	3.34	128	10.25	0.16	0.62	0.56	0.14	0.17	0.49	0.40
743.5	10.499	211.42	4.03	128	10.42	0.16	0.63	0.57	0.14	0.17	0.49	0.40
743.3	10.663	100.81	3.44	128	10.58	0.16	0.64	0.58	0.15	0.18	0.50	0.41
743.2	10.827	10.09	2.44	128	10.74	0.16	0.65	0.59	0.15	0.18	0.50	0.41
743.0	10.991	10.23	0.31	128	10.91	0.16	0.66	0.60	0.16	0.19	0.51	0.42
742.8	11.155	184.13	0.47	128	11.07	0.16	0.67	0.61	0.16	0.19	0.51	0.42
742.7	11.319	167.31	0.43	128	11.24	0.16	0.69	0.63	0.17	0.20	0.52	0.43
742.5	11.483	115.70	2.10	128	11.40	0.16	0.70	0.64	0.17	0.20	0.52	0.43
742.4	11.647	24.62	1.98	128	11.56	0.16	0.71	0.65	0.18	0.21	0.53	0.44
742.2	11.811	7.05	1.55	128	11.73	0.16	0.72	0.66	0.18	0.21	0.54	0.44
742.0	11.975	11.19	0.28	128	11.89	0.16	0.73	0.67	0.19	0.22	0.54	0.45
741.9	12.139	4.05	0.23	128	12.06	0.16	0.74	0.68	0.19	0.22	0.55	0.45
741.7	12.303	4.62	0.20	128	12.22	0.16	0.75	0.69	0.20	0.23	0.55	0.46
741.5	12.467	3.87	0.15	128	12.39	0.16	0.76	0.70	0.20	0.23	0.56	0.47
741.4	12.631	5.73	0.14	128	12.55	0.16	0.77	0.71	0.21	0.24	0.56	0.47
741.2	12.795	6.01	0.33	128	12.71	0.16	0.78	0.72	0.21	0.24	0.57	0.48
741.0	12.959	6.03	0.60	128	12.88	0.16	0.79	0.73	0.22	0.25	0.57	0.48
740.9	13.123	42.61	0.56	128	13.04	0.16	0.80	0.74	0.22	0.25	0.58	0.49
740.7	13.287	6.54	0.86	128	13.21	0.16	0.81	0.75	0.23	0.26	0.58	0.49
740.5	13.451	19.89	0.48	128	13.37	0.16	0.82	0.76	0.23	0.26	0.59	0.50
740.4	13.615	19.99	0.05	128	13.53	0.16	0.83	0.77	0.24	0.27	0.59	0.50
740.2	13.779	5.95	0.17	128	13.70	0.16	0.84	0.78	0.24	0.27	0.60	0.51
740.1	13.943	5.62	0.21	128	13.86	0.16	0.85	0.79	0.25	0.28	0.61	0.51
739.9	14.107	5.02	0.23	128	14.03	0.16	0.86	0.80	0.25	0.28	0.61	0.52
739.7	14.271	10.28	0.18	128	14.19	0.16	0.87	0.81	0.26	0.29	0.62	0.52
739.6	14.436	11.16	0.24	128	14.35	0.16	0.88	0.82	0.26	0.29	0.62	0.53
739.4	14.600	12.71	0.30	128	14.52	0.16	0.89	0.83	0.27	0.30	0.63	0.54
739.2	14.764	16.03	0.25	128	14.68	0.16	0.91	0.85	0.27	0.30	0.63	0.54
739.1	14.928	15.40	0.36	128	14.85	0.16	0.92	0.86	0.28	0.31	0.64	0.55
738.9	15.092	11.53	0.41	128	15.01	0.16	0.93	0.87	0.28	0.31	0.64	0.55
738.7	15.256	16.97	0.55	128	15.17	0.16	0.94	0.88	0.29	0.32	0.65	0.56
738.6	15.420	43.87	0.77	128	15.34	0.16	0.95	0.89	0.29	0.33	0.65	0.56
738.4	15.584	40.31	0.68	128	15.50	0.16	0.96	0.90	0.30	0.33	0.66	0.57
738.3	15.748	48.77	1.33	128	15.67	0.16	0.97	0.91	0.30	0.34	0.66	0.57
738.1	15.912	45.46	0.13	128	15.83	0.16	0.98	0.92	0.31	0.34	0.67	0.58
737.9	16.076	38.80	0.01	128	15.99	0.16	0.99	0.93	0.31	0.35	0.68	0.58
737.8	16.240	304.23	0.01	128	16.16	0.08	1.00	0.94	0.32	0.35	0.68	0.59

LIQUEFACTION POTENTIAL ASSESSMENT FOR COARSE GRAINED SOILS USING CONE PENETRATION TEST DATA

Project Site: KIF TDEC Stability
Project No.: 175668043
CPT ID: CPT-07

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
754.0												
753.8	0.164	847.39	0.15	0.67	0.5	1.70	138.85	0	0.00	138.85	0.057	#NUM!
753.7	0.328	1440.21	0.15	0.50	0.5	1.70	328.24	0	0.00	328.24	0.054	#NUM!
753.5	0.492	1164.92	0.15	0.57	0.5	1.70	323.35	0	0.00	323.35	0.052	#NUM!
753.3	0.656	999.76	0.15	0.61	0.5	1.70	319.55	0	0.00	319.55	0.049	#NUM!
753.2	0.820	927.99	0.15	0.64	0.5	1.70	331.06	0	0.00	331.06	0.046	#NUM!
753.0	0.984	785.89	0.15	0.70	0.5	1.70	306.79	0	0.00	306.79	0.044	#NUM!
752.9	1.148	700.87	0.15	0.74	0.5	1.70	295.30	0	0.00	295.30	0.041	-0.600
752.7	1.312	590.83	0.23	0.91	0.5	1.70	265.99	0	0.00	265.99	0.038	-0.600
752.5	1.476	517.86	0.29	1.02	0.5	1.70	247.18	0	0.00	247.18	0.035	-0.600
752.4	1.640	518.47	0.16	0.86	0.5	1.70	260.77	0	0.00	260.77	0.033	-0.600
752.2	1.804	657.06	0.17	0.79	0.5	1.70	346.46	0	0.00	346.46	0.030	-0.600
752.0	1.968	568.10	0.34	1.04	0.5	1.70	312.82	0	0.00	312.82	0.027	-0.600
751.9	2.133	504.36	0.55	1.23	0.5	1.70	289.02	0	0.00	289.02	0.028	-0.600
751.7	2.297	371.86	1.20	1.58	0.5	1.70	221.16	0	0.00	221.16	0.031	-0.600
751.5	2.461	256.53	1.65	1.79	0.5	1.70	157.97	6	0.00	157.97	0.033	-0.600
751.4	2.625	252.52	1.65	1.79	0.5	1.70	160.59	6	0.00	160.59	0.035	-0.600
751.2	2.789	301.75	1.16	1.62	0.5	1.70	197.74	0	0.00	197.74	0.037	-0.600
751.0	2.953	446.41	0.75	1.37	0.5	1.63	288.06	0	0.00	288.06	0.040	-0.600
750.9	3.117	387.44	0.43	1.23	0.5	1.61	253.58	0	0.00	253.58	0.041	-0.600
750.7	3.281	216.03	1.07	1.69	0.5	1.70	153.60	0	0.00	153.60	0.039	-0.600
750.6	3.445	124.78	2.15	2.07	0.5	1.70	91.04	29	0.00	91.04	0.038	-0.383
750.4	3.609	81.49	2.84	2.29	0.5	1.70	60.97	46	0.00	60.97	0.037	-0.224
750.2	3.773	70.45	2.85	2.33	0.5	1.70	53.94	50	0.00	53.94	0.036	-0.178
750.1	3.937	52.69	2.94	2.43	0.5	1.70	41.30	57	0.00	41.30	0.035	-0.084
749.9	4.101	44.95	2.64	2.45	0.5	1.70	36.02	59	0.00	36.02	0.032	-0.037
749.7	4.265	39.12	2.48	2.48	0.5	1.70	32.03	61	0.00	32.03	0.030	0.001
749.6	4.429	34.84	2.57	2.53	0.5	1.70	29.12	65	0.00	29.12	0.027	0.032
749.4	4.593	39.47	2.97	2.53	0.7	1.70	25.39	65	0.00	25.39	0.025	0.074
749.2	4.757	35.59	2.86	2.55	0.7	1.70	23.51	67	0.00	23.51	0.022	0.097
749.1	4.921	31.46	2.88	2.59	0.7	1.70	21.33	70	0.00	21.33	0.020	0.100
748.9	5.085	59.18	0.93	2.07	0.5	1.70	52.77	29	44.66	97.43	0.016	-0.403
748.8	5.249	60.10	1.00	2.08	0.5	1.70	54.57	30	46.08	100.65	0.013	-0.416
748.6	5.413	48.24	1.72	2.30	0.5	1.70	44.68	47	56.67	101.35	0.012	-0.419
748.4	5.577	36.03	2.74	2.53	0.5	1.70	34.07	66	59.62	93.69	0.015	-0.385
748.3	5.741	40.74	4.03	2.61	1.0	1.70	22.00	71	57.28	79.29	0.013	-0.316
748.1	5.905	24.88	3.30	2.71	0.7	1.70	19.60	79	57.82	77.41	0.010	-0.306
747.9	6.069	24.70	2.61	2.64	0.7	1.70	19.80	75	57.15	76.95	0.008	-0.303
747.8	6.234	28.94	3.25	2.65	1.0	1.70	16.96	75	56.40	73.36	0.006	-0.284
747.6	6.398	29.36	3.27	2.65	1.0	1.70	17.47	75	56.52	73.98	0.004	-0.287
747.4	6.562	29.68	3.98	2.70	1.0	1.70	17.93	79	57.27	75.20	0.003	-0.293
747.3	6.726	29.05	4.09	2.72	1.0	1.70	17.82	80	57.41	75.23	0.002	-0.293
747.1	6.890	24.91	4.58	2.80	1.0	1.70	15.61	87	57.53	73.14	0.001	-0.281
746.9	7.054	23.09	4.36	2.81	1.0	1.70	14.73	88	57.36	72.09	0.001	-0.275
746.8	7.218	20.89	4.03	2.82	1.0	1.70	13.59	89	57.10	70.69	0.001	-0.267
746.6	7.382	22.73	3.49	2.75	1.0	1.70	14.94	83	56.89	71.83	0.002	-0.273
746.5	7.546	25.65	3.60	2.72	1.0	1.70	17.00	81	57.20	74.20	0.003	-0.286
746.3	7.710	25.93	2.82	2.65	1.0	1.70	17.42	75	56.51	73.93	0.005	-0.284
746.1	7.874	23.40	3.02	2.70	1.0	1.70	16.01	79	56.71	72.72	0.006	-0.277
746.0	8.038	24.47	2.88	2.67	1.0	1.70	16.94	77	56.67	73.61	0.007	-0.281
745.8	8.202	26.35	4.31	2.76	1.0	1.68	18.20	84	57.98	76.18	0.009	-0.295
745.6	8.366	33.67	3.15	2.59	0.7	1.62	29.40	70	59.27	88.67	0.010	-0.356
745.5	8.530	51.18	3.16	2.46	0.5	1.53	50.51	60	62.84	113.36	0.011	-0.460
745.3	8.694	50.31	3.99	2.54	0.5	1.52	49.65	66	64.21	113.86	0.012	-0.462
745.1	8.858	44.51	5.10	2.65	0.7	1.55	37.97	75	62.62	100.59	0.013	-0.408
745.0	9.022	46.92	4.32	2.58	0.7	1.53	39.97	70	62.21	102.18	0.014	-0.414
744.8	9.186	45.74	3.67	2.54	0.5	1.51	45.69	66	63.13	108.83	0.015	-0.441
744.6	9.350	57.27	2.64	2.37	0.5	1.47	56.13	53	62.02	118.15	0.016	-0.477
744.5	9.514	41.69	4.49	2.63	0.7	1.52	36.17	74	61.81	97.98	0.017	-0.395
744.3	9.678	69.58	0.83	1.99	0.5	1.49	69.51	22	36.64	106.14	0.018	-0.429
744.2	9.842	45.74	1.64	2.31	0.5	1.49	46.21	48	57.25	103.46	0.019	-0.418

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
744.0	10.006	55.61	0.44	1.93	0.5	1.54	58.13	17	25.41	83.54	0.020	-0.328
743.8	10.170	410.94	0.15	0.94	0.5	1.23	341.70	0	0.00	341.70	0.021	-0.600
743.7	10.335	285.28	1.63	1.76	0.5	1.24	240.88	3	0.01	240.88	0.022	-0.600
743.5	10.499	292.11	1.91	1.81	0.5	1.23	245.50	7	3.40	248.90	0.023	-0.600
743.3	10.663	138.06	3.43	2.20	0.5	1.29	122.90	39	70.86	193.76	0.024	-0.600
743.2	10.827	18.76	25.83	3.43	1.0	1.52	14.52	100	58.44	72.95	0.026	-0.273
743.0	10.991	18.81	3.23	2.79	1.0	1.52	14.66	87	57.20	71.86	0.027	-0.266
742.8	11.155	248.85	0.26	1.25	0.5	1.25	217.21	0	0.00	217.21	0.028	-0.600
742.7	11.319	224.84	0.26	1.28	0.5	1.26	199.89	0	0.00	199.89	0.029	-0.600
742.5	11.483	154.40	1.83	1.96	0.5	1.28	140.21	20	41.59	181.79	0.030	-0.600
742.4	11.647	45.14	8.28	2.80	1.0	1.42	33.04	87	62.88	95.93	0.031	-0.382
742.2	11.811	11.84	24.40	3.54	1.0	1.49	9.91	100	57.01	66.92	0.032	-0.237
742.0	11.975	19.35	2.69	2.74	1.0	1.46	15.47	82	56.89	72.36	0.033	-0.267
741.9	12.139	6.08	7.05	3.39	1.0	1.49	5.70	100	55.70	61.40	0.034	-0.204
741.7	12.303	7.02	5.14	3.26	1.0	1.47	6.44	100	55.93	62.37	0.034	-0.210
741.5	12.467	5.59	4.73	3.32	1.0	1.47	5.38	100	55.60	60.98	0.035	-0.201
741.4	12.631	8.82	2.78	3.02	1.0	1.45	7.86	100	56.37	64.24	0.036	-0.220
741.2	12.795	9.21	6.26	3.22	1.0	1.44	8.19	100	56.48	64.67	0.037	-0.223
741.0	12.959	9.14	11.36	3.39	1.0	1.44	8.18	100	56.47	64.65	0.038	-0.222
740.9	13.123	53.45	1.35	2.20	0.5	1.34	53.81	39	54.44	108.26	0.039	-0.432
740.7	13.287	9.82	14.94	3.45	1.0	1.42	8.76	100	56.65	65.42	0.039	-0.226
740.5	13.451	27.16	2.53	2.60	0.7	1.37	25.72	71	58.35	84.08	0.040	-0.325
740.4	13.615	24.15	0.27	2.18	0.5	1.38	26.16	38	46.85	73.01	0.041	-0.268
740.2	13.779	8.52	3.31	3.08	1.0	1.40	7.87	100	56.38	64.24	0.041	-0.219
740.1	13.943	7.88	4.42	3.18	1.0	1.39	7.40	100	56.23	63.63	0.042	-0.215
739.9	14.107	6.82	5.58	3.29	1.0	1.39	6.59	100	55.98	62.57	0.043	-0.208
739.7	14.271	15.27	1.90	2.73	1.0	1.36	13.26	82	56.21	69.47	0.043	-0.248
739.6	14.436	16.53	2.34	2.76	1.0	1.35	14.28	83	56.73	71.01	0.044	-0.256
739.4	14.600	18.85	2.54	2.73	1.0	1.34	16.14	81	57.04	73.18	0.045	-0.268
739.2	14.764	20.51	1.65	2.59	0.7	1.33	20.17	70	56.57	76.74	0.046	-0.286
739.1	14.928	22.72	2.46	2.66	1.0	1.32	19.28	76	57.16	76.44	0.046	-0.284
738.9	15.092	16.49	3.89	2.89	1.0	1.33	14.45	94	57.91	72.36	0.047	-0.263
738.7	15.256	24.73	3.44	2.72	1.0	1.31	20.97	81	58.38	79.34	0.048	-0.299
738.6	15.420	51.62	1.78	2.29	0.5	1.26	52.14	46	58.15	110.29	0.049	-0.436
738.4	15.584	47.14	1.73	2.31	0.5	1.26	47.94	48	57.86	105.80	0.050	-0.418
738.3	15.748	57.01	2.79	2.39	0.5	1.24	57.01	54	62.77	119.78	0.051	-0.472
738.1	15.912	52.84	0.30	1.88	0.5	1.30	55.75	14	15.47	71.22	0.052	-0.255
737.9	16.076	44.74	0.15	1.86	0.5	1.31	48.16	12	10.92	59.08	0.052	-0.184
737.8	16.240	357.37	0.15	1.00	0.5	1.12	322.94	0	0.00	322.94	0.053	-0.600

LIQUEFACTION POTENTIAL ASSESSMENT FOR COARSE GRAINED SOILS USING CONE PENETRATION TEST DATA

Project Site: **KIF TDEC Stability**
Stantec Project No.: **175668043**
CPT ID: **CPT-07**

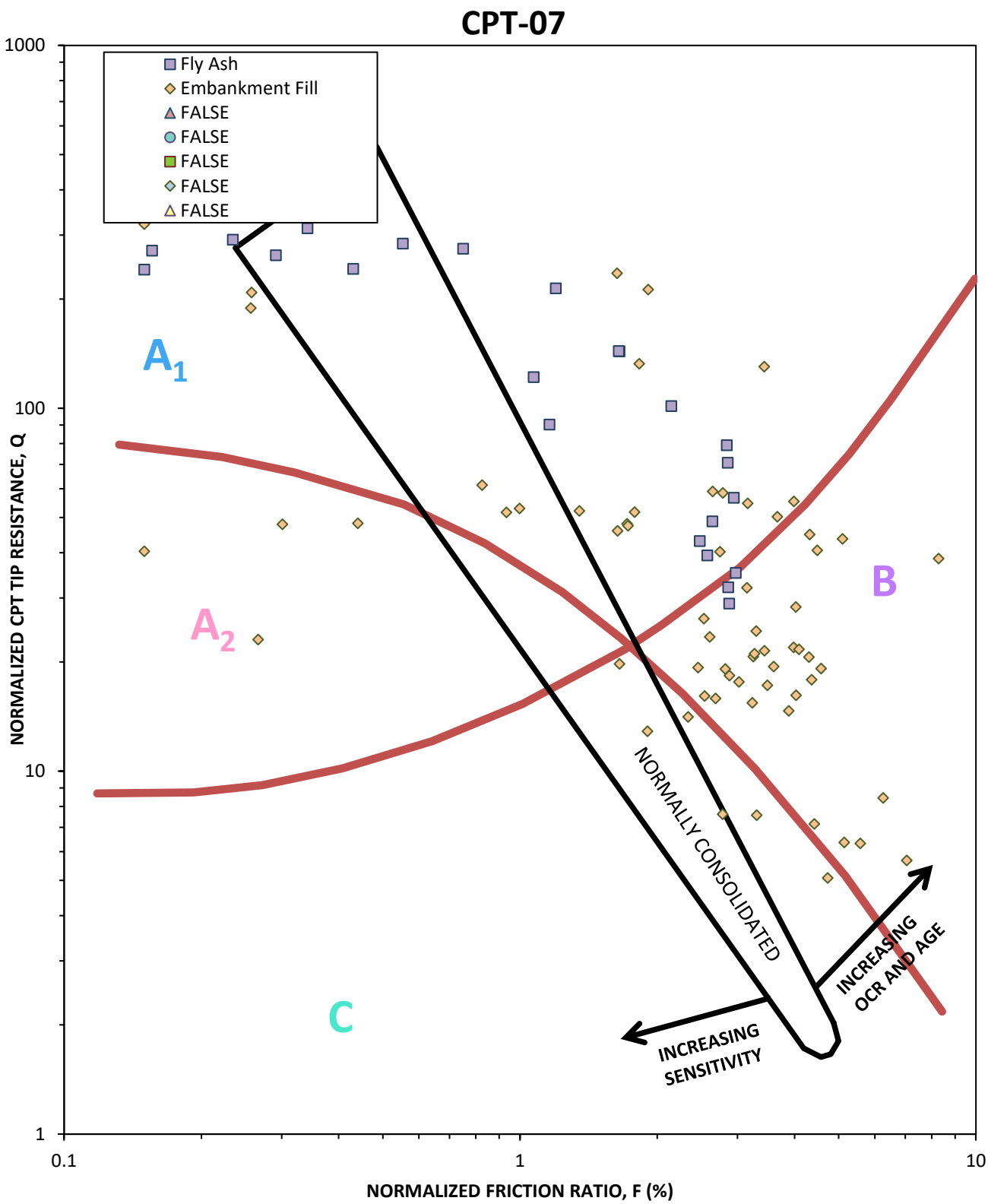
Depth to Water during Earthquake:	5.0	ft
Final Grade Elevation during EQ:	753.0	ft
Height of Final Grade above CPT TOH:	-1.0	ft
Normalize K_σ to:	1.058	tsf
a_{max} at top of ground surface:	0.09	g
Earthquake Magnitude:	7.60	M_W
Earthquake File or Source Zone:	1	Hz

Shear Stress Fit Parameters

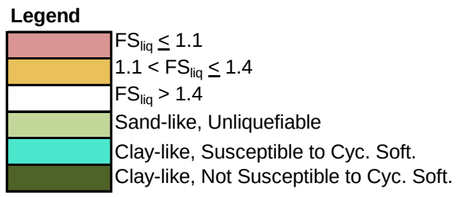
m4:	0
m3:	0
m2:	0
m1:	0

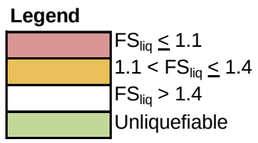
Elev. (ft)	Depth *z* (ft)	Cyclic Resistance Ratio *CRR 7.5*	Relative Density *D r* (%)	Correction for Overburden Pressure *K σ*	Correction for Sloping Ground *K α*	Magnitude Scaling Factor *MSF*	Cyclic Resistance Ratio *CRR*	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress *τ Max* (psf)	From Ground Response: Average Cyclic Shear Stress *τ Avg* (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. *(qc 1N) CS ≥ 175*	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
754.0																	
753.8	0.164	0.229	70	#NUM!	N/A	0.98	N/A	1.000	0	0	**0.059**	FALSE	FALSE	TRUE	**N/A**	**Fly Ash**	**A1**
753.7	0.328	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.059**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
753.5	0.492	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.059**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
753.3	0.656	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.059**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
753.2	0.820	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.059**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
753.0	0.984	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.059**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
752.9	1.148	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.059**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
752.7	1.312	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.059**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
752.5	1.476	N/A	98	N/A	N/A	N/A	N/A	1.000	0	0	**0.059**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
752.4	1.640	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.059**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
752.2	1.804	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.059**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
752.0	1.968	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.059**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
751.9	2.133	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.059**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
751.7	2.297	N/A	93	N/A	N/A	N/A	N/A	1.000	0	0	**0.059**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
751.5	2.461	0.351	76	1.100	N/A	0.97	N/A	1.000	0	0	**0.059**	FALSE	FALSE	TRUE	**N/A**	**Fly Ash**	**A1**
751.4	2.625	0.377	76	1.100	N/A	0.97	N/A	1.000	0	0	**0.059**	FALSE	FALSE	TRUE	**N/A**	**Fly Ash**	**A1**
751.2	2.789	N/A	87	N/A	N/A	N/A	N/A	1.000	0	0	**0.059**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
751.0	2.953	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.059**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
750.9	3.117	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.059**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
750.7	3.281	0.314	74	1.100	N/A	0.98	N/A	1.000	0	0	**0.059**	FALSE	FALSE	TRUE	**N/A**	**Fly Ash**	**A1**
750.6	3.445	0.127	51	1.100	N/A	0.99	N/A	1.000	0	0	**0.059**	FALSE	FALSE	TRUE	**N/A**	**Fly Ash**	**A1**
750.4	3.609	0.100	35	1.100	N/A	1.00	N/A	1.000	0	0	**0.059**	FALSE	FALSE	TRUE	**N/A**	**Fly Ash**	**A1**
750.2	3.773	0.095	31	1.100	N/A	1.00	N/A	1.000	0	0	**0.059**	FALSE	FALSE	TRUE	**N/A**	**Fly Ash**	**A1**
750.1	3.937	0.086	21	1.100	N/A	1.00	N/A	1.000	0	0	**0.059**	FALSE	FALSE	TRUE	**N/A**	**Fly Ash**	**A1**
749.9	4.101	0.083	17	1.100	N/A	1.00	N/A	1.000	0	0	**0.059**	FALSE	FALSE	TRUE	**N/A**	**Fly Ash**	**A1**
749.7	4.265	0.080	13	1.100	N/A	1.00	N/A	1.000	0	0	**0.059**	FALSE	FALSE	TRUE	**N/A**	**Fly Ash**	**A1**
749.6	4.429	0.078	10	1.100	N/A	1.00	N/A	0.999	0	0	**0.059**	FALSE	FALSE	TRUE	**N/A**	**Fly Ash**	**A1**
749.4	4.593	0.076	6	1.094	N/A	1.00	N/A	0.999	0	0	**0.059**	FALSE	FALSE	TRUE	**N/A**	**Fly Ash**	**B**
749.2	4.757	0.075	4	1.089	N/A	1.00	N/A	0.998	0	0	**0.059**	FALSE	FALSE	TRUE	**N/A**	**Fly Ash**	**B**
749.1	4.921	0.073	1	1.085	N/A	1.00	N/A	0.998	0	0	**0.059**	FALSE	FALSE	TRUE	**N/A**	**Fly Ash**	**B**
748.9	5.085	N/A	54	N/A	N/A	N/A	N/A	0.998	0	0	**0.060**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
748.8	5.249	N/A	55	N/A	N/A	N/A	N/A	0.997	0	0	**0.061**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
748.6	5.413	N/A	56	N/A	N/A	N/A	N/A	0.997	0	0	**0.062**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
748.4	5.577	N/A	52	N/A	N/A	N/A	N/A	0.997	0	0	**0.063**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
748.3	5.741	N/A	45	N/A	N/A	N/A	N/A	0.996	0	0	**0.064**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
748.1	5.905	N/A	44	N/A	N/A	N/A	N/A	0.996	0	0	**0.065**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
747.9	6.069	N/A	44	N/A	N/A	N/A	N/A	0.996	0	0	**0.066**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
747.8	6.234	N/A	42	N/A	N/A	N/A	N/A	0.995	0	0	**0.067**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
747.6	6.398	N/A	43	N/A	N/A	N/A	N/A	0.995	0	0	**0.068**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
747.4	6.562	N/A	43	N/A	N/A	N/A	N/A	0.994	0	0	**0.069**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
747.3	6.726	N/A	43	N/A	N/A	N/A	N/A	0.994	0	0	**0.070**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
747.1	6.890	N/A	42	N/A	N/A	N/A	N/A	0.994	0	0	**0.071**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
746.9	7.054	N/A	42	N/A	N/A	N/A	N/A	0.993	0	0	**0.072**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
746.8	7.218	N/A	41	N/A	N/A	N/A	N/A	0.993	0	0	**0.072**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**

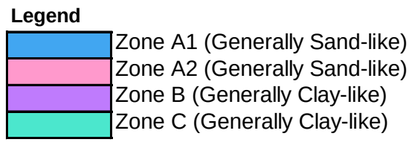
Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
746.6	7.382	N/A	41	N/A	N/A	N/A	N/A	0.992	0	0	**0.073**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
746.5	7.546	N/A	43	N/A	N/A	N/A	N/A	0.992	0	0	**0.074**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
746.3	7.710	N/A	43	N/A	N/A	N/A	N/A	0.992	0	0	**0.075**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
746.1	7.874	N/A	42	N/A	N/A	N/A	N/A	0.991	0	0	**0.075**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
746.0	8.038	N/A	42	N/A	N/A	N/A	N/A	0.991	0	0	**0.076**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
745.8	8.202	N/A	44	N/A	N/A	N/A	N/A	0.990	0	0	**0.076**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
745.6	8.366	N/A	50	N/A	N/A	N/A	N/A	0.990	0	0	**0.077**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
745.5	8.530	N/A	60	N/A	N/A	N/A	N/A	0.990	0	0	**0.078**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
745.3	8.694	N/A	61	N/A	N/A	N/A	N/A	0.989	0	0	**0.078**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
745.1	8.858	N/A	55	N/A	N/A	N/A	N/A	0.989	0	0	**0.079**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
745.0	9.022	N/A	56	N/A	N/A	N/A	N/A	0.988	0	0	**0.079**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
744.8	9.186	N/A	59	N/A	N/A	N/A	N/A	0.988	0	0	**0.080**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
744.6	9.350	N/A	62	N/A	N/A	N/A	N/A	0.987	0	0	**0.080**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
744.5	9.514	N/A	54	N/A	N/A	N/A	N/A	0.987	0	0	**0.081**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
744.3	9.678	N/A	58	N/A	N/A	N/A	N/A	0.987	0	0	**0.081**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
744.2	9.842	N/A	56	N/A	N/A	N/A	N/A	0.986	0	0	**0.081**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
744.0	10.006	N/A	47	N/A	N/A	N/A	N/A	0.986	0	0	**0.082**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A2**
743.8	10.170	N/A	100	N/A	N/A	N/A	N/A	0.985	0	0	**0.082**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
743.7	10.335	N/A	97	N/A	N/A	N/A	N/A	0.985	0	0	**0.083**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
743.5	10.499	N/A	99	N/A	N/A	N/A	N/A	0.984	0	0	**0.083**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
743.3	10.663	N/A	86	N/A	N/A	N/A	N/A	0.984	0	0	**0.083**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
743.2	10.827	N/A	42	N/A	N/A	N/A	N/A	0.983	0	0	**0.084**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
743.0	10.991	N/A	41	N/A	N/A	N/A	N/A	0.983	0	0	**0.084**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
742.8	11.155	N/A	92	N/A	N/A	N/A	N/A	0.983	0	0	**0.084**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
742.7	11.319	N/A	87	N/A	N/A	N/A	N/A	0.982	0	0	**0.085**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
742.5	11.483	N/A	83	N/A	N/A	N/A	N/A	0.982	0	0	**0.085**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
742.4	11.647	N/A	53	N/A	N/A	N/A	N/A	0.981	0	0	**0.085**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
742.2	11.811	N/A	39	N/A	N/A	N/A	N/A	0.981	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
742.0	11.975	N/A	42	N/A	N/A	N/A	N/A	0.980	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
741.9	12.139	N/A	35	N/A	N/A	N/A	N/A	0.980	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
741.7	12.303	N/A	36	N/A	N/A	N/A	N/A	0.979	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
741.5	12.467	N/A	35	N/A	N/A	N/A	N/A	0.979	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**C**
741.4	12.631	N/A	37	N/A	N/A	N/A	N/A	0.978	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**C**
741.2	12.795	N/A	37	N/A	N/A	N/A	N/A	0.978	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
741.0	12.959	N/A	37	N/A	N/A	N/A	N/A	0.977	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
740.9	13.123	N/A	58	N/A	N/A	N/A	N/A	0.977	0	0	**0.088**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
740.7	13.287	N/A	38	N/A	N/A	N/A	N/A	0.976	0	0	**0.088**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
740.5	13.451	N/A	48	N/A	N/A	N/A	N/A	0.976	0	0	**0.088**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
740.4	13.615	N/A	42	N/A	N/A	N/A	N/A	0.975	0	0	**0.088**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A2**
740.2	13.779	N/A	37	N/A	N/A	N/A	N/A	0.975	0	0	**0.089**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**C**
740.1	13.943	N/A	37	N/A	N/A	N/A	N/A	0.975	0	0	**0.089**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
739.9	14.107	N/A	36	N/A	N/A	N/A	N/A	0.974	0	0	**0.089**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
739.7	14.271	N/A	40	N/A	N/A	N/A	N/A	0.974	0	0	**0.089**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**C**
739.6	14.436	N/A	41	N/A	N/A	N/A	N/A	0.973	0	0	**0.089**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**C**
739.4	14.600	N/A	42	N/A	N/A	N/A	N/A	0.973	0	0	**0.090**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
739.2	14.764	N/A	44	N/A	N/A	N/A	N/A	0.972	0	0	**0.090**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**C**
739.1	14.928	N/A	44	N/A	N/A	N/A	N/A	0.972	0	0	**0.090**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
738.9	15.092	N/A	42	N/A	N/A	N/A	N/A	0.971	0	0	**0.090**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
738.7	15.256	N/A	45	N/A	N/A	N/A	N/A	0.971	0	0	**0.090**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
738.6	15.420	N/A	59	N/A	N/A	N/A	N/A	0.970	0	0	**0.090**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
738.4	15.584	N/A	57	N/A	N/A	N/A	N/A	0.970	0	0	**0.091**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
738.3	15.748	N/A	63	N/A	N/A	N/A	N/A	0.969	0	0	**0.091**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
738.1	15.912	N/A	41	N/A	N/A	N/A	N/A	0.968	0	0	**0.091**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A2**
737.9	16.076	N/A	34	N/A	N/A	N/A	N/A	0.968	0	0	**0.091**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A2**
737.8	16.240	N/A	100	N/A	N/A	N/A	N/A	0.967	0	0	**0.091**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**



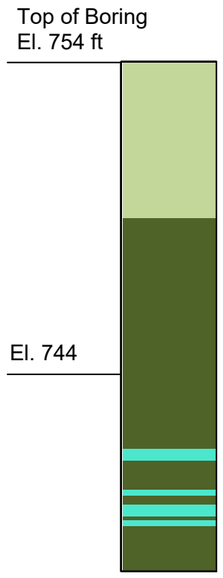
Adapted from "Discussion of 'Liquefaction Potential of Silts from CPTu'" (Robertson 2008). Zone A_1 and Zone A_2 samples are generally sand-like. Zone B samples are generally clay-like and not susceptible to cyclic softening. Zone C samples are generally clay-like and susceptible to cyclic softening. Note that the transition from clay-like to sand-like in this chart does not exactly match the liquefaction calculations herein; that is, some transitional samples in Zone B and Zone C will be treated as sand-like and analyzed for liquefaction if the calculations indicate as such.



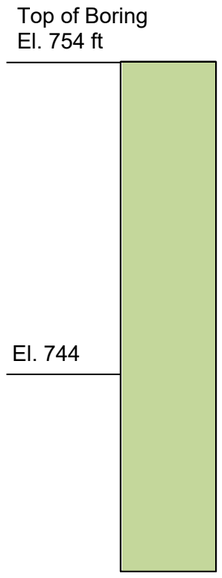




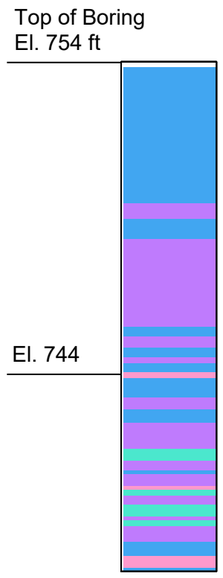
CPT-07, Liquefaction Triggering Results



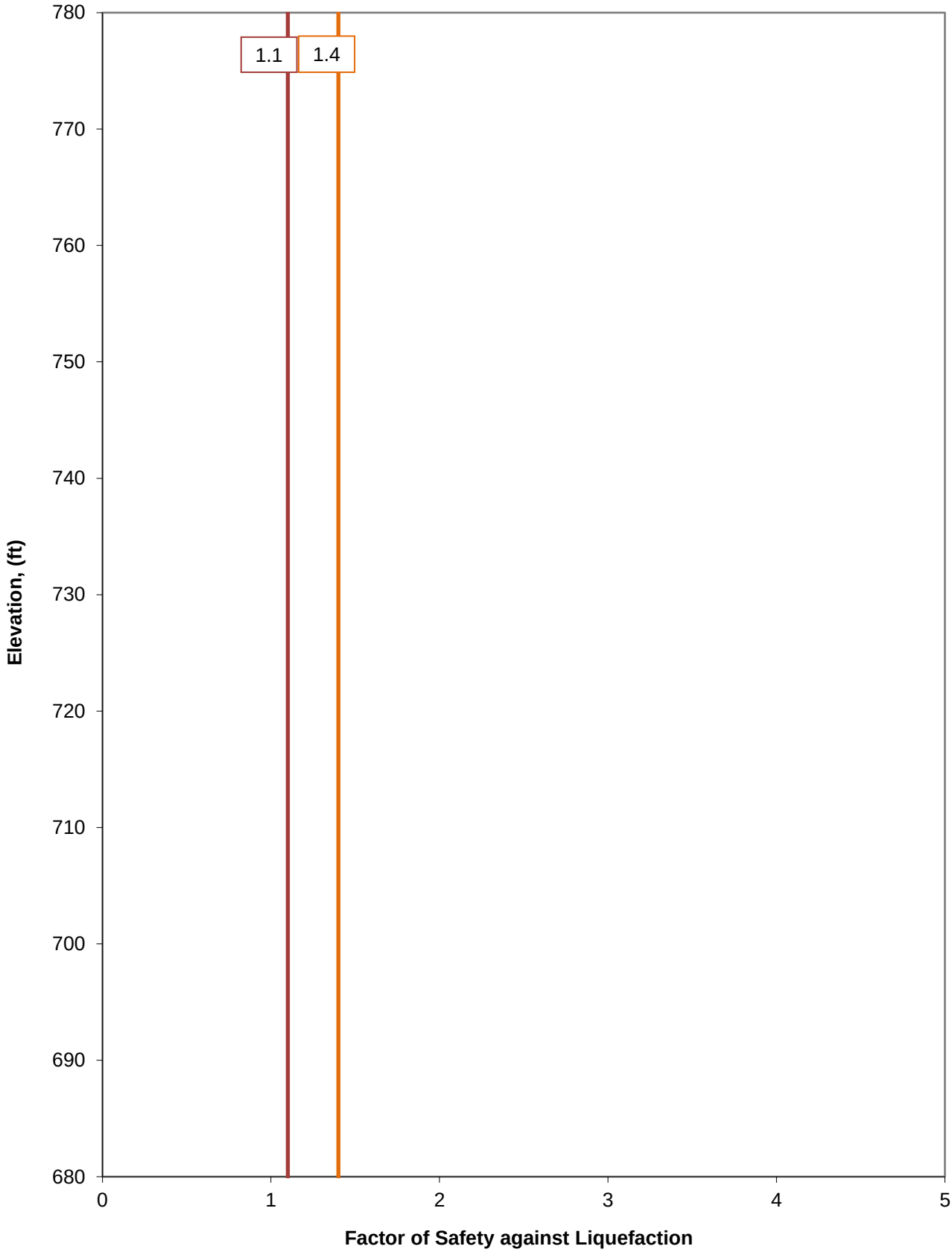
CPT-07, Liquefaction Triggering Results



CPT-07, Robertson Soil Type



KIF TDEC Stability, Boring = CPT-07, Source = 1 Hz, Mw = 7.6, Event = Design EQ, CPT Data, Simplified Stress-Based Approach



Inputs

Project Information

Stantec Project Number =	175668043
Project Name =	KIF TDEC Stability
CPT ID =	KIF-BF-CPT-2

Boring Location (optional)

Northing =	
Easting =	
OR	
Baseline Station =	
Offset (+ Right) =	

Using qt (corrected for u2 PWP) or qc (backcalculated uncorrected field tip)

Cone ID (optional) =	AD184	
Use qc instead of qt?	0	(1: Yes, 0: No)
Cone Area Ratio (a) =	0.80	

Drilling Information

Top of Hole Elevation =	769.0	feet
Water Depth during CPT (negative for U/S borings) =	14.0	feet
Depth data collection began =	0.16	feet
Avg. Total Unit Wt. Above 1st Sample =	122.00	pcf

During Earthquake Information

Water Depth during EQ (relative to CPT TOH, negative for U/S borings) =	15.0	feet
Final Grade Elevation during EQ =	769.0	feet
Avg. Total Unit Wt. of Cut/Fill =	122	pcf

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile?	0	(1: Yes, 0: No)

If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile:	ng_Pond_Section, KIF-BF-CPT2_NOR	
α at each Sample Depth known?	1	(1: Yes, 0: No)

If previous answer is No, then enter curve fit parameters below (α vs. depth curve)

If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_α will be one.

m4:	
m3:	
m2:	
m1:	
m0:	

Associated ground response profile:	shing_Pond_Section, KIF-BF-SPT5	
Get CSR from shear stress envelope?	0	(1: Yes, 0: No)

If previous answer is No, then CSR will be calculated using a_{max} and r_d

Max. Shear Stress at each sample depth known?		(1: Yes, 0: No)

If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4:	
m3:	
m2:	
m1:	

Earthquake Information

EQ Source (e.g., New Madrid)	1 Hz
Event (e.g., MCE, OBE)	Design EQ
a_{max} (g) (top of ground surface)	0.10
EQ Mag (Mw)	7.6

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
0.164	0.010	0.000	119	Bottom Ash	Sand-like		0.101			
0.328	0.010	0.000	119	Bottom Ash	Sand-like		0.100			
0.492	0.010	0.000	119	Bottom Ash	Sand-like		0.100			
0.656	0.010	0.000	119	Bottom Ash	Sand-like		0.099			
0.820	0.010	0.000	119	Bottom Ash	Sand-like		0.098			
0.984	0.010	0.000	119	Bottom Ash	Sand-like		0.098			
1.148	0.010	0.000	119	Bottom Ash	Sand-like		0.095			
1.312	0.010	0.000	119	Bottom Ash	Sand-like		0.094			
1.476	0.010	0.000	119	Bottom Ash	Sand-like		0.093			
1.640	0.010	0.000	119	Bottom Ash	Sand-like		0.092			
1.804	0.010	0.000	119	Bottom Ash	Sand-like		0.090			
1.968	0.010	0.000	119	Bottom Ash	Sand-like		0.089			
2.133	0.010	0.000	119	Bottom Ash	Sand-like		0.088			
2.297	0.010	0.000	119	Bottom Ash	Sand-like		0.086			
2.461	0.010	0.000	119	Bottom Ash	Sand-like		0.085			
2.625	0.010	0.000	119	Bottom Ash	Sand-like		0.083			
2.789	0.010	0.000	119	Bottom Ash	Sand-like		0.081			
2.953	0.010	0.000	119	Bottom Ash	Sand-like		0.080			
3.117	0.010	0.000	119	Bottom Ash	Sand-like		0.078			
3.281	0.010	0.000	119	Bottom Ash	Sand-like		0.077			
3.445	0.010	0.000	119	Bottom Ash	Sand-like		0.076			
3.609	0.010	0.000	119	Bottom Ash	Sand-like		0.074			
3.773	0.010	0.000	119	Bottom Ash	Sand-like		0.074			
3.937	0.010	0.000	119	Bottom Ash	Sand-like		0.073			
4.101	0.010	0.000	119	Bottom Ash	Sand-like		0.072			
4.265	0.010	0.000	119	Bottom Ash	Sand-like		0.071			
4.429	0.010	0.000	119	Bottom Ash	Sand-like		0.070			
4.593	0.010	0.000	119	Bottom Ash	Sand-like		0.070			
4.757	0.010	0.000	119	Bottom Ash	Sand-like		0.069			
4.921	0.010	0.000	119	Bottom Ash	Sand-like		0.069			
5.085	0.010	0.000	119	Bottom Ash	Sand-like		0.068			
5.249	0.010	0.000	119	Bottom Ash	Sand-like		0.067			
5.413	0.010	0.000	119	Bottom Ash	Sand-like		0.067			
5.577	0.010	0.000	119	Bottom Ash	Sand-like		0.066			
5.741	0.010	0.000	119	Bottom Ash	Sand-like		0.065			
5.905	0.010	0.000	119	Bottom Ash	Sand-like		0.064			
6.069	0.010	0.000	119	Bottom Ash	Sand-like		0.064			
6.234	0.010	0.000	119	Bottom Ash	Sand-like		0.063			
6.398	0.010	0.000	119	Bottom Ash	Sand-like		0.062			
6.562	0.010	0.000	119	Bottom Ash	Sand-like		0.062			
6.726	0.010	0.000	119	Bottom Ash	Sand-like		0.061			
6.890	0.010	0.000	119	Bottom Ash	Sand-like		0.061			
7.054	0.010	0.000	119	Bottom Ash	Sand-like		0.060			
7.218	0.010	0.000	119	Bottom Ash	Sand-like		0.060			
7.382	0.010	0.000	119	Bottom Ash	Sand-like		0.060			
7.546	0.010	0.000	119	Bottom Ash	Sand-like		0.059			
7.710	0.010	0.000	119	Bottom Ash	Sand-like		0.059			
7.874	0.010	0.000	119	Bottom Ash	Sand-like		0.059			
8.038	0.010	0.000	119	Bottom Ash	Sand-like		0.059			
8.202	0.010	0.000	119	Bottom Ash	Sand-like		0.058			
8.366	0.010	0.000	119	Bottom Ash	Sand-like		0.057			
8.530	0.010	0.000	119	Bottom Ash	Sand-like		0.057			
8.694	0.010	0.000	119	Bottom Ash	Sand-like		0.056			
8.858	0.010	0.000	119	Bottom Ash	Sand-like		0.056			
9.022	0.010	0.000	119	Bottom Ash	Sand-like		0.055			
9.186	0.010	0.000	119	Bottom Ash	Sand-like		0.055			
9.350	0.010	0.000	119	Bottom Ash	Sand-like		0.055			
9.514	0.010	0.000	119	Bottom Ash	Sand-like		0.055			
9.678	0.010	0.000	119	Bottom Ash	Sand-like		0.055			
9.842	0.010	0.000	119	Bottom Ash	Sand-like		0.055			
10.006	0.010	0.000	119	Bottom Ash	Sand-like		0.055			
10.170	0.010	0.000	119	Bottom Ash	Sand-like		0.055			
10.335	0.010	0.000	119	Bottom Ash	Sand-like		0.054			

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
10.499	0.010	0.000	119	Bottom Ash	Sand-like		0.054			
10.663	0.010	0.000	119	Bottom Ash	Sand-like		0.054			
10.827	0.010	0.000	119	Bottom Ash	Sand-like		0.053			
10.991	0.010	0.000	119	Bottom Ash	Sand-like		0.053			
11.155	0.010	0.000	119	Bottom Ash	Sand-like		0.053			
11.319	0.010	0.000	119	Bottom Ash	Sand-like		0.052			
11.483	0.010	0.000	119	Bottom Ash	Sand-like		0.052			
11.647	0.010	0.000	119	Bottom Ash	Sand-like		0.052			
11.811	0.010	0.000	119	Bottom Ash	Sand-like		0.052			
11.975	0.010	0.000	119	Bottom Ash	Sand-like		0.051			
12.139	6.137	0.057	119	Bottom Ash	Sand-like		0.051			
12.303	59.036	0.165	119	Bottom Ash	Sand-like		0.051			
12.467	128.016	0.621	119	Bottom Ash	Sand-like		0.051			
12.631	222.971	1.576	119	Bottom Ash	Sand-like		0.051			
12.795	271.677	2.482	119	Bottom Ash	Sand-like		0.050			
12.959	286.505	2.986	119	Bottom Ash	Sand-like		0.050			
13.123	260.882	4.051	119	Bottom Ash	Sand-like		0.050			
13.287	253.202	4.081	119	Bottom Ash	Sand-like		0.050			
13.451	290.517	4.259	119	Bottom Ash	Sand-like		0.050			
13.615	403.436	5.838	119	Bottom Ash	Sand-like		0.050			
13.779	429.561	6.927	119	Bottom Ash	Sand-like		0.050			
13.943	418.999	8.826	119	Bottom Ash	Sand-like		0.050			
14.107	490.270	1.935	119	Bottom Ash	Sand-like		0.050			
14.271	460.511	3.408	119	Bottom Ash	Sand-like		0.050			
14.436	482.099	6.528	119	Bottom Ash	Sand-like		0.049			
14.600	434.327	9.536	119	Bottom Ash	Sand-like		0.049			
14.764	356.870	9.791	119	Bottom Ash	Sand-like		0.049			
14.928	272.838	8.249	119	Bottom Ash	Sand-like		0.049			
15.092	215.395	5.564	119	Bottom Ash	Sand-like		0.049			
15.256	178.804	4.095	119	Bottom Ash	Sand-like		0.049			
15.420	142.760	3.021	119	Bottom Ash	Sand-like		0.049			
15.584	113.920	2.310	119	Bottom Ash	Sand-like		0.049			
15.748	97.382	1.899	119	Bottom Ash	Sand-like		0.049			
15.912	101.646	1.862	119	Bottom Ash	Sand-like		0.049			
16.076	135.352	1.516	119	Bottom Ash	Sand-like		0.049			
16.240	180.304	1.091	119	Bottom Ash	Sand-like		0.049			
16.404	202.500	0.814	119	Bottom Ash	Sand-like		0.049			
16.568	237.378	0.652	119	Bottom Ash	Sand-like		0.049			
16.732	251.227	0.979	119	Bottom Ash	Sand-like		0.049			
16.896	279.920	0.984	119	Bottom Ash	Sand-like		0.049			
17.060	311.636	1.131	119	Bottom Ash	Sand-like		0.049			
17.224	314.588	0.943	119	Bottom Ash	Sand-like		0.049			
17.388	281.112	0.695	119	Bottom Ash	Sand-like		0.050			
17.552	255.150	0.731	119	Bottom Ash	Sand-like		0.050			
17.716	246.382	0.628	119	Bottom Ash	Sand-like		0.051			
17.880	230.179	0.745	119	Bottom Ash	Sand-like		0.051			
18.044	227.783	0.737	119	Bottom Ash	Sand-like		0.052			
18.208	221.997	0.858	119	Bottom Ash	Sand-like		0.049			
18.372	254.522	0.727	119	Bottom Ash	Sand-like		0.046			
18.537	307.782	0.971	119	Bottom Ash	Sand-like		0.043			
18.701	343.547	0.863	119	Bottom Ash	Sand-like		0.039			
18.865	370.354	0.963	119	Bottom Ash	Sand-like		0.036			
19.029	418.192	0.965	119	Bottom Ash	Sand-like		0.033			
19.193	463.571	1.689	119	Bottom Ash	Sand-like		0.032			
19.357	482.248	1.816	119	Bottom Ash	Sand-like		0.031			
19.521	460.198	1.325	119	Bottom Ash	Sand-like		0.031			
19.685	423.377	1.062	119	Bottom Ash	Sand-like		0.031			
19.849	370.111	1.267	119	Bottom Ash	Sand-like		0.031			
20.013	333.342	1.110	119	Bottom Ash	Sand-like		0.031			
20.177	275.821	1.346	119	Bottom Ash	Sand-like		0.030			
20.341	270.361	1.227	119	Bottom Ash	Sand-like		0.030			
20.505	250.670	0.928	119	Bottom Ash	Sand-like		0.029			
20.669	216.932	0.710	119	Bottom Ash	Sand-like		0.029			
20.833	198.533	0.316	119	Bottom Ash	Sand-like		0.028			
20.997	175.392	0.268	119	Bottom Ash	Sand-like		0.028			
21.161	149.702	0.146	119	Bottom Ash	Sand-like		0.027			
21.325	130.360	0.117	119	Bottom Ash	Sand-like		0.027			
21.489	123.138	0.115	119	Bottom Ash	Sand-like		0.027			
21.653	121.421	0.146	119	Bottom Ash	Sand-like		0.026			
21.817	111.725	0.098	119	Bottom Ash	Sand-like		0.026			
21.981	99.944	0.044	119	Bottom Ash	Sand-like		0.025			
22.145	116.803	0.180	112	Fly Ash	Sand-like	Do Not Correct for FC	0.025			
22.309	145.803	0.393	112	Fly Ash	Sand-like	Do Not Correct for FC	0.024			
22.473	141.017	0.729	112	Fly Ash	Sand-like	Do Not Correct for FC	0.024			
22.638	139.933	1.467	112	Fly Ash	Sand-like	Do Not Correct for FC	0.023			

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
22.802	131.435	1.519	112	Fly Ash	Sand-like	Do Not Correct for FC	0.023			
22.966	120.183	1.562	112	Fly Ash	Sand-like	Do Not Correct for FC	0.022			
23.130	106.011	1.232	112	Fly Ash	Sand-like	Do Not Correct for FC	0.022			
23.294	99.030	0.882	112	Fly Ash	Sand-like	Do Not Correct for FC	0.021			
23.458	101.883	0.493	112	Fly Ash	Sand-like	Do Not Correct for FC	0.021			
23.622	100.677	0.340	112	Fly Ash	Sand-like	Do Not Correct for FC	0.020			
23.786	100.617	0.473	112	Fly Ash	Sand-like	Do Not Correct for FC	0.020			
23.950	102.232	0.757	112	Fly Ash	Sand-like	Do Not Correct for FC	0.019			
24.114	102.146	1.061	112	Fly Ash	Sand-like	Do Not Correct for FC	0.019			
24.278	101.168	1.174	112	Fly Ash	Sand-like	Do Not Correct for FC	0.019			
24.442	108.668	1.177	112	Fly Ash	Sand-like	Do Not Correct for FC	0.018			
24.606	131.045	1.058	112	Fly Ash	Sand-like	Do Not Correct for FC	0.018			
24.770	140.487	0.791	112	Fly Ash	Sand-like	Do Not Correct for FC	0.017			
24.934	131.379	0.537	112	Fly Ash	Sand-like	Do Not Correct for FC	0.017			
25.098	121.519	0.234	112	Fly Ash	Sand-like	Do Not Correct for FC	0.016			
25.262	108.903	0.135	112	Fly Ash	Sand-like	Do Not Correct for FC	0.016			
25.426	103.725	0.176	112	Fly Ash	Sand-like	Do Not Correct for FC	0.015			
25.590	107.942	0.126	112	Fly Ash	Sand-like	Do Not Correct for FC	0.015			
25.754	113.350	0.142	112	Fly Ash	Sand-like	Do Not Correct for FC	0.015			
25.918	104.207	0.236	112	Fly Ash	Sand-like	Do Not Correct for FC	0.014			
26.082	88.036	0.186	112	Fly Ash	Sand-like	Do Not Correct for FC	0.014			
26.246	73.048	0.160	112	Fly Ash	Sand-like	Do Not Correct for FC	0.013			
26.410	62.891	0.111	112	Fly Ash	Sand-like	Do Not Correct for FC	0.013			
26.574	61.952	0.072	112	Fly Ash	Sand-like	Do Not Correct for FC	0.013			
26.739	58.923	0.050	112	Fly Ash	Sand-like	Do Not Correct for FC	0.012			
26.903	55.273	0.052	112	Fly Ash	Sand-like	Do Not Correct for FC	0.012			
27.067	55.037	0.058	112	Fly Ash	Sand-like	Do Not Correct for FC	0.012			
27.231	49.267	0.082	112	Fly Ash	Sand-like	Do Not Correct for FC	0.011			
27.395	43.334	0.145	112	Fly Ash	Sand-like	Do Not Correct for FC	0.011			
27.559	39.461	0.207	112	Fly Ash	Sand-like	Do Not Correct for FC	0.010			
27.723	38.263	0.276	112	Fly Ash	Sand-like	Do Not Correct for FC	0.010			
27.887	39.521	0.319	112	Fly Ash	Sand-like	Do Not Correct for FC	0.010			
28.051	40.282	0.371	112	Fly Ash	Sand-like	Do Not Correct for FC	0.009			
28.215	37.511	0.373	112	Fly Ash	Sand-like	Do Not Correct for FC	0.009			
28.379	34.114	0.342	112	Fly Ash	Sand-like	Do Not Correct for FC	0.008			
28.543	30.916	0.311	112	Fly Ash	Sand-like	Do Not Correct for FC	0.008			
28.707	31.370	0.312	112	Fly Ash	Sand-like	Do Not Correct for FC	0.008			
28.871	34.711	0.344	112	Fly Ash	Sand-like	Do Not Correct for FC	0.007			
29.035	37.462	0.403	112	Fly Ash	Sand-like	Do Not Correct for FC	0.007			
29.199	40.393	0.419	112	Fly Ash	Sand-like	Do Not Correct for FC	0.006			
29.363	42.099	0.391	112	Fly Ash	Sand-like	Do Not Correct for FC	0.006			
29.527	42.130	0.401	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
29.691	38.584	0.412	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
29.855	34.095	0.409	112	Fly Ash	Sand-like	Do Not Correct for FC	0.004			
30.019	32.244	0.351	112	Fly Ash	Sand-like	Do Not Correct for FC	0.004			
30.183	31.255	0.290	112	Fly Ash	Sand-like	Do Not Correct for FC	0.003			
30.347	30.598	0.240	112	Fly Ash	Sand-like	Do Not Correct for FC	0.003			
30.511	29.868	0.238	112	Fly Ash	Sand-like	Do Not Correct for FC	0.002			
30.675	29.294	0.264	112	Fly Ash	Sand-like	Do Not Correct for FC	0.002			
30.840	29.455	0.302	112	Fly Ash	Sand-like	Do Not Correct for FC	0.001			
31.004	30.595	0.339	112	Fly Ash	Sand-like	Do Not Correct for FC	0.001			
31.168	34.628	0.355	112	Fly Ash	Sand-like	Do Not Correct for FC	0.000			
31.332	36.800	0.400	112	Fly Ash	Sand-like	Do Not Correct for FC	0.001			
31.496	35.764	0.457	112	Fly Ash	Sand-like	Do Not Correct for FC	0.001			
31.660	35.535	0.486	112	Fly Ash	Sand-like	Do Not Correct for FC	0.001			
31.824	31.996	0.496	112	Fly Ash	Sand-like	Do Not Correct for FC	0.002			
31.988	32.824	0.501	112	Fly Ash	Sand-like	Do Not Correct for FC	0.002			
32.152	37.254	0.542	112	Fly Ash	Sand-like	Do Not Correct for FC	0.003			
32.316	38.274	0.602	112	Fly Ash	Sand-like	Do Not Correct for FC	0.003			
32.480	41.473	0.672	112	Fly Ash	Sand-like	Do Not Correct for FC	0.003			
32.644	46.277	0.601	112	Fly Ash	Sand-like	Do Not Correct for FC	0.004			
32.808	53.984	0.824	112	Fly Ash	Sand-like	Do Not Correct for FC	0.004			
32.972	56.951	1.006	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
33.136	55.086	1.109	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
33.300	50.289	1.114	112	Fly Ash	Sand-like	Do Not Correct for FC	0.006			
33.464	48.639	1.090	112	Fly Ash	Sand-like	Do Not Correct for FC	0.006			
33.628	50.911	1.130	112	Fly Ash	Sand-like	Do Not Correct for FC	0.007			
33.792	52.879	1.198	112	Fly Ash	Sand-like	Do Not Correct for FC	0.007			
33.956	59.232	1.270	112	Fly Ash	Sand-like	Do Not Correct for FC	0.007			
34.120	64.376	1.254	112	Fly Ash	Sand-like	Do Not Correct for FC	0.008			
34.284	64.098	1.343	112	Fly Ash	Sand-like	Do Not Correct for FC	0.008			
34.448	70.000	1.474	112	Fly Ash	Sand-like	Do Not Correct for FC	0.009			
34.612	76.585	1.639	112	Fly Ash	Sand-like	Do Not Correct for FC	0.009			
34.776	81.054	1.695	112	Fly Ash	Sand-like	Do Not Correct for FC	0.010			
34.941	84.137	1.727	112	Fly Ash	Sand-like	Do Not Correct for FC	0.010			

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
35.105	88.802	1.754	112	Fly Ash	Sand-like	Do Not Correct for FC	0.010			
35.269	104.585	1.510	112	Fly Ash	Sand-like	Do Not Correct for FC	0.011			
35.433	97.016	1.018	112	Fly Ash	Sand-like	Do Not Correct for FC	0.011			
35.597	82.927	0.745	112	Fly Ash	Sand-like	Do Not Correct for FC	0.012			
35.761	45.833	0.735	112	Fly Ash	Sand-like	Do Not Correct for FC	0.012			
35.925	24.054	0.690	112	Fly Ash	Sand-like	Do Not Correct for FC	0.013			
36.089	14.338	0.523	112	Fly Ash	Sand-like	Do Not Correct for FC	0.013			
36.253	11.446	0.306	112	Fly Ash	Sand-like	Do Not Correct for FC	0.013			
36.417	9.571	0.145	112	Fly Ash	Sand-like	Do Not Correct for FC	0.014			
36.581	8.606	0.062	112	Fly Ash	Sand-like	Do Not Correct for FC	0.014			
36.745	8.050	0.051	112	Fly Ash	Sand-like	Do Not Correct for FC	0.015			
36.909	7.881	0.056	112	Fly Ash	Sand-like	Do Not Correct for FC	0.015			
37.073	8.096	0.069	112	Fly Ash	Sand-like	Do Not Correct for FC	0.016			
37.237	8.450	0.083	112	Fly Ash	Sand-like	Do Not Correct for FC	0.016			
37.401	8.945	0.098	112	Fly Ash	Sand-like	Do Not Correct for FC	0.016			
37.565	8.917	0.100	112	Fly Ash	Sand-like	Do Not Correct for FC	0.017			
37.729	9.353	0.114	112	Fly Ash	Sand-like	Do Not Correct for FC	0.017			
37.893	9.257	0.178	112	Fly Ash	Sand-like	Do Not Correct for FC	0.018			
38.057	9.350	0.213	112	Fly Ash	Sand-like	Do Not Correct for FC	0.018			
38.221	9.227	0.174	112	Fly Ash	Sand-like	Do Not Correct for FC	0.018			
38.385	8.761	0.150	112	Fly Ash	Sand-like	Do Not Correct for FC	0.019			
38.549	7.913	0.124	112	Fly Ash	Sand-like	Do Not Correct for FC	0.019			
38.713	7.879	0.115	112	Fly Ash	Sand-like	Do Not Correct for FC	0.019			
38.877	7.889	0.110	112	Fly Ash	Sand-like	Do Not Correct for FC	0.020			
39.042	8.066	0.100	112	Fly Ash	Sand-like	Do Not Correct for FC	0.020			
39.206	7.684	0.108	112	Fly Ash	Sand-like	Do Not Correct for FC	0.021			
39.370	8.215	0.126	112	Fly Ash	Sand-like	Do Not Correct for FC	0.021			
39.534	10.277	0.114	126	Subunit 2	Sand-like		0.021			
39.698	9.175	0.112	126	Subunit 2	Sand-like		0.022			
39.862	8.354	0.099	126	Subunit 2	Sand-like		0.022			
40.026	8.233	0.088	126	Subunit 2	Sand-like		0.022			
40.190	8.284	0.089	126	Subunit 2	Sand-like		0.023			
40.354	8.573	0.085	126	Subunit 2	Sand-like		0.023			
40.518	8.975	0.086	126	Subunit 2	Sand-like		0.023			
40.682	8.824	0.080	126	Subunit 2	Sand-like		0.024			
40.846	9.143	0.096	126	Subunit 2	Sand-like		0.024			
41.010	10.141	0.096	126	Subunit 2	Sand-like		0.024			
41.174	10.296	0.104	126	Subunit 2	Sand-like		0.025			
41.338	12.716	0.168	126	Subunit 2	Sand-like		0.025			
41.502	32.375	0.161	126	Subunit 2	Sand-like		0.025			
41.666	26.153	0.192	126	Subunit 2	Sand-like		0.025			
41.830	21.626	0.187	126	Subunit 2	Sand-like		0.026			
41.994	24.671	0.227	126	Subunit 2	Sand-like		0.026			
42.158	28.752	0.343	126	Subunit 2	Sand-like		0.026			
42.322	28.537	0.443	126	Subunit 2	Sand-like		0.027			
42.486	32.352	0.359	126	Subunit 2	Sand-like		0.027			
42.650	46.739	0.474	126	Subunit 2	Sand-like		0.027			
42.814	57.134	0.516	126	Subunit 2	Sand-like		0.027			
42.978	55.125	0.569	126	Subunit 2	Sand-like		0.028			
43.143	52.729	0.598	126	Subunit 2	Sand-like		0.028			
43.307	52.693	0.502	126	Subunit 2	Sand-like		0.028			
43.471	48.765	0.481	126	Subunit 2	Sand-like		0.028			
43.635	44.388	0.415	126	Subunit 2	Sand-like		0.028			
43.799	38.956	0.413	126	Subunit 2	Sand-like		0.029			
43.963	34.084	0.363	126	Subunit 2	Sand-like		0.029			
44.127	27.631	0.319	126	Subunit 2	Sand-like		0.029			
44.291	24.008	0.369	126	Subunit 2	Sand-like		0.029			
44.455	21.999	0.434	126	Subunit 2	Sand-like		0.029			
44.619	22.266	0.706	126	Subunit 2	Sand-like		0.030			
44.783	25.235	0.832	126	Subunit 2	Sand-like		0.030			
44.947	25.652	0.720	126	Subunit 2	Sand-like		0.030			
45.111	19.845	0.502	126	Subunit 2	Sand-like		0.030			
45.275	15.611	0.555	126	Subunit 2	Sand-like		0.030			
45.439	14.361	0.281	126	Subunit 2	Sand-like		0.030			
45.603	13.597	0.192	126	Subunit 2	Sand-like		0.031			
45.767	11.960	0.301	126	Subunit 2	Sand-like		0.031			
45.931	14.726	0.263	126	Subunit 2	Sand-like		0.031			
46.095	22.845	0.293	126	Subunit 2	Sand-like		0.031			
46.259	20.854	0.386	126	Subunit 2	Sand-like		0.031			
46.423	27.585	0.471	126	Subunit 2	Sand-like		0.031			
46.587	44.180	0.673	126	Subunit 2	Sand-like		0.031			
46.751	58.819	0.659	126	Subunit 2	Sand-like		0.031			
46.915	78.019	0.458	126	Subunit 2	Sand-like		0.032			
47.079	83.258	0.341	126	Subunit 2	Sand-like		0.032			
47.244	83.060	0.365	126	Subunit 2	Sand-like		0.032			

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
47.408	81.931	0.453	126	Subunit 2	Sand-like		0.032			
47.572	78.679	0.503	126	Subunit 2	Sand-like		0.032			
47.736	69.074	0.539	126	Subunit 2	Sand-like		0.032			
47.900	61.185	0.466	126	Subunit 2	Sand-like		0.032			
48.064	55.094	0.361	126	Subunit 2	Sand-like		0.033			
48.228	53.076	0.347	126	Subunit 2	Sand-like		0.033			
48.392	47.724	0.355	126	Subunit 2	Sand-like		0.033			
48.556	39.375	0.348	126	Subunit 2	Sand-like		0.033			
48.720	23.763	0.301	126	Subunit 2	Sand-like		0.033			
48.884	16.883	0.156	126	Subunit 2	Sand-like		0.033			
49.048	13.270	0.157	126	Subunit 2	Sand-like		0.033			
49.212	11.813	0.261	126	Subunit 2	Sand-like		0.033			
49.376	20.569	0.268	126	Subunit 2	Sand-like		0.033			
49.540	38.241	0.137	126	Subunit 2	Sand-like		0.033			
49.704	38.466	0.271	126	Subunit 2	Sand-like		0.033			
49.868	30.748	0.460	126	Subunit 2	Sand-like		0.034			
50.032	43.281	0.485	126	Subunit 2	Sand-like		0.034			
50.196	55.806	0.195	126	Subunit 2	Sand-like		0.034			
50.360	53.822	0.242	126	Subunit 2	Sand-like		0.034			
50.524	39.862	0.455	126	Subunit 2	Sand-like		0.034			
50.688	32.881	0.416	126	Subunit 2	Sand-like		0.034			
50.852	38.296	0.264	126	Subunit 2	Sand-like		0.034			
51.016	41.833	0.202	126	Subunit 2	Sand-like		0.034			
51.180	41.937	0.181	126	Subunit 2	Sand-like		0.034			
51.345	28.603	0.324	126	Subunit 2	Sand-like		0.034			
51.509	24.904	0.318	126	Subunit 2	Sand-like		0.034			
51.673	36.859	0.261	126	Subunit 2	Sand-like		0.034			
51.837	46.063	0.236	126	Subunit 2	Sand-like		0.034			
52.001	50.568	0.259	126	Subunit 2	Sand-like		0.034			
52.165	59.727	0.289	126	Subunit 2	Sand-like		0.034			
52.329	70.467	0.243	126	Subunit 2	Sand-like		0.034			
52.493	74.505	0.247	126	Subunit 2	Sand-like		0.035			
52.657	72.950	0.335	126	Subunit 2	Sand-like		0.035			
52.821	69.901	0.382	126	Subunit 2	Sand-like		0.035			
52.985	70.930	0.373	126	Subunit 2	Sand-like		0.035			
53.149	77.849	0.359	126	Subunit 2	Sand-like		0.035			
53.313	79.033	0.400	126	Subunit 2	Sand-like		0.035			
53.477	79.130	0.433	126	Subunit 2	Sand-like		0.035			
53.641	83.409	0.436	126	Subunit 2	Sand-like		0.035			
53.805	93.357	0.379	126	Subunit 2	Sand-like		0.035			
53.969	88.609	0.331	126	Subunit 2	Sand-like		0.035			
54.133	78.458	0.194	126	Subunit 2	Sand-like		0.035			
54.297	64.244	0.132	126	Subunit 2	Sand-like		0.035			
54.461	54.869	0.130	131	Subunit 3	Sand-like		0.035			
54.625	49.322	0.210	131	Subunit 3	Sand-like		0.035			
54.789	48.375	0.277	131	Subunit 3	Sand-like		0.035			
54.953	58.228	0.269	131	Subunit 3	Sand-like		0.035			
55.117	68.048	0.293	131	Subunit 3	Sand-like		0.035			
55.281	68.717	0.333	131	Subunit 3	Sand-like		0.035			
55.446	69.155	0.374	131	Subunit 3	Sand-like		0.035			
55.610	75.230	0.411	131	Subunit 3	Sand-like		0.035			
55.774	82.637	0.321	131	Subunit 3	Sand-like		0.035			
55.938	77.595	0.366	131	Subunit 3	Sand-like		0.036			
56.102	79.840	0.419	131	Subunit 3	Sand-like		0.036			
56.266	90.556	0.437	131	Subunit 3	Sand-like		0.036			
56.430	104.748	0.349	131	Subunit 3	Sand-like		0.036			
56.594	102.134	0.276	131	Subunit 3	Sand-like		0.036			
56.758	90.508	0.141	131	Subunit 3	Sand-like		0.036			
56.922	81.676	0.152	131	Subunit 3	Sand-like		0.036			
57.086	71.151	0.142	131	Subunit 3	Sand-like		0.036			
57.250	58.855	0.168	131	Subunit 3	Sand-like		0.036			
57.414	54.071	0.193	131	Subunit 3	Sand-like		0.036			
57.578	54.439	0.224	131	Subunit 3	Sand-like		0.036			
57.742	53.256	0.258	131	Subunit 3	Sand-like		0.036			
57.906	61.041	0.260	131	Subunit 3	Sand-like		0.036			
58.070	66.812	0.108	131	Subunit 3	Sand-like		0.036			
58.234	64.512	0.280	131	Subunit 3	Sand-like		0.036			
58.398	63.773	2.257	131	Subunit 3	Sand-like		0.036			
58.562	78.920	1.166	131	Subunit 3	Sand-like		0.036			
58.726	127.738	1.554	131	Subunit 3	Sand-like		0.036			
58.890	174.517	0.000	131	Subunit 3	Sand-like		0.036			
59.054	63.752	0.000	131	Subunit 3	Sand-like		0.036			

LIQUEFACTION POTENTIAL ASSESSMENT FOR COARSE GRAINED SOILS USING CONE PENETRATION TEST DATA

Facility: KIF TDEC Stability
Project No.: 175668043
CPT ID: KIF-BF-CPT-2

Water Elevation during CPT:	755.0	ft
Depth to Water during CPT:	14.0	ft *(relative to ground surface during CPT)*
Water Elevation during Earthquake:	754.0	ft
Depth to Water during Earthquake:	15.0	ft *(relative to ground surface during CPT)*
Final Grade Elevation during EQ:	769	ft *(if no fill, then set this equal to top of CPT hole elev.)*
Height of Final Grade above CPT TOH:	0.0	ft *(relative to ground surface during CPT, + Fill, - Cut)*
Unit Weight of Cut/Fill to Achieve Final Grade	122	pcf
Cut/Fill Total Stress (+ Fill, - Cut):	0.00	tsf

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
769.0				Vertical Stresses above 1st CPT:			**0.01**	**0.01**	**0.00**	**0.00**	**0.01**	**0.01**
768.8	0.164	0.10	0.01	119	**0.16**	0.08	0.01	0.01	0.00	0.00	0.01	0.01
768.7	0.328	0.10	0.01	119	0.25	0.16	0.02	0.02	0.00	0.00	0.02	0.02
768.5	0.492	0.10	0.01	119	0.41	0.16	0.03	0.03	0.00	0.00	0.03	0.03
768.3	0.656	0.10	0.01	119	0.57	0.16	0.04	0.04	0.00	0.00	0.04	0.04
768.2	0.820	0.10	0.01	119	0.74	0.16	0.05	0.05	0.00	0.00	0.05	0.05
768.0	0.984	0.10	0.01	119	0.90	0.16	0.06	0.06	0.00	0.00	0.06	0.06
767.9	1.148	0.10	0.01	119	1.07	0.16	0.07	0.07	0.00	0.00	0.07	0.07
767.7	1.312	0.10	0.01	119	1.23	0.16	0.08	0.08	0.00	0.00	0.08	0.08
767.5	1.476	0.10	0.01	119	1.39	0.16	0.09	0.09	0.00	0.00	0.09	0.09
767.4	1.640	0.10	0.01	119	1.56	0.16	0.10	0.10	0.00	0.00	0.10	0.10
767.2	1.804	0.10	0.01	119	1.72	0.16	0.11	0.11	0.00	0.00	0.11	0.11
767.0	1.968	0.10	0.01	119	1.89	0.16	0.12	0.12	0.00	0.00	0.12	0.12
766.9	2.133	0.10	0.01	119	2.05	0.16	0.13	0.13	0.00	0.00	0.13	0.13
766.7	2.297	0.10	0.01	119	2.21	0.16	0.14	0.14	0.00	0.00	0.14	0.14
766.5	2.461	0.10	0.01	119	2.38	0.16	0.15	0.15	0.00	0.00	0.15	0.15
766.4	2.625	0.10	0.01	119	2.54	0.16	0.16	0.16	0.00	0.00	0.16	0.16
766.2	2.789	0.10	0.01	119	2.71	0.16	0.17	0.17	0.00	0.00	0.17	0.17
766.0	2.953	0.10	0.01	119	2.87	0.16	0.18	0.18	0.00	0.00	0.18	0.18
765.9	3.117	0.10	0.01	119	3.03	0.16	0.19	0.19	0.00	0.00	0.19	0.19
765.7	3.281	0.10	0.01	119	3.20	0.16	0.20	0.20	0.00	0.00	0.20	0.20
765.6	3.445	0.10	0.01	119	3.36	0.16	0.21	0.21	0.00	0.00	0.21	0.21
765.4	3.609	0.10	0.01	119	3.53	0.16	0.21	0.21	0.00	0.00	0.21	0.21
765.2	3.773	0.10	0.01	119	3.69	0.16	0.22	0.22	0.00	0.00	0.22	0.22
765.1	3.937	0.10	0.01	119	3.85	0.16	0.23	0.23	0.00	0.00	0.23	0.23
764.9	4.101	0.10	0.01	119	4.02	0.16	0.24	0.24	0.00	0.00	0.24	0.24
764.7	4.265	0.10	0.01	119	4.18	0.16	0.25	0.25	0.00	0.00	0.25	0.25
764.6	4.429	0.10	0.01	119	4.35	0.16	0.26	0.26	0.00	0.00	0.26	0.26
764.4	4.593	0.10	0.01	119	4.51	0.16	0.27	0.27	0.00	0.00	0.27	0.27
764.2	4.757	0.10	0.01	119	4.68	0.16	0.28	0.28	0.00	0.00	0.28	0.28
764.1	4.921	0.10	0.01	119	4.84	0.16	0.29	0.29	0.00	0.00	0.29	0.29
763.9	5.085	0.10	0.01	119	5.00	0.16	0.30	0.30	0.00	0.00	0.30	0.30
763.8	5.249	0.10	0.01	119	5.17	0.16	0.31	0.31	0.00	0.00	0.31	0.31
763.6	5.413	0.10	0.01	119	5.33	0.16	0.32	0.32	0.00	0.00	0.32	0.32
763.4	5.577	0.10	0.01	119	5.50	0.16	0.33	0.33	0.00	0.00	0.33	0.33
763.3	5.741	0.10	0.01	119	5.66	0.16	0.34	0.34	0.00	0.00	0.34	0.34
763.1	5.905	0.10	0.01	119	5.82	0.16	0.35	0.35	0.00	0.00	0.35	0.35
762.9	6.069	0.10	0.01	119	5.99	0.16	0.36	0.36	0.00	0.00	0.36	0.36
762.8	6.234	0.10	0.01	119	6.15	0.16	0.37	0.37	0.00	0.00	0.37	0.37
762.6	6.398	0.10	0.01	119	6.32	0.16	0.38	0.38	0.00	0.00	0.38	0.38
762.4	6.562	0.10	0.01	119	6.48	0.16	0.39	0.39	0.00	0.00	0.39	0.39
762.3	6.726	0.10	0.01	119	6.64	0.16	0.40	0.40	0.00	0.00	0.40	0.40
762.1	6.890	0.10	0.01	119	6.81	0.16	0.41	0.41	0.00	0.00	0.41	0.41
761.9	7.054	0.10	0.01	119	6.97	0.16	0.42	0.42	0.00	0.00	0.42	0.42
761.8	7.218	0.10	0.01	119	7.14	0.16	0.43	0.43	0.00	0.00	0.43	0.43
761.6	7.382	0.10	0.01	119	7.30	0.16	0.44	0.44	0.00	0.00	0.44	0.44
761.5	7.546	0.10	0.01	119	7.46	0.16	0.45	0.45	0.00	0.00	0.45	0.45
761.3	7.710	0.10	0.01	119	7.63	0.16	0.46	0.46	0.00	0.00	0.46	0.46
761.1	7.874	0.10	0.01	119	7.79	0.16	0.47	0.47	0.00	0.00	0.47	0.47
761.0	8.038	0.10	0.01	119	7.96	0.16	0.48	0.48	0.00	0.00	0.48	0.48
760.8	8.202	0.10	0.01	119	8.12	0.16	0.49	0.49	0.00	0.00	0.49	0.49
760.6	8.366	0.10	0.01	119	8.28	0.16	0.50	0.50	0.00	0.00	0.50	0.50
760.5	8.530	0.10	0.01	119	8.45	0.16	0.51	0.51	0.00	0.00	0.51	0.51
760.3	8.694	0.10	0.01	119	8.61	0.16	0.52	0.52	0.00	0.00	0.52	0.52
760.1	8.858	0.10	0.01	119	8.78	0.16	0.53	0.53	0.00	0.00	0.53	0.53
760.0	9.022	0.10	0.01	119	8.94	0.16	0.54	0.54	0.00	0.00	0.54	0.54
759.8	9.186	0.10	0.01	119	9.10	0.16	0.55	0.55	0.00	0.00	0.55	0.55
759.6	9.350	0.10	0.01	119	9.27	0.16	0.56	0.56	0.00	0.00	0.56	0.56
759.5	9.514	0.10	0.01	119	9.43	0.16	0.57	0.57	0.00	0.00	0.57	0.57

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
759.3	9.678	0.10	0.01	119	9.60	0.16	0.58	0.58	0.00	0.00	0.58	0.58
759.2	9.842	0.10	0.01	119	9.76	0.16	0.59	0.59	0.00	0.00	0.59	0.59
759.0	10.006	0.10	0.01	119	9.92	0.16	0.60	0.60	0.00	0.00	0.60	0.60
758.8	10.170	0.10	0.01	119	10.09	0.16	0.61	0.61	0.00	0.00	0.61	0.61
758.7	10.335	0.10	0.01	119	10.25	0.16	0.62	0.62	0.00	0.00	0.62	0.62
758.5	10.499	0.10	0.01	119	10.42	0.16	0.62	0.62	0.00	0.00	0.62	0.62
758.3	10.663	0.10	0.01	119	10.58	0.16	0.63	0.63	0.00	0.00	0.63	0.63
758.2	10.827	0.10	0.01	119	10.74	0.16	0.64	0.64	0.00	0.00	0.64	0.64
758.0	10.991	0.10	0.01	119	10.91	0.16	0.65	0.65	0.00	0.00	0.65	0.65
757.8	11.155	0.10	0.01	119	11.07	0.16	0.66	0.66	0.00	0.00	0.66	0.66
757.7	11.319	0.10	0.01	119	11.24	0.16	0.67	0.67	0.00	0.00	0.67	0.67
757.5	11.483	0.10	0.01	119	11.40	0.16	0.68	0.68	0.00	0.00	0.68	0.68
757.4	11.647	0.10	0.01	119	11.56	0.16	0.69	0.69	0.00	0.00	0.69	0.69
757.2	11.811	0.10	0.01	119	11.73	0.16	0.70	0.70	0.00	0.00	0.70	0.70
757.0	11.975	0.10	0.01	119	11.89	0.16	0.71	0.71	0.00	0.00	0.71	0.71
756.9	12.139	6.14	0.06	119	12.06	0.16	0.72	0.72	0.00	0.00	0.72	0.72
756.7	12.303	59.04	0.17	119	12.22	0.16	0.73	0.73	0.00	0.00	0.73	0.73
756.5	12.467	128.02	0.62	119	12.39	0.16	0.74	0.74	0.00	0.00	0.74	0.74
756.4	12.631	222.97	1.58	119	12.55	0.16	0.75	0.75	0.00	0.00	0.75	0.75
756.2	12.795	271.68	2.48	119	12.71	0.16	0.76	0.76	0.00	0.00	0.76	0.76
756.0	12.959	286.50	2.99	119	12.88	0.16	0.77	0.77	0.00	0.00	0.77	0.77
755.9	13.123	260.88	4.05	119	13.04	0.16	0.78	0.78	0.00	0.00	0.78	0.78
755.7	13.287	253.20	4.08	119	13.21	0.16	0.79	0.79	0.00	0.00	0.79	0.79
755.5	13.451	290.52	4.26	119	13.37	0.16	0.80	0.80	0.00	0.00	0.80	0.80
755.4	13.615	403.44	5.84	119	13.53	0.16	0.81	0.81	0.00	0.00	0.81	0.81
755.2	13.779	429.56	6.93	119	13.70	0.16	0.82	0.82	0.00	0.00	0.82	0.82
755.1	13.943	419.00	8.83	119	13.86	0.16	0.83	0.83	0.00	0.00	0.83	0.83
754.9	14.107	490.27	1.94	119	14.03	0.16	0.84	0.84	0.00	0.00	0.84	0.84
754.7	14.271	460.51	3.41	119	14.19	0.16	0.85	0.85	0.01	0.00	0.84	0.85
754.6	14.436	482.10	6.53	119	14.35	0.16	0.86	0.86	0.01	0.00	0.85	0.86
754.4	14.600	434.33	9.54	119	14.52	0.16	0.87	0.87	0.02	0.00	0.85	0.87
754.2	14.764	356.87	9.79	119	14.68	0.16	0.88	0.88	0.02	0.00	0.85	0.88
754.1	14.928	272.84	8.25	119	14.85	0.16	0.89	0.89	0.03	0.00	0.86	0.89
753.9	15.092	215.40	5.56	119	15.01	0.16	0.90	0.90	0.03	0.00	0.86	0.90
753.7	15.256	178.80	4.10	119	15.17	0.16	0.91	0.91	0.04	0.01	0.87	0.90
753.6	15.420	142.76	3.02	119	15.34	0.16	0.92	0.92	0.04	0.01	0.87	0.90
753.4	15.584	113.92	2.31	119	15.50	0.16	0.93	0.93	0.05	0.02	0.88	0.91
753.3	15.748	97.38	1.90	119	15.67	0.16	0.94	0.94	0.05	0.02	0.88	0.91
753.1	15.912	101.65	1.86	119	15.83	0.16	0.95	0.95	0.06	0.03	0.89	0.92
752.9	16.076	135.35	1.52	119	15.99	0.16	0.96	0.96	0.06	0.03	0.89	0.92
752.8	16.240	180.30	1.09	119	16.16	0.16	0.97	0.97	0.07	0.04	0.90	0.93
752.6	16.404	202.50	0.81	119	16.32	0.16	0.98	0.98	0.08	0.04	0.90	0.93
752.4	16.568	237.38	0.65	119	16.49	0.16	0.99	0.99	0.08	0.05	0.91	0.94
752.3	16.732	251.23	0.98	119	16.65	0.16	1.00	1.00	0.09	0.05	0.91	0.94
752.1	16.896	279.92	0.98	119	16.81	0.16	1.01	1.01	0.09	0.06	0.92	0.95
751.9	17.060	311.64	1.13	119	16.98	0.16	1.02	1.02	0.10	0.06	0.92	0.95
751.8	17.224	314.59	0.94	119	17.14	0.16	1.03	1.03	0.10	0.07	0.92	0.96
751.6	17.388	281.11	0.70	119	17.31	0.16	1.03	1.03	0.11	0.07	0.93	0.96
751.4	17.552	255.15	0.73	119	17.47	0.16	1.04	1.04	0.11	0.08	0.93	0.96
751.3	17.716	246.38	0.63	119	17.63	0.16	1.05	1.05	0.12	0.08	0.94	0.97
751.1	17.880	230.18	0.75	119	17.80	0.16	1.06	1.06	0.12	0.09	0.94	0.97
751.0	18.044	227.78	0.74	119	17.96	0.16	1.07	1.07	0.13	0.09	0.95	0.98
750.8	18.208	222.00	0.86	119	18.13	0.16	1.08	1.08	0.13	0.10	0.95	0.98
750.6	18.372	254.52	0.73	119	18.29	0.16	1.09	1.09	0.14	0.11	0.96	0.99
750.5	18.537	307.78	0.97	119	18.45	0.16	1.10	1.10	0.14	0.11	0.96	0.99
750.3	18.701	343.55	0.86	119	18.62	0.16	1.11	1.11	0.15	0.12	0.97	1.00
750.1	18.865	370.35	0.96	119	18.78	0.16	1.12	1.12	0.15	0.12	0.97	1.00
750.0	19.029	418.19	0.97	119	18.95	0.16	1.13	1.13	0.16	0.13	0.98	1.01
749.8	19.193	463.57	1.69	119	19.11	0.16	1.14	1.14	0.16	0.13	0.98	1.01
749.6	19.357	482.25	1.82	119	19.27	0.16	1.15	1.15	0.17	0.14	0.98	1.02
749.5	19.521	460.20	1.33	119	19.44	0.16	1.16	1.16	0.17	0.14	0.99	1.02
749.3	19.685	423.38	1.06	119	19.60	0.16	1.17	1.17	0.18	0.15	0.99	1.03
749.2	19.849	370.11	1.27	119	19.77	0.16	1.18	1.18	0.18	0.15	1.00	1.03
749.0	20.013	333.34	1.11	119	19.93	0.16	1.19	1.19	0.19	0.16	1.00	1.03
748.8	20.177	275.82	1.35	119	20.09	0.16	1.20	1.20	0.19	0.16	1.01	1.04
748.7	20.341	270.36	1.23	119	20.26	0.16	1.21	1.21	0.20	0.17	1.01	1.04
748.5	20.505	250.67	0.93	119	20.42	0.16	1.22	1.22	0.20	0.17	1.02	1.05
748.3	20.669	216.93	0.71	119	20.59	0.16	1.23	1.23	0.21	0.18	1.02	1.05
748.2	20.833	198.53	0.32	119	20.75	0.16	1.24	1.24	0.21	0.18	1.03	1.06

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
748.0	20.997	175.39	0.27	119	20.92	0.16	1.25	1.25	0.22	0.19	1.03	1.06
747.8	21.161	149.70	0.15	119	21.08	0.16	1.26	1.26	0.22	0.19	1.04	1.07
747.7	21.325	130.36	0.12	119	21.24	0.16	1.27	1.27	0.23	0.20	1.04	1.07
747.5	21.489	123.14	0.12	119	21.41	0.16	1.28	1.28	0.23	0.20	1.05	1.08
747.3	21.653	121.42	0.15	119	21.57	0.16	1.29	1.29	0.24	0.21	1.05	1.08
747.2	21.817	111.72	0.10	119	21.74	0.16	1.30	1.30	0.24	0.21	1.05	1.09
747.0	21.981	99.94	0.04	119	21.90	0.16	1.31	1.31	0.25	0.22	1.06	1.09
746.9	22.145	116.80	0.18	112	22.06	0.16	1.32	1.32	0.25	0.22	1.06	1.09
746.7	22.309	145.80	0.39	112	22.23	0.16	1.33	1.33	0.26	0.23	1.07	1.10
746.5	22.473	141.02	0.73	112	22.39	0.16	1.34	1.34	0.26	0.23	1.07	1.10
746.4	22.638	139.93	1.47	112	22.56	0.16	1.35	1.35	0.27	0.24	1.08	1.11
746.2	22.802	131.43	1.52	112	22.72	0.16	1.35	1.35	0.27	0.24	1.08	1.11
746.0	22.966	120.18	1.56	112	22.88	0.16	1.36	1.36	0.28	0.25	1.08	1.12
745.9	23.130	106.01	1.23	112	23.05	0.16	1.37	1.37	0.28	0.25	1.09	1.12
745.7	23.294	99.03	0.88	112	23.21	0.16	1.38	1.38	0.29	0.26	1.09	1.12
745.5	23.458	101.88	0.49	112	23.38	0.16	1.39	1.39	0.30	0.26	1.10	1.13
745.4	23.622	100.68	0.34	112	23.54	0.16	1.40	1.40	0.30	0.27	1.10	1.13
745.2	23.786	100.62	0.47	112	23.70	0.16	1.41	1.41	0.31	0.27	1.10	1.14
745.1	23.950	102.23	0.76	112	23.87	0.16	1.42	1.42	0.31	0.28	1.11	1.14
744.9	24.114	102.15	1.06	112	24.03	0.16	1.43	1.43	0.32	0.28	1.11	1.14
744.7	24.278	101.17	1.17	112	24.20	0.16	1.44	1.44	0.32	0.29	1.12	1.15
744.6	24.442	108.67	1.18	112	24.36	0.16	1.45	1.45	0.33	0.29	1.12	1.15
744.4	24.606	131.05	1.06	112	24.52	0.16	1.46	1.46	0.33	0.30	1.12	1.16
744.2	24.770	140.49	0.79	112	24.69	0.16	1.46	1.46	0.34	0.30	1.13	1.16
744.1	24.934	131.38	0.54	112	24.85	0.16	1.47	1.47	0.34	0.31	1.13	1.16
743.9	25.098	121.52	0.23	112	25.02	0.16	1.48	1.48	0.35	0.32	1.14	1.17
743.7	25.262	108.90	0.14	112	25.18	0.16	1.49	1.49	0.35	0.32	1.14	1.17
743.6	25.426	103.73	0.18	112	25.34	0.16	1.50	1.50	0.36	0.33	1.14	1.18
743.4	25.590	107.94	0.13	112	25.51	0.16	1.51	1.51	0.36	0.33	1.15	1.18
743.2	25.754	113.35	0.14	112	25.67	0.16	1.52	1.52	0.37	0.34	1.15	1.18
743.1	25.918	104.21	0.24	112	25.84	0.16	1.53	1.53	0.37	0.34	1.16	1.19
742.9	26.082	88.04	0.19	112	26.00	0.16	1.54	1.54	0.38	0.35	1.16	1.19
742.8	26.246	73.05	0.16	112	26.16	0.16	1.55	1.55	0.38	0.35	1.17	1.20
742.6	26.410	62.89	0.11	112	26.33	0.16	1.56	1.56	0.39	0.36	1.17	1.20
742.4	26.574	61.95	0.07	112	26.49	0.16	1.57	1.57	0.39	0.36	1.17	1.20
742.3	26.739	58.92	0.05	112	26.66	0.16	1.57	1.57	0.40	0.37	1.18	1.21
742.1	26.903	55.27	0.05	112	26.82	0.16	1.58	1.58	0.40	0.37	1.18	1.21
741.9	27.067	55.04	0.06	112	26.98	0.16	1.59	1.59	0.41	0.38	1.19	1.22
741.8	27.231	49.27	0.08	112	27.15	0.16	1.60	1.60	0.41	0.38	1.19	1.22
741.6	27.395	43.33	0.15	112	27.31	0.16	1.61	1.61	0.42	0.39	1.19	1.22
741.4	27.559	39.46	0.21	112	27.48	0.16	1.62	1.62	0.42	0.39	1.20	1.23
741.3	27.723	38.26	0.28	112	27.64	0.16	1.63	1.63	0.43	0.40	1.20	1.23
741.1	27.887	39.52	0.32	112	27.80	0.16	1.64	1.64	0.43	0.40	1.21	1.24
740.9	28.051	40.28	0.37	112	27.97	0.16	1.65	1.65	0.44	0.41	1.21	1.24
740.8	28.215	37.51	0.37	112	28.13	0.16	1.66	1.66	0.44	0.41	1.21	1.25
740.6	28.379	34.11	0.34	112	28.30	0.16	1.67	1.67	0.45	0.42	1.22	1.25
740.5	28.543	30.92	0.31	112	28.46	0.16	1.68	1.68	0.45	0.42	1.22	1.25
740.3	28.707	31.37	0.31	112	28.62	0.16	1.69	1.69	0.46	0.43	1.23	1.26
740.1	28.871	34.71	0.34	112	28.79	0.16	1.69	1.69	0.46	0.43	1.23	1.26
740.0	29.035	37.46	0.40	112	28.95	0.16	1.70	1.70	0.47	0.44	1.23	1.27
739.8	29.199	40.39	0.42	112	29.12	0.16	1.71	1.71	0.47	0.44	1.24	1.27
739.6	29.363	42.10	0.39	112	29.28	0.16	1.72	1.72	0.48	0.45	1.24	1.27
739.5	29.527	42.13	0.40	112	29.45	0.16	1.73	1.73	0.48	0.45	1.25	1.28
739.3	29.691	38.58	0.41	112	29.61	0.16	1.74	1.74	0.49	0.46	1.25	1.28
739.1	29.855	34.09	0.41	112	29.77	0.16	1.75	1.75	0.49	0.46	1.25	1.29
739.0	30.019	32.24	0.35	112	29.94	0.16	1.76	1.76	0.50	0.47	1.26	1.29
738.8	30.183	31.26	0.29	112	30.10	0.16	1.77	1.77	0.50	0.47	1.26	1.29
738.7	30.347	30.60	0.24	112	30.27	0.16	1.78	1.78	0.51	0.48	1.27	1.30
738.5	30.511	29.87	0.24	112	30.43	0.16	1.79	1.79	0.52	0.48	1.27	1.30
738.3	30.675	29.29	0.26	112	30.59	0.16	1.80	1.80	0.52	0.49	1.28	1.31
738.2	30.840	29.45	0.30	112	30.76	0.16	1.80	1.80	0.53	0.49	1.28	1.31
738.0	31.004	30.59	0.34	112	30.92	0.16	1.81	1.81	0.53	0.50	1.28	1.31
737.8	31.168	34.63	0.36	112	31.09	0.16	1.82	1.82	0.54	0.50	1.29	1.32
737.7	31.332	36.80	0.40	112	31.25	0.16	1.83	1.83	0.54	0.51	1.29	1.32
737.5	31.496	35.76	0.46	112	31.41	0.16	1.84	1.84	0.55	0.51	1.30	1.33
737.3	31.660	35.53	0.49	112	31.58	0.16	1.85	1.85	0.55	0.52	1.30	1.33
737.2	31.824	32.00	0.50	112	31.74	0.16	1.86	1.86	0.56	0.52	1.30	1.33
737.0	31.988	32.82	0.50	112	31.91	0.16	1.87	1.87	0.56	0.53	1.31	1.34
736.8	32.152	37.25	0.54	112	32.07	0.16	1.88	1.88	0.57	0.54	1.31	1.34

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
736.7	32.316	38.27	0.60	112	32.23	0.16	1.89	1.89	0.57	0.54	1.32	1.35
736.5	32.480	41.47	0.67	112	32.40	0.16	1.90	1.90	0.58	0.55	1.32	1.35
736.4	32.644	46.28	0.60	112	32.56	0.16	1.91	1.91	0.58	0.55	1.32	1.36
736.2	32.808	53.98	0.82	112	32.73	0.16	1.91	1.91	0.59	0.56	1.33	1.36
736.0	32.972	56.95	1.01	112	32.89	0.16	1.92	1.92	0.59	0.56	1.33	1.36
735.9	33.136	55.09	1.11	112	33.05	0.16	1.93	1.93	0.60	0.57	1.34	1.37
735.7	33.300	50.29	1.11	112	33.22	0.16	1.94	1.94	0.60	0.57	1.34	1.37
735.5	33.464	48.64	1.09	112	33.38	0.16	1.95	1.95	0.61	0.58	1.34	1.38
735.4	33.628	50.91	1.13	112	33.55	0.16	1.96	1.96	0.61	0.58	1.35	1.38
735.2	33.792	52.88	1.20	112	33.71	0.16	1.97	1.97	0.62	0.59	1.35	1.38
735.0	33.956	59.23	1.27	112	33.87	0.16	1.98	1.98	0.62	0.59	1.36	1.39
734.9	34.120	64.38	1.25	112	34.04	0.16	1.99	1.99	0.63	0.60	1.36	1.39
734.7	34.284	64.10	1.34	112	34.20	0.16	2.00	2.00	0.63	0.60	1.36	1.40
734.6	34.448	70.00	1.47	112	34.37	0.16	2.01	2.01	0.64	0.61	1.37	1.40
734.4	34.612	76.58	1.64	112	34.53	0.16	2.02	2.02	0.64	0.61	1.37	1.40
734.2	34.776	81.05	1.70	112	34.69	0.16	2.02	2.02	0.65	0.62	1.38	1.41
734.1	34.941	84.14	1.73	112	34.86	0.16	2.03	2.03	0.65	0.62	1.38	1.41
733.9	35.105	88.80	1.75	112	35.02	0.16	2.04	2.04	0.66	0.63	1.38	1.42
733.7	35.269	104.59	1.51	112	35.19	0.16	2.05	2.05	0.66	0.63	1.39	1.42
733.6	35.433	97.02	1.02	112	35.35	0.16	2.06	2.06	0.67	0.64	1.39	1.42
733.4	35.597	82.93	0.75	112	35.51	0.16	2.07	2.07	0.67	0.64	1.40	1.43
733.2	35.761	45.83	0.74	112	35.68	0.16	2.08	2.08	0.68	0.65	1.40	1.43
733.1	35.925	24.05	0.69	112	35.84	0.16	2.09	2.09	0.68	0.65	1.41	1.44
732.9	36.089	14.34	0.52	112	36.01	0.16	2.10	2.10	0.69	0.66	1.41	1.44
732.7	36.253	11.45	0.31	112	36.17	0.16	2.11	2.11	0.69	0.66	1.41	1.44
732.6	36.417	9.57	0.15	112	36.33	0.16	2.12	2.12	0.70	0.67	1.42	1.45
732.4	36.581	8.61	0.06	112	36.50	0.16	2.13	2.13	0.70	0.67	1.42	1.45
732.3	36.745	8.05	0.05	112	36.66	0.16	2.14	2.14	0.71	0.68	1.43	1.46
732.1	36.909	7.88	0.06	112	36.83	0.16	2.14	2.14	0.71	0.68	1.43	1.46
731.9	37.073	8.10	0.07	112	36.99	0.16	2.15	2.15	0.72	0.69	1.43	1.46
731.8	37.237	8.45	0.08	112	37.16	0.16	2.16	2.16	0.72	0.69	1.44	1.47
731.6	37.401	8.95	0.10	112	37.32	0.16	2.17	2.17	0.73	0.70	1.44	1.47
731.4	37.565	8.92	0.10	112	37.48	0.16	2.18	2.18	0.74	0.70	1.45	1.48
731.3	37.729	9.35	0.11	112	37.65	0.16	2.19	2.19	0.74	0.71	1.45	1.48
731.1	37.893	9.26	0.18	112	37.81	0.16	2.20	2.20	0.75	0.71	1.45	1.49
730.9	38.057	9.35	0.21	112	37.98	0.16	2.21	2.21	0.75	0.72	1.46	1.49
730.8	38.221	9.23	0.17	112	38.14	0.16	2.22	2.22	0.76	0.72	1.46	1.49
730.6	38.385	8.76	0.15	112	38.30	0.16	2.23	2.23	0.76	0.73	1.47	1.50
730.5	38.549	7.91	0.12	112	38.47	0.16	2.24	2.24	0.77	0.73	1.47	1.50
730.3	38.713	7.88	0.12	112	38.63	0.16	2.25	2.25	0.77	0.74	1.47	1.51
730.1	38.877	7.89	0.11	112	38.80	0.16	2.25	2.25	0.78	0.74	1.48	1.51
730.0	39.042	8.07	0.10	112	38.96	0.16	2.26	2.26	0.78	0.75	1.48	1.51
729.8	39.206	7.68	0.11	112	39.12	0.16	2.27	2.27	0.79	0.76	1.49	1.52
729.6	39.370	8.22	0.13	112	39.29	0.16	2.28	2.28	0.79	0.76	1.49	1.52
729.5	39.534	10.28	0.11	126	39.45	0.16	2.29	2.29	0.80	0.77	1.50	1.53
729.3	39.698	9.18	0.11	126	39.62	0.16	2.30	2.30	0.80	0.77	1.50	1.53
729.1	39.862	8.35	0.10	126	39.78	0.16	2.31	2.31	0.81	0.78	1.51	1.54
729.0	40.026	8.23	0.09	126	39.94	0.16	2.32	2.32	0.81	0.78	1.51	1.54
728.8	40.190	8.28	0.09	126	40.11	0.16	2.33	2.33	0.82	0.79	1.52	1.55
728.6	40.354	8.57	0.09	126	40.27	0.16	2.34	2.34	0.82	0.79	1.52	1.55
728.5	40.518	8.97	0.09	126	40.44	0.16	2.35	2.35	0.83	0.80	1.53	1.56
728.3	40.682	8.82	0.08	126	40.60	0.16	2.36	2.36	0.83	0.80	1.53	1.56
728.2	40.846	9.14	0.10	126	40.76	0.16	2.37	2.37	0.84	0.81	1.54	1.57
728.0	41.010	10.14	0.10	126	40.93	0.16	2.38	2.38	0.84	0.81	1.54	1.57
727.8	41.174	10.30	0.10	126	41.09	0.16	2.40	2.40	0.85	0.82	1.55	1.58
727.7	41.338	12.72	0.17	126	41.26	0.16	2.41	2.41	0.85	0.82	1.55	1.58
727.5	41.502	32.38	0.16	126	41.42	0.16	2.42	2.42	0.86	0.83	1.56	1.59
727.3	41.666	26.15	0.19	126	41.58	0.16	2.43	2.43	0.86	0.83	1.56	1.59
727.2	41.830	21.63	0.19	126	41.75	0.16	2.44	2.44	0.87	0.84	1.57	1.60
727.0	41.994	24.67	0.23	126	41.91	0.16	2.45	2.45	0.87	0.84	1.57	1.60
726.8	42.158	28.75	0.34	126	42.08	0.16	2.46	2.46	0.88	0.85	1.58	1.61
726.7	42.322	28.54	0.44	126	42.24	0.16	2.47	2.47	0.88	0.85	1.58	1.62
726.5	42.486	32.35	0.36	126	42.40	0.16	2.48	2.48	0.89	0.86	1.59	1.62
726.3	42.650	46.74	0.47	126	42.57	0.16	2.49	2.49	0.89	0.86	1.59	1.63
726.2	42.814	57.13	0.52	126	42.73	0.16	2.50	2.50	0.90	0.87	1.60	1.63
726.0	42.978	55.13	0.57	126	42.90	0.16	2.51	2.51	0.90	0.87	1.60	1.64
725.9	43.143	52.73	0.60	126	43.06	0.16	2.52	2.52	0.91	0.88	1.61	1.64
725.7	43.307	52.69	0.50	126	43.22	0.16	2.53	2.53	0.91	0.88	1.62	1.65
725.5	43.471	48.77	0.48	126	43.39	0.16	2.54	2.54	0.92	0.89	1.62	1.65

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
725.4	43.635	44.39	0.42	126	43.55	0.16	2.55	2.55	0.92	0.89	1.63	1.66
725.2	43.799	38.96	0.41	126	43.72	0.16	2.56	2.56	0.93	0.90	1.63	1.66
725.0	43.963	34.08	0.36	126	43.88	0.16	2.57	2.57	0.93	0.90	1.64	1.67
724.9	44.127	27.63	0.32	126	44.04	0.16	2.58	2.58	0.94	0.91	1.64	1.67
724.7	44.291	24.01	0.37	126	44.21	0.16	2.59	2.59	0.95	0.91	1.65	1.68
724.5	44.455	22.00	0.43	126	44.37	0.16	2.60	2.60	0.95	0.92	1.65	1.68
724.4	44.619	22.27	0.71	126	44.54	0.16	2.61	2.61	0.96	0.92	1.66	1.69
724.2	44.783	25.24	0.83	126	44.70	0.16	2.62	2.62	0.96	0.93	1.66	1.69
724.1	44.947	25.65	0.72	126	44.86	0.16	2.63	2.63	0.97	0.93	1.67	1.70
723.9	45.111	19.84	0.50	126	45.03	0.16	2.64	2.64	0.97	0.94	1.67	1.70
723.7	45.275	15.61	0.56	126	45.19	0.16	2.65	2.65	0.98	0.94	1.68	1.71
723.6	45.439	14.36	0.28	126	45.36	0.16	2.66	2.66	0.98	0.95	1.68	1.71
723.4	45.603	13.60	0.19	126	45.52	0.16	2.67	2.67	0.99	0.95	1.69	1.72
723.2	45.767	11.96	0.30	126	45.69	0.16	2.68	2.68	0.99	0.96	1.69	1.72
723.1	45.931	14.73	0.26	126	45.85	0.16	2.69	2.69	1.00	0.97	1.70	1.73
722.9	46.095	22.84	0.29	126	46.01	0.16	2.71	2.71	1.00	0.97	1.70	1.74
722.7	46.259	20.85	0.39	126	46.18	0.16	2.72	2.72	1.01	0.98	1.71	1.74
722.6	46.423	27.59	0.47	126	46.34	0.16	2.73	2.73	1.01	0.98	1.71	1.75
722.4	46.587	44.18	0.67	126	46.51	0.16	2.74	2.74	1.02	0.99	1.72	1.75
722.2	46.751	58.82	0.66	126	46.67	0.16	2.75	2.75	1.02	0.99	1.72	1.76
722.1	46.915	78.02	0.46	126	46.83	0.16	2.76	2.76	1.03	1.00	1.73	1.76
721.9	47.079	83.26	0.34	126	47.00	0.16	2.77	2.77	1.03	1.00	1.74	1.77
721.8	47.244	83.06	0.37	126	47.16	0.16	2.78	2.78	1.04	1.01	1.74	1.77
721.6	47.408	81.93	0.45	126	47.33	0.16	2.79	2.79	1.04	1.01	1.75	1.78
721.4	47.572	78.68	0.50	126	47.49	0.16	2.80	2.80	1.05	1.02	1.75	1.78
721.3	47.736	69.07	0.54	126	47.65	0.16	2.81	2.81	1.05	1.02	1.76	1.79
721.1	47.900	61.19	0.47	126	47.82	0.16	2.82	2.82	1.06	1.03	1.76	1.79
720.9	48.064	55.09	0.36	126	47.98	0.16	2.83	2.83	1.06	1.03	1.77	1.80
720.8	48.228	53.08	0.35	126	48.15	0.16	2.84	2.84	1.07	1.04	1.77	1.80
720.6	48.392	47.72	0.36	126	48.31	0.16	2.85	2.85	1.07	1.04	1.78	1.81
720.4	48.556	39.38	0.35	126	48.47	0.16	2.86	2.86	1.08	1.05	1.78	1.81
720.3	48.720	23.76	0.30	126	48.64	0.16	2.87	2.87	1.08	1.05	1.79	1.82
720.1	48.884	16.88	0.16	126	48.80	0.16	2.88	2.88	1.09	1.06	1.79	1.82
720.0	49.048	13.27	0.16	126	48.97	0.16	2.89	2.89	1.09	1.06	1.80	1.83
719.8	49.212	11.81	0.26	126	49.13	0.16	2.90	2.90	1.10	1.07	1.80	1.83
719.6	49.376	20.57	0.27	126	49.29	0.16	2.91	2.91	1.10	1.07	1.81	1.84
719.5	49.540	38.24	0.14	126	49.46	0.16	2.92	2.92	1.11	1.08	1.81	1.84
719.3	49.704	38.47	0.27	126	49.62	0.16	2.93	2.93	1.11	1.08	1.82	1.85
719.1	49.868	30.75	0.46	126	49.79	0.16	2.94	2.94	1.12	1.09	1.82	1.86
719.0	50.032	43.28	0.49	126	49.95	0.16	2.95	2.95	1.12	1.09	1.83	1.86
718.8	50.196	55.81	0.20	126	50.11	0.16	2.96	2.96	1.13	1.10	1.83	1.87
718.6	50.360	53.82	0.24	126	50.28	0.16	2.97	2.97	1.13	1.10	1.84	1.87
718.5	50.524	39.86	0.46	126	50.44	0.16	2.98	2.98	1.14	1.11	1.84	1.88
718.3	50.688	32.88	0.42	126	50.61	0.16	2.99	2.99	1.14	1.11	1.85	1.88
718.1	50.852	38.30	0.26	126	50.77	0.16	3.01	3.01	1.15	1.12	1.86	1.89
718.0	51.016	41.83	0.20	126	50.93	0.16	3.02	3.02	1.15	1.12	1.86	1.89
717.8	51.180	41.94	0.18	126	51.10	0.16	3.03	3.03	1.16	1.13	1.87	1.90
717.7	51.345	28.60	0.32	126	51.26	0.16	3.04	3.04	1.17	1.13	1.87	1.90
717.5	51.509	24.90	0.32	126	51.43	0.16	3.05	3.05	1.17	1.14	1.88	1.91
717.3	51.673	36.86	0.26	126	51.59	0.16	3.06	3.06	1.18	1.14	1.88	1.91
717.2	51.837	46.06	0.24	126	51.75	0.16	3.07	3.07	1.18	1.15	1.89	1.92
717.0	52.001	50.57	0.26	126	51.92	0.16	3.08	3.08	1.19	1.15	1.89	1.92
716.8	52.165	59.73	0.29	126	52.08	0.16	3.09	3.09	1.19	1.16	1.90	1.93
716.7	52.329	70.47	0.24	126	52.25	0.16	3.10	3.10	1.20	1.16	1.90	1.93
716.5	52.493	74.50	0.25	126	52.41	0.16	3.11	3.11	1.20	1.17	1.91	1.94
716.3	52.657	72.95	0.34	126	52.57	0.16	3.12	3.12	1.21	1.17	1.91	1.94
716.2	52.821	69.90	0.38	126	52.74	0.16	3.13	3.13	1.21	1.18	1.92	1.95
716.0	52.985	70.93	0.37	126	52.90	0.16	3.14	3.14	1.22	1.19	1.92	1.95
715.9	53.149	77.85	0.36	126	53.07	0.16	3.15	3.15	1.22	1.19	1.93	1.96
715.7	53.313	79.03	0.40	126	53.23	0.16	3.16	3.16	1.23	1.20	1.93	1.96
715.5	53.477	79.13	0.43	126	53.40	0.16	3.17	3.17	1.23	1.20	1.94	1.97
715.4	53.641	83.41	0.44	126	53.56	0.16	3.18	3.18	1.24	1.21	1.94	1.98
715.2	53.805	93.36	0.38	126	53.72	0.16	3.19	3.19	1.24	1.21	1.95	1.98
715.0	53.969	88.61	0.33	126	53.89	0.16	3.20	3.20	1.25	1.22	1.95	1.99
714.9	54.133	78.46	0.19	126	54.05	0.16	3.21	3.21	1.25	1.22	1.96	1.99
714.7	54.297	64.24	0.13	126	54.22	0.16	3.22	3.22	1.26	1.23	1.96	2.00
714.5	54.461	54.87	0.13	131	54.38	0.16	3.23	3.23	1.26	1.23	1.97	2.00
714.4	54.625	49.32	0.21	131	54.54	0.16	3.24	3.24	1.27	1.24	1.98	2.01
714.2	54.789	48.37	0.28	131	54.71	0.16	3.25	3.25	1.27	1.24	1.98	2.01

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
714.0	54.953	58.23	0.27	131	54.87	0.16	3.26	3.26	1.28	1.25	1.99	2.02
713.9	55.117	68.05	0.29	131	55.04	0.16	3.28	3.28	1.28	1.25	1.99	2.02
713.7	55.281	68.72	0.33	131	55.20	0.16	3.29	3.29	1.29	1.26	2.00	2.03
713.6	55.446	69.16	0.37	131	55.36	0.16	3.30	3.30	1.29	1.26	2.00	2.04
713.4	55.610	75.23	0.41	131	55.53	0.16	3.31	3.31	1.30	1.27	2.01	2.04
713.2	55.774	82.64	0.32	131	55.69	0.16	3.32	3.32	1.30	1.27	2.02	2.05
713.1	55.938	77.60	0.37	131	55.86	0.16	3.33	3.33	1.31	1.28	2.02	2.05
712.9	56.102	79.84	0.42	131	56.02	0.16	3.34	3.34	1.31	1.28	2.03	2.06
712.7	56.266	90.56	0.44	131	56.18	0.16	3.35	3.35	1.32	1.29	2.03	2.06
712.6	56.430	104.75	0.35	131	56.35	0.16	3.36	3.36	1.32	1.29	2.04	2.07
712.4	56.594	102.13	0.28	131	56.51	0.16	3.37	3.37	1.33	1.30	2.04	2.07
712.2	56.758	90.51	0.14	131	56.68	0.16	3.38	3.38	1.33	1.30	2.05	2.08
712.1	56.922	81.68	0.15	131	56.84	0.16	3.39	3.39	1.34	1.31	2.05	2.09
711.9	57.086	71.15	0.14	131	57.00	0.16	3.40	3.40	1.34	1.31	2.06	2.09
711.8	57.250	58.86	0.17	131	57.17	0.16	3.42	3.42	1.35	1.32	2.07	2.10
711.6	57.414	54.07	0.19	131	57.33	0.16	3.43	3.43	1.35	1.32	2.07	2.10
711.4	57.578	54.44	0.22	131	57.50	0.16	3.44	3.44	1.36	1.33	2.08	2.11
711.3	57.742	53.26	0.26	131	57.66	0.16	3.45	3.45	1.36	1.33	2.08	2.11
711.1	57.906	61.04	0.26	131	57.82	0.16	3.46	3.46	1.37	1.34	2.09	2.12
710.9	58.070	66.81	0.11	131	57.99	0.16	3.47	3.47	1.37	1.34	2.09	2.13
710.8	58.234	64.51	0.28	131	58.15	0.16	3.48	3.48	1.38	1.35	2.10	2.13
710.6	58.398	63.77	2.26	131	58.32	0.16	3.49	3.49	1.39	1.35	2.11	2.14
710.4	58.562	78.92	1.17	131	58.48	0.16	3.50	3.50	1.39	1.36	2.11	2.14
710.3	58.726	127.74	1.55	131	58.64	0.16	3.51	3.51	1.40	1.36	2.12	2.15
710.1	58.890	174.52	0.01	131	58.81	0.16	3.52	3.52	1.40	1.37	2.12	2.15
709.9	59.054	63.75	0.01	131	58.97	0.08	3.53	3.53	1.41	1.37	2.13	2.16

LIQUEFACTION POTENTIAL ASSESSMENT FOR COARSE GRAINED SOILS USING CONE PENETRATION TEST DATA

Project Site: KIF TDEC Stability
Project No.: 175668043
CPT ID: KIF-BF-CPT-2

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
769.0												
768.8	0.164	8.99	11.11	3.39	1.0	1.70	0.16	100	53.98	54.14	0.101	-0.213
768.7	0.328	4.06	12.46	3.68	1.0	1.70	0.16	100	53.98	54.14	0.100	-0.206
768.5	0.492	2.39	14.19	3.90	1.0	1.70	0.16	100	53.98	54.14	0.100	-0.202
768.3	0.656	1.55	16.47	4.09	1.0	1.70	0.16	100	53.98	54.14	0.099	-0.199
768.2	0.820	1.04	19.63	4.27	1.0	1.70	0.16	100	53.98	54.14	0.098	-0.196
768.0	0.984	0.70	24.28	4.46	1.0	1.70	0.16	100	53.98	54.14	0.098	-0.193
767.9	1.148	0.46	31.82	4.68	1.0	1.70	0.16	100	53.98	54.14	0.095	-0.191
767.7	1.312	0.28	46.14	4.95	1.0	1.70	0.16	100	53.98	54.14	0.094	-0.189
767.5	1.476	0.14	83.96	5.36	1.0	1.70	0.16	100	53.98	54.14	0.093	-0.188
767.4	1.640	0.02	465.07	6.44	1.0	1.70	0.16	100	53.98	54.14	0.092	-0.186
767.2	1.804	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.090	-0.185
767.0	1.968	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.089	-0.183
766.9	2.133	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.088	-0.182
766.7	2.297	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.086	-0.181
766.5	2.461	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.085	-0.180
766.4	2.625	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.083	-0.179
766.2	2.789	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.081	-0.178
766.0	2.953	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.080	-0.177
765.9	3.117	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.078	-0.176
765.7	3.281	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.077	-0.175
765.6	3.445	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.076	-0.174
765.4	3.609	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.074	-0.173
765.2	3.773	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.074	-0.172
765.1	3.937	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.073	-0.172
764.9	4.101	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.072	-0.171
764.7	4.265	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.071	-0.170
764.6	4.429	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.070	-0.169
764.4	4.593	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.070	-0.169
764.2	4.757	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.069	-0.168
764.1	4.921	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.069	-0.167
763.9	5.085	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.068	-0.167
763.8	5.249	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.067	-0.166
763.6	5.413	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.067	-0.165
763.4	5.577	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.066	-0.165
763.3	5.741	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.065	-0.164
763.1	5.905	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.064	-0.164
762.9	6.069	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.064	-0.163
762.8	6.234	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.063	-0.162
762.6	6.398	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.062	-0.162
762.4	6.562	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.062	-0.161
762.3	6.726	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.061	-0.161
762.1	6.890	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.061	-0.160
761.9	7.054	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.060	-0.160
761.8	7.218	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.060	-0.159
761.6	7.382	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.060	-0.159
761.5	7.546	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.059	-0.158
761.3	7.710	0.01	0.15	5.48	1.0	1.68	0.16	100	53.98	54.14	0.059	-0.158
761.1	7.874	0.01	0.15	5.48	1.0	1.66	0.16	100	53.98	54.14	0.059	-0.157
761.0	8.038	0.01	0.15	5.48	1.0	1.64	0.15	100	53.98	54.14	0.059	-0.157
760.8	8.202	0.01	0.15	5.48	1.0	1.62	0.15	100	53.98	54.13	0.058	-0.156
760.6	8.366	0.01	0.15	5.48	1.0	1.60	0.15	100	53.98	54.13	0.057	-0.156
760.5	8.530	0.01	0.15	5.48	1.0	1.58	0.15	100	53.98	54.13	0.057	-0.155
760.3	8.694	0.01	0.15	5.48	1.0	1.56	0.15	100	53.98	54.13	0.056	-0.155
760.1	8.858	0.01	0.15	5.48	1.0	1.54	0.15	100	53.98	54.12	0.056	-0.154
760.0	9.022	0.01	0.15	5.48	1.0	1.53	0.14	100	53.98	54.12	0.055	-0.154
759.8	9.186	0.01	0.15	5.48	1.0	1.51	0.14	100	53.98	54.12	0.055	-0.154
759.6	9.350	0.01	0.15	5.48	1.0	1.49	0.14	100	53.98	54.12	0.055	-0.153
759.5	9.514	0.01	0.15	5.48	1.0	1.48	0.14	100	53.98	54.12	0.055	-0.153
759.3	9.678	0.01	0.15	5.48	1.0	1.46	0.14	100	53.98	54.11	0.055	-0.152
759.2	9.842	0.01	0.15	5.48	1.0	1.45	0.14	100	53.98	54.11	0.055	-0.152

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
759.0	10.006	0.01	0.15	5.48	1.0	1.43	0.14	100	53.98	54.11	0.055	-0.151
758.8	10.170	0.01	0.15	5.48	1.0	1.42	0.13	100	53.97	54.11	0.055	-0.151
758.7	10.335	0.01	0.15	5.48	1.0	1.40	0.13	100	53.97	54.11	0.054	-0.151
758.5	10.499	0.01	0.15	5.48	1.0	1.39	0.13	100	53.97	54.11	0.054	-0.150
758.3	10.663	0.01	0.15	5.48	1.0	1.38	0.13	100	53.97	54.10	0.054	-0.150
758.2	10.827	0.01	0.15	5.48	1.0	1.36	0.13	100	53.97	54.10	0.053	-0.149
758.0	10.991	0.01	0.15	5.48	1.0	1.35	0.13	100	53.97	54.10	0.053	-0.149
757.8	11.155	0.01	0.15	5.48	1.0	1.34	0.13	100	53.97	54.10	0.053	-0.149
757.7	11.319	0.01	0.15	5.48	1.0	1.32	0.13	100	53.97	54.10	0.052	-0.148
757.5	11.483	0.01	0.15	5.48	1.0	1.31	0.12	100	53.97	54.10	0.052	-0.148
757.4	11.647	0.01	0.15	5.48	1.0	1.30	0.12	100	53.97	54.09	0.052	-0.147
757.2	11.811	0.01	0.15	5.48	1.0	1.29	0.12	100	53.97	54.09	0.052	-0.147
757.0	11.975	0.01	0.15	5.48	1.0	1.28	0.12	100	53.97	54.09	0.051	-0.147
756.9	12.139	7.49	1.05	2.88	1.0	1.25	7.28	93	55.61	62.89	0.051	-0.202
756.7	12.303	66.24	0.28	1.78	0.5	1.24	68.96	5	0.27	69.23	0.051	-0.238
756.5	12.467	143.64	0.49	1.60	0.5	1.16	140.38	0	0.00	140.38	0.051	-0.538
756.4	12.631	249.17	0.71	1.52	0.5	1.10	232.54	0	0.00	232.54	0.051	-0.600
756.2	12.795	301.81	0.92	1.54	0.5	1.09	279.97	0	0.00	279.97	0.050	-0.600
756.0	12.959	316.30	1.05	1.57	0.5	1.09	294.27	0	0.00	294.27	0.050	-0.600
755.9	13.123	286.12	1.56	1.74	0.5	1.08	267.07	2	0.00	267.07	0.050	-0.600
755.7	13.287	275.95	1.62	1.76	0.5	1.08	258.36	4	0.02	258.38	0.050	-0.600
755.5	13.451	314.79	1.47	1.69	0.5	1.08	295.48	0	0.00	295.48	0.050	-0.600
755.4	13.615	434.83	1.45	1.61	0.5	1.07	409.02	0	0.00	409.02	0.050	-0.600
755.2	13.779	460.27	1.62	1.64	0.5	1.07	434.14	0	0.00	434.14	0.050	-0.600
755.1	13.943	446.27	2.11	1.75	0.5	1.07	422.15	3	0.00	422.15	0.050	-0.600
754.9	14.107	520.32	0.40	1.11	0.5	1.06	492.96	0	0.00	492.96	0.050	-0.600
754.7	14.271	487.32	0.74	1.34	0.5	1.06	462.36	0	0.00	462.36	0.050	-0.600
754.6	14.436	508.80	1.36	1.55	0.5	1.06	483.34	0	0.00	483.34	0.049	-0.600
754.4	14.600	457.02	2.20	1.76	0.5	1.06	434.82	4	0.03	434.84	0.049	-0.600
754.2	14.764	374.33	2.75	1.89	0.5	1.06	356.76	14	37.98	394.74	0.049	-0.600
754.1	14.928	285.18	3.03	1.98	0.5	1.06	272.37	22	66.13	338.50	0.049	-0.600
753.9	15.092	224.33	2.59	1.98	0.5	1.05	214.72	21	57.32	272.03	0.049	-0.600
753.7	15.256	185.55	2.30	1.99	0.5	1.06	178.88	22	53.44	232.32	0.049	-0.600
753.6	15.420	147.55	2.13	2.02	0.5	1.07	143.77	25	54.82	198.59	0.049	-0.600
753.4	15.584	117.23	2.04	2.07	0.5	1.07	115.31	29	57.17	172.48	0.049	-0.600
753.3	15.748	99.80	1.97	2.11	0.5	1.07	98.82	32	57.73	156.55	0.049	-0.584
753.1	15.912	103.93	1.85	2.08	0.5	1.07	102.89	29	55.21	158.09	0.049	-0.589
752.9	16.076	138.34	1.13	1.84	0.5	1.07	137.17	10	9.34	146.51	0.049	-0.552
752.8	16.240	184.13	0.61	1.57	0.5	1.06	180.75	0	0.00	180.75	0.049	-0.600
752.6	16.404	206.37	0.40	1.42	0.5	1.05	201.69	0	0.00	201.69	0.049	-0.600
752.4	16.568	241.46	0.28	1.27	0.5	1.05	234.53	0	0.00	234.53	0.049	-0.600
752.3	16.732	254.94	0.39	1.34	0.5	1.04	247.30	0	0.00	247.30	0.049	-0.600
752.1	16.896	283.45	0.35	1.27	0.5	1.04	274.86	0	0.00	274.86	0.049	-0.600
751.9	17.060	314.87	0.36	1.25	0.5	1.04	305.59	0	0.00	305.59	0.049	-0.600
751.8	17.224	317.05	0.30	1.19	0.5	1.04	308.08	0	0.00	308.08	0.049	-0.600
751.6	17.388	282.49	0.25	1.19	0.5	1.03	274.93	0	0.00	274.93	0.050	-0.600
751.4	17.552	255.65	0.29	1.26	0.5	1.03	249.38	0	0.00	249.38	0.050	-0.600
751.3	17.716	246.21	0.26	1.25	0.5	1.03	240.78	0	0.00	240.78	0.051	-0.600
751.1	17.880	229.37	0.33	1.33	0.5	1.03	225.12	0	0.00	225.12	0.051	-0.600
751.0	18.044	226.41	0.33	1.33	0.5	1.03	222.53	0	0.00	222.53	0.052	-0.600
750.8	18.208	220.08	0.39	1.39	0.5	1.03	216.72	0	0.00	216.72	0.049	-0.600
750.6	18.372	251.86	0.29	1.27	0.5	1.03	247.20	0	0.00	247.20	0.046	-0.600
750.5	18.537	304.04	0.32	1.22	0.5	1.03	298.31	0	0.00	298.31	0.043	-0.600
750.3	18.701	338.68	0.25	1.13	0.5	1.02	332.55	0	0.00	332.55	0.039	-0.600
750.1	18.865	364.31	0.26	1.11	0.5	1.02	358.05	0	0.00	358.05	0.036	-0.600
750.0	19.029	410.51	0.23	1.04	0.5	1.02	403.79	0	0.00	403.79	0.033	-0.600
749.8	19.193	454.09	0.37	1.13	0.5	1.02	447.05	0	0.00	447.05	0.032	-0.600
749.6	19.357	471.31	0.38	1.13	0.5	1.02	464.48	0	0.00	464.48	0.031	-0.600
749.5	19.521	448.64	0.29	1.06	0.5	1.02	442.70	0	0.00	442.70	0.031	-0.600
749.3	19.685	411.68	0.25	1.06	0.5	1.02	406.77	0	0.00	406.77	0.031	-0.600
749.2	19.849	358.90	0.34	1.19	0.5	1.02	355.16	0	0.00	355.16	0.031	-0.600
749.0	20.013	322.37	0.33	1.22	0.5	1.01	319.49	0	0.00	319.49	0.031	-0.600
748.8	20.177	265.92	0.49	1.39	0.5	1.01	264.04	0	0.00	264.04	0.030	-0.600
748.7	20.341	260.02	0.46	1.37	0.5	1.01	258.50	0	0.00	258.50	0.030	-0.600
748.5	20.505	240.44	0.37	1.35	0.5	1.01	239.54	0	0.00	239.54	0.029	-0.600
748.3	20.669	207.44	0.33	1.37	0.5	1.01	207.32	0	0.00	207.32	0.029	-0.600

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
748.2	20.833	189.31	0.16	1.27	0.5	1.01	189.60	0	0.00	189.60	0.028	-0.600
748.0	20.997	166.72	0.15	1.31	0.5	1.01	167.38	0	0.00	167.38	0.028	-0.600
747.8	21.161	141.79	0.15	1.38	0.5	1.01	142.74	0	0.00	142.74	0.027	-0.536
747.7	21.325	123.03	0.15	1.44	0.5	1.01	124.14	0	0.00	124.14	0.027	-0.472
747.5	21.489	115.88	0.15	1.46	0.5	1.01	117.04	0	0.00	117.04	0.027	-0.445
747.3	21.653	113.99	0.15	1.47	0.5	1.00	115.18	0	0.00	115.18	0.026	-0.438
747.2	21.817	104.55	0.15	1.50	0.5	1.00	105.77	0	0.00	105.77	0.026	-0.401
747.0	21.981	93.18	0.15	1.55	0.5	1.00	94.41	0	0.00	94.41	0.025	-0.352
746.9	22.145	108.87	0.16	1.49	0.5	1.00	110.13	0	0.00	110.13	0.025	-0.418
746.7	22.309	135.94	0.27	1.49	0.5	1.00	137.29	0	0.00	137.29	0.024	-0.517
746.5	22.473	131.18	0.52	1.65	0.5	0.99	132.55	0	0.00	132.55	0.024	-0.501
746.4	22.638	129.91	1.06	1.84	0.5	0.99	131.31	10	0.00	131.31	0.023	-0.496
746.2	22.802	121.71	1.17	1.89	0.5	0.99	123.10	14	0.00	123.10	0.023	-0.467
746.0	22.966	110.96	1.31	1.96	0.5	0.99	112.31	19	0.00	112.31	0.022	-0.426
745.9	23.130	97.53	1.18	1.96	0.5	0.99	98.81	20	0.00	98.81	0.022	-0.370
745.7	23.294	90.85	0.90	1.92	0.5	0.98	92.09	16	0.00	92.09	0.021	-0.341
745.5	23.458	93.32	0.49	1.75	0.5	0.98	94.58	3	0.00	94.58	0.021	-0.352
745.4	23.622	92.02	0.34	1.68	0.5	0.98	93.27	0	0.00	93.27	0.020	-0.346
745.2	23.786	91.79	0.48	1.75	0.5	0.98	93.04	3	0.00	93.04	0.020	-0.345
745.1	23.950	93.10	0.75	1.86	0.5	0.98	94.37	12	0.00	94.37	0.019	-0.350
744.9	24.114	92.84	1.05	1.95	0.5	0.97	94.11	19	0.00	94.11	0.019	-0.349
744.7	24.278	91.77	1.18	1.98	0.5	0.97	93.02	22	0.00	93.02	0.019	-0.344
744.6	24.442	98.48	1.10	1.94	0.5	0.97	99.82	18	0.00	99.82	0.018	-0.374
744.4	24.606	118.81	0.82	1.80	0.5	0.97	120.47	7	0.00	120.47	0.018	-0.456
744.2	24.770	127.23	0.57	1.68	0.5	0.97	129.07	0	0.00	129.07	0.017	-0.487
744.1	24.934	118.67	0.41	1.63	0.5	0.97	120.38	0	0.00	120.38	0.017	-0.455
743.9	25.098	109.46	0.19	1.52	0.5	0.97	111.02	0	0.00	111.02	0.016	-0.419
743.7	25.262	97.77	0.15	1.53	0.5	0.96	99.13	0	0.00	99.13	0.016	-0.370
743.6	25.426	92.88	0.17	1.57	0.5	0.96	94.17	0	0.00	94.17	0.015	-0.349
743.4	25.590	96.53	0.15	1.54	0.5	0.96	97.89	0	0.00	97.89	0.015	-0.365
743.2	25.754	101.25	0.15	1.52	0.5	0.96	102.70	0	0.00	102.70	0.015	-0.385
743.1	25.918	92.80	0.23	1.61	0.5	0.96	94.09	0	0.00	94.09	0.014	-0.348
742.9	26.082	78.04	0.22	1.67	0.5	0.95	79.07	0	0.00	79.07	0.014	-0.277
742.8	26.246	64.40	0.22	1.76	0.5	0.94	65.24	3	0.00	65.24	0.013	-0.202
742.6	26.410	55.15	0.18	1.79	0.5	0.94	55.89	6	0.00	55.89	0.013	-0.144
742.4	26.574	54.20	0.15	1.78	0.5	0.94	54.91	5	0.00	54.91	0.013	-0.137
742.3	26.739	51.38	0.15	1.80	0.5	0.93	52.06	7	0.00	52.06	0.012	-0.118
742.1	26.903	48.02	0.15	1.83	0.5	0.93	48.66	10	0.00	48.66	0.012	-0.094
741.9	27.067	47.72	0.15	1.83	0.5	0.93	48.34	10	0.00	48.34	0.012	-0.091
741.8	27.231	42.49	0.17	1.90	0.5	0.92	43.07	15	0.00	43.07	0.011	-0.051
741.6	27.395	37.13	0.35	2.05	0.5	0.92	37.69	27	0.00	37.69	0.011	-0.007
741.4	27.559	33.61	0.55	2.17	0.5	0.92	34.17	36	0.00	34.17	0.010	0.025
741.3	27.723	32.49	0.75	2.24	0.5	0.91	33.03	43	0.00	33.03	0.010	0.036
741.1	27.887	33.54	0.84	2.26	0.5	0.91	34.06	44	0.00	34.06	0.010	0.027
740.9	28.051	34.15	0.96	2.28	0.5	0.91	34.65	45	0.00	34.65	0.009	0.021
740.8	28.215	31.64	1.04	2.33	0.5	0.91	32.13	49	0.00	32.13	0.009	0.045
740.6	28.379	28.58	1.05	2.37	0.5	0.90	29.09	52	0.00	29.09	0.008	0.077
740.5	28.543	25.71	1.06	2.41	0.5	0.90	26.23	56	0.00	26.23	0.008	0.100
740.3	28.707	26.06	1.05	2.40	0.5	0.90	26.56	55	0.00	26.56	0.008	0.100
740.1	28.871	28.94	1.04	2.36	0.5	0.90	29.39	52	0.00	29.39	0.007	0.074
740.0	29.035	31.29	1.13	2.35	0.5	0.90	31.70	51	0.00	31.70	0.007	0.050
739.8	29.199	33.79	1.08	2.31	0.5	0.89	34.17	48	0.00	34.17	0.006	0.026
739.6	29.363	35.22	0.97	2.27	0.5	0.89	35.57	45	0.00	35.57	0.006	0.014
739.5	29.527	35.18	0.99	2.28	0.5	0.89	35.51	45	0.00	35.51	0.005	0.014
739.3	29.691	32.03	1.12	2.34	0.5	0.89	32.36	50	0.00	32.36	0.005	0.044
739.1	29.855	28.07	1.26	2.42	0.5	0.88	28.43	56	0.00	28.43	0.004	0.084
739.0	30.019	26.42	1.15	2.42	0.5	0.88	26.78	56	0.00	26.78	0.004	0.100
738.8	30.183	25.51	0.98	2.39	0.5	0.88	25.87	54	0.00	25.87	0.003	0.100
738.7	30.347	24.89	0.83	2.37	0.5	0.87	25.25	52	0.00	25.25	0.003	0.100
738.5	30.511	24.22	0.85	2.38	0.5	0.87	24.57	53	0.00	24.57	0.002	0.100
738.3	30.675	23.68	0.96	2.42	0.5	0.87	24.02	56	0.00	24.02	0.002	0.100
738.2	30.840	23.77	1.09	2.44	0.5	0.87	24.10	58	0.00	24.10	0.001	0.100
738.0	31.004	24.70	1.18	2.45	0.5	0.86	25.00	59	0.00	25.00	0.001	0.100
737.8	31.168	28.11	1.08	2.38	0.5	0.87	28.33	53	0.00	28.33	0.000	0.086
737.7	31.332	29.92	1.14	2.37	0.5	0.87	30.10	52	0.00	30.10	0.001	0.068
737.5	31.496	28.98	1.35	2.42	0.5	0.86	29.15	57	0.00	29.15	0.001	0.078

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737.3	31.660	28.73	1.44	2.44	0.5	0.86	28.89	58	0.00	28.89	0.001	0.081
737.2	31.824	25.66	1.65	2.51	0.5	0.86	25.86	64	0.00	25.86	0.002	0.100
737.0	31.988	26.32	1.62	2.50	0.5	0.85	26.49	63	0.00	26.49	0.002	0.100
736.8	32.152	30.03	1.53	2.44	0.5	0.86	30.13	58	0.00	30.13	0.003	0.068
736.7	32.316	30.84	1.65	2.45	0.5	0.85	30.91	59	0.00	30.91	0.003	0.060
736.5	32.480	33.49	1.70	2.43	0.5	0.86	33.52	57	0.00	33.52	0.003	0.035
736.4	32.644	37.49	1.35	2.33	0.5	0.86	37.48	49	0.00	37.48	0.004	-0.001
736.2	32.808	43.93	1.58	2.31	0.5	0.86	43.90	48	0.00	43.90	0.004	-0.054
736.0	32.972	46.35	1.83	2.33	0.5	0.86	46.32	50	0.00	46.32	0.005	-0.073
735.9	33.136	44.71	2.09	2.38	0.5	0.86	44.65	54	0.00	44.65	0.005	-0.060
735.7	33.300	40.60	2.30	2.44	0.5	0.85	40.51	58	0.00	40.51	0.006	-0.027
735.5	33.464	39.15	2.33	2.46	0.5	0.85	39.04	60	0.00	39.04	0.006	-0.014
735.4	33.628	40.99	2.31	2.44	0.5	0.85	40.86	58	0.00	40.86	0.007	-0.030
735.2	33.792	42.56	2.35	2.43	0.5	0.85	42.42	58	0.00	42.42	0.007	-0.042
735.0	33.956	47.79	2.22	2.38	0.5	0.85	47.67	53	0.00	47.67	0.007	-0.082
734.9	34.120	52.00	2.01	2.32	0.5	0.85	51.92	49	0.00	51.92	0.008	-0.112
734.7	34.284	51.68	2.16	2.35	0.5	0.85	51.58	51	0.00	51.58	0.008	-0.110
734.6	34.448	56.51	2.17	2.32	0.5	0.85	56.47	48	0.00	56.47	0.009	-0.143
734.4	34.612	61.88	2.20	2.29	0.5	0.86	61.96	46	0.00	61.96	0.009	-0.177
734.2	34.776	65.48	2.14	2.27	0.5	0.86	65.66	44	0.00	65.66	0.010	-0.199
734.1	34.941	67.93	2.10	2.25	0.5	0.86	68.17	43	0.00	68.17	0.010	-0.213
733.9	35.105	71.67	2.02	2.22	0.5	0.86	72.05	41	0.00	72.05	0.010	-0.234
733.7	35.269	84.58	1.47	2.08	0.5	0.87	85.54	29	0.00	85.54	0.011	-0.303
733.6	35.433	78.22	1.07	2.01	0.5	0.86	78.85	24	0.00	78.85	0.011	-0.270
733.4	35.597	66.51	0.92	2.03	0.5	0.85	66.65	25	0.00	66.65	0.012	-0.204
733.2	35.761	35.94	1.68	2.40	0.5	0.82	35.61	55	0.00	35.61	0.012	0.017
733.1	35.925	15.63	3.14	2.85	1.0	0.80	18.20	91	0.00	18.20	0.013	0.100
732.9	36.089	8.69	4.27	3.14	1.0	0.80	10.82	100	0.00	10.82	0.013	0.100
732.7	36.253	6.61	3.28	3.17	1.0	0.80	8.62	100	0.00	8.62	0.013	0.100
732.6	36.417	5.26	1.95	3.14	1.0	0.80	7.19	100	0.00	7.19	0.014	0.100
732.4	36.581	4.56	0.96	3.06	1.0	0.79	6.45	100	0.00	6.45	0.014	0.100
732.3	36.745	4.15	0.86	3.08	1.0	0.79	6.02	100	0.00	6.02	0.015	0.100
732.1	36.909	4.01	0.98	3.11	1.0	0.79	5.88	100	0.00	5.88	0.015	0.100
731.9	37.073	4.14	1.16	3.13	1.0	0.79	6.03	100	0.00	6.03	0.016	0.100
731.8	37.237	4.37	1.32	3.13	1.0	0.79	6.28	100	0.00	6.28	0.016	0.100
731.6	37.401	4.70	1.45	3.12	1.0	0.78	6.63	100	0.00	6.63	0.016	0.100
731.4	37.565	4.66	1.48	3.13	1.0	0.78	6.60	100	0.00	6.60	0.017	0.100
731.3	37.729	4.94	1.59	3.12	1.0	0.78	6.90	100	0.00	6.90	0.017	0.100
731.1	37.893	4.85	2.52	3.22	1.0	0.78	6.82	100	0.00	6.82	0.018	0.100
730.9	38.057	4.90	2.98	3.26	1.0	0.78	6.87	100	0.00	6.87	0.018	0.100
730.8	38.221	4.79	2.48	3.22	1.0	0.78	6.77	100	0.00	6.77	0.018	0.100
730.6	38.385	4.46	2.30	3.23	1.0	0.77	6.41	100	0.00	6.41	0.019	0.100
730.5	38.549	3.86	2.18	3.28	1.0	0.77	5.78	100	0.00	5.78	0.019	0.100
730.3	38.713	3.82	2.04	3.27	1.0	0.77	5.74	100	0.00	5.74	0.019	0.100
730.1	38.877	3.81	1.95	3.26	1.0	0.77	5.74	100	0.00	5.74	0.020	0.100
730.0	39.042	3.91	1.72	3.22	1.0	0.77	5.85	100	0.00	5.85	0.020	0.100
729.8	39.206	3.64	2.00	3.28	1.0	0.77	5.56	100	0.00	5.56	0.021	0.100
729.6	39.370	3.98	2.12	3.26	1.0	0.76	5.93	100	0.00	5.93	0.021	0.100
729.5	39.534	5.34	1.43	3.07	1.0	0.82	7.92	100	56.39	64.31	0.021	-0.188
729.3	39.698	4.58	1.63	3.15	1.0	0.81	7.05	100	56.12	63.17	0.022	-0.181
729.1	39.862	4.01	1.64	3.21	1.0	0.81	6.40	100	55.92	62.32	0.022	-0.176
729.0	40.026	3.91	1.49	3.20	1.0	0.81	6.29	100	55.89	62.18	0.022	-0.175
728.8	40.190	3.92	1.50	3.20	1.0	0.81	6.32	100	55.89	62.21	0.023	-0.175
728.6	40.354	4.09	1.36	3.16	1.0	0.81	6.53	100	55.96	62.49	0.023	-0.177
728.5	40.518	4.34	1.30	3.13	1.0	0.80	6.82	100	56.05	62.87	0.023	-0.179
728.3	40.682	4.22	1.24	3.13	1.0	0.80	6.69	100	56.01	62.70	0.024	-0.178
728.2	40.846	4.40	1.42	3.14	1.0	0.80	6.92	100	56.08	63.00	0.024	-0.180
728.0	41.010	5.03	1.24	3.06	1.0	0.80	7.67	100	56.31	63.99	0.024	-0.185
727.8	41.174	5.11	1.32	3.07	1.0	0.80	7.77	100	56.35	64.12	0.025	-0.186
727.7	41.338	6.64	1.63	3.01	1.0	0.80	9.61	100	56.92	66.53	0.025	-0.200
727.5	41.502	23.34	0.54	2.31	0.5	0.81	24.68	48	51.58	76.26	0.025	-0.253
727.3	41.666	18.45	0.81	2.48	0.5	0.80	19.86	61	54.55	74.41	0.025	-0.243
727.2	41.830	12.24	0.97	2.67	1.0	0.80	16.36	77	56.46	72.82	0.026	-0.234
727.0	41.994	14.12	1.02	2.63	1.0	0.80	18.68	73	56.58	75.26	0.026	-0.247
726.8	42.158	16.66	1.30	2.62	1.0	0.80	21.83	72	57.36	79.19	0.026	-0.267
726.7	42.322	16.46	1.70	2.68	1.0	0.80	21.64	77	58.13	79.76	0.027	-0.270

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
726.5	42.486	23.04	1.20	2.48	0.5	0.80	24.50	61	55.86	80.36	0.027	-0.273
726.3	42.650	34.07	1.07	2.31	0.5	0.81	35.69	47	54.41	90.09	0.027	-0.320
726.2	42.814	42.00	0.94	2.20	0.5	0.81	43.78	39	51.82	95.60	0.027	-0.344
726.0	42.978	40.38	1.08	2.25	0.5	0.81	42.18	43	53.71	95.90	0.028	-0.345
725.9	43.143	38.47	1.19	2.29	0.5	0.81	40.26	46	54.92	95.17	0.028	-0.342
725.7	43.307	38.37	1.00	2.25	0.5	0.80	40.09	43	53.19	93.28	0.028	-0.334
725.5	43.471	35.30	1.04	2.29	0.5	0.80	36.95	46	54.01	90.97	0.028	-0.323
725.4	43.635	31.90	0.99	2.31	0.5	0.80	33.46	48	54.04	87.50	0.028	-0.307
725.2	43.799	27.71	1.13	2.39	0.5	0.79	29.22	55	55.35	84.57	0.029	-0.293
725.0	43.963	23.95	1.15	2.45	0.5	0.79	25.43	59	55.63	81.05	0.029	-0.276
724.9	44.127	15.26	1.27	2.64	1.0	0.78	20.50	74	57.33	77.83	0.029	-0.259
724.7	44.291	13.01	1.72	2.77	1.0	0.78	17.73	85	57.90	75.64	0.029	-0.248
724.5	44.455	11.74	2.24	2.87	1.0	0.78	16.20	92	58.28	74.48	0.029	-0.242
724.4	44.619	11.86	3.59	2.98	1.0	0.78	16.38	100	59.02	75.40	0.030	-0.246
724.2	44.783	13.60	3.68	2.94	1.0	0.78	18.60	98	59.56	78.16	0.030	-0.260
724.1	44.947	13.81	3.13	2.89	1.0	0.78	18.87	94	59.30	78.18	0.030	-0.260
723.9	45.111	10.28	2.92	2.98	1.0	0.77	14.48	100	58.43	72.91	0.030	-0.233
723.7	45.275	7.72	4.28	3.18	1.0	0.77	11.31	100	57.44	68.75	0.030	-0.210
723.6	45.439	6.95	2.40	3.08	1.0	0.76	10.37	100	57.15	67.52	0.030	-0.203
723.4	45.603	6.47	1.76	3.04	1.0	0.76	9.79	100	56.97	66.76	0.031	-0.198
723.2	45.767	5.48	3.25	3.23	1.0	0.76	8.57	100	56.60	65.17	0.031	-0.189
723.1	45.931	7.08	2.19	3.05	1.0	0.76	10.58	100	57.22	67.80	0.031	-0.204
722.9	46.095	11.82	1.45	2.77	1.0	0.77	16.52	84	57.52	74.04	0.031	-0.238
722.7	46.259	10.61	2.13	2.89	1.0	0.76	15.04	94	58.12	73.16	0.031	-0.233
722.6	46.423	14.50	1.89	2.75	1.0	0.77	20.00	83	58.41	78.41	0.031	-0.261
722.4	46.587	30.73	1.62	2.44	0.5	0.78	32.42	59	57.42	89.84	0.031	-0.316
722.2	46.751	41.51	1.18	2.26	0.5	0.78	43.50	44	54.50	98.00	0.031	-0.352
722.1	46.915	55.63	0.61	2.00	0.5	0.78	57.33	23	36.35	93.68	0.032	-0.333
721.9	47.079	59.40	0.42	1.90	0.5	0.76	59.98	15	18.81	78.79	0.032	-0.262
721.8	47.244	59.16	0.45	1.91	0.5	0.76	59.99	16	22.05	82.04	0.032	-0.278
721.6	47.408	58.24	0.57	1.97	0.5	0.77	59.80	20	32.03	91.82	0.032	-0.324
721.4	47.572	55.75	0.66	2.01	0.5	0.78	57.65	24	38.87	96.52	0.032	-0.345
721.3	47.736	48.61	0.81	2.11	0.5	0.78	50.63	32	47.55	98.18	0.032	-0.352
721.1	47.900	42.76	0.80	2.15	0.5	0.77	44.56	35	49.33	93.88	0.032	-0.333
720.9	48.064	38.23	0.69	2.16	0.5	0.76	39.81	36	48.88	88.69	0.033	-0.310
720.8	48.228	36.69	0.69	2.18	0.5	0.76	38.24	37	49.43	87.68	0.033	-0.305
720.6	48.392	32.73	0.79	2.25	0.5	0.76	34.27	43	52.00	86.27	0.033	-0.298
720.4	48.556	26.59	0.95	2.37	0.5	0.75	28.09	53	54.41	82.50	0.033	-0.280
720.3	48.720	11.69	1.44	2.77	1.0	0.75	16.74	85	57.60	74.34	0.033	-0.238
720.1	48.884	7.81	1.11	2.87	1.0	0.74	11.77	93	56.96	68.73	0.033	-0.207
720.0	49.048	5.77	1.51	3.05	1.0	0.73	9.20	100	56.79	65.99	0.033	-0.192
719.8	49.212	4.94	2.93	3.25	1.0	0.73	8.16	100	56.47	64.62	0.033	-0.184
719.6	49.376	9.76	1.52	2.85	1.0	0.74	14.34	91	57.56	71.90	0.033	-0.225
719.5	49.540	25.50	0.39	2.22	0.5	0.74	26.75	40	48.56	75.31	0.033	-0.243
719.3	49.704	25.62	0.76	2.34	0.5	0.74	27.06	50	53.18	80.24	0.033	-0.268
719.1	49.868	15.24	1.65	2.70	1.0	0.74	21.59	79	58.36	79.95	0.034	-0.266
719.0	50.032	28.99	1.20	2.39	0.5	0.75	30.61	54	55.65	86.26	0.034	-0.297
718.8	50.196	37.93	0.37	2.05	0.5	0.74	38.98	27	39.52	78.50	0.034	-0.259
718.6	50.360	36.45	0.48	2.11	0.5	0.74	37.74	32	44.63	82.38	0.034	-0.278
718.5	50.524	26.40	1.23	2.43	0.5	0.74	27.97	58	55.90	83.87	0.034	-0.285
718.3	50.688	16.15	1.39	2.64	1.0	0.74	22.94	74	58.03	80.98	0.034	-0.271
718.1	50.852	25.19	0.75	2.34	0.5	0.74	26.63	50	53.14	79.78	0.034	-0.265
718.0	51.016	27.67	0.52	2.23	0.5	0.73	29.01	42	49.89	78.90	0.034	-0.260
717.8	51.180	27.70	0.47	2.21	0.5	0.73	29.00	40	48.96	77.96	0.034	-0.255
717.7	51.345	13.67	1.27	2.68	1.0	0.73	19.73	78	57.60	77.32	0.034	-0.252
717.5	51.509	11.65	1.45	2.77	1.0	0.73	17.08	85	57.74	74.82	0.034	-0.239
717.3	51.673	23.96	0.77	2.37	0.5	0.73	25.41	52	53.55	78.96	0.034	-0.260
717.2	51.837	30.43	0.55	2.21	0.5	0.73	31.81	39	49.29	81.10	0.034	-0.271
717.0	52.001	33.57	0.55	2.17	0.5	0.73	34.96	36	47.90	82.86	0.034	-0.279
716.8	52.165	39.98	0.51	2.09	0.5	0.73	41.35	30	43.51	84.86	0.034	-0.289
716.7	52.329	47.49	0.36	1.95	0.5	0.72	48.12	19	28.70	76.82	0.034	-0.249
716.5	52.493	50.26	0.35	1.92	0.5	0.72	50.60	17	23.73	74.33	0.035	-0.236
716.3	52.657	49.09	0.48	1.99	0.5	0.73	50.32	23	35.02	85.34	0.035	-0.291
716.2	52.821	46.88	0.57	2.05	0.5	0.73	48.45	27	41.20	89.65	0.035	-0.311
716.0	52.985	47.53	0.55	2.03	0.5	0.73	49.04	26	39.84	88.88	0.035	-0.307
715.9	53.149	52.30	0.48	1.97	0.5	0.73	53.47	21	31.92	85.39	0.035	-0.291

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715.7	53.313	53.05	0.53	1.98	0.5	0.73	54.46	22	34.09	88.55	0.035	-0.306
715.5	53.477	53.04	0.57	2.00	0.5	0.73	54.65	23	36.47	91.13	0.035	-0.317
715.4	53.641	55.94	0.54	1.97	0.5	0.73	57.42	21	32.37	89.79	0.035	-0.311
715.2	53.805	62.79	0.42	1.87	0.5	0.71	62.91	13	14.02	76.93	0.035	-0.248
715.0	53.969	59.40	0.39	1.88	0.5	0.71	59.38	13	15.14	74.52	0.035	-0.236
714.9	54.133	52.26	0.26	1.86	0.5	0.69	51.37	12	11.11	62.48	0.035	-0.168
714.7	54.297	42.32	0.22	1.93	0.5	0.70	42.21	17	22.92	65.13	0.035	-0.183
714.5	54.461	35.77	0.25	2.01	0.5	0.70	36.43	24	35.39	71.82	0.035	-0.221
714.4	54.625	31.87	0.46	2.15	0.5	0.71	33.15	35	46.72	79.87	0.035	-0.263
714.2	54.789	31.16	0.61	2.22	0.5	0.71	32.61	40	50.08	82.69	0.035	-0.277
714.0	54.953	37.91	0.49	2.10	0.5	0.71	39.23	31	44.14	83.38	0.035	-0.280
713.9	55.117	44.61	0.45	2.02	0.5	0.71	45.78	25	37.63	83.41	0.035	-0.280
713.7	55.281	45.00	0.51	2.04	0.5	0.71	46.38	26	39.96	86.33	0.035	-0.294
713.6	55.446	45.23	0.57	2.06	0.5	0.72	46.79	28	42.14	88.93	0.035	-0.306
713.4	55.610	49.33	0.57	2.03	0.5	0.72	50.94	25	39.44	90.38	0.035	-0.313
713.2	55.774	54.32	0.40	1.92	0.5	0.70	54.81	17	23.67	78.48	0.035	-0.255
713.1	55.938	50.79	0.49	1.99	0.5	0.71	52.05	22	34.18	86.23	0.036	-0.293
712.9	56.102	52.25	0.55	2.00	0.5	0.71	53.78	23	35.96	89.74	0.036	-0.309
712.7	56.266	59.47	0.50	1.93	0.5	0.71	60.56	17	25.64	86.21	0.036	-0.293
712.6	56.430	69.05	0.34	1.80	0.5	0.69	67.88	7	1.19	69.08	0.036	-0.205
712.4	56.594	67.17	0.28	1.77	0.5	0.68	65.66	5	0.10	65.76	0.036	-0.186
712.2	56.758	59.17	0.16	1.75	0.5	0.67	57.03	3	0.00	57.03	0.036	-0.132
712.1	56.922	53.10	0.19	1.82	0.5	0.66	51.05	8	3.16	54.21	0.036	-0.114
711.9	57.086	45.89	0.21	1.89	0.5	0.67	45.08	14	15.95	61.03	0.036	-0.157
711.8	57.250	37.50	0.30	2.02	0.5	0.69	38.25	25	36.51	74.76	0.036	-0.235
711.6	57.414	34.21	0.38	2.10	0.5	0.69	35.32	31	43.04	78.36	0.036	-0.254
711.4	57.578	34.40	0.44	2.12	0.5	0.69	35.64	32	44.80	80.43	0.036	-0.264
711.3	57.742	33.55	0.52	2.16	0.5	0.69	34.92	36	47.32	82.23	0.036	-0.273
711.1	57.906	38.74	0.45	2.08	0.5	0.69	39.97	29	42.29	82.26	0.036	-0.273
710.9	58.070	42.56	0.17	1.90	0.5	0.66	41.73	15	17.29	59.02	0.036	-0.144
710.8	58.234	40.95	0.46	2.06	0.5	0.69	42.18	28	40.94	83.12	0.036	-0.277
710.6	58.398	28.64	3.74	2.70	1.0	0.72	43.32	79	64.78	108.10	0.036	-0.387
710.4	58.562	50.47	1.55	2.26	0.5	0.72	53.76	44	57.22	110.98	0.036	-0.398
710.3	58.726	83.02	1.25	2.03	0.5	0.75	89.95	26	47.24	137.19	0.036	-0.494
710.1	58.890	114.12	0.15	1.47	0.5	0.73	120.09	0	0.00	120.09	0.036	-0.433
709.9	59.054	40.14	0.15	1.91	0.5	0.65	39.42	16	19.48	58.90	0.036	-0.143

LIQUEFACTION POTENTIAL ASSESSMENT FOR COARSE GRAINED SOILS USING CONE PENETRATION TEST DATA

Project Site: KIF TDEC Stability
Stantec Project No.: 175668043
CPT ID: KIF-BF-CPT-2

Depth to Water during Earthquake:	15.0	ft
Final Grade Elevation during EQ:	769.0	ft
Height of Final Grade above CPT TOH:	0.0	ft
Normalize K_σ to:	1.058	tsf
a_{max} at top of ground surface:	0.10	g
Earthquake Magnitude:	7.60	M_W
Earthquake File or Source Zone:	1	Hz

Shear Stress Fit Parameters

m4:	0
m3:	0
m2:	0
m1:	0

Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
769.0																	
768.8	0.164	0.095	31	1.100	N/A	1.00	N/A	1.000	0	0	**0.063**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**B**
768.7	0.328	0.095	31	1.100	N/A	1.00	N/A	1.000	0	0	**0.063**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**B**
768.5	0.492	0.095	31	1.100	N/A	1.00	N/A	1.000	0	0	**0.063**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**B**
768.3	0.656	0.095	31	1.100	N/A	1.00	N/A	1.000	0	0	**0.063**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**B**
768.2	0.820	0.095	31	1.100	N/A	1.00	N/A	1.000	0	0	**0.063**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**B**
768.0	0.984	0.095	31	1.100	N/A	1.00	N/A	1.000	0	0	**0.063**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**B**
767.9	1.148	0.095	31	1.100	N/A	1.00	N/A	1.000	0	0	**0.063**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**B**
767.7	1.312	0.095	31	1.100	N/A	1.00	N/A	1.000	0	0	**0.063**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**B**
767.5	1.476	0.095	31	1.100	N/A	1.00	N/A	1.000	0	0	**0.063**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**B**
767.4	1.640	0.095	31	1.100	N/A	1.00	N/A	1.000	0	0	**0.063**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**B**
767.2	1.804	0.095	31	1.100	N/A	1.00	N/A	1.000	0	0	**0.063**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
767.0	1.968	0.095	31	1.100	N/A	1.00	N/A	1.000	0	0	**0.063**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
766.9	2.133	0.095	31	1.100	N/A	1.00	N/A	1.000	0	0	**0.063**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
766.7	2.297	0.095	31	1.100	N/A	1.00	N/A	1.000	0	0	**0.063**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
766.5	2.461	0.095	31	1.100	N/A	1.00	N/A	1.000	0	0	**0.063**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
766.4	2.625	0.095	31	1.100	N/A	1.00	N/A	1.000	0	0	**0.063**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
766.2	2.789	0.095	31	1.100	N/A	1.00	N/A	1.000	0	0	**0.063**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
766.0	2.953	0.095	31	1.100	N/A	1.00	N/A	1.000	0	0	**0.063**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
765.9	3.117	0.095	31	1.100	N/A	1.00	N/A	1.000	0	0	**0.063**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
765.7	3.281	0.095	31	1.100	N/A	1.00	N/A	1.000	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
765.6	3.445	0.095	31	1.100	N/A	1.00	N/A	0.999	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
765.4	3.609	0.095	31	1.100	N/A	1.00	N/A	0.999	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
765.2	3.773	0.095	31	1.100	N/A	1.00	N/A	0.998	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
765.1	3.937	0.095	31	1.100	N/A	1.00	N/A	0.998	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
764.9	4.101	0.095	31	1.100	N/A	1.00	N/A	0.998	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
764.7	4.265	0.095	31	1.100	N/A	1.00	N/A	0.997	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
764.6	4.429	0.095	31	1.100	N/A	1.00	N/A	0.997	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
764.4	4.593	0.095	31	1.100	N/A	1.00	N/A	0.997	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
764.2	4.757	0.095	31	1.097	N/A	1.00	N/A	0.996	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
764.1	4.921	0.095	31	1.095	N/A	1.00	N/A	0.996	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
763.9	5.085	0.095	31	1.092	N/A	1.00	N/A	0.995	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
763.8	5.249	0.095	31	1.090	N/A	1.00	N/A	0.995	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
763.6	5.413	0.095	31	1.088	N/A	1.00	N/A	0.995	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
763.4	5.577	0.095	31	1.085	N/A	1.00	N/A	0.994	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
763.3	5.741	0.095	31	1.083	N/A	1.00	N/A	0.994	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
763.1	5.905	0.095	31	1.081	N/A	1.00	N/A	0.994	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
762.9	6.069	0.095	31	1.079	N/A	1.00	N/A	0.993	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
762.8	6.234	0.095	31	1.077	N/A	1.00	N/A	0.993	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
762.6	6.398	0.095	31	1.075	N/A	1.00	N/A	0.992	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
762.4	6.562	0.095	31	1.073	N/A	1.00	N/A	0.992	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
762.3	6.726	0.095	31	1.072	N/A	1.00	N/A	0.992	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
762.1	6.890	0.095	31	1.070	N/A	1.00	N/A	0.991	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
761.9	7.054	0.095	31	1.068	N/A	1.00	N/A	0.991	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
761.8	7.218	0.095	31	1.066	N/A	1.00	N/A	0.990	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**

Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
761.6	7.382	0.095	31	1.065	N/A	1.00	N/A	0.990	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
761.5	7.546	0.095	31	1.063	N/A	1.00	N/A	0.989	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
761.3	7.710	0.095	31	1.062	N/A	1.00	N/A	0.989	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
761.1	7.874	0.095	31	1.060	N/A	1.00	N/A	0.989	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
761.0	8.038	0.095	31	1.058	N/A	1.00	N/A	0.988	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
760.8	8.202	0.095	31	1.057	N/A	1.00	N/A	0.988	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
760.6	8.366	0.095	31	1.056	N/A	1.00	N/A	0.987	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
760.5	8.530	0.095	31	1.054	N/A	1.00	N/A	0.987	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
760.3	8.694	0.095	31	1.053	N/A	1.00	N/A	0.986	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
760.1	8.858	0.095	31	1.051	N/A	1.00	N/A	0.986	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
760.0	9.022	0.095	31	1.050	N/A	1.00	N/A	0.986	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
759.8	9.186	0.095	31	1.049	N/A	1.00	N/A	0.985	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
759.6	9.350	0.095	31	1.047	N/A	1.00	N/A	0.985	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
759.5	9.514	0.095	31	1.046	N/A	1.00	N/A	0.984	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
759.3	9.678	0.095	31	1.045	N/A	1.00	N/A	0.984	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
759.2	9.842	0.095	31	1.044	N/A	1.00	N/A	0.983	0	0	**0.061**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
759.0	10.006	0.095	31	1.042	N/A	1.00	N/A	0.983	0	0	**0.061**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
758.8	10.170	0.095	31	1.041	N/A	1.00	N/A	0.982	0	0	**0.061**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
758.7	10.335	0.095	31	1.040	N/A	1.00	N/A	0.982	0	0	**0.061**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
758.5	10.499	0.095	31	1.039	N/A	1.00	N/A	0.982	0	0	**0.061**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
758.3	10.663	0.095	31	1.038	N/A	1.00	N/A	0.981	0	0	**0.061**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
758.2	10.827	0.095	31	1.037	N/A	1.00	N/A	0.981	0	0	**0.061**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
758.0	10.991	0.095	31	1.035	N/A	1.00	N/A	0.980	0	0	**0.061**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
757.8	11.155	0.095	31	1.034	N/A	1.00	N/A	0.980	0	0	**0.061**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
757.7	11.319	0.095	31	1.033	N/A	1.00	N/A	0.979	0	0	**0.061**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
757.5	11.483	0.095	31	1.032	N/A	1.00	N/A	0.979	0	0	**0.061**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
757.4	11.647	0.095	31	1.031	N/A	1.00	N/A	0.978	0	0	**0.061**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
757.2	11.811	0.095	31	1.030	N/A	1.00	N/A	0.978	0	0	**0.061**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
757.0	11.975	0.095	31	1.029	N/A	1.00	N/A	0.977	0	0	**0.061**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
756.9	12.139	0.102	36	1.030	N/A	1.00	N/A	0.977	0	0	**0.061**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
756.7	12.303	0.107	40	1.031	N/A	1.00	N/A	0.976	0	0	**0.061**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**A2**
756.5	12.467	0.236	70	1.052	N/A	0.98	N/A	0.976	0	0	**0.061**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**A1**
756.4	12.631	N/A	95	N/A	N/A	N/A	N/A	0.975	0	0	**0.061**	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**	**A1**
756.2	12.795	N/A	100	N/A	N/A	N/A	N/A	0.975	0	0	**0.061**	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**	**A1**
756.0	12.959	N/A	100	N/A	N/A	N/A	N/A	0.974	0	0	**0.061**	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**	**A1**
755.9	13.123	N/A	100	N/A	N/A	N/A	N/A	0.974	0	0	**0.061**	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**	**A1**
755.7	13.287	N/A	100	N/A	N/A	N/A	N/A	0.973	0	0	**0.061**	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**	**A1**
755.5	13.451	N/A	100	N/A	N/A	N/A	N/A	0.973	0	0	**0.061**	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**	**A1**
755.4	13.615	N/A	100	N/A	N/A	N/A	N/A	0.972	0	0	**0.061**	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**	**A1**
755.2	13.779	N/A	100	N/A	N/A	N/A	N/A	0.972	0	0	**0.061**	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**	**A1**
755.1	13.943	N/A	100	N/A	N/A	N/A	N/A	0.971	0	0	**0.061**	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**	**A1**
754.9	14.107	N/A	100	N/A	N/A	N/A	N/A	0.971	0	0	**0.061**	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**	**A1**
754.7	14.271	N/A	100	N/A	N/A	N/A	N/A	0.970	0	0	**0.061**	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**	**A1**
754.6	14.436	N/A	100	N/A	N/A	N/A	N/A	0.970	0	0	**0.061**	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**	**A1**
754.4	14.600	N/A	100	N/A	N/A	N/A	N/A	0.969	0	0	**0.061**	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**	**A1**
754.2	14.764	N/A	100	N/A	N/A	N/A	N/A	0.969	0	0	**0.061**	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**	**A1**
754.1	14.928	N/A	100	N/A	N/A	N/A	N/A	0.968	0	0	**0.061**	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**	**A1**
753.9	15.092	N/A	100	N/A	N/A	N/A	N/A	0.968	0	0	**0.061**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
753.7	15.256	N/A	95	N/A	N/A	N/A	N/A	0.967	0	0	**0.061**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
753.6	15.420	N/A	87	N/A	N/A	N/A	N/A	0.967	0	0	**0.061**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
753.4	15.584	0.548	80	1.030	1.325	0.97	0.724	0.966	0	0	**0.062**	FALSE	FALSE	FALSE	**11.7**	**Bottom Ash**	**A1**
753.3	15.748	0.338	75	1.025	1.281	0.98	0.434	0.966	0	0	**0.062**	FALSE	FALSE	FALSE	**7.0**	**Bottom Ash**	**A1**
753.1	15.912	0.353	76	1.024	1.293	0.97	0.455	0.965	0	0	**0.062**	FALSE	FALSE	FALSE	**7.3**	**Bottom Ash**	**A1**
752.9	16.076	0.267	72	1.021	1.208	0.98	0.323	0.965	0	0	**0.063**	FALSE	FALSE	FALSE	**5.2**	**Bottom Ash**	**A1**
752.8	16.240	N/A	82	N/A	N/A	N/A	N/A	0.964	0	0	**0.063**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**

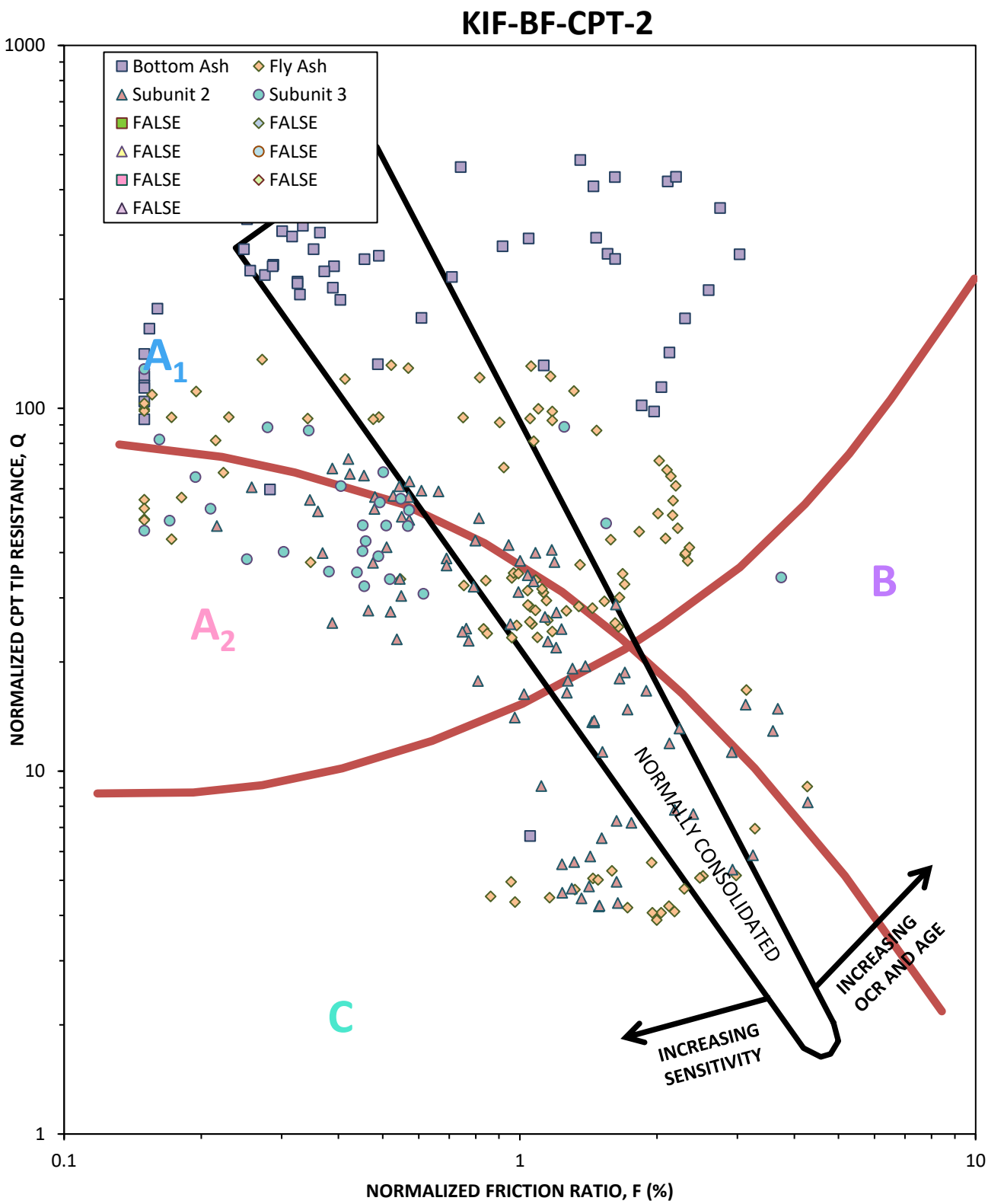
Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
752.6	16.404	N/A	88	N/A	N/A	N/A	N/A	0.964	0	0	**0.063**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
752.4	16.568	N/A	96	N/A	N/A	N/A	N/A	0.963	0	0	**0.063**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
752.3	16.732	N/A	99	N/A	N/A	N/A	N/A	0.963	0	0	**0.064**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
752.1	16.896	N/A	100	N/A	N/A	N/A	N/A	0.962	0	0	**0.064**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
751.9	17.060	N/A	100	N/A	N/A	N/A	N/A	0.962	0	0	**0.064**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
751.8	17.224	N/A	100	N/A	N/A	N/A	N/A	0.961	0	0	**0.064**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
751.6	17.388	N/A	100	N/A	N/A	N/A	N/A	0.961	0	0	**0.065**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
751.4	17.552	N/A	99	N/A	N/A	N/A	N/A	0.960	0	0	**0.065**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
751.3	17.716	N/A	97	N/A	N/A	N/A	N/A	0.959	0	0	**0.065**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
751.1	17.880	N/A	93	N/A	N/A	N/A	N/A	0.959	0	0	**0.065**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
751.0	18.044	N/A	93	N/A	N/A	N/A	N/A	0.958	0	0	**0.066**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
750.8	18.208	N/A	91	N/A	N/A	N/A	N/A	0.958	0	0	**0.066**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
750.6	18.372	N/A	98	N/A	N/A	N/A	N/A	0.957	0	0	**0.066**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
750.5	18.537	N/A	100	N/A	N/A	N/A	N/A	0.957	0	0	**0.066**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
750.3	18.701	N/A	100	N/A	N/A	N/A	N/A	0.956	0	0	**0.067**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
750.1	18.865	N/A	100	N/A	N/A	N/A	N/A	0.956	0	0	**0.067**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
750.0	19.029	N/A	100	N/A	N/A	N/A	N/A	0.955	0	0	**0.067**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
749.8	19.193	N/A	100	N/A	N/A	N/A	N/A	0.954	0	0	**0.067**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
749.6	19.357	N/A	100	N/A	N/A	N/A	N/A	0.954	0	0	**0.068**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
749.5	19.521	N/A	100	N/A	N/A	N/A	N/A	0.953	0	0	**0.068**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
749.3	19.685	N/A	100	N/A	N/A	N/A	N/A	0.953	0	0	**0.068**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
749.2	19.849	N/A	100	N/A	N/A	N/A	N/A	0.952	0	0	**0.068**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
749.0	20.013	N/A	100	N/A	N/A	N/A	N/A	0.952	0	0	**0.068**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
748.8	20.177	N/A	100	N/A	N/A	N/A	N/A	0.951	0	0	**0.069**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
748.7	20.341	N/A	100	N/A	N/A	N/A	N/A	0.951	0	0	**0.069**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
748.5	20.505	N/A	97	N/A	N/A	N/A	N/A	0.950	0	0	**0.069**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
748.3	20.669	N/A	89	N/A	N/A	N/A	N/A	0.949	0	0	**0.069**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
748.2	20.833	N/A	85	N/A	N/A	N/A	N/A	0.949	0	0	**0.070**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
748.0	20.997	0.462	78	0.999	1.160	0.97	0.520	0.948	0	0	**0.070**	FALSE	FALSE	FALSE	**7.5**	**Bottom Ash**	**A1**
747.8	21.161	0.247	71	0.999	1.080	0.98	0.261	0.948	0	0	**0.070**	FALSE	FALSE	FALSE	**3.7**	**Bottom Ash**	**A1**
747.7	21.325	0.181	64	0.998	1.031	0.99	0.184	0.947	0	0	**0.070**	FALSE	FALSE	FALSE	**2.6**	**Bottom Ash**	**A1**
747.5	21.489	0.165	62	0.998	1.016	0.99	0.165	0.946	0	0	**0.070**	FALSE	FALSE	FALSE	**2.4**	**Bottom Ash**	**A1**
747.3	21.653	0.161	61	0.997	1.012	0.99	0.161	0.946	0	0	**0.070**	FALSE	FALSE	FALSE	**2.3**	**Bottom Ash**	**A1**
747.2	21.817	0.145	57	0.997	0.997	0.99	0.143	0.945	0	0	**0.071**	FALSE	FALSE	FALSE	**2.0**	**Bottom Ash**	**A1**
747.0	21.981	0.130	53	0.997	0.984	0.99	0.127	0.945	0	0	**0.071**	FALSE	FALSE	FALSE	**1.8**	**Bottom Ash**	**A1**
746.9	22.145	0.152	59	0.996	1.003	0.99	0.150	0.944	0	0	**0.071**	FALSE	FALSE	FALSE	**2.1**	**Fly Ash**	**A1**
746.7	22.309	0.223	69	0.995	1.052	0.98	0.229	0.944	0	0	**0.071**	FALSE	FALSE	FALSE	**3.2**	**Fly Ash**	**A1**
746.5	22.473	0.206	67	0.994	1.040	0.98	0.209	0.943	0	0	**0.071**	FALSE	FALSE	FALSE	**2.9**	**Fly Ash**	**A1**
746.4	22.638	0.202	67	0.994	1.036	0.98	0.204	0.942	0	0	**0.072**	FALSE	FALSE	FALSE	**2.9**	**Fly Ash**	**A1**
746.2	22.802	0.178	64	0.994	1.020	0.99	0.179	0.942	0	0	**0.072**	FALSE	FALSE	FALSE	**2.5**	**Fly Ash**	**A1**
746.0	22.966	0.156	60	0.994	1.004	0.99	0.154	0.941	0	0	**0.072**	FALSE	FALSE	FALSE	**2.1**	**Fly Ash**	**A1**
745.9	23.130	0.136	54	0.994	0.989	0.99	0.132	0.941	0	0	**0.072**	FALSE	FALSE	FALSE	**1.8**	**Fly Ash**	**A1**
745.7	23.294	0.128	51	0.994	0.983	0.99	0.124	0.940	0	0	**0.072**	FALSE	FALSE	FALSE	**1.7**	**Fly Ash**	**A1**
745.5	23.458	0.131	53	0.994	0.985	0.99	0.127	0.939	0	0	**0.072**	FALSE	FALSE	FALSE	**1.8**	**Fly Ash**	**A1**
745.4	23.622	0.129	52	0.993	0.984	0.99	0.125	0.939	0	0	**0.073**	FALSE	FALSE	FALSE	**1.7**	**Fly Ash**	**A1**
745.2	23.786	0.129	52	0.993	0.984	0.99	0.125	0.938	0	0	**0.073**	FALSE	FALSE	FALSE	**1.7**	**Fly Ash**	**A1**
745.1	23.950	0.130	53	0.992	0.985	0.99	0.127	0.938	0	0	**0.073**	FALSE	FALSE	FALSE	**1.7**	**Fly Ash**	**A1**
744.9	24.114	0.130	52	0.992	0.985	0.99	0.126	0.937	0	0	**0.073**	FALSE	FALSE	FALSE	**1.7**	**Fly Ash**	**A1**
744.7	24.278	0.129	52	0.992	0.985	0.99	0.125	0.936	0	0	**0.073**	FALSE	FALSE	FALSE	**1.7**	**Fly Ash**	**A1**
744.6	24.442	0.137	55	0.991	0.990	0.99	0.133	0.936	0	0	**0.073**	FALSE	FALSE	FALSE	**1.8**	**Fly Ash**	**A1**
744.4	24.606	0.172	63	0.989	1.009	0.99	0.170	0.935	0	0	**0.074**	FALSE	FALSE	FALSE	**2.3**	**Fly Ash**	**A1**
744.2	24.770	0.195	66	0.988	1.019	0.98	0.193	0.934	0	0	**0.074**	FALSE	FALSE	FALSE	**2.6**	**Fly Ash**	**A1**
744.1	24.934	0.172	63	0.988	1.008	0.99	0.169	0.934	0	0	**0.074**	FALSE	FALSE	FALSE	**2.3**	**Fly Ash**	**A1**
743.9	25.098	0.154	59	0.989	0.998	0.99	0.150	0.933	0	0	**0.074**	FALSE	FALSE	FALSE	**2.0**	**Fly Ash**	**A1**
743.7	25.262	0.136	55	0.989	0.990	0.99	0.132	0.933	0	0	**0.074**	FALSE	FALSE	FALSE	**1.8**	**Fly Ash**	**A1**

Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
743.6	25.426	0.130	52	0.989	0.987	0.99	0.126	0.932	0	0	**0.074**	FALSE	FALSE	FALSE	**1.7**	**Fly Ash**	**A1**
743.4	25.590	0.135	54	0.989	0.989	0.99	0.131	0.931	0	0	**0.075**	FALSE	FALSE	FALSE	**1.8**	**Fly Ash**	**A1**
743.2	25.754	0.141	56	0.988	0.992	0.99	0.137	0.931	0	0	**0.075**	FALSE	FALSE	FALSE	**1.8**	**Fly Ash**	**A1**
743.1	25.918	0.130	52	0.988	0.988	0.99	0.126	0.930	0	0	**0.075**	FALSE	FALSE	FALSE	**1.7**	**Fly Ash**	**A1**
742.9	26.082	0.115	45	0.989	0.982	0.99	0.111	0.930	0	0	**0.075**	FALSE	FALSE	FALSE	**1.5**	**Fly Ash**	**A1**
742.8	26.246	0.104	38	0.990	0.979	1.00	0.100	0.929	0	0	**0.075**	FALSE	FALSE	FALSE	**1.3**	**Fly Ash**	**A2**
742.6	26.410	0.096	32	0.991	0.978	1.00	0.093	0.928	0	0	**0.075**	FALSE	FALSE	FALSE	**1.2**	**Fly Ash**	**A2**
742.4	26.574	0.096	31	0.990	0.978	1.00	0.092	0.928	0	0	**0.075**	FALSE	FALSE	FALSE	**1.2**	**Fly Ash**	**A2**
742.3	26.739	0.094	29	0.990	0.978	1.00	0.091	0.927	0	0	**0.076**	FALSE	FALSE	FALSE	**1.2**	**Fly Ash**	**A2**
742.1	26.903	0.091	27	0.990	0.979	1.00	0.088	0.926	0	0	**0.076**	FALSE	FALSE	FALSE	**1.2**	**Fly Ash**	**A2**
741.9	27.067	0.091	27	0.990	0.979	1.00	0.088	0.926	0	0	**0.076**	FALSE	FALSE	FALSE	**1.2**	**Fly Ash**	**A2**
741.8	27.231	0.087	23	0.990	0.979	1.00	0.085	0.925	0	0	**0.076**	FALSE	FALSE	FALSE	**1.1**	**Fly Ash**	**A2**
741.6	27.395	0.084	18	0.991	0.980	1.00	0.081	0.925	0	0	**0.076**	FALSE	FALSE	FALSE	**1.1**	**Fly Ash**	**A2**
741.4	27.559	0.082	15	0.991	0.980	1.00	0.079	0.924	0	0	**0.076**	FALSE	FALSE	FALSE	**1.0**	**Fly Ash**	**A2**
741.3	27.723	0.081	14	0.991	0.981	1.00	0.078	0.923	0	0	**0.076**	FALSE	FALSE	FALSE	**1.0**	**Fly Ash**	**A2**
741.1	27.887	0.081	15	0.990	0.981	1.00	0.079	0.923	0	0	**0.076**	FALSE	FALSE	FALSE	**1.0**	**Fly Ash**	**A2**
740.9	28.051	0.082	16	0.990	0.982	1.00	0.079	0.922	0	0	**0.077**	FALSE	FALSE	FALSE	**1.0**	**Fly Ash**	**A2**
740.8	28.215	0.080	13	0.990	0.983	1.00	0.078	0.921	0	0	**0.077**	FALSE	FALSE	FALSE	**1.0**	**Fly Ash**	**A2**
740.6	28.379	0.078	10	0.990	0.984	1.00	0.076	0.921	0	0	**0.077**	FALSE	FALSE	FALSE	**1.0**	**Fly Ash**	**A2**
740.5	28.543	0.076	7	0.990	0.984	1.00	0.074	0.920	0	0	**0.077**	FALSE	FALSE	FALSE	**1.0**	**Fly Ash**	**A2**
740.3	28.707	0.077	7	0.990	0.985	1.00	0.074	0.919	0	0	**0.077**	FALSE	FALSE	FALSE	**1.0**	**Fly Ash**	**A2**
740.1	28.871	0.078	10	0.990	0.986	1.00	0.076	0.919	0	0	**0.077**	FALSE	FALSE	FALSE	**1.0**	**Fly Ash**	**A2**
740.0	29.035	0.080	13	0.989	0.987	1.00	0.078	0.918	0	0	**0.077**	FALSE	FALSE	FALSE	**1.0**	**Fly Ash**	**A2**
739.8	29.199	0.082	15	0.989	0.988	1.00	0.079	0.917	0	0	**0.077**	FALSE	FALSE	FALSE	**1.0**	**Fly Ash**	**A2**
739.6	29.363	0.082	16	0.988	0.989	1.00	0.080	0.917	0	0	**0.077**	FALSE	FALSE	FALSE	**1.0**	**Fly Ash**	**A2**
739.5	29.527	0.082	16	0.988	0.990	1.00	0.080	0.916	0	0	**0.078**	FALSE	FALSE	FALSE	**1.0**	**Fly Ash**	**A2**
739.3	29.691	0.080	13	0.988	0.991	1.00	0.078	0.916	0	0	**0.078**	FALSE	FALSE	FALSE	**1.0**	**Fly Ash**	**A2**
739.1	29.855	0.078	9	0.989	0.992	1.00	0.076	0.915	0	0	**0.078**	FALSE	FALSE	FALSE	**1.0**	**Fly Ash**	**A2**
739.0	30.019	0.077	8	0.989	0.993	1.00	0.075	0.914	0	0	**0.078**	FALSE	FALSE	FALSE	**1.0**	**Fly Ash**	**A2**
738.8	30.183	0.076	7	0.989	0.994	1.00	0.075	0.914	0	0	**0.078**	FALSE	FALSE	FALSE	**1.0**	**Fly Ash**	**A2**
738.7	30.347	0.076	6	0.989	0.995	1.00	0.074	0.913	0	0	**0.078**	FALSE	FALSE	FALSE	**1.0**	**Fly Ash**	**A2**
738.5	30.511	0.075	5	0.988	0.996	1.00	0.074	0.912	0	0	**0.078**	FALSE	FALSE	FALSE	**0.9**	**Fly Ash**	**A2**
738.3	30.675	0.075	4	0.988	0.997	1.00	0.074	0.912	0	0	**0.078**	FALSE	FALSE	FALSE	**0.9**	**Fly Ash**	**A2**
738.2	30.840	0.075	4	0.988	0.997	1.00	0.074	0.911	0	0	**0.078**	FALSE	FALSE	FALSE	**0.9**	**Fly Ash**	**A2**
738.0	31.004	0.076	6	0.988	0.998	1.00	0.074	0.910	0	0	**0.079**	FALSE	FALSE	FALSE	**0.9**	**Fly Ash**	**A2**
737.8	31.168	0.078	9	0.987	0.999	1.00	0.076	0.910	0	0	**0.079**	FALSE	FALSE	FALSE	**1.0**	**Fly Ash**	**A2**
737.7	31.332	0.079	11	0.987	0.998	1.00	0.077	0.909	0	0	**0.079**	FALSE	FALSE	FALSE	**1.0**	**Fly Ash**	**A2**
737.5	31.496	0.078	10	0.987	0.998	1.00	0.077	0.908	0	0	**0.079**	FALSE	FALSE	FALSE	**1.0**	**Fly Ash**	**A2**
737.3	31.660	0.078	10	0.987	0.997	1.00	0.077	0.908	0	0	**0.079**	FALSE	FALSE	FALSE	**1.0**	**Fly Ash**	**A1**
737.2	31.824	0.076	7	0.987	0.996	1.00	0.075	0.907	0	0	**0.079**	FALSE	FALSE	FALSE	**0.9**	**Fly Ash**	**A1**
737.0	31.988	0.077	7	0.987	0.996	1.00	0.075	0.906	0	0	**0.079**	FALSE	FALSE	FALSE	**0.9**	**Fly Ash**	**A1**
736.8	32.152	0.079	11	0.986	0.995	1.00	0.077	0.906	0	0	**0.079**	FALSE	FALSE	FALSE	**1.0**	**Fly Ash**	**A1**
736.7	32.316	0.079	12	0.986	0.994	1.00	0.078	0.905	0	0	**0.079**	FALSE	FALSE	FALSE	**1.0**	**Fly Ash**	**A1**
736.5	32.480	0.081	15	0.985	0.993	1.00	0.079	0.904	0	0	**0.079**	FALSE	FALSE	FALSE	**1.0**	**Fly Ash**	**A1**
736.4	32.644	0.084	18	0.984	0.992	1.00	0.082	0.904	0	0	**0.079**	FALSE	FALSE	FALSE	**1.0**	**Fly Ash**	**A1**
736.2	32.808	0.088	23	0.983	0.992	1.00	0.086	0.903	0	0	**0.080**	FALSE	FALSE	FALSE	**1.1**	**Fly Ash**	**A1**
736.0	32.972	0.090	25	0.983	0.991	1.00	0.087	0.902	0	0	**0.080**	FALSE	FALSE	FALSE	**1.1**	**Fly Ash**	**A1**
735.9	33.136	0.089	24	0.983	0.990	1.00	0.086	0.902	0	0	**0.080**	FALSE	FALSE	FALSE	**1.1**	**Fly Ash**	**A1**
735.7	33.300	0.086	21	0.983	0.989	1.00	0.083	0.901	0	0	**0.080**	FALSE	FALSE	FALSE	**1.0**	**Fly Ash**	**A1**
735.5	33.464	0.085	20	0.983	0.988	1.00	0.082	0.900	0	0	**0.080**	FALSE	FALSE	FALSE	**1.0**	**Fly Ash**	**A1**
735.4	33.628	0.086	21	0.983	0.988	1.00	0.083	0.900	0	0	**0.080**	FALSE	FALSE	FALSE	**1.0**	**Fly Ash**	**A1**
735.2	33.792	0.087	22	0.982	0.987	1.00	0.084	0.899	0	0	**0.080**	FALSE	FALSE	FALSE	**1.1**	**Fly Ash**	**A1**
735.0	33.956	0.091	26	0.981	0.986	1.00	0.087	0.898	0	0	**0.080**	FALSE	FALSE	FALSE	**1.1**	**Fly Ash**	**A1**
734.9	34.120	0.094	29	0.980	0.986	1.00	0.090	0.898	0	0	**0.080**	FALSE	FALSE	FALSE	**1.1**	**Fly Ash**	**A1**
734.7	34.284	0.093	29	0.980	0.985	1.00	0.090	0.897	0	0	**0.080**	FALSE	FALSE	FALSE	**1.1**	**Fly Ash**	**A1**

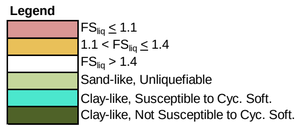
Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
734.6	34.448	0.097	32	0.979	0.985	1.00	0.093	0.896	0	0	**0.080**	FALSE	FALSE	FALSE	**1.2**	**Fly Ash**	**A1**
734.4	34.612	0.101	36	0.978	0.984	1.00	0.097	0.896	0	0	**0.080**	FALSE	FALSE	FALSE	**1.2**	**Fly Ash**	**A1**
734.2	34.776	0.104	38	0.977	0.984	1.00	0.099	0.895	0	0	**0.080**	FALSE	FALSE	FALSE	**1.2**	**Fly Ash**	**A1**
734.1	34.941	0.106	39	0.976	0.984	1.00	0.101	0.894	0	0	**0.081**	FALSE	FALSE	FALSE	**1.3**	**Fly Ash**	**A1**
733.9	35.105	0.109	42	0.975	0.984	0.99	0.104	0.894	0	0	**0.081**	FALSE	FALSE	FALSE	**1.3**	**Fly Ash**	**A1**
733.7	35.269	0.121	48	0.972	0.986	0.99	0.115	0.893	0	0	**0.081**	FALSE	FALSE	FALSE	**1.4**	**Fly Ash**	**A1**
733.6	35.433	0.115	45	0.973	0.984	0.99	0.109	0.892	0	0	**0.081**	FALSE	FALSE	FALSE	**1.4**	**Fly Ash**	**A1**
733.4	35.597	0.105	39	0.975	0.981	1.00	0.100	0.891	0	0	**0.081**	FALSE	FALSE	FALSE	**1.2**	**Fly Ash**	**A1**
733.2	35.761	0.082	16	0.981	0.977	1.00	0.079	0.891	0	0	**0.081**	FALSE	FALSE	FALSE	**1.0**	**Fly Ash**	**A1**
733.1	35.925	0.071	0	0.984	0.976	1.00	0.068	0.890	0	0	**0.081**	FALSE	FALSE	FALSE	**0.8**	**Fly Ash**	**B**
732.9	36.089	0.067	0	0.984	0.975	1.00	0.064	0.889	0	0	**0.081**	FALSE	FALSE	FALSE	**0.8**	**Fly Ash**	**B**
732.7	36.253	0.066	0	0.984	0.974	1.00	0.063	0.889	0	0	**0.081**	FALSE	FALSE	FALSE	**0.8**	**Fly Ash**	**C**
732.6	36.417	0.065	0	0.983	0.973	1.00	0.062	0.888	0	0	**0.081**	FALSE	FALSE	FALSE	**0.8**	**Fly Ash**	**C**
732.4	36.581	0.064	0	0.983	0.973	1.00	0.061	0.887	0	0	**0.081**	FALSE	FALSE	FALSE	**0.8**	**Fly Ash**	**C**
732.3	36.745	0.064	0	0.983	0.972	1.00	0.061	0.887	0	0	**0.081**	FALSE	FALSE	FALSE	**0.8**	**Fly Ash**	**C**
732.1	36.909	0.064	0	0.983	0.971	1.00	0.061	0.886	0	0	**0.081**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**C**
731.9	37.073	0.064	0	0.983	0.970	1.00	0.061	0.885	0	0	**0.081**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**C**
731.8	37.237	0.064	0	0.983	0.970	1.00	0.061	0.885	0	0	**0.081**	FALSE	FALSE	FALSE	**0.8**	**Fly Ash**	**C**
731.6	37.401	0.064	0	0.982	0.969	1.00	0.061	0.884	0	0	**0.081**	FALSE	FALSE	FALSE	**0.8**	**Fly Ash**	**C**
731.4	37.565	0.064	0	0.982	0.968	1.00	0.061	0.883	0	0	**0.082**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**C**
731.3	37.729	0.065	0	0.982	0.967	1.00	0.061	0.883	0	0	**0.082**	FALSE	FALSE	FALSE	**0.8**	**Fly Ash**	**C**
731.1	37.893	0.065	0	0.982	0.967	1.00	0.061	0.882	0	0	**0.082**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**C**
730.9	38.057	0.065	0	0.982	0.966	1.00	0.061	0.881	0	0	**0.082**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**C**
730.8	38.221	0.065	0	0.982	0.965	1.00	0.061	0.880	0	0	**0.082**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**C**
730.6	38.385	0.064	0	0.982	0.965	1.00	0.061	0.880	0	0	**0.082**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**C**
730.5	38.549	0.064	0	0.981	0.964	1.00	0.060	0.879	0	0	**0.082**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**C**
730.3	38.713	0.064	0	0.981	0.963	1.00	0.060	0.878	0	0	**0.082**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**C**
730.1	38.877	0.064	0	0.981	0.963	1.00	0.060	0.878	0	0	**0.082**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**C**
730.0	39.042	0.064	0	0.981	0.962	1.00	0.060	0.877	0	0	**0.082**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**C**
729.8	39.206	0.064	0	0.981	0.961	1.00	0.060	0.876	0	0	**0.082**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**C**
729.6	39.370	0.064	0	0.981	0.961	1.00	0.060	0.876	0	0	**0.082**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**C**
729.5	39.534	0.103	37	0.971	0.967	1.00	0.096	0.875	0	0	**0.082**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**C**
729.3	39.698	0.102	37	0.971	0.966	1.00	0.095	0.874	0	0	**0.082**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**C**
729.1	39.862	0.101	36	0.971	0.965	1.00	0.094	0.873	0	0	**0.082**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**C**
729.0	40.026	0.101	36	0.970	0.965	1.00	0.094	0.873	0	0	**0.082**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**C**
728.8	40.190	0.101	36	0.970	0.964	1.00	0.094	0.872	0	0	**0.082**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**C**
728.6	40.354	0.101	36	0.970	0.964	1.00	0.094	0.871	0	0	**0.082**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**C**
728.5	40.518	0.102	36	0.969	0.964	1.00	0.095	0.871	0	0	**0.082**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**C**
728.3	40.682	0.102	36	0.969	0.963	1.00	0.094	0.870	0	0	**0.082**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**C**
728.2	40.846	0.102	36	0.969	0.963	1.00	0.095	0.869	0	0	**0.082**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**C**
728.0	41.010	0.103	37	0.968	0.963	1.00	0.095	0.869	0	0	**0.082**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**C**
727.8	41.174	0.103	37	0.968	0.962	1.00	0.095	0.868	0	0	**0.082**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**C**
727.7	41.338	0.105	39	0.967	0.963	1.00	0.097	0.867	0	0	**0.082**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**C**
727.5	41.502	0.112	44	0.964	0.968	0.99	0.104	0.866	0	0	**0.082**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**A2**
727.3	41.666	0.111	43	0.964	0.966	0.99	0.103	0.866	0	0	**0.082**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**A2**
727.2	41.830	0.110	42	0.964	0.965	0.99	0.101	0.865	0	0	**0.082**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**C**
727.0	41.994	0.112	43	0.963	0.966	0.99	0.103	0.864	0	0	**0.082**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**A2**
726.8	42.158	0.115	45	0.962	0.968	0.99	0.107	0.864	0	0	**0.082**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**A2**
726.7	42.322	0.116	46	0.962	0.968	0.99	0.107	0.863	0	0	**0.082**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**C**
726.5	42.486	0.116	46	0.961	0.969	0.99	0.107	0.862	0	0	**0.082**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**A2**
726.3	42.650	0.126	51	0.958	0.976	0.99	0.117	0.861	0	0	**0.082**	FALSE	FALSE	FALSE	**1.4**	**Subunit 2**	**A2**
726.2	42.814	0.132	53	0.955	0.982	0.99	0.123	0.861	0	0	**0.082**	FALSE	FALSE	FALSE	**1.5**	**Subunit 2**	**A1**
726.0	42.978	0.132	53	0.955	0.982	0.99	0.123	0.860	0	0	**0.082**	FALSE	FALSE	FALSE	**1.5**	**Subunit 2**	**A1**
725.9	43.143	0.131	53	0.955	0.981	0.99	0.122	0.859	0	0	**0.082**	FALSE	FALSE	FALSE	**1.5**	**Subunit 2**	**A1**
725.7	43.307	0.129	52	0.955	0.979	0.99	0.120	0.859	0	0	**0.082**	FALSE	FALSE	FALSE	**1.5**	**Subunit 2**	**A1**

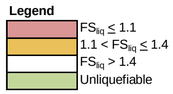
Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
725.5	43.471	0.127	51	0.956	0.976	0.99	0.117	0.858	0	0	**0.082**	FALSE	FALSE	FALSE	**1.4**	**Subunit 2**	**A2**
725.4	43.635	0.123	49	0.957	0.973	0.99	0.114	0.857	0	0	**0.082**	FALSE	FALSE	FALSE	**1.4**	**Subunit 2**	**A2**
725.2	43.799	0.120	48	0.957	0.970	0.99	0.111	0.857	0	0	**0.082**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**A2**
725.0	43.963	0.117	46	0.958	0.967	0.99	0.108	0.856	0	0	**0.082**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**A2**
724.9	44.127	0.114	45	0.959	0.965	0.99	0.105	0.855	0	0	**0.082**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**C**
724.7	44.291	0.112	44	0.959	0.963	0.99	0.103	0.854	0	0	**0.083**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**C**
724.5	44.455	0.111	43	0.960	0.962	0.99	0.102	0.854	0	0	**0.083**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**C**
724.4	44.619	0.112	43	0.959	0.962	0.99	0.103	0.853	0	0	**0.083**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**B**
724.2	44.783	0.114	45	0.958	0.964	0.99	0.105	0.852	0	0	**0.083**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**B**
724.1	44.947	0.114	45	0.958	0.964	0.99	0.105	0.852	0	0	**0.083**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**B**
723.9	45.111	0.110	42	0.959	0.960	0.99	0.100	0.851	0	0	**0.083**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**C**
723.7	45.275	0.106	40	0.960	0.957	1.00	0.097	0.850	0	0	**0.083**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**B**
723.6	45.439	0.105	39	0.960	0.956	1.00	0.096	0.849	0	0	**0.083**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**C**
723.4	45.603	0.105	39	0.960	0.956	1.00	0.096	0.849	0	0	**0.083**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**C**
723.2	45.767	0.103	38	0.961	0.955	1.00	0.094	0.848	0	0	**0.083**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**C**
723.1	45.931	0.106	39	0.959	0.956	1.00	0.096	0.847	0	0	**0.083**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**C**
722.9	46.095	0.111	43	0.957	0.960	0.99	0.101	0.847	0	0	**0.083**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**C**
722.7	46.259	0.110	42	0.957	0.959	0.99	0.100	0.846	0	0	**0.083**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**C**
722.6	46.423	0.114	45	0.955	0.963	0.99	0.105	0.845	0	0	**0.083**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**C**
722.4	46.587	0.125	50	0.950	0.973	0.99	0.115	0.844	0	0	**0.083**	FALSE	FALSE	FALSE	**1.4**	**Subunit 2**	**A1**
722.2	46.751	0.135	54	0.947	0.983	0.99	0.124	0.844	0	0	**0.082**	FALSE	FALSE	FALSE	**1.5**	**Subunit 2**	**A1**
722.1	46.915	0.130	52	0.948	0.978	0.99	0.119	0.843	0	0	**0.082**	FALSE	FALSE	FALSE	**1.4**	**Subunit 2**	**A1**
721.9	47.079	0.115	45	0.954	0.963	0.99	0.105	0.842	0	0	**0.082**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**A1**
721.8	47.244	0.118	47	0.952	0.965	0.99	0.108	0.842	0	0	**0.082**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**A1**
721.6	47.408	0.128	51	0.948	0.975	0.99	0.117	0.841	0	0	**0.082**	FALSE	FALSE	FALSE	**1.4**	**Subunit 2**	**A1**
721.4	47.572	0.133	53	0.946	0.981	0.99	0.122	0.840	0	0	**0.082**	FALSE	FALSE	FALSE	**1.5**	**Subunit 2**	**A1**
721.3	47.736	0.135	54	0.945	0.983	0.99	0.124	0.839	0	0	**0.082**	FALSE	FALSE	FALSE	**1.5**	**Subunit 2**	**A1**
721.1	47.900	0.130	52	0.946	0.977	0.99	0.119	0.839	0	0	**0.082**	FALSE	FALSE	FALSE	**1.4**	**Subunit 2**	**A2**
720.9	48.064	0.124	50	0.948	0.971	0.99	0.114	0.838	0	0	**0.082**	FALSE	FALSE	FALSE	**1.4**	**Subunit 2**	**A2**
720.8	48.228	0.123	49	0.948	0.970	0.99	0.113	0.837	0	0	**0.082**	FALSE	FALSE	FALSE	**1.4**	**Subunit 2**	**A2**
720.6	48.392	0.122	49	0.949	0.968	0.99	0.111	0.837	0	0	**0.082**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**A2**
720.4	48.556	0.118	47	0.950	0.965	0.99	0.108	0.836	0	0	**0.082**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**A2**
720.3	48.720	0.111	43	0.953	0.958	0.99	0.101	0.835	0	0	**0.082**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**C**
720.1	48.884	0.106	40	0.955	0.954	1.00	0.096	0.834	0	0	**0.082**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**C**
720.0	49.048	0.104	38	0.955	0.952	1.00	0.094	0.834	0	0	**0.082**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**C**
719.8	49.212	0.103	37	0.956	0.951	1.00	0.093	0.833	0	0	**0.082**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**C**
719.6	49.376	0.109	42	0.953	0.955	0.99	0.099	0.832	0	0	**0.082**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**C**
719.5	49.540	0.112	43	0.951	0.958	0.99	0.101	0.832	0	0	**0.082**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**A2**
719.3	49.704	0.116	46	0.949	0.962	0.99	0.105	0.831	0	0	**0.082**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**A2**
719.1	49.868	0.116	46	0.949	0.962	0.99	0.105	0.830	0	0	**0.082**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**C**
719.0	50.032	0.122	49	0.946	0.968	0.99	0.111	0.829	0	0	**0.082**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**A2**
718.8	50.196	0.114	45	0.949	0.960	0.99	0.104	0.829	0	0	**0.082**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**A2**
718.6	50.360	0.118	47	0.947	0.964	0.99	0.107	0.828	0	0	**0.082**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**A2**
718.5	50.524	0.119	48	0.946	0.965	0.99	0.108	0.827	0	0	**0.082**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**A2**
718.3	50.688	0.117	46	0.947	0.962	0.99	0.106	0.827	0	0	**0.082**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**A2**
718.1	50.852	0.116	46	0.947	0.961	0.99	0.105	0.826	0	0	**0.082**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**A2**
718.0	51.016	0.115	45	0.948	0.960	0.99	0.104	0.825	0	0	**0.082**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**A2**
717.8	51.180	0.114	45	0.948	0.959	0.99	0.103	0.825	0	0	**0.082**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**A2**
717.7	51.345	0.113	44	0.948	0.959	0.99	0.102	0.824	0	0	**0.082**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**C**
717.5	51.509	0.111	43	0.949	0.957	0.99	0.100	0.823	0	0	**0.082**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**C**
717.3	51.673	0.115	45	0.947	0.960	0.99	0.104	0.822	0	0	**0.082**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**A2**
717.2	51.837	0.117	46	0.945	0.962	0.99	0.106	0.822	0	0	**0.082**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**A2**
717.0	52.001	0.118	47	0.944	0.964	0.99	0.107	0.821	0	0	**0.082**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**A2**
716.8	52.165	0.120	48	0.943	0.966	0.99	0.109	0.820	0	0	**0.082**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**A2**
716.7	52.329	0.113	44	0.946	0.958	0.99	0.102	0.820	0	0	**0.082**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**A2**

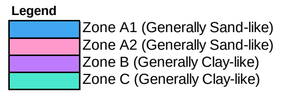
Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
716.5	52.493	0.111	43	0.947	0.956	0.99	0.100	0.819	0	0	**0.082**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**A2**
716.3	52.657	0.121	48	0.942	0.966	0.99	0.109	0.818	0	0	**0.082**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**A2**
716.2	52.821	0.125	50	0.940	0.971	0.99	0.113	0.817	0	0	**0.082**	FALSE	FALSE	FALSE	**1.4**	**Subunit 2**	**A2**
716.0	52.985	0.124	50	0.940	0.970	0.99	0.113	0.817	0	0	**0.082**	FALSE	FALSE	FALSE	**1.4**	**Subunit 2**	**A2**
715.9	53.149	0.121	48	0.941	0.966	0.99	0.109	0.816	0	0	**0.082**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**A2**
715.7	53.313	0.124	50	0.940	0.969	0.99	0.112	0.815	0	0	**0.082**	FALSE	FALSE	FALSE	**1.4**	**Subunit 2**	**A1**
715.5	53.477	0.127	51	0.938	0.972	0.99	0.115	0.815	0	0	**0.082**	FALSE	FALSE	FALSE	**1.4**	**Subunit 2**	**A1**
715.4	53.641	0.125	50	0.939	0.971	0.99	0.113	0.814	0	0	**0.082**	FALSE	FALSE	FALSE	**1.4**	**Subunit 2**	**A1**
715.2	53.805	0.113	44	0.944	0.957	0.99	0.102	0.813	0	0	**0.082**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**A1**
715.0	53.969	0.111	43	0.945	0.955	0.99	0.100	0.812	0	0	**0.082**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**A1**
714.9	54.133	0.101	36	0.950	0.947	1.00	0.091	0.812	0	0	**0.082**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**A2**
714.7	54.297	0.103	38	0.949	0.948	1.00	0.093	0.811	0	0	**0.082**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**A2**
714.5	54.461	0.109	41	0.946	0.953	0.99	0.098	0.810	0	0	**0.082**	FALSE	FALSE	FALSE	**1.2**	**Subunit 3**	**A2**
714.4	54.625	0.116	46	0.942	0.960	0.99	0.104	0.810	0	0	**0.082**	FALSE	FALSE	FALSE	**1.3**	**Subunit 3**	**A2**
714.2	54.789	0.118	47	0.940	0.962	0.99	0.106	0.809	0	0	**0.082**	FALSE	FALSE	FALSE	**1.3**	**Subunit 3**	**A2**
714.0	54.953	0.119	47	0.940	0.963	0.99	0.107	0.808	0	0	**0.082**	FALSE	FALSE	FALSE	**1.3**	**Subunit 3**	**A2**
713.9	55.117	0.119	47	0.939	0.963	0.99	0.107	0.808	0	0	**0.082**	FALSE	FALSE	FALSE	**1.3**	**Subunit 3**	**A2**
713.7	55.281	0.122	49	0.938	0.966	0.99	0.110	0.807	0	0	**0.082**	FALSE	FALSE	FALSE	**1.3**	**Subunit 3**	**A2**
713.6	55.446	0.124	50	0.936	0.969	0.99	0.112	0.806	0	0	**0.082**	FALSE	FALSE	FALSE	**1.4**	**Subunit 3**	**A2**
713.4	55.610	0.126	51	0.935	0.971	0.99	0.114	0.805	0	0	**0.082**	FALSE	FALSE	FALSE	**1.4**	**Subunit 3**	**A2**
713.2	55.774	0.114	45	0.941	0.958	0.99	0.103	0.805	0	0	**0.082**	FALSE	FALSE	FALSE	**1.3**	**Subunit 3**	**A2**
713.1	55.938	0.122	49	0.937	0.966	0.99	0.109	0.804	0	0	**0.082**	FALSE	FALSE	FALSE	**1.3**	**Subunit 3**	**A2**
712.9	56.102	0.125	50	0.935	0.970	0.99	0.113	0.803	0	0	**0.082**	FALSE	FALSE	FALSE	**1.4**	**Subunit 3**	**A1**
712.7	56.266	0.122	49	0.936	0.966	0.99	0.109	0.803	0	0	**0.081**	FALSE	FALSE	FALSE	**1.3**	**Subunit 3**	**A1**
712.6	56.430	0.107	40	0.944	0.950	1.00	0.095	0.802	0	0	**0.081**	FALSE	FALSE	FALSE	**1.2**	**Subunit 3**	**A1**
712.4	56.594	0.104	38	0.945	0.948	1.00	0.093	0.801	0	0	**0.081**	FALSE	FALSE	FALSE	**1.1**	**Subunit 3**	**A1**
712.2	56.758	0.097	33	0.949	0.943	1.00	0.087	0.800	0	0	**0.081**	FALSE	FALSE	FALSE	**1.1**	**Subunit 3**	**A1**
712.1	56.922	0.095	31	0.950	0.942	1.00	0.085	0.800	0	0	**0.081**	FALSE	FALSE	FALSE	**1.0**	**Subunit 3**	**A2**
711.9	57.086	0.100	35	0.947	0.945	1.00	0.089	0.799	0	0	**0.081**	FALSE	FALSE	FALSE	**1.1**	**Subunit 3**	**A2**
711.8	57.250	0.111	43	0.940	0.954	0.99	0.099	0.798	0	0	**0.081**	FALSE	FALSE	FALSE	**1.2**	**Subunit 3**	**A2**
711.6	57.414	0.114	45	0.938	0.957	0.99	0.102	0.798	0	0	**0.081**	FALSE	FALSE	FALSE	**1.3**	**Subunit 3**	**A2**
711.4	57.578	0.116	46	0.937	0.959	0.99	0.104	0.797	0	0	**0.081**	FALSE	FALSE	FALSE	**1.3**	**Subunit 3**	**A2**
711.3	57.742	0.118	47	0.936	0.961	0.99	0.105	0.796	0	0	**0.081**	FALSE	FALSE	FALSE	**1.3**	**Subunit 3**	**A2**
711.1	57.906	0.118	47	0.936	0.961	0.99	0.105	0.796	0	0	**0.081**	FALSE	FALSE	FALSE	**1.3**	**Subunit 3**	**A2**
710.9	58.070	0.099	34	0.946	0.944	1.00	0.088	0.795	0	0	**0.081**	FALSE	FALSE	FALSE	**1.1**	**Subunit 3**	**A2**
710.8	58.234	0.119	47	0.935	0.962	0.99	0.106	0.794	0	0	**0.081**	FALSE	FALSE	FALSE	**1.3**	**Subunit 3**	**A2**
710.6	58.398	0.149	58	0.920	0.997	0.99	0.135	0.793	0	0	**0.081**	FALSE	FALSE	FALSE	**1.7**	**Subunit 3**	**B**
710.4	58.562	0.154	59	0.918	1.002	0.99	0.140	0.793	0	0	**0.081**	FALSE	FALSE	FALSE	**1.7**	**Subunit 3**	**A1**
710.3	58.726	0.223	69	0.898	1.069	0.98	0.210	0.792	0	0	**0.081**	FALSE	FALSE	FALSE	**2.6**	**Subunit 3**	**A1**
710.1	58.890	0.171	63	0.911	1.022	0.99	0.158	0.791	0	0	**0.081**	FALSE	FALSE	FALSE	**1.9**	**Subunit 3**	**A1**
709.9	59.054	0.099	34	0.945	0.944	1.00	0.088	0.791	0	0	**0.081**	FALSE	FALSE	FALSE	**1.1**	**Subunit 3**	**A2**



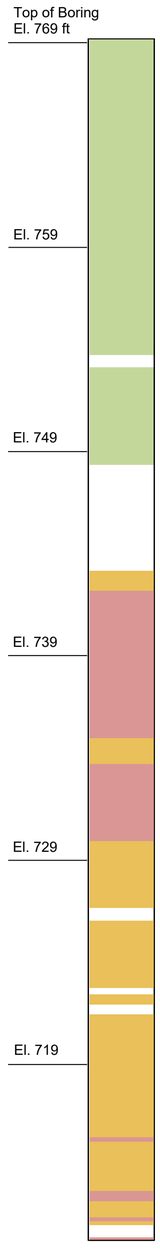
Adapted from "Discussion of 'Liquefaction Potential of Silts from CPTu'" (Robertson 2008). Zone A_1 and Zone A_2 samples are generally sand-like. Zone B samples are generally clay-like and not susceptible to cyclic softening. Zone C samples are generally clay-like and susceptible to cyclic softening. Note that the transition from clay-like to sand-like in this chart does not exactly match the liquefaction calculations herein; that is, some transitional samples in Zone B and Zone C will be treated as sand-like and analyzed for liquefaction if the calculations indicate as such.



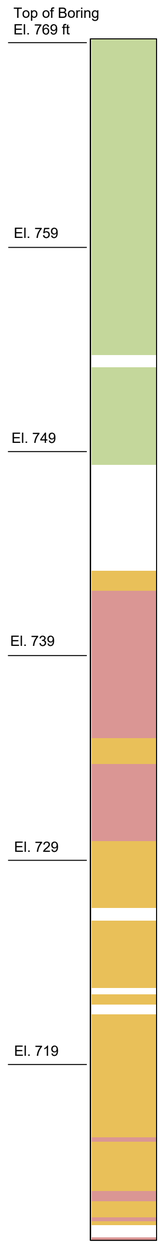




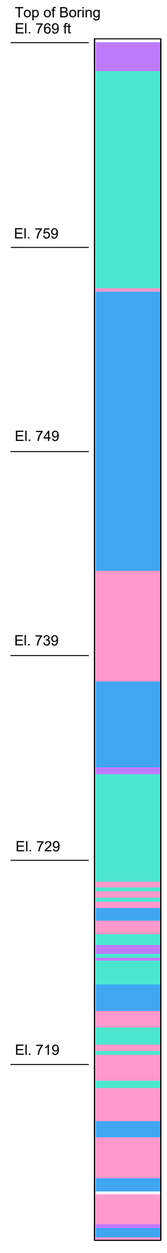
KIF-BF-CPT-2, Liquefaction Triggering Results



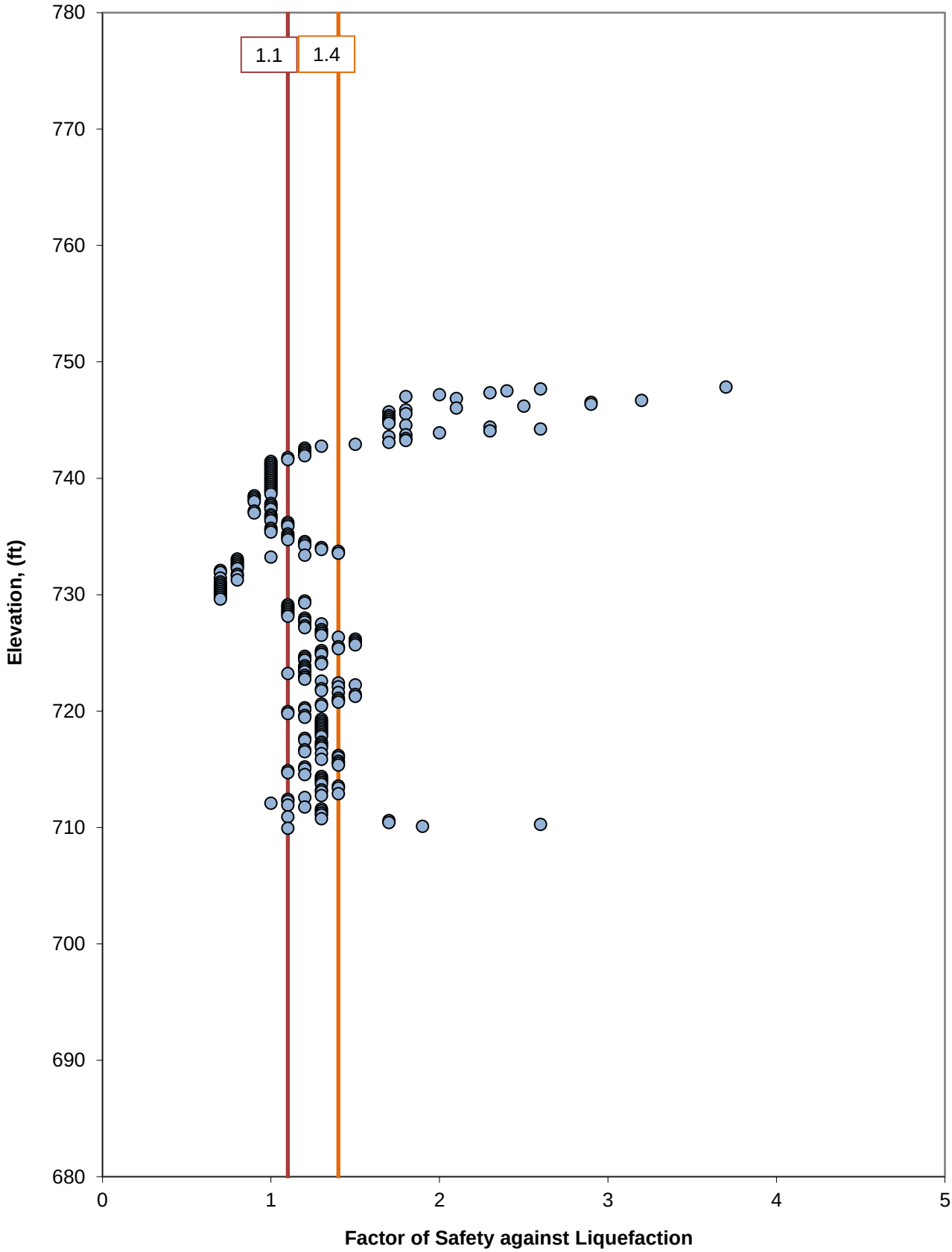
KIF-BF-CPT-2, Liquefaction Triggering Results



KIF-BF-CPT-2, Robertson Soil Type



KIF TDEC Stability, Boring = KIF-BF-CPT-2, Source = 1 Hz, Mw = 7.6, Event = Design EQ,
CPT Data, Simplified Stress-Based Approach



Inputs

Project Information

Stantec Project Number =	175668043
Project Name =	KIF TDEC Stability
CPT ID =	KIF-BF-CPT-3A

Boring Location (optional)

Northing =	
Easting =	

OR

Baseline Station =	
Offset (+ Right) =	

Using qt (corrected for u2 PWP) or qc (backcalculated uncorrected field tip)

Cone ID (optional) =	AD184	
Use qc instead of qt?	0	(1: Yes, 0: No)
Cone Area Ratio (a) =	0.80	

Drilling Information

Top of Hole Elevation =	748.0	feet
Water Depth during CPT (negative for U/S borings) =	9.0	feet
Depth data collection began =	0.16	feet
Avg. Total Unit Wt. Above 1st Sample =	120.00	pcf

During Earthquake Information

Water Depth during EQ (relative to CPT TOH, negative for U/S borings) =	6.5	feet
Final Grade Elevation during EQ =	748.0	feet
Avg. Total Unit Wt. of Cut/Fill =		pcf

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile?	0	(1: Yes, 0: No)

If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile:	g_Pond_Section, KIF-BF-CPT3A_NOR	
α at each Sample Depth known?	1	(1: Yes, 0: No)

If previous answer is No, then enter curve fit parameters below (α vs. depth curve)

If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_σ will be one.

m4:	
m3:	
m2:	
m1:	
m0:	

Associated ground response profile:	shing_Pond_Section, KIF-BF-SPT3	
Get CSR from shear stress envelope?	0	(1: Yes, 0: No)

If previous answer is No, then CSR will be calculated using a_{max} and r_d

Max. Shear Stress at each sample depth known?		(1: Yes, 0: No)

If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4:	
m3:	
m2:	
m1:	

Earthquake Information

EQ Source (e.g., New Madrid)	1 Hz
Event (e.g., MCE, OBE)	Design EQ
a_{max} (g) (top of ground surface)	0.09
EQ Mag (Mw)	7.6

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
0.164	26.316	0.056	112	Fly Ash	Sand-like	Do Not Correct for FC	0.198			
0.328	185.305	0.419	112	Fly Ash	Sand-like	Do Not Correct for FC	0.199			
0.492	214.180	0.336	112	Fly Ash	Sand-like	Do Not Correct for FC	0.200			
0.656	272.354	0.571	112	Fly Ash	Sand-like	Do Not Correct for FC	0.200			
0.820	327.450	0.690	112	Fly Ash	Sand-like	Do Not Correct for FC	0.200			
0.984	251.957	1.359	112	Fly Ash	Sand-like	Do Not Correct for FC	0.199			
1.148	157.059	1.747	112	Fly Ash	Sand-like	Do Not Correct for FC	0.200			
1.312	353.338	2.010	112	Fly Ash	Sand-like	Do Not Correct for FC	0.200			
1.476	416.192	2.802	112	Fly Ash	Sand-like	Do Not Correct for FC	0.201			
1.640	376.382	2.955	112	Fly Ash	Sand-like	Do Not Correct for FC	0.200			
1.804	399.242	2.176	112	Fly Ash	Sand-like	Do Not Correct for FC	0.199			
1.968	454.909	1.843	112	Fly Ash	Sand-like	Do Not Correct for FC	0.197			
2.133	487.422	2.053	112	Fly Ash	Sand-like	Do Not Correct for FC	0.195			
2.297	447.556	2.523	112	Fly Ash	Sand-like	Do Not Correct for FC	0.193			
2.461	315.717	3.060	112	Fly Ash	Sand-like	Do Not Correct for FC	0.190			
2.625	189.215	3.173	112	Fly Ash	Sand-like	Do Not Correct for FC	0.188			
2.789	115.976	3.547	112	Fly Ash	Sand-like	Do Not Correct for FC	0.186			
2.953	131.980	3.444	112	Fly Ash	Sand-like	Do Not Correct for FC	0.186			
3.117	90.529	2.768	112	Fly Ash	Sand-like	Do Not Correct for FC	0.185			
3.281	185.620	3.126	112	Fly Ash	Sand-like	Do Not Correct for FC	0.185			
3.445	240.267	3.335	112	Fly Ash	Sand-like	Do Not Correct for FC	0.184			
3.609	220.756	2.994	112	Fly Ash	Sand-like	Do Not Correct for FC	0.183			
3.773	300.374	3.272	112	Fly Ash	Sand-like	Do Not Correct for FC	0.183			
3.937	222.044	3.365	112	Fly Ash	Sand-like	Do Not Correct for FC	0.182			
4.101	119.173	2.818	112	Fly Ash	Sand-like	Do Not Correct for FC	0.181			
4.265	85.936	2.799	112	Fly Ash	Sand-like	Do Not Correct for FC	0.180			
4.429	57.539	3.051	112	Fly Ash	Sand-like	Do Not Correct for FC	0.180			
4.593	46.239	2.830	112	Fly Ash	Sand-like	Do Not Correct for FC	0.179			
4.757	41.435	2.356	112	Fly Ash	Sand-like	Do Not Correct for FC	0.179			
4.921	41.050	2.082	112	Fly Ash	Sand-like	Do Not Correct for FC	0.178			
5.085	69.986	2.148	128	Embankment Clay	Clay-like		0.178			
5.249	136.601	2.720	128	Embankment Clay	Clay-like		0.178			
5.413	126.635	3.376	128	Embankment Clay	Clay-like		0.178			
5.577	110.182	4.335	128	Embankment Clay	Clay-like		0.178			
5.741	193.056	4.715	128	Embankment Clay	Clay-like		0.177			
5.905	248.145	5.992	128	Embankment Clay	Clay-like		0.175			
6.069	195.588	5.145	128	Embankment Clay	Clay-like		0.174			
6.234	326.489	6.142	128	Embankment Clay	Clay-like		0.173			
6.398	330.906	7.887	128	Embankment Clay	Clay-like		0.171			
6.562	242.195	8.164	128	Embankment Clay	Clay-like		0.170			
6.726	341.526	5.403	128	Embankment Clay	Clay-like		0.169			
6.890	327.141	4.671	128	Embankment Clay	Clay-like		0.169			
7.054	199.033	7.547	128	Embankment Clay	Clay-like		0.169			
7.218	521.910	6.128	128	Embankment Clay	Clay-like		0.169			
7.382	470.988	5.179	128	Embankment Clay	Clay-like		0.169			
7.546	290.131	4.243	128	Embankment Clay	Clay-like		0.169			
7.710	205.756	3.897	128	Embankment Clay	Clay-like		0.169			
7.874	198.168	3.714	128	Embankment Clay	Clay-like		0.169			
8.038	146.944	3.855	128	Embankment Clay	Clay-like		0.169			
8.202	145.164	3.432	128	Embankment Clay	Clay-like		0.168			
8.366	136.831	3.013	128	Embankment Clay	Clay-like		0.168			
8.530	156.217	2.347	128	Embankment Clay	Clay-like		0.168			
8.694	112.657	2.425	128	Embankment Clay	Clay-like		0.167			
8.858	62.657	2.086	128	Embankment Clay	Clay-like		0.167			
9.022	42.509	1.450	128	Embankment Clay	Clay-like		0.166			
9.186	26.654	1.411	128	Embankment Clay	Clay-like		0.166			
9.350	24.337	1.175	128	Embankment Clay	Clay-like		0.166			
9.514	38.493	2.298	128	Embankment Clay	Clay-like		0.165			
9.678	52.131	2.983	128	Embankment Clay	Clay-like		0.165			
9.842	36.571	3.701	128	Embankment Clay	Clay-like		0.164			
10.006	56.360	1.319	128	Embankment Clay	Clay-like		0.164			
10.170	102.100	2.306	128	Embankment Clay	Clay-like		0.164			
10.335	140.249	3.889	128	Embankment Clay	Clay-like		0.163			

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
10.499	177.103	4.475	128	Embankment Clay	Clay-like		0.163			
10.663	112.201	5.226	128	Embankment Clay	Clay-like		0.163			
10.827	92.780	3.585	128	Embankment Clay	Clay-like		0.162			
10.991	203.926	2.350	128	Embankment Clay	Clay-like		0.162			
11.155	151.421	1.934	128	Embankment Clay	Clay-like		0.162			
11.319	129.463	3.854	128	Embankment Clay	Clay-like		0.162			
11.483	140.653	3.818	128	Embankment Clay	Clay-like		0.163			
11.647	87.342	3.996	128	Embankment Clay	Clay-like		0.164			
11.811	67.214	3.699	128	Embankment Clay	Clay-like		0.164			
11.975	80.407	3.394	128	Embankment Clay	Clay-like		0.165			
12.139	73.671	3.205	128	Embankment Clay	Clay-like		0.166			
12.303	79.570	3.533	128	Embankment Clay	Clay-like		0.166			
12.467	93.049	3.789	128	Embankment Clay	Clay-like		0.167			
12.631	95.095	4.692	128	Embankment Clay	Clay-like		0.166			
12.795	97.788	3.285	128	Embankment Clay	Clay-like		0.165			
12.959	144.811	2.711	128	Embankment Clay	Clay-like		0.164			
13.123	157.485	2.351	128	Embankment Clay	Clay-like		0.164			
13.287	90.553	2.275	128	Embankment Clay	Clay-like		0.163			
13.451	66.018	2.335	128	Embankment Clay	Clay-like		0.162			
13.615	61.482	2.236	128	Embankment Clay	Clay-like		0.162			
13.779	65.983	1.975	128	Embankment Clay	Clay-like		0.162			
13.943	66.741	1.513	128	Embankment Clay	Clay-like		0.162			
14.107	68.144	1.160	128	Embankment Clay	Clay-like		0.161			
14.271	71.768	1.026	128	Embankment Clay	Clay-like		0.161			
14.436	65.545	0.609	128	Embankment Clay	Clay-like		0.161			
14.600	54.027	0.581	128	Embankment Clay	Clay-like		0.161			
14.764	37.901	0.936	128	Embankment Clay	Clay-like		0.162			
14.928	23.641	0.868	128	Embankment Clay	Clay-like		0.162			
15.092	12.796	0.746	128	Embankment Clay	Clay-like		0.162			
15.256	10.842	0.493	128	Embankment Clay	Clay-like		0.162			
15.420	9.835	0.338	128	Embankment Clay	Clay-like		0.162			
15.584	8.329	0.246	128	Embankment Clay	Clay-like		0.162			
15.748	7.092	0.189	128	Embankment Clay	Clay-like		0.163			
15.912	7.367	0.132	128	Embankment Clay	Clay-like		0.163			
16.076	6.701	0.182	128	Embankment Clay	Clay-like		0.163			
16.240	8.651	0.204	128	Embankment Clay	Clay-like		0.163			
16.404	10.531	0.266	128	Embankment Clay	Clay-like		0.164			
16.568	8.633	0.284	128	Embankment Clay	Clay-like		0.164			
16.732	26.327	0.282	128	Embankment Clay	Clay-like		0.164			
16.896	37.798	0.608	128	Embankment Clay	Clay-like		0.164			
17.060	29.248	0.725	128	Embankment Clay	Clay-like		0.165			
17.224	33.175	0.765	128	Embankment Clay	Clay-like		0.165			
17.388	25.502	0.765	128	Embankment Clay	Clay-like		0.165			
17.552	26.932	0.677	128	Embankment Clay	Clay-like		0.165			
17.716	24.847	0.531	128	Embankment Clay	Clay-like		0.166			
17.880	20.606	0.529	128	Embankment Clay	Clay-like		0.166			
18.044	21.353	0.621	128	Embankment Clay	Clay-like		0.166			
18.208	15.162	0.570	128	Embankment Clay	Clay-like		0.167			
18.372	5.735	0.508	128	Embankment Clay	Clay-like		0.167			
18.537	4.140	0.277	128	Embankment Clay	Clay-like		0.167			
18.701	3.213	0.130	128	Embankment Clay	Clay-like		0.168			
18.865	2.677	0.103	128	Embankment Clay	Clay-like		0.168			
19.029	3.371	0.128	128	Embankment Clay	Clay-like		0.169			
19.193	7.617	0.214	128	Embankment Clay	Clay-like		0.169			
19.357	11.721	0.400	128	Embankment Clay	Clay-like		0.169			
19.521	14.089	0.374	128	Embankment Clay	Clay-like		0.170			
19.685	18.850	0.402	128	Embankment Clay	Clay-like		0.170			
19.849	15.287	0.393	128	Embankment Clay	Clay-like		0.171			
20.013	27.328	0.482	128	Embankment Clay	Clay-like		0.171			
20.177	36.102	0.526	128	Embankment Clay	Clay-like		0.172			
20.341	33.723	0.502	128	Embankment Clay	Clay-like		0.172			
20.505	21.793	0.674	128	Embankment Clay	Clay-like		0.172			
20.669	11.105	0.669	128	Embankment Clay	Clay-like		0.173			
20.833	7.247	0.426	128	Embankment Clay	Clay-like		0.173			
20.997	6.686	0.311	128	Embankment Clay	Clay-like		0.174			
21.161	9.361	0.281	128	Embankment Clay	Clay-like		0.174			
21.325	7.012	0.206	128	Embankment Clay	Clay-like		0.175			
21.489	5.946	0.143	128	Embankment Clay	Clay-like		0.175			
21.653	4.268	0.102	128	Embankment Clay	Clay-like		0.176			
21.817	3.725	0.061	128	Embankment Clay	Clay-like		0.176			
21.981	3.189	0.050	128	Embankment Clay	Clay-like		0.177			
22.145	3.005	0.046	128	Embankment Clay	Clay-like		0.177			
22.309	3.123	0.044	128	Embankment Clay	Clay-like		0.178			
22.473	3.580	0.048	128	Embankment Clay	Clay-like		0.178			
22.638	3.739	0.053	128	Embankment Clay	Clay-like		0.179			

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
22.802	4.009	0.068	128	Embankment Clay	Clay-like		0.179			
22.966	4.845	0.096	128	Embankment Clay	Clay-like		0.180			
23.130	8.662	0.137	128	Embankment Clay	Clay-like		0.181			
23.294	9.736	0.162	128	Embankment Clay	Clay-like		0.181			
23.458	9.518	0.190	128	Embankment Clay	Clay-like		0.182			
23.622	9.569	0.198	128	Embankment Clay	Clay-like		0.182			
23.786	10.304	0.210	128	Embankment Clay	Clay-like		0.183			
23.950	10.483	0.262	128	Embankment Clay	Clay-like		0.183			
24.114	9.787	0.249	128	Embankment Clay	Clay-like		0.184			
24.278	9.233	0.197	128	Embankment Clay	Clay-like		0.184			
24.442	8.482	0.142	128	Embankment Clay	Clay-like		0.185			
24.606	7.823	0.112	126	Subunit 2	Sand-like		0.185			
24.770	8.025	0.097	126	Subunit 2	Sand-like		0.186			
24.934	9.588	0.110	126	Subunit 2	Sand-like		0.186			
25.098	11.479	0.128	126	Subunit 2	Sand-like		0.187			
25.262	12.504	0.139	126	Subunit 2	Sand-like		0.187			
25.426	14.486	0.178	126	Subunit 2	Sand-like		0.188			
25.590	15.372	0.177	126	Subunit 2	Sand-like		0.188			
25.754	15.729	0.160	126	Subunit 2	Sand-like		0.189			
25.918	15.926	0.160	126	Subunit 2	Sand-like		0.189			
26.082	15.858	0.268	126	Subunit 2	Sand-like		0.190			
26.246	18.014	0.426	126	Subunit 2	Sand-like		0.190			
26.410	26.829	0.413	126	Subunit 2	Sand-like		0.191			
26.574	20.987	0.386	126	Subunit 2	Sand-like		0.191			
26.739	20.078	0.337	126	Subunit 2	Sand-like		0.192			
26.903	20.532	0.324	126	Subunit 2	Sand-like		0.192			
27.067	23.178	0.372	126	Subunit 2	Sand-like		0.193			
27.231	27.443	0.582	126	Subunit 2	Sand-like		0.193			
27.395	30.232	0.678	126	Subunit 2	Sand-like		0.194			
27.559	35.839	0.470	126	Subunit 2	Sand-like		0.194			
27.723	37.290	0.455	126	Subunit 2	Sand-like		0.195			
27.887	36.821	0.743	126	Subunit 2	Sand-like		0.195			
28.051	37.756	0.996	126	Subunit 2	Sand-like		0.196			
28.215	42.386	1.170	126	Subunit 2	Sand-like		0.196			
28.379	40.263	1.319	126	Subunit 2	Sand-like		0.197			
28.543	34.155	1.191	126	Subunit 2	Sand-like		0.197			
28.707	32.568	1.123	126	Subunit 2	Sand-like		0.197			
28.871	30.585	0.820	126	Subunit 2	Sand-like		0.198			
29.035	26.138	0.830	126	Subunit 2	Sand-like		0.198			
29.199	21.807	0.789	126	Subunit 2	Sand-like		0.199			
29.363	24.107	0.686	126	Subunit 2	Sand-like		0.199			
29.527	23.391	1.003	126	Subunit 2	Sand-like		0.199			
29.691	30.816	0.906	126	Subunit 2	Sand-like		0.200			
29.855	27.709	0.708	126	Subunit 2	Sand-like		0.200			
30.019	28.156	0.757	126	Subunit 2	Sand-like		0.201			
30.183	29.178	0.784	126	Subunit 2	Sand-like		0.201			
30.347	26.819	0.682	126	Subunit 2	Sand-like		0.201			
30.511	25.021	0.556	126	Subunit 2	Sand-like		0.202			
30.675	22.150	0.669	126	Subunit 2	Sand-like		0.202			
30.840	22.949	0.729	126	Subunit 2	Sand-like		0.202			
31.004	40.683	0.784	126	Subunit 2	Sand-like		0.203			
31.168	65.454	0.764	126	Subunit 2	Sand-like		0.203			
31.332	83.503	0.611	126	Subunit 2	Sand-like		0.203			
31.496	84.684	0.637	126	Subunit 2	Sand-like		0.204			
31.660	81.596	0.722	126	Subunit 2	Sand-like		0.204			
31.824	75.235	0.712	126	Subunit 2	Sand-like		0.204			
31.988	66.627	0.962	126	Subunit 2	Sand-like		0.205			
32.152	62.659	0.827	126	Subunit 2	Sand-like		0.205			
32.316	114.132	1.133	126	Subunit 2	Sand-like		0.205			
32.480	88.315	1.450	126	Subunit 2	Sand-like		0.206			
32.644	68.141	0.803	126	Subunit 2	Sand-like		0.206			
32.808	58.668	1.079	126	Subunit 2	Sand-like		0.206			
32.972	55.335	1.085	126	Subunit 2	Sand-like		0.206			
33.136	49.204	0.908	126	Subunit 2	Sand-like		0.207			
33.300	44.234	0.639	126	Subunit 2	Sand-like		0.207			
33.464	44.563	0.445	126	Subunit 2	Sand-like		0.207			
33.628	44.285	0.489	126	Subunit 2	Sand-like		0.207			
33.792	43.101	0.566	126	Subunit 2	Sand-like		0.207			
33.956	43.585	0.807	126	Subunit 2	Sand-like		0.208			
34.120	41.799	1.156	126	Subunit 2	Sand-like		0.208			
34.284	32.892	0.914	126	Subunit 2	Sand-like		0.208			
34.448	29.383	0.489	126	Subunit 2	Sand-like		0.208			
34.612	28.326	0.459	126	Subunit 2	Sand-like		0.208			
34.776	29.292	0.370	126	Subunit 2	Sand-like		0.208			
34.941	37.438	0.242	126	Subunit 2	Sand-like		0.209			

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
35.105	25.932	0.291	126	Subunit 2	Sand-like		0.209			
35.269	18.655	0.449	126	Subunit 2	Sand-like		0.209			
35.433	16.013	0.382	126	Subunit 2	Sand-like		0.209			
35.597	21.641	0.238	126	Subunit 2	Sand-like		0.209			
35.761	22.206	0.248	126	Subunit 2	Sand-like		0.209			
35.925	19.245	0.091	126	Subunit 2	Sand-like		0.209			
36.089	18.779	0.131	126	Subunit 2	Sand-like		0.209			
36.253	16.141	0.137	126	Subunit 2	Sand-like		0.210			
36.417	18.232	0.143	126	Subunit 2	Sand-like		0.210			
36.581	14.492	0.164	126	Subunit 2	Sand-like		0.210			
36.745	16.345	0.264	126	Subunit 2	Sand-like		0.210			
36.909	22.683	0.569	126	Subunit 2	Sand-like		0.210			
37.073	32.497	0.828	126	Subunit 2	Sand-like		0.210			
37.237	41.215	1.215	126	Subunit 2	Sand-like		0.210			
37.401	51.071	1.519	126	Subunit 2	Sand-like		0.210			
37.565	62.020	1.989	126	Subunit 2	Sand-like		0.210			
37.729	47.326	2.135	126	Subunit 2	Sand-like		0.210			
37.893	38.195	1.799	126	Subunit 2	Sand-like		0.210			
38.057	42.719	0.890	126	Subunit 2	Sand-like		0.210			
38.221	48.720	0.499	126	Subunit 2	Sand-like		0.210			
38.385	45.218	0.242	126	Subunit 2	Sand-like		0.210			
38.549	34.289	0.191	126	Subunit 2	Sand-like		0.210			
38.713	23.882	0.253	126	Subunit 2	Sand-like		0.210			
38.877	20.327	0.315	126	Subunit 2	Sand-like		0.210			
39.042	25.262	0.248	126	Subunit 2	Sand-like		0.210			
39.206	28.801	0.129	126	Subunit 2	Sand-like		0.210			
39.370	23.571	0.122	126	Subunit 2	Sand-like		0.210			
39.534	21.369	0.182	131	Subunit 3	Sand-like		0.209			
39.698	25.690	0.165	131	Subunit 3	Sand-like		0.209			
39.862	36.026	0.153	131	Subunit 3	Sand-like		0.209			
40.026	42.441	0.123	131	Subunit 3	Sand-like		0.209			
40.190	48.085	0.102	131	Subunit 3	Sand-like		0.209			
40.354	47.323	0.122	131	Subunit 3	Sand-like		0.208			
40.518	44.724	0.144	131	Subunit 3	Sand-like		0.208			
40.682	43.724	0.151	131	Subunit 3	Sand-like		0.208			
40.846	41.095	0.187	131	Subunit 3	Sand-like		0.208			
41.010	33.386	0.269	131	Subunit 3	Sand-like		0.207			
41.174	30.868	0.345	131	Subunit 3	Sand-like		0.207			
41.338	48.766	0.239	131	Subunit 3	Sand-like		0.207			
41.502	70.309	0.210	131	Subunit 3	Sand-like		0.207			
41.666	90.323	0.186	131	Subunit 3	Sand-like		0.206			
41.830	97.782	0.233	131	Subunit 3	Sand-like		0.206			
41.994	92.868	0.312	131	Subunit 3	Sand-like		0.206			
42.158	90.547	0.352	131	Subunit 3	Sand-like		0.206			
42.322	77.880	0.380	131	Subunit 3	Sand-like		0.205			
42.486	64.944	0.461	131	Subunit 3	Sand-like		0.205			
42.650	60.520	0.357	131	Subunit 3	Sand-like		0.205			
42.814	68.304	0.234	131	Subunit 3	Sand-like		0.205			
42.978	71.635	0.534	131	Subunit 3	Sand-like		0.204			
43.143	66.141	0.308	131	Subunit 3	Sand-like		0.204			
43.307	63.674	0.553	131	Subunit 3	Sand-like		0.204			
43.471	41.595	0.534	131	Subunit 3	Sand-like		0.203			
43.635	33.387	0.704	131	Subunit 3	Sand-like		0.203			
43.799	31.227	0.592	131	Subunit 3	Sand-like		0.203			
43.963	28.366	0.750	131	Subunit 3	Sand-like		0.203			
44.127	27.147	1.116	131	Subunit 3	Sand-like		0.202			
44.291	27.564	1.472	131	Subunit 3	Sand-like		0.202			
44.455	37.463	1.081	131	Subunit 3	Sand-like		0.202			
44.619	91.187	1.681	131	Subunit 3	Sand-like		0.201			
44.783	65.050	1.569	131	Subunit 3	Sand-like		0.201			
44.947	89.372	1.358	131	Subunit 3	Sand-like		0.201			
45.111	90.420	0.413	131	Subunit 3	Sand-like		0.201			
45.275	86.406	0.307	131	Subunit 3	Sand-like		0.200			
45.439	74.402	0.272	131	Subunit 3	Sand-like		0.200			
45.603	72.334	0.438	131	Subunit 3	Sand-like		0.200			
45.767	79.964	0.349	131	Subunit 3	Sand-like		0.199			
45.931	86.323	0.631	131	Subunit 3	Sand-like		0.199			
46.095	82.340	0.986	131	Subunit 3	Sand-like		0.199			
46.259	118.528	0.838	131	Subunit 3	Sand-like		0.199			
46.423	175.346	1.367	131	Subunit 3	Sand-like		0.198			
46.587	143.579	1.543	131	Subunit 3	Sand-like		0.198			
46.751	125.575	1.628	131	Subunit 3	Sand-like		0.198			
46.915	115.790	1.058	131	Subunit 3	Sand-like		0.197			
47.079	136.797	0.639	131	Subunit 3	Sand-like		0.197			
47.244	186.216	1.984	131	Subunit 3	Sand-like		0.197			

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
47.408	197.546	2.840	131	Subunit 3	Sand-like		0.196			
47.572	141.018	2.562	131	Subunit 3	Sand-like		0.196			
47.736	126.966	1.380	131	Subunit 3	Sand-like		0.196			
47.900	135.704	2.656	131	Subunit 3	Sand-like		0.196			
48.064	193.976	5.203	131	Subunit 3	Sand-like		0.195			
48.228	400.004	0.000	131	Subunit 3	Sand-like		0.195			
48.392	469.813	0.000	131	Subunit 3	Sand-like		0.195			

LIQUEFACTION POTENTIAL ASSESSMENT FOR COARSE GRAINED SOILS USING CONE PENETRATION TEST DATA

Facility: KIF TDEC Stability
Project No.: 175668043
CPT ID: KIF-BF-CPT-3A

Water Elevation during CPT:	739.0	ft
Depth to Water during CPT:	9.0	ft *(relative to ground surface during CPT)*
Water Elevation during Earthquake:	741.5	ft
Depth to Water during Earthquake:	6.5	ft *(relative to ground surface during CPT)*
Final Grade Elevation during EQ:	748	ft *(if no fill, then set this equal to top of CPT hole elev.)*
Height of Final Grade above CPT TOH:	0.0	ft *(relative to ground surface during CPT, + Fill, - Cut)*
Unit Weight of Cut/Fill to Achieve Final Grade	0	pcf
Cut/Fill Total Stress (+ Fill, - Cut):	0.00	tsf

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
748.0				Vertical Stresses above 1st CPT:			**0.01**	**0.01**	**0.00**	**0.00**	**0.01**	**0.01**
747.8	0.164	26.32	0.06	112	**0.16**	0.08	0.01	0.01	0.00	0.00	0.01	0.01
747.7	0.328	185.31	0.42	112	0.25	0.16	0.02	0.02	0.00	0.00	0.02	0.02
747.5	0.492	214.18	0.34	112	0.41	0.16	0.03	0.03	0.00	0.00	0.03	0.03
747.3	0.656	272.35	0.57	112	0.57	0.16	0.04	0.04	0.00	0.00	0.04	0.04
747.2	0.820	327.45	0.69	112	0.74	0.16	0.05	0.05	0.00	0.00	0.05	0.05
747.0	0.984	251.96	1.36	112	0.90	0.16	0.06	0.06	0.00	0.00	0.06	0.06
746.9	1.148	157.06	1.75	112	1.07	0.16	0.06	0.06	0.00	0.00	0.06	0.06
746.7	1.312	353.34	2.01	112	1.23	0.16	0.07	0.07	0.00	0.00	0.07	0.07
746.5	1.476	416.19	2.80	112	1.39	0.16	0.08	0.08	0.00	0.00	0.08	0.08
746.4	1.640	376.38	2.96	112	1.56	0.16	0.09	0.09	0.00	0.00	0.09	0.09
746.2	1.804	399.24	2.18	112	1.72	0.16	0.10	0.10	0.00	0.00	0.10	0.10
746.0	1.968	454.91	1.84	112	1.89	0.16	0.11	0.11	0.00	0.00	0.11	0.11
745.9	2.133	487.42	2.05	112	2.05	0.16	0.12	0.12	0.00	0.00	0.12	0.12
745.7	2.297	447.56	2.52	112	2.21	0.16	0.13	0.13	0.00	0.00	0.13	0.13
745.5	2.461	315.72	3.06	112	2.38	0.16	0.14	0.14	0.00	0.00	0.14	0.14
745.4	2.625	189.21	3.17	112	2.54	0.16	0.15	0.15	0.00	0.00	0.15	0.15
745.2	2.789	115.98	3.55	112	2.71	0.16	0.16	0.16	0.00	0.00	0.16	0.16
745.0	2.953	131.98	3.44	112	2.87	0.16	0.17	0.17	0.00	0.00	0.17	0.17
744.9	3.117	90.53	2.77	112	3.03	0.16	0.18	0.18	0.00	0.00	0.18	0.18
744.7	3.281	185.62	3.13	112	3.20	0.16	0.18	0.18	0.00	0.00	0.18	0.18
744.6	3.445	240.27	3.34	112	3.36	0.16	0.19	0.19	0.00	0.00	0.19	0.19
744.4	3.609	220.76	2.99	112	3.53	0.16	0.20	0.20	0.00	0.00	0.20	0.20
744.2	3.773	300.37	3.27	112	3.69	0.16	0.21	0.21	0.00	0.00	0.21	0.21
744.1	3.937	222.04	3.37	112	3.85	0.16	0.22	0.22	0.00	0.00	0.22	0.22
743.9	4.101	119.17	2.82	112	4.02	0.16	0.23	0.23	0.00	0.00	0.23	0.23
743.7	4.265	85.94	2.80	112	4.18	0.16	0.24	0.24	0.00	0.00	0.24	0.24
743.6	4.429	57.54	3.05	112	4.35	0.16	0.25	0.25	0.00	0.00	0.25	0.25
743.4	4.593	46.24	2.83	112	4.51	0.16	0.26	0.26	0.00	0.00	0.26	0.26
743.2	4.757	41.43	2.36	112	4.68	0.16	0.27	0.27	0.00	0.00	0.27	0.27
743.1	4.921	41.05	2.08	112	4.84	0.16	0.28	0.28	0.00	0.00	0.28	0.28
742.9	5.085	69.99	2.15	128	5.00	0.16	0.29	0.29	0.00	0.00	0.29	0.29
742.8	5.249	136.60	2.72	128	5.17	0.16	0.30	0.30	0.00	0.00	0.30	0.30
742.6	5.413	126.64	3.38	128	5.33	0.16	0.31	0.31	0.00	0.00	0.31	0.31
742.4	5.577	110.18	4.34	128	5.50	0.16	0.32	0.32	0.00	0.00	0.32	0.32
742.3	5.741	193.06	4.72	128	5.66	0.16	0.33	0.33	0.00	0.00	0.33	0.33
742.1	5.905	248.14	5.99	128	5.82	0.16	0.34	0.34	0.00	0.00	0.34	0.34
741.9	6.069	195.59	5.15	128	5.99	0.16	0.35	0.35	0.00	0.00	0.35	0.35
741.8	6.234	326.49	6.14	128	6.15	0.16	0.36	0.36	0.00	0.00	0.36	0.36
741.6	6.398	330.91	7.89	128	6.32	0.16	0.37	0.37	0.00	0.00	0.37	0.37
741.4	6.562	242.19	8.16	128	6.48	0.16	0.38	0.38	0.00	0.00	0.38	0.38
741.3	6.726	341.53	5.40	128	6.64	0.16	0.39	0.39	0.00	0.01	0.39	0.38
741.1	6.890	327.14	4.67	128	6.81	0.16	0.40	0.40	0.00	0.01	0.40	0.39
740.9	7.054	199.03	7.55	128	6.97	0.16	0.41	0.41	0.00	0.02	0.41	0.39
740.8	7.218	521.91	6.13	128	7.14	0.16	0.42	0.42	0.00	0.02	0.42	0.40
740.6	7.382	470.99	5.18	128	7.30	0.16	0.43	0.43	0.00	0.03	0.43	0.41
740.5	7.546	290.13	4.24	128	7.46	0.16	0.44	0.44	0.00	0.03	0.44	0.41
740.3	7.710	205.76	3.90	128	7.63	0.16	0.45	0.45	0.00	0.04	0.45	0.42
740.1	7.874	198.17	3.71	128	7.79	0.16	0.46	0.46	0.00	0.04	0.46	0.42
740.0	8.038	146.94	3.86	128	7.96	0.16	0.48	0.48	0.00	0.05	0.48	0.43
739.8	8.202	145.16	3.43	128	8.12	0.16	0.49	0.49	0.00	0.05	0.49	0.43
739.6	8.366	136.83	3.01	128	8.28	0.16	0.50	0.50	0.00	0.06	0.50	0.44
739.5	8.530	156.22	2.35	128	8.45	0.16	0.51	0.51	0.00	0.06	0.51	0.44
739.3	8.694	112.66	2.43	128	8.61	0.16	0.52	0.52	0.00	0.07	0.52	0.45
739.1	8.858	62.66	2.09	128	8.78	0.16	0.53	0.53	0.00	0.07	0.53	0.45
739.0	9.022	42.51	1.45	128	8.94	0.16	0.54	0.54	0.00	0.08	0.54	0.46
738.8	9.186	26.65	1.41	128	9.10	0.16	0.55	0.55	0.01	0.08	0.54	0.46
738.6	9.350	24.34	1.18	128	9.27	0.16	0.56	0.56	0.01	0.09	0.55	0.47
738.5	9.514	38.49	2.30	128	9.43	0.16	0.57	0.57	0.02	0.09	0.55	0.48

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
738.3	9.678	52.13	2.98	128	9.60	0.16	0.58	0.58	0.02	0.10	0.56	0.48
738.2	9.842	36.57	3.70	128	9.76	0.16	0.59	0.59	0.03	0.10	0.56	0.49
738.0	10.006	56.36	1.32	128	9.92	0.16	0.60	0.60	0.03	0.11	0.57	0.49
737.8	10.170	102.10	2.31	128	10.09	0.16	0.61	0.61	0.04	0.11	0.58	0.50
737.7	10.335	140.25	3.89	128	10.25	0.16	0.62	0.62	0.04	0.12	0.58	0.50
737.5	10.499	177.10	4.48	128	10.42	0.16	0.63	0.63	0.05	0.12	0.59	0.51
737.3	10.663	112.20	5.23	128	10.58	0.16	0.64	0.64	0.05	0.13	0.59	0.51
737.2	10.827	92.78	3.59	128	10.74	0.16	0.65	0.65	0.06	0.13	0.60	0.52
737.0	10.991	203.93	2.35	128	10.91	0.16	0.66	0.66	0.06	0.14	0.60	0.52
736.8	11.155	151.42	1.93	128	11.07	0.16	0.67	0.67	0.07	0.15	0.61	0.53
736.7	11.319	129.46	3.85	128	11.24	0.16	0.69	0.69	0.07	0.15	0.61	0.53
736.5	11.483	140.65	3.82	128	11.40	0.16	0.70	0.70	0.08	0.16	0.62	0.54
736.4	11.647	87.34	4.00	128	11.56	0.16	0.71	0.71	0.08	0.16	0.62	0.55
736.2	11.811	67.21	3.70	128	11.73	0.16	0.72	0.72	0.09	0.17	0.63	0.55
736.0	11.975	80.41	3.39	128	11.89	0.16	0.73	0.73	0.09	0.17	0.63	0.56
735.9	12.139	73.67	3.21	128	12.06	0.16	0.74	0.74	0.10	0.18	0.64	0.56
735.7	12.303	79.57	3.53	128	12.22	0.16	0.75	0.75	0.10	0.18	0.64	0.57
735.5	12.467	93.05	3.79	128	12.39	0.16	0.76	0.76	0.11	0.19	0.65	0.57
735.4	12.631	95.09	4.69	128	12.55	0.16	0.77	0.77	0.11	0.19	0.66	0.58
735.2	12.795	97.79	3.29	128	12.71	0.16	0.78	0.78	0.12	0.20	0.66	0.58
735.0	12.959	144.81	2.71	128	12.88	0.16	0.79	0.79	0.12	0.20	0.67	0.59
734.9	13.123	157.48	2.35	128	13.04	0.16	0.80	0.80	0.13	0.21	0.67	0.59
734.7	13.287	90.55	2.28	128	13.21	0.16	0.81	0.81	0.13	0.21	0.68	0.60
734.5	13.451	66.02	2.34	128	13.37	0.16	0.82	0.82	0.14	0.22	0.68	0.60
734.4	13.615	61.48	2.24	128	13.53	0.16	0.83	0.83	0.14	0.22	0.69	0.61
734.2	13.779	65.98	1.98	128	13.70	0.16	0.84	0.84	0.15	0.23	0.69	0.62
734.1	13.943	66.74	1.51	128	13.86	0.16	0.85	0.85	0.15	0.23	0.70	0.62
733.9	14.107	68.14	1.16	128	14.03	0.16	0.86	0.86	0.16	0.24	0.70	0.63
733.7	14.271	71.77	1.03	128	14.19	0.16	0.87	0.87	0.16	0.24	0.71	0.63
733.6	14.436	65.55	0.61	128	14.35	0.16	0.88	0.88	0.17	0.25	0.71	0.64
733.4	14.600	54.03	0.58	128	14.52	0.16	0.90	0.90	0.17	0.25	0.72	0.64
733.2	14.764	37.90	0.94	128	14.68	0.16	0.91	0.91	0.18	0.26	0.73	0.65
733.1	14.928	23.64	0.87	128	14.85	0.16	0.92	0.92	0.18	0.26	0.73	0.65
732.9	15.092	12.80	0.75	128	15.01	0.16	0.93	0.93	0.19	0.27	0.74	0.66
732.7	15.256	10.84	0.49	128	15.17	0.16	0.94	0.94	0.20	0.27	0.74	0.66
732.6	15.420	9.84	0.34	128	15.34	0.16	0.95	0.95	0.20	0.28	0.75	0.67
732.4	15.584	8.33	0.25	128	15.50	0.16	0.96	0.96	0.21	0.28	0.75	0.67
732.3	15.748	7.09	0.19	128	15.67	0.16	0.97	0.97	0.21	0.29	0.76	0.68
732.1	15.912	7.37	0.13	128	15.83	0.16	0.98	0.98	0.22	0.29	0.76	0.69
731.9	16.076	6.70	0.18	128	15.99	0.16	0.99	0.99	0.22	0.30	0.77	0.69
731.8	16.240	8.65	0.20	128	16.16	0.16	1.00	1.00	0.23	0.30	0.77	0.70
731.6	16.404	10.53	0.27	128	16.32	0.16	1.01	1.01	0.23	0.31	0.78	0.70
731.4	16.568	8.63	0.28	128	16.49	0.16	1.02	1.02	0.24	0.31	0.78	0.71
731.3	16.732	26.33	0.28	128	16.65	0.16	1.03	1.03	0.24	0.32	0.79	0.71
731.1	16.896	37.80	0.61	128	16.81	0.16	1.04	1.04	0.25	0.32	0.80	0.72
730.9	17.060	29.25	0.73	128	16.98	0.16	1.05	1.05	0.25	0.33	0.80	0.72
730.8	17.224	33.18	0.77	128	17.14	0.16	1.06	1.06	0.26	0.33	0.81	0.73
730.6	17.388	25.50	0.77	128	17.31	0.16	1.07	1.07	0.26	0.34	0.81	0.73
730.4	17.552	26.93	0.68	128	17.47	0.16	1.08	1.08	0.27	0.34	0.82	0.74
730.3	17.716	24.85	0.53	128	17.63	0.16	1.09	1.09	0.27	0.35	0.82	0.74
730.1	17.880	20.61	0.53	128	17.80	0.16	1.10	1.10	0.28	0.36	0.83	0.75
730.0	18.044	21.35	0.62	128	17.96	0.16	1.12	1.12	0.28	0.36	0.83	0.76
729.8	18.208	15.16	0.57	128	18.13	0.16	1.13	1.13	0.29	0.37	0.84	0.76
729.6	18.372	5.73	0.51	128	18.29	0.16	1.14	1.14	0.29	0.37	0.84	0.77
729.5	18.537	4.14	0.28	128	18.45	0.16	1.15	1.15	0.30	0.38	0.85	0.77
729.3	18.701	3.21	0.13	128	18.62	0.16	1.16	1.16	0.30	0.38	0.85	0.78
729.1	18.865	2.68	0.10	128	18.78	0.16	1.17	1.17	0.31	0.39	0.86	0.78
729.0	19.029	3.37	0.13	128	18.95	0.16	1.18	1.18	0.31	0.39	0.87	0.79
728.8	19.193	7.62	0.21	128	19.11	0.16	1.19	1.19	0.32	0.40	0.87	0.79
728.6	19.357	11.72	0.40	128	19.27	0.16	1.20	1.20	0.32	0.40	0.88	0.80
728.5	19.521	14.09	0.37	128	19.44	0.16	1.21	1.21	0.33	0.41	0.88	0.80
728.3	19.685	18.85	0.40	128	19.60	0.16	1.22	1.22	0.33	0.41	0.89	0.81
728.2	19.849	15.29	0.39	128	19.77	0.16	1.23	1.23	0.34	0.42	0.89	0.81
728.0	20.013	27.33	0.48	128	19.93	0.16	1.24	1.24	0.34	0.42	0.90	0.82
727.8	20.177	36.10	0.53	128	20.09	0.16	1.25	1.25	0.35	0.43	0.90	0.83
727.7	20.341	33.72	0.50	128	20.26	0.16	1.26	1.26	0.35	0.43	0.91	0.83
727.5	20.505	21.79	0.67	128	20.42	0.16	1.27	1.27	0.36	0.44	0.91	0.84
727.3	20.669	11.11	0.67	128	20.59	0.16	1.28	1.28	0.36	0.44	0.92	0.84
727.2	20.833	7.25	0.43	128	20.75	0.16	1.29	1.29	0.37	0.45	0.92	0.85

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
727.0	20.997	6.69	0.31	128	20.92	0.16	1.30	1.30	0.37	0.45	0.93	0.85
726.8	21.161	9.36	0.28	128	21.08	0.16	1.31	1.31	0.38	0.46	0.94	0.86
726.7	21.325	7.01	0.21	128	21.24	0.16	1.33	1.33	0.38	0.46	0.94	0.86
726.5	21.489	5.95	0.14	128	21.41	0.16	1.34	1.34	0.39	0.47	0.95	0.87
726.3	21.653	4.27	0.10	128	21.57	0.16	1.35	1.35	0.39	0.47	0.95	0.87
726.2	21.817	3.72	0.06	128	21.74	0.16	1.36	1.36	0.40	0.48	0.96	0.88
726.0	21.981	3.19	0.05	128	21.90	0.16	1.37	1.37	0.41	0.48	0.96	0.88
725.9	22.145	3.00	0.05	128	22.06	0.16	1.38	1.38	0.41	0.49	0.97	0.89
725.7	22.309	3.12	0.04	128	22.23	0.16	1.39	1.39	0.42	0.49	0.97	0.90
725.5	22.473	3.58	0.05	128	22.39	0.16	1.40	1.40	0.42	0.50	0.98	0.90
725.4	22.638	3.74	0.05	128	22.56	0.16	1.41	1.41	0.43	0.50	0.98	0.91
725.2	22.802	4.01	0.07	128	22.72	0.16	1.42	1.42	0.43	0.51	0.99	0.91
725.0	22.966	4.84	0.10	128	22.88	0.16	1.43	1.43	0.44	0.51	0.99	0.92
724.9	23.130	8.66	0.14	128	23.05	0.16	1.44	1.44	0.44	0.52	1.00	0.92
724.7	23.294	9.74	0.16	128	23.21	0.16	1.45	1.45	0.45	0.52	1.01	0.93
724.5	23.458	9.52	0.19	128	23.38	0.16	1.46	1.46	0.45	0.53	1.01	0.93
724.4	23.622	9.57	0.20	128	23.54	0.16	1.47	1.47	0.46	0.53	1.02	0.94
724.2	23.786	10.30	0.21	128	23.70	0.16	1.48	1.48	0.46	0.54	1.02	0.94
724.1	23.950	10.48	0.26	128	23.87	0.16	1.49	1.49	0.47	0.54	1.03	0.95
723.9	24.114	9.79	0.25	128	24.03	0.16	1.50	1.50	0.47	0.55	1.03	0.95
723.7	24.278	9.23	0.20	128	24.20	0.16	1.51	1.51	0.48	0.55	1.04	0.96
723.6	24.442	8.48	0.14	128	24.36	0.16	1.52	1.52	0.48	0.56	1.04	0.97
723.4	24.606	7.82	0.11	126	24.52	0.16	1.54	1.54	0.49	0.56	1.05	0.97
723.2	24.770	8.02	0.10	126	24.69	0.16	1.55	1.55	0.49	0.57	1.05	0.98
723.1	24.934	9.59	0.11	126	24.85	0.16	1.56	1.56	0.50	0.58	1.06	0.98
722.9	25.098	11.48	0.13	126	25.02	0.16	1.57	1.57	0.50	0.58	1.06	0.99
722.7	25.262	12.50	0.14	126	25.18	0.16	1.58	1.58	0.51	0.59	1.07	0.99
722.6	25.426	14.49	0.18	126	25.34	0.16	1.59	1.59	0.51	0.59	1.07	1.00
722.4	25.590	15.37	0.18	126	25.51	0.16	1.60	1.60	0.52	0.60	1.08	1.00
722.2	25.754	15.73	0.16	126	25.67	0.16	1.61	1.61	0.52	0.60	1.08	1.01
722.1	25.918	15.93	0.16	126	25.84	0.16	1.62	1.62	0.53	0.61	1.09	1.01
721.9	26.082	15.86	0.27	126	26.00	0.16	1.63	1.63	0.53	0.61	1.10	1.02
721.8	26.246	18.01	0.43	126	26.16	0.16	1.64	1.64	0.54	0.62	1.10	1.02
721.6	26.410	26.83	0.41	126	26.33	0.16	1.65	1.65	0.54	0.62	1.11	1.03
721.4	26.574	20.99	0.39	126	26.49	0.16	1.66	1.66	0.55	0.63	1.11	1.03
721.3	26.739	20.08	0.34	126	26.66	0.16	1.67	1.67	0.55	0.63	1.12	1.04
721.1	26.903	20.53	0.32	126	26.82	0.16	1.68	1.68	0.56	0.64	1.12	1.04
720.9	27.067	23.18	0.37	126	26.98	0.16	1.69	1.69	0.56	0.64	1.13	1.05
720.8	27.231	27.44	0.58	126	27.15	0.16	1.70	1.70	0.57	0.65	1.13	1.05
720.6	27.395	30.23	0.68	126	27.31	0.16	1.71	1.71	0.57	0.65	1.14	1.06
720.4	27.559	35.84	0.47	126	27.48	0.16	1.72	1.72	0.58	0.66	1.14	1.06
720.3	27.723	37.29	0.46	126	27.64	0.16	1.73	1.73	0.58	0.66	1.15	1.07
720.1	27.887	36.82	0.74	126	27.80	0.16	1.74	1.74	0.59	0.67	1.15	1.07
719.9	28.051	37.76	1.00	126	27.97	0.16	1.75	1.75	0.59	0.67	1.16	1.08
719.8	28.215	42.39	1.17	126	28.13	0.16	1.76	1.76	0.60	0.68	1.16	1.09
719.6	28.379	40.26	1.32	126	28.30	0.16	1.77	1.77	0.60	0.68	1.17	1.09
719.5	28.543	34.16	1.19	126	28.46	0.16	1.78	1.78	0.61	0.69	1.17	1.10
719.3	28.707	32.57	1.12	126	28.62	0.16	1.79	1.79	0.61	0.69	1.18	1.10
719.1	28.871	30.58	0.82	126	28.79	0.16	1.80	1.80	0.62	0.70	1.18	1.11
719.0	29.035	26.14	0.83	126	28.95	0.16	1.81	1.81	0.63	0.70	1.19	1.11
718.8	29.199	21.81	0.79	126	29.12	0.16	1.82	1.82	0.63	0.71	1.19	1.12
718.6	29.363	24.11	0.69	126	29.28	0.16	1.84	1.84	0.64	0.71	1.20	1.12
718.5	29.527	23.39	1.00	126	29.45	0.16	1.85	1.85	0.64	0.72	1.20	1.13
718.3	29.691	30.82	0.91	126	29.61	0.16	1.86	1.86	0.65	0.72	1.21	1.13
718.1	29.855	27.71	0.71	126	29.77	0.16	1.87	1.87	0.65	0.73	1.22	1.14
718.0	30.019	28.16	0.76	126	29.94	0.16	1.88	1.88	0.66	0.73	1.22	1.14
717.8	30.183	29.18	0.78	126	30.10	0.16	1.89	1.89	0.66	0.74	1.23	1.15
717.7	30.347	26.82	0.68	126	30.27	0.16	1.90	1.90	0.67	0.74	1.23	1.15
717.5	30.511	25.02	0.56	126	30.43	0.16	1.91	1.91	0.67	0.75	1.24	1.16
717.3	30.675	22.15	0.67	126	30.59	0.16	1.92	1.92	0.68	0.75	1.24	1.16
717.2	30.840	22.95	0.73	126	30.76	0.16	1.93	1.93	0.68	0.76	1.25	1.17
717.0	31.004	40.68	0.78	126	30.92	0.16	1.94	1.94	0.69	0.76	1.25	1.17
716.8	31.168	65.45	0.76	126	31.09	0.16	1.95	1.95	0.69	0.77	1.26	1.18
716.7	31.332	83.50	0.61	126	31.25	0.16	1.96	1.96	0.70	0.77	1.26	1.18
716.5	31.496	84.68	0.64	126	31.41	0.16	1.97	1.97	0.70	0.78	1.27	1.19
716.3	31.660	81.60	0.72	126	31.58	0.16	1.98	1.98	0.71	0.78	1.27	1.19
716.2	31.824	75.24	0.71	126	31.74	0.16	1.99	1.99	0.71	0.79	1.28	1.20
716.0	31.988	66.63	0.96	126	31.91	0.16	2.00	2.00	0.72	0.80	1.28	1.21
715.8	32.152	62.66	0.83	126	32.07	0.16	2.01	2.01	0.72	0.80	1.29	1.21

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
715.7	32.316	114.13	1.13	126	32.23	0.16	2.02	2.02	0.73	0.81	1.29	1.22
715.5	32.480	88.32	1.45	126	32.40	0.16	2.03	2.03	0.73	0.81	1.30	1.22
715.4	32.644	68.14	0.80	126	32.56	0.16	2.04	2.04	0.74	0.82	1.30	1.23
715.2	32.808	58.67	1.08	126	32.73	0.16	2.05	2.05	0.74	0.82	1.31	1.23
715.0	32.972	55.34	1.09	126	32.89	0.16	2.06	2.06	0.75	0.83	1.31	1.24
714.9	33.136	49.20	0.91	126	33.05	0.16	2.07	2.07	0.75	0.83	1.32	1.24
714.7	33.300	44.23	0.64	126	33.22	0.16	2.08	2.08	0.76	0.84	1.32	1.25
714.5	33.464	44.56	0.45	126	33.38	0.16	2.09	2.09	0.76	0.84	1.33	1.25
714.4	33.628	44.28	0.49	126	33.55	0.16	2.10	2.10	0.77	0.85	1.34	1.26
714.2	33.792	43.10	0.57	126	33.71	0.16	2.11	2.11	0.77	0.85	1.34	1.26
714.0	33.956	43.59	0.81	126	33.87	0.16	2.12	2.12	0.78	0.86	1.35	1.27
713.9	34.120	41.80	1.16	126	34.04	0.16	2.13	2.13	0.78	0.86	1.35	1.27
713.7	34.284	32.89	0.91	126	34.20	0.16	2.15	2.15	0.79	0.87	1.36	1.28
713.6	34.448	29.38	0.49	126	34.37	0.16	2.16	2.16	0.79	0.87	1.36	1.28
713.4	34.612	28.33	0.46	126	34.53	0.16	2.17	2.17	0.80	0.88	1.37	1.29
713.2	34.776	29.29	0.37	126	34.69	0.16	2.18	2.18	0.80	0.88	1.37	1.29
713.1	34.941	37.44	0.24	126	34.86	0.16	2.19	2.19	0.81	0.89	1.38	1.30
712.9	35.105	25.93	0.29	126	35.02	0.16	2.20	2.20	0.81	0.89	1.38	1.30
712.7	35.269	18.65	0.45	126	35.19	0.16	2.21	2.21	0.82	0.90	1.39	1.31
712.6	35.433	16.01	0.38	126	35.35	0.16	2.22	2.22	0.82	0.90	1.39	1.31
712.4	35.597	21.64	0.24	126	35.51	0.16	2.23	2.23	0.83	0.91	1.40	1.32
712.2	35.761	22.21	0.25	126	35.68	0.16	2.24	2.24	0.83	0.91	1.40	1.33
712.1	35.925	19.25	0.09	126	35.84	0.16	2.25	2.25	0.84	0.92	1.41	1.33
711.9	36.089	18.78	0.13	126	36.01	0.16	2.26	2.26	0.85	0.92	1.41	1.34
711.7	36.253	16.14	0.14	126	36.17	0.16	2.27	2.27	0.85	0.93	1.42	1.34
711.6	36.417	18.23	0.14	126	36.33	0.16	2.28	2.28	0.86	0.93	1.42	1.35
711.4	36.581	14.49	0.16	126	36.50	0.16	2.29	2.29	0.86	0.94	1.43	1.35
711.3	36.745	16.34	0.26	126	36.66	0.16	2.30	2.30	0.87	0.94	1.43	1.36
711.1	36.909	22.68	0.57	126	36.83	0.16	2.31	2.31	0.87	0.95	1.44	1.36
710.9	37.073	32.50	0.83	126	36.99	0.16	2.32	2.32	0.88	0.95	1.44	1.37
710.8	37.237	41.21	1.22	126	37.16	0.16	2.33	2.33	0.88	0.96	1.45	1.37
710.6	37.401	51.07	1.52	126	37.32	0.16	2.34	2.34	0.89	0.96	1.46	1.38
710.4	37.565	62.02	1.99	126	37.48	0.16	2.35	2.35	0.89	0.97	1.46	1.38
710.3	37.729	47.33	2.14	126	37.65	0.16	2.36	2.36	0.90	0.97	1.47	1.39
710.1	37.893	38.19	1.80	126	37.81	0.16	2.37	2.37	0.90	0.98	1.47	1.39
709.9	38.057	42.72	0.89	126	37.98	0.16	2.38	2.38	0.91	0.98	1.48	1.40
709.8	38.221	48.72	0.50	126	38.14	0.16	2.39	2.39	0.91	0.99	1.48	1.40
709.6	38.385	45.22	0.24	126	38.30	0.16	2.40	2.40	0.92	0.99	1.49	1.41
709.5	38.549	34.29	0.19	126	38.47	0.16	2.41	2.41	0.92	1.00	1.49	1.41
709.3	38.713	23.88	0.25	126	38.63	0.16	2.42	2.42	0.93	1.01	1.50	1.42
709.1	38.877	20.33	0.32	126	38.80	0.16	2.43	2.43	0.93	1.01	1.50	1.42
709.0	39.042	25.26	0.25	126	38.96	0.16	2.44	2.44	0.94	1.02	1.51	1.43
708.8	39.206	28.80	0.13	126	39.12	0.16	2.46	2.46	0.94	1.02	1.51	1.43
708.6	39.370	23.57	0.12	126	39.29	0.16	2.47	2.47	0.95	1.03	1.52	1.44
708.5	39.534	21.37	0.18	131	39.45	0.16	2.48	2.48	0.95	1.03	1.52	1.45
708.3	39.698	25.69	0.17	131	39.62	0.16	2.49	2.49	0.96	1.04	1.53	1.45
708.1	39.862	36.03	0.15	131	39.78	0.16	2.50	2.50	0.96	1.04	1.53	1.46
708.0	40.026	42.44	0.12	131	39.94	0.16	2.51	2.51	0.97	1.05	1.54	1.46
707.8	40.190	48.08	0.10	131	40.11	0.16	2.52	2.52	0.97	1.05	1.55	1.47
707.6	40.354	47.32	0.12	131	40.27	0.16	2.53	2.53	0.98	1.06	1.55	1.47
707.5	40.518	44.72	0.14	131	40.44	0.16	2.54	2.54	0.98	1.06	1.56	1.48
707.3	40.682	43.72	0.15	131	40.60	0.16	2.55	2.55	0.99	1.07	1.56	1.48
707.2	40.846	41.10	0.19	131	40.76	0.16	2.56	2.56	0.99	1.07	1.57	1.49
707.0	41.010	33.39	0.27	131	40.93	0.16	2.57	2.57	1.00	1.08	1.57	1.50
706.8	41.174	30.87	0.35	131	41.09	0.16	2.58	2.58	1.00	1.08	1.58	1.50
706.7	41.338	48.77	0.24	131	41.26	0.16	2.59	2.59	1.01	1.09	1.59	1.51
706.5	41.502	70.31	0.21	131	41.42	0.16	2.60	2.60	1.01	1.09	1.59	1.51
706.3	41.666	90.32	0.19	131	41.58	0.16	2.62	2.62	1.02	1.10	1.60	1.52
706.2	41.830	97.78	0.23	131	41.75	0.16	2.63	2.63	1.02	1.10	1.60	1.52
706.0	41.994	92.87	0.31	131	41.91	0.16	2.64	2.64	1.03	1.11	1.61	1.53
705.8	42.158	90.55	0.35	131	42.08	0.16	2.65	2.65	1.03	1.11	1.61	1.54
705.7	42.322	77.88	0.38	131	42.24	0.16	2.66	2.66	1.04	1.12	1.62	1.54
705.5	42.486	64.94	0.46	131	42.40	0.16	2.67	2.67	1.04	1.12	1.62	1.55
705.3	42.650	60.52	0.36	131	42.57	0.16	2.68	2.68	1.05	1.13	1.63	1.55
705.2	42.814	68.30	0.23	131	42.73	0.16	2.69	2.69	1.06	1.13	1.64	1.56
705.0	42.978	71.63	0.53	131	42.90	0.16	2.70	2.70	1.06	1.14	1.64	1.56
704.9	43.143	66.14	0.31	131	43.06	0.16	2.71	2.71	1.07	1.14	1.65	1.57
704.7	43.307	63.67	0.55	131	43.22	0.16	2.72	2.72	1.07	1.15	1.65	1.57
704.5	43.471	41.59	0.53	131	43.39	0.16	2.73	2.73	1.08	1.15	1.66	1.58

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
704.4	43.635	33.39	0.70	131	43.55	0.16	2.74	2.74	1.08	1.16	1.66	1.59
704.2	43.799	31.23	0.59	131	43.72	0.16	2.76	2.76	1.09	1.16	1.67	1.59
704.0	43.963	28.37	0.75	131	43.88	0.16	2.77	2.77	1.09	1.17	1.68	1.60
703.9	44.127	27.15	1.12	131	44.04	0.16	2.78	2.78	1.10	1.17	1.68	1.60
703.7	44.291	27.56	1.47	131	44.21	0.16	2.79	2.79	1.10	1.18	1.69	1.61
703.5	44.455	37.46	1.08	131	44.37	0.16	2.80	2.80	1.11	1.18	1.69	1.61
703.4	44.619	91.19	1.68	131	44.54	0.16	2.81	2.81	1.11	1.19	1.70	1.62
703.2	44.783	65.05	1.57	131	44.70	0.16	2.82	2.82	1.12	1.19	1.70	1.63
703.1	44.947	89.37	1.36	131	44.86	0.16	2.83	2.83	1.12	1.20	1.71	1.63
702.9	45.111	90.42	0.41	131	45.03	0.16	2.84	2.84	1.13	1.20	1.71	1.64
702.7	45.275	86.41	0.31	131	45.19	0.16	2.85	2.85	1.13	1.21	1.72	1.64
702.6	45.439	74.40	0.27	131	45.36	0.16	2.86	2.86	1.14	1.21	1.73	1.65
702.4	45.603	72.33	0.44	131	45.52	0.16	2.87	2.87	1.14	1.22	1.73	1.65
702.2	45.767	79.96	0.35	131	45.69	0.16	2.88	2.88	1.15	1.23	1.74	1.66
702.1	45.931	86.32	0.63	131	45.85	0.16	2.90	2.90	1.15	1.23	1.74	1.66
701.9	46.095	82.34	0.99	131	46.01	0.16	2.91	2.91	1.16	1.24	1.75	1.67
701.7	46.259	118.53	0.84	131	46.18	0.16	2.92	2.92	1.16	1.24	1.75	1.68
701.6	46.423	175.35	1.37	131	46.34	0.16	2.93	2.93	1.17	1.25	1.76	1.68
701.4	46.587	143.58	1.54	131	46.51	0.16	2.94	2.94	1.17	1.25	1.77	1.69
701.2	46.751	125.58	1.63	131	46.67	0.16	2.95	2.95	1.18	1.26	1.77	1.69
701.1	46.915	115.79	1.06	131	46.83	0.16	2.96	2.96	1.18	1.26	1.78	1.70
700.9	47.079	136.80	0.64	131	47.00	0.16	2.97	2.97	1.19	1.27	1.78	1.70
700.8	47.244	186.22	1.98	131	47.16	0.16	2.98	2.98	1.19	1.27	1.79	1.71
700.6	47.408	197.55	2.84	131	47.33	0.16	2.99	2.99	1.20	1.28	1.79	1.72
700.4	47.572	141.02	2.56	131	47.49	0.16	3.00	3.00	1.20	1.28	1.80	1.72
700.3	47.736	126.97	1.38	131	47.65	0.16	3.01	3.01	1.21	1.29	1.80	1.73
700.1	47.900	135.70	2.66	131	47.82	0.16	3.02	3.02	1.21	1.29	1.81	1.73
699.9	48.064	193.98	5.20	131	47.98	0.16	3.03	3.03	1.22	1.30	1.82	1.74
699.8	48.228	400.00	0.01	131	48.15	0.16	3.05	3.05	1.22	1.30	1.82	1.74
699.6	48.392	469.81	0.01	131	48.31	0.08	3.06	3.06	1.23	1.31	1.83	1.75

LIQUEFACTION POTENTIAL ASSESSMENT FOR COARSE GRAINED SOILS USING CONE PENETRATION TEST DATA

Project Site: KIF TDEC Stability
Project No.: 175668043
CPT ID: KIF-BF-CPT-3A

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
748.0												
747.8	0.164	257.79	0.21	1.19	0.5	1.70	42.28	0	0.00	42.28	0.198	-0.126
747.7	0.328	1305.87	0.23	0.67	0.5	1.70	297.75	0	0.00	297.75	0.199	-0.600
747.5	0.492	1239.49	0.16	0.56	0.5	1.70	344.15	0	0.00	344.15	0.200	-0.600
747.3	0.656	1368.96	0.21	0.64	0.5	1.70	437.62	0	0.00	437.62	0.200	-0.600
747.2	0.820	1474.71	0.21	0.62	0.5	1.70	526.15	0	0.00	526.15	0.200	-0.600
747.0	0.984	1036.99	0.54	1.05	0.5	1.70	404.85	0	0.00	404.85	0.199	-0.600
746.9	1.148	598.85	1.11	1.44	0.5	1.70	252.36	0	0.00	252.36	0.200	-0.600
746.7	1.312	1261.28	0.57	1.04	0.5	1.70	567.75	0	0.00	567.75	0.200	-0.600
746.5	1.476	1401.39	0.67	1.10	0.5	1.70	668.74	0	0.00	668.74	0.201	-0.600
746.4	1.640	1202.72	0.79	1.18	0.5	1.70	604.77	0	0.00	604.77	0.200	-0.600
746.2	1.804	1216.78	0.55	1.03	0.5	1.70	641.50	0	0.00	641.50	0.199	-0.600
746.0	1.968	1327.79	0.41	0.90	0.5	1.70	730.95	0	0.00	730.95	0.197	-0.600
745.9	2.133	1367.18	0.42	0.91	0.5	1.70	783.19	0	0.00	783.19	0.195	-0.600
745.7	2.297	1209.88	0.56	1.05	0.5	1.70	719.13	0	0.00	719.13	0.193	-0.600
745.5	2.461	824.55	0.97	1.33	0.5	1.70	507.30	0	0.00	507.30	0.190	-0.600
745.4	2.625	478.38	1.68	1.65	0.5	1.68	300.20	0	0.00	300.20	0.188	-0.600
745.2	2.789	284.34	3.06	1.99	0.5	1.70	186.35	22	0.00	186.35	0.186	-0.600
745.0	2.953	314.52	2.61	1.90	0.5	1.70	212.07	15	0.00	212.07	0.186	-0.600
744.9	3.117	209.87	3.06	2.06	0.5	1.70	145.46	28	0.00	145.46	0.185	-0.586
744.7	3.281	419.85	1.69	1.68	0.5	1.58	277.78	0	0.00	277.78	0.185	-0.600
744.6	3.445	530.50	1.39	1.55	0.5	1.56	354.99	0	0.00	354.99	0.184	-0.600
744.4	3.609	476.20	1.36	1.57	0.5	1.54	322.21	0	0.00	322.21	0.183	-0.600
744.2	3.773	633.88	1.09	1.42	0.5	1.53	433.33	0	0.00	433.33	0.183	-0.600
744.1	3.937	458.61	1.52	1.62	0.5	1.51	316.78	0	0.00	316.78	0.182	-0.600
743.9	4.101	240.96	2.37	1.93	0.5	1.69	189.92	17	0.00	189.92	0.181	-0.600
743.7	4.265	170.24	3.27	2.13	0.5	1.70	138.08	33	0.00	138.08	0.180	-0.556
743.6	4.429	111.69	5.33	2.41	0.5	1.70	92.45	56	0.00	92.45	0.180	-0.379
743.4	4.593	88.03	6.15	2.52	0.5	1.70	74.30	65	0.00	74.30	0.179	-0.289
743.2	4.757	77.45	5.72	2.53	0.5	1.70	66.58	66	0.00	66.58	0.179	-0.246
743.1	4.921	75.42	5.11	2.50	0.5	1.70	65.96	63	0.00	65.96	0.178	-0.242
742.9	5.085	126.69	3.08	2.19	0.5	1.62	106.89	38	66.06	172.94	0.178	-0.600
742.8	5.249	243.33	2.00	1.87	0.5	1.49	192.32	12	19.66	211.98	0.178	-0.600
742.6	5.413	221.63	2.67	1.99	0.5	1.44	172.45	23	54.10	226.55	0.178	-0.600
742.4	5.577	189.53	3.95	2.17	0.5	1.43	149.16	37	74.64	223.80	0.178	-0.600
742.3	5.741	327.12	2.45	1.87	0.5	1.36	248.28	13	24.20	272.48	0.177	-0.600
742.1	5.905	414.04	2.42	1.82	0.5	1.35	316.49	8	6.53	323.02	0.175	-0.600
741.9	6.069	321.26	2.64	1.90	0.5	1.34	247.46	15	36.46	283.92	0.174	-0.600
741.8	6.234	528.75	1.88	1.67	0.5	1.33	409.87	0	0.00	409.87	0.173	-0.600
741.6	6.398	528.24	2.39	1.76	0.5	1.32	412.29	4	0.06	412.34	0.171	-0.600
741.4	6.562	381.08	3.38	1.96	0.5	1.31	299.55	20	63.62	363.16	0.170	-0.600
741.3	6.726	530.34	1.58	1.60	0.5	1.30	419.39	0	0.00	419.39	0.169	-0.600
741.1	6.890	501.28	1.43	1.58	0.5	1.29	398.93	0	0.00	398.93	0.169	-0.600
740.9	7.054	300.81	3.80	2.05	0.5	1.28	241.07	27	78.37	319.44	0.169	-0.600
740.8	7.218	779.93	1.18	1.41	0.5	1.27	627.97	0	0.00	627.97	0.169	-0.600
740.6	7.382	695.17	1.10	1.41	0.5	1.26	563.05	0	0.00	563.05	0.169	-0.600
740.5	7.546	422.87	1.46	1.62	0.5	1.26	344.67	0	0.00	344.67	0.169	-0.600
740.3	7.710	296.20	1.90	1.80	0.5	1.26	244.60	7	2.45	247.05	0.169	-0.600
740.1	7.874	282.00	1.88	1.81	0.5	1.26	235.78	8	3.83	239.61	0.169	-0.600
740.0	8.038	206.60	2.63	2.01	0.5	1.26	175.00	23	57.00	232.00	0.169	-0.600
739.8	8.202	201.85	2.37	1.98	0.5	1.26	173.22	21	49.98	223.20	0.168	-0.600
739.6	8.366	188.19	2.21	1.97	0.5	1.27	164.09	21	47.18	211.26	0.168	-0.600
739.5	8.530	212.70	1.51	1.81	0.5	1.28	189.56	7	2.85	192.41	0.168	-0.600
739.3	8.694	151.62	2.16	2.02	0.5	1.28	136.17	25	53.09	189.26	0.167	-0.600
739.1	8.858	83.16	3.36	2.33	0.5	1.33	78.78	50	66.77	145.55	0.167	-0.567
739.0	9.022	55.66	3.45	2.46	0.5	1.36	54.81	60	64.09	118.90	0.166	-0.474
738.8	9.186	48.10	5.40	2.65	1.0	1.40	35.28	75	61.76	97.04	0.166	-0.386
738.6	9.350	43.38	4.94	2.65	1.0	1.40	32.24	75	60.90	93.13	0.166	-0.368
738.5	9.514	56.41	6.06	2.64	0.7	1.35	49.21	74	65.75	114.96	0.165	-0.459
738.3	9.678	67.04	5.79	2.58	0.5	1.32	64.83	69	69.28	134.11	0.165	-0.528
738.2	9.842	63.77	10.29	2.79	1.0	1.34	46.44	86	66.75	113.19	0.164	-0.451

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
738.0	10.006	71.82	2.37	2.27	0.5	1.31	69.73	44	61.62	131.35	0.164	-0.518
737.8	10.170	130.12	2.27	2.08	0.5	1.24	120.08	29	58.64	178.71	0.164	-0.600
737.7	10.335	178.18	2.79	2.06	0.5	1.20	158.70	28	64.11	222.81	0.163	-0.600
737.5	10.499	224.16	2.54	1.97	0.5	1.17	196.25	21	52.62	248.87	0.163	-0.600
737.3	10.663	141.06	4.68	2.31	0.5	1.21	127.82	47	78.36	206.18	0.163	-0.600
737.2	10.827	115.96	3.89	2.29	0.5	1.23	107.58	46	72.41	179.99	0.162	-0.600
737.0	10.991	254.71	1.16	1.67	0.5	1.18	227.51	0	0.00	227.51	0.162	-0.600
736.8	11.155	188.06	1.28	1.79	0.5	1.22	175.04	6	0.75	175.79	0.162	-0.600
736.7	11.319	159.95	2.99	2.12	0.5	1.19	145.08	32	68.15	213.23	0.162	-0.600
736.5	11.483	173.08	2.73	2.06	0.5	1.18	156.46	28	63.71	220.17	0.163	-0.600
736.4	11.647	106.67	4.61	2.37	0.5	1.21	100.15	53	73.89	174.04	0.164	-0.600
736.2	11.811	81.53	5.56	2.51	0.5	1.23	78.33	64	71.79	150.12	0.164	-0.577
736.0	11.975	97.27	4.26	2.37	0.5	1.21	92.33	53	71.69	164.02	0.165	-0.600
735.9	12.139	88.66	4.39	2.41	0.5	1.22	84.88	55	70.87	155.75	0.166	-0.594
735.7	12.303	95.42	4.48	2.39	0.5	1.21	90.86	54	72.07	162.94	0.166	-0.600
735.5	12.467	111.26	4.11	2.32	0.5	1.19	104.77	49	73.06	177.83	0.167	-0.600
735.4	12.631	113.25	4.97	2.38	0.5	1.18	106.43	54	75.98	182.40	0.166	-0.600
735.2	12.795	115.99	3.39	2.24	0.5	1.18	109.33	43	70.30	179.63	0.165	-0.600
735.0	12.959	171.51	1.88	1.94	0.5	1.17	159.47	18	39.22	198.69	0.164	-0.600
734.9	13.123	185.84	1.50	1.84	0.5	1.17	174.41	10	10.95	185.36	0.164	-0.600
734.7	13.287	106.02	2.54	2.17	0.5	1.18	101.35	37	63.66	165.01	0.163	-0.600
734.5	13.451	76.72	3.58	2.38	0.5	1.20	74.87	53	67.29	142.16	0.162	-0.549
734.4	13.615	71.09	3.69	2.41	0.5	1.20	69.79	56	66.88	136.66	0.162	-0.531
734.2	13.779	76.05	3.03	2.33	0.5	1.19	74.47	49	65.38	139.85	0.162	-0.541
734.1	13.943	76.63	2.30	2.24	0.5	1.19	75.25	42	61.56	136.81	0.162	-0.531
733.9	14.107	77.95	1.72	2.15	0.5	1.19	76.80	35	56.10	132.90	0.161	-0.517
733.7	14.271	81.82	1.45	2.08	0.5	1.19	80.69	29	50.96	131.65	0.161	-0.513
733.6	14.436	74.35	0.94	2.00	0.5	1.20	74.46	23	38.98	113.44	0.161	-0.446
733.4	14.600	60.86	1.09	2.10	0.5	1.20	61.30	31	49.17	110.47	0.161	-0.434
733.2	14.764	42.22	2.53	2.46	0.5	1.20	43.08	60	60.67	103.75	0.162	-0.406
733.1	14.928	31.09	3.82	2.68	1.0	1.22	27.16	77	59.72	86.88	0.162	-0.332
732.9	15.092	16.12	6.28	3.03	1.0	1.23	14.83	100	58.54	73.37	0.162	-0.264
732.7	15.256	13.35	4.98	3.03	1.0	1.23	12.55	100	57.83	70.39	0.162	-0.247
732.6	15.420	11.89	3.80	3.00	1.0	1.22	11.36	100	57.46	68.82	0.162	-0.238
732.4	15.584	9.79	3.34	3.03	1.0	1.22	9.60	100	56.91	66.52	0.162	-0.225
732.3	15.748	8.08	3.09	3.08	1.0	1.22	8.16	100	56.47	64.63	0.163	-0.214
732.1	15.912	8.37	2.07	2.97	1.0	1.21	8.44	100	56.55	64.99	0.163	-0.216
731.9	16.076	7.43	3.19	3.12	1.0	1.21	7.65	100	56.31	63.96	0.163	-0.210
731.8	16.240	9.88	2.67	2.97	1.0	1.20	9.81	100	56.98	66.79	0.163	-0.226
731.6	16.404	12.21	2.79	2.91	1.0	1.19	11.87	96	57.25	69.12	0.164	-0.239
731.4	16.568	9.70	3.73	3.06	1.0	1.19	9.71	100	56.95	66.66	0.164	-0.225
731.3	16.732	27.66	1.11	2.39	0.5	1.17	29.09	54	55.22	84.31	0.164	-0.317
731.1	16.896	40.06	1.65	2.36	0.5	1.15	41.20	52	57.54	98.74	0.164	-0.383
730.9	17.060	30.63	2.57	2.57	0.5	1.15	31.92	68	59.61	91.53	0.165	-0.351
730.8	17.224	34.77	2.38	2.50	0.5	1.15	35.99	63	59.66	95.64	0.165	-0.369
730.6	17.388	30.09	3.13	2.63	1.0	1.15	27.72	73	59.28	87.00	0.165	-0.329
730.4	17.552	29.27	2.62	2.59	0.7	1.15	29.15	70	59.12	88.27	0.165	-0.335
730.3	17.716	25.46	2.24	2.59	0.5	1.14	26.85	70	58.52	85.37	0.166	-0.321
730.1	17.880	23.55	2.71	2.67	1.0	1.14	22.26	77	58.21	80.47	0.166	-0.297
730.0	18.044	24.29	3.07	2.69	1.0	1.14	22.97	79	58.69	81.66	0.166	-0.303
729.8	18.208	16.74	4.06	2.90	1.0	1.14	16.32	95	58.54	74.86	0.167	-0.268
729.6	18.372	5.45	11.05	3.55	1.0	1.14	6.20	100	55.86	62.06	0.167	-0.195
729.5	18.537	3.52	9.26	3.65	1.0	1.14	4.47	100	55.32	59.79	0.167	-0.181
729.3	18.701	2.40	6.32	3.69	1.0	1.14	3.46	100	55.01	58.46	0.168	-0.173
729.1	18.865	1.75	6.83	3.82	1.0	1.13	2.87	100	54.82	57.70	0.168	-0.168
729.0	19.029	2.53	5.84	3.65	1.0	1.13	3.60	100	55.05	58.65	0.169	-0.174
728.8	19.193	7.38	3.33	3.13	1.0	1.12	8.07	100	56.44	64.51	0.169	-0.209
728.6	19.357	12.01	3.80	2.99	1.0	1.11	12.34	100	57.76	70.11	0.169	-0.241
728.5	19.521	14.61	2.90	2.85	1.0	1.11	14.76	91	57.74	72.50	0.170	-0.254
728.3	19.685	19.87	2.28	2.68	1.0	1.10	19.64	78	57.59	77.23	0.170	-0.278
728.2	19.849	15.75	2.80	2.82	1.0	1.10	15.90	88	57.79	73.69	0.171	-0.260
728.0	20.013	26.77	1.85	2.53	0.5	1.09	28.18	65	57.83	86.01	0.171	-0.322
727.8	20.177	35.65	1.51	2.37	0.5	1.08	37.00	53	56.89	93.89	0.172	-0.358
727.7	20.341	33.11	1.55	2.41	0.5	1.08	34.48	55	57.07	91.55	0.172	-0.347
727.5	20.505	22.45	3.28	2.74	1.0	1.08	22.30	82	58.98	81.28	0.172	-0.298
727.3	20.669	10.68	6.81	3.19	1.0	1.08	11.38	100	57.47	68.85	0.173	-0.232

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727.2	20.833	6.44	7.16	3.37	1.0	1.08	7.42	100	56.24	63.65	0.173	-0.202
727.0	20.997	5.79	5.78	3.36	1.0	1.08	6.82	100	56.05	62.87	0.174	-0.197
726.8	21.161	8.60	3.49	3.09	1.0	1.07	9.51	100	56.88	66.39	0.174	-0.218
726.7	21.325	6.04	3.62	3.22	1.0	1.07	7.11	100	56.14	63.24	0.175	-0.199
726.5	21.489	4.87	3.10	3.27	1.0	1.07	6.01	100	55.80	61.81	0.175	-0.191
726.3	21.653	3.07	3.49	3.46	1.0	1.07	4.30	100	55.27	59.57	0.176	-0.177
726.2	21.817	2.47	2.58	3.48	1.0	1.06	3.74	100	55.09	58.84	0.176	-0.172
726.0	21.981	1.89	2.74	3.60	1.0	1.06	3.19	100	54.92	58.12	0.177	-0.167
725.9	22.145	1.68	2.83	3.65	1.0	1.06	3.00	100	54.86	57.86	0.177	-0.165
725.7	22.309	1.78	2.54	3.61	1.0	1.05	3.11	100	54.90	58.00	0.178	-0.166
725.5	22.473	2.23	2.20	3.49	1.0	1.05	3.55	100	55.03	58.58	0.178	-0.170
725.4	22.638	2.37	2.27	3.47	1.0	1.05	3.69	100	55.08	58.77	0.179	-0.171
725.2	22.802	2.62	2.63	3.46	1.0	1.04	3.95	100	55.16	59.10	0.179	-0.173
725.0	22.966	3.43	2.81	3.38	1.0	1.04	4.75	100	55.41	60.16	0.180	-0.179
724.9	23.130	7.22	1.90	3.01	1.0	1.03	8.46	100	56.56	65.02	0.181	-0.208
724.7	23.294	8.24	1.96	2.97	1.0	1.03	9.48	100	56.88	66.36	0.181	-0.216
724.5	23.458	7.97	2.36	3.02	1.0	1.03	9.24	100	56.80	66.04	0.182	-0.214
724.4	23.622	7.97	2.45	3.03	1.0	1.02	9.26	100	56.81	66.07	0.182	-0.214
724.2	23.786	8.63	2.38	2.99	1.0	1.02	9.94	100	57.02	66.96	0.183	-0.219
724.1	23.950	8.75	2.91	3.04	1.0	1.02	10.08	100	57.06	67.14	0.183	-0.219
723.9	24.114	8.02	3.01	3.08	1.0	1.01	9.38	100	56.85	66.23	0.184	-0.214
723.7	24.278	7.44	2.55	3.07	1.0	1.01	8.83	100	56.67	65.50	0.184	-0.210
723.6	24.442	6.67	2.04	3.06	1.0	1.01	8.08	100	56.44	64.53	0.185	-0.204
723.4	24.606	6.00	1.78	3.07	1.0	1.01	7.43	100	56.24	63.68	0.185	-0.199
723.2	24.770	6.15	1.50	3.02	1.0	1.00	7.60	100	56.29	63.90	0.186	-0.200
723.1	24.934	7.59	1.37	2.92	1.0	1.00	9.06	97	56.49	65.55	0.186	-0.209
722.9	25.098	9.32	1.29	2.83	1.0	1.00	10.81	90	56.36	67.17	0.187	-0.218
722.7	25.262	10.22	1.27	2.79	1.0	0.99	11.75	87	56.32	68.06	0.187	-0.223
722.6	25.426	12.00	1.38	2.75	1.0	0.99	13.57	83	56.46	70.03	0.188	-0.234
722.4	25.590	12.76	1.28	2.71	1.0	0.99	14.36	80	56.31	70.68	0.188	-0.238
722.2	25.754	13.02	1.13	2.68	1.0	0.99	14.65	77	56.03	70.68	0.189	-0.238
722.1	25.918	13.13	1.12	2.67	1.0	0.98	14.80	77	56.00	70.80	0.189	-0.238
721.9	26.082	12.99	1.88	2.79	1.0	0.98	14.70	86	57.18	71.87	0.190	-0.244
721.8	26.246	14.88	2.60	2.82	1.0	0.98	16.65	89	58.03	74.69	0.190	-0.259
721.6	26.410	23.28	1.64	2.55	0.5	0.98	24.76	67	57.18	81.94	0.191	-0.295
721.4	26.574	17.40	2.00	2.70	1.0	0.97	19.31	79	57.65	76.95	0.191	-0.270
721.3	26.739	16.49	1.83	2.70	1.0	0.97	18.42	79	57.36	75.78	0.192	-0.264
721.1	26.903	16.81	1.72	2.67	1.0	0.97	18.79	77	57.22	76.01	0.192	-0.265
720.9	27.067	19.07	1.73	2.63	1.0	0.97	21.16	73	57.38	78.54	0.193	-0.278
720.8	27.231	22.74	2.26	2.64	1.0	0.96	25.02	74	58.57	83.59	0.193	-0.303
720.6	27.395	25.08	2.38	2.61	1.0	0.96	27.51	72	59.02	86.52	0.194	-0.317
720.4	27.559	31.03	1.38	2.40	0.5	0.96	32.54	55	56.39	88.93	0.194	-0.328
720.3	27.723	32.27	1.28	2.37	0.5	0.96	33.78	52	55.86	89.64	0.195	-0.331
720.1	27.887	31.76	2.12	2.50	0.5	0.96	33.30	63	58.86	92.16	0.195	-0.342
719.9	28.051	32.53	2.77	2.57	0.5	0.95	34.08	68	60.24	94.31	0.196	-0.352
719.8	28.215	36.62	2.88	2.54	0.5	0.95	38.21	66	60.96	99.17	0.196	-0.373
719.6	28.379	32.94	3.43	2.63	1.0	0.95	36.21	73	61.72	97.93	0.197	-0.367
719.5	28.543	27.58	3.68	2.70	1.0	0.95	30.60	79	61.07	91.67	0.197	-0.340
719.3	28.707	26.11	3.65	2.72	1.0	0.95	29.10	81	60.80	89.90	0.197	-0.331
719.1	28.871	24.31	2.85	2.67	1.0	0.94	27.24	77	59.72	86.96	0.198	-0.317
719.0	29.035	20.45	3.41	2.78	1.0	0.94	23.20	86	59.67	82.87	0.198	-0.298
718.8	29.199	16.73	3.95	2.89	1.0	0.94	19.28	94	59.39	78.68	0.199	-0.277
718.6	29.363	18.56	3.08	2.79	1.0	0.93	21.28	86	59.14	80.42	0.199	-0.285
718.5	29.527	17.88	4.66	2.91	1.0	0.93	20.60	96	59.97	80.57	0.199	-0.286
718.3	29.691	23.93	3.13	2.70	1.0	0.93	27.13	79	60.05	87.19	0.200	-0.318
718.1	29.855	21.26	2.74	2.71	1.0	0.93	24.31	80	59.26	83.57	0.200	-0.300
718.0	30.019	21.53	2.88	2.72	1.0	0.93	24.65	80	59.46	84.11	0.201	-0.303
717.8	30.183	22.26	2.87	2.71	1.0	0.92	25.50	79	59.58	85.07	0.201	-0.307
717.7	30.347	20.25	2.74	2.73	1.0	0.92	23.36	81	59.15	82.51	0.201	-0.295
717.5	30.511	18.70	2.41	2.72	1.0	0.92	21.73	81	58.60	80.33	0.202	-0.284
717.3	30.675	16.30	3.31	2.85	1.0	0.92	19.17	91	59.05	78.23	0.202	-0.273
717.2	30.840	16.86	3.47	2.85	1.0	0.91	19.83	91	59.26	79.09	0.202	-0.277
717.0	31.004	33.67	2.02	2.47	0.5	0.92	35.28	61	58.78	94.06	0.203	-0.348
716.8	31.168	55.07	1.20	2.16	0.5	0.92	56.98	36	52.74	109.73	0.203	-0.414
716.7	31.332	70.56	0.75	1.96	0.5	0.92	72.41	20	32.17	104.59	0.203	-0.393
716.5	31.496	71.43	0.77	1.96	0.5	0.92	73.33	20	32.71	106.04	0.204	-0.399

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
716.3	31.660	68.61	0.91	2.01	0.5	0.92	70.67	24	41.03	111.71	0.204	-0.421
716.2	31.824	62.99	0.97	2.06	0.5	0.91	65.01	28	45.83	110.84	0.204	-0.418
716.0	31.988	55.47	1.49	2.22	0.5	0.91	57.53	40	56.09	113.62	0.205	-0.429
715.8	32.152	51.95	1.36	2.22	0.5	0.91	53.90	40	55.15	109.05	0.205	-0.410
715.7	32.316	95.83	1.01	1.93	0.5	0.92	98.73	17	29.45	128.17	0.205	-0.482
715.5	32.480	73.61	1.68	2.16	0.5	0.92	76.40	36	56.83	133.23	0.206	-0.500
715.4	32.644	56.27	1.21	2.16	0.5	0.91	58.33	36	52.72	111.05	0.206	-0.418
715.2	32.808	48.10	1.91	2.33	0.5	0.90	50.08	50	59.15	109.23	0.206	-0.411
715.0	32.972	45.17	2.04	2.37	0.5	0.90	47.09	53	59.60	106.70	0.206	-0.400
714.9	33.136	39.89	1.93	2.40	0.5	0.90	41.67	55	58.87	100.54	0.207	-0.375
714.7	33.300	35.60	1.52	2.38	0.5	0.89	37.27	53	57.01	94.28	0.207	-0.347
714.5	33.464	35.80	1.05	2.28	0.5	0.89	37.42	46	54.00	91.42	0.207	-0.334
714.4	33.628	35.49	1.16	2.31	0.5	0.89	37.12	48	54.92	92.04	0.207	-0.337
714.2	33.792	34.42	1.38	2.36	0.5	0.89	36.06	52	56.35	92.42	0.207	-0.339
714.0	33.956	34.75	1.95	2.45	0.5	0.88	36.45	59	58.64	95.09	0.208	-0.350
713.9	34.120	29.36	2.91	2.62	1.0	0.88	34.91	72	61.22	96.13	0.208	-0.355
713.7	34.284	22.67	2.97	2.71	1.0	0.88	27.28	80	60.14	87.42	0.208	-0.315
713.6	34.448	20.00	1.80	2.62	1.0	0.87	24.24	73	58.17	82.41	0.208	-0.291
713.4	34.612	19.14	1.75	2.63	1.0	0.87	23.30	74	58.03	81.34	0.208	-0.286
713.2	34.776	22.51	1.36	2.51	0.5	0.87	24.03	64	56.43	80.47	0.208	-0.281
713.1	34.941	29.21	0.69	2.27	0.5	0.87	30.69	44	51.65	82.35	0.209	-0.290
712.9	35.105	19.63	1.23	2.54	0.5	0.86	21.14	66	56.05	77.19	0.209	-0.264
712.7	35.269	11.85	2.73	2.91	1.0	0.86	15.13	96	58.29	73.43	0.209	-0.244
712.6	35.433	9.91	2.77	2.98	1.0	0.85	12.94	100	57.95	70.89	0.209	-0.230
712.4	35.597	13.89	1.23	2.67	1.0	0.86	17.49	77	56.78	74.27	0.209	-0.249
712.2	35.761	14.23	1.24	2.66	1.0	0.85	17.92	76	56.83	74.75	0.209	-0.251
712.1	35.925	13.92	0.54	2.51	0.5	0.85	15.43	64	53.95	69.38	0.209	-0.222
711.9	36.089	11.69	0.79	2.65	1.0	0.85	15.04	75	55.82	70.86	0.209	-0.230
711.7	36.253	9.78	0.99	2.76	1.0	0.84	12.89	84	56.36	69.25	0.210	-0.221
711.6	36.417	11.20	0.90	2.69	1.0	0.84	14.54	78	56.13	70.67	0.210	-0.229
711.4	36.581	8.54	1.34	2.87	1.0	0.84	11.51	93	56.90	68.41	0.210	-0.216
711.3	36.745	9.79	1.88	2.89	1.0	0.84	12.98	95	57.50	70.48	0.210	-0.227
711.1	36.909	14.15	2.79	2.86	1.0	0.84	18.08	91	58.76	76.84	0.210	-0.261
710.9	37.073	20.89	2.74	2.72	1.0	0.85	26.03	80	59.84	85.88	0.210	-0.306
710.8	37.237	26.81	3.12	2.67	1.0	0.85	33.17	76	61.39	94.56	0.210	-0.345
710.6	37.401	39.27	3.12	2.54	0.5	0.86	41.28	66	61.85	103.13	0.210	-0.382
710.4	37.565	48.00	3.33	2.50	0.5	0.86	50.41	63	63.62	114.03	0.210	-0.426
710.3	37.729	30.68	4.75	2.74	1.0	0.85	38.08	83	63.78	101.87	0.210	-0.377
710.1	37.893	24.35	5.02	2.83	1.0	0.84	30.48	90	62.37	92.85	0.210	-0.337
709.9	38.057	32.28	2.21	2.51	0.5	0.84	34.03	64	59.18	93.21	0.210	-0.339
709.8	38.221	37.00	1.08	2.28	0.5	0.84	38.73	45	54.13	92.86	0.210	-0.337
709.6	38.385	34.14	0.57	2.17	0.5	0.83	35.61	36	48.07	83.69	0.210	-0.294
709.5	38.549	25.37	0.60	2.29	0.5	0.83	26.83	47	51.70	78.53	0.210	-0.268
709.3	38.713	14.33	1.18	2.65	1.0	0.82	18.60	75	56.86	75.46	0.210	-0.253
709.1	38.877	11.91	1.76	2.81	1.0	0.82	15.77	88	57.65	73.42	0.210	-0.242
709.0	39.042	15.14	1.09	2.61	1.0	0.82	19.61	72	56.67	76.28	0.210	-0.257
708.8	39.206	20.83	0.49	2.34	0.5	0.82	22.27	50	51.86	74.13	0.210	-0.245
708.6	39.370	16.65	0.58	2.45	0.5	0.81	18.15	59	53.62	71.77	0.210	-0.232
708.5	39.534	12.40	0.96	2.66	1.0	0.81	16.44	76	56.39	72.83	0.209	-0.238
708.3	39.698	18.24	0.71	2.46	0.5	0.81	19.74	59	54.10	73.84	0.209	-0.243
708.1	39.862	26.31	0.46	2.23	0.5	0.81	27.72	41	49.43	77.15	0.209	-0.260
708.0	40.026	31.28	0.31	2.10	0.5	0.81	32.53	31	42.70	75.22	0.209	-0.250
707.8	40.190	35.63	0.22	2.00	0.5	0.80	36.58	23	33.76	70.34	0.209	-0.224
707.6	40.354	34.96	0.27	2.03	0.5	0.81	36.06	26	37.58	73.64	0.208	-0.242
707.5	40.518	32.87	0.34	2.09	0.5	0.81	34.12	30	42.67	76.79	0.208	-0.258
707.3	40.682	32.02	0.37	2.12	0.5	0.81	33.32	32	44.18	77.49	0.208	-0.262
707.2	40.846	29.91	0.49	2.19	0.5	0.81	31.32	38	48.37	79.69	0.208	-0.273
707.0	41.010	23.88	0.87	2.39	0.5	0.80	25.40	54	54.25	79.64	0.207	-0.272
706.8	41.174	21.88	1.22	2.50	0.5	0.80	23.43	63	55.98	79.41	0.207	-0.271
706.7	41.338	35.65	0.52	2.13	0.5	0.80	37.09	34	46.26	83.35	0.207	-0.290
706.5	41.502	52.19	0.31	1.89	0.5	0.79	52.59	14	17.29	69.88	0.207	-0.220
706.3	41.666	67.49	0.21	1.73	0.5	0.79	67.21	1	0.00	67.21	0.206	-0.205
706.2	41.830	73.09	0.24	1.72	0.5	0.79	73.13	0	0.00	73.13	0.206	-0.238
706.0	41.994	69.18	0.35	1.80	0.5	0.79	69.08	7	1.21	70.29	0.206	-0.222
705.8	42.158	67.28	0.40	1.84	0.5	0.79	67.53	10	6.62	74.15	0.206	-0.243
705.7	42.322	57.47	0.51	1.94	0.5	0.80	58.80	19	28.19	87.00	0.205	-0.307

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
705.5	42.486	47.50	0.74	2.10	0.5	0.80	49.37	31	46.21	95.59	0.205	-0.346
705.3	42.650	44.04	0.62	2.09	0.5	0.80	45.68	30	44.49	90.17	0.205	-0.322
705.2	42.814	49.87	0.36	1.93	0.5	0.78	50.66	18	25.28	75.93	0.205	-0.252
705.0	42.978	52.31	0.77	2.07	0.5	0.80	54.38	29	44.94	99.32	0.204	-0.362
704.9	43.143	48.05	0.49	2.00	0.5	0.79	49.42	23	36.32	85.74	0.204	-0.300
704.7	43.307	46.09	0.91	2.16	0.5	0.80	48.13	36	50.26	98.39	0.204	-0.358
704.5	43.471	29.34	1.37	2.42	0.5	0.79	31.03	57	56.45	87.48	0.203	-0.308
704.4	43.635	18.42	2.30	2.71	1.0	0.78	24.77	80	59.44	84.21	0.203	-0.293
704.2	43.799	17.05	2.08	2.72	1.0	0.78	23.07	80	58.96	82.02	0.203	-0.282
704.0	43.963	15.28	2.93	2.84	1.0	0.78	20.87	90	59.50	80.37	0.203	-0.274
703.9	44.127	14.50	4.58	2.98	1.0	0.78	19.93	100	60.12	80.05	0.202	-0.272
703.7	44.291	14.69	5.94	3.05	1.0	0.78	20.21	100	60.21	80.42	0.202	-0.274
703.5	44.455	20.49	3.12	2.76	1.0	0.78	27.68	83	60.78	88.46	0.202	-0.312
703.4	44.619	65.94	1.90	2.23	0.5	0.81	70.08	41	59.80	129.88	0.201	-0.479
703.2	44.783	46.36	2.52	2.43	0.5	0.80	49.04	57	61.57	110.61	0.201	-0.407
703.1	44.947	64.36	1.57	2.18	0.5	0.81	68.17	38	56.58	124.75	0.201	-0.460
702.9	45.111	65.02	0.47	1.88	0.5	0.77	65.85	14	16.34	82.18	0.201	-0.282
702.7	45.275	61.93	0.37	1.85	0.5	0.76	61.95	11	9.64	71.59	0.200	-0.227
702.6	45.439	52.94	0.38	1.92	0.5	0.76	53.63	17	23.28	76.91	0.200	-0.255
702.4	45.603	51.32	0.63	2.03	0.5	0.78	53.13	26	40.53	93.66	0.200	-0.335
702.2	45.767	56.86	0.45	1.93	0.5	0.77	57.85	17	24.73	82.58	0.199	-0.283
702.1	45.931	61.44	0.76	2.01	0.5	0.78	63.86	24	39.20	103.06	0.199	-0.375
701.9	46.095	58.40	1.24	2.15	0.5	0.79	61.55	35	52.95	114.50	0.199	-0.421
701.7	46.259	84.87	0.72	1.88	0.5	0.78	87.63	14	17.73	105.35	0.199	-0.385
701.6	46.423	126.37	0.79	1.77	0.5	0.80	133.05	4	0.06	133.11	0.198	-0.489
701.4	46.587	102.91	1.10	1.93	0.5	0.81	109.47	17	30.45	139.92	0.198	-0.512
701.2	46.751	89.59	1.33	2.03	0.5	0.81	95.88	25	47.17	143.05	0.198	-0.522
701.1	46.915	82.30	0.94	1.96	0.5	0.79	86.48	20	34.52	121.01	0.197	-0.445
700.9	47.079	97.46	0.48	1.73	0.5	0.77	99.71	2	0.00	99.71	0.197	-0.361
700.8	47.244	133.23	1.08	1.84	0.5	0.81	142.76	10	9.42	152.18	0.197	-0.551
700.6	47.408	141.24	1.46	1.91	0.5	0.83	155.49	16	31.46	186.95	0.196	-0.600
700.4	47.572	100.04	1.86	2.09	0.5	0.82	109.19	30	57.92	167.11	0.196	-0.596
700.3	47.736	89.71	1.11	1.98	0.5	0.80	95.41	21	38.98	134.40	0.196	-0.492
700.1	47.900	95.87	2.00	2.13	0.5	0.82	104.67	33	60.63	165.31	0.196	-0.590
699.9	48.064	137.76	2.72	2.12	0.5	0.85	156.46	33	71.43	227.89	0.195	-0.600
699.8	48.228	285.95	0.15	1.09	0.5	0.87	327.74	0	0.00	327.74	0.195	-0.600
699.6	48.392	335.71	0.15	1.02	0.5	0.87	384.62	0	0.00	384.62	0.195	-0.600

LIQUEFACTION POTENTIAL ASSESSMENT FOR COARSE GRAINED SOILS USING CONE PENETRATION TEST DATA

Project Site: KIF TDEC Stability
Stantec Project No.: 175668043
CPT ID: KIF-BF-CPT-3A

Depth to Water during Earthquake:	6.5	ft
Final Grade Elevation during EQ:	748.0	ft
Height of Final Grade above CPT TOH:	0.0	ft
Normalize K_σ to:	1.058	tsf
a_{max} at top of ground surface:	0.09	g
Earthquake Magnitude:	7.60	M_W
Earthquake File or Source Zone:	1	Hz

Shear Stress Fit Parameters

m4:	0
m3:	0
m2:	0
m1:	0

Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
748.0																	
747.8	0.164	0.087	22	1.100	N/A	1.00	N/A	1.000	0	0	**0.059**	FALSE	FALSE	TRUE	**N/A**	**Fly Ash**	**A2**
747.7	0.328	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.059**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
747.5	0.492	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.059**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
747.3	0.656	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.059**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
747.2	0.820	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.059**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
747.0	0.984	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.059**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
746.9	1.148	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.059**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
746.7	1.312	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.059**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
746.5	1.476	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.059**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
746.4	1.640	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.059**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
746.2	1.804	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.059**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
746.0	1.968	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.059**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
745.9	2.133	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.059**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
745.7	2.297	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.059**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
745.5	2.461	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.059**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
745.4	2.625	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.059**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
745.2	2.789	N/A	84	N/A	N/A	N/A	N/A	1.000	0	0	**0.059**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
745.0	2.953	N/A	90	N/A	N/A	N/A	N/A	1.000	0	0	**0.059**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
744.9	3.117	0.261	72	1.100	N/A	0.98	N/A	1.000	0	0	**0.059**	FALSE	FALSE	TRUE	**N/A**	**Fly Ash**	**A1**
744.7	3.281	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.059**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
744.6	3.445	N/A	100	N/A	N/A	N/A	N/A	0.999	0	0	**0.059**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
744.4	3.609	N/A	100	N/A	N/A	N/A	N/A	0.999	0	0	**0.059**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
744.2	3.773	N/A	100	N/A	N/A	N/A	N/A	0.998	0	0	**0.059**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
744.1	3.937	N/A	100	N/A	N/A	N/A	N/A	0.998	0	0	**0.059**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
743.9	4.101	N/A	85	N/A	N/A	N/A	N/A	0.998	0	0	**0.059**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
743.7	4.265	0.226	69	1.100	N/A	0.98	N/A	0.997	0	0	**0.059**	FALSE	FALSE	TRUE	**N/A**	**Fly Ash**	**A1**
743.6	4.429	0.128	52	1.100	N/A	0.99	N/A	0.997	0	0	**0.059**	FALSE	FALSE	TRUE	**N/A**	**Fly Ash**	**A1**
743.4	4.593	0.111	43	1.100	N/A	0.99	N/A	0.997	0	0	**0.059**	FALSE	FALSE	TRUE	**N/A**	**Fly Ash**	**A1**
743.2	4.757	0.105	39	1.100	N/A	1.00	N/A	0.996	0	0	**0.059**	FALSE	FALSE	TRUE	**N/A**	**Fly Ash**	**A1**
743.1	4.921	0.104	38	1.100	N/A	1.00	N/A	0.996	0	0	**0.059**	FALSE	FALSE	TRUE	**N/A**	**Fly Ash**	**A1**
742.9	5.085	N/A	80	N/A	N/A	N/A	N/A	0.995	0	0	**0.059**	TRUE	FALSE	TRUE	**N/A**	**Embankment Clay**	**A1**
742.8	5.249	N/A	90	N/A	N/A	N/A	N/A	0.995	0	0	**0.059**	TRUE	TRUE	TRUE	**N/A**	**Embankment Clay**	**A1**
742.6	5.413	N/A	94	N/A	N/A	N/A	N/A	0.995	0	0	**0.059**	TRUE	TRUE	TRUE	**N/A**	**Embankment Clay**	**A1**
742.4	5.577	N/A	93	N/A	N/A	N/A	N/A	0.994	0	0	**0.059**	TRUE	TRUE	TRUE	**N/A**	**Embankment Clay**	**A1**
742.3	5.741	N/A	100	N/A	N/A	N/A	N/A	0.994	0	0	**0.059**	TRUE	TRUE	TRUE	**N/A**	**Embankment Clay**	**A1**
742.1	5.905	N/A	100	N/A	N/A	N/A	N/A	0.994	0	0	**0.059**	TRUE	TRUE	TRUE	**N/A**	**Embankment Clay**	**A1**
741.9	6.069	N/A	100	N/A	N/A	N/A	N/A	0.993	0	0	**0.059**	TRUE	TRUE	TRUE	**N/A**	**Embankment Clay**	**A1**
741.8	6.234	N/A	100	N/A	N/A	N/A	N/A	0.993	0	0	**0.059**	TRUE	TRUE	TRUE	**N/A**	**Embankment Clay**	**A1**
741.6	6.398	N/A	100	N/A	N/A	N/A	N/A	0.992	0	0	**0.059**	TRUE	TRUE	TRUE	**N/A**	**Embankment Clay**	**A1**
741.4	6.562	N/A	100	N/A	N/A	N/A	N/A	0.992	0	0	**0.059**	TRUE	TRUE	FALSE	**N/A**	**Embankment Clay**	**A1**
741.3	6.726	N/A	100	N/A	N/A	N/A	N/A	0.992	0	0	**0.060**	TRUE	TRUE	FALSE	**N/A**	**Embankment Clay**	**A1**
741.1	6.890	N/A	100	N/A	N/A	N/A	N/A	0.991	0	0	**0.060**	TRUE	TRUE	FALSE	**N/A**	**Embankment Clay**	**A1**
740.9	7.054	N/A	100	N/A	N/A	N/A	N/A	0.991	0	0	**0.061**	TRUE	TRUE	FALSE	**N/A**	**Embankment Clay**	**A1**
740.8	7.218	N/A	100	N/A	N/A	N/A	N/A	0.990	0	0	**0.062**	TRUE	TRUE	FALSE	**N/A**	**Embankment Clay**	**A1**

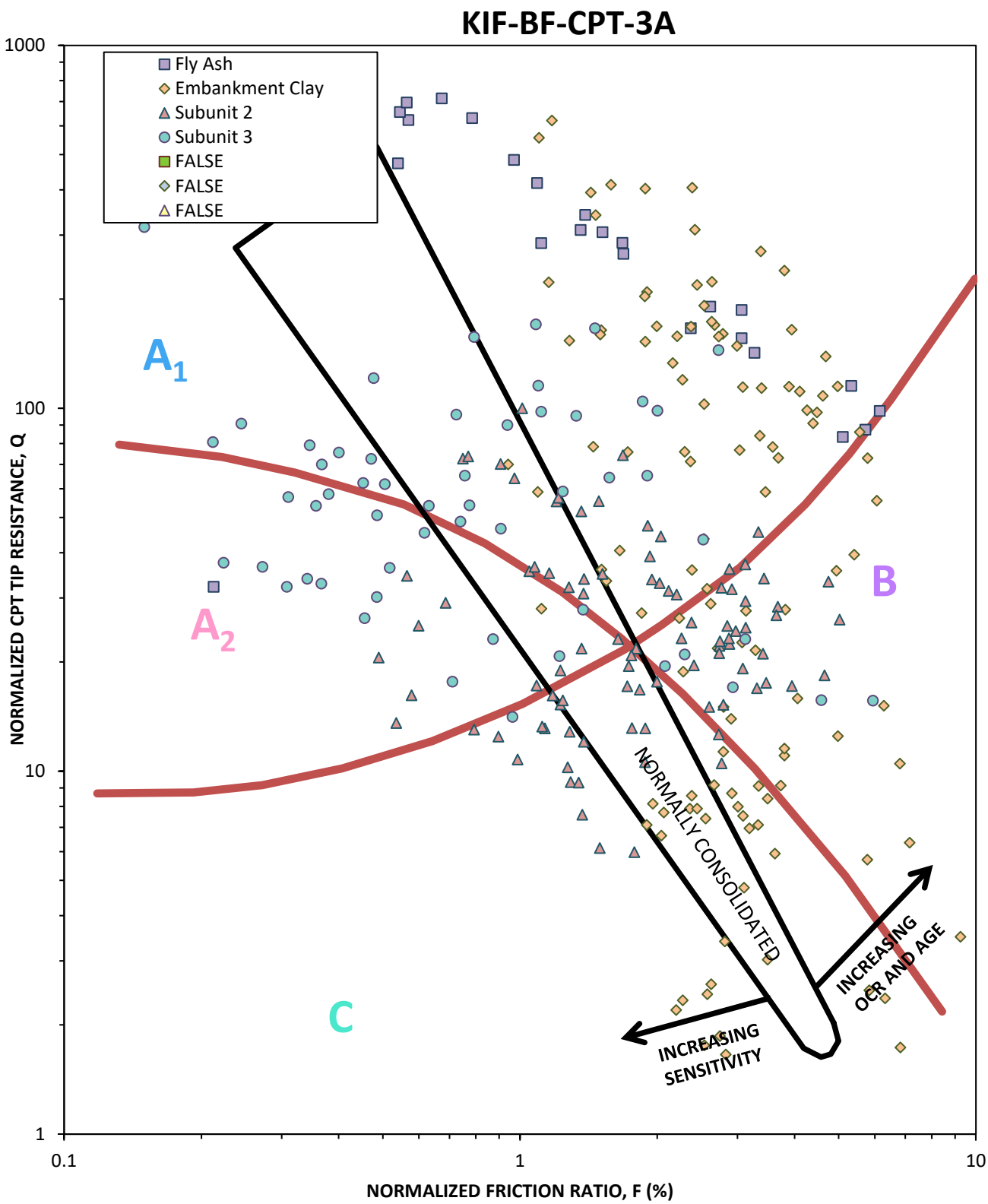
Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
740.6	7.382	N/A	100	N/A	N/A	N/A	N/A	0.990	0	0	**0.062**	TRUE	TRUE	FALSE	**N/A**	**Embankment Clay**	**A1**
740.5	7.546	N/A	100	N/A	N/A	N/A	N/A	0.989	0	0	**0.063**	TRUE	TRUE	FALSE	**N/A**	**Embankment Clay**	**A1**
740.3	7.710	N/A	98	N/A	N/A	N/A	N/A	0.989	0	0	**0.064**	TRUE	TRUE	FALSE	**N/A**	**Embankment Clay**	**A1**
740.1	7.874	N/A	97	N/A	N/A	N/A	N/A	0.989	0	0	**0.064**	TRUE	TRUE	FALSE	**N/A**	**Embankment Clay**	**A1**
740.0	8.038	N/A	95	N/A	N/A	N/A	N/A	0.988	0	0	**0.065**	TRUE	TRUE	FALSE	**N/A**	**Embankment Clay**	**A1**
739.8	8.202	N/A	93	N/A	N/A	N/A	N/A	0.988	0	0	**0.065**	TRUE	TRUE	FALSE	**N/A**	**Embankment Clay**	**A1**
739.6	8.366	N/A	90	N/A	N/A	N/A	N/A	0.987	0	0	**0.066**	TRUE	TRUE	FALSE	**N/A**	**Embankment Clay**	**A1**
739.5	8.530	N/A	85	N/A	N/A	N/A	N/A	0.987	0	0	**0.067**	TRUE	TRUE	FALSE	**N/A**	**Embankment Clay**	**A1**
739.3	8.694	N/A	85	N/A	N/A	N/A	N/A	0.986	0	0	**0.067**	TRUE	TRUE	FALSE	**N/A**	**Embankment Clay**	**A1**
739.1	8.858	N/A	72	N/A	N/A	N/A	N/A	0.986	0	0	**0.068**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**A1**
739.0	9.022	N/A	63	N/A	N/A	N/A	N/A	0.986	0	0	**0.068**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**A1**
738.8	9.186	N/A	54	N/A	N/A	N/A	N/A	0.985	0	0	**0.069**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**B**
738.6	9.350	N/A	52	N/A	N/A	N/A	N/A	0.985	0	0	**0.069**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**B**
738.5	9.514	N/A	61	N/A	N/A	N/A	N/A	0.984	0	0	**0.070**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**B**
738.3	9.678	N/A	68	N/A	N/A	N/A	N/A	0.984	0	0	**0.070**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**B**
738.2	9.842	N/A	60	N/A	N/A	N/A	N/A	0.983	0	0	**0.070**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**B**
738.0	10.006	N/A	67	N/A	N/A	N/A	N/A	0.983	0	0	**0.071**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**A1**
737.8	10.170	N/A	82	N/A	N/A	N/A	N/A	0.982	0	0	**0.071**	TRUE	TRUE	FALSE	**N/A**	**Embankment Clay**	**A1**
737.7	10.335	N/A	93	N/A	N/A	N/A	N/A	0.982	0	0	**0.072**	TRUE	TRUE	FALSE	**N/A**	**Embankment Clay**	**A1**
737.5	10.499	N/A	99	N/A	N/A	N/A	N/A	0.982	0	0	**0.072**	TRUE	TRUE	FALSE	**N/A**	**Embankment Clay**	**A1**
737.3	10.663	N/A	89	N/A	N/A	N/A	N/A	0.981	0	0	**0.073**	TRUE	TRUE	FALSE	**N/A**	**Embankment Clay**	**A1**
737.2	10.827	N/A	82	N/A	N/A	N/A	N/A	0.981	0	0	**0.073**	TRUE	TRUE	FALSE	**N/A**	**Embankment Clay**	**A1**
737.0	10.991	N/A	94	N/A	N/A	N/A	N/A	0.980	0	0	**0.073**	TRUE	TRUE	FALSE	**N/A**	**Embankment Clay**	**A1**
736.8	11.155	N/A	81	N/A	N/A	N/A	N/A	0.980	0	0	**0.074**	TRUE	TRUE	FALSE	**N/A**	**Embankment Clay**	**A1**
736.7	11.319	N/A	91	N/A	N/A	N/A	N/A	0.979	0	0	**0.074**	TRUE	TRUE	FALSE	**N/A**	**Embankment Clay**	**A1**
736.5	11.483	N/A	92	N/A	N/A	N/A	N/A	0.979	0	0	**0.074**	TRUE	TRUE	FALSE	**N/A**	**Embankment Clay**	**A1**
736.4	11.647	N/A	80	N/A	N/A	N/A	N/A	0.978	0	0	**0.075**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**A1**
736.2	11.811	N/A	73	N/A	N/A	N/A	N/A	0.978	0	0	**0.075**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**A1**
736.0	11.975	N/A	77	N/A	N/A	N/A	N/A	0.977	0	0	**0.075**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**A1**
735.9	12.139	N/A	75	N/A	N/A	N/A	N/A	0.977	0	0	**0.076**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**A1**
735.7	12.303	N/A	77	N/A	N/A	N/A	N/A	0.976	0	0	**0.076**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**A1**
735.5	12.467	N/A	81	N/A	N/A	N/A	N/A	0.976	0	0	**0.076**	TRUE	TRUE	FALSE	**N/A**	**Embankment Clay**	**A1**
735.4	12.631	N/A	83	N/A	N/A	N/A	N/A	0.975	0	0	**0.077**	TRUE	TRUE	FALSE	**N/A**	**Embankment Clay**	**A1**
735.2	12.795	N/A	82	N/A	N/A	N/A	N/A	0.975	0	0	**0.077**	TRUE	TRUE	FALSE	**N/A**	**Embankment Clay**	**A1**
735.0	12.959	N/A	87	N/A	N/A	N/A	N/A	0.974	0	0	**0.077**	TRUE	TRUE	FALSE	**N/A**	**Embankment Clay**	**A1**
734.9	13.123	N/A	83	N/A	N/A	N/A	N/A	0.974	0	0	**0.077**	TRUE	TRUE	FALSE	**N/A**	**Embankment Clay**	**A1**
734.7	13.287	N/A	78	N/A	N/A	N/A	N/A	0.973	0	0	**0.078**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**A1**
734.5	13.451	N/A	71	N/A	N/A	N/A	N/A	0.973	0	0	**0.078**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**A1**
734.4	13.615	N/A	69	N/A	N/A	N/A	N/A	0.972	0	0	**0.078**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**A1**
734.2	13.779	N/A	70	N/A	N/A	N/A	N/A	0.972	0	0	**0.079**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**A1**
734.1	13.943	N/A	69	N/A	N/A	N/A	N/A	0.971	0	0	**0.079**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**A1**
733.9	14.107	N/A	68	N/A	N/A	N/A	N/A	0.971	0	0	**0.079**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**A1**
733.7	14.271	N/A	67	N/A	N/A	N/A	N/A	0.970	0	0	**0.079**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**A1**
733.6	14.436	N/A	60	N/A	N/A	N/A	N/A	0.970	0	0	**0.080**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**A1**
733.4	14.600	N/A	59	N/A	N/A	N/A	N/A	0.969	0	0	**0.080**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**A1**
733.2	14.764	N/A	57	N/A	N/A	N/A	N/A	0.969	0	0	**0.080**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**A1**
733.1	14.928	N/A	49	N/A	N/A	N/A	N/A	0.968	0	0	**0.080**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**B**
732.9	15.092	N/A	42	N/A	N/A	N/A	N/A	0.968	0	0	**0.080**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**B**
732.7	15.256	N/A	41	N/A	N/A	N/A	N/A	0.967	0	0	**0.081**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**B**
732.6	15.420	N/A	40	N/A	N/A	N/A	N/A	0.967	0	0	**0.081**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**B**
732.4	15.584	N/A	39	N/A	N/A	N/A	N/A	0.966	0	0	**0.081**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**C**
732.3	15.748	N/A	37	N/A	N/A	N/A	N/A	0.966	0	0	**0.081**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**C**
732.1	15.912	N/A	38	N/A	N/A	N/A	N/A	0.965	0	0	**0.081**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**C**
731.9	16.076	N/A	37	N/A	N/A	N/A	N/A	0.965	0	0	**0.082**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**C**
731.8	16.240	N/A	39	N/A	N/A	N/A	N/A	0.964	0	0	**0.082**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**C**

Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
731.6	16.404	N/A	40	N/A	N/A	N/A	N/A	0.964	0	0	**0.082**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**C**
731.4	16.568	N/A	39	N/A	N/A	N/A	N/A	0.963	0	0	**0.082**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**B**
731.3	16.732	N/A	48	N/A	N/A	N/A	N/A	0.963	0	0	**0.082**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**A2**
731.1	16.896	N/A	54	N/A	N/A	N/A	N/A	0.962	0	0	**0.082**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**A1**
730.9	17.060	N/A	51	N/A	N/A	N/A	N/A	0.962	0	0	**0.083**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**A1**
730.8	17.224	N/A	53	N/A	N/A	N/A	N/A	0.961	0	0	**0.083**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**A1**
730.6	17.388	N/A	49	N/A	N/A	N/A	N/A	0.961	0	0	**0.083**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**B**
730.4	17.552	N/A	50	N/A	N/A	N/A	N/A	0.960	0	0	**0.083**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**B**
730.3	17.716	N/A	48	N/A	N/A	N/A	N/A	0.959	0	0	**0.083**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**B**
730.1	17.880	N/A	46	N/A	N/A	N/A	N/A	0.959	0	0	**0.083**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**B**
730.0	18.044	N/A	47	N/A	N/A	N/A	N/A	0.958	0	0	**0.084**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**B**
729.8	18.208	N/A	43	N/A	N/A	N/A	N/A	0.958	0	0	**0.084**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**B**
729.6	18.372	N/A	36	N/A	N/A	N/A	N/A	0.957	0	0	**0.084**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**B**
729.5	18.537	N/A	34	N/A	N/A	N/A	N/A	0.957	0	0	**0.084**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**B**
729.3	18.701	N/A	34	N/A	N/A	N/A	N/A	0.956	0	0	**0.084**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**C**
729.1	18.865	N/A	33	N/A	N/A	N/A	N/A	0.956	0	0	**0.084**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**C**
729.0	19.029	N/A	34	N/A	N/A	N/A	N/A	0.955	0	0	**0.084**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**C**
728.8	19.193	N/A	37	N/A	N/A	N/A	N/A	0.954	0	0	**0.084**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**C**
728.6	19.357	N/A	41	N/A	N/A	N/A	N/A	0.954	0	0	**0.085**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**B**
728.5	19.521	N/A	42	N/A	N/A	N/A	N/A	0.953	0	0	**0.085**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**B**
728.3	19.685	N/A	44	N/A	N/A	N/A	N/A	0.953	0	0	**0.085**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**B**
728.2	19.849	N/A	42	N/A	N/A	N/A	N/A	0.952	0	0	**0.085**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**B**
728.0	20.013	N/A	49	N/A	N/A	N/A	N/A	0.952	0	0	**0.085**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**A1**
727.8	20.177	N/A	52	N/A	N/A	N/A	N/A	0.951	0	0	**0.085**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**A1**
727.7	20.341	N/A	51	N/A	N/A	N/A	N/A	0.951	0	0	**0.085**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**A1**
727.5	20.505	N/A	46	N/A	N/A	N/A	N/A	0.950	0	0	**0.085**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**B**
727.3	20.669	N/A	40	N/A	N/A	N/A	N/A	0.949	0	0	**0.085**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**B**
727.2	20.833	N/A	37	N/A	N/A	N/A	N/A	0.949	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**B**
727.0	20.997	N/A	36	N/A	N/A	N/A	N/A	0.948	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**B**
726.8	21.161	N/A	38	N/A	N/A	N/A	N/A	0.948	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**C**
726.7	21.325	N/A	37	N/A	N/A	N/A	N/A	0.947	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**C**
726.5	21.489	N/A	36	N/A	N/A	N/A	N/A	0.946	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**C**
726.3	21.653	N/A	34	N/A	N/A	N/A	N/A	0.946	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**C**
726.2	21.817	N/A	34	N/A	N/A	N/A	N/A	0.945	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**C**
726.0	21.981	N/A	33	N/A	N/A	N/A	N/A	0.945	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**C**
725.9	22.145	N/A	33	N/A	N/A	N/A	N/A	0.944	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**C**
725.7	22.309	N/A	33	N/A	N/A	N/A	N/A	0.944	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**C**
725.5	22.473	N/A	34	N/A	N/A	N/A	N/A	0.943	0	0	**0.086**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**C**
725.4	22.638	N/A	34	N/A	N/A	N/A	N/A	0.942	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**C**
725.2	22.802	N/A	34	N/A	N/A	N/A	N/A	0.942	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**C**
725.0	22.966	N/A	35	N/A	N/A	N/A	N/A	0.941	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**C**
724.9	23.130	N/A	38	N/A	N/A	N/A	N/A	0.941	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**C**
724.7	23.294	N/A	38	N/A	N/A	N/A	N/A	0.940	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**C**
724.5	23.458	N/A	38	N/A	N/A	N/A	N/A	0.939	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**C**
724.4	23.622	N/A	38	N/A	N/A	N/A	N/A	0.939	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**C**
724.2	23.786	N/A	39	N/A	N/A	N/A	N/A	0.938	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**C**
724.1	23.950	N/A	39	N/A	N/A	N/A	N/A	0.938	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**C**
723.9	24.114	N/A	38	N/A	N/A	N/A	N/A	0.937	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**C**
723.7	24.278	N/A	38	N/A	N/A	N/A	N/A	0.936	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**C**
723.6	24.442	N/A	37	N/A	N/A	N/A	N/A	0.936	0	0	**0.087**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**C**
723.4	24.606	0.102	37	1.007	0.837	1.00	0.086	0.935	0	0	**0.087**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
723.2	24.770	0.102	37	1.006	0.838	1.00	0.086	0.934	0	0	**0.087**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
723.1	24.934	0.104	38	1.006	0.847	1.00	0.088	0.934	0	0	**0.087**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
722.9	25.098	0.105	39	1.006	0.857	1.00	0.090	0.933	0	0	**0.088**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
722.7	25.262	0.106	39	1.005	0.862	1.00	0.091	0.933	0	0	**0.088**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**

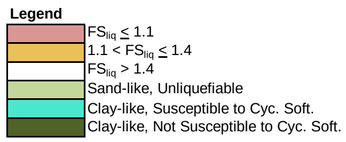
Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
722.6	25.426	0.107	40	1.005	0.874	1.00	0.094	0.932	0	0	**0.088**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**C**
722.4	25.590	0.108	41	1.005	0.878	1.00	0.095	0.931	0	0	**0.088**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**C**
722.2	25.754	0.108	41	1.004	0.877	1.00	0.095	0.931	0	0	**0.088**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**C**
722.1	25.918	0.108	41	1.004	0.878	1.00	0.095	0.930	0	0	**0.088**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**C**
721.9	26.082	0.109	41	1.003	0.885	0.99	0.096	0.930	0	0	**0.088**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**C**
721.8	26.246	0.111	43	1.003	0.904	0.99	0.100	0.929	0	0	**0.088**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**B**
721.6	26.410	0.118	47	1.003	0.961	0.99	0.113	0.928	0	0	**0.088**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**A2**
721.4	26.574	0.113	44	1.002	0.921	0.99	0.104	0.928	0	0	**0.088**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**C**
721.3	26.739	0.112	44	1.002	0.911	0.99	0.102	0.927	0	0	**0.088**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**C**
721.1	26.903	0.112	44	1.001	0.913	0.99	0.102	0.926	0	0	**0.088**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**C**
720.9	27.067	0.114	45	1.001	0.932	0.99	0.106	0.926	0	0	**0.088**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**C**
720.8	27.231	0.119	48	1.000	0.974	0.99	0.115	0.925	0	0	**0.088**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**B**
720.6	27.395	0.122	49	1.000	1.000	0.99	0.121	0.925	0	0	**0.088**	FALSE	FALSE	FALSE	**1.4**	**Subunit 2**	**B**
720.4	27.559	0.124	50	0.999	1.022	0.99	0.126	0.924	0	0	**0.088**	FALSE	FALSE	FALSE	**1.4**	**Subunit 2**	**A1**
720.3	27.723	0.125	50	0.999	1.029	0.99	0.128	0.923	0	0	**0.088**	FALSE	FALSE	FALSE	**1.4**	**Subunit 2**	**A1**
720.1	27.887	0.128	52	0.998	1.054	0.99	0.134	0.923	0	0	**0.088**	FALSE	FALSE	FALSE	**1.5**	**Subunit 2**	**A1**
719.9	28.051	0.130	52	0.998	1.077	0.99	0.139	0.922	0	0	**0.088**	FALSE	FALSE	FALSE	**1.6**	**Subunit 2**	**B**
719.8	28.215	0.136	55	0.997	1.130	0.99	0.152	0.921	0	0	**0.088**	FALSE	FALSE	FALSE	**1.7**	**Subunit 2**	**A1**
719.6	28.379	0.135	54	0.997	1.116	0.99	0.149	0.921	0	0	**0.088**	FALSE	FALSE	FALSE	**1.7**	**Subunit 2**	**B**
719.5	28.543	0.127	51	0.997	1.049	0.99	0.132	0.920	0	0	**0.088**	FALSE	FALSE	FALSE	**1.5**	**Subunit 2**	**B**
719.3	28.707	0.125	50	0.996	1.031	0.99	0.128	0.919	0	0	**0.088**	FALSE	FALSE	FALSE	**1.4**	**Subunit 2**	**B**
719.1	28.871	0.122	49	0.996	1.002	0.99	0.121	0.919	0	0	**0.088**	FALSE	FALSE	FALSE	**1.4**	**Subunit 2**	**B**
719.0	29.035	0.118	47	0.995	0.965	0.99	0.113	0.918	0	0	**0.088**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**B**
718.8	29.199	0.115	45	0.995	0.929	0.99	0.105	0.917	0	0	**0.089**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**B**
718.6	29.363	0.116	46	0.995	0.943	0.99	0.108	0.917	0	0	**0.089**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**B**
718.5	29.527	0.116	46	0.994	0.944	0.99	0.109	0.916	0	0	**0.089**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**B**
718.3	29.691	0.123	49	0.993	1.004	0.99	0.121	0.916	0	0	**0.089**	FALSE	FALSE	FALSE	**1.4**	**Subunit 2**	**B**
718.1	29.855	0.119	47	0.993	0.970	0.99	0.114	0.915	0	0	**0.089**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**B**
718.0	30.019	0.120	48	0.993	0.975	0.99	0.115	0.914	0	0	**0.089**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**B**
717.8	30.183	0.121	48	0.992	0.983	0.99	0.117	0.914	0	0	**0.089**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**B**
717.7	30.347	0.118	47	0.992	0.960	0.99	0.112	0.913	0	0	**0.089**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**B**
717.5	30.511	0.116	46	0.992	0.941	0.99	0.108	0.912	0	0	**0.089**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**B**
717.3	30.675	0.114	45	0.991	0.923	0.99	0.104	0.912	0	0	**0.089**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**B**
717.2	30.840	0.115	45	0.991	0.930	0.99	0.105	0.911	0	0	**0.089**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**B**
717.0	31.004	0.130	52	0.989	1.072	0.99	0.137	0.910	0	0	**0.089**	FALSE	FALSE	FALSE	**1.5**	**Subunit 2**	**A1**
716.8	31.168	0.152	59	0.988	1.263	0.99	0.187	0.910	0	0	**0.089**	FALSE	FALSE	FALSE	**2.1**	**Subunit 2**	**A1**
716.7	31.332	0.144	57	0.988	1.195	0.99	0.168	0.909	0	0	**0.089**	FALSE	FALSE	FALSE	**1.9**	**Subunit 2**	**A1**
716.5	31.496	0.146	57	0.987	1.214	0.99	0.173	0.908	0	0	**0.089**	FALSE	FALSE	FALSE	**1.9**	**Subunit 2**	**A1**
716.3	31.660	0.155	60	0.986	1.291	0.99	0.195	0.908	0	0	**0.089**	FALSE	FALSE	FALSE	**2.2**	**Subunit 2**	**A1**
716.2	31.824	0.153	59	0.985	1.278	0.99	0.191	0.907	0	0	**0.089**	FALSE	FALSE	FALSE	**2.2**	**Subunit 2**	**A1**
716.0	31.988	0.158	60	0.985	1.318	0.99	0.203	0.906	0	0	**0.089**	FALSE	FALSE	FALSE	**2.3**	**Subunit 2**	**A1**
715.8	32.152	0.150	59	0.985	1.253	0.99	0.184	0.906	0	0	**0.089**	FALSE	FALSE	FALSE	**2.1**	**Subunit 2**	**A1**
715.7	32.316	0.192	66	0.981	1.553	0.99	0.288	0.905	0	0	**0.089**	FALSE	FALSE	FALSE	**3.2**	**Subunit 2**	**A1**
715.5	32.480	0.208	68	0.980	1.647	0.98	0.330	0.904	0	0	**0.089**	FALSE	FALSE	FALSE	**3.7**	**Subunit 2**	**A1**
715.4	32.644	0.154	59	0.983	1.281	0.99	0.192	0.904	0	0	**0.089**	FALSE	FALSE	FALSE	**2.2**	**Subunit 2**	**A1**
715.2	32.808	0.151	59	0.983	1.256	0.99	0.184	0.903	0	0	**0.089**	FALSE	FALSE	FALSE	**2.1**	**Subunit 2**	**A1**
715.0	32.972	0.147	58	0.983	1.221	0.99	0.174	0.902	0	0	**0.089**	FALSE	FALSE	FALSE	**2.0**	**Subunit 2**	**A1**
714.9	33.136	0.138	55	0.983	1.144	0.99	0.154	0.902	0	0	**0.089**	FALSE	FALSE	FALSE	**1.7**	**Subunit 2**	**A1**
714.7	33.300	0.130	52	0.983	1.072	0.99	0.136	0.901	0	0	**0.089**	FALSE	FALSE	FALSE	**1.5**	**Subunit 2**	**A1**
714.5	33.464	0.127	51	0.983	1.041	0.99	0.129	0.900	0	0	**0.089**	FALSE	FALSE	FALSE	**1.5**	**Subunit 2**	**A2**
714.4	33.628	0.128	51	0.983	1.047	0.99	0.131	0.900	0	0	**0.089**	FALSE	FALSE	FALSE	**1.5**	**Subunit 2**	**A1**
714.2	33.792	0.128	52	0.982	1.051	0.99	0.131	0.899	0	0	**0.089**	FALSE	FALSE	FALSE	**1.5**	**Subunit 2**	**A1**
714.0	33.956	0.131	53	0.981	1.080	0.99	0.138	0.898	0	0	**0.089**	FALSE	FALSE	FALSE	**1.6**	**Subunit 2**	**A1**
713.9	34.120	0.132	53	0.981	1.091	0.99	0.141	0.898	0	0	**0.089**	FALSE	FALSE	FALSE	**1.6**	**Subunit 2**	**B**
713.7	34.284	0.123	49	0.982	1.000	0.99	0.120	0.897	0	0	**0.089**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**B**

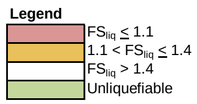
Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
713.6	34.448	0.118	47	0.982	0.952	0.99	0.110	0.896	0	0	**0.089**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**B**
713.4	34.612	0.117	46	0.982	0.943	0.99	0.108	0.896	0	0	**0.089**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**C**
713.2	34.776	0.116	46	0.982	0.935	0.99	0.106	0.895	0	0	**0.089**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**A2**
713.1	34.941	0.118	47	0.981	0.951	0.99	0.109	0.894	0	0	**0.089**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**A2**
712.9	35.105	0.113	44	0.981	0.907	0.99	0.100	0.894	0	0	**0.089**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**A2**
712.7	35.269	0.110	42	0.982	0.877	0.99	0.094	0.893	0	0	**0.089**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**C**
712.6	35.433	0.108	41	0.982	0.858	1.00	0.090	0.892	0	0	**0.089**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
712.4	35.597	0.111	43	0.981	0.883	0.99	0.095	0.891	0	0	**0.089**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**C**
712.2	35.761	0.111	43	0.980	0.886	0.99	0.096	0.891	0	0	**0.089**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**C**
712.1	35.925	0.107	40	0.981	0.846	1.00	0.088	0.890	0	0	**0.089**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**A2**
711.9	36.089	0.108	41	0.980	0.856	1.00	0.090	0.889	0	0	**0.089**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
711.7	36.253	0.107	40	0.980	0.845	1.00	0.088	0.889	0	0	**0.089**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
711.6	36.417	0.108	41	0.980	0.855	1.00	0.090	0.888	0	0	**0.089**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
711.4	36.581	0.106	40	0.980	0.838	1.00	0.087	0.887	0	0	**0.089**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
711.3	36.745	0.108	41	0.979	0.853	1.00	0.089	0.887	0	0	**0.089**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
711.1	36.909	0.113	44	0.978	0.901	0.99	0.099	0.886	0	0	**0.089**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**B**
710.9	37.073	0.121	49	0.976	0.980	0.99	0.115	0.885	0	0	**0.089**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**B**
710.8	37.237	0.131	53	0.973	1.069	0.99	0.135	0.885	0	0	**0.089**	FALSE	FALSE	FALSE	**1.5**	**Subunit 2**	**B**
710.6	37.401	0.142	56	0.971	1.169	0.99	0.159	0.884	0	0	**0.089**	FALSE	FALSE	FALSE	**1.8**	**Subunit 2**	**B**
710.4	37.565	0.159	61	0.968	1.315	0.99	0.200	0.883	0	0	**0.089**	FALSE	FALSE	FALSE	**2.3**	**Subunit 2**	**A1**
710.3	37.729	0.140	56	0.971	1.152	0.99	0.155	0.883	0	0	**0.089**	FALSE	FALSE	FALSE	**1.7**	**Subunit 2**	**B**
710.1	37.893	0.129	52	0.972	1.049	0.99	0.130	0.882	0	0	**0.089**	FALSE	FALSE	FALSE	**1.5**	**Subunit 2**	**B**
709.9	38.057	0.129	52	0.972	1.053	0.99	0.131	0.881	0	0	**0.089**	FALSE	FALSE	FALSE	**1.5**	**Subunit 2**	**A1**
709.8	38.221	0.129	52	0.972	1.049	0.99	0.130	0.880	0	0	**0.089**	FALSE	FALSE	FALSE	**1.5**	**Subunit 2**	**A1**
709.6	38.385	0.119	48	0.973	0.958	0.99	0.110	0.880	0	0	**0.089**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**A2**
709.5	38.549	0.114	45	0.974	0.913	0.99	0.101	0.879	0	0	**0.089**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**A2**
709.3	38.713	0.112	43	0.974	0.888	0.99	0.096	0.878	0	0	**0.089**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**C**
709.1	38.877	0.110	42	0.974	0.872	0.99	0.093	0.878	0	0	**0.089**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**C**
709.0	39.042	0.113	44	0.973	0.894	0.99	0.097	0.877	0	0	**0.089**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**A2**
708.8	39.206	0.111	43	0.974	0.877	0.99	0.094	0.876	0	0	**0.089**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**A2**
708.6	39.370	0.109	41	0.974	0.860	0.99	0.091	0.876	0	0	**0.088**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**A2**
708.5	39.534	0.110	42	0.973	0.867	0.99	0.092	0.875	0	0	**0.088**	FALSE	FALSE	FALSE	**1.0**	**Subunit 3**	**C**
708.3	39.698	0.110	43	0.973	0.875	0.99	0.093	0.874	0	0	**0.088**	FALSE	FALSE	FALSE	**1.1**	**Subunit 3**	**A2**
708.1	39.862	0.113	44	0.972	0.901	0.99	0.099	0.873	0	0	**0.088**	FALSE	FALSE	FALSE	**1.1**	**Subunit 3**	**A2**
708.0	40.026	0.112	43	0.972	0.885	0.99	0.095	0.873	0	0	**0.088**	FALSE	FALSE	FALSE	**1.1**	**Subunit 3**	**A2**
707.8	40.190	0.108	41	0.972	0.849	1.00	0.088	0.872	0	0	**0.088**	FALSE	FALSE	FALSE	**1.0**	**Subunit 3**	**A2**
707.6	40.354	0.110	42	0.971	0.873	0.99	0.093	0.871	0	0	**0.088**	FALSE	FALSE	FALSE	**1.1**	**Subunit 3**	**A2**
707.5	40.518	0.113	44	0.970	0.897	0.99	0.098	0.871	0	0	**0.088**	FALSE	FALSE	FALSE	**1.1**	**Subunit 3**	**A2**
707.3	40.682	0.114	44	0.970	0.903	0.99	0.099	0.870	0	0	**0.088**	FALSE	FALSE	FALSE	**1.1**	**Subunit 3**	**A2**
707.2	40.846	0.116	46	0.969	0.921	0.99	0.102	0.869	0	0	**0.088**	FALSE	FALSE	FALSE	**1.2**	**Subunit 3**	**A2**
707.0	41.010	0.115	46	0.969	0.920	0.99	0.102	0.869	0	0	**0.088**	FALSE	FALSE	FALSE	**1.2**	**Subunit 3**	**A2**
706.8	41.174	0.115	45	0.968	0.918	0.99	0.102	0.868	0	0	**0.088**	FALSE	FALSE	FALSE	**1.2**	**Subunit 3**	**A2**
706.7	41.338	0.119	47	0.967	0.951	0.99	0.109	0.867	0	0	**0.088**	FALSE	FALSE	FALSE	**1.2**	**Subunit 3**	**A2**
706.5	41.502	0.107	40	0.970	0.846	1.00	0.088	0.866	0	0	**0.088**	FALSE	FALSE	FALSE	**1.0**	**Subunit 3**	**A2**
706.3	41.666	0.105	39	0.970	0.828	1.00	0.084	0.866	0	0	**0.088**	FALSE	FALSE	FALSE	**1.0**	**Subunit 3**	**A1**
706.2	41.830	0.110	42	0.969	0.869	0.99	0.092	0.865	0	0	**0.088**	FALSE	FALSE	FALSE	**1.0**	**Subunit 3**	**A1**
706.0	41.994	0.107	41	0.969	0.849	1.00	0.088	0.864	0	0	**0.088**	FALSE	FALSE	FALSE	**1.0**	**Subunit 3**	**A1**
705.8	42.158	0.111	43	0.968	0.877	0.99	0.093	0.864	0	0	**0.088**	FALSE	FALSE	FALSE	**1.1**	**Subunit 3**	**A1**
705.7	42.322	0.122	49	0.964	0.983	0.99	0.115	0.863	0	0	**0.088**	FALSE	FALSE	FALSE	**1.3**	**Subunit 3**	**A1**
705.5	42.486	0.132	53	0.961	1.068	0.99	0.134	0.862	0	0	**0.088**	FALSE	FALSE	FALSE	**1.5**	**Subunit 3**	**A1**
705.3	42.650	0.126	51	0.962	1.012	0.99	0.122	0.861	0	0	**0.088**	FALSE	FALSE	FALSE	**1.4**	**Subunit 3**	**A2**
705.2	42.814	0.112	44	0.966	0.890	0.99	0.096	0.861	0	0	**0.088**	FALSE	FALSE	FALSE	**1.1**	**Subunit 3**	**A2**
705.0	42.978	0.136	55	0.959	1.107	0.99	0.144	0.860	0	0	**0.088**	FALSE	FALSE	FALSE	**1.6**	**Subunit 3**	**A1**
704.9	43.143	0.121	49	0.962	0.970	0.99	0.112	0.859	0	0	**0.088**	FALSE	FALSE	FALSE	**1.3**	**Subunit 3**	**A2**
704.7	43.307	0.135	54	0.958	1.096	0.99	0.141	0.859	0	0	**0.088**	FALSE	FALSE	FALSE	**1.6**	**Subunit 3**	**A1**

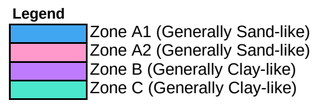
Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
704.5	43.471	0.123	49	0.961	0.985	0.99	0.116	0.858	0	0	**0.088**	FALSE	FALSE	FALSE	**1.3**	**Subunit 3**	**A2**
704.4	43.635	0.120	48	0.962	0.956	0.99	0.109	0.857	0	0	**0.088**	FALSE	FALSE	FALSE	**1.2**	**Subunit 3**	**B**
704.2	43.799	0.118	47	0.962	0.937	0.99	0.105	0.857	0	0	**0.088**	FALSE	FALSE	FALSE	**1.2**	**Subunit 3**	**B**
704.0	43.963	0.116	46	0.962	0.924	0.99	0.103	0.856	0	0	**0.087**	FALSE	FALSE	FALSE	**1.2**	**Subunit 3**	**B**
703.9	44.127	0.116	46	0.962	0.921	0.99	0.102	0.855	0	0	**0.087**	FALSE	FALSE	FALSE	**1.2**	**Subunit 3**	**B**
703.7	44.291	0.116	46	0.962	0.924	0.99	0.103	0.854	0	0	**0.087**	FALSE	FALSE	FALSE	**1.2**	**Subunit 3**	**B**
703.5	44.455	0.124	50	0.959	0.993	0.99	0.117	0.854	0	0	**0.087**	FALSE	FALSE	FALSE	**1.3**	**Subunit 3**	**B**
703.4	44.619	0.197	66	0.942	1.528	0.98	0.279	0.853	0	0	**0.087**	FALSE	FALSE	FALSE	**3.2**	**Subunit 3**	**A1**
703.2	44.783	0.153	59	0.950	1.237	0.99	0.178	0.852	0	0	**0.087**	FALSE	FALSE	FALSE	**2.0**	**Subunit 3**	**A1**
703.1	44.947	0.183	65	0.944	1.441	0.99	0.245	0.852	0	0	**0.087**	FALSE	FALSE	FALSE	**2.8**	**Subunit 3**	**A1**
702.9	45.111	0.118	47	0.960	0.937	0.99	0.105	0.851	0	0	**0.087**	FALSE	FALSE	FALSE	**1.2**	**Subunit 3**	**A1**
702.7	45.275	0.109	41	0.963	0.858	0.99	0.089	0.850	0	0	**0.087**	FALSE	FALSE	FALSE	**1.0**	**Subunit 3**	**A1**
702.6	45.439	0.113	44	0.961	0.896	0.99	0.097	0.849	0	0	**0.087**	FALSE	FALSE	FALSE	**1.1**	**Subunit 3**	**A2**
702.4	45.603	0.130	52	0.955	1.040	0.99	0.128	0.849	0	0	**0.087**	FALSE	FALSE	FALSE	**1.5**	**Subunit 3**	**A1**
702.2	45.767	0.118	47	0.958	0.940	0.99	0.106	0.848	0	0	**0.087**	FALSE	FALSE	FALSE	**1.2**	**Subunit 3**	**A1**
702.1	45.931	0.141	56	0.951	1.140	0.99	0.152	0.847	0	0	**0.087**	FALSE	FALSE	FALSE	**1.7**	**Subunit 3**	**A1**
701.9	46.095	0.160	61	0.945	1.283	0.99	0.192	0.847	0	0	**0.087**	FALSE	FALSE	FALSE	**2.2**	**Subunit 3**	**A1**
701.7	46.259	0.145	57	0.949	1.165	0.99	0.159	0.846	0	0	**0.087**	FALSE	FALSE	FALSE	**1.8**	**Subunit 3**	**A1**
701.6	46.423	0.207	68	0.936	1.570	0.98	0.300	0.845	0	0	**0.087**	FALSE	FALSE	FALSE	**3.5**	**Subunit 3**	**A1**
701.4	46.587	0.234	70	0.931	1.694	0.98	0.362	0.844	0	0	**0.087**	FALSE	FALSE	FALSE	**4.2**	**Subunit 3**	**A1**
701.2	46.751	0.249	71	0.929	1.754	0.98	0.397	0.844	0	0	**0.087**	FALSE	FALSE	FALSE	**4.6**	**Subunit 3**	**A1**
701.1	46.915	0.173	63	0.940	1.370	0.99	0.221	0.843	0	0	**0.087**	FALSE	FALSE	FALSE	**2.5**	**Subunit 3**	**A1**
700.9	47.079	0.137	55	0.949	1.099	0.99	0.142	0.842	0	0	**0.087**	FALSE	FALSE	FALSE	**1.6**	**Subunit 3**	**A1**
700.8	47.244	0.304	74	0.922	1.942	0.98	0.531	0.842	0	0	**0.087**	FALSE	FALSE	FALSE	**6.1**	**Subunit 3**	**A1**
700.6	47.408	N/A	84	N/A	N/A	N/A	N/A	0.841	0	0	**0.087**	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**	**A1**
700.4	47.572	0.458	78	0.909	2.303	0.97	0.931	0.840	0	0	**0.087**	FALSE	FALSE	FALSE	**10.8**	**Subunit 3**	**A1**
700.3	47.736	0.212	68	0.931	1.582	0.98	0.307	0.839	0	0	**0.086**	FALSE	FALSE	FALSE	**3.6**	**Subunit 3**	**A1**
700.1	47.900	0.433	78	0.909	2.251	0.97	0.862	0.839	0	0	**0.086**	FALSE	FALSE	FALSE	**10.0**	**Subunit 3**	**A1**
699.9	48.064	N/A	94	N/A	N/A	N/A	N/A	0.838	0	0	**0.086**	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**	**A1**
699.8	48.228	N/A	100	N/A	N/A	N/A	N/A	0.837	0	0	**0.086**	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**	**A1**
699.6	48.392	N/A	100	N/A	N/A	N/A	N/A	0.837	0	0	**0.086**	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**	**A1**



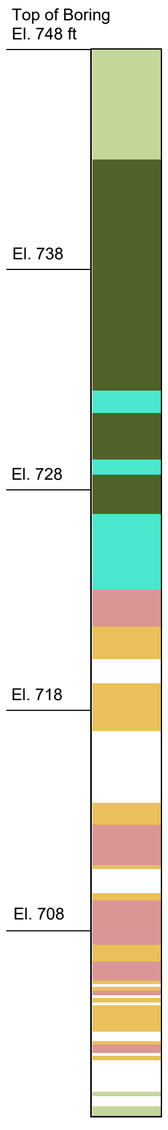
Adapted from "Discussion of 'Liquefaction Potential of Silts from CPTu'" (Robertson 2008). Zone A_1 and Zone A_2 samples are generally sand-like. Zone B samples are generally clay-like and not susceptible to cyclic softening. Zone C samples are generally clay-like and susceptible to cyclic softening. Note that the transition from clay-like to sand-like in this chart does not exactly match the liquefaction calculations herein; that is, some transitional samples in Zone B and Zone C will be treated as sand-like and analyzed for liquefaction if the calculations indicate as such.



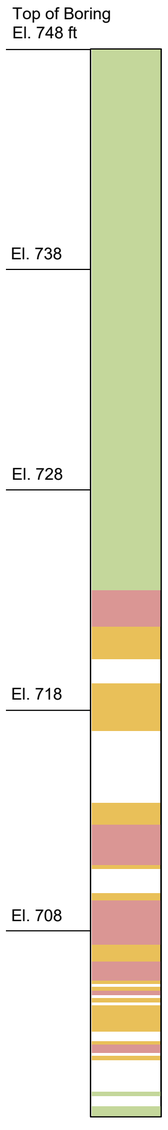




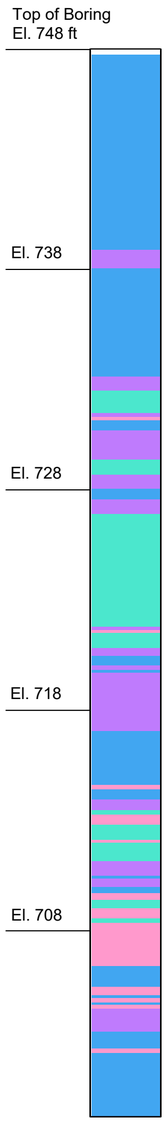
KIF-BF-CPT-3A, Liquefaction Triggering Results



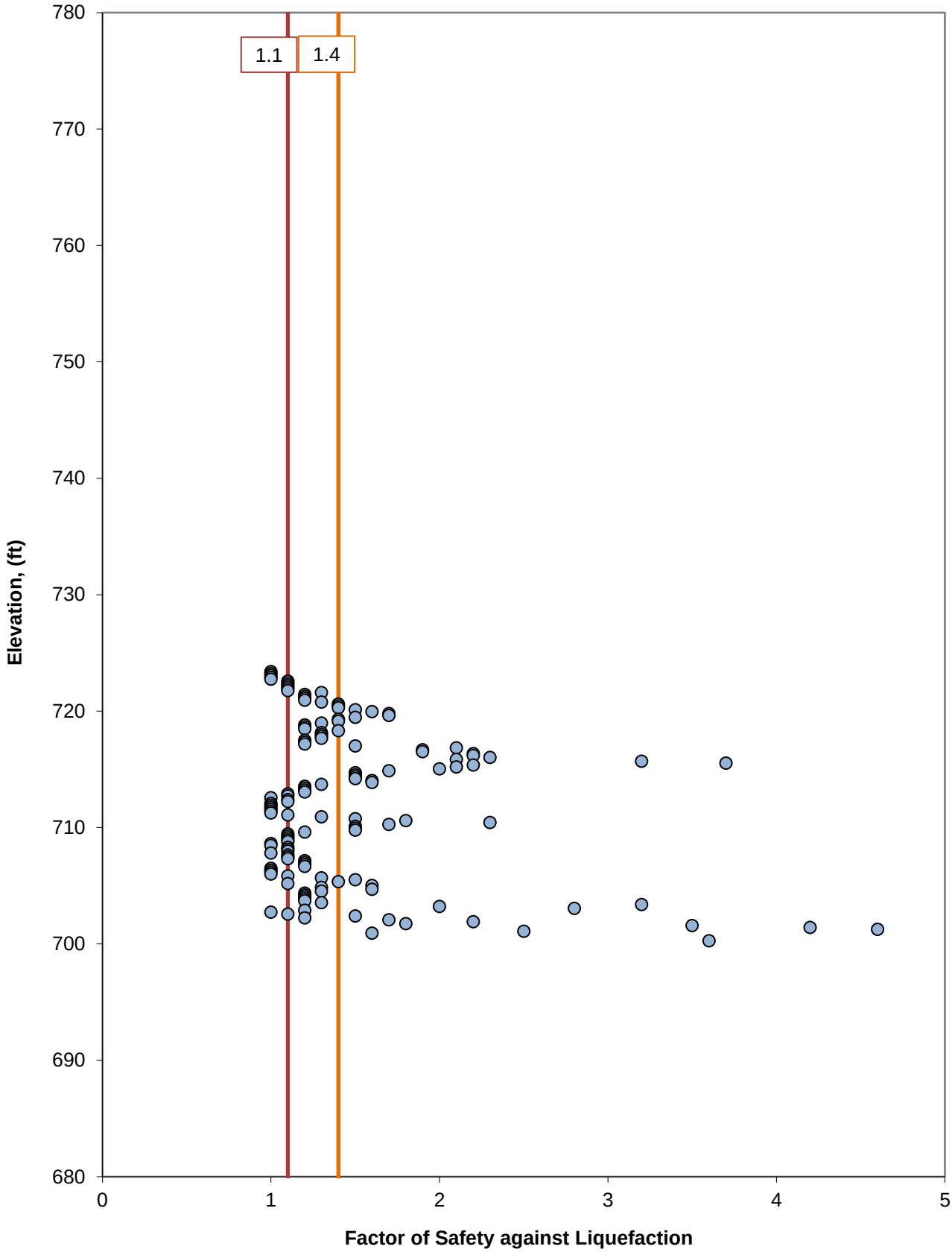
KIF-BF-CPT-3A, Liquefaction Triggering Results



KIF-BF-CPT-3A, Robertson Soil Type



KIF TDEC Stability, Boring = KIF-BF-CPT-3A, Source = 1 Hz, Mw = 7.6, Event = Design EQ, CPT Data, Simplified Stress-Based Approach



Inputs

Project Information

Stantec Project Number =	175668043
Project Name =	KIF TDEC Stability
CPT ID =	KIF-BF-CPT-4AA

Boring Location (optional)

Northing =	
Easting =	

OR

Baseline Station =	
Offset (+ Right) =	

Using qt (corrected for u2 PWP) or qc (backcalculated uncorrected field tip)

Cone ID (optional) =	AD184	
Use qc instead of qt?	0	(1: Yes, 0: No)
Cone Area Ratio (a) =	0.80	

Drilling Information

Top of Hole Elevation =	769.0	feet
Water Depth during CPT (negative for U/S borings) =	10.0	feet
Depth data collection began =	0.16	feet
Avg. Total Unit Wt. Above 1st Sample =	120.00	pcf

During Earthquake Information

Water Depth during EQ (relative to CPT TOH, negative for U/S borings) =	6.5	feet
Final Grade Elevation during EQ =	769.0	feet
Avg. Total Unit Wt. of Cut/Fill =	120	pcf

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile?	0	(1: Yes, 0: No)

If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile:	ng_Pond_Section, KIF-BF-SPT5_NOR	
α at each Sample Depth known?	1	(1: Yes, 0: No)

If previous answer is No, then enter curve fit parameters below (α vs. depth curve)

If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_α will be one.

m4:	
m3:	
m2:	
m1:	
m0:	

Associated ground response profile:	ning_Pond_Section, KIF-BF-CPT4AA	
Get CSR from shear stress envelope?	0	(1: Yes, 0: No)

If previous answer is No, then CSR will be calculated using a_{max} and r_d

Max. Shear Stress at each sample depth known?		(1: Yes, 0: No)

If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4:	
m3:	
m2:	
m1:	

Earthquake Information

EQ Source (e.g., New Madrid)	1 Hz
Event (e.g., MCE, OBE)	Design EQ
a_{max} (g) (top of ground surface)	0.10
EQ Mag (Mw)	7.6

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
0.164	2.639	0.020	120	Irrelevant Fill	Sand-like		0.004			
0.328	130.019	0.083	120	Irrelevant Fill	Sand-like		0.005			
0.492	183.257	0.182	120	Irrelevant Fill	Sand-like		0.005			
0.656	232.246	0.325	120	Irrelevant Fill	Sand-like		0.006			
0.820	220.213	0.820	120	Irrelevant Fill	Sand-like		0.006			
0.984	282.529	1.053	120	Irrelevant Fill	Sand-like		0.007			
1.148	299.954	1.483	120	Irrelevant Fill	Sand-like		0.007			
1.312	315.940	2.294	120	Irrelevant Fill	Sand-like		0.008			
1.476	364.677	3.785	120	Irrelevant Fill	Sand-like		0.008			
1.640	388.790	5.553	120	Irrelevant Fill	Sand-like		0.008			
1.804	457.090	6.271	120	Irrelevant Fill	Sand-like		0.009			
1.968	453.147	7.046	120	Irrelevant Fill	Sand-like		0.009			
2.133	444.885	8.377	120	Irrelevant Fill	Sand-like		0.009			
2.297	403.562	8.090	120	Irrelevant Fill	Sand-like		0.009			
2.461	328.364	7.781	120	Irrelevant Fill	Sand-like		0.010			
2.625	278.385	6.935	120	Irrelevant Fill	Sand-like		0.010			
2.789	256.133	5.790	120	Irrelevant Fill	Sand-like		0.010			
2.953	332.414	5.400	120	Irrelevant Fill	Sand-like		0.010			
3.117	415.701	5.518	120	Irrelevant Fill	Sand-like		0.010			
3.281	460.816	5.618	120	Irrelevant Fill	Sand-like		0.010			
3.445	480.138	6.269	120	Irrelevant Fill	Sand-like		0.010			
3.609	496.246	7.052	120	Irrelevant Fill	Sand-like		0.010			
3.773	524.725	8.021	120	Irrelevant Fill	Sand-like		0.010			
3.937	528.234	8.202	120	Irrelevant Fill	Sand-like		0.009			
4.101	508.828	8.800	120	Irrelevant Fill	Sand-like		0.009			
4.265	493.653	9.608	120	Irrelevant Fill	Sand-like		0.009			
4.429	465.634	10.015	120	Irrelevant Fill	Sand-like		0.009			
4.593	449.198	9.647	112	Fly Ash	Sand-like	Do Not Correct for FC	0.009			
4.757	407.646	9.147	112	Fly Ash	Sand-like	Do Not Correct for FC	0.009			
4.921	328.346	8.494	112	Fly Ash	Sand-like	Do Not Correct for FC	0.009			
5.085	267.177	7.785	112	Fly Ash	Sand-like	Do Not Correct for FC	0.009			
5.249	190.688	6.836	112	Fly Ash	Sand-like	Do Not Correct for FC	0.009			
5.413	125.602	4.996	112	Fly Ash	Sand-like	Do Not Correct for FC	0.009			
5.577	147.780	4.286	112	Fly Ash	Sand-like	Do Not Correct for FC	0.008			
5.741	248.404	5.139	112	Fly Ash	Sand-like	Do Not Correct for FC	0.008			
5.905	248.429	5.755	112	Fly Ash	Sand-like	Do Not Correct for FC	0.008			
6.069	316.011	5.464	112	Fly Ash	Sand-like	Do Not Correct for FC	0.008			
6.234	319.327	4.646	112	Fly Ash	Sand-like	Do Not Correct for FC	0.008			
6.398	317.945	3.765	112	Fly Ash	Sand-like	Do Not Correct for FC	0.007			
6.562	301.081	3.001	112	Fly Ash	Sand-like	Do Not Correct for FC	0.007			
6.726	300.363	3.039	112	Fly Ash	Sand-like	Do Not Correct for FC	0.007			
6.890	301.438	3.555	112	Fly Ash	Sand-like	Do Not Correct for FC	0.007			
7.054	297.550	3.316	112	Fly Ash	Sand-like	Do Not Correct for FC	0.007			
7.218	268.580	3.119	112	Fly Ash	Sand-like	Do Not Correct for FC	0.006			
7.382	255.644	2.264	112	Fly Ash	Sand-like	Do Not Correct for FC	0.006			
7.546	250.272	1.914	112	Fly Ash	Sand-like	Do Not Correct for FC	0.006			
7.710	233.543	1.881	112	Fly Ash	Sand-like	Do Not Correct for FC	0.006			
7.874	229.895	2.002	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
8.038	220.607	1.900	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
8.202	207.647	1.731	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
8.366	164.967	1.780	112	Fly Ash	Sand-like	Do Not Correct for FC	0.004			
8.530	116.873	1.970	112	Fly Ash	Sand-like	Do Not Correct for FC	0.004			
8.694	108.490	1.956	112	Fly Ash	Sand-like	Do Not Correct for FC	0.004			
8.858	103.345	1.401	112	Fly Ash	Sand-like	Do Not Correct for FC	0.003			
9.022	82.273	0.862	112	Fly Ash	Sand-like	Do Not Correct for FC	0.003			
9.186	77.669	0.486	112	Fly Ash	Sand-like	Do Not Correct for FC	0.003			
9.350	78.671	0.372	112	Fly Ash	Sand-like	Do Not Correct for FC	0.002			
9.514	81.215	0.405	112	Fly Ash	Sand-like	Do Not Correct for FC	0.002			
9.678	86.453	0.156	112	Fly Ash	Sand-like	Do Not Correct for FC	0.001			
9.842	88.027	0.392	112	Fly Ash	Sand-like	Do Not Correct for FC	0.001			
10.006	43.776	0.560	112	Fly Ash	Sand-like	Do Not Correct for FC	0.001			
10.170	103.070	0.546	112	Fly Ash	Sand-like	Do Not Correct for FC	0.001			
10.335	94.959	0.581	112	Fly Ash	Sand-like	Do Not Correct for FC	0.001			

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
10.499	92.425	0.523	112	Fly Ash	Sand-like	Do Not Correct for FC	0.001			
10.663	90.477	0.588	112	Fly Ash	Sand-like	Do Not Correct for FC	0.002			
10.827	88.391	0.524	112	Fly Ash	Sand-like	Do Not Correct for FC	0.002			
10.991	91.209	0.490	112	Fly Ash	Sand-like	Do Not Correct for FC	0.002			
11.155	107.069	0.500	112	Fly Ash	Sand-like	Do Not Correct for FC	0.002			
11.319	116.255	0.530	112	Fly Ash	Sand-like	Do Not Correct for FC	0.003			
11.483	112.922	0.705	112	Fly Ash	Sand-like	Do Not Correct for FC	0.003			
11.647	97.791	0.899	112	Fly Ash	Sand-like	Do Not Correct for FC	0.003			
11.811	82.742	1.031	112	Fly Ash	Sand-like	Do Not Correct for FC	0.003			
11.975	73.257	0.925	112	Fly Ash	Sand-like	Do Not Correct for FC	0.004			
12.139	66.123	0.778	112	Fly Ash	Sand-like	Do Not Correct for FC	0.004			
12.303	61.142	0.601	112	Fly Ash	Sand-like	Do Not Correct for FC	0.004			
12.467	55.972	0.398	112	Fly Ash	Sand-like	Do Not Correct for FC	0.004			
12.631	48.353	0.242	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
12.795	42.712	0.141	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
12.959	36.379	0.099	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
13.123	32.913	0.059	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
13.287	54.900	0.100	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
13.451	120.421	0.190	112	Fly Ash	Sand-like	Do Not Correct for FC	0.006			
13.615	99.886	0.701	112	Fly Ash	Sand-like	Do Not Correct for FC	0.006			
13.779	77.508	1.008	112	Fly Ash	Sand-like	Do Not Correct for FC	0.006			
13.943	62.712	1.210	112	Fly Ash	Sand-like	Do Not Correct for FC	0.006			
14.107	66.189	1.157	112	Fly Ash	Sand-like	Do Not Correct for FC	0.006			
14.271	99.477	1.320	112	Fly Ash	Sand-like	Do Not Correct for FC	0.006			
14.436	154.070	2.136	112	Fly Ash	Sand-like	Do Not Correct for FC	0.006			
14.600	234.558	2.897	112	Fly Ash	Sand-like	Do Not Correct for FC	0.006			
14.764	190.759	3.604	112	Fly Ash	Sand-like	Do Not Correct for FC	0.006			
14.928	155.299	3.518	112	Fly Ash	Sand-like	Do Not Correct for FC	0.007			
15.092	112.502	2.937	112	Fly Ash	Sand-like	Do Not Correct for FC	0.007			
15.256	91.782	1.995	112	Fly Ash	Sand-like	Do Not Correct for FC	0.007			
15.420	84.900	1.437	112	Fly Ash	Sand-like	Do Not Correct for FC	0.007			
15.584	78.789	1.203	112	Fly Ash	Sand-like	Do Not Correct for FC	0.007			
15.748	70.817	1.020	112	Fly Ash	Sand-like	Do Not Correct for FC	0.007			
15.912	60.783	0.976	112	Fly Ash	Sand-like	Do Not Correct for FC	0.007			
16.076	54.713	0.982	112	Fly Ash	Sand-like	Do Not Correct for FC	0.007			
16.240	47.934	0.959	112	Fly Ash	Sand-like	Do Not Correct for FC	0.006			
16.404	39.838	0.798	112	Fly Ash	Sand-like	Do Not Correct for FC	0.006			
16.568	37.786	0.717	112	Fly Ash	Sand-like	Do Not Correct for FC	0.006			
16.732	37.945	0.672	112	Fly Ash	Sand-like	Do Not Correct for FC	0.006			
16.896	35.533	0.613	112	Fly Ash	Sand-like	Do Not Correct for FC	0.006			
17.060	35.606	0.556	112	Fly Ash	Sand-like	Do Not Correct for FC	0.006			
17.224	43.062	0.565	112	Fly Ash	Sand-like	Do Not Correct for FC	0.006			
17.388	55.266	0.928	112	Fly Ash	Sand-like	Do Not Correct for FC	0.006			
17.552	99.014	1.475	112	Fly Ash	Sand-like	Do Not Correct for FC	0.006			
17.716	123.457	2.063	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
17.880	123.671	2.039	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
18.044	86.475	2.015	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
18.208	66.529	1.642	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
18.372	66.264	1.542	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
18.537	72.606	1.556	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
18.701	70.176	1.527	112	Fly Ash	Sand-like	Do Not Correct for FC	0.004			
18.865	66.242	1.495	112	Fly Ash	Sand-like	Do Not Correct for FC	0.004			
19.029	65.650	1.556	112	Fly Ash	Sand-like	Do Not Correct for FC	0.004			
19.193	82.708	2.042	112	Fly Ash	Sand-like	Do Not Correct for FC	0.004			
19.357	110.413	2.322	112	Fly Ash	Sand-like	Do Not Correct for FC	0.004			
19.521	100.416	2.697	119	Bottom Ash	Sand-like		0.004			
19.685	84.846	1.466	119	Bottom Ash	Sand-like		0.003			
19.849	63.346	1.578	119	Bottom Ash	Sand-like		0.003			
20.013	44.247	1.243	119	Bottom Ash	Sand-like		0.003			
20.177	119.002	1.342	119	Bottom Ash	Sand-like		0.003			
20.341	176.829	1.618	119	Bottom Ash	Sand-like		0.003			
20.505	249.068	2.700	119	Bottom Ash	Sand-like		0.003			
20.669	230.746	3.233	119	Bottom Ash	Sand-like		0.002			
20.833	204.365	3.523	119	Bottom Ash	Sand-like		0.002			
20.997	190.621	2.948	119	Bottom Ash	Sand-like		0.002			
21.161	163.201	2.386	126	Subunit 2	Sand-like		0.002			
21.325	150.862	1.741	126	Subunit 2	Sand-like		0.001			
21.489	148.996	1.378	126	Subunit 2	Sand-like		0.001			
21.653	150.169	0.968	126	Subunit 2	Sand-like		0.001			
21.817	149.996	0.611	126	Subunit 2	Sand-like		0.000			
21.981	127.240	0.534	126	Subunit 2	Sand-like		0.000			
22.145	101.706	0.481	126	Subunit 2	Sand-like		0.001			
22.309	87.542	0.378	126	Subunit 2	Sand-like		0.001			
22.473	90.373	0.259	126	Subunit 2	Sand-like		0.002			
22.638	97.322	0.162	126	Subunit 2	Sand-like		0.002			

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
22.802	107.255	0.300	126	Subunit 2	Sand-like		0.002			
22.966	93.901	0.654	126	Subunit 2	Sand-like		0.003			
23.130	80.397	0.819	126	Subunit 2	Sand-like		0.003			
23.294	105.311	1.179	126	Subunit 2	Sand-like		0.004			
23.458	109.322	1.243	126	Subunit 2	Sand-like		0.004			
23.622	116.918	1.056	126	Subunit 2	Sand-like		0.005			
23.786	124.485	0.762	126	Subunit 2	Sand-like		0.005			
23.950	107.057	0.401	126	Subunit 2	Sand-like		0.006			
24.114	96.440	0.287	126	Subunit 2	Sand-like		0.006			
24.278	81.198	0.201	126	Subunit 2	Sand-like		0.006			
24.442	68.630	0.170	126	Subunit 2	Sand-like		0.007			
24.606	62.767	0.140	126	Subunit 2	Sand-like		0.007			
24.770	64.754	0.203	126	Subunit 2	Sand-like		0.008			
24.934	61.114	0.337	126	Subunit 2	Sand-like		0.008			
25.098	57.917	0.554	126	Subunit 2	Sand-like		0.009			
25.262	56.157	0.727	126	Subunit 2	Sand-like		0.009			
25.426	55.222	0.842	126	Subunit 2	Sand-like		0.010			
25.590	59.185	1.044	126	Subunit 2	Sand-like		0.010			
25.754	66.318	1.289	126	Subunit 2	Sand-like		0.011			
25.918	67.090	1.523	126	Subunit 2	Sand-like		0.011			
26.082	66.376	1.307	126	Subunit 2	Sand-like		0.012			
26.246	75.867	1.481	126	Subunit 2	Sand-like		0.012			
26.410	82.494	1.665	126	Subunit 2	Sand-like		0.013			
26.574	85.527	1.909	126	Subunit 2	Sand-like		0.013			
26.739	94.386	1.972	126	Subunit 2	Sand-like		0.014			
26.903	117.598	2.087	126	Subunit 2	Sand-like		0.014			
27.067	105.614	2.200	126	Subunit 2	Sand-like		0.015			
27.231	98.900	2.109	126	Subunit 2	Sand-like		0.015			
27.395	90.685	2.141	126	Subunit 2	Sand-like		0.016			
27.559	88.420	2.098	126	Subunit 2	Sand-like		0.017			
27.723	83.355	2.098	126	Subunit 2	Sand-like		0.017			
27.887	76.178	1.960	126	Subunit 2	Sand-like		0.018			
28.051	73.250	1.854	126	Subunit 2	Sand-like		0.018			
28.215	67.814	1.670	126	Subunit 2	Sand-like		0.019			
28.379	63.587	1.547	126	Subunit 2	Sand-like		0.019			
28.543	63.430	1.437	131	Subunit 3	Sand-like		0.020			
28.707	57.258	1.341	131	Subunit 3	Sand-like		0.020			
28.871	53.062	1.228	131	Subunit 3	Sand-like		0.021			
29.035	53.712	1.108	131	Subunit 3	Sand-like		0.021			
29.199	55.586	1.084	131	Subunit 3	Sand-like		0.022			
29.363	61.570	0.914	131	Subunit 3	Sand-like		0.022			
29.527	68.145	1.142	131	Subunit 3	Sand-like		0.023			
29.691	62.571	1.319	131	Subunit 3	Sand-like		0.023			
29.855	57.236	1.402	131	Subunit 3	Sand-like		0.024			
30.019	60.460	1.445	131	Subunit 3	Sand-like		0.024			
30.183	61.873	1.525	131	Subunit 3	Sand-like		0.025			
30.347	62.897	1.621	131	Subunit 3	Sand-like		0.025			
30.511	64.073	1.657	131	Subunit 3	Sand-like		0.026			
30.675	62.966	1.676	131	Subunit 3	Sand-like		0.026			
30.840	61.062	1.701	131	Subunit 3	Sand-like		0.027			
31.004	60.665	1.706	131	Subunit 3	Sand-like		0.027			
31.168	65.176	1.756	131	Subunit 3	Sand-like		0.028			
31.332	71.652	1.845	131	Subunit 3	Sand-like		0.028			
31.496	75.213	1.974	131	Subunit 3	Sand-like		0.028			
31.660	69.316	1.980	131	Subunit 3	Sand-like		0.029			
31.824	64.978	1.863	131	Subunit 3	Sand-like		0.029			
31.988	60.561	1.720	131	Subunit 3	Sand-like		0.030			
32.152	59.665	1.657	131	Subunit 3	Sand-like		0.030			
32.316	61.876	1.635	131	Subunit 3	Sand-like		0.030			
32.480	65.290	1.706	131	Subunit 3	Sand-like		0.031			
32.644	68.998	1.264	131	Subunit 3	Sand-like		0.031			
32.808	69.815	1.440	131	Subunit 3	Sand-like		0.032			
32.972	77.170	1.758	131	Subunit 3	Sand-like		0.032			
33.136	74.776	1.855	131	Subunit 3	Sand-like		0.032			
33.300	71.406	1.684	131	Subunit 3	Sand-like		0.033			
33.464	63.715	1.381	131	Subunit 3	Sand-like		0.033			
33.628	45.326	1.144	126	Subunit 2	Sand-like		0.033			
33.792	31.534	0.936	126	Subunit 2	Sand-like		0.033			
33.956	17.565	0.755	126	Subunit 2	Sand-like		0.034			
34.120	12.897	0.405	126	Subunit 2	Sand-like		0.034			
34.284	11.226	0.180	126	Subunit 2	Sand-like		0.034			
34.448	9.533	0.070	126	Subunit 2	Sand-like		0.035			
34.612	8.887	0.059	126	Subunit 2	Sand-like		0.035			
34.776	9.119	0.061	126	Subunit 2	Sand-like		0.035			
34.941	9.377	0.062	126	Subunit 2	Sand-like		0.035			

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
35.105	8.482	0.059	126	Subunit 2	Sand-like		0.036			
35.269	7.629	0.046	126	Subunit 2	Sand-like		0.036			
35.433	7.210	0.034	126	Subunit 2	Sand-like		0.036			
35.597	6.952	0.026	126	Subunit 2	Sand-like		0.036			
35.761	6.400	0.018	126	Subunit 2	Sand-like		0.037			
35.925	6.113	0.018	126	Subunit 2	Sand-like		0.037			
36.089	5.884	0.015	126	Subunit 2	Sand-like		0.037			
36.253	5.439	0.017	126	Subunit 2	Sand-like		0.037			
36.417	5.571	0.016	126	Subunit 2	Sand-like		0.037			
36.581	5.573	0.020	126	Subunit 2	Sand-like		0.038			
36.745	6.611	0.031	126	Subunit 2	Sand-like		0.038			
36.909	7.785	0.048	126	Subunit 2	Sand-like		0.038			
37.073	8.188	0.076	126	Subunit 2	Sand-like		0.038			
37.237	8.505	0.083	126	Subunit 2	Sand-like		0.038			
37.401	7.939	0.092	126	Subunit 2	Sand-like		0.038			
37.565	7.724	0.129	126	Subunit 2	Sand-like		0.038			
37.729	6.566	0.124	126	Subunit 2	Sand-like		0.039			
37.893	6.174	0.115	126	Subunit 2	Sand-like		0.039			
38.057	6.672	0.095	126	Subunit 2	Sand-like		0.039			
38.221	7.042	0.096	126	Subunit 2	Sand-like		0.039			
38.385	7.296	0.092	126	Subunit 2	Sand-like		0.039			
38.549	7.634	0.086	126	Subunit 2	Sand-like		0.039			
38.713	7.383	0.069	126	Subunit 2	Sand-like		0.039			
38.877	7.025	0.075	126	Subunit 2	Sand-like		0.039			
39.042	7.030	0.085	126	Subunit 2	Sand-like		0.039			
39.206	8.417	0.099	126	Subunit 2	Sand-like		0.039			
39.370	9.609	0.120	126	Subunit 2	Sand-like		0.039			
39.534	12.506	0.134	126	Subunit 2	Sand-like		0.039			
39.698	16.396	0.224	126	Subunit 2	Sand-like		0.039			
39.862	18.038	0.269	126	Subunit 2	Sand-like		0.039			
40.026	19.109	0.312	126	Subunit 2	Sand-like		0.039			
40.190	20.413	0.338	126	Subunit 2	Sand-like		0.039			
40.354	22.849	0.358	126	Subunit 2	Sand-like		0.039			
40.518	23.069	0.352	126	Subunit 2	Sand-like		0.039			
40.682	22.827	0.354	126	Subunit 2	Sand-like		0.039			
40.846	22.404	0.343	126	Subunit 2	Sand-like		0.039			
41.010	21.454	0.325	126	Subunit 2	Sand-like		0.039			
41.174	21.392	0.314	126	Subunit 2	Sand-like		0.039			
41.338	20.389	0.310	126	Subunit 2	Sand-like		0.039			
41.502	19.372	0.291	126	Subunit 2	Sand-like		0.039			
41.666	16.935	0.254	126	Subunit 2	Sand-like		0.039			
41.830	15.243	0.213	126	Subunit 2	Sand-like		0.039			
41.994	12.940	0.175	126	Subunit 2	Sand-like		0.039			
42.158	9.641	0.135	126	Subunit 2	Sand-like		0.039			
42.322	8.587	0.098	126	Subunit 2	Sand-like		0.039			
42.486	6.644	0.045	126	Subunit 2	Sand-like		0.039			
42.650	6.214	0.029	126	Subunit 2	Sand-like		0.039			
42.814	6.027	0.010	126	Subunit 2	Sand-like		0.039			
42.978	5.616	0.010	126	Subunit 2	Sand-like		0.039			
43.143	5.444	0.010	126	Subunit 2	Sand-like		0.039			
43.307	5.401	0.010	126	Subunit 2	Sand-like		0.039			
43.471	5.656	0.010	126	Subunit 2	Sand-like		0.039			
43.635	6.041	0.016	126	Subunit 2	Sand-like		0.038			
43.799	6.546	0.108	126	Subunit 2	Sand-like		0.038			
43.963	22.931	0.163	126	Subunit 2	Sand-like		0.038			
44.127	113.873	0.370	126	Subunit 2	Sand-like		0.038			
44.291	156.685	0.630	126	Subunit 2	Sand-like		0.038			
44.455	149.127	0.825	126	Subunit 2	Sand-like		0.038			
44.619	105.675	0.874	126	Subunit 2	Sand-like		0.038			
44.783	60.451	0.844	126	Subunit 2	Sand-like		0.038			
44.947	43.417	0.548	126	Subunit 2	Sand-like		0.038			
45.111	32.268	0.357	126	Subunit 2	Sand-like		0.038			
45.275	26.010	0.176	126	Subunit 2	Sand-like		0.037			
45.439	20.238	0.149	126	Subunit 2	Sand-like		0.037			
45.603	17.060	0.146	126	Subunit 2	Sand-like		0.037			
45.767	13.975	0.108	126	Subunit 2	Sand-like		0.037			
45.931	12.382	0.073	126	Subunit 2	Sand-like		0.037			
46.095	13.347	0.108	126	Subunit 2	Sand-like		0.037			
46.259	12.529	0.182	126	Subunit 2	Sand-like		0.037			
46.423	17.504	0.253	126	Subunit 2	Sand-like		0.037			
46.587	15.365	0.182	126	Subunit 2	Sand-like		0.037			
46.751	18.427	0.299	126	Subunit 2	Sand-like		0.036			
46.915	18.163	0.245	126	Subunit 2	Sand-like		0.036			
47.079	25.941	0.326	126	Subunit 2	Sand-like		0.036			
47.244	26.022	0.495	126	Subunit 2	Sand-like		0.036			

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
47.408	35.160	0.468	126	Subunit 2	Sand-like		0.036			
47.572	58.274	0.252	126	Subunit 2	Sand-like		0.036			
47.736	56.127	0.142	126	Subunit 2	Sand-like		0.036			
47.900	40.388	0.116	126	Subunit 2	Sand-like		0.035			
48.064	27.362	0.113	126	Subunit 2	Sand-like		0.035			
48.228	19.865	0.155	126	Subunit 2	Sand-like		0.035			
48.392	20.471	0.143	126	Subunit 2	Sand-like		0.035			
48.556	25.798	0.236	126	Subunit 2	Sand-like		0.035			
48.720	27.708	0.346	126	Subunit 2	Sand-like		0.035			
48.884	35.627	0.459	126	Subunit 2	Sand-like		0.035			
49.048	64.370	0.525	126	Subunit 2	Sand-like		0.034			
49.212	95.218	0.464	126	Subunit 2	Sand-like		0.034			
49.376	114.575	0.631	126	Subunit 2	Sand-like		0.034			
49.540	139.740	0.900	126	Subunit 2	Sand-like		0.034			
49.704	148.264	1.315	126	Subunit 2	Sand-like		0.034			
49.868	169.830	1.500	126	Subunit 2	Sand-like		0.034			
50.032	206.122	1.847	126	Subunit 2	Sand-like		0.034			
50.196	232.649	2.079	126	Subunit 2	Sand-like		0.033			
50.360	274.765	2.601	126	Subunit 2	Sand-like		0.033			
50.524	290.766	3.127	126	Subunit 2	Sand-like		0.033			
50.688	278.857	3.383	126	Subunit 2	Sand-like		0.033			
50.852	268.156	3.530	126	Subunit 2	Sand-like		0.033			
51.016	246.548	3.490	126	Subunit 2	Sand-like		0.033			
51.180	219.938	3.264	126	Subunit 2	Sand-like		0.033			
51.345	199.443	2.850	126	Subunit 2	Sand-like		0.032			
51.509	191.033	2.440	126	Subunit 2	Sand-like		0.032			
51.673	187.086	2.071	126	Subunit 2	Sand-like		0.032			
51.837	181.640	1.876	126	Subunit 2	Sand-like		0.032			
52.001	170.652	1.779	126	Subunit 2	Sand-like		0.032			
52.165	151.634	1.656	126	Subunit 2	Sand-like		0.032			
52.329	139.106	1.507	126	Subunit 2	Sand-like		0.032			
52.493	137.025	1.133	126	Subunit 2	Sand-like		0.031			
52.657	135.482	1.063	126	Subunit 2	Sand-like		0.031			
52.821	135.838	1.076	126	Subunit 2	Sand-like		0.031			
52.985	139.957	1.222	126	Subunit 2	Sand-like		0.031			
53.149	147.425	1.250	126	Subunit 2	Sand-like		0.031			
53.313	160.763	1.200	126	Subunit 2	Sand-like		0.031			
53.477	166.239	1.111	126	Subunit 2	Sand-like		0.031			
53.641	141.620	1.041	126	Subunit 2	Sand-like		0.030			
53.805	99.093	1.044	126	Subunit 2	Sand-like		0.030			
53.969	65.002	1.147	126	Subunit 2	Sand-like		0.030			
54.133	49.276	1.470	126	Subunit 2	Sand-like		0.030			
54.297	41.924	1.494	126	Subunit 2	Sand-like		0.030			
54.461	86.513	1.352	126	Subunit 2	Sand-like		0.030			
54.625	187.063	1.812	126	Subunit 2	Sand-like		0.030			
54.789	209.754	2.610	126	Subunit 2	Sand-like		0.029			
54.953	243.932	3.353	126	Subunit 2	Sand-like		0.029			
55.117	380.557	3.943	126	Subunit 2	Sand-like		0.029			
55.281	426.676	4.060	126	Subunit 2	Sand-like		0.029			
55.446	364.165	4.565	126	Subunit 2	Sand-like		0.029			
55.610	259.736	4.111	126	Subunit 2	Sand-like		0.029			
55.774	156.185	4.481	126	Subunit 2	Sand-like		0.029			
55.938	140.327	4.417	126	Subunit 2	Sand-like		0.028			
56.102	141.012	4.856	126	Subunit 2	Sand-like		0.028			
56.266	150.276	5.486	126	Subunit 2	Sand-like		0.028			
56.430	165.085	6.011	126	Subunit 2	Sand-like		0.028			
56.594	162.286	5.835	126	Subunit 2	Sand-like		0.028			
56.758	185.670	5.775	126	Subunit 2	Sand-like		0.028			
56.922	185.290	6.359	126	Subunit 2	Sand-like		0.028			
57.086	191.478	7.096	126	Subunit 2	Sand-like		0.028			
57.250	184.174	7.872	126	Subunit 2	Sand-like		0.028			
57.414	197.641	8.618	126	Subunit 2	Sand-like		0.028			
57.578	240.047	9.487	126	Subunit 2	Sand-like		0.027			
57.742	228.254	9.153	126	Subunit 2	Sand-like		0.027			
57.906	204.934	8.391	126	Subunit 2	Sand-like		0.027			
58.070	214.208	8.029	126	Subunit 2	Sand-like		0.027			
58.234	222.245	7.923	126	Subunit 2	Sand-like		0.027			
58.398	238.266	8.661	126	Subunit 2	Sand-like		0.027			
58.562	237.901	8.659	126	Subunit 2	Sand-like		0.027			
58.726	213.407	8.714	126	Subunit 2	Sand-like		0.027			
58.890	237.858	4.280	126	Subunit 2	Sand-like		0.027			
59.054	269.769	8.482	126	Subunit 2	Sand-like		0.026			
59.218	165.543	9.981	126	Subunit 2	Sand-like		0.026			
59.382	304.614	11.326	126	Subunit 2	Sand-like		0.026			
59.547	262.839	10.653	126	Subunit 2	Sand-like		0.026			

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
59.711	213.755	9.677	126	Subunit 2	Sand-like		0.026			
59.875	204.927	9.438	126	Subunit 2	Sand-like		0.026			
60.039	242.923	9.587	126	Subunit 2	Sand-like		0.026			
60.203	270.338	11.132	126	Subunit 2	Sand-like		0.026			
60.367	300.951	12.281	126	Subunit 2	Sand-like		0.026			
60.531	261.076	12.633	126	Subunit 2	Sand-like		0.026			
60.695	259.840	11.426	126	Subunit 2	Sand-like		0.025			
60.859	228.048	10.154	126	Subunit 2	Sand-like		0.025			
61.023	179.627	10.011	126	Subunit 2	Sand-like		0.025			
61.187	189.049	9.129	126	Subunit 2	Sand-like		0.025			
61.351	189.237	9.032	126	Subunit 2	Sand-like		0.025			
61.515	240.542	10.145	126	Subunit 2	Sand-like		0.025			
61.679	233.121	10.263	126	Subunit 2	Sand-like		0.025			
61.843	223.737	10.245	126	Subunit 2	Sand-like		0.025			
62.007	213.284	9.649	126	Subunit 2	Sand-like		0.025			
62.171	188.642	7.383	126	Subunit 2	Sand-like		0.025			
62.335	163.960	6.942	126	Subunit 2	Sand-like		0.025			
62.499	144.568	5.689	126	Subunit 2	Sand-like		0.024			
62.663	105.808	5.016	126	Subunit 2	Sand-like		0.024			
62.827	60.789	5.024	126	Subunit 2	Sand-like		0.024			
62.991	230.631	5.040	126	Subunit 2	Sand-like		0.024			
63.155	273.555	5.648	126	Subunit 2	Sand-like		0.024			
63.319	306.372	7.573	126	Subunit 2	Sand-like		0.024			
63.483	433.621	8.433	126	Subunit 2	Sand-like		0.024			
63.648	424.555	8.954	126	Subunit 2	Sand-like		0.024			
63.812	339.376	9.063	126	Subunit 2	Sand-like		0.024			
63.976	348.035	9.735	126	Subunit 2	Sand-like		0.024			
64.140	422.922	10.462	126	Subunit 2	Sand-like		0.024			
64.304	492.193	11.026	126	Subunit 2	Sand-like		0.023			
64.468	554.480	0.000	126	Subunit 2	Sand-like		0.023			
64.632	526.363	0.000	126	Subunit 2	Sand-like		0.023			

LIQUEFACTION POTENTIAL ASSESSMENT FOR COARSE GRAINED SOILS USING CONE PENETRATION TEST DATA

Facility: KIF TDEC Stability
Project No.: 175668043
CPT ID: KIF-BF-CPT-4AA

Water Elevation during CPT:	759.0	ft
Depth to Water during CPT:	10.0	ft *(relative to ground surface during CPT)*
Water Elevation during Earthquake:	762.5	ft
Depth to Water during Earthquake:	6.5	ft *(relative to ground surface during CPT)*
Final Grade Elevation during EQ:	769	ft *(if no fill, then set this equal to top of CPT hole elev.)*
Height of Final Grade above CPT TOH:	0.0	ft *(relative to ground surface during CPT, + Fill, - Cut)*
Unit Weight of Cut/Fill to Achieve Final Grade	120	pcf
Cut/Fill Total Stress (+ Fill, - Cut):	0.00	tsf

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
769.0				Vertical Stresses above 1st CPT:			**0.01**	**0.01**	**0.00**	**0.00**	**0.01**	**0.01**
768.8	0.164	2.64	0.02	120	**0.16**	0.08	0.01	0.01	0.00	0.00	0.01	0.01
768.7	0.328	130.02	0.08	120	0.25	0.16	0.02	0.02	0.00	0.00	0.02	0.02
768.5	0.492	183.26	0.18	120	0.41	0.16	0.03	0.03	0.00	0.00	0.03	0.03
768.3	0.656	232.25	0.33	120	0.57	0.16	0.04	0.04	0.00	0.00	0.04	0.04
768.2	0.820	220.21	0.82	120	0.74	0.16	0.05	0.05	0.00	0.00	0.05	0.05
768.0	0.984	282.53	1.05	120	0.90	0.16	0.06	0.06	0.00	0.00	0.06	0.06
767.9	1.148	299.95	1.48	120	1.07	0.16	0.07	0.07	0.00	0.00	0.07	0.07
767.7	1.312	315.94	2.29	120	1.23	0.16	0.08	0.08	0.00	0.00	0.08	0.08
767.5	1.476	364.68	3.79	120	1.39	0.16	0.09	0.09	0.00	0.00	0.09	0.09
767.4	1.640	388.79	5.55	120	1.56	0.16	0.10	0.10	0.00	0.00	0.10	0.10
767.2	1.804	457.09	6.27	120	1.72	0.16	0.11	0.11	0.00	0.00	0.11	0.11
767.0	1.968	453.15	7.05	120	1.89	0.16	0.12	0.12	0.00	0.00	0.12	0.12
766.9	2.133	444.88	8.38	120	2.05	0.16	0.13	0.13	0.00	0.00	0.13	0.13
766.7	2.297	403.56	8.09	120	2.21	0.16	0.14	0.14	0.00	0.00	0.14	0.14
766.5	2.461	328.36	7.78	120	2.38	0.16	0.15	0.15	0.00	0.00	0.15	0.15
766.4	2.625	278.38	6.94	120	2.54	0.16	0.16	0.16	0.00	0.00	0.16	0.16
766.2	2.789	256.13	5.79	120	2.71	0.16	0.17	0.17	0.00	0.00	0.17	0.17
766.0	2.953	332.41	5.40	120	2.87	0.16	0.18	0.18	0.00	0.00	0.18	0.18
765.9	3.117	415.70	5.52	120	3.03	0.16	0.19	0.19	0.00	0.00	0.19	0.19
765.7	3.281	460.82	5.62	120	3.20	0.16	0.20	0.20	0.00	0.00	0.20	0.20
765.6	3.445	480.14	6.27	120	3.36	0.16	0.21	0.21	0.00	0.00	0.21	0.21
765.4	3.609	496.25	7.05	120	3.53	0.16	0.22	0.22	0.00	0.00	0.22	0.22
765.2	3.773	524.72	8.02	120	3.69	0.16	0.23	0.23	0.00	0.00	0.23	0.23
765.1	3.937	528.23	8.20	120	3.85	0.16	0.24	0.24	0.00	0.00	0.24	0.24
764.9	4.101	508.83	8.80	120	4.02	0.16	0.25	0.25	0.00	0.00	0.25	0.25
764.7	4.265	493.65	9.61	120	4.18	0.16	0.26	0.26	0.00	0.00	0.26	0.26
764.6	4.429	465.63	10.02	120	4.35	0.16	0.27	0.27	0.00	0.00	0.27	0.27
764.4	4.593	449.20	9.65	112	4.51	0.16	0.28	0.28	0.00	0.00	0.28	0.28
764.2	4.757	407.65	9.15	112	4.68	0.16	0.28	0.28	0.00	0.00	0.28	0.28
764.1	4.921	328.35	8.49	112	4.84	0.16	0.29	0.29	0.00	0.00	0.29	0.29
763.9	5.085	267.18	7.79	112	5.00	0.16	0.30	0.30	0.00	0.00	0.30	0.30
763.8	5.249	190.69	6.84	112	5.17	0.16	0.31	0.31	0.00	0.00	0.31	0.31
763.6	5.413	125.60	5.00	112	5.33	0.16	0.32	0.32	0.00	0.00	0.32	0.32
763.4	5.577	147.78	4.29	112	5.50	0.16	0.33	0.33	0.00	0.00	0.33	0.33
763.3	5.741	248.40	5.14	112	5.66	0.16	0.34	0.34	0.00	0.00	0.34	0.34
763.1	5.905	248.43	5.76	112	5.82	0.16	0.35	0.35	0.00	0.00	0.35	0.35
762.9	6.069	316.01	5.46	112	5.99	0.16	0.36	0.36	0.00	0.00	0.36	0.36
762.8	6.234	319.33	4.65	112	6.15	0.16	0.37	0.37	0.00	0.00	0.37	0.37
762.6	6.398	317.94	3.77	112	6.32	0.16	0.38	0.38	0.00	0.00	0.38	0.38
762.4	6.562	301.08	3.00	112	6.48	0.16	0.39	0.39	0.00	0.00	0.39	0.38
762.3	6.726	300.36	3.04	112	6.64	0.16	0.39	0.39	0.00	0.01	0.39	0.39
762.1	6.890	301.44	3.56	112	6.81	0.16	0.40	0.40	0.00	0.01	0.40	0.39
761.9	7.054	297.55	3.32	112	6.97	0.16	0.41	0.41	0.00	0.02	0.41	0.40
761.8	7.218	268.58	3.12	112	7.14	0.16	0.42	0.42	0.00	0.02	0.42	0.40
761.6	7.382	255.64	2.26	112	7.30	0.16	0.43	0.43	0.00	0.03	0.43	0.40
761.5	7.546	250.27	1.91	112	7.46	0.16	0.44	0.44	0.00	0.03	0.44	0.41
761.3	7.710	233.54	1.88	112	7.63	0.16	0.45	0.45	0.00	0.04	0.45	0.41
761.1	7.874	229.89	2.00	112	7.79	0.16	0.46	0.46	0.00	0.04	0.46	0.42
761.0	8.038	220.61	1.90	112	7.96	0.16	0.47	0.47	0.00	0.05	0.47	0.42
760.8	8.202	207.65	1.73	112	8.12	0.16	0.48	0.48	0.00	0.05	0.48	0.42
760.6	8.366	164.97	1.78	112	8.28	0.16	0.49	0.49	0.00	0.06	0.49	0.43
760.5	8.530	116.87	1.97	112	8.45	0.16	0.50	0.50	0.00	0.06	0.50	0.43
760.3	8.694	108.49	1.96	112	8.61	0.16	0.50	0.50	0.00	0.07	0.50	0.44
760.1	8.858	103.34	1.40	112	8.78	0.16	0.51	0.51	0.00	0.07	0.51	0.44
760.0	9.022	82.27	0.86	112	8.94	0.16	0.52	0.52	0.00	0.08	0.52	0.44
759.8	9.186	77.67	0.49	112	9.10	0.16	0.53	0.53	0.00	0.08	0.53	0.45
759.6	9.350	78.67	0.37	112	9.27	0.16	0.54	0.54	0.00	0.09	0.54	0.45
759.5	9.514	81.22	0.41	112	9.43	0.16	0.55	0.55	0.00	0.09	0.55	0.46

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
759.3	9.678	86.45	0.16	112	9.60	0.16	0.56	0.56	0.00	0.10	0.56	0.46
759.2	9.842	88.03	0.39	112	9.76	0.16	0.57	0.57	0.00	0.10	0.57	0.46
759.0	10.006	43.78	0.56	112	9.92	0.16	0.58	0.58	0.00	0.11	0.58	0.47
758.8	10.170	103.07	0.55	112	10.09	0.16	0.59	0.59	0.01	0.11	0.58	0.47
758.7	10.335	94.96	0.58	112	10.25	0.16	0.60	0.60	0.01	0.12	0.59	0.48
758.5	10.499	92.42	0.52	112	10.42	0.16	0.61	0.61	0.02	0.12	0.59	0.48
758.3	10.663	90.48	0.59	112	10.58	0.16	0.62	0.62	0.02	0.13	0.59	0.49
758.2	10.827	88.39	0.52	112	10.74	0.16	0.62	0.62	0.03	0.13	0.60	0.49
758.0	10.991	91.21	0.49	112	10.91	0.16	0.63	0.63	0.03	0.14	0.60	0.49
757.8	11.155	107.07	0.50	112	11.07	0.16	0.64	0.64	0.04	0.15	0.61	0.50
757.7	11.319	116.26	0.53	112	11.24	0.16	0.65	0.65	0.04	0.15	0.61	0.50
757.5	11.483	112.92	0.71	112	11.40	0.16	0.66	0.66	0.05	0.16	0.61	0.51
757.4	11.647	97.79	0.90	112	11.56	0.16	0.67	0.67	0.05	0.16	0.62	0.51
757.2	11.811	82.74	1.03	112	11.73	0.16	0.68	0.68	0.06	0.17	0.62	0.51
757.0	11.975	73.26	0.93	112	11.89	0.16	0.69	0.69	0.06	0.17	0.63	0.52
756.9	12.139	66.12	0.78	112	12.06	0.16	0.70	0.70	0.07	0.18	0.63	0.52
756.7	12.303	61.14	0.60	112	12.22	0.16	0.71	0.71	0.07	0.18	0.64	0.53
756.5	12.467	55.97	0.40	112	12.39	0.16	0.72	0.72	0.08	0.19	0.64	0.53
756.4	12.631	48.35	0.24	112	12.55	0.16	0.73	0.73	0.08	0.19	0.64	0.53
756.2	12.795	42.71	0.14	112	12.71	0.16	0.73	0.73	0.09	0.20	0.65	0.54
756.0	12.959	36.38	0.10	112	12.88	0.16	0.74	0.74	0.09	0.20	0.65	0.54
755.9	13.123	32.91	0.06	112	13.04	0.16	0.75	0.75	0.10	0.21	0.66	0.55
755.7	13.287	54.90	0.10	112	13.21	0.16	0.76	0.76	0.10	0.21	0.66	0.55
755.5	13.451	120.42	0.19	112	13.37	0.16	0.77	0.77	0.11	0.22	0.66	0.55
755.4	13.615	99.89	0.70	112	13.53	0.16	0.78	0.78	0.11	0.22	0.67	0.56
755.2	13.779	77.51	1.01	112	13.70	0.16	0.79	0.79	0.12	0.23	0.67	0.56
755.1	13.943	62.71	1.21	112	13.86	0.16	0.80	0.80	0.12	0.23	0.68	0.57
754.9	14.107	66.19	1.16	112	14.03	0.16	0.81	0.81	0.13	0.24	0.68	0.57
754.7	14.271	99.48	1.32	112	14.19	0.16	0.82	0.82	0.13	0.24	0.68	0.57
754.6	14.436	154.07	2.14	112	14.35	0.16	0.83	0.83	0.14	0.25	0.69	0.58
754.4	14.600	234.56	2.90	112	14.52	0.16	0.84	0.84	0.14	0.25	0.69	0.58
754.2	14.764	190.76	3.60	112	14.68	0.16	0.84	0.84	0.15	0.26	0.70	0.59
754.1	14.928	155.30	3.52	112	14.85	0.16	0.85	0.85	0.15	0.26	0.70	0.59
753.9	15.092	112.50	2.94	112	15.01	0.16	0.86	0.86	0.16	0.27	0.70	0.60
753.7	15.256	91.78	2.00	112	15.17	0.16	0.87	0.87	0.16	0.27	0.71	0.60
753.6	15.420	84.90	1.44	112	15.34	0.16	0.88	0.88	0.17	0.28	0.71	0.60
753.4	15.584	78.79	1.20	112	15.50	0.16	0.89	0.89	0.17	0.28	0.72	0.61
753.3	15.748	70.82	1.02	112	15.67	0.16	0.90	0.90	0.18	0.29	0.72	0.61
753.1	15.912	60.78	0.98	112	15.83	0.16	0.91	0.91	0.18	0.29	0.72	0.62
752.9	16.076	54.71	0.98	112	15.99	0.16	0.92	0.92	0.19	0.30	0.73	0.62
752.8	16.240	47.93	0.96	112	16.16	0.16	0.93	0.93	0.19	0.30	0.73	0.62
752.6	16.404	39.84	0.80	112	16.32	0.16	0.94	0.94	0.20	0.31	0.74	0.63
752.4	16.568	37.79	0.72	112	16.49	0.16	0.95	0.95	0.20	0.31	0.74	0.63
752.3	16.732	37.95	0.67	112	16.65	0.16	0.96	0.96	0.21	0.32	0.74	0.64
752.1	16.896	35.53	0.61	112	16.81	0.16	0.96	0.96	0.22	0.32	0.75	0.64
751.9	17.060	35.61	0.56	112	16.98	0.16	0.97	0.97	0.22	0.33	0.75	0.64
751.8	17.224	43.06	0.57	112	17.14	0.16	0.98	0.98	0.23	0.33	0.76	0.65
751.6	17.388	55.27	0.93	112	17.31	0.16	0.99	0.99	0.23	0.34	0.76	0.65
751.4	17.552	99.01	1.48	112	17.47	0.16	1.00	1.00	0.24	0.34	0.77	0.66
751.3	17.716	123.46	2.06	112	17.63	0.16	1.01	1.01	0.24	0.35	0.77	0.66
751.1	17.880	123.67	2.04	112	17.80	0.16	1.02	1.02	0.25	0.36	0.77	0.66
751.0	18.044	86.47	2.02	112	17.96	0.16	1.03	1.03	0.25	0.36	0.78	0.67
750.8	18.208	66.53	1.64	112	18.13	0.16	1.04	1.04	0.26	0.37	0.78	0.67
750.6	18.372	66.26	1.54	112	18.29	0.16	1.05	1.05	0.26	0.37	0.79	0.68
750.5	18.537	72.61	1.56	112	18.45	0.16	1.06	1.06	0.27	0.38	0.79	0.68
750.3	18.701	70.18	1.53	112	18.62	0.16	1.07	1.07	0.27	0.38	0.79	0.68
750.1	18.865	66.24	1.50	112	18.78	0.16	1.07	1.07	0.28	0.39	0.80	0.69
750.0	19.029	65.65	1.56	112	18.95	0.16	1.08	1.08	0.28	0.39	0.80	0.69
749.8	19.193	82.71	2.04	112	19.11	0.16	1.09	1.09	0.29	0.40	0.81	0.70
749.6	19.357	110.41	2.32	112	19.27	0.16	1.10	1.10	0.29	0.40	0.81	0.70
749.5	19.521	100.42	2.70	119	19.44	0.16	1.11	1.11	0.30	0.41	0.81	0.71
749.3	19.685	84.85	1.47	119	19.60	0.16	1.12	1.12	0.30	0.41	0.82	0.71
749.2	19.849	63.35	1.58	119	19.77	0.16	1.13	1.13	0.31	0.42	0.82	0.71
749.0	20.013	44.25	1.24	119	19.93	0.16	1.14	1.14	0.31	0.42	0.83	0.72
748.8	20.177	119.00	1.34	119	20.09	0.16	1.15	1.15	0.32	0.43	0.83	0.72
748.7	20.341	176.83	1.62	119	20.26	0.16	1.16	1.16	0.32	0.43	0.84	0.73
748.5	20.505	249.07	2.70	119	20.42	0.16	1.17	1.17	0.33	0.44	0.84	0.73
748.3	20.669	230.75	3.23	119	20.59	0.16	1.18	1.18	0.33	0.44	0.85	0.74
748.2	20.833	204.36	3.52	119	20.75	0.16	1.19	1.19	0.34	0.45	0.85	0.74

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
748.0	20.997	190.62	2.95	119	20.92	0.16	1.20	1.20	0.34	0.45	0.86	0.75
747.8	21.161	163.20	2.39	126	21.08	0.16	1.21	1.21	0.35	0.46	0.86	0.75
747.7	21.325	150.86	1.74	126	21.24	0.16	1.22	1.22	0.35	0.46	0.87	0.76
747.5	21.489	149.00	1.38	126	21.41	0.16	1.23	1.23	0.36	0.47	0.87	0.76
747.3	21.653	150.17	0.97	126	21.57	0.16	1.24	1.24	0.36	0.47	0.88	0.77
747.2	21.817	150.00	0.61	126	21.74	0.16	1.25	1.25	0.37	0.48	0.88	0.77
747.0	21.981	127.24	0.53	126	21.90	0.16	1.26	1.26	0.37	0.48	0.89	0.78
746.9	22.145	101.71	0.48	126	22.06	0.16	1.27	1.27	0.38	0.49	0.89	0.78
746.7	22.309	87.54	0.38	126	22.23	0.16	1.28	1.28	0.38	0.49	0.90	0.79
746.5	22.473	90.37	0.26	126	22.39	0.16	1.29	1.29	0.39	0.50	0.90	0.79
746.4	22.638	97.32	0.16	126	22.56	0.16	1.30	1.30	0.39	0.50	0.91	0.80
746.2	22.802	107.26	0.30	126	22.72	0.16	1.31	1.31	0.40	0.51	0.91	0.80
746.0	22.966	93.90	0.65	126	22.88	0.16	1.32	1.32	0.40	0.51	0.92	0.81
745.9	23.130	80.40	0.82	126	23.05	0.16	1.33	1.33	0.41	0.52	0.92	0.81
745.7	23.294	105.31	1.18	126	23.21	0.16	1.34	1.34	0.41	0.52	0.93	0.82
745.5	23.458	109.32	1.24	126	23.38	0.16	1.35	1.35	0.42	0.53	0.93	0.82
745.4	23.622	116.92	1.06	126	23.54	0.16	1.36	1.36	0.42	0.53	0.94	0.83
745.2	23.786	124.49	0.76	126	23.70	0.16	1.37	1.37	0.43	0.54	0.94	0.84
745.1	23.950	107.06	0.40	126	23.87	0.16	1.39	1.39	0.44	0.54	0.95	0.84
744.9	24.114	96.44	0.29	126	24.03	0.16	1.40	1.40	0.44	0.55	0.96	0.85
744.7	24.278	81.20	0.20	126	24.20	0.16	1.41	1.41	0.45	0.55	0.96	0.85
744.6	24.442	68.63	0.17	126	24.36	0.16	1.42	1.42	0.45	0.56	0.97	0.86
744.4	24.606	62.77	0.14	126	24.52	0.16	1.43	1.43	0.46	0.56	0.97	0.86
744.2	24.770	64.75	0.20	126	24.69	0.16	1.44	1.44	0.46	0.57	0.98	0.87
744.1	24.934	61.11	0.34	126	24.85	0.16	1.45	1.45	0.47	0.58	0.98	0.87
743.9	25.098	57.92	0.55	126	25.02	0.16	1.46	1.46	0.47	0.58	0.99	0.88
743.7	25.262	56.16	0.73	126	25.18	0.16	1.47	1.47	0.48	0.59	0.99	0.88
743.6	25.426	55.22	0.84	126	25.34	0.16	1.48	1.48	0.48	0.59	1.00	0.89
743.4	25.590	59.18	1.04	126	25.51	0.16	1.49	1.49	0.49	0.60	1.00	0.89
743.2	25.754	66.32	1.29	126	25.67	0.16	1.50	1.50	0.49	0.60	1.01	0.90
743.1	25.918	67.09	1.52	126	25.84	0.16	1.51	1.51	0.50	0.61	1.01	0.90
742.9	26.082	66.38	1.31	126	26.00	0.16	1.52	1.52	0.50	0.61	1.02	0.91
742.8	26.246	75.87	1.48	126	26.16	0.16	1.53	1.53	0.51	0.62	1.02	0.91
742.6	26.410	82.49	1.67	126	26.33	0.16	1.54	1.54	0.51	0.62	1.03	0.92
742.4	26.574	85.53	1.91	126	26.49	0.16	1.55	1.55	0.52	0.63	1.03	0.92
742.3	26.739	94.39	1.97	126	26.66	0.16	1.56	1.56	0.52	0.63	1.04	0.93
742.1	26.903	117.60	2.09	126	26.82	0.16	1.57	1.57	0.53	0.64	1.04	0.93
741.9	27.067	105.61	2.20	126	26.98	0.16	1.58	1.58	0.53	0.64	1.05	0.94
741.8	27.231	98.90	2.11	126	27.15	0.16	1.59	1.59	0.54	0.65	1.05	0.94
741.6	27.395	90.69	2.14	126	27.31	0.16	1.60	1.60	0.54	0.65	1.06	0.95
741.4	27.559	88.42	2.10	126	27.48	0.16	1.61	1.61	0.55	0.66	1.06	0.96
741.3	27.723	83.36	2.10	126	27.64	0.16	1.62	1.62	0.55	0.66	1.07	0.96
741.1	27.887	76.18	1.96	126	27.80	0.16	1.63	1.63	0.56	0.67	1.08	0.97
740.9	28.051	73.25	1.85	126	27.97	0.16	1.64	1.64	0.56	0.67	1.08	0.97
740.8	28.215	67.81	1.67	126	28.13	0.16	1.65	1.65	0.57	0.68	1.09	0.98
740.6	28.379	63.59	1.55	126	28.30	0.16	1.66	1.66	0.57	0.68	1.09	0.98
740.5	28.543	63.43	1.44	131	28.46	0.16	1.67	1.67	0.58	0.69	1.10	0.99
740.3	28.707	57.26	1.34	131	28.62	0.16	1.69	1.69	0.58	0.69	1.10	0.99
740.1	28.871	53.06	1.23	131	28.79	0.16	1.70	1.70	0.59	0.70	1.11	1.00
740.0	29.035	53.71	1.11	131	28.95	0.16	1.71	1.71	0.59	0.70	1.11	1.00
739.8	29.199	55.59	1.08	131	29.12	0.16	1.72	1.72	0.60	0.71	1.12	1.01
739.6	29.363	61.57	0.91	131	29.28	0.16	1.73	1.73	0.60	0.71	1.12	1.02
739.5	29.527	68.15	1.14	131	29.45	0.16	1.74	1.74	0.61	0.72	1.13	1.02
739.3	29.691	62.57	1.32	131	29.61	0.16	1.75	1.75	0.61	0.72	1.14	1.03
739.1	29.855	57.24	1.40	131	29.77	0.16	1.76	1.76	0.62	0.73	1.14	1.03
739.0	30.019	60.46	1.45	131	29.94	0.16	1.77	1.77	0.62	0.73	1.15	1.04
738.8	30.183	61.87	1.53	131	30.10	0.16	1.78	1.78	0.63	0.74	1.15	1.04
738.7	30.347	62.90	1.62	131	30.27	0.16	1.79	1.79	0.63	0.74	1.16	1.05
738.5	30.511	64.07	1.66	131	30.43	0.16	1.80	1.80	0.64	0.75	1.16	1.05
738.3	30.675	62.97	1.68	131	30.59	0.16	1.81	1.81	0.65	0.75	1.17	1.06
738.2	30.840	61.06	1.70	131	30.76	0.16	1.83	1.83	0.65	0.76	1.17	1.07
738.0	31.004	60.66	1.71	131	30.92	0.16	1.84	1.84	0.66	0.76	1.18	1.07
737.8	31.168	65.18	1.76	131	31.09	0.16	1.85	1.85	0.66	0.77	1.19	1.08
737.7	31.332	71.65	1.85	131	31.25	0.16	1.86	1.86	0.67	0.77	1.19	1.08
737.5	31.496	75.21	1.97	131	31.41	0.16	1.87	1.87	0.67	0.78	1.20	1.09
737.3	31.660	69.32	1.98	131	31.58	0.16	1.88	1.88	0.68	0.78	1.20	1.09
737.2	31.824	64.98	1.86	131	31.74	0.16	1.89	1.89	0.68	0.79	1.21	1.10
737.0	31.988	60.56	1.72	131	31.91	0.16	1.90	1.90	0.69	0.80	1.21	1.11
736.8	32.152	59.67	1.66	131	32.07	0.16	1.91	1.91	0.69	0.80	1.22	1.11

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
736.7	32.316	61.88	1.64	131	32.23	0.16	1.92	1.92	0.70	0.81	1.23	1.12
736.5	32.480	65.29	1.71	131	32.40	0.16	1.93	1.93	0.70	0.81	1.23	1.12
736.4	32.644	69.00	1.26	131	32.56	0.16	1.94	1.94	0.71	0.82	1.24	1.13
736.2	32.808	69.82	1.44	131	32.73	0.16	1.95	1.95	0.71	0.82	1.24	1.13
736.0	32.972	77.17	1.76	131	32.89	0.16	1.96	1.96	0.72	0.83	1.25	1.14
735.9	33.136	74.78	1.86	131	33.05	0.16	1.98	1.98	0.72	0.83	1.25	1.14
735.7	33.300	71.41	1.68	131	33.22	0.16	1.99	1.99	0.73	0.84	1.26	1.15
735.5	33.464	63.71	1.38	131	33.38	0.16	2.00	2.00	0.73	0.84	1.26	1.16
735.4	33.628	45.33	1.14	126	33.55	0.16	2.01	2.01	0.74	0.85	1.27	1.16
735.2	33.792	31.53	0.94	126	33.71	0.16	2.02	2.02	0.74	0.85	1.28	1.17
735.0	33.956	17.57	0.76	126	33.87	0.16	2.03	2.03	0.75	0.86	1.28	1.17
734.9	34.120	12.90	0.41	126	34.04	0.16	2.04	2.04	0.75	0.86	1.29	1.18
734.7	34.284	11.23	0.18	126	34.20	0.16	2.05	2.05	0.76	0.87	1.29	1.18
734.6	34.448	9.53	0.07	126	34.37	0.16	2.06	2.06	0.76	0.87	1.30	1.19
734.4	34.612	8.89	0.06	126	34.53	0.16	2.07	2.07	0.77	0.88	1.30	1.19
734.2	34.776	9.12	0.06	126	34.69	0.16	2.08	2.08	0.77	0.88	1.31	1.20
734.1	34.941	9.38	0.06	126	34.86	0.16	2.09	2.09	0.78	0.89	1.31	1.20
733.9	35.105	8.48	0.06	126	35.02	0.16	2.10	2.10	0.78	0.89	1.32	1.21
733.7	35.269	7.63	0.05	126	35.19	0.16	2.11	2.11	0.79	0.90	1.32	1.21
733.6	35.433	7.21	0.03	126	35.35	0.16	2.12	2.12	0.79	0.90	1.33	1.22
733.4	35.597	6.95	0.03	126	35.51	0.16	2.13	2.13	0.80	0.91	1.33	1.22
733.2	35.761	6.40	0.02	126	35.68	0.16	2.14	2.14	0.80	0.91	1.34	1.23
733.1	35.925	6.11	0.02	126	35.84	0.16	2.15	2.15	0.81	0.92	1.34	1.23
732.9	36.089	5.88	0.02	126	36.01	0.16	2.16	2.16	0.81	0.92	1.35	1.24
732.7	36.253	5.44	0.02	126	36.17	0.16	2.17	2.17	0.82	0.93	1.35	1.24
732.6	36.417	5.57	0.02	126	36.33	0.16	2.18	2.18	0.82	0.93	1.36	1.25
732.4	36.581	5.57	0.02	126	36.50	0.16	2.19	2.19	0.83	0.94	1.36	1.26
732.3	36.745	6.61	0.03	126	36.66	0.16	2.20	2.20	0.83	0.94	1.37	1.26
732.1	36.909	7.78	0.05	126	36.83	0.16	2.21	2.21	0.84	0.95	1.37	1.27
731.9	37.073	8.19	0.08	126	36.99	0.16	2.22	2.22	0.84	0.95	1.38	1.27
731.8	37.237	8.50	0.08	126	37.16	0.16	2.23	2.23	0.85	0.96	1.39	1.28
731.6	37.401	7.94	0.09	126	37.32	0.16	2.25	2.25	0.85	0.96	1.39	1.28
731.4	37.565	7.72	0.13	126	37.48	0.16	2.26	2.26	0.86	0.97	1.40	1.29
731.3	37.729	6.57	0.12	126	37.65	0.16	2.27	2.27	0.87	0.97	1.40	1.29
731.1	37.893	6.17	0.12	126	37.81	0.16	2.28	2.28	0.87	0.98	1.41	1.30
730.9	38.057	6.67	0.10	126	37.98	0.16	2.29	2.29	0.88	0.98	1.41	1.30
730.8	38.221	7.04	0.10	126	38.14	0.16	2.30	2.30	0.88	0.99	1.42	1.31
730.6	38.385	7.30	0.09	126	38.30	0.16	2.31	2.31	0.89	0.99	1.42	1.31
730.5	38.549	7.63	0.09	126	38.47	0.16	2.32	2.32	0.89	1.00	1.43	1.32
730.3	38.713	7.38	0.07	126	38.63	0.16	2.33	2.33	0.90	1.01	1.43	1.32
730.1	38.877	7.03	0.08	126	38.80	0.16	2.34	2.34	0.90	1.01	1.44	1.33
730.0	39.042	7.03	0.09	126	38.96	0.16	2.35	2.35	0.91	1.02	1.44	1.33
729.8	39.206	8.42	0.10	126	39.12	0.16	2.36	2.36	0.91	1.02	1.45	1.34
729.6	39.370	9.61	0.12	126	39.29	0.16	2.37	2.37	0.92	1.03	1.45	1.34
729.5	39.534	12.51	0.13	126	39.45	0.16	2.38	2.38	0.92	1.03	1.46	1.35
729.3	39.698	16.40	0.22	126	39.62	0.16	2.39	2.39	0.93	1.04	1.46	1.35
729.1	39.862	18.04	0.27	126	39.78	0.16	2.40	2.40	0.93	1.04	1.47	1.36
729.0	40.026	19.11	0.31	126	39.94	0.16	2.41	2.41	0.94	1.05	1.47	1.36
728.8	40.190	20.41	0.34	126	40.11	0.16	2.42	2.42	0.94	1.05	1.48	1.37
728.6	40.354	22.85	0.36	126	40.27	0.16	2.43	2.43	0.95	1.06	1.48	1.37
728.5	40.518	23.07	0.35	126	40.44	0.16	2.44	2.44	0.95	1.06	1.49	1.38
728.3	40.682	22.83	0.35	126	40.60	0.16	2.45	2.45	0.96	1.07	1.49	1.39
728.2	40.846	22.40	0.34	126	40.76	0.16	2.46	2.46	0.96	1.07	1.50	1.39
728.0	41.010	21.45	0.33	126	40.93	0.16	2.47	2.47	0.97	1.08	1.51	1.40
727.8	41.174	21.39	0.31	126	41.09	0.16	2.48	2.48	0.97	1.08	1.51	1.40
727.7	41.338	20.39	0.31	126	41.26	0.16	2.49	2.49	0.98	1.09	1.52	1.41
727.5	41.502	19.37	0.29	126	41.42	0.16	2.50	2.50	0.98	1.09	1.52	1.41
727.3	41.666	16.93	0.25	126	41.58	0.16	2.51	2.51	0.99	1.10	1.53	1.42
727.2	41.830	15.24	0.21	126	41.75	0.16	2.52	2.52	0.99	1.10	1.53	1.42
727.0	41.994	12.94	0.18	126	41.91	0.16	2.53	2.53	1.00	1.11	1.54	1.43
726.8	42.158	9.64	0.14	126	42.08	0.16	2.54	2.54	1.00	1.11	1.54	1.43
726.7	42.322	8.59	0.10	126	42.24	0.16	2.56	2.56	1.01	1.12	1.55	1.44
726.5	42.486	6.64	0.05	126	42.40	0.16	2.57	2.57	1.01	1.12	1.55	1.44
726.3	42.650	6.21	0.03	126	42.57	0.16	2.58	2.58	1.02	1.13	1.56	1.45
726.2	42.814	6.03	0.01	126	42.73	0.16	2.59	2.59	1.02	1.13	1.56	1.45
726.0	42.978	5.62	0.01	126	42.90	0.16	2.60	2.60	1.03	1.14	1.57	1.46
725.9	43.143	5.44	0.01	126	43.06	0.16	2.61	2.61	1.03	1.14	1.57	1.46
725.7	43.307	5.40	0.01	126	43.22	0.16	2.62	2.62	1.04	1.15	1.58	1.47
725.5	43.471	5.66	0.01	126	43.39	0.16	2.63	2.63	1.04	1.15	1.58	1.47

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
725.4	43.635	6.04	0.02	126	43.55	0.16	2.64	2.64	1.05	1.16	1.59	1.48
725.2	43.799	6.55	0.11	126	43.72	0.16	2.65	2.65	1.05	1.16	1.59	1.48
725.0	43.963	22.93	0.16	126	43.88	0.16	2.66	2.66	1.06	1.17	1.60	1.49
724.9	44.127	113.87	0.37	126	44.04	0.16	2.67	2.67	1.06	1.17	1.60	1.49
724.7	44.291	156.68	0.63	126	44.21	0.16	2.68	2.68	1.07	1.18	1.61	1.50
724.5	44.455	149.13	0.83	126	44.37	0.16	2.69	2.69	1.07	1.18	1.61	1.51
724.4	44.619	105.67	0.87	126	44.54	0.16	2.70	2.70	1.08	1.19	1.62	1.51
724.2	44.783	60.45	0.84	126	44.70	0.16	2.71	2.71	1.09	1.19	1.63	1.52
724.1	44.947	43.42	0.55	126	44.86	0.16	2.72	2.72	1.09	1.20	1.63	1.52
723.9	45.111	32.27	0.36	126	45.03	0.16	2.73	2.73	1.10	1.20	1.64	1.53
723.7	45.275	26.01	0.18	126	45.19	0.16	2.74	2.74	1.10	1.21	1.64	1.53
723.6	45.439	20.24	0.15	126	45.36	0.16	2.75	2.75	1.11	1.21	1.65	1.54
723.4	45.603	17.06	0.15	126	45.52	0.16	2.76	2.76	1.11	1.22	1.65	1.54
723.2	45.767	13.97	0.11	126	45.69	0.16	2.77	2.77	1.12	1.23	1.66	1.55
723.1	45.931	12.38	0.07	126	45.85	0.16	2.78	2.78	1.12	1.23	1.66	1.55
722.9	46.095	13.35	0.11	126	46.01	0.16	2.79	2.79	1.13	1.24	1.67	1.56
722.7	46.259	12.53	0.18	126	46.18	0.16	2.80	2.80	1.13	1.24	1.67	1.56
722.6	46.423	17.50	0.25	126	46.34	0.16	2.81	2.81	1.14	1.25	1.68	1.57
722.4	46.587	15.37	0.18	126	46.51	0.16	2.82	2.82	1.14	1.25	1.68	1.57
722.2	46.751	18.43	0.30	126	46.67	0.16	2.83	2.83	1.15	1.26	1.69	1.58
722.1	46.915	18.16	0.25	126	46.83	0.16	2.84	2.84	1.15	1.26	1.69	1.58
721.9	47.079	25.94	0.33	126	47.00	0.16	2.85	2.85	1.16	1.27	1.70	1.59
721.8	47.244	26.02	0.50	126	47.16	0.16	2.87	2.87	1.16	1.27	1.70	1.59
721.6	47.408	35.16	0.47	126	47.33	0.16	2.88	2.88	1.17	1.28	1.71	1.60
721.4	47.572	58.27	0.25	126	47.49	0.16	2.89	2.89	1.17	1.28	1.71	1.60
721.3	47.736	56.13	0.14	126	47.65	0.16	2.90	2.90	1.18	1.29	1.72	1.61
721.1	47.900	40.39	0.12	126	47.82	0.16	2.91	2.91	1.18	1.29	1.72	1.61
720.9	48.064	27.36	0.11	126	47.98	0.16	2.92	2.92	1.19	1.30	1.73	1.62
720.8	48.228	19.87	0.16	126	48.15	0.16	2.93	2.93	1.19	1.30	1.73	1.63
720.6	48.392	20.47	0.14	126	48.31	0.16	2.94	2.94	1.20	1.31	1.74	1.63
720.4	48.556	25.80	0.24	126	48.47	0.16	2.95	2.95	1.20	1.31	1.75	1.64
720.3	48.720	27.71	0.35	126	48.64	0.16	2.96	2.96	1.21	1.32	1.75	1.64
720.1	48.884	35.63	0.46	126	48.80	0.16	2.97	2.97	1.21	1.32	1.76	1.65
720.0	49.048	64.37	0.53	126	48.97	0.16	2.98	2.98	1.22	1.33	1.76	1.65
719.8	49.212	95.22	0.46	126	49.13	0.16	2.99	2.99	1.22	1.33	1.77	1.66
719.6	49.376	114.58	0.63	126	49.29	0.16	3.00	3.00	1.23	1.34	1.77	1.66
719.5	49.540	139.74	0.90	126	49.46	0.16	3.01	3.01	1.23	1.34	1.78	1.67
719.3	49.704	148.26	1.32	126	49.62	0.16	3.02	3.02	1.24	1.35	1.78	1.67
719.1	49.868	169.83	1.50	126	49.79	0.16	3.03	3.03	1.24	1.35	1.79	1.68
719.0	50.032	206.12	1.85	126	49.95	0.16	3.04	3.04	1.25	1.36	1.79	1.68
718.8	50.196	232.65	2.08	126	50.11	0.16	3.05	3.05	1.25	1.36	1.80	1.69
718.6	50.360	274.76	2.60	126	50.28	0.16	3.06	3.06	1.26	1.37	1.80	1.69
718.5	50.524	290.77	3.13	126	50.44	0.16	3.07	3.07	1.26	1.37	1.81	1.70
718.3	50.688	278.86	3.38	126	50.61	0.16	3.08	3.08	1.27	1.38	1.81	1.70
718.1	50.852	268.16	3.53	126	50.77	0.16	3.09	3.09	1.27	1.38	1.82	1.71
718.0	51.016	246.55	3.49	126	50.93	0.16	3.10	3.10	1.28	1.39	1.82	1.71
717.8	51.180	219.94	3.26	126	51.10	0.16	3.11	3.11	1.28	1.39	1.83	1.72
717.7	51.345	199.44	2.85	126	51.26	0.16	3.12	3.12	1.29	1.40	1.83	1.72
717.5	51.509	191.03	2.44	126	51.43	0.16	3.13	3.13	1.30	1.40	1.84	1.73
717.3	51.673	187.09	2.07	126	51.59	0.16	3.14	3.14	1.30	1.41	1.84	1.73
717.2	51.837	181.64	1.88	126	51.75	0.16	3.15	3.15	1.31	1.41	1.85	1.74
717.0	52.001	170.65	1.78	126	51.92	0.16	3.16	3.16	1.31	1.42	1.85	1.75
716.8	52.165	151.63	1.66	126	52.08	0.16	3.18	3.18	1.32	1.42	1.86	1.75
716.7	52.329	139.11	1.51	126	52.25	0.16	3.19	3.19	1.32	1.43	1.86	1.76
716.5	52.493	137.02	1.13	126	52.41	0.16	3.20	3.20	1.33	1.43	1.87	1.76
716.3	52.657	135.48	1.06	126	52.57	0.16	3.21	3.21	1.33	1.44	1.88	1.77
716.2	52.821	135.84	1.08	126	52.74	0.16	3.22	3.22	1.34	1.45	1.88	1.77
716.0	52.985	139.96	1.22	126	52.90	0.16	3.23	3.23	1.34	1.45	1.89	1.78
715.9	53.149	147.42	1.25	126	53.07	0.16	3.24	3.24	1.35	1.46	1.89	1.78
715.7	53.313	160.76	1.20	126	53.23	0.16	3.25	3.25	1.35	1.46	1.90	1.79
715.5	53.477	166.24	1.11	126	53.40	0.16	3.26	3.26	1.36	1.47	1.90	1.79
715.4	53.641	141.62	1.04	126	53.56	0.16	3.27	3.27	1.36	1.47	1.91	1.80
715.2	53.805	99.09	1.04	126	53.72	0.16	3.28	3.28	1.37	1.48	1.91	1.80
715.0	53.969	65.00	1.15	126	53.89	0.16	3.29	3.29	1.37	1.48	1.92	1.81
714.9	54.133	49.28	1.47	126	54.05	0.16	3.30	3.30	1.38	1.49	1.92	1.81
714.7	54.297	41.92	1.49	126	54.22	0.16	3.31	3.31	1.38	1.49	1.93	1.82
714.5	54.461	86.51	1.35	126	54.38	0.16	3.32	3.32	1.39	1.50	1.93	1.82
714.4	54.625	187.06	1.81	126	54.54	0.16	3.33	3.33	1.39	1.50	1.94	1.83
714.2	54.789	209.75	2.61	126	54.71	0.16	3.34	3.34	1.40	1.51	1.94	1.83

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight ϒ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
714.0	54.953	243.93	3.35	126	54.87	0.16	3.35	3.35	1.40	1.51	1.95	1.84
713.9	55.117	380.56	3.94	126	55.04	0.16	3.36	3.36	1.41	1.52	1.95	1.84
713.7	55.281	426.68	4.06	126	55.20	0.16	3.37	3.37	1.41	1.52	1.96	1.85
713.6	55.446	364.17	4.57	126	55.36	0.16	3.38	3.38	1.42	1.53	1.96	1.85
713.4	55.610	259.74	4.11	126	55.53	0.16	3.39	3.39	1.42	1.53	1.97	1.86
713.2	55.774	156.18	4.48	126	55.69	0.16	3.40	3.40	1.43	1.54	1.97	1.87
713.1	55.938	140.33	4.42	126	55.86	0.16	3.41	3.41	1.43	1.54	1.98	1.87
712.9	56.102	141.01	4.86	126	56.02	0.16	3.42	3.42	1.44	1.55	1.98	1.88
712.7	56.266	150.28	5.49	126	56.18	0.16	3.43	3.43	1.44	1.55	1.99	1.88
712.6	56.430	165.09	6.01	126	56.35	0.16	3.44	3.44	1.45	1.56	2.00	1.89
712.4	56.594	162.29	5.84	126	56.51	0.16	3.45	3.45	1.45	1.56	2.00	1.89
712.2	56.758	185.67	5.78	126	56.68	0.16	3.46	3.46	1.46	1.57	2.01	1.90
712.1	56.922	185.29	6.36	126	56.84	0.16	3.48	3.48	1.46	1.57	2.01	1.90
711.9	57.086	191.48	7.10	126	57.00	0.16	3.49	3.49	1.47	1.58	2.02	1.91
711.8	57.250	184.17	7.87	126	57.17	0.16	3.50	3.50	1.47	1.58	2.02	1.91
711.6	57.414	197.64	8.62	126	57.33	0.16	3.51	3.51	1.48	1.59	2.03	1.92
711.4	57.578	240.05	9.49	126	57.50	0.16	3.52	3.52	1.48	1.59	2.03	1.92
711.3	57.742	228.25	9.15	126	57.66	0.16	3.53	3.53	1.49	1.60	2.04	1.93
711.1	57.906	204.93	8.39	126	57.82	0.16	3.54	3.54	1.49	1.60	2.04	1.93
710.9	58.070	214.21	8.03	126	57.99	0.16	3.55	3.55	1.50	1.61	2.05	1.94
710.8	58.234	222.25	7.92	126	58.15	0.16	3.56	3.56	1.50	1.61	2.05	1.94
710.6	58.398	238.27	8.66	126	58.32	0.16	3.57	3.57	1.51	1.62	2.06	1.95
710.4	58.562	237.90	8.66	126	58.48	0.16	3.58	3.58	1.52	1.62	2.06	1.95
710.3	58.726	213.41	8.71	126	58.64	0.16	3.59	3.59	1.52	1.63	2.07	1.96
710.1	58.890	237.86	4.28	126	58.81	0.16	3.60	3.60	1.53	1.63	2.07	1.96
709.9	59.054	269.77	8.48	126	58.97	0.16	3.61	3.61	1.53	1.64	2.08	1.97
709.8	59.218	165.54	9.98	126	59.14	0.16	3.62	3.62	1.54	1.64	2.08	1.97
709.6	59.382	304.61	11.33	126	59.30	0.16	3.63	3.63	1.54	1.65	2.09	1.98
709.5	59.547	262.84	10.65	126	59.46	0.16	3.64	3.64	1.55	1.66	2.09	1.99
709.3	59.711	213.75	9.68	126	59.63	0.16	3.65	3.65	1.55	1.66	2.10	1.99
709.1	59.875	204.93	9.44	126	59.79	0.16	3.66	3.66	1.56	1.67	2.10	2.00
709.0	60.039	242.92	9.59	126	59.96	0.16	3.67	3.67	1.56	1.67	2.11	2.00
708.8	60.203	270.34	11.13	126	60.12	0.16	3.68	3.68	1.57	1.68	2.12	2.01
708.6	60.367	300.95	12.28	126	60.28	0.16	3.69	3.69	1.57	1.68	2.12	2.01
708.5	60.531	261.08	12.63	126	60.45	0.16	3.70	3.70	1.58	1.69	2.13	2.02
708.3	60.695	259.84	11.43	126	60.61	0.16	3.71	3.71	1.58	1.69	2.13	2.02
708.1	60.859	228.05	10.15	126	60.78	0.16	3.72	3.72	1.59	1.70	2.14	2.03
708.0	61.023	179.63	10.01	126	60.94	0.16	3.73	3.73	1.59	1.70	2.14	2.03
707.8	61.187	189.05	9.13	126	61.10	0.16	3.74	3.74	1.60	1.71	2.15	2.04
707.6	61.351	189.24	9.03	126	61.27	0.16	3.75	3.75	1.60	1.71	2.15	2.04
707.5	61.515	240.54	10.15	126	61.43	0.16	3.76	3.76	1.61	1.72	2.16	2.05
707.3	61.679	233.12	10.26	126	61.60	0.16	3.77	3.77	1.61	1.72	2.16	2.05
707.2	61.843	223.74	10.25	126	61.76	0.16	3.79	3.79	1.62	1.73	2.17	2.06
707.0	62.007	213.28	9.65	126	61.93	0.16	3.80	3.80	1.62	1.73	2.17	2.06
706.8	62.171	188.64	7.38	126	62.09	0.16	3.81	3.81	1.63	1.74	2.18	2.07
706.7	62.335	163.96	6.94	126	62.25	0.16	3.82	3.82	1.63	1.74	2.18	2.07
706.5	62.499	144.57	5.69	126	62.42	0.16	3.83	3.83	1.64	1.75	2.19	2.08
706.3	62.663	105.81	5.02	126	62.58	0.16	3.84	3.84	1.64	1.75	2.19	2.08
706.2	62.827	60.79	5.02	126	62.75	0.16	3.85	3.85	1.65	1.76	2.20	2.09
706.0	62.991	230.63	5.04	126	62.91	0.16	3.86	3.86	1.65	1.76	2.20	2.09
705.8	63.155	273.55	5.65	126	63.07	0.16	3.87	3.87	1.66	1.77	2.21	2.10
705.7	63.319	306.37	7.57	126	63.24	0.16	3.88	3.88	1.66	1.77	2.21	2.11
705.5	63.483	433.62	8.43	126	63.40	0.16	3.89	3.89	1.67	1.78	2.22	2.11
705.4	63.648	424.56	8.95	126	63.57	0.16	3.90	3.90	1.67	1.78	2.22	2.12
705.2	63.812	339.38	9.06	126	63.73	0.16	3.91	3.91	1.68	1.79	2.23	2.12
705.0	63.976	348.04	9.74	126	63.89	0.16	3.92	3.92	1.68	1.79	2.24	2.13
704.9	64.140	422.92	10.46	126	64.06	0.16	3.93	3.93	1.69	1.80	2.24	2.13
704.7	64.304	492.19	11.03	126	64.22	0.16	3.94	3.94	1.69	1.80	2.25	2.14
704.5	64.468	554.48	0.01	126	64.39	0.16	3.95	3.95	1.70	1.81	2.25	2.14
704.4	64.632	526.36	0.01	126	64.55	0.08	3.96	3.96	1.70	1.81	2.26	2.15

LIQUEFACTION POTENTIAL ASSESSMENT FOR COARSE GRAINED SOILS USING CONE PENETRATION TEST DATA

Project Site: KIF TDEC Stability
Project No.: 175668043
CPT ID: KIF-BF-CPT-4AA

Elev. (ft)	Depth *z* (ft)	Normalized Cone Resistance *Q*	Normalized Friction Ratio *F* (%)	Soil Behavior Type Index I_C	Soil Type Exponent *n*	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content *FC* (%)	Clean Sand Correction *Δqc1N*	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
769.0												
768.8	0.164	25.76	0.76	2.34	0.5	1.70	4.24	50	47.07	51.31	0.004	-0.194
768.7	0.328	900.81	0.15	0.65	0.5	1.70	208.92	0	0.00	208.92	0.005	-0.600
768.5	0.492	1036.66	0.15	0.60	0.5	1.70	294.46	0	0.00	294.46	0.005	-0.600
768.3	0.656	1137.76	0.15	0.57	0.5	1.70	373.17	0	0.00	373.17	0.006	-0.600
768.2	0.820	964.87	0.37	0.93	0.5	1.70	353.84	0	0.00	353.84	0.006	-0.600
768.0	0.984	1130.06	0.37	0.89	0.5	1.70	453.97	0	0.00	453.97	0.007	-0.600
767.9	1.148	1110.74	0.49	1.01	0.5	1.70	481.97	0	0.00	481.97	0.007	-0.600
767.7	1.312	1094.36	0.73	1.16	0.5	1.70	507.65	0	0.00	507.65	0.008	-0.600
767.5	1.476	1190.94	1.04	1.30	0.5	1.70	585.96	0	0.00	585.96	0.008	-0.600
767.4	1.640	1204.51	1.43	1.43	0.5	1.70	624.71	0	0.00	624.71	0.008	-0.600
767.2	1.804	1350.24	1.37	1.40	0.5	1.70	734.46	0	0.00	734.46	0.009	-0.600
767.0	1.968	1281.57	1.56	1.46	0.5	1.70	728.12	0	0.00	728.12	0.009	-0.600
766.9	2.133	1208.81	1.88	1.54	0.5	1.70	714.84	0	0.00	714.84	0.009	-0.600
766.7	2.297	1056.58	2.01	1.59	0.5	1.70	648.45	0	0.00	648.45	0.009	-0.600
766.5	2.461	830.46	2.37	1.69	0.5	1.68	520.97	0	0.00	520.97	0.010	-0.600
766.4	2.625	681.63	2.49	1.74	0.5	1.65	434.24	2	0.00	434.24	0.010	-0.600
766.2	2.789	608.37	2.26	1.72	0.5	1.62	393.21	0	0.00	393.21	0.010	-0.600
766.0	2.953	767.39	1.63	1.55	0.5	1.60	502.70	0	0.00	502.70	0.010	-0.600
765.9	3.117	934.15	1.33	1.43	0.5	1.58	619.78	0	0.00	619.78	0.010	-0.600
765.7	3.281	1009.33	1.22	1.39	0.5	1.56	677.84	0	0.00	677.84	0.010	-0.600
765.6	3.445	1026.30	1.31	1.41	0.5	1.54	697.25	0	0.00	697.25	0.010	-0.600
765.4	3.609	1036.34	1.42	1.45	0.5	1.52	711.88	0	0.00	711.88	0.010	-0.600
765.2	3.773	1071.73	1.53	1.47	0.5	1.50	743.99	0	0.00	743.99	0.010	-0.600
765.1	3.937	1056.17	1.55	1.48	0.5	1.48	740.63	0	0.00	740.63	0.009	-0.600
764.9	4.101	996.78	1.73	1.53	0.5	1.47	705.80	0	0.00	705.80	0.009	-0.600
764.7	4.265	948.24	1.95	1.59	0.5	1.45	677.72	0	0.00	677.72	0.009	-0.600
764.6	4.429	877.65	2.15	1.64	0.5	1.44	632.94	0	0.00	632.94	0.009	-0.600
764.4	4.593	831.88	2.15	1.65	0.5	1.42	604.98	0	0.00	604.98	0.009	-0.600
764.2	4.757	742.57	2.25	1.68	0.5	1.41	544.30	0	0.00	544.30	0.009	-0.600
764.1	4.921	588.57	2.59	1.78	0.5	1.40	434.76	5	0.00	434.76	0.009	-0.600
763.9	5.085	471.49	2.92	1.86	0.5	1.39	350.92	12	0.00	350.92	0.009	-0.600
763.8	5.249	331.35	3.59	2.01	0.5	1.39	249.95	24	0.00	249.95	0.009	-0.600
763.6	5.413	214.91	3.99	2.15	0.5	1.53	181.23	35	0.00	181.23	0.009	-0.600
763.4	5.577	249.40	2.91	2.00	0.5	1.46	203.68	23	0.00	203.68	0.008	-0.600
763.3	5.741	413.87	2.07	1.76	0.5	1.35	316.58	4	0.00	316.58	0.008	-0.600
763.1	5.905	408.41	2.32	1.80	0.5	1.34	314.39	7	0.00	314.39	0.008	-0.600
762.9	6.069	512.94	1.73	1.64	0.5	1.33	397.20	0	0.00	397.20	0.008	-0.600
762.8	6.234	511.79	1.46	1.58	0.5	1.32	398.70	0	0.00	398.70	0.008	-0.600
762.6	6.398	503.30	1.19	1.50	0.5	1.31	394.40	0	0.00	394.40	0.007	-0.600
762.4	6.562	470.84	1.00	1.46	0.5	1.30	371.12	0	0.00	371.12	0.007	-0.600
762.3	6.726	464.21	1.01	1.47	0.5	1.30	367.95	0	0.00	367.95	0.007	-0.600
762.1	6.890	460.53	1.18	1.52	0.5	1.29	367.04	0	0.00	367.04	0.007	-0.600
761.9	7.054	449.48	1.12	1.51	0.5	1.28	360.17	0	0.00	360.17	0.007	-0.600
761.8	7.218	401.21	1.16	1.55	0.5	1.27	323.23	0	0.00	323.23	0.006	-0.600
761.6	7.382	377.75	0.89	1.47	0.5	1.27	305.92	0	0.00	305.92	0.006	-0.600
761.5	7.546	365.91	0.77	1.43	0.5	1.26	297.84	0	0.00	297.84	0.006	-0.600
761.3	7.710	337.89	0.81	1.47	0.5	1.25	276.43	0	0.00	276.43	0.006	-0.600
761.1	7.874	329.25	0.87	1.50	0.5	1.25	270.66	0	0.00	270.66	0.005	-0.600
761.0	8.038	312.79	0.86	1.51	0.5	1.24	258.38	0	0.00	258.38	0.005	-0.600
760.8	8.202	291.52	0.84	1.52	0.5	1.24	244.16	0	0.00	244.16	0.005	-0.600
760.6	8.366	229.25	1.08	1.67	0.5	1.29	201.09	0	0.00	201.09	0.004	-0.600
760.5	8.530	160.70	1.69	1.92	0.5	1.36	149.92	17	0.00	149.92	0.004	-0.582
760.3	8.694	147.74	1.81	1.97	0.5	1.36	139.88	20	0.00	139.88	0.004	-0.549
760.1	8.858	139.43	1.36	1.90	0.5	1.37	133.35	15	0.00	133.35	0.003	-0.527
760.0	9.022	109.87	1.05	1.89	0.5	1.40	108.91	15	0.00	108.91	0.003	-0.436
759.8	9.186	102.77	0.63	1.78	0.5	1.40	102.87	5	0.00	102.87	0.003	-0.412
759.6	9.350	103.21	0.48	1.71	0.5	1.39	103.26	0	0.00	103.26	0.002	-0.413
759.5	9.514	105.66	0.50	1.71	0.5	1.37	105.41	0	0.00	105.41	0.002	-0.422
759.3	9.678	111.59	0.18	1.50	0.5	1.35	110.55	0	0.00	110.55	0.001	-0.442
759.2	9.842	112.70	0.45	1.66	0.5	1.34	111.55	0	0.00	111.55	0.001	-0.446

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
759.0	10.006	55.23	1.30	2.18	0.5	1.44	59.63	38	0.00	59.63	0.001	-0.193
758.8	10.170	130.57	0.53	1.65	0.5	1.30	126.93	0	0.00	126.93	0.001	-0.503
758.7	10.335	119.81	0.62	1.72	0.5	1.31	117.79	1	0.00	117.79	0.001	-0.469
758.5	10.499	116.18	0.57	1.71	0.5	1.31	114.69	0	0.00	114.69	0.001	-0.457
758.3	10.663	113.31	0.65	1.75	0.5	1.31	112.24	3	0.00	112.24	0.002	-0.448
758.2	10.827	110.29	0.60	1.74	0.5	1.31	109.63	2	0.00	109.63	0.002	-0.437
758.0	10.991	113.43	0.54	1.71	0.5	1.30	112.40	0	0.00	112.40	0.002	-0.448
757.8	11.155	132.84	0.47	1.62	0.5	1.28	129.18	0	0.00	129.18	0.002	-0.510
757.7	11.319	143.81	0.46	1.58	0.5	1.26	138.56	0	0.00	138.56	0.003	-0.542
757.5	11.483	139.19	0.63	1.67	0.5	1.26	134.71	0	0.00	134.71	0.003	-0.529
757.4	11.647	120.02	0.93	1.83	0.5	1.28	118.26	9	0.00	118.26	0.003	-0.470
757.2	11.811	101.08	1.26	1.97	0.5	1.30	101.60	21	0.00	101.60	0.003	-0.403
757.0	11.975	89.10	1.27	2.02	0.5	1.31	90.83	24	0.00	90.83	0.004	-0.356
756.9	12.139	80.07	1.19	2.03	0.5	1.32	82.57	26	0.00	82.57	0.004	-0.316
756.7	12.303	73.72	0.99	2.01	0.5	1.33	76.69	24	0.00	76.69	0.004	-0.287
756.5	12.467	67.19	0.72	1.96	0.5	1.33	70.56	20	0.00	70.56	0.004	-0.254
756.4	12.631	57.73	0.51	1.94	0.5	1.35	61.56	18	0.00	61.56	0.005	-0.202
756.2	12.795	50.72	0.34	1.92	0.5	1.36	54.77	16	0.00	54.77	0.005	-0.158
756.0	12.959	42.92	0.28	1.95	0.5	1.37	47.11	19	0.00	47.11	0.005	-0.104
755.9	13.123	38.62	0.18	1.94	0.5	1.38	42.80	19	0.00	42.80	0.005	-0.071
755.7	13.287	64.81	0.18	1.73	0.5	1.31	68.20	1	0.00	68.20	0.005	-0.240
755.5	13.451	142.79	0.16	1.38	0.5	1.22	138.58	0	0.00	138.58	0.006	-0.540
755.4	13.615	117.91	0.71	1.76	0.5	1.24	116.81	4	0.00	116.81	0.006	-0.462
755.2	13.779	91.00	1.31	2.02	0.5	1.26	92.55	24	0.00	92.55	0.006	-0.362
755.1	13.943	73.22	1.95	2.20	0.5	1.28	76.05	39	0.00	76.05	0.006	-0.282
754.9	14.107	77.09	1.77	2.16	0.5	1.27	79.66	36	0.00	79.66	0.006	-0.300
754.7	14.271	115.98	1.34	1.95	0.5	1.23	115.20	19	0.00	115.20	0.006	-0.455
754.6	14.436	179.61	1.39	1.83	0.5	1.17	170.77	9	0.00	170.77	0.006	-0.600
754.4	14.600	273.13	1.24	1.67	0.5	1.12	248.55	0	0.00	248.55	0.006	-0.600
754.2	14.764	221.29	1.90	1.87	0.5	1.14	206.21	13	0.00	206.21	0.006	-0.600
754.1	14.928	179.43	2.28	1.99	0.5	1.16	170.99	22	0.00	170.99	0.007	-0.600
753.9	15.092	129.33	2.63	2.13	0.5	1.20	127.30	33	0.00	127.30	0.007	-0.499
753.7	15.256	105.01	2.19	2.13	0.5	1.22	105.42	33	0.00	105.42	0.007	-0.415
753.6	15.420	96.77	1.71	2.08	0.5	1.22	97.88	29	0.00	97.88	0.007	-0.383
753.4	15.584	89.47	1.54	2.07	0.5	1.22	91.13	29	0.00	91.13	0.007	-0.353
753.3	15.748	80.07	1.46	2.09	0.5	1.23	82.35	30	0.00	82.35	0.007	-0.312
753.1	15.912	68.38	1.63	2.17	0.5	1.24	71.27	37	0.00	71.27	0.007	-0.254
752.9	16.076	61.26	1.83	2.24	0.5	1.25	64.43	42	0.00	64.43	0.007	-0.215
752.8	16.240	53.39	2.04	2.32	0.5	1.25	56.77	48	0.00	56.77	0.006	-0.168
752.6	16.404	44.06	2.05	2.38	0.5	1.26	47.59	54	0.00	47.59	0.006	-0.104
752.4	16.568	41.61	1.95	2.39	0.5	1.26	45.13	54	0.00	45.13	0.006	-0.086
752.3	16.732	41.66	1.82	2.37	0.5	1.26	45.16	53	0.00	45.16	0.006	-0.086
752.1	16.896	38.83	1.77	2.39	0.5	1.26	42.30	54	0.00	42.30	0.006	-0.063
751.9	17.060	38.80	1.61	2.36	0.5	1.26	42.24	52	0.00	42.24	0.006	-0.063
751.8	17.224	47.01	1.34	2.25	0.5	1.24	50.36	43	0.00	50.36	0.006	-0.124
751.6	17.388	60.48	1.71	2.23	0.5	1.22	63.49	41	0.00	63.49	0.006	-0.208
751.4	17.552	108.92	1.50	2.00	0.5	1.17	109.25	23	0.00	109.25	0.006	-0.428
751.3	17.716	135.71	1.68	1.97	0.5	1.15	133.84	21	0.00	133.84	0.005	-0.519
751.1	17.880	135.58	1.66	1.97	0.5	1.14	133.77	20	0.00	133.77	0.005	-0.519
751.0	18.044	94.21	2.36	2.18	0.5	1.17	95.57	38	0.00	95.57	0.005	-0.371
750.8	18.208	72.02	2.51	2.29	0.5	1.18	74.51	46	0.00	74.51	0.005	-0.269
750.6	18.372	71.53	2.36	2.27	0.5	1.18	74.03	45	0.00	74.03	0.005	-0.266
750.5	18.537	78.27	2.17	2.22	0.5	1.17	80.47	40	0.00	80.47	0.005	-0.300
750.3	18.701	75.41	2.21	2.23	0.5	1.17	77.72	42	0.00	77.72	0.004	-0.285
750.1	18.865	70.93	2.29	2.26	0.5	1.17	73.40	44	0.00	73.40	0.004	-0.263
750.0	19.029	70.10	2.41	2.28	0.5	1.17	72.58	46	0.00	72.58	0.004	-0.258
749.8	19.193	88.38	2.50	2.22	0.5	1.15	90.07	41	0.00	90.07	0.004	-0.345
749.6	19.357	118.07	2.12	2.09	0.5	1.13	118.00	30	0.00	118.00	0.004	-0.461
749.5	19.521	106.98	2.72	2.19	0.5	1.10	104.58	38	65.86	170.44	0.004	-0.600
749.3	19.685	89.94	1.75	2.11	0.5	1.11	89.11	32	55.30	144.41	0.003	-0.553
749.2	19.849	66.64	2.54	2.31	0.5	1.12	66.81	48	62.76	129.58	0.003	-0.502
749.0	20.013	46.05	2.88	2.47	0.5	1.12	47.01	60	62.00	109.01	0.003	-0.425
748.8	20.177	125.54	1.14	1.87	0.5	1.10	124.24	13	17.79	142.04	0.003	-0.544
748.7	20.341	186.60	0.92	1.69	0.5	1.09	181.56	0	0.00	181.56	0.003	-0.600
748.5	20.505	262.60	1.09	1.64	0.5	1.06	250.22	0	0.00	250.22	0.003	-0.600
748.3	20.669	242.51	1.41	1.75	0.5	1.07	232.53	3	0.00	232.53	0.002	-0.600

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748.2	20.833	214.05	1.73	1.85	0.5	1.07	206.23	11	15.07	221.30	0.002	-0.600
748.0	20.997	199.02	1.56	1.83	0.5	1.07	193.02	10	9.46	202.49	0.002	-0.600
747.8	21.161	169.71	1.47	1.86	0.5	1.08	165.88	12	16.59	182.47	0.002	-0.600
747.7	21.325	156.30	1.16	1.81	0.5	1.08	154.16	8	3.52	157.67	0.001	-0.593
747.5	21.489	153.88	0.93	1.75	0.5	1.08	152.16	3	0.00	152.16	0.001	-0.575
747.3	21.653	154.63	0.65	1.65	0.5	1.08	152.95	0	0.00	152.95	0.001	-0.578
747.2	21.817	153.98	0.41	1.53	0.5	1.08	152.44	0	0.00	152.44	0.000	-0.576
747.0	21.981	130.03	0.42	1.60	0.5	1.08	129.89	0	0.00	129.89	0.000	-0.501
746.9	22.145	103.36	0.48	1.71	0.5	1.09	104.45	0	0.00	104.45	0.001	-0.404
746.7	22.309	88.51	0.44	1.75	0.5	1.09	90.13	3	0.00	90.13	0.001	-0.342
746.5	22.473	91.14	0.29	1.66	0.5	1.08	92.68	0	0.00	92.68	0.002	-0.353
746.4	22.638	97.96	0.17	1.55	0.5	1.08	99.28	0	0.00	99.28	0.002	-0.382
746.2	22.802	107.77	0.28	1.59	0.5	1.07	108.77	0	0.00	108.77	0.002	-0.421
746.0	22.966	93.91	0.71	1.84	0.5	1.07	95.13	10	8.05	103.18	0.003	-0.398
745.9	23.130	79.97	1.04	2.00	0.5	1.06	80.82	23	39.98	120.81	0.003	-0.467
745.7	23.294	104.87	1.13	1.93	0.5	1.06	105.22	17	30.75	135.96	0.004	-0.521
745.5	23.458	108.60	1.15	1.92	0.5	1.05	108.91	17	29.50	138.41	0.004	-0.529
745.4	23.622	115.91	0.91	1.84	0.5	1.05	116.55	10	7.83	124.38	0.005	-0.480
745.2	23.786	123.15	0.62	1.71	0.5	1.05	123.80	0	0.00	123.80	0.005	-0.477
745.1	23.950	105.41	0.38	1.65	0.5	1.05	106.60	0	0.00	106.60	0.006	-0.411
744.9	24.114	94.55	0.30	1.65	0.5	1.05	96.01	0	0.00	96.01	0.006	-0.366
744.7	24.278	79.16	0.25	1.69	0.5	1.05	80.90	0	0.00	80.90	0.006	-0.296
744.6	24.442	66.50	0.25	1.76	0.5	1.05	68.39	4	0.01	68.40	0.007	-0.229
744.4	24.606	60.53	0.23	1.78	0.5	1.05	62.44	6	0.39	62.83	0.007	-0.197
744.2	24.770	62.31	0.32	1.83	0.5	1.05	64.12	9	4.64	68.77	0.008	-0.231
744.1	24.934	58.56	0.56	1.96	0.5	1.04	60.06	20	31.23	91.29	0.008	-0.344
743.9	25.098	55.27	0.98	2.11	0.5	1.03	56.64	32	48.73	105.37	0.009	-0.405
743.7	25.262	53.39	1.33	2.20	0.5	1.03	54.75	39	54.47	109.22	0.009	-0.420
743.6	25.426	52.33	1.57	2.25	0.5	1.03	53.69	43	56.81	110.50	0.010	-0.425
743.4	25.590	56.04	1.81	2.27	0.5	1.03	57.37	44	58.51	115.88	0.010	-0.446
743.2	25.754	62.79	1.99	2.26	0.5	1.02	64.08	44	59.75	123.83	0.011	-0.476
743.1	25.918	63.37	2.32	2.30	0.5	1.02	64.66	47	61.77	126.44	0.011	-0.485
742.9	26.082	62.50	2.02	2.26	0.5	1.02	63.84	44	59.94	123.78	0.012	-0.475
742.8	26.246	71.46	1.99	2.22	0.5	1.01	72.76	40	59.80	132.56	0.012	-0.506
742.6	26.410	77.62	2.06	2.20	0.5	1.01	78.92	39	60.31	139.23	0.013	-0.529
742.4	26.574	80.32	2.27	2.22	0.5	1.01	81.63	41	62.16	143.79	0.013	-0.543
742.3	26.739	88.56	2.12	2.17	0.5	1.01	89.88	37	60.82	150.70	0.014	-0.565
742.1	26.903	110.41	1.80	2.05	0.5	1.01	111.72	27	53.58	165.31	0.014	-0.600
741.9	27.067	98.75	2.11	2.14	0.5	1.00	100.16	34	60.38	160.54	0.015	-0.595
741.8	27.231	92.14	2.17	2.17	0.5	1.00	93.61	36	61.24	154.85	0.015	-0.578
741.6	27.395	84.14	2.40	2.22	0.5	1.00	85.67	41	63.32	148.99	0.016	-0.559
741.4	27.559	81.79	2.42	2.24	0.5	1.00	83.36	42	63.34	146.70	0.017	-0.552
741.3	27.723	76.82	2.57	2.27	0.5	1.00	78.42	45	64.04	142.46	0.017	-0.538
741.1	27.887	69.90	2.63	2.31	0.5	0.99	71.51	48	63.84	135.36	0.018	-0.514
740.9	28.051	66.98	2.59	2.32	0.5	0.99	68.61	48	63.42	132.03	0.018	-0.502
740.8	28.215	61.74	2.52	2.33	0.5	0.99	63.37	50	62.70	126.07	0.019	-0.481
740.6	28.379	57.64	2.50	2.35	0.5	0.99	59.28	51	62.25	121.53	0.019	-0.465
740.5	28.543	57.35	2.33	2.33	0.5	0.98	59.00	50	61.51	120.50	0.020	-0.461
740.3	28.707	51.47	2.41	2.38	0.5	0.98	53.10	53	61.40	114.51	0.020	-0.438
740.1	28.871	47.46	2.39	2.40	0.5	0.98	49.08	55	60.98	110.05	0.021	-0.420
740.0	29.035	47.92	2.13	2.37	0.5	0.98	49.55	52	60.06	109.61	0.021	-0.418
739.8	29.199	49.52	2.01	2.34	0.5	0.97	51.17	50	59.63	110.79	0.022	-0.423
739.6	29.363	54.87	1.53	2.23	0.5	0.97	56.56	41	56.41	112.97	0.022	-0.431
739.5	29.527	60.74	1.72	2.23	0.5	0.97	62.51	41	57.83	120.34	0.023	-0.459
739.3	29.691	55.49	2.17	2.32	0.5	0.97	57.25	49	60.68	117.93	0.023	-0.450
739.1	29.855	50.49	2.53	2.40	0.5	0.97	52.22	55	61.73	113.95	0.024	-0.435
739.0	30.019	53.28	2.46	2.37	0.5	0.96	55.06	53	61.77	116.83	0.024	-0.445
738.8	30.183	54.42	2.54	2.38	0.5	0.96	56.23	53	62.16	118.39	0.025	-0.451
738.7	30.347	55.20	2.65	2.38	0.5	0.96	57.05	54	62.64	119.69	0.025	-0.456
738.5	30.511	56.12	2.66	2.38	0.5	0.96	58.00	53	62.77	120.77	0.026	-0.460
738.3	30.675	54.98	2.74	2.40	0.5	0.96	56.86	55	62.91	119.77	0.026	-0.456
738.2	30.840	53.13	2.87	2.42	0.5	0.95	55.00	57	63.09	118.09	0.027	-0.449
738.0	31.004	52.64	2.90	2.43	0.5	0.95	54.52	57	63.11	117.63	0.027	-0.447
737.8	31.168	56.53	2.77	2.39	0.5	0.95	58.49	54	63.21	121.70	0.028	-0.463
737.7	31.332	62.16	2.64	2.35	0.5	0.95	64.25	51	63.35	127.61	0.028	-0.484
737.5	31.496	65.16	2.69	2.34	0.5	0.95	67.36	50	63.85	131.22	0.028	-0.496

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
737.3	31.660	59.78	2.94	2.39	0.5	0.94	61.88	54	64.13	126.01	0.029	-0.478
737.2	31.824	55.79	2.95	2.41	0.5	0.94	57.82	56	63.68	121.50	0.029	-0.461
737.0	31.988	51.75	2.93	2.44	0.5	0.94	53.71	58	63.11	116.82	0.030	-0.443
736.8	32.152	50.84	2.87	2.43	0.5	0.94	52.78	58	62.83	115.61	0.030	-0.439
736.7	32.316	52.65	2.73	2.41	0.5	0.93	54.65	56	62.65	117.30	0.030	-0.445
736.5	32.480	55.51	2.69	2.39	0.5	0.93	57.60	54	62.87	120.47	0.031	-0.457
736.4	32.644	58.62	1.89	2.27	0.5	0.93	60.73	44	59.22	119.95	0.031	-0.455
736.2	32.808	59.19	2.12	2.30	0.5	0.93	61.36	47	60.71	122.08	0.032	-0.462
736.0	32.972	65.45	2.34	2.29	0.5	0.93	67.86	46	62.26	130.12	0.032	-0.491
735.9	33.136	63.21	2.55	2.33	0.5	0.93	65.60	49	63.12	128.72	0.032	-0.486
735.7	33.300	60.14	2.43	2.33	0.5	0.93	62.44	49	62.32	124.75	0.033	-0.472
735.5	33.464	53.35	2.24	2.35	0.5	0.92	55.44	51	60.97	116.40	0.033	-0.441
735.4	33.628	37.37	2.64	2.51	0.5	0.91	39.11	64	60.64	99.75	0.033	-0.373
735.2	33.792	23.14	3.17	2.72	1.0	0.91	27.01	81	60.18	87.19	0.033	-0.317
735.0	33.956	12.13	4.86	3.05	1.0	0.90	14.91	100	58.56	73.47	0.034	-0.248
734.9	34.120	8.44	3.73	3.11	1.0	0.89	10.89	100	57.31	68.20	0.034	-0.219
734.7	34.284	7.11	1.96	3.02	1.0	0.89	9.45	100	56.87	66.31	0.034	-0.208
734.6	34.448	5.76	0.94	2.96	1.0	0.89	7.99	100	56.40	64.39	0.035	-0.197
734.4	34.612	5.24	0.87	2.98	1.0	0.88	7.43	100	56.24	63.67	0.035	-0.192
734.2	34.776	5.39	0.87	2.97	1.0	0.88	7.61	100	56.29	63.90	0.035	-0.194
734.1	34.941	5.55	0.85	2.96	1.0	0.88	7.81	100	56.33	64.13	0.035	-0.195
733.9	35.105	4.84	0.92	3.03	1.0	0.88	7.04	100	56.12	63.16	0.036	-0.189
733.7	35.269	4.17	0.83	3.07	1.0	0.88	6.31	100	55.89	62.20	0.036	-0.183
733.6	35.433	3.83	0.67	3.07	1.0	0.87	5.95	100	55.78	61.73	0.036	-0.180
733.4	35.597	3.62	0.54	3.06	1.0	0.87	5.72	100	55.71	61.43	0.036	-0.178
733.2	35.761	3.18	0.42	3.09	1.0	0.87	5.25	100	55.56	60.82	0.037	-0.174
733.1	35.925	2.95	0.45	3.13	1.0	0.87	5.00	100	55.49	60.49	0.037	-0.172
732.9	36.089	2.76	0.40	3.14	1.0	0.86	4.80	100	55.42	60.23	0.037	-0.170
732.7	36.253	2.41	0.52	3.23	1.0	0.86	4.43	100	55.31	59.74	0.037	-0.167
732.6	36.417	2.49	0.47	3.20	1.0	0.86	4.53	100	55.34	59.86	0.037	-0.168
732.4	36.581	2.48	0.59	3.23	1.0	0.86	4.52	100	55.34	59.85	0.038	-0.168
732.3	36.745	3.22	0.70	3.15	1.0	0.86	5.35	100	55.59	60.95	0.038	-0.174
732.1	36.909	4.05	0.86	3.09	1.0	0.86	6.29	100	55.89	62.18	0.038	-0.182
731.9	37.073	4.32	1.27	3.13	1.0	0.85	6.61	100	55.98	62.59	0.038	-0.184
731.8	37.237	4.53	1.32	3.12	1.0	0.85	6.85	100	56.06	62.91	0.038	-0.186
731.6	37.401	4.10	1.62	3.19	1.0	0.85	6.38	100	55.91	62.29	0.038	-0.182
731.4	37.565	3.92	2.36	3.29	1.0	0.85	6.19	100	55.85	62.04	0.038	-0.180
731.3	37.729	3.07	2.88	3.42	1.0	0.84	5.24	100	55.56	60.80	0.039	-0.173
731.1	37.893	2.77	2.95	3.47	1.0	0.84	4.92	100	55.46	60.38	0.039	-0.170
730.9	38.057	3.11	2.17	3.36	1.0	0.84	5.30	100	55.58	60.88	0.039	-0.173
730.8	38.221	3.35	2.02	3.32	1.0	0.84	5.59	100	55.67	61.26	0.039	-0.175
730.6	38.385	3.51	1.84	3.28	1.0	0.84	5.78	100	55.73	61.50	0.039	-0.176
730.5	38.549	3.73	1.62	3.23	1.0	0.84	6.03	100	55.81	61.84	0.039	-0.178
730.3	38.713	3.53	1.36	3.22	1.0	0.83	5.82	100	55.74	61.56	0.039	-0.176
730.1	38.877	3.26	1.60	3.28	1.0	0.83	5.53	100	55.65	61.17	0.039	-0.174
730.0	39.042	3.25	1.82	3.31	1.0	0.83	5.52	100	55.65	61.16	0.039	-0.174
729.8	39.206	4.18	1.63	3.19	1.0	0.83	6.60	100	55.98	62.58	0.039	-0.182
729.6	39.370	4.98	1.66	3.12	1.0	0.83	7.53	100	56.27	63.80	0.039	-0.189
729.5	39.534	6.94	1.32	2.95	1.0	0.83	9.80	99	56.90	66.71	0.039	-0.206
729.3	39.698	9.57	1.60	2.87	1.0	0.83	12.87	92	57.26	70.13	0.039	-0.225
729.1	39.862	10.65	1.72	2.84	1.0	0.83	14.15	90	57.46	71.61	0.039	-0.233
729.0	40.026	11.33	1.87	2.84	1.0	0.83	14.97	90	57.68	72.65	0.039	-0.239
728.8	40.190	12.16	1.88	2.81	1.0	0.83	15.98	88	57.78	73.76	0.039	-0.245
728.6	40.354	13.76	1.75	2.75	1.0	0.83	17.88	83	57.79	75.67	0.039	-0.255
728.5	40.518	13.85	1.71	2.74	1.0	0.83	18.02	83	57.74	75.77	0.039	-0.255
728.3	40.682	13.63	1.74	2.75	1.0	0.82	17.80	83	57.77	75.57	0.039	-0.254
728.2	40.846	13.30	1.72	2.76	1.0	0.82	17.42	84	57.73	75.15	0.039	-0.252
728.0	41.010	12.61	1.71	2.78	1.0	0.82	16.64	85	57.67	74.31	0.039	-0.247
727.8	41.174	12.52	1.66	2.78	1.0	0.82	16.56	85	57.60	74.16	0.039	-0.246
727.7	41.338	11.81	1.73	2.81	1.0	0.82	15.74	88	57.64	73.37	0.039	-0.242
727.5	41.502	11.09	1.73	2.83	1.0	0.81	14.91	89	57.57	72.49	0.039	-0.237
727.3	41.666	9.45	1.76	2.89	1.0	0.81	12.98	94	57.49	70.47	0.039	-0.226
727.2	41.830	8.31	1.67	2.93	1.0	0.81	11.64	97	57.34	68.98	0.039	-0.217
727.0	41.994	6.77	1.68	3.01	1.0	0.80	9.84	100	56.99	66.83	0.039	-0.205
726.8	42.158	4.60	1.90	3.18	1.0	0.80	7.29	100	56.20	63.49	0.039	-0.185
726.7	42.322	3.90	1.62	3.21	1.0	0.80	6.47	100	55.94	62.41	0.039	-0.179

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726.5	42.486	2.63	1.10	3.30	1.0	0.79	4.99	100	55.48	60.47	0.039	-0.167
726.3	42.650	2.34	0.80	3.30	1.0	0.79	4.65	100	55.38	60.03	0.039	-0.164
726.2	42.814	2.20	0.29	3.20	1.0	0.79	4.50	100	55.33	59.83	0.039	-0.163
726.0	42.978	1.93	0.33	3.27	1.0	0.79	4.18	100	55.23	59.42	0.039	-0.160
725.9	43.143	1.80	0.35	3.30	1.0	0.79	4.05	100	55.19	59.24	0.039	-0.159
725.7	43.307	1.76	0.36	3.32	1.0	0.78	4.01	100	55.18	59.18	0.039	-0.158
725.5	43.471	1.91	0.33	3.27	1.0	0.78	4.19	100	55.23	59.42	0.039	-0.160
725.4	43.635	2.14	0.47	3.26	1.0	0.78	4.47	100	55.32	59.79	0.038	-0.162
725.2	43.799	2.45	2.77	3.50	1.0	0.78	4.83	100	55.43	60.27	0.038	-0.165
725.0	43.963	12.68	0.80	2.62	1.0	0.79	17.17	73	56.07	73.24	0.038	-0.239
724.9	44.127	85.36	0.33	1.71	0.5	0.80	86.34	0	0.00	86.34	0.038	-0.305
724.7	44.291	118.02	0.41	1.63	0.5	0.83	122.55	0	0.00	122.55	0.038	-0.455
724.5	44.455	112.04	0.56	1.72	0.5	0.82	115.83	1	0.00	115.83	0.038	-0.430
724.4	44.619	78.66	0.85	1.95	0.5	0.82	81.81	19	31.96	113.77	0.038	-0.422
724.2	44.783	44.04	1.46	2.29	0.5	0.81	46.28	46	56.64	102.91	0.038	-0.378
724.1	44.947	30.99	1.35	2.40	0.5	0.80	32.73	55	56.31	89.04	0.038	-0.317
723.9	45.111	22.45	1.21	2.49	0.5	0.79	24.05	62	55.94	79.98	0.038	-0.273
723.7	45.275	17.66	0.76	2.48	0.5	0.78	19.21	61	54.43	73.64	0.037	-0.240
723.6	45.439	10.62	0.85	2.70	1.0	0.78	14.87	79	56.35	71.22	0.037	-0.227
723.4	45.603	8.66	1.02	2.81	1.0	0.77	12.48	88	56.72	69.20	0.037	-0.216
723.2	45.767	6.76	0.96	2.90	1.0	0.77	10.17	95	56.68	66.85	0.037	-0.203
723.1	45.931	5.78	0.76	2.92	1.0	0.77	8.98	97	56.47	65.45	0.037	-0.194
722.9	46.095	6.33	1.02	2.94	1.0	0.77	9.68	98	56.78	66.46	0.037	-0.200
722.7	46.259	5.82	1.87	3.09	1.0	0.76	9.06	100	56.75	65.80	0.037	-0.196
722.6	46.423	8.76	1.72	2.92	1.0	0.77	12.71	96	57.57	70.28	0.037	-0.221
722.4	46.587	7.45	1.45	2.94	1.0	0.76	11.11	98	57.25	68.36	0.037	-0.210
722.2	46.751	9.24	1.92	2.92	1.0	0.77	13.35	97	57.79	71.14	0.036	-0.226
722.1	46.915	9.05	1.60	2.89	1.0	0.76	13.12	94	57.50	70.62	0.036	-0.223
721.9	47.079	13.60	1.41	2.71	1.0	0.77	18.86	80	57.62	76.48	0.036	-0.254
721.8	47.244	13.60	2.14	2.80	1.0	0.77	18.91	87	58.58	77.48	0.036	-0.259
721.6	47.408	24.01	1.45	2.50	0.5	0.77	25.66	63	56.73	82.39	0.036	-0.284
721.4	47.572	41.13	0.45	2.05	0.5	0.77	42.50	27	40.66	83.16	0.036	-0.287
721.3	47.736	39.47	0.27	1.98	0.5	0.76	40.28	22	31.79	72.08	0.036	-0.230
721.1	47.900	27.75	0.31	2.15	0.5	0.76	29.03	35	45.41	74.44	0.035	-0.243
720.9	48.064	18.07	0.46	2.38	0.5	0.76	19.57	54	52.43	72.00	0.035	-0.230
720.8	48.228	9.76	0.92	2.75	1.0	0.75	14.16	83	56.61	70.77	0.035	-0.223
720.6	48.392	10.08	0.82	2.71	1.0	0.75	14.57	80	56.39	70.96	0.035	-0.224
720.4	48.556	13.09	1.03	2.66	1.0	0.76	18.44	76	56.90	75.35	0.035	-0.247
720.3	48.720	14.14	1.40	2.69	1.0	0.76	19.83	78	57.72	77.56	0.035	-0.258
720.1	48.884	23.96	1.41	2.50	0.5	0.76	25.62	63	56.59	82.21	0.035	-0.282
720.0	49.048	44.98	0.86	2.15	0.5	0.77	47.04	35	49.69	96.74	0.034	-0.349
719.8	49.212	67.47	0.50	1.88	0.5	0.76	68.49	14	16.40	84.88	0.034	-0.294
719.6	49.376	81.51	0.57	1.84	0.5	0.76	82.81	10	7.17	89.98	0.034	-0.318
719.5	49.540	99.74	0.66	1.80	0.5	0.78	102.54	7	1.64	104.18	0.034	-0.380
719.3	49.704	105.79	0.91	1.86	0.5	0.79	111.11	12	14.55	125.66	0.034	-0.463
719.1	49.868	121.32	0.90	1.82	0.5	0.80	127.87	8	4.05	131.93	0.034	-0.485
719.0	50.032	147.49	0.91	1.76	0.5	0.81	158.75	3	0.01	158.75	0.034	-0.571
718.8	50.196	166.51	0.91	1.72	0.5	0.83	182.36	0	0.00	182.36	0.033	-0.600
718.6	50.360	196.76	0.96	1.68	0.5	0.85	221.13	0	0.00	221.13	0.033	-0.600
718.5	50.524	208.03	1.09	1.70	0.5	0.86	236.07	0	0.00	236.07	0.033	-0.600
718.3	50.688	199.13	1.23	1.76	0.5	0.85	224.54	3	0.01	224.54	0.033	-0.600
718.1	50.852	191.12	1.33	1.79	0.5	0.85	214.51	7	1.52	216.03	0.033	-0.600
718.0	51.016	175.28	1.43	1.84	0.5	0.84	195.97	10	12.19	208.16	0.033	-0.600
717.8	51.180	155.89	1.51	1.89	0.5	0.84	173.76	14	27.15	200.90	0.033	-0.600
717.7	51.345	140.95	1.45	1.91	0.5	0.83	155.78	16	31.17	186.95	0.032	-0.600
717.5	51.509	134.71	1.30	1.89	0.5	0.82	147.25	14	24.36	171.61	0.032	-0.600
717.3	51.673	131.69	1.13	1.85	0.5	0.80	142.09	11	13.52	155.62	0.032	-0.561
717.2	51.837	127.60	1.05	1.84	0.5	0.80	136.76	11	10.54	147.30	0.032	-0.535
717.0	52.001	119.57	1.06	1.87	0.5	0.79	128.03	12	16.70	144.73	0.032	-0.526
716.8	52.165	105.84	1.12	1.92	0.5	0.79	113.48	17	29.81	143.29	0.032	-0.521
716.7	52.329	96.76	1.11	1.95	0.5	0.79	103.49	19	34.94	138.43	0.032	-0.505
716.5	52.493	95.14	0.85	1.88	0.5	0.77	99.67	14	18.53	118.20	0.031	-0.433
716.3	52.657	93.90	0.80	1.87	0.5	0.76	97.96	13	16.10	114.06	0.031	-0.418
716.2	52.821	94.02	0.81	1.87	0.5	0.76	98.18	13	16.64	114.81	0.031	-0.420
716.0	52.985	96.80	0.89	1.89	0.5	0.77	101.94	14	20.85	122.79	0.031	-0.450
715.9	53.149	101.94	0.87	1.86	0.5	0.77	107.11	12	14.55	121.65	0.031	-0.446

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
715.7	53.313	111.21	0.76	1.80	0.5	0.76	116.15	7	1.69	117.84	0.031	-0.432
715.5	53.477	114.91	0.68	1.76	0.5	0.77	120.29	4	0.01	120.30	0.031	-0.441
715.4	53.641	97.41	0.75	1.84	0.5	0.76	101.13	10	8.97	110.10	0.030	-0.401
715.2	53.805	67.37	1.09	2.07	0.5	0.76	71.43	28	47.73	119.17	0.030	-0.436
715.0	53.969	43.33	1.86	2.36	0.5	0.75	46.00	52	58.96	104.96	0.030	-0.380
714.9	54.133	23.92	3.20	2.71	1.0	0.74	34.45	80	62.31	96.76	0.030	-0.346
714.7	54.297	20.03	3.87	2.82	1.0	0.73	29.03	89	61.83	90.86	0.030	-0.319
714.5	54.461	58.18	1.63	2.23	0.5	0.76	62.10	41	57.64	119.73	0.030	-0.438
714.4	54.625	128.31	0.99	1.82	0.5	0.78	137.63	9	5.73	143.36	0.030	-0.520
714.2	54.789	143.96	1.26	1.86	0.5	0.80	158.97	12	16.48	175.45	0.029	-0.600
714.0	54.953	167.56	1.39	1.85	0.5	0.82	188.92	11	13.18	202.11	0.029	-0.600
713.9	55.117	262.36	1.05	1.62	0.5	0.85	306.11	0	0.00	306.11	0.029	-0.600
713.7	55.281	294.04	0.96	1.56	0.5	0.85	342.97	0	0.00	342.97	0.029	-0.600
713.6	55.446	250.28	1.27	1.70	0.5	0.85	292.52	0	0.00	292.52	0.029	-0.600
713.4	55.610	177.59	1.60	1.88	0.5	0.83	204.63	13	23.65	228.27	0.029	-0.600
713.2	55.774	105.71	2.93	2.22	0.5	0.81	119.28	41	71.35	190.64	0.029	-0.600
713.1	55.938	94.60	3.23	2.28	0.5	0.80	105.83	46	71.62	177.45	0.028	-0.600
712.9	56.102	94.94	3.53	2.31	0.5	0.80	106.45	48	73.15	179.60	0.028	-0.600
712.7	56.266	101.20	3.74	2.31	0.5	0.81	114.36	48	75.28	189.64	0.028	-0.600
712.6	56.430	111.25	3.72	2.29	0.5	0.81	127.10	46	77.21	204.31	0.028	-0.600
712.4	56.594	109.17	3.67	2.29	0.5	0.81	124.51	46	76.59	201.10	0.028	-0.600
712.2	56.758	125.07	3.17	2.20	0.5	0.82	144.62	39	75.98	220.60	0.028	-0.600
712.1	56.922	124.64	3.50	2.24	0.5	0.82	144.48	42	78.46	222.94	0.028	-0.600
711.9	57.086	128.71	3.77	2.25	0.5	0.83	150.15	43	81.06	231.21	0.028	-0.600
711.8	57.250	123.55	4.36	2.31	0.5	0.83	143.82	48	82.94	226.76	0.028	-0.600
711.6	57.414	132.58	4.44	2.30	0.5	0.83	155.98	47	85.49	241.46	0.028	-0.600
711.4	57.578	161.32	4.01	2.22	0.5	0.84	191.10	40	88.47	279.57	0.027	-0.600
711.3	57.742	153.07	4.07	2.24	0.5	0.84	181.59	42	87.62	269.22	0.027	-0.600
711.1	57.906	137.01	4.17	2.27	0.5	0.84	162.10	45	85.24	247.35	0.027	-0.600
710.9	58.070	143.13	3.81	2.23	0.5	0.84	170.19	41	84.33	254.52	0.027	-0.600
710.8	58.234	148.39	3.62	2.20	0.5	0.84	176.46	39	83.67	260.13	0.027	-0.600
710.6	58.398	159.05	3.69	2.19	0.5	0.84	189.05	38	85.68	274.73	0.027	-0.600
710.4	58.562	158.60	3.70	2.19	0.5	0.84	188.64	38	85.69	274.33	0.027	-0.600
710.3	58.726	141.83	4.15	2.26	0.5	0.84	169.10	44	86.37	255.47	0.027	-0.600
710.1	58.890	158.16	1.83	1.95	0.5	0.82	184.94	19	45.75	230.69	0.027	-0.600
709.9	59.054	179.47	3.19	2.11	0.5	0.84	213.48	32	81.76	295.24	0.026	-0.600
709.8	59.218	109.05	6.16	2.47	0.5	0.81	126.38	60	84.32	210.71	0.026	-0.600
709.6	59.382	202.44	3.76	2.14	0.5	0.84	240.74	34	91.79	332.52	0.026	-0.600
709.5	59.547	174.12	4.11	2.21	0.5	0.84	207.59	40	91.58	299.16	0.026	-0.600
709.3	59.711	140.96	4.61	2.30	0.5	0.84	168.71	47	88.65	257.36	0.026	-0.600
709.1	59.875	134.87	4.69	2.32	0.5	0.83	160.93	48	87.60	248.53	0.026	-0.600
709.0	60.039	160.12	4.01	2.22	0.5	0.83	191.48	41	88.69	280.17	0.026	-0.600
708.8	60.203	178.24	4.17	2.21	0.5	0.83	212.95	40	92.87	305.82	0.026	-0.600
708.6	60.367	198.46	4.13	2.18	0.5	0.83	236.91	37	95.58	332.49	0.026	-0.600
708.5	60.531	171.62	4.91	2.28	0.5	0.83	205.39	45	96.47	301.87	0.026	-0.600
708.3	60.695	170.58	4.46	2.24	0.5	0.83	204.29	42	93.71	298.00	0.025	-0.600
708.1	60.859	149.21	4.53	2.28	0.5	0.83	179.18	45	90.10	269.27	0.025	-0.600
708.0	61.023	116.86	5.69	2.42	0.5	0.81	137.51	57	85.91	223.41	0.025	-0.600
707.8	61.187	122.96	4.93	2.36	0.5	0.81	145.57	52	85.54	231.11	0.025	-0.600
707.6	61.351	122.93	4.87	2.35	0.5	0.81	145.59	51	85.36	230.95	0.025	-0.600
707.5	61.515	156.73	4.28	2.25	0.5	0.83	188.51	43	90.25	278.77	0.025	-0.600
707.3	61.679	151.63	4.47	2.27	0.5	0.83	182.58	45	90.43	273.01	0.025	-0.600
707.2	61.843	145.24	4.66	2.30	0.5	0.83	175.12	47	90.11	265.22	0.025	-0.600
707.0	62.007	138.17	4.61	2.31	0.5	0.83	166.83	47	88.45	255.29	0.025	-0.600
706.8	62.171	121.76	3.99	2.29	0.5	0.81	143.94	46	81.55	225.49	0.025	-0.600
706.7	62.335	105.37	4.33	2.35	0.5	0.79	122.28	51	79.12	201.40	0.025	-0.600
706.5	62.499	92.49	4.04	2.37	0.5	0.77	105.51	52	75.09	180.61	0.024	-0.600
706.3	62.663	46.49	4.92	2.63	1.0	0.74	74.32	73	72.97	147.29	0.024	-0.528
706.2	62.827	25.90	8.82	2.99	1.0	0.70	40.36	100	66.46	106.82	0.024	-0.383
706.0	62.991	148.50	2.22	2.03	0.5	0.82	177.70	26	62.97	240.67	0.024	-0.600
705.8	63.155	176.40	2.09	1.97	0.5	0.82	213.04	20	53.70	266.74	0.024	-0.600
705.7	63.319	197.62	2.50	2.00	0.5	0.82	238.45	23	65.79	304.24	0.024	-0.600
705.5	63.483	280.42	1.96	1.83	0.5	0.82	337.28	9	9.91	347.19	0.024	-0.600
705.4	63.648	274.17	2.13	1.86	0.5	0.82	330.02	12	24.14	354.16	0.024	-0.600
705.2	63.812	218.39	2.70	2.00	0.5	0.82	263.65	23	70.35	334.00	0.024	-0.600
705.0	63.976	223.76	2.83	2.01	0.5	0.82	270.21	24	74.16	344.37	0.024	-0.600

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
704.9	64.140	272.13	2.50	1.92	0.5	0.82	328.15	17	51.22	379.37	0.024	-0.600
704.7	64.304	316.75	2.26	1.85	0.5	0.82	381.66	11	20.60	402.27	0.023	-0.600
704.5	64.468	356.74	0.15	1.00	0.5	0.82	429.70	0	0.00	429.70	0.023	-0.600
704.4	64.632	338.12	0.15	1.02	0.5	0.82	407.66	0	0.00	407.66	0.023	-0.600

LIQUEFACTION POTENTIAL ASSESSMENT FOR COARSE GRAINED SOILS USING CONE PENETRATION TEST DATA

		Depth to Water during Earthquake:	6.5 ft	Shear Stress Fit Parameters
		Final Grade Elevation during EQ:	769.0 ft	m4: 0
		Height of Final Grade above CPT TOH:	0.0 ft	m3: 0
Project Site:	**KIF TDEC Stability**	Normalize K_σ to:	1.058 tsf	m2: 0
Stantec Project No.:	**175668043**	a_{max} at top of ground surface:	0.10 g	m1: 0
CPT ID:	**KIF-BF-CPT-4AA**	Earthquake Magnitude:	7.60 M_W	
		Earthquake File or Source Zone:	1 Hz	

Elev. (ft)	Depth *z* (ft)	Cyclic Resistance Ratio *CRR 7.5*	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor *MSF*	Cyclic Resistance Ratio *CRR*	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
769.0																	
768.8	0.164	0.093	29	1.100	N/A	1.00	N/A	1.000	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Irrelevant Fill**	**A2**
768.7	0.328	N/A	90	N/A	N/A	N/A	N/A	1.000	0	0	**0.062**	FALSE	TRUE	TRUE	**N/A**	**Irrelevant Fill**	**A1**
768.5	0.492	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.062**	FALSE	TRUE	TRUE	**N/A**	**Irrelevant Fill**	**A1**
768.3	0.656	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.062**	FALSE	TRUE	TRUE	**N/A**	**Irrelevant Fill**	**A1**
768.2	0.820	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.062**	FALSE	TRUE	TRUE	**N/A**	**Irrelevant Fill**	**A1**
768.0	0.984	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.062**	FALSE	TRUE	TRUE	**N/A**	**Irrelevant Fill**	**A1**
767.9	1.148	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.062**	FALSE	TRUE	TRUE	**N/A**	**Irrelevant Fill**	**A1**
767.7	1.312	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.062**	FALSE	TRUE	TRUE	**N/A**	**Irrelevant Fill**	**A1**
767.5	1.476	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.062**	FALSE	TRUE	TRUE	**N/A**	**Irrelevant Fill**	**A1**
767.4	1.640	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.062**	FALSE	TRUE	TRUE	**N/A**	**Irrelevant Fill**	**A1**
767.2	1.804	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.062**	FALSE	TRUE	TRUE	**N/A**	**Irrelevant Fill**	**A1**
767.0	1.968	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.062**	FALSE	TRUE	TRUE	**N/A**	**Irrelevant Fill**	**A1**
766.9	2.133	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.062**	FALSE	TRUE	TRUE	**N/A**	**Irrelevant Fill**	**A1**
766.7	2.297	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.062**	FALSE	TRUE	TRUE	**N/A**	**Irrelevant Fill**	**A1**
766.5	2.461	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.062**	FALSE	TRUE	TRUE	**N/A**	**Irrelevant Fill**	**A1**
766.4	2.625	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.062**	FALSE	TRUE	TRUE	**N/A**	**Irrelevant Fill**	**A1**
766.2	2.789	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.062**	FALSE	TRUE	TRUE	**N/A**	**Irrelevant Fill**	**A1**
766.0	2.953	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.062**	FALSE	TRUE	TRUE	**N/A**	**Irrelevant Fill**	**A1**
765.9	3.117	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.062**	FALSE	TRUE	TRUE	**N/A**	**Irrelevant Fill**	**A1**
765.7	3.281	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.062**	FALSE	TRUE	TRUE	**N/A**	**Irrelevant Fill**	**A1**
765.6	3.445	N/A	100	N/A	N/A	N/A	N/A	0.999	0	0	**0.062**	FALSE	TRUE	TRUE	**N/A**	**Irrelevant Fill**	**A1**
765.4	3.609	N/A	100	N/A	N/A	N/A	N/A	0.999	0	0	**0.062**	FALSE	TRUE	TRUE	**N/A**	**Irrelevant Fill**	**A1**
765.2	3.773	N/A	100	N/A	N/A	N/A	N/A	0.998	0	0	**0.062**	FALSE	TRUE	TRUE	**N/A**	**Irrelevant Fill**	**A1**
765.1	3.937	N/A	100	N/A	N/A	N/A	N/A	0.998	0	0	**0.062**	FALSE	TRUE	TRUE	**N/A**	**Irrelevant Fill**	**A1**
764.9	4.101	N/A	100	N/A	N/A	N/A	N/A	0.998	0	0	**0.062**	FALSE	TRUE	TRUE	**N/A**	**Irrelevant Fill**	**A1**
764.7	4.265	N/A	100	N/A	N/A	N/A	N/A	0.997	0	0	**0.062**	FALSE	TRUE	TRUE	**N/A**	**Irrelevant Fill**	**A1**
764.6	4.429	N/A	100	N/A	N/A	N/A	N/A	0.997	0	0	**0.062**	FALSE	TRUE	TRUE	**N/A**	**Irrelevant Fill**	**A1**
764.4	4.593	N/A	100	N/A	N/A	N/A	N/A	0.997	0	0	**0.062**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
764.2	4.757	N/A	100	N/A	N/A	N/A	N/A	0.996	0	0	**0.062**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
764.1	4.921	N/A	100	N/A	N/A	N/A	N/A	0.996	0	0	**0.062**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
763.9	5.085	N/A	100	N/A	N/A	N/A	N/A	0.995	0	0	**0.062**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
763.8	5.249	N/A	99	N/A	N/A	N/A	N/A	0.995	0	0	**0.062**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
763.6	5.413	N/A	82	N/A	N/A	N/A	N/A	0.995	0	0	**0.062**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
763.4	5.577	N/A	88	N/A	N/A	N/A	N/A	0.994	0	0	**0.062**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
763.3	5.741	N/A	100	N/A	N/A	N/A	N/A	0.994	0	0	**0.062**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
763.1	5.905	N/A	100	N/A	N/A	N/A	N/A	0.994	0	0	**0.062**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
762.9	6.069	N/A	100	N/A	N/A	N/A	N/A	0.993	0	0	**0.062**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
762.8	6.234	N/A	100	N/A	N/A	N/A	N/A	0.993	0	0	**0.062**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
762.6	6.398	N/A	100	N/A	N/A	N/A	N/A	0.992	0	0	**0.062**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
762.4	6.562	N/A	100	N/A	N/A	N/A	N/A	0.992	0	0	**0.062**	FALSE	TRUE	FALSE	**N/A**	**Fly Ash**	**A1**
762.3	6.726	N/A	100	N/A	N/A	N/A	N/A	0.992	0	0	**0.063**	FALSE	TRUE	FALSE	**N/A**	**Fly Ash**	**A1**
762.1	6.890	N/A	100	N/A	N/A	N/A	N/A	0.991	0	0	**0.063**	FALSE	TRUE	FALSE	**N/A**	**Fly Ash**	**A1**
761.9	7.054	N/A	100	N/A	N/A	N/A	N/A	0.991	0	0	**0.064**	FALSE	TRUE	FALSE	**N/A**	**Fly Ash**	**A1**
761.8	7.218	N/A	100	N/A	N/A	N/A	N/A	0.990	0	0	**0.065**	FALSE	TRUE	FALSE	**N/A**	**Fly Ash**	**A1**

Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
761.6	7.382	N/A	100	N/A	N/A	N/A	N/A	0.990	0	0	**0.066**	FALSE	TRUE	FALSE	**N/A**	**Fly Ash**	**A1**
761.5	7.546	N/A	100	N/A	N/A	N/A	N/A	0.989	0	0	**0.066**	FALSE	TRUE	FALSE	**N/A**	**Fly Ash**	**A1**
761.3	7.710	N/A	100	N/A	N/A	N/A	N/A	0.989	0	0	**0.067**	FALSE	TRUE	FALSE	**N/A**	**Fly Ash**	**A1**
761.1	7.874	N/A	100	N/A	N/A	N/A	N/A	0.989	0	0	**0.068**	FALSE	TRUE	FALSE	**N/A**	**Fly Ash**	**A1**
761.0	8.038	N/A	100	N/A	N/A	N/A	N/A	0.988	0	0	**0.068**	FALSE	TRUE	FALSE	**N/A**	**Fly Ash**	**A1**
760.8	8.202	N/A	98	N/A	N/A	N/A	N/A	0.988	0	0	**0.069**	FALSE	TRUE	FALSE	**N/A**	**Fly Ash**	**A1**
760.6	8.366	N/A	88	N/A	N/A	N/A	N/A	0.987	0	0	**0.070**	FALSE	TRUE	FALSE	**N/A**	**Fly Ash**	**A1**
760.5	8.530	0.288	73	1.100	1.009	0.98	0.313	0.987	0	0	**0.070**	FALSE	FALSE	FALSE	**4.4**	**Fly Ash**	**A1**
760.3	8.694	0.234	70	1.100	1.005	0.98	0.254	0.986	0	0	**0.071**	FALSE	FALSE	FALSE	**3.6**	**Fly Ash**	**A1**
760.1	8.858	0.208	68	1.100	1.002	0.98	0.226	0.986	0	0	**0.071**	FALSE	FALSE	FALSE	**3.2**	**Fly Ash**	**A1**
760.0	9.022	0.150	59	1.099	0.998	0.99	0.163	0.986	0	0	**0.072**	FALSE	FALSE	FALSE	**2.3**	**Fly Ash**	**A1**
759.8	9.186	0.141	56	1.093	0.998	0.99	0.153	0.985	0	0	**0.073**	FALSE	FALSE	FALSE	**2.1**	**Fly Ash**	**A1**
759.6	9.350	0.142	56	1.093	0.998	0.99	0.153	0.985	0	0	**0.073**	FALSE	FALSE	FALSE	**2.1**	**Fly Ash**	**A1**
759.5	9.514	0.145	57	1.093	0.998	0.99	0.157	0.984	0	0	**0.074**	FALSE	FALSE	FALSE	**2.1**	**Fly Ash**	**A1**
759.3	9.678	0.153	59	1.096	0.999	0.99	0.166	0.984	0	0	**0.074**	FALSE	FALSE	FALSE	**2.2**	**Fly Ash**	**A1**
759.2	9.842	0.155	60	1.096	0.999	0.99	0.168	0.983	0	0	**0.075**	FALSE	FALSE	FALSE	**2.2**	**Fly Ash**	**A1**
759.0	10.006	0.099	34	1.063	0.999	1.00	0.105	0.983	0	0	**0.075**	FALSE	FALSE	FALSE	**1.4**	**Fly Ash**	**A1**
758.8	10.170	0.188	65	1.100	1.000	0.99	0.204	0.982	0	0	**0.076**	FALSE	FALSE	FALSE	**2.7**	**Fly Ash**	**A1**
758.7	10.335	0.166	62	1.098	0.999	0.99	0.180	0.982	0	0	**0.076**	FALSE	FALSE	FALSE	**2.4**	**Fly Ash**	**A1**
758.5	10.499	0.160	61	1.094	0.999	0.99	0.173	0.982	0	0	**0.077**	FALSE	FALSE	FALSE	**2.3**	**Fly Ash**	**A1**
758.3	10.663	0.156	60	1.091	0.999	0.99	0.168	0.981	0	0	**0.077**	FALSE	FALSE	FALSE	**2.2**	**Fly Ash**	**A1**
758.2	10.827	0.151	59	1.089	0.999	0.99	0.163	0.981	0	0	**0.078**	FALSE	FALSE	FALSE	**2.1**	**Fly Ash**	**A1**
758.0	10.991	0.156	60	1.090	0.999	0.99	0.168	0.980	0	0	**0.078**	FALSE	FALSE	FALSE	**2.1**	**Fly Ash**	**A1**
757.8	11.155	0.195	66	1.100	1.000	0.98	0.211	0.980	0	0	**0.079**	FALSE	FALSE	FALSE	**2.7**	**Fly Ash**	**A1**
757.7	11.319	0.228	69	1.100	1.002	0.98	0.247	0.979	0	0	**0.079**	FALSE	FALSE	FALSE	**3.1**	**Fly Ash**	**A1**
757.5	11.483	0.213	68	1.100	1.002	0.98	0.231	0.979	0	0	**0.079**	FALSE	FALSE	FALSE	**2.9**	**Fly Ash**	**A1**
757.4	11.647	0.167	62	1.090	0.999	0.99	0.180	0.978	0	0	**0.080**	FALSE	FALSE	FALSE	**2.3**	**Fly Ash**	**A1**
757.2	11.811	0.139	56	1.078	0.997	0.99	0.148	0.978	0	0	**0.080**	FALSE	FALSE	FALSE	**1.8**	**Fly Ash**	**A1**
757.0	11.975	0.126	51	1.071	0.996	0.99	0.134	0.977	0	0	**0.081**	FALSE	FALSE	FALSE	**1.7**	**Fly Ash**	**A1**
756.9	12.139	0.118	47	1.066	0.995	0.99	0.124	0.977	0	0	**0.081**	FALSE	FALSE	FALSE	**1.5**	**Fly Ash**	**A1**
756.7	12.303	0.113	44	1.062	0.994	0.99	0.118	0.976	0	0	**0.082**	FALSE	FALSE	FALSE	**1.5**	**Fly Ash**	**A1**
756.5	12.467	0.108	41	1.058	0.993	1.00	0.113	0.976	0	0	**0.082**	FALSE	FALSE	FALSE	**1.4**	**Fly Ash**	**A1**
756.4	12.631	0.101	36	1.054	0.992	1.00	0.105	0.975	0	0	**0.082**	FALSE	FALSE	FALSE	**1.3**	**Fly Ash**	**A2**
756.2	12.795	0.096	31	1.050	0.991	1.00	0.099	0.975	0	0	**0.083**	FALSE	FALSE	FALSE	**1.2**	**Fly Ash**	**A2**
756.0	12.959	0.090	26	1.046	0.991	1.00	0.093	0.974	0	0	**0.083**	FALSE	FALSE	FALSE	**1.1**	**Fly Ash**	**A2**
755.9	13.123	0.087	23	1.044	0.990	1.00	0.090	0.974	0	0	**0.083**	FALSE	FALSE	FALSE	**1.1**	**Fly Ash**	**A2**
755.7	13.287	0.106	39	1.054	0.991	1.00	0.110	0.973	0	0	**0.084**	FALSE	FALSE	FALSE	**1.3**	**Fly Ash**	**A2**
755.5	13.451	0.228	69	1.094	1.007	0.98	0.247	0.973	0	0	**0.084**	FALSE	FALSE	FALSE	**2.9**	**Fly Ash**	**A1**
755.4	13.615	0.164	62	1.078	1.000	0.99	0.175	0.972	0	0	**0.084**	FALSE	FALSE	FALSE	**2.1**	**Fly Ash**	**A1**
755.2	13.779	0.128	52	1.063	0.994	0.99	0.135	0.972	0	0	**0.085**	FALSE	FALSE	FALSE	**1.6**	**Fly Ash**	**A1**
755.1	13.943	0.112	44	1.055	0.991	0.99	0.117	0.971	0	0	**0.085**	FALSE	FALSE	FALSE	**1.4**	**Fly Ash**	**A1**
754.9	14.107	0.115	46	1.056	0.992	0.99	0.120	0.971	0	0	**0.085**	FALSE	FALSE	FALSE	**1.4**	**Fly Ash**	**A1**
754.7	14.271	0.161	61	1.073	0.999	0.99	0.171	0.970	0	0	**0.086**	FALSE	FALSE	FALSE	**2.0**	**Fly Ash**	**A1**
754.6	14.436	0.517	79	1.100	1.021	0.97	0.562	0.970	0	0	**0.086**	FALSE	FALSE	FALSE	**6.5**	**Fly Ash**	**A1**
754.4	14.600	N/A	99	N/A	N/A	N/A	N/A	0.969	0	0	**0.086**	FALSE	TRUE	FALSE	**N/A**	**Fly Ash**	**A1**
754.2	14.764	N/A	89	N/A	N/A	N/A	N/A	0.969	0	0	**0.087**	FALSE	TRUE	FALSE	**N/A**	**Fly Ash**	**A1**
754.1	14.928	0.521	79	1.100	1.022	0.97	0.567	0.968	0	0	**0.087**	FALSE	FALSE	FALSE	**6.5**	**Fly Ash**	**A1**
753.9	15.092	0.189	66	1.076	1.004	0.99	0.202	0.968	0	0	**0.087**	FALSE	FALSE	FALSE	**2.3**	**Fly Ash**	**A1**
753.7	15.256	0.145	57	1.063	0.996	0.99	0.152	0.967	0	0	**0.087**	FALSE	FALSE	FALSE	**1.7**	**Fly Ash**	**A1**
753.6	15.420	0.135	54	1.059	0.994	0.99	0.141	0.967	0	0	**0.088**	FALSE	FALSE	FALSE	**1.6**	**Fly Ash**	**A1**
753.4	15.584	0.127	51	1.055	0.993	0.99	0.132	0.966	0	0	**0.088**	FALSE	FALSE	FALSE	**1.5**	**Fly Ash**	**A1**
753.3	15.748	0.118	47	1.051	0.991	0.99	0.122	0.966	0	0	**0.088**	FALSE	FALSE	FALSE	**1.4**	**Fly Ash**	**A1**
753.1	15.912	0.108	41	1.046	0.990	1.00	0.112	0.965	0	0	**0.089**	FALSE	FALSE	FALSE	**1.3**	**Fly Ash**	**A1**
752.9	16.076	0.103	37	1.043	0.989	1.00	0.106	0.965	0	0	**0.089**	FALSE	FALSE	FALSE	**1.2**	**Fly Ash**	**A1**
752.8	16.240	0.097	33	1.040	0.989	1.00	0.099	0.964	0	0	**0.089**	FALSE	FALSE	FALSE	**1.1**	**Fly Ash**	**A1**

Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
752.6	16.404	0.091	26	1.036	0.988	1.00	0.092	0.964	0	0	**0.089**	FALSE	FALSE	FALSE	**1.0**	**Fly Ash**	**A1**
752.4	16.568	0.089	24	1.035	0.988	1.00	0.091	0.963	0	0	**0.090**	FALSE	FALSE	FALSE	**1.0**	**Fly Ash**	**A1**
752.3	16.732	0.089	24	1.035	0.989	1.00	0.091	0.963	0	0	**0.090**	FALSE	FALSE	FALSE	**1.0**	**Fly Ash**	**A1**
752.1	16.896	0.087	22	1.033	0.989	1.00	0.089	0.962	0	0	**0.090**	FALSE	FALSE	FALSE	**1.0**	**Fly Ash**	**A1**
751.9	17.060	0.087	22	1.033	0.989	1.00	0.088	0.962	0	0	**0.090**	FALSE	FALSE	FALSE	**1.0**	**Fly Ash**	**A1**
751.8	17.224	0.093	28	1.035	0.989	1.00	0.094	0.961	0	0	**0.091**	FALSE	FALSE	FALSE	**1.0**	**Fly Ash**	**A1**
751.6	17.388	0.102	37	1.039	0.990	1.00	0.105	0.961	0	0	**0.091**	FALSE	FALSE	FALSE	**1.2**	**Fly Ash**	**A1**
751.4	17.552	0.151	59	1.055	0.997	0.99	0.157	0.960	0	0	**0.091**	FALSE	FALSE	FALSE	**1.7**	**Fly Ash**	**A1**
751.3	17.716	0.210	68	1.066	1.005	0.98	0.221	0.959	0	0	**0.091**	FALSE	FALSE	FALSE	**2.4**	**Fly Ash**	**A1**
751.1	17.880	0.210	68	1.065	1.004	0.98	0.221	0.959	0	0	**0.091**	FALSE	FALSE	FALSE	**2.4**	**Fly Ash**	**A1**
751.0	18.044	0.132	53	1.047	0.995	0.99	0.136	0.958	0	0	**0.092**	FALSE	FALSE	FALSE	**1.5**	**Fly Ash**	**A1**
750.8	18.208	0.111	43	1.039	0.992	0.99	0.114	0.958	0	0	**0.092**	FALSE	FALSE	FALSE	**1.2**	**Fly Ash**	**A1**
750.6	18.372	0.111	43	1.039	0.993	0.99	0.113	0.957	0	0	**0.092**	FALSE	FALSE	FALSE	**1.2**	**Fly Ash**	**A1**
750.5	18.537	0.116	46	1.040	0.993	0.99	0.119	0.957	0	0	**0.092**	FALSE	FALSE	FALSE	**1.3**	**Fly Ash**	**A1**
750.3	18.701	0.114	45	1.039	0.993	0.99	0.117	0.956	0	0	**0.092**	FALSE	FALSE	FALSE	**1.3**	**Fly Ash**	**A1**
750.1	18.865	0.110	42	1.037	0.993	0.99	0.113	0.956	0	0	**0.093**	FALSE	FALSE	FALSE	**1.2**	**Fly Ash**	**A1**
750.0	19.029	0.109	42	1.036	0.994	0.99	0.112	0.955	0	0	**0.093**	FALSE	FALSE	FALSE	**1.2**	**Fly Ash**	**A1**
749.8	19.193	0.126	51	1.041	0.995	0.99	0.129	0.954	0	0	**0.093**	FALSE	FALSE	FALSE	**1.4**	**Fly Ash**	**A1**
749.6	19.357	0.167	62	1.051	0.999	0.99	0.173	0.954	0	0	**0.093**	FALSE	FALSE	FALSE	**1.9**	**Fly Ash**	**A1**
749.5	19.521	0.511	79	1.078	1.009	0.97	0.539	0.953	0	0	**0.093**	FALSE	FALSE	FALSE	**5.8**	**Bottom Ash**	**A1**
749.3	19.685	0.256	71	1.061	1.004	0.98	0.267	0.953	0	0	**0.093**	FALSE	FALSE	FALSE	**2.9**	**Bottom Ash**	**A1**
749.2	19.849	0.196	66	1.053	1.001	0.98	0.203	0.952	0	0	**0.094**	FALSE	FALSE	FALSE	**2.2**	**Bottom Ash**	**A1**
749.0	20.013	0.150	59	1.044	0.998	0.99	0.155	0.952	0	0	**0.094**	FALSE	FALSE	FALSE	**1.7**	**Bottom Ash**	**A1**
748.8	20.177	0.244	71	1.057	1.003	0.98	0.253	0.951	0	0	**0.094**	FALSE	FALSE	FALSE	**2.7**	**Bottom Ash**	**A1**
748.7	20.341	N/A	82	N/A	N/A	N/A	N/A	0.951	0	0	**0.094**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
748.5	20.505	N/A	99	N/A	N/A	N/A	N/A	0.950	0	0	**0.094**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
748.3	20.669	N/A	95	N/A	N/A	N/A	N/A	0.949	0	0	**0.094**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
748.2	20.833	N/A	93	N/A	N/A	N/A	N/A	0.949	0	0	**0.094**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
748.0	20.997	N/A	88	N/A	N/A	N/A	N/A	0.948	0	0	**0.095**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
747.8	21.161	N/A	83	N/A	N/A	N/A	N/A	0.948	0	0	**0.095**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
747.7	21.325	0.349	76	1.057	1.002	0.98	0.360	0.947	0	0	**0.095**	FALSE	FALSE	FALSE	**3.8**	**Subunit 2**	**A1**
747.5	21.489	0.303	74	1.054	1.001	0.98	0.313	0.946	0	0	**0.095**	FALSE	FALSE	FALSE	**3.3**	**Subunit 2**	**A1**
747.3	21.653	0.309	74	1.053	1.000	0.98	0.318	0.946	0	0	**0.095**	FALSE	FALSE	FALSE	**3.4**	**Subunit 2**	**A1**
747.2	21.817	0.305	74	1.051	1.000	0.98	0.314	0.945	0	0	**0.095**	FALSE	FALSE	FALSE	**3.3**	**Subunit 2**	**A1**
747.0	21.981	0.197	66	1.042	1.000	0.98	0.202	0.945	0	0	**0.095**	FALSE	FALSE	FALSE	**2.1**	**Subunit 2**	**A1**
746.9	22.145	0.143	57	1.033	0.999	0.99	0.147	0.944	0	0	**0.095**	FALSE	FALSE	FALSE	**1.5**	**Subunit 2**	**A1**
746.7	22.309	0.126	51	1.029	0.998	0.99	0.128	0.944	0	0	**0.095**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**A1**
746.5	22.473	0.128	52	1.029	0.998	0.99	0.131	0.943	0	0	**0.095**	FALSE	FALSE	FALSE	**1.4**	**Subunit 2**	**A1**
746.4	22.638	0.136	55	1.030	0.998	0.99	0.139	0.942	0	0	**0.095**	FALSE	FALSE	FALSE	**1.5**	**Subunit 2**	**A1**
746.2	22.802	0.150	59	1.031	0.998	0.99	0.153	0.942	0	0	**0.095**	FALSE	FALSE	FALSE	**1.6**	**Subunit 2**	**A1**
746.0	22.966	0.142	56	1.029	0.997	0.99	0.144	0.941	0	0	**0.096**	FALSE	FALSE	FALSE	**1.5**	**Subunit 2**	**A1**
745.9	23.130	0.173	63	1.033	0.999	0.99	0.176	0.941	0	0	**0.096**	FALSE	FALSE	FALSE	**1.8**	**Subunit 2**	**A1**
745.7	23.294	0.218	69	1.036	1.002	0.98	0.222	0.940	0	0	**0.096**	FALSE	FALSE	FALSE	**2.3**	**Subunit 2**	**A1**
745.5	23.458	0.228	69	1.036	1.003	0.98	0.232	0.939	0	0	**0.096**	FALSE	FALSE	FALSE	**2.4**	**Subunit 2**	**A1**
745.4	23.622	0.182	65	1.031	1.000	0.99	0.185	0.939	0	0	**0.096**	FALSE	FALSE	FALSE	**1.9**	**Subunit 2**	**A1**
745.2	23.786	0.180	64	1.030	1.000	0.99	0.183	0.938	0	0	**0.096**	FALSE	FALSE	FALSE	**1.9**	**Subunit 2**	**A1**
745.1	23.950	0.147	58	1.026	0.996	0.99	0.148	0.938	0	0	**0.096**	FALSE	FALSE	FALSE	**1.5**	**Subunit 2**	**A1**
744.9	24.114	0.132	53	1.023	0.994	0.99	0.133	0.937	0	0	**0.096**	FALSE	FALSE	FALSE	**1.4**	**Subunit 2**	**A1**
744.7	24.278	0.117	46	1.020	0.991	0.99	0.117	0.936	0	0	**0.096**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**A1**
744.6	24.442	0.106	40	1.018	0.989	1.00	0.106	0.936	0	0	**0.096**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**A2**
744.4	24.606	0.102	36	1.016	0.988	1.00	0.102	0.935	0	0	**0.096**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**A2**
744.2	24.770	0.106	40	1.017	0.987	1.00	0.106	0.934	0	0	**0.096**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**A2**
744.1	24.934	0.127	51	1.019	0.991	0.99	0.127	0.934	0	0	**0.096**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**A1**
743.9	25.098	0.145	57	1.021	0.995	0.99	0.146	0.933	0	0	**0.096**	FALSE	FALSE	FALSE	**1.5**	**Subunit 2**	**A1**
743.7	25.262	0.151	59	1.021	0.997	0.99	0.152	0.933	0	0	**0.096**	FALSE	FALSE	FALSE	**1.6**	**Subunit 2**	**A1**

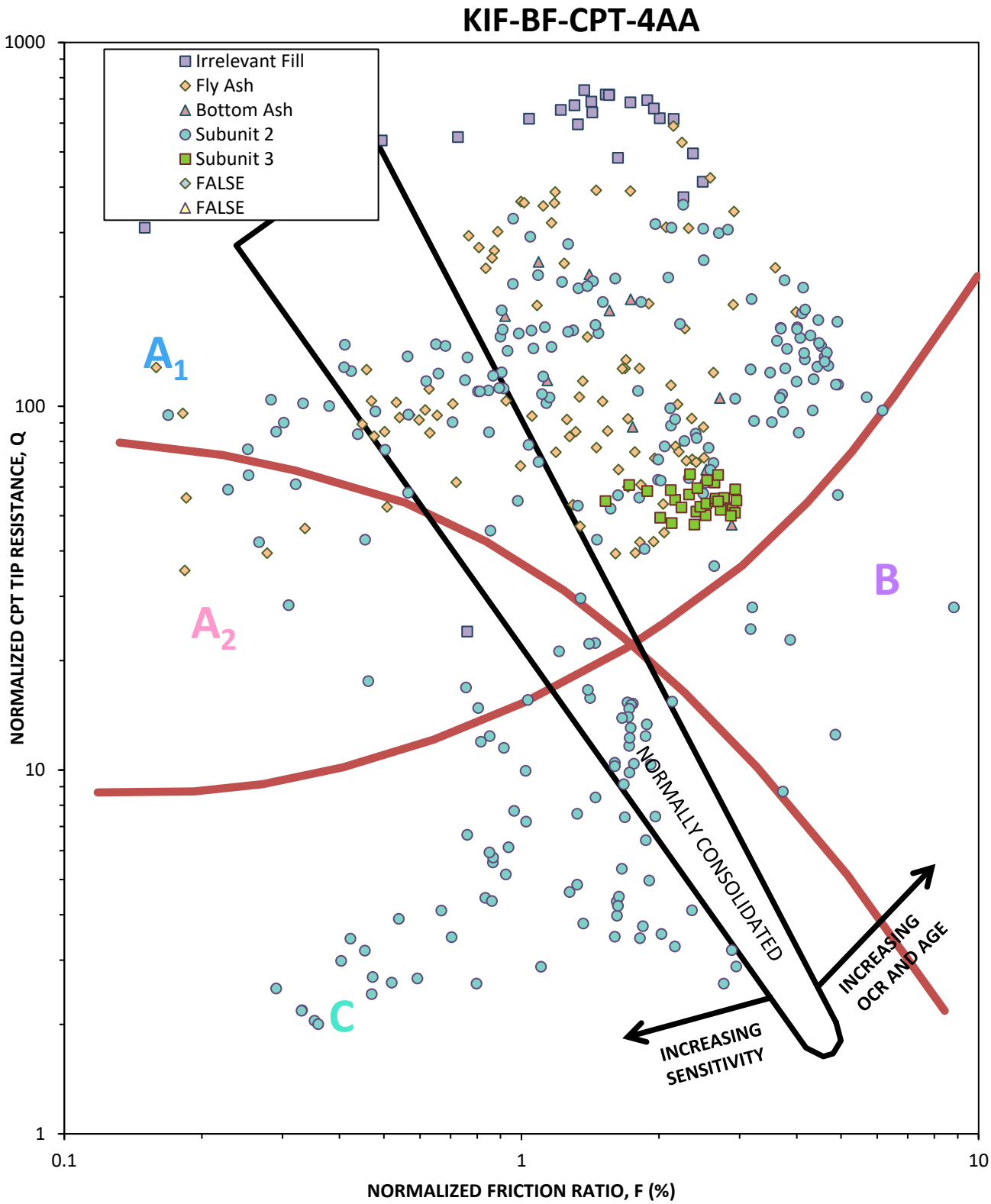
Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
743.6	25.426	0.153	59	1.020	0.997	0.99	0.154	0.932	0	0	**0.096**	FALSE	FALSE	FALSE	**1.6**	**Subunit 2**	**A1**
743.4	25.590	0.163	61	1.020	1.000	0.99	0.164	0.931	0	0	**0.096**	FALSE	FALSE	FALSE	**1.7**	**Subunit 2**	**A1**
743.2	25.754	0.180	64	1.021	1.006	0.99	0.183	0.931	0	0	**0.096**	FALSE	FALSE	FALSE	**1.9**	**Subunit 2**	**A1**
743.1	25.918	0.187	65	1.021	1.008	0.99	0.190	0.930	0	0	**0.097**	FALSE	FALSE	FALSE	**2.0**	**Subunit 2**	**A1**
742.9	26.082	0.180	64	1.020	1.007	0.99	0.182	0.930	0	0	**0.097**	FALSE	FALSE	FALSE	**1.9**	**Subunit 2**	**A1**
742.8	26.246	0.206	67	1.020	1.015	0.98	0.210	0.929	0	0	**0.097**	FALSE	FALSE	FALSE	**2.2**	**Subunit 2**	**A1**
742.6	26.410	0.231	70	1.021	1.024	0.98	0.237	0.928	0	0	**0.097**	FALSE	FALSE	FALSE	**2.5**	**Subunit 2**	**A1**
742.4	26.574	0.252	71	1.021	1.031	0.98	0.260	0.928	0	0	**0.097**	FALSE	FALSE	FALSE	**2.7**	**Subunit 2**	**A1**
742.3	26.739	0.293	73	1.021	1.043	0.98	0.305	0.927	0	0	**0.097**	FALSE	FALSE	FALSE	**3.2**	**Subunit 2**	**A1**
742.1	26.903	0.433	78	1.023	1.066	0.97	0.459	0.926	0	0	**0.097**	FALSE	FALSE	FALSE	**4.7**	**Subunit 2**	**A1**
741.9	27.067	0.377	76	1.021	1.066	0.97	0.399	0.926	0	0	**0.097**	FALSE	FALSE	FALSE	**4.1**	**Subunit 2**	**A1**
741.8	27.231	0.324	75	1.019	1.058	0.98	0.341	0.925	0	0	**0.097**	FALSE	FALSE	FALSE	**3.5**	**Subunit 2**	**A1**
741.6	27.395	0.282	73	1.017	1.049	0.98	0.295	0.925	0	0	**0.097**	FALSE	FALSE	FALSE	**3.0**	**Subunit 2**	**A1**
741.4	27.559	0.268	72	1.016	1.047	0.98	0.279	0.924	0	0	**0.097**	FALSE	FALSE	FALSE	**2.9**	**Subunit 2**	**A1**
741.3	27.723	0.246	71	1.015	1.042	0.98	0.255	0.923	0	0	**0.097**	FALSE	FALSE	FALSE	**2.6**	**Subunit 2**	**A1**
741.1	27.887	0.216	68	1.013	1.031	0.98	0.221	0.923	0	0	**0.097**	FALSE	FALSE	FALSE	**2.3**	**Subunit 2**	**A1**
740.9	28.051	0.204	67	1.012	1.028	0.98	0.209	0.922	0	0	**0.097**	FALSE	FALSE	FALSE	**2.2**	**Subunit 2**	**A1**
740.8	28.215	0.186	65	1.011	1.020	0.99	0.189	0.921	0	0	**0.097**	FALSE	FALSE	FALSE	**2.0**	**Subunit 2**	**A1**
740.6	28.379	0.175	63	1.009	1.014	0.99	0.177	0.921	0	0	**0.097**	FALSE	FALSE	FALSE	**1.8**	**Subunit 2**	**A1**
740.5	28.543	0.172	63	1.009	1.013	0.99	0.174	0.920	0	0	**0.097**	FALSE	FALSE	FALSE	**1.8**	**Subunit 3**	**A1**
740.3	28.707	0.160	61	1.008	1.006	0.99	0.160	0.919	0	0	**0.097**	FALSE	FALSE	FALSE	**1.7**	**Subunit 3**	**A1**
740.1	28.871	0.152	59	1.007	1.001	0.99	0.152	0.919	0	0	**0.097**	FALSE	FALSE	FALSE	**1.6**	**Subunit 3**	**A1**
740.0	29.035	0.151	59	1.006	1.001	0.99	0.151	0.918	0	0	**0.097**	FALSE	FALSE	FALSE	**1.6**	**Subunit 3**	**A1**
739.8	29.199	0.153	59	1.005	1.003	0.99	0.153	0.917	0	0	**0.097**	FALSE	FALSE	FALSE	**1.6**	**Subunit 3**	**A1**
739.6	29.363	0.157	60	1.005	1.006	0.99	0.157	0.917	0	0	**0.097**	FALSE	FALSE	FALSE	**1.6**	**Subunit 3**	**A1**
739.5	29.527	0.172	63	1.004	1.017	0.99	0.173	0.916	0	0	**0.097**	FALSE	FALSE	FALSE	**1.8**	**Subunit 3**	**A1**
739.3	29.691	0.167	62	1.004	1.014	0.99	0.168	0.916	0	0	**0.097**	FALSE	FALSE	FALSE	**1.7**	**Subunit 3**	**A1**
739.1	29.855	0.159	61	1.003	1.008	0.99	0.159	0.915	0	0	**0.097**	FALSE	FALSE	FALSE	**1.6**	**Subunit 3**	**A1**
739.0	30.019	0.165	62	1.002	1.013	0.99	0.165	0.914	0	0	**0.097**	FALSE	FALSE	FALSE	**1.7**	**Subunit 3**	**A1**
738.8	30.183	0.168	62	1.002	1.016	0.99	0.169	0.914	0	0	**0.097**	FALSE	FALSE	FALSE	**1.7**	**Subunit 3**	**A1**
738.7	30.347	0.171	63	1.001	1.019	0.99	0.172	0.913	0	0	**0.097**	FALSE	FALSE	FALSE	**1.8**	**Subunit 3**	**A1**
738.5	30.511	0.173	63	1.000	1.022	0.99	0.175	0.912	0	0	**0.097**	FALSE	FALSE	FALSE	**1.8**	**Subunit 3**	**A1**
738.3	30.675	0.171	63	1.000	1.021	0.99	0.172	0.912	0	0	**0.097**	FALSE	FALSE	FALSE	**1.8**	**Subunit 3**	**A1**
738.2	30.840	0.167	62	0.999	1.018	0.99	0.168	0.911	0	0	**0.097**	FALSE	FALSE	FALSE	**1.7**	**Subunit 3**	**A1**
738.0	31.004	0.166	62	0.998	1.018	0.99	0.167	0.910	0	0	**0.097**	FALSE	FALSE	FALSE	**1.7**	**Subunit 3**	**A1**
737.8	31.168	0.175	64	0.998	1.027	0.99	0.177	0.910	0	0	**0.097**	FALSE	FALSE	FALSE	**1.8**	**Subunit 3**	**A1**
737.7	31.332	0.190	66	0.997	1.040	0.99	0.195	0.909	0	0	**0.097**	FALSE	FALSE	FALSE	**2.0**	**Subunit 3**	**A1**
737.5	31.496	0.201	67	0.996	1.050	0.98	0.207	0.908	0	0	**0.097**	FALSE	FALSE	FALSE	**2.1**	**Subunit 3**	**A1**
737.3	31.660	0.186	65	0.996	1.038	0.99	0.189	0.908	0	0	**0.097**	FALSE	FALSE	FALSE	**2.0**	**Subunit 3**	**A1**
737.2	31.824	0.175	63	0.995	1.029	0.99	0.176	0.907	0	0	**0.097**	FALSE	FALSE	FALSE	**1.8**	**Subunit 3**	**A1**
737.0	31.988	0.164	62	0.995	1.019	0.99	0.165	0.906	0	0	**0.097**	FALSE	FALSE	FALSE	**1.7**	**Subunit 3**	**A1**
736.8	32.152	0.162	61	0.994	1.017	0.99	0.162	0.906	0	0	**0.097**	FALSE	FALSE	FALSE	**1.7**	**Subunit 3**	**A1**
736.7	32.316	0.165	62	0.993	1.021	0.99	0.166	0.905	0	0	**0.097**	FALSE	FALSE	FALSE	**1.7**	**Subunit 3**	**A1**
736.5	32.480	0.172	63	0.993	1.029	0.99	0.174	0.904	0	0	**0.097**	FALSE	FALSE	FALSE	**1.8**	**Subunit 3**	**A1**
736.4	32.644	0.171	63	0.992	1.028	0.99	0.172	0.904	0	0	**0.097**	FALSE	FALSE	FALSE	**1.8**	**Subunit 3**	**A1**
736.2	32.808	0.176	64	0.991	1.034	0.99	0.178	0.903	0	0	**0.097**	FALSE	FALSE	FALSE	**1.8**	**Subunit 3**	**A1**
736.0	32.972	0.198	67	0.990	1.056	0.98	0.203	0.902	0	0	**0.097**	FALSE	FALSE	FALSE	**2.1**	**Subunit 3**	**A1**
735.9	33.136	0.194	66	0.989	1.052	0.99	0.199	0.902	0	0	**0.097**	FALSE	FALSE	FALSE	**2.1**	**Subunit 3**	**A1**
735.7	33.300	0.183	65	0.989	1.042	0.99	0.186	0.901	0	0	**0.097**	FALSE	FALSE	FALSE	**1.9**	**Subunit 3**	**A1**
735.5	33.464	0.164	62	0.989	1.022	0.99	0.164	0.900	0	0	**0.097**	FALSE	FALSE	FALSE	**1.7**	**Subunit 3**	**A1**
735.4	33.628	0.137	55	0.990	0.990	0.99	0.133	0.900	0	0	**0.097**	FALSE	FALSE	FALSE	**1.4**	**Subunit 2**	**A1**
735.2	33.792	0.123	49	0.991	0.973	0.99	0.117	0.899	0	0	**0.097**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**B**
735.0	33.956	0.110	42	0.991	0.958	0.99	0.104	0.898	0	0	**0.097**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**B**
734.9	34.120	0.106	39	0.991	0.954	1.00	0.100	0.898	0	0	**0.097**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**B**
734.7	34.284	0.104	38	0.991	0.952	1.00	0.098	0.897	0	0	**0.097**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**

Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
734.6	34.448	0.103	37	0.991	0.951	1.00	0.096	0.896	0	0	**0.097**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
734.4	34.612	0.102	37	0.990	0.950	1.00	0.096	0.896	0	0	**0.097**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
734.2	34.776	0.102	37	0.990	0.950	1.00	0.096	0.895	0	0	**0.097**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
734.1	34.941	0.103	37	0.990	0.949	1.00	0.096	0.894	0	0	**0.096**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
733.9	35.105	0.102	37	0.989	0.948	1.00	0.095	0.894	0	0	**0.096**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
733.7	35.269	0.101	36	0.989	0.947	1.00	0.094	0.893	0	0	**0.096**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
733.6	35.433	0.101	36	0.989	0.947	1.00	0.094	0.892	0	0	**0.096**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
733.4	35.597	0.101	35	0.989	0.946	1.00	0.094	0.891	0	0	**0.096**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
733.2	35.761	0.100	35	0.988	0.946	1.00	0.093	0.891	0	0	**0.096**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
733.1	35.925	0.100	35	0.988	0.945	1.00	0.093	0.890	0	0	**0.096**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
732.9	36.089	0.100	35	0.988	0.945	1.00	0.093	0.889	0	0	**0.096**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
732.7	36.253	0.099	34	0.987	0.944	1.00	0.092	0.889	0	0	**0.096**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
732.6	36.417	0.099	35	0.987	0.944	1.00	0.092	0.888	0	0	**0.096**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
732.4	36.581	0.099	35	0.987	0.944	1.00	0.092	0.887	0	0	**0.096**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
732.3	36.745	0.100	35	0.986	0.944	1.00	0.093	0.887	0	0	**0.096**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
732.1	36.909	0.101	36	0.986	0.945	1.00	0.094	0.886	0	0	**0.096**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
731.9	37.073	0.101	36	0.986	0.945	1.00	0.094	0.885	0	0	**0.096**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
731.8	37.237	0.102	36	0.985	0.945	1.00	0.094	0.885	0	0	**0.096**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
731.6	37.401	0.101	36	0.985	0.944	1.00	0.094	0.884	0	0	**0.096**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
731.4	37.565	0.101	36	0.985	0.944	1.00	0.094	0.883	0	0	**0.096**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
731.3	37.729	0.100	35	0.984	0.943	1.00	0.093	0.883	0	0	**0.096**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
731.1	37.893	0.100	35	0.984	0.943	1.00	0.092	0.882	0	0	**0.096**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
730.9	38.057	0.100	35	0.984	0.943	1.00	0.093	0.881	0	0	**0.096**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
730.8	38.221	0.100	35	0.983	0.943	1.00	0.093	0.880	0	0	**0.096**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
730.6	38.385	0.101	36	0.983	0.943	1.00	0.093	0.880	0	0	**0.096**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
730.5	38.549	0.101	36	0.983	0.943	1.00	0.093	0.879	0	0	**0.096**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
730.3	38.713	0.101	36	0.982	0.943	1.00	0.093	0.878	0	0	**0.096**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
730.1	38.877	0.100	35	0.982	0.943	1.00	0.093	0.878	0	0	**0.096**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
730.0	39.042	0.100	35	0.982	0.943	1.00	0.093	0.877	0	0	**0.096**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
729.8	39.206	0.101	36	0.981	0.943	1.00	0.094	0.876	0	0	**0.096**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
729.6	39.370	0.102	37	0.981	0.944	1.00	0.094	0.876	0	0	**0.096**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
729.5	39.534	0.105	39	0.980	0.947	1.00	0.097	0.875	0	0	**0.096**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
729.3	39.698	0.107	41	0.979	0.949	1.00	0.099	0.874	0	0	**0.096**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
729.1	39.862	0.109	41	0.979	0.951	0.99	0.101	0.873	0	0	**0.096**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
729.0	40.026	0.109	42	0.978	0.952	0.99	0.101	0.873	0	0	**0.096**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**C**
728.8	40.190	0.110	43	0.978	0.953	0.99	0.102	0.872	0	0	**0.096**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**C**
728.6	40.354	0.112	44	0.977	0.955	0.99	0.104	0.871	0	0	**0.096**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**C**
728.5	40.518	0.112	44	0.977	0.955	0.99	0.104	0.871	0	0	**0.096**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**C**
728.3	40.682	0.112	43	0.976	0.955	0.99	0.104	0.870	0	0	**0.096**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**C**
728.2	40.846	0.112	43	0.976	0.954	0.99	0.103	0.869	0	0	**0.096**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**C**
728.0	41.010	0.111	43	0.976	0.953	0.99	0.103	0.869	0	0	**0.096**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**C**
727.8	41.174	0.111	43	0.976	0.953	0.99	0.102	0.868	0	0	**0.096**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**C**
727.7	41.338	0.110	42	0.975	0.952	0.99	0.102	0.867	0	0	**0.095**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**C**
727.5	41.502	0.109	42	0.975	0.951	0.99	0.101	0.866	0	0	**0.095**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**C**
727.3	41.666	0.108	41	0.975	0.950	1.00	0.099	0.866	0	0	**0.095**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
727.2	41.830	0.106	40	0.975	0.948	1.00	0.098	0.865	0	0	**0.095**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
727.0	41.994	0.105	39	0.975	0.946	1.00	0.096	0.864	0	0	**0.095**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
726.8	42.158	0.102	37	0.976	0.944	1.00	0.094	0.864	0	0	**0.095**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
726.7	42.322	0.101	36	0.976	0.943	1.00	0.093	0.863	0	0	**0.095**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
726.5	42.486	0.100	35	0.976	0.942	1.00	0.091	0.862	0	0	**0.095**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
726.3	42.650	0.100	35	0.976	0.942	1.00	0.091	0.861	0	0	**0.095**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
726.2	42.814	0.099	35	0.975	0.942	1.00	0.091	0.861	0	0	**0.095**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
726.0	42.978	0.099	34	0.975	0.941	1.00	0.091	0.860	0	0	**0.095**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
725.9	43.143	0.099	34	0.975	0.941	1.00	0.090	0.859	0	0	**0.095**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
725.7	43.307	0.099	34	0.975	0.941	1.00	0.090	0.859	0	0	**0.095**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**

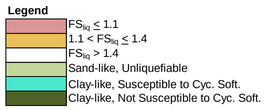
Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
725.5	43.471	0.099	34	0.974	0.942	1.00	0.091	0.858	0	0	**0.095**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
725.4	43.635	0.099	34	0.974	0.942	1.00	0.091	0.857	0	0	**0.095**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
725.2	43.799	0.100	35	0.974	0.942	1.00	0.091	0.857	0	0	**0.095**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
725.0	43.963	0.110	42	0.970	0.953	0.99	0.101	0.856	0	0	**0.095**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**A2**
724.9	44.127	0.122	49	0.967	0.967	0.99	0.113	0.855	0	0	**0.095**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**A1**
724.7	44.291	0.177	64	0.956	1.041	0.99	0.174	0.854	0	0	**0.095**	FALSE	FALSE	FALSE	**1.8**	**Subunit 2**	**A1**
724.5	44.455	0.163	61	0.957	1.022	0.99	0.157	0.854	0	0	**0.095**	FALSE	FALSE	FALSE	**1.7**	**Subunit 2**	**A1**
724.4	44.619	0.159	61	0.958	1.017	0.99	0.153	0.853	0	0	**0.095**	FALSE	FALSE	FALSE	**1.6**	**Subunit 2**	**A1**
724.2	44.783	0.141	56	0.961	0.994	0.99	0.134	0.852	0	0	**0.095**	FALSE	FALSE	FALSE	**1.4**	**Subunit 2**	**A1**
724.1	44.947	0.125	50	0.965	0.971	0.99	0.116	0.852	0	0	**0.095**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**A1**
723.9	45.111	0.116	46	0.967	0.960	0.99	0.107	0.851	0	0	**0.095**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**A2**
723.7	45.275	0.110	42	0.968	0.954	0.99	0.101	0.850	0	0	**0.095**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**A2**
723.6	45.439	0.108	41	0.968	0.952	1.00	0.099	0.849	0	0	**0.094**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**C**
723.4	45.603	0.107	40	0.969	0.950	1.00	0.098	0.849	0	0	**0.094**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
723.2	45.767	0.105	39	0.969	0.948	1.00	0.096	0.848	0	0	**0.094**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
723.1	45.931	0.104	38	0.969	0.947	1.00	0.095	0.847	0	0	**0.094**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
722.9	46.095	0.104	38	0.968	0.948	1.00	0.095	0.847	0	0	**0.094**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
722.7	46.259	0.104	38	0.968	0.948	1.00	0.095	0.846	0	0	**0.094**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
722.6	46.423	0.107	41	0.967	0.951	1.00	0.098	0.845	0	0	**0.094**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
722.4	46.587	0.106	40	0.967	0.950	1.00	0.097	0.844	0	0	**0.094**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
722.2	46.751	0.108	41	0.966	0.952	1.00	0.099	0.844	0	0	**0.094**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**C**
722.1	46.915	0.108	41	0.966	0.952	1.00	0.099	0.843	0	0	**0.094**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**C**
721.9	47.079	0.113	44	0.964	0.957	0.99	0.103	0.842	0	0	**0.094**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**C**
721.8	47.244	0.114	44	0.963	0.958	0.99	0.104	0.842	0	0	**0.094**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**C**
721.6	47.408	0.118	47	0.962	0.963	0.99	0.109	0.841	0	0	**0.094**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**A2**
721.4	47.572	0.119	47	0.961	0.964	0.99	0.109	0.840	0	0	**0.094**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**A2**
721.3	47.736	0.109	42	0.964	0.954	0.99	0.100	0.839	0	0	**0.094**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**A2**
721.1	47.900	0.111	43	0.963	0.956	0.99	0.102	0.839	0	0	**0.094**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**A2**
720.9	48.064	0.109	42	0.964	0.954	0.99	0.100	0.838	0	0	**0.094**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**A2**
720.8	48.228	0.108	41	0.964	0.953	1.00	0.099	0.837	0	0	**0.094**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**C**
720.6	48.392	0.108	41	0.963	0.954	1.00	0.099	0.837	0	0	**0.094**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**C**
720.4	48.556	0.112	43	0.962	0.957	0.99	0.102	0.836	0	0	**0.094**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**A2**
720.3	48.720	0.114	44	0.961	0.959	0.99	0.104	0.835	0	0	**0.094**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**C**
720.1	48.884	0.118	47	0.959	0.964	0.99	0.108	0.834	0	0	**0.093**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**A2**
720.0	49.048	0.133	54	0.954	0.982	0.99	0.124	0.834	0	0	**0.093**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**A1**
719.8	49.212	0.120	48	0.958	0.967	0.99	0.111	0.833	0	0	**0.093**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**A1**
719.6	49.376	0.126	51	0.956	0.973	0.99	0.116	0.832	0	0	**0.093**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**A1**
719.5	49.540	0.143	57	0.950	0.993	0.99	0.134	0.832	0	0	**0.093**	FALSE	FALSE	FALSE	**1.4**	**Subunit 2**	**A1**
719.3	49.704	0.185	65	0.940	1.038	0.99	0.178	0.831	0	0	**0.093**	FALSE	FALSE	FALSE	**1.9**	**Subunit 2**	**A1**
719.1	49.868	0.204	67	0.937	1.055	0.98	0.198	0.830	0	0	**0.093**	FALSE	FALSE	FALSE	**2.1**	**Subunit 2**	**A1**
719.0	50.032	0.359	76	0.920	1.154	0.97	0.371	0.829	0	0	**0.093**	FALSE	FALSE	FALSE	**4.0**	**Subunit 2**	**A1**
718.8	50.196	N/A	83	N/A	N/A	N/A	N/A	0.829	0	0	**0.093**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
718.6	50.360	N/A	93	N/A	N/A	N/A	N/A	0.828	0	0	**0.093**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
718.5	50.524	N/A	96	N/A	N/A	N/A	N/A	0.827	0	0	**0.093**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
718.3	50.688	N/A	93	N/A	N/A	N/A	N/A	0.827	0	0	**0.093**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
718.1	50.852	N/A	91	N/A	N/A	N/A	N/A	0.826	0	0	**0.093**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
718.0	51.016	N/A	89	N/A	N/A	N/A	N/A	0.825	0	0	**0.093**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
717.8	51.180	N/A	88	N/A	N/A	N/A	N/A	0.825	0	0	**0.093**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
717.7	51.345	N/A	84	N/A	N/A	N/A	N/A	0.824	0	0	**0.093**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
717.5	51.509	0.532	80	0.904	1.193	0.97	0.555	0.823	0	0	**0.093**	FALSE	FALSE	FALSE	**6.0**	**Subunit 2**	**A1**
717.3	51.673	0.330	75	0.917	1.131	0.98	0.334	0.822	0	0	**0.093**	FALSE	FALSE	FALSE	**3.6**	**Subunit 2**	**A1**
717.2	51.837	0.272	72	0.922	1.098	0.98	0.269	0.822	0	0	**0.093**	FALSE	FALSE	FALSE	**2.9**	**Subunit 2**	**A1**
717.0	52.001	0.257	71	0.923	1.088	0.98	0.253	0.821	0	0	**0.092**	FALSE	FALSE	FALSE	**2.7**	**Subunit 2**	**A1**
716.8	52.165	0.250	71	0.924	1.083	0.98	0.245	0.820	0	0	**0.092**	FALSE	FALSE	FALSE	**2.7**	**Subunit 2**	**A1**
716.7	52.329	0.228	69	0.926	1.067	0.98	0.221	0.820	0	0	**0.092**	FALSE	FALSE	FALSE	**2.4**	**Subunit 2**	**A1**

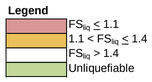
Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
716.5	52.493	0.167	62	0.937	1.016	0.99	0.157	0.819	0	0	**0.092**	FALSE	FALSE	FALSE	**1.7**	**Subunit 2**	**A1**
716.3	52.657	0.159	61	0.939	1.008	0.99	0.149	0.818	0	0	**0.092**	FALSE	FALSE	FALSE	**1.6**	**Subunit 2**	**A1**
716.2	52.821	0.161	61	0.938	1.009	0.99	0.150	0.817	0	0	**0.092**	FALSE	FALSE	FALSE	**1.6**	**Subunit 2**	**A1**
716.0	52.985	0.178	64	0.934	1.025	0.99	0.168	0.817	0	0	**0.092**	FALSE	FALSE	FALSE	**1.8**	**Subunit 2**	**A1**
715.9	53.149	0.175	64	0.934	1.022	0.99	0.165	0.816	0	0	**0.092**	FALSE	FALSE	FALSE	**1.8**	**Subunit 2**	**A1**
715.7	53.313	0.167	62	0.936	1.014	0.99	0.156	0.815	0	0	**0.092**	FALSE	FALSE	FALSE	**1.7**	**Subunit 2**	**A1**
715.5	53.477	0.172	63	0.934	1.019	0.99	0.162	0.815	0	0	**0.092**	FALSE	FALSE	FALSE	**1.8**	**Subunit 2**	**A1**
715.4	53.641	0.152	59	0.939	1.000	0.99	0.141	0.814	0	0	**0.092**	FALSE	FALSE	FALSE	**1.5**	**Subunit 2**	**A1**
715.2	53.805	0.169	63	0.934	1.016	0.99	0.159	0.813	0	0	**0.092**	FALSE	FALSE	FALSE	**1.7**	**Subunit 2**	**A1**
715.0	53.969	0.144	57	0.941	0.992	0.99	0.133	0.812	0	0	**0.092**	FALSE	FALSE	FALSE	**1.5**	**Subunit 2**	**A1**
714.9	54.133	0.133	54	0.944	0.981	0.99	0.122	0.812	0	0	**0.092**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**B**
714.7	54.297	0.126	51	0.946	0.975	0.99	0.116	0.811	0	0	**0.092**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**B**
714.5	54.461	0.171	63	0.932	1.016	0.99	0.160	0.810	0	0	**0.092**	FALSE	FALSE	FALSE	**1.7**	**Subunit 2**	**A1**
714.4	54.625	0.250	71	0.917	1.074	0.98	0.242	0.810	0	0	**0.092**	FALSE	FALSE	FALSE	**2.6**	**Subunit 2**	**A1**
714.2	54.789	N/A	81	N/A	N/A	N/A	N/A	0.809	0	0	**0.092**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
714.0	54.953	N/A	88	N/A	N/A	N/A	N/A	0.808	0	0	**0.091**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
713.9	55.117	N/A	100	N/A	N/A	N/A	N/A	0.808	0	0	**0.091**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
713.7	55.281	N/A	100	N/A	N/A	N/A	N/A	0.807	0	0	**0.091**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
713.6	55.446	N/A	100	N/A	N/A	N/A	N/A	0.806	0	0	**0.091**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
713.4	55.610	N/A	94	N/A	N/A	N/A	N/A	0.805	0	0	**0.091**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
713.2	55.774	N/A	85	N/A	N/A	N/A	N/A	0.805	0	0	**0.091**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
713.1	55.938	N/A	81	N/A	N/A	N/A	N/A	0.804	0	0	**0.091**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
712.9	56.102	N/A	82	N/A	N/A	N/A	N/A	0.803	0	0	**0.091**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
712.7	56.266	N/A	85	N/A	N/A	N/A	N/A	0.803	0	0	**0.091**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
712.6	56.430	N/A	88	N/A	N/A	N/A	N/A	0.802	0	0	**0.091**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
712.4	56.594	N/A	88	N/A	N/A	N/A	N/A	0.801	0	0	**0.091**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
712.2	56.758	N/A	92	N/A	N/A	N/A	N/A	0.800	0	0	**0.091**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
712.1	56.922	N/A	93	N/A	N/A	N/A	N/A	0.800	0	0	**0.091**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
711.9	57.086	N/A	95	N/A	N/A	N/A	N/A	0.799	0	0	**0.091**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
711.8	57.250	N/A	94	N/A	N/A	N/A	N/A	0.798	0	0	**0.091**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
711.6	57.414	N/A	97	N/A	N/A	N/A	N/A	0.798	0	0	**0.091**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
711.4	57.578	N/A	100	N/A	N/A	N/A	N/A	0.797	0	0	**0.091**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
711.3	57.742	N/A	100	N/A	N/A	N/A	N/A	0.796	0	0	**0.090**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
711.1	57.906	N/A	99	N/A	N/A	N/A	N/A	0.796	0	0	**0.090**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
710.9	58.070	N/A	100	N/A	N/A	N/A	N/A	0.795	0	0	**0.090**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
710.8	58.234	N/A	100	N/A	N/A	N/A	N/A	0.794	0	0	**0.090**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
710.6	58.398	N/A	100	N/A	N/A	N/A	N/A	0.793	0	0	**0.090**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
710.4	58.562	N/A	100	N/A	N/A	N/A	N/A	0.793	0	0	**0.090**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
710.3	58.726	N/A	100	N/A	N/A	N/A	N/A	0.792	0	0	**0.090**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
710.1	58.890	N/A	95	N/A	N/A	N/A	N/A	0.791	0	0	**0.090**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
709.9	59.054	N/A	100	N/A	N/A	N/A	N/A	0.791	0	0	**0.090**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
709.8	59.218	N/A	90	N/A	N/A	N/A	N/A	0.790	0	0	**0.090**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
709.6	59.382	N/A	100	N/A	N/A	N/A	N/A	0.789	0	0	**0.090**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
709.5	59.547	N/A	100	N/A	N/A	N/A	N/A	0.789	0	0	**0.090**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
709.3	59.711	N/A	100	N/A	N/A	N/A	N/A	0.788	0	0	**0.090**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
709.1	59.875	N/A	99	N/A	N/A	N/A	N/A	0.787	0	0	**0.090**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
709.0	60.039	N/A	100	N/A	N/A	N/A	N/A	0.787	0	0	**0.090**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
708.8	60.203	N/A	100	N/A	N/A	N/A	N/A	0.786	0	0	**0.090**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
708.6	60.367	N/A	100	N/A	N/A	N/A	N/A	0.785	0	0	**0.090**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
708.5	60.531	N/A	100	N/A	N/A	N/A	N/A	0.784	0	0	**0.089**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
708.3	60.695	N/A	100	N/A	N/A	N/A	N/A	0.784	0	0	**0.089**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
708.1	60.859	N/A	100	N/A	N/A	N/A	N/A	0.783	0	0	**0.089**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
708.0	61.023	N/A	93	N/A	N/A	N/A	N/A	0.782	0	0	**0.089**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
707.8	61.187	N/A	95	N/A	N/A	N/A	N/A	0.782	0	0	**0.089**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
707.6	61.351	N/A	95	N/A	N/A	N/A	N/A	0.781	0	0	**0.089**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**

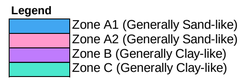
Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
707.5	61.515	N/A	100	N/A	N/A	N/A	N/A	0.780	0	0	**0.089**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
707.3	61.679	N/A	100	N/A	N/A	N/A	N/A	0.780	0	0	**0.089**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
707.2	61.843	N/A	100	N/A	N/A	N/A	N/A	0.779	0	0	**0.089**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
707.0	62.007	N/A	100	N/A	N/A	N/A	N/A	0.778	0	0	**0.089**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
706.8	62.171	N/A	94	N/A	N/A	N/A	N/A	0.778	0	0	**0.089**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
706.7	62.335	N/A	88	N/A	N/A	N/A	N/A	0.777	0	0	**0.089**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
706.5	62.499	N/A	82	N/A	N/A	N/A	N/A	0.776	0	0	**0.089**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
706.3	62.663	0.272	72	0.894	1.061	0.98	0.252	0.776	0	0	**0.089**	FALSE	FALSE	FALSE	**2.8**	**Subunit 2**	**B**
706.2	62.827	0.147	58	0.924	0.992	0.99	0.133	0.775	0	0	**0.089**	FALSE	FALSE	FALSE	**1.5**	**Subunit 2**	**B**
706.0	62.991	N/A	97	N/A	N/A	N/A	N/A	0.774	0	0	**0.089**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
705.8	63.155	N/A	100	N/A	N/A	N/A	N/A	0.774	0	0	**0.088**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
705.7	63.319	N/A	100	N/A	N/A	N/A	N/A	0.773	0	0	**0.088**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
705.5	63.483	N/A	100	N/A	N/A	N/A	N/A	0.772	0	0	**0.088**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
705.4	63.648	N/A	100	N/A	N/A	N/A	N/A	0.772	0	0	**0.088**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
705.2	63.812	N/A	100	N/A	N/A	N/A	N/A	0.771	0	0	**0.088**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
705.0	63.976	N/A	100	N/A	N/A	N/A	N/A	0.770	0	0	**0.088**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
704.9	64.140	N/A	100	N/A	N/A	N/A	N/A	0.769	0	0	**0.088**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
704.7	64.304	N/A	100	N/A	N/A	N/A	N/A	0.769	0	0	**0.088**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
704.5	64.468	N/A	100	N/A	N/A	N/A	N/A	0.768	0	0	**0.088**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
704.4	64.632	N/A	100	N/A	N/A	N/A	N/A	0.767	0	0	**0.088**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**



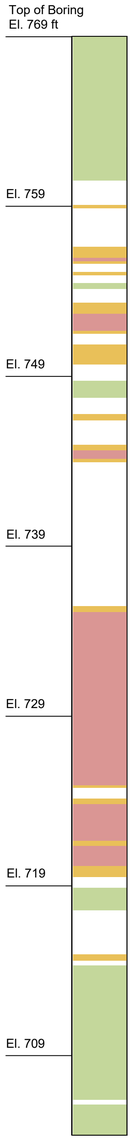
Adapted from "Discussion of 'Liquefaction Potential of Silts from CPTu'" (Robertson 2008). Zone A_1 and Zone A_2 samples are generally sand-like. Zone B samples are generally clay-like and not susceptible to cyclic softening. Zone C samples are generally clay-like and susceptible to cyclic softening. Note that the transition from clay-like to sand-like in this chart does not exactly match the liquefaction calculations herein; that is, some transitional samples in Zone B and Zone C will be treated as sand-like and analyzed for liquefaction if the calculations indicate as such.



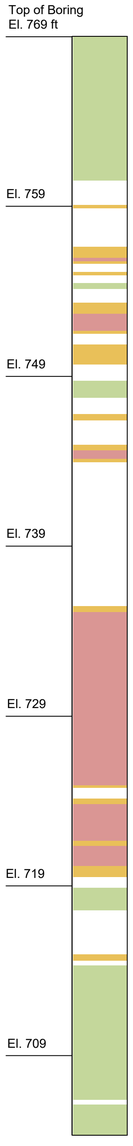




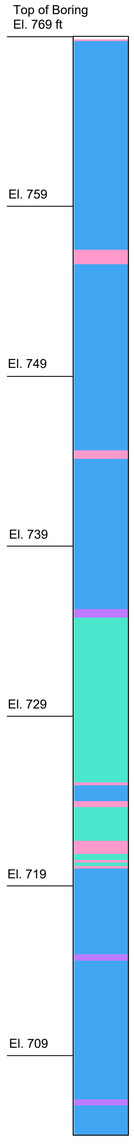
KIF-BF-CPT-4AA, Liquefaction Triggering Results



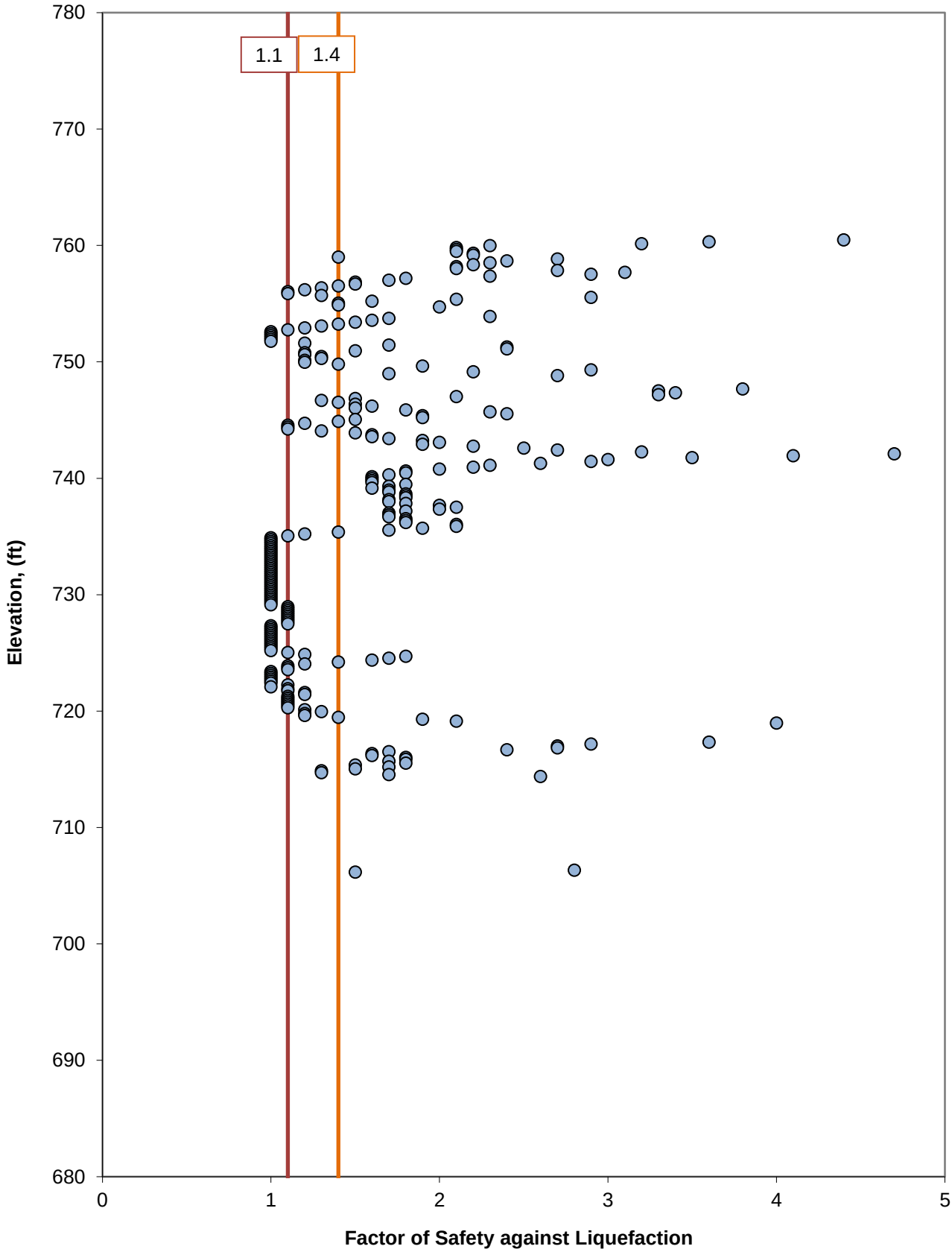
KIF-BF-CPT-4AA, Liquefaction Triggering Results



KIF-BF-CPT-4AA, Robertson Soil Type



KIF TDEC Stability, Boring = KIF-BF-CPT-4AA, Source = 1 Hz, Mw = 7.6, Event = Design EQ, CPT Data, Simplified Stress-Based Approach



Project Information

Stantec Project Number =	175668043
Project Name =	KIF TDEC Stability
CPT ID =	KIF-BF-CPT-5B

Boring Location (optional)

Northing =	
Easting =	

OR

Baseline Station =	
Offset (+ Right) =	

Using qt (corrected for u2 PWP) or qc (backcalculated uncorrected field tip)

Cone ID (optional) =	AD184	
Use qc instead of qt?	0	(1: Yes, 0: No)
Cone Area Ratio (a) =	0.80	

Drilling Information

Top of Hole Elevation =	769.0	feet
Water Depth during CPT (negative for U/S borings) =	13.0	feet
Depth data collection began =	0.16	feet
Avg. Total Unit Wt. Above 1st Sample =	122.00	pcf

During Earthquake Information

Water Depth during EQ (relative to CPT TOH, negative for U/S borings) =	15.0	feet
Final Grade Elevation during EQ =	766.0	feet
Avg. Total Unit Wt. of Cut/Fill =	122	pcf

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile?	0	(1: Yes, 0: No)

If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile:	g_Pond_Section, KIF-BF-CPT5B_NOR	
α at each Sample Depth known?	1	(1: Yes, 0: No)

If previous answer is No, then enter curve fit parameters below (α vs. depth curve)

If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_α will be one.

m4:	
m3:	
m2:	
m1:	
m0:	

Associated ground response profile:	shing_Pond_Section, KIF-BF-SPT5	
Get CSR from shear stress envelope?	0	(1: Yes, 0: No)

If previous answer is No, then CSR will be calculated using a_{max} and r_d

Max. Shear Stress at each sample depth known?		(1: Yes, 0: No)

If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4:	
m3:	
m2:	
m1:	

Earthquake Information

EQ Source (e.g., New Madrid)	1 Hz
Event (e.g., MCE, OBE)	Design EQ
a_{max} (g) (top of ground surface)	0.10
EQ Mag (Mw)	7.6

Inputs

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
0.164	0.010	0.000	119	Bottom Ash	Sand-like		-0.010			
0.328	0.010	0.000	119	Bottom Ash	Sand-like		-0.006			
0.492	0.010	0.000	119	Bottom Ash	Sand-like		-0.003			
0.656	0.010	0.000	119	Bottom Ash	Sand-like		0.001			
0.820	0.010	0.000	119	Bottom Ash	Sand-like		0.005			
0.984	0.010	0.000	119	Bottom Ash	Sand-like		0.008			
1.148	0.010	0.000	119	Bottom Ash	Sand-like		0.012			
1.312	0.010	0.000	119	Bottom Ash	Sand-like		0.016			
1.476	0.010	0.000	119	Bottom Ash	Sand-like		0.019			
1.640	0.010	0.000	119	Bottom Ash	Sand-like		0.023			
1.804	0.010	0.000	119	Bottom Ash	Sand-like		0.026			
1.968	0.010	0.000	119	Bottom Ash	Sand-like		0.030			
2.133	0.010	0.000	119	Bottom Ash	Sand-like		0.034			
2.297	0.010	0.000	119	Bottom Ash	Sand-like		0.037			
2.461	0.010	0.000	119	Bottom Ash	Sand-like		0.041			
2.625	0.010	0.000	119	Bottom Ash	Sand-like		0.045			
2.789	0.010	0.000	119	Bottom Ash	Sand-like		0.048			
2.953	0.010	0.000	119	Bottom Ash	Sand-like		0.052			
3.117	0.010	0.000	119	Bottom Ash	Sand-like		0.056			
3.281	0.010	0.000	119	Bottom Ash	Sand-like		0.059			
3.445	0.010	0.000	119	Bottom Ash	Sand-like		0.063			
3.609	0.010	0.000	119	Bottom Ash	Sand-like		0.067			
3.773	0.010	0.000	119	Bottom Ash	Sand-like		0.070			
3.937	0.010	0.000	119	Bottom Ash	Sand-like		0.074			
4.101	0.010	0.000	119	Bottom Ash	Sand-like		0.078			
4.265	0.010	0.000	119	Bottom Ash	Sand-like		0.081			
4.429	0.010	0.000	119	Bottom Ash	Sand-like		0.085			
4.593	0.010	0.000	119	Bottom Ash	Sand-like		0.089			
4.757	0.010	0.000	119	Bottom Ash	Sand-like		0.093			
4.921	0.010	0.000	119	Bottom Ash	Sand-like		0.097			
5.085	0.010	0.000	119	Bottom Ash	Sand-like		0.100			
5.249	0.010	0.000	119	Bottom Ash	Sand-like		0.102			
5.413	0.010	0.000	119	Bottom Ash	Sand-like		0.104			
5.577	0.010	0.000	119	Bottom Ash	Sand-like		0.106			
5.741	0.010	0.000	119	Bottom Ash	Sand-like		0.108			
5.905	0.010	0.000	119	Bottom Ash	Sand-like		0.110			
6.069	0.010	0.000	119	Bottom Ash	Sand-like		0.112			
6.234	0.010	0.000	119	Bottom Ash	Sand-like		0.113			
6.398	0.010	0.000	119	Bottom Ash	Sand-like		0.114			
6.562	0.010	0.000	119	Bottom Ash	Sand-like		0.115			
6.726	0.010	0.000	119	Bottom Ash	Sand-like		0.116			
6.890	0.010	0.000	119	Bottom Ash	Sand-like		0.117			
7.054	0.010	0.000	119	Bottom Ash	Sand-like		0.118			
7.218	0.010	0.000	119	Bottom Ash	Sand-like		0.118			
7.382	0.010	0.000	119	Bottom Ash	Sand-like		0.119			
7.546	0.010	0.000	119	Bottom Ash	Sand-like		0.119			
7.710	0.010	0.000	119	Bottom Ash	Sand-like		0.119			
7.874	0.010	0.000	119	Bottom Ash	Sand-like		0.119			
8.038	0.010	0.000	119	Bottom Ash	Sand-like		0.120			
8.202	0.010	0.000	119	Bottom Ash	Sand-like		0.120			
8.366	0.010	0.000	119	Bottom Ash	Sand-like		0.120			
8.530	0.010	0.000	119	Bottom Ash	Sand-like		0.120			
8.694	0.010	0.000	119	Bottom Ash	Sand-like		0.120			
8.858	0.010	0.000	119	Bottom Ash	Sand-like		0.119			
9.022	0.010	0.000	119	Bottom Ash	Sand-like		0.119			
9.186	0.010	0.000	119	Bottom Ash	Sand-like		0.119			
9.350	0.010	0.000	119	Bottom Ash	Sand-like		0.119			
9.514	0.010	0.000	119	Bottom Ash	Sand-like		0.119			
9.678	0.010	0.000	119	Bottom Ash	Sand-like		0.119			
9.842	0.010	0.000	119	Bottom Ash	Sand-like		0.120			
10.006	0.010	0.000	119	Bottom Ash	Sand-like		0.120			
10.170	0.010	0.000	119	Bottom Ash	Sand-like		0.120			
10.335	0.010	0.000	119	Bottom Ash	Sand-like		0.120			

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
10.499	0.010	0.000	119	Bottom Ash	Sand-like		0.120			
10.663	0.010	0.000	119	Bottom Ash	Sand-like		0.121			
10.827	0.010	0.000	119	Bottom Ash	Sand-like		0.121			
10.991	0.010	0.000	119	Bottom Ash	Sand-like		0.121			
11.155	0.010	0.000	119	Bottom Ash	Sand-like		0.122			
11.319	0.010	0.000	119	Bottom Ash	Sand-like		0.122			
11.483	0.010	0.000	119	Bottom Ash	Sand-like		0.122			
11.647	0.010	0.000	119	Bottom Ash	Sand-like		0.122			
11.811	0.010	0.000	119	Bottom Ash	Sand-like		0.122			
11.975	0.010	0.000	119	Bottom Ash	Sand-like		0.122			
12.139	0.010	0.000	119	Bottom Ash	Sand-like		0.122			
12.303	0.010	0.000	119	Bottom Ash	Sand-like		0.122			
12.467	17.931	0.229	119	Bottom Ash	Sand-like		0.123			
12.631	88.712	0.318	119	Bottom Ash	Sand-like		0.123			
12.795	135.437	0.482	119	Bottom Ash	Sand-like		0.123			
12.959	162.552	1.078	119	Bottom Ash	Sand-like		0.123			
13.123	146.638	1.257	119	Bottom Ash	Sand-like		0.123			
13.287	135.162	1.602	119	Bottom Ash	Sand-like		0.123			
13.451	160.380	2.054	119	Bottom Ash	Sand-like		0.126			
13.615	182.750	2.800	119	Bottom Ash	Sand-like		0.130			
13.779	175.539	3.537	119	Bottom Ash	Sand-like		0.134			
13.943	139.731	3.409	119	Bottom Ash	Sand-like		0.138			
14.107	111.945	2.841	119	Bottom Ash	Sand-like		0.142			
14.271	101.047	2.192	119	Bottom Ash	Sand-like		0.141			
14.436	105.200	1.958	119	Bottom Ash	Sand-like		0.120			
14.600	113.450	1.839	119	Bottom Ash	Sand-like		0.098			
14.764	116.511	1.906	119	Bottom Ash	Sand-like		0.077			
14.928	108.389	1.887	119	Bottom Ash	Sand-like		0.056			
15.092	108.025	1.827	119	Bottom Ash	Sand-like		0.035			
15.256	94.543	1.660	119	Bottom Ash	Sand-like		0.023			
15.420	77.147	1.783	119	Bottom Ash	Sand-like		0.019			
15.584	70.599	1.525	119	Bottom Ash	Sand-like		0.015			
15.748	73.152	1.214	119	Bottom Ash	Sand-like		0.011			
15.912	70.365	0.955	119	Bottom Ash	Sand-like		0.008			
16.076	56.715	0.824	119	Bottom Ash	Sand-like		0.004			
16.240	44.747	0.621	119	Bottom Ash	Sand-like		0.002			
16.404	34.805	0.569	119	Bottom Ash	Sand-like		0.002			
16.568	48.743	0.577	119	Bottom Ash	Sand-like		0.002			
16.732	47.148	0.647	119	Bottom Ash	Sand-like		0.002			
16.896	50.857	0.832	119	Bottom Ash	Sand-like		0.002			
17.060	47.953	0.924	119	Bottom Ash	Sand-like		0.002			
17.224	50.698	0.911	119	Bottom Ash	Sand-like		0.002			
17.388	45.435	0.796	119	Bottom Ash	Sand-like		0.002			
17.552	38.702	0.662	119	Bottom Ash	Sand-like		0.002			
17.716	32.245	0.548	119	Bottom Ash	Sand-like		0.002			
17.880	30.530	0.481	119	Bottom Ash	Sand-like		0.002			
18.044	33.904	0.462	119	Bottom Ash	Sand-like		0.002			
18.208	41.593	0.555	119	Bottom Ash	Sand-like		0.002			
18.372	41.570	0.625	119	Bottom Ash	Sand-like		0.002			
18.537	41.843	0.647	119	Bottom Ash	Sand-like		0.002			
18.701	36.818	0.627	119	Bottom Ash	Sand-like		0.003			
18.865	29.479	0.642	119	Bottom Ash	Sand-like		0.003			
19.029	26.797	0.708	119	Bottom Ash	Sand-like		0.003			
19.193	53.782	0.828	119	Bottom Ash	Sand-like		0.003			
19.357	167.541	0.906	119	Bottom Ash	Sand-like		0.003			
19.521	241.380	0.440	119	Bottom Ash	Sand-like		0.003			
19.685	283.056	0.949	119	Bottom Ash	Sand-like		0.003			
19.849	286.448	1.056	119	Bottom Ash	Sand-like		0.003			
20.013	381.474	1.163	119	Bottom Ash	Sand-like		0.003			
20.177	399.587	1.871	119	Bottom Ash	Sand-like		0.003			
20.341	402.329	2.095	119	Bottom Ash	Sand-like		0.003			
20.505	372.969	2.316	119	Bottom Ash	Sand-like		0.003			
20.669	367.470	2.616	119	Bottom Ash	Sand-like		0.004			
20.833	348.424	2.601	119	Bottom Ash	Sand-like		0.004			
20.997	310.413	3.065	119	Bottom Ash	Sand-like		0.004			
21.161	290.527	2.812	119	Bottom Ash	Sand-like		0.004			
21.325	261.470	2.076	119	Bottom Ash	Sand-like		0.004			
21.489	227.354	1.285	119	Bottom Ash	Sand-like		0.004			
21.653	192.912	0.614	119	Bottom Ash	Sand-like		0.004			
21.817	172.948	0.297	119	Bottom Ash	Sand-like		0.004			
21.981	158.248	0.298	119	Bottom Ash	Sand-like		0.004			
22.145	160.432	0.289	112	Fly Ash	Sand-like	Do Not Correct for FC	0.004			
22.309	160.563	0.252	112	Fly Ash	Sand-like	Do Not Correct for FC	0.004			
22.473	136.171	0.222	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
22.638	123.864	0.214	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
22.802	117.618	0.058	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
22.966	104.441	0.052	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
23.130	89.032	0.179	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
23.294	84.830	0.078	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
23.458	82.804	0.047	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
23.622	67.479	0.046	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
23.786	51.672	0.068	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
23.950	43.568	0.056	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
24.114	37.835	0.036	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
24.278	40.195	0.060	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
24.442	45.128	0.086	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
24.606	60.393	0.171	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
24.770	73.947	0.273	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
24.934	76.810	0.608	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
25.098	74.902	0.905	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
25.262	68.969	1.129	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
25.426	72.855	1.056	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
25.590	79.321	0.803	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
25.754	74.141	0.615	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
25.918	59.699	0.404	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
26.082	46.241	0.107	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
26.246	37.122	0.060	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
26.410	31.389	0.077	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
26.574	31.556	0.055	112	Fly Ash	Sand-like	Do Not Correct for FC	0.006			
26.739	33.968	0.060	112	Fly Ash	Sand-like	Do Not Correct for FC	0.006			
26.903	36.993	0.089	112	Fly Ash	Sand-like	Do Not Correct for FC	0.006			
27.067	37.781	0.164	112	Fly Ash	Sand-like	Do Not Correct for FC	0.006			
27.231	43.966	0.254	112	Fly Ash	Sand-like	Do Not Correct for FC	0.006			
27.395	46.759	0.329	112	Fly Ash	Sand-like	Do Not Correct for FC	0.006			
27.559	51.232	0.403	112	Fly Ash	Sand-like	Do Not Correct for FC	0.006			
27.723	51.715	0.523	112	Fly Ash	Sand-like	Do Not Correct for FC	0.006			
27.887	53.230	0.648	112	Fly Ash	Sand-like	Do Not Correct for FC	0.006			
28.051	53.294	0.766	112	Fly Ash	Sand-like	Do Not Correct for FC	0.007			
28.215	52.733	0.807	112	Fly Ash	Sand-like	Do Not Correct for FC	0.007			
28.379	49.692	0.815	112	Fly Ash	Sand-like	Do Not Correct for FC	0.007			
28.543	46.993	0.787	112	Fly Ash	Sand-like	Do Not Correct for FC	0.007			
28.707	45.002	0.757	112	Fly Ash	Sand-like	Do Not Correct for FC	0.007			
28.871	44.380	0.712	112	Fly Ash	Sand-like	Do Not Correct for FC	0.007			
29.035	49.942	0.630	112	Fly Ash	Sand-like	Do Not Correct for FC	0.007			
29.199	60.132	0.621	112	Fly Ash	Sand-like	Do Not Correct for FC	0.007			
29.363	63.157	0.498	112	Fly Ash	Sand-like	Do Not Correct for FC	0.007			
29.527	57.901	0.604	112	Fly Ash	Sand-like	Do Not Correct for FC	0.007			
29.691	51.286	0.730	112	Fly Ash	Sand-like	Do Not Correct for FC	0.007			
29.855	49.810	0.820	112	Fly Ash	Sand-like	Do Not Correct for FC	0.008			
30.019	53.881	0.944	112	Fly Ash	Sand-like	Do Not Correct for FC	0.008			
30.183	62.668	1.141	112	Fly Ash	Sand-like	Do Not Correct for FC	0.008			
30.347	75.854	1.406	112	Fly Ash	Sand-like	Do Not Correct for FC	0.008			
30.511	78.345	1.737	112	Fly Ash	Sand-like	Do Not Correct for FC	0.008			
30.675	79.271	1.920	112	Fly Ash	Sand-like	Do Not Correct for FC	0.008			
30.840	73.417	1.950	112	Fly Ash	Sand-like	Do Not Correct for FC	0.008			
31.004	73.528	1.872	112	Fly Ash	Sand-like	Do Not Correct for FC	0.008			
31.168	79.680	1.895	112	Fly Ash	Sand-like	Do Not Correct for FC	0.008			
31.332	82.725	2.040	112	Fly Ash	Sand-like	Do Not Correct for FC	0.008			
31.496	73.444	2.144	112	Fly Ash	Sand-like	Do Not Correct for FC	0.008			
31.660	70.184	2.060	112	Fly Ash	Sand-like	Do Not Correct for FC	0.008			
31.824	69.401	2.028	112	Fly Ash	Sand-like	Do Not Correct for FC	0.008			
31.988	69.361	1.974	112	Fly Ash	Sand-like	Do Not Correct for FC	0.009			
32.152	70.906	1.959	112	Fly Ash	Sand-like	Do Not Correct for FC	0.009			
32.316	69.099	1.954	112	Fly Ash	Sand-like	Do Not Correct for FC	0.009			
32.480	70.980	1.934	112	Fly Ash	Sand-like	Do Not Correct for FC	0.009			
32.644	73.010	1.449	112	Fly Ash	Sand-like	Do Not Correct for FC	0.009			
32.808	68.149	1.479	112	Fly Ash	Sand-like	Do Not Correct for FC	0.009			
32.972	66.202	1.594	112	Fly Ash	Sand-like	Do Not Correct for FC	0.009			
33.136	69.194	1.811	112	Fly Ash	Sand-like	Do Not Correct for FC	0.009			
33.300	71.300	1.945	112	Fly Ash	Sand-like	Do Not Correct for FC	0.009			
33.464	76.257	2.079	112	Fly Ash	Sand-like	Do Not Correct for FC	0.009			
33.628	80.456	2.062	112	Fly Ash	Sand-like	Do Not Correct for FC	0.009			
33.792	69.872	1.938	112	Fly Ash	Sand-like	Do Not Correct for FC	0.009			
33.956	58.049	1.629	112	Fly Ash	Sand-like	Do Not Correct for FC	0.010			
34.120	39.371	1.365	112	Fly Ash	Sand-like	Do Not Correct for FC	0.010			
34.284	27.171	1.049	112	Fly Ash	Sand-like	Do Not Correct for FC	0.010			
34.448	18.431	0.745	112	Fly Ash	Sand-like	Do Not Correct for FC	0.010			
34.612	13.321	0.487	112	Fly Ash	Sand-like	Do Not Correct for FC	0.010			
34.776	11.156	0.245	112	Fly Ash	Sand-like	Do Not Correct for FC	0.010			
34.941	10.166	0.137	112	Fly Ash	Sand-like	Do Not Correct for FC	0.010			

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
35.105	9.307	0.094	112	Fly Ash	Sand-like	Do Not Correct for FC	0.010			
35.269	9.205	0.107	112	Fly Ash	Sand-like	Do Not Correct for FC	0.010			
35.433	10.071	0.137	112	Fly Ash	Sand-like	Do Not Correct for FC	0.010			
35.597	11.085	0.165	112	Fly Ash	Sand-like	Do Not Correct for FC	0.010			
35.761	12.643	0.333	112	Fly Ash	Sand-like	Do Not Correct for FC	0.010			
35.925	15.196	0.324	112	Fly Ash	Sand-like	Do Not Correct for FC	0.010			
36.089	14.972	0.619	112	Fly Ash	Sand-like	Do Not Correct for FC	0.010			
36.253	15.353	0.600	112	Fly Ash	Sand-like	Do Not Correct for FC	0.010			
36.417	14.102	0.516	112	Fly Ash	Sand-like	Do Not Correct for FC	0.010			
36.581	13.491	0.370	112	Fly Ash	Sand-like	Do Not Correct for FC	0.010			
36.745	11.058	0.303	112	Fly Ash	Sand-like	Do Not Correct for FC	0.010			
36.909	9.715	0.248	112	Fly Ash	Sand-like	Do Not Correct for FC	0.011			
37.073	8.069	0.243	112	Fly Ash	Sand-like	Do Not Correct for FC	0.011			
37.237	7.503	0.223	112	Fly Ash	Sand-like	Do Not Correct for FC	0.011			
37.401	7.265	0.195	112	Fly Ash	Sand-like	Do Not Correct for FC	0.011			
37.565	8.463	0.169	112	Fly Ash	Sand-like	Do Not Correct for FC	0.011			
37.729	8.790	0.144	112	Fly Ash	Sand-like	Do Not Correct for FC	0.011			
37.893	8.113	0.124	112	Fly Ash	Sand-like	Do Not Correct for FC	0.011			
38.057	9.472	0.133	112	Fly Ash	Sand-like	Do Not Correct for FC	0.011			
38.221	11.195	0.169	112	Fly Ash	Sand-like	Do Not Correct for FC	0.011			
38.385	21.383	0.280	112	Fly Ash	Sand-like	Do Not Correct for FC	0.011			
38.549	19.437	0.270	112	Fly Ash	Sand-like	Do Not Correct for FC	0.011			
38.713	18.100	0.248	112	Fly Ash	Sand-like	Do Not Correct for FC	0.011			
38.877	17.821	0.226	112	Fly Ash	Sand-like	Do Not Correct for FC	0.011			
39.042	18.718	0.246	112	Fly Ash	Sand-like	Do Not Correct for FC	0.011			
39.206	21.084	0.386	112	Fly Ash	Sand-like	Do Not Correct for FC	0.011			
39.370	21.695	0.575	112	Fly Ash	Sand-like	Do Not Correct for FC	0.011			
39.534	25.800	0.529	126	Subunit 2	Sand-like		0.012			
39.698	21.238	0.423	126	Subunit 2	Sand-like		0.012			
39.862	19.163	0.311	126	Subunit 2	Sand-like		0.012			
40.026	18.708	0.236	126	Subunit 2	Sand-like		0.012			
40.190	20.284	0.261	126	Subunit 2	Sand-like		0.012			
40.354	20.949	0.326	126	Subunit 2	Sand-like		0.012			
40.518	22.109	0.277	126	Subunit 2	Sand-like		0.012			
40.682	22.658	0.250	126	Subunit 2	Sand-like		0.012			
40.846	22.606	0.256	126	Subunit 2	Sand-like		0.012			
41.010	24.108	0.352	126	Subunit 2	Sand-like		0.012			
41.174	26.634	0.345	126	Subunit 2	Sand-like		0.012			
41.338	28.246	0.452	126	Subunit 2	Sand-like		0.012			
41.502	30.147	0.570	126	Subunit 2	Sand-like		0.012			
41.666	33.673	0.624	126	Subunit 2	Sand-like		0.013			
41.830	58.309	0.665	126	Subunit 2	Sand-like		0.013			
41.994	49.492	1.029	126	Subunit 2	Sand-like		0.013			
42.158	57.778	1.304	126	Subunit 2	Sand-like		0.013			
42.322	68.440	1.545	126	Subunit 2	Sand-like		0.013			
42.486	74.254	0.857	126	Subunit 2	Sand-like		0.013			
42.650	72.622	0.776	126	Subunit 2	Sand-like		0.013			
42.814	69.133	1.028	126	Subunit 2	Sand-like		0.013			
42.978	63.519	1.151	126	Subunit 2	Sand-like		0.013			
43.143	66.505	1.365	126	Subunit 2	Sand-like		0.013			
43.307	71.220	1.058	126	Subunit 2	Sand-like		0.013			
43.471	73.497	0.424	126	Subunit 2	Sand-like		0.014			
43.635	62.797	0.402	126	Subunit 2	Sand-like		0.014			
43.799	47.159	0.346	126	Subunit 2	Sand-like		0.014			
43.963	33.705	0.288	126	Subunit 2	Sand-like		0.014			
44.127	25.404	0.218	126	Subunit 2	Sand-like		0.014			
44.291	20.567	0.389	126	Subunit 2	Sand-like		0.014			
44.455	22.579	0.589	126	Subunit 2	Sand-like		0.014			
44.619	51.241	0.672	126	Subunit 2	Sand-like		0.014			
44.783	73.627	0.442	126	Subunit 2	Sand-like		0.014			
44.947	92.759	0.401	126	Subunit 2	Sand-like		0.015			
45.111	95.950	0.480	126	Subunit 2	Sand-like		0.015			
45.275	89.858	0.538	126	Subunit 2	Sand-like		0.015			
45.439	83.712	0.560	126	Subunit 2	Sand-like		0.015			
45.603	76.073	0.524	126	Subunit 2	Sand-like		0.015			
45.767	65.308	0.523	126	Subunit 2	Sand-like		0.015			
45.931	47.331	0.445	126	Subunit 2	Sand-like		0.015			
46.095	38.311	0.360	126	Subunit 2	Sand-like		0.015			
46.259	25.885	0.297	126	Subunit 2	Sand-like		0.015			
46.423	25.277	0.232	126	Subunit 2	Sand-like		0.015			
46.587	45.311	0.129	126	Subunit 2	Sand-like		0.015			
46.751	32.461	0.213	126	Subunit 2	Sand-like		0.015			
46.915	19.400	0.210	126	Subunit 2	Sand-like		0.016			
47.079	12.929	0.200	126	Subunit 2	Sand-like		0.016			
47.244	10.615	0.133	126	Subunit 2	Sand-like		0.016			

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
47.408	11.062	0.287	126	Subunit 2	Sand-like		0.016			
47.572	13.682	0.439	126	Subunit 2	Sand-like		0.016			
47.736	21.014	0.498	126	Subunit 2	Sand-like		0.016			
47.900	26.688	0.515	126	Subunit 2	Sand-like		0.016			
48.064	30.544	0.310	126	Subunit 2	Sand-like		0.016			
48.228	33.880	0.214	126	Subunit 2	Sand-like		0.016			
48.392	28.839	0.195	126	Subunit 2	Sand-like		0.016			
48.556	26.461	0.290	126	Subunit 2	Sand-like		0.016			
48.720	34.273	0.212	126	Subunit 2	Sand-like		0.017			
48.884	44.742	0.122	126	Subunit 2	Sand-like		0.017			
49.048	41.566	0.395	126	Subunit 2	Sand-like		0.017			
49.212	31.155	0.579	126	Subunit 2	Sand-like		0.017			
49.376	29.126	0.573	126	Subunit 2	Sand-like		0.017			
49.540	30.515	0.167	126	Subunit 2	Sand-like		0.017			
49.704	33.498	0.124	126	Subunit 2	Sand-like		0.017			
49.868	32.293	0.137	126	Subunit 2	Sand-like		0.017			
50.032	34.894	0.217	126	Subunit 2	Sand-like		0.017			
50.196	44.197	0.253	126	Subunit 2	Sand-like		0.017			
50.360	52.645	0.346	126	Subunit 2	Sand-like		0.017			
50.524	57.737	0.467	126	Subunit 2	Sand-like		0.018			
50.688	60.398	0.450	126	Subunit 2	Sand-like		0.018			
50.852	56.834	0.442	126	Subunit 2	Sand-like		0.018			
51.016	49.976	0.454	126	Subunit 2	Sand-like		0.018			
51.180	46.073	0.455	126	Subunit 2	Sand-like		0.018			
51.345	46.468	0.357	126	Subunit 2	Sand-like		0.018			
51.509	50.912	0.268	126	Subunit 2	Sand-like		0.018			
51.673	53.955	0.310	126	Subunit 2	Sand-like		0.018			
51.837	54.385	0.468	126	Subunit 2	Sand-like		0.018			
52.001	50.528	0.552	126	Subunit 2	Sand-like		0.018			
52.165	44.204	0.471	126	Subunit 2	Sand-like		0.018			
52.329	39.553	0.631	126	Subunit 2	Sand-like		0.018			
52.493	33.291	0.510	126	Subunit 2	Sand-like		0.018			
52.657	38.922	0.424	126	Subunit 2	Sand-like		0.019			
52.821	44.540	0.213	126	Subunit 2	Sand-like		0.019			
52.985	46.299	0.155	126	Subunit 2	Sand-like		0.019			
53.149	47.457	0.208	126	Subunit 2	Sand-like		0.019			
53.313	45.169	0.370	126	Subunit 2	Sand-like		0.019			
53.477	45.052	0.406	126	Subunit 2	Sand-like		0.019			
53.641	46.340	0.382	126	Subunit 2	Sand-like		0.019			
53.805	45.754	0.344	126	Subunit 2	Sand-like		0.019			
53.969	44.819	0.340	126	Subunit 2	Sand-like		0.019			
54.133	42.533	0.363	126	Subunit 2	Sand-like		0.019			
54.297	40.227	0.437	126	Subunit 2	Sand-like		0.019			
54.461	33.525	0.569	131	Subunit 3	Sand-like		0.019			
54.625	23.837	0.594	131	Subunit 3	Sand-like		0.019			
54.789	26.710	0.303	131	Subunit 3	Sand-like		0.019			
54.953	34.982	0.095	131	Subunit 3	Sand-like		0.019			
55.117	31.291	0.121	131	Subunit 3	Sand-like		0.019			
55.281	22.222	0.235	131	Subunit 3	Sand-like		0.019			
55.446	19.118	0.263	131	Subunit 3	Sand-like		0.020			
55.610	30.554	0.186	131	Subunit 3	Sand-like		0.020			
55.774	48.548	0.094	131	Subunit 3	Sand-like		0.020			
55.938	54.301	0.175	131	Subunit 3	Sand-like		0.020			
56.102	49.762	0.357	131	Subunit 3	Sand-like		0.020			
56.266	42.638	0.506	131	Subunit 3	Sand-like		0.020			
56.430	37.649	0.451	131	Subunit 3	Sand-like		0.020			
56.594	36.967	0.416	131	Subunit 3	Sand-like		0.020			
56.758	39.911	0.460	131	Subunit 3	Sand-like		0.020			
56.922	49.947	0.425	131	Subunit 3	Sand-like		0.020			
57.086	58.979	0.422	131	Subunit 3	Sand-like		0.020			
57.250	65.707	0.485	131	Subunit 3	Sand-like		0.020			
57.414	69.788	0.569	131	Subunit 3	Sand-like		0.020			
57.578	75.909	0.695	131	Subunit 3	Sand-like		0.020			
57.742	89.334	0.732	131	Subunit 3	Sand-like		0.020			
57.906	114.272	0.848	131	Subunit 3	Sand-like		0.020			
58.070	137.604	1.050	131	Subunit 3	Sand-like		0.020			
58.234	143.225	1.251	131	Subunit 3	Sand-like		0.020			
58.398	133.266	1.310	131	Subunit 3	Sand-like		0.020			
58.562	118.803	1.157	131	Subunit 3	Sand-like		0.020			
58.726	105.343	1.064	131	Subunit 3	Sand-like		0.020			
58.890	102.739	0.884	131	Subunit 3	Sand-like		0.020			
59.054	113.993	0.751	131	Subunit 3	Sand-like		0.020			
59.218	131.800	0.719	131	Subunit 3	Sand-like		0.020			
59.382	145.328	0.737	131	Subunit 3	Sand-like		0.020			
59.547	145.059	0.827	131	Subunit 3	Sand-like		0.020			

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
59.711	135.883	0.865	131	Subunit 3	Sand-like		0.020			
59.875	129.120	0.801	131	Subunit 3	Sand-like		0.020			
60.039	131.301	0.767	131	Subunit 3	Sand-like		0.020			
60.203	129.044	0.799	131	Subunit 3	Sand-like		0.020			
60.367	116.341	0.793	131	Subunit 3	Sand-like		0.020			
60.531	103.776	0.779	131	Subunit 3	Sand-like		0.020			
60.695	95.162	0.727	131	Subunit 3	Sand-like		0.020			
60.859	90.063	0.683	131	Subunit 3	Sand-like		0.020			
61.023	87.759	0.678	131	Subunit 3	Sand-like		0.020			
61.187	77.282	0.769	131	Subunit 3	Sand-like		0.020			
61.351	68.845	0.846	131	Subunit 3	Sand-like		0.020			
61.515	76.318	0.857	131	Subunit 3	Sand-like		0.020			
61.679	76.946	0.950	131	Subunit 3	Sand-like		0.020			
61.843	80.389	1.040	131	Subunit 3	Sand-like		0.020			
62.007	87.948	1.749	131	Subunit 3	Sand-like		0.020			
62.171	112.346	1.103	131	Subunit 3	Sand-like		0.021			
62.335	155.480	2.242	131	Subunit 3	Sand-like		0.021			
62.499	177.065	1.445	131	Subunit 3	Sand-like		0.021			
62.663	288.143	2.127	131	Subunit 3	Sand-like		0.021			
62.827	336.696	3.061	131	Subunit 3	Sand-like		0.021			
62.991	285.423	3.404	131	Subunit 3	Sand-like		0.021			
63.155	222.918	2.307	131	Subunit 3	Sand-like		0.021			
63.319	193.018	1.174	131	Subunit 3	Sand-like		0.021			
63.483	176.729	1.469	131	Subunit 3	Sand-like		0.021			
63.648	117.892	1.890	131	Subunit 3	Sand-like		0.021			
63.812	94.721	2.164	131	Subunit 3	Sand-like		0.021			
63.976	99.018	2.508	131	Subunit 3	Sand-like		0.021			
64.140	104.055	2.813	131	Subunit 3	Sand-like		0.021			
64.304	109.286	3.331	131	Subunit 3	Sand-like		0.021			
64.468	139.211	3.717	131	Subunit 3	Sand-like		0.021			
64.632	168.607	3.687	131	Subunit 3	Sand-like		0.021			
64.796	190.960	3.939	131	Subunit 3	Sand-like		0.021			
64.960	220.243	4.450	131	Subunit 3	Sand-like		0.021			
65.124	227.791	4.877	131	Subunit 3	Sand-like		0.021			
65.288	245.795	5.148	131	Subunit 3	Sand-like		0.021			
65.452	253.501	4.120	131	Subunit 3	Sand-like		0.021			
65.616	4.381	3.430	131	Subunit 3	Sand-like		0.021			
65.780	91.407	2.527	131	Subunit 3	Sand-like		0.021			
65.944	140.406	2.453	131	Subunit 3	Sand-like		0.021			
66.108	143.600	2.957	131	Subunit 3	Sand-like		0.021			
66.272	173.878	2.323	131	Subunit 3	Sand-like		0.021			
66.436	248.994	3.879	131	Subunit 3	Sand-like		0.021			
66.600	293.835	4.192	131	Subunit 3	Sand-like		0.021			
66.764	321.004	4.798	131	Subunit 3	Sand-like		0.021			
66.928	393.972	5.474	131	Subunit 3	Sand-like		0.021			
67.092	460.614	6.029	131	Subunit 3	Sand-like		0.021			
67.256	465.253	0.000	131	Subunit 3	Sand-like		0.021			
67.420	441.381	0.000	131	Subunit 3	Sand-like		0.021			

LIQUEFACTION POTENTIAL ASSESSMENT FOR COARSE GRAINED SOILS USING CONE PENETRATION TEST DATA

Facility: KIF TDEC Stability
Project No.: 175668043
CPT ID: KIF-BF-CPT-5B

Water Elevation during CPT:	756.0	ft
Depth to Water during CPT:	13.0	ft *(relative to ground surface during CPT)*
Water Elevation during Earthquake:	754.0	ft
Depth to Water during Earthquake:	15.0	ft *(relative to ground surface during CPT)*
Final Grade Elevation during EQ:	766	ft *(if no fill, then set this equal to top of CPT hole elev.)*
Height of Final Grade above CPT TOH:	-3.0	ft *(relative to ground surface during CPT, + Fill, - Cut)*
Unit Weight of Cut/Fill to Achieve Final Grade	122	pcf
Cut/Fill Total Stress (+ Fill, - Cut):	-0.18	tsf

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
769.0				Vertical Stresses above 1st CPT:			**0.01**	**-0.17**	**0.00**	**0.00**	**0.01**	**-0.17**
768.8	0.164	0.10	0.01	119	**0.16**	0.09	0.01	-0.17	0.00	0.00	0.01	-0.17
768.7	0.328	0.10	0.01	119	0.25	0.16	0.02	-0.16	0.00	0.00	0.02	-0.16
768.5	0.492	0.10	0.01	119	0.41	0.16	0.03	-0.15	0.00	0.00	0.03	-0.15
768.3	0.656	0.10	0.01	119	0.57	0.16	0.04	-0.14	0.00	0.00	0.04	-0.14
768.2	0.820	0.10	0.01	119	0.74	0.16	0.05	-0.13	0.00	0.00	0.05	-0.13
768.0	0.984	0.10	0.01	119	0.90	0.16	0.06	-0.12	0.00	0.00	0.06	-0.12
767.9	1.148	0.10	0.01	119	1.07	0.16	0.07	-0.11	0.00	0.00	0.07	-0.11
767.7	1.312	0.10	0.01	119	1.23	0.16	0.08	-0.10	0.00	0.00	0.08	-0.10
767.5	1.476	0.10	0.01	119	1.39	0.16	0.09	-0.09	0.00	0.00	0.09	-0.09
767.4	1.640	0.10	0.01	119	1.56	0.16	0.10	-0.09	0.00	0.00	0.10	-0.09
767.2	1.804	0.10	0.01	119	1.72	0.16	0.11	-0.08	0.00	0.00	0.11	-0.08
767.0	1.968	0.10	0.01	119	1.89	0.16	0.12	-0.07	0.00	0.00	0.12	-0.07
766.9	2.133	0.10	0.01	119	2.05	0.16	0.13	-0.06	0.00	0.00	0.13	-0.06
766.7	2.297	0.10	0.01	119	2.21	0.16	0.14	-0.05	0.00	0.00	0.14	-0.05
766.5	2.461	0.10	0.01	119	2.38	0.16	0.15	-0.04	0.00	0.00	0.15	-0.04
766.4	2.625	0.10	0.01	119	2.54	0.16	0.16	-0.03	0.00	0.00	0.16	-0.03
766.2	2.789	0.10	0.01	119	2.71	0.16	0.17	-0.02	0.00	0.00	0.17	-0.02
766.0	2.953	0.10	0.01	119	2.87	0.16	0.18	-0.01	0.00	0.00	0.18	-0.01
765.9	3.117	0.10	0.01	119	3.03	0.16	0.19	0.00	0.00	0.00	0.19	0.00
765.7	3.281	0.10	0.01	119	3.20	0.16	0.20	0.01	0.00	0.00	0.20	0.01
765.6	3.445	0.10	0.01	119	3.36	0.16	0.21	0.02	0.00	0.00	0.21	0.02
765.4	3.609	0.10	0.01	119	3.53	0.16	0.21	0.03	0.00	0.00	0.21	0.03
765.2	3.773	0.10	0.01	119	3.69	0.16	0.22	0.04	0.00	0.00	0.22	0.04
765.1	3.937	0.10	0.01	119	3.85	0.16	0.23	0.05	0.00	0.00	0.23	0.05
764.9	4.101	0.10	0.01	119	4.02	0.16	0.24	0.06	0.00	0.00	0.24	0.06
764.7	4.265	0.10	0.01	119	4.18	0.16	0.25	0.07	0.00	0.00	0.25	0.07
764.6	4.429	0.10	0.01	119	4.35	0.16	0.26	0.08	0.00	0.00	0.26	0.08
764.4	4.593	0.10	0.01	119	4.51	0.16	0.27	0.09	0.00	0.00	0.27	0.09
764.2	4.757	0.10	0.01	119	4.68	0.16	0.28	0.10	0.00	0.00	0.28	0.10
764.1	4.921	0.10	0.01	119	4.84	0.16	0.29	0.11	0.00	0.00	0.29	0.11
763.9	5.085	0.10	0.01	119	5.00	0.16	0.30	0.12	0.00	0.00	0.30	0.12
763.8	5.249	0.10	0.01	119	5.17	0.16	0.31	0.13	0.00	0.00	0.31	0.13
763.6	5.413	0.10	0.01	119	5.33	0.16	0.32	0.14	0.00	0.00	0.32	0.14
763.4	5.577	0.10	0.01	119	5.50	0.16	0.33	0.15	0.00	0.00	0.33	0.15
763.3	5.741	0.10	0.01	119	5.66	0.16	0.34	0.16	0.00	0.00	0.34	0.16
763.1	5.905	0.10	0.01	119	5.82	0.16	0.35	0.17	0.00	0.00	0.35	0.17
762.9	6.069	0.10	0.01	119	5.99	0.16	0.36	0.18	0.00	0.00	0.36	0.18
762.8	6.234	0.10	0.01	119	6.15	0.16	0.37	0.19	0.00	0.00	0.37	0.19
762.6	6.398	0.10	0.01	119	6.32	0.16	0.38	0.20	0.00	0.00	0.38	0.20
762.4	6.562	0.10	0.01	119	6.48	0.16	0.39	0.21	0.00	0.00	0.39	0.21
762.3	6.726	0.10	0.01	119	6.64	0.16	0.40	0.22	0.00	0.00	0.40	0.22
762.1	6.890	0.10	0.01	119	6.81	0.16	0.41	0.23	0.00	0.00	0.41	0.23
761.9	7.054	0.10	0.01	119	6.97	0.16	0.42	0.24	0.00	0.00	0.42	0.24
761.8	7.218	0.10	0.01	119	7.14	0.16	0.43	0.25	0.00	0.00	0.43	0.25
761.6	7.382	0.10	0.01	119	7.30	0.16	0.44	0.26	0.00	0.00	0.44	0.26
761.5	7.546	0.10	0.01	119	7.46	0.16	0.45	0.27	0.00	0.00	0.45	0.27
761.3	7.710	0.10	0.01	119	7.63	0.16	0.46	0.28	0.00	0.00	0.46	0.28
761.1	7.874	0.10	0.01	119	7.79	0.16	0.47	0.29	0.00	0.00	0.47	0.29
761.0	8.038	0.10	0.01	119	7.96	0.16	0.48	0.30	0.00	0.00	0.48	0.30
760.8	8.202	0.10	0.01	119	8.12	0.16	0.49	0.31	0.00	0.00	0.49	0.31
760.6	8.366	0.10	0.01	119	8.28	0.16	0.50	0.32	0.00	0.00	0.50	0.32
760.5	8.530	0.10	0.01	119	8.45	0.16	0.51	0.32	0.00	0.00	0.51	0.32
760.3	8.694	0.10	0.01	119	8.61	0.16	0.52	0.33	0.00	0.00	0.52	0.33
760.1	8.858	0.10	0.01	119	8.78	0.16	0.53	0.34	0.00	0.00	0.53	0.34
760.0	9.022	0.10	0.01	119	8.94	0.16	0.54	0.35	0.00	0.00	0.54	0.35
759.8	9.186	0.10	0.01	119	9.10	0.16	0.55	0.36	0.00	0.00	0.55	0.36
759.6	9.350	0.10	0.01	119	9.27	0.16	0.56	0.37	0.00	0.00	0.56	0.37
759.5	9.514	0.10	0.01	119	9.43	0.16	0.57	0.38	0.00	0.00	0.57	0.38

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
759.3	9.678	0.10	0.01	119	9.60	0.16	0.58	0.39	0.00	0.00	0.58	0.39
759.2	9.842	0.10	0.01	119	9.76	0.16	0.59	0.40	0.00	0.00	0.59	0.40
759.0	10.006	0.10	0.01	119	9.92	0.16	0.60	0.41	0.00	0.00	0.60	0.41
758.8	10.170	0.10	0.01	119	10.09	0.16	0.61	0.42	0.00	0.00	0.61	0.42
758.7	10.335	0.10	0.01	119	10.25	0.16	0.62	0.43	0.00	0.00	0.62	0.43
758.5	10.499	0.10	0.01	119	10.42	0.16	0.62	0.44	0.00	0.00	0.62	0.44
758.3	10.663	0.10	0.01	119	10.58	0.16	0.63	0.45	0.00	0.00	0.63	0.45
758.2	10.827	0.10	0.01	119	10.74	0.16	0.64	0.46	0.00	0.00	0.64	0.46
758.0	10.991	0.10	0.01	119	10.91	0.16	0.65	0.47	0.00	0.00	0.65	0.47
757.8	11.155	0.10	0.01	119	11.07	0.16	0.66	0.48	0.00	0.00	0.66	0.48
757.7	11.319	0.10	0.01	119	11.24	0.16	0.67	0.49	0.00	0.00	0.67	0.49
757.5	11.483	0.10	0.01	119	11.40	0.16	0.68	0.50	0.00	0.00	0.68	0.50
757.4	11.647	0.10	0.01	119	11.56	0.16	0.69	0.51	0.00	0.00	0.69	0.51
757.2	11.811	0.10	0.01	119	11.73	0.16	0.70	0.52	0.00	0.00	0.70	0.52
757.0	11.975	0.10	0.01	119	11.89	0.16	0.71	0.53	0.00	0.00	0.71	0.53
756.9	12.139	0.10	0.01	119	12.06	0.16	0.72	0.54	0.00	0.00	0.72	0.54
756.7	12.303	0.10	0.01	119	12.22	0.16	0.73	0.55	0.00	0.00	0.73	0.55
756.5	12.467	17.93	0.23	119	12.39	0.16	0.74	0.56	0.00	0.00	0.74	0.56
756.4	12.631	88.71	0.32	119	12.55	0.16	0.75	0.57	0.00	0.00	0.75	0.57
756.2	12.795	135.44	0.48	119	12.71	0.16	0.76	0.58	0.00	0.00	0.76	0.58
756.0	12.959	162.55	1.08	119	12.88	0.16	0.77	0.59	0.00	0.00	0.77	0.59
755.9	13.123	146.64	1.26	119	13.04	0.16	0.78	0.60	0.00	0.00	0.78	0.60
755.7	13.287	135.16	1.60	119	13.21	0.16	0.79	0.61	0.01	0.00	0.78	0.61
755.5	13.451	160.38	2.05	119	13.37	0.16	0.80	0.62	0.01	0.00	0.79	0.62
755.4	13.615	182.75	2.80	119	13.53	0.16	0.81	0.63	0.02	0.00	0.79	0.63
755.2	13.779	175.54	3.54	119	13.70	0.16	0.82	0.64	0.02	0.00	0.80	0.64
755.1	13.943	139.73	3.41	119	13.86	0.16	0.83	0.65	0.03	0.00	0.80	0.65
754.9	14.107	111.94	2.84	119	14.03	0.16	0.84	0.66	0.03	0.00	0.81	0.66
754.7	14.271	101.05	2.19	119	14.19	0.16	0.85	0.67	0.04	0.00	0.81	0.67
754.6	14.436	105.20	1.96	119	14.35	0.16	0.86	0.68	0.04	0.00	0.81	0.68
754.4	14.600	113.45	1.84	119	14.52	0.16	0.87	0.69	0.05	0.00	0.82	0.69
754.2	14.764	116.51	1.91	119	14.68	0.16	0.88	0.70	0.06	0.00	0.82	0.70
754.1	14.928	108.39	1.89	119	14.85	0.16	0.89	0.71	0.06	0.00	0.83	0.71
753.9	15.092	108.02	1.83	119	15.01	0.16	0.90	0.72	0.07	0.00	0.83	0.71
753.7	15.256	94.54	1.66	119	15.17	0.16	0.91	0.72	0.07	0.01	0.84	0.72
753.6	15.420	77.15	1.78	119	15.34	0.16	0.92	0.73	0.08	0.01	0.84	0.72
753.4	15.584	70.60	1.53	119	15.50	0.16	0.93	0.74	0.08	0.02	0.85	0.73
753.3	15.748	73.15	1.21	119	15.67	0.16	0.94	0.75	0.09	0.02	0.85	0.73
753.1	15.912	70.36	0.96	119	15.83	0.16	0.95	0.76	0.09	0.03	0.86	0.74
752.9	16.076	56.72	0.82	119	15.99	0.16	0.96	0.77	0.10	0.03	0.86	0.74
752.8	16.240	44.75	0.62	119	16.16	0.16	0.97	0.78	0.10	0.04	0.87	0.74
752.6	16.404	34.81	0.57	119	16.32	0.16	0.98	0.79	0.11	0.04	0.87	0.75
752.4	16.568	48.74	0.58	119	16.49	0.16	0.99	0.80	0.11	0.05	0.87	0.75
752.3	16.732	47.15	0.65	119	16.65	0.16	1.00	0.81	0.12	0.05	0.88	0.76
752.1	16.896	50.86	0.83	119	16.81	0.16	1.01	0.82	0.12	0.06	0.88	0.76
751.9	17.060	47.95	0.92	119	16.98	0.16	1.02	0.83	0.13	0.06	0.89	0.77
751.8	17.224	50.70	0.91	119	17.14	0.16	1.03	0.84	0.13	0.07	0.89	0.77
751.6	17.388	45.44	0.80	119	17.31	0.16	1.03	0.85	0.14	0.07	0.90	0.78
751.4	17.552	38.70	0.66	119	17.47	0.16	1.04	0.86	0.14	0.08	0.90	0.78
751.3	17.716	32.25	0.55	119	17.63	0.16	1.05	0.87	0.15	0.08	0.91	0.79
751.1	17.880	30.53	0.48	119	17.80	0.16	1.06	0.88	0.15	0.09	0.91	0.79
751.0	18.044	33.90	0.46	119	17.96	0.16	1.07	0.89	0.16	0.09	0.92	0.80
750.8	18.208	41.59	0.56	119	18.13	0.16	1.08	0.90	0.16	0.10	0.92	0.80
750.6	18.372	41.57	0.63	119	18.29	0.16	1.09	0.91	0.17	0.11	0.93	0.81
750.5	18.537	41.84	0.65	119	18.45	0.16	1.10	0.92	0.17	0.11	0.93	0.81
750.3	18.701	36.82	0.63	119	18.62	0.16	1.11	0.93	0.18	0.12	0.94	0.81
750.1	18.865	29.48	0.64	119	18.78	0.16	1.12	0.94	0.18	0.12	0.94	0.82
750.0	19.029	26.80	0.71	119	18.95	0.16	1.13	0.95	0.19	0.13	0.94	0.82
749.8	19.193	53.78	0.83	119	19.11	0.16	1.14	0.96	0.19	0.13	0.95	0.83
749.6	19.357	167.54	0.91	119	19.27	0.16	1.15	0.97	0.20	0.14	0.95	0.83
749.5	19.521	241.38	0.44	119	19.44	0.16	1.16	0.98	0.20	0.14	0.96	0.84
749.3	19.685	283.06	0.95	119	19.60	0.16	1.17	0.99	0.21	0.15	0.96	0.84
749.2	19.849	286.45	1.06	119	19.77	0.16	1.18	1.00	0.21	0.15	0.97	0.85
749.0	20.013	381.47	1.16	119	19.93	0.16	1.19	1.01	0.22	0.16	0.97	0.85
748.8	20.177	399.59	1.87	119	20.09	0.16	1.20	1.02	0.22	0.16	0.98	0.86
748.7	20.341	402.33	2.10	119	20.26	0.16	1.21	1.03	0.23	0.17	0.98	0.86
748.5	20.505	372.97	2.32	119	20.42	0.16	1.22	1.04	0.23	0.17	0.99	0.87
748.3	20.669	367.47	2.62	119	20.59	0.16	1.23	1.05	0.24	0.18	0.99	0.87
748.2	20.833	348.42	2.60	119	20.75	0.16	1.24	1.06	0.24	0.18	1.00	0.87

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
748.0	20.997	310.41	3.07	119	20.92	0.16	1.25	1.07	0.25	0.19	1.00	0.88
747.8	21.161	290.53	2.81	119	21.08	0.16	1.26	1.08	0.25	0.19	1.00	0.88
747.7	21.325	261.47	2.08	119	21.24	0.16	1.27	1.09	0.26	0.20	1.01	0.89
747.5	21.489	227.35	1.29	119	21.41	0.16	1.28	1.10	0.26	0.20	1.01	0.89
747.3	21.653	192.91	0.61	119	21.57	0.16	1.29	1.11	0.27	0.21	1.02	0.90
747.2	21.817	172.95	0.30	119	21.74	0.16	1.30	1.12	0.28	0.21	1.02	0.90
747.0	21.981	158.25	0.30	119	21.90	0.16	1.31	1.13	0.28	0.22	1.03	0.91
746.9	22.145	160.43	0.29	112	22.06	0.16	1.32	1.13	0.29	0.22	1.03	0.91
746.7	22.309	160.56	0.25	112	22.23	0.16	1.33	1.14	0.29	0.23	1.04	0.92
746.5	22.473	136.17	0.22	112	22.39	0.16	1.34	1.15	0.30	0.23	1.04	0.92
746.4	22.638	123.86	0.21	112	22.56	0.16	1.35	1.16	0.30	0.24	1.04	0.92
746.2	22.802	117.62	0.06	112	22.72	0.16	1.35	1.17	0.31	0.24	1.05	0.93
746.0	22.966	104.44	0.05	112	22.88	0.16	1.36	1.18	0.31	0.25	1.05	0.93
745.9	23.130	89.03	0.18	112	23.05	0.16	1.37	1.19	0.32	0.25	1.06	0.94
745.7	23.294	84.83	0.08	112	23.21	0.16	1.38	1.20	0.32	0.26	1.06	0.94
745.5	23.458	82.80	0.05	112	23.38	0.16	1.39	1.21	0.33	0.26	1.06	0.94
745.4	23.622	67.48	0.05	112	23.54	0.16	1.40	1.22	0.33	0.27	1.07	0.95
745.2	23.786	51.67	0.07	112	23.70	0.16	1.41	1.23	0.34	0.27	1.07	0.95
745.1	23.950	43.57	0.06	112	23.87	0.16	1.42	1.24	0.34	0.28	1.08	0.96
744.9	24.114	37.84	0.04	112	24.03	0.16	1.43	1.24	0.35	0.28	1.08	0.96
744.7	24.278	40.20	0.06	112	24.20	0.16	1.44	1.25	0.35	0.29	1.09	0.96
744.6	24.442	45.13	0.09	112	24.36	0.16	1.45	1.26	0.36	0.29	1.09	0.97
744.4	24.606	60.39	0.17	112	24.52	0.16	1.46	1.27	0.36	0.30	1.09	0.97
744.2	24.770	73.95	0.27	112	24.69	0.16	1.46	1.28	0.37	0.30	1.10	0.98
744.1	24.934	76.81	0.61	112	24.85	0.16	1.47	1.29	0.37	0.31	1.10	0.98
743.9	25.098	74.90	0.91	112	25.02	0.16	1.48	1.30	0.38	0.32	1.11	0.98
743.7	25.262	68.97	1.13	112	25.18	0.16	1.49	1.31	0.38	0.32	1.11	0.99
743.6	25.426	72.86	1.06	112	25.34	0.16	1.50	1.32	0.39	0.33	1.11	0.99
743.4	25.590	79.32	0.80	112	25.51	0.16	1.51	1.33	0.39	0.33	1.12	1.00
743.2	25.754	74.14	0.62	112	25.67	0.16	1.52	1.34	0.40	0.34	1.12	1.00
743.1	25.918	59.70	0.40	112	25.84	0.16	1.53	1.35	0.40	0.34	1.13	1.01
742.9	26.082	46.24	0.11	112	26.00	0.16	1.54	1.36	0.41	0.35	1.13	1.01
742.8	26.246	37.12	0.06	112	26.16	0.16	1.55	1.36	0.41	0.35	1.13	1.01
742.6	26.410	31.39	0.08	112	26.33	0.16	1.56	1.37	0.42	0.36	1.14	1.02
742.4	26.574	31.56	0.06	112	26.49	0.16	1.57	1.38	0.42	0.36	1.14	1.02
742.3	26.739	33.97	0.06	112	26.66	0.16	1.57	1.39	0.43	0.37	1.15	1.03
742.1	26.903	36.99	0.09	112	26.82	0.16	1.58	1.40	0.43	0.37	1.15	1.03
741.9	27.067	37.78	0.16	112	26.98	0.16	1.59	1.41	0.44	0.38	1.15	1.03
741.8	27.231	43.97	0.25	112	27.15	0.16	1.60	1.42	0.44	0.38	1.16	1.04
741.6	27.395	46.76	0.33	112	27.31	0.16	1.61	1.43	0.45	0.39	1.16	1.04
741.4	27.559	51.23	0.40	112	27.48	0.16	1.62	1.44	0.45	0.39	1.17	1.05
741.3	27.723	51.71	0.52	112	27.64	0.16	1.63	1.45	0.46	0.40	1.17	1.05
741.1	27.887	53.23	0.65	112	27.80	0.16	1.64	1.46	0.46	0.40	1.17	1.05
740.9	28.051	53.29	0.77	112	27.97	0.16	1.65	1.47	0.47	0.41	1.18	1.06
740.8	28.215	52.73	0.81	112	28.13	0.16	1.66	1.47	0.47	0.41	1.18	1.06
740.6	28.379	49.69	0.82	112	28.30	0.16	1.67	1.48	0.48	0.42	1.19	1.07
740.5	28.543	46.99	0.79	112	28.46	0.16	1.68	1.49	0.48	0.42	1.19	1.07
740.3	28.707	45.00	0.76	112	28.62	0.16	1.69	1.50	0.49	0.43	1.19	1.07
740.1	28.871	44.38	0.71	112	28.79	0.16	1.69	1.51	0.50	0.43	1.20	1.08
740.0	29.035	49.94	0.63	112	28.95	0.16	1.70	1.52	0.50	0.44	1.20	1.08
739.8	29.199	60.13	0.62	112	29.12	0.16	1.71	1.53	0.51	0.44	1.21	1.09
739.6	29.363	63.16	0.50	112	29.28	0.16	1.72	1.54	0.51	0.45	1.21	1.09
739.5	29.527	57.90	0.60	112	29.45	0.16	1.73	1.55	0.52	0.45	1.22	1.09
739.3	29.691	51.29	0.73	112	29.61	0.16	1.74	1.56	0.52	0.46	1.22	1.10
739.1	29.855	49.81	0.82	112	29.77	0.16	1.75	1.57	0.53	0.46	1.22	1.10
739.0	30.019	53.88	0.94	112	29.94	0.16	1.76	1.58	0.53	0.47	1.23	1.11
738.8	30.183	62.67	1.14	112	30.10	0.16	1.77	1.58	0.54	0.47	1.23	1.11
738.7	30.347	75.85	1.41	112	30.27	0.16	1.78	1.59	0.54	0.48	1.24	1.12
738.5	30.511	78.34	1.74	112	30.43	0.16	1.79	1.60	0.55	0.48	1.24	1.12
738.3	30.675	79.27	1.92	112	30.59	0.16	1.80	1.61	0.55	0.49	1.24	1.12
738.2	30.840	73.42	1.95	112	30.76	0.16	1.80	1.62	0.56	0.49	1.25	1.13
738.0	31.004	73.53	1.87	112	30.92	0.16	1.81	1.63	0.56	0.50	1.25	1.13
737.8	31.168	79.68	1.90	112	31.09	0.16	1.82	1.64	0.57	0.50	1.26	1.14
737.7	31.332	82.73	2.04	112	31.25	0.16	1.83	1.65	0.57	0.51	1.26	1.14
737.5	31.496	73.44	2.14	112	31.41	0.16	1.84	1.66	0.58	0.51	1.26	1.14
737.3	31.660	70.18	2.06	112	31.58	0.16	1.85	1.67	0.58	0.52	1.27	1.15
737.2	31.824	69.40	2.03	112	31.74	0.16	1.86	1.68	0.59	0.52	1.27	1.15
737.0	31.988	69.36	1.97	112	31.91	0.16	1.87	1.69	0.59	0.53	1.28	1.16
736.8	32.152	70.91	1.96	112	32.07	0.16	1.88	1.69	0.60	0.54	1.28	1.16

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
736.7	32.316	69.10	1.95	112	32.23	0.16	1.89	1.70	0.60	0.54	1.28	1.16
736.5	32.480	70.98	1.93	112	32.40	0.16	1.90	1.71	0.61	0.55	1.29	1.17
736.4	32.644	73.01	1.45	112	32.56	0.16	1.91	1.72	0.61	0.55	1.29	1.17
736.2	32.808	68.15	1.48	112	32.73	0.16	1.91	1.73	0.62	0.56	1.30	1.18
736.0	32.972	66.20	1.59	112	32.89	0.16	1.92	1.74	0.62	0.56	1.30	1.18
735.9	33.136	69.19	1.81	112	33.05	0.16	1.93	1.75	0.63	0.57	1.30	1.18
735.7	33.300	71.30	1.95	112	33.22	0.16	1.94	1.76	0.63	0.57	1.31	1.19
735.5	33.464	76.26	2.08	112	33.38	0.16	1.95	1.77	0.64	0.58	1.31	1.19
735.4	33.628	80.46	2.06	112	33.55	0.16	1.96	1.78	0.64	0.58	1.32	1.20
735.2	33.792	69.87	1.94	112	33.71	0.16	1.97	1.79	0.65	0.59	1.32	1.20
735.0	33.956	58.05	1.63	112	33.87	0.16	1.98	1.80	0.65	0.59	1.33	1.20
734.9	34.120	39.37	1.37	112	34.04	0.16	1.99	1.81	0.66	0.60	1.33	1.21
734.7	34.284	27.17	1.05	112	34.20	0.16	2.00	1.81	0.66	0.60	1.33	1.21
734.6	34.448	18.43	0.75	112	34.37	0.16	2.01	1.82	0.67	0.61	1.34	1.22
734.4	34.612	13.32	0.49	112	34.53	0.16	2.02	1.83	0.67	0.61	1.34	1.22
734.2	34.776	11.16	0.25	112	34.69	0.16	2.02	1.84	0.68	0.62	1.35	1.22
734.1	34.941	10.17	0.14	112	34.86	0.16	2.03	1.85	0.68	0.62	1.35	1.23
733.9	35.105	9.31	0.09	112	35.02	0.16	2.04	1.86	0.69	0.63	1.35	1.23
733.7	35.269	9.20	0.11	112	35.19	0.16	2.05	1.87	0.69	0.63	1.36	1.24
733.6	35.433	10.07	0.14	112	35.35	0.16	2.06	1.88	0.70	0.64	1.36	1.24
733.4	35.597	11.09	0.17	112	35.51	0.16	2.07	1.89	0.71	0.64	1.37	1.25
733.2	35.761	12.64	0.33	112	35.68	0.16	2.08	1.90	0.71	0.65	1.37	1.25
733.1	35.925	15.20	0.32	112	35.84	0.16	2.09	1.91	0.72	0.65	1.37	1.25
732.9	36.089	14.97	0.62	112	36.01	0.16	2.10	1.92	0.72	0.66	1.38	1.26
732.7	36.253	15.35	0.60	112	36.17	0.16	2.11	1.92	0.73	0.66	1.38	1.26
732.6	36.417	14.10	0.52	112	36.33	0.16	2.12	1.93	0.73	0.67	1.39	1.27
732.4	36.581	13.49	0.37	112	36.50	0.16	2.13	1.94	0.74	0.67	1.39	1.27
732.3	36.745	11.06	0.30	112	36.66	0.16	2.14	1.95	0.74	0.68	1.39	1.27
732.1	36.909	9.72	0.25	112	36.83	0.16	2.14	1.96	0.75	0.68	1.40	1.28
731.9	37.073	8.07	0.24	112	36.99	0.16	2.15	1.97	0.75	0.69	1.40	1.28
731.8	37.237	7.50	0.22	112	37.16	0.16	2.16	1.98	0.76	0.69	1.41	1.29
731.6	37.401	7.26	0.20	112	37.32	0.16	2.17	1.99	0.76	0.70	1.41	1.29
731.4	37.565	8.46	0.17	112	37.48	0.16	2.18	2.00	0.77	0.70	1.41	1.29
731.3	37.729	8.79	0.14	112	37.65	0.16	2.19	2.01	0.77	0.71	1.42	1.30
731.1	37.893	8.11	0.12	112	37.81	0.16	2.20	2.02	0.78	0.71	1.42	1.30
730.9	38.057	9.47	0.13	112	37.98	0.16	2.21	2.03	0.78	0.72	1.43	1.31
730.8	38.221	11.19	0.17	112	38.14	0.16	2.22	2.03	0.79	0.72	1.43	1.31
730.6	38.385	21.38	0.28	112	38.30	0.16	2.23	2.04	0.79	0.73	1.44	1.31
730.5	38.549	19.44	0.27	112	38.47	0.16	2.24	2.05	0.80	0.73	1.44	1.32
730.3	38.713	18.10	0.25	112	38.63	0.16	2.25	2.06	0.80	0.74	1.44	1.32
730.1	38.877	17.82	0.23	112	38.80	0.16	2.25	2.07	0.81	0.74	1.45	1.33
730.0	39.042	18.72	0.25	112	38.96	0.16	2.26	2.08	0.81	0.75	1.45	1.33
729.8	39.206	21.08	0.39	112	39.12	0.16	2.27	2.09	0.82	0.76	1.46	1.33
729.6	39.370	21.69	0.58	112	39.29	0.16	2.28	2.10	0.82	0.76	1.46	1.34
729.5	39.534	25.80	0.53	126	39.45	0.16	2.29	2.11	0.83	0.77	1.46	1.34
729.3	39.698	21.24	0.42	126	39.62	0.16	2.30	2.12	0.83	0.77	1.47	1.35
729.1	39.862	19.16	0.31	126	39.78	0.16	2.31	2.13	0.84	0.78	1.47	1.35
729.0	40.026	18.71	0.24	126	39.94	0.16	2.32	2.14	0.84	0.78	1.48	1.36
728.8	40.190	20.28	0.26	126	40.11	0.16	2.33	2.15	0.85	0.79	1.48	1.36
728.6	40.354	20.95	0.33	126	40.27	0.16	2.34	2.16	0.85	0.79	1.49	1.37
728.5	40.518	22.11	0.28	126	40.44	0.16	2.35	2.17	0.86	0.80	1.50	1.37
728.3	40.682	22.66	0.25	126	40.60	0.16	2.36	2.18	0.86	0.80	1.50	1.38
728.2	40.846	22.61	0.26	126	40.76	0.16	2.37	2.19	0.87	0.81	1.51	1.39
728.0	41.010	24.11	0.35	126	40.93	0.16	2.38	2.20	0.87	0.81	1.51	1.39
727.8	41.174	26.63	0.35	126	41.09	0.16	2.40	2.21	0.88	0.82	1.52	1.40
727.7	41.338	28.25	0.45	126	41.26	0.16	2.41	2.22	0.88	0.82	1.52	1.40
727.5	41.502	30.15	0.57	126	41.42	0.16	2.42	2.23	0.89	0.83	1.53	1.41
727.3	41.666	33.67	0.62	126	41.58	0.16	2.43	2.24	0.89	0.83	1.53	1.41
727.2	41.830	58.31	0.67	126	41.75	0.16	2.44	2.25	0.90	0.84	1.54	1.42
727.0	41.994	49.49	1.03	126	41.91	0.16	2.45	2.26	0.90	0.84	1.54	1.42
726.8	42.158	57.78	1.30	126	42.08	0.16	2.46	2.27	0.91	0.85	1.55	1.43
726.7	42.322	68.44	1.55	126	42.24	0.16	2.47	2.28	0.91	0.85	1.55	1.43
726.5	42.486	74.25	0.86	126	42.40	0.16	2.48	2.29	0.92	0.86	1.56	1.44
726.3	42.650	72.62	0.78	126	42.57	0.16	2.49	2.31	0.93	0.86	1.56	1.44
726.2	42.814	69.13	1.03	126	42.73	0.16	2.50	2.32	0.93	0.87	1.57	1.45
726.0	42.978	63.52	1.15	126	42.90	0.16	2.51	2.33	0.94	0.87	1.57	1.45
725.9	43.143	66.51	1.37	126	43.06	0.16	2.52	2.34	0.94	0.88	1.58	1.46
725.7	43.307	71.22	1.06	126	43.22	0.16	2.53	2.35	0.95	0.88	1.58	1.46
725.5	43.471	73.50	0.42	126	43.39	0.16	2.54	2.36	0.95	0.89	1.59	1.47

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
725.4	43.635	62.80	0.40	126	43.55	0.16	2.55	2.37	0.96	0.89	1.59	1.47
725.2	43.799	47.16	0.35	126	43.72	0.16	2.56	2.38	0.96	0.90	1.60	1.48
725.0	43.963	33.70	0.29	126	43.88	0.16	2.57	2.39	0.97	0.90	1.60	1.48
724.9	44.127	25.40	0.22	126	44.04	0.16	2.58	2.40	0.97	0.91	1.61	1.49
724.7	44.291	20.57	0.39	126	44.21	0.16	2.59	2.41	0.98	0.91	1.62	1.49
724.5	44.455	22.58	0.59	126	44.37	0.16	2.60	2.42	0.98	0.92	1.62	1.50
724.4	44.619	51.24	0.67	126	44.54	0.16	2.61	2.43	0.99	0.92	1.63	1.51
724.2	44.783	73.63	0.44	126	44.70	0.16	2.62	2.44	0.99	0.93	1.63	1.51
724.1	44.947	92.76	0.40	126	44.86	0.16	2.63	2.45	1.00	0.93	1.64	1.52
723.9	45.111	95.95	0.48	126	45.03	0.16	2.64	2.46	1.00	0.94	1.64	1.52
723.7	45.275	89.86	0.54	126	45.19	0.16	2.65	2.47	1.01	0.94	1.65	1.53
723.6	45.439	83.71	0.56	126	45.36	0.16	2.66	2.48	1.01	0.95	1.65	1.53
723.4	45.603	76.07	0.52	126	45.52	0.16	2.67	2.49	1.02	0.95	1.66	1.54
723.2	45.767	65.31	0.52	126	45.69	0.16	2.68	2.50	1.02	0.96	1.66	1.54
723.1	45.931	47.33	0.45	126	45.85	0.16	2.69	2.51	1.03	0.97	1.67	1.55
722.9	46.095	38.31	0.36	126	46.01	0.16	2.71	2.52	1.03	0.97	1.67	1.55
722.7	46.259	25.89	0.30	126	46.18	0.16	2.72	2.53	1.04	0.98	1.68	1.56
722.6	46.423	25.28	0.23	126	46.34	0.16	2.73	2.54	1.04	0.98	1.68	1.56
722.4	46.587	45.31	0.13	126	46.51	0.16	2.74	2.55	1.05	0.99	1.69	1.57
722.2	46.751	32.46	0.21	126	46.67	0.16	2.75	2.56	1.05	0.99	1.69	1.57
722.1	46.915	19.40	0.21	126	46.83	0.16	2.76	2.57	1.06	1.00	1.70	1.58
721.9	47.079	12.93	0.20	126	47.00	0.16	2.77	2.58	1.06	1.00	1.70	1.58
721.8	47.244	10.61	0.13	126	47.16	0.16	2.78	2.59	1.07	1.01	1.71	1.59
721.6	47.408	11.06	0.29	126	47.33	0.16	2.79	2.60	1.07	1.01	1.71	1.59
721.4	47.572	13.68	0.44	126	47.49	0.16	2.80	2.62	1.08	1.02	1.72	1.60
721.3	47.736	21.01	0.50	126	47.65	0.16	2.81	2.63	1.08	1.02	1.72	1.60
721.1	47.900	26.69	0.52	126	47.82	0.16	2.82	2.64	1.09	1.03	1.73	1.61
720.9	48.064	30.54	0.31	126	47.98	0.16	2.83	2.65	1.09	1.03	1.74	1.61
720.8	48.228	33.88	0.21	126	48.15	0.16	2.84	2.66	1.10	1.04	1.74	1.62
720.6	48.392	28.84	0.20	126	48.31	0.16	2.85	2.67	1.10	1.04	1.75	1.63
720.4	48.556	26.46	0.29	126	48.47	0.16	2.86	2.68	1.11	1.05	1.75	1.63
720.3	48.720	34.27	0.21	126	48.64	0.16	2.87	2.69	1.11	1.05	1.76	1.64
720.1	48.884	44.74	0.12	126	48.80	0.16	2.88	2.70	1.12	1.06	1.76	1.64
720.0	49.048	41.57	0.40	126	48.97	0.16	2.89	2.71	1.12	1.06	1.77	1.65
719.8	49.212	31.16	0.58	126	49.13	0.16	2.90	2.72	1.13	1.07	1.77	1.65
719.6	49.376	29.13	0.57	126	49.29	0.16	2.91	2.73	1.13	1.07	1.78	1.66
719.5	49.540	30.51	0.17	126	49.46	0.16	2.92	2.74	1.14	1.08	1.78	1.66
719.3	49.704	33.50	0.12	126	49.62	0.16	2.93	2.75	1.15	1.08	1.79	1.67
719.1	49.868	32.29	0.14	126	49.79	0.16	2.94	2.76	1.15	1.09	1.79	1.67
719.0	50.032	34.89	0.22	126	49.95	0.16	2.95	2.77	1.16	1.09	1.80	1.68
718.8	50.196	44.20	0.25	126	50.11	0.16	2.96	2.78	1.16	1.10	1.80	1.68
718.6	50.360	52.65	0.35	126	50.28	0.16	2.97	2.79	1.17	1.10	1.81	1.69
718.5	50.524	57.74	0.47	126	50.44	0.16	2.98	2.80	1.17	1.11	1.81	1.69
718.3	50.688	60.40	0.45	126	50.61	0.16	2.99	2.81	1.18	1.11	1.82	1.70
718.1	50.852	56.83	0.44	126	50.77	0.16	3.01	2.82	1.18	1.12	1.82	1.70
718.0	51.016	49.98	0.45	126	50.93	0.16	3.02	2.83	1.19	1.12	1.83	1.71
717.8	51.180	46.07	0.46	126	51.10	0.16	3.03	2.84	1.19	1.13	1.83	1.71
717.7	51.345	46.47	0.36	126	51.26	0.16	3.04	2.85	1.20	1.13	1.84	1.72
717.5	51.509	50.91	0.27	126	51.43	0.16	3.05	2.86	1.20	1.14	1.84	1.72
717.3	51.673	53.95	0.31	126	51.59	0.16	3.06	2.87	1.21	1.14	1.85	1.73
717.2	51.837	54.39	0.47	126	51.75	0.16	3.07	2.88	1.21	1.15	1.86	1.73
717.0	52.001	50.53	0.55	126	51.92	0.16	3.08	2.89	1.22	1.15	1.86	1.74
716.8	52.165	44.20	0.47	126	52.08	0.16	3.09	2.90	1.22	1.16	1.87	1.75
716.7	52.329	39.55	0.63	126	52.25	0.16	3.10	2.92	1.23	1.16	1.87	1.75
716.5	52.493	33.29	0.51	126	52.41	0.16	3.11	2.93	1.23	1.17	1.88	1.76
716.3	52.657	38.92	0.42	126	52.57	0.16	3.12	2.94	1.24	1.17	1.88	1.76
716.2	52.821	44.54	0.21	126	52.74	0.16	3.13	2.95	1.24	1.18	1.89	1.77
716.0	52.985	46.30	0.16	126	52.90	0.16	3.14	2.96	1.25	1.19	1.89	1.77
715.9	53.149	47.46	0.21	126	53.07	0.16	3.15	2.97	1.25	1.19	1.90	1.78
715.7	53.313	45.17	0.37	126	53.23	0.16	3.16	2.98	1.26	1.20	1.90	1.78
715.5	53.477	45.05	0.41	126	53.40	0.16	3.17	2.99	1.26	1.20	1.91	1.79
715.4	53.641	46.34	0.38	126	53.56	0.16	3.18	3.00	1.27	1.21	1.91	1.79
715.2	53.805	45.75	0.34	126	53.72	0.16	3.19	3.01	1.27	1.21	1.92	1.80
715.0	53.969	44.82	0.34	126	53.89	0.16	3.20	3.02	1.28	1.22	1.92	1.80
714.9	54.133	42.53	0.36	126	54.05	0.16	3.21	3.03	1.28	1.22	1.93	1.81
714.7	54.297	40.23	0.44	126	54.22	0.16	3.22	3.04	1.29	1.23	1.93	1.81
714.5	54.461	33.52	0.57	131	54.38	0.16	3.23	3.05	1.29	1.23	1.94	1.82
714.4	54.625	23.84	0.59	131	54.54	0.16	3.24	3.06	1.30	1.24	1.94	1.82
714.2	54.789	26.71	0.30	131	54.71	0.16	3.25	3.07	1.30	1.24	1.95	1.83

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
714.0	54.953	34.98	0.10	131	54.87	0.16	3.26	3.08	1.31	1.25	1.96	1.84
713.9	55.117	31.29	0.12	131	55.04	0.16	3.28	3.09	1.31	1.25	1.96	1.84
713.7	55.281	22.22	0.24	131	55.20	0.16	3.29	3.10	1.32	1.26	1.97	1.85
713.6	55.446	19.12	0.26	131	55.36	0.16	3.30	3.11	1.32	1.26	1.97	1.85
713.4	55.610	30.55	0.19	131	55.53	0.16	3.31	3.12	1.33	1.27	1.98	1.86
713.2	55.774	48.55	0.09	131	55.69	0.16	3.32	3.14	1.33	1.27	1.98	1.86
713.1	55.938	54.30	0.18	131	55.86	0.16	3.33	3.15	1.34	1.28	1.99	1.87
712.9	56.102	49.76	0.36	131	56.02	0.16	3.34	3.16	1.34	1.28	2.00	1.87
712.7	56.266	42.64	0.51	131	56.18	0.16	3.35	3.17	1.35	1.29	2.00	1.88
712.6	56.430	37.65	0.45	131	56.35	0.16	3.36	3.18	1.36	1.29	2.01	1.89
712.4	56.594	36.97	0.42	131	56.51	0.16	3.37	3.19	1.36	1.30	2.01	1.89
712.2	56.758	39.91	0.46	131	56.68	0.16	3.38	3.20	1.37	1.30	2.02	1.90
712.1	56.922	49.95	0.43	131	56.84	0.16	3.39	3.21	1.37	1.31	2.02	1.90
711.9	57.086	58.98	0.42	131	57.00	0.16	3.40	3.22	1.38	1.31	2.03	1.91
711.8	57.250	65.71	0.49	131	57.17	0.16	3.42	3.23	1.38	1.32	2.03	1.91
711.6	57.414	69.79	0.57	131	57.33	0.16	3.43	3.24	1.39	1.32	2.04	1.92
711.4	57.578	75.91	0.70	131	57.50	0.16	3.44	3.25	1.39	1.33	2.05	1.93
711.3	57.742	89.33	0.73	131	57.66	0.16	3.45	3.26	1.40	1.33	2.05	1.93
711.1	57.906	114.27	0.85	131	57.82	0.16	3.46	3.28	1.40	1.34	2.06	1.94
710.9	58.070	137.60	1.05	131	57.99	0.16	3.47	3.29	1.41	1.34	2.06	1.94
710.8	58.234	143.22	1.25	131	58.15	0.16	3.48	3.30	1.41	1.35	2.07	1.95
710.6	58.398	133.27	1.31	131	58.32	0.16	3.49	3.31	1.42	1.35	2.07	1.95
710.4	58.562	118.80	1.16	131	58.48	0.16	3.50	3.32	1.42	1.36	2.08	1.96
710.3	58.726	105.34	1.06	131	58.64	0.16	3.51	3.33	1.43	1.36	2.09	1.96
710.1	58.890	102.74	0.88	131	58.81	0.16	3.52	3.34	1.43	1.37	2.09	1.97
709.9	59.054	113.99	0.75	131	58.97	0.16	3.53	3.35	1.44	1.37	2.10	1.98
709.8	59.218	131.80	0.72	131	59.14	0.16	3.54	3.36	1.44	1.38	2.10	1.98
709.6	59.382	145.33	0.74	131	59.30	0.16	3.55	3.37	1.45	1.38	2.11	1.99
709.5	59.547	145.06	0.83	131	59.46	0.16	3.57	3.38	1.45	1.39	2.11	1.99
709.3	59.711	135.88	0.87	131	59.63	0.16	3.58	3.39	1.46	1.39	2.12	2.00
709.1	59.875	129.12	0.80	131	59.79	0.16	3.59	3.40	1.46	1.40	2.12	2.00
709.0	60.039	131.30	0.77	131	59.96	0.16	3.60	3.41	1.47	1.41	2.13	2.01
708.8	60.203	129.04	0.80	131	60.12	0.16	3.61	3.43	1.47	1.41	2.14	2.02
708.6	60.367	116.34	0.79	131	60.28	0.16	3.62	3.44	1.48	1.42	2.14	2.02
708.5	60.531	103.78	0.78	131	60.45	0.16	3.63	3.45	1.48	1.42	2.15	2.03
708.3	60.695	95.16	0.73	131	60.61	0.16	3.64	3.46	1.49	1.43	2.15	2.03
708.1	60.859	90.06	0.68	131	60.78	0.16	3.65	3.47	1.49	1.43	2.16	2.04
708.0	61.023	87.76	0.68	131	60.94	0.16	3.66	3.48	1.50	1.44	2.16	2.04
707.8	61.187	77.28	0.77	131	61.10	0.16	3.67	3.49	1.50	1.44	2.17	2.05
707.6	61.351	68.84	0.85	131	61.27	0.16	3.68	3.50	1.51	1.45	2.18	2.05
707.5	61.515	76.32	0.86	131	61.43	0.16	3.69	3.51	1.51	1.45	2.18	2.06
707.3	61.679	76.95	0.95	131	61.60	0.16	3.71	3.52	1.52	1.46	2.19	2.07
707.2	61.843	80.39	1.04	131	61.76	0.16	3.72	3.53	1.52	1.46	2.19	2.07
707.0	62.007	87.95	1.75	131	61.93	0.16	3.73	3.54	1.53	1.47	2.20	2.08
706.8	62.171	112.35	1.10	131	62.09	0.16	3.74	3.55	1.53	1.47	2.20	2.08
706.7	62.335	155.48	2.24	131	62.25	0.16	3.75	3.57	1.54	1.48	2.21	2.09
706.5	62.499	177.07	1.45	131	62.42	0.16	3.76	3.58	1.54	1.48	2.21	2.09
706.3	62.663	288.14	2.13	131	62.58	0.16	3.77	3.59	1.55	1.49	2.22	2.10
706.2	62.827	336.70	3.06	131	62.75	0.16	3.78	3.60	1.55	1.49	2.23	2.11
706.0	62.991	285.42	3.40	131	62.91	0.16	3.79	3.61	1.56	1.50	2.23	2.11
705.8	63.155	222.92	2.31	131	63.07	0.16	3.80	3.62	1.56	1.50	2.24	2.12
705.7	63.319	193.02	1.17	131	63.24	0.16	3.81	3.63	1.57	1.51	2.24	2.12
705.5	63.483	176.73	1.47	131	63.40	0.16	3.82	3.64	1.58	1.51	2.25	2.13
705.4	63.648	117.89	1.89	131	63.57	0.16	3.83	3.65	1.58	1.52	2.25	2.13
705.2	63.812	94.72	2.16	131	63.73	0.16	3.85	3.66	1.59	1.52	2.26	2.14
705.0	63.976	99.02	2.51	131	63.89	0.16	3.86	3.67	1.59	1.53	2.27	2.14
704.9	64.140	104.06	2.81	131	64.06	0.16	3.87	3.68	1.60	1.53	2.27	2.15
704.7	64.304	109.29	3.33	131	64.22	0.16	3.88	3.69	1.60	1.54	2.28	2.16
704.5	64.468	139.21	3.72	131	64.39	0.16	3.89	3.70	1.61	1.54	2.28	2.16
704.4	64.632	168.61	3.69	131	64.55	0.16	3.90	3.72	1.61	1.55	2.29	2.17
704.2	64.796	190.96	3.94	131	64.71	0.16	3.91	3.73	1.62	1.55	2.29	2.17
704.0	64.960	220.24	4.45	131	64.88	0.16	3.92	3.74	1.62	1.56	2.30	2.18
703.9	65.124	227.79	4.88	131	65.04	0.16	3.93	3.75	1.63	1.56	2.30	2.18
703.7	65.288	245.80	5.15	131	65.21	0.16	3.94	3.76	1.63	1.57	2.31	2.19
703.5	65.452	253.50	4.12	131	65.37	0.16	3.95	3.77	1.64	1.57	2.32	2.20
703.4	65.616	4.38	3.43	131	65.53	0.16	3.96	3.78	1.64	1.58	2.32	2.20
703.2	65.780	91.41	2.53	131	65.70	0.16	3.97	3.79	1.65	1.58	2.33	2.21
703.1	65.944	140.41	2.45	131	65.86	0.16	3.98	3.80	1.65	1.59	2.33	2.21
702.9	66.108	143.60	2.96	131	66.03	0.16	4.00	3.81	1.66	1.59	2.34	2.22

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
702.7	66.272	173.88	2.32	131	66.19	0.16	4.01	3.82	1.66	1.60	2.34	2.22
702.6	66.436	248.99	3.88	131	66.35	0.16	4.02	3.83	1.67	1.60	2.35	2.23
702.4	66.600	293.83	4.19	131	66.52	0.16	4.03	3.84	1.67	1.61	2.36	2.23
702.2	66.764	321.00	4.80	131	66.68	0.16	4.04	3.86	1.68	1.62	2.36	2.24
702.1	66.928	393.97	5.47	131	66.85	0.16	4.05	3.87	1.68	1.62	2.37	2.25
701.9	67.092	460.61	6.03	131	67.01	0.16	4.06	3.88	1.69	1.63	2.37	2.25
701.7	67.256	465.25	0.01	131	67.17	0.16	4.07	3.89	1.69	1.63	2.38	2.26
701.6	67.420	441.38	0.01	131	67.34	0.08	4.08	3.90	1.70	1.64	2.38	2.26

LIQUEFACTION POTENTIAL ASSESSMENT FOR COARSE GRAINED SOILS USING CONE PENETRATION TEST DATA

Project Site: KIF TDEC Stability
Project No.: 175668043
CPT ID: KIF-BF-CPT-5B

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
769.0												
768.8	0.164	9.00	11.11	3.39	1.0	1.70	0.16	100	53.98	54.14	0.000	#NUM!
768.7	0.328	4.06	12.46	3.68	1.0	1.70	0.16	100	53.98	54.14	0.000	#NUM!
768.5	0.492	2.39	14.19	3.90	1.0	1.70	0.16	100	53.98	54.14	0.000	#NUM!
768.3	0.656	1.55	16.47	4.09	1.0	1.70	0.16	100	53.98	54.14	0.001	#NUM!
768.2	0.820	1.04	19.62	4.27	1.0	1.70	0.16	100	53.98	54.14	0.005	#NUM!
768.0	0.984	0.70	24.27	4.46	1.0	1.70	0.16	100	53.98	54.14	0.008	#NUM!
767.9	1.148	0.46	31.81	4.68	1.0	1.70	0.16	100	53.98	54.14	0.012	#NUM!
767.7	1.312	0.28	46.13	4.95	1.0	1.70	0.16	100	53.98	54.14	0.016	#NUM!
767.5	1.476	0.14	83.92	5.36	1.0	1.70	0.16	100	53.98	54.14	0.019	#NUM!
767.4	1.640	0.02	463.78	6.43	1.0	1.70	0.16	100	53.98	54.14	0.023	#NUM!
767.2	1.804	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.026	#NUM!
767.0	1.968	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.030	#NUM!
766.9	2.133	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.034	#NUM!
766.7	2.297	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.037	#NUM!
766.5	2.461	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.041	#NUM!
766.4	2.625	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.045	#NUM!
766.2	2.789	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.048	#NUM!
766.0	2.953	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.052	#NUM!
765.9	3.117	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.056	-0.224
765.7	3.281	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.059	-0.211
765.6	3.445	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.063	-0.205
765.4	3.609	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.067	-0.201
765.2	3.773	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.070	-0.198
765.1	3.937	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.074	-0.195
764.9	4.101	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.078	-0.193
764.7	4.265	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.081	-0.191
764.6	4.429	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.085	-0.189
764.4	4.593	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.089	-0.187
764.2	4.757	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.093	-0.186
764.1	4.921	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.097	-0.184
763.9	5.085	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.100	-0.183
763.8	5.249	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.102	-0.182
763.6	5.413	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.104	-0.181
763.4	5.577	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.106	-0.180
763.3	5.741	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.108	-0.179
763.1	5.905	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.110	-0.178
762.9	6.069	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.112	-0.177
762.8	6.234	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.113	-0.176
762.6	6.398	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.114	-0.175
762.4	6.562	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.115	-0.174
762.3	6.726	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.116	-0.173
762.1	6.890	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.117	-0.172
761.9	7.054	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.118	-0.171
761.8	7.218	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.118	-0.171
761.6	7.382	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.119	-0.170
761.5	7.546	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.119	-0.169
761.3	7.710	0.01	0.15	5.48	1.0	1.68	0.16	100	53.98	54.14	0.119	-0.168
761.1	7.874	0.01	0.15	5.48	1.0	1.66	0.16	100	53.98	54.14	0.119	-0.168
761.0	8.038	0.01	0.15	5.48	1.0	1.64	0.15	100	53.98	54.14	0.120	-0.167
760.8	8.202	0.01	0.15	5.48	1.0	1.62	0.15	100	53.98	54.13	0.120	-0.166
760.6	8.366	0.01	0.15	5.48	1.0	1.60	0.15	100	53.98	54.13	0.120	-0.166
760.5	8.530	0.01	0.15	5.48	1.0	1.58	0.15	100	53.98	54.13	0.120	-0.165
760.3	8.694	0.01	0.15	5.48	1.0	1.56	0.15	100	53.98	54.13	0.120	-0.165
760.1	8.858	0.01	0.15	5.48	1.0	1.54	0.15	100	53.98	54.12	0.119	-0.164
760.0	9.022	0.01	0.15	5.48	1.0	1.53	0.14	100	53.98	54.12	0.119	-0.163
759.8	9.186	0.01	0.15	5.48	1.0	1.51	0.14	100	53.98	54.12	0.119	-0.163
759.6	9.350	0.01	0.15	5.48	1.0	1.49	0.14	100	53.98	54.12	0.119	-0.162
759.5	9.514	0.01	0.15	5.48	1.0	1.48	0.14	100	53.98	54.12	0.119	-0.162
759.3	9.678	0.01	0.15	5.48	1.0	1.46	0.14	100	53.98	54.11	0.119	-0.161
759.2	9.842	0.01	0.15	5.48	1.0	1.45	0.14	100	53.98	54.11	0.120	-0.160

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
759.0	10.006	0.01	0.15	5.48	1.0	1.43	0.14	100	53.98	54.11	0.120	-0.160
758.8	10.170	0.01	0.15	5.48	1.0	1.42	0.13	100	53.97	54.11	0.120	-0.159
758.7	10.335	0.01	0.15	5.48	1.0	1.40	0.13	100	53.97	54.11	0.120	-0.159
758.5	10.499	0.01	0.15	5.48	1.0	1.39	0.13	100	53.97	54.11	0.120	-0.158
758.3	10.663	0.01	0.15	5.48	1.0	1.38	0.13	100	53.97	54.10	0.121	-0.158
758.2	10.827	0.01	0.15	5.48	1.0	1.36	0.13	100	53.97	54.10	0.121	-0.157
758.0	10.991	0.01	0.15	5.48	1.0	1.35	0.13	100	53.97	54.10	0.121	-0.157
757.8	11.155	0.01	0.15	5.48	1.0	1.34	0.13	100	53.97	54.10	0.122	-0.156
757.7	11.319	0.01	0.15	5.48	1.0	1.32	0.13	100	53.97	54.10	0.122	-0.156
757.5	11.483	0.01	0.15	5.48	1.0	1.31	0.12	100	53.97	54.10	0.122	-0.155
757.4	11.647	0.01	0.15	5.48	1.0	1.30	0.12	100	53.97	54.09	0.122	-0.155
757.2	11.811	0.01	0.15	5.48	1.0	1.29	0.12	100	53.97	54.09	0.122	-0.155
757.0	11.975	0.01	0.15	5.48	1.0	1.28	0.12	100	53.97	54.09	0.122	-0.154
756.9	12.139	0.01	0.15	5.48	1.0	1.27	0.12	100	53.97	54.09	0.122	-0.154
756.7	12.303	0.01	0.15	5.48	1.0	1.26	0.12	100	53.97	54.09	0.122	-0.153
756.5	12.467	19.40	1.33	2.56	0.5	1.22	20.63	68	56.26	76.89	0.123	-0.286
756.4	12.631	98.63	0.36	1.67	0.5	1.19	99.43	0	0.00	99.43	0.123	-0.391
756.2	12.795	150.04	0.36	1.51	0.5	1.14	146.42	0	0.00	146.42	0.123	-0.564
756.0	12.959	179.09	0.67	1.60	0.5	1.12	172.56	0	0.00	172.56	0.123	-0.600
755.9	13.123	160.85	0.86	1.71	0.5	1.13	156.42	0	0.00	156.42	0.123	-0.595
755.7	13.287	147.74	1.19	1.84	0.5	1.13	144.11	10	8.63	152.73	0.123	-0.583
755.5	13.451	174.94	1.29	1.81	0.5	1.12	169.06	8	3.31	172.36	0.126	-0.600
755.4	13.615	198.86	1.54	1.83	0.5	1.10	190.16	9	8.42	198.59	0.130	-0.600
755.2	13.779	190.41	2.02	1.94	0.5	1.09	180.79	18	40.65	221.44	0.134	-0.600
755.1	13.943	150.94	2.45	2.06	0.5	1.09	144.45	28	61.39	205.85	0.138	-0.600
754.9	14.107	120.38	2.56	2.14	0.5	1.10	116.59	34	64.33	180.93	0.142	-0.600
754.7	14.271	108.25	2.19	2.12	0.5	1.11	105.66	33	60.06	165.72	0.141	-0.600
754.6	14.436	112.41	1.88	2.06	0.5	1.10	109.84	28	54.26	164.10	0.120	-0.600
754.4	14.600	120.94	1.63	1.99	0.5	1.10	118.20	23	45.73	163.93	0.098	-0.600
754.2	14.764	123.87	1.65	1.99	0.5	1.10	121.02	22	45.36	166.38	0.077	-0.600
754.1	14.928	114.84	1.76	2.03	0.5	1.10	112.47	26	50.98	163.45	0.056	-0.600
753.9	15.092	114.12	1.71	2.03	0.5	1.10	111.92	25	49.83	161.75	0.035	-0.600
753.7	15.256	99.47	1.77	2.08	0.5	1.10	98.09	29	54.29	152.38	0.023	-0.578
753.6	15.420	80.75	2.34	2.23	0.5	1.10	80.17	41	62.21	142.37	0.019	-0.546
753.4	15.584	73.61	2.19	2.24	0.5	1.10	73.42	42	61.00	134.42	0.015	-0.519
753.3	15.748	76.08	1.68	2.15	0.5	1.10	75.97	35	55.94	131.91	0.011	-0.510
753.1	15.912	72.94	1.38	2.10	0.5	1.10	73.11	31	51.69	124.80	0.008	-0.485
752.9	16.076	58.43	1.48	2.20	0.5	1.10	59.03	39	55.37	114.40	0.004	-0.446
752.8	16.240	45.75	1.42	2.27	0.5	1.10	46.69	45	55.89	102.58	0.002	-0.398
752.6	16.404	35.26	1.68	2.41	0.5	1.11	36.36	55	57.57	93.93	0.002	-0.360
752.4	16.568	49.64	1.21	2.20	0.5	1.10	50.56	39	53.49	104.05	0.002	-0.404
752.3	16.732	47.85	1.40	2.25	0.5	1.09	48.77	43	55.62	104.39	0.002	-0.405
752.1	16.896	51.55	1.67	2.27	0.5	1.09	52.37	45	57.47	109.83	0.002	-0.427
751.9	17.060	48.41	1.97	2.34	0.5	1.09	49.28	50	59.17	108.45	0.002	-0.421
751.8	17.224	51.10	1.83	2.30	0.5	1.08	51.93	47	58.52	110.45	0.002	-0.429
751.6	17.388	45.55	1.79	2.34	0.5	1.08	46.52	50	58.25	104.77	0.002	-0.406
751.4	17.552	38.54	1.76	2.39	0.5	1.08	39.62	54	57.96	97.59	0.002	-0.375
751.3	17.716	31.84	1.76	2.45	0.5	1.08	33.01	59	57.75	90.76	0.002	-0.345
751.1	17.880	30.00	1.63	2.45	0.5	1.08	31.20	59	57.29	88.49	0.002	-0.334
751.0	18.044	33.34	1.41	2.38	0.5	1.08	34.52	53	56.39	90.91	0.002	-0.345
750.8	18.208	41.03	1.37	2.30	0.5	1.07	42.14	47	55.86	98.01	0.002	-0.377
750.6	18.372	40.90	1.54	2.33	0.5	1.07	42.00	50	56.95	98.95	0.002	-0.380
750.5	18.537	41.06	1.59	2.34	0.5	1.07	42.17	50	57.19	99.36	0.002	-0.382
750.3	18.701	35.90	1.76	2.41	0.5	1.06	37.06	56	57.89	94.95	0.003	-0.363
750.1	18.865	28.44	2.26	2.56	0.5	1.06	29.65	68	58.80	88.45	0.003	-0.333
750.0	19.029	27.18	2.76	2.63	1.0	1.06	26.90	73	59.02	85.92	0.003	-0.321
749.8	19.193	52.53	1.57	2.25	0.5	1.05	53.53	43	56.76	110.29	0.003	-0.426
749.6	19.357	165.65	0.54	1.57	0.5	1.04	164.72	0	0.00	164.72	0.003	-0.600
749.5	19.521	238.57	0.18	1.19	0.5	1.03	234.69	0	0.00	234.69	0.003	-0.600
749.3	19.685	279.28	0.34	1.27	0.5	1.03	274.25	0	0.00	274.25	0.003	-0.600
749.2	19.849	281.95	0.37	1.29	0.5	1.02	277.18	0	0.00	277.18	0.003	-0.600
749.0	20.013	374.96	0.31	1.14	0.5	1.02	368.67	0	0.00	368.67	0.003	-0.600
748.8	20.177	391.88	0.47	1.25	0.5	1.02	385.69	0	0.00	385.69	0.003	-0.600
748.7	20.341	393.63	0.52	1.28	0.5	1.02	387.85	0	0.00	387.85	0.003	-0.600
748.5	20.505	363.95	0.62	1.36	0.5	1.02	359.11	0	0.00	359.11	0.003	-0.600
748.3	20.669	357.71	0.71	1.41	0.5	1.02	353.37	0	0.00	353.37	0.004	-0.600

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
748.2	20.833	338.31	0.75	1.44	0.5	1.02	334.65	0	0.00	334.65	0.004	-0.600
748.0	20.997	300.56	0.99	1.57	0.5	1.01	297.77	0	0.00	297.77	0.004	-0.600
747.8	21.161	280.57	0.97	1.58	0.5	1.01	278.36	0	0.00	278.36	0.004	-0.600
747.7	21.325	251.79	0.80	1.55	0.5	1.01	250.27	0	0.00	250.27	0.004	-0.600
747.5	21.489	218.27	0.57	1.49	0.5	1.01	217.70	0	0.00	217.70	0.004	-0.600
747.3	21.653	184.59	0.32	1.41	0.5	1.01	184.77	0	0.00	184.77	0.004	-0.600
747.2	21.817	164.97	0.17	1.33	0.5	1.01	165.54	0	0.00	165.54	0.004	-0.600
747.0	21.981	150.49	0.19	1.39	0.5	1.01	151.31	0	0.00	151.31	0.004	-0.568
746.9	22.145	152.25	0.18	1.37	0.5	1.01	153.13	0	0.00	153.13	0.004	-0.574
746.7	22.309	152.07	0.16	1.35	0.5	1.01	153.02	0	0.00	153.02	0.004	-0.573
746.5	22.473	128.52	0.16	1.43	0.5	1.01	129.65	0	0.00	129.65	0.005	-0.496
746.4	22.638	116.55	0.17	1.48	0.5	1.01	117.77	0	0.00	117.77	0.005	-0.452
746.2	22.802	110.38	0.15	1.48	0.5	1.00	111.64	0	0.00	111.64	0.005	-0.429
746.0	22.966	97.68	0.15	1.53	0.5	1.00	98.97	0	0.00	98.97	0.005	-0.376
745.9	23.130	82.91	0.20	1.64	0.5	1.00	84.21	0	0.00	84.21	0.005	-0.309
745.7	23.294	78.77	0.15	1.62	0.5	1.00	80.07	0	0.00	80.07	0.005	-0.289
745.5	23.458	76.70	0.15	1.63	0.5	1.00	77.99	0	0.00	77.99	0.005	-0.278
745.4	23.622	62.14	0.15	1.72	0.5	0.99	63.39	1	0.00	63.39	0.005	-0.198
745.2	23.786	47.17	0.15	1.84	0.5	0.99	48.40	10	0.00	48.40	0.005	-0.099
745.1	23.950	39.49	0.15	1.91	0.5	0.99	40.69	16	0.00	40.69	0.005	-0.039
744.9	24.114	34.04	0.15	1.98	0.5	0.99	35.22	21	0.00	35.22	0.005	0.008
744.7	24.278	36.17	0.15	1.96	0.5	0.98	37.33	19	0.00	37.33	0.005	-0.011
744.6	24.442	40.69	0.20	1.93	0.5	0.98	41.83	17	0.00	41.83	0.005	-0.048
744.4	24.606	54.80	0.29	1.86	0.5	0.98	55.94	12	0.00	55.94	0.005	-0.150
744.2	24.770	67.27	0.38	1.82	0.5	0.98	68.43	9	0.00	68.43	0.005	-0.226
744.1	24.934	69.79	0.81	1.98	0.5	0.98	70.95	21	0.00	70.95	0.005	-0.240
743.9	25.098	67.89	1.23	2.10	0.5	0.98	69.03	31	0.00	69.03	0.005	-0.229
743.7	25.262	62.28	1.67	2.21	0.5	0.97	63.37	40	0.00	63.37	0.005	-0.196
743.6	25.426	65.74	1.48	2.16	0.5	0.97	66.84	36	0.00	66.84	0.005	-0.216
743.4	25.590	71.55	1.03	2.03	0.5	0.97	72.68	26	0.00	72.68	0.005	-0.249
743.2	25.754	66.66	0.85	2.01	0.5	0.97	67.74	24	0.00	67.74	0.005	-0.221
743.1	25.918	53.30	0.69	2.04	0.5	0.96	54.28	26	0.00	54.28	0.005	-0.139
742.9	26.082	40.89	0.24	1.95	0.5	0.96	41.82	19	0.00	41.82	0.005	-0.047
742.8	26.246	32.48	0.17	2.01	0.5	0.95	33.40	24	0.00	33.40	0.005	0.027
742.6	26.410	27.19	0.26	2.13	0.5	0.95	28.12	34	0.00	28.12	0.005	0.081
742.4	26.574	27.28	0.18	2.09	0.5	0.95	28.19	30	0.00	28.19	0.006	0.080
742.3	26.739	29.42	0.19	2.06	0.5	0.94	30.30	28	0.00	30.30	0.006	0.058
742.1	26.903	32.10	0.25	2.06	0.5	0.94	32.95	28	0.00	32.95	0.006	0.032
741.9	27.067	32.75	0.45	2.14	0.5	0.94	33.57	34	0.00	33.57	0.006	0.026
741.8	27.231	38.27	0.60	2.13	0.5	0.94	39.06	34	0.00	39.06	0.006	-0.023
741.6	27.395	40.71	0.73	2.15	0.5	0.94	41.49	35	0.00	41.49	0.006	-0.043
741.4	27.559	44.66	0.81	2.14	0.5	0.94	45.42	34	0.00	45.42	0.006	-0.074
741.3	27.723	45.00	1.04	2.20	0.5	0.94	45.75	39	0.00	45.75	0.006	-0.077
741.1	27.887	46.28	1.26	2.24	0.5	0.93	47.01	42	0.00	47.01	0.006	-0.086
740.9	28.051	46.25	1.48	2.28	0.5	0.93	46.96	45	0.00	46.96	0.007	-0.085
740.8	28.215	45.66	1.58	2.30	0.5	0.93	46.35	47	0.00	46.35	0.007	-0.081
740.6	28.379	42.86	1.70	2.34	0.5	0.93	43.52	50	0.00	43.52	0.007	-0.059
740.5	28.543	40.37	1.74	2.37	0.5	0.92	41.01	52	0.00	41.01	0.007	-0.039
740.3	28.707	38.52	1.75	2.39	0.5	0.92	39.15	54	0.00	39.15	0.007	-0.023
740.1	28.871	37.90	1.67	2.38	0.5	0.92	38.50	53	0.00	38.50	0.007	-0.017
740.0	29.035	42.76	1.31	2.27	0.5	0.92	43.34	45	0.00	43.34	0.007	-0.057
739.8	29.199	51.69	1.06	2.15	0.5	0.92	52.30	35	0.00	52.30	0.007	-0.123
739.6	29.363	54.27	0.81	2.07	0.5	0.92	54.89	29	0.00	54.89	0.007	-0.140
739.5	29.527	49.54	1.08	2.17	0.5	0.92	50.10	37	0.00	50.10	0.007	-0.107
739.3	29.691	43.62	1.47	2.30	0.5	0.91	44.13	47	0.00	44.13	0.007	-0.063
739.1	29.855	42.24	1.71	2.35	0.5	0.91	42.73	51	0.00	42.73	0.008	-0.052
739.0	30.019	45.74	1.81	2.34	0.5	0.91	46.22	50	0.00	46.22	0.008	-0.079
738.8	30.183	53.35	1.87	2.29	0.5	0.91	53.87	47	0.00	53.87	0.008	-0.133
738.7	30.347	64.79	1.90	2.24	0.5	0.91	65.46	42	0.00	65.46	0.008	-0.205
738.5	30.511	66.85	2.27	2.28	0.5	0.91	67.54	45	0.00	67.54	0.008	-0.217
738.3	30.675	67.54	2.48	2.30	0.5	0.91	68.23	47	0.00	68.23	0.008	-0.221
738.2	30.840	62.32	2.72	2.35	0.5	0.91	62.91	51	0.00	62.91	0.008	-0.190
738.0	31.004	62.31	2.61	2.34	0.5	0.90	62.88	50	0.00	62.88	0.008	-0.189
737.8	31.168	67.54	2.43	2.30	0.5	0.91	68.20	47	0.00	68.20	0.008	-0.220
737.7	31.332	70.06	2.52	2.30	0.5	0.91	70.76	47	0.00	70.76	0.008	-0.234
737.5	31.496	61.91	2.99	2.39	0.5	0.90	62.43	54	0.00	62.43	0.008	-0.186

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
737.3	31.660	58.99	3.01	2.40	0.5	0.90	59.44	55	0.00	59.44	0.008	-0.168
737.2	31.824	58.21	3.00	2.41	0.5	0.89	58.64	55	0.00	58.64	0.008	-0.163
737.0	31.988	58.08	2.92	2.40	0.5	0.89	58.48	55	0.00	58.48	0.009	-0.162
736.8	32.152	59.31	2.84	2.38	0.5	0.89	59.72	54	0.00	59.72	0.009	-0.169
736.7	32.316	57.66	2.91	2.40	0.5	0.89	58.02	55	0.00	58.02	0.009	-0.158
736.5	32.480	59.17	2.80	2.38	0.5	0.89	59.54	53	0.00	59.54	0.009	-0.168
736.4	32.644	60.80	2.04	2.28	0.5	0.89	61.20	45	0.00	61.20	0.009	-0.178
736.2	32.808	56.55	2.23	2.33	0.5	0.88	56.85	49	0.00	56.85	0.009	-0.151
736.0	32.972	54.79	2.48	2.37	0.5	0.88	55.05	52	0.00	55.05	0.009	-0.139
735.9	33.136	57.25	2.69	2.38	0.5	0.88	57.53	53	0.00	57.53	0.009	-0.155
735.7	33.300	58.94	2.80	2.38	0.5	0.88	59.24	53	0.00	59.24	0.009	-0.165
735.5	33.464	63.05	2.80	2.36	0.5	0.88	63.42	52	0.00	63.42	0.009	-0.191
735.4	33.628	66.50	2.63	2.32	0.5	0.88	66.94	49	0.00	66.94	0.009	-0.211
735.2	33.792	57.43	2.85	2.39	0.5	0.87	57.66	55	0.00	57.66	0.009	-0.155
735.0	33.956	47.35	2.91	2.46	0.5	0.86	47.42	60	0.00	47.42	0.010	-0.085
734.9	34.120	28.12	3.65	2.69	1.0	0.85	31.59	79	0.00	31.59	0.010	0.050
734.7	34.284	18.88	4.17	2.86	1.0	0.84	21.45	92	0.00	21.45	0.010	0.100
734.6	34.448	12.28	4.54	3.03	1.0	0.83	14.50	100	0.00	14.50	0.010	0.100
734.4	34.612	8.43	4.31	3.15	1.0	0.83	10.45	100	0.00	10.45	0.010	0.100
734.2	34.776	6.79	2.68	3.11	1.0	0.83	8.73	100	0.00	8.73	0.010	0.100
734.1	34.941	6.03	1.68	3.05	1.0	0.83	7.94	100	0.00	7.94	0.010	0.100
733.9	35.105	5.37	1.29	3.05	1.0	0.82	7.25	100	0.00	7.25	0.010	0.100
733.7	35.269	5.27	1.50	3.08	1.0	0.82	7.15	100	0.00	7.15	0.010	0.100
733.6	35.433	5.88	1.71	3.07	1.0	0.82	7.81	100	0.00	7.81	0.010	0.100
733.4	35.597	6.60	1.83	3.04	1.0	0.82	8.58	100	0.00	8.58	0.010	0.100
733.2	35.761	7.71	3.15	3.10	1.0	0.82	9.76	100	0.00	9.76	0.010	0.100
733.1	35.925	9.54	2.47	2.97	1.0	0.81	11.70	100	0.00	11.70	0.010	0.100
732.9	36.089	9.34	4.81	3.14	1.0	0.81	11.50	100	0.00	11.50	0.010	0.100
732.7	36.253	9.58	4.53	3.12	1.0	0.81	11.77	100	0.00	11.77	0.010	0.100
732.6	36.417	8.65	4.31	3.14	1.0	0.81	10.78	100	0.00	10.78	0.010	0.100
732.4	36.581	8.17	3.26	3.09	1.0	0.81	10.29	100	0.00	10.29	0.010	0.100
732.3	36.745	6.40	3.40	3.19	1.0	0.81	8.42	100	0.00	8.42	0.010	0.100
732.1	36.909	5.41	3.28	3.24	1.0	0.80	7.38	100	0.00	7.38	0.011	0.100
731.9	37.073	4.22	4.11	3.38	1.0	0.80	6.11	100	0.00	6.11	0.011	0.100
731.8	37.237	3.80	4.18	3.43	1.0	0.80	5.67	100	0.00	5.67	0.011	0.100
731.6	37.401	3.61	3.83	3.43	1.0	0.80	5.48	100	0.00	5.48	0.011	0.100
731.4	37.565	4.44	2.69	3.27	1.0	0.80	6.37	100	0.00	6.37	0.011	0.100
731.3	37.729	4.65	2.18	3.21	1.0	0.79	6.60	100	0.00	6.60	0.011	0.100
731.1	37.893	4.16	2.10	3.24	1.0	0.79	6.08	100	0.00	6.08	0.011	0.100
730.9	38.057	5.09	1.83	3.14	1.0	0.79	7.08	100	0.00	7.08	0.011	0.100
730.8	38.221	6.27	1.88	3.06	1.0	0.79	8.35	100	0.00	8.35	0.011	0.100
730.6	38.385	13.35	1.46	2.72	1.0	0.79	15.91	81	0.00	15.91	0.011	0.100
730.5	38.549	11.95	1.57	2.78	1.0	0.79	14.43	85	0.00	14.43	0.011	0.100
730.3	38.713	10.99	1.56	2.81	1.0	0.78	13.41	88	0.00	13.41	0.011	0.100
730.1	38.877	10.76	1.45	2.80	1.0	0.78	13.18	87	0.00	13.18	0.011	0.100
730.0	39.042	11.34	1.50	2.79	1.0	0.78	13.81	86	0.00	13.81	0.011	0.100
729.8	39.206	12.93	2.05	2.81	1.0	0.78	15.52	88	0.00	15.52	0.011	0.100
729.6	39.370	13.30	2.96	2.89	1.0	0.78	15.93	94	0.00	15.93	0.011	0.100
729.5	39.534	16.06	2.25	2.76	1.0	0.84	20.41	84	58.59	78.99	0.012	-0.272
729.3	39.698	12.89	2.23	2.83	1.0	0.83	16.70	90	58.16	74.87	0.012	-0.251
729.1	39.862	11.43	1.85	2.83	1.0	0.83	15.01	90	57.64	72.65	0.012	-0.239
729.0	40.026	11.07	1.44	2.79	1.0	0.83	14.61	86	57.15	71.76	0.012	-0.234
728.8	40.190	12.09	1.45	2.76	1.0	0.83	15.83	84	57.23	73.06	0.012	-0.241
728.6	40.354	12.49	1.75	2.79	1.0	0.82	16.33	86	57.66	73.99	0.012	-0.246
728.5	40.518	13.21	1.40	2.72	1.0	0.82	17.21	80	57.23	74.44	0.012	-0.248
728.3	40.682	13.52	1.23	2.68	1.0	0.82	17.61	77	56.94	74.55	0.012	-0.249
728.2	40.846	13.44	1.27	2.69	1.0	0.82	17.53	78	57.01	74.54	0.012	-0.248
728.0	41.010	14.38	1.62	2.72	1.0	0.82	18.69	80	57.68	76.37	0.012	-0.258
727.8	41.174	15.99	1.42	2.65	1.0	0.82	20.65	75	57.47	78.12	0.012	-0.267
727.7	41.338	16.98	1.75	2.68	1.0	0.82	21.90	77	58.15	80.05	0.012	-0.276
727.5	41.502	18.16	2.06	2.69	1.0	0.82	23.37	78	58.76	82.14	0.012	-0.287
727.3	41.666	20.40	2.00	2.64	1.0	0.82	26.13	74	58.99	85.12	0.013	-0.301
727.2	41.830	43.81	1.19	2.24	0.5	0.83	45.77	42	54.35	100.12	0.013	-0.369
727.0	41.994	36.83	2.19	2.46	0.5	0.83	38.72	60	59.54	98.27	0.013	-0.361
726.8	42.158	43.23	2.36	2.43	0.5	0.83	45.42	57	60.66	106.08	0.013	-0.393
726.7	42.322	51.47	2.34	2.37	0.5	0.84	54.12	53	61.41	115.53	0.013	-0.430

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726.5	42.486	55.91	1.19	2.16	0.5	0.83	58.42	35	52.58	111.00	0.013	-0.413
726.3	42.650	54.54	1.11	2.15	0.5	0.83	56.92	35	51.48	108.40	0.013	-0.402
726.2	42.814	51.73	1.54	2.25	0.5	0.83	54.22	43	56.93	111.15	0.013	-0.413
726.0	42.978	47.28	1.89	2.34	0.5	0.83	49.64	50	59.13	108.77	0.013	-0.403
725.9	43.143	49.51	2.13	2.36	0.5	0.83	52.05	51	60.41	112.46	0.013	-0.418
725.7	43.307	53.06	1.54	2.24	0.5	0.83	55.66	42	56.86	112.52	0.013	-0.418
725.5	43.471	54.72	0.60	2.00	0.5	0.81	56.36	23	36.51	92.87	0.014	-0.336
725.4	43.635	46.38	0.67	2.08	0.5	0.81	48.07	30	44.71	92.78	0.014	-0.335
725.2	43.799	34.28	0.78	2.23	0.5	0.80	35.84	41	51.43	87.28	0.014	-0.310
725.0	43.963	23.89	0.93	2.40	0.5	0.80	25.38	55	54.54	79.91	0.014	-0.274
724.9	44.127	14.17	0.96	2.61	1.0	0.79	19.00	72	56.47	75.47	0.014	-0.251
724.7	44.291	11.13	2.16	2.88	1.0	0.79	15.32	93	58.10	73.42	0.014	-0.240
724.5	44.455	12.33	2.95	2.92	1.0	0.79	16.83	96	58.85	75.68	0.014	-0.252
724.4	44.619	37.08	1.38	2.34	0.5	0.80	38.93	50	56.32	95.25	0.014	-0.345
724.2	44.783	54.05	0.62	2.01	0.5	0.80	55.78	24	38.24	94.02	0.014	-0.340
724.1	44.947	68.50	0.44	1.85	0.5	0.79	68.99	11	9.50	78.49	0.015	-0.266
723.9	45.111	70.80	0.51	1.87	0.5	0.79	71.79	12	13.57	85.37	0.015	-0.300
723.7	45.275	66.07	0.62	1.93	0.5	0.80	67.84	18	27.54	95.37	0.015	-0.346
723.6	45.439	61.31	0.69	1.99	0.5	0.80	63.36	22	36.18	99.54	0.015	-0.364
723.4	45.603	55.43	0.71	2.03	0.5	0.80	57.44	26	41.19	98.63	0.015	-0.359
723.2	45.767	47.22	0.84	2.13	0.5	0.80	49.18	33	48.53	97.72	0.015	-0.355
723.1	45.931	33.61	1.00	2.29	0.5	0.79	35.27	47	53.88	89.15	0.015	-0.317
722.9	46.095	26.76	1.01	2.38	0.5	0.78	28.30	54	54.75	83.05	0.015	-0.288
722.7	46.259	13.81	1.28	2.68	1.0	0.77	18.94	78	57.34	76.28	0.015	-0.254
722.6	46.423	13.40	1.03	2.65	1.0	0.77	18.43	75	56.78	75.22	0.015	-0.248
722.4	46.587	31.85	0.30	2.09	0.5	0.77	32.98	30	42.01	74.98	0.015	-0.247
722.2	46.751	22.20	0.72	2.38	0.5	0.77	23.65	53	53.46	77.11	0.015	-0.258
722.1	46.915	9.80	1.26	2.81	1.0	0.76	14.00	88	57.13	71.13	0.016	-0.226
721.9	47.079	5.96	1.97	3.09	1.0	0.76	9.25	100	56.80	66.05	0.016	-0.197
721.8	47.244	4.59	1.70	3.16	1.0	0.75	7.55	100	56.28	63.83	0.016	-0.184
721.6	47.408	4.83	3.47	3.30	1.0	0.75	7.86	100	56.37	64.24	0.016	-0.186
721.4	47.572	6.33	4.03	3.23	1.0	0.75	9.74	100	56.96	66.70	0.016	-0.200
721.3	47.736	10.55	2.74	2.95	1.0	0.76	15.09	99	58.57	73.65	0.016	-0.239
721.1	47.900	13.80	2.16	2.80	1.0	0.76	19.23	87	58.65	77.88	0.016	-0.261
720.9	48.064	20.45	1.12	2.50	0.5	0.76	21.97	63	55.67	77.64	0.016	-0.259
720.8	48.228	22.87	0.69	2.36	0.5	0.76	24.32	52	53.13	77.45	0.016	-0.258
720.6	48.392	19.12	0.75	2.45	0.5	0.76	20.59	59	54.18	74.77	0.016	-0.244
720.4	48.556	13.48	1.23	2.68	1.0	0.76	18.90	78	57.34	76.24	0.016	-0.252
720.3	48.720	23.04	0.68	2.35	0.5	0.76	24.48	51	52.98	77.47	0.017	-0.258
720.1	48.884	30.66	0.29	2.10	0.5	0.75	31.77	31	42.56	74.33	0.017	-0.242
720.0	49.048	28.29	1.02	2.36	0.5	0.76	29.88	52	54.68	84.55	0.017	-0.293
719.8	49.212	15.95	2.05	2.74	1.0	0.76	22.26	82	58.94	81.20	0.017	-0.277
719.6	49.376	14.75	2.19	2.78	1.0	0.75	20.73	85	58.91	79.64	0.017	-0.269
719.5	49.540	20.09	0.61	2.39	0.5	0.75	21.54	54	53.06	74.60	0.017	-0.243
719.3	49.704	22.23	0.41	2.28	0.5	0.74	23.58	45	50.33	73.91	0.017	-0.239
719.1	49.868	21.31	0.47	2.32	0.5	0.74	22.70	48	51.45	74.15	0.017	-0.240
719.0	50.032	23.16	0.68	2.35	0.5	0.75	24.61	51	52.99	77.60	0.017	-0.258
718.8	50.196	29.85	0.61	2.24	0.5	0.75	31.31	42	50.52	81.83	0.017	-0.279
718.6	50.360	35.91	0.70	2.19	0.5	0.75	37.51	38	49.81	87.32	0.017	-0.305
718.5	50.524	39.53	0.85	2.20	0.5	0.76	41.35	39	51.17	92.53	0.018	-0.329
718.3	50.688	41.38	0.78	2.16	0.5	0.76	43.21	36	49.53	92.73	0.018	-0.330
718.1	50.852	38.75	0.82	2.20	0.5	0.75	40.53	39	50.91	91.44	0.018	-0.324
718.0	51.016	33.76	0.97	2.29	0.5	0.75	35.48	46	53.61	89.09	0.018	-0.313
717.8	51.180	30.90	1.06	2.34	0.5	0.75	32.58	50	54.67	87.24	0.018	-0.305
717.7	51.345	31.13	0.82	2.28	0.5	0.75	32.72	45	52.68	85.41	0.018	-0.296
717.5	51.509	34.26	0.56	2.16	0.5	0.74	35.71	36	47.90	83.61	0.018	-0.287
717.3	51.673	36.38	0.61	2.16	0.5	0.74	37.91	36	48.01	85.92	0.018	-0.298
717.2	51.837	36.63	0.91	2.24	0.5	0.75	38.42	42	52.58	91.00	0.018	-0.321
717.0	52.001	33.82	1.16	2.33	0.5	0.75	35.63	49	55.14	90.78	0.018	-0.320
716.8	52.165	29.26	1.15	2.38	0.5	0.74	30.94	53	55.34	86.28	0.018	-0.299
716.7	52.329	19.48	1.73	2.62	1.0	0.74	27.66	73	59.19	86.85	0.018	-0.302
716.5	52.493	16.09	1.69	2.69	1.0	0.73	23.08	78	58.64	81.71	0.018	-0.277
716.3	52.657	25.38	1.18	2.44	0.5	0.73	26.98	58	55.73	82.71	0.019	-0.282
716.2	52.821	29.31	0.51	2.21	0.5	0.73	30.70	40	49.16	79.85	0.019	-0.268
716.0	52.985	30.51	0.36	2.13	0.5	0.72	31.70	34	44.96	76.67	0.019	-0.251
715.9	53.149	31.28	0.47	2.17	0.5	0.73	32.62	36	47.36	79.98	0.019	-0.268

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
715.7	53.313	29.61	0.88	2.31	0.5	0.73	31.22	48	53.50	84.71	0.019	-0.291
715.5	53.477	29.48	0.97	2.34	0.5	0.73	31.12	50	54.21	85.33	0.019	-0.294
715.4	53.641	30.34	0.89	2.31	0.5	0.73	31.96	47	53.42	85.39	0.019	-0.294
715.2	53.805	29.88	0.81	2.29	0.5	0.73	31.46	46	52.80	84.26	0.019	-0.289
715.0	53.969	29.18	0.82	2.30	0.5	0.73	30.75	47	53.01	83.77	0.019	-0.286
714.9	54.133	27.53	0.92	2.35	0.5	0.72	29.12	51	54.12	83.24	0.019	-0.283
714.7	54.297	25.87	1.18	2.43	0.5	0.72	27.50	57	55.70	83.20	0.019	-0.283
714.5	54.461	15.62	1.88	2.72	1.0	0.72	22.83	81	58.96	81.80	0.019	-0.276
714.4	54.625	10.59	2.88	2.97	1.0	0.71	16.03	100	58.91	74.94	0.019	-0.241
714.2	54.789	12.03	1.29	2.74	1.0	0.71	17.95	82	57.63	75.59	0.019	-0.244
714.0	54.953	22.05	0.30	2.24	0.5	0.71	23.33	42	48.67	72.00	0.019	-0.225
713.9	55.117	19.45	0.43	2.34	0.5	0.71	20.85	50	51.69	72.54	0.019	-0.228
713.7	55.281	9.63	1.24	2.81	1.0	0.70	14.78	88	57.39	72.17	0.019	-0.226
713.6	55.446	8.02	1.66	2.94	1.0	0.70	12.65	98	57.73	70.38	0.020	-0.216
713.4	55.610	18.83	0.68	2.44	0.5	0.70	20.32	58	53.84	74.17	0.020	-0.236
713.2	55.774	31.22	0.21	2.05	0.5	0.70	32.01	27	38.15	70.16	0.020	-0.215
713.1	55.938	35.13	0.34	2.07	0.5	0.70	36.18	28	40.84	77.02	0.020	-0.251
712.9	56.102	31.95	0.77	2.26	0.5	0.71	33.57	43	51.94	85.51	0.020	-0.293
712.7	56.266	27.00	1.29	2.43	0.5	0.71	28.69	58	56.14	84.83	0.020	-0.290
712.6	56.430	17.09	1.32	2.61	1.0	0.71	25.24	72	58.26	83.50	0.020	-0.283
712.4	56.594	16.70	1.24	2.60	1.0	0.71	24.72	71	58.04	82.75	0.020	-0.279
712.2	56.758	25.00	1.26	2.46	0.5	0.71	26.64	60	56.07	82.71	0.020	-0.279
712.1	56.922	31.82	0.91	2.29	0.5	0.71	33.52	47	53.44	86.96	0.020	-0.299
711.9	57.086	37.93	0.76	2.19	0.5	0.71	39.71	38	50.21	89.92	0.020	-0.313
711.8	57.250	42.46	0.78	2.15	0.5	0.72	44.42	35	49.10	93.52	0.020	-0.329
711.6	57.414	45.17	0.86	2.15	0.5	0.72	47.37	35	49.70	97.07	0.020	-0.345
711.4	57.578	49.26	0.96	2.15	0.5	0.72	51.84	35	50.38	102.22	0.020	-0.367
711.3	57.742	58.30	0.85	2.06	0.5	0.73	61.24	28	44.55	105.79	0.020	-0.381
711.1	57.906	75.11	0.77	1.94	0.5	0.73	78.49	18	29.64	108.12	0.020	-0.391
710.9	58.070	90.80	0.78	1.88	0.5	0.73	94.90	13	17.14	112.05	0.020	-0.406
710.8	58.234	94.47	0.90	1.90	0.5	0.74	100.09	15	22.90	122.99	0.020	-0.447
710.6	58.398	87.61	1.01	1.96	0.5	0.74	93.71	20	35.16	128.87	0.020	-0.469
710.4	58.562	77.73	1.00	2.00	0.5	0.74	82.86	23	40.50	123.36	0.020	-0.449
710.3	58.726	68.56	1.04	2.05	0.5	0.73	72.97	27	46.12	119.09	0.020	-0.433
710.1	58.890	66.71	0.89	2.02	0.5	0.73	70.41	25	41.73	112.15	0.020	-0.406
709.9	59.054	74.17	0.68	1.91	0.5	0.71	76.80	16	24.41	101.21	0.020	-0.362
709.8	59.218	86.00	0.56	1.82	0.5	0.70	87.21	8	3.37	90.59	0.020	-0.315
709.6	59.382	94.94	0.52	1.76	0.5	0.71	97.03	4	0.02	97.05	0.020	-0.343
709.5	59.547	94.62	0.58	1.79	0.5	0.71	96.80	6	0.77	97.57	0.020	-0.346
709.3	59.711	88.36	0.65	1.84	0.5	0.71	90.79	10	8.46	99.25	0.020	-0.353
709.1	59.875	83.73	0.64	1.86	0.5	0.70	85.89	11	11.34	97.22	0.020	-0.344
709.0	60.039	85.06	0.60	1.84	0.5	0.70	86.73	10	6.95	93.67	0.020	-0.328
708.8	60.203	83.44	0.64	1.86	0.5	0.70	85.59	12	11.51	97.11	0.020	-0.343
708.6	60.367	74.89	0.70	1.92	0.5	0.71	77.82	17	25.52	103.34	0.020	-0.370
708.5	60.531	66.44	0.78	1.99	0.5	0.71	69.67	22	36.96	106.63	0.020	-0.383
708.3	60.695	60.64	0.79	2.03	0.5	0.71	63.65	25	41.33	104.98	0.020	-0.376
708.1	60.859	57.18	0.79	2.05	0.5	0.70	59.99	27	43.09	103.08	0.020	-0.368
708.0	61.023	55.58	0.81	2.06	0.5	0.70	58.35	28	44.42	102.77	0.020	-0.367
707.8	61.187	48.58	1.04	2.17	0.5	0.70	51.36	37	51.98	103.34	0.020	-0.369
707.6	61.351	42.95	1.30	2.27	0.5	0.70	45.54	45	55.57	101.10	0.020	-0.360
707.5	61.515	47.81	1.18	2.21	0.5	0.70	50.69	40	53.91	104.61	0.020	-0.374
707.3	61.679	48.15	1.30	2.23	0.5	0.70	51.18	41	55.15	106.34	0.020	-0.381
707.2	61.843	50.35	1.36	2.23	0.5	0.71	53.64	41	55.57	109.21	0.020	-0.393
707.0	62.007	55.23	2.08	2.31	0.5	0.72	59.59	48	60.89	120.48	0.020	-0.436
706.8	62.171	71.13	1.02	2.03	0.5	0.72	76.00	25	44.18	120.18	0.021	-0.435
706.7	62.335	99.25	1.48	2.03	0.5	0.75	110.56	25	49.51	160.07	0.021	-0.568
706.5	62.499	113.22	0.83	1.82	0.5	0.72	120.25	8	4.33	124.59	0.021	-0.451
706.3	62.663	185.54	0.75	1.62	0.5	0.80	216.90	0	0.00	216.90	0.021	-0.600
706.2	62.827	216.94	0.92	1.64	0.5	0.82	261.70	0	0.00	261.70	0.021	-0.600
706.0	62.991	183.29	1.21	1.78	0.5	0.79	213.98	5	0.24	214.22	0.021	-0.600
705.8	63.155	142.42	1.05	1.81	0.5	0.75	157.97	8	3.33	161.30	0.021	-0.571
705.7	63.319	122.83	0.62	1.71	0.5	0.72	131.63	0	0.00	131.63	0.021	-0.475
705.5	63.483	112.11	0.85	1.83	0.5	0.71	119.33	9	5.95	125.28	0.021	-0.452
705.4	63.648	73.86	1.66	2.15	0.5	0.73	80.96	35	57.47	138.43	0.021	-0.498
705.2	63.812	58.77	2.38	2.33	0.5	0.71	63.95	50	62.78	126.73	0.021	-0.457
705.0	63.976	61.47	2.64	2.35	0.5	0.72	67.22	51	64.23	131.45	0.021	-0.474

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
704.9	64.140	64.64	2.81	2.35	0.5	0.72	71.04	51	65.38	136.43	0.021	-0.491
704.7	64.304	67.92	3.16	2.37	0.5	0.73	75.12	53	67.22	142.35	0.021	-0.511
704.5	64.468	87.09	2.75	2.26	0.5	0.75	98.54	44	68.30	166.85	0.021	-0.586
704.4	64.632	105.87	2.24	2.13	0.5	0.77	121.96	34	64.94	186.90	0.021	-0.600
704.2	64.796	120.08	2.11	2.08	0.5	0.78	140.34	29	62.45	202.79	0.021	-0.600
704.0	64.960	138.70	2.06	2.03	0.5	0.79	165.29	25	59.61	224.90	0.021	-0.600
703.9	65.124	143.36	2.18	2.04	0.5	0.80	172.46	26	62.58	235.04	0.021	-0.600
703.7	65.288	154.69	2.13	2.01	0.5	0.81	188.14	24	59.78	247.93	0.021	-0.600
703.5	65.452	159.42	1.65	1.92	0.5	0.79	190.04	16	35.98	226.01	0.021	-0.600
703.4	65.616	0.18	820.67	5.90	1.0	0.62	2.56	100	54.73	57.29	0.021	-0.132
703.2	65.780	55.72	2.89	2.41	0.5	0.70	60.76	56	64.32	125.08	0.021	-0.450
703.1	65.944	86.84	1.80	2.13	0.5	0.73	97.27	33	58.81	156.09	0.021	-0.553
702.9	66.108	88.75	2.12	2.17	0.5	0.74	100.30	37	63.10	163.40	0.021	-0.575
702.7	66.272	107.87	1.37	1.98	0.5	0.74	121.44	21	42.63	164.08	0.021	-0.577
702.6	66.436	155.37	1.58	1.91	0.5	0.78	184.38	16	33.51	217.89	0.021	-0.600
702.4	66.600	183.59	1.45	1.83	0.5	0.79	219.95	10	9.71	229.67	0.021	-0.600
702.2	66.764	200.55	1.51	1.82	0.5	0.81	245.34	9	7.39	252.73	0.021	-0.600
702.1	66.928	246.42	1.40	1.74	0.5	0.81	301.32	2	0.00	301.32	0.021	-0.600
701.9	67.092	288.19	1.32	1.68	0.5	0.81	352.07	0	0.00	352.07	0.021	-0.600
701.7	67.256	290.76	0.15	1.08	0.5	0.81	355.39	0	0.00	355.39	0.021	-0.600
701.6	67.420	275.38	0.15	1.10	0.5	0.81	336.95	0	0.00	336.95	0.021	-0.600

LIQUEFACTION POTENTIAL ASSESSMENT FOR COARSE GRAINED SOILS USING CONE PENETRATION TEST DATA

	Depth to Water during Earthquake:	15.0	ft	Shear Stress Fit Parameters
	Final Grade Elevation during EQ:	766.0	ft	m4: 0
	Height of Final Grade above CPT TOH:	-3.0	ft	m3: 0
Project Site: KIF TDEC Stability	Normalize K_σ to:	1.058	tsf	m2: 0
Stantec Project No.: 175668043	a_{max} at top of ground surface:	0.10	g	m1: 0
CPT ID: KIF-BF-CPT-5B	Earthquake Magnitude:	7.60	M_W	
	Earthquake File or Source Zone:	1	Hz	

Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
769.0																	
768.8	0.164	0.095	31	#NUM!	N/A	1.00	N/A	1.000	0	0	**0.063**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**B**
768.7	0.328	0.095	31	#NUM!	N/A	1.00	N/A	1.000	0	0	**0.063**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**B**
768.5	0.492	0.095	31	#NUM!	N/A	1.00	N/A	1.000	0	0	**0.063**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**B**
768.3	0.656	0.095	31	#NUM!	N/A	1.00	N/A	1.000	0	0	**0.063**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**B**
768.2	0.820	0.095	31	#NUM!	N/A	1.00	N/A	1.000	0	0	**0.063**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**B**
768.0	0.984	0.095	31	#NUM!	N/A	1.00	N/A	1.000	0	0	**0.063**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**B**
767.9	1.148	0.095	31	#NUM!	N/A	1.00	N/A	1.000	0	0	**0.063**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**B**
767.7	1.312	0.095	31	#NUM!	N/A	1.00	N/A	1.000	0	0	**0.063**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**B**
767.5	1.476	0.095	31	#NUM!	N/A	1.00	N/A	1.000	0	0	**0.063**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**B**
767.4	1.640	0.095	31	#NUM!	N/A	1.00	N/A	1.000	0	0	**0.063**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**B**
767.2	1.804	0.095	31	#NUM!	N/A	1.00	N/A	1.000	0	0	**0.063**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
767.0	1.968	0.095	31	#NUM!	N/A	1.00	N/A	1.000	0	0	**0.063**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
766.9	2.133	0.095	31	#NUM!	N/A	1.00	N/A	1.000	0	0	**0.063**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
766.7	2.297	0.095	31	#NUM!	N/A	1.00	N/A	1.000	0	0	**0.063**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
766.5	2.461	0.095	31	#NUM!	N/A	1.00	N/A	1.000	0	0	**0.063**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
766.4	2.625	0.095	31	#NUM!	N/A	1.00	N/A	1.000	0	0	**0.063**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
766.2	2.789	0.095	31	#NUM!	N/A	1.00	N/A	1.000	0	0	**0.063**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
766.0	2.953	0.095	31	#NUM!	N/A	1.00	N/A	1.000	0	0	**0.063**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
765.9	3.117	0.095	31	1.100	N/A	1.00	N/A	1.000	0	0	**0.063**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
765.7	3.281	0.095	31	1.100	N/A	1.00	N/A	1.000	0	0	**0.063**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
765.6	3.445	0.095	31	1.100	N/A	1.00	N/A	1.000	0	0	**0.063**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
765.4	3.609	0.095	31	1.100	N/A	1.00	N/A	1.000	0	0	**0.063**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
765.2	3.773	0.095	31	1.100	N/A	1.00	N/A	1.000	0	0	**0.063**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
765.1	3.937	0.095	31	1.100	N/A	1.00	N/A	1.000	0	0	**0.063**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
764.9	4.101	0.095	31	1.100	N/A	1.00	N/A	1.000	0	0	**0.063**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
764.7	4.265	0.095	31	1.100	N/A	1.00	N/A	1.000	0	0	**0.063**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
764.6	4.429	0.095	31	1.100	N/A	1.00	N/A	1.000	0	0	**0.063**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
764.4	4.593	0.095	31	1.100	N/A	1.00	N/A	1.000	0	0	**0.063**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
764.2	4.757	0.095	31	1.100	N/A	1.00	N/A	1.000	0	0	**0.063**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
764.1	4.921	0.095	31	1.100	N/A	1.00	N/A	1.000	0	0	**0.063**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
763.9	5.085	0.095	31	1.100	N/A	1.00	N/A	1.000	0	0	**0.063**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
763.8	5.249	0.095	31	1.100	N/A	1.00	N/A	1.000	0	0	**0.063**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
763.6	5.413	0.095	31	1.100	N/A	1.00	N/A	1.000	0	0	**0.063**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
763.4	5.577	0.095	31	1.100	N/A	1.00	N/A	1.000	0	0	**0.063**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
763.3	5.741	0.095	31	1.100	N/A	1.00	N/A	1.000	0	0	**0.063**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
763.1	5.905	0.095	31	1.100	N/A	1.00	N/A	1.000	0	0	**0.063**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
762.9	6.069	0.095	31	1.100	N/A	1.00	N/A	1.000	0	0	**0.063**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
762.8	6.234	0.095	31	1.100	N/A	1.00	N/A	1.000	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
762.6	6.398	0.095	31	1.100	N/A	1.00	N/A	0.999	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
762.4	6.562	0.095	31	1.100	N/A	1.00	N/A	0.999	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
762.3	6.726	0.095	31	1.100	N/A	1.00	N/A	0.999	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
762.1	6.890	0.095	31	1.100	N/A	1.00	N/A	0.998	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
761.9	7.054	0.095	31	1.100	N/A	1.00	N/A	0.998	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
761.8	7.218	0.095	31	1.100	N/A	1.00	N/A	0.997	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**

Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
761.6	7.382	0.095	31	1.100	N/A	1.00	N/A	0.997	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
761.5	7.546	0.095	31	1.100	N/A	1.00	N/A	0.997	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
761.3	7.710	0.095	31	1.099	N/A	1.00	N/A	0.996	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
761.1	7.874	0.095	31	1.097	N/A	1.00	N/A	0.996	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
761.0	8.038	0.095	31	1.094	N/A	1.00	N/A	0.996	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
760.8	8.202	0.095	31	1.092	N/A	1.00	N/A	0.995	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
760.6	8.366	0.095	31	1.089	N/A	1.00	N/A	0.995	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
760.5	8.530	0.095	31	1.087	N/A	1.00	N/A	0.994	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
760.3	8.694	0.095	31	1.085	N/A	1.00	N/A	0.994	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
760.1	8.858	0.095	31	1.083	N/A	1.00	N/A	0.994	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
760.0	9.022	0.095	31	1.081	N/A	1.00	N/A	0.993	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
759.8	9.186	0.095	31	1.079	N/A	1.00	N/A	0.993	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
759.6	9.350	0.095	31	1.077	N/A	1.00	N/A	0.992	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
759.5	9.514	0.095	31	1.075	N/A	1.00	N/A	0.992	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
759.3	9.678	0.095	31	1.073	N/A	1.00	N/A	0.992	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
759.2	9.842	0.095	31	1.071	N/A	1.00	N/A	0.991	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
759.0	10.006	0.095	31	1.069	N/A	1.00	N/A	0.991	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
758.8	10.170	0.095	31	1.068	N/A	1.00	N/A	0.990	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
758.7	10.335	0.095	31	1.066	N/A	1.00	N/A	0.990	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
758.5	10.499	0.095	31	1.064	N/A	1.00	N/A	0.990	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
758.3	10.663	0.095	31	1.063	N/A	1.00	N/A	0.989	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
758.2	10.827	0.095	31	1.061	N/A	1.00	N/A	0.989	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
758.0	10.991	0.095	31	1.060	N/A	1.00	N/A	0.988	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
757.8	11.155	0.095	31	1.058	N/A	1.00	N/A	0.988	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
757.7	11.319	0.095	31	1.057	N/A	1.00	N/A	0.987	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
757.5	11.483	0.095	31	1.055	N/A	1.00	N/A	0.987	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
757.4	11.647	0.095	31	1.054	N/A	1.00	N/A	0.987	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
757.2	11.811	0.095	31	1.052	N/A	1.00	N/A	0.986	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
757.0	11.975	0.095	31	1.051	N/A	1.00	N/A	0.986	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
756.9	12.139	0.095	31	1.050	N/A	1.00	N/A	0.985	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
756.7	12.303	0.095	31	1.048	N/A	1.00	N/A	0.985	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
756.5	12.467	0.113	44	1.057	N/A	0.99	N/A	0.984	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**A2**
756.4	12.631	0.137	55	1.066	N/A	0.99	N/A	0.984	0	0	**0.062**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**A1**
756.2	12.795	0.267	72	1.094	N/A	0.98	N/A	0.984	0	0	**0.061**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**A1**
756.0	12.959	0.550	80	1.100	N/A	0.97	N/A	0.983	0	0	**0.061**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**A1**
755.9	13.123	0.337	75	1.097	N/A	0.98	N/A	0.983	0	0	**0.061**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**A1**
755.7	13.287	0.308	74	1.091	N/A	0.98	N/A	0.982	0	0	**0.061**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**A1**
755.5	13.451	0.546	80	1.100	N/A	0.97	N/A	0.982	0	0	**0.061**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**A1**
755.4	13.615	N/A	87	N/A	N/A	N/A	N/A	0.981	0	0	**0.061**	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**	**A1**
755.2	13.779	N/A	93	N/A	N/A	N/A	N/A	0.981	0	0	**0.061**	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**	**A1**
755.1	13.943	N/A	89	N/A	N/A	N/A	N/A	0.980	0	0	**0.061**	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**	**A1**
754.9	14.107	N/A	82	N/A	N/A	N/A	N/A	0.980	0	0	**0.061**	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**	**A1**
754.7	14.271	0.439	78	1.085	N/A	0.97	N/A	0.979	0	0	**0.061**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**A1**
754.6	14.436	0.418	77	1.081	N/A	0.97	N/A	0.979	0	0	**0.061**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**A1**
754.4	14.600	0.416	77	1.079	N/A	0.97	N/A	0.978	0	0	**0.061**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**A1**
754.2	14.764	0.448	78	1.078	N/A	0.97	N/A	0.978	0	0	**0.061**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**A1**
754.1	14.928	0.410	77	1.073	N/A	0.97	N/A	0.978	0	0	**0.061**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**A1**
753.9	15.092	0.390	77	1.070	1.210	0.97	0.492	0.977	0	0	**0.061**	FALSE	FALSE	FALSE	**8.0**	**Bottom Ash**	**A1**
753.7	15.256	0.305	74	1.064	1.097	0.98	0.348	0.977	0	0	**0.062**	FALSE	FALSE	FALSE	**5.6**	**Bottom Ash**	**A1**
753.6	15.420	0.245	71	1.057	1.053	0.98	0.268	0.976	0	0	**0.062**	FALSE	FALSE	FALSE	**4.3**	**Bottom Ash**	**A1**
753.4	15.584	0.212	68	1.053	1.027	0.98	0.225	0.976	0	0	**0.063**	FALSE	FALSE	FALSE	**3.6**	**Bottom Ash**	**A1**
753.3	15.748	0.203	67	1.051	1.014	0.98	0.213	0.975	0	0	**0.063**	FALSE	FALSE	FALSE	**3.4**	**Bottom Ash**	**A1**
753.1	15.912	0.183	65	1.047	1.003	0.99	0.189	0.975	0	0	**0.063**	FALSE	FALSE	FALSE	**3.0**	**Bottom Ash**	**A1**
752.9	16.076	0.160	61	1.043	0.998	0.99	0.164	0.974	0	0	**0.064**	FALSE	FALSE	FALSE	**2.6**	**Bottom Ash**	**A1**
752.8	16.240	0.141	56	1.038	0.998	0.99	0.144	0.974	0	0	**0.064**	FALSE	FALSE	FALSE	**2.3**	**Bottom Ash**	**A1**

Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
752.6	16.404	0.130	52	1.035	0.997	0.99	0.133	0.973	0	0	**0.064**	FALSE	FALSE	FALSE	**2.1**	**Bottom Ash**	**A1**
752.4	16.568	0.143	57	1.037	0.998	0.99	0.146	0.973	0	0	**0.065**	FALSE	FALSE	FALSE	**2.3**	**Bottom Ash**	**A1**
752.3	16.732	0.143	57	1.037	0.998	0.99	0.147	0.972	0	0	**0.065**	FALSE	FALSE	FALSE	**2.3**	**Bottom Ash**	**A1**
752.1	16.896	0.152	59	1.038	0.998	0.99	0.155	0.972	0	0	**0.065**	FALSE	FALSE	FALSE	**2.4**	**Bottom Ash**	**A1**
751.9	17.060	0.149	58	1.036	0.998	0.99	0.153	0.971	0	0	**0.066**	FALSE	FALSE	FALSE	**2.3**	**Bottom Ash**	**A1**
751.8	17.224	0.153	59	1.036	0.998	0.99	0.156	0.971	0	0	**0.066**	FALSE	FALSE	FALSE	**2.4**	**Bottom Ash**	**A1**
751.6	17.388	0.144	57	1.034	0.998	0.99	0.147	0.970	0	0	**0.066**	FALSE	FALSE	FALSE	**2.2**	**Bottom Ash**	**A1**
751.4	17.552	0.134	54	1.032	0.997	0.99	0.137	0.970	0	0	**0.067**	FALSE	FALSE	FALSE	**2.1**	**Bottom Ash**	**A1**
751.3	17.716	0.126	51	1.029	0.997	0.99	0.129	0.969	0	0	**0.067**	FALSE	FALSE	FALSE	**1.9**	**Bottom Ash**	**A1**
751.1	17.880	0.124	50	1.028	0.997	0.99	0.126	0.969	0	0	**0.067**	FALSE	FALSE	FALSE	**1.9**	**Bottom Ash**	**A1**
751.0	18.044	0.127	51	1.028	0.997	0.99	0.129	0.968	0	0	**0.068**	FALSE	FALSE	FALSE	**1.9**	**Bottom Ash**	**A1**
750.8	18.208	0.135	54	1.029	0.997	0.99	0.137	0.968	0	0	**0.068**	FALSE	FALSE	FALSE	**2.0**	**Bottom Ash**	**A1**
750.6	18.372	0.136	55	1.029	0.997	0.99	0.138	0.967	0	0	**0.068**	FALSE	FALSE	FALSE	**2.0**	**Bottom Ash**	**A1**
750.5	18.537	0.136	55	1.028	0.997	0.99	0.139	0.967	0	0	**0.069**	FALSE	FALSE	FALSE	**2.0**	**Bottom Ash**	**A1**
750.3	18.701	0.131	53	1.027	0.997	0.99	0.133	0.966	0	0	**0.069**	FALSE	FALSE	FALSE	**1.9**	**Bottom Ash**	**A1**
750.1	18.865	0.124	50	1.025	0.996	0.99	0.126	0.965	0	0	**0.069**	FALSE	FALSE	FALSE	**1.8**	**Bottom Ash**	**A1**
750.0	19.029	0.121	49	1.024	0.996	0.99	0.123	0.965	0	0	**0.070**	FALSE	FALSE	FALSE	**1.8**	**Bottom Ash**	**B**
749.8	19.193	0.152	59	1.028	0.998	0.99	0.155	0.964	0	0	**0.070**	FALSE	FALSE	FALSE	**2.2**	**Bottom Ash**	**A1**
749.6	19.357	0.426	78	1.044	1.007	0.97	0.435	0.964	0	0	**0.070**	FALSE	FALSE	FALSE	**6.2**	**Bottom Ash**	**A1**
749.5	19.521	N/A	96	N/A	N/A	N/A	N/A	0.963	0	0	**0.070**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
749.3	19.685	N/A	100	N/A	N/A	N/A	N/A	0.963	0	0	**0.071**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
749.2	19.849	N/A	100	N/A	N/A	N/A	N/A	0.962	0	0	**0.071**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
749.0	20.013	N/A	100	N/A	N/A	N/A	N/A	0.962	0	0	**0.071**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
748.8	20.177	N/A	100	N/A	N/A	N/A	N/A	0.961	0	0	**0.071**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
748.7	20.341	N/A	100	N/A	N/A	N/A	N/A	0.961	0	0	**0.072**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
748.5	20.505	N/A	100	N/A	N/A	N/A	N/A	0.960	0	0	**0.072**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
748.3	20.669	N/A	100	N/A	N/A	N/A	N/A	0.960	0	0	**0.072**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
748.2	20.833	N/A	100	N/A	N/A	N/A	N/A	0.959	0	0	**0.072**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
748.0	20.997	N/A	100	N/A	N/A	N/A	N/A	0.959	0	0	**0.073**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
747.8	21.161	N/A	100	N/A	N/A	N/A	N/A	0.958	0	0	**0.073**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
747.7	21.325	N/A	99	N/A	N/A	N/A	N/A	0.957	0	0	**0.073**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
747.5	21.489	N/A	92	N/A	N/A	N/A	N/A	0.957	0	0	**0.073**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
747.3	21.653	N/A	83	N/A	N/A	N/A	N/A	0.956	0	0	**0.074**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
747.2	21.817	0.436	78	1.029	1.011	0.97	0.442	0.956	0	0	**0.074**	FALSE	FALSE	FALSE	**6.0**	**Bottom Ash**	**A1**
747.0	21.981	0.297	74	1.025	1.008	0.98	0.300	0.955	0	0	**0.074**	FALSE	FALSE	FALSE	**4.1**	**Bottom Ash**	**A1**
746.9	22.145	0.311	74	1.025	1.009	0.98	0.314	0.955	0	0	**0.074**	FALSE	FALSE	FALSE	**4.2**	**Fly Ash**	**A1**
746.7	22.309	0.310	74	1.024	1.009	0.98	0.313	0.954	0	0	**0.074**	FALSE	FALSE	FALSE	**4.2**	**Fly Ash**	**A1**
746.5	22.473	0.196	66	1.019	1.001	0.98	0.197	0.954	0	0	**0.075**	FALSE	FALSE	FALSE	**2.6**	**Fly Ash**	**A1**
746.4	22.638	0.166	62	1.017	0.999	0.99	0.167	0.953	0	0	**0.075**	FALSE	FALSE	FALSE	**2.2**	**Fly Ash**	**A1**
746.2	22.802	0.155	60	1.015	0.997	0.99	0.155	0.952	0	0	**0.075**	FALSE	FALSE	FALSE	**2.1**	**Fly Ash**	**A1**
746.0	22.966	0.136	55	1.013	0.995	0.99	0.136	0.952	0	0	**0.075**	FALSE	FALSE	FALSE	**1.8**	**Fly Ash**	**A1**
745.9	23.130	0.120	48	1.012	0.993	0.99	0.120	0.951	0	0	**0.076**	FALSE	FALSE	FALSE	**1.6**	**Fly Ash**	**A1**
745.7	23.294	0.116	46	1.011	0.993	0.99	0.116	0.951	0	0	**0.076**	FALSE	FALSE	FALSE	**1.5**	**Fly Ash**	**A1**
745.5	23.458	0.114	45	1.010	0.993	0.99	0.114	0.950	0	0	**0.076**	FALSE	FALSE	FALSE	**1.5**	**Fly Ash**	**A2**
745.4	23.622	0.102	37	1.009	0.992	1.00	0.102	0.950	0	0	**0.076**	FALSE	FALSE	FALSE	**1.3**	**Fly Ash**	**A2**
745.2	23.786	0.091	27	1.007	0.991	1.00	0.091	0.949	0	0	**0.076**	FALSE	FALSE	FALSE	**1.2**	**Fly Ash**	**A2**
745.1	23.950	0.086	21	1.007	0.991	1.00	0.085	0.948	0	0	**0.077**	FALSE	FALSE	FALSE	**1.1**	**Fly Ash**	**A2**
744.9	24.114	0.082	16	1.006	0.991	1.00	0.082	0.948	0	0	**0.077**	FALSE	FALSE	FALSE	**1.1**	**Fly Ash**	**A2**
744.7	24.278	0.084	18	1.006	0.991	1.00	0.083	0.947	0	0	**0.077**	FALSE	FALSE	FALSE	**1.1**	**Fly Ash**	**A2**
744.6	24.442	0.087	22	1.006	0.991	1.00	0.086	0.947	0	0	**0.077**	FALSE	FALSE	FALSE	**1.1**	**Fly Ash**	**A2**
744.4	24.606	0.097	32	1.006	0.991	1.00	0.096	0.946	0	0	**0.077**	FALSE	FALSE	FALSE	**1.2**	**Fly Ash**	**A2**
744.2	24.770	0.106	40	1.007	0.992	1.00	0.105	0.945	0	0	**0.078**	FALSE	FALSE	FALSE	**1.4**	**Fly Ash**	**A1**
744.1	24.934	0.108	41	1.006	0.992	1.00	0.107	0.945	0	0	**0.078**	FALSE	FALSE	FALSE	**1.4**	**Fly Ash**	**A1**
743.9	25.098	0.106	40	1.006	0.992	1.00	0.106	0.944	0	0	**0.078**	FALSE	FALSE	FALSE	**1.4**	**Fly Ash**	**A1**
743.7	25.262	0.102	37	1.005	0.992	1.00	0.101	0.944	0	0	**0.078**	FALSE	FALSE	FALSE	**1.3**	**Fly Ash**	**A1**

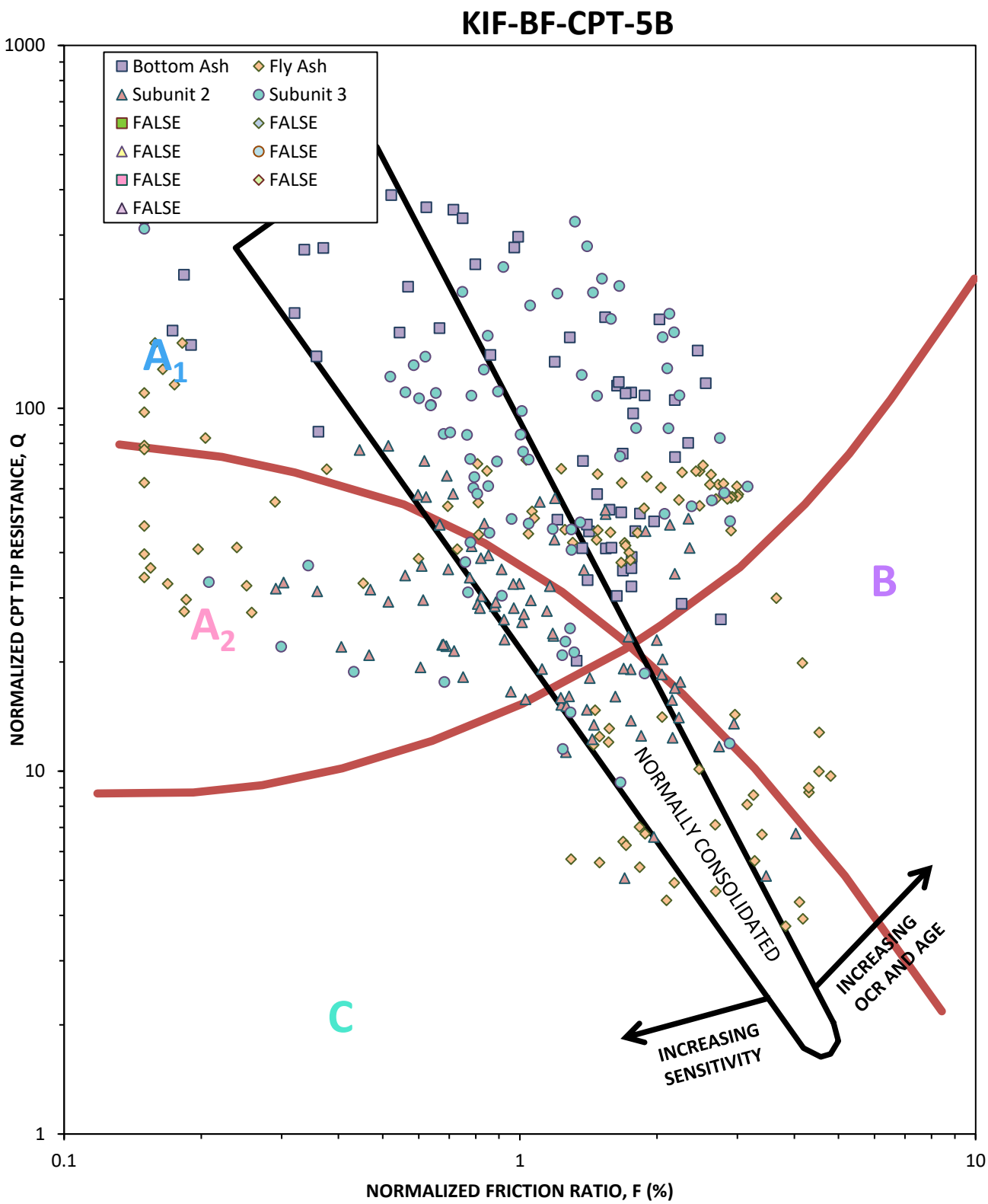
Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
743.6	25.426	0.105	39	1.005	0.992	1.00	0.104	0.943	0	0	**0.078**	FALSE	FALSE	FALSE	**1.3**	**Fly Ash**	**A1**
743.4	25.590	0.109	42	1.005	0.992	0.99	0.109	0.943	0	0	**0.078**	FALSE	FALSE	FALSE	**1.4**	**Fly Ash**	**A1**
743.2	25.754	0.105	39	1.005	0.992	1.00	0.105	0.942	0	0	**0.079**	FALSE	FALSE	FALSE	**1.3**	**Fly Ash**	**A1**
743.1	25.918	0.095	31	1.004	0.991	1.00	0.094	0.941	0	0	**0.079**	FALSE	FALSE	FALSE	**1.2**	**Fly Ash**	**A1**
742.9	26.082	0.087	22	1.003	0.990	1.00	0.086	0.941	0	0	**0.079**	FALSE	FALSE	FALSE	**1.1**	**Fly Ash**	**A2**
742.8	26.246	0.081	14	1.003	0.990	1.00	0.080	0.940	0	0	**0.079**	FALSE	FALSE	FALSE	**1.0**	**Fly Ash**	**A2**
742.6	26.410	0.078	9	1.002	0.989	1.00	0.077	0.940	0	0	**0.079**	FALSE	FALSE	FALSE	**1.0**	**Fly Ash**	**A2**
742.4	26.574	0.078	9	1.002	0.989	1.00	0.077	0.939	0	0	**0.079**	FALSE	FALSE	FALSE	**1.0**	**Fly Ash**	**A2**
742.3	26.739	0.079	11	1.002	0.989	1.00	0.078	0.938	0	0	**0.080**	FALSE	FALSE	FALSE	**1.0**	**Fly Ash**	**A2**
742.1	26.903	0.081	14	1.002	0.989	1.00	0.080	0.938	0	0	**0.080**	FALSE	FALSE	FALSE	**1.0**	**Fly Ash**	**A2**
741.9	27.067	0.081	15	1.001	0.989	1.00	0.080	0.937	0	0	**0.080**	FALSE	FALSE	FALSE	**1.0**	**Fly Ash**	**A2**
741.8	27.231	0.085	20	1.001	0.989	1.00	0.084	0.937	0	0	**0.080**	FALSE	FALSE	FALSE	**1.0**	**Fly Ash**	**A2**
741.6	27.395	0.086	22	1.001	0.988	1.00	0.085	0.936	0	0	**0.080**	FALSE	FALSE	FALSE	**1.1**	**Fly Ash**	**A2**
741.4	27.559	0.089	25	1.001	0.988	1.00	0.088	0.935	0	0	**0.080**	FALSE	FALSE	FALSE	**1.1**	**Fly Ash**	**A1**
741.3	27.723	0.089	25	1.001	0.988	1.00	0.088	0.935	0	0	**0.081**	FALSE	FALSE	FALSE	**1.1**	**Fly Ash**	**A1**
741.1	27.887	0.090	26	1.000	0.988	1.00	0.089	0.934	0	0	**0.081**	FALSE	FALSE	FALSE	**1.1**	**Fly Ash**	**A1**
740.9	28.051	0.090	26	1.000	0.988	1.00	0.089	0.933	0	0	**0.081**	FALSE	FALSE	FALSE	**1.1**	**Fly Ash**	**A1**
740.8	28.215	0.090	25	1.000	0.988	1.00	0.088	0.933	0	0	**0.081**	FALSE	FALSE	FALSE	**1.1**	**Fly Ash**	**A1**
740.6	28.379	0.088	23	0.999	0.987	1.00	0.086	0.932	0	0	**0.081**	FALSE	FALSE	FALSE	**1.1**	**Fly Ash**	**A1**
740.5	28.543	0.086	21	0.999	0.987	1.00	0.085	0.932	0	0	**0.081**	FALSE	FALSE	FALSE	**1.0**	**Fly Ash**	**A1**
740.3	28.707	0.085	20	0.999	0.987	1.00	0.083	0.931	0	0	**0.081**	FALSE	FALSE	FALSE	**1.0**	**Fly Ash**	**A1**
740.1	28.871	0.084	19	0.999	0.987	1.00	0.083	0.930	0	0	**0.081**	FALSE	FALSE	FALSE	**1.0**	**Fly Ash**	**A1**
740.0	29.035	0.088	23	0.998	0.987	1.00	0.086	0.930	0	0	**0.082**	FALSE	FALSE	FALSE	**1.1**	**Fly Ash**	**A1**
739.8	29.199	0.094	30	0.998	0.987	1.00	0.092	0.929	0	0	**0.082**	FALSE	FALSE	FALSE	**1.1**	**Fly Ash**	**A1**
739.6	29.363	0.096	31	0.998	0.987	1.00	0.094	0.928	0	0	**0.082**	FALSE	FALSE	FALSE	**1.1**	**Fly Ash**	**A1**
739.5	29.527	0.092	28	0.998	0.987	1.00	0.091	0.928	0	0	**0.082**	FALSE	FALSE	FALSE	**1.1**	**Fly Ash**	**A1**
739.3	29.691	0.088	24	0.997	0.986	1.00	0.086	0.927	0	0	**0.082**	FALSE	FALSE	FALSE	**1.1**	**Fly Ash**	**A1**
739.1	29.855	0.087	23	0.997	0.986	1.00	0.085	0.927	0	0	**0.082**	FALSE	FALSE	FALSE	**1.0**	**Fly Ash**	**A1**
739.0	30.019	0.090	25	0.997	0.986	1.00	0.088	0.926	0	0	**0.082**	FALSE	FALSE	FALSE	**1.1**	**Fly Ash**	**A1**
738.8	30.183	0.095	31	0.996	0.986	1.00	0.093	0.925	0	0	**0.083**	FALSE	FALSE	FALSE	**1.1**	**Fly Ash**	**A1**
738.7	30.347	0.104	38	0.996	0.987	1.00	0.101	0.925	0	0	**0.083**	FALSE	FALSE	FALSE	**1.2**	**Fly Ash**	**A1**
738.5	30.511	0.105	39	0.995	0.987	1.00	0.103	0.924	0	0	**0.083**	FALSE	FALSE	FALSE	**1.2**	**Fly Ash**	**A1**
738.3	30.675	0.106	39	0.995	0.987	1.00	0.103	0.923	0	0	**0.083**	FALSE	FALSE	FALSE	**1.2**	**Fly Ash**	**A1**
738.2	30.840	0.102	36	0.995	0.987	1.00	0.099	0.923	0	0	**0.083**	FALSE	FALSE	FALSE	**1.2**	**Fly Ash**	**A1**
738.0	31.004	0.102	36	0.995	0.987	1.00	0.099	0.922	0	0	**0.083**	FALSE	FALSE	FALSE	**1.2**	**Fly Ash**	**A1**
737.8	31.168	0.106	39	0.994	0.987	1.00	0.103	0.922	0	0	**0.083**	FALSE	FALSE	FALSE	**1.2**	**Fly Ash**	**A1**
737.7	31.332	0.108	41	0.994	0.987	1.00	0.105	0.921	0	0	**0.083**	FALSE	FALSE	FALSE	**1.3**	**Fly Ash**	**A1**
737.5	31.496	0.101	36	0.994	0.986	1.00	0.099	0.920	0	0	**0.083**	FALSE	FALSE	FALSE	**1.2**	**Fly Ash**	**A1**
737.3	31.660	0.099	34	0.994	0.986	1.00	0.097	0.920	0	0	**0.084**	FALSE	FALSE	FALSE	**1.2**	**Fly Ash**	**A1**
737.2	31.824	0.099	34	0.994	0.985	1.00	0.096	0.919	0	0	**0.084**	FALSE	FALSE	FALSE	**1.1**	**Fly Ash**	**A1**
737.0	31.988	0.098	34	0.993	0.985	1.00	0.096	0.918	0	0	**0.084**	FALSE	FALSE	FALSE	**1.1**	**Fly Ash**	**A1**
736.8	32.152	0.099	34	0.993	0.985	1.00	0.097	0.918	0	0	**0.084**	FALSE	FALSE	FALSE	**1.2**	**Fly Ash**	**A1**
736.7	32.316	0.098	33	0.993	0.985	1.00	0.095	0.917	0	0	**0.084**	FALSE	FALSE	FALSE	**1.1**	**Fly Ash**	**A1**
736.5	32.480	0.099	34	0.992	0.985	1.00	0.097	0.916	0	0	**0.084**	FALSE	FALSE	FALSE	**1.1**	**Fly Ash**	**A1**
736.4	32.644	0.100	35	0.992	0.985	1.00	0.098	0.916	0	0	**0.084**	FALSE	FALSE	FALSE	**1.2**	**Fly Ash**	**A1**
736.2	32.808	0.097	33	0.992	0.984	1.00	0.095	0.915	0	0	**0.084**	FALSE	FALSE	FALSE	**1.1**	**Fly Ash**	**A1**
736.0	32.972	0.096	31	0.992	0.984	1.00	0.093	0.914	0	0	**0.084**	FALSE	FALSE	FALSE	**1.1**	**Fly Ash**	**A1**
735.9	33.136	0.098	33	0.991	0.984	1.00	0.095	0.914	0	0	**0.084**	FALSE	FALSE	FALSE	**1.1**	**Fly Ash**	**A1**
735.7	33.300	0.099	34	0.991	0.984	1.00	0.096	0.913	0	0	**0.085**	FALSE	FALSE	FALSE	**1.1**	**Fly Ash**	**A1**
735.5	33.464	0.102	37	0.990	0.984	1.00	0.099	0.912	0	0	**0.085**	FALSE	FALSE	FALSE	**1.2**	**Fly Ash**	**A1**
735.4	33.628	0.105	39	0.990	0.985	1.00	0.102	0.912	0	0	**0.085**	FALSE	FALSE	FALSE	**1.2**	**Fly Ash**	**A1**
735.2	33.792	0.098	33	0.990	0.984	1.00	0.095	0.911	0	0	**0.085**	FALSE	FALSE	FALSE	**1.1**	**Fly Ash**	**A1**
735.0	33.956	0.090	26	0.991	0.983	1.00	0.088	0.910	0	0	**0.085**	FALSE	FALSE	FALSE	**1.0**	**Fly Ash**	**A1**
734.9	34.120	0.080	13	0.992	0.982	1.00	0.077	0.910	0	0	**0.085**	FALSE	FALSE	FALSE	**0.9**	**Fly Ash**	**B**
734.7	34.284	0.073	1	0.993	0.981	1.00	0.071	0.909	0	0	**0.085**	FALSE	FALSE	FALSE	**0.8**	**Fly Ash**	**B**

Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
734.6	34.448	0.069	0	0.993	0.981	1.00	0.067	0.908	0	0	**0.085**	FALSE	FALSE	FALSE	**0.8**	**Fly Ash**	**B**
734.4	34.612	0.067	0	0.992	0.981	1.00	0.065	0.908	0	0	**0.085**	FALSE	FALSE	FALSE	**0.8**	**Fly Ash**	**B**
734.2	34.776	0.066	0	0.992	0.981	1.00	0.064	0.907	0	0	**0.085**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**C**
734.1	34.941	0.065	0	0.992	0.981	1.00	0.063	0.906	0	0	**0.085**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**C**
733.9	35.105	0.065	0	0.992	0.981	1.00	0.063	0.906	0	0	**0.085**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**C**
733.7	35.269	0.065	0	0.992	0.981	1.00	0.063	0.905	0	0	**0.086**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**C**
733.6	35.433	0.065	0	0.992	0.981	1.00	0.063	0.904	0	0	**0.086**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**C**
733.4	35.597	0.066	0	0.991	0.981	1.00	0.064	0.904	0	0	**0.086**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**C**
733.2	35.761	0.066	0	0.991	0.980	1.00	0.064	0.903	0	0	**0.086**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**C**
733.1	35.925	0.067	0	0.991	0.980	1.00	0.065	0.902	0	0	**0.086**	FALSE	FALSE	FALSE	**0.8**	**Fly Ash**	**C**
732.9	36.089	0.067	0	0.991	0.980	1.00	0.065	0.902	0	0	**0.086**	FALSE	FALSE	FALSE	**0.8**	**Fly Ash**	**B**
732.7	36.253	0.067	0	0.991	0.980	1.00	0.065	0.901	0	0	**0.086**	FALSE	FALSE	FALSE	**0.8**	**Fly Ash**	**B**
732.6	36.417	0.067	0	0.991	0.980	1.00	0.065	0.900	0	0	**0.086**	FALSE	FALSE	FALSE	**0.8**	**Fly Ash**	**B**
732.4	36.581	0.067	0	0.990	0.980	1.00	0.064	0.900	0	0	**0.086**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**C**
732.3	36.745	0.066	0	0.990	0.980	1.00	0.063	0.899	0	0	**0.086**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**C**
732.1	36.909	0.065	0	0.990	0.980	1.00	0.063	0.898	0	0	**0.086**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**C**
731.9	37.073	0.064	0	0.990	0.980	1.00	0.062	0.898	0	0	**0.086**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**C**
731.8	37.237	0.064	0	0.990	0.980	1.00	0.062	0.897	0	0	**0.086**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**C**
731.6	37.401	0.064	0	0.990	0.979	1.00	0.062	0.896	0	0	**0.086**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**C**
731.4	37.565	0.064	0	0.989	0.979	1.00	0.062	0.896	0	0	**0.086**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**C**
731.3	37.729	0.064	0	0.989	0.979	1.00	0.062	0.895	0	0	**0.087**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**C**
731.1	37.893	0.064	0	0.989	0.979	1.00	0.062	0.894	0	0	**0.087**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**C**
730.9	38.057	0.065	0	0.989	0.979	1.00	0.062	0.894	0	0	**0.087**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**C**
730.8	38.221	0.065	0	0.989	0.979	1.00	0.063	0.893	0	0	**0.087**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**C**
730.6	38.385	0.070	0	0.989	0.979	1.00	0.067	0.892	0	0	**0.087**	FALSE	FALSE	FALSE	**0.8**	**Fly Ash**	**C**
730.5	38.549	0.069	0	0.988	0.979	1.00	0.067	0.892	0	0	**0.087**	FALSE	FALSE	FALSE	**0.8**	**Fly Ash**	**C**
730.3	38.713	0.068	0	0.988	0.978	1.00	0.066	0.891	0	0	**0.087**	FALSE	FALSE	FALSE	**0.8**	**Fly Ash**	**C**
730.1	38.877	0.068	0	0.988	0.978	1.00	0.066	0.890	0	0	**0.087**	FALSE	FALSE	FALSE	**0.8**	**Fly Ash**	**C**
730.0	39.042	0.069	0	0.988	0.978	1.00	0.066	0.890	0	0	**0.087**	FALSE	FALSE	FALSE	**0.8**	**Fly Ash**	**C**
729.8	39.206	0.070	0	0.988	0.978	1.00	0.067	0.889	0	0	**0.087**	FALSE	FALSE	FALSE	**0.8**	**Fly Ash**	**C**
729.6	39.370	0.070	0	0.988	0.978	1.00	0.067	0.888	0	0	**0.087**	FALSE	FALSE	FALSE	**0.8**	**Fly Ash**	**B**
729.5	39.534	0.115	45	0.978	0.984	0.99	0.110	0.888	0	0	**0.087**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**B**
729.3	39.698	0.111	43	0.979	0.983	0.99	0.107	0.887	0	0	**0.087**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**C**
729.1	39.862	0.109	42	0.979	0.983	0.99	0.105	0.886	0	0	**0.087**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**C**
729.0	40.026	0.109	41	0.979	0.982	0.99	0.104	0.885	0	0	**0.087**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**C**
728.8	40.190	0.110	42	0.978	0.982	0.99	0.105	0.885	0	0	**0.087**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**C**
728.6	40.354	0.111	43	0.978	0.983	0.99	0.106	0.884	0	0	**0.087**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**C**
728.5	40.518	0.111	43	0.977	0.983	0.99	0.106	0.883	0	0	**0.087**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**C**
728.3	40.682	0.111	43	0.977	0.982	0.99	0.106	0.883	0	0	**0.087**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**C**
728.2	40.846	0.111	43	0.977	0.982	0.99	0.106	0.882	0	0	**0.087**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**C**
728.0	41.010	0.113	44	0.976	0.983	0.99	0.107	0.881	0	0	**0.087**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**C**
727.8	41.174	0.114	45	0.975	0.983	0.99	0.109	0.881	0	0	**0.087**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**C**
727.7	41.338	0.116	46	0.974	0.983	0.99	0.110	0.880	0	0	**0.087**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**C**
727.5	41.502	0.118	47	0.974	0.984	0.99	0.112	0.879	0	0	**0.087**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**B**
727.3	41.666	0.121	48	0.973	0.985	0.99	0.115	0.879	0	0	**0.087**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**B**
727.2	41.830	0.137	55	0.969	0.990	0.99	0.131	0.878	0	0	**0.087**	FALSE	FALSE	FALSE	**1.5**	**Subunit 2**	**A1**
727.0	41.994	0.135	54	0.969	0.990	0.99	0.128	0.877	0	0	**0.087**	FALSE	FALSE	FALSE	**1.5**	**Subunit 2**	**A1**
726.8	42.158	0.146	57	0.967	0.993	0.99	0.139	0.876	0	0	**0.087**	FALSE	FALSE	FALSE	**1.6**	**Subunit 2**	**A1**
726.7	42.322	0.162	61	0.964	0.999	0.99	0.154	0.876	0	0	**0.087**	FALSE	FALSE	FALSE	**1.8**	**Subunit 2**	**A1**
726.5	42.486	0.154	59	0.964	0.996	0.99	0.146	0.875	0	0	**0.087**	FALSE	FALSE	FALSE	**1.7**	**Subunit 2**	**A1**
726.3	42.650	0.149	58	0.965	0.995	0.99	0.142	0.874	0	0	**0.087**	FALSE	FALSE	FALSE	**1.6**	**Subunit 2**	**A1**
726.2	42.814	0.154	60	0.964	0.996	0.99	0.146	0.874	0	0	**0.087**	FALSE	FALSE	FALSE	**1.7**	**Subunit 2**	**A1**
726.0	42.978	0.150	59	0.964	0.995	0.99	0.142	0.873	0	0	**0.087**	FALSE	FALSE	FALSE	**1.6**	**Subunit 2**	**A1**
725.9	43.143	0.156	60	0.962	0.997	0.99	0.148	0.872	0	0	**0.087**	FALSE	FALSE	FALSE	**1.7**	**Subunit 2**	**A1**
725.7	43.307	0.156	60	0.962	0.997	0.99	0.148	0.872	0	0	**0.087**	FALSE	FALSE	FALSE	**1.7**	**Subunit 2**	**A1**

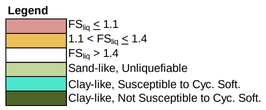
Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
725.5	43.471	0.129	52	0.967	0.987	0.99	0.122	0.871	0	0	**0.087**	FALSE	FALSE	FALSE	**1.4**	**Subunit 2**	**A1**
725.4	43.635	0.129	52	0.967	0.986	0.99	0.122	0.870	0	0	**0.087**	FALSE	FALSE	FALSE	**1.4**	**Subunit 2**	**A2**
725.2	43.799	0.123	49	0.968	0.984	0.99	0.116	0.869	0	0	**0.087**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**A2**
725.0	43.963	0.116	46	0.969	0.981	0.99	0.109	0.869	0	0	**0.087**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**A2**
724.9	44.127	0.112	43	0.970	0.980	0.99	0.106	0.868	0	0	**0.087**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**A2**
724.7	44.291	0.110	42	0.970	0.979	0.99	0.104	0.867	0	0	**0.087**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**C**
724.5	44.455	0.112	44	0.969	0.980	0.99	0.106	0.867	0	0	**0.087**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**B**
724.4	44.619	0.131	53	0.964	0.987	0.99	0.124	0.866	0	0	**0.087**	FALSE	FALSE	FALSE	**1.4**	**Subunit 2**	**A1**
724.2	44.783	0.130	52	0.964	0.986	0.99	0.123	0.865	0	0	**0.087**	FALSE	FALSE	FALSE	**1.4**	**Subunit 2**	**A1**
724.1	44.947	0.114	45	0.968	0.980	0.99	0.108	0.865	0	0	**0.087**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**A1**
723.9	45.111	0.121	48	0.966	0.983	0.99	0.114	0.864	0	0	**0.087**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**A1**
723.7	45.275	0.132	53	0.962	0.987	0.99	0.124	0.863	0	0	**0.087**	FALSE	FALSE	FALSE	**1.4**	**Subunit 2**	**A1**
723.6	45.439	0.137	55	0.961	0.989	0.99	0.129	0.862	0	0	**0.087**	FALSE	FALSE	FALSE	**1.5**	**Subunit 2**	**A1**
723.4	45.603	0.136	54	0.961	0.988	0.99	0.128	0.862	0	0	**0.087**	FALSE	FALSE	FALSE	**1.5**	**Subunit 2**	**A1**
723.2	45.767	0.134	54	0.961	0.988	0.99	0.127	0.861	0	0	**0.087**	FALSE	FALSE	FALSE	**1.4**	**Subunit 2**	**A1**
723.1	45.931	0.125	50	0.963	0.984	0.99	0.117	0.860	0	0	**0.087**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**A2**
722.9	46.095	0.119	47	0.964	0.981	0.99	0.112	0.860	0	0	**0.087**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**A2**
722.7	46.259	0.113	44	0.966	0.979	0.99	0.106	0.859	0	0	**0.087**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**C**
722.6	46.423	0.112	43	0.966	0.978	0.99	0.105	0.858	0	0	**0.087**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**A2**
722.4	46.587	0.111	43	0.966	0.978	0.99	0.105	0.857	0	0	**0.087**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**A2**
722.2	46.751	0.113	44	0.965	0.979	0.99	0.106	0.857	0	0	**0.087**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**A2**
722.1	46.915	0.108	41	0.966	0.977	1.00	0.102	0.856	0	0	**0.087**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**C**
721.9	47.079	0.104	38	0.967	0.975	1.00	0.098	0.855	0	0	**0.087**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**C**
721.8	47.244	0.102	37	0.968	0.975	1.00	0.096	0.855	0	0	**0.087**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**C**
721.6	47.408	0.103	37	0.967	0.975	1.00	0.096	0.854	0	0	**0.087**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**C**
721.4	47.572	0.105	39	0.966	0.975	1.00	0.098	0.853	0	0	**0.087**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**C**
721.3	47.736	0.110	42	0.964	0.977	0.99	0.103	0.852	0	0	**0.087**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**C**
721.1	47.900	0.114	45	0.962	0.978	0.99	0.107	0.852	0	0	**0.087**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**C**
720.9	48.064	0.114	45	0.962	0.978	0.99	0.106	0.851	0	0	**0.087**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**A2**
720.8	48.228	0.114	44	0.962	0.978	0.99	0.106	0.850	0	0	**0.087**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**A2**
720.6	48.392	0.111	43	0.963	0.977	0.99	0.104	0.850	0	0	**0.087**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**A2**
720.4	48.556	0.112	44	0.962	0.977	0.99	0.105	0.849	0	0	**0.087**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**C**
720.3	48.720	0.114	44	0.961	0.977	0.99	0.106	0.848	0	0	**0.087**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**A2**
720.1	48.884	0.111	43	0.962	0.976	0.99	0.104	0.848	0	0	**0.087**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**A2**
720.0	49.048	0.120	48	0.958	0.980	0.99	0.112	0.847	0	0	**0.087**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**A2**
719.8	49.212	0.117	46	0.959	0.979	0.99	0.109	0.846	0	0	**0.087**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**B**
719.6	49.376	0.115	46	0.959	0.978	0.99	0.108	0.845	0	0	**0.087**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**C**
719.5	49.540	0.111	43	0.961	0.976	0.99	0.104	0.845	0	0	**0.087**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**A2**
719.3	49.704	0.110	43	0.961	0.976	0.99	0.103	0.844	0	0	**0.087**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**A2**
719.1	49.868	0.111	43	0.960	0.975	0.99	0.103	0.843	0	0	**0.087**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**A2**
719.0	50.032	0.114	45	0.959	0.977	0.99	0.106	0.843	0	0	**0.087**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**A2**
718.8	50.196	0.117	47	0.957	0.978	0.99	0.109	0.842	0	0	**0.087**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**A2**
718.6	50.360	0.123	49	0.955	0.981	0.99	0.114	0.841	0	0	**0.087**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**A2**
718.5	50.524	0.128	52	0.953	0.983	0.99	0.119	0.840	0	0	**0.087**	FALSE	FALSE	FALSE	**1.4**	**Subunit 2**	**A2**
718.3	50.688	0.129	52	0.952	0.983	0.99	0.119	0.840	0	0	**0.087**	FALSE	FALSE	FALSE	**1.4**	**Subunit 2**	**A2**
718.1	50.852	0.127	51	0.953	0.983	0.99	0.118	0.839	0	0	**0.087**	FALSE	FALSE	FALSE	**1.4**	**Subunit 2**	**A2**
718.0	51.016	0.125	50	0.953	0.981	0.99	0.116	0.838	0	0	**0.087**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**A2**
717.8	51.180	0.123	49	0.954	0.980	0.99	0.114	0.838	0	0	**0.087**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**A2**
717.7	51.345	0.121	48	0.954	0.979	0.99	0.112	0.837	0	0	**0.087**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**A2**
717.5	51.509	0.119	48	0.954	0.978	0.99	0.111	0.836	0	0	**0.087**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**A2**
717.3	51.673	0.121	49	0.953	0.979	0.99	0.113	0.835	0	0	**0.087**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**A2**
717.2	51.837	0.127	51	0.951	0.982	0.99	0.117	0.835	0	0	**0.087**	FALSE	FALSE	FALSE	**1.4**	**Subunit 2**	**A2**
717.0	52.001	0.126	51	0.951	0.982	0.99	0.117	0.834	0	0	**0.087**	FALSE	FALSE	FALSE	**1.4**	**Subunit 2**	**A2**
716.8	52.165	0.122	49	0.952	0.979	0.99	0.113	0.833	0	0	**0.087**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**A2**
716.7	52.329	0.122	49	0.952	0.979	0.99	0.113	0.833	0	0	**0.087**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**A1**

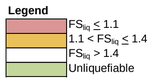
Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
716.5	52.493	0.117	47	0.953	0.977	0.99	0.109	0.832	0	0	**0.087**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**C**
716.3	52.657	0.118	47	0.953	0.977	0.99	0.109	0.831	0	0	**0.087**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**A2**
716.2	52.821	0.116	46	0.953	0.976	0.99	0.107	0.830	0	0	**0.087**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**A2**
716.0	52.985	0.113	44	0.954	0.975	0.99	0.104	0.830	0	0	**0.087**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**A2**
715.9	53.149	0.116	46	0.953	0.976	0.99	0.107	0.829	0	0	**0.087**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**A2**
715.7	53.313	0.120	48	0.951	0.978	0.99	0.111	0.828	0	0	**0.087**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**A2**
715.5	53.477	0.121	48	0.950	0.978	0.99	0.112	0.828	0	0	**0.086**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**A2**
715.4	53.641	0.121	48	0.950	0.978	0.99	0.112	0.827	0	0	**0.086**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**A2**
715.2	53.805	0.120	48	0.950	0.978	0.99	0.111	0.826	0	0	**0.086**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**A2**
715.0	53.969	0.119	48	0.950	0.977	0.99	0.110	0.825	0	0	**0.086**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**A2**
714.9	54.133	0.119	47	0.950	0.977	0.99	0.110	0.825	0	0	**0.086**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**A2**
714.7	54.297	0.119	47	0.950	0.977	0.99	0.109	0.824	0	0	**0.086**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**A2**
714.5	54.461	0.117	47	0.950	0.976	0.99	0.108	0.823	0	0	**0.086**	FALSE	FALSE	FALSE	**1.3**	**Subunit 3**	**C**
714.4	54.625	0.111	43	0.952	0.973	0.99	0.103	0.823	0	0	**0.086**	FALSE	FALSE	FALSE	**1.2**	**Subunit 3**	**C**
714.2	54.789	0.112	43	0.952	0.973	0.99	0.103	0.822	0	0	**0.086**	FALSE	FALSE	FALSE	**1.2**	**Subunit 3**	**C**
714.0	54.953	0.109	42	0.953	0.972	0.99	0.100	0.821	0	0	**0.086**	FALSE	FALSE	FALSE	**1.2**	**Subunit 3**	**A2**
713.9	55.117	0.109	42	0.952	0.972	0.99	0.101	0.820	0	0	**0.086**	FALSE	FALSE	FALSE	**1.2**	**Subunit 3**	**A2**
713.7	55.281	0.109	42	0.952	0.972	0.99	0.100	0.820	0	0	**0.086**	FALSE	FALSE	FALSE	**1.2**	**Subunit 3**	**C**
713.6	55.446	0.108	41	0.953	0.971	1.00	0.099	0.819	0	0	**0.086**	FALSE	FALSE	FALSE	**1.2**	**Subunit 3**	**C**
713.4	55.610	0.111	43	0.951	0.972	0.99	0.102	0.818	0	0	**0.086**	FALSE	FALSE	FALSE	**1.2**	**Subunit 3**	**A2**
713.2	55.774	0.107	41	0.952	0.971	1.00	0.099	0.818	0	0	**0.086**	FALSE	FALSE	FALSE	**1.1**	**Subunit 3**	**A2**
713.1	55.938	0.113	44	0.949	0.973	0.99	0.104	0.817	0	0	**0.086**	FALSE	FALSE	FALSE	**1.2**	**Subunit 3**	**A2**
712.9	56.102	0.121	48	0.946	0.977	0.99	0.111	0.816	0	0	**0.086**	FALSE	FALSE	FALSE	**1.3**	**Subunit 3**	**A2**
712.7	56.266	0.120	48	0.946	0.977	0.99	0.110	0.815	0	0	**0.086**	FALSE	FALSE	FALSE	**1.3**	**Subunit 3**	**A2**
712.6	56.430	0.119	47	0.946	0.976	0.99	0.109	0.815	0	0	**0.086**	FALSE	FALSE	FALSE	**1.3**	**Subunit 3**	**A2**
712.4	56.594	0.118	47	0.946	0.976	0.99	0.109	0.814	0	0	**0.086**	FALSE	FALSE	FALSE	**1.3**	**Subunit 3**	**A2**
712.2	56.758	0.118	47	0.946	0.976	0.99	0.108	0.813	0	0	**0.086**	FALSE	FALSE	FALSE	**1.3**	**Subunit 3**	**A2**
712.1	56.922	0.122	49	0.944	0.978	0.99	0.112	0.813	0	0	**0.086**	FALSE	FALSE	FALSE	**1.3**	**Subunit 3**	**A2**
711.9	57.086	0.125	51	0.942	0.980	0.99	0.115	0.812	0	0	**0.086**	FALSE	FALSE	FALSE	**1.3**	**Subunit 3**	**A2**
711.8	57.250	0.129	52	0.940	0.982	0.99	0.119	0.811	0	0	**0.086**	FALSE	FALSE	FALSE	**1.4**	**Subunit 3**	**A2**
711.6	57.414	0.134	54	0.938	0.984	0.99	0.122	0.811	0	0	**0.086**	FALSE	FALSE	FALSE	**1.4**	**Subunit 3**	**A1**
711.4	57.578	0.140	56	0.935	0.988	0.99	0.128	0.810	0	0	**0.086**	FALSE	FALSE	FALSE	**1.5**	**Subunit 3**	**A1**
711.3	57.742	0.145	57	0.933	0.991	0.99	0.133	0.809	0	0	**0.086**	FALSE	FALSE	FALSE	**1.6**	**Subunit 3**	**A1**
711.1	57.906	0.149	58	0.931	0.993	0.99	0.136	0.808	0	0	**0.085**	FALSE	FALSE	FALSE	**1.6**	**Subunit 3**	**A1**
710.9	58.070	0.155	60	0.929	0.997	0.99	0.142	0.808	0	0	**0.085**	FALSE	FALSE	FALSE	**1.7**	**Subunit 3**	**A1**
710.8	58.234	0.178	64	0.922	1.009	0.99	0.164	0.807	0	0	**0.085**	FALSE	FALSE	FALSE	**1.9**	**Subunit 3**	**A1**
710.6	58.398	0.194	66	0.918	1.017	0.99	0.178	0.806	0	0	**0.085**	FALSE	FALSE	FALSE	**2.1**	**Subunit 3**	**A1**
710.4	58.562	0.179	64	0.921	1.010	0.99	0.164	0.806	0	0	**0.085**	FALSE	FALSE	FALSE	**1.9**	**Subunit 3**	**A1**
710.3	58.726	0.169	63	0.923	1.004	0.99	0.155	0.805	0	0	**0.085**	FALSE	FALSE	FALSE	**1.8**	**Subunit 3**	**A1**
710.1	58.890	0.156	60	0.927	0.997	0.99	0.142	0.804	0	0	**0.085**	FALSE	FALSE	FALSE	**1.7**	**Subunit 3**	**A1**
709.9	59.054	0.139	55	0.933	0.987	0.99	0.127	0.803	0	0	**0.085**	FALSE	FALSE	FALSE	**1.5**	**Subunit 3**	**A1**
709.8	59.218	0.126	51	0.938	0.980	0.99	0.115	0.803	0	0	**0.085**	FALSE	FALSE	FALSE	**1.4**	**Subunit 3**	**A1**
709.6	59.382	0.134	54	0.934	0.984	0.99	0.122	0.802	0	0	**0.085**	FALSE	FALSE	FALSE	**1.4**	**Subunit 3**	**A1**
709.5	59.547	0.134	54	0.934	0.984	0.99	0.122	0.801	0	0	**0.085**	FALSE	FALSE	FALSE	**1.4**	**Subunit 3**	**A1**
709.3	59.711	0.136	55	0.933	0.986	0.99	0.124	0.801	0	0	**0.085**	FALSE	FALSE	FALSE	**1.5**	**Subunit 3**	**A1**
709.1	59.875	0.134	54	0.933	0.984	0.99	0.122	0.800	0	0	**0.085**	FALSE	FALSE	FALSE	**1.4**	**Subunit 3**	**A1**
709.0	60.039	0.130	52	0.935	0.982	0.99	0.118	0.799	0	0	**0.085**	FALSE	FALSE	FALSE	**1.4**	**Subunit 3**	**A1**
708.8	60.203	0.134	54	0.933	0.984	0.99	0.122	0.799	0	0	**0.085**	FALSE	FALSE	FALSE	**1.4**	**Subunit 3**	**A1**
708.6	60.367	0.142	56	0.929	0.989	0.99	0.129	0.798	0	0	**0.085**	FALSE	FALSE	FALSE	**1.5**	**Subunit 3**	**A1**
708.5	60.531	0.147	58	0.927	0.991	0.99	0.133	0.797	0	0	**0.085**	FALSE	FALSE	FALSE	**1.6**	**Subunit 3**	**A1**
708.3	60.695	0.144	57	0.928	0.990	0.99	0.131	0.796	0	0	**0.085**	FALSE	FALSE	FALSE	**1.5**	**Subunit 3**	**A1**
708.1	60.859	0.141	56	0.928	0.988	0.99	0.129	0.796	0	0	**0.085**	FALSE	FALSE	FALSE	**1.5**	**Subunit 3**	**A1**
708.0	61.023	0.141	56	0.928	0.988	0.99	0.128	0.795	0	0	**0.085**	FALSE	FALSE	FALSE	**1.5**	**Subunit 3**	**A1**
707.8	61.187	0.142	56	0.928	0.989	0.99	0.129	0.794	0	0	**0.085**	FALSE	FALSE	FALSE	**1.5**	**Subunit 3**	**A1**
707.6	61.351	0.139	55	0.929	0.987	0.99	0.126	0.794	0	0	**0.085**	FALSE	FALSE	FALSE	**1.5**	**Subunit 3**	**A1**

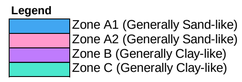
Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
707.5	61.515	0.144	57	0.926	0.990	0.99	0.130	0.793	0	0	**0.084**	FALSE	FALSE	FALSE	**1.5**	**Subunit 3**	**A1**
707.3	61.679	0.146	58	0.925	0.991	0.99	0.133	0.792	0	0	**0.084**	FALSE	FALSE	FALSE	**1.6**	**Subunit 3**	**A1**
707.2	61.843	0.151	59	0.923	0.994	0.99	0.137	0.792	0	0	**0.084**	FALSE	FALSE	FALSE	**1.6**	**Subunit 3**	**A1**
707.0	62.007	0.172	63	0.916	1.006	0.99	0.157	0.791	0	0	**0.084**	FALSE	FALSE	FALSE	**1.9**	**Subunit 3**	**A1**
706.8	62.171	0.172	63	0.915	1.005	0.99	0.156	0.790	0	0	**0.084**	FALSE	FALSE	FALSE	**1.8**	**Subunit 3**	**A1**
706.7	62.335	0.372	76	0.881	1.077	0.97	0.344	0.790	0	0	**0.084**	FALSE	FALSE	FALSE	**4.1**	**Subunit 3**	**A1**
706.5	62.499	0.182	65	0.912	1.011	0.99	0.166	0.789	0	0	**0.084**	FALSE	FALSE	FALSE	**2.0**	**Subunit 3**	**A1**
706.3	62.663	N/A	92	N/A	N/A	N/A	N/A	0.788	0	0	**0.084**	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**	**A1**
706.2	62.827	N/A	100	N/A	N/A	N/A	N/A	0.787	0	0	**0.084**	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**	**A1**
706.0	62.991	N/A	91	N/A	N/A	N/A	N/A	0.787	0	0	**0.084**	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**	**A1**
705.8	63.155	0.385	77	0.877	1.080	0.97	0.355	0.786	0	0	**0.084**	FALSE	FALSE	FALSE	**4.2**	**Subunit 3**	**A1**
705.7	63.319	0.203	67	0.905	1.021	0.98	0.184	0.785	0	0	**0.084**	FALSE	FALSE	FALSE	**2.2**	**Subunit 3**	**A1**
705.5	63.483	0.184	65	0.909	1.012	0.99	0.167	0.785	0	0	**0.084**	FALSE	FALSE	FALSE	**2.0**	**Subunit 3**	**A1**
705.4	63.648	0.228	69	0.898	1.032	0.98	0.207	0.784	0	0	**0.084**	FALSE	FALSE	FALSE	**2.5**	**Subunit 3**	**A1**
705.2	63.812	0.188	65	0.907	1.014	0.99	0.170	0.783	0	0	**0.084**	FALSE	FALSE	FALSE	**2.0**	**Subunit 3**	**A1**
705.0	63.976	0.202	67	0.903	1.021	0.98	0.183	0.783	0	0	**0.084**	FALSE	FALSE	FALSE	**2.2**	**Subunit 3**	**A1**
704.9	64.140	0.220	69	0.899	1.028	0.98	0.199	0.782	0	0	**0.084**	FALSE	FALSE	FALSE	**2.4**	**Subunit 3**	**A1**
704.7	64.304	0.245	71	0.893	1.039	0.98	0.223	0.781	0	0	**0.084**	FALSE	FALSE	FALSE	**2.7**	**Subunit 3**	**A1**
704.5	64.468	0.455	78	0.867	1.095	0.97	0.419	0.781	0	0	**0.084**	FALSE	FALSE	FALSE	**5.0**	**Subunit 3**	**A1**
704.4	64.632	N/A	84	N/A	N/A	N/A	N/A	0.780	0	0	**0.084**	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**	**A1**
704.2	64.796	N/A	88	N/A	N/A	N/A	N/A	0.779	0	0	**0.084**	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**	**A1**
704.0	64.960	N/A	93	N/A	N/A	N/A	N/A	0.779	0	0	**0.083**	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**	**A1**
703.9	65.124	N/A	96	N/A	N/A	N/A	N/A	0.778	0	0	**0.083**	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**	**A1**
703.7	65.288	N/A	99	N/A	N/A	N/A	N/A	0.777	0	0	**0.083**	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**	**A1**
703.5	65.452	N/A	94	N/A	N/A	N/A	N/A	0.776	0	0	**0.083**	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**	**A1**
703.4	65.616	0.098	33	0.945	0.965	1.00	0.088	0.776	0	0	**0.083**	FALSE	FALSE	FALSE	**1.1**	**Subunit 3**	**B**
703.2	65.780	0.183	65	0.904	1.011	0.99	0.165	0.775	0	0	**0.083**	FALSE	FALSE	FALSE	**2.0**	**Subunit 3**	**A1**
703.1	65.944	0.334	75	0.875	1.068	0.98	0.305	0.774	0	0	**0.083**	FALSE	FALSE	FALSE	**3.7**	**Subunit 3**	**A1**
702.9	66.108	0.409	77	0.866	1.086	0.97	0.374	0.774	0	0	**0.083**	FALSE	FALSE	FALSE	**4.5**	**Subunit 3**	**A1**
702.7	66.272	0.417	77	0.865	1.088	0.97	0.382	0.773	0	0	**0.083**	FALSE	FALSE	FALSE	**4.6**	**Subunit 3**	**A1**
702.6	66.436	N/A	92	N/A	N/A	N/A	N/A	0.772	0	0	**0.083**	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**	**A1**
702.4	66.600	N/A	95	N/A	N/A	N/A	N/A	0.772	0	0	**0.083**	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**	**A1**
702.2	66.764	N/A	100	N/A	N/A	N/A	N/A	0.771	0	0	**0.083**	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**	**A1**
702.1	66.928	N/A	100	N/A	N/A	N/A	N/A	0.770	0	0	**0.083**	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**	**A1**
701.9	67.092	N/A	100	N/A	N/A	N/A	N/A	0.770	0	0	**0.083**	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**	**A1**
701.7	67.256	N/A	100	N/A	N/A	N/A	N/A	0.769	0	0	**0.083**	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**	**A1**
701.6	67.420	N/A	100	N/A	N/A	N/A	N/A	0.768	0	0	**0.083**	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**	**A1**



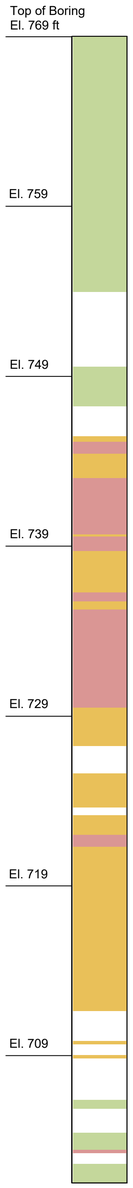
Adapted from "Discussion of 'Liquefaction Potential of Silts from CPTu'" (Robertson 2008). Zone A_1 and Zone A_2 samples are generally sand-like. Zone B samples are generally clay-like and not susceptible to cyclic softening. Zone C samples are generally clay-like and susceptible to cyclic softening. Note that the transition from clay-like to sand-like in this chart does not exactly match the liquefaction calculations herein; that is, some transitional samples in Zone B and Zone C will be treated as sand-like and analyzed for liquefaction if the calculations indicate as such.



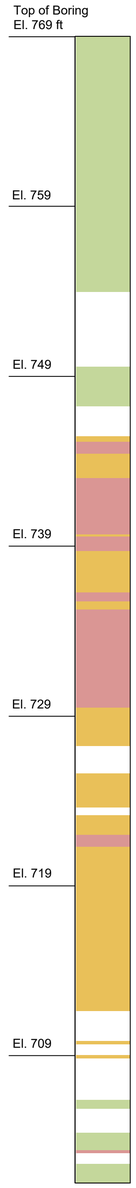




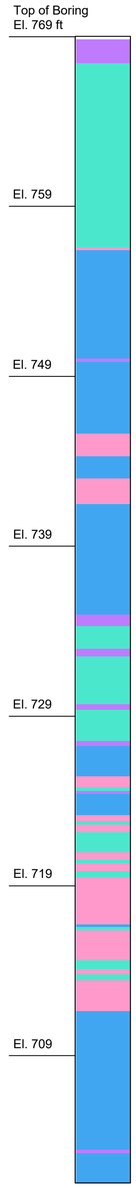
KIF-BF-CPT-5B, Liquefaction Triggering Results



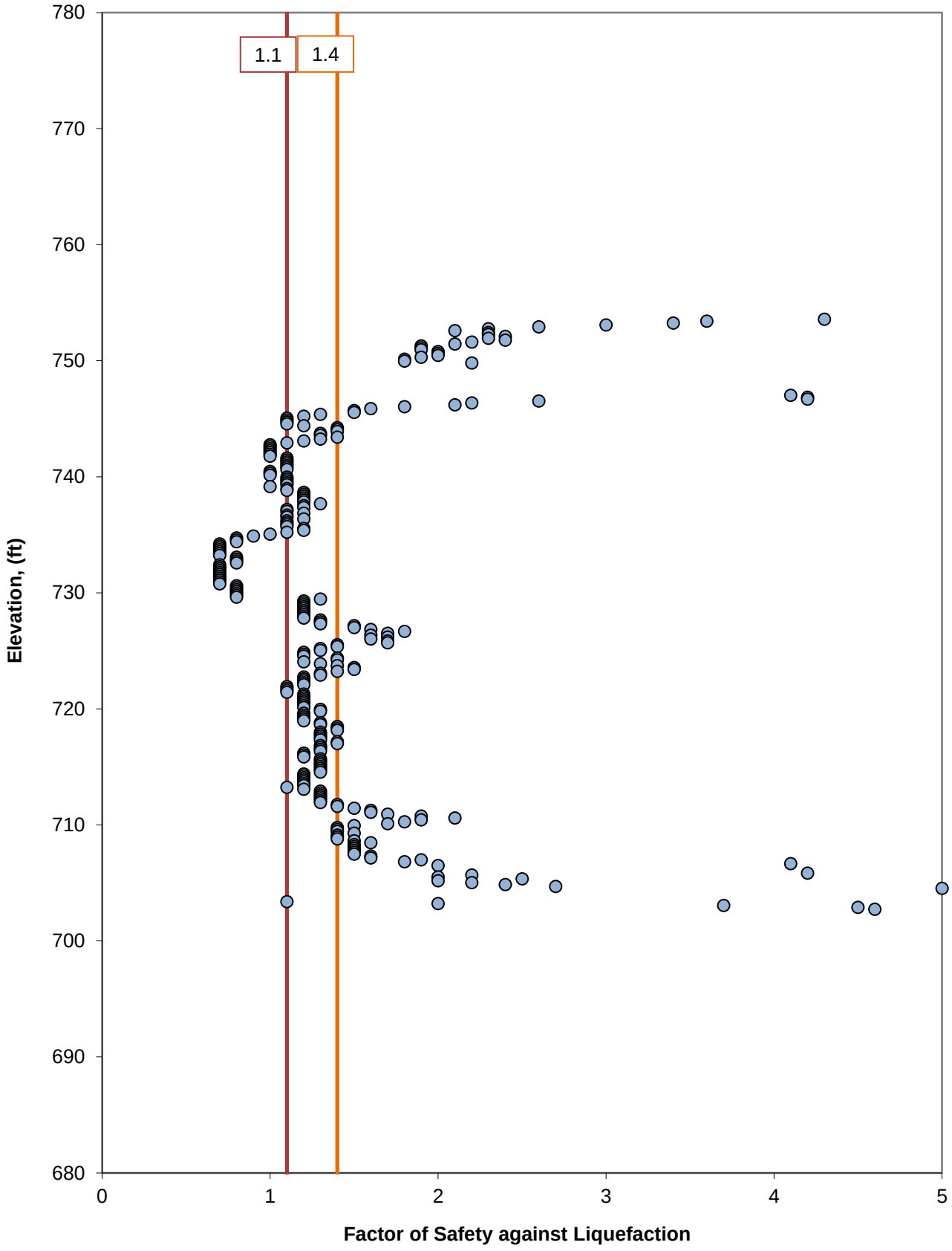
KIF-BF-CPT-5B, Liquefaction Triggering Results



KIF-BF-CPT-5B, Robertson Soil Type



KIF TDEC Stability, Boring = KIF-BF-CPT-5B, Source = 1 Hz, Mw = 7.6, Event = Design EQ, CPT Data, Simplified Stress-Based Approach



3.4.2 10 Hz Design Earthquake

Project Information

Stantec Project Number =	175668043
Project Name =	KIF TDEC Stability
CPT ID =	CPT-01B

Boring Location (optional)

Northing =	
Easting =	

OR

Baseline Station =	
Offset (+ Right) =	

Using qt (corrected for u2 PWP) or qc (backcalculated uncorrected field tip)

Cone ID (optional) =	AD184	
Use qc instead of qt?	0	(1: Yes, 0: No)
Cone Area Ratio (a) =	0.80	

Drilling Information

Top of Hole Elevation =	755.0	feet
Water Depth during CPT (negative for U/S borings) =	3.0	feet
Depth data collection began =	0.16	feet
Avg. Total Unit Wt. Above 1st Sample =	120.00	pcf

During Earthquake Information

Water Depth during EQ (relative to CPT TOH, negative for U/S borings) =	5.9	feet
Final Grade Elevation during EQ =	755.3	feet
Avg. Total Unit Wt. of Cut/Fill =	120	pcf

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile?	0	(1: Yes, 0: No)

If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile:	Section_AA, KIF-A2_NOR	
α at each Sample Depth known?	1	(1: Yes, 0: No)

If previous answer is No, then enter curve fit parameters below (α vs. depth curve)

If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_α will be one.

m4:	
m3:	
m2:	
m1:	
m0:	

Associated ground response profile:	Section_AA, KIF-A2_NOR	
Get CSR from shear stress envelope?	0	(1: Yes, 0: No)

If previous answer is No, then CSR will be calculated using a_{max} and r_d

Max. Shear Stress at each sample depth known?		(1: Yes, 0: No)

If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4:	
m3:	
m2:	
m1:	

Earthquake Information

EQ Source (e.g., New Madrid)	10 Hz
Event (e.g., MCE, OBE)	Design EQ
a_{max} (g) (top of ground surface)	0.20
EQ Mag (Mw)	6.0

Inputs

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
0.164	88.969	0.130	120	Clay Fill (irrelevant)	Clay-like		0.002			
0.328	160.211	0.385	120	Clay Fill (irrelevant)	Clay-like		0.001			
0.492	189.295	0.926	120	Clay Fill (irrelevant)	Clay-like		0.000			
0.656	129.389	1.029	120	Clay Fill (irrelevant)	Clay-like		0.003			
0.820	260.216	1.229	120	Clay Fill (irrelevant)	Clay-like		0.005			
0.984	254.916	1.247	120	Clay Fill (irrelevant)	Clay-like		0.008			
1.148	276.126	1.376	120	Clay Fill (irrelevant)	Clay-like		0.011			
1.312	318.196	1.795	120	Clay Fill (irrelevant)	Clay-like		0.014			
1.476	310.323	2.259	120	Clay Fill (irrelevant)	Clay-like		0.017			
1.640	249.632	2.112	119	Bottom Ash	Sand-like		0.017			
1.804	201.828	2.091	119	Bottom Ash	Sand-like		0.016			
1.968	153.270	2.034	119	Bottom Ash	Sand-like		0.015			
2.133	117.632	1.502	119	Bottom Ash	Sand-like		0.014			
2.297	76.819	1.251	119	Bottom Ash	Sand-like		0.013			
2.461	46.992	1.208	119	Bottom Ash	Sand-like		0.013			
2.625	31.230	1.267	119	Bottom Ash	Sand-like		0.015			
2.789	28.340	1.322	119	Bottom Ash	Sand-like		0.016			
2.953	22.897	1.260	119	Bottom Ash	Sand-like		0.018			
3.117	23.085	1.022	119	Bottom Ash	Sand-like		0.019			
3.281	24.177	0.952	119	Bottom Ash	Sand-like		0.020			
3.445	23.802	0.940	119	Bottom Ash	Sand-like		0.021			
3.609	24.054	0.949	128	Embankment Fill	Clay-like		0.022			
3.773	23.418	0.957	128	Embankment Fill	Clay-like		0.023			
3.937	25.668	0.945	128	Embankment Fill	Clay-like		0.024			
4.101	23.592	0.936	128	Embankment Fill	Clay-like		0.025			
4.265	19.766	0.904	128	Embankment Fill	Clay-like		0.026			
4.429	18.474	0.930	128	Embankment Fill	Clay-like		0.027			
4.593	25.216	1.425	128	Embankment Fill	Clay-like		0.029			
4.757	68.151	1.985	128	Embankment Fill	Clay-like		0.030			
4.921	100.806	1.852	128	Embankment Fill	Clay-like		0.032			
5.085	126.317	2.363	128	Embankment Fill	Clay-like		0.035			
5.249	102.408	2.396	128	Embankment Fill	Clay-like		0.037			
5.413	54.593	2.205	128	Embankment Fill	Clay-like		0.039			
5.577	71.072	1.575	128	Embankment Fill	Clay-like		0.041			
5.741	337.961	1.809	128	Embankment Fill	Clay-like		0.042			
5.905	420.084	2.530	128	Embankment Fill	Clay-like		0.043			
6.069	465.042	2.608	128	Embankment Fill	Clay-like		0.044			
6.234	536.124	2.395	128	Embankment Fill	Clay-like		0.045			
6.398	485.173	1.375	128	Embankment Fill	Clay-like		0.046			
6.562	416.597	1.562	128	Embankment Fill	Clay-like		0.047			
6.726	372.316	1.650	128	Embankment Fill	Clay-like		0.048			
6.890	316.937	1.613	128	Embankment Fill	Clay-like		0.049			
7.054	284.756	1.308	128	Embankment Fill	Clay-like		0.051			
7.218	280.841	1.081	128	Embankment Fill	Clay-like		0.052			
7.382	236.891	0.904	128	Embankment Fill	Clay-like		0.053			
7.546	164.930	1.271	128	Embankment Fill	Clay-like		0.055			
7.710	124.648	1.591	128	Embankment Fill	Clay-like		0.056			
7.874	72.990	1.990	128	Embankment Fill	Clay-like		0.057			
8.038	44.393	2.212	128	Embankment Fill	Clay-like		0.058			
8.202	36.209	1.884	128	Embankment Fill	Clay-like		0.059			
8.366	28.709	2.171	128	Embankment Fill	Clay-like		0.059			
8.530	35.044	3.400	128	Embankment Fill	Clay-like		0.060			
8.694	399.820	10.333	128	Embankment Fill	Clay-like		0.061			
8.858	432.322	6.256	128	Embankment Fill	Clay-like		0.061			
9.022	324.642	5.573	128	Embankment Fill	Clay-like		0.062			
9.186	106.471	3.866	128	Embankment Fill	Clay-like		0.063			
9.350	52.510	4.022	128	Embankment Fill	Clay-like		0.064			
9.514	49.314	4.014	128	Embankment Fill	Clay-like		0.065			
9.678	42.805	2.076	128	Embankment Fill	Clay-like		0.066			
9.842	39.860	2.090	128	Embankment Fill	Clay-like		0.067			
10.006	48.173	2.264	128	Embankment Fill	Clay-like		0.068			
10.170	47.802	2.254	128	Embankment Fill	Clay-like		0.068			
10.335	36.557	2.152	128	Embankment Fill	Clay-like		0.069			

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
10.499	29.872	1.865	128	Embankment Fill	Clay-like		0.070			
10.663	34.388	1.862	128	Embankment Fill	Clay-like		0.070			
10.827	42.176	2.065	128	Embankment Fill	Clay-like		0.071			
10.991	52.562	2.510	128	Embankment Fill	Clay-like		0.071			
11.155	58.835	3.734	128	Embankment Fill	Clay-like		0.072			
11.319	70.139	0.010	128	Embankment Fill	Clay-like		0.072			
11.483	426.751	0.010	128	Embankment Fill	Clay-like		0.073			

LIQUEFACTION POTENTIAL ASSESSMENT FOR COARSE GRAINED SOILS USING CONE PENETRATION TEST DATA

Facility: KIF TDEC Stability
Project No.: 175668043
CPT ID: CPT-01B

Water Elevation during CPT:	752.0	ft
Depth to Water during CPT:	3.0	ft *(relative to ground surface during CPT)*
Water Elevation during Earthquake:	749.1	ft
Depth to Water during Earthquake:	5.9	ft *(relative to ground surface during CPT)*
Final Grade Elevation during EQ:	755.3	ft *(if no fill, then set this equal to top of CPT hole elev.)*
Height of Final Grade above CPT TOH:	0.3	ft *(relative to ground surface during CPT, + Fill, - Cut)*
Unit Weight of Cut/Fill to Achieve Final Grade	120	pcf
Cut/Fill Total Stress (+ Fill, - Cut):	0.02	tsf

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
755.0				Vertical Stresses above 1st CPT:			**0.01**	**0.03**	**0.00**	**0.00**	**0.01**	**0.03**
754.8	0.164	88.97	0.13	120	**0.16**	0.09	0.01	0.03	0.00	0.00	0.01	0.03
754.7	0.328	160.21	0.39	120	0.25	0.16	0.02	0.04	0.00	0.00	0.02	0.04
754.5	0.492	189.30	0.93	120	0.41	0.16	0.03	0.05	0.00	0.00	0.03	0.05
754.3	0.656	129.39	1.03	120	0.57	0.16	0.04	0.06	0.00	0.00	0.04	0.06
754.2	0.820	260.22	1.23	120	0.74	0.16	0.05	0.07	0.00	0.00	0.05	0.07
754.0	0.984	254.92	1.25	120	0.90	0.16	0.06	0.08	0.00	0.00	0.06	0.08
753.9	1.148	276.13	1.38	120	1.07	0.16	0.07	0.09	0.00	0.00	0.07	0.09
753.7	1.312	318.20	1.80	120	1.23	0.16	0.08	0.10	0.00	0.00	0.08	0.10
753.5	1.476	310.32	2.26	120	1.39	0.16	0.09	0.11	0.00	0.00	0.09	0.11
753.4	1.640	249.63	2.11	119	1.56	0.16	0.10	0.12	0.00	0.00	0.10	0.12
753.2	1.804	201.83	2.09	119	1.72	0.16	0.11	0.13	0.00	0.00	0.11	0.13
753.0	1.968	153.27	2.03	119	1.89	0.16	0.12	0.14	0.00	0.00	0.12	0.14
752.9	2.133	117.63	1.50	119	2.05	0.16	0.13	0.15	0.00	0.00	0.13	0.15
752.7	2.297	76.82	1.25	119	2.21	0.16	0.14	0.16	0.00	0.00	0.14	0.16
752.5	2.461	46.99	1.21	119	2.38	0.16	0.15	0.17	0.00	0.00	0.15	0.17
752.4	2.625	31.23	1.27	119	2.54	0.16	0.16	0.17	0.00	0.00	0.16	0.17
752.2	2.789	28.34	1.32	119	2.71	0.16	0.17	0.18	0.00	0.00	0.17	0.18
752.0	2.953	22.90	1.26	119	2.87	0.16	0.18	0.19	0.00	0.00	0.18	0.19
751.9	3.117	23.09	1.02	119	3.03	0.16	0.19	0.20	0.00	0.00	0.18	0.20
751.7	3.281	24.18	0.95	119	3.20	0.16	0.20	0.21	0.01	0.00	0.19	0.21
751.6	3.445	23.80	0.94	119	3.36	0.16	0.21	0.22	0.01	0.00	0.19	0.22
751.4	3.609	24.05	0.95	128	3.53	0.16	0.22	0.23	0.02	0.00	0.20	0.23
751.2	3.773	23.42	0.96	128	3.69	0.16	0.23	0.24	0.02	0.00	0.20	0.24
751.1	3.937	25.67	0.95	128	3.85	0.16	0.24	0.25	0.03	0.00	0.21	0.25
750.9	4.101	23.59	0.94	128	4.02	0.16	0.25	0.27	0.03	0.00	0.21	0.27
750.7	4.265	19.77	0.90	128	4.18	0.16	0.26	0.28	0.04	0.00	0.22	0.28
750.6	4.429	18.47	0.93	128	4.35	0.16	0.27	0.29	0.04	0.00	0.22	0.29
750.4	4.593	25.22	1.43	128	4.51	0.16	0.28	0.30	0.05	0.00	0.23	0.30
750.2	4.757	68.15	1.99	128	4.68	0.16	0.29	0.31	0.05	0.00	0.23	0.31
750.1	4.921	100.81	1.85	128	4.84	0.16	0.30	0.32	0.06	0.00	0.24	0.32
749.9	5.085	126.32	2.36	128	5.00	0.16	0.31	0.33	0.07	0.00	0.25	0.33
749.8	5.249	102.41	2.40	128	5.17	0.16	0.32	0.34	0.07	0.00	0.25	0.34
749.6	5.413	54.59	2.21	128	5.33	0.16	0.33	0.35	0.08	0.00	0.26	0.35
749.4	5.577	71.07	1.58	128	5.50	0.16	0.34	0.36	0.08	0.00	0.26	0.36
749.3	5.741	337.96	1.81	128	5.66	0.16	0.35	0.37	0.09	0.00	0.27	0.37
749.1	5.905	420.08	2.53	128	5.82	0.16	0.36	0.38	0.09	0.00	0.27	0.38
748.9	6.069	465.04	2.61	128	5.99	0.16	0.37	0.39	0.10	0.01	0.28	0.39
748.8	6.234	536.12	2.40	128	6.15	0.16	0.38	0.40	0.10	0.01	0.28	0.39
748.6	6.398	485.17	1.38	128	6.32	0.16	0.39	0.41	0.11	0.02	0.29	0.40
748.4	6.562	416.60	1.56	128	6.48	0.16	0.40	0.42	0.11	0.02	0.29	0.40
748.3	6.726	372.32	1.65	128	6.64	0.16	0.42	0.43	0.12	0.03	0.30	0.41
748.1	6.890	316.94	1.61	128	6.81	0.16	0.43	0.44	0.12	0.03	0.30	0.41
747.9	7.054	284.76	1.31	128	6.97	0.16	0.44	0.45	0.13	0.04	0.31	0.42
747.8	7.218	280.84	1.08	128	7.14	0.16	0.45	0.46	0.13	0.04	0.32	0.42
747.6	7.382	236.89	0.90	128	7.30	0.16	0.46	0.48	0.14	0.05	0.32	0.43
747.5	7.546	164.93	1.27	128	7.46	0.16	0.47	0.49	0.14	0.05	0.33	0.43
747.3	7.710	124.65	1.59	128	7.63	0.16	0.48	0.50	0.15	0.06	0.33	0.44
747.1	7.874	72.99	1.99	128	7.79	0.16	0.49	0.51	0.15	0.06	0.34	0.45
747.0	8.038	44.39	2.21	128	7.96	0.16	0.50	0.52	0.16	0.07	0.34	0.45
746.8	8.202	36.21	1.88	128	8.12	0.16	0.51	0.53	0.16	0.07	0.35	0.46
746.6	8.366	28.71	2.17	128	8.28	0.16	0.52	0.54	0.17	0.08	0.35	0.46
746.5	8.530	35.04	3.40	128	8.45	0.16	0.53	0.55	0.17	0.08	0.36	0.47
746.3	8.694	399.82	10.33	128	8.61	0.16	0.54	0.56	0.18	0.09	0.36	0.47
746.1	8.858	432.32	6.26	128	8.78	0.16	0.55	0.57	0.18	0.09	0.37	0.48
746.0	9.022	324.64	5.57	128	8.94	0.16	0.56	0.58	0.19	0.10	0.37	0.48
745.8	9.186	106.47	3.87	128	9.10	0.16	0.57	0.59	0.19	0.10	0.38	0.49
745.6	9.350	52.51	4.02	128	9.27	0.16	0.58	0.60	0.20	0.11	0.39	0.49
745.5	9.514	49.31	4.01	128	9.43	0.16	0.59	0.61	0.20	0.11	0.39	0.50

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
745.3	9.678	42.80	2.08	128	9.60	0.16	0.60	0.62	0.21	0.12	0.40	0.50
745.2	9.842	39.86	2.09	128	9.76	0.16	0.61	0.63	0.21	0.12	0.40	0.51
745.0	10.006	48.17	2.26	128	9.92	0.16	0.63	0.64	0.22	0.13	0.41	0.52
744.8	10.170	47.80	2.25	128	10.09	0.16	0.64	0.65	0.22	0.13	0.41	0.52
744.7	10.335	36.56	2.15	128	10.25	0.16	0.65	0.66	0.23	0.14	0.42	0.53
744.5	10.499	29.87	1.87	128	10.42	0.16	0.66	0.67	0.23	0.14	0.42	0.53
744.3	10.663	34.39	1.86	128	10.58	0.16	0.67	0.69	0.24	0.15	0.43	0.54
744.2	10.827	42.18	2.07	128	10.74	0.16	0.68	0.70	0.24	0.15	0.43	0.54
744.0	10.991	52.56	2.51	128	10.91	0.16	0.69	0.71	0.25	0.16	0.44	0.55
743.8	11.155	58.83	3.73	128	11.07	0.16	0.70	0.72	0.25	0.16	0.44	0.55
743.7	11.319	70.14	0.01	128	11.24	0.16	0.71	0.73	0.26	0.17	0.45	0.56
743.5	11.483	426.75	0.01	128	11.40	0.08	0.72	0.74	0.26	0.17	0.46	0.56

LIQUEFACTION POTENTIAL ASSESSMENT FOR COARSE GRAINED SOILS USING CONE PENETRATION TEST DATA

Project Site: KIF TDEC Stability
Project No.: 175668043
CPT ID: CPT-01B

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
755.0												
754.8	0.164	871.76	0.15	0.66	0.5	1.70	142.96	0	0.00	142.96	0.002	-0.600
754.7	0.328	1110.02	0.24	0.74	0.5	1.70	257.43	0	0.00	257.43	0.001	-0.600
754.5	0.492	1070.82	0.49	1.01	0.5	1.70	304.16	0	0.00	304.16	0.000	-0.600
754.3	0.656	633.79	0.80	1.30	0.5	1.70	207.90	0	0.00	207.90	0.003	-0.600
754.2	0.820	1140.18	0.47	0.99	0.5	1.70	418.12	0	0.00	418.12	0.005	-0.600
754.0	0.984	1019.59	0.49	1.02	0.5	1.70	409.60	0	0.00	409.60	0.008	-0.600
753.9	1.148	1022.48	0.50	1.03	0.5	1.70	443.68	0	0.00	443.68	0.011	-0.600
753.7	1.312	1102.17	0.56	1.06	0.5	1.70	511.28	0	0.00	511.28	0.014	-0.600
753.5	1.476	1013.39	0.73	1.18	0.5	1.70	498.63	0	0.00	498.63	0.017	-0.600
753.4	1.640	773.44	0.85	1.29	0.5	1.70	401.11	0	0.00	401.11	0.017	-0.600
753.2	1.804	596.36	1.04	1.42	0.5	1.70	324.30	0	0.00	324.30	0.016	-0.600
753.0	1.968	433.63	1.33	1.58	0.5	1.70	246.27	0	0.00	246.27	0.015	-0.600
752.9	2.133	319.72	1.28	1.64	0.5	1.70	189.01	0	0.00	189.01	0.014	-0.600
752.7	2.297	201.10	1.63	1.85	0.5	1.70	123.43	11	10.81	134.24	0.013	-0.550
752.5	2.461	118.71	2.58	2.15	0.5	1.70	75.51	35	55.75	131.26	0.013	-0.539
752.4	2.625	76.26	4.08	2.42	0.5	1.70	50.18	57	61.82	112.00	0.015	-0.467
752.2	2.789	67.08	4.69	2.51	0.5	1.70	45.54	63	62.40	107.94	0.016	-0.450
752.0	2.953	75.23	5.55	2.53	0.7	1.70	36.79	65	60.35	97.14	0.018	-0.404
751.9	3.117	52.10	4.46	2.56	0.5	1.70	37.09	68	61.03	98.12	0.019	-0.407
751.7	3.281	53.88	3.97	2.52	0.5	1.70	38.85	64	60.70	99.54	0.020	-0.413
751.6	3.445	52.37	3.98	2.53	0.5	1.70	38.24	65	60.70	98.95	0.021	-0.409
751.4	3.609	52.23	3.98	2.53	0.5	1.70	38.65	65	60.83	99.48	0.022	-0.411
751.2	3.773	50.13	4.13	2.55	0.5	1.70	37.63	67	60.96	98.59	0.023	-0.406
751.1	3.937	54.26	3.72	2.49	0.5	1.70	41.24	62	60.93	102.17	0.024	-0.420
750.9	4.101	49.17	4.01	2.55	0.5	1.70	37.91	67	60.98	98.89	0.025	-0.406
750.7	4.265	55.64	4.63	2.56	0.7	1.70	31.76	67	59.36	91.12	0.026	-0.371
750.6	4.429	51.05	5.11	2.61	0.7	1.70	29.68	72	59.63	89.31	0.027	-0.361
750.4	4.593	68.77	5.71	2.56	0.7	1.70	40.52	68	62.03	102.55	0.029	-0.419
750.2	4.757	136.23	2.93	2.15	0.5	1.70	109.51	35	63.72	173.23	0.030	-0.600
750.1	4.921	199.49	1.84	1.89	0.5	1.68	159.94	14	25.35	185.29	0.032	-0.600
749.9	5.085	247.34	1.88	1.84	0.5	1.61	191.92	10	11.26	203.17	0.035	-0.600
749.8	5.249	198.23	2.35	1.98	0.5	1.60	154.76	21	47.53	202.29	0.037	-0.600
749.6	5.413	104.25	4.06	2.34	0.5	1.70	87.72	50	69.15	156.87	0.039	-0.600
749.4	5.577	134.48	2.23	2.06	0.5	1.69	113.23	28	55.30	168.53	0.041	-0.600
749.3	5.741	635.41	0.54	1.16	0.5	1.44	458.90	0	0.00	458.90	0.042	-0.600
749.1	5.905	782.11	0.60	1.15	0.5	1.43	567.43	0	0.00	567.43	0.043	-0.600
748.9	6.069	857.43	0.56	1.11	0.5	1.42	624.93	0	0.00	624.93	0.044	-0.600
748.8	6.234	979.14	0.45	0.99	0.5	1.41	716.82	0	0.00	716.82	0.045	-0.600
748.6	6.398	877.69	0.28	0.85	0.5	1.41	645.49	0	0.00	645.49	0.046	-0.600
748.4	6.562	746.58	0.38	0.99	0.5	1.40	551.57	0	0.00	551.57	0.047	-0.600
748.3	6.726	661.10	0.44	1.08	0.5	1.39	490.59	0	0.00	490.59	0.048	-0.600
748.1	6.890	557.65	0.51	1.18	0.5	1.39	415.67	0	0.00	415.67	0.049	-0.600
747.9	7.054	496.56	0.46	1.17	0.5	1.38	371.75	0	0.00	371.75	0.051	-0.600
747.8	7.218	485.51	0.39	1.12	0.5	1.37	364.98	0	0.00	364.98	0.052	-0.600
747.6	7.382	405.94	0.38	1.18	0.5	1.37	306.49	0	0.00	306.49	0.053	-0.600
747.5	7.546	280.03	0.77	1.51	0.5	1.42	222.09	0	0.00	222.09	0.055	-0.600
747.3	7.710	209.70	1.28	1.76	0.5	1.52	178.64	3	0.00	178.64	0.056	-0.600
747.1	7.874	121.46	2.74	2.16	0.5	1.53	105.65	36	63.68	169.33	0.057	-0.600
747.0	8.038	72.95	5.04	2.51	0.5	1.62	67.84	63	68.74	136.58	0.058	-0.538
746.8	8.202	58.87	5.28	2.58	0.5	1.65	56.46	70	66.96	123.42	0.059	-0.491
746.6	8.366	79.88	7.70	2.63	1.0	1.69	45.74	73	64.54	110.29	0.059	-0.441
746.5	8.530	96.33	9.85	2.67	1.0	1.63	54.09	76	67.59	121.68	0.060	-0.484
746.3	8.694	643.69	2.59	1.76	0.5	1.32	500.44	4	0.04	500.48	0.061	-0.600
746.1	8.858	690.98	1.45	1.52	0.5	1.32	539.03	0	0.00	539.03	0.061	-0.600
746.0	9.022	514.90	1.72	1.64	0.5	1.31	403.24	0	0.00	403.24	0.062	-0.600
745.8	9.186	167.06	3.65	2.18	0.5	1.38	138.84	37	72.49	211.33	0.063	-0.600
745.6	9.350	99.56	7.75	2.57	0.7	1.51	74.92	69	72.15	147.07	0.064	-0.570
745.5	9.514	92.51	8.24	2.61	0.7	1.51	70.55	72	71.60	142.15	0.065	-0.554
745.3	9.678	65.20	4.92	2.53	0.5	1.54	62.20	65	67.64	129.84	0.066	-0.512
745.2	9.842	60.23	5.33	2.58	0.5	1.54	58.05	69	67.36	125.40	0.067	-0.496

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
745.0	10.006	72.48	4.76	2.49	0.5	1.50	68.36	62	68.51	136.87	0.068	-0.536
744.8	10.170	71.43	4.78	2.49	0.5	1.50	67.56	63	68.40	135.96	0.068	-0.532
744.7	10.335	65.08	5.99	2.60	0.7	1.53	52.90	71	66.16	119.06	0.069	-0.472
744.5	10.499	52.47	6.38	2.68	0.7	1.55	43.82	77	64.68	108.50	0.070	-0.431
744.3	10.663	60.03	5.52	2.59	0.7	1.53	49.57	70	65.11	114.68	0.070	-0.455
744.2	10.827	61.27	4.98	2.55	0.5	1.49	59.23	67	67.21	126.44	0.071	-0.498
744.0	10.991	76.11	4.84	2.48	0.5	1.44	71.75	61	69.27	141.02	0.071	-0.548
743.8	11.155	84.79	6.42	2.55	0.5	1.42	78.70	67	72.75	151.45	0.072	-0.581
743.7	11.319	100.65	0.15	1.52	0.5	1.53	101.24	0	0.00	101.24	0.072	-0.400
743.5	11.483	613.94	0.15	0.79	0.5	1.25	503.54	0	0.00	503.54	0.073	-0.600

LIQUEFACTION POTENTIAL ASSESSMENT FOR COARSE GRAINED SOILS USING CONE PENETRATION TEST DATA

Project Site: **KIF TDEC Stability**
Stantec Project No.: **175668043**
CPT ID: **CPT-01B**

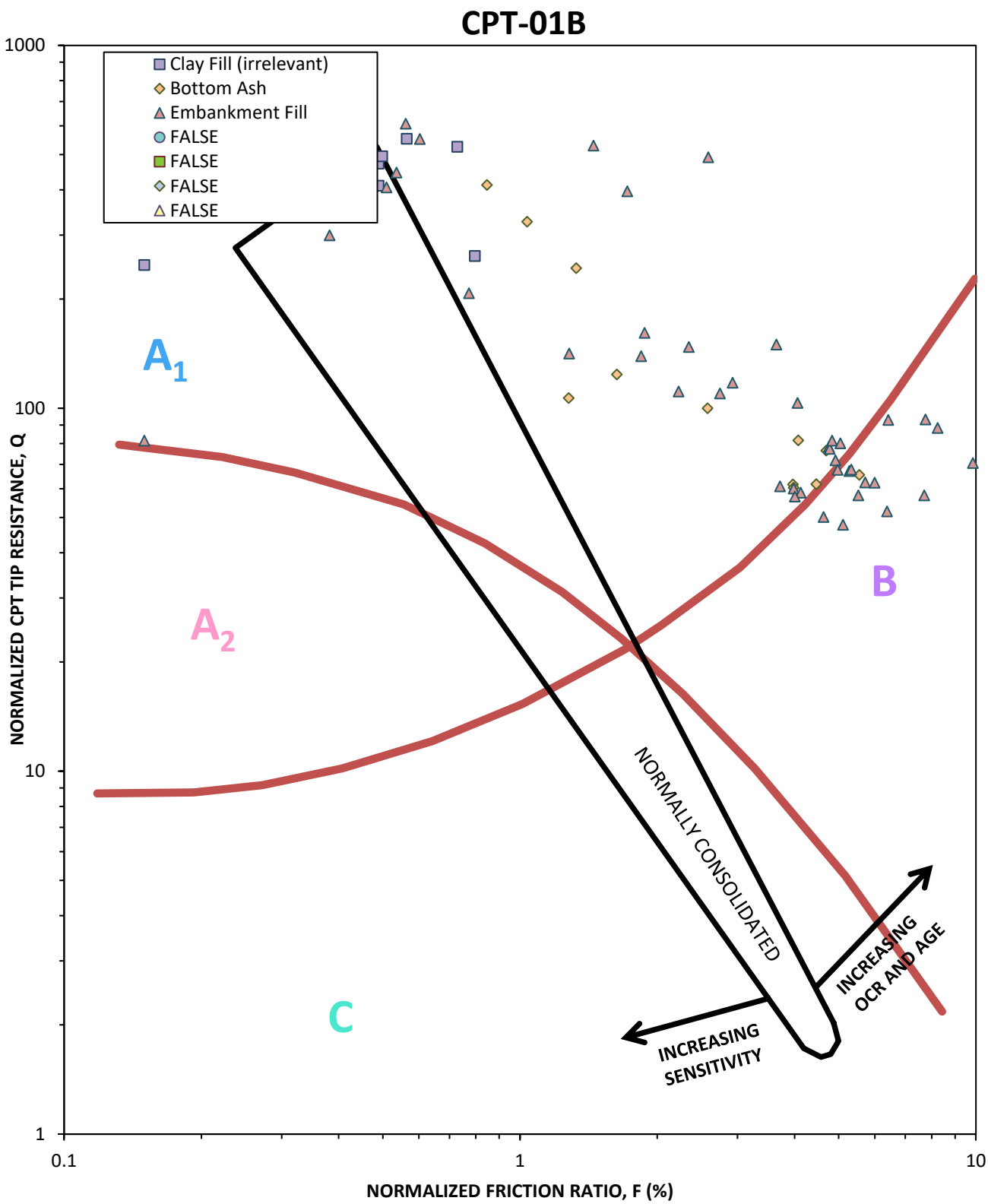
Depth to Water during Earthquake:	5.9	ft
Final Grade Elevation during EQ:	755.3	ft
Height of Final Grade above CPT TOH:	0.3	ft
Normalize K_σ to:	1.058	tsf
a_{max} at top of ground surface:	0.20	g
Earthquake Magnitude:	6.00	M_W
Earthquake File or Source Zone:	10	Hz

Shear Stress Fit Parameters

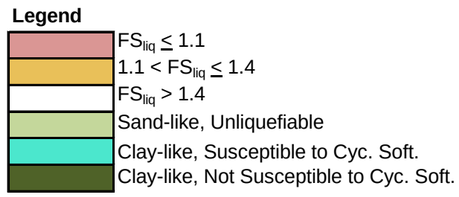
m4:	0
m3:	0
m2:	0
m1:	0

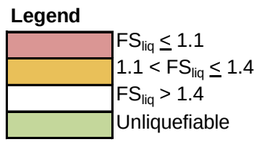
Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
755.0																	
754.8	0.164	N/A	71	N/A	N/A	N/A	N/A	1.000	0	0	**0.132**	TRUE	FALSE	TRUE	**N/A**	**Clay Fill (irrelevant)**	**A1**
754.7	0.328	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.132**	TRUE	TRUE	TRUE	**N/A**	**Clay Fill (irrelevant)**	**A1**
754.5	0.492	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.132**	TRUE	TRUE	TRUE	**N/A**	**Clay Fill (irrelevant)**	**A1**
754.3	0.656	N/A	89	N/A	N/A	N/A	N/A	1.000	0	0	**0.132**	TRUE	TRUE	TRUE	**N/A**	**Clay Fill (irrelevant)**	**A1**
754.2	0.820	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.132**	TRUE	TRUE	TRUE	**N/A**	**Clay Fill (irrelevant)**	**A1**
754.0	0.984	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.132**	TRUE	TRUE	TRUE	**N/A**	**Clay Fill (irrelevant)**	**A1**
753.9	1.148	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.132**	TRUE	TRUE	TRUE	**N/A**	**Clay Fill (irrelevant)**	**A1**
753.7	1.312	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.132**	TRUE	TRUE	TRUE	**N/A**	**Clay Fill (irrelevant)**	**A1**
753.5	1.476	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.132**	TRUE	TRUE	TRUE	**N/A**	**Clay Fill (irrelevant)**	**A1**
753.4	1.640	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.132**	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**	**A1**
753.2	1.804	N/A	100	N/A	N/A	N/A	N/A	0.999	0	0	**0.132**	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**	**A1**
753.0	1.968	N/A	98	N/A	N/A	N/A	N/A	0.999	0	0	**0.132**	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**	**A1**
752.9	2.133	N/A	84	N/A	N/A	N/A	N/A	0.998	0	0	**0.132**	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**	**A1**
752.7	2.297	0.211	68	1.100	N/A	1.30	N/A	0.997	0	0	**0.132**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**A1**
752.5	2.461	0.201	67	1.100	N/A	1.29	N/A	0.996	0	0	**0.132**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**A1**
752.4	2.625	0.155	60	1.100	N/A	1.20	N/A	0.996	0	0	**0.132**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**A1**
752.2	2.789	0.149	58	1.100	N/A	1.18	N/A	0.995	0	0	**0.132**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**A1**
752.0	2.953	0.134	54	1.100	N/A	1.15	N/A	0.994	0	0	**0.132**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**B**
751.9	3.117	0.135	54	1.100	N/A	1.15	N/A	0.993	0	0	**0.131**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**A1**
751.7	3.281	0.137	55	1.100	N/A	1.16	N/A	0.993	0	0	**0.131**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**A1**
751.6	3.445	0.136	55	1.100	N/A	1.15	N/A	0.992	0	0	**0.131**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**A1**
751.4	3.609	N/A	55	N/A	N/A	N/A	N/A	0.991	0	0	**0.131**	TRUE	FALSE	TRUE	**N/A**	**Embankment Fill**	**A1**
751.2	3.773	N/A	54	N/A	N/A	N/A	N/A	0.990	0	0	**0.131**	TRUE	FALSE	TRUE	**N/A**	**Embankment Fill**	**A1**
751.1	3.937	N/A	56	N/A	N/A	N/A	N/A	0.989	0	0	**0.131**	TRUE	FALSE	TRUE	**N/A**	**Embankment Fill**	**A1**
750.9	4.101	N/A	54	N/A	N/A	N/A	N/A	0.989	0	0	**0.131**	TRUE	FALSE	TRUE	**N/A**	**Embankment Fill**	**A1**
750.7	4.265	N/A	51	N/A	N/A	N/A	N/A	0.988	0	0	**0.131**	TRUE	FALSE	TRUE	**N/A**	**Embankment Fill**	**B**
750.6	4.429	N/A	50	N/A	N/A	N/A	N/A	0.987	0	0	**0.131**	TRUE	FALSE	TRUE	**N/A**	**Embankment Fill**	**B**
750.4	4.593	N/A	56	N/A	N/A	N/A	N/A	0.986	0	0	**0.131**	TRUE	FALSE	TRUE	**N/A**	**Embankment Fill**	**B**
750.2	4.757	N/A	80	N/A	N/A	N/A	N/A	0.985	0	0	**0.130**	TRUE	FALSE	TRUE	**N/A**	**Embankment Fill**	**A1**
750.1	4.921	N/A	83	N/A	N/A	N/A	N/A	0.985	0	0	**0.130**	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**	**A1**
749.9	5.085	N/A	88	N/A	N/A	N/A	N/A	0.984	0	0	**0.130**	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**	**A1**
749.8	5.249	N/A	88	N/A	N/A	N/A	N/A	0.983	0	0	**0.130**	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**	**A1**
749.6	5.413	N/A	75	N/A	N/A	N/A	N/A	0.982	0	0	**0.130**	TRUE	FALSE	TRUE	**N/A**	**Embankment Fill**	**A1**
749.4	5.577	N/A	79	N/A	N/A	N/A	N/A	0.981	0	0	**0.130**	TRUE	FALSE	TRUE	**N/A**	**Embankment Fill**	**A1**
749.3	5.741	N/A	100	N/A	N/A	N/A	N/A	0.980	0	0	**0.130**	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**	**A1**
749.1	5.905	N/A	100	N/A	N/A	N/A	N/A	0.980	0	0	**0.130**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
748.9	6.069	N/A	100	N/A	N/A	N/A	N/A	0.979	0	0	**0.131**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
748.8	6.234	N/A	100	N/A	N/A	N/A	N/A	0.978	0	0	**0.133**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
748.6	6.398	N/A	100	N/A	N/A	N/A	N/A	0.977	0	0	**0.134**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
748.4	6.562	N/A	100	N/A	N/A	N/A	N/A	0.976	0	0	**0.136**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
748.3	6.726	N/A	100	N/A	N/A	N/A	N/A	0.975	0	0	**0.137**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
748.1	6.890	N/A	100	N/A	N/A	N/A	N/A	0.974	0	0	**0.139**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
747.9	7.054	N/A	100	N/A	N/A	N/A	N/A	0.973	0	0	**0.140**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
747.8	7.218	N/A	100	N/A	N/A	N/A	N/A	0.973	0	0	**0.141**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**

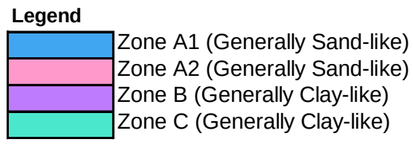
Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
747.6	7.382	N/A	100	N/A	N/A	N/A	N/A	0.972	0	0	**0.142**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
747.5	7.546	N/A	93	N/A	N/A	N/A	N/A	0.971	0	0	**0.144**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
747.3	7.710	N/A	82	N/A	N/A	N/A	N/A	0.970	0	0	**0.145**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
747.1	7.874	N/A	79	N/A	N/A	N/A	N/A	0.969	0	0	**0.146**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
747.0	8.038	N/A	69	N/A	N/A	N/A	N/A	0.968	0	0	**0.147**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
746.8	8.202	N/A	64	N/A	N/A	N/A	N/A	0.967	0	0	**0.148**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
746.6	8.366	N/A	59	N/A	N/A	N/A	N/A	0.966	0	0	**0.149**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
746.5	8.530	N/A	64	N/A	N/A	N/A	N/A	0.965	0	0	**0.150**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
746.3	8.694	N/A	100	N/A	N/A	N/A	N/A	0.964	0	0	**0.151**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
746.1	8.858	N/A	100	N/A	N/A	N/A	N/A	0.963	0	0	**0.152**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
746.0	9.022	N/A	100	N/A	N/A	N/A	N/A	0.962	0	0	**0.153**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
745.8	9.186	N/A	90	N/A	N/A	N/A	N/A	0.961	0	0	**0.154**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
745.6	9.350	N/A	72	N/A	N/A	N/A	N/A	0.961	0	0	**0.155**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
745.5	9.514	N/A	71	N/A	N/A	N/A	N/A	0.960	0	0	**0.156**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
745.3	9.678	N/A	66	N/A	N/A	N/A	N/A	0.959	0	0	**0.157**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
745.2	9.842	N/A	65	N/A	N/A	N/A	N/A	0.958	0	0	**0.157**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
745.0	10.006	N/A	69	N/A	N/A	N/A	N/A	0.957	0	0	**0.158**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
744.8	10.170	N/A	69	N/A	N/A	N/A	N/A	0.956	0	0	**0.159**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
744.7	10.335	N/A	63	N/A	N/A	N/A	N/A	0.955	0	0	**0.160**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
744.5	10.499	N/A	58	N/A	N/A	N/A	N/A	0.954	0	0	**0.160**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
744.3	10.663	N/A	61	N/A	N/A	N/A	N/A	0.953	0	0	**0.161**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
744.2	10.827	N/A	65	N/A	N/A	N/A	N/A	0.952	0	0	**0.162**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
744.0	10.991	N/A	70	N/A	N/A	N/A	N/A	0.951	0	0	**0.162**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
743.8	11.155	N/A	74	N/A	N/A	N/A	N/A	0.950	0	0	**0.163**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
743.7	11.319	N/A	55	N/A	N/A	N/A	N/A	0.949	0	0	**0.164**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
743.5	11.483	N/A	100	N/A	N/A	N/A	N/A	0.948	0	0	**0.164**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**



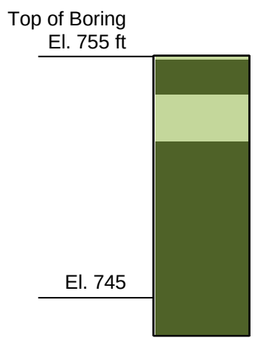
Adapted from "Discussion of 'Liquefaction Potential of Silts from CPTu'" (Robertson 2008). Zone A_1 and Zone A_2 samples are generally sand-like. Zone B samples are generally clay-like and not susceptible to cyclic softening. Zone C samples are generally clay-like and susceptible to cyclic softening. Note that the transition from clay-like to sand-like in this chart does not exactly match the liquefaction calculations herein; that is, some transitional samples in Zone B and Zone C will be treated as sand-like and analyzed for liquefaction if the calculations indicate as such.



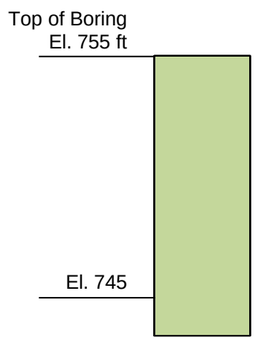




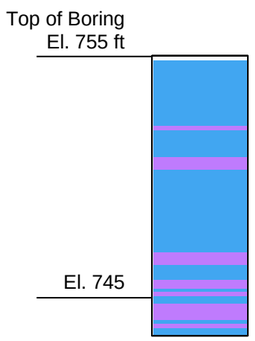
CPT-01B, Liquefaction Triggering Results



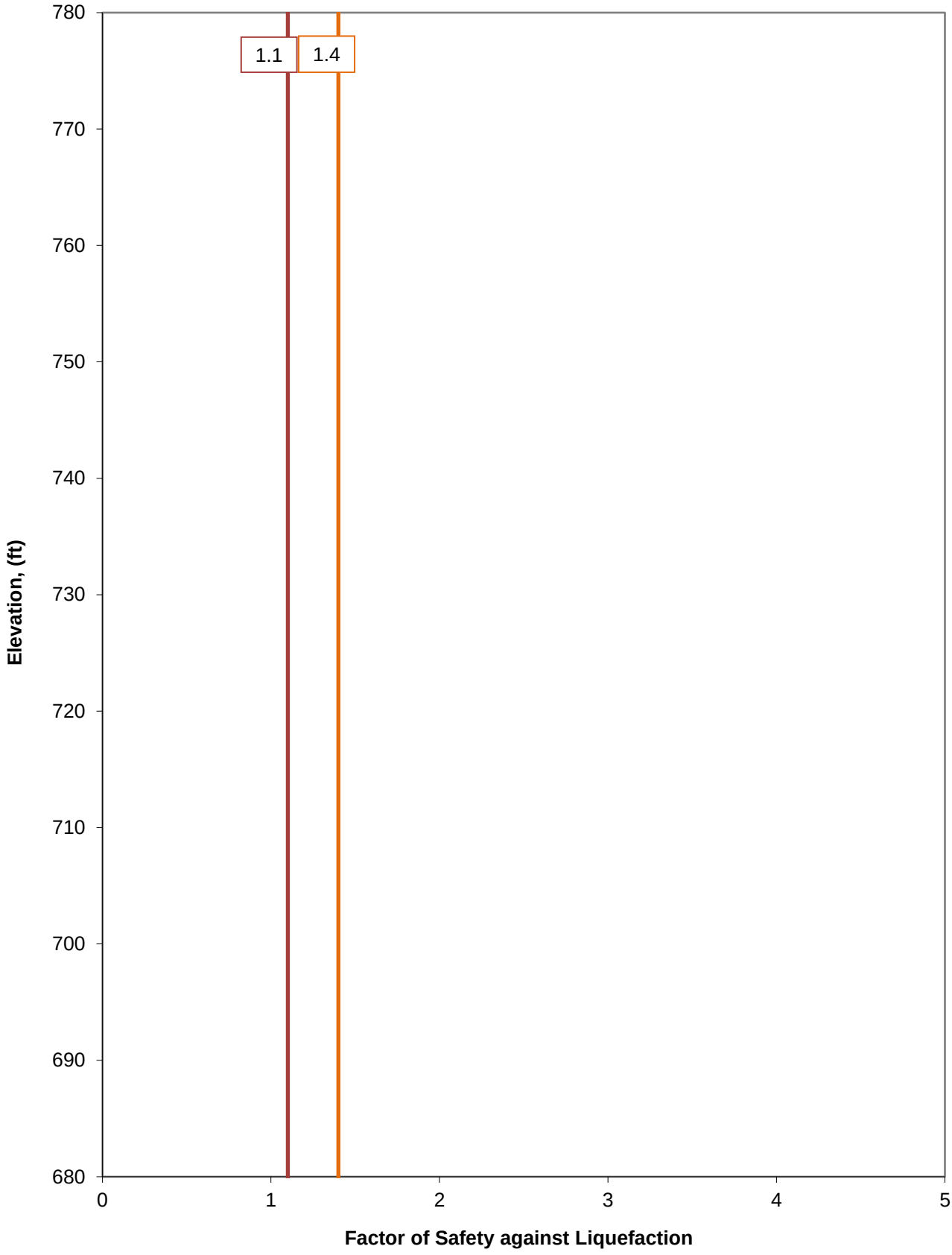
CPT-01B, Liquefaction Triggering Results



CPT-01B, Robertson Soil Type



KIF TDEC Stability, Boring = CPT-01B, Source = 10 Hz, Mw = 6, Event = Design EQ, CPT Data, Simplified Stress-Based Approach



Project Information

Stantec Project Number =	175668043
Project Name =	KIF TDEC Stability
CPT ID =	CPT-02D

Boring Location (optional)

Northing =	
Easting =	

OR

Baseline Station =	
Offset (+ Right) =	

Using qt (corrected for u2 PWP) or qc (backcalculated uncorrected field tip)

Cone ID (optional) =	AD184	
Use qc instead of qt?	0	(1: Yes, 0: No)
Cone Area Ratio (a) =	0.80	

Drilling Information

Top of Hole Elevation =	755.0	feet
Water Depth during CPT (negative for U/S borings) =	2.0	feet
Depth data collection began =	0.16	feet
Avg. Total Unit Wt. Above 1st Sample =	120.00	pcf

During Earthquake Information

Water Depth during EQ (relative to CPT TOH, negative for U/S borings) =	5.9	feet
Final Grade Elevation during EQ =	755.3	feet
Avg. Total Unit Wt. of Cut/Fill =	120	pcf

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile?	0	(1: Yes, 0: No)

If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile:	Section_AA, KIF-A2_NOR	
α at each Sample Depth known?	1	(1: Yes, 0: No)

If previous answer is No, then enter curve fit parameters below (α vs. depth curve)
If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_α will be one.

m4:	
m3:	
m2:	
m1:	
m0:	

Associated ground response profile:	Section_AA, KIF-A2_NOR	
Get CSR from shear stress envelope?	0	(1: Yes, 0: No)

If previous answer is No, then CSR will be calculated using a_{max} and r_d

Max. Shear Stress at each sample depth known?		(1: Yes, 0: No)

If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4:	
m3:	
m2:	
m1:	

Earthquake Information

EQ Source (e.g., New Madrid)	10 Hz
Event (e.g., MCE, OBE)	Design EQ
a_{max} (g) (top of ground surface)	0.20
EQ Mag (Mw)	6.0

Inputs

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
0.164	7.712	0.216	120	Clay Fill (irrelevant)	Clay-like		0.002			
0.328	103.424	0.643	120	Clay Fill (irrelevant)	Clay-like		0.001			
0.492	90.740	0.930	120	Clay Fill (irrelevant)	Clay-like		0.000			
0.656	135.224	1.443	120	Clay Fill (irrelevant)	Clay-like		0.003			
0.820	215.937	1.540	120	Clay Fill (irrelevant)	Clay-like		0.005			
0.984	278.495	1.643	120	Clay Fill (irrelevant)	Clay-like		0.008			
1.148	305.513	1.350	120	Clay Fill (irrelevant)	Clay-like		0.011			
1.312	366.806	1.940	120	Clay Fill (irrelevant)	Clay-like		0.014			
1.476	391.651	2.399	120	Clay Fill (irrelevant)	Clay-like		0.017			
1.640	300.890	2.659	119	Bottom Ash	Sand-like		0.017			
1.804	302.997	2.544	119	Bottom Ash	Sand-like		0.016			
1.968	306.466	2.163	119	Bottom Ash	Sand-like		0.015			
2.133	284.785	1.823	119	Bottom Ash	Sand-like		0.014			
2.297	223.345	1.564	119	Bottom Ash	Sand-like		0.013			
2.461	166.667	1.472	119	Bottom Ash	Sand-like		0.013			
2.625	102.425	1.442	119	Bottom Ash	Sand-like		0.015			
2.789	54.951	1.462	119	Bottom Ash	Sand-like		0.016			
2.953	37.954	1.420	119	Bottom Ash	Sand-like		0.018			
3.117	27.937	1.083	119	Bottom Ash	Sand-like		0.019			
3.281	28.022	1.154	119	Bottom Ash	Sand-like		0.020			
3.445	40.146	1.251	119	Bottom Ash	Sand-like		0.021			
3.609	30.465	1.338	128	Embankment Fill	Clay-like		0.022			
3.773	24.840	1.391	128	Embankment Fill	Clay-like		0.023			
3.937	21.814	1.266	128	Embankment Fill	Clay-like		0.024			
4.101	18.854	1.089	128	Embankment Fill	Clay-like		0.025			
4.265	21.430	1.039	128	Embankment Fill	Clay-like		0.026			
4.429	21.487	1.220	128	Embankment Fill	Clay-like		0.027			
4.593	161.282	1.679	128	Embankment Fill	Clay-like		0.029			
4.757	243.586	1.670	128	Embankment Fill	Clay-like		0.030			
4.921	239.290	1.221	128	Embankment Fill	Clay-like		0.032			
5.085	229.474	1.225	128	Embankment Fill	Clay-like		0.035			
5.249	169.190	1.308	128	Embankment Fill	Clay-like		0.037			
5.413	82.374	1.665	128	Embankment Fill	Clay-like		0.039			
5.577	59.819	1.744	128	Embankment Fill	Clay-like		0.041			
5.741	39.072	1.982	128	Embankment Fill	Clay-like		0.042			
5.905	39.185	2.131	128	Embankment Fill	Clay-like		0.043			
6.069	40.060	2.168	128	Embankment Fill	Clay-like		0.044			
6.234	43.697	2.128	128	Embankment Fill	Clay-like		0.045			
6.398	50.913	1.838	128	Embankment Fill	Clay-like		0.046			
6.562	50.454	2.258	128	Embankment Fill	Clay-like		0.047			
6.726	48.328	2.538	128	Embankment Fill	Clay-like		0.048			
6.890	56.047	2.821	128	Embankment Fill	Clay-like		0.049			
7.054	53.783	2.876	128	Embankment Fill	Clay-like		0.051			
7.218	50.315	2.375	128	Embankment Fill	Clay-like		0.052			
7.382	58.586	2.430	128	Embankment Fill	Clay-like		0.053			
7.546	47.595	1.966	128	Embankment Fill	Clay-like		0.055			
7.710	37.712	1.911	128	Embankment Fill	Clay-like		0.056			
7.874	36.009	1.607	128	Embankment Fill	Clay-like		0.057			
8.038	32.757	1.490	128	Embankment Fill	Clay-like		0.058			
8.202	31.026	1.451	128	Embankment Fill	Clay-like		0.059			
8.366	30.224	1.513	128	Embankment Fill	Clay-like		0.059			
8.530	32.222	1.581	128	Embankment Fill	Clay-like		0.060			
8.694	30.447	1.618	128	Embankment Fill	Clay-like		0.061			
8.858	47.258	1.893	128	Embankment Fill	Clay-like		0.061			
9.022	63.802	2.259	128	Embankment Fill	Clay-like		0.062			
9.186	72.738	3.121	128	Embankment Fill	Clay-like		0.063			
9.350	76.166	2.382	128	Embankment Fill	Clay-like		0.064			
9.514	88.291	2.712	128	Embankment Fill	Clay-like		0.065			
9.678	113.312	2.166	128	Embankment Fill	Clay-like		0.066			
9.842	75.277	2.282	128	Embankment Fill	Clay-like		0.067			
10.006	61.860	1.739	128	Embankment Fill	Clay-like		0.068			
10.170	73.412	2.188	128	Embankment Fill	Clay-like		0.068			
10.335	113.509	2.483	128	Embankment Fill	Clay-like		0.069			

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
10.499	106.958	3.082	128	Embankment Fill	Clay-like		0.070			
10.663	88.408	3.151	128	Embankment Fill	Clay-like		0.070			
10.827	108.157	4.034	128	Embankment Fill	Clay-like		0.071			
10.991	135.064	4.377	128	Embankment Fill	Clay-like		0.071			
11.155	178.150	3.144	128	Embankment Fill	Clay-like		0.072			
11.319	128.382	3.777	128	Embankment Fill	Clay-like		0.072			
11.483	135.018	3.605	128	Embankment Fill	Clay-like		0.073			
11.647	82.493	3.237	128	Embankment Fill	Clay-like		0.073			
11.811	63.833	2.855	128	Embankment Fill	Clay-like		0.074			
11.975	53.083	2.676	128	Embankment Fill	Clay-like		0.074			
12.139	58.353	2.534	128	Embankment Fill	Clay-like		0.075			
12.303	61.463	2.394	128	Embankment Fill	Clay-like		0.075			
12.467	65.852	2.631	128	Embankment Fill	Clay-like		0.076			
12.631	140.713	2.788	128	Embankment Fill	Clay-like		0.076			
12.795	175.443	2.494	128	Embankment Fill	Clay-like		0.077			
12.959	171.503	1.921	128	Embankment Fill	Clay-like		0.077			
13.123	117.301	2.048	128	Embankment Fill	Clay-like		0.077			
13.287	69.207	2.230	128	Embankment Fill	Clay-like		0.078			
13.451	59.818	2.573	128	Embankment Fill	Clay-like		0.078			
13.615	52.119	2.701	128	Embankment Fill	Clay-like		0.078			
13.779	40.530	2.521	128	Embankment Fill	Clay-like		0.079			
13.943	41.820	2.372	128	Embankment Fill	Clay-like		0.080			
14.107	45.090	2.343	128	Embankment Fill	Clay-like		0.080			
14.271	45.891	2.339	128	Embankment Fill	Clay-like		0.081			
14.436	30.079	2.009	128	Embankment Fill	Clay-like		0.081			
14.600	28.500	1.947	128	Embankment Fill	Clay-like		0.082			
14.764	26.460	1.804	128	Embankment Fill	Clay-like		0.083			
14.928	26.401	1.737	128	Embankment Fill	Clay-like		0.083			
15.092	26.081	1.674	128	Embankment Fill	Clay-like		0.084			
15.256	26.551	1.656	128	Embankment Fill	Clay-like		0.085			
15.420	26.041	1.597	128	Embankment Fill	Clay-like		0.085			
15.584	25.076	1.524	128	Embankment Fill	Clay-like		0.085			
15.748	25.895	1.456	128	Embankment Fill	Clay-like		0.085			
15.912	24.715	1.424	128	Embankment Fill	Clay-like		0.086			
16.076	25.985	1.029	128	Embankment Fill	Clay-like		0.086			
16.240	29.839	0.548	128	Embankment Fill	Clay-like		0.086			
16.404	94.624	0.668	128	Embankment Fill	Clay-like		0.086			
16.568	81.430	1.705	128	Embankment Fill	Clay-like		0.086			
16.732	49.200	2.097	128	Embankment Fill	Clay-like		0.085			
16.896	17.949	2.273	128	Embankment Fill	Clay-like		0.085			
17.060	16.861	0.991	128	Embankment Fill	Clay-like		0.085			
17.224	14.473	0.900	128	Embankment Fill	Clay-like		0.085			
17.388	16.182	0.935	128	Embankment Fill	Clay-like		0.085			
17.552	19.440	0.977	128	Embankment Fill	Clay-like		0.086			
17.716	25.198	1.105	128	Embankment Fill	Clay-like		0.087			
17.880	19.345	1.175	128	Embankment Fill	Clay-like		0.087			
18.044	17.990	1.159	128	Embankment Fill	Clay-like		0.088			
18.208	22.321	1.156	128	Embankment Fill	Clay-like		0.089			
18.372	31.450	1.284	128	Embankment Fill	Clay-like		0.090			
18.537	25.351	1.427	128	Embankment Fill	Clay-like		0.090			
18.701	27.631	1.414	128	Embankment Fill	Clay-like		0.090			
18.865	26.088	1.484	128	Embankment Fill	Clay-like		0.091			
19.029	35.098	1.579	128	Embankment Fill	Clay-like		0.091			
19.193	38.056	1.665	128	Embankment Fill	Clay-like		0.092			
19.357	29.044	1.748	128	Embankment Fill	Clay-like		0.092			
19.521	21.134	0.747	128	Embankment Fill	Clay-like		0.093			
19.685	12.363	0.686	128	Embankment Fill	Clay-like		0.093			
19.849	8.640	0.521	128	Embankment Fill	Clay-like		0.093			
20.013	9.639	0.554	128	Embankment Fill	Clay-like		0.094			
20.177	12.772	0.631	128	Embankment Fill	Clay-like		0.094			
20.341	13.771	0.614	128	Embankment Fill	Clay-like		0.095			
20.505	13.020	0.619	128	Embankment Fill	Clay-like		0.095			
20.669	10.900	0.579	128	Embankment Fill	Clay-like		0.095			
20.833	17.480	0.613	128	Embankment Fill	Clay-like		0.096			
20.997	17.530	0.564	128	Embankment Fill	Clay-like		0.096			
21.161	17.149	0.529	128	Embankment Fill	Clay-like		0.097			
21.325	17.969	0.361	128	Embankment Fill	Clay-like		0.097			
21.489	16.088	0.367	128	Embankment Fill	Clay-like		0.098			
21.653	8.069	0.382	128	Embankment Fill	Clay-like		0.098			
21.817	5.861	0.303	128	Embankment Fill	Clay-like		0.098			
21.981	14.130	0.360	128	Embankment Fill	Clay-like		0.099			
22.145	19.912	0.579	128	Embankment Fill	Clay-like		0.099			
22.309	13.692	0.585	128	Embankment Fill	Clay-like		0.099			
22.473	15.920	0.615	128	Embankment Fill	Clay-like		0.100			
22.638	13.140	0.481	128	Embankment Fill	Clay-like		0.100			

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
22.802	14.589	0.290	128	Embankment Fill	Clay-like		0.100			
22.966	10.219	0.356	128	Embankment Fill	Clay-like		0.101			
23.130	8.252	0.377	128	Embankment Fill	Clay-like		0.101			
23.294	7.073	0.285	128	Embankment Fill	Clay-like		0.101			
23.458	6.907	0.308	128	Embankment Fill	Clay-like		0.102			
23.622	9.445	0.310	128	Embankment Fill	Clay-like		0.102			
23.786	11.081	0.416	128	Embankment Fill	Clay-like		0.102			
23.950	9.066	0.432	128	Embankment Fill	Clay-like		0.102			
24.114	18.578	0.422	128	Embankment Fill	Clay-like		0.103			
24.278	22.798	0.595	128	Embankment Fill	Clay-like		0.103			
24.442	16.047	0.575	128	Embankment Fill	Clay-like		0.103			
24.606	10.446	0.361	128	Embankment Fill	Clay-like		0.103			
24.770	9.057	0.363	128	Embankment Fill	Clay-like		0.104			
24.934	5.927	0.363	128	Embankment Fill	Clay-like		0.104			
25.098	7.691	0.340	128	Embankment Fill	Clay-like		0.104			
25.262	7.691	0.344	128	Embankment Fill	Clay-like		0.104			
25.426	8.632	0.319	128	Embankment Fill	Clay-like		0.105			
25.590	7.171	0.277	128	Embankment Fill	Clay-like		0.105			
25.754	7.692	0.291	128	Embankment Fill	Clay-like		0.105			
25.918	6.795	0.300	128	Embankment Fill	Clay-like		0.105			
26.082	7.447	0.216	128	Embankment Fill	Clay-like		0.106			
26.246	6.999	0.273	128	Embankment Fill	Clay-like		0.106			
26.410	8.596	0.302	128	Embankment Fill	Clay-like		0.106			
26.574	7.325	0.311	128	Embankment Fill	Clay-like		0.106			
26.739	7.164	0.261	128	Embankment Fill	Clay-like		0.107			
26.903	7.357	0.265	128	Embankment Fill	Clay-like		0.107			
27.067	7.529	0.217	128	Embankment Fill	Clay-like		0.107			
27.231	8.601	0.242	128	Embankment Fill	Clay-like		0.107			
27.395	7.594	0.378	128	Embankment Fill	Clay-like		0.108			
27.559	9.797	0.316	128	Embankment Fill	Clay-like		0.108			
27.723	11.937	0.369	128	Embankment Fill	Clay-like		0.108			
27.887	11.938	0.500	128	Embankment Fill	Clay-like		0.108			
28.051	9.773	0.437	128	Embankment Fill	Clay-like		0.109			
28.215	15.387	0.445	128	Embankment Fill	Clay-like		0.109			
28.379	14.103	0.478	128	Embankment Fill	Clay-like		0.109			
28.543	11.539	0.501	128	Embankment Fill	Clay-like		0.109			
28.707	10.384	0.413	128	Embankment Fill	Clay-like		0.110			
28.871	9.923	0.344	128	Embankment Fill	Clay-like		0.110			
29.035	9.659	0.315	128	Embankment Fill	Clay-like		0.110			
29.199	8.068	0.267	128	Embankment Fill	Clay-like		0.110			
29.363	7.043	0.154	128	Embankment Fill	Clay-like		0.110			
29.527	6.280	0.271	128	Embankment Fill	Clay-like		0.111			
29.691	7.509	0.366	128	Embankment Fill	Clay-like		0.111			
29.855	10.723	0.355	128	Embankment Fill	Clay-like		0.111			
30.019	11.447	0.376	127	Subunit 1	Clay-like		0.111			
30.183	7.567	0.371	127	Subunit 1	Clay-like		0.112			
30.347	13.739	0.511	127	Subunit 1	Clay-like		0.112			
30.511	19.108	0.723	127	Subunit 1	Clay-like		0.112			
30.675	34.497	0.683	127	Subunit 1	Clay-like		0.112			
30.840	14.360	0.816	127	Subunit 1	Clay-like		0.113			
31.004	10.942	0.551	127	Subunit 1	Clay-like		0.113			
31.168	15.396	0.541	127	Subunit 1	Clay-like		0.113			
31.332	13.095	0.590	127	Subunit 1	Clay-like		0.113			
31.496	10.337	0.556	127	Subunit 1	Clay-like		0.113			
31.660	10.030	0.495	127	Subunit 1	Clay-like		0.113			
31.824	10.363	0.370	127	Subunit 1	Clay-like		0.114			
31.988	10.582	0.312	127	Subunit 1	Clay-like		0.114			
32.152	11.892	0.308	127	Subunit 1	Clay-like		0.114			
32.316	10.131	0.282	127	Subunit 1	Clay-like		0.114			
32.480	8.379	0.258	127	Subunit 1	Clay-like		0.114			
32.644	7.750	0.204	127	Subunit 1	Clay-like		0.114			
32.808	8.207	0.179	127	Subunit 1	Clay-like		0.114			
32.972	9.343	0.142	127	Subunit 1	Clay-like		0.114			
33.136	8.089	0.141	127	Subunit 1	Clay-like		0.115			
33.300	7.658	0.128	127	Subunit 1	Clay-like		0.115			
33.464	7.601	0.162	127	Subunit 1	Clay-like		0.115			
33.628	7.582	0.233	127	Subunit 1	Clay-like		0.115			
33.792	7.260	0.232	127	Subunit 1	Clay-like		0.115			
33.956	7.429	0.232	127	Subunit 1	Clay-like		0.116			
34.120	7.142	0.256	127	Subunit 1	Clay-like		0.118			
34.284	7.396	0.197	127	Subunit 1	Clay-like		0.118			
34.448	7.831	0.188	127	Subunit 1	Clay-like		0.118			
34.612	7.383	0.169	127	Subunit 1	Clay-like		0.118			
34.776	6.577	0.187	127	Subunit 1	Clay-like		0.118			
34.941	6.522	0.194	127	Subunit 1	Clay-like		0.118			

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
35.105	7.840	0.217	127	Subunit 1	Clay-like		0.118			
35.269	9.124	0.329	127	Subunit 1	Clay-like		0.119			
35.433	18.087	0.504	127	Subunit 1	Clay-like		0.119			
35.597	26.406	0.981	127	Subunit 1	Clay-like		0.119			
35.761	29.262	1.322	127	Subunit 1	Clay-like		0.119			
35.925	28.760	1.048	127	Subunit 1	Clay-like		0.119			
36.089	27.552	1.209	127	Subunit 1	Clay-like		0.119			
36.253	27.397	1.187	127	Subunit 1	Clay-like		0.120			
36.417	24.480	1.129	127	Subunit 1	Clay-like		0.120			
36.581	23.566	0.878	127	Subunit 1	Clay-like		0.120			
36.745	24.116	0.899	127	Subunit 1	Clay-like		0.120			
36.909	21.791	0.767	127	Subunit 1	Clay-like		0.120			
37.073	19.476	0.684	127	Subunit 1	Clay-like		0.120			
37.237	21.326	0.638	127	Subunit 1	Clay-like		0.121			
37.401	21.642	0.557	127	Subunit 1	Clay-like		0.121			
37.565	20.650	0.603	127	Subunit 1	Clay-like		0.121			
37.729	21.603	0.549	127	Subunit 1	Clay-like		0.121			
37.893	20.056	0.528	127	Subunit 1	Clay-like		0.122			
38.057	19.550	0.497	127	Subunit 1	Clay-like		0.122			
38.221	20.689	0.435	127	Subunit 1	Clay-like		0.122			
38.385	22.252	0.441	127	Subunit 1	Clay-like		0.122			
38.549	22.545	0.500	127	Subunit 1	Clay-like		0.123			
38.713	23.172	0.465	127	Subunit 1	Clay-like		0.123			
38.877	21.460	0.452	127	Subunit 1	Clay-like		0.123			
39.042	22.033	0.449	126	Subunit 2	Sand-like		0.124			
39.206	22.441	0.446	126	Subunit 2	Sand-like		0.124			
39.370	23.119	0.579	126	Subunit 2	Sand-like		0.124			
39.534	25.529	0.640	126	Subunit 2	Sand-like		0.124			
39.698	24.439	0.725	126	Subunit 2	Sand-like		0.124			
39.862	25.654	0.747	126	Subunit 2	Sand-like		0.125			
40.026	23.334	0.716	126	Subunit 2	Sand-like		0.125			
40.190	21.203	0.693	126	Subunit 2	Sand-like		0.125			
40.354	20.927	0.566	126	Subunit 2	Sand-like		0.125			
40.518	20.486	0.532	126	Subunit 2	Sand-like		0.125			
40.682	19.341	0.556	126	Subunit 2	Sand-like		0.125			
40.846	19.251	0.560	126	Subunit 2	Sand-like		0.125			
41.010	20.060	0.491	126	Subunit 2	Sand-like		0.125			
41.174	20.610	0.494	126	Subunit 2	Sand-like		0.125			
41.338	19.360	0.517	126	Subunit 2	Sand-like		0.125			
41.502	19.017	0.504	126	Subunit 2	Sand-like		0.125			
41.666	18.585	0.485	126	Subunit 2	Sand-like		0.126			
41.830	18.332	0.437	126	Subunit 2	Sand-like		0.126			
41.994	20.010	0.468	126	Subunit 2	Sand-like		0.126			
42.158	22.947	0.439	126	Subunit 2	Sand-like		0.126			
42.322	23.247	0.481	126	Subunit 2	Sand-like		0.127			
42.486	23.847	0.451	126	Subunit 2	Sand-like		0.127			
42.650	23.520	0.487	126	Subunit 2	Sand-like		0.127			
42.814	23.527	0.514	126	Subunit 2	Sand-like		0.127			
42.978	21.100	0.657	126	Subunit 2	Sand-like		0.128			
43.143	19.645	0.756	126	Subunit 2	Sand-like		0.128			
43.307	20.737	0.810	126	Subunit 2	Sand-like		0.128			
43.471	15.766	0.744	126	Subunit 2	Sand-like		0.128			
43.635	11.246	0.506	126	Subunit 2	Sand-like		0.128			
43.799	9.662	0.282	126	Subunit 2	Sand-like		0.128			
43.963	8.687	0.215	126	Subunit 2	Sand-like		0.128			
44.127	7.960	0.190	126	Subunit 2	Sand-like		0.128			
44.291	7.871	0.175	126	Subunit 2	Sand-like		0.128			
44.455	7.788	0.167	126	Subunit 2	Sand-like		0.128			
44.619	7.714	0.159	126	Subunit 2	Sand-like		0.128			
44.783	7.581	0.148	126	Subunit 2	Sand-like		0.128			
44.947	7.431	0.141	126	Subunit 2	Sand-like		0.129			
45.111	7.330	0.132	126	Subunit 2	Sand-like		0.129			
45.275	7.423	0.133	126	Subunit 2	Sand-like		0.129			
45.439	7.408	0.133	126	Subunit 2	Sand-like		0.129			
45.603	7.533	0.143	126	Subunit 2	Sand-like		0.129			
45.767	8.180	0.223	126	Subunit 2	Sand-like		0.129			
45.931	9.580	0.368	126	Subunit 2	Sand-like		0.129			
46.095	18.419	0.350	126	Subunit 2	Sand-like		0.130			
46.259	19.124	0.373	126	Subunit 2	Sand-like		0.130			
46.423	18.149	0.309	126	Subunit 2	Sand-like		0.130			
46.587	24.918	0.239	126	Subunit 2	Sand-like		0.130			
46.751	37.664	0.132	126	Subunit 2	Sand-like		0.131			
46.915	42.542	0.129	126	Subunit 2	Sand-like		0.131			
47.079	44.870	0.198	126	Subunit 2	Sand-like		0.131			
47.244	46.438	0.265	126	Subunit 2	Sand-like		0.131			

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
47.408	48.772	0.469	126	Subunit 2	Sand-like		0.131			
47.572	49.478	0.463	126	Subunit 2	Sand-like		0.131			
47.736	73.191	0.456	126	Subunit 2	Sand-like		0.131			
47.900	91.149	0.634	126	Subunit 2	Sand-like		0.131			
48.064	91.762	0.849	131	Subunit 3	Sand-like		0.131			
48.228	87.743	0.963	131	Subunit 3	Sand-like		0.131			
48.392	88.523	0.975	131	Subunit 3	Sand-like		0.131			
48.556	104.838	0.976	131	Subunit 3	Sand-like		0.131			
48.720	117.594	0.976	131	Subunit 3	Sand-like		0.130			
48.884	122.183	1.089	131	Subunit 3	Sand-like		0.130			
49.048	122.183	1.106	131	Subunit 3	Sand-like		0.130			
49.212	120.454	1.128	131	Subunit 3	Sand-like		0.129			
49.376	113.936	1.054	131	Subunit 3	Sand-like		0.129			
49.540	107.154	0.947	131	Subunit 3	Sand-like		0.128			
49.704	99.304	0.912	131	Subunit 3	Sand-like		0.128			
49.868	93.535	0.881	131	Subunit 3	Sand-like		0.127			
50.032	85.169	0.832	131	Subunit 3	Sand-like		0.127			
50.196	74.053	0.691	131	Subunit 3	Sand-like		0.127			
50.360	70.862	0.736	131	Subunit 3	Sand-like		0.126			
50.524	82.607	2.259	131	Subunit 3	Sand-like		0.126			
50.688	100.815	0.010	131	Subunit 3	Sand-like		0.126			
50.852	332.748	0.010	131	Subunit 3	Sand-like		0.126			

LIQUEFACTION POTENTIAL ASSESSMENT FOR COARSE GRAINED SOILS USING CONE PENETRATION TEST DATA

Facility: KIF TDEC Stability
Project No.: 175668043
CPT ID: CPT-02D

Water Elevation during CPT:	753.0	ft
Depth to Water during CPT:	2.0	ft *(relative to ground surface during CPT)*
Water Elevation during Earthquake:	749.1	ft
Depth to Water during Earthquake:	5.9	ft *(relative to ground surface during CPT)*
Final Grade Elevation during EQ:	755.3	ft *(if no fill, then set this equal to top of CPT hole elev.)*
Height of Final Grade above CPT TOH:	0.3	ft *(relative to ground surface during CPT, + Fill, - Cut)*
Unit Weight of Cut/Fill to Achieve Final Grade	120	pcf
Cut/Fill Total Stress (+ Fill, - Cut):	0.02	tsf

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v}'_{CPT}$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v}'_{EQ}$ (tsf)
755.0				Vertical Stresses above 1st CPT:			**0.01**	**0.03**	**0.00**	**0.00**	**0.01**	**0.03**
754.8	0.164	7.71	0.22	120	**0.16**	0.08	0.01	0.03	0.00	0.00	0.01	0.03
754.7	0.328	103.42	0.64	120	0.25	0.16	0.02	0.04	0.00	0.00	0.02	0.04
754.5	0.492	90.74	0.93	120	0.41	0.16	0.03	0.05	0.00	0.00	0.03	0.05
754.3	0.656	135.22	1.44	120	0.57	0.16	0.04	0.06	0.00	0.00	0.04	0.06
754.2	0.820	215.94	1.54	120	0.74	0.16	0.05	0.07	0.00	0.00	0.05	0.07
754.0	0.984	278.50	1.64	120	0.90	0.16	0.06	0.08	0.00	0.00	0.06	0.08
753.9	1.148	305.51	1.35	120	1.07	0.16	0.07	0.09	0.00	0.00	0.07	0.09
753.7	1.312	366.81	1.94	120	1.23	0.16	0.08	0.10	0.00	0.00	0.08	0.10
753.5	1.476	391.65	2.40	120	1.39	0.16	0.09	0.11	0.00	0.00	0.09	0.11
753.4	1.640	300.89	2.66	119	1.56	0.16	0.10	0.12	0.00	0.00	0.10	0.12
753.2	1.804	303.00	2.54	119	1.72	0.16	0.11	0.13	0.00	0.00	0.11	0.13
753.0	1.968	306.47	2.16	119	1.89	0.16	0.12	0.14	0.00	0.00	0.12	0.14
752.9	2.133	284.78	1.82	119	2.05	0.16	0.13	0.15	0.00	0.00	0.12	0.15
752.7	2.297	223.35	1.56	119	2.21	0.16	0.14	0.16	0.01	0.00	0.13	0.16
752.5	2.461	166.67	1.47	119	2.38	0.16	0.15	0.17	0.01	0.00	0.13	0.17
752.4	2.625	102.42	1.44	119	2.54	0.16	0.16	0.17	0.02	0.00	0.14	0.17
752.2	2.789	54.95	1.46	119	2.71	0.16	0.17	0.18	0.02	0.00	0.14	0.18
752.0	2.953	37.95	1.42	119	2.87	0.16	0.18	0.19	0.03	0.00	0.15	0.19
751.9	3.117	27.94	1.08	119	3.03	0.16	0.19	0.20	0.03	0.00	0.15	0.20
751.7	3.281	28.02	1.15	119	3.20	0.16	0.20	0.21	0.04	0.00	0.16	0.21
751.6	3.445	40.15	1.25	119	3.36	0.16	0.21	0.22	0.05	0.00	0.16	0.22
751.4	3.609	30.46	1.34	128	3.53	0.16	0.22	0.23	0.05	0.00	0.17	0.23
751.2	3.773	24.84	1.39	128	3.69	0.16	0.23	0.24	0.06	0.00	0.17	0.24
751.1	3.937	21.81	1.27	128	3.85	0.16	0.24	0.25	0.06	0.00	0.18	0.25
750.9	4.101	18.85	1.09	128	4.02	0.16	0.25	0.27	0.07	0.00	0.18	0.27
750.7	4.265	21.43	1.04	128	4.18	0.16	0.26	0.28	0.07	0.00	0.19	0.28
750.6	4.429	21.49	1.22	128	4.35	0.16	0.27	0.29	0.08	0.00	0.19	0.29
750.4	4.593	161.28	1.68	128	4.51	0.16	0.28	0.30	0.08	0.00	0.20	0.30
750.2	4.757	243.59	1.67	128	4.68	0.16	0.29	0.31	0.09	0.00	0.20	0.31
750.1	4.921	239.29	1.22	128	4.84	0.16	0.30	0.32	0.09	0.00	0.21	0.32
749.9	5.085	229.47	1.23	128	5.00	0.16	0.31	0.33	0.10	0.00	0.21	0.33
749.8	5.249	169.19	1.31	128	5.17	0.16	0.32	0.34	0.10	0.00	0.22	0.34
749.6	5.413	82.37	1.67	128	5.33	0.16	0.33	0.35	0.11	0.00	0.22	0.35
749.4	5.577	59.82	1.74	128	5.50	0.16	0.34	0.36	0.11	0.00	0.23	0.36
749.3	5.741	39.07	1.98	128	5.66	0.16	0.35	0.37	0.12	0.00	0.24	0.37
749.1	5.905	39.18	2.13	128	5.82	0.16	0.36	0.38	0.12	0.00	0.24	0.38
748.9	6.069	40.06	2.17	128	5.99	0.16	0.37	0.39	0.13	0.01	0.25	0.39
748.8	6.234	43.70	2.13	128	6.15	0.16	0.38	0.40	0.13	0.01	0.25	0.39
748.6	6.398	50.91	1.84	128	6.32	0.16	0.39	0.41	0.14	0.02	0.26	0.40
748.4	6.562	50.45	2.26	128	6.48	0.16	0.40	0.42	0.14	0.02	0.26	0.40
748.3	6.726	48.33	2.54	128	6.64	0.16	0.42	0.43	0.15	0.03	0.27	0.41
748.1	6.890	56.05	2.82	128	6.81	0.16	0.43	0.44	0.15	0.03	0.27	0.41
747.9	7.054	53.78	2.88	128	6.97	0.16	0.44	0.45	0.16	0.04	0.28	0.42
747.8	7.218	50.31	2.38	128	7.14	0.16	0.45	0.46	0.16	0.04	0.28	0.42
747.6	7.382	58.59	2.43	128	7.30	0.16	0.46	0.48	0.17	0.05	0.29	0.43
747.5	7.546	47.59	1.97	128	7.46	0.16	0.47	0.49	0.17	0.05	0.29	0.43
747.3	7.710	37.71	1.91	128	7.63	0.16	0.48	0.50	0.18	0.06	0.30	0.44
747.1	7.874	36.01	1.61	128	7.79	0.16	0.49	0.51	0.18	0.06	0.31	0.45
747.0	8.038	32.76	1.49	128	7.96	0.16	0.50	0.52	0.19	0.07	0.31	0.45
746.8	8.202	31.03	1.45	128	8.12	0.16	0.51	0.53	0.19	0.07	0.32	0.46
746.6	8.366	30.22	1.51	128	8.28	0.16	0.52	0.54	0.20	0.08	0.32	0.46
746.5	8.530	32.22	1.58	128	8.45	0.16	0.53	0.55	0.20	0.08	0.33	0.47
746.3	8.694	30.45	1.62	128	8.61	0.16	0.54	0.56	0.21	0.09	0.33	0.47
746.1	8.858	47.26	1.89	128	8.78	0.16	0.55	0.57	0.21	0.09	0.34	0.48
746.0	9.022	63.80	2.26	128	8.94	0.16	0.56	0.58	0.22	0.10	0.34	0.48
745.8	9.186	72.74	3.12	128	9.10	0.16	0.57	0.59	0.22	0.10	0.35	0.49
745.6	9.350	76.17	2.38	128	9.27	0.16	0.58	0.60	0.23	0.11	0.35	0.49
745.5	9.514	88.29	2.71	128	9.43	0.16	0.59	0.61	0.23	0.11	0.36	0.50

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
745.3	9.678	113.31	2.17	128	9.60	0.16	0.60	0.62	0.24	0.12	0.36	0.50
745.2	9.842	75.28	2.28	128	9.76	0.16	0.61	0.63	0.24	0.12	0.37	0.51
745.0	10.006	61.86	1.74	128	9.92	0.16	0.63	0.64	0.25	0.13	0.38	0.52
744.8	10.170	73.41	2.19	128	10.09	0.16	0.64	0.65	0.25	0.13	0.38	0.52
744.7	10.335	113.51	2.48	128	10.25	0.16	0.65	0.66	0.26	0.14	0.39	0.53
744.5	10.499	106.96	3.08	128	10.42	0.16	0.66	0.67	0.27	0.14	0.39	0.53
744.3	10.663	88.41	3.15	128	10.58	0.16	0.67	0.69	0.27	0.15	0.40	0.54
744.2	10.827	108.16	4.03	128	10.74	0.16	0.68	0.70	0.28	0.15	0.40	0.54
744.0	10.991	135.06	4.38	128	10.91	0.16	0.69	0.71	0.28	0.16	0.41	0.55
743.8	11.155	178.15	3.14	128	11.07	0.16	0.70	0.72	0.29	0.16	0.41	0.55
743.7	11.319	128.38	3.78	128	11.24	0.16	0.71	0.73	0.29	0.17	0.42	0.56
743.5	11.483	135.02	3.61	128	11.40	0.16	0.72	0.74	0.30	0.17	0.42	0.56
743.4	11.647	82.49	3.24	128	11.56	0.16	0.73	0.75	0.30	0.18	0.43	0.57
743.2	11.811	63.83	2.86	128	11.73	0.16	0.74	0.76	0.31	0.18	0.43	0.57
743.0	11.975	53.08	2.68	128	11.89	0.16	0.75	0.77	0.31	0.19	0.44	0.58
742.9	12.139	58.35	2.53	128	12.06	0.16	0.76	0.78	0.32	0.19	0.45	0.59
742.7	12.303	61.46	2.39	128	12.22	0.16	0.77	0.79	0.32	0.20	0.45	0.59
742.5	12.467	65.85	2.63	128	12.39	0.16	0.78	0.80	0.33	0.20	0.46	0.60
742.4	12.631	140.71	2.79	128	12.55	0.16	0.79	0.81	0.33	0.21	0.46	0.60
742.2	12.795	175.44	2.49	128	12.71	0.16	0.80	0.82	0.34	0.22	0.47	0.61
742.0	12.959	171.50	1.92	128	12.88	0.16	0.81	0.83	0.34	0.22	0.47	0.61
741.9	13.123	117.30	2.05	128	13.04	0.16	0.82	0.84	0.35	0.23	0.48	0.62
741.7	13.287	69.21	2.23	128	13.21	0.16	0.84	0.85	0.35	0.23	0.48	0.62
741.5	13.451	59.82	2.57	128	13.37	0.16	0.85	0.86	0.36	0.24	0.49	0.63
741.4	13.615	52.12	2.70	128	13.53	0.16	0.86	0.87	0.36	0.24	0.49	0.63
741.2	13.779	40.53	2.52	128	13.70	0.16	0.87	0.88	0.37	0.25	0.50	0.64
741.1	13.943	41.82	2.37	128	13.86	0.16	0.88	0.90	0.37	0.25	0.50	0.64
740.9	14.107	45.09	2.34	128	14.03	0.16	0.89	0.91	0.38	0.26	0.51	0.65
740.7	14.271	45.89	2.34	128	14.19	0.16	0.90	0.92	0.38	0.26	0.52	0.66
740.6	14.436	30.08	2.01	128	14.35	0.16	0.91	0.93	0.39	0.27	0.52	0.66
740.4	14.600	28.50	1.95	128	14.52	0.16	0.92	0.94	0.39	0.27	0.53	0.67
740.2	14.764	26.46	1.80	128	14.68	0.16	0.93	0.95	0.40	0.28	0.53	0.67
740.1	14.928	26.40	1.74	128	14.85	0.16	0.94	0.96	0.40	0.28	0.54	0.68
739.9	15.092	26.08	1.67	128	15.01	0.16	0.95	0.97	0.41	0.29	0.54	0.68
739.7	15.256	26.55	1.66	128	15.17	0.16	0.96	0.98	0.41	0.29	0.55	0.69
739.6	15.420	26.04	1.60	128	15.34	0.16	0.97	0.99	0.42	0.30	0.55	0.69
739.4	15.584	25.08	1.52	128	15.50	0.16	0.98	1.00	0.42	0.30	0.56	0.70
739.3	15.748	25.89	1.46	128	15.67	0.16	0.99	1.01	0.43	0.31	0.56	0.70
739.1	15.912	24.71	1.42	128	15.83	0.16	1.00	1.02	0.43	0.31	0.57	0.71
738.9	16.076	25.98	1.03	128	15.99	0.16	1.01	1.03	0.44	0.32	0.57	0.71
738.8	16.240	29.84	0.55	128	16.16	0.16	1.02	1.04	0.44	0.32	0.58	0.72
738.6	16.404	94.62	0.67	128	16.32	0.16	1.03	1.05	0.45	0.33	0.59	0.73
738.4	16.568	81.43	1.71	128	16.49	0.16	1.05	1.06	0.45	0.33	0.59	0.73
738.3	16.732	49.20	2.10	128	16.65	0.16	1.06	1.07	0.46	0.34	0.60	0.74
738.1	16.896	17.95	2.27	128	16.81	0.16	1.07	1.08	0.46	0.34	0.60	0.74
737.9	17.060	16.86	0.99	128	16.98	0.16	1.08	1.09	0.47	0.35	0.61	0.75
737.8	17.224	14.47	0.90	128	17.14	0.16	1.09	1.11	0.47	0.35	0.61	0.75
737.6	17.388	16.18	0.94	128	17.31	0.16	1.10	1.12	0.48	0.36	0.62	0.76
737.4	17.552	19.44	0.98	128	17.47	0.16	1.11	1.13	0.49	0.36	0.62	0.76
737.3	17.716	25.20	1.11	128	17.63	0.16	1.12	1.14	0.49	0.37	0.63	0.77
737.1	17.880	19.34	1.18	128	17.80	0.16	1.13	1.15	0.50	0.37	0.63	0.77
737.0	18.044	17.99	1.16	128	17.96	0.16	1.14	1.16	0.50	0.38	0.64	0.78
736.8	18.208	22.32	1.16	128	18.13	0.16	1.15	1.17	0.51	0.38	0.64	0.78
736.6	18.372	31.45	1.28	128	18.29	0.16	1.16	1.18	0.51	0.39	0.65	0.79
736.5	18.537	25.35	1.43	128	18.45	0.16	1.17	1.19	0.52	0.39	0.66	0.79
736.3	18.701	27.63	1.41	128	18.62	0.16	1.18	1.20	0.52	0.40	0.66	0.80
736.1	18.865	26.09	1.48	128	18.78	0.16	1.19	1.21	0.53	0.40	0.67	0.81
736.0	19.029	35.10	1.58	128	18.95	0.16	1.20	1.22	0.53	0.41	0.67	0.81
735.8	19.193	38.06	1.67	128	19.11	0.16	1.21	1.23	0.54	0.41	0.68	0.82
735.6	19.357	29.04	1.75	128	19.27	0.16	1.22	1.24	0.54	0.42	0.68	0.82
735.5	19.521	21.13	0.75	128	19.44	0.16	1.23	1.25	0.55	0.42	0.69	0.83
735.3	19.685	12.36	0.69	128	19.60	0.16	1.24	1.26	0.55	0.43	0.69	0.83
735.2	19.849	8.64	0.52	128	19.77	0.16	1.26	1.27	0.56	0.44	0.70	0.84
735.0	20.013	9.64	0.55	128	19.93	0.16	1.27	1.28	0.56	0.44	0.70	0.84
734.8	20.177	12.77	0.63	128	20.09	0.16	1.28	1.29	0.57	0.45	0.71	0.85
734.7	20.341	13.77	0.61	128	20.26	0.16	1.29	1.30	0.57	0.45	0.71	0.85
734.5	20.505	13.02	0.62	128	20.42	0.16	1.30	1.32	0.58	0.46	0.72	0.86
734.3	20.669	10.90	0.58	128	20.59	0.16	1.31	1.33	0.58	0.46	0.73	0.86
734.2	20.833	17.48	0.61	128	20.75	0.16	1.32	1.34	0.59	0.47	0.73	0.87

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
734.0	20.997	17.53	0.56	128	20.92	0.16	1.33	1.35	0.59	0.47	0.74	0.88
733.8	21.161	17.15	0.53	128	21.08	0.16	1.34	1.36	0.60	0.48	0.74	0.88
733.7	21.325	17.97	0.36	128	21.24	0.16	1.35	1.37	0.60	0.48	0.75	0.89
733.5	21.489	16.09	0.37	128	21.41	0.16	1.36	1.38	0.61	0.49	0.75	0.89
733.3	21.653	8.07	0.38	128	21.57	0.16	1.37	1.39	0.61	0.49	0.76	0.90
733.2	21.817	5.86	0.30	128	21.74	0.16	1.38	1.40	0.62	0.50	0.76	0.90
733.0	21.981	14.13	0.36	128	21.90	0.16	1.39	1.41	0.62	0.50	0.77	0.91
732.9	22.145	19.91	0.58	128	22.06	0.16	1.40	1.42	0.63	0.51	0.77	0.91
732.7	22.309	13.69	0.59	128	22.23	0.16	1.41	1.43	0.63	0.51	0.78	0.92
732.5	22.473	15.92	0.62	128	22.39	0.16	1.42	1.44	0.64	0.52	0.78	0.92
732.4	22.638	13.14	0.48	128	22.56	0.16	1.43	1.45	0.64	0.52	0.79	0.93
732.2	22.802	14.59	0.29	128	22.72	0.16	1.44	1.46	0.65	0.53	0.80	0.93
732.0	22.966	10.22	0.36	128	22.88	0.16	1.45	1.47	0.65	0.53	0.80	0.94
731.9	23.130	8.25	0.38	128	23.05	0.16	1.47	1.48	0.66	0.54	0.81	0.95
731.7	23.294	7.07	0.29	128	23.21	0.16	1.48	1.49	0.66	0.54	0.81	0.95
731.5	23.458	6.91	0.31	128	23.38	0.16	1.49	1.50	0.67	0.55	0.82	0.96
731.4	23.622	9.44	0.31	128	23.54	0.16	1.50	1.51	0.67	0.55	0.82	0.96
731.2	23.786	11.08	0.42	128	23.70	0.16	1.51	1.53	0.68	0.56	0.83	0.97
731.1	23.950	9.07	0.43	128	23.87	0.16	1.52	1.54	0.68	0.56	0.83	0.97
730.9	24.114	18.58	0.42	128	24.03	0.16	1.53	1.55	0.69	0.57	0.84	0.98
730.7	24.278	22.80	0.60	128	24.20	0.16	1.54	1.56	0.70	0.57	0.84	0.98
730.6	24.442	16.05	0.58	128	24.36	0.16	1.55	1.57	0.70	0.58	0.85	0.99
730.4	24.606	10.45	0.36	128	24.52	0.16	1.56	1.58	0.71	0.58	0.85	0.99
730.2	24.770	9.06	0.36	128	24.69	0.16	1.57	1.59	0.71	0.59	0.86	1.00
730.1	24.934	5.93	0.36	128	24.85	0.16	1.58	1.60	0.72	0.59	0.87	1.00
729.9	25.098	7.69	0.34	128	25.02	0.16	1.59	1.61	0.72	0.60	0.87	1.01
729.7	25.262	7.69	0.34	128	25.18	0.16	1.60	1.62	0.73	0.60	0.88	1.02
729.6	25.426	8.63	0.32	128	25.34	0.16	1.61	1.63	0.73	0.61	0.88	1.02
729.4	25.590	7.17	0.28	128	25.51	0.16	1.62	1.64	0.74	0.61	0.89	1.03
729.2	25.754	7.69	0.29	128	25.67	0.16	1.63	1.65	0.74	0.62	0.89	1.03
729.1	25.918	6.79	0.30	128	25.84	0.16	1.64	1.66	0.75	0.62	0.90	1.04
728.9	26.082	7.45	0.22	128	26.00	0.16	1.65	1.67	0.75	0.63	0.90	1.04
728.8	26.246	7.00	0.27	128	26.16	0.16	1.66	1.68	0.76	0.63	0.91	1.05
728.6	26.410	8.60	0.30	128	26.33	0.16	1.68	1.69	0.76	0.64	0.91	1.05
728.4	26.574	7.33	0.31	128	26.49	0.16	1.69	1.70	0.77	0.65	0.92	1.06
728.3	26.739	7.16	0.26	128	26.66	0.16	1.70	1.71	0.77	0.65	0.92	1.06
728.1	26.903	7.36	0.27	128	26.82	0.16	1.71	1.72	0.78	0.66	0.93	1.07
727.9	27.067	7.53	0.22	128	26.98	0.16	1.72	1.74	0.78	0.66	0.94	1.07
727.8	27.231	8.60	0.24	128	27.15	0.16	1.73	1.75	0.79	0.67	0.94	1.08
727.6	27.395	7.59	0.38	128	27.31	0.16	1.74	1.76	0.79	0.67	0.95	1.09
727.4	27.559	9.80	0.32	128	27.48	0.16	1.75	1.77	0.80	0.68	0.95	1.09
727.3	27.723	11.94	0.37	128	27.64	0.16	1.76	1.78	0.80	0.68	0.96	1.10
727.1	27.887	11.94	0.50	128	27.80	0.16	1.77	1.79	0.81	0.69	0.96	1.10
726.9	28.051	9.77	0.44	128	27.97	0.16	1.78	1.80	0.81	0.69	0.97	1.11
726.8	28.215	15.39	0.45	128	28.13	0.16	1.79	1.81	0.82	0.70	0.97	1.11
726.6	28.379	14.10	0.48	128	28.30	0.16	1.80	1.82	0.82	0.70	0.98	1.12
726.5	28.543	11.54	0.50	128	28.46	0.16	1.81	1.83	0.83	0.71	0.98	1.12
726.3	28.707	10.38	0.41	128	28.62	0.16	1.82	1.84	0.83	0.71	0.99	1.13
726.1	28.871	9.92	0.34	128	28.79	0.16	1.83	1.85	0.84	0.72	0.99	1.13
726.0	29.035	9.66	0.32	128	28.95	0.16	1.84	1.86	0.84	0.72	1.00	1.14
725.8	29.199	8.07	0.27	128	29.12	0.16	1.85	1.87	0.85	0.73	1.01	1.14
725.6	29.363	7.04	0.15	128	29.28	0.16	1.86	1.88	0.85	0.73	1.01	1.15
725.5	29.527	6.28	0.27	128	29.45	0.16	1.87	1.89	0.86	0.74	1.02	1.16
725.3	29.691	7.51	0.37	128	29.61	0.16	1.89	1.90	0.86	0.74	1.02	1.16
725.1	29.855	10.72	0.36	128	29.77	0.16	1.90	1.91	0.87	0.75	1.03	1.17
725.0	30.019	11.45	0.38	127	29.94	0.16	1.91	1.92	0.87	0.75	1.03	1.17
724.8	30.183	7.57	0.37	127	30.10	0.16	1.92	1.93	0.88	0.76	1.04	1.18
724.7	30.347	13.74	0.51	127	30.27	0.16	1.93	1.94	0.88	0.76	1.04	1.18
724.5	30.511	19.11	0.72	127	30.43	0.16	1.94	1.96	0.89	0.77	1.05	1.19
724.3	30.675	34.50	0.68	127	30.59	0.16	1.95	1.97	0.89	0.77	1.05	1.19
724.2	30.840	14.36	0.82	127	30.76	0.16	1.96	1.98	0.90	0.78	1.06	1.20
724.0	31.004	10.94	0.55	127	30.92	0.16	1.97	1.99	0.90	0.78	1.06	1.20
723.8	31.168	15.40	0.54	127	31.09	0.16	1.98	2.00	0.91	0.79	1.07	1.21
723.7	31.332	13.10	0.59	127	31.25	0.16	1.99	2.01	0.92	0.79	1.07	1.21
723.5	31.496	10.34	0.56	127	31.41	0.16	2.00	2.02	0.92	0.80	1.08	1.22
723.3	31.660	10.03	0.50	127	31.58	0.16	2.01	2.03	0.93	0.80	1.08	1.22
723.2	31.824	10.36	0.37	127	31.74	0.16	2.02	2.04	0.93	0.81	1.09	1.23
723.0	31.988	10.58	0.31	127	31.91	0.16	2.03	2.05	0.94	0.81	1.10	1.24
722.8	32.152	11.89	0.31	127	32.07	0.16	2.04	2.06	0.94	0.82	1.10	1.24

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
722.7	32.316	10.13	0.28	127	32.23	0.16	2.05	2.07	0.95	0.82	1.11	1.25
722.5	32.480	8.38	0.26	127	32.40	0.16	2.06	2.08	0.95	0.83	1.11	1.25
722.4	32.644	7.75	0.20	127	32.56	0.16	2.07	2.09	0.96	0.83	1.12	1.26
722.2	32.808	8.21	0.18	127	32.73	0.16	2.08	2.10	0.96	0.84	1.12	1.26
722.0	32.972	9.34	0.14	127	32.89	0.16	2.09	2.11	0.97	0.84	1.13	1.27
721.9	33.136	8.09	0.14	127	33.05	0.16	2.10	2.12	0.97	0.85	1.13	1.27
721.7	33.300	7.66	0.13	127	33.22	0.16	2.11	2.13	0.98	0.85	1.14	1.28
721.5	33.464	7.60	0.16	127	33.38	0.16	2.12	2.14	0.98	0.86	1.14	1.28
721.4	33.628	7.58	0.23	127	33.55	0.16	2.14	2.15	0.99	0.87	1.15	1.29
721.2	33.792	7.26	0.23	127	33.71	0.16	2.15	2.16	0.99	0.87	1.15	1.29
721.0	33.956	7.43	0.23	127	33.87	0.16	2.16	2.17	1.00	0.88	1.16	1.30
720.9	34.120	7.14	0.26	127	34.04	0.16	2.17	2.18	1.00	0.88	1.16	1.30
720.7	34.284	7.40	0.20	127	34.20	0.16	2.18	2.19	1.01	0.89	1.17	1.31
720.6	34.448	7.83	0.19	127	34.37	0.16	2.19	2.21	1.01	0.89	1.17	1.31
720.4	34.612	7.38	0.17	127	34.53	0.16	2.20	2.22	1.02	0.90	1.18	1.32
720.2	34.776	6.58	0.19	127	34.69	0.16	2.21	2.23	1.02	0.90	1.19	1.33
720.1	34.941	6.52	0.19	127	34.86	0.16	2.22	2.24	1.03	0.91	1.19	1.33
719.9	35.105	7.84	0.22	127	35.02	0.16	2.23	2.25	1.03	0.91	1.20	1.34
719.7	35.269	9.12	0.33	127	35.19	0.16	2.24	2.26	1.04	0.92	1.20	1.34
719.6	35.433	18.09	0.50	127	35.35	0.16	2.25	2.27	1.04	0.92	1.21	1.35
719.4	35.597	26.41	0.98	127	35.51	0.16	2.26	2.28	1.05	0.93	1.21	1.35
719.2	35.761	29.26	1.32	127	35.68	0.16	2.27	2.29	1.05	0.93	1.22	1.36
719.1	35.925	28.76	1.05	127	35.84	0.16	2.28	2.30	1.06	0.94	1.22	1.36
718.9	36.089	27.55	1.21	127	36.01	0.16	2.29	2.31	1.06	0.94	1.23	1.37
718.7	36.253	27.40	1.19	127	36.17	0.16	2.30	2.32	1.07	0.95	1.23	1.37
718.6	36.417	24.48	1.13	127	36.33	0.16	2.31	2.33	1.07	0.95	1.24	1.38
718.4	36.581	23.57	0.88	127	36.50	0.16	2.32	2.34	1.08	0.96	1.24	1.38
718.3	36.745	24.12	0.90	127	36.66	0.16	2.33	2.35	1.08	0.96	1.25	1.39
718.1	36.909	21.79	0.77	127	36.83	0.16	2.34	2.36	1.09	0.97	1.25	1.39
717.9	37.073	19.48	0.68	127	36.99	0.16	2.35	2.37	1.09	0.97	1.26	1.40
717.8	37.237	21.33	0.64	127	37.16	0.16	2.36	2.38	1.10	0.98	1.27	1.40
717.6	37.401	21.64	0.56	127	37.32	0.16	2.37	2.39	1.10	0.98	1.27	1.41
717.4	37.565	20.65	0.60	127	37.48	0.16	2.39	2.40	1.11	0.99	1.28	1.42
717.3	37.729	21.60	0.55	127	37.65	0.16	2.40	2.41	1.11	0.99	1.28	1.42
717.1	37.893	20.06	0.53	127	37.81	0.16	2.41	2.42	1.12	1.00	1.29	1.43
716.9	38.057	19.55	0.50	127	37.98	0.16	2.42	2.43	1.12	1.00	1.29	1.43
716.8	38.221	20.69	0.44	127	38.14	0.16	2.43	2.44	1.13	1.01	1.30	1.44
716.6	38.385	22.25	0.44	127	38.30	0.16	2.44	2.46	1.14	1.01	1.30	1.44
716.5	38.549	22.55	0.50	127	38.47	0.16	2.45	2.47	1.14	1.02	1.31	1.45
716.3	38.713	23.17	0.47	127	38.63	0.16	2.46	2.48	1.15	1.02	1.31	1.45
716.1	38.877	21.46	0.45	127	38.80	0.16	2.47	2.49	1.15	1.03	1.32	1.46
716.0	39.042	22.03	0.45	126	38.96	0.16	2.48	2.50	1.16	1.03	1.32	1.46
715.8	39.206	22.44	0.45	126	39.12	0.16	2.49	2.51	1.16	1.04	1.33	1.47
715.6	39.370	23.12	0.58	126	39.29	0.16	2.50	2.52	1.17	1.04	1.33	1.47
715.5	39.534	25.53	0.64	126	39.45	0.16	2.51	2.53	1.17	1.05	1.34	1.48
715.3	39.698	24.44	0.73	126	39.62	0.16	2.52	2.54	1.18	1.05	1.34	1.48
715.1	39.862	25.65	0.75	126	39.78	0.16	2.53	2.55	1.18	1.06	1.35	1.49
715.0	40.026	23.33	0.72	126	39.94	0.16	2.54	2.56	1.19	1.06	1.35	1.49
714.8	40.190	21.20	0.69	126	40.11	0.16	2.55	2.57	1.19	1.07	1.36	1.50
714.6	40.354	20.93	0.57	126	40.27	0.16	2.56	2.58	1.20	1.07	1.37	1.50
714.5	40.518	20.49	0.53	126	40.44	0.16	2.57	2.59	1.20	1.08	1.37	1.51
714.3	40.682	19.34	0.56	126	40.60	0.16	2.58	2.60	1.21	1.09	1.38	1.52
714.2	40.846	19.25	0.56	126	40.76	0.16	2.59	2.61	1.21	1.09	1.38	1.52
714.0	41.010	20.06	0.49	126	40.93	0.16	2.60	2.62	1.22	1.10	1.39	1.53
713.8	41.174	20.61	0.49	126	41.09	0.16	2.61	2.63	1.22	1.10	1.39	1.53
713.7	41.338	19.36	0.52	126	41.26	0.16	2.62	2.64	1.23	1.11	1.40	1.54
713.5	41.502	19.02	0.50	126	41.42	0.16	2.63	2.65	1.23	1.11	1.40	1.54
713.3	41.666	18.59	0.49	126	41.58	0.16	2.64	2.66	1.24	1.12	1.41	1.55
713.2	41.830	18.33	0.44	126	41.75	0.16	2.65	2.67	1.24	1.12	1.41	1.55
713.0	41.994	20.01	0.47	126	41.91	0.16	2.66	2.68	1.25	1.13	1.42	1.56
712.8	42.158	22.95	0.44	126	42.08	0.16	2.68	2.69	1.25	1.13	1.42	1.56
712.7	42.322	23.25	0.48	126	42.24	0.16	2.69	2.70	1.26	1.14	1.43	1.57
712.5	42.486	23.85	0.45	126	42.40	0.16	2.70	2.71	1.26	1.14	1.43	1.57
712.3	42.650	23.52	0.49	126	42.57	0.16	2.71	2.72	1.27	1.15	1.44	1.58
712.2	42.814	23.53	0.51	126	42.73	0.16	2.72	2.73	1.27	1.15	1.44	1.58
712.0	42.978	21.10	0.66	126	42.90	0.16	2.73	2.75	1.28	1.16	1.45	1.59
711.9	43.143	19.65	0.76	126	43.06	0.16	2.74	2.76	1.28	1.16	1.45	1.59
711.7	43.307	20.74	0.81	126	43.22	0.16	2.75	2.77	1.29	1.17	1.46	1.60
711.5	43.471	15.77	0.74	126	43.39	0.16	2.76	2.78	1.29	1.17	1.46	1.60

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
711.4	43.635	11.25	0.51	126	43.55	0.16	2.77	2.79	1.30	1.18	1.47	1.61
711.2	43.799	9.66	0.28	126	43.72	0.16	2.78	2.80	1.30	1.18	1.47	1.61
711.0	43.963	8.69	0.22	126	43.88	0.16	2.79	2.81	1.31	1.19	1.48	1.62
710.9	44.127	7.96	0.19	126	44.04	0.16	2.80	2.82	1.31	1.19	1.48	1.62
710.7	44.291	7.87	0.18	126	44.21	0.16	2.81	2.83	1.32	1.20	1.49	1.63
710.5	44.455	7.79	0.17	126	44.37	0.16	2.82	2.84	1.32	1.20	1.50	1.64
710.4	44.619	7.71	0.16	126	44.54	0.16	2.83	2.85	1.33	1.21	1.50	1.64
710.2	44.783	7.58	0.15	126	44.70	0.16	2.84	2.86	1.33	1.21	1.51	1.65
710.1	44.947	7.43	0.14	126	44.86	0.16	2.85	2.87	1.34	1.22	1.51	1.65
709.9	45.111	7.33	0.13	126	45.03	0.16	2.86	2.88	1.35	1.22	1.52	1.66
709.7	45.275	7.42	0.13	126	45.19	0.16	2.87	2.89	1.35	1.23	1.52	1.66
709.6	45.439	7.41	0.13	126	45.36	0.16	2.88	2.90	1.36	1.23	1.53	1.67
709.4	45.603	7.53	0.14	126	45.52	0.16	2.89	2.91	1.36	1.24	1.53	1.67
709.2	45.767	8.18	0.22	126	45.69	0.16	2.90	2.92	1.37	1.24	1.54	1.68
709.1	45.931	9.58	0.37	126	45.85	0.16	2.91	2.93	1.37	1.25	1.54	1.68
708.9	46.095	18.42	0.35	126	46.01	0.16	2.92	2.94	1.38	1.25	1.55	1.69
708.7	46.259	19.12	0.37	126	46.18	0.16	2.93	2.95	1.38	1.26	1.55	1.69
708.6	46.423	18.15	0.31	126	46.34	0.16	2.94	2.96	1.39	1.26	1.56	1.70
708.4	46.587	24.92	0.24	126	46.51	0.16	2.95	2.97	1.39	1.27	1.56	1.70
708.2	46.751	37.66	0.13	126	46.67	0.16	2.96	2.98	1.40	1.27	1.57	1.71
708.1	46.915	42.54	0.13	126	46.83	0.16	2.98	2.99	1.40	1.28	1.57	1.71
707.9	47.079	44.87	0.20	126	47.00	0.16	2.99	3.00	1.41	1.28	1.58	1.72
707.8	47.244	46.44	0.27	126	47.16	0.16	3.00	3.01	1.41	1.29	1.58	1.72
707.6	47.408	48.77	0.47	126	47.33	0.16	3.01	3.02	1.42	1.30	1.59	1.73
707.4	47.572	49.48	0.46	126	47.49	0.16	3.02	3.03	1.42	1.30	1.59	1.73
707.3	47.736	73.19	0.46	126	47.65	0.16	3.03	3.04	1.43	1.31	1.60	1.74
707.1	47.900	91.15	0.63	126	47.82	0.16	3.04	3.06	1.43	1.31	1.60	1.74
706.9	48.064	91.76	0.85	131	47.98	0.16	3.05	3.07	1.44	1.32	1.61	1.75
706.8	48.228	87.74	0.96	131	48.15	0.16	3.06	3.08	1.44	1.32	1.62	1.76
706.6	48.392	88.52	0.98	131	48.31	0.16	3.07	3.09	1.45	1.33	1.62	1.76
706.4	48.556	104.84	0.98	131	48.47	0.16	3.08	3.10	1.45	1.33	1.63	1.77
706.3	48.720	117.59	0.98	131	48.64	0.16	3.09	3.11	1.46	1.34	1.63	1.77
706.1	48.884	122.18	1.09	131	48.80	0.16	3.10	3.12	1.46	1.34	1.64	1.78
706.0	49.048	122.18	1.11	131	48.97	0.16	3.11	3.13	1.47	1.35	1.64	1.78
705.8	49.212	120.45	1.13	131	49.13	0.16	3.12	3.14	1.47	1.35	1.65	1.79
705.6	49.376	113.94	1.05	131	49.29	0.16	3.13	3.15	1.48	1.36	1.66	1.80
705.5	49.540	107.15	0.95	131	49.46	0.16	3.14	3.16	1.48	1.36	1.66	1.80
705.3	49.704	99.30	0.91	131	49.62	0.16	3.16	3.17	1.49	1.37	1.67	1.81
705.1	49.868	93.54	0.88	131	49.79	0.16	3.17	3.18	1.49	1.37	1.67	1.81
705.0	50.032	85.17	0.83	131	49.95	0.16	3.18	3.19	1.50	1.38	1.68	1.82
704.8	50.196	74.05	0.69	131	50.11	0.16	3.19	3.21	1.50	1.38	1.68	1.82
704.6	50.360	70.86	0.74	131	50.28	0.16	3.20	3.22	1.51	1.39	1.69	1.83
704.5	50.524	82.61	2.26	131	50.44	0.16	3.21	3.23	1.51	1.39	1.69	1.83
704.3	50.688	100.81	0.01	131	50.61	0.16	3.22	3.24	1.52	1.40	1.70	1.84
704.1	50.852	332.75	0.01	131	50.77	0.08	3.23	3.25	1.52	1.40	1.71	1.85

LIQUEFACTION POTENTIAL ASSESSMENT FOR COARSE GRAINED SOILS USING CONE PENETRATION TEST DATA

Project Site: KIF TDEC Stability
Project No.: 175668043
CPT ID: CPT-02D

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
755.0												
754.8	0.164	75.47	2.80	2.31	0.5	1.70	12.39	47	48.36	60.75	0.002	-0.245
754.7	0.328	716.52	0.62	1.19	0.5	1.70	166.18	0	0.00	166.18	0.001	-0.600
754.5	0.492	513.22	1.03	1.45	0.5	1.70	145.80	0	0.00	145.80	0.000	-0.600
754.3	0.656	662.37	1.07	1.41	0.5	1.70	217.28	0	0.00	217.28	0.003	-0.600
754.2	0.820	946.13	0.71	1.18	0.5	1.70	346.97	0	0.00	346.97	0.005	-0.600
754.0	0.984	1113.93	0.59	1.08	0.5	1.70	447.49	0	0.00	447.49	0.008	-0.600
753.9	1.148	1131.33	0.44	0.96	0.5	1.70	490.90	0	0.00	490.90	0.011	-0.600
753.7	1.312	1270.59	0.53	1.01	0.5	1.70	589.39	0	0.00	589.39	0.014	-0.600
753.5	1.476	1279.05	0.61	1.07	0.5	1.70	629.31	0	0.00	629.31	0.017	-0.600
753.4	1.640	932.31	0.88	1.27	0.5	1.70	483.47	0	0.00	483.47	0.017	-0.600
753.2	1.804	895.45	0.84	1.26	0.5	1.70	486.86	0	0.00	486.86	0.016	-0.600
753.0	1.968	867.38	0.71	1.19	0.5	1.70	492.43	0	0.00	492.43	0.015	-0.600
752.9	2.133	787.40	0.64	1.18	0.5	1.70	457.59	0	0.00	457.59	0.014	-0.600
752.7	2.297	606.14	0.70	1.27	0.5	1.70	358.87	0	0.00	358.87	0.013	-0.600
752.5	2.461	444.22	0.88	1.43	0.5	1.70	267.80	0	0.00	267.80	0.013	-0.600
752.4	2.625	268.17	1.41	1.72	0.5	1.70	164.58	1	0.00	164.58	0.015	-0.600
752.2	2.789	141.29	2.67	2.11	0.5	1.70	88.30	32	55.41	143.71	0.016	-0.579
752.0	2.953	95.88	3.76	2.33	0.5	1.70	60.98	50	61.96	122.94	0.018	-0.507
751.9	3.117	69.34	3.90	2.44	0.5	1.70	44.89	58	60.68	105.57	0.019	-0.439
751.7	3.281	68.49	4.15	2.46	0.5	1.70	45.03	60	61.27	106.29	0.020	-0.441
751.6	3.445	96.87	3.13	2.27	0.5	1.70	64.51	44	60.31	124.81	0.021	-0.511
751.4	3.609	72.25	4.42	2.47	0.5	1.70	48.95	60	62.50	111.45	0.022	-0.460
751.2	3.773	83.30	5.65	2.51	0.7	1.70	39.91	64	60.85	100.76	0.023	-0.415
751.1	3.937	71.45	5.87	2.56	0.7	1.70	35.05	68	60.42	95.47	0.024	-0.392
750.9	4.101	60.33	5.85	2.61	0.7	1.70	30.29	72	59.75	90.05	0.025	-0.366
750.7	4.265	67.27	4.91	2.52	0.7	1.70	34.43	65	59.50	93.93	0.026	-0.383
750.6	4.429	66.09	5.75	2.58	0.7	1.70	34.52	69	60.51	95.03	0.027	-0.387
750.4	4.593	351.80	1.04	1.54	0.5	1.59	242.31	0	0.00	242.31	0.029	-0.600
750.2	4.757	524.54	0.69	1.30	0.5	1.54	355.26	0	0.00	355.26	0.030	-0.600
750.1	4.921	508.57	0.51	1.20	0.5	1.53	346.60	0	0.00	346.60	0.032	-0.600
749.9	5.085	481.49	0.53	1.23	0.5	1.52	330.17	0	0.00	330.17	0.035	-0.600
749.8	5.249	350.43	0.77	1.44	0.5	1.54	245.58	0	0.00	245.58	0.037	-0.600
749.6	5.413	168.20	2.03	1.97	0.5	1.70	132.36	21	42.99	175.35	0.039	-0.600
749.4	5.577	120.51	2.93	2.19	0.5	1.70	96.12	38	63.31	159.42	0.041	-0.600
749.3	5.741	77.55	5.12	2.49	0.5	1.70	62.78	63	67.05	129.83	0.042	-0.519
749.1	5.905	76.88	5.49	2.52	0.5	1.70	62.96	65	67.66	130.62	0.043	-0.521
748.9	6.069	77.73	5.46	2.52	0.5	1.70	64.37	64	67.96	132.33	0.044	-0.527
748.8	6.234	83.92	4.91	2.46	0.5	1.70	70.21	60	68.30	138.51	0.045	-0.547
748.6	6.398	96.85	3.64	2.32	0.5	1.70	81.81	48	66.90	148.71	0.046	-0.580
748.4	6.562	94.97	4.51	2.40	0.5	1.70	81.07	55	69.52	150.59	0.047	-0.586
748.3	6.726	89.99	5.30	2.47	0.5	1.70	77.65	60	70.55	148.21	0.048	-0.578
748.1	6.890	103.44	5.07	2.41	0.5	1.68	89.14	56	72.28	161.42	0.049	-0.600
747.9	7.054	98.25	5.39	2.45	0.5	1.68	85.54	59	72.30	157.84	0.051	-0.600
747.8	7.218	90.97	4.76	2.43	0.5	1.69	80.60	57	70.30	150.91	0.052	-0.586
747.6	7.382	105.04	4.18	2.34	0.5	1.65	91.13	50	70.35	161.48	0.053	-0.600
747.5	7.546	84.38	4.17	2.40	0.5	1.69	76.15	55	68.37	144.51	0.055	-0.565
747.3	7.710	66.07	5.13	2.54	0.5	1.70	60.60	66	67.38	127.97	0.056	-0.508
747.1	7.874	62.47	4.52	2.51	0.5	1.70	57.86	64	66.09	123.95	0.057	-0.494
747.0	8.038	56.24	4.62	2.55	0.5	1.70	52.63	67	65.31	117.95	0.058	-0.471
746.8	8.202	52.75	4.75	2.58	0.5	1.70	49.85	69	65.01	114.86	0.059	-0.459
746.6	8.366	64.60	5.09	2.54	0.7	1.70	48.56	66	63.99	112.56	0.059	-0.450
746.5	8.530	53.87	4.99	2.59	0.5	1.70	51.77	70	65.72	117.49	0.060	-0.469
746.3	8.694	63.56	5.41	2.57	0.7	1.70	48.92	68	64.53	113.46	0.061	-0.453
746.1	8.858	78.12	4.05	2.41	0.5	1.62	72.14	56	67.63	139.77	0.061	-0.547
746.0	9.022	104.94	3.57	2.29	0.5	1.54	92.95	46	68.55	161.50	0.062	-0.600
745.8	9.186	118.83	4.32	2.32	0.5	1.50	102.89	49	72.59	175.48	0.063	-0.600
745.6	9.350	123.50	3.15	2.20	0.5	1.49	107.31	39	67.18	174.49	0.064	-0.600
745.5	9.514	142.22	3.09	2.16	0.5	1.45	121.13	36	67.00	188.13	0.065	-0.600
745.3	9.678	181.43	1.92	1.93	0.5	1.44	154.13	17	36.35	190.48	0.066	-0.600
745.2	9.842	119.31	3.06	2.20	0.5	1.47	104.86	39	66.53	171.38	0.067	-0.600

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
745.0	10.006	97.15	2.84	2.24	0.5	1.51	88.30	42	64.59	152.89	0.068	-0.588
744.8	10.170	114.64	3.01	2.21	0.5	1.47	101.73	40	66.15	167.88	0.068	-0.600
744.7	10.335	176.54	2.20	1.98	0.5	1.40	149.78	22	48.54	198.32	0.069	-0.600
744.5	10.499	165.13	2.90	2.10	0.5	1.38	139.42	31	64.73	204.15	0.070	-0.600
744.3	10.663	135.37	3.59	2.22	0.5	1.40	117.19	41	70.92	188.12	0.070	-0.600
744.2	10.827	164.72	3.75	2.19	0.5	1.35	138.40	38	73.50	211.90	0.071	-0.600
744.0	10.991	204.58	3.26	2.08	0.5	1.31	167.31	30	68.84	236.15	0.071	-0.600
743.8	11.155	268.39	1.77	1.80	0.5	1.32	222.66	7	2.26	224.93	0.072	-0.600
743.7	11.319	191.86	2.96	2.07	0.5	1.32	159.90	28	64.72	224.62	0.072	-0.600
743.5	11.483	200.53	2.68	2.02	0.5	1.31	167.30	25	58.53	225.83	0.073	-0.600
743.4	11.647	121.32	3.96	2.29	0.5	1.38	107.59	46	72.11	179.71	0.073	-0.600
743.2	11.811	93.03	4.53	2.40	0.5	1.42	85.52	55	70.95	156.47	0.074	-0.596
743.0	11.975	76.69	5.11	2.50	0.5	1.44	72.27	63	69.80	142.07	0.074	-0.550
742.9	12.139	83.89	4.40	2.42	0.5	1.42	78.37	57	69.56	147.93	0.075	-0.569
742.7	12.303	87.87	3.94	2.37	0.5	1.41	81.82	53	68.93	150.75	0.075	-0.578
742.5	12.467	93.66	4.04	2.36	0.5	1.39	86.57	52	69.88	156.45	0.076	-0.595
742.4	12.631	200.22	1.99	1.92	0.5	1.30	173.27	16	34.36	207.63	0.076	-0.600
742.2	12.795	248.45	1.43	1.75	0.5	1.29	213.84	3	0.00	213.84	0.077	-0.600
742.0	12.959	241.45	1.13	1.67	0.5	1.29	209.28	0	0.00	209.28	0.077	-0.600
741.9	13.123	163.83	1.76	1.93	0.5	1.32	146.87	17	35.19	182.06	0.077	-0.600
741.7	13.287	95.63	3.26	2.29	0.5	1.36	88.98	46	67.33	156.30	0.078	-0.593
741.5	13.451	82.03	4.36	2.42	0.5	1.37	77.49	57	69.41	146.90	0.078	-0.564
741.4	13.615	70.92	5.27	2.53	0.5	1.38	68.06	65	69.30	137.35	0.078	-0.532
741.2	13.779	63.42	6.36	2.62	0.7	1.41	53.90	73	66.88	120.78	0.079	-0.473
741.1	13.943	64.97	5.79	2.58	0.7	1.40	55.26	70	66.66	121.92	0.080	-0.477
740.9	14.107	60.17	5.30	2.58	0.5	1.38	58.92	69	67.59	126.51	0.080	-0.494
740.7	14.271	60.93	5.20	2.57	0.5	1.37	59.63	68	67.62	127.24	0.081	-0.496
740.6	14.436	56.01	6.89	2.68	1.0	1.41	40.21	78	63.70	103.91	0.081	-0.407
740.4	14.600	52.42	7.06	2.71	1.0	1.41	38.05	80	63.38	101.43	0.082	-0.396
740.2	14.764	48.03	7.07	2.73	1.0	1.41	35.33	82	62.85	98.18	0.083	-0.382
740.1	14.928	47.42	6.82	2.73	1.0	1.41	35.09	81	62.69	97.78	0.083	-0.380
739.9	15.092	46.34	6.66	2.73	1.0	1.40	34.53	81	62.51	97.04	0.084	-0.377
739.7	15.256	46.72	6.47	2.71	1.0	1.39	34.96	80	62.50	97.46	0.085	-0.378
739.6	15.420	45.33	6.37	2.72	1.0	1.39	34.17	80	62.31	96.47	0.085	-0.374
739.4	15.584	43.14	6.33	2.73	1.0	1.38	32.82	81	62.04	94.86	0.085	-0.366
739.3	15.748	44.16	5.85	2.70	1.0	1.38	33.69	79	61.93	95.62	0.085	-0.370
739.1	15.912	41.66	6.01	2.72	1.0	1.37	32.08	81	61.75	93.83	0.086	-0.361
738.9	16.076	36.19	4.12	2.65	0.7	1.36	33.52	75	61.27	94.79	0.086	-0.366
738.8	16.240	36.78	1.90	2.42	0.5	1.35	38.21	57	58.53	96.74	0.086	-0.374
738.6	16.404	118.92	0.71	1.76	0.5	1.31	117.50	4	0.01	117.51	0.086	-0.458
738.4	16.568	101.68	2.12	2.13	0.5	1.26	96.80	33	58.95	155.75	0.086	-0.588
738.3	16.732	60.62	4.36	2.51	0.5	1.29	59.98	64	66.62	126.60	0.085	-0.491
738.1	16.896	28.07	13.46	3.10	1.0	1.35	22.95	100	61.06	84.01	0.085	-0.315
737.9	17.060	26.01	6.28	2.88	1.0	1.35	21.54	93	60.02	81.55	0.085	-0.302
737.8	17.224	21.86	6.72	2.95	1.0	1.35	18.49	99	59.62	78.11	0.085	-0.285
737.6	17.388	24.42	6.20	2.90	1.0	1.34	20.51	95	59.82	80.33	0.085	-0.296
737.4	17.552	29.42	5.33	2.79	1.0	1.33	24.38	86	60.13	84.51	0.086	-0.316
737.3	17.716	38.32	4.59	2.66	1.0	1.31	31.16	76	60.77	91.93	0.087	-0.351
737.1	17.880	28.74	6.45	2.86	1.0	1.31	24.04	92	60.60	84.64	0.087	-0.317
737.0	18.044	26.36	6.88	2.90	1.0	1.31	22.31	95	60.44	82.74	0.088	-0.307
736.8	18.208	32.85	5.46	2.77	1.0	1.30	27.37	84	60.77	88.14	0.089	-0.333
736.6	18.372	40.27	4.24	2.63	0.7	1.27	37.88	73	62.22	100.10	0.090	-0.386
736.5	18.537	36.90	5.90	2.75	1.0	1.28	30.67	83	61.66	92.32	0.090	-0.352
736.3	18.701	40.03	5.35	2.70	1.0	1.27	33.19	79	61.79	94.98	0.090	-0.363
736.1	18.865	37.38	5.96	2.75	1.0	1.27	31.27	83	61.83	93.10	0.091	-0.355
736.0	19.029	44.04	4.66	2.63	0.7	1.25	41.40	73	63.28	104.68	0.091	-0.404
735.8	19.193	47.61	4.52	2.59	0.7	1.24	44.57	71	63.70	108.27	0.092	-0.419
735.6	19.357	40.78	6.28	2.74	1.0	1.25	34.26	83	62.63	96.89	0.092	-0.371
735.5	19.521	28.94	3.75	2.69	1.0	1.26	25.15	78	59.33	84.48	0.093	-0.314
735.3	19.685	16.04	6.17	3.03	1.0	1.27	14.83	100	58.54	73.37	0.093	-0.257
735.2	19.849	10.57	7.05	3.20	1.0	1.27	10.39	100	57.16	67.55	0.093	-0.225
735.0	20.013	11.90	6.62	3.15	1.0	1.26	11.52	100	57.51	69.03	0.094	-0.233
734.8	20.177	16.21	5.49	2.99	1.0	1.25	15.12	100	58.63	73.75	0.094	-0.259
734.7	20.341	17.47	4.92	2.94	1.0	1.25	16.21	98	58.78	74.99	0.095	-0.265
734.5	20.505	16.28	5.28	2.98	1.0	1.24	15.28	100	58.68	73.96	0.095	-0.260
734.3	20.669	13.23	6.04	3.09	1.0	1.24	12.78	100	57.90	70.68	0.095	-0.242

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
734.2	20.833	22.12	3.79	2.78	1.0	1.23	20.24	86	58.80	79.04	0.096	-0.286
734.0	20.997	22.01	3.48	2.76	1.0	1.22	20.22	84	58.58	78.80	0.096	-0.284
733.8	21.161	21.32	3.35	2.76	1.0	1.22	19.71	84	58.43	78.14	0.097	-0.281
733.7	21.325	22.25	2.17	2.63	1.0	1.21	20.58	74	57.23	77.81	0.097	-0.279
733.5	21.489	19.58	2.49	2.71	1.0	1.21	18.39	80	57.52	75.91	0.098	-0.269
733.3	21.653	8.84	5.70	3.21	1.0	1.22	9.27	100	56.81	66.08	0.098	-0.215
733.2	21.817	5.87	6.76	3.39	1.0	1.21	6.73	100	56.02	62.75	0.098	-0.195
733.0	21.981	16.58	2.83	2.80	1.0	1.20	15.99	87	57.68	73.67	0.099	-0.257
732.9	22.145	23.92	3.13	2.70	1.0	1.19	22.31	79	58.61	80.92	0.099	-0.294
732.7	22.309	15.76	4.76	2.96	1.0	1.19	15.37	100	58.69	74.06	0.099	-0.258
732.5	22.473	18.48	4.24	2.88	1.0	1.18	17.76	93	58.82	76.59	0.100	-0.271
732.4	22.638	14.82	4.11	2.94	1.0	1.18	14.65	98	58.34	72.98	0.100	-0.252
732.2	22.802	16.53	2.21	2.74	1.0	1.17	16.20	82	57.17	73.36	0.100	-0.254
732.0	22.966	10.95	4.06	3.04	1.0	1.17	11.34	100	57.45	68.80	0.101	-0.229
731.9	23.130	8.42	5.55	3.21	1.0	1.17	9.15	100	56.77	65.92	0.101	-0.212
731.7	23.294	6.90	5.09	3.26	1.0	1.17	7.82	100	56.36	64.18	0.101	-0.202
731.5	23.458	6.64	5.68	3.30	1.0	1.17	7.61	100	56.29	63.90	0.102	-0.200
731.4	23.622	9.67	3.90	3.07	1.0	1.16	10.33	100	57.14	67.48	0.102	-0.221
731.2	23.786	11.57	4.35	3.04	1.0	1.15	12.06	100	57.68	69.74	0.102	-0.233
731.1	23.950	9.06	5.72	3.20	1.0	1.15	9.85	100	56.99	66.84	0.102	-0.217
730.9	24.114	20.34	2.48	2.70	1.0	1.14	19.97	79	57.83	77.80	0.103	-0.276
730.7	24.278	25.20	2.80	2.66	1.0	1.13	24.34	76	58.65	82.99	0.103	-0.302
730.6	24.442	17.08	3.97	2.88	1.0	1.13	17.14	94	58.69	75.84	0.103	-0.266
730.4	24.606	10.40	4.06	3.06	1.0	1.13	11.17	100	57.40	68.57	0.103	-0.226
730.2	24.770	8.71	4.85	3.17	1.0	1.13	9.66	100	56.93	66.59	0.104	-0.215
730.1	24.934	5.02	8.35	3.50	1.0	1.13	6.32	100	55.89	62.21	0.104	-0.189
729.9	25.098	7.01	5.57	3.28	1.0	1.12	8.15	100	56.46	64.62	0.104	-0.203
729.7	25.262	6.95	5.65	3.29	1.0	1.12	8.13	100	56.46	64.58	0.104	-0.203
729.6	25.426	7.97	4.54	3.18	1.0	1.11	9.08	100	56.75	65.83	0.105	-0.210
729.4	25.590	6.26	4.99	3.29	1.0	1.11	7.53	100	56.27	63.79	0.105	-0.198
729.2	25.754	6.79	4.80	3.25	1.0	1.11	8.04	100	56.43	64.47	0.105	-0.201
729.1	25.918	5.74	5.82	3.36	1.0	1.10	7.08	100	56.13	63.21	0.105	-0.194
728.9	26.082	6.42	3.73	3.21	1.0	1.10	7.73	100	56.33	64.06	0.106	-0.199
728.8	26.246	5.87	5.12	3.32	1.0	1.09	7.24	100	56.18	63.42	0.106	-0.195
728.6	26.410	7.58	4.36	3.19	1.0	1.09	8.85	100	56.68	65.54	0.106	-0.207
728.4	26.574	6.14	5.51	3.32	1.0	1.09	7.53	100	56.27	63.80	0.106	-0.197
728.3	26.739	5.92	4.77	3.30	1.0	1.08	7.34	100	56.21	63.55	0.107	-0.195
728.1	26.903	6.08	4.69	3.29	1.0	1.08	7.51	100	56.26	63.77	0.107	-0.196
727.9	27.067	6.22	3.73	3.22	1.0	1.08	7.66	100	56.31	63.97	0.107	-0.197
727.8	27.231	7.31	3.52	3.15	1.0	1.07	8.71	100	56.64	65.35	0.107	-0.205
727.6	27.395	6.19	6.46	3.36	1.0	1.07	7.67	100	56.31	63.98	0.108	-0.197
727.4	27.559	8.46	3.93	3.12	1.0	1.06	9.85	100	56.99	66.84	0.108	-0.214
727.3	27.723	10.64	3.63	3.02	1.0	1.06	11.95	100	57.64	69.60	0.108	-0.229
727.1	27.887	10.57	4.92	3.10	1.0	1.06	11.92	100	57.63	69.55	0.108	-0.229
726.9	28.051	8.26	5.47	3.22	1.0	1.05	9.73	100	56.95	66.69	0.109	-0.212
726.8	28.215	13.98	3.27	2.90	1.0	1.05	15.25	95	58.24	73.49	0.109	-0.250
726.6	28.379	12.58	3.89	2.98	1.0	1.05	13.94	100	58.26	72.20	0.109	-0.243
726.5	28.543	9.89	5.15	3.14	1.0	1.04	11.38	100	57.46	68.84	0.109	-0.224
726.3	28.707	8.66	4.82	3.17	1.0	1.04	10.21	100	57.10	67.31	0.110	-0.215
726.1	28.871	8.14	4.25	3.16	1.0	1.04	9.73	100	56.95	66.68	0.110	-0.211
726.0	29.035	7.82	4.03	3.16	1.0	1.03	9.44	100	56.86	66.30	0.110	-0.209
725.8	29.199	6.18	4.30	3.26	1.0	1.03	7.86	100	56.37	64.23	0.110	-0.197
725.6	29.363	5.13	2.97	3.24	1.0	1.03	6.84	100	56.06	62.90	0.110	-0.189
725.5	29.527	4.34	6.15	3.47	1.0	1.02	6.08	100	55.82	61.90	0.111	-0.183
725.3	29.691	5.51	6.51	3.40	1.0	1.02	7.25	100	56.18	63.43	0.111	-0.192
725.1	29.855	8.60	4.02	3.12	1.0	1.02	10.31	100	57.13	67.45	0.111	-0.215
725.0	30.019	9.25	3.94	3.09	1.0	1.01	10.98	100	57.34	68.32	0.111	-0.220
724.8	30.183	5.45	6.57	3.41	1.0	1.01	7.24	100	56.18	63.42	0.112	-0.191
724.7	30.347	11.33	4.33	3.05	1.0	1.01	13.10	100	58.00	71.09	0.112	-0.235
724.5	30.511	16.39	4.21	2.91	1.0	1.01	18.16	96	59.23	77.39	0.112	-0.268
724.3	30.675	30.84	2.10	2.51	0.5	1.00	32.68	64	58.83	91.51	0.112	-0.336
724.2	30.840	11.72	6.58	3.15	1.0	1.00	13.57	100	58.15	71.72	0.113	-0.238
724.0	31.004	8.44	6.14	3.24	1.0	1.00	10.31	100	57.13	67.44	0.113	-0.214
723.8	31.168	12.55	4.03	2.99	1.0	0.99	14.47	100	58.42	72.89	0.113	-0.244
723.7	31.332	10.34	5.31	3.13	1.0	0.99	12.27	100	57.74	70.01	0.113	-0.228
723.5	31.496	7.72	6.67	3.29	1.0	0.99	9.66	100	56.93	66.59	0.113	-0.209

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
723.3	31.660	7.39	6.17	3.29	1.0	0.99	9.34	100	56.83	66.18	0.113	-0.206
723.2	31.824	7.65	4.43	3.19	1.0	0.98	9.63	100	56.92	66.55	0.114	-0.208
723.0	31.988	7.81	3.65	3.13	1.0	0.98	9.80	100	56.98	66.78	0.114	-0.209
722.8	32.152	8.95	3.13	3.05	1.0	0.98	10.99	100	57.34	68.33	0.114	-0.218
722.7	32.316	7.30	3.49	3.15	1.0	0.97	9.33	100	56.83	66.16	0.114	-0.206
722.5	32.480	5.68	4.08	3.28	1.0	0.97	7.69	100	56.32	64.01	0.114	-0.193
722.4	32.644	5.08	3.59	3.28	1.0	0.97	7.09	100	56.14	63.23	0.114	-0.188
722.2	32.808	5.46	2.92	3.21	1.0	0.97	7.49	100	56.26	63.75	0.114	-0.191
722.0	32.972	6.43	1.96	3.06	1.0	0.96	8.51	100	56.57	65.08	0.114	-0.199
721.9	33.136	5.28	2.36	3.18	1.0	0.96	7.34	100	56.21	63.56	0.115	-0.190
721.7	33.300	4.87	2.31	3.20	1.0	0.96	6.93	100	56.09	63.02	0.115	-0.186
721.5	33.464	4.79	2.96	3.26	1.0	0.96	6.86	100	56.06	62.92	0.115	-0.186
721.4	33.628	4.74	4.28	3.35	1.0	0.95	6.83	100	56.05	62.88	0.115	-0.185
721.2	33.792	4.43	4.54	3.39	1.0	0.95	6.52	100	55.96	62.47	0.115	-0.183
721.0	33.956	4.55	4.40	3.37	1.0	0.95	6.65	100	56.00	62.65	0.116	-0.184
720.9	34.120	4.27	5.15	3.43	1.0	0.94	6.38	100	55.91	62.29	0.118	-0.181
720.7	34.284	4.46	3.77	3.34	1.0	0.94	6.59	100	55.98	62.56	0.118	-0.183
720.6	34.448	4.80	3.33	3.29	1.0	0.94	6.96	100	56.09	63.05	0.118	-0.186
720.4	34.612	4.39	3.26	3.32	1.0	0.94	6.54	100	55.96	62.50	0.118	-0.182
720.2	34.776	3.68	4.28	3.44	1.0	0.93	5.81	100	55.74	61.54	0.118	-0.176
720.1	34.941	3.61	4.51	3.46	1.0	0.93	5.74	100	55.72	61.46	0.118	-0.176
719.9	35.105	4.69	3.87	3.33	1.0	0.93	6.89	100	56.07	62.96	0.118	-0.185
719.7	35.269	5.73	4.78	3.31	1.0	0.93	8.00	100	56.42	64.42	0.119	-0.193
719.6	35.433	13.12	3.18	2.92	1.0	0.93	15.88	96	58.54	74.42	0.119	-0.249
719.4	35.597	19.92	4.06	2.84	1.0	0.93	23.20	90	60.19	83.39	0.119	-0.294
719.2	35.761	22.17	4.90	2.86	1.0	0.93	25.68	92	61.10	86.78	0.119	-0.310
719.1	35.925	21.66	3.96	2.80	1.0	0.93	25.17	87	60.48	85.65	0.119	-0.305
718.9	36.089	20.57	4.79	2.87	1.0	0.92	24.05	93	60.74	84.80	0.119	-0.301
718.7	36.253	20.35	4.73	2.87	1.0	0.92	23.86	93	60.69	84.55	0.120	-0.299
718.6	36.417	17.90	5.09	2.94	1.0	0.92	21.25	98	60.36	81.60	0.120	-0.285
718.4	36.581	17.08	4.13	2.89	1.0	0.92	20.39	95	59.78	80.17	0.120	-0.277
718.3	36.745	17.44	4.13	2.89	1.0	0.91	20.83	94	59.85	80.68	0.120	-0.280
718.1	36.909	15.50	3.94	2.91	1.0	0.91	18.75	96	59.42	78.17	0.120	-0.267
717.9	37.073	13.59	3.99	2.96	1.0	0.91	16.70	100	59.12	75.82	0.120	-0.255
717.8	37.237	14.99	3.36	2.88	1.0	0.91	18.26	94	59.04	77.30	0.121	-0.262
717.6	37.401	15.17	2.89	2.84	1.0	0.90	18.49	90	58.76	77.25	0.121	-0.262
717.4	37.565	14.32	3.30	2.89	1.0	0.90	17.59	95	58.92	76.51	0.121	-0.258
717.3	37.729	14.99	2.86	2.84	1.0	0.90	18.37	90	58.73	77.10	0.121	-0.261
717.1	37.893	13.72	2.99	2.88	1.0	0.90	17.00	94	58.65	75.65	0.122	-0.253
716.9	38.057	13.27	2.90	2.89	1.0	0.89	16.53	94	58.54	75.07	0.122	-0.250
716.8	38.221	14.08	2.38	2.82	1.0	0.89	17.46	88	58.26	75.71	0.122	-0.253
716.6	38.385	15.22	2.23	2.77	1.0	0.89	18.75	85	58.24	76.99	0.122	-0.260
716.5	38.549	15.37	2.49	2.80	1.0	0.89	18.96	87	58.53	77.49	0.123	-0.262
716.3	38.713	15.78	2.24	2.76	1.0	0.89	19.44	84	58.35	77.80	0.123	-0.264
716.1	38.877	14.41	2.38	2.81	1.0	0.89	17.95	88	58.33	76.28	0.123	-0.256
716.0	39.042	14.78	2.30	2.79	1.0	0.88	18.40	86	58.31	76.70	0.124	-0.258
715.8	39.206	15.02	2.24	2.78	1.0	0.88	18.70	85	58.28	76.98	0.124	-0.259
715.6	39.370	15.46	2.81	2.83	1.0	0.88	19.24	89	58.87	78.10	0.124	-0.265
715.5	39.534	17.19	2.78	2.79	1.0	0.88	21.22	86	59.12	80.34	0.124	-0.276
715.3	39.698	16.31	3.31	2.85	1.0	0.88	20.27	91	59.39	79.65	0.124	-0.273
715.1	39.862	17.14	3.23	2.83	1.0	0.88	21.24	89	59.49	80.73	0.125	-0.278
715.0	40.026	15.35	3.44	2.88	1.0	0.87	19.26	94	59.33	78.58	0.125	-0.267
714.8	40.190	13.72	3.72	2.94	1.0	0.87	17.44	98	59.20	76.63	0.125	-0.257
714.6	40.354	13.45	3.08	2.90	1.0	0.87	17.17	95	58.81	75.98	0.125	-0.253
714.5	40.518	13.07	2.97	2.90	1.0	0.87	16.76	95	58.69	75.46	0.125	-0.250
714.3	40.682	12.18	3.32	2.95	1.0	0.86	15.78	99	58.76	74.54	0.125	-0.245
714.2	40.846	12.07	3.36	2.96	1.0	0.86	15.67	100	58.78	74.45	0.125	-0.245
714.0	41.010	12.60	2.81	2.90	1.0	0.86	16.30	95	58.55	74.85	0.125	-0.247
713.8	41.174	12.94	2.74	2.88	1.0	0.86	16.72	94	58.56	75.28	0.125	-0.249
713.7	41.338	11.99	3.09	2.94	1.0	0.86	15.66	98	58.64	74.30	0.125	-0.244
713.5	41.502	11.69	3.08	2.95	1.0	0.85	15.35	99	58.60	73.95	0.125	-0.242
713.3	41.666	11.33	3.04	2.96	1.0	0.85	14.96	99	58.53	73.50	0.126	-0.239
713.2	41.830	11.10	2.79	2.94	1.0	0.85	14.72	98	58.36	73.09	0.126	-0.237
713.0	41.994	12.24	2.70	2.90	1.0	0.85	16.06	95	58.47	74.53	0.126	-0.244
712.8	42.158	14.25	2.17	2.79	1.0	0.85	18.41	86	58.30	76.71	0.126	-0.256
712.7	42.322	14.40	2.34	2.81	1.0	0.85	18.62	87	58.50	77.11	0.127	-0.258

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
712.5	42.486	14.76	2.13	2.77	1.0	0.85	19.06	85	58.34	77.41	0.127	-0.259
712.3	42.650	14.47	2.34	2.80	1.0	0.84	18.76	87	58.53	77.29	0.127	-0.258
712.2	42.814	14.42	2.47	2.82	1.0	0.84	18.73	88	58.65	77.38	0.127	-0.259
712.0	42.978	12.68	3.58	2.96	1.0	0.84	16.74	100	59.10	75.84	0.128	-0.251
711.9	43.143	11.63	4.47	3.05	1.0	0.84	15.54	100	58.76	74.29	0.128	-0.242
711.7	43.307	12.33	4.50	3.03	1.0	0.84	16.38	100	59.02	75.40	0.128	-0.248
711.5	43.471	8.88	5.72	3.20	1.0	0.83	12.37	100	57.77	70.15	0.128	-0.220
711.4	43.635	5.77	5.97	3.36	1.0	0.82	8.77	100	56.65	65.42	0.128	-0.193
711.2	43.799	4.67	4.10	3.35	1.0	0.82	7.50	100	56.26	63.77	0.128	-0.183
711.0	43.963	3.99	3.65	3.38	1.0	0.82	6.73	100	56.02	62.75	0.128	-0.177
710.9	44.127	3.48	3.68	3.43	1.0	0.82	6.14	100	55.84	61.99	0.128	-0.172
710.7	44.291	3.40	3.46	3.43	1.0	0.81	6.06	100	55.82	61.88	0.128	-0.171
710.5	44.455	3.32	3.36	3.43	1.0	0.81	5.98	100	55.79	61.78	0.128	-0.171
710.4	44.619	3.25	3.26	3.43	1.0	0.81	5.92	100	55.77	61.69	0.128	-0.170
710.2	44.783	3.15	3.12	3.43	1.0	0.81	5.80	100	55.73	61.53	0.128	-0.169
710.1	44.947	3.03	3.08	3.44	1.0	0.81	5.67	100	55.69	61.37	0.129	-0.168
709.9	45.111	2.95	2.95	3.44	1.0	0.81	5.58	100	55.67	61.25	0.129	-0.167
709.7	45.275	2.99	2.92	3.44	1.0	0.80	5.64	100	55.69	61.33	0.129	-0.167
709.6	45.439	2.96	2.94	3.44	1.0	0.80	5.62	100	55.68	61.30	0.129	-0.167
709.4	45.603	3.03	3.08	3.44	1.0	0.80	5.70	100	55.70	61.41	0.129	-0.168
709.2	45.767	3.43	4.23	3.47	1.0	0.80	6.19	100	55.85	62.04	0.129	-0.171
709.1	45.931	4.32	5.52	3.45	1.0	0.80	7.24	100	56.18	63.42	0.129	-0.180
708.9	46.095	10.01	2.26	2.93	1.0	0.81	14.03	97	58.06	72.09	0.130	-0.229
708.7	46.259	10.43	2.30	2.92	1.0	0.80	14.55	96	58.15	72.70	0.130	-0.232
708.6	46.423	9.76	2.03	2.91	1.0	0.80	13.77	96	57.87	71.64	0.130	-0.226
708.4	46.587	14.05	1.09	2.64	1.0	0.80	18.95	74	56.85	75.80	0.130	-0.248
708.2	46.751	26.94	0.38	2.19	0.5	0.80	28.61	38	47.76	76.37	0.131	-0.251
708.1	46.915	30.66	0.33	2.11	0.5	0.80	32.25	32	43.89	76.14	0.131	-0.250
707.9	47.079	32.41	0.47	2.15	0.5	0.80	34.13	35	46.94	81.07	0.131	-0.275
707.8	47.244	33.56	0.61	2.19	0.5	0.81	35.38	38	49.24	84.63	0.131	-0.292
707.6	47.408	35.29	1.02	2.28	0.5	0.81	37.34	46	53.98	91.33	0.131	-0.323
707.4	47.572	35.77	1.00	2.27	0.5	0.81	37.83	45	53.66	91.48	0.131	-0.324
707.3	47.736	53.93	0.65	2.02	0.5	0.81	56.09	25	39.61	95.70	0.131	-0.342
707.1	47.900	67.62	0.72	1.96	0.5	0.82	70.22	20	32.89	103.10	0.131	-0.374
706.9	48.064	67.97	0.96	2.03	0.5	0.82	71.29	25	43.40	114.69	0.131	-0.420
706.8	48.228	64.76	1.14	2.09	0.5	0.82	68.24	30	49.59	117.83	0.131	-0.432
706.6	48.392	65.24	1.14	2.09	0.5	0.82	68.76	30	49.54	118.30	0.131	-0.434
706.4	48.556	77.55	0.96	1.99	0.5	0.82	81.41	22	38.48	119.90	0.131	-0.440
706.3	48.720	87.12	0.85	1.91	0.5	0.82	90.92	16	25.64	116.55	0.130	-0.427
706.1	48.884	90.44	0.91	1.92	0.5	0.82	94.76	17	27.32	122.08	0.130	-0.447
706.0	49.048	90.28	0.93	1.92	0.5	0.82	94.69	17	28.40	123.09	0.130	-0.451
705.8	49.212	88.81	0.96	1.94	0.5	0.82	93.35	18	31.49	124.83	0.129	-0.457
705.6	49.376	83.73	0.95	1.96	0.5	0.82	87.97	20	34.32	122.29	0.129	-0.448
705.5	49.540	78.46	0.91	1.97	0.5	0.81	82.29	20	35.58	117.87	0.128	-0.431
705.3	49.704	72.41	0.95	2.01	0.5	0.81	76.08	24	40.89	116.97	0.128	-0.428
705.1	49.868	67.94	0.97	2.04	0.5	0.81	71.45	26	44.05	115.50	0.127	-0.422
705.0	50.032	61.54	1.01	2.08	0.5	0.80	64.78	29	47.75	112.53	0.127	-0.411
704.8	50.196	53.10	0.98	2.12	0.5	0.80	55.85	33	49.58	105.43	0.127	-0.382
704.6	50.360	50.61	1.09	2.17	0.5	0.80	53.36	36	52.15	105.52	0.126	-0.382
704.5	50.524	59.29	2.85	2.38	0.5	0.81	63.41	54	64.33	127.75	0.126	-0.467
704.3	50.688	72.76	0.15	1.66	0.5	0.76	72.88	0	0.00	72.88	0.126	-0.230
704.1	50.852	245.27	0.15	1.15	0.5	0.88	277.37	0	0.00	277.37	0.126	-0.600

LIQUEFACTION POTENTIAL ASSESSMENT FOR COARSE GRAINED SOILS USING CONE PENETRATION TEST DATA

Project Site: **KIF TDEC Stability**
Stantec Project No.: **175668043**
CPT ID: **CPT-02D**

Depth to Water during Earthquake:	5.9	ft
Final Grade Elevation during EQ:	755.3	ft
Height of Final Grade above CPT TOH:	0.3	ft
Normalize K_σ to:	1.058	tsf
a_{max} at top of ground surface:	0.20	g
Earthquake Magnitude:	6.00	M_W
Earthquake File or Source Zone:	10	Hz

Shear Stress Fit Parameters

m4:	0
m3:	0
m2:	0
m1:	0

Elev. (ft)	Depth *z* (ft)	Cyclic Resistance Ratio *CRR 7.5*	Relative Density *D r* (%)	Correction for Overburden Pressure *K σ*	Correction for Sloping Ground *K α*	Magnitude Scaling Factor *MSF*	Cyclic Resistance Ratio *CRR*	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress *τ Max* (psf)	From Ground Response: Average Cyclic Shear Stress *τ Avg* (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. *(qc 1N) CS ≥ 175*	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
755.0																	
754.8	0.164	N/A	35	N/A	N/A	N/A	N/A	1.000	0	0	**0.132**	TRUE	FALSE	TRUE	**N/A**	**Clay Fill (irrelevant)**	**A1**
754.7	0.328	N/A	78	N/A	N/A	N/A	N/A	1.000	0	0	**0.132**	TRUE	FALSE	TRUE	**N/A**	**Clay Fill (irrelevant)**	**A1**
754.5	0.492	N/A	72	N/A	N/A	N/A	N/A	1.000	0	0	**0.132**	TRUE	FALSE	TRUE	**N/A**	**Clay Fill (irrelevant)**	**A1**
754.3	0.656	N/A	92	N/A	N/A	N/A	N/A	1.000	0	0	**0.132**	TRUE	TRUE	TRUE	**N/A**	**Clay Fill (irrelevant)**	**A1**
754.2	0.820	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.132**	TRUE	TRUE	TRUE	**N/A**	**Clay Fill (irrelevant)**	**A1**
754.0	0.984	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.132**	TRUE	TRUE	TRUE	**N/A**	**Clay Fill (irrelevant)**	**A1**
753.9	1.148	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.132**	TRUE	TRUE	TRUE	**N/A**	**Clay Fill (irrelevant)**	**A1**
753.7	1.312	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.132**	TRUE	TRUE	TRUE	**N/A**	**Clay Fill (irrelevant)**	**A1**
753.5	1.476	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.132**	TRUE	TRUE	TRUE	**N/A**	**Clay Fill (irrelevant)**	**A1**
753.4	1.640	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.132**	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**	**A1**
753.2	1.804	N/A	100	N/A	N/A	N/A	N/A	0.999	0	0	**0.132**	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**	**A1**
753.0	1.968	N/A	100	N/A	N/A	N/A	N/A	0.999	0	0	**0.132**	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**	**A1**
752.9	2.133	N/A	100	N/A	N/A	N/A	N/A	0.998	0	0	**0.132**	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**	**A1**
752.7	2.297	N/A	100	N/A	N/A	N/A	N/A	0.997	0	0	**0.132**	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**	**A1**
752.5	2.461	N/A	100	N/A	N/A	N/A	N/A	0.996	0	0	**0.132**	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**	**A1**
752.4	2.625	0.424	78	1.100	N/A	1.52	N/A	0.996	0	0	**0.132**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**A1**
752.2	2.789	0.252	71	1.100	N/A	1.36	N/A	0.995	0	0	**0.132**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**A1**
752.0	2.953	0.178	64	1.100	N/A	1.25	N/A	0.994	0	0	**0.132**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**A1**
751.9	3.117	0.145	57	1.100	N/A	1.18	N/A	0.993	0	0	**0.131**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**A1**
751.7	3.281	0.146	58	1.100	N/A	1.18	N/A	0.993	0	0	**0.131**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**A1**
751.6	3.445	0.183	65	1.100	N/A	1.26	N/A	0.992	0	0	**0.131**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**A1**
751.4	3.609	N/A	60	N/A	N/A	N/A	N/A	0.991	0	0	**0.131**	TRUE	FALSE	TRUE	**N/A**	**Embankment Fill**	**A1**
751.2	3.773	N/A	55	N/A	N/A	N/A	N/A	0.990	0	0	**0.131**	TRUE	FALSE	TRUE	**N/A**	**Embankment Fill**	**B**
751.1	3.937	N/A	53	N/A	N/A	N/A	N/A	0.989	0	0	**0.131**	TRUE	FALSE	TRUE	**N/A**	**Embankment Fill**	**B**
750.9	4.101	N/A	51	N/A	N/A	N/A	N/A	0.989	0	0	**0.131**	TRUE	FALSE	TRUE	**N/A**	**Embankment Fill**	**B**
750.7	4.265	N/A	52	N/A	N/A	N/A	N/A	0.988	0	0	**0.131**	TRUE	FALSE	TRUE	**N/A**	**Embankment Fill**	**B**
750.6	4.429	N/A	53	N/A	N/A	N/A	N/A	0.987	0	0	**0.131**	TRUE	FALSE	TRUE	**N/A**	**Embankment Fill**	**B**
750.4	4.593	N/A	97	N/A	N/A	N/A	N/A	0.986	0	0	**0.131**	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**	**A1**
750.2	4.757	N/A	100	N/A	N/A	N/A	N/A	0.985	0	0	**0.130**	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**	**A1**
750.1	4.921	N/A	100	N/A	N/A	N/A	N/A	0.985	0	0	**0.130**	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**	**A1**
749.9	5.085	N/A	100	N/A	N/A	N/A	N/A	0.984	0	0	**0.130**	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**	**A1**
749.8	5.249	N/A	98	N/A	N/A	N/A	N/A	0.983	0	0	**0.130**	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**	**A1**
749.6	5.413	N/A	81	N/A	N/A	N/A	N/A	0.982	0	0	**0.130**	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**	**A1**
749.4	5.577	N/A	76	N/A	N/A	N/A	N/A	0.981	0	0	**0.130**	TRUE	FALSE	TRUE	**N/A**	**Embankment Fill**	**A1**
749.3	5.741	N/A	66	N/A	N/A	N/A	N/A	0.980	0	0	**0.130**	TRUE	FALSE	TRUE	**N/A**	**Embankment Fill**	**A1**
749.1	5.905	N/A	67	N/A	N/A	N/A	N/A	0.980	0	0	**0.130**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
748.9	6.069	N/A	67	N/A	N/A	N/A	N/A	0.979	0	0	**0.131**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
748.8	6.234	N/A	69	N/A	N/A	N/A	N/A	0.978	0	0	**0.133**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
748.6	6.398	N/A	73	N/A	N/A	N/A	N/A	0.977	0	0	**0.134**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
748.4	6.562	N/A	73	N/A	N/A	N/A	N/A	0.976	0	0	**0.136**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
748.3	6.726	N/A	73	N/A	N/A	N/A	N/A	0.975	0	0	**0.137**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
748.1	6.890	N/A	77	N/A	N/A	N/A	N/A	0.974	0	0	**0.139**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
747.9	7.054	N/A	76	N/A	N/A	N/A	N/A	0.973	0	0	**0.140**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
747.8	7.218	N/A	73	N/A	N/A	N/A	N/A	0.973	0	0	**0.141**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**

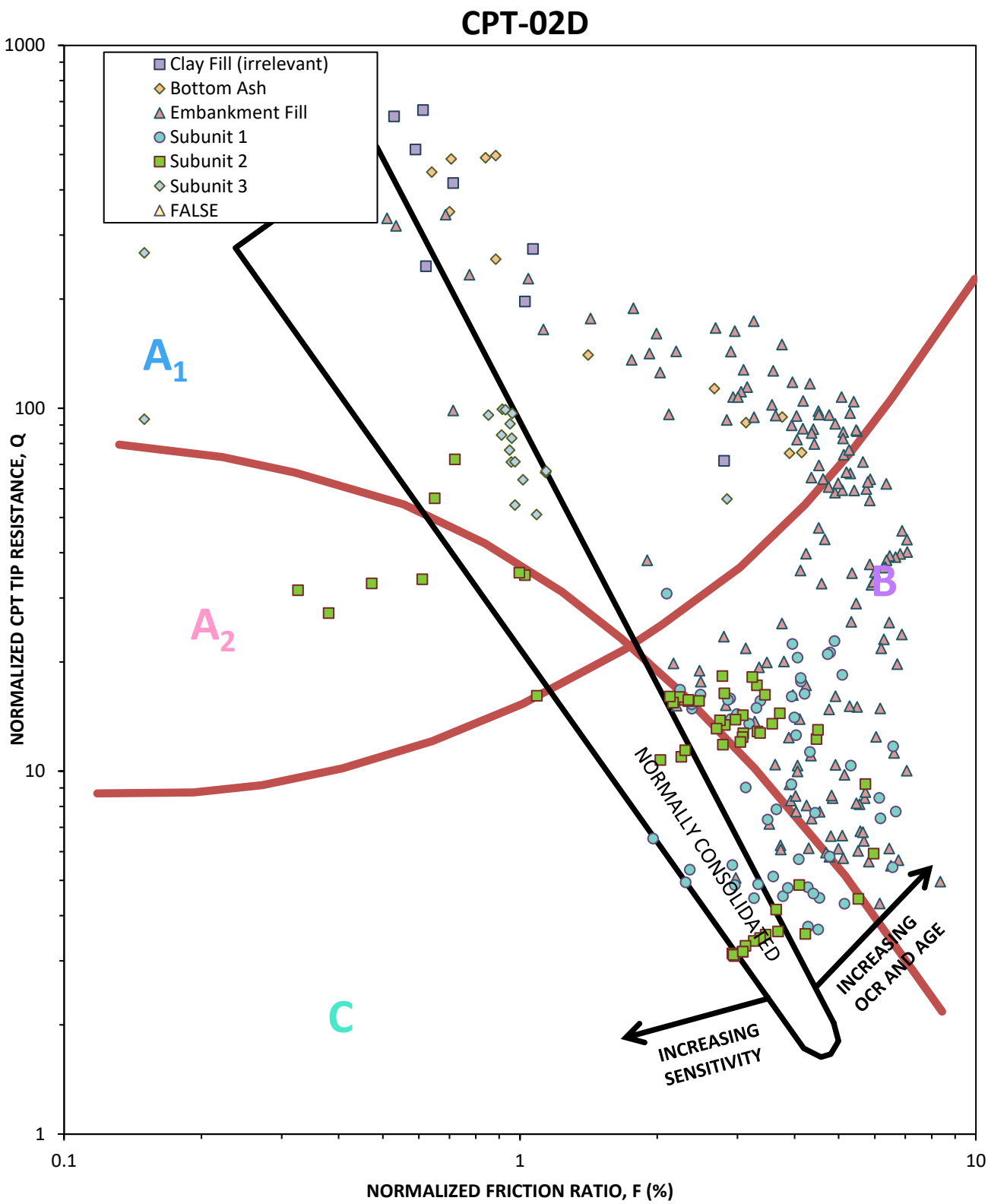
Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
747.6	7.382	N/A	77	N/A	N/A	N/A	N/A	0.972	0	0	**0.142**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
747.5	7.546	N/A	71	N/A	N/A	N/A	N/A	0.971	0	0	**0.144**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
747.3	7.710	N/A	66	N/A	N/A	N/A	N/A	0.970	0	0	**0.145**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
747.1	7.874	N/A	64	N/A	N/A	N/A	N/A	0.969	0	0	**0.146**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
747.0	8.038	N/A	62	N/A	N/A	N/A	N/A	0.968	0	0	**0.147**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
746.8	8.202	N/A	61	N/A	N/A	N/A	N/A	0.967	0	0	**0.148**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
746.6	8.366	N/A	60	N/A	N/A	N/A	N/A	0.966	0	0	**0.149**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
746.5	8.530	N/A	62	N/A	N/A	N/A	N/A	0.965	0	0	**0.150**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
746.3	8.694	N/A	60	N/A	N/A	N/A	N/A	0.964	0	0	**0.151**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
746.1	8.858	N/A	70	N/A	N/A	N/A	N/A	0.963	0	0	**0.152**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
746.0	9.022	N/A	77	N/A	N/A	N/A	N/A	0.962	0	0	**0.153**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
745.8	9.186	N/A	81	N/A	N/A	N/A	N/A	0.961	0	0	**0.154**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
745.6	9.350	N/A	80	N/A	N/A	N/A	N/A	0.961	0	0	**0.155**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
745.5	9.514	N/A	84	N/A	N/A	N/A	N/A	0.960	0	0	**0.156**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
745.3	9.678	N/A	85	N/A	N/A	N/A	N/A	0.959	0	0	**0.157**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
745.2	9.842	N/A	80	N/A	N/A	N/A	N/A	0.958	0	0	**0.157**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
745.0	10.006	N/A	74	N/A	N/A	N/A	N/A	0.957	0	0	**0.158**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
744.8	10.170	N/A	79	N/A	N/A	N/A	N/A	0.956	0	0	**0.159**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
744.7	10.335	N/A	87	N/A	N/A	N/A	N/A	0.955	0	0	**0.160**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
744.5	10.499	N/A	88	N/A	N/A	N/A	N/A	0.954	0	0	**0.160**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
744.3	10.663	N/A	84	N/A	N/A	N/A	N/A	0.953	0	0	**0.161**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
744.2	10.827	N/A	90	N/A	N/A	N/A	N/A	0.952	0	0	**0.162**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
744.0	10.991	N/A	96	N/A	N/A	N/A	N/A	0.951	0	0	**0.162**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
743.8	11.155	N/A	93	N/A	N/A	N/A	N/A	0.950	0	0	**0.163**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
743.7	11.319	N/A	93	N/A	N/A	N/A	N/A	0.949	0	0	**0.164**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
743.5	11.483	N/A	94	N/A	N/A	N/A	N/A	0.948	0	0	**0.164**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
743.4	11.647	N/A	82	N/A	N/A	N/A	N/A	0.947	0	0	**0.165**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
743.2	11.811	N/A	75	N/A	N/A	N/A	N/A	0.946	0	0	**0.165**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
743.0	11.975	N/A	71	N/A	N/A	N/A	N/A	0.945	0	0	**0.166**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
742.9	12.139	N/A	73	N/A	N/A	N/A	N/A	0.944	0	0	**0.166**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
742.7	12.303	N/A	73	N/A	N/A	N/A	N/A	0.943	0	0	**0.167**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
742.5	12.467	N/A	75	N/A	N/A	N/A	N/A	0.942	0	0	**0.168**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
742.4	12.631	N/A	89	N/A	N/A	N/A	N/A	0.941	0	0	**0.168**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
742.2	12.795	N/A	91	N/A	N/A	N/A	N/A	0.940	0	0	**0.168**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
742.0	12.959	N/A	90	N/A	N/A	N/A	N/A	0.939	0	0	**0.169**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
741.9	13.123	N/A	83	N/A	N/A	N/A	N/A	0.938	0	0	**0.169**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
741.7	13.287	N/A	75	N/A	N/A	N/A	N/A	0.937	0	0	**0.170**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
741.5	13.451	N/A	72	N/A	N/A	N/A	N/A	0.936	0	0	**0.170**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
741.4	13.615	N/A	69	N/A	N/A	N/A	N/A	0.935	0	0	**0.171**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
741.2	13.779	N/A	63	N/A	N/A	N/A	N/A	0.934	0	0	**0.171**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
741.1	13.943	N/A	64	N/A	N/A	N/A	N/A	0.932	0	0	**0.171**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
740.9	14.107	N/A	65	N/A	N/A	N/A	N/A	0.931	0	0	**0.172**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
740.7	14.271	N/A	66	N/A	N/A	N/A	N/A	0.930	0	0	**0.172**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
740.6	14.436	N/A	57	N/A	N/A	N/A	N/A	0.929	0	0	**0.173**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
740.4	14.600	N/A	56	N/A	N/A	N/A	N/A	0.928	0	0	**0.173**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
740.2	14.764	N/A	54	N/A	N/A	N/A	N/A	0.927	0	0	**0.173**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
740.1	14.928	N/A	54	N/A	N/A	N/A	N/A	0.926	0	0	**0.174**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
739.9	15.092	N/A	54	N/A	N/A	N/A	N/A	0.925	0	0	**0.174**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
739.7	15.256	N/A	54	N/A	N/A	N/A	N/A	0.924	0	0	**0.174**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
739.6	15.420	N/A	53	N/A	N/A	N/A	N/A	0.923	0	0	**0.175**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
739.4	15.584	N/A	53	N/A	N/A	N/A	N/A	0.922	0	0	**0.175**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
739.3	15.748	N/A	53	N/A	N/A	N/A	N/A	0.921	0	0	**0.175**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
739.1	15.912	N/A	52	N/A	N/A	N/A	N/A	0.920	0	0	**0.175**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
738.9	16.076	N/A	53	N/A	N/A	N/A	N/A	0.919	0	0	**0.176**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
738.8	16.240	N/A	54	N/A	N/A	N/A	N/A	0.917	0	0	**0.176**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**

Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
738.6	16.404	N/A	62	N/A	N/A	N/A	N/A	0.916	0	0	**0.176**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
738.4	16.568	N/A	75	N/A	N/A	N/A	N/A	0.915	0	0	**0.176**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
738.3	16.732	N/A	65	N/A	N/A	N/A	N/A	0.914	0	0	**0.177**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
738.1	16.896	N/A	48	N/A	N/A	N/A	N/A	0.913	0	0	**0.177**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
737.9	17.060	N/A	47	N/A	N/A	N/A	N/A	0.912	0	0	**0.177**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
737.8	17.224	N/A	45	N/A	N/A	N/A	N/A	0.911	0	0	**0.177**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
737.6	17.388	N/A	46	N/A	N/A	N/A	N/A	0.910	0	0	**0.177**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
737.4	17.552	N/A	48	N/A	N/A	N/A	N/A	0.909	0	0	**0.178**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
737.3	17.716	N/A	51	N/A	N/A	N/A	N/A	0.907	0	0	**0.178**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
737.1	17.880	N/A	48	N/A	N/A	N/A	N/A	0.906	0	0	**0.178**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
737.0	18.044	N/A	47	N/A	N/A	N/A	N/A	0.905	0	0	**0.178**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
736.8	18.208	N/A	50	N/A	N/A	N/A	N/A	0.904	0	0	**0.178**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
736.6	18.372	N/A	55	N/A	N/A	N/A	N/A	0.903	0	0	**0.178**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
736.5	18.537	N/A	52	N/A	N/A	N/A	N/A	0.902	0	0	**0.179**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
736.3	18.701	N/A	53	N/A	N/A	N/A	N/A	0.901	0	0	**0.179**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
736.1	18.865	N/A	52	N/A	N/A	N/A	N/A	0.900	0	0	**0.179**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
736.0	19.029	N/A	57	N/A	N/A	N/A	N/A	0.898	0	0	**0.179**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
735.8	19.193	N/A	58	N/A	N/A	N/A	N/A	0.897	0	0	**0.179**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
735.6	19.357	N/A	54	N/A	N/A	N/A	N/A	0.896	0	0	**0.179**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
735.5	19.521	N/A	48	N/A	N/A	N/A	N/A	0.895	0	0	**0.179**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
735.3	19.685	N/A	42	N/A	N/A	N/A	N/A	0.894	0	0	**0.179**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
735.2	19.849	N/A	39	N/A	N/A	N/A	N/A	0.893	0	0	**0.180**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
735.0	20.013	N/A	40	N/A	N/A	N/A	N/A	0.891	0	0	**0.180**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
734.8	20.177	N/A	43	N/A	N/A	N/A	N/A	0.890	0	0	**0.180**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
734.7	20.341	N/A	43	N/A	N/A	N/A	N/A	0.889	0	0	**0.180**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
734.5	20.505	N/A	43	N/A	N/A	N/A	N/A	0.888	0	0	**0.180**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
734.3	20.669	N/A	41	N/A	N/A	N/A	N/A	0.887	0	0	**0.180**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
734.2	20.833	N/A	45	N/A	N/A	N/A	N/A	0.886	0	0	**0.180**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
734.0	20.997	N/A	45	N/A	N/A	N/A	N/A	0.885	0	0	**0.180**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
733.8	21.161	N/A	45	N/A	N/A	N/A	N/A	0.883	0	0	**0.180**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
733.7	21.325	N/A	45	N/A	N/A	N/A	N/A	0.882	0	0	**0.180**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
733.5	21.489	N/A	44	N/A	N/A	N/A	N/A	0.881	0	0	**0.180**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
733.3	21.653	N/A	38	N/A	N/A	N/A	N/A	0.880	0	0	**0.180**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
733.2	21.817	N/A	36	N/A	N/A	N/A	N/A	0.879	0	0	**0.180**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
733.0	21.981	N/A	42	N/A	N/A	N/A	N/A	0.877	0	0	**0.180**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
732.9	22.145	N/A	46	N/A	N/A	N/A	N/A	0.876	0	0	**0.180**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
732.7	22.309	N/A	43	N/A	N/A	N/A	N/A	0.875	0	0	**0.180**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
732.5	22.473	N/A	44	N/A	N/A	N/A	N/A	0.874	0	0	**0.180**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
732.4	22.638	N/A	42	N/A	N/A	N/A	N/A	0.873	0	0	**0.180**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
732.2	22.802	N/A	42	N/A	N/A	N/A	N/A	0.872	0	0	**0.180**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**C**
732.0	22.966	N/A	40	N/A	N/A	N/A	N/A	0.870	0	0	**0.180**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
731.9	23.130	N/A	38	N/A	N/A	N/A	N/A	0.869	0	0	**0.180**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
731.7	23.294	N/A	37	N/A	N/A	N/A	N/A	0.868	0	0	**0.180**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
731.5	23.458	N/A	37	N/A	N/A	N/A	N/A	0.867	0	0	**0.180**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
731.4	23.622	N/A	39	N/A	N/A	N/A	N/A	0.866	0	0	**0.180**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
731.2	23.786	N/A	40	N/A	N/A	N/A	N/A	0.864	0	0	**0.180**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
731.1	23.950	N/A	39	N/A	N/A	N/A	N/A	0.863	0	0	**0.180**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
730.9	24.114	N/A	45	N/A	N/A	N/A	N/A	0.862	0	0	**0.180**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
730.7	24.278	N/A	47	N/A	N/A	N/A	N/A	0.861	0	0	**0.180**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
730.6	24.442	N/A	44	N/A	N/A	N/A	N/A	0.860	0	0	**0.180**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
730.4	24.606	N/A	40	N/A	N/A	N/A	N/A	0.858	0	0	**0.180**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
730.2	24.770	N/A	39	N/A	N/A	N/A	N/A	0.857	0	0	**0.180**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
730.1	24.934	N/A	36	N/A	N/A	N/A	N/A	0.856	0	0	**0.180**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
729.9	25.098	N/A	37	N/A	N/A	N/A	N/A	0.855	0	0	**0.180**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
729.7	25.262	N/A	37	N/A	N/A	N/A	N/A	0.854	0	0	**0.180**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**

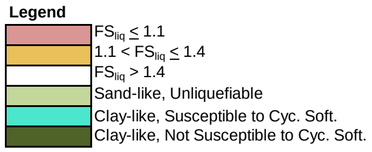
Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
729.6	25.426	N/A	38	N/A	N/A	N/A	N/A	0.852	0	0	**0.180**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
729.4	25.590	N/A	37	N/A	N/A	N/A	N/A	0.851	0	0	**0.180**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
729.2	25.754	N/A	37	N/A	N/A	N/A	N/A	0.850	0	0	**0.180**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
729.1	25.918	N/A	37	N/A	N/A	N/A	N/A	0.849	0	0	**0.180**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
728.9	26.082	N/A	37	N/A	N/A	N/A	N/A	0.847	0	0	**0.180**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**C**
728.8	26.246	N/A	37	N/A	N/A	N/A	N/A	0.846	0	0	**0.180**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
728.6	26.410	N/A	38	N/A	N/A	N/A	N/A	0.845	0	0	**0.180**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
728.4	26.574	N/A	37	N/A	N/A	N/A	N/A	0.844	0	0	**0.180**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
728.3	26.739	N/A	37	N/A	N/A	N/A	N/A	0.843	0	0	**0.180**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
728.1	26.903	N/A	37	N/A	N/A	N/A	N/A	0.841	0	0	**0.180**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
727.9	27.067	N/A	37	N/A	N/A	N/A	N/A	0.840	0	0	**0.180**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**C**
727.8	27.231	N/A	38	N/A	N/A	N/A	N/A	0.839	0	0	**0.179**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**C**
727.6	27.395	N/A	37	N/A	N/A	N/A	N/A	0.838	0	0	**0.179**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
727.4	27.559	N/A	39	N/A	N/A	N/A	N/A	0.836	0	0	**0.179**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
727.3	27.723	N/A	40	N/A	N/A	N/A	N/A	0.835	0	0	**0.179**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
727.1	27.887	N/A	40	N/A	N/A	N/A	N/A	0.834	0	0	**0.179**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
726.9	28.051	N/A	39	N/A	N/A	N/A	N/A	0.833	0	0	**0.179**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
726.8	28.215	N/A	42	N/A	N/A	N/A	N/A	0.832	0	0	**0.179**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
726.6	28.379	N/A	42	N/A	N/A	N/A	N/A	0.830	0	0	**0.179**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
726.5	28.543	N/A	40	N/A	N/A	N/A	N/A	0.829	0	0	**0.179**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
726.3	28.707	N/A	39	N/A	N/A	N/A	N/A	0.828	0	0	**0.179**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
726.1	28.871	N/A	39	N/A	N/A	N/A	N/A	0.827	0	0	**0.179**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
726.0	29.035	N/A	38	N/A	N/A	N/A	N/A	0.825	0	0	**0.178**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
725.8	29.199	N/A	37	N/A	N/A	N/A	N/A	0.824	0	0	**0.178**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**C**
725.6	29.363	N/A	36	N/A	N/A	N/A	N/A	0.823	0	0	**0.178**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**C**
725.5	29.527	N/A	36	N/A	N/A	N/A	N/A	0.822	0	0	**0.178**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
725.3	29.691	N/A	37	N/A	N/A	N/A	N/A	0.820	0	0	**0.178**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
725.1	29.855	N/A	39	N/A	N/A	N/A	N/A	0.819	0	0	**0.178**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
725.0	30.019	N/A	40	N/A	N/A	N/A	N/A	0.818	0	0	**0.178**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**B**
724.8	30.183	N/A	37	N/A	N/A	N/A	N/A	0.817	0	0	**0.178**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**B**
724.7	30.347	N/A	41	N/A	N/A	N/A	N/A	0.816	0	0	**0.178**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**B**
724.5	30.511	N/A	44	N/A	N/A	N/A	N/A	0.814	0	0	**0.177**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**B**
724.3	30.675	N/A	51	N/A	N/A	N/A	N/A	0.813	0	0	**0.177**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**A1**
724.2	30.840	N/A	41	N/A	N/A	N/A	N/A	0.812	0	0	**0.177**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**B**
724.0	31.004	N/A	39	N/A	N/A	N/A	N/A	0.811	0	0	**0.177**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**B**
723.8	31.168	N/A	42	N/A	N/A	N/A	N/A	0.809	0	0	**0.177**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**B**
723.7	31.332	N/A	40	N/A	N/A	N/A	N/A	0.808	0	0	**0.177**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**B**
723.5	31.496	N/A	39	N/A	N/A	N/A	N/A	0.807	0	0	**0.177**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**B**
723.3	31.660	N/A	38	N/A	N/A	N/A	N/A	0.806	0	0	**0.177**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**B**
723.2	31.824	N/A	39	N/A	N/A	N/A	N/A	0.804	0	0	**0.176**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**B**
723.0	31.988	N/A	39	N/A	N/A	N/A	N/A	0.803	0	0	**0.176**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
722.8	32.152	N/A	40	N/A	N/A	N/A	N/A	0.802	0	0	**0.176**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
722.7	32.316	N/A	38	N/A	N/A	N/A	N/A	0.801	0	0	**0.176**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
722.5	32.480	N/A	37	N/A	N/A	N/A	N/A	0.799	0	0	**0.176**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
722.4	32.644	N/A	37	N/A	N/A	N/A	N/A	0.798	0	0	**0.176**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
722.2	32.808	N/A	37	N/A	N/A	N/A	N/A	0.797	0	0	**0.176**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
722.0	32.972	N/A	38	N/A	N/A	N/A	N/A	0.796	0	0	**0.176**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
721.9	33.136	N/A	37	N/A	N/A	N/A	N/A	0.794	0	0	**0.175**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
721.7	33.300	N/A	36	N/A	N/A	N/A	N/A	0.793	0	0	**0.175**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
721.5	33.464	N/A	36	N/A	N/A	N/A	N/A	0.792	0	0	**0.175**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
721.4	33.628	N/A	36	N/A	N/A	N/A	N/A	0.791	0	0	**0.175**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
721.2	33.792	N/A	36	N/A	N/A	N/A	N/A	0.790	0	0	**0.175**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
721.0	33.956	N/A	36	N/A	N/A	N/A	N/A	0.788	0	0	**0.175**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
720.9	34.120	N/A	36	N/A	N/A	N/A	N/A	0.787	0	0	**0.175**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
720.7	34.284	N/A	36	N/A	N/A	N/A	N/A	0.786	0	0	**0.174**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**

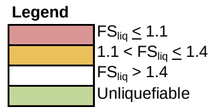
Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
720.6	34.448	N/A	36	N/A	N/A	N/A	N/A	0.785	0	0	**0.174**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
720.4	34.612	N/A	36	N/A	N/A	N/A	N/A	0.783	0	0	**0.174**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
720.2	34.776	N/A	36	N/A	N/A	N/A	N/A	0.782	0	0	**0.174**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
720.1	34.941	N/A	36	N/A	N/A	N/A	N/A	0.781	0	0	**0.174**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
719.9	35.105	N/A	36	N/A	N/A	N/A	N/A	0.780	0	0	**0.174**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
719.7	35.269	N/A	37	N/A	N/A	N/A	N/A	0.778	0	0	**0.173**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**B**
719.6	35.433	N/A	43	N/A	N/A	N/A	N/A	0.777	0	0	**0.173**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**B**
719.4	35.597	N/A	47	N/A	N/A	N/A	N/A	0.776	0	0	**0.173**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**B**
719.2	35.761	N/A	49	N/A	N/A	N/A	N/A	0.775	0	0	**0.173**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**B**
719.1	35.925	N/A	49	N/A	N/A	N/A	N/A	0.773	0	0	**0.173**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**B**
718.9	36.089	N/A	48	N/A	N/A	N/A	N/A	0.772	0	0	**0.173**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**B**
718.7	36.253	N/A	48	N/A	N/A	N/A	N/A	0.771	0	0	**0.172**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**B**
718.6	36.417	N/A	47	N/A	N/A	N/A	N/A	0.770	0	0	**0.172**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**B**
718.4	36.581	N/A	46	N/A	N/A	N/A	N/A	0.768	0	0	**0.172**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**B**
718.3	36.745	N/A	46	N/A	N/A	N/A	N/A	0.767	0	0	**0.172**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**B**
718.1	36.909	N/A	45	N/A	N/A	N/A	N/A	0.766	0	0	**0.172**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**B**
717.9	37.073	N/A	44	N/A	N/A	N/A	N/A	0.765	0	0	**0.172**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**B**
717.8	37.237	N/A	44	N/A	N/A	N/A	N/A	0.764	0	0	**0.171**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**B**
717.6	37.401	N/A	44	N/A	N/A	N/A	N/A	0.762	0	0	**0.171**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**B**
717.4	37.565	N/A	44	N/A	N/A	N/A	N/A	0.761	0	0	**0.171**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**B**
717.3	37.729	N/A	44	N/A	N/A	N/A	N/A	0.760	0	0	**0.171**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**B**
717.1	37.893	N/A	44	N/A	N/A	N/A	N/A	0.759	0	0	**0.171**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**B**
716.9	38.057	N/A	43	N/A	N/A	N/A	N/A	0.757	0	0	**0.171**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**B**
716.8	38.221	N/A	44	N/A	N/A	N/A	N/A	0.756	0	0	**0.170**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
716.6	38.385	N/A	44	N/A	N/A	N/A	N/A	0.755	0	0	**0.170**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
716.5	38.549	N/A	44	N/A	N/A	N/A	N/A	0.754	0	0	**0.170**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**B**
716.3	38.713	N/A	45	N/A	N/A	N/A	N/A	0.752	0	0	**0.170**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**B**
716.1	38.877	N/A	44	N/A	N/A	N/A	N/A	0.751	0	0	**0.170**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
716.0	39.042	0.113	44	0.971	0.917	1.10	0.111	0.750	0	0	**0.169**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**C**
715.8	39.206	0.113	44	0.971	0.918	1.10	0.111	0.749	0	0	**0.169**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**C**
715.6	39.370	0.114	45	0.970	0.923	1.10	0.113	0.748	0	0	**0.169**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**B**
715.5	39.534	0.116	46	0.969	0.933	1.11	0.116	0.746	0	0	**0.169**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**B**
715.3	39.698	0.115	46	0.969	0.930	1.11	0.115	0.745	0	0	**0.169**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**B**
715.1	39.862	0.116	46	0.969	0.934	1.11	0.117	0.744	0	0	**0.169**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**B**
715.0	40.026	0.115	45	0.969	0.924	1.10	0.113	0.743	0	0	**0.168**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**B**
714.8	40.190	0.113	44	0.969	0.916	1.10	0.110	0.741	0	0	**0.168**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**B**
714.6	40.354	0.112	44	0.969	0.913	1.10	0.109	0.740	0	0	**0.168**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**B**
714.5	40.518	0.112	43	0.969	0.911	1.10	0.108	0.739	0	0	**0.168**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**B**
714.3	40.682	0.111	43	0.969	0.907	1.10	0.107	0.738	0	0	**0.168**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**B**
714.2	40.846	0.111	43	0.968	0.906	1.10	0.107	0.737	0	0	**0.167**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**B**
714.0	41.010	0.111	43	0.968	0.908	1.10	0.107	0.735	0	0	**0.167**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**B**
713.8	41.174	0.112	43	0.968	0.909	1.10	0.108	0.734	0	0	**0.167**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**B**
713.7	41.338	0.111	43	0.968	0.905	1.10	0.106	0.733	0	0	**0.167**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**B**
713.5	41.502	0.111	43	0.967	0.904	1.10	0.106	0.732	0	0	**0.167**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**B**
713.3	41.666	0.110	42	0.967	0.902	1.10	0.105	0.731	0	0	**0.166**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**B**
713.2	41.830	0.110	42	0.967	0.900	1.09	0.105	0.729	0	0	**0.166**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
713.0	41.994	0.111	43	0.966	0.905	1.10	0.107	0.728	0	0	**0.166**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**B**
712.8	42.158	0.113	44	0.965	0.914	1.10	0.110	0.727	0	0	**0.166**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**C**
712.7	42.322	0.113	44	0.965	0.916	1.10	0.110	0.726	0	0	**0.166**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**C**
712.5	42.486	0.113	44	0.965	0.917	1.10	0.111	0.725	0	0	**0.166**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**C**
712.3	42.650	0.113	44	0.964	0.917	1.10	0.110	0.723	0	0	**0.165**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**C**
712.2	42.814	0.113	44	0.964	0.917	1.10	0.111	0.722	0	0	**0.165**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**B**
712.0	42.978	0.112	44	0.964	0.910	1.10	0.108	0.721	0	0	**0.165**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**B**
711.9	43.143	0.111	43	0.964	0.903	1.10	0.106	0.720	0	0	**0.165**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**B**
711.7	43.307	0.112	43	0.964	0.908	1.10	0.107	0.719	0	0	**0.165**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**B**

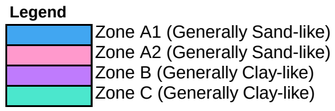
Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
711.5	43.471	0.107	41	0.965	0.887	1.09	0.100	0.717	0	0	**0.164**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**B**
711.4	43.635	0.104	38	0.966	0.870	1.08	0.094	0.716	0	0	**0.164**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**B**
711.2	43.799	0.102	37	0.966	0.864	1.08	0.092	0.715	0	0	**0.164**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
711.0	43.963	0.102	36	0.966	0.861	1.08	0.091	0.714	0	0	**0.164**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
710.9	44.127	0.101	36	0.966	0.859	1.08	0.090	0.713	0	0	**0.164**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
710.7	44.291	0.101	36	0.966	0.858	1.08	0.090	0.711	0	0	**0.163**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
710.5	44.455	0.101	36	0.966	0.858	1.08	0.090	0.710	0	0	**0.163**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
710.4	44.619	0.101	36	0.966	0.857	1.08	0.090	0.709	0	0	**0.163**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
710.2	44.783	0.101	36	0.965	0.857	1.08	0.090	0.708	0	0	**0.163**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
710.1	44.947	0.101	35	0.965	0.856	1.08	0.090	0.707	0	0	**0.163**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
709.9	45.111	0.100	35	0.965	0.856	1.08	0.089	0.706	0	0	**0.162**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
709.7	45.275	0.101	35	0.965	0.856	1.08	0.089	0.704	0	0	**0.162**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
709.6	45.439	0.100	35	0.964	0.855	1.08	0.089	0.703	0	0	**0.162**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
709.4	45.603	0.101	35	0.964	0.856	1.08	0.089	0.702	0	0	**0.162**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
709.2	45.767	0.101	36	0.964	0.857	1.08	0.090	0.701	0	0	**0.162**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
709.1	45.931	0.102	37	0.963	0.861	1.08	0.092	0.700	0	0	**0.161**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
708.9	46.095	0.109	42	0.960	0.892	1.09	0.102	0.698	0	0	**0.161**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
708.7	46.259	0.109	42	0.960	0.894	1.09	0.103	0.697	0	0	**0.161**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
708.6	46.423	0.109	41	0.960	0.890	1.09	0.101	0.696	0	0	**0.161**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
708.4	46.587	0.112	44	0.958	0.907	1.10	0.107	0.695	0	0	**0.161**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**A2**
708.2	46.751	0.113	44	0.958	0.909	1.10	0.108	0.694	0	0	**0.160**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**A2**
708.1	46.915	0.112	44	0.957	0.908	1.10	0.107	0.693	0	0	**0.160**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**A2**
707.9	47.079	0.117	46	0.955	0.931	1.11	0.115	0.691	0	0	**0.160**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**A2**
707.8	47.244	0.120	48	0.954	0.949	1.12	0.121	0.690	0	0	**0.160**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**A2**
707.6	47.408	0.127	51	0.951	0.987	1.13	0.135	0.689	0	0	**0.160**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**A2**
707.4	47.572	0.127	51	0.951	0.988	1.13	0.135	0.688	0	0	**0.159**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**A2**
707.3	47.736	0.132	53	0.949	1.014	1.14	0.145	0.687	0	0	**0.159**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**A1**
707.1	47.900	0.141	56	0.945	1.067	1.17	0.167	0.686	0	0	**0.159**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**A1**
706.9	48.064	0.160	61	0.940	1.166	1.21	0.213	0.685	0	0	**0.159**	FALSE	FALSE	FALSE	**1.3**	**Subunit 3**	**A1**
706.8	48.228	0.167	62	0.938	1.196	1.22	0.229	0.683	0	0	**0.159**	FALSE	FALSE	FALSE	**1.4**	**Subunit 3**	**A1**
706.6	48.392	0.168	62	0.937	1.199	1.23	0.231	0.682	0	0	**0.158**	FALSE	FALSE	FALSE	**1.5**	**Subunit 3**	**A1**
706.4	48.556	0.171	63	0.936	1.215	1.23	0.240	0.681	0	0	**0.158**	FALSE	FALSE	FALSE	**1.5**	**Subunit 3**	**A1**
706.3	48.720	0.164	62	0.937	1.180	1.22	0.221	0.680	0	0	**0.158**	FALSE	FALSE	FALSE	**1.4**	**Subunit 3**	**A1**
706.1	48.884	0.176	64	0.934	1.235	1.24	0.252	0.679	0	0	**0.158**	FALSE	FALSE	FALSE	**1.6**	**Subunit 3**	**A1**
706.0	49.048	0.178	64	0.933	1.245	1.25	0.258	0.678	0	0	**0.157**	FALSE	FALSE	FALSE	**1.6**	**Subunit 3**	**A1**
705.8	49.212	0.183	65	0.932	1.262	1.26	0.270	0.677	0	0	**0.157**	FALSE	FALSE	FALSE	**1.7**	**Subunit 3**	**A1**
705.6	49.376	0.176	64	0.933	1.234	1.24	0.253	0.675	0	0	**0.157**	FALSE	FALSE	FALSE	**1.6**	**Subunit 3**	**A1**
705.5	49.540	0.167	62	0.935	1.188	1.22	0.226	0.674	0	0	**0.157**	FALSE	FALSE	FALSE	**1.4**	**Subunit 3**	**A1**
705.3	49.704	0.165	62	0.935	1.178	1.22	0.221	0.673	0	0	**0.157**	FALSE	FALSE	FALSE	**1.4**	**Subunit 3**	**A1**
705.1	49.868	0.162	61	0.935	1.163	1.21	0.214	0.672	0	0	**0.156**	FALSE	FALSE	FALSE	**1.4**	**Subunit 3**	**A1**
705.0	50.032	0.156	60	0.936	1.135	1.20	0.200	0.671	0	0	**0.156**	FALSE	FALSE	FALSE	**1.3**	**Subunit 3**	**A1**
704.8	50.196	0.145	57	0.940	1.077	1.18	0.172	0.670	0	0	**0.156**	FALSE	FALSE	FALSE	**1.1**	**Subunit 3**	**A1**
704.6	50.360	0.145	57	0.939	1.077	1.18	0.172	0.669	0	0	**0.156**	FALSE	FALSE	FALSE	**1.1**	**Subunit 3**	**A1**
704.5	50.524	0.191	66	0.927	1.284	1.27	0.288	0.668	0	0	**0.155**	FALSE	FALSE	FALSE	**1.9**	**Subunit 3**	**A1**
704.3	50.688	0.110	42	0.952	0.895	1.09	0.102	0.666	0	0	**0.155**	FALSE	FALSE	FALSE	**0.7**	**Subunit 3**	**A1**
704.1	50.852	N/A	100	N/A	N/A	N/A	N/A	0.665	0	0	**0.155**	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**	**A1**



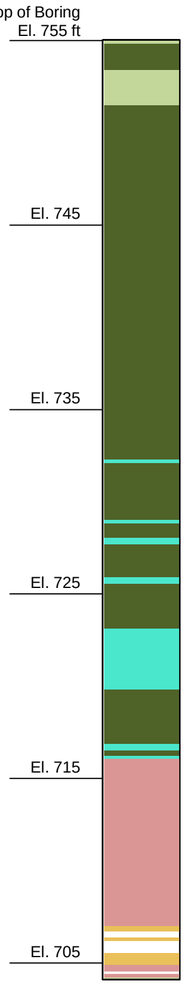
Adapted from "Discussion of 'Liquefaction Potential of Silts from CPTu'" (Robertson 2008). Zone A_1 and Zone A_2 samples are generally sand-like. Zone B samples are generally clay-like and not susceptible to cyclic softening. Zone C samples are generally clay-like and susceptible to cyclic softening. Note that the transition from clay-like to sand-like in this chart does not exactly match the liquefaction calculations herein; that is, some transitional samples in Zone B and Zone C will be treated as sand-like and analyzed for liquefaction if the calculations indicate as such.



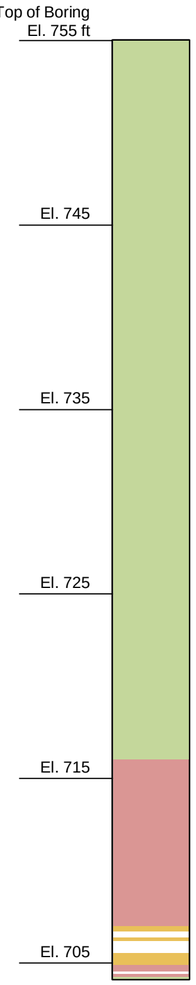




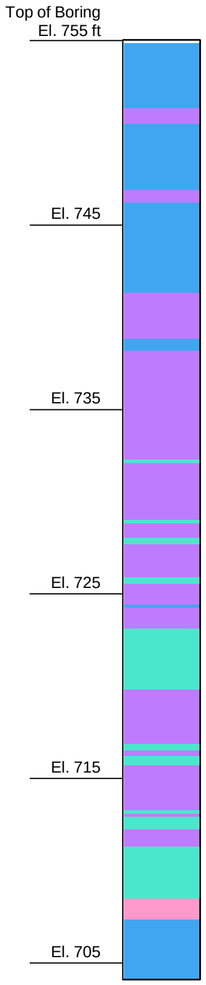
CPT-02D, Liquefaction Triggering Results



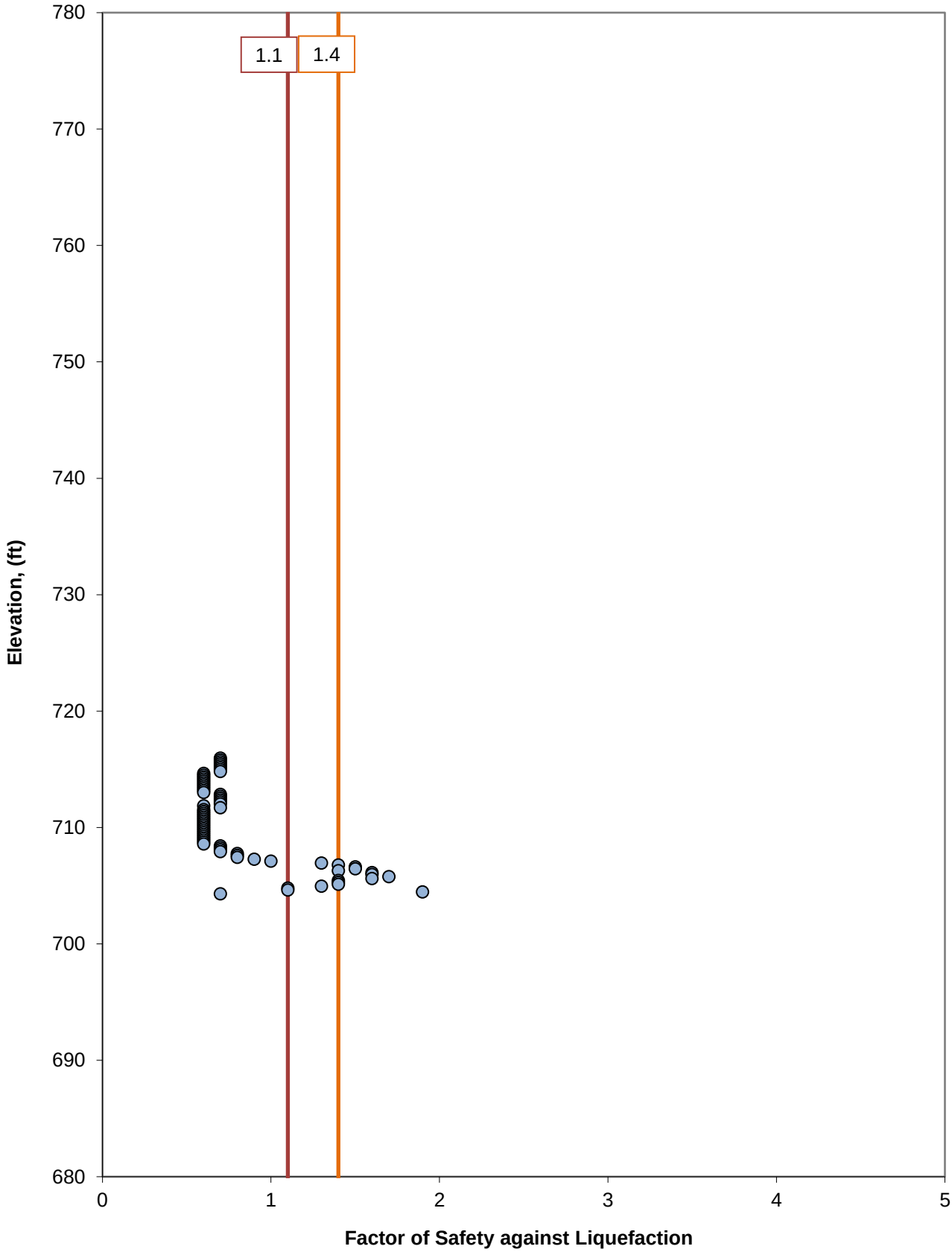
CPT-02D, Liquefaction Triggering Results



CPT-02D, Robertson Soil Type



KIF TDEC Stability, Boring = CPT-02D, Source = 10 Hz, Mw = 6, Event = Design EQ, CPT Data, Simplified Stress-Based Approach



Project Information

Stantec Project Number =	175668043
Project Name =	KIF TDEC Stability
CPT ID =	CPT-03C

Boring Location (optional)

Northing =	
Easting =	

OR

Baseline Station =	
Offset (+ Right) =	

Using qt (corrected for u2 PWP) or qc (backcalculated uncorrected field tip)

Cone ID (optional) =	AD184	
Use qc instead of qt?	0	(1: Yes, 0: No)
Cone Area Ratio (a) =	0.80	

Drilling Information

Top of Hole Elevation =	754.0	feet
Water Depth during CPT (negative for U/S borings) =	4.0	feet
Depth data collection began =	0.16	feet
Avg. Total Unit Wt. Above 1st Sample =	120.00	pcf

During Earthquake Information

Water Depth during EQ (relative to CPT TOH, negative for U/S borings) =	5.3	feet
Final Grade Elevation during EQ =	753.8	feet
Avg. Total Unit Wt. of Cut/Fill =	120	pcf

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile?	0	(1: Yes, 0: No)

If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile:	Section_AA, KIF-A2_NOR	
α at each Sample Depth known?	1	(1: Yes, 0: No)

If previous answer is No, then enter curve fit parameters below (α vs. depth curve)

If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_σ will be one.

m4:	
m3:	
m2:	
m1:	
m0:	

Associated ground response profile:	Section_AA, KIF-CPT03_NOR	
Get CSR from shear stress envelope?	0	(1: Yes, 0: No)

If previous answer is No, then CSR will be calculated using a_{max} and r_d

Max. Shear Stress at each sample depth known?		(1: Yes, 0: No)

If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4:	
m3:	
m2:	
m1:	

Earthquake Information

EQ Source (e.g., New Madrid)	10 Hz
Event (e.g., MCE, OBE)	Design EQ
a_{max} (g) (top of ground surface)	0.19
EQ Mag (Mw)	6.0

Inputs

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
0.164	47.035	0.059	120	Clay fill (irrelevant)	Clay-like		0.006			
0.328	76.574	0.115	120	Clay fill (irrelevant)	Clay-like		0.005			
0.492	113.920	0.098	120	Clay fill (irrelevant)	Clay-like		0.004			
0.656	127.401	0.238	120	Clay fill (irrelevant)	Clay-like		0.002			
0.820	142.974	0.283	120	Clay fill (irrelevant)	Clay-like		0.001			
0.984	269.243	0.524	128	Embankemnt Fill	Clay-like		0.000			
1.148	393.383	1.185	128	Embankemnt Fill	Clay-like		0.002			
1.312	333.624	1.916	128	Embankemnt Fill	Clay-like		0.005			
1.476	290.128	2.618	128	Embankemnt Fill	Clay-like		0.008			
1.640	281.234	3.813	128	Embankemnt Fill	Clay-like		0.011			
1.804	188.836	3.671	128	Embankemnt Fill	Clay-like		0.014			
1.968	224.017	3.004	128	Embankemnt Fill	Clay-like		0.017			
2.133	265.821	2.564	128	Embankemnt Fill	Clay-like		0.017			
2.297	295.342	2.183	128	Embankemnt Fill	Clay-like		0.016			
2.461	311.668	2.372	128	Embankemnt Fill	Clay-like		0.015			
2.625	277.489	2.009	128	Embankemnt Fill	Clay-like		0.014			
2.789	219.453	1.994	128	Embankemnt Fill	Clay-like		0.013			
2.953	159.383	1.606	128	Embankemnt Fill	Clay-like		0.013			
3.117	84.065	1.060	128	Embankemnt Fill	Clay-like		0.015			
3.281	46.785	1.551	128	Embankemnt Fill	Clay-like		0.016			
3.445	38.962	1.637	128	Embankemnt Fill	Clay-like		0.018			
3.609	36.177	1.936	128	Embankemnt Fill	Clay-like		0.019			
3.773	64.324	1.977	128	Embankemnt Fill	Clay-like		0.020			
3.937	46.722	2.112	128	Embankemnt Fill	Clay-like		0.021			
4.101	34.363	1.734	128	Embankemnt Fill	Clay-like		0.022			
4.265	119.984	2.741	128	Embankemnt Fill	Clay-like		0.023			
4.429	256.936	2.781	128	Embankemnt Fill	Clay-like		0.024			
4.593	282.149	2.768	128	Embankemnt Fill	Clay-like		0.025			
4.757	203.110	1.837	128	Embankemnt Fill	Clay-like		0.026			
4.921	123.985	1.778	128	Embankemnt Fill	Clay-like		0.027			
5.085	85.541	1.897	128	Embankemnt Fill	Clay-like		0.029			
5.249	44.831	2.087	128	Embankemnt Fill	Clay-like		0.030			
5.413	45.141	2.683	128	Embankemnt Fill	Clay-like		0.032			
5.577	48.282	2.762	128	Embankemnt Fill	Clay-like		0.035			
5.741	37.745	2.219	128	Embankemnt Fill	Clay-like		0.037			
5.905	71.939	1.823	128	Embankemnt Fill	Clay-like		0.039			
6.069	199.053	2.606	128	Embankemnt Fill	Clay-like		0.041			
6.234	162.048	2.860	128	Embankemnt Fill	Clay-like		0.042			
6.398	100.743	3.546	128	Embankemnt Fill	Clay-like		0.043			
6.562	69.788	4.928	128	Embankemnt Fill	Clay-like		0.044			
6.726	184.287	3.059	128	Embankemnt Fill	Clay-like		0.045			
6.890	218.926	4.286	128	Embankemnt Fill	Clay-like		0.046			
7.054	121.757	5.617	128	Embankemnt Fill	Clay-like		0.047			
7.218	82.002	6.543	128	Embankemnt Fill	Clay-like		0.048			
7.382	85.733	3.755	128	Embankemnt Fill	Clay-like		0.049			
7.546	163.038	4.460	128	Embankemnt Fill	Clay-like		0.051			
7.710	177.553	7.482	128	Embankemnt Fill	Clay-like		0.052			
7.874	216.443	5.150	128	Embankemnt Fill	Clay-like		0.053			
8.038	276.222	5.597	128	Embankemnt Fill	Clay-like		0.055			
8.202	203.355	5.073	128	Embankemnt Fill	Clay-like		0.056			
8.366	126.907	4.478	128	Embankemnt Fill	Clay-like		0.057			
8.530	98.891	4.080	128	Embankemnt Fill	Clay-like		0.058			
8.694	80.039	3.510	128	Embankemnt Fill	Clay-like		0.059			
8.858	66.775	4.226	128	Embankemnt Fill	Clay-like		0.059			
9.022	55.403	3.312	128	Embankemnt Fill	Clay-like		0.060			
9.186	45.023	2.984	128	Embankemnt Fill	Clay-like		0.061			
9.350	64.623	2.926	128	Embankemnt Fill	Clay-like		0.061			
9.514	58.551	5.504	128	Embankemnt Fill	Clay-like		0.062			
9.678	69.712	7.309	128	Embankemnt Fill	Clay-like		0.063			
9.842	304.048	7.652	128	Embankemnt Fill	Clay-like		0.064			
10.006	319.457	2.501	128	Embankemnt Fill	Clay-like		0.065			
10.170	252.355	3.957	128	Embankemnt Fill	Clay-like		0.066			
10.335	140.028	4.180	128	Embankemnt Fill	Clay-like		0.067			

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
10.499	121.192	5.040	128	Embankemnt Fill	Clay-like		0.068			
10.663	100.985	3.654	128	Embankemnt Fill	Clay-like		0.068			
10.827	129.292	2.470	128	Embankemnt Fill	Clay-like		0.069			
10.991	71.777	1.797	128	Embankemnt Fill	Clay-like		0.070			
11.155	64.490	1.453	128	Embankemnt Fill	Clay-like		0.070			
11.319	61.650	1.158	128	Embankemnt Fill	Clay-like		0.071			
11.483	50.205	1.216	128	Embankemnt Fill	Clay-like		0.071			
11.647	53.643	1.247	128	Embankemnt Fill	Clay-like		0.072			
11.811	39.970	1.235	128	Embankemnt Fill	Clay-like		0.072			
11.975	43.783	1.247	128	Embankemnt Fill	Clay-like		0.073			
12.139	49.680	2.303	128	Embankemnt Fill	Clay-like		0.073			
12.303	96.225	3.753	128	Embankemnt Fill	Clay-like		0.074			
12.467	255.099	3.856	128	Embankemnt Fill	Clay-like		0.074			
12.631	201.382	1.708	128	Embankemnt Fill	Clay-like		0.075			
12.795	186.977	2.126	128	Embankemnt Fill	Clay-like		0.075			
12.959	161.977	4.452	128	Embankemnt Fill	Clay-like		0.076			
13.123	164.536	3.292	128	Embankemnt Fill	Clay-like		0.076			
13.287	46.283	3.147	128	Embankemnt Fill	Clay-like		0.077			
13.451	41.482	1.930	128	Embankemnt Fill	Clay-like		0.077			
13.615	95.280	1.005	128	Embankemnt Fill	Clay-like		0.077			
13.779	34.691	1.251	128	Embankemnt Fill	Clay-like		0.078			
13.943	54.189	1.234	128	Embankemnt Fill	Clay-like		0.078			
14.107	54.968	1.085	128	Embankemnt Fill	Clay-like		0.078			
14.271	39.258	1.127	128	Embankemnt Fill	Clay-like		0.079			
14.436	61.209	1.299	128	Embankemnt Fill	Clay-like		0.080			
14.600	70.498	1.486	128	Embankemnt Fill	Clay-like		0.080			
14.764	56.047	1.536	128	Embankemnt Fill	Clay-like		0.081			
14.928	42.647	2.372	128	Embankemnt Fill	Clay-like		0.081			
15.092	39.818	2.712	128	Embankemnt Fill	Clay-like		0.082			
15.256	99.591	2.912	128	Embankemnt Fill	Clay-like		0.083			
15.420	88.460	3.172	128	Embankemnt Fill	Clay-like		0.083			
15.584	72.560	3.267	128	Embankemnt Fill	Clay-like		0.084			
15.748	48.731	2.964	128	Embankemnt Fill	Clay-like		0.085			
15.912	40.741	3.044	128	Embankemnt Fill	Clay-like		0.085			
16.076	51.302	2.831	128	Embankemnt Fill	Clay-like		0.085			
16.240	46.252	2.029	128	Embankemnt Fill	Clay-like		0.085			
16.404	33.393	1.890	128	Embankemnt Fill	Clay-like		0.086			
16.568	31.545	1.701	128	Embankemnt Fill	Clay-like		0.086			
16.732	27.498	1.541	128	Embankemnt Fill	Clay-like		0.086			
16.896	24.137	1.419	128	Embankemnt Fill	Clay-like		0.086			
17.060	18.246	1.360	128	Embankemnt Fill	Clay-like		0.086			
17.224	16.257	1.242	128	Embankemnt Fill	Clay-like		0.086			
17.388	18.669	1.108	128	Embankemnt Fill	Clay-like		0.085			
17.552	13.189	0.873	128	Embankemnt Fill	Clay-like		0.085			
17.716	9.160	0.645	128	Embankemnt Fill	Clay-like		0.085			
17.880	9.273	0.564	128	Embankemnt Fill	Clay-like		0.085			
18.044	12.016	0.641	128	Embankemnt Fill	Clay-like		0.086			
18.208	13.937	0.732	128	Embankemnt Fill	Clay-like		0.086			
18.372	13.208	0.721	128	Embankemnt Fill	Clay-like		0.087			
18.537	15.048	0.666	128	Embankemnt Fill	Clay-like		0.088			
18.701	12.089	0.611	128	Embankemnt Fill	Clay-like		0.089			
18.865	8.589	0.501	128	Embankemnt Fill	Clay-like		0.090			
19.029	11.141	0.418	128	Embankemnt Fill	Clay-like		0.090			
19.193	11.291	0.351	128	Embankemnt Fill	Clay-like		0.090			
19.357	8.453	0.252	128	Embankemnt Fill	Clay-like		0.091			
19.521	6.026	0.282	128	Embankemnt Fill	Clay-like		0.091			
19.685	5.026	0.314	128	Embankemnt Fill	Clay-like		0.092			
19.849	6.654	0.257	128	Embankemnt Fill	Clay-like		0.092			
20.013	5.153	0.273	128	Embankemnt Fill	Clay-like		0.093			
20.177	4.752	0.224	128	Embankemnt Fill	Clay-like		0.093			
20.341	6.176	0.198	128	Embankemnt Fill	Clay-like		0.093			
20.505	5.423	0.252	128	Embankemnt Fill	Clay-like		0.094			
20.669	6.174	0.239	128	Embankemnt Fill	Clay-like		0.094			
20.833	9.461	0.241	128	Embankemnt Fill	Clay-like		0.095			
20.997	8.585	0.236	128	Embankemnt Fill	Clay-like		0.095			
21.161	7.075	0.269	128	Embankemnt Fill	Clay-like		0.095			
21.325	5.934	0.233	128	Embankemnt Fill	Clay-like		0.096			
21.489	8.275	0.215	128	Embankemnt Fill	Clay-like		0.096			
21.653	6.831	0.221	128	Embankemnt Fill	Clay-like		0.097			
21.817	5.299	0.289	128	Embankemnt Fill	Clay-like		0.097			
21.981	7.333	0.228	128	Embankemnt Fill	Clay-like		0.098			
22.145	8.769	0.209	128	Embankemnt Fill	Clay-like		0.098			
22.309	7.495	0.325	128	Embankemnt Fill	Clay-like		0.098			
22.473	6.676	0.358	128	Embankemnt Fill	Clay-like		0.099			
22.638	7.370	0.350	128	Embankemnt Fill	Clay-like		0.099			

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
22.802	6.160	0.263	128	Embankemnt Fill	Clay-like		0.099			
22.966	7.252	0.455	128	Embankemnt Fill	Clay-like		0.100			
23.130	9.747	0.553	128	Embankemnt Fill	Clay-like		0.100			
23.294	9.498	0.565	128	Embankemnt Fill	Clay-like		0.100			
23.458	8.807	0.458	128	Embankemnt Fill	Clay-like		0.101			
23.622	10.230	0.432	128	Embankemnt Fill	Clay-like		0.101			
23.786	9.709	0.520	128	Embankemnt Fill	Clay-like		0.101			
23.950	8.041	0.525	128	Embankemnt Fill	Clay-like		0.102			
24.114	7.845	0.363	128	Embankemnt Fill	Clay-like		0.102			
24.278	6.646	0.285	128	Embankemnt Fill	Clay-like		0.102			
24.442	5.140	0.252	128	Embankemnt Fill	Clay-like		0.102			
24.606	5.984	0.313	128	Embankemnt Fill	Clay-like		0.103			
24.770	7.292	0.650	128	Embankemnt Fill	Clay-like		0.103			
24.934	26.935	1.429	128	Embankemnt Fill	Clay-like		0.103			
25.098	24.948	0.991	128	Embankemnt Fill	Clay-like		0.103			
25.262	95.003	1.006	128	Embankemnt Fill	Clay-like		0.104			
25.426	41.638	0.969	128	Embankemnt Fill	Clay-like		0.104			
25.590	32.047	1.024	128	Embankemnt Fill	Clay-like		0.104			
25.754	31.187	1.142	128	Embankemnt Fill	Clay-like		0.104			
25.918	17.836	1.029	128	Embankemnt Fill	Clay-like		0.105			
26.082	13.801	0.504	128	Embankemnt Fill	Clay-like		0.105			
26.246	10.688	0.458	128	Embankemnt Fill	Clay-like		0.105			
26.410	11.205	0.426	128	Embankemnt Fill	Clay-like		0.105			
26.574	9.107	0.459	128	Embankemnt Fill	Clay-like		0.106			
26.739	8.659	0.463	128	Embankemnt Fill	Clay-like		0.106			
26.903	12.106	0.406	128	Embankemnt Fill	Clay-like		0.106			
27.067	11.805	0.425	128	Embankemnt Fill	Clay-like		0.106			
27.231	9.618	0.452	128	Embankemnt Fill	Clay-like		0.107			
27.395	12.081	0.587	128	Embankemnt Fill	Clay-like		0.107			
27.559	12.155	0.583	128	Embankemnt Fill	Clay-like		0.107			
27.723	15.495	0.452	128	Embankemnt Fill	Clay-like		0.107			
27.887	14.361	0.453	128	Embankemnt Fill	Clay-like		0.108			
28.051	9.341	0.406	128	Embankemnt Fill	Clay-like		0.108			
28.215	10.448	0.420	128	Embankemnt Fill	Clay-like		0.108			
28.379	12.236	0.344	128	Embankemnt Fill	Clay-like		0.108			
28.543	12.587	0.367	128	Embankemnt Fill	Clay-like		0.109			
28.707	13.706	0.400	128	Embankemnt Fill	Clay-like		0.109			
28.871	10.358	0.402	128	Embankemnt Fill	Clay-like		0.109			
29.035	9.187	0.414	128	Embankemnt Fill	Clay-like		0.109			
29.199	7.640	0.380	128	Embankemnt Fill	Clay-like		0.110			
29.363	6.781	0.205	128	Embankemnt Fill	Clay-like		0.110			
29.527	6.847	0.241	128	Embankemnt Fill	Clay-like		0.110			
29.691	5.682	0.259	128	Embankemnt Fill	Clay-like		0.110			
29.855	5.176	0.247	128	Embankemnt Fill	Clay-like		0.110			
30.019	6.777	0.146	127	Subunit 1	Clay-like		0.111			
30.183	8.306	0.168	127	Subunit 1	Clay-like		0.111			
30.347	9.152	0.244	127	Subunit 1	Clay-like		0.111			
30.511	10.067	0.273	127	Subunit 1	Clay-like		0.111			
30.675	9.961	0.267	127	Subunit 1	Clay-like		0.112			
30.840	9.628	0.244	127	Subunit 1	Clay-like		0.112			
31.004	8.807	0.207	127	Subunit 1	Clay-like		0.112			
31.168	7.569	0.172	127	Subunit 1	Clay-like		0.112			
31.332	7.447	0.150	127	Subunit 1	Clay-like		0.113			
31.496	7.498	0.121	127	Subunit 1	Clay-like		0.113			
31.660	7.078	0.104	127	Subunit 1	Clay-like		0.113			
31.824	7.856	0.123	127	Subunit 1	Clay-like		0.113			
31.988	8.360	0.134	127	Subunit 1	Clay-like		0.113			
32.152	8.352	0.127	127	Subunit 1	Clay-like		0.113			
32.316	8.288	0.137	127	Subunit 1	Clay-like		0.114			
32.480	7.980	0.130	127	Subunit 1	Clay-like		0.114			
32.644	8.064	0.144	127	Subunit 1	Clay-like		0.114			
32.808	9.495	0.248	126	Subunit 2	Sand-like		0.114			
32.972	11.526	0.278	126	Subunit 2	Sand-like		0.114			
33.136	9.379	0.285	126	Subunit 2	Sand-like		0.114			
33.300	9.392	0.261	126	Subunit 2	Sand-like		0.114			
33.464	9.039	0.233	126	Subunit 2	Sand-like		0.114			
33.628	8.525	0.246	126	Subunit 2	Sand-like		0.115			
33.792	9.205	0.271	126	Subunit 2	Sand-like		0.115			
33.956	10.547	0.374	126	Subunit 2	Sand-like		0.115			
34.120	11.030	0.521	126	Subunit 2	Sand-like		0.115			
34.284	13.190	0.614	126	Subunit 2	Sand-like		0.115			
34.448	15.440	0.660	126	Subunit 2	Sand-like		0.116			
34.612	19.465	0.732	126	Subunit 2	Sand-like		0.118			
34.776	25.939	0.853	126	Subunit 2	Sand-like		0.118			
34.941	29.491	1.015	126	Subunit 2	Sand-like		0.118			

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
35.105	33.560	1.498	126	Subunit 2	Sand-like		0.118			
35.269	36.800	1.796	126	Subunit 2	Sand-like		0.118			
35.433	39.143	1.852	126	Subunit 2	Sand-like		0.118			
35.597	37.321	1.831	126	Subunit 2	Sand-like		0.118			
35.761	36.659	1.571	126	Subunit 2	Sand-like		0.119			
35.925	33.718	1.368	126	Subunit 2	Sand-like		0.119			
36.089	35.143	1.571	126	Subunit 2	Sand-like		0.119			
36.253	40.161	1.693	126	Subunit 2	Sand-like		0.119			
36.417	36.244	1.587	126	Subunit 2	Sand-like		0.119			
36.581	34.152	1.474	126	Subunit 2	Sand-like		0.119			
36.745	32.511	1.291	126	Subunit 2	Sand-like		0.120			
36.909	29.528	1.282	126	Subunit 2	Sand-like		0.120			
37.073	28.890	1.233	126	Subunit 2	Sand-like		0.120			
37.237	29.684	1.147	126	Subunit 2	Sand-like		0.120			
37.401	30.855	1.166	126	Subunit 2	Sand-like		0.120			
37.565	30.930	1.302	126	Subunit 2	Sand-like		0.120			
37.729	27.419	1.153	126	Subunit 2	Sand-like		0.121			
37.893	25.121	1.137	126	Subunit 2	Sand-like		0.121			
38.057	25.828	0.801	126	Subunit 2	Sand-like		0.121			
38.221	24.960	0.716	126	Subunit 2	Sand-like		0.121			
38.385	24.499	0.711	126	Subunit 2	Sand-like		0.122			
38.549	26.088	0.802	126	Subunit 2	Sand-like		0.122			
38.713	22.525	0.906	126	Subunit 2	Sand-like		0.122			
38.877	21.161	0.945	126	Subunit 2	Sand-like		0.122			
39.042	20.169	0.853	126	Subunit 2	Sand-like		0.123			
39.206	19.151	0.662	126	Subunit 2	Sand-like		0.123			
39.370	16.905	0.706	126	Subunit 2	Sand-like		0.123			
39.534	15.751	0.589	126	Subunit 2	Sand-like		0.124			
39.698	14.757	0.552	126	Subunit 2	Sand-like		0.124			
39.862	16.070	0.497	126	Subunit 2	Sand-like		0.124			
40.026	17.924	0.574	126	Subunit 2	Sand-like		0.124			
40.190	22.241	0.619	126	Subunit 2	Sand-like		0.124			
40.354	18.531	0.835	126	Subunit 2	Sand-like		0.125			
40.518	16.770	0.717	126	Subunit 2	Sand-like		0.125			
40.682	13.444	0.559	126	Subunit 2	Sand-like		0.125			
40.846	11.025	0.381	126	Subunit 2	Sand-like		0.125			
41.010	9.609	0.316	126	Subunit 2	Sand-like		0.125			
41.174	8.859	0.381	126	Subunit 2	Sand-like		0.125			
41.338	11.224	0.369	126	Subunit 2	Sand-like		0.125			
41.502	12.614	0.338	126	Subunit 2	Sand-like		0.125			
41.666	15.032	0.283	126	Subunit 2	Sand-like		0.125			
41.830	11.514	0.203	126	Subunit 2	Sand-like		0.125			
41.994	9.517	0.176	126	Subunit 2	Sand-like		0.125			
42.158	7.505	0.135	126	Subunit 2	Sand-like		0.126			
42.322	19.319	0.087	126	Subunit 2	Sand-like		0.126			
42.486	21.856	0.132	126	Subunit 2	Sand-like		0.126			
42.650	17.312	0.167	126	Subunit 2	Sand-like		0.126			
42.814	14.806	0.167	126	Subunit 2	Sand-like		0.127			
42.978	10.959	0.130	126	Subunit 2	Sand-like		0.127			
43.143	13.996	0.073	126	Subunit 2	Sand-like		0.127			
43.307	18.675	0.085	126	Subunit 2	Sand-like		0.127			
43.471	15.704	0.124	126	Subunit 2	Sand-like		0.128			
43.635	12.990	0.152	126	Subunit 2	Sand-like		0.128			
43.799	21.825	0.170	126	Subunit 2	Sand-like		0.128			
43.963	24.380	0.119	126	Subunit 2	Sand-like		0.128			
44.127	27.870	0.118	126	Subunit 2	Sand-like		0.128			
44.291	29.293	0.127	126	Subunit 2	Sand-like		0.128			
44.455	25.274	0.154	126	Subunit 2	Sand-like		0.128			
44.619	24.318	0.198	126	Subunit 2	Sand-like		0.128			
44.783	25.889	0.221	126	Subunit 2	Sand-like		0.128			
44.947	29.550	0.191	131	Subunit 3	Sand-like		0.128			
45.111	32.066	0.125	131	Subunit 3	Sand-like		0.128			
45.275	37.823	0.150	131	Subunit 3	Sand-like		0.128			
45.439	39.587	0.175	131	Subunit 3	Sand-like		0.129			
45.603	37.563	0.405	131	Subunit 3	Sand-like		0.129			
45.767	34.680	0.421	131	Subunit 3	Sand-like		0.129			
45.931	59.660	0.333	131	Subunit 3	Sand-like		0.129			
46.095	77.264	0.419	131	Subunit 3	Sand-like		0.129			
46.259	85.326	0.527	131	Subunit 3	Sand-like		0.129			
46.423	96.491	0.567	131	Subunit 3	Sand-like		0.129			
46.587	99.760	0.642	131	Subunit 3	Sand-like		0.130			
46.751	99.419	0.798	131	Subunit 3	Sand-like		0.130			
46.915	89.554	0.738	131	Subunit 3	Sand-like		0.130			
47.079	80.742	0.716	131	Subunit 3	Sand-like		0.130			
47.244	70.101	0.642	131	Subunit 3	Sand-like		0.131			

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
47.408	62.642	0.577	131	Subunit 3	Sand-like		0.131			
47.572	60.228	0.539	131	Subunit 3	Sand-like		0.131			
47.736	58.831	0.504	131	Subunit 3	Sand-like		0.131			
47.900	53.747	0.461	131	Subunit 3	Sand-like		0.131			
48.064	47.516	0.427	131	Subunit 3	Sand-like		0.131			
48.228	40.044	0.371	131	Subunit 3	Sand-like		0.131			
48.392	33.294	0.374	131	Subunit 3	Sand-like		0.131			
48.556	28.801	0.388	131	Subunit 3	Sand-like		0.131			
48.720	42.725	0.326	131	Subunit 3	Sand-like		0.131			
48.884	51.616	0.343	131	Subunit 3	Sand-like		0.131			
49.048	47.955	0.377	131	Subunit 3	Sand-like		0.131			
49.212	46.021	0.355	131	Subunit 3	Sand-like		0.130			
49.376	51.443	0.310	131	Subunit 3	Sand-like		0.130			
49.540	64.817	0.395	131	Subunit 3	Sand-like		0.130			
49.704	83.215	0.786	131	Subunit 3	Sand-like		0.129			
49.868	109.839	0.613	131	Subunit 3	Sand-like		0.129			
50.032	196.779	0.010	131	Subunit 3	Sand-like		0.128			
50.196	312.712	0.010	131	Subunit 3	Sand-like		0.128			

LIQUEFACTION POTENTIAL ASSESSMENT FOR COARSE GRAINED SOILS USING CONE PENETRATION TEST DATA

Facility: KIF TDEC Stability
Project No.: 175668043
CPT ID: CPT-03C

Water Elevation during CPT:	750.0	ft
Depth to Water during CPT:	4.0	ft *(relative to ground surface during CPT)*
Water Elevation during Earthquake:	748.7	ft
Depth to Water during Earthquake:	5.3	ft *(relative to ground surface during CPT)*
Final Grade Elevation during EQ:	753.8	ft *(if no fill, then set this equal to top of CPT hole elev.)*
Height of Final Grade above CPT TOH:	-0.2	ft *(relative to ground surface during CPT, + Fill, - Cut)*
Unit Weight of Cut/Fill to Achieve Final Grade	120	pcf
Cut/Fill Total Stress (+ Fill, - Cut):	-0.01	tsf

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight γ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
754.0				Vertical Stresses above 1st CPT:			**0.01**	**0.00**	**0.00**	**0.00**	**0.01**	**0.00**
753.8	0.164	47.04	0.06	120	**0.16**	0.09	0.01	0.00	0.00	0.00	0.01	0.00
753.7	0.328	76.57	0.12	120	0.25	0.16	0.02	0.01	0.00	0.00	0.02	0.01
753.5	0.492	113.92	0.10	120	0.41	0.16	0.03	0.02	0.00	0.00	0.03	0.02
753.3	0.656	127.40	0.24	120	0.57	0.16	0.04	0.03	0.00	0.00	0.04	0.03
753.2	0.820	142.97	0.28	120	0.74	0.16	0.05	0.04	0.00	0.00	0.05	0.04
753.0	0.984	269.24	0.52	128	0.90	0.16	0.06	0.05	0.00	0.00	0.06	0.05
752.9	1.148	393.38	1.19	128	1.07	0.16	0.07	0.06	0.00	0.00	0.07	0.06
752.7	1.312	333.62	1.92	128	1.23	0.16	0.08	0.07	0.00	0.00	0.08	0.07
752.5	1.476	290.13	2.62	128	1.39	0.16	0.09	0.08	0.00	0.00	0.09	0.08
752.4	1.640	281.23	3.81	128	1.56	0.16	0.10	0.09	0.00	0.00	0.10	0.09
752.2	1.804	188.84	3.67	128	1.72	0.16	0.11	0.10	0.00	0.00	0.11	0.10
752.0	1.968	224.02	3.00	128	1.89	0.16	0.12	0.11	0.00	0.00	0.12	0.11
751.9	2.133	265.82	2.56	128	2.05	0.16	0.13	0.12	0.00	0.00	0.13	0.12
751.7	2.297	295.34	2.18	128	2.21	0.16	0.14	0.13	0.00	0.00	0.14	0.13
751.5	2.461	311.67	2.37	128	2.38	0.16	0.15	0.14	0.00	0.00	0.15	0.14
751.4	2.625	277.49	2.01	128	2.54	0.16	0.16	0.15	0.00	0.00	0.16	0.15
751.2	2.789	219.45	1.99	128	2.71	0.16	0.17	0.16	0.00	0.00	0.17	0.16
751.0	2.953	159.38	1.61	128	2.87	0.16	0.19	0.17	0.00	0.00	0.19	0.17
750.9	3.117	84.07	1.06	128	3.03	0.16	0.20	0.18	0.00	0.00	0.20	0.18
750.7	3.281	46.78	1.55	128	3.20	0.16	0.21	0.19	0.00	0.00	0.21	0.19
750.6	3.445	38.96	1.64	128	3.36	0.16	0.22	0.20	0.00	0.00	0.22	0.20
750.4	3.609	36.18	1.94	128	3.53	0.16	0.23	0.22	0.00	0.00	0.23	0.22
750.2	3.773	64.32	1.98	128	3.69	0.16	0.24	0.23	0.00	0.00	0.24	0.23
750.1	3.937	46.72	2.11	128	3.85	0.16	0.25	0.24	0.00	0.00	0.25	0.24
749.9	4.101	34.36	1.73	128	4.02	0.16	0.26	0.25	0.00	0.00	0.26	0.25
749.7	4.265	119.98	2.74	128	4.18	0.16	0.27	0.26	0.01	0.00	0.26	0.26
749.6	4.429	256.94	2.78	128	4.35	0.16	0.28	0.27	0.01	0.00	0.27	0.27
749.4	4.593	282.15	2.77	128	4.51	0.16	0.29	0.28	0.02	0.00	0.27	0.28
749.2	4.757	203.11	1.84	128	4.68	0.16	0.30	0.29	0.02	0.00	0.28	0.29
749.1	4.921	123.99	1.78	128	4.84	0.16	0.31	0.30	0.03	0.00	0.28	0.30
748.9	5.085	85.54	1.90	128	5.00	0.16	0.32	0.31	0.03	0.00	0.29	0.31
748.8	5.249	44.83	2.09	128	5.17	0.16	0.33	0.32	0.04	0.00	0.29	0.32
748.6	5.413	45.14	2.68	128	5.33	0.16	0.34	0.33	0.04	0.00	0.30	0.33
748.4	5.577	48.28	2.76	128	5.50	0.16	0.35	0.34	0.05	0.01	0.30	0.33
748.3	5.741	37.75	2.22	128	5.66	0.16	0.36	0.35	0.05	0.01	0.31	0.34
748.1	5.905	71.94	1.82	128	5.82	0.16	0.37	0.36	0.06	0.02	0.31	0.34
747.9	6.069	199.05	2.61	128	5.99	0.16	0.38	0.37	0.06	0.02	0.32	0.35
747.8	6.234	162.05	2.86	128	6.15	0.16	0.40	0.38	0.07	0.03	0.33	0.35
747.6	6.398	100.74	3.55	128	6.32	0.16	0.41	0.39	0.07	0.03	0.33	0.36
747.4	6.562	69.79	4.93	128	6.48	0.16	0.42	0.40	0.08	0.04	0.34	0.36
747.3	6.726	184.29	3.06	128	6.64	0.16	0.43	0.41	0.09	0.04	0.34	0.37
747.1	6.890	218.93	4.29	128	6.81	0.16	0.44	0.43	0.09	0.05	0.35	0.38
746.9	7.054	121.76	5.62	128	6.97	0.16	0.45	0.44	0.10	0.05	0.35	0.38
746.8	7.218	82.00	6.54	128	7.14	0.16	0.46	0.45	0.10	0.06	0.36	0.39
746.6	7.382	85.73	3.76	128	7.30	0.16	0.47	0.46	0.11	0.06	0.36	0.39
746.5	7.546	163.04	4.46	128	7.46	0.16	0.48	0.47	0.11	0.07	0.37	0.40
746.3	7.710	177.55	7.48	128	7.63	0.16	0.49	0.48	0.12	0.08	0.37	0.40
746.1	7.874	216.44	5.15	128	7.79	0.16	0.50	0.49	0.12	0.08	0.38	0.41
746.0	8.038	276.22	5.60	128	7.96	0.16	0.51	0.50	0.13	0.09	0.38	0.41
745.8	8.202	203.36	5.07	128	8.12	0.16	0.52	0.51	0.13	0.09	0.39	0.42
745.6	8.366	126.91	4.48	128	8.28	0.16	0.53	0.52	0.14	0.10	0.40	0.42
745.5	8.530	98.89	4.08	128	8.45	0.16	0.54	0.53	0.14	0.10	0.40	0.43
745.3	8.694	80.04	3.51	128	8.61	0.16	0.55	0.54	0.15	0.11	0.41	0.43
745.1	8.858	66.78	4.23	128	8.78	0.16	0.56	0.55	0.15	0.11	0.41	0.44
745.0	9.022	55.40	3.31	128	8.94	0.16	0.57	0.56	0.16	0.12	0.42	0.45
744.8	9.186	45.02	2.98	128	9.10	0.16	0.58	0.57	0.16	0.12	0.42	0.45
744.6	9.350	64.62	2.93	128	9.27	0.16	0.59	0.58	0.17	0.13	0.43	0.46
744.5	9.514	58.55	5.50	128	9.43	0.16	0.61	0.59	0.17	0.13	0.43	0.46

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
744.3	9.678	69.71	7.31	128	9.60	0.16	0.62	0.60	0.18	0.14	0.44	0.47
744.2	9.842	304.05	7.65	128	9.76	0.16	0.63	0.61	0.18	0.14	0.44	0.47
744.0	10.006	319.46	2.50	128	9.92	0.16	0.64	0.62	0.19	0.15	0.45	0.48
743.8	10.170	252.35	3.96	128	10.09	0.16	0.65	0.64	0.19	0.15	0.45	0.48
743.7	10.335	140.03	4.18	128	10.25	0.16	0.66	0.65	0.20	0.16	0.46	0.49
743.5	10.499	121.19	5.04	128	10.42	0.16	0.67	0.66	0.20	0.16	0.47	0.49
743.3	10.663	100.98	3.65	128	10.58	0.16	0.68	0.67	0.21	0.17	0.47	0.50
743.2	10.827	129.29	2.47	128	10.74	0.16	0.69	0.68	0.21	0.17	0.48	0.50
743.0	10.991	71.78	1.80	128	10.91	0.16	0.70	0.69	0.22	0.18	0.48	0.51
742.8	11.155	64.49	1.45	128	11.07	0.16	0.71	0.70	0.22	0.18	0.49	0.52
742.7	11.319	61.65	1.16	128	11.24	0.16	0.72	0.71	0.23	0.19	0.49	0.52
742.5	11.483	50.20	1.22	128	11.40	0.16	0.73	0.72	0.23	0.19	0.50	0.53
742.4	11.647	53.64	1.25	128	11.56	0.16	0.74	0.73	0.24	0.20	0.50	0.53
742.2	11.811	39.97	1.24	128	11.73	0.16	0.75	0.74	0.24	0.20	0.51	0.54
742.0	11.975	43.78	1.25	128	11.89	0.16	0.76	0.75	0.25	0.21	0.51	0.54
741.9	12.139	49.68	2.30	128	12.06	0.16	0.77	0.76	0.25	0.21	0.52	0.55
741.7	12.303	96.22	3.75	128	12.22	0.16	0.78	0.77	0.26	0.22	0.52	0.55
741.5	12.467	255.10	3.86	128	12.39	0.16	0.79	0.78	0.26	0.22	0.53	0.56
741.4	12.631	201.38	1.71	128	12.55	0.16	0.80	0.79	0.27	0.23	0.54	0.56
741.2	12.795	186.98	2.13	128	12.71	0.16	0.82	0.80	0.27	0.23	0.54	0.57
741.0	12.959	161.98	4.45	128	12.88	0.16	0.83	0.81	0.28	0.24	0.55	0.57
740.9	13.123	164.54	3.29	128	13.04	0.16	0.84	0.82	0.28	0.24	0.55	0.58
740.7	13.287	46.28	3.15	128	13.21	0.16	0.85	0.83	0.29	0.25	0.56	0.59
740.5	13.451	41.48	1.93	128	13.37	0.16	0.86	0.85	0.29	0.25	0.56	0.59
740.4	13.615	95.28	1.01	128	13.53	0.16	0.87	0.86	0.30	0.26	0.57	0.60
740.2	13.779	34.69	1.25	128	13.70	0.16	0.88	0.87	0.31	0.26	0.57	0.60
740.1	13.943	54.19	1.23	128	13.86	0.16	0.89	0.88	0.31	0.27	0.58	0.61
739.9	14.107	54.97	1.09	128	14.03	0.16	0.90	0.89	0.32	0.27	0.58	0.61
739.7	14.271	39.26	1.13	128	14.19	0.16	0.91	0.90	0.32	0.28	0.59	0.62
739.6	14.436	61.21	1.30	128	14.35	0.16	0.92	0.91	0.33	0.29	0.59	0.62
739.4	14.600	70.50	1.49	128	14.52	0.16	0.93	0.92	0.33	0.29	0.60	0.63
739.2	14.764	56.05	1.54	128	14.68	0.16	0.94	0.93	0.34	0.30	0.61	0.63
739.1	14.928	42.65	2.37	128	14.85	0.16	0.95	0.94	0.34	0.30	0.61	0.64
738.9	15.092	39.82	2.71	128	15.01	0.16	0.96	0.95	0.35	0.31	0.62	0.64
738.7	15.256	99.59	2.91	128	15.17	0.16	0.97	0.96	0.35	0.31	0.62	0.65
738.6	15.420	88.46	3.17	128	15.34	0.16	0.98	0.97	0.36	0.32	0.63	0.66
738.4	15.584	72.56	3.27	128	15.50	0.16	0.99	0.98	0.36	0.32	0.63	0.66
738.3	15.748	48.73	2.96	128	15.67	0.16	1.00	0.99	0.37	0.33	0.64	0.67
738.1	15.912	40.74	3.04	128	15.83	0.16	1.01	1.00	0.37	0.33	0.64	0.67
737.9	16.076	51.30	2.83	128	15.99	0.16	1.03	1.01	0.38	0.34	0.65	0.68
737.8	16.240	46.25	2.03	128	16.16	0.16	1.04	1.02	0.38	0.34	0.65	0.68
737.6	16.404	33.39	1.89	128	16.32	0.16	1.05	1.03	0.39	0.35	0.66	0.69
737.4	16.568	31.55	1.70	128	16.49	0.16	1.06	1.04	0.39	0.35	0.66	0.69
737.3	16.732	27.50	1.54	128	16.65	0.16	1.07	1.06	0.40	0.36	0.67	0.70
737.1	16.896	24.14	1.42	128	16.81	0.16	1.08	1.07	0.40	0.36	0.68	0.70
736.9	17.060	18.25	1.36	128	16.98	0.16	1.09	1.08	0.41	0.37	0.68	0.71
736.8	17.224	16.26	1.24	128	17.14	0.16	1.10	1.09	0.41	0.37	0.69	0.71
736.6	17.388	18.67	1.11	128	17.31	0.16	1.11	1.10	0.42	0.38	0.69	0.72
736.4	17.552	13.19	0.87	128	17.47	0.16	1.12	1.11	0.42	0.38	0.70	0.73
736.3	17.716	9.16	0.65	128	17.63	0.16	1.13	1.12	0.43	0.39	0.70	0.73
736.1	17.880	9.27	0.56	128	17.80	0.16	1.14	1.13	0.43	0.39	0.71	0.74
736.0	18.044	12.02	0.64	128	17.96	0.16	1.15	1.14	0.44	0.40	0.71	0.74
735.8	18.208	13.94	0.73	128	18.13	0.16	1.16	1.15	0.44	0.40	0.72	0.75
735.6	18.372	13.21	0.72	128	18.29	0.16	1.17	1.16	0.45	0.41	0.72	0.75
735.5	18.537	15.05	0.67	128	18.45	0.16	1.18	1.17	0.45	0.41	0.73	0.76
735.3	18.701	12.09	0.61	128	18.62	0.16	1.19	1.18	0.46	0.42	0.73	0.76
735.1	18.865	8.59	0.50	128	18.78	0.16	1.20	1.19	0.46	0.42	0.74	0.77
735.0	19.029	11.14	0.42	128	18.95	0.16	1.21	1.20	0.47	0.43	0.75	0.77
734.8	19.193	11.29	0.35	128	19.11	0.16	1.22	1.21	0.47	0.43	0.75	0.78
734.6	19.357	8.45	0.25	128	19.27	0.16	1.24	1.22	0.48	0.44	0.76	0.78
734.5	19.521	6.03	0.28	128	19.44	0.16	1.25	1.23	0.48	0.44	0.76	0.79
734.3	19.685	5.03	0.31	128	19.60	0.16	1.26	1.24	0.49	0.45	0.77	0.80
734.2	19.849	6.65	0.26	128	19.77	0.16	1.27	1.25	0.49	0.45	0.77	0.80
734.0	20.013	5.15	0.27	128	19.93	0.16	1.28	1.27	0.50	0.46	0.78	0.81
733.8	20.177	4.75	0.22	128	20.09	0.16	1.29	1.28	0.50	0.46	0.78	0.81
733.7	20.341	6.18	0.20	128	20.26	0.16	1.30	1.29	0.51	0.47	0.79	0.82
733.5	20.505	5.42	0.25	128	20.42	0.16	1.31	1.30	0.51	0.47	0.79	0.82
733.3	20.669	6.17	0.24	128	20.59	0.16	1.32	1.31	0.52	0.48	0.80	0.83
733.2	20.833	9.46	0.24	128	20.75	0.16	1.33	1.32	0.53	0.48	0.80	0.83

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
733.0	20.997	8.58	0.24	128	20.92	0.16	1.34	1.33	0.53	0.49	0.81	0.84
732.8	21.161	7.08	0.27	128	21.08	0.16	1.35	1.34	0.54	0.49	0.82	0.84
732.7	21.325	5.93	0.23	128	21.24	0.16	1.36	1.35	0.54	0.50	0.82	0.85
732.5	21.489	8.27	0.22	128	21.41	0.16	1.37	1.36	0.55	0.51	0.83	0.85
732.3	21.653	6.83	0.22	128	21.57	0.16	1.38	1.37	0.55	0.51	0.83	0.86
732.2	21.817	5.30	0.29	128	21.74	0.16	1.39	1.38	0.56	0.52	0.84	0.87
732.0	21.981	7.33	0.23	128	21.90	0.16	1.40	1.39	0.56	0.52	0.84	0.87
731.9	22.145	8.77	0.21	128	22.06	0.16	1.41	1.40	0.57	0.53	0.85	0.88
731.7	22.309	7.49	0.33	128	22.23	0.16	1.42	1.41	0.57	0.53	0.85	0.88
731.5	22.473	6.68	0.36	128	22.39	0.16	1.43	1.42	0.58	0.54	0.86	0.89
731.4	22.638	7.37	0.35	128	22.56	0.16	1.45	1.43	0.58	0.54	0.86	0.89
731.2	22.802	6.16	0.26	128	22.72	0.16	1.46	1.44	0.59	0.55	0.87	0.90
731.0	22.966	7.25	0.46	128	22.88	0.16	1.47	1.45	0.59	0.55	0.87	0.90
730.9	23.130	9.75	0.55	128	23.05	0.16	1.48	1.46	0.60	0.56	0.88	0.91
730.7	23.294	9.50	0.57	128	23.21	0.16	1.49	1.48	0.60	0.56	0.89	0.91
730.5	23.458	8.81	0.46	128	23.38	0.16	1.50	1.49	0.61	0.57	0.89	0.92
730.4	23.622	10.23	0.43	128	23.54	0.16	1.51	1.50	0.61	0.57	0.90	0.92
730.2	23.786	9.71	0.52	128	23.70	0.16	1.52	1.51	0.62	0.58	0.90	0.93
730.1	23.950	8.04	0.53	128	23.87	0.16	1.53	1.52	0.62	0.58	0.91	0.94
729.9	24.114	7.84	0.36	128	24.03	0.16	1.54	1.53	0.63	0.59	0.91	0.94
729.7	24.278	6.65	0.29	128	24.20	0.16	1.55	1.54	0.63	0.59	0.92	0.95
729.6	24.442	5.14	0.25	128	24.36	0.16	1.56	1.55	0.64	0.60	0.92	0.95
729.4	24.606	5.98	0.31	128	24.52	0.16	1.57	1.56	0.64	0.60	0.93	0.96
729.2	24.770	7.29	0.65	128	24.69	0.16	1.58	1.57	0.65	0.61	0.93	0.96
729.1	24.934	26.94	1.43	128	24.85	0.16	1.59	1.58	0.65	0.61	0.94	0.97
728.9	25.098	24.95	0.99	128	25.02	0.16	1.60	1.59	0.66	0.62	0.94	0.97
728.7	25.262	95.00	1.01	128	25.18	0.16	1.61	1.60	0.66	0.62	0.95	0.98
728.6	25.426	41.64	0.97	128	25.34	0.16	1.62	1.61	0.67	0.63	0.96	0.98
728.4	25.590	32.05	1.02	128	25.51	0.16	1.63	1.62	0.67	0.63	0.96	0.99
728.2	25.754	31.19	1.14	128	25.67	0.16	1.64	1.63	0.68	0.64	0.97	0.99
728.1	25.918	17.84	1.03	128	25.84	0.16	1.66	1.64	0.68	0.64	0.97	1.00
727.9	26.082	13.80	0.50	128	26.00	0.16	1.67	1.65	0.69	0.65	0.98	1.01
727.8	26.246	10.69	0.46	128	26.16	0.16	1.68	1.66	0.69	0.65	0.98	1.01
727.6	26.410	11.20	0.43	128	26.33	0.16	1.69	1.67	0.70	0.66	0.99	1.02
727.4	26.574	9.11	0.46	128	26.49	0.16	1.70	1.69	0.70	0.66	0.99	1.02
727.3	26.739	8.66	0.46	128	26.66	0.16	1.71	1.70	0.71	0.67	1.00	1.03
727.1	26.903	12.11	0.41	128	26.82	0.16	1.72	1.71	0.71	0.67	1.00	1.03
726.9	27.067	11.81	0.43	128	26.98	0.16	1.73	1.72	0.72	0.68	1.01	1.04
726.8	27.231	9.62	0.45	128	27.15	0.16	1.74	1.73	0.72	0.68	1.01	1.04
726.6	27.395	12.08	0.59	128	27.31	0.16	1.75	1.74	0.73	0.69	1.02	1.05
726.4	27.559	12.15	0.58	128	27.48	0.16	1.76	1.75	0.74	0.69	1.03	1.05
726.3	27.723	15.49	0.45	128	27.64	0.16	1.77	1.76	0.74	0.70	1.03	1.06
726.1	27.887	14.36	0.45	128	27.80	0.16	1.78	1.77	0.75	0.70	1.04	1.06
725.9	28.051	9.34	0.41	128	27.97	0.16	1.79	1.78	0.75	0.71	1.04	1.07
725.8	28.215	10.45	0.42	128	28.13	0.16	1.80	1.79	0.76	0.71	1.05	1.08
725.6	28.379	12.24	0.34	128	28.30	0.16	1.81	1.80	0.76	0.72	1.05	1.08
725.5	28.543	12.59	0.37	128	28.46	0.16	1.82	1.81	0.77	0.73	1.06	1.09
725.3	28.707	13.71	0.40	128	28.62	0.16	1.83	1.82	0.77	0.73	1.06	1.09
725.1	28.871	10.36	0.40	128	28.79	0.16	1.84	1.83	0.78	0.74	1.07	1.10
725.0	29.035	9.19	0.41	128	28.95	0.16	1.85	1.84	0.78	0.74	1.07	1.10
724.8	29.199	7.64	0.38	128	29.12	0.16	1.87	1.85	0.79	0.75	1.08	1.11
724.6	29.363	6.78	0.21	128	29.28	0.16	1.88	1.86	0.79	0.75	1.08	1.11
724.5	29.527	6.85	0.24	128	29.45	0.16	1.89	1.87	0.80	0.76	1.09	1.12
724.3	29.691	5.68	0.26	128	29.61	0.16	1.90	1.88	0.80	0.76	1.10	1.12
724.1	29.855	5.18	0.25	128	29.77	0.16	1.91	1.90	0.81	0.77	1.10	1.13
724.0	30.019	6.78	0.15	127	29.94	0.16	1.92	1.91	0.81	0.77	1.11	1.13
723.8	30.183	8.31	0.17	127	30.10	0.16	1.93	1.92	0.82	0.78	1.11	1.14
723.7	30.347	9.15	0.24	127	30.27	0.16	1.94	1.93	0.82	0.78	1.12	1.14
723.5	30.511	10.07	0.27	127	30.43	0.16	1.95	1.94	0.83	0.79	1.12	1.15
723.3	30.675	9.96	0.27	127	30.59	0.16	1.96	1.95	0.83	0.79	1.13	1.16
723.2	30.840	9.63	0.24	127	30.76	0.16	1.97	1.96	0.84	0.80	1.13	1.16
723.0	31.004	8.81	0.21	127	30.92	0.16	1.98	1.97	0.84	0.80	1.14	1.17
722.8	31.168	7.57	0.17	127	31.09	0.16	1.99	1.98	0.85	0.81	1.14	1.17
722.7	31.332	7.45	0.15	127	31.25	0.16	2.00	1.99	0.85	0.81	1.15	1.18
722.5	31.496	7.50	0.12	127	31.41	0.16	2.01	2.00	0.86	0.82	1.15	1.18
722.3	31.660	7.08	0.10	127	31.58	0.16	2.02	2.01	0.86	0.82	1.16	1.19
722.2	31.824	7.86	0.12	127	31.74	0.16	2.03	2.02	0.87	0.83	1.16	1.19
722.0	31.988	8.36	0.13	127	31.91	0.16	2.04	2.03	0.87	0.83	1.17	1.20
721.8	32.152	8.35	0.13	127	32.07	0.16	2.05	2.04	0.88	0.84	1.17	1.20

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
721.7	32.316	8.29	0.14	127	32.23	0.16	2.06	2.05	0.88	0.84	1.18	1.21
721.5	32.480	7.98	0.13	127	32.40	0.16	2.07	2.06	0.89	0.85	1.19	1.21
721.4	32.644	8.06	0.14	127	32.56	0.16	2.08	2.07	0.89	0.85	1.19	1.22
721.2	32.808	9.50	0.25	126	32.73	0.16	2.09	2.08	0.90	0.86	1.20	1.22
721.0	32.972	11.53	0.28	126	32.89	0.16	2.10	2.09	0.90	0.86	1.20	1.23
720.9	33.136	9.38	0.29	126	33.05	0.16	2.12	2.10	0.91	0.87	1.21	1.23
720.7	33.300	9.39	0.26	126	33.22	0.16	2.13	2.11	0.91	0.87	1.21	1.24
720.5	33.464	9.04	0.23	126	33.38	0.16	2.14	2.12	0.92	0.88	1.22	1.25
720.4	33.628	8.52	0.25	126	33.55	0.16	2.15	2.13	0.92	0.88	1.22	1.25
720.2	33.792	9.20	0.27	126	33.71	0.16	2.16	2.14	0.93	0.89	1.23	1.26
720.0	33.956	10.55	0.37	126	33.87	0.16	2.17	2.15	0.93	0.89	1.23	1.26
719.9	34.120	11.03	0.52	126	34.04	0.16	2.18	2.17	0.94	0.90	1.24	1.27
719.7	34.284	13.19	0.61	126	34.20	0.16	2.19	2.18	0.94	0.90	1.24	1.27
719.6	34.448	15.44	0.66	126	34.37	0.16	2.20	2.19	0.95	0.91	1.25	1.28
719.4	34.612	19.46	0.73	126	34.53	0.16	2.21	2.20	0.96	0.91	1.25	1.28
719.2	34.776	25.94	0.85	126	34.69	0.16	2.22	2.21	0.96	0.92	1.26	1.29
719.1	34.941	29.49	1.02	126	34.86	0.16	2.23	2.22	0.97	0.92	1.26	1.29
718.9	35.105	33.56	1.50	126	35.02	0.16	2.24	2.23	0.97	0.93	1.27	1.30
718.7	35.269	36.80	1.80	126	35.19	0.16	2.25	2.24	0.98	0.94	1.27	1.30
718.6	35.433	39.14	1.85	126	35.35	0.16	2.26	2.25	0.98	0.94	1.28	1.31
718.4	35.597	37.32	1.83	126	35.51	0.16	2.27	2.26	0.99	0.95	1.28	1.31
718.2	35.761	36.66	1.57	126	35.68	0.16	2.28	2.27	0.99	0.95	1.29	1.32
718.1	35.925	33.72	1.37	126	35.84	0.16	2.29	2.28	1.00	0.96	1.29	1.32
717.9	36.089	35.14	1.57	126	36.01	0.16	2.30	2.29	1.00	0.96	1.30	1.33
717.7	36.253	40.16	1.69	126	36.17	0.16	2.31	2.30	1.01	0.97	1.31	1.33
717.6	36.417	36.24	1.59	126	36.33	0.16	2.32	2.31	1.01	0.97	1.31	1.34
717.4	36.581	34.15	1.47	126	36.50	0.16	2.33	2.32	1.02	0.98	1.32	1.34
717.3	36.745	32.51	1.29	126	36.66	0.16	2.34	2.33	1.02	0.98	1.32	1.35
717.1	36.909	29.53	1.28	126	36.83	0.16	2.35	2.34	1.03	0.99	1.33	1.35
716.9	37.073	28.89	1.23	126	36.99	0.16	2.36	2.35	1.03	0.99	1.33	1.36
716.8	37.237	29.68	1.15	126	37.16	0.16	2.37	2.36	1.04	1.00	1.34	1.37
716.6	37.401	30.86	1.17	126	37.32	0.16	2.38	2.37	1.04	1.00	1.34	1.37
716.4	37.565	30.93	1.30	126	37.48	0.16	2.39	2.38	1.05	1.01	1.35	1.38
716.3	37.729	27.42	1.15	126	37.65	0.16	2.40	2.39	1.05	1.01	1.35	1.38
716.1	37.893	25.12	1.14	126	37.81	0.16	2.41	2.40	1.06	1.02	1.36	1.39
715.9	38.057	25.83	0.80	126	37.98	0.16	2.43	2.41	1.06	1.02	1.36	1.39
715.8	38.221	24.96	0.72	126	38.14	0.16	2.44	2.42	1.07	1.03	1.37	1.40
715.6	38.385	24.50	0.71	126	38.30	0.16	2.45	2.43	1.07	1.03	1.37	1.40
715.5	38.549	26.09	0.80	126	38.47	0.16	2.46	2.44	1.08	1.04	1.38	1.41
715.3	38.713	22.52	0.91	126	38.63	0.16	2.47	2.45	1.08	1.04	1.38	1.41
715.1	38.877	21.16	0.95	126	38.80	0.16	2.48	2.47	1.09	1.05	1.39	1.42
715.0	39.042	20.17	0.85	126	38.96	0.16	2.49	2.48	1.09	1.05	1.39	1.42
714.8	39.206	19.15	0.66	126	39.12	0.16	2.50	2.49	1.10	1.06	1.40	1.43
714.6	39.370	16.90	0.71	126	39.29	0.16	2.51	2.50	1.10	1.06	1.40	1.43
714.5	39.534	15.75	0.59	126	39.45	0.16	2.52	2.51	1.11	1.07	1.41	1.44
714.3	39.698	14.76	0.55	126	39.62	0.16	2.53	2.52	1.11	1.07	1.41	1.44
714.1	39.862	16.07	0.50	126	39.78	0.16	2.54	2.53	1.12	1.08	1.42	1.45
714.0	40.026	17.92	0.57	126	39.94	0.16	2.55	2.54	1.12	1.08	1.43	1.45
713.8	40.190	22.24	0.62	126	40.11	0.16	2.56	2.55	1.13	1.09	1.43	1.46
713.6	40.354	18.53	0.84	126	40.27	0.16	2.57	2.56	1.13	1.09	1.44	1.46
713.5	40.518	16.77	0.72	126	40.44	0.16	2.58	2.57	1.14	1.10	1.44	1.47
713.3	40.682	13.44	0.56	126	40.60	0.16	2.59	2.58	1.14	1.10	1.45	1.47
713.2	40.846	11.03	0.38	126	40.76	0.16	2.60	2.59	1.15	1.11	1.45	1.48
713.0	41.010	9.61	0.32	126	40.93	0.16	2.61	2.60	1.15	1.11	1.46	1.49
712.8	41.174	8.86	0.38	126	41.09	0.16	2.62	2.61	1.16	1.12	1.46	1.49
712.7	41.338	11.22	0.37	126	41.26	0.16	2.63	2.62	1.16	1.12	1.47	1.50
712.5	41.502	12.61	0.34	126	41.42	0.16	2.64	2.63	1.17	1.13	1.47	1.50
712.3	41.666	15.03	0.28	126	41.58	0.16	2.65	2.64	1.18	1.13	1.48	1.51
712.2	41.830	11.51	0.20	126	41.75	0.16	2.66	2.65	1.18	1.14	1.48	1.51
712.0	41.994	9.52	0.18	126	41.91	0.16	2.67	2.66	1.19	1.14	1.49	1.52
711.8	42.158	7.51	0.14	126	42.08	0.16	2.68	2.67	1.19	1.15	1.49	1.52
711.7	42.322	19.32	0.09	126	42.24	0.16	2.69	2.68	1.20	1.16	1.50	1.53
711.5	42.486	21.86	0.13	126	42.40	0.16	2.70	2.69	1.20	1.16	1.50	1.53
711.3	42.650	17.31	0.17	126	42.57	0.16	2.71	2.70	1.21	1.17	1.51	1.54
711.2	42.814	14.81	0.17	126	42.73	0.16	2.73	2.71	1.21	1.17	1.51	1.54
711.0	42.978	10.96	0.13	126	42.90	0.16	2.74	2.72	1.22	1.18	1.52	1.55
710.9	43.143	14.00	0.07	126	43.06	0.16	2.75	2.73	1.22	1.18	1.52	1.55
710.7	43.307	18.68	0.09	126	43.22	0.16	2.76	2.74	1.23	1.19	1.53	1.56
710.5	43.471	15.70	0.12	126	43.39	0.16	2.77	2.75	1.23	1.19	1.53	1.56

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
710.4	43.635	12.99	0.15	126	43.55	0.16	2.78	2.76	1.24	1.20	1.54	1.57
710.2	43.799	21.83	0.17	126	43.72	0.16	2.79	2.78	1.24	1.20	1.55	1.57
710.0	43.963	24.38	0.12	126	43.88	0.16	2.80	2.79	1.25	1.21	1.55	1.58
709.9	44.127	27.87	0.12	126	44.04	0.16	2.81	2.80	1.25	1.21	1.56	1.58
709.7	44.291	29.29	0.13	126	44.21	0.16	2.82	2.81	1.26	1.22	1.56	1.59
709.5	44.455	25.27	0.15	126	44.37	0.16	2.83	2.82	1.26	1.22	1.57	1.59
709.4	44.619	24.32	0.20	126	44.54	0.16	2.84	2.83	1.27	1.23	1.57	1.60
709.2	44.783	25.89	0.22	126	44.70	0.16	2.85	2.84	1.27	1.23	1.58	1.61
709.1	44.947	29.55	0.19	131	44.86	0.16	2.86	2.85	1.28	1.24	1.58	1.61
708.9	45.111	32.07	0.13	131	45.03	0.16	2.87	2.86	1.28	1.24	1.59	1.62
708.7	45.275	37.82	0.15	131	45.19	0.16	2.88	2.87	1.29	1.25	1.59	1.62
708.6	45.439	39.59	0.18	131	45.36	0.16	2.89	2.88	1.29	1.25	1.60	1.63
708.4	45.603	37.56	0.41	131	45.52	0.16	2.90	2.89	1.30	1.26	1.60	1.63
708.2	45.767	34.68	0.42	131	45.69	0.16	2.91	2.90	1.30	1.26	1.61	1.64
708.1	45.931	59.66	0.33	131	45.85	0.16	2.92	2.91	1.31	1.27	1.62	1.64
707.9	46.095	77.26	0.42	131	46.01	0.16	2.93	2.92	1.31	1.27	1.62	1.65
707.7	46.259	85.33	0.53	131	46.18	0.16	2.95	2.93	1.32	1.28	1.63	1.66
707.6	46.423	96.49	0.57	131	46.34	0.16	2.96	2.94	1.32	1.28	1.63	1.66
707.4	46.587	99.76	0.64	131	46.51	0.16	2.97	2.96	1.33	1.29	1.64	1.67
707.2	46.751	99.42	0.80	131	46.67	0.16	2.98	2.97	1.33	1.29	1.64	1.67
707.1	46.915	89.55	0.74	131	46.83	0.16	2.99	2.98	1.34	1.30	1.65	1.68
706.9	47.079	80.74	0.72	131	47.00	0.16	3.00	2.99	1.34	1.30	1.66	1.68
706.8	47.244	70.10	0.64	131	47.16	0.16	3.01	3.00	1.35	1.31	1.66	1.69
706.6	47.408	62.64	0.58	131	47.33	0.16	3.02	3.01	1.35	1.31	1.67	1.69
706.4	47.572	60.23	0.54	131	47.49	0.16	3.03	3.02	1.36	1.32	1.67	1.70
706.3	47.736	58.83	0.50	131	47.65	0.16	3.04	3.03	1.36	1.32	1.68	1.71
706.1	47.900	53.75	0.46	131	47.82	0.16	3.05	3.04	1.37	1.33	1.68	1.71
705.9	48.064	47.52	0.43	131	47.98	0.16	3.06	3.05	1.37	1.33	1.69	1.72
705.8	48.228	40.04	0.37	131	48.15	0.16	3.07	3.06	1.38	1.34	1.69	1.72
705.6	48.392	33.29	0.37	131	48.31	0.16	3.09	3.07	1.39	1.34	1.70	1.73
705.4	48.556	28.80	0.39	131	48.47	0.16	3.10	3.08	1.39	1.35	1.71	1.73
705.3	48.720	42.72	0.33	131	48.64	0.16	3.11	3.09	1.40	1.35	1.71	1.74
705.1	48.884	51.62	0.34	131	48.80	0.16	3.12	3.11	1.40	1.36	1.72	1.75
705.0	49.048	47.95	0.38	131	48.97	0.16	3.13	3.12	1.41	1.36	1.72	1.75
704.8	49.212	46.02	0.36	131	49.13	0.16	3.14	3.13	1.41	1.37	1.73	1.76
704.6	49.376	51.44	0.31	131	49.29	0.16	3.15	3.14	1.42	1.38	1.73	1.76
704.5	49.540	64.82	0.40	131	49.46	0.16	3.16	3.15	1.42	1.38	1.74	1.77
704.3	49.704	83.22	0.79	131	49.62	0.16	3.17	3.16	1.43	1.39	1.75	1.77
704.1	49.868	109.84	0.61	131	49.79	0.16	3.18	3.17	1.43	1.39	1.75	1.78
704.0	50.032	196.78	0.01	131	49.95	0.16	3.19	3.18	1.44	1.40	1.76	1.79
703.8	50.196	312.71	0.01	131	50.11	0.08	3.20	3.19	1.44	1.40	1.76	1.79

LIQUEFACTION POTENTIAL ASSESSMENT FOR COARSE GRAINED SOILS USING CONE PENETRATION TEST DATA

Project Site: KIF TDEC Stability
Project No.: 175668043
CPT ID: CPT-03C

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
754.0												
753.8	0.164	460.83	0.15	0.90	0.5	1.70	75.58	0	0.00	75.58	0.006	#NUM!
753.7	0.328	530.47	0.15	0.84	0.5	1.70	123.04	0	0.00	123.04	0.005	-0.547
753.5	0.492	644.37	0.15	0.77	0.5	1.70	183.05	0	0.00	183.05	0.004	-0.600
753.3	0.656	624.04	0.19	0.83	0.5	1.70	204.71	0	0.00	204.71	0.002	-0.600
753.2	0.820	626.37	0.20	0.85	0.5	1.70	229.73	0	0.00	229.73	0.001	-0.600
753.0	0.984	1073.93	0.19	0.67	0.5	1.70	432.62	0	0.00	432.62	0.000	-0.600
752.9	1.148	1446.49	0.30	0.76	0.5	1.70	632.09	0	0.00	632.09	0.002	-0.600
752.7	1.312	1143.77	0.57	1.06	0.5	1.70	536.07	0	0.00	536.07	0.005	-0.600
752.5	1.476	935.37	0.90	1.28	0.5	1.70	466.18	0	0.00	466.18	0.008	-0.600
752.4	1.640	858.42	1.36	1.45	0.5	1.70	451.89	0	0.00	451.89	0.011	-0.600
752.2	1.804	548.55	1.95	1.68	0.5	1.70	303.42	0	0.00	303.42	0.014	-0.600
752.0	1.968	622.24	1.34	1.51	0.5	1.70	359.95	0	0.00	359.95	0.017	-0.600
751.9	2.133	708.62	0.97	1.35	0.5	1.70	427.12	0	0.00	427.12	0.017	-0.600
751.7	2.297	757.95	0.74	1.24	0.5	1.69	472.20	0	0.00	472.20	0.016	-0.600
751.5	2.461	772.07	0.76	1.25	0.5	1.66	489.13	0	0.00	489.13	0.015	-0.600
751.4	2.625	665.02	0.72	1.26	0.5	1.63	428.00	0	0.00	428.00	0.014	-0.600
751.2	2.789	509.80	0.91	1.40	0.5	1.61	333.01	0	0.00	333.01	0.013	-0.600
751.0	2.953	359.49	1.01	1.53	0.5	1.62	243.34	0	0.00	243.34	0.013	-0.600
750.9	3.117	184.24	1.26	1.79	0.5	1.70	135.08	6	0.73	135.81	0.015	-0.553
750.7	3.281	99.68	3.33	2.28	0.5	1.70	75.17	45	63.57	138.74	0.016	-0.562
750.6	3.445	80.89	4.23	2.42	0.5	1.70	62.60	56	65.12	127.72	0.018	-0.523
750.4	3.609	73.30	5.39	2.53	0.5	1.70	58.13	65	66.41	124.54	0.019	-0.511
750.2	3.773	127.75	3.08	2.19	0.5	1.70	103.36	38	65.09	168.44	0.020	-0.600
750.1	3.937	90.66	4.54	2.41	0.5	1.70	75.07	56	68.34	143.41	0.021	-0.574
749.9	4.101	65.57	5.08	2.54	0.5	1.70	55.22	66	65.81	121.03	0.022	-0.495
749.7	4.265	227.78	2.29	1.93	0.5	1.54	175.13	18	39.05	214.17	0.023	-0.600
749.6	4.429	483.38	1.08	1.48	0.5	1.44	349.01	0	0.00	349.01	0.024	-0.600
749.4	4.593	525.57	0.98	1.43	0.5	1.43	381.25	0	0.00	381.25	0.025	-0.600
749.2	4.757	374.48	0.91	1.48	0.5	1.42	273.04	0	0.00	273.04	0.026	-0.600
749.1	4.921	226.17	1.44	1.77	0.5	1.58	185.62	5	0.15	185.77	0.027	-0.600
748.9	5.085	154.39	2.23	2.02	0.5	1.59	128.38	25	52.52	180.90	0.029	-0.600
748.8	5.249	79.87	4.69	2.46	0.5	1.70	72.03	60	68.76	140.79	0.030	-0.559
748.6	5.413	79.68	5.99	2.54	0.5	1.69	72.09	66	70.69	142.78	0.032	-0.565
748.4	5.577	84.49	5.76	2.51	0.5	1.66	75.86	64	71.15	147.01	0.035	-0.579
748.3	5.741	65.32	5.94	2.59	0.5	1.70	60.65	70	68.34	128.99	0.037	-0.518
748.1	5.905	123.99	2.55	2.13	0.5	1.57	106.97	33	61.34	168.31	0.039	-0.600
747.9	6.069	341.29	1.31	1.63	0.5	1.37	257.62	0	0.00	257.62	0.041	-0.600
747.8	6.234	275.40	1.77	1.79	0.5	1.43	218.86	6	1.38	220.25	0.042	-0.600
747.6	6.398	169.54	3.53	2.16	0.5	1.45	137.72	36	70.90	208.63	0.043	-0.600
747.4	6.562	116.28	7.10	2.50	0.5	1.51	99.68	63	77.74	177.42	0.044	-0.600
747.3	6.726	305.75	1.66	1.75	0.5	1.37	239.08	3	0.00	239.08	0.045	-0.600
747.1	6.890	360.51	1.96	1.77	0.5	1.34	277.39	4	0.08	277.46	0.046	-0.600
746.9	7.054	198.63	4.63	2.22	0.5	1.36	156.94	41	80.38	237.32	0.047	-0.600
746.8	7.218	132.51	8.02	2.52	0.5	1.44	111.79	64	81.52	193.31	0.048	-0.600
746.6	7.382	137.53	4.40	2.29	0.5	1.44	116.63	46	74.68	191.31	0.049	-0.600
746.5	7.546	260.28	2.74	1.97	0.5	1.32	203.33	20	51.70	255.04	0.051	-0.600
746.3	7.710	281.45	4.23	2.11	0.5	1.31	220.59	32	83.28	303.87	0.052	-0.600
746.1	7.874	340.81	2.38	1.85	0.5	1.31	267.90	11	17.89	285.79	0.053	-0.600
746.0	8.038	432.09	2.03	1.74	0.5	1.30	340.63	2	0.00	340.63	0.055	-0.600
745.8	8.202	315.68	2.50	1.89	0.5	1.30	249.86	14	30.63	280.49	0.056	-0.600
745.6	8.366	195.34	3.54	2.13	0.5	1.33	159.39	33	72.33	231.72	0.057	-0.600
745.5	8.530	151.00	4.15	2.25	0.5	1.37	128.09	43	75.06	203.15	0.058	-0.600
745.3	8.694	121.23	4.42	2.32	0.5	1.41	106.42	49	73.60	180.02	0.059	-0.600
745.1	8.858	100.32	6.38	2.50	0.5	1.43	90.22	63	75.01	165.23	0.059	-0.600
745.0	9.022	82.53	6.04	2.53	0.5	1.46	76.39	66	71.79	148.18	0.060	-0.576
744.8	9.186	79.86	6.71	2.58	0.7	1.49	63.34	69	68.91	132.25	0.061	-0.523
744.6	9.350	95.16	4.57	2.40	0.5	1.42	86.91	55	71.24	158.15	0.061	-0.600
744.5	9.514	102.32	9.50	2.64	0.7	1.43	78.89	74	74.50	153.40	0.062	-0.592
744.3	9.678	120.96	10.58	2.64	0.7	1.39	91.42	74	78.20	169.61	0.063	-0.600
744.2	9.842	442.69	2.52	1.82	0.5	1.26	361.10	9	8.02	369.12	0.064	-0.600

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
744.0	10.006	462.37	0.78	1.37	0.5	1.25	378.20	0	0.00	378.20	0.065	-0.600
743.8	10.170	362.87	1.57	1.68	0.5	1.25	297.83	0	0.00	297.83	0.066	-0.600
743.7	10.335	199.74	3.00	2.06	0.5	1.27	168.04	28	65.52	233.56	0.067	-0.600
743.5	10.499	171.73	4.18	2.22	0.5	1.28	146.34	40	77.59	223.93	0.068	-0.600
743.3	10.663	142.10	3.64	2.22	0.5	1.31	124.94	40	72.29	197.23	0.068	-0.600
743.2	10.827	181.16	1.92	1.93	0.5	1.31	159.49	17	37.00	196.49	0.069	-0.600
743.0	10.991	99.56	2.53	2.19	0.5	1.36	92.50	38	62.84	155.34	0.070	-0.595
742.8	11.155	88.85	2.28	2.19	0.5	1.38	83.88	38	60.85	144.73	0.070	-0.562
742.7	11.319	84.41	1.90	2.15	0.5	1.38	80.55	35	57.25	137.80	0.071	-0.538
742.5	11.483	68.17	2.46	2.30	0.5	1.39	66.16	47	61.93	128.09	0.071	-0.505
742.4	11.647	72.50	2.36	2.26	0.5	1.38	70.03	44	61.51	131.54	0.072	-0.517
742.2	11.811	53.46	3.15	2.45	0.5	1.40	53.05	59	63.21	116.27	0.072	-0.461
742.0	11.975	58.34	2.90	2.39	0.5	1.39	57.48	55	63.04	120.53	0.073	-0.476
741.9	12.139	65.98	4.71	2.51	0.5	1.36	63.96	64	67.77	131.73	0.073	-0.516
741.7	12.303	128.09	3.93	2.27	0.5	1.27	115.75	45	73.32	189.07	0.074	-0.600
741.5	12.467	339.57	1.52	1.69	0.5	1.20	289.17	0	0.00	289.17	0.074	-0.600
741.4	12.631	266.48	0.85	1.55	0.5	1.22	231.73	0	0.00	231.73	0.075	-0.600
741.2	12.795	246.09	1.14	1.67	0.5	1.23	217.12	0	0.00	217.12	0.075	-0.600
741.0	12.959	211.98	2.76	2.02	0.5	1.20	183.54	24	60.62	244.16	0.076	-0.600
740.9	13.123	214.28	2.01	1.90	0.5	1.22	189.37	15	31.28	220.65	0.076	-0.600
740.7	13.287	67.29	6.93	2.63	0.7	1.33	58.16	74	68.33	126.49	0.077	-0.496
740.5	13.451	52.67	4.75	2.58	0.5	1.34	52.43	69	65.76	118.18	0.077	-0.466
740.4	13.615	121.81	1.06	1.86	0.5	1.31	117.89	12	14.69	132.58	0.077	-0.517
740.2	13.779	43.42	3.70	2.56	0.5	1.34	44.07	68	63.00	107.07	0.078	-0.422
740.1	13.943	68.13	2.32	2.28	0.5	1.30	66.83	45	61.33	128.16	0.078	-0.501
739.9	14.107	68.79	2.01	2.23	0.5	1.30	67.61	42	59.31	126.92	0.078	-0.497
739.7	14.271	48.57	2.94	2.46	0.5	1.32	48.96	59	62.29	111.25	0.079	-0.438
739.6	14.436	76.01	2.15	2.22	0.5	1.28	74.09	41	60.36	134.45	0.080	-0.523
739.4	14.600	87.31	2.14	2.18	0.5	1.26	84.20	37	59.93	144.12	0.080	-0.555
739.2	14.764	68.85	2.79	2.33	0.5	1.27	67.54	50	63.68	131.22	0.081	-0.511
739.1	14.928	57.89	5.69	2.61	0.7	1.29	51.90	72	66.12	118.02	0.081	-0.463
738.9	15.092	63.06	6.98	2.66	1.0	1.29	48.46	75	65.77	114.22	0.082	-0.448
738.7	15.256	121.61	2.95	2.19	0.5	1.21	113.69	38	67.42	181.11	0.083	-0.600
738.6	15.420	107.41	3.63	2.29	0.5	1.21	101.38	46	70.65	172.03	0.083	-0.600
738.4	15.584	87.50	4.56	2.42	0.5	1.23	84.02	57	71.14	155.15	0.084	-0.588
738.3	15.748	64.29	6.21	2.61	0.7	1.25	57.72	72	67.81	125.53	0.085	-0.490
738.1	15.912	61.77	7.66	2.69	1.0	1.26	48.57	78	66.30	114.87	0.085	-0.450
737.9	16.076	60.70	5.63	2.59	0.5	1.24	60.15	71	68.25	128.40	0.085	-0.500
737.8	16.240	54.36	4.49	2.55	0.5	1.25	54.44	67	65.85	120.28	0.085	-0.470
737.6	16.404	49.07	5.84	2.67	1.0	1.26	39.81	76	63.36	103.17	0.086	-0.402
737.4	16.568	45.87	5.58	2.67	1.0	1.26	37.56	77	62.76	100.32	0.086	-0.390
737.3	16.732	39.45	5.83	2.73	1.0	1.26	32.80	81	62.04	94.84	0.086	-0.366
737.1	16.896	34.14	6.15	2.79	1.0	1.26	28.81	86	61.46	90.27	0.086	-0.346
736.9	17.060	25.20	7.93	2.96	1.0	1.27	21.87	100	60.72	82.59	0.086	-0.309
736.8	17.224	22.09	8.19	3.01	1.0	1.27	19.47	100	59.98	79.45	0.086	-0.293
736.6	17.388	25.39	6.31	2.89	1.0	1.26	22.19	94	60.29	82.48	0.085	-0.308
736.4	17.552	17.32	7.23	3.05	1.0	1.26	15.75	100	58.82	74.57	0.085	-0.268
736.3	17.716	11.43	8.03	3.21	1.0	1.27	10.97	100	57.34	68.31	0.085	-0.233
736.1	17.880	11.49	6.94	3.17	1.0	1.26	11.06	100	57.37	68.42	0.085	-0.234
736.0	18.044	15.24	5.90	3.03	1.0	1.25	14.20	100	58.34	72.54	0.086	-0.256
735.8	18.208	17.78	5.73	2.97	1.0	1.24	16.35	100	59.01	75.36	0.086	-0.271
735.6	18.372	16.63	5.99	3.01	1.0	1.24	15.45	100	58.73	74.18	0.087	-0.265
735.5	18.537	19.01	4.80	2.90	1.0	1.23	17.49	95	58.93	76.42	0.088	-0.276
735.3	18.701	14.83	5.61	3.03	1.0	1.23	14.05	100	58.29	72.34	0.089	-0.254
735.1	18.865	9.98	6.78	3.21	1.0	1.23	10.00	100	57.04	67.03	0.090	-0.225
735.0	19.029	13.32	4.21	2.98	1.0	1.22	12.86	100	57.93	70.79	0.090	-0.245
734.8	19.193	13.41	3.49	2.93	1.0	1.22	12.98	98	57.76	70.74	0.090	-0.245
734.6	19.357	9.55	3.49	3.05	1.0	1.22	9.72	100	56.95	66.67	0.091	-0.222
734.5	19.521	6.28	5.90	3.33	1.0	1.22	6.93	100	56.08	63.01	0.091	-0.200
734.3	19.685	4.92	8.33	3.51	1.0	1.21	5.76	100	55.72	61.48	0.092	-0.191
734.2	19.849	6.98	4.77	3.24	1.0	1.20	7.58	100	56.29	63.86	0.092	-0.205
734.0	20.013	4.98	7.04	3.46	1.0	1.20	5.86	100	55.75	61.61	0.093	-0.191
733.8	20.177	4.42	6.47	3.48	1.0	1.20	5.38	100	55.60	60.99	0.093	-0.187
733.7	20.341	6.19	4.06	3.24	1.0	1.19	6.95	100	56.09	63.04	0.093	-0.200
733.5	20.505	5.18	6.12	3.41	1.0	1.19	6.09	100	55.82	61.91	0.094	-0.193
733.3	20.669	6.07	4.92	3.30	1.0	1.18	6.89	100	56.07	62.97	0.094	-0.199

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733.2	20.833	10.11	2.96	2.99	1.0	1.17	10.48	100	57.19	67.67	0.095	-0.226
733.0	20.997	8.95	3.26	3.06	1.0	1.17	9.48	100	56.88	66.36	0.095	-0.218
732.8	21.161	7.02	4.70	3.23	1.0	1.17	7.80	100	56.35	64.15	0.095	-0.205
732.7	21.325	5.57	5.10	3.34	1.0	1.16	6.53	100	55.96	62.48	0.096	-0.195
732.5	21.489	8.36	3.11	3.07	1.0	1.16	9.04	100	56.74	65.78	0.096	-0.215
732.3	21.653	6.55	4.06	3.22	1.0	1.15	7.45	100	56.24	63.69	0.097	-0.202
732.2	21.817	4.67	7.40	3.49	1.0	1.15	5.76	100	55.72	61.49	0.097	-0.189
732.0	21.981	7.04	3.84	3.18	1.0	1.14	7.93	100	56.40	64.33	0.098	-0.206
731.9	22.145	8.68	2.84	3.03	1.0	1.14	9.43	100	56.86	66.30	0.098	-0.217
731.7	22.309	7.12	5.35	3.26	1.0	1.14	8.04	100	56.43	64.47	0.098	-0.206
731.5	22.473	6.11	6.83	3.38	1.0	1.13	7.14	100	56.15	63.29	0.099	-0.199
731.4	22.638	6.86	5.91	3.30	1.0	1.13	7.85	100	56.37	64.22	0.099	-0.204
731.2	22.802	5.41	5.59	3.37	1.0	1.12	6.55	100	55.97	62.51	0.099	-0.194
731.0	22.966	6.62	7.86	3.39	1.0	1.12	7.67	100	56.31	63.99	0.100	-0.202
730.9	23.130	9.40	6.69	3.23	1.0	1.11	10.25	100	57.12	67.37	0.100	-0.222
730.7	23.294	9.05	7.05	3.26	1.0	1.11	9.96	100	57.02	66.98	0.100	-0.220
730.5	23.458	8.21	6.27	3.26	1.0	1.11	9.21	100	56.79	66.00	0.101	-0.214
730.4	23.622	9.73	4.95	3.13	1.0	1.10	10.65	100	57.24	67.88	0.101	-0.224
730.2	23.786	9.09	6.35	3.22	1.0	1.10	10.07	100	57.06	67.13	0.101	-0.220
730.1	23.950	7.18	8.06	3.37	1.0	1.10	8.32	100	56.52	64.84	0.102	-0.207
729.9	24.114	6.91	5.76	3.29	1.0	1.09	8.09	100	56.45	64.54	0.102	-0.205
729.7	24.278	5.55	5.59	3.36	1.0	1.09	6.84	100	56.06	62.89	0.102	-0.195
729.6	24.442	3.88	7.04	3.55	1.0	1.09	5.27	100	55.57	60.84	0.102	-0.182
729.4	24.606	4.75	7.09	3.48	1.0	1.08	6.12	100	55.83	61.95	0.103	-0.189
729.2	24.770	6.12	11.38	3.52	1.0	1.08	7.42	100	56.24	63.66	0.103	-0.199
729.1	24.934	26.99	5.64	2.84	1.0	1.06	27.10	90	61.36	88.46	0.103	-0.328
728.9	25.098	24.72	4.24	2.78	1.0	1.06	25.05	85	60.22	85.27	0.103	-0.313
728.7	25.262	93.16	1.08	1.95	0.5	1.05	94.16	19	34.67	128.83	0.104	-0.491
728.6	25.426	39.80	2.42	2.46	0.5	1.05	41.39	60	60.35	101.74	0.104	-0.387
728.4	25.590	31.66	3.37	2.63	1.0	1.05	31.84	74	60.55	92.38	0.104	-0.346
728.2	25.754	30.58	3.87	2.68	1.0	1.05	30.90	78	60.93	91.83	0.104	-0.343
728.1	25.918	16.66	6.36	3.02	1.0	1.05	17.67	100	59.42	77.09	0.105	-0.272
727.9	26.082	12.43	4.15	3.00	1.0	1.05	13.65	100	58.17	71.82	0.105	-0.244
727.8	26.246	9.18	5.08	3.16	1.0	1.04	10.55	100	57.21	67.75	0.105	-0.221
727.6	26.410	9.64	4.48	3.11	1.0	1.04	11.02	100	57.35	68.38	0.105	-0.224
727.4	26.574	7.46	6.19	3.29	1.0	1.04	8.93	100	56.71	65.64	0.106	-0.209
727.3	26.739	6.96	6.66	3.33	1.0	1.03	8.47	100	56.56	65.03	0.106	-0.205
727.1	26.903	10.35	3.91	3.05	1.0	1.03	11.80	100	57.59	69.39	0.106	-0.230
726.9	27.067	9.99	4.22	3.08	1.0	1.03	11.47	100	57.49	68.96	0.106	-0.227
726.8	27.231	7.77	5.74	3.25	1.0	1.02	9.32	100	56.83	66.14	0.107	-0.211
726.6	27.395	10.13	5.68	3.16	1.0	1.02	11.66	100	57.55	69.22	0.107	-0.228
726.4	27.559	10.14	5.61	3.15	1.0	1.02	11.70	100	57.56	69.26	0.107	-0.228
726.3	27.723	13.32	3.29	2.92	1.0	1.01	14.86	97	58.25	73.12	0.107	-0.249
726.1	27.887	12.14	3.60	2.97	1.0	1.01	13.74	100	58.20	71.94	0.108	-0.243
725.9	28.051	7.25	5.38	3.26	1.0	1.01	8.91	100	56.70	65.61	0.108	-0.207
725.8	28.215	8.26	4.86	3.19	1.0	1.01	9.94	100	57.02	66.96	0.108	-0.215
725.6	28.379	9.91	3.30	3.02	1.0	1.00	11.60	100	57.54	69.14	0.108	-0.227
725.5	28.543	10.18	3.41	3.02	1.0	1.00	11.90	100	57.63	69.53	0.109	-0.229
725.3	28.707	11.17	3.37	2.99	1.0	1.00	12.92	100	57.94	70.87	0.109	-0.236
725.1	28.871	7.97	4.72	3.19	1.0	0.99	9.74	100	56.96	66.69	0.109	-0.213
725.0	29.035	6.83	5.65	3.29	1.0	0.99	8.61	100	56.61	65.21	0.109	-0.204
724.8	29.199	5.35	6.58	3.42	1.0	0.99	7.14	100	56.15	63.29	0.110	-0.192
724.6	29.363	4.52	4.18	3.36	1.0	0.99	6.32	100	55.89	62.21	0.110	-0.186
724.5	29.527	4.55	4.86	3.40	1.0	0.98	6.36	100	55.91	62.27	0.110	-0.186
724.3	29.691	3.46	6.84	3.58	1.0	0.98	5.26	100	55.57	60.83	0.110	-0.177
724.1	29.855	2.97	7.56	3.66	1.0	0.98	4.78	100	55.42	60.19	0.110	-0.173
724.0	30.019	4.39	3.00	3.30	1.0	0.97	6.24	100	55.87	62.11	0.111	-0.185
723.8	30.183	5.74	2.63	3.17	1.0	0.97	7.63	100	56.30	63.93	0.111	-0.195
723.7	30.347	6.46	3.38	3.18	1.0	0.97	8.38	100	56.54	64.92	0.111	-0.201
723.5	30.511	7.24	3.36	3.14	1.0	0.97	9.20	100	56.79	65.98	0.111	-0.207
723.3	30.675	7.10	3.34	3.15	1.0	0.96	9.07	100	56.75	65.82	0.112	-0.206
723.2	30.840	6.76	3.19	3.15	1.0	0.96	8.75	100	56.65	65.39	0.112	-0.203
723.0	31.004	6.00	3.03	3.18	1.0	0.96	7.98	100	56.41	64.38	0.112	-0.197
722.8	31.168	4.88	3.08	3.26	1.0	0.96	6.83	100	56.05	62.89	0.112	-0.188
722.7	31.332	4.74	2.75	3.25	1.0	0.95	6.70	100	56.01	62.72	0.113	-0.187
722.5	31.496	4.76	2.21	3.20	1.0	0.95	6.73	100	56.02	62.76	0.113	-0.187

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
722.3	31.660	4.36	2.06	3.22	1.0	0.95	6.34	100	55.90	62.24	0.113	-0.184
722.2	31.824	5.00	2.11	3.17	1.0	0.94	7.02	100	56.11	63.13	0.113	-0.189
722.0	31.988	5.40	2.12	3.14	1.0	0.94	7.45	100	56.25	63.69	0.113	-0.192
721.8	32.152	5.36	2.02	3.14	1.0	0.94	7.42	100	56.24	63.66	0.113	-0.192
721.7	32.316	5.27	2.20	3.16	1.0	0.94	7.34	100	56.21	63.56	0.114	-0.191
721.5	32.480	4.98	2.20	3.18	1.0	0.93	7.05	100	56.12	63.17	0.114	-0.189
721.4	32.644	5.02	2.41	3.20	1.0	0.93	7.11	100	56.14	63.25	0.114	-0.189
721.2	32.808	6.19	3.35	3.20	1.0	0.93	8.35	100	56.53	64.88	0.114	-0.199
721.0	32.972	7.84	2.95	3.08	1.0	0.93	10.12	100	57.07	67.19	0.114	-0.212
720.9	33.136	6.02	3.92	3.24	1.0	0.93	8.21	100	56.48	64.69	0.114	-0.197
720.7	33.300	6.00	3.59	3.22	1.0	0.92	8.20	100	56.48	64.67	0.114	-0.197
720.5	33.464	5.67	3.38	3.23	1.0	0.92	7.87	100	56.38	64.24	0.114	-0.194
720.4	33.628	5.22	3.86	3.29	1.0	0.92	7.40	100	56.23	63.63	0.115	-0.191
720.2	33.792	5.74	3.85	3.26	1.0	0.92	7.97	100	56.41	64.38	0.115	-0.195
720.0	33.956	6.80	4.46	3.23	1.0	0.91	9.12	100	56.76	65.88	0.115	-0.204
719.9	34.120	7.15	5.89	3.29	1.0	0.91	9.51	100	56.89	66.40	0.115	-0.206
719.7	34.284	8.85	5.58	3.20	1.0	0.91	11.36	100	57.46	68.82	0.115	-0.220
719.6	34.448	10.61	4.98	3.11	1.0	0.91	13.28	100	58.06	71.34	0.116	-0.234
719.4	34.612	13.77	4.24	2.97	1.0	0.91	16.74	100	59.13	75.87	0.118	-0.258
719.2	34.776	18.85	3.60	2.82	1.0	0.91	22.32	89	59.79	82.11	0.118	-0.289
719.1	34.941	21.57	3.72	2.79	1.0	0.91	25.37	86	60.39	85.75	0.118	-0.307
718.9	35.105	24.68	4.78	2.82	1.0	0.91	28.86	88	61.71	90.57	0.118	-0.329
718.7	35.269	27.12	5.20	2.81	1.0	0.91	31.63	88	62.50	94.13	0.118	-0.345
718.6	35.433	28.83	5.02	2.78	1.0	0.91	33.61	85	62.81	96.42	0.118	-0.355
718.4	35.597	27.29	5.22	2.81	1.0	0.91	31.95	88	62.60	94.55	0.118	-0.347
718.2	35.761	26.66	4.57	2.78	1.0	0.90	31.30	85	62.08	93.39	0.119	-0.342
718.1	35.925	24.27	4.35	2.79	1.0	0.90	28.69	86	61.45	90.14	0.119	-0.327
717.9	36.089	25.26	4.78	2.81	1.0	0.90	29.86	88	61.94	91.81	0.119	-0.334
717.7	36.253	29.00	4.47	2.74	1.0	0.90	34.14	83	62.59	96.73	0.119	-0.356
717.6	36.417	25.88	4.68	2.79	1.0	0.90	30.69	86	62.06	92.74	0.119	-0.338
717.4	36.581	24.18	4.63	2.81	1.0	0.89	28.82	88	61.67	90.49	0.119	-0.328
717.3	36.745	22.84	4.28	2.81	1.0	0.89	27.35	88	61.18	88.54	0.120	-0.319
717.1	36.909	20.49	4.72	2.87	1.0	0.89	24.75	93	60.94	85.69	0.120	-0.305
716.9	37.073	19.92	4.65	2.88	1.0	0.88	24.16	93	60.79	84.95	0.120	-0.301
716.8	37.237	20.43	4.20	2.84	1.0	0.88	24.78	90	60.68	85.45	0.120	-0.304
716.6	37.401	21.22	4.10	2.82	1.0	0.88	25.72	89	60.79	86.51	0.120	-0.309
716.4	37.565	21.18	4.56	2.85	1.0	0.88	25.73	91	61.07	86.80	0.120	-0.310
716.3	37.729	18.50	4.61	2.90	1.0	0.88	22.71	95	60.52	83.24	0.121	-0.293
716.1	37.893	16.73	5.01	2.96	1.0	0.87	20.74	99	60.32	81.06	0.121	-0.282
715.9	38.057	17.17	3.42	2.84	1.0	0.87	21.28	90	59.62	80.90	0.121	-0.281
715.8	38.221	16.47	3.18	2.84	1.0	0.87	20.50	90	59.34	79.85	0.121	-0.276
715.6	38.385	16.06	3.22	2.85	1.0	0.87	20.08	91	59.32	79.39	0.122	-0.273
715.5	38.549	17.14	3.39	2.84	1.0	0.87	21.36	90	59.63	80.99	0.122	-0.281
715.3	38.713	14.50	4.52	2.97	1.0	0.86	18.36	100	59.63	78.00	0.122	-0.266
715.1	38.877	13.45	5.06	3.03	1.0	0.86	17.20	100	59.27	76.47	0.122	-0.258
715.0	39.042	12.68	4.82	3.04	1.0	0.86	16.34	100	59.01	75.35	0.123	-0.252
714.8	39.206	11.90	3.98	3.01	1.0	0.85	15.47	100	58.74	74.21	0.123	-0.246
714.6	39.370	10.25	4.90	3.11	1.0	0.85	13.60	100	58.16	71.76	0.123	-0.232
714.5	39.534	9.39	4.45	3.12	1.0	0.85	12.63	100	57.86	70.49	0.124	-0.225
714.3	39.698	8.64	4.51	3.15	1.0	0.85	11.80	100	57.60	69.40	0.124	-0.219
714.1	39.862	9.53	3.67	3.06	1.0	0.85	12.84	100	57.92	70.76	0.124	-0.227
714.0	40.026	10.79	3.73	3.03	1.0	0.84	14.31	100	58.38	72.69	0.124	-0.237
713.8	40.190	13.76	3.15	2.90	1.0	0.85	17.78	95	58.98	76.77	0.124	-0.258
713.6	40.354	11.12	5.23	3.10	1.0	0.84	14.74	100	58.51	73.26	0.125	-0.240
713.5	40.518	9.85	5.05	3.14	1.0	0.84	13.29	100	58.06	71.35	0.125	-0.229
713.3	40.682	7.50	5.15	3.23	1.0	0.83	10.60	100	57.22	67.83	0.125	-0.210
713.2	40.846	5.80	4.52	3.29	1.0	0.83	8.66	100	56.62	65.28	0.125	-0.195
713.0	41.010	4.80	4.52	3.36	1.0	0.83	7.52	100	56.27	63.78	0.125	-0.186
712.8	41.174	4.27	6.11	3.48	1.0	0.83	6.91	100	56.08	62.99	0.125	-0.181
712.7	41.338	5.86	4.29	3.28	1.0	0.83	8.76	100	56.65	65.41	0.125	-0.195
712.5	41.502	6.77	3.39	3.17	1.0	0.82	9.84	100	56.99	66.82	0.125	-0.203
712.3	41.666	8.38	2.29	3.00	1.0	0.83	11.72	100	57.57	69.30	0.125	-0.217
712.2	41.830	5.97	2.29	3.12	1.0	0.82	8.93	100	56.71	65.64	0.125	-0.196
712.0	41.994	4.60	2.57	3.25	1.0	0.82	7.35	100	56.22	63.57	0.125	-0.184
711.8	42.158	3.23	2.80	3.40	1.0	0.81	5.77	100	55.72	61.50	0.126	-0.171
711.7	42.322	11.10	0.52	2.60	1.0	0.82	14.96	71	55.15	70.11	0.126	-0.221

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
711.5	42.486	15.18	0.69	2.52	0.5	0.82	16.91	65	54.53	71.44	0.126	-0.228
711.3	42.650	9.67	1.14	2.79	1.0	0.82	13.35	87	56.80	70.15	0.126	-0.221
711.2	42.814	7.98	1.38	2.91	1.0	0.81	11.38	95	57.09	68.46	0.127	-0.212
711.0	42.978	5.41	1.58	3.08	1.0	0.81	8.37	100	56.53	64.90	0.127	-0.191
710.9	43.143	7.38	0.65	2.80	1.0	0.81	10.69	87	56.04	66.73	0.127	-0.202
710.7	43.307	10.41	0.53	2.63	1.0	0.81	14.28	73	55.33	69.62	0.127	-0.218
710.5	43.471	8.43	0.96	2.81	1.0	0.81	11.97	88	56.55	68.52	0.128	-0.212
710.4	43.635	6.63	1.49	2.99	1.0	0.80	9.87	100	57.00	66.86	0.128	-0.202
710.2	43.799	12.32	0.89	2.65	1.0	0.81	16.66	75	56.31	72.97	0.128	-0.236
710.0	43.963	16.85	0.55	2.44	0.5	0.81	18.55	58	53.47	72.02	0.128	-0.231
709.9	44.127	19.53	0.47	2.36	0.5	0.80	21.20	51	52.12	73.32	0.128	-0.237
709.7	44.291	20.60	0.48	2.34	0.5	0.80	22.26	50	51.88	74.14	0.128	-0.242
709.5	44.455	17.44	0.69	2.47	0.5	0.80	19.15	60	54.16	73.31	0.128	-0.237
709.4	44.619	13.67	0.92	2.62	1.0	0.80	18.42	72	56.40	74.82	0.128	-0.245
709.2	44.783	17.84	0.96	2.52	0.5	0.80	19.58	65	55.32	74.89	0.128	-0.245
709.1	44.947	20.63	0.72	2.41	0.5	0.80	22.33	56	53.80	76.13	0.128	-0.252
708.9	45.111	22.53	0.43	2.28	0.5	0.80	24.15	46	50.60	74.74	0.128	-0.244
708.7	45.275	26.91	0.43	2.21	0.5	0.80	28.51	40	48.74	77.24	0.128	-0.257
708.6	45.439	28.21	0.48	2.21	0.5	0.80	29.83	40	49.02	78.85	0.129	-0.265
708.4	45.603	26.60	1.17	2.42	0.5	0.80	28.41	56	55.66	84.07	0.129	-0.291
708.2	45.767	24.34	1.33	2.48	0.5	0.80	26.14	61	56.37	82.50	0.129	-0.283
708.1	45.931	43.39	0.59	2.08	0.5	0.80	45.19	30	43.96	89.16	0.129	-0.315
707.9	46.095	56.75	0.56	1.97	0.5	0.80	58.56	21	32.91	91.47	0.129	-0.325
707.7	46.259	62.79	0.64	1.96	0.5	0.80	64.91	20	32.14	97.05	0.129	-0.350
707.6	46.423	71.17	0.61	1.90	0.5	0.80	73.10	15	21.50	94.60	0.129	-0.339
707.4	46.587	73.52	0.66	1.91	0.5	0.80	75.82	16	23.73	99.54	0.130	-0.361
707.2	46.751	73.13	0.83	1.97	0.5	0.81	76.25	20	34.78	111.03	0.130	-0.408
707.1	46.915	65.53	0.85	2.01	0.5	0.81	68.46	24	40.77	109.23	0.130	-0.400
706.9	47.079	58.75	0.92	2.07	0.5	0.81	61.54	29	46.31	107.85	0.130	-0.395
706.8	47.244	50.61	0.96	2.14	0.5	0.80	53.10	34	49.93	103.02	0.131	-0.375
706.6	47.408	44.90	0.97	2.18	0.5	0.80	47.17	38	51.58	98.75	0.131	-0.357
706.4	47.572	43.00	0.94	2.19	0.5	0.79	45.18	38	51.65	96.84	0.131	-0.348
706.3	47.736	41.87	0.90	2.19	0.5	0.79	43.99	38	51.36	95.35	0.131	-0.342
706.1	47.900	37.99	0.91	2.23	0.5	0.79	39.99	41	52.32	92.31	0.131	-0.328
705.9	48.064	33.25	0.96	2.29	0.5	0.78	35.16	46	53.68	88.84	0.131	-0.312
705.8	48.228	27.61	1.00	2.37	0.5	0.78	29.42	52	54.69	84.11	0.131	-0.289
705.6	48.392	22.52	1.24	2.49	0.5	0.77	24.30	62	56.09	80.40	0.131	-0.271
705.4	48.556	15.07	1.51	2.69	1.0	0.77	20.95	78	57.98	78.93	0.131	-0.264
705.3	48.720	29.44	0.82	2.30	0.5	0.77	31.23	47	53.07	84.30	0.131	-0.290
705.1	48.884	35.98	0.71	2.19	0.5	0.78	37.82	38	50.02	87.83	0.131	-0.307
705.0	49.048	33.20	0.84	2.26	0.5	0.77	35.06	44	52.52	87.59	0.131	-0.305
704.8	49.212	31.71	0.83	2.27	0.5	0.77	33.54	45	52.68	86.22	0.130	-0.299
704.6	49.376	35.66	0.64	2.18	0.5	0.77	37.43	37	49.00	86.43	0.130	-0.300
704.5	49.540	45.45	0.64	2.08	0.5	0.77	47.39	30	44.48	91.87	0.130	-0.325
704.3	49.704	58.91	0.98	2.09	0.5	0.79	61.96	30	47.85	109.81	0.129	-0.401
704.1	49.868	78.37	0.57	1.86	0.5	0.77	79.96	11	11.00	90.96	0.129	-0.320
704.0	50.032	142.01	0.15	1.38	0.5	0.82	151.88	0	0.00	151.88	0.128	-0.548
703.8	50.196	226.68	0.15	1.18	0.5	0.87	258.46	0	0.00	258.46	0.128	-0.600

LIQUEFACTION POTENTIAL ASSESSMENT FOR COARSE GRAINED SOILS USING CONE PENETRATION TEST DATA

Project Site: **KIF TDEC Stability**
Stantec Project No.: **175668043**
CPT ID: **CPT-03C**

Depth to Water during Earthquake:	5.3	ft
Final Grade Elevation during EQ:	753.8	ft
Height of Final Grade above CPT TOH:	-0.2	ft
Normalize K_σ to:	1.058	tsf
a_{max} at top of ground surface:	0.19	g
Earthquake Magnitude:	6.00	M_W
Earthquake File or Source Zone:	10	Hz

Shear Stress Fit Parameters

m4:	0
m3:	0
m2:	0
m1:	0

Elev. (ft)	Depth *z* (ft)	Cyclic Resistance Ratio *CRR 7.5*	Relative Density *D r* (%)	Correction for Overburden Pressure *K σ*	Correction for Sloping Ground *K α*	Magnitude Scaling Factor *MSF*	Cyclic Resistance Ratio *CRR*	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress *τ Max* (psf)	From Ground Response: Average Cyclic Shear Stress *τ Avg* (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. *(qc 1N) CS ≥ 175*	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
754.0																	
753.8	0.164	N/A	43	N/A	N/A	N/A	N/A	1.000	0	0	**0.121**	TRUE	FALSE	TRUE	**N/A**	**Clay fill (irrelevant)**	**A1**
753.7	0.328	N/A	64	N/A	N/A	N/A	N/A	1.000	0	0	**0.121**	TRUE	FALSE	TRUE	**N/A**	**Clay fill (irrelevant)**	**A1**
753.5	0.492	N/A	83	N/A	N/A	N/A	N/A	1.000	0	0	**0.121**	TRUE	TRUE	TRUE	**N/A**	**Clay fill (irrelevant)**	**A1**
753.3	0.656	N/A	89	N/A	N/A	N/A	N/A	1.000	0	0	**0.121**	TRUE	TRUE	TRUE	**N/A**	**Clay fill (irrelevant)**	**A1**
753.2	0.820	N/A	95	N/A	N/A	N/A	N/A	1.000	0	0	**0.121**	TRUE	TRUE	TRUE	**N/A**	**Clay fill (irrelevant)**	**A1**
753.0	0.984	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.121**	TRUE	TRUE	TRUE	**N/A**	**Embankemnt Fill**	**A1**
752.9	1.148	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.121**	TRUE	TRUE	TRUE	**N/A**	**Embankemnt Fill**	**A1**
752.7	1.312	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.121**	TRUE	TRUE	TRUE	**N/A**	**Embankemnt Fill**	**A1**
752.5	1.476	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.121**	TRUE	TRUE	TRUE	**N/A**	**Embankemnt Fill**	**A1**
752.4	1.640	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.121**	TRUE	TRUE	TRUE	**N/A**	**Embankemnt Fill**	**A1**
752.2	1.804	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.121**	TRUE	TRUE	TRUE	**N/A**	**Embankemnt Fill**	**A1**
752.0	1.968	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.121**	TRUE	TRUE	TRUE	**N/A**	**Embankemnt Fill**	**A1**
751.9	2.133	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.121**	TRUE	TRUE	TRUE	**N/A**	**Embankemnt Fill**	**A1**
751.7	2.297	N/A	100	N/A	N/A	N/A	N/A	0.999	0	0	**0.120**	TRUE	TRUE	TRUE	**N/A**	**Embankemnt Fill**	**A1**
751.5	2.461	N/A	100	N/A	N/A	N/A	N/A	0.999	0	0	**0.120**	TRUE	TRUE	TRUE	**N/A**	**Embankemnt Fill**	**A1**
751.4	2.625	N/A	100	N/A	N/A	N/A	N/A	0.998	0	0	**0.120**	TRUE	TRUE	TRUE	**N/A**	**Embankemnt Fill**	**A1**
751.2	2.789	N/A	100	N/A	N/A	N/A	N/A	0.997	0	0	**0.120**	TRUE	TRUE	TRUE	**N/A**	**Embankemnt Fill**	**A1**
751.0	2.953	N/A	98	N/A	N/A	N/A	N/A	0.996	0	0	**0.120**	TRUE	TRUE	TRUE	**N/A**	**Embankemnt Fill**	**A1**
750.9	3.117	N/A	69	N/A	N/A	N/A	N/A	0.996	0	0	**0.120**	TRUE	FALSE	TRUE	**N/A**	**Embankemnt Fill**	**A1**
750.7	3.281	N/A	70	N/A	N/A	N/A	N/A	0.995	0	0	**0.120**	TRUE	FALSE	TRUE	**N/A**	**Embankemnt Fill**	**A1**
750.6	3.445	N/A	66	N/A	N/A	N/A	N/A	0.994	0	0	**0.120**	TRUE	FALSE	TRUE	**N/A**	**Embankemnt Fill**	**A1**
750.4	3.609	N/A	65	N/A	N/A	N/A	N/A	0.993	0	0	**0.120**	TRUE	FALSE	TRUE	**N/A**	**Embankemnt Fill**	**A1**
750.2	3.773	N/A	79	N/A	N/A	N/A	N/A	0.993	0	0	**0.120**	TRUE	FALSE	TRUE	**N/A**	**Embankemnt Fill**	**A1**
750.1	3.937	N/A	71	N/A	N/A	N/A	N/A	0.992	0	0	**0.120**	TRUE	FALSE	TRUE	**N/A**	**Embankemnt Fill**	**A1**
749.9	4.101	N/A	63	N/A	N/A	N/A	N/A	0.991	0	0	**0.119**	TRUE	FALSE	TRUE	**N/A**	**Embankemnt Fill**	**A1**
749.7	4.265	N/A	91	N/A	N/A	N/A	N/A	0.990	0	0	**0.119**	TRUE	TRUE	TRUE	**N/A**	**Embankemnt Fill**	**A1**
749.6	4.429	N/A	100	N/A	N/A	N/A	N/A	0.989	0	0	**0.119**	TRUE	TRUE	TRUE	**N/A**	**Embankemnt Fill**	**A1**
749.4	4.593	N/A	100	N/A	N/A	N/A	N/A	0.989	0	0	**0.119**	TRUE	TRUE	TRUE	**N/A**	**Embankemnt Fill**	**A1**
749.2	4.757	N/A	100	N/A	N/A	N/A	N/A	0.988	0	0	**0.119**	TRUE	TRUE	TRUE	**N/A**	**Embankemnt Fill**	**A1**
749.1	4.921	N/A	84	N/A	N/A	N/A	N/A	0.987	0	0	**0.119**	TRUE	TRUE	TRUE	**N/A**	**Embankemnt Fill**	**A1**
748.9	5.085	N/A	82	N/A	N/A	N/A	N/A	0.986	0	0	**0.119**	TRUE	TRUE	TRUE	**N/A**	**Embankemnt Fill**	**A1**
748.8	5.249	N/A	70	N/A	N/A	N/A	N/A	0.985	0	0	**0.119**	TRUE	FALSE	TRUE	**N/A**	**Embankemnt Fill**	**A1**
748.6	5.413	N/A	71	N/A	N/A	N/A	N/A	0.985	0	0	**0.120**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
748.4	5.577	N/A	72	N/A	N/A	N/A	N/A	0.984	0	0	**0.122**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
748.3	5.741	N/A	66	N/A	N/A	N/A	N/A	0.983	0	0	**0.123**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
748.1	5.905	N/A	79	N/A	N/A	N/A	N/A	0.982	0	0	**0.125**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
747.9	6.069	N/A	100	N/A	N/A	N/A	N/A	0.981	0	0	**0.126**	TRUE	TRUE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
747.8	6.234	N/A	92	N/A	N/A	N/A	N/A	0.980	0	0	**0.128**	TRUE	TRUE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
747.6	6.398	N/A	90	N/A	N/A	N/A	N/A	0.980	0	0	**0.129**	TRUE	TRUE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
747.4	6.562	N/A	81	N/A	N/A	N/A	N/A	0.979	0	0	**0.131**	TRUE	TRUE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
747.3	6.726	N/A	97	N/A	N/A	N/A	N/A	0.978	0	0	**0.132**	TRUE	TRUE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
747.1	6.890	N/A	100	N/A	N/A	N/A	N/A	0.977	0	0	**0.133**	TRUE	TRUE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
746.9	7.054	N/A	96	N/A	N/A	N/A	N/A	0.976	0	0	**0.135**	TRUE	TRUE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
746.8	7.218	N/A	86	N/A	N/A	N/A	N/A	0.975	0	0	**0.136**	TRUE	TRUE	FALSE	**N/A**	**Embankemnt Fill**	**B**

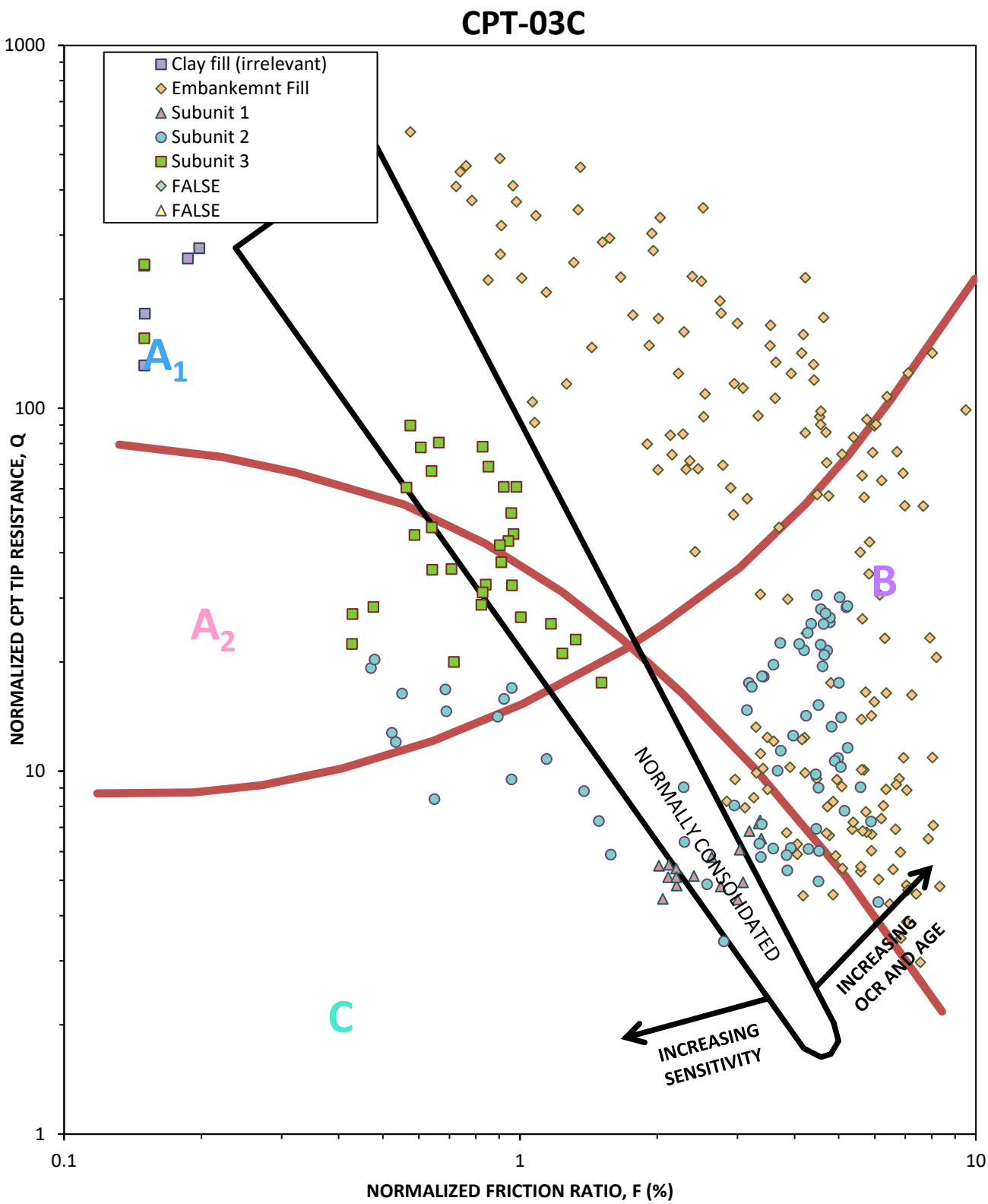
Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
746.6	7.382	N/A	85	N/A	N/A	N/A	N/A	0.974	0	0	**0.137**	TRUE	TRUE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
746.5	7.546	N/A	100	N/A	N/A	N/A	N/A	0.973	0	0	**0.138**	TRUE	TRUE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
746.3	7.710	N/A	100	N/A	N/A	N/A	N/A	0.973	0	0	**0.139**	TRUE	TRUE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
746.1	7.874	N/A	100	N/A	N/A	N/A	N/A	0.972	0	0	**0.140**	TRUE	TRUE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
746.0	8.038	N/A	100	N/A	N/A	N/A	N/A	0.971	0	0	**0.141**	TRUE	TRUE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
745.8	8.202	N/A	100	N/A	N/A	N/A	N/A	0.970	0	0	**0.142**	TRUE	TRUE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
745.6	8.366	N/A	95	N/A	N/A	N/A	N/A	0.969	0	0	**0.143**	TRUE	TRUE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
745.5	8.530	N/A	88	N/A	N/A	N/A	N/A	0.968	0	0	**0.144**	TRUE	TRUE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
745.3	8.694	N/A	82	N/A	N/A	N/A	N/A	0.967	0	0	**0.145**	TRUE	TRUE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
745.1	8.858	N/A	78	N/A	N/A	N/A	N/A	0.966	0	0	**0.146**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
745.0	9.022	N/A	73	N/A	N/A	N/A	N/A	0.965	0	0	**0.147**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
744.8	9.186	N/A	67	N/A	N/A	N/A	N/A	0.964	0	0	**0.148**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
744.6	9.350	N/A	76	N/A	N/A	N/A	N/A	0.963	0	0	**0.148**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
744.5	9.514	N/A	74	N/A	N/A	N/A	N/A	0.962	0	0	**0.149**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
744.3	9.678	N/A	79	N/A	N/A	N/A	N/A	0.962	0	0	**0.150**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
744.2	9.842	N/A	100	N/A	N/A	N/A	N/A	0.961	0	0	**0.151**	TRUE	TRUE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
744.0	10.006	N/A	100	N/A	N/A	N/A	N/A	0.960	0	0	**0.151**	TRUE	TRUE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
743.8	10.170	N/A	100	N/A	N/A	N/A	N/A	0.959	0	0	**0.152**	TRUE	TRUE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
743.7	10.335	N/A	95	N/A	N/A	N/A	N/A	0.958	0	0	**0.153**	TRUE	TRUE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
743.5	10.499	N/A	93	N/A	N/A	N/A	N/A	0.957	0	0	**0.153**	TRUE	TRUE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
743.3	10.663	N/A	87	N/A	N/A	N/A	N/A	0.956	0	0	**0.154**	TRUE	TRUE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
743.2	10.827	N/A	86	N/A	N/A	N/A	N/A	0.955	0	0	**0.154**	TRUE	TRUE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
743.0	10.991	N/A	75	N/A	N/A	N/A	N/A	0.954	0	0	**0.155**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
742.8	11.155	N/A	71	N/A	N/A	N/A	N/A	0.953	0	0	**0.156**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
742.7	11.319	N/A	69	N/A	N/A	N/A	N/A	0.952	0	0	**0.156**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
742.5	11.483	N/A	66	N/A	N/A	N/A	N/A	0.951	0	0	**0.157**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
742.4	11.647	N/A	67	N/A	N/A	N/A	N/A	0.950	0	0	**0.157**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
742.2	11.811	N/A	62	N/A	N/A	N/A	N/A	0.949	0	0	**0.158**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
742.0	11.975	N/A	63	N/A	N/A	N/A	N/A	0.948	0	0	**0.158**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
741.9	12.139	N/A	67	N/A	N/A	N/A	N/A	0.947	0	0	**0.159**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
741.7	12.303	N/A	84	N/A	N/A	N/A	N/A	0.946	0	0	**0.159**	TRUE	TRUE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
741.5	12.467	N/A	100	N/A	N/A	N/A	N/A	0.945	0	0	**0.160**	TRUE	TRUE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
741.4	12.631	N/A	95	N/A	N/A	N/A	N/A	0.944	0	0	**0.160**	TRUE	TRUE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
741.2	12.795	N/A	92	N/A	N/A	N/A	N/A	0.943	0	0	**0.160**	TRUE	TRUE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
741.0	12.959	N/A	98	N/A	N/A	N/A	N/A	0.942	0	0	**0.161**	TRUE	TRUE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
740.9	13.123	N/A	92	N/A	N/A	N/A	N/A	0.941	0	0	**0.161**	TRUE	TRUE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
740.7	13.287	N/A	65	N/A	N/A	N/A	N/A	0.940	0	0	**0.162**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
740.5	13.451	N/A	62	N/A	N/A	N/A	N/A	0.939	0	0	**0.162**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
740.4	13.615	N/A	67	N/A	N/A	N/A	N/A	0.938	0	0	**0.162**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
740.2	13.779	N/A	58	N/A	N/A	N/A	N/A	0.937	0	0	**0.163**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
740.1	13.943	N/A	66	N/A	N/A	N/A	N/A	0.936	0	0	**0.163**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
739.9	14.107	N/A	65	N/A	N/A	N/A	N/A	0.935	0	0	**0.163**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
739.7	14.271	N/A	60	N/A	N/A	N/A	N/A	0.934	0	0	**0.164**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
739.6	14.436	N/A	68	N/A	N/A	N/A	N/A	0.933	0	0	**0.164**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
739.4	14.600	N/A	71	N/A	N/A	N/A	N/A	0.931	0	0	**0.164**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
739.2	14.764	N/A	67	N/A	N/A	N/A	N/A	0.930	0	0	**0.164**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
739.1	14.928	N/A	62	N/A	N/A	N/A	N/A	0.929	0	0	**0.165**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
738.9	15.092	N/A	61	N/A	N/A	N/A	N/A	0.928	0	0	**0.165**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
738.7	15.256	N/A	82	N/A	N/A	N/A	N/A	0.927	0	0	**0.165**	TRUE	TRUE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
738.6	15.420	N/A	80	N/A	N/A	N/A	N/A	0.926	0	0	**0.165**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
738.4	15.584	N/A	75	N/A	N/A	N/A	N/A	0.925	0	0	**0.166**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
738.3	15.748	N/A	65	N/A	N/A	N/A	N/A	0.924	0	0	**0.166**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
738.1	15.912	N/A	61	N/A	N/A	N/A	N/A	0.923	0	0	**0.166**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
737.9	16.076	N/A	66	N/A	N/A	N/A	N/A	0.922	0	0	**0.166**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
737.8	16.240	N/A	63	N/A	N/A	N/A	N/A	0.921	0	0	**0.167**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**

Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
737.6	16.404	N/A	56	N/A	N/A	N/A	N/A	0.920	0	0	**0.167**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
737.4	16.568	N/A	55	N/A	N/A	N/A	N/A	0.919	0	0	**0.167**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
737.3	16.732	N/A	53	N/A	N/A	N/A	N/A	0.917	0	0	**0.167**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
737.1	16.896	N/A	51	N/A	N/A	N/A	N/A	0.916	0	0	**0.167**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
736.9	17.060	N/A	47	N/A	N/A	N/A	N/A	0.915	0	0	**0.167**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
736.8	17.224	N/A	45	N/A	N/A	N/A	N/A	0.914	0	0	**0.168**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
736.6	17.388	N/A	47	N/A	N/A	N/A	N/A	0.913	0	0	**0.168**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
736.4	17.552	N/A	43	N/A	N/A	N/A	N/A	0.912	0	0	**0.168**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
736.3	17.716	N/A	40	N/A	N/A	N/A	N/A	0.911	0	0	**0.168**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
736.1	17.880	N/A	40	N/A	N/A	N/A	N/A	0.910	0	0	**0.168**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
736.0	18.044	N/A	42	N/A	N/A	N/A	N/A	0.909	0	0	**0.168**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
735.8	18.208	N/A	43	N/A	N/A	N/A	N/A	0.907	0	0	**0.168**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
735.6	18.372	N/A	43	N/A	N/A	N/A	N/A	0.906	0	0	**0.168**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
735.5	18.537	N/A	44	N/A	N/A	N/A	N/A	0.905	0	0	**0.169**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
735.3	18.701	N/A	42	N/A	N/A	N/A	N/A	0.904	0	0	**0.169**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
735.1	18.865	N/A	39	N/A	N/A	N/A	N/A	0.903	0	0	**0.169**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
735.0	19.029	N/A	41	N/A	N/A	N/A	N/A	0.902	0	0	**0.169**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
734.8	19.193	N/A	41	N/A	N/A	N/A	N/A	0.901	0	0	**0.169**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
734.6	19.357	N/A	39	N/A	N/A	N/A	N/A	0.900	0	0	**0.169**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**C**
734.5	19.521	N/A	36	N/A	N/A	N/A	N/A	0.898	0	0	**0.169**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
734.3	19.685	N/A	36	N/A	N/A	N/A	N/A	0.897	0	0	**0.169**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
734.2	19.849	N/A	37	N/A	N/A	N/A	N/A	0.896	0	0	**0.169**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
734.0	20.013	N/A	36	N/A	N/A	N/A	N/A	0.895	0	0	**0.169**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
733.8	20.177	N/A	35	N/A	N/A	N/A	N/A	0.894	0	0	**0.169**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
733.7	20.341	N/A	36	N/A	N/A	N/A	N/A	0.893	0	0	**0.169**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**C**
733.5	20.505	N/A	36	N/A	N/A	N/A	N/A	0.892	0	0	**0.169**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
733.3	20.669	N/A	36	N/A	N/A	N/A	N/A	0.890	0	0	**0.170**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
733.2	20.833	N/A	39	N/A	N/A	N/A	N/A	0.889	0	0	**0.170**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**C**
733.0	20.997	N/A	38	N/A	N/A	N/A	N/A	0.888	0	0	**0.170**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**C**
732.8	21.161	N/A	37	N/A	N/A	N/A	N/A	0.887	0	0	**0.170**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
732.7	21.325	N/A	36	N/A	N/A	N/A	N/A	0.886	0	0	**0.170**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
732.5	21.489	N/A	38	N/A	N/A	N/A	N/A	0.885	0	0	**0.170**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**C**
732.3	21.653	N/A	37	N/A	N/A	N/A	N/A	0.883	0	0	**0.170**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**C**
732.2	21.817	N/A	36	N/A	N/A	N/A	N/A	0.882	0	0	**0.170**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
732.0	21.981	N/A	37	N/A	N/A	N/A	N/A	0.881	0	0	**0.170**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**C**
731.9	22.145	N/A	38	N/A	N/A	N/A	N/A	0.880	0	0	**0.170**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**C**
731.7	22.309	N/A	37	N/A	N/A	N/A	N/A	0.879	0	0	**0.170**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
731.5	22.473	N/A	37	N/A	N/A	N/A	N/A	0.878	0	0	**0.170**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
731.4	22.638	N/A	37	N/A	N/A	N/A	N/A	0.876	0	0	**0.170**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
731.2	22.802	N/A	36	N/A	N/A	N/A	N/A	0.875	0	0	**0.170**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
731.0	22.966	N/A	37	N/A	N/A	N/A	N/A	0.874	0	0	**0.170**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
730.9	23.130	N/A	39	N/A	N/A	N/A	N/A	0.873	0	0	**0.170**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
730.7	23.294	N/A	39	N/A	N/A	N/A	N/A	0.872	0	0	**0.170**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
730.5	23.458	N/A	38	N/A	N/A	N/A	N/A	0.870	0	0	**0.170**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
730.4	23.622	N/A	39	N/A	N/A	N/A	N/A	0.869	0	0	**0.170**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
730.2	23.786	N/A	39	N/A	N/A	N/A	N/A	0.868	0	0	**0.170**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
730.1	23.950	N/A	38	N/A	N/A	N/A	N/A	0.867	0	0	**0.170**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
729.9	24.114	N/A	37	N/A	N/A	N/A	N/A	0.866	0	0	**0.169**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
729.7	24.278	N/A	36	N/A	N/A	N/A	N/A	0.864	0	0	**0.169**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
729.6	24.442	N/A	35	N/A	N/A	N/A	N/A	0.863	0	0	**0.169**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
729.4	24.606	N/A	36	N/A	N/A	N/A	N/A	0.862	0	0	**0.169**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
729.2	24.770	N/A	37	N/A	N/A	N/A	N/A	0.861	0	0	**0.169**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
729.1	24.934	N/A	50	N/A	N/A	N/A	N/A	0.860	0	0	**0.169**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
728.9	25.098	N/A	48	N/A	N/A	N/A	N/A	0.858	0	0	**0.169**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
728.7	25.262	N/A	66	N/A	N/A	N/A	N/A	0.857	0	0	**0.169**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**A1**

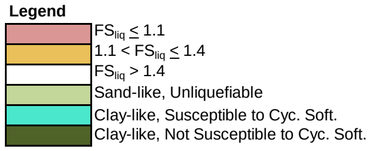
Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
728.6	25.426	N/A	56	N/A	N/A	N/A	N/A	0.856	0	0	**0.169**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**A1**
728.4	25.590	N/A	52	N/A	N/A	N/A	N/A	0.855	0	0	**0.169**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
728.2	25.754	N/A	51	N/A	N/A	N/A	N/A	0.854	0	0	**0.169**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
728.1	25.918	N/A	44	N/A	N/A	N/A	N/A	0.852	0	0	**0.169**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
727.9	26.082	N/A	41	N/A	N/A	N/A	N/A	0.851	0	0	**0.169**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
727.8	26.246	N/A	39	N/A	N/A	N/A	N/A	0.850	0	0	**0.169**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
727.6	26.410	N/A	40	N/A	N/A	N/A	N/A	0.849	0	0	**0.169**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
727.4	26.574	N/A	38	N/A	N/A	N/A	N/A	0.848	0	0	**0.169**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
727.3	26.739	N/A	38	N/A	N/A	N/A	N/A	0.846	0	0	**0.168**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
727.1	26.903	N/A	40	N/A	N/A	N/A	N/A	0.845	0	0	**0.168**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
726.9	27.067	N/A	40	N/A	N/A	N/A	N/A	0.844	0	0	**0.168**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
726.8	27.231	N/A	38	N/A	N/A	N/A	N/A	0.843	0	0	**0.168**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
726.6	27.395	N/A	40	N/A	N/A	N/A	N/A	0.841	0	0	**0.168**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
726.4	27.559	N/A	40	N/A	N/A	N/A	N/A	0.840	0	0	**0.168**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
726.3	27.723	N/A	42	N/A	N/A	N/A	N/A	0.839	0	0	**0.168**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
726.1	27.887	N/A	42	N/A	N/A	N/A	N/A	0.838	0	0	**0.168**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
725.9	28.051	N/A	38	N/A	N/A	N/A	N/A	0.837	0	0	**0.168**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
725.8	28.215	N/A	39	N/A	N/A	N/A	N/A	0.835	0	0	**0.168**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
725.6	28.379	N/A	40	N/A	N/A	N/A	N/A	0.834	0	0	**0.168**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**C**
725.5	28.543	N/A	40	N/A	N/A	N/A	N/A	0.833	0	0	**0.167**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
725.3	28.707	N/A	41	N/A	N/A	N/A	N/A	0.832	0	0	**0.167**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
725.1	28.871	N/A	39	N/A	N/A	N/A	N/A	0.830	0	0	**0.167**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
725.0	29.035	N/A	38	N/A	N/A	N/A	N/A	0.829	0	0	**0.167**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
724.8	29.199	N/A	37	N/A	N/A	N/A	N/A	0.828	0	0	**0.167**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
724.6	29.363	N/A	36	N/A	N/A	N/A	N/A	0.827	0	0	**0.167**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**C**
724.5	29.527	N/A	36	N/A	N/A	N/A	N/A	0.825	0	0	**0.167**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**C**
724.3	29.691	N/A	35	N/A	N/A	N/A	N/A	0.824	0	0	**0.167**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
724.1	29.855	N/A	35	N/A	N/A	N/A	N/A	0.823	0	0	**0.167**	TRUE	FALSE	FALSE	**N/A**	**Embankemnt Fill**	**B**
724.0	30.019	N/A	36	N/A	N/A	N/A	N/A	0.822	0	0	**0.166**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
723.8	30.183	N/A	37	N/A	N/A	N/A	N/A	0.821	0	0	**0.166**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
723.7	30.347	N/A	38	N/A	N/A	N/A	N/A	0.819	0	0	**0.166**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
723.5	30.511	N/A	38	N/A	N/A	N/A	N/A	0.818	0	0	**0.166**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
723.3	30.675	N/A	38	N/A	N/A	N/A	N/A	0.817	0	0	**0.166**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
723.2	30.840	N/A	38	N/A	N/A	N/A	N/A	0.816	0	0	**0.166**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
723.0	31.004	N/A	37	N/A	N/A	N/A	N/A	0.814	0	0	**0.166**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
722.8	31.168	N/A	36	N/A	N/A	N/A	N/A	0.813	0	0	**0.166**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
722.7	31.332	N/A	36	N/A	N/A	N/A	N/A	0.812	0	0	**0.165**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
722.5	31.496	N/A	36	N/A	N/A	N/A	N/A	0.811	0	0	**0.165**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
722.3	31.660	N/A	36	N/A	N/A	N/A	N/A	0.809	0	0	**0.165**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
722.2	31.824	N/A	37	N/A	N/A	N/A	N/A	0.808	0	0	**0.165**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
722.0	31.988	N/A	37	N/A	N/A	N/A	N/A	0.807	0	0	**0.165**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
721.8	32.152	N/A	37	N/A	N/A	N/A	N/A	0.806	0	0	**0.165**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
721.7	32.316	N/A	37	N/A	N/A	N/A	N/A	0.804	0	0	**0.165**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
721.5	32.480	N/A	37	N/A	N/A	N/A	N/A	0.803	0	0	**0.164**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
721.4	32.644	N/A	37	N/A	N/A	N/A	N/A	0.802	0	0	**0.164**	TRUE	FALSE	FALSE	**N/A**	**Subunit 1**	**C**
721.2	32.808	0.103	38	0.988	0.882	1.08	0.097	0.801	0	0	**0.164**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
721.0	32.972	0.105	39	0.988	0.889	1.09	0.100	0.800	0	0	**0.164**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
720.9	33.136	0.103	37	0.988	0.881	1.08	0.097	0.798	0	0	**0.164**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
720.7	33.300	0.103	37	0.987	0.881	1.08	0.097	0.797	0	0	**0.164**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
720.5	33.464	0.103	37	0.987	0.880	1.08	0.096	0.796	0	0	**0.164**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
720.4	33.628	0.102	37	0.987	0.878	1.08	0.096	0.795	0	0	**0.163**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
720.2	33.792	0.103	37	0.986	0.880	1.08	0.097	0.793	0	0	**0.163**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
720.0	33.956	0.104	38	0.986	0.884	1.08	0.098	0.792	0	0	**0.163**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**B**
719.9	34.120	0.104	38	0.985	0.885	1.08	0.099	0.791	0	0	**0.163**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**B**
719.7	34.284	0.106	40	0.985	0.893	1.09	0.102	0.790	0	0	**0.163**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**B**

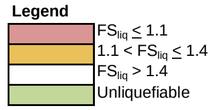
Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
719.6	34.448	0.108	41	0.984	0.901	1.09	0.105	0.788	0	0	**0.163**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**B**
719.4	34.612	0.112	44	0.983	0.918	1.10	0.111	0.787	0	0	**0.163**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**B**
719.2	34.776	0.118	47	0.982	0.946	1.11	0.121	0.786	0	0	**0.162**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**B**
719.1	34.941	0.121	49	0.981	0.963	1.12	0.128	0.785	0	0	**0.162**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**B**
718.9	35.105	0.126	51	0.980	0.989	1.13	0.138	0.783	0	0	**0.162**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**B**
718.7	35.269	0.130	52	0.979	1.010	1.14	0.147	0.782	0	0	**0.162**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**B**
718.6	35.433	0.133	53	0.978	1.024	1.15	0.153	0.781	0	0	**0.162**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**B**
718.4	35.597	0.131	53	0.978	1.012	1.14	0.148	0.780	0	0	**0.162**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**B**
718.2	35.761	0.129	52	0.978	1.005	1.14	0.145	0.778	0	0	**0.161**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**B**
718.1	35.925	0.126	51	0.978	0.986	1.13	0.137	0.777	0	0	**0.161**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**B**
717.9	36.089	0.128	51	0.977	0.996	1.13	0.141	0.776	0	0	**0.161**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**B**
717.7	36.253	0.133	54	0.976	1.026	1.15	0.153	0.775	0	0	**0.161**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**B**
717.6	36.417	0.129	52	0.976	1.001	1.14	0.143	0.773	0	0	**0.161**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**B**
717.4	36.581	0.126	51	0.976	0.988	1.13	0.138	0.772	0	0	**0.161**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**B**
717.3	36.745	0.124	50	0.976	0.977	1.13	0.133	0.771	0	0	**0.161**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**B**
717.1	36.909	0.121	49	0.976	0.962	1.12	0.127	0.770	0	0	**0.160**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**B**
716.9	37.073	0.120	48	0.976	0.958	1.12	0.126	0.769	0	0	**0.160**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**B**
716.8	37.237	0.121	48	0.976	0.960	1.12	0.127	0.767	0	0	**0.160**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**B**
716.6	37.401	0.122	49	0.975	0.966	1.12	0.129	0.766	0	0	**0.160**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**B**
716.4	37.565	0.122	49	0.975	0.967	1.12	0.129	0.765	0	0	**0.160**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**B**
716.3	37.729	0.119	47	0.975	0.949	1.11	0.122	0.764	0	0	**0.160**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**B**
716.1	37.893	0.117	46	0.975	0.938	1.11	0.119	0.762	0	0	**0.159**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**B**
715.9	38.057	0.117	46	0.975	0.937	1.11	0.118	0.761	0	0	**0.159**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**B**
715.8	38.221	0.116	46	0.975	0.932	1.11	0.116	0.760	0	0	**0.159**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**B**
715.6	38.385	0.115	45	0.975	0.930	1.11	0.116	0.759	0	0	**0.159**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**B**
715.5	38.549	0.117	46	0.974	0.938	1.11	0.118	0.757	0	0	**0.159**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**B**
715.3	38.713	0.114	45	0.974	0.924	1.10	0.113	0.756	0	0	**0.158**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**B**
715.1	38.877	0.113	44	0.974	0.917	1.10	0.111	0.755	0	0	**0.158**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**B**
715.0	39.042	0.112	43	0.974	0.912	1.10	0.109	0.754	0	0	**0.158**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**B**
714.8	39.206	0.111	43	0.974	0.907	1.10	0.107	0.753	0	0	**0.158**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**B**
714.6	39.370	0.109	41	0.974	0.897	1.09	0.104	0.751	0	0	**0.158**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**B**
714.5	39.534	0.108	41	0.974	0.892	1.09	0.102	0.750	0	0	**0.158**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**B**
714.3	39.698	0.107	40	0.974	0.888	1.09	0.101	0.749	0	0	**0.157**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**B**
714.1	39.862	0.108	41	0.973	0.893	1.09	0.102	0.748	0	0	**0.157**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**B**
714.0	40.026	0.109	42	0.973	0.900	1.09	0.105	0.746	0	0	**0.157**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**B**
713.8	40.190	0.113	44	0.971	0.917	1.10	0.111	0.745	0	0	**0.157**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**B**
713.6	40.354	0.110	42	0.972	0.902	1.09	0.106	0.744	0	0	**0.157**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**B**
713.5	40.518	0.108	41	0.972	0.895	1.09	0.103	0.743	0	0	**0.156**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**B**
713.3	40.682	0.106	39	0.973	0.882	1.09	0.098	0.742	0	0	**0.156**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**B**
713.2	40.846	0.104	38	0.973	0.873	1.08	0.095	0.740	0	0	**0.156**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
713.0	41.010	0.102	37	0.973	0.868	1.08	0.093	0.739	0	0	**0.156**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
712.8	41.174	0.102	36	0.973	0.866	1.08	0.093	0.738	0	0	**0.156**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**B**
712.7	41.338	0.104	38	0.972	0.873	1.08	0.095	0.737	0	0	**0.156**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
712.5	41.502	0.105	39	0.971	0.878	1.09	0.097	0.735	0	0	**0.155**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
712.3	41.666	0.107	40	0.970	0.887	1.09	0.100	0.734	0	0	**0.155**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
712.2	41.830	0.104	38	0.971	0.874	1.08	0.095	0.733	0	0	**0.155**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
712.0	41.994	0.102	37	0.971	0.867	1.08	0.093	0.732	0	0	**0.155**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
711.8	42.158	0.101	36	0.971	0.860	1.08	0.091	0.731	0	0	**0.155**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
711.7	42.322	0.107	41	0.969	0.889	1.09	0.101	0.729	0	0	**0.154**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**A2**
711.5	42.486	0.108	41	0.969	0.894	1.09	0.102	0.728	0	0	**0.154**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**A2**
711.3	42.650	0.107	41	0.969	0.888	1.09	0.101	0.727	0	0	**0.154**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**C**
711.2	42.814	0.106	40	0.969	0.882	1.09	0.099	0.726	0	0	**0.154**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
711.0	42.978	0.103	38	0.969	0.869	1.08	0.094	0.725	0	0	**0.154**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
710.9	43.143	0.105	39	0.969	0.875	1.08	0.096	0.723	0	0	**0.154**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
710.7	43.307	0.107	40	0.968	0.886	1.09	0.100	0.722	0	0	**0.153**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**A2**

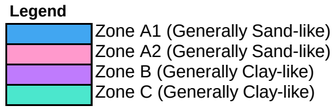
Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
710.5	43.471	0.106	40	0.968	0.882	1.09	0.098	0.721	0	0	**0.153**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
710.4	43.635	0.105	39	0.968	0.876	1.09	0.096	0.720	0	0	**0.153**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
710.2	43.799	0.110	42	0.966	0.898	1.09	0.104	0.719	0	0	**0.153**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**C**
710.0	43.963	0.109	42	0.966	0.894	1.09	0.103	0.717	0	0	**0.153**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**A2**
709.9	44.127	0.110	42	0.965	0.899	1.09	0.105	0.716	0	0	**0.152**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**A2**
709.7	44.291	0.111	43	0.965	0.903	1.10	0.106	0.715	0	0	**0.152**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**A2**
709.5	44.455	0.110	42	0.965	0.899	1.09	0.104	0.714	0	0	**0.152**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**A2**
709.4	44.619	0.111	43	0.964	0.905	1.10	0.107	0.713	0	0	**0.152**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**A2**
709.2	44.783	0.111	43	0.964	0.906	1.10	0.107	0.711	0	0	**0.152**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**A2**
709.1	44.947	0.112	44	0.963	0.911	1.10	0.108	0.710	0	0	**0.151**	FALSE	FALSE	FALSE	**0.7**	**Subunit 3**	**A2**
708.9	45.111	0.111	43	0.963	0.905	1.10	0.106	0.709	0	0	**0.151**	FALSE	FALSE	FALSE	**0.7**	**Subunit 3**	**A2**
708.7	45.275	0.113	44	0.962	0.915	1.10	0.110	0.708	0	0	**0.151**	FALSE	FALSE	FALSE	**0.7**	**Subunit 3**	**A2**
708.6	45.439	0.115	45	0.961	0.922	1.10	0.112	0.707	0	0	**0.151**	FALSE	FALSE	FALSE	**0.7**	**Subunit 3**	**A2**
708.4	45.603	0.120	48	0.959	0.948	1.12	0.121	0.706	0	0	**0.151**	FALSE	FALSE	FALSE	**0.8**	**Subunit 3**	**A2**
708.2	45.767	0.118	47	0.959	0.940	1.11	0.118	0.704	0	0	**0.150**	FALSE	FALSE	FALSE	**0.8**	**Subunit 3**	**A2**
708.1	45.931	0.125	50	0.957	0.976	1.13	0.131	0.703	0	0	**0.150**	FALSE	FALSE	FALSE	**0.9**	**Subunit 3**	**A2**
707.9	46.095	0.127	51	0.956	0.989	1.13	0.136	0.702	0	0	**0.150**	FALSE	FALSE	FALSE	**0.9**	**Subunit 3**	**A1**
707.7	46.259	0.134	54	0.953	1.025	1.15	0.150	0.701	0	0	**0.150**	FALSE	FALSE	FALSE	**1.0**	**Subunit 3**	**A1**
707.6	46.423	0.131	53	0.954	1.009	1.14	0.144	0.700	0	0	**0.149**	FALSE	FALSE	FALSE	**1.0**	**Subunit 3**	**A1**
707.4	46.587	0.137	55	0.952	1.042	1.16	0.157	0.699	0	0	**0.149**	FALSE	FALSE	FALSE	**1.1**	**Subunit 3**	**A1**
707.2	46.751	0.154	59	0.947	1.134	1.20	0.197	0.697	0	0	**0.149**	FALSE	FALSE	FALSE	**1.3**	**Subunit 3**	**A1**
707.1	46.915	0.151	59	0.947	1.118	1.19	0.190	0.696	0	0	**0.149**	FALSE	FALSE	FALSE	**1.3**	**Subunit 3**	**A1**
706.9	47.079	0.149	58	0.947	1.106	1.18	0.184	0.695	0	0	**0.149**	FALSE	FALSE	FALSE	**1.2**	**Subunit 3**	**A1**
706.8	47.244	0.141	56	0.949	1.068	1.17	0.167	0.694	0	0	**0.148**	FALSE	FALSE	FALSE	**1.1**	**Subunit 3**	**A1**
706.6	47.408	0.136	54	0.950	1.036	1.15	0.154	0.693	0	0	**0.148**	FALSE	FALSE	FALSE	**1.0**	**Subunit 3**	**A1**
706.4	47.572	0.133	54	0.951	1.023	1.15	0.149	0.692	0	0	**0.148**	FALSE	FALSE	FALSE	**1.0**	**Subunit 3**	**A1**
706.3	47.736	0.132	53	0.951	1.013	1.14	0.145	0.690	0	0	**0.148**	FALSE	FALSE	FALSE	**1.0**	**Subunit 3**	**A1**
706.1	47.900	0.128	52	0.952	0.993	1.14	0.138	0.689	0	0	**0.148**	FALSE	FALSE	FALSE	**0.9**	**Subunit 3**	**A2**
705.9	48.064	0.124	50	0.953	0.972	1.13	0.130	0.688	0	0	**0.147**	FALSE	FALSE	FALSE	**0.9**	**Subunit 3**	**A2**
705.8	48.228	0.120	48	0.954	0.946	1.12	0.121	0.687	0	0	**0.147**	FALSE	FALSE	FALSE	**0.8**	**Subunit 3**	**A2**
705.6	48.392	0.116	46	0.955	0.927	1.11	0.114	0.686	0	0	**0.147**	FALSE	FALSE	FALSE	**0.8**	**Subunit 3**	**A2**
705.4	48.556	0.115	45	0.955	0.920	1.11	0.112	0.685	0	0	**0.147**	FALSE	FALSE	FALSE	**0.8**	**Subunit 3**	**C**
705.3	48.720	0.120	48	0.953	0.947	1.12	0.121	0.683	0	0	**0.147**	FALSE	FALSE	FALSE	**0.8**	**Subunit 3**	**A2**
705.1	48.884	0.123	50	0.952	0.966	1.12	0.127	0.682	0	0	**0.146**	FALSE	FALSE	FALSE	**0.9**	**Subunit 3**	**A2**
705.0	49.048	0.123	49	0.951	0.964	1.12	0.127	0.681	0	0	**0.146**	FALSE	FALSE	FALSE	**0.9**	**Subunit 3**	**A2**
704.8	49.212	0.122	49	0.952	0.957	1.12	0.124	0.680	0	0	**0.146**	FALSE	FALSE	FALSE	**0.9**	**Subunit 3**	**A2**
704.6	49.376	0.122	49	0.951	0.958	1.12	0.124	0.679	0	0	**0.146**	FALSE	FALSE	FALSE	**0.9**	**Subunit 3**	**A2**
704.5	49.540	0.128	51	0.949	0.988	1.13	0.136	0.678	0	0	**0.145**	FALSE	FALSE	FALSE	**0.9**	**Subunit 3**	**A2**
704.3	49.704	0.152	59	0.941	1.117	1.19	0.190	0.677	0	0	**0.145**	FALSE	FALSE	FALSE	**1.3**	**Subunit 3**	**A1**
704.1	49.868	0.127	51	0.948	0.982	1.13	0.134	0.675	0	0	**0.145**	FALSE	FALSE	FALSE	**0.9**	**Subunit 3**	**A1**
704.0	50.032	0.301	74	0.915	1.631	1.42	0.637	0.674	0	0	**0.145**	FALSE	FALSE	FALSE	**4.4**	**Subunit 3**	**A1**
703.8	50.196	N/A	100	N/A	N/A	N/A	N/A	0.673	0	0	**0.145**	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**	**A1**



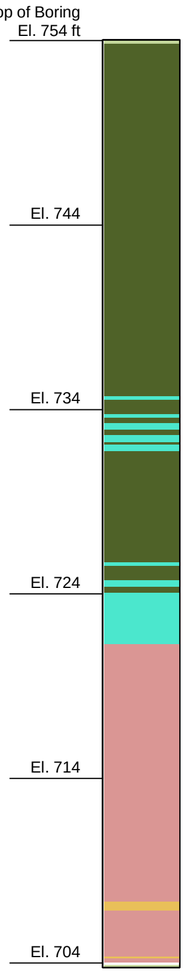
Adapted from "Discussion of 'Liquefaction Potential of Silts from CPTu'" (Robertson 2008). Zone A_1 and Zone A_2 samples are generally sand-like. Zone B samples are generally clay-like and not susceptible to cyclic softening. Zone C samples are generally clay-like and susceptible to cyclic softening. Note that the transition from clay-like to sand-like in this chart does not exactly match the liquefaction calculations herein; that is, some transitional samples in Zone B and Zone C will be treated as sand-like and analyzed for liquefaction if the calculations indicate as such.



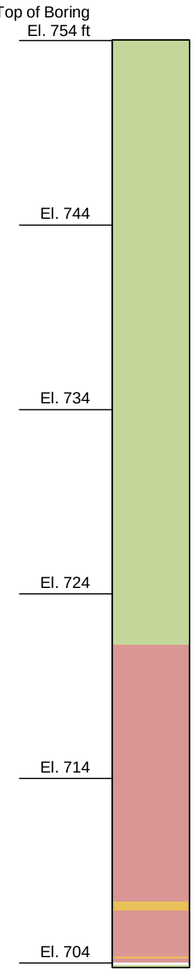




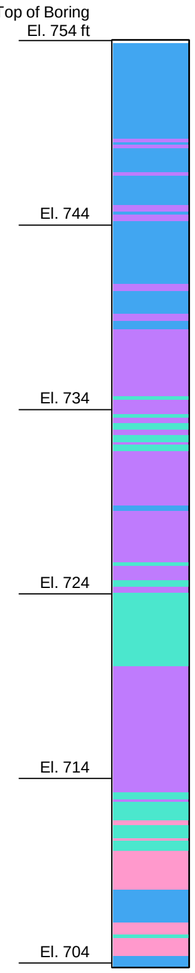
CPT-03C, Liquefaction Triggering Results



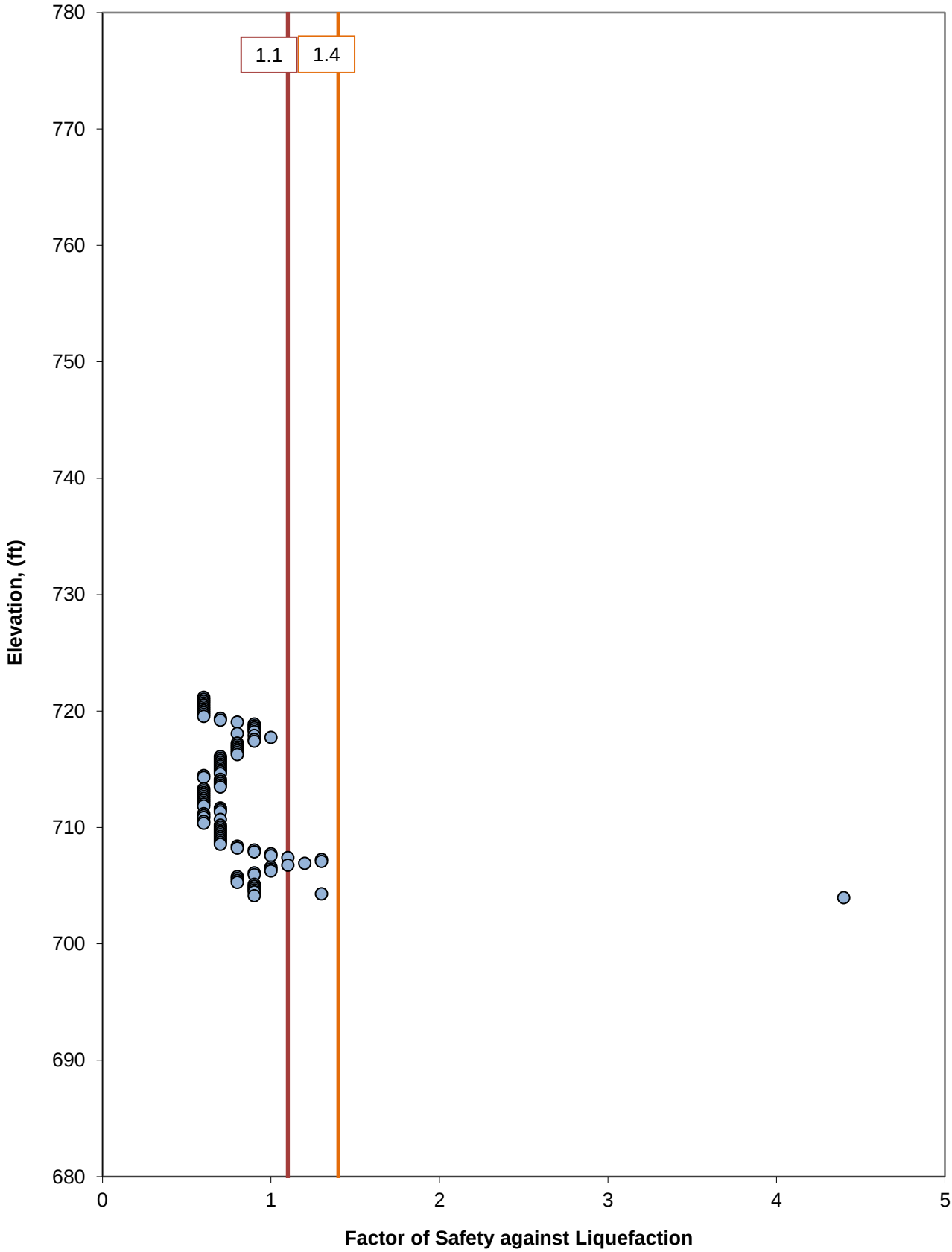
CPT-03C, Liquefaction Triggering Results



CPT-03C, Robertson Soil Type



KIF TDEC Stability, Boring = CPT-03C, Source = 10 Hz, Mw = 6, Event = Design EQ, CPT Data, Simplified Stress-Based Approach



Project Information

Stantec Project Number =	175668043
Project Name =	KIF TDEC Stability
CPT ID =	CPT-04A

Boring Location (optional)

Northing =	
Easting =	

OR

Baseline Station =	
Offset (+ Right) =	

Using qt (corrected for u2 PWP) or qc (backcalculated uncorrected field tip)

Cone ID (optional) =	AD184	
Use qc instead of qt?	0	(1: Yes, 0: No)
Cone Area Ratio (a) =	0.80	

Drilling Information

Top of Hole Elevation =	753.0	feet
Water Depth during CPT (negative for U/S borings) =	6.0	feet
Depth data collection began =	0.16	feet
Avg. Total Unit Wt. Above 1st Sample =	120.00	pcf

During Earthquake Information

Water Depth during EQ (relative to CPT TOH, negative for U/S borings) =	4.6	feet
Final Grade Elevation during EQ =	752.2	feet
Avg. Total Unit Wt. of Cut/Fill =	120	pcf

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile?	0	(1: Yes, 0: No)

If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile:	ng_Pond_Section, KIF-BF-SPT3_NOR	
α at each Sample Depth known?	1	(1: Yes, 0: No)

If previous answer is No, then enter curve fit parameters below (α vs. depth curve)

If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_σ will be one.

m4:	
m3:	
m2:	
m1:	
m0:	

Associated ground response profile:	shing_Pond_Section, KIF-BF-SPT3	
Get CSR from shear stress envelope?	0	(1: Yes, 0: No)

If previous answer is No, then CSR will be calculated using a_{max} and r_d

Max. Shear Stress at each sample depth known?		(1: Yes, 0: No)

If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4:	
m3:	
m2:	
m1:	

Earthquake Information

EQ Source (e.g., New Madrid)	10 Hz
Event (e.g., MCE, OBE)	Design EQ
a_{max} (g) (top of ground surface)	0.21
EQ Mag (Mw)	6.0

Inputs

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
0.164	204.327	0.150	128	Embankment Fill	Clay-like		0.054			
0.328	415.979	0.417	128	Embankment Fill	Clay-like		0.051			
0.492	366.540	1.110	128	Embankment Fill	Clay-like		0.048			
0.656	406.239	0.899	128	Embankment Fill	Clay-like		0.046			
0.820	283.260	0.811	128	Embankment Fill	Clay-like		0.043			
0.984	168.175	1.422	128	Embankment Fill	Clay-like		0.040			
1.148	120.542	1.880	128	Embankment Fill	Clay-like		0.038			
1.312	110.085	1.963	128	Embankment Fill	Clay-like		0.035			
1.476	207.460	1.901	128	Embankment Fill	Clay-like		0.032			
1.640	303.436	2.160	128	Embankment Fill	Clay-like		0.030			
1.804	246.907	2.514	128	Embankment Fill	Clay-like		0.027			
1.968	140.292	2.621	128	Embankment Fill	Clay-like		0.029			
2.133	84.507	2.014	128	Embankment Fill	Clay-like		0.031			
2.297	139.967	2.748	128	Embankment Fill	Clay-like		0.033			
2.461	123.102	2.557	128	Embankment Fill	Clay-like		0.036			
2.625	128.575	2.569	128	Embankment Fill	Clay-like		0.038			
2.789	291.489	3.104	128	Embankment Fill	Clay-like		0.040			
2.953	308.381	2.809	128	Embankment Fill	Clay-like		0.040			
3.117	322.096	1.801	128	Embankment Fill	Clay-like		0.039			
3.281	249.621	2.258	128	Embankment Fill	Clay-like		0.038			
3.445	160.349	2.530	128	Embankment Fill	Clay-like		0.037			
3.609	97.050	2.722	128	Embankment Fill	Clay-like		0.036			
3.773	60.885	2.271	128	Embankment Fill	Clay-like		0.034			
3.937	47.905	2.457	128	Embankment Fill	Clay-like		0.032			
4.101	42.150	2.463	128	Embankment Fill	Clay-like		0.029			
4.265	44.279	2.432	128	Embankment Fill	Clay-like		0.027			
4.429	70.444	1.907	128	Embankment Fill	Clay-like		0.024			
4.593	212.951	2.728	128	Embankment Fill	Clay-like		0.022			
4.757	169.490	3.094	128	Embankment Fill	Clay-like		0.019			
4.921	118.785	3.538	128	Embankment Fill	Clay-like		0.016			
5.085	105.301	3.925	128	Embankment Fill	Clay-like		0.012			
5.249	95.169	4.231	128	Embankment Fill	Clay-like		0.013			
5.413	98.445	4.641	128	Embankment Fill	Clay-like		0.014			
5.577	173.936	4.629	128	Embankment Fill	Clay-like		0.012			
5.741	170.025	3.961	128	Embankment Fill	Clay-like		0.010			
5.905	151.990	5.176	128	Embankment Fill	Clay-like		0.007			
6.069	143.533	4.256	128	Embankment Fill	Clay-like		0.005			
6.234	85.958	3.982	128	Embankment Fill	Clay-like		0.004			
6.398	154.155	4.270	128	Embankment Fill	Clay-like		0.003			
6.562	240.940	3.500	128	Embankment Fill	Clay-like		0.002			
6.726	197.746	3.624	128	Embankment Fill	Clay-like		0.001			
6.890	181.923	3.425	128	Embankment Fill	Clay-like		0.001			
7.054	160.839	3.602	128	Embankment Fill	Clay-like		0.001			
7.218	146.423	2.797	128	Embankment Fill	Clay-like		0.002			
7.382	153.571	2.579	128	Embankment Fill	Clay-like		0.003			
7.546	107.355	3.013	128	Embankment Fill	Clay-like		0.005			
7.710	76.290	2.634	128	Embankment Fill	Clay-like		0.006			
7.874	63.315	1.735	128	Embankment Fill	Clay-like		0.008			
8.038	54.137	1.683	128	Embankment Fill	Clay-like		0.009			
8.202	185.443	2.444	128	Embankment Fill	Clay-like		0.011			
8.366	195.650	3.477	128	Embankment Fill	Clay-like		0.011			
8.530	153.529	3.545	128	Embankment Fill	Clay-like		0.012			
8.694	92.129	3.821	128	Embankment Fill	Clay-like		0.013			
8.858	88.222	2.304	128	Embankment Fill	Clay-like		0.014			
9.022	86.269	2.986	128	Embankment Fill	Clay-like		0.015			
9.186	71.581	3.941	128	Embankment Fill	Clay-like		0.016			
9.350	170.554	3.863	128	Embankment Fill	Clay-like		0.017			
9.514	21.711	3.899	128	Embankment Fill	Clay-like		0.018			
9.678	33.097	2.711	128	Embankment Fill	Clay-like		0.019			
9.842	97.026	2.200	128	Embankment Fill	Clay-like		0.020			
10.006	106.982	2.007	128	Embankment Fill	Clay-like		0.021			
10.170	150.830	1.978	128	Embankment Fill	Clay-like		0.022			
10.335	167.568	1.577	128	Embankment Fill	Clay-like		0.024			

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
10.499	125.595	2.988	128	Embankment Fill	Clay-like		0.025			
10.663	108.377	1.720	128	Embankment Fill	Clay-like		0.026			
10.827	106.678	1.298	128	Embankment Fill	Clay-like		0.027			
10.991	84.657	1.509	128	Embankment Fill	Clay-like		0.028			
11.155	63.009	2.516	128	Embankment Fill	Clay-like		0.029			
11.319	64.205	3.084	128	Embankment Fill	Clay-like		0.030			
11.483	106.492	2.404	128	Embankment Fill	Clay-like		0.031			
11.647	145.446	2.287	128	Embankment Fill	Clay-like		0.032			
11.811	151.976	1.313	128	Embankment Fill	Clay-like		0.033			
11.975	125.986	0.805	128	Embankment Fill	Clay-like		0.034			
12.139	135.658	0.589	128	Embankment Fill	Clay-like		0.035			
12.303	136.838	0.833	128	Embankment Fill	Clay-like		0.035			
12.467	100.480	2.106	128	Embankment Fill	Clay-like		0.036			
12.631	73.919	2.225	128	Embankment Fill	Clay-like		0.037			
12.795	60.191	2.943	128	Embankment Fill	Clay-like		0.038			
12.959	111.227	2.597	128	Embankment Fill	Clay-like		0.039			
13.123	94.812	2.948	128	Embankment Fill	Clay-like		0.040			
13.287	78.934	3.232	128	Embankment Fill	Clay-like		0.040			
13.451	69.192	2.904	128	Embankment Fill	Clay-like		0.041			
13.615	78.481	3.037	128	Embankment Fill	Clay-like		0.041			
13.779	89.212	3.209	128	Embankment Fill	Clay-like		0.042			
13.943	81.982	3.175	128	Embankment Fill	Clay-like		0.043			
14.107	64.698	2.971	128	Embankment Fill	Clay-like		0.043			
14.271	62.628	2.485	128	Embankment Fill	Clay-like		0.044			
14.436	58.369	2.402	128	Embankment Fill	Clay-like		0.045			
14.600	53.720	2.229	128	Embankment Fill	Clay-like		0.046			
14.764	39.151	2.051	128	Embankment Fill	Clay-like		0.047			
14.928	31.921	1.589	128	Embankment Fill	Clay-like		0.047			
15.092	25.182	1.403	128	Embankment Fill	Clay-like		0.048			
15.256	21.172	1.446	128	Embankment Fill	Clay-like		0.049			
15.420	31.412	1.577	128	Embankment Fill	Clay-like		0.050			
15.584	35.642	1.625	128	Embankment Fill	Clay-like		0.051			
15.748	20.573	1.475	128	Embankment Fill	Clay-like		0.052			
15.912	21.200	0.886	128	Embankment Fill	Clay-like		0.053			
16.076	22.840	0.860	128	Embankment Fill	Clay-like		0.054			
16.240	22.831	0.631	128	Embankment Fill	Clay-like		0.054			
16.404	17.522	0.679	128	Embankment Fill	Clay-like		0.055			
16.568	20.537	0.749	128	Embankment Fill	Clay-like		0.056			
16.732	18.683	0.652	128	Embankment Fill	Clay-like		0.056			
16.896	14.592	0.538	128	Embankment Fill	Clay-like		0.056			
17.060	12.828	0.483	128	Embankment Fill	Clay-like		0.056			
17.224	8.857	0.346	128	Embankment Fill	Clay-like		0.056			
17.388	11.921	0.271	128	Embankment Fill	Clay-like		0.055			
17.552	13.002	0.259	128	Embankment Fill	Clay-like		0.055			
17.716	9.105	0.392	128	Embankment Fill	Clay-like		0.055			
17.880	10.103	0.399	128	Embankment Fill	Clay-like		0.055			
18.044	12.926	0.342	128	Embankment Fill	Clay-like		0.056			
18.208	12.474	0.440	128	Embankment Fill	Clay-like		0.058			
18.372	17.331	0.604	128	Embankment Fill	Clay-like		0.060			
18.537	23.158	0.837	128	Embankment Fill	Clay-like		0.061			
18.701	30.390	1.135	128	Embankment Fill	Clay-like		0.063			
18.865	31.383	1.016	128	Embankment Fill	Clay-like		0.064			
19.029	62.349	0.533	128	Embankment Fill	Clay-like		0.065			
19.193	61.713	0.855	128	Embankment Fill	Clay-like		0.066			
19.357	30.715	1.947	128	Embankment Fill	Clay-like		0.066			
19.521	42.296	2.193	128	Embankment Fill	Clay-like		0.067			
19.685	70.211	1.387	128	Embankment Fill	Clay-like		0.068			
19.849	20.481	0.792	128	Embankment Fill	Clay-like		0.069			
20.013	25.720	1.209	128	Embankment Fill	Clay-like		0.069			
20.177	45.593	0.692	128	Embankment Fill	Clay-like		0.070			
20.341	38.740	0.888	128	Embankment Fill	Clay-like		0.071			
20.505	27.156	0.791	128	Embankment Fill	Clay-like		0.071			
20.669	23.313	1.018	128	Embankment Fill	Clay-like		0.072			
20.833	73.726	1.839	128	Embankment Fill	Clay-like		0.073			
20.997	75.153	2.153	128	Embankment Fill	Clay-like		0.074			
21.161	43.915	2.329	128	Embankment Fill	Clay-like		0.074			
21.325	30.574	1.425	128	Embankment Fill	Clay-like		0.075			
21.489	24.239	0.995	128	Embankment Fill	Clay-like		0.076			
21.653	26.573	0.928	128	Embankment Fill	Clay-like		0.076			
21.817	36.923	1.042	128	Embankment Fill	Clay-like		0.077			
21.981	43.036	0.929	128	Embankment Fill	Clay-like		0.077			
22.145	28.676	0.772	128	Embankment Fill	Clay-like		0.078			
22.309	20.918	0.758	128	Embankment Fill	Clay-like		0.079			
22.473	15.873	0.495	128	Embankment Fill	Clay-like		0.080			
22.638	15.835	0.498	128	Embankment Fill	Clay-like		0.080			

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
22.802	12.218	0.373	128	Embankment Fill	Clay-like		0.081			
22.966	12.560	0.426	128	Embankment Fill	Clay-like		0.082			
23.130	23.264	0.400	128	Embankment Fill	Clay-like		0.082			
23.294	27.707	0.497	128	Embankment Fill	Clay-like		0.083			
23.458	16.492	0.490	128	Embankment Fill	Clay-like		0.084			
23.622	12.949	0.492	128	Embankment Fill	Clay-like		0.084			
23.786	9.784	0.429	128	Embankment Fill	Clay-like		0.085			
23.950	10.252	0.375	128	Embankment Fill	Clay-like		0.086			
24.114	7.365	0.259	128	Embankment Fill	Clay-like		0.086			
24.278	7.029	0.274	128	Embankment Fill	Clay-like		0.087			
24.442	6.499	0.280	128	Embankment Fill	Clay-like		0.088			
24.606	7.865	0.302	128	Embankment Fill	Clay-like		0.088			
24.770	8.154	0.353	128	Embankment Fill	Clay-like		0.089			
24.934	12.139	0.432	128	Embankment Fill	Clay-like		0.090			
25.098	12.020	0.466	128	Embankment Fill	Clay-like		0.090			
25.262	12.362	0.361	128	Embankment Fill	Clay-like		0.091			
25.426	8.811	0.242	128	Embankment Fill	Clay-like		0.092			
25.590	7.766	0.171	128	Embankment Fill	Clay-like		0.092			
25.754	5.865	0.113	128	Embankment Fill	Clay-like		0.093			
25.918	6.858	0.112	128	Embankment Fill	Clay-like		0.094			
26.082	6.836	0.162	126	Subunit 2	Sand-like		0.094			
26.246	5.911	0.166	126	Subunit 2	Sand-like		0.095			
26.410	8.183	0.132	126	Subunit 2	Sand-like		0.095			
26.574	8.047	0.101	126	Subunit 2	Sand-like		0.096			
26.739	7.381	0.082	126	Subunit 2	Sand-like		0.097			
26.903	6.418	0.076	126	Subunit 2	Sand-like		0.097			
27.067	6.379	0.073	126	Subunit 2	Sand-like		0.098			
27.231	6.598	0.077	126	Subunit 2	Sand-like		0.099			
27.395	6.493	0.082	126	Subunit 2	Sand-like		0.099			
27.559	6.430	0.092	126	Subunit 2	Sand-like		0.100			
27.723	6.799	0.091	126	Subunit 2	Sand-like		0.100			
27.887	6.287	0.095	126	Subunit 2	Sand-like		0.101			
28.051	5.943	0.118	126	Subunit 2	Sand-like		0.102			
28.215	6.445	0.139	126	Subunit 2	Sand-like		0.102			
28.379	6.874	0.143	126	Subunit 2	Sand-like		0.103			
28.543	6.470	0.134	126	Subunit 2	Sand-like		0.103			
28.707	6.466	0.127	126	Subunit 2	Sand-like		0.104			
28.871	6.910	0.133	126	Subunit 2	Sand-like		0.104			
29.035	7.720	0.165	126	Subunit 2	Sand-like		0.105			
29.199	8.910	0.180	126	Subunit 2	Sand-like		0.105			
29.363	9.106	0.248	126	Subunit 2	Sand-like		0.106			
29.527	8.370	0.321	126	Subunit 2	Sand-like		0.106			
29.691	10.791	0.293	126	Subunit 2	Sand-like		0.107			
29.855	9.623	0.268	126	Subunit 2	Sand-like		0.107			
30.019	9.641	0.181	126	Subunit 2	Sand-like		0.108			
30.183	12.309	0.382	126	Subunit 2	Sand-like		0.108			
30.347	14.990	0.365	126	Subunit 2	Sand-like		0.109			
30.511	23.250	0.378	126	Subunit 2	Sand-like		0.110			
30.675	28.617	0.393	126	Subunit 2	Sand-like		0.111			
30.840	30.417	0.287	126	Subunit 2	Sand-like		0.112			
31.004	36.854	0.168	126	Subunit 2	Sand-like		0.113			
31.168	44.469	0.174	126	Subunit 2	Sand-like		0.114			
31.332	57.324	0.268	126	Subunit 2	Sand-like		0.115			
31.496	75.421	0.513	126	Subunit 2	Sand-like		0.115			
31.660	80.956	0.661	126	Subunit 2	Sand-like		0.115			
31.824	83.088	0.782	126	Subunit 2	Sand-like		0.115			
31.988	82.073	0.774	126	Subunit 2	Sand-like		0.115			
32.152	77.346	0.825	126	Subunit 2	Sand-like		0.116			
32.316	68.923	0.933	126	Subunit 2	Sand-like		0.116			
32.480	72.001	0.875	126	Subunit 2	Sand-like		0.116			
32.644	77.585	0.622	126	Subunit 2	Sand-like		0.116			
32.808	78.287	0.348	126	Subunit 2	Sand-like		0.116			
32.972	75.591	0.326	126	Subunit 2	Sand-like		0.117			
33.136	80.350	0.371	126	Subunit 2	Sand-like		0.118			
33.300	89.348	0.525	126	Subunit 2	Sand-like		0.118			
33.464	100.212	0.667	126	Subunit 2	Sand-like		0.119			
33.628	98.632	0.791	126	Subunit 2	Sand-like		0.119			
33.792	91.064	0.656	126	Subunit 2	Sand-like		0.120			
33.956	69.182	0.733	126	Subunit 2	Sand-like		0.120			
34.120	48.107	0.941	126	Subunit 2	Sand-like		0.121			
34.284	41.582	1.107	126	Subunit 2	Sand-like		0.121			
34.448	41.506	0.728	126	Subunit 2	Sand-like		0.122			
34.612	35.012	0.693	126	Subunit 2	Sand-like		0.122			
34.776	30.746	0.706	126	Subunit 2	Sand-like		0.122			
34.941	34.667	1.097	126	Subunit 2	Sand-like		0.123			

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
35.105	39.395	1.105	126	Subunit 2	Sand-like		0.123			
35.269	47.206	0.792	126	Subunit 2	Sand-like		0.124			
35.433	54.056	0.643	126	Subunit 2	Sand-like		0.124			
35.597	49.145	0.354	126	Subunit 2	Sand-like		0.124			
35.761	39.709	0.463	126	Subunit 2	Sand-like		0.125			
35.925	30.944	0.400	126	Subunit 2	Sand-like		0.125			
36.089	27.152	0.302	126	Subunit 2	Sand-like		0.126			
36.253	26.757	0.333	126	Subunit 2	Sand-like		0.126			
36.417	23.583	0.223	126	Subunit 2	Sand-like		0.126			
36.581	21.781	0.137	126	Subunit 2	Sand-like		0.127			
36.745	16.925	0.106	126	Subunit 2	Sand-like		0.127			
36.909	14.163	0.070	126	Subunit 2	Sand-like		0.127			
37.073	12.494	0.080	126	Subunit 2	Sand-like		0.128			
37.237	16.976	0.051	126	Subunit 2	Sand-like		0.128			
37.401	23.097	0.053	126	Subunit 2	Sand-like		0.128			
37.565	23.216	0.138	126	Subunit 2	Sand-like		0.129			
37.729	23.081	0.196	126	Subunit 2	Sand-like		0.129			
37.893	29.324	0.189	126	Subunit 2	Sand-like		0.129			
38.057	36.686	0.138	126	Subunit 2	Sand-like		0.130			
38.221	36.444	0.113	126	Subunit 2	Sand-like		0.130			
38.385	34.617	0.247	126	Subunit 2	Sand-like		0.130			
38.549	32.975	0.510	126	Subunit 2	Sand-like		0.131			
38.713	32.260	0.584	126	Subunit 2	Sand-like		0.131			
38.877	35.917	0.387	126	Subunit 2	Sand-like		0.131			
39.042	26.603	0.337	126	Subunit 2	Sand-like		0.131			
39.206	27.283	0.461	126	Subunit 2	Sand-like		0.132			
39.370	33.126	0.234	126	Subunit 2	Sand-like		0.132			
39.534	43.712	0.269	131	Subunit 3	Sand-like		0.132			
39.698	44.343	0.253	131	Subunit 3	Sand-like		0.132			
39.862	38.765	0.312	131	Subunit 3	Sand-like		0.133			
40.026	31.532	0.286	131	Subunit 3	Sand-like		0.133			
40.190	38.886	0.319	131	Subunit 3	Sand-like		0.133			
40.354	55.731	0.506	131	Subunit 3	Sand-like		0.133			
40.518	74.142	0.613	131	Subunit 3	Sand-like		0.134			
40.682	89.899	0.945	131	Subunit 3	Sand-like		0.134			
40.846	99.308	0.862	131	Subunit 3	Sand-like		0.134			
41.010	97.125	0.847	131	Subunit 3	Sand-like		0.135			
41.174	94.463	0.822	131	Subunit 3	Sand-like		0.135			
41.338	99.543	0.753	131	Subunit 3	Sand-like		0.135			
41.502	109.610	0.762	131	Subunit 3	Sand-like		0.135			
41.666	113.817	0.996	131	Subunit 3	Sand-like		0.135			
41.830	120.754	1.150	131	Subunit 3	Sand-like		0.135			
41.994	127.832	1.277	131	Subunit 3	Sand-like		0.136			
42.158	137.053	1.287	131	Subunit 3	Sand-like		0.136			
42.322	144.521	1.275	131	Subunit 3	Sand-like		0.136			
42.486	150.503	1.017	131	Subunit 3	Sand-like		0.136			
42.650	150.726	1.057	131	Subunit 3	Sand-like		0.136			
42.814	145.668	1.097	131	Subunit 3	Sand-like		0.137			
42.978	144.281	1.190	131	Subunit 3	Sand-like		0.137			
43.143	134.775	1.302	131	Subunit 3	Sand-like		0.137			
43.307	118.775	1.866	131	Subunit 3	Sand-like		0.137			
43.471	115.897	2.300	131	Subunit 3	Sand-like		0.137			
43.635	177.323	1.159	131	Subunit 3	Sand-like		0.136			
43.799	302.608	0.010	131	Subunit 3	Sand-like		0.136			
43.963	488.180	0.010	131	Subunit 3	Sand-like		0.135			

LIQUEFACTION POTENTIAL ASSESSMENT FOR COARSE GRAINED SOILS USING CONE PENETRATION TEST DATA

Facility: KIF TDEC Stability
Project No.: 175668043
CPT ID: CPT-04A

Water Elevation during CPT:	747.0	ft
Depth to Water during CPT:	6.0	ft *(relative to ground surface during CPT)*
Water Elevation during Earthquake:	748.4	ft
Depth to Water during Earthquake:	4.6	ft *(relative to ground surface during CPT)*
Final Grade Elevation during EQ:	752.2	ft *(if no fill, then set this equal to top of CPT hole elev.)*
Height of Final Grade above CPT TOH:	-0.8	ft *(relative to ground surface during CPT, + Fill, - Cut)*
Unit Weight of Cut/Fill to Achieve Final Grade	120	pcf
Cut/Fill Total Stress (+ Fill, - Cut):	-0.05	tsf

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
753.0				Vertical Stresses above 1st CPT:			**0.01**	**-0.04**	**0.00**	**0.00**	**0.01**	**-0.04**
752.8	0.164	204.33	0.15	128	**0.16**	0.09	0.01	-0.04	0.00	0.00	0.01	-0.04
752.7	0.328	415.98	0.42	128	0.25	0.16	0.02	-0.03	0.00	0.00	0.02	-0.03
752.5	0.492	366.54	1.11	128	0.41	0.16	0.03	-0.02	0.00	0.00	0.03	-0.02
752.3	0.656	406.24	0.90	128	0.57	0.16	0.04	-0.01	0.00	0.00	0.04	-0.01
752.2	0.820	283.26	0.81	128	0.74	0.16	0.05	0.00	0.00	0.00	0.05	0.00
752.0	0.984	168.18	1.42	128	0.90	0.16	0.06	0.01	0.00	0.00	0.06	0.01
751.9	1.148	120.54	1.88	128	1.07	0.16	0.07	0.02	0.00	0.00	0.07	0.02
751.7	1.312	110.09	1.96	128	1.23	0.16	0.08	0.04	0.00	0.00	0.08	0.04
751.5	1.476	207.46	1.90	128	1.39	0.16	0.09	0.05	0.00	0.00	0.09	0.05
751.4	1.640	303.44	2.16	128	1.56	0.16	0.10	0.06	0.00	0.00	0.10	0.06
751.2	1.804	246.91	2.51	128	1.72	0.16	0.11	0.07	0.00	0.00	0.11	0.07
751.0	1.968	140.29	2.62	128	1.89	0.16	0.13	0.08	0.00	0.00	0.13	0.08
750.9	2.133	84.51	2.01	128	2.05	0.16	0.14	0.09	0.00	0.00	0.14	0.09
750.7	2.297	139.97	2.75	128	2.21	0.16	0.15	0.10	0.00	0.00	0.15	0.10
750.5	2.461	123.10	2.56	128	2.38	0.16	0.16	0.11	0.00	0.00	0.16	0.11
750.4	2.625	128.58	2.57	128	2.54	0.16	0.17	0.12	0.00	0.00	0.17	0.12
750.2	2.789	291.49	3.10	128	2.71	0.16	0.18	0.13	0.00	0.00	0.18	0.13
750.0	2.953	308.38	2.81	128	2.87	0.16	0.19	0.14	0.00	0.00	0.19	0.14
749.9	3.117	322.10	1.80	128	3.03	0.16	0.20	0.15	0.00	0.00	0.20	0.15
749.7	3.281	249.62	2.26	128	3.20	0.16	0.21	0.16	0.00	0.00	0.21	0.16
749.6	3.445	160.35	2.53	128	3.36	0.16	0.22	0.17	0.00	0.00	0.22	0.17
749.4	3.609	97.05	2.72	128	3.53	0.16	0.23	0.18	0.00	0.00	0.23	0.18
749.2	3.773	60.89	2.27	128	3.69	0.16	0.24	0.19	0.00	0.00	0.24	0.19
749.1	3.937	47.91	2.46	128	3.85	0.16	0.25	0.20	0.00	0.00	0.25	0.20
748.9	4.101	42.15	2.46	128	4.02	0.16	0.26	0.21	0.00	0.00	0.26	0.21
748.7	4.265	44.28	2.43	128	4.18	0.16	0.27	0.22	0.00	0.00	0.27	0.22
748.6	4.429	70.44	1.91	128	4.35	0.16	0.28	0.23	0.00	0.00	0.28	0.23
748.4	4.593	212.95	2.73	128	4.51	0.16	0.29	0.25	0.00	0.00	0.29	0.25
748.2	4.757	169.49	3.09	128	4.68	0.16	0.30	0.26	0.00	0.00	0.30	0.25
748.1	4.921	118.79	3.54	128	4.84	0.16	0.31	0.27	0.00	0.01	0.31	0.26
747.9	5.085	105.30	3.93	128	5.00	0.16	0.32	0.28	0.00	0.02	0.32	0.26
747.8	5.249	95.17	4.23	128	5.17	0.16	0.34	0.29	0.00	0.02	0.34	0.27
747.6	5.413	98.45	4.64	128	5.33	0.16	0.35	0.30	0.00	0.03	0.35	0.27
747.4	5.577	173.94	4.63	128	5.50	0.16	0.36	0.31	0.00	0.03	0.36	0.28
747.3	5.741	170.03	3.96	128	5.66	0.16	0.37	0.32	0.00	0.04	0.37	0.28
747.1	5.905	151.99	5.18	128	5.82	0.16	0.38	0.33	0.00	0.04	0.38	0.29
746.9	6.069	143.53	4.26	128	5.99	0.16	0.39	0.34	0.00	0.05	0.39	0.29
746.8	6.234	85.96	3.98	128	6.15	0.16	0.40	0.35	0.01	0.05	0.39	0.30
746.6	6.398	154.15	4.27	128	6.32	0.16	0.41	0.36	0.01	0.06	0.40	0.30
746.4	6.562	240.94	3.50	128	6.48	0.16	0.42	0.37	0.02	0.06	0.40	0.31
746.3	6.726	197.75	3.62	128	6.64	0.16	0.43	0.38	0.02	0.07	0.41	0.32
746.1	6.890	181.92	3.43	128	6.81	0.16	0.44	0.39	0.03	0.07	0.41	0.32
745.9	7.054	160.84	3.60	128	6.97	0.16	0.45	0.40	0.03	0.08	0.42	0.33
745.8	7.218	146.42	2.80	128	7.14	0.16	0.46	0.41	0.04	0.08	0.42	0.33
745.6	7.382	153.57	2.58	128	7.30	0.16	0.47	0.42	0.04	0.09	0.43	0.34
745.5	7.546	107.35	3.01	128	7.46	0.16	0.48	0.43	0.05	0.09	0.43	0.34
745.3	7.710	76.29	2.63	128	7.63	0.16	0.49	0.44	0.05	0.10	0.44	0.35
745.1	7.874	63.32	1.74	128	7.79	0.16	0.50	0.46	0.06	0.10	0.44	0.35
745.0	8.038	54.14	1.68	128	7.96	0.16	0.51	0.47	0.06	0.11	0.45	0.36
744.8	8.202	185.44	2.44	128	8.12	0.16	0.52	0.48	0.07	0.11	0.46	0.36
744.6	8.366	195.65	3.48	128	8.28	0.16	0.53	0.49	0.07	0.12	0.46	0.37
744.5	8.530	153.53	3.55	128	8.45	0.16	0.55	0.50	0.08	0.12	0.47	0.37
744.3	8.694	92.13	3.82	128	8.61	0.16	0.56	0.51	0.08	0.13	0.47	0.38
744.1	8.858	88.22	2.30	128	8.78	0.16	0.57	0.52	0.09	0.13	0.48	0.39
744.0	9.022	86.27	2.99	128	8.94	0.16	0.58	0.53	0.09	0.14	0.48	0.39
743.8	9.186	71.58	3.94	128	9.10	0.16	0.59	0.54	0.10	0.14	0.49	0.40
743.6	9.350	170.55	3.86	128	9.27	0.16	0.60	0.55	0.10	0.15	0.49	0.40
743.5	9.514	21.71	3.90	128	9.43	0.16	0.61	0.56	0.11	0.15	0.50	0.41

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
743.3	9.678	33.10	2.71	128	9.60	0.16	0.62	0.57	0.11	0.16	0.50	0.41
743.2	9.842	97.03	2.20	128	9.76	0.16	0.63	0.58	0.12	0.16	0.51	0.42
743.0	10.006	106.98	2.01	128	9.92	0.16	0.64	0.59	0.13	0.17	0.51	0.42
742.8	10.170	150.83	1.98	128	10.09	0.16	0.65	0.60	0.13	0.17	0.52	0.43
742.7	10.335	167.57	1.58	128	10.25	0.16	0.66	0.61	0.14	0.18	0.53	0.43
742.5	10.499	125.60	2.99	128	10.42	0.16	0.67	0.62	0.14	0.18	0.53	0.44
742.3	10.663	108.38	1.72	128	10.58	0.16	0.68	0.63	0.15	0.19	0.54	0.44
742.2	10.827	106.68	1.30	128	10.74	0.16	0.69	0.64	0.15	0.19	0.54	0.45
742.0	10.991	84.66	1.51	128	10.91	0.16	0.70	0.65	0.16	0.20	0.55	0.46
741.8	11.155	63.01	2.52	128	11.07	0.16	0.71	0.67	0.16	0.20	0.55	0.46
741.7	11.319	64.21	3.08	128	11.24	0.16	0.72	0.68	0.17	0.21	0.56	0.47
741.5	11.483	106.49	2.40	128	11.40	0.16	0.73	0.69	0.17	0.21	0.56	0.47
741.4	11.647	145.45	2.29	128	11.56	0.16	0.74	0.70	0.18	0.22	0.57	0.48
741.2	11.811	151.98	1.31	128	11.73	0.16	0.76	0.71	0.18	0.22	0.57	0.48
741.0	11.975	125.99	0.81	128	11.89	0.16	0.77	0.72	0.19	0.23	0.58	0.49
740.9	12.139	135.66	0.59	128	12.06	0.16	0.78	0.73	0.19	0.24	0.58	0.49
740.7	12.303	136.84	0.83	128	12.22	0.16	0.79	0.74	0.20	0.24	0.59	0.50
740.5	12.467	100.48	2.11	128	12.39	0.16	0.80	0.75	0.20	0.25	0.60	0.50
740.4	12.631	73.92	2.23	128	12.55	0.16	0.81	0.76	0.21	0.25	0.60	0.51
740.2	12.795	60.19	2.94	128	12.71	0.16	0.82	0.77	0.21	0.26	0.61	0.51
740.0	12.959	111.23	2.60	128	12.88	0.16	0.83	0.78	0.22	0.26	0.61	0.52
739.9	13.123	94.81	2.95	128	13.04	0.16	0.84	0.79	0.22	0.27	0.62	0.53
739.7	13.287	78.93	3.23	128	13.21	0.16	0.85	0.80	0.23	0.27	0.62	0.53
739.5	13.451	69.19	2.90	128	13.37	0.16	0.86	0.81	0.23	0.28	0.63	0.54
739.4	13.615	78.48	3.04	128	13.53	0.16	0.87	0.82	0.24	0.28	0.63	0.54
739.2	13.779	89.21	3.21	128	13.70	0.16	0.88	0.83	0.24	0.29	0.64	0.55
739.1	13.943	81.98	3.18	128	13.86	0.16	0.89	0.84	0.25	0.29	0.64	0.55
738.9	14.107	64.70	2.97	128	14.03	0.16	0.90	0.85	0.25	0.30	0.65	0.56
738.7	14.271	62.63	2.49	128	14.19	0.16	0.91	0.86	0.26	0.30	0.65	0.56
738.6	14.436	58.37	2.40	128	14.35	0.16	0.92	0.88	0.26	0.31	0.66	0.57
738.4	14.600	53.72	2.23	128	14.52	0.16	0.93	0.89	0.27	0.31	0.67	0.57
738.2	14.764	39.15	2.05	128	14.68	0.16	0.94	0.90	0.27	0.32	0.67	0.58
738.1	14.928	31.92	1.59	128	14.85	0.16	0.95	0.91	0.28	0.32	0.68	0.58
737.9	15.092	25.18	1.40	128	15.01	0.16	0.97	0.92	0.28	0.33	0.68	0.59
737.7	15.256	21.17	1.45	128	15.17	0.16	0.98	0.93	0.29	0.33	0.69	0.60
737.6	15.420	31.41	1.58	128	15.34	0.16	0.99	0.94	0.29	0.34	0.69	0.60
737.4	15.584	35.64	1.63	128	15.50	0.16	1.00	0.95	0.30	0.34	0.70	0.61
737.3	15.748	20.57	1.48	128	15.67	0.16	1.01	0.96	0.30	0.35	0.70	0.61
737.1	15.912	21.20	0.89	128	15.83	0.16	1.02	0.97	0.31	0.35	0.71	0.62
736.9	16.076	22.84	0.86	128	15.99	0.16	1.03	0.98	0.31	0.36	0.71	0.62
736.8	16.240	22.83	0.63	128	16.16	0.16	1.04	0.99	0.32	0.36	0.72	0.63
736.6	16.404	17.52	0.68	128	16.32	0.16	1.05	1.00	0.32	0.37	0.72	0.63
736.4	16.568	20.54	0.75	128	16.49	0.16	1.06	1.01	0.33	0.37	0.73	0.64
736.3	16.732	18.68	0.65	128	16.65	0.16	1.07	1.02	0.33	0.38	0.74	0.64
736.1	16.896	14.59	0.54	128	16.81	0.16	1.08	1.03	0.34	0.38	0.74	0.65
735.9	17.060	12.83	0.48	128	16.98	0.16	1.09	1.04	0.35	0.39	0.75	0.65
735.8	17.224	8.86	0.35	128	17.14	0.16	1.10	1.05	0.35	0.39	0.75	0.66
735.6	17.388	11.92	0.27	128	17.31	0.16	1.11	1.06	0.36	0.40	0.76	0.67
735.4	17.552	13.00	0.26	128	17.47	0.16	1.12	1.07	0.36	0.40	0.76	0.67
735.3	17.716	9.10	0.39	128	17.63	0.16	1.13	1.09	0.37	0.41	0.77	0.68
735.1	17.880	10.10	0.40	128	17.80	0.16	1.14	1.10	0.37	0.41	0.77	0.68
735.0	18.044	12.93	0.34	128	17.96	0.16	1.15	1.11	0.38	0.42	0.78	0.69
734.8	18.208	12.47	0.44	128	18.13	0.16	1.16	1.12	0.38	0.42	0.78	0.69
734.6	18.372	17.33	0.60	128	18.29	0.16	1.18	1.13	0.39	0.43	0.79	0.70
734.5	18.537	23.16	0.84	128	18.45	0.16	1.19	1.14	0.39	0.43	0.79	0.70
734.3	18.701	30.39	1.14	128	18.62	0.16	1.20	1.15	0.40	0.44	0.80	0.71
734.1	18.865	31.38	1.02	128	18.78	0.16	1.21	1.16	0.40	0.45	0.81	0.71
734.0	19.029	62.35	0.53	128	18.95	0.16	1.22	1.17	0.41	0.45	0.81	0.72
733.8	19.193	61.71	0.86	128	19.11	0.16	1.23	1.18	0.41	0.46	0.82	0.72
733.6	19.357	30.72	1.95	128	19.27	0.16	1.24	1.19	0.42	0.46	0.82	0.73
733.5	19.521	42.30	2.19	128	19.44	0.16	1.25	1.20	0.42	0.47	0.83	0.74
733.3	19.685	70.21	1.39	128	19.60	0.16	1.26	1.21	0.43	0.47	0.83	0.74
733.2	19.849	20.48	0.79	128	19.77	0.16	1.27	1.22	0.43	0.48	0.84	0.75
733.0	20.013	25.72	1.21	128	19.93	0.16	1.28	1.23	0.44	0.48	0.84	0.75
732.8	20.177	45.59	0.69	128	20.09	0.16	1.29	1.24	0.44	0.49	0.85	0.76
732.7	20.341	38.74	0.89	128	20.26	0.16	1.30	1.25	0.45	0.49	0.85	0.76
732.5	20.505	27.16	0.79	128	20.42	0.16	1.31	1.26	0.45	0.50	0.86	0.77
732.3	20.669	23.31	1.02	128	20.59	0.16	1.32	1.27	0.46	0.50	0.86	0.77
732.2	20.833	73.73	1.84	128	20.75	0.16	1.33	1.28	0.46	0.51	0.87	0.78

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
732.0	20.997	75.15	2.15	128	20.92	0.16	1.34	1.30	0.47	0.51	0.88	0.78
731.8	21.161	43.91	2.33	128	21.08	0.16	1.35	1.31	0.47	0.52	0.88	0.79
731.7	21.325	30.57	1.43	128	21.24	0.16	1.36	1.32	0.48	0.52	0.89	0.79
731.5	21.489	24.24	1.00	128	21.41	0.16	1.37	1.33	0.48	0.53	0.89	0.80
731.3	21.653	26.57	0.93	128	21.57	0.16	1.39	1.34	0.49	0.53	0.90	0.81
731.2	21.817	36.92	1.04	128	21.74	0.16	1.40	1.35	0.49	0.54	0.90	0.81
731.0	21.981	43.04	0.93	128	21.90	0.16	1.41	1.36	0.50	0.54	0.91	0.82
730.9	22.145	28.68	0.77	128	22.06	0.16	1.42	1.37	0.50	0.55	0.91	0.82
730.7	22.309	20.92	0.76	128	22.23	0.16	1.43	1.38	0.51	0.55	0.92	0.83
730.5	22.473	15.87	0.50	128	22.39	0.16	1.44	1.39	0.51	0.56	0.92	0.83
730.4	22.638	15.83	0.50	128	22.56	0.16	1.45	1.40	0.52	0.56	0.93	0.84
730.2	22.802	12.22	0.37	128	22.72	0.16	1.46	1.41	0.52	0.57	0.93	0.84
730.0	22.966	12.56	0.43	128	22.88	0.16	1.47	1.42	0.53	0.57	0.94	0.85
729.9	23.130	23.26	0.40	128	23.05	0.16	1.48	1.43	0.53	0.58	0.95	0.85
729.7	23.294	27.71	0.50	128	23.21	0.16	1.49	1.44	0.54	0.58	0.95	0.86
729.5	23.458	16.49	0.49	128	23.38	0.16	1.50	1.45	0.54	0.59	0.96	0.86
729.4	23.622	12.95	0.49	128	23.54	0.16	1.51	1.46	0.55	0.59	0.96	0.87
729.2	23.786	9.78	0.43	128	23.70	0.16	1.52	1.47	0.55	0.60	0.97	0.88
729.1	23.950	10.25	0.38	128	23.87	0.16	1.53	1.48	0.56	0.60	0.97	0.88
728.9	24.114	7.37	0.26	128	24.03	0.16	1.54	1.49	0.57	0.61	0.98	0.89
728.7	24.278	7.03	0.27	128	24.20	0.16	1.55	1.51	0.57	0.61	0.98	0.89
728.6	24.442	6.50	0.28	128	24.36	0.16	1.56	1.52	0.58	0.62	0.99	0.90
728.4	24.606	7.86	0.30	128	24.52	0.16	1.57	1.53	0.58	0.62	0.99	0.90
728.2	24.770	8.15	0.35	128	24.69	0.16	1.58	1.54	0.59	0.63	1.00	0.91
728.1	24.934	12.14	0.43	128	24.85	0.16	1.60	1.55	0.59	0.63	1.00	0.91
727.9	25.098	12.02	0.47	128	25.02	0.16	1.61	1.56	0.60	0.64	1.01	0.92
727.7	25.262	12.36	0.36	128	25.18	0.16	1.62	1.57	0.60	0.64	1.02	0.92
727.6	25.426	8.81	0.24	128	25.34	0.16	1.63	1.58	0.61	0.65	1.02	0.93
727.4	25.590	7.77	0.17	128	25.51	0.16	1.64	1.59	0.61	0.65	1.03	0.93
727.2	25.754	5.87	0.11	128	25.67	0.16	1.65	1.60	0.62	0.66	1.03	0.94
727.1	25.918	6.86	0.11	128	25.84	0.16	1.66	1.61	0.62	0.67	1.04	0.95
726.9	26.082	6.84	0.16	126	26.00	0.16	1.67	1.62	0.63	0.67	1.04	0.95
726.8	26.246	5.91	0.17	126	26.16	0.16	1.68	1.63	0.63	0.68	1.05	0.96
726.6	26.410	8.18	0.13	126	26.33	0.16	1.69	1.64	0.64	0.68	1.05	0.96
726.4	26.574	8.05	0.10	126	26.49	0.16	1.70	1.65	0.64	0.69	1.06	0.97
726.3	26.739	7.38	0.08	126	26.66	0.16	1.71	1.66	0.65	0.69	1.06	0.97
726.1	26.903	6.42	0.08	126	26.82	0.16	1.72	1.67	0.65	0.70	1.07	0.98
725.9	27.067	6.38	0.07	126	26.98	0.16	1.73	1.68	0.66	0.70	1.07	0.98
725.8	27.231	6.60	0.08	126	27.15	0.16	1.74	1.69	0.66	0.71	1.08	0.99
725.6	27.395	6.49	0.08	126	27.31	0.16	1.75	1.70	0.67	0.71	1.08	0.99
725.4	27.559	6.43	0.09	126	27.48	0.16	1.76	1.71	0.67	0.72	1.09	1.00
725.3	27.723	6.80	0.09	126	27.64	0.16	1.77	1.72	0.68	0.72	1.09	1.00
725.1	27.887	6.29	0.10	126	27.80	0.16	1.78	1.73	0.68	0.73	1.10	1.01
724.9	28.051	5.94	0.12	126	27.97	0.16	1.79	1.74	0.69	0.73	1.10	1.01
724.8	28.215	6.44	0.14	126	28.13	0.16	1.80	1.75	0.69	0.74	1.11	1.02
724.6	28.379	6.87	0.14	126	28.30	0.16	1.81	1.77	0.70	0.74	1.12	1.02
724.5	28.543	6.47	0.13	126	28.46	0.16	1.82	1.78	0.70	0.75	1.12	1.03
724.3	28.707	6.47	0.13	126	28.62	0.16	1.83	1.79	0.71	0.75	1.13	1.03
724.1	28.871	6.91	0.13	126	28.79	0.16	1.84	1.80	0.71	0.76	1.13	1.04
724.0	29.035	7.72	0.17	126	28.95	0.16	1.85	1.81	0.72	0.76	1.14	1.04
723.8	29.199	8.91	0.18	126	29.12	0.16	1.86	1.82	0.72	0.77	1.14	1.05
723.6	29.363	9.11	0.25	126	29.28	0.16	1.88	1.83	0.73	0.77	1.15	1.05
723.5	29.527	8.37	0.32	126	29.45	0.16	1.89	1.84	0.73	0.78	1.15	1.06
723.3	29.691	10.79	0.29	126	29.61	0.16	1.90	1.85	0.74	0.78	1.16	1.07
723.1	29.855	9.62	0.27	126	29.77	0.16	1.91	1.86	0.74	0.79	1.16	1.07
723.0	30.019	9.64	0.18	126	29.94	0.16	1.92	1.87	0.75	0.79	1.17	1.08
722.8	30.183	12.31	0.38	126	30.10	0.16	1.93	1.88	0.75	0.80	1.17	1.08
722.7	30.347	14.99	0.37	126	30.27	0.16	1.94	1.89	0.76	0.80	1.18	1.09
722.5	30.511	23.25	0.38	126	30.43	0.16	1.95	1.90	0.76	0.81	1.18	1.09
722.3	30.675	28.62	0.39	126	30.59	0.16	1.96	1.91	0.77	0.81	1.19	1.10
722.2	30.840	30.42	0.29	126	30.76	0.16	1.97	1.92	0.77	0.82	1.19	1.10
722.0	31.004	36.85	0.17	126	30.92	0.16	1.98	1.93	0.78	0.82	1.20	1.11
721.8	31.168	44.47	0.17	126	31.09	0.16	1.99	1.94	0.79	0.83	1.20	1.11
721.7	31.332	57.32	0.27	126	31.25	0.16	2.00	1.95	0.79	0.83	1.21	1.12
721.5	31.496	75.42	0.51	126	31.41	0.16	2.01	1.96	0.80	0.84	1.21	1.12
721.3	31.660	80.96	0.66	126	31.58	0.16	2.02	1.97	0.80	0.84	1.22	1.13
721.2	31.824	83.09	0.78	126	31.74	0.16	2.03	1.98	0.81	0.85	1.22	1.13
721.0	31.988	82.07	0.77	126	31.91	0.16	2.04	1.99	0.81	0.85	1.23	1.14
720.8	32.152	77.35	0.83	126	32.07	0.16	2.05	2.00	0.82	0.86	1.23	1.14

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
720.7	32.316	68.92	0.93	126	32.23	0.16	2.06	2.01	0.82	0.86	1.24	1.15
720.5	32.480	72.00	0.88	126	32.40	0.16	2.07	2.02	0.83	0.87	1.25	1.15
720.4	32.644	77.58	0.62	126	32.56	0.16	2.08	2.03	0.83	0.87	1.25	1.16
720.2	32.808	78.29	0.35	126	32.73	0.16	2.09	2.04	0.84	0.88	1.26	1.16
720.0	32.972	75.59	0.33	126	32.89	0.16	2.10	2.05	0.84	0.89	1.26	1.17
719.9	33.136	80.35	0.37	126	33.05	0.16	2.11	2.06	0.85	0.89	1.27	1.17
719.7	33.300	89.35	0.53	126	33.22	0.16	2.12	2.08	0.85	0.90	1.27	1.18
719.5	33.464	100.21	0.67	126	33.38	0.16	2.13	2.09	0.86	0.90	1.28	1.19
719.4	33.628	98.63	0.79	126	33.55	0.16	2.14	2.10	0.86	0.91	1.28	1.19
719.2	33.792	91.06	0.66	126	33.71	0.16	2.15	2.11	0.87	0.91	1.29	1.20
719.0	33.956	69.18	0.73	126	33.87	0.16	2.16	2.12	0.87	0.92	1.29	1.20
718.9	34.120	48.11	0.94	126	34.04	0.16	2.17	2.13	0.88	0.92	1.30	1.21
718.7	34.284	41.58	1.11	126	34.20	0.16	2.19	2.14	0.88	0.93	1.30	1.21
718.6	34.448	41.51	0.73	126	34.37	0.16	2.20	2.15	0.89	0.93	1.31	1.22
718.4	34.612	35.01	0.69	126	34.53	0.16	2.21	2.16	0.89	0.94	1.31	1.22
718.2	34.776	30.75	0.71	126	34.69	0.16	2.22	2.17	0.90	0.94	1.32	1.23
718.1	34.941	34.67	1.10	126	34.86	0.16	2.23	2.18	0.90	0.95	1.32	1.23
717.9	35.105	39.40	1.11	126	35.02	0.16	2.24	2.19	0.91	0.95	1.33	1.24
717.7	35.269	47.21	0.79	126	35.19	0.16	2.25	2.20	0.91	0.96	1.33	1.24
717.6	35.433	54.06	0.64	126	35.35	0.16	2.26	2.21	0.92	0.96	1.34	1.25
717.4	35.597	49.15	0.35	126	35.51	0.16	2.27	2.22	0.92	0.97	1.34	1.25
717.2	35.761	39.71	0.46	126	35.68	0.16	2.28	2.23	0.93	0.97	1.35	1.26
717.1	35.925	30.94	0.40	126	35.84	0.16	2.29	2.24	0.93	0.98	1.35	1.26
716.9	36.089	27.15	0.30	126	36.01	0.16	2.30	2.25	0.94	0.98	1.36	1.27
716.7	36.253	26.76	0.33	126	36.17	0.16	2.31	2.26	0.94	0.99	1.37	1.27
716.6	36.417	23.58	0.22	126	36.33	0.16	2.32	2.27	0.95	0.99	1.37	1.28
716.4	36.581	21.78	0.14	126	36.50	0.16	2.33	2.28	0.95	1.00	1.38	1.28
716.3	36.745	16.93	0.11	126	36.66	0.16	2.34	2.29	0.96	1.00	1.38	1.29
716.1	36.909	14.16	0.07	126	36.83	0.16	2.35	2.30	0.96	1.01	1.39	1.29
715.9	37.073	12.49	0.08	126	36.99	0.16	2.36	2.31	0.97	1.01	1.39	1.30
715.8	37.237	16.98	0.05	126	37.16	0.16	2.37	2.32	0.97	1.02	1.40	1.31
715.6	37.401	23.10	0.05	126	37.32	0.16	2.38	2.33	0.98	1.02	1.40	1.31
715.4	37.565	23.22	0.14	126	37.48	0.16	2.39	2.34	0.98	1.03	1.41	1.32
715.3	37.729	23.08	0.20	126	37.65	0.16	2.40	2.35	0.99	1.03	1.41	1.32
715.1	37.893	29.32	0.19	126	37.81	0.16	2.41	2.36	1.00	1.04	1.42	1.33
714.9	38.057	36.69	0.14	126	37.98	0.16	2.42	2.37	1.00	1.04	1.42	1.33
714.8	38.221	36.44	0.11	126	38.14	0.16	2.43	2.39	1.01	1.05	1.43	1.34
714.6	38.385	34.62	0.25	126	38.30	0.16	2.44	2.40	1.01	1.05	1.43	1.34
714.5	38.549	32.97	0.51	126	38.47	0.16	2.45	2.41	1.02	1.06	1.44	1.35
714.3	38.713	32.26	0.58	126	38.63	0.16	2.46	2.42	1.02	1.06	1.44	1.35
714.1	38.877	35.92	0.39	126	38.80	0.16	2.47	2.43	1.03	1.07	1.45	1.36
714.0	39.042	26.60	0.34	126	38.96	0.16	2.48	2.44	1.03	1.07	1.45	1.36
713.8	39.206	27.28	0.46	126	39.12	0.16	2.50	2.45	1.04	1.08	1.46	1.37
713.6	39.370	33.13	0.23	126	39.29	0.16	2.51	2.46	1.04	1.08	1.46	1.37
713.5	39.534	43.71	0.27	131	39.45	0.16	2.52	2.47	1.05	1.09	1.47	1.38
713.3	39.698	44.34	0.25	131	39.62	0.16	2.53	2.48	1.05	1.10	1.48	1.38
713.1	39.862	38.77	0.31	131	39.78	0.16	2.54	2.49	1.06	1.10	1.48	1.39
713.0	40.026	31.53	0.29	131	39.94	0.16	2.55	2.50	1.06	1.11	1.49	1.40
712.8	40.190	38.89	0.32	131	40.11	0.16	2.56	2.51	1.07	1.11	1.49	1.40
712.6	40.354	55.73	0.51	131	40.27	0.16	2.57	2.52	1.07	1.12	1.50	1.41
712.5	40.518	74.14	0.61	131	40.44	0.16	2.58	2.53	1.08	1.12	1.50	1.41
712.3	40.682	89.90	0.95	131	40.60	0.16	2.59	2.54	1.08	1.13	1.51	1.42
712.2	40.846	99.31	0.86	131	40.76	0.16	2.60	2.55	1.09	1.13	1.51	1.42
712.0	41.010	97.12	0.85	131	40.93	0.16	2.61	2.56	1.09	1.14	1.52	1.43
711.8	41.174	94.46	0.82	131	41.09	0.16	2.62	2.58	1.10	1.14	1.53	1.43
711.7	41.338	99.54	0.75	131	41.26	0.16	2.63	2.59	1.10	1.15	1.53	1.44
711.5	41.502	109.61	0.76	131	41.42	0.16	2.65	2.60	1.11	1.15	1.54	1.45
711.3	41.666	113.82	1.00	131	41.58	0.16	2.66	2.61	1.11	1.16	1.54	1.45
711.2	41.830	120.75	1.15	131	41.75	0.16	2.67	2.62	1.12	1.16	1.55	1.46
711.0	41.994	127.83	1.28	131	41.91	0.16	2.68	2.63	1.12	1.17	1.55	1.46
710.8	42.158	137.05	1.29	131	42.08	0.16	2.69	2.64	1.13	1.17	1.56	1.47
710.7	42.322	144.52	1.28	131	42.24	0.16	2.70	2.65	1.13	1.18	1.57	1.47
710.5	42.486	150.50	1.02	131	42.40	0.16	2.71	2.66	1.14	1.18	1.57	1.48
710.3	42.650	150.73	1.06	131	42.57	0.16	2.72	2.67	1.14	1.19	1.58	1.49
710.2	42.814	145.67	1.10	131	42.73	0.16	2.73	2.68	1.15	1.19	1.58	1.49
710.0	42.978	144.28	1.19	131	42.90	0.16	2.74	2.69	1.15	1.20	1.59	1.50
709.9	43.143	134.78	1.30	131	43.06	0.16	2.75	2.70	1.16	1.20	1.59	1.50
709.7	43.307	118.78	1.87	131	43.22	0.16	2.76	2.72	1.16	1.21	1.60	1.51
709.5	43.471	115.90	2.30	131	43.39	0.16	2.77	2.73	1.17	1.21	1.60	1.51

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
709.4	43.635	177.32	1.16	131	43.55	0.16	2.78	2.74	1.17	1.22	1.61	1.52
709.2	43.799	302.61	0.01	131	43.72	0.16	2.80	2.75	1.18	1.22	1.62	1.52
709.0	43.963	488.18	0.01	131	43.88	0.08	2.81	2.76	1.18	1.23	1.62	1.53

LIQUEFACTION POTENTIAL ASSESSMENT FOR COARSE GRAINED SOILS USING CONE PENETRATION TEST DATA

Project Site: KIF TDEC Stability
Project No.: 175668043
CPT ID: CPT-04A

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
753.0												
752.8	0.164	2000.58	0.15	0.43	0.5	1.70	328.31	0	0.00	328.31	0.054	#NUM!
752.7	0.328	2834.32	0.15	0.40	0.5	1.70	668.40	0	0.00	668.40	0.051	#NUM!
752.5	0.492	2028.50	0.30	0.72	0.5	1.70	588.96	0	0.00	588.96	0.048	#NUM!
752.3	0.656	1941.93	0.22	0.59	0.5	1.70	652.75	0	0.00	652.75	0.046	#NUM!
752.2	0.820	1209.14	0.29	0.78	0.5	1.70	455.14	0	0.00	455.14	0.043	-0.600
752.0	0.984	654.54	0.85	1.32	0.5	1.70	270.22	0	0.00	270.22	0.040	-0.600
751.9	1.148	433.93	1.56	1.64	0.5	1.70	193.69	0	0.00	193.69	0.038	-0.600
751.7	1.312	370.43	1.78	1.73	0.5	1.70	176.89	1	0.00	176.89	0.035	-0.600
751.5	1.476	658.09	0.92	1.35	0.5	1.70	333.35	0	0.00	333.35	0.032	-0.600
751.4	1.640	912.93	0.71	1.19	0.5	1.70	487.56	0	0.00	487.56	0.030	-0.600
751.2	1.804	708.00	1.02	1.38	0.5	1.70	396.73	0	0.00	396.73	0.027	-0.600
751.0	1.968	384.90	1.87	1.73	0.5	1.70	225.42	2	0.00	225.42	0.029	-0.600
750.9	2.133	222.55	2.39	1.95	0.5	1.70	135.79	19	39.63	175.42	0.031	-0.600
750.7	2.297	355.34	1.97	1.77	0.5	1.70	224.90	5	0.13	225.03	0.033	-0.600
750.5	2.461	301.82	2.08	1.83	0.5	1.70	197.80	9	8.12	205.92	0.036	-0.600
750.4	2.625	305.18	2.00	1.81	0.5	1.70	206.60	8	4.28	210.88	0.038	-0.600
750.2	2.789	671.59	1.07	1.40	0.5	1.60	440.37	0	0.00	440.37	0.040	-0.600
750.0	2.953	690.42	0.91	1.34	0.5	1.57	458.92	0	0.00	458.92	0.040	-0.600
749.9	3.117	701.83	0.56	1.15	0.5	1.55	472.54	0	0.00	472.54	0.039	-0.600
749.7	3.281	529.98	0.91	1.39	0.5	1.53	361.29	0	0.00	361.29	0.038	-0.600
749.6	3.445	332.04	1.58	1.71	0.5	1.56	236.52	0	0.00	236.52	0.037	-0.600
749.4	3.609	196.13	2.81	2.04	0.5	1.62	149.03	26	59.07	208.10	0.036	-0.600
749.2	3.773	120.14	3.74	2.27	0.5	1.70	97.83	45	68.78	166.61	0.034	-0.600
749.1	3.937	92.41	5.16	2.45	0.5	1.70	76.97	59	69.94	146.91	0.032	-0.588
748.9	4.101	79.59	5.88	2.53	0.5	1.70	67.73	66	69.31	137.04	0.029	-0.554
748.7	4.265	81.98	5.53	2.50	0.5	1.70	71.15	63	69.67	140.81	0.027	-0.566
748.6	4.429	128.26	2.72	2.14	0.5	1.63	108.42	34	62.76	171.17	0.024	-0.600
748.4	4.593	381.74	1.28	1.60	0.5	1.40	282.05	0	0.00	282.05	0.022	-0.600
748.2	4.757	298.41	1.83	1.79	0.5	1.44	230.06	6	0.73	230.79	0.019	-0.600
748.1	4.921	205.44	2.99	2.05	0.5	1.44	161.22	27	62.92	224.14	0.016	-0.600
747.9	5.085	179.07	3.74	2.17	0.5	1.44	143.23	36	72.76	215.99	0.012	-0.600
747.8	5.249	159.22	4.46	2.26	0.5	1.45	130.01	44	76.33	206.34	0.013	-0.600
747.6	5.413	162.18	4.73	2.28	0.5	1.42	132.41	45	77.91	210.31	0.014	-0.600
747.4	5.577	282.71	2.67	1.94	0.5	1.33	218.88	18	45.07	263.95	0.012	-0.600
747.3	5.741	272.34	2.33	1.90	0.5	1.33	214.51	15	31.16	245.67	0.010	-0.600
747.1	5.905	239.96	3.41	2.06	0.5	1.31	188.41	28	69.98	258.38	0.007	-0.600
746.9	6.069	224.10	2.97	2.03	0.5	1.32	179.44	25	62.38	241.82	0.005	-0.600
746.8	6.234	133.02	4.65	2.32	0.5	1.41	114.29	48	75.43	189.73	0.004	-0.600
746.6	6.398	237.41	2.78	1.99	0.5	1.31	190.24	22	56.26	246.50	0.003	-0.600
746.4	6.562	368.91	1.46	1.65	0.5	1.29	293.77	0	0.00	293.77	0.002	-0.600
746.3	6.726	300.63	1.84	1.79	0.5	1.30	243.00	6	0.73	243.74	0.001	-0.600
746.1	6.890	274.70	1.89	1.82	0.5	1.31	225.84	8	5.46	231.30	0.001	-0.600
745.9	7.054	241.20	2.25	1.91	0.5	1.31	198.44	16	35.00	233.44	0.001	-0.600
745.8	7.218	218.11	1.92	1.88	0.5	1.34	185.06	13	23.89	208.95	0.002	-0.600
745.6	7.382	227.33	1.68	1.83	0.5	1.34	194.92	9	7.04	201.96	0.003	-0.600
745.5	7.546	157.71	2.82	2.10	0.5	1.34	135.98	31	64.29	200.27	0.005	-0.600
745.3	7.710	111.16	3.48	2.26	0.5	1.39	100.04	44	69.10	169.14	0.006	-0.600
745.1	7.874	91.56	2.76	2.24	0.5	1.42	84.94	43	64.21	149.15	0.008	-0.584
745.0	8.038	77.70	3.14	2.33	0.5	1.43	73.38	50	65.27	138.65	0.009	-0.550
744.8	8.202	266.35	1.32	1.70	0.5	1.28	225.10	0	0.00	225.10	0.011	-0.600
744.6	8.366	279.39	1.78	1.79	0.5	1.27	234.22	6	1.33	235.54	0.011	-0.600
744.5	8.530	217.79	2.32	1.95	0.5	1.27	184.39	19	44.47	228.86	0.012	-0.600
744.3	8.694	129.62	4.17	2.29	0.5	1.32	114.96	46	74.05	189.01	0.013	-0.600
744.1	8.858	123.38	2.63	2.14	0.5	1.34	111.44	34	63.39	174.83	0.014	-0.600
744.0	9.022	119.94	3.48	2.25	0.5	1.33	108.12	43	70.03	178.15	0.015	-0.600
743.8	9.186	98.82	5.55	2.46	0.5	1.34	90.75	60	74.00	164.74	0.016	-0.600
743.6	9.350	235.27	2.27	1.92	0.5	1.24	199.79	17	38.49	238.28	0.017	-0.600
743.5	9.514	42.32	18.48	3.10	1.0	1.47	30.17	100	63.30	93.47	0.018	-0.373
743.3	9.678	64.44	8.35	2.71	1.0	1.42	44.54	80	65.32	109.87	0.019	-0.442
743.2	9.842	131.31	2.28	2.08	0.5	1.30	119.31	29	58.35	177.66	0.020	-0.600

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
743.0	10.006	144.10	1.89	1.99	0.5	1.30	131.04	22	46.70	177.75	0.021	-0.600
742.8	10.170	202.44	1.32	1.77	0.5	1.28	183.04	5	0.19	183.23	0.022	-0.600
742.7	10.335	223.84	0.94	1.64	0.5	1.26	199.47	0	0.00	199.47	0.024	-0.600
742.5	10.499	166.68	2.39	2.03	0.5	1.25	148.27	25	56.60	204.87	0.025	-0.600
742.3	10.663	142.97	1.60	1.94	0.5	1.29	132.14	18	35.58	167.72	0.026	-0.600
742.2	10.827	140.00	1.22	1.86	0.5	1.31	132.43	12	14.82	147.26	0.027	-0.573
742.0	10.991	110.35	1.80	2.05	0.5	1.30	103.72	27	52.07	155.79	0.028	-0.599
741.8	11.155	81.48	4.04	2.40	0.5	1.30	77.67	55	68.75	146.42	0.029	-0.570
741.7	11.319	82.63	4.86	2.46	0.5	1.30	78.59	60	70.65	149.25	0.030	-0.578
741.5	11.483	137.01	2.27	2.06	0.5	1.25	125.63	28	57.90	183.53	0.031	-0.600
741.4	11.647	186.57	1.58	1.86	0.5	1.24	170.61	12	15.62	186.23	0.032	-0.600
741.2	11.811	194.06	0.87	1.66	0.5	1.24	178.84	0	0.00	178.84	0.033	-0.600
741.0	11.975	159.94	0.64	1.63	0.5	1.27	151.54	0	0.00	151.54	0.034	-0.585
740.9	12.139	171.49	0.44	1.51	0.5	1.26	161.10	0	0.00	161.10	0.035	-0.600
740.7	12.303	172.19	0.61	1.59	0.5	1.25	161.82	0	0.00	161.82	0.035	-0.600
740.5	12.467	125.59	2.11	2.07	0.5	1.23	117.21	28	56.36	173.57	0.036	-0.600
740.4	12.631	91.70	3.04	2.27	0.5	1.25	87.43	45	66.42	153.85	0.037	-0.591
740.2	12.795	74.13	4.96	2.50	0.5	1.26	71.77	63	69.64	141.40	0.038	-0.551
740.0	12.959	137.24	2.35	2.08	0.5	1.21	127.15	29	59.61	186.76	0.039	-0.600
739.9	13.123	116.31	3.14	2.22	0.5	1.21	108.84	40	68.54	177.38	0.040	-0.600
739.7	13.287	96.23	4.14	2.36	0.5	1.23	91.40	52	71.19	162.59	0.040	-0.600
739.5	13.451	83.85	4.25	2.41	0.5	1.23	80.66	56	69.85	150.51	0.041	-0.579
739.4	13.615	94.83	3.91	2.35	0.5	1.22	90.41	51	70.37	160.78	0.041	-0.600
739.2	13.779	107.47	3.63	2.29	0.5	1.20	101.54	46	70.72	172.26	0.042	-0.600
739.1	13.943	98.25	3.92	2.34	0.5	1.21	93.57	50	70.84	164.41	0.043	-0.600
738.9	14.107	76.97	4.66	2.46	0.5	1.22	74.77	60	69.73	144.50	0.043	-0.559
738.7	14.271	74.16	4.03	2.43	0.5	1.22	72.38	57	68.06	140.44	0.044	-0.545
738.6	14.436	68.74	4.18	2.46	0.5	1.22	67.52	60	67.61	135.13	0.045	-0.527
738.4	14.600	62.91	4.22	2.49	0.5	1.23	62.24	62	66.81	129.05	0.046	-0.506
738.2	14.764	49.68	5.37	2.64	0.7	1.24	45.94	74	64.75	110.69	0.047	-0.437
738.1	14.928	45.80	5.13	2.65	1.0	1.25	37.69	75	62.45	100.15	0.047	-0.394
737.9	15.092	35.53	5.79	2.76	1.0	1.26	29.88	84	61.48	91.36	0.048	-0.355
737.7	15.256	29.40	7.16	2.88	1.0	1.26	25.15	94	61.15	86.31	0.049	-0.331
737.6	15.420	43.95	5.18	2.66	1.0	1.24	36.70	76	62.36	99.06	0.050	-0.389
737.4	15.584	43.83	4.69	2.63	0.7	1.23	41.27	73	63.29	104.56	0.051	-0.411
737.3	15.748	27.83	7.54	2.92	1.0	1.24	24.17	96	61.10	85.27	0.052	-0.326
737.1	15.912	28.49	4.39	2.74	1.0	1.24	24.82	83	59.79	84.61	0.053	-0.322
736.9	16.076	30.56	3.94	2.69	1.0	1.23	26.59	78	59.72	86.31	0.054	-0.330
736.8	16.240	30.30	2.90	2.60	1.0	1.23	26.51	71	58.58	85.09	0.054	-0.324
736.6	16.404	22.73	4.12	2.80	1.0	1.23	20.37	87	58.98	79.35	0.055	-0.296
736.4	16.568	26.68	3.85	2.73	1.0	1.22	23.70	81	59.27	82.97	0.056	-0.313
736.3	16.732	23.95	3.70	2.75	1.0	1.22	21.53	83	58.87	80.40	0.056	-0.301
736.1	16.896	18.24	3.98	2.86	1.0	1.22	16.83	92	58.43	75.26	0.056	-0.274
735.9	17.060	15.73	4.12	2.92	1.0	1.22	14.77	97	58.24	73.00	0.056	-0.262
735.8	17.224	10.32	4.46	3.09	1.0	1.22	10.21	100	57.10	67.32	0.056	-0.230
735.6	17.388	14.28	2.51	2.83	1.0	1.21	13.64	89	57.16	70.80	0.055	-0.249
735.4	17.552	15.58	2.18	2.76	1.0	1.20	14.81	84	56.92	71.73	0.055	-0.254
735.3	17.716	10.38	4.92	3.11	1.0	1.20	10.37	100	57.15	67.52	0.055	-0.231
735.1	17.880	11.59	4.45	3.05	1.0	1.20	11.44	100	57.49	68.93	0.055	-0.238
735.0	18.044	15.12	2.91	2.84	1.0	1.19	14.54	90	57.57	72.11	0.056	-0.256
734.8	18.208	14.43	3.89	2.94	1.0	1.19	13.98	98	58.09	72.07	0.058	-0.255
734.6	18.372	20.47	3.74	2.81	1.0	1.18	19.25	87	58.70	77.95	0.060	-0.286
734.5	18.537	27.65	3.81	2.71	1.0	1.16	25.49	80	59.65	85.14	0.061	-0.322
734.3	18.701	36.50	3.89	2.63	1.0	1.15	33.14	73	60.89	94.02	0.063	-0.362
734.1	18.865	34.53	3.37	2.60	0.7	1.15	34.08	71	60.81	94.89	0.064	-0.366
734.0	19.029	66.01	0.87	2.02	0.5	1.14	66.98	24	40.92	107.90	0.065	-0.421
733.8	19.193	65.09	1.41	2.15	0.5	1.13	65.68	35	53.77	119.45	0.066	-0.465
733.6	19.357	35.88	6.61	2.80	1.0	1.14	33.01	87	62.81	95.81	0.066	-0.369
733.5	19.521	49.64	5.34	2.63	1.0	1.12	44.97	74	64.44	109.41	0.067	-0.426
733.3	19.685	73.48	2.01	2.21	0.5	1.11	73.60	40	59.66	133.26	0.068	-0.514
733.2	19.849	22.94	4.12	2.80	1.0	1.13	21.97	87	59.44	81.41	0.069	-0.302
733.0	20.013	28.99	4.95	2.77	1.0	1.13	27.39	85	60.87	88.26	0.069	-0.335
732.8	20.177	46.76	1.56	2.29	0.5	1.11	47.98	46	56.96	104.94	0.070	-0.407
732.7	20.341	39.39	2.37	2.46	0.5	1.11	40.73	60	60.11	100.83	0.071	-0.390
732.5	20.505	30.08	3.06	2.62	1.0	1.12	28.63	73	59.46	88.09	0.071	-0.333
732.3	20.669	25.44	4.63	2.80	1.0	1.11	24.54	87	60.22	84.76	0.072	-0.317

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732.2	20.833	75.46	2.54	2.27	0.5	1.09	75.67	45	63.44	139.11	0.073	-0.533
732.0	20.997	76.70	2.92	2.31	0.5	1.08	76.86	48	65.42	142.28	0.074	-0.543
731.8	21.161	48.33	5.47	2.65	1.0	1.09	45.30	75	64.76	110.06	0.074	-0.427
731.7	21.325	32.97	4.88	2.73	1.0	1.10	31.65	81	61.69	93.34	0.075	-0.356
731.5	21.489	25.65	4.35	2.78	1.0	1.10	25.10	85	60.19	85.28	0.076	-0.319
731.3	21.653	28.09	3.68	2.70	1.0	1.09	27.40	79	60.05	87.45	0.076	-0.329
731.2	21.817	36.36	2.93	2.55	0.5	1.08	37.80	67	60.97	98.77	0.077	-0.380
731.0	21.981	42.48	2.23	2.42	0.5	1.08	43.85	57	59.98	103.82	0.077	-0.401
730.9	22.145	29.86	2.83	2.60	1.0	1.08	29.28	71	59.38	88.66	0.078	-0.334
730.7	22.309	21.22	3.89	2.81	1.0	1.08	21.35	87	59.33	80.69	0.079	-0.295
730.5	22.473	15.63	3.43	2.87	1.0	1.08	16.19	93	58.33	74.52	0.080	-0.264
730.4	22.638	15.48	3.46	2.88	1.0	1.08	16.10	93	58.35	74.44	0.080	-0.263
730.2	22.802	11.51	3.47	2.98	1.0	1.07	12.40	100	57.78	70.18	0.081	-0.240
730.0	22.966	11.80	3.84	3.00	1.0	1.07	12.70	100	57.88	70.58	0.082	-0.242
729.9	23.130	21.78	1.84	2.60	0.5	1.06	23.38	71	57.57	80.95	0.082	-0.296
729.7	23.294	26.14	1.90	2.54	0.5	1.06	27.72	66	57.95	85.67	0.083	-0.319
729.5	23.458	15.68	3.27	2.86	1.0	1.06	16.50	92	58.32	74.81	0.084	-0.264
729.4	23.622	11.90	4.30	3.03	1.0	1.06	12.93	100	57.95	70.87	0.084	-0.243
729.2	23.786	8.55	5.19	3.19	1.0	1.05	9.75	100	56.96	66.71	0.085	-0.219
729.1	23.950	8.97	4.30	3.13	1.0	1.05	10.18	100	57.09	67.27	0.086	-0.222
728.9	24.114	5.96	4.45	3.28	1.0	1.05	7.30	100	56.20	63.49	0.086	-0.200
728.7	24.278	5.57	5.00	3.33	1.0	1.04	6.94	100	56.09	63.03	0.087	-0.197
728.6	24.442	4.99	5.67	3.40	1.0	1.04	6.40	100	55.92	62.32	0.088	-0.193
728.4	24.606	6.33	4.80	3.28	1.0	1.04	7.71	100	56.33	64.04	0.088	-0.203
728.2	24.770	6.58	5.37	3.29	1.0	1.03	7.97	100	56.41	64.38	0.089	-0.205
728.1	24.934	10.50	4.10	3.06	1.0	1.03	11.82	100	57.60	69.43	0.090	-0.233
727.9	25.098	10.31	4.47	3.09	1.0	1.03	11.67	100	57.56	69.23	0.090	-0.232
727.7	25.262	10.59	3.36	3.00	1.0	1.02	11.96	100	57.65	69.61	0.091	-0.234
727.6	25.426	7.04	3.37	3.15	1.0	1.02	8.51	100	56.57	65.08	0.092	-0.208
727.4	25.590	5.97	2.79	3.17	1.0	1.02	7.48	100	56.25	63.73	0.092	-0.200
727.2	25.754	4.09	2.68	3.30	1.0	1.02	5.63	100	55.68	61.31	0.093	-0.185
727.1	25.918	5.02	2.15	3.18	1.0	1.01	6.56	100	55.97	62.53	0.094	-0.193
726.9	26.082	4.96	3.14	3.26	1.0	1.01	6.52	100	55.96	62.48	0.094	-0.192
726.8	26.246	4.04	3.92	3.39	1.0	1.01	5.62	100	55.68	61.30	0.095	-0.185
726.6	26.410	6.17	2.03	3.08	1.0	1.00	7.76	100	56.34	64.10	0.095	-0.201
726.4	26.574	6.00	1.59	3.04	1.0	1.00	7.61	100	56.29	63.90	0.096	-0.200
726.3	26.739	5.34	1.45	3.07	1.0	1.00	6.96	100	56.09	63.05	0.097	-0.195
726.1	26.903	4.40	1.62	3.17	1.0	0.99	6.03	100	55.81	61.84	0.097	-0.187
725.9	27.067	4.33	1.57	3.17	1.0	0.99	5.98	100	55.79	61.77	0.098	-0.187
725.8	27.231	4.50	1.59	3.15	1.0	0.99	6.17	100	55.85	62.01	0.099	-0.188
725.6	27.395	4.38	1.73	3.18	1.0	0.99	6.05	100	55.81	61.86	0.099	-0.187
725.4	27.559	4.29	1.97	3.22	1.0	0.98	5.97	100	55.79	61.76	0.100	-0.186
725.3	27.723	4.59	1.81	3.17	1.0	0.98	6.30	100	55.89	62.19	0.100	-0.189
725.1	27.887	4.10	2.11	3.25	1.0	0.98	5.81	100	55.74	61.54	0.101	-0.185
724.9	28.051	3.76	2.84	3.34	1.0	0.97	5.47	100	55.63	61.11	0.102	-0.182
724.8	28.215	4.18	2.99	3.32	1.0	0.97	5.92	100	55.77	61.69	0.102	-0.185
724.6	28.379	4.54	2.83	3.27	1.0	0.97	6.30	100	55.89	62.18	0.103	-0.188
724.5	28.543	4.15	2.88	3.31	1.0	0.97	5.91	100	55.77	61.68	0.103	-0.185
724.3	28.707	4.12	2.74	3.30	1.0	0.96	5.89	100	55.76	61.65	0.104	-0.185
724.1	28.871	4.48	2.63	3.26	1.0	0.96	6.28	100	55.88	62.16	0.104	-0.188
724.0	29.035	5.16	2.81	3.22	1.0	0.96	7.00	100	56.10	63.10	0.105	-0.193
723.8	29.199	6.17	2.55	3.13	1.0	0.96	8.05	100	56.43	64.49	0.105	-0.201
723.6	29.363	6.31	3.43	3.20	1.0	0.95	8.21	100	56.48	64.69	0.106	-0.202
723.5	29.527	5.63	4.95	3.33	1.0	0.95	7.52	100	56.27	63.79	0.106	-0.197
723.3	29.691	7.69	3.29	3.11	1.0	0.95	9.68	100	56.94	66.62	0.107	-0.213
723.1	29.855	6.64	3.47	3.18	1.0	0.95	8.61	100	56.61	65.21	0.107	-0.205
723.0	30.019	6.62	2.34	3.09	1.0	0.94	8.60	100	56.60	65.21	0.108	-0.205
722.8	30.183	8.86	3.68	3.09	1.0	0.94	10.96	100	57.34	68.30	0.108	-0.222
722.7	30.347	11.08	2.80	2.94	1.0	0.94	13.33	98	57.94	71.27	0.109	-0.239
722.5	30.511	18.01	1.77	2.66	1.0	0.94	20.67	76	57.57	78.24	0.110	-0.275
722.3	30.675	23.78	1.47	2.51	0.5	0.94	25.41	64	56.79	82.20	0.111	-0.295
722.2	30.840	25.32	1.01	2.40	0.5	0.94	26.94	55	54.89	81.83	0.112	-0.293
722.0	31.004	30.97	0.48	2.18	0.5	0.93	32.55	37	47.83	80.38	0.113	-0.286
721.8	31.168	37.64	0.41	2.07	0.5	0.93	39.18	29	41.59	80.77	0.114	-0.287
721.7	31.332	48.92	0.48	2.00	0.5	0.93	50.48	23	35.49	85.98	0.115	-0.313
721.5	31.496	64.77	0.70	1.97	0.5	0.93	66.58	21	33.88	100.46	0.115	-0.377

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
721.3	31.660	69.50	0.84	1.99	0.5	0.93	71.50	22	37.56	109.06	0.115	-0.413
721.2	31.824	71.21	0.96	2.02	0.5	0.93	73.37	24	41.88	115.24	0.115	-0.437
721.0	31.988	70.16	0.97	2.02	0.5	0.93	72.32	25	42.49	114.80	0.115	-0.435
720.8	32.152	65.87	1.10	2.08	0.5	0.93	68.04	29	48.02	116.07	0.116	-0.440
720.7	32.316	58.37	1.40	2.18	0.5	0.93	60.50	38	54.80	115.30	0.116	-0.437
720.5	32.480	60.92	1.25	2.14	0.5	0.93	63.08	34	52.40	115.48	0.116	-0.437
720.4	32.644	65.64	0.82	2.01	0.5	0.92	67.65	23	39.38	107.02	0.116	-0.404
720.2	32.808	66.10	0.46	1.87	0.5	0.91	67.42	13	13.57	80.99	0.116	-0.287
720.0	32.972	63.62	0.44	1.88	0.5	0.91	64.93	13	15.37	80.30	0.117	-0.283
719.9	33.136	67.59	0.47	1.87	0.5	0.91	68.93	13	13.48	82.41	0.118	-0.294
719.7	33.300	75.20	0.60	1.88	0.5	0.91	76.86	14	16.80	93.66	0.118	-0.346
719.5	33.464	84.39	0.68	1.87	0.5	0.91	86.28	12	14.33	100.62	0.119	-0.376
719.4	33.628	82.85	0.82	1.92	0.5	0.91	85.14	17	26.73	111.87	0.119	-0.422
719.2	33.792	76.19	0.74	1.93	0.5	0.91	78.24	17	26.71	104.95	0.120	-0.394
719.0	33.956	57.31	1.09	2.12	0.5	0.91	59.44	33	50.51	109.96	0.120	-0.414
718.9	34.120	39.20	2.05	2.42	0.5	0.90	41.08	57	59.29	100.37	0.121	-0.375
718.7	34.284	33.56	2.81	2.56	0.5	0.90	35.37	68	60.51	95.88	0.121	-0.355
718.6	34.448	33.42	1.85	2.45	0.5	0.90	35.19	59	58.30	93.49	0.122	-0.345
718.4	34.612	27.83	2.11	2.55	0.5	0.89	29.54	67	58.58	88.13	0.122	-0.320
718.2	34.776	21.64	2.47	2.68	1.0	0.89	25.85	77	59.33	85.18	0.122	-0.306
718.1	34.941	24.51	3.38	2.72	1.0	0.89	29.16	80	60.81	89.97	0.123	-0.328
717.9	35.105	27.96	2.97	2.64	1.0	0.89	33.14	74	61.01	94.15	0.123	-0.347
717.7	35.269	37.84	1.76	2.39	0.5	0.89	39.71	54	58.17	97.88	0.124	-0.363
717.6	35.433	43.51	1.24	2.25	0.5	0.89	45.44	43	54.86	100.30	0.124	-0.373
717.4	35.597	39.30	0.76	2.17	0.5	0.88	41.02	37	49.69	90.71	0.124	-0.331
717.2	35.761	31.32	1.24	2.37	0.5	0.88	33.04	53	55.73	88.77	0.125	-0.322
717.1	35.925	23.93	1.40	2.50	0.5	0.87	25.59	63	56.56	82.15	0.125	-0.290
716.9	36.089	20.72	1.22	2.52	0.5	0.87	22.35	64	56.02	78.37	0.126	-0.271
716.7	36.253	20.34	1.36	2.55	0.5	0.87	21.98	67	56.46	78.44	0.126	-0.271
716.6	36.417	17.66	1.05	2.55	0.5	0.87	19.29	67	55.60	74.89	0.126	-0.253
716.4	36.581	16.12	0.70	2.50	0.5	0.86	17.74	63	54.42	72.16	0.127	-0.238
716.3	36.745	10.56	0.73	2.67	1.0	0.86	13.73	77	55.71	69.44	0.127	-0.223
716.1	36.909	8.52	0.59	2.73	1.0	0.85	11.44	81	55.59	67.03	0.127	-0.209
715.9	37.073	7.28	0.79	2.84	1.0	0.85	10.06	90	56.16	66.22	0.128	-0.205
715.8	37.237	12.01	0.35	2.51	0.5	0.85	13.65	64	53.39	67.04	0.128	-0.209
715.6	37.401	17.01	0.26	2.33	0.5	0.85	18.57	49	50.58	69.14	0.128	-0.221
715.4	37.565	17.07	0.66	2.47	0.5	0.85	18.68	60	54.06	72.74	0.129	-0.241
715.3	37.729	16.92	0.95	2.54	0.5	0.85	18.55	66	55.32	73.86	0.129	-0.246
715.1	37.893	21.97	0.70	2.38	0.5	0.85	23.57	53	53.44	77.01	0.129	-0.263
714.9	38.057	27.93	0.40	2.19	0.5	0.85	29.43	38	47.68	77.11	0.130	-0.263
714.8	38.221	27.67	0.33	2.16	0.5	0.85	29.14	36	46.13	75.27	0.130	-0.253
714.6	38.385	26.13	0.77	2.33	0.5	0.85	27.74	50	53.17	80.92	0.130	-0.282
714.5	38.549	24.74	1.67	2.53	0.5	0.85	26.44	65	57.38	83.81	0.131	-0.296
714.3	38.713	20.64	1.96	2.63	1.0	0.85	25.83	74	58.78	84.61	0.131	-0.300
714.1	38.877	27.01	1.16	2.41	0.5	0.85	28.69	56	55.55	84.24	0.131	-0.298
714.0	39.042	16.59	1.40	2.63	1.0	0.84	21.11	74	57.38	78.49	0.131	-0.269
713.8	39.206	16.99	1.86	2.69	1.0	0.84	21.63	78	58.24	79.88	0.132	-0.276
713.6	39.370	24.60	0.76	2.35	0.5	0.84	26.21	51	53.42	79.63	0.132	-0.275
713.5	39.534	33.03	0.65	2.21	0.5	0.84	34.67	40	50.09	84.76	0.132	-0.300
713.3	39.698	33.47	0.61	2.19	0.5	0.84	35.08	38	49.14	84.22	0.132	-0.297
713.1	39.862	28.94	0.86	2.32	0.5	0.84	30.60	48	53.46	84.06	0.133	-0.296
713.0	40.026	23.11	0.99	2.43	0.5	0.83	24.75	57	54.98	79.73	0.133	-0.275
712.8	40.190	28.91	0.88	2.32	0.5	0.83	30.58	49	53.60	84.18	0.133	-0.297
712.6	40.354	42.23	0.95	2.20	0.5	0.84	44.17	39	51.91	96.08	0.133	-0.351
712.5	40.518	56.74	0.86	2.07	0.5	0.84	59.03	28	45.28	104.31	0.134	-0.386
712.3	40.682	69.09	1.08	2.06	0.5	0.85	72.20	28	46.73	118.94	0.134	-0.444
712.2	40.846	76.39	0.89	1.97	0.5	0.85	79.42	21	35.85	115.27	0.134	-0.430
712.0	41.010	74.51	0.90	1.98	0.5	0.84	77.51	22	37.28	114.80	0.135	-0.428
711.8	41.174	72.27	0.90	1.99	0.5	0.84	75.20	22	38.60	113.80	0.135	-0.424
711.7	41.338	76.12	0.78	1.94	0.5	0.84	78.78	18	29.48	108.25	0.135	-0.402
711.5	41.502	83.87	0.71	1.88	0.5	0.83	86.29	14	17.62	103.91	0.135	-0.384
711.3	41.666	87.00	0.90	1.93	0.5	0.84	90.51	17	28.64	119.15	0.135	-0.444
711.2	41.830	92.25	0.97	1.93	0.5	0.84	96.35	17	29.79	126.14	0.135	-0.469
711.0	41.994	97.60	1.02	1.92	0.5	0.85	102.20	17	29.02	131.23	0.136	-0.487
710.8	42.158	104.59	0.96	1.88	0.5	0.84	109.21	14	19.52	128.73	0.136	-0.478
710.7	42.322	110.19	0.90	1.85	0.5	0.84	114.70	11	10.71	125.41	0.136	-0.466

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
710.5	42.486	114.63	0.69	1.76	0.5	0.83	118.65	4	0.02	118.67	0.136	-0.441
710.3	42.650	114.59	0.71	1.77	0.5	0.83	118.64	5	0.13	118.77	0.136	-0.441
710.2	42.814	110.47	0.77	1.80	0.5	0.83	114.26	7	2.16	116.42	0.137	-0.432
710.0	42.978	109.19	0.84	1.83	0.5	0.83	113.34	10	7.10	120.44	0.137	-0.447
709.9	43.143	101.67	0.99	1.90	0.5	0.84	106.52	15	23.83	130.35	0.137	-0.483
709.7	43.307	89.18	1.61	2.08	0.5	0.85	95.00	30	54.19	149.19	0.137	-0.546
709.5	43.471	86.81	2.03	2.16	0.5	0.85	92.86	36	60.95	153.80	0.137	-0.560
709.4	43.635	133.71	0.66	1.70	0.5	0.84	140.57	0	0.00	140.57	0.136	-0.517
709.2	43.799	229.27	0.15	1.18	0.5	0.89	255.86	0	0.00	255.86	0.136	-0.600
709.0	43.963	370.53	0.15	0.98	0.5	0.89	412.38	0	0.00	412.38	0.135	-0.600

LIQUEFACTION POTENTIAL ASSESSMENT FOR COARSE GRAINED SOILS USING CONE PENETRATION TEST DATA

Project Site: **KIF TDEC Stability**
Stantec Project No.: **175668043**
CPT ID: **CPT-04A**

Depth to Water during Earthquake:	4.6	ft
Final Grade Elevation during EQ:	752.2	ft
Height of Final Grade above CPT TOH:	-0.8	ft
Normalize K_σ to:	1.058	tsf
a_{max} at top of ground surface:	0.21	g
Earthquake Magnitude:	6.00	M_W
Earthquake File or Source Zone:	10	Hz

Shear Stress Fit Parameters

m4:	0
m3:	0
m2:	0
m1:	0

Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
753.0																	
752.8	0.164	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.136**	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**	**A1**
752.7	0.328	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.136**	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**	**A1**
752.5	0.492	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.136**	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**	**A1**
752.3	0.656	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.136**	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**	**A1**
752.2	0.820	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.136**	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**	**A1**
752.0	0.984	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.136**	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**	**A1**
751.9	1.148	N/A	86	N/A	N/A	N/A	N/A	1.000	0	0	**0.136**	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**	**A1**
751.7	1.312	N/A	81	N/A	N/A	N/A	N/A	1.000	0	0	**0.136**	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**	**A1**
751.5	1.476	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.136**	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**	**A1**
751.4	1.640	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.136**	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**	**A1**
751.2	1.804	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.136**	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**	**A1**
751.0	1.968	N/A	94	N/A	N/A	N/A	N/A	1.000	0	0	**0.136**	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**	**A1**
750.9	2.133	N/A	81	N/A	N/A	N/A	N/A	1.000	0	0	**0.136**	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**	**A1**
750.7	2.297	N/A	93	N/A	N/A	N/A	N/A	1.000	0	0	**0.136**	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**	**A1**
750.5	2.461	N/A	89	N/A	N/A	N/A	N/A	1.000	0	0	**0.136**	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**	**A1**
750.4	2.625	N/A	90	N/A	N/A	N/A	N/A	1.000	0	0	**0.136**	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**	**A1**
750.2	2.789	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.136**	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**	**A1**
750.0	2.953	N/A	100	N/A	N/A	N/A	N/A	0.999	0	0	**0.136**	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**	**A1**
749.9	3.117	N/A	100	N/A	N/A	N/A	N/A	0.998	0	0	**0.136**	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**	**A1**
749.7	3.281	N/A	100	N/A	N/A	N/A	N/A	0.998	0	0	**0.136**	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**	**A1**
749.6	3.445	N/A	96	N/A	N/A	N/A	N/A	0.997	0	0	**0.136**	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**	**A1**
749.4	3.609	N/A	89	N/A	N/A	N/A	N/A	0.996	0	0	**0.136**	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**	**A1**
749.2	3.773	N/A	78	N/A	N/A	N/A	N/A	0.995	0	0	**0.136**	TRUE	FALSE	TRUE	**N/A**	**Embankment Fill**	**A1**
749.1	3.937	N/A	72	N/A	N/A	N/A	N/A	0.995	0	0	**0.135**	TRUE	FALSE	TRUE	**N/A**	**Embankment Fill**	**A1**
748.9	4.101	N/A	69	N/A	N/A	N/A	N/A	0.994	0	0	**0.135**	TRUE	FALSE	TRUE	**N/A**	**Embankment Fill**	**A1**
748.7	4.265	N/A	70	N/A	N/A	N/A	N/A	0.993	0	0	**0.135**	TRUE	FALSE	TRUE	**N/A**	**Embankment Fill**	**A1**
748.6	4.429	N/A	80	N/A	N/A	N/A	N/A	0.992	0	0	**0.135**	TRUE	FALSE	TRUE	**N/A**	**Embankment Fill**	**A1**
748.4	4.593	N/A	100	N/A	N/A	N/A	N/A	0.992	0	0	**0.135**	TRUE	TRUE	TRUE	**N/A**	**Embankment Fill**	**A1**
748.2	4.757	N/A	95	N/A	N/A	N/A	N/A	0.991	0	0	**0.138**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
748.1	4.921	N/A	93	N/A	N/A	N/A	N/A	0.990	0	0	**0.140**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
747.9	5.085	N/A	91	N/A	N/A	N/A	N/A	0.989	0	0	**0.143**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
747.8	5.249	N/A	89	N/A	N/A	N/A	N/A	0.988	0	0	**0.145**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
747.6	5.413	N/A	90	N/A	N/A	N/A	N/A	0.988	0	0	**0.147**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
747.4	5.577	N/A	100	N/A	N/A	N/A	N/A	0.987	0	0	**0.149**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
747.3	5.741	N/A	98	N/A	N/A	N/A	N/A	0.986	0	0	**0.151**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
747.1	5.905	N/A	100	N/A	N/A	N/A	N/A	0.985	0	0	**0.153**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
746.9	6.069	N/A	97	N/A	N/A	N/A	N/A	0.984	0	0	**0.155**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
746.8	6.234	N/A	85	N/A	N/A	N/A	N/A	0.983	0	0	**0.157**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
746.6	6.398	N/A	98	N/A	N/A	N/A	N/A	0.983	0	0	**0.158**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
746.4	6.562	N/A	100	N/A	N/A	N/A	N/A	0.982	0	0	**0.160**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
746.3	6.726	N/A	98	N/A	N/A	N/A	N/A	0.981	0	0	**0.162**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
746.1	6.890	N/A	95	N/A	N/A	N/A	N/A	0.980	0	0	**0.163**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
745.9	7.054	N/A	95	N/A	N/A	N/A	N/A	0.979	0	0	**0.165**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
745.8	7.218	N/A	90	N/A	N/A	N/A	N/A	0.978	0	0	**0.166**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**

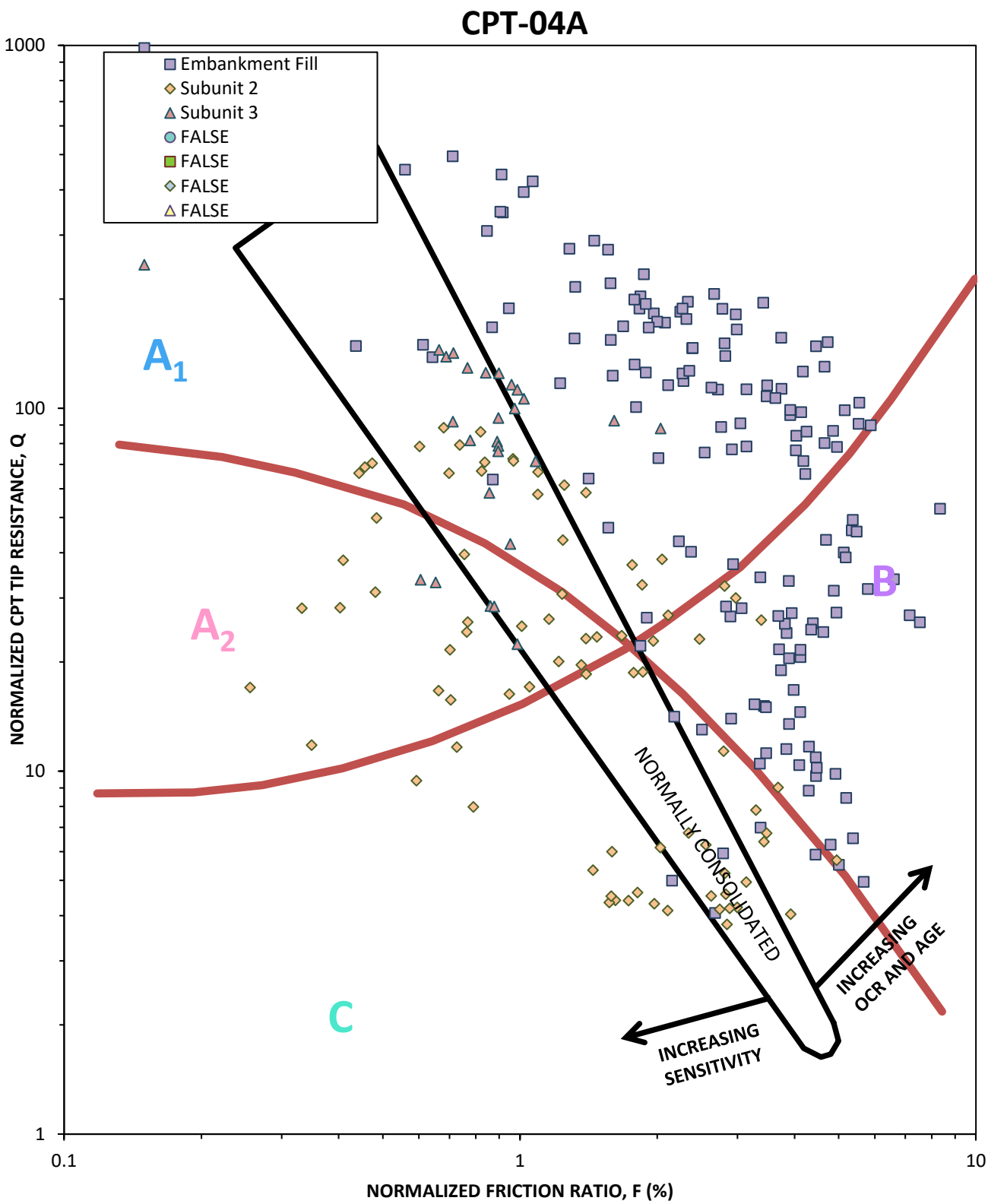
Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
745.6	7.382	N/A	88	N/A	N/A	N/A	N/A	0.978	0	0	**0.167**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
745.5	7.546	N/A	87	N/A	N/A	N/A	N/A	0.977	0	0	**0.169**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
745.3	7.710	N/A	79	N/A	N/A	N/A	N/A	0.976	0	0	**0.170**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
745.1	7.874	N/A	73	N/A	N/A	N/A	N/A	0.975	0	0	**0.171**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
745.0	8.038	N/A	69	N/A	N/A	N/A	N/A	0.974	0	0	**0.172**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
744.8	8.202	N/A	93	N/A	N/A	N/A	N/A	0.973	0	0	**0.173**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
744.6	8.366	N/A	96	N/A	N/A	N/A	N/A	0.972	0	0	**0.175**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
744.5	8.530	N/A	94	N/A	N/A	N/A	N/A	0.971	0	0	**0.176**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
744.3	8.694	N/A	84	N/A	N/A	N/A	N/A	0.970	0	0	**0.177**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
744.1	8.858	N/A	81	N/A	N/A	N/A	N/A	0.970	0	0	**0.178**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
744.0	9.022	N/A	82	N/A	N/A	N/A	N/A	0.969	0	0	**0.179**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
743.8	9.186	N/A	78	N/A	N/A	N/A	N/A	0.968	0	0	**0.179**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
743.6	9.350	N/A	97	N/A	N/A	N/A	N/A	0.967	0	0	**0.180**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
743.5	9.514	N/A	52	N/A	N/A	N/A	N/A	0.966	0	0	**0.181**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
743.3	9.678	N/A	59	N/A	N/A	N/A	N/A	0.965	0	0	**0.182**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
743.2	9.842	N/A	81	N/A	N/A	N/A	N/A	0.964	0	0	**0.183**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
743.0	10.006	N/A	81	N/A	N/A	N/A	N/A	0.963	0	0	**0.183**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
742.8	10.170	N/A	83	N/A	N/A	N/A	N/A	0.962	0	0	**0.184**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
742.7	10.335	N/A	87	N/A	N/A	N/A	N/A	0.961	0	0	**0.185**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
742.5	10.499	N/A	89	N/A	N/A	N/A	N/A	0.960	0	0	**0.186**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
742.3	10.663	N/A	79	N/A	N/A	N/A	N/A	0.959	0	0	**0.186**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
742.2	10.827	N/A	72	N/A	N/A	N/A	N/A	0.958	0	0	**0.187**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
742.0	10.991	N/A	75	N/A	N/A	N/A	N/A	0.957	0	0	**0.188**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
741.8	11.155	N/A	72	N/A	N/A	N/A	N/A	0.956	0	0	**0.188**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
741.7	11.319	N/A	73	N/A	N/A	N/A	N/A	0.955	0	0	**0.189**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
741.5	11.483	N/A	83	N/A	N/A	N/A	N/A	0.955	0	0	**0.189**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
741.4	11.647	N/A	84	N/A	N/A	N/A	N/A	0.954	0	0	**0.190**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
741.2	11.811	N/A	82	N/A	N/A	N/A	N/A	0.953	0	0	**0.190**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
741.0	11.975	N/A	74	N/A	N/A	N/A	N/A	0.952	0	0	**0.191**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
740.9	12.139	N/A	77	N/A	N/A	N/A	N/A	0.951	0	0	**0.191**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
740.7	12.303	N/A	77	N/A	N/A	N/A	N/A	0.950	0	0	**0.192**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
740.5	12.467	N/A	80	N/A	N/A	N/A	N/A	0.949	0	0	**0.192**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
740.4	12.631	N/A	74	N/A	N/A	N/A	N/A	0.948	0	0	**0.193**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
740.2	12.795	N/A	70	N/A	N/A	N/A	N/A	0.947	0	0	**0.193**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
740.0	12.959	N/A	84	N/A	N/A	N/A	N/A	0.946	0	0	**0.193**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
739.9	13.123	N/A	81	N/A	N/A	N/A	N/A	0.945	0	0	**0.194**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
739.7	13.287	N/A	77	N/A	N/A	N/A	N/A	0.944	0	0	**0.194**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
739.5	13.451	N/A	73	N/A	N/A	N/A	N/A	0.943	0	0	**0.195**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
739.4	13.615	N/A	77	N/A	N/A	N/A	N/A	0.942	0	0	**0.195**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
739.2	13.779	N/A	80	N/A	N/A	N/A	N/A	0.940	0	0	**0.195**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
739.1	13.943	N/A	78	N/A	N/A	N/A	N/A	0.939	0	0	**0.196**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
738.9	14.107	N/A	71	N/A	N/A	N/A	N/A	0.938	0	0	**0.196**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
738.7	14.271	N/A	70	N/A	N/A	N/A	N/A	0.937	0	0	**0.196**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
738.6	14.436	N/A	68	N/A	N/A	N/A	N/A	0.936	0	0	**0.196**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
738.4	14.600	N/A	66	N/A	N/A	N/A	N/A	0.935	0	0	**0.197**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
738.2	14.764	N/A	59	N/A	N/A	N/A	N/A	0.934	0	0	**0.197**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
738.1	14.928	N/A	55	N/A	N/A	N/A	N/A	0.933	0	0	**0.197**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
737.9	15.092	N/A	51	N/A	N/A	N/A	N/A	0.932	0	0	**0.197**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
737.7	15.256	N/A	49	N/A	N/A	N/A	N/A	0.931	0	0	**0.198**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
737.6	15.420	N/A	55	N/A	N/A	N/A	N/A	0.930	0	0	**0.198**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
737.4	15.584	N/A	57	N/A	N/A	N/A	N/A	0.929	0	0	**0.198**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
737.3	15.748	N/A	48	N/A	N/A	N/A	N/A	0.928	0	0	**0.198**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
737.1	15.912	N/A	48	N/A	N/A	N/A	N/A	0.927	0	0	**0.198**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
736.9	16.076	N/A	49	N/A	N/A	N/A	N/A	0.926	0	0	**0.199**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
736.8	16.240	N/A	48	N/A	N/A	N/A	N/A	0.925	0	0	**0.199**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**

Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
736.6	16.404	N/A	45	N/A	N/A	N/A	N/A	0.924	0	0	**0.199**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
736.4	16.568	N/A	47	N/A	N/A	N/A	N/A	0.923	0	0	**0.199**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
736.3	16.732	N/A	46	N/A	N/A	N/A	N/A	0.921	0	0	**0.199**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
736.1	16.896	N/A	43	N/A	N/A	N/A	N/A	0.920	0	0	**0.199**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
735.9	17.060	N/A	42	N/A	N/A	N/A	N/A	0.919	0	0	**0.200**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
735.8	17.224	N/A	39	N/A	N/A	N/A	N/A	0.918	0	0	**0.200**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
735.6	17.388	N/A	41	N/A	N/A	N/A	N/A	0.917	0	0	**0.200**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**C**
735.4	17.552	N/A	41	N/A	N/A	N/A	N/A	0.916	0	0	**0.200**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**C**
735.3	17.716	N/A	39	N/A	N/A	N/A	N/A	0.915	0	0	**0.200**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
735.1	17.880	N/A	40	N/A	N/A	N/A	N/A	0.914	0	0	**0.200**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
735.0	18.044	N/A	42	N/A	N/A	N/A	N/A	0.913	0	0	**0.200**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
734.8	18.208	N/A	42	N/A	N/A	N/A	N/A	0.912	0	0	**0.200**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
734.6	18.372	N/A	45	N/A	N/A	N/A	N/A	0.910	0	0	**0.200**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
734.5	18.537	N/A	48	N/A	N/A	N/A	N/A	0.909	0	0	**0.200**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
734.3	18.701	N/A	52	N/A	N/A	N/A	N/A	0.908	0	0	**0.201**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
734.1	18.865	N/A	53	N/A	N/A	N/A	N/A	0.907	0	0	**0.201**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
734.0	19.029	N/A	58	N/A	N/A	N/A	N/A	0.906	0	0	**0.201**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
733.8	19.193	N/A	63	N/A	N/A	N/A	N/A	0.905	0	0	**0.201**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
733.6	19.357	N/A	53	N/A	N/A	N/A	N/A	0.904	0	0	**0.201**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
733.5	19.521	N/A	59	N/A	N/A	N/A	N/A	0.903	0	0	**0.201**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
733.3	19.685	N/A	68	N/A	N/A	N/A	N/A	0.901	0	0	**0.201**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
733.2	19.849	N/A	46	N/A	N/A	N/A	N/A	0.900	0	0	**0.201**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
733.0	20.013	N/A	50	N/A	N/A	N/A	N/A	0.899	0	0	**0.201**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
732.8	20.177	N/A	57	N/A	N/A	N/A	N/A	0.898	0	0	**0.201**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
732.7	20.341	N/A	55	N/A	N/A	N/A	N/A	0.897	0	0	**0.201**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
732.5	20.505	N/A	50	N/A	N/A	N/A	N/A	0.896	0	0	**0.201**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
732.3	20.669	N/A	48	N/A	N/A	N/A	N/A	0.895	0	0	**0.201**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
732.2	20.833	N/A	70	N/A	N/A	N/A	N/A	0.893	0	0	**0.201**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
732.0	20.997	N/A	71	N/A	N/A	N/A	N/A	0.892	0	0	**0.201**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
731.8	21.161	N/A	59	N/A	N/A	N/A	N/A	0.891	0	0	**0.201**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
731.7	21.325	N/A	52	N/A	N/A	N/A	N/A	0.890	0	0	**0.201**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
731.5	21.489	N/A	48	N/A	N/A	N/A	N/A	0.889	0	0	**0.201**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
731.3	21.653	N/A	49	N/A	N/A	N/A	N/A	0.888	0	0	**0.201**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
731.2	21.817	N/A	54	N/A	N/A	N/A	N/A	0.887	0	0	**0.201**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
731.0	21.981	N/A	57	N/A	N/A	N/A	N/A	0.885	0	0	**0.201**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
730.9	22.145	N/A	50	N/A	N/A	N/A	N/A	0.884	0	0	**0.201**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
730.7	22.309	N/A	46	N/A	N/A	N/A	N/A	0.883	0	0	**0.201**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
730.5	22.473	N/A	43	N/A	N/A	N/A	N/A	0.882	0	0	**0.201**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
730.4	22.638	N/A	43	N/A	N/A	N/A	N/A	0.881	0	0	**0.201**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
730.2	22.802	N/A	41	N/A	N/A	N/A	N/A	0.879	0	0	**0.201**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
730.0	22.966	N/A	41	N/A	N/A	N/A	N/A	0.878	0	0	**0.200**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
729.9	23.130	N/A	46	N/A	N/A	N/A	N/A	0.877	0	0	**0.200**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
729.7	23.294	N/A	49	N/A	N/A	N/A	N/A	0.876	0	0	**0.200**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
729.5	23.458	N/A	43	N/A	N/A	N/A	N/A	0.875	0	0	**0.200**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
729.4	23.622	N/A	41	N/A	N/A	N/A	N/A	0.874	0	0	**0.200**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
729.2	23.786	N/A	39	N/A	N/A	N/A	N/A	0.872	0	0	**0.200**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
729.1	23.950	N/A	39	N/A	N/A	N/A	N/A	0.871	0	0	**0.200**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
728.9	24.114	N/A	37	N/A	N/A	N/A	N/A	0.870	0	0	**0.200**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**C**
728.7	24.278	N/A	36	N/A	N/A	N/A	N/A	0.869	0	0	**0.200**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
728.6	24.442	N/A	36	N/A	N/A	N/A	N/A	0.868	0	0	**0.200**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
728.4	24.606	N/A	37	N/A	N/A	N/A	N/A	0.866	0	0	**0.200**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
728.2	24.770	N/A	37	N/A	N/A	N/A	N/A	0.865	0	0	**0.200**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
728.1	24.934	N/A	40	N/A	N/A	N/A	N/A	0.864	0	0	**0.200**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
727.9	25.098	N/A	40	N/A	N/A	N/A	N/A	0.863	0	0	**0.199**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
727.7	25.262	N/A	40	N/A	N/A	N/A	N/A	0.862	0	0	**0.199**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**

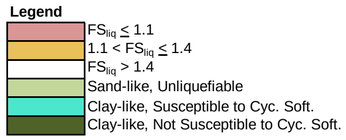
Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
727.6	25.426	N/A	38	N/A	N/A	N/A	N/A	0.860	0	0	**0.199**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**C**
727.4	25.590	N/A	37	N/A	N/A	N/A	N/A	0.859	0	0	**0.199**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**C**
727.2	25.754	N/A	35	N/A	N/A	N/A	N/A	0.858	0	0	**0.199**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**C**
727.1	25.918	N/A	36	N/A	N/A	N/A	N/A	0.857	0	0	**0.199**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**C**
726.9	26.082	0.101	36	1.008	0.893	1.08	0.099	0.856	0	0	**0.199**	FALSE	FALSE	FALSE	**0.5**	**Subunit 2**	**C**
726.8	26.246	0.100	35	1.008	0.890	1.08	0.097	0.854	0	0	**0.199**	FALSE	FALSE	FALSE	**0.5**	**Subunit 2**	**C**
726.6	26.410	0.103	37	1.008	0.896	1.08	0.100	0.853	0	0	**0.199**	FALSE	FALSE	FALSE	**0.5**	**Subunit 2**	**C**
726.4	26.574	0.102	37	1.007	0.895	1.08	0.100	0.852	0	0	**0.198**	FALSE	FALSE	FALSE	**0.5**	**Subunit 2**	**C**
726.3	26.739	0.102	36	1.007	0.892	1.08	0.099	0.851	0	0	**0.198**	FALSE	FALSE	FALSE	**0.5**	**Subunit 2**	**C**
726.1	26.903	0.101	36	1.006	0.889	1.08	0.097	0.850	0	0	**0.198**	FALSE	FALSE	FALSE	**0.5**	**Subunit 2**	**C**
725.9	27.067	0.101	36	1.006	0.888	1.08	0.097	0.848	0	0	**0.198**	FALSE	FALSE	FALSE	**0.5**	**Subunit 2**	**C**
725.8	27.231	0.101	36	1.005	0.888	1.08	0.097	0.847	0	0	**0.198**	FALSE	FALSE	FALSE	**0.5**	**Subunit 2**	**C**
725.6	27.395	0.101	36	1.005	0.887	1.08	0.097	0.846	0	0	**0.198**	FALSE	FALSE	FALSE	**0.5**	**Subunit 2**	**C**
725.4	27.559	0.101	36	1.005	0.886	1.08	0.097	0.845	0	0	**0.198**	FALSE	FALSE	FALSE	**0.5**	**Subunit 2**	**C**
725.3	27.723	0.101	36	1.004	0.887	1.08	0.097	0.843	0	0	**0.198**	FALSE	FALSE	FALSE	**0.5**	**Subunit 2**	**C**
725.1	27.887	0.101	36	1.004	0.885	1.08	0.096	0.842	0	0	**0.197**	FALSE	FALSE	FALSE	**0.5**	**Subunit 2**	**C**
724.9	28.051	0.100	35	1.003	0.883	1.08	0.096	0.841	0	0	**0.197**	FALSE	FALSE	FALSE	**0.5**	**Subunit 2**	**C**
724.8	28.215	0.101	36	1.003	0.884	1.08	0.096	0.840	0	0	**0.197**	FALSE	FALSE	FALSE	**0.5**	**Subunit 2**	**C**
724.6	28.379	0.101	36	1.003	0.885	1.08	0.097	0.839	0	0	**0.197**	FALSE	FALSE	FALSE	**0.5**	**Subunit 2**	**C**
724.5	28.543	0.101	36	1.002	0.883	1.08	0.096	0.837	0	0	**0.197**	FALSE	FALSE	FALSE	**0.5**	**Subunit 2**	**C**
724.3	28.707	0.101	36	1.002	0.883	1.08	0.096	0.836	0	0	**0.197**	FALSE	FALSE	FALSE	**0.5**	**Subunit 2**	**C**
724.1	28.871	0.101	36	1.001	0.883	1.08	0.097	0.835	0	0	**0.197**	FALSE	FALSE	FALSE	**0.5**	**Subunit 2**	**C**
724.0	29.035	0.102	37	1.001	0.885	1.08	0.098	0.834	0	0	**0.196**	FALSE	FALSE	FALSE	**0.5**	**Subunit 2**	**C**
723.8	29.199	0.103	37	1.001	0.889	1.08	0.099	0.832	0	0	**0.196**	FALSE	FALSE	FALSE	**0.5**	**Subunit 2**	**C**
723.6	29.363	0.103	37	1.000	0.889	1.08	0.099	0.831	0	0	**0.196**	FALSE	FALSE	FALSE	**0.5**	**Subunit 2**	**C**
723.5	29.527	0.102	37	1.000	0.886	1.08	0.098	0.830	0	0	**0.196**	FALSE	FALSE	FALSE	**0.5**	**Subunit 2**	**B**
723.3	29.691	0.105	39	0.999	0.894	1.08	0.101	0.829	0	0	**0.196**	FALSE	FALSE	FALSE	**0.5**	**Subunit 2**	**C**
723.1	29.855	0.103	38	0.999	0.889	1.08	0.100	0.828	0	0	**0.196**	FALSE	FALSE	FALSE	**0.5**	**Subunit 2**	**C**
723.0	30.019	0.103	38	0.999	0.889	1.08	0.099	0.826	0	0	**0.196**	FALSE	FALSE	FALSE	**0.5**	**Subunit 2**	**C**
722.8	30.183	0.106	40	0.998	0.898	1.09	0.103	0.825	0	0	**0.195**	FALSE	FALSE	FALSE	**0.5**	**Subunit 2**	**B**
722.7	30.347	0.108	41	0.998	0.907	1.09	0.107	0.824	0	0	**0.195**	FALSE	FALSE	FALSE	**0.5**	**Subunit 2**	**C**
722.5	30.511	0.114	45	0.997	0.933	1.10	0.117	0.823	0	0	**0.195**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
722.3	30.675	0.118	47	0.997	0.950	1.11	0.124	0.821	0	0	**0.195**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**A2**
722.2	30.840	0.117	47	0.996	0.948	1.11	0.123	0.820	0	0	**0.195**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**A2**
722.0	31.004	0.116	46	0.996	0.942	1.11	0.121	0.819	0	0	**0.195**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**A2**
721.8	31.168	0.116	46	0.995	0.943	1.11	0.121	0.818	0	0	**0.194**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**A2**
721.7	31.332	0.121	49	0.995	0.968	1.12	0.131	0.816	0	0	**0.194**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**A2**
721.5	31.496	0.138	55	0.994	1.055	1.16	0.168	0.815	0	0	**0.194**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**A1**
721.3	31.660	0.150	59	0.993	1.120	1.19	0.199	0.814	0	0	**0.194**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**A1**
721.2	31.824	0.161	61	0.992	1.174	1.21	0.228	0.813	0	0	**0.194**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**A1**
721.0	31.988	0.161	61	0.991	1.170	1.21	0.225	0.811	0	0	**0.194**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**A1**
720.8	32.152	0.163	61	0.991	1.181	1.22	0.232	0.810	0	0	**0.193**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**A1**
720.7	32.316	0.162	61	0.990	1.174	1.21	0.228	0.809	0	0	**0.193**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**A1**
720.5	32.480	0.162	61	0.990	1.175	1.21	0.228	0.808	0	0	**0.193**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**A1**
720.4	32.644	0.147	58	0.990	1.103	1.18	0.190	0.807	0	0	**0.193**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**A1**
720.2	32.808	0.117	46	0.991	0.943	1.11	0.121	0.805	0	0	**0.193**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**A1**
720.0	32.972	0.116	46	0.991	0.940	1.11	0.120	0.804	0	0	**0.192**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**A1**
719.9	33.136	0.118	47	0.990	0.950	1.11	0.123	0.803	0	0	**0.192**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**A1**
719.7	33.300	0.130	52	0.989	1.011	1.14	0.148	0.802	0	0	**0.192**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**A1**
719.5	33.464	0.138	55	0.988	1.058	1.16	0.167	0.800	0	0	**0.192**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**A1**
719.4	33.628	0.155	60	0.986	1.148	1.20	0.211	0.799	0	0	**0.192**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**A1**
719.2	33.792	0.144	57	0.986	1.091	1.17	0.182	0.798	0	0	**0.191**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**A1**
719.0	33.956	0.152	59	0.985	1.132	1.19	0.202	0.797	0	0	**0.191**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**A1**
718.9	34.120	0.138	55	0.986	1.057	1.16	0.166	0.795	0	0	**0.191**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**A1**
718.7	34.284	0.132	53	0.986	1.026	1.15	0.153	0.794	0	0	**0.191**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**B**

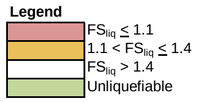
Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
718.6	34.448	0.129	52	0.986	1.011	1.14	0.147	0.793	0	0	**0.191**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**A1**
718.4	34.612	0.124	50	0.986	0.979	1.12	0.134	0.792	0	0	**0.190**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**A1**
718.2	34.776	0.121	48	0.986	0.963	1.12	0.128	0.790	0	0	**0.190**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**B**
718.1	34.941	0.126	51	0.985	0.990	1.13	0.138	0.789	0	0	**0.190**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**B**
717.9	35.105	0.130	52	0.984	1.016	1.14	0.148	0.788	0	0	**0.190**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**B**
717.7	35.269	0.135	54	0.983	1.041	1.15	0.159	0.787	0	0	**0.190**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**A1**
717.6	35.433	0.138	55	0.982	1.058	1.16	0.166	0.785	0	0	**0.189**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**A1**
717.4	35.597	0.126	51	0.983	0.994	1.13	0.140	0.784	0	0	**0.189**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**A2**
717.2	35.761	0.124	50	0.983	0.983	1.13	0.135	0.783	0	0	**0.189**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**A2**
717.1	35.925	0.118	47	0.984	0.947	1.11	0.122	0.782	0	0	**0.189**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**A2**
716.9	36.089	0.114	45	0.984	0.928	1.10	0.115	0.780	0	0	**0.189**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**A2**
716.7	36.253	0.114	45	0.983	0.928	1.10	0.115	0.779	0	0	**0.188**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**A2**
716.6	36.417	0.111	43	0.983	0.912	1.10	0.110	0.778	0	0	**0.188**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**A2**
716.4	36.581	0.109	42	0.983	0.900	1.09	0.106	0.777	0	0	**0.188**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**A2**
716.3	36.745	0.107	40	0.983	0.889	1.09	0.102	0.776	0	0	**0.188**	FALSE	FALSE	FALSE	**0.5**	**Subunit 2**	**C**
716.1	36.909	0.105	39	0.983	0.880	1.09	0.099	0.774	0	0	**0.188**	FALSE	FALSE	FALSE	**0.5**	**Subunit 2**	**C**
715.9	37.073	0.104	38	0.983	0.877	1.08	0.097	0.773	0	0	**0.187**	FALSE	FALSE	FALSE	**0.5**	**Subunit 2**	**C**
715.8	37.237	0.105	39	0.983	0.880	1.09	0.098	0.772	0	0	**0.187**	FALSE	FALSE	FALSE	**0.5**	**Subunit 2**	**A2**
715.6	37.401	0.107	40	0.982	0.887	1.09	0.101	0.771	0	0	**0.187**	FALSE	FALSE	FALSE	**0.5**	**Subunit 2**	**A2**
715.4	37.565	0.110	42	0.981	0.902	1.09	0.106	0.769	0	0	**0.187**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**A2**
715.3	37.729	0.110	43	0.981	0.906	1.10	0.108	0.768	0	0	**0.187**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**A2**
715.1	37.893	0.113	44	0.980	0.920	1.10	0.112	0.767	0	0	**0.186**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**A2**
714.9	38.057	0.113	44	0.980	0.920	1.10	0.112	0.766	0	0	**0.186**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**A2**
714.8	38.221	0.112	43	0.980	0.912	1.10	0.110	0.764	0	0	**0.186**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**A2**
714.6	38.385	0.117	46	0.978	0.939	1.11	0.119	0.763	0	0	**0.186**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**A2**
714.5	38.549	0.119	48	0.977	0.954	1.12	0.124	0.762	0	0	**0.185**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**A1**
714.3	38.713	0.120	48	0.977	0.958	1.12	0.126	0.761	0	0	**0.185**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**B**
714.1	38.877	0.120	48	0.977	0.956	1.12	0.125	0.759	0	0	**0.185**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**A2**
714.0	39.042	0.114	45	0.977	0.926	1.10	0.114	0.758	0	0	**0.185**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
713.8	39.206	0.116	46	0.977	0.933	1.11	0.117	0.757	0	0	**0.185**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
713.6	39.370	0.115	46	0.976	0.931	1.11	0.116	0.756	0	0	**0.184**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**A2**
713.5	39.534	0.120	48	0.975	0.958	1.12	0.126	0.755	0	0	**0.184**	FALSE	FALSE	FALSE	**0.7**	**Subunit 3**	**A2**
713.3	39.698	0.120	48	0.975	0.955	1.12	0.124	0.753	0	0	**0.184**	FALSE	FALSE	FALSE	**0.7**	**Subunit 3**	**A2**
713.1	39.862	0.120	48	0.974	0.954	1.12	0.124	0.752	0	0	**0.184**	FALSE	FALSE	FALSE	**0.7**	**Subunit 3**	**A2**
713.0	40.026	0.116	46	0.975	0.931	1.11	0.116	0.751	0	0	**0.183**	FALSE	FALSE	FALSE	**0.6**	**Subunit 3**	**A2**
712.8	40.190	0.120	48	0.974	0.955	1.12	0.124	0.750	0	0	**0.183**	FALSE	FALSE	FALSE	**0.7**	**Subunit 3**	**A2**
712.6	40.354	0.132	53	0.971	1.030	1.15	0.152	0.748	0	0	**0.183**	FALSE	FALSE	FALSE	**0.8**	**Subunit 3**	**A1**
712.5	40.518	0.143	57	0.968	1.094	1.17	0.178	0.747	0	0	**0.183**	FALSE	FALSE	FALSE	**1.0**	**Subunit 3**	**A1**
712.3	40.682	0.169	63	0.964	1.233	1.23	0.247	0.746	0	0	**0.182**	FALSE	FALSE	FALSE	**1.4**	**Subunit 3**	**A1**
712.2	40.846	0.161	61	0.964	1.195	1.21	0.226	0.745	0	0	**0.182**	FALSE	FALSE	FALSE	**1.2**	**Subunit 3**	**A1**
712.0	41.010	0.161	61	0.964	1.190	1.21	0.223	0.744	0	0	**0.182**	FALSE	FALSE	FALSE	**1.2**	**Subunit 3**	**A1**
711.8	41.174	0.159	61	0.964	1.180	1.21	0.218	0.742	0	0	**0.182**	FALSE	FALSE	FALSE	**1.2**	**Subunit 3**	**A1**
711.7	41.338	0.149	58	0.965	1.128	1.19	0.192	0.741	0	0	**0.181**	FALSE	FALSE	FALSE	**1.1**	**Subunit 3**	**A1**
711.5	41.502	0.143	57	0.966	1.090	1.17	0.176	0.740	0	0	**0.181**	FALSE	FALSE	FALSE	**1.0**	**Subunit 3**	**A1**
711.3	41.666	0.169	63	0.961	1.236	1.23	0.247	0.739	0	0	**0.181**	FALSE	FALSE	FALSE	**1.4**	**Subunit 3**	**A1**
711.2	41.830	0.186	65	0.958	1.317	1.26	0.297	0.737	0	0	**0.181**	FALSE	FALSE	FALSE	**1.6**	**Subunit 3**	**A1**
711.0	41.994	0.201	67	0.956	1.382	1.29	0.342	0.736	0	0	**0.180**	FALSE	FALSE	FALSE	**1.9**	**Subunit 3**	**A1**
710.8	42.158	0.194	66	0.956	1.350	1.27	0.318	0.735	0	0	**0.180**	FALSE	FALSE	FALSE	**1.8**	**Subunit 3**	**A1**
710.7	42.322	0.184	65	0.957	1.309	1.26	0.290	0.734	0	0	**0.180**	FALSE	FALSE	FALSE	**1.6**	**Subunit 3**	**A1**
710.5	42.486	0.168	62	0.959	1.231	1.23	0.244	0.733	0	0	**0.180**	FALSE	FALSE	FALSE	**1.4**	**Subunit 3**	**A1**
710.3	42.650	0.169	62	0.958	1.233	1.23	0.244	0.731	0	0	**0.179**	FALSE	FALSE	FALSE	**1.4**	**Subunit 3**	**A1**
710.2	42.814	0.164	62	0.958	1.208	1.22	0.231	0.730	0	0	**0.179**	FALSE	FALSE	FALSE	**1.3**	**Subunit 3**	**A1**
710.0	42.978	0.172	63	0.957	1.251	1.23	0.255	0.729	0	0	**0.179**	FALSE	FALSE	FALSE	**1.4**	**Subunit 3**	**A1**
709.9	43.143	0.198	67	0.952	1.372	1.28	0.333	0.728	0	0	**0.179**	FALSE	FALSE	FALSE	**1.9**	**Subunit 3**	**A1**
709.7	43.307	0.283	73	0.944	1.659	1.40	0.620	0.727	0	0	**0.178**	FALSE	FALSE	FALSE	**3.5**	**Subunit 3**	**A1**

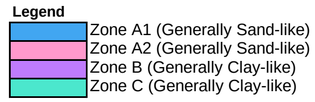
Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
709.5	43.471	0.316	74	0.941	1.741	1.43	0.740	0.725	0	0	**0.178**	FALSE	FALSE	FALSE	**4.2**	**Subunit 3**	**A1**
709.4	43.635	0.237	70	0.947	1.513	1.34	0.455	0.724	0	0	**0.178**	FALSE	FALSE	FALSE	**2.6**	**Subunit 3**	**A1**
709.2	43.799	N/A	100	N/A	N/A	N/A	N/A	0.723	0	0	**0.177**	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**	**A1**
709.0	43.963	N/A	100	N/A	N/A	N/A	N/A	0.722	0	0	**0.177**	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**	**A1**



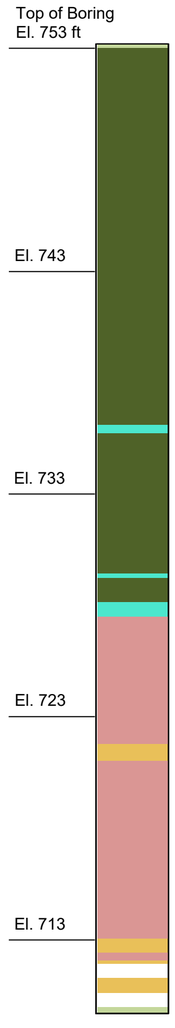
Adapted from "Discussion of 'Liquefaction Potential of Silts from CPTu'" (Robertson 2008). Zone A_1 and Zone A_2 samples are generally sand-like. Zone B samples are generally clay-like and not susceptible to cyclic softening. Zone C samples are generally clay-like and susceptible to cyclic softening. Note that the transition from clay-like to sand-like in this chart does not exactly match the liquefaction calculations herein; that is, some transitional samples in Zone B and Zone C will be treated as sand-like and analyzed for liquefaction if the calculations indicate as such.



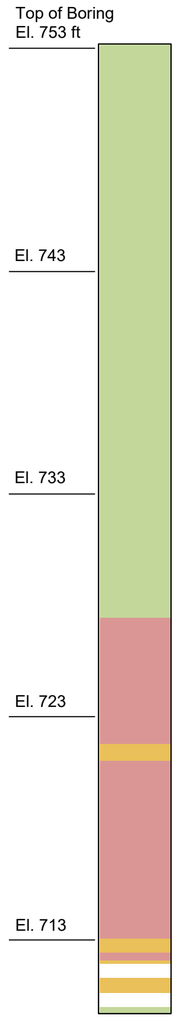




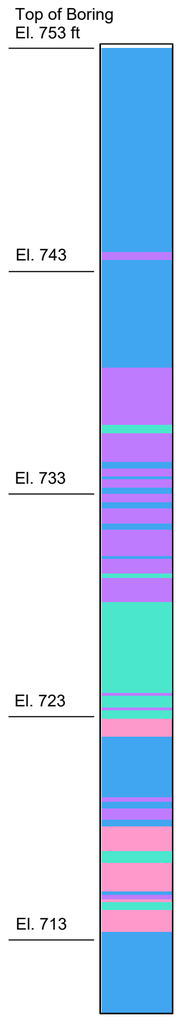
CPT-04A, Liquefaction Triggering Results



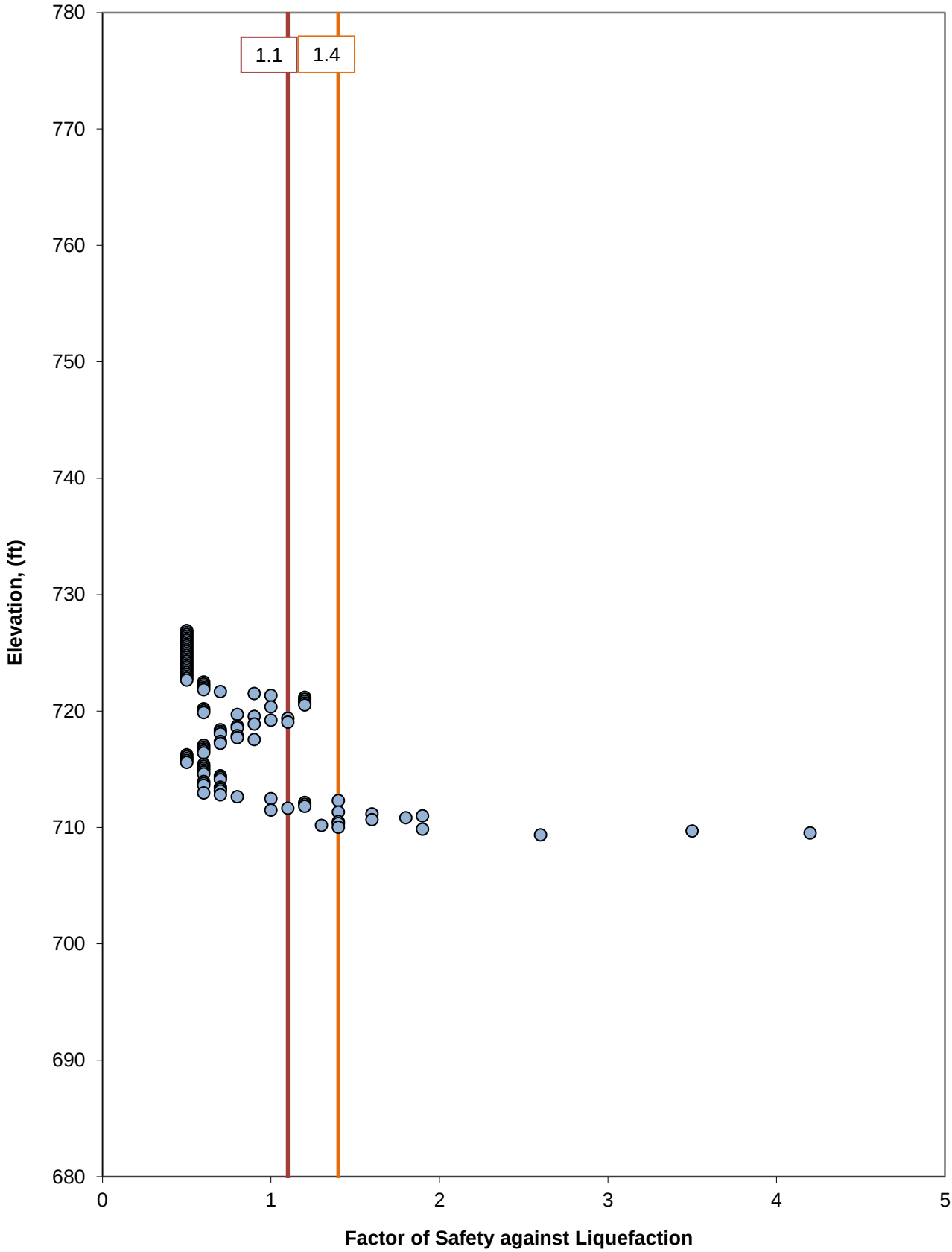
CPT-04A, Liquefaction Triggering Results



CPT-04A, Robertson Soil Type



KIF TDEC Stability, Boring = CPT-04A, Source = 10 Hz, Mw = 6, Event = Design EQ, CPT Data, Simplified Stress-Based Approach



Inputs

Project Information

Stantec Project Number =	175668043
Project Name =	KIF TDEC Stability
CPT ID =	CPT-05A

Boring Location (optional)

Northing =	
Easting =	
OR	
Baseline Station =	
Offset (+ Right) =	

Using qt (corrected for u2 PWP) or qc (backcalculated uncorrected field tip)

Cone ID (optional) =	AD184	
Use qc instead of qt?	0	(1: Yes, 0: No)
Cone Area Ratio (a) =	0.80	

Drilling Information

Top of Hole Elevation =	754.0	feet
Water Depth during CPT (negative for U/S borings) =	2.5	feet
Depth data collection began =	0.16	feet
Avg. Total Unit Wt. Above 1st Sample =	120.00	pcf

During Earthquake Information

Water Depth during EQ (relative to CPT TOH, negative for U/S borings) =	5.0	feet
Final Grade Elevation during EQ =	753.0	feet
Avg. Total Unit Wt. of Cut/Fill =	120	pcf

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile?	0	(1: Yes, 0: No)

If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile:	ng_Pond_Section, KIF-BF-SPT3_NOR	
α at each Sample Depth known?	1	(1: Yes, 0: No)

If previous answer is No, then enter curve fit parameters below (α vs. depth curve)

If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_α will be one.

m4:	
m3:	
m2:	
m1:	
m0:	

Associated ground response profile:	shing_Pond_Section, KIF-BF-SPT3	
Get CSR from shear stress envelope?	0	(1: Yes, 0: No)

If previous answer is No, then CSR will be calculated using a_{max} and r_d

Max. Shear Stress at each sample depth known?		(1: Yes, 0: No)

If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4:	
m3:	
m2:	
m1:	

Earthquake Information

EQ Source (e.g., New Madrid)	10 Hz
Event (e.g., MCE, OBE)	Design EQ
a_{max} (g) (top of ground surface)	0.21
EQ Mag (Mw)	6.0

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
0.164	2.407	0.326	112	Fly Ash	Sand-like	Do Not Correct for FC	0.057			
0.328	145.342	0.372	112	Fly Ash	Sand-like	Do Not Correct for FC	0.054			
0.492	211.844	1.295	112	Fly Ash	Sand-like	Do Not Correct for FC	0.052			
0.656	262.259	1.359	112	Fly Ash	Sand-like	Do Not Correct for FC	0.049			
0.820	179.440	1.300	112	Fly Ash	Sand-like	Do Not Correct for FC	0.046			
0.984	121.328	1.556	112	Fly Ash	Sand-like	Do Not Correct for FC	0.044			
1.148	58.113	1.912	112	Fly Ash	Sand-like	Do Not Correct for FC	0.041			
1.312	93.512	2.269	112	Fly Ash	Sand-like	Do Not Correct for FC	0.038			
1.476	476.473	3.882	112	Fly Ash	Sand-like	Do Not Correct for FC	0.035			
1.640	381.349	4.760	112	Fly Ash	Sand-like	Do Not Correct for FC	0.033			
1.804	395.865	4.970	112	Fly Ash	Sand-like	Do Not Correct for FC	0.030			
1.968	391.744	3.464	112	Fly Ash	Sand-like	Do Not Correct for FC	0.027			
2.133	368.624	2.264	112	Fly Ash	Sand-like	Do Not Correct for FC	0.028			
2.297	295.028	2.037	112	Fly Ash	Sand-like	Do Not Correct for FC	0.031			
2.461	208.074	1.671	112	Fly Ash	Sand-like	Do Not Correct for FC	0.033			
2.625	124.134	2.137	112	Fly Ash	Sand-like	Do Not Correct for FC	0.035			
2.789	75.431	2.502	112	Fly Ash	Sand-like	Do Not Correct for FC	0.037			
2.953	54.290	2.395	112	Fly Ash	Sand-like	Do Not Correct for FC	0.040			
3.117	53.631	1.758	112	Fly Ash	Sand-like	Do Not Correct for FC	0.041			
3.281	237.383	2.138	112	Fly Ash	Sand-like	Do Not Correct for FC	0.039			
3.445	273.842	1.762	112	Fly Ash	Sand-like	Do Not Correct for FC	0.038			
3.609	374.483	2.331	112	Fly Ash	Sand-like	Do Not Correct for FC	0.037			
3.773	299.701	2.556	112	Fly Ash	Sand-like	Do Not Correct for FC	0.036			
3.937	200.481	3.304	112	Fly Ash	Sand-like	Do Not Correct for FC	0.035			
4.101	120.478	3.765	112	Fly Ash	Sand-like	Do Not Correct for FC	0.032			
4.265	82.661	3.901	112	Fly Ash	Sand-like	Do Not Correct for FC	0.030			
4.429	51.339	4.191	112	Fly Ash	Sand-like	Do Not Correct for FC	0.027			
4.593	67.918	2.917	112	Fly Ash	Sand-like	Do Not Correct for FC	0.025			
4.757	124.664	2.227	112	Fly Ash	Sand-like	Do Not Correct for FC	0.022			
4.921	142.843	2.587	112	Fly Ash	Sand-like	Do Not Correct for FC	0.020			
5.085	55.974	2.492	128	Embankment Fill	Clay-like		0.016			
5.249	252.808	3.095	128	Embankment Fill	Clay-like		0.013			
5.413	352.615	5.222	128	Embankment Fill	Clay-like		0.012			
5.577	335.337	2.956	128	Embankment Fill	Clay-like		0.015			
5.741	394.099	4.309	128	Embankment Fill	Clay-like		0.013			
5.905	365.287	5.551	128	Embankment Fill	Clay-like		0.010			
6.069	232.026	6.687	128	Embankment Fill	Clay-like		0.008			
6.234	208.755	7.280	128	Embankment Fill	Clay-like		0.006			
6.398	139.125	5.969	128	Embankment Fill	Clay-like		0.004			
6.562	136.096	5.391	128	Embankment Fill	Clay-like		0.003			
6.726	132.272	4.518	128	Embankment Fill	Clay-like		0.002			
6.890	211.126	4.383	128	Embankment Fill	Clay-like		0.001			
7.054	221.132	5.400	128	Embankment Fill	Clay-like		0.001			
7.218	228.743	4.798	128	Embankment Fill	Clay-like		0.001			
7.382	249.955	4.808	128	Embankment Fill	Clay-like		0.002			
7.546	257.928	4.374	128	Embankment Fill	Clay-like		0.003			
7.710	345.612	3.732	128	Embankment Fill	Clay-like		0.005			
7.874	371.470	4.527	128	Embankment Fill	Clay-like		0.006			
8.038	384.177	3.560	128	Embankment Fill	Clay-like		0.007			
8.202	423.782	5.362	128	Embankment Fill	Clay-like		0.009			
8.366	322.756	4.431	128	Embankment Fill	Clay-like		0.010			
8.530	206.499	4.614	128	Embankment Fill	Clay-like		0.011			
8.694	178.718	4.565	128	Embankment Fill	Clay-like		0.012			
8.858	91.407	3.795	128	Embankment Fill	Clay-like		0.013			
9.022	70.328	3.745	128	Embankment Fill	Clay-like		0.014			
9.186	61.511	2.676	128	Embankment Fill	Clay-like		0.015			
9.350	74.844	2.342	128	Embankment Fill	Clay-like		0.016			
9.514	74.492	2.255	128	Embankment Fill	Clay-like		0.017			
9.678	63.229	1.378	128	Embankment Fill	Clay-like		0.018			
9.842	43.357	1.626	128	Embankment Fill	Clay-like		0.019			
10.006	36.017	1.471	128	Embankment Fill	Clay-like		0.020			
10.170	68.331	1.432	128	Embankment Fill	Clay-like		0.021			
10.335	66.191	2.037	128	Embankment Fill	Clay-like		0.022			

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
10.499	60.808	2.118	128	Embankment Fill	Clay-like		0.023			
10.663	38.169	2.113	128	Embankment Fill	Clay-like		0.024			
10.827	36.968	2.067	128	Embankment Fill	Clay-like		0.026			
10.991	53.412	2.104	128	Embankment Fill	Clay-like		0.027			
11.155	60.174	2.150	128	Embankment Fill	Clay-like		0.028			
11.319	72.691	2.076	128	Embankment Fill	Clay-like		0.029			
11.483	112.388	1.916	128	Embankment Fill	Clay-like		0.030			
11.647	65.874	2.755	128	Embankment Fill	Clay-like		0.031			
11.811	59.006	2.846	128	Embankment Fill	Clay-like		0.032			
11.975	42.831	2.778	128	Embankment Fill	Clay-like		0.033			
12.139	42.167	2.252	128	Embankment Fill	Clay-like		0.034			
12.303	43.458	2.332	128	Embankment Fill	Clay-like		0.034			
12.467	84.811	2.668	128	Embankment Fill	Clay-like		0.035			
12.631	101.619	3.679	128	Embankment Fill	Clay-like		0.036			
12.795	108.920	3.849	128	Embankment Fill	Clay-like		0.037			
12.959	79.980	2.781	128	Embankment Fill	Clay-like		0.038			
13.123	54.346	2.333	128	Embankment Fill	Clay-like		0.039			
13.287	46.589	1.860	128	Embankment Fill	Clay-like		0.039			
13.451	33.778	1.412	128	Embankment Fill	Clay-like		0.040			
13.615	28.367	1.177	128	Embankment Fill	Clay-like		0.041			
13.779	42.087	0.793	128	Embankment Fill	Clay-like		0.041			
13.943	46.027	0.703	128	Embankment Fill	Clay-like		0.042			
14.107	42.506	0.507	128	Embankment Fill	Clay-like		0.043			
14.271	45.614	0.462	128	Embankment Fill	Clay-like		0.043			
14.436	46.963	0.535	128	Embankment Fill	Clay-like		0.044			
14.600	33.874	0.510	128	Embankment Fill	Clay-like		0.045			
14.764	34.705	0.617	128	Embankment Fill	Clay-like		0.046			
14.928	18.885	0.405	128	Embankment Fill	Clay-like		0.046			
15.092	16.019	0.145	128	Embankment Fill	Clay-like		0.047			
15.256	26.947	0.129	128	Embankment Fill	Clay-like		0.048			
15.420	34.838	0.163	128	Embankment Fill	Clay-like		0.049			
15.584	39.212	0.287	128	Embankment Fill	Clay-like		0.050			
15.748	43.160	0.277	128	Embankment Fill	Clay-like		0.051			
15.912	44.826	0.376	128	Embankment Fill	Clay-like		0.052			
16.076	46.258	0.611	128	Embankment Fill	Clay-like		0.052			
16.240	49.129	0.261	128	Embankment Fill	Clay-like		0.053			
16.404	39.864	0.233	128	Embankment Fill	Clay-like		0.054			
16.568	41.341	0.433	128	Embankment Fill	Clay-like		0.055			
16.732	41.253	0.196	128	Embankment Fill	Clay-like		0.056			
16.896	41.201	0.143	128	Embankment Fill	Clay-like		0.056			
17.060	41.377	0.167	128	Embankment Fill	Clay-like		0.056			
17.224	40.168	0.314	128	Embankment Fill	Clay-like		0.056			
17.388	47.681	0.760	128	Embankment Fill	Clay-like		0.056			
17.552	74.506	0.600	128	Embankment Fill	Clay-like		0.056			
17.716	83.753	1.531	128	Embankment Fill	Clay-like		0.055			
17.880	66.036	1.346	128	Embankment Fill	Clay-like		0.055			
18.044	46.891	1.411	128	Embankment Fill	Clay-like		0.055			
18.208	50.511	0.380	128	Embankment Fill	Clay-like		0.056			
18.372	42.744	0.299	128	Embankment Fill	Clay-like		0.058			
18.537	32.773	0.354	128	Embankment Fill	Clay-like		0.059			
18.701	27.472	0.581	128	Embankment Fill	Clay-like		0.061			
18.865	20.292	0.741	128	Embankment Fill	Clay-like		0.062			
19.029	25.196	0.833	128	Embankment Fill	Clay-like		0.064			
19.193	30.930	0.990	128	Embankment Fill	Clay-like		0.065			
19.357	32.069	1.093	128	Embankment Fill	Clay-like		0.065			
19.521	30.336	0.513	128	Embankment Fill	Clay-like		0.066			
19.685	26.771	0.801	128	Embankment Fill	Clay-like		0.067			
19.849	25.262	0.722	128	Embankment Fill	Clay-like		0.068			
20.013	25.372	0.753	128	Embankment Fill	Clay-like		0.068			
20.177	27.430	0.829	128	Embankment Fill	Clay-like		0.069			
20.341	28.425	0.623	128	Embankment Fill	Clay-like		0.070			
20.505	29.587	0.787	128	Embankment Fill	Clay-like		0.071			
20.669	23.365	0.479	128	Embankment Fill	Clay-like		0.071			
20.833	9.091	0.482	128	Embankment Fill	Clay-like		0.072			
20.997	14.141	0.394	128	Embankment Fill	Clay-like		0.073			
21.161	8.245	0.309	128	Embankment Fill	Clay-like		0.073			
21.325	6.870	0.229	128	Embankment Fill	Clay-like		0.074			
21.489	6.681	0.115	128	Embankment Fill	Clay-like		0.075			
21.653	6.110	0.084	128	Embankment Fill	Clay-like		0.075			
21.817	5.035	0.063	128	Embankment Fill	Clay-like		0.076			
21.981	5.254	0.054	128	Embankment Fill	Clay-like		0.077			
22.145	5.574	0.054	128	Embankment Fill	Clay-like		0.077			
22.309	5.782	0.070	128	Embankment Fill	Clay-like		0.078			
22.473	5.902	0.089	128	Embankment Fill	Clay-like		0.079			
22.638	6.326	0.088	128	Embankment Fill	Clay-like		0.079			

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
22.802	8.499	0.108	128	Embankment Fill	Clay-like		0.080			
22.966	9.049	0.255	128	Embankment Fill	Clay-like		0.081			
23.130	11.975	0.283	128	Embankment Fill	Clay-like		0.081			
23.294	12.874	0.320	128	Embankment Fill	Clay-like		0.082			
23.458	12.590	0.529	128	Embankment Fill	Clay-like		0.083			
23.622	11.215	0.985	126	Subunit 2	Sand-like		0.083			
23.786	23.640	0.713	126	Subunit 2	Sand-like		0.084			
23.950	6.945	0.677	126	Subunit 2	Sand-like		0.085			
24.114	12.109	0.226	126	Subunit 2	Sand-like		0.086			
24.278	11.799	0.176	126	Subunit 2	Sand-like		0.086			
24.442	10.457	0.169	126	Subunit 2	Sand-like		0.087			
24.606	12.628	0.162	126	Subunit 2	Sand-like		0.088			
24.770	13.008	0.161	126	Subunit 2	Sand-like		0.088			
24.934	13.042	0.220	126	Subunit 2	Sand-like		0.089			
25.098	14.460	0.216	126	Subunit 2	Sand-like		0.089			
25.262	17.054	0.355	126	Subunit 2	Sand-like		0.090			
25.426	23.965	0.607	126	Subunit 2	Sand-like		0.091			
25.590	33.997	0.711	126	Subunit 2	Sand-like		0.091			
25.754	30.950	0.712	126	Subunit 2	Sand-like		0.092			
25.918	25.192	0.575	126	Subunit 2	Sand-like		0.093			
26.082	21.985	0.992	126	Subunit 2	Sand-like		0.093			
26.246	19.876	1.142	126	Subunit 2	Sand-like		0.094			
26.410	29.563	1.234	126	Subunit 2	Sand-like		0.095			
26.574	26.664	0.972	126	Subunit 2	Sand-like		0.095			
26.739	25.433	0.869	126	Subunit 2	Sand-like		0.096			
26.903	24.870	0.803	126	Subunit 2	Sand-like		0.097			
27.067	24.848	0.838	126	Subunit 2	Sand-like		0.097			
27.231	25.412	0.859	126	Subunit 2	Sand-like		0.098			
27.395	25.491	0.922	126	Subunit 2	Sand-like		0.098			
27.559	24.937	1.003	126	Subunit 2	Sand-like		0.099			
27.723	24.679	1.087	126	Subunit 2	Sand-like		0.100			
27.887	27.065	1.164	126	Subunit 2	Sand-like		0.100			
28.051	27.028	1.234	126	Subunit 2	Sand-like		0.101			
28.215	27.593	1.185	126	Subunit 2	Sand-like		0.101			
28.379	26.598	1.117	126	Subunit 2	Sand-like		0.102			
28.543	25.861	1.071	126	Subunit 2	Sand-like		0.103			
28.707	25.037	1.071	126	Subunit 2	Sand-like		0.103			
28.871	24.635	1.004	126	Subunit 2	Sand-like		0.104			
29.035	24.635	1.013	126	Subunit 2	Sand-like		0.104			
29.199	25.625	1.064	126	Subunit 2	Sand-like		0.105			
29.363	27.507	1.060	126	Subunit 2	Sand-like		0.105			
29.527	30.050	1.864	126	Subunit 2	Sand-like		0.106			
29.691	37.858	1.403	126	Subunit 2	Sand-like		0.106			
29.855	32.118	1.881	126	Subunit 2	Sand-like		0.107			
30.019	42.790	2.335	126	Subunit 2	Sand-like		0.107			
30.183	37.782	2.214	126	Subunit 2	Sand-like		0.107			
30.347	44.362	2.080	126	Subunit 2	Sand-like		0.108			
30.511	31.547	1.774	126	Subunit 2	Sand-like		0.109			
30.675	25.321	1.212	126	Subunit 2	Sand-like		0.110			
30.840	22.278	0.624	126	Subunit 2	Sand-like		0.111			
31.004	22.452	0.648	126	Subunit 2	Sand-like		0.112			
31.168	25.276	0.718	126	Subunit 2	Sand-like		0.113			
31.332	29.999	0.840	126	Subunit 2	Sand-like		0.114			
31.496	35.562	0.719	126	Subunit 2	Sand-like		0.114			
31.660	51.563	0.466	126	Subunit 2	Sand-like		0.115			
31.824	51.319	0.319	126	Subunit 2	Sand-like		0.115			
31.988	46.880	0.246	126	Subunit 2	Sand-like		0.115			
32.152	38.437	0.234	126	Subunit 2	Sand-like		0.115			
32.316	23.816	0.253	126	Subunit 2	Sand-like		0.116			
32.480	17.197	0.248	126	Subunit 2	Sand-like		0.116			
32.644	14.550	0.256	126	Subunit 2	Sand-like		0.116			
32.808	13.166	0.185	126	Subunit 2	Sand-like		0.116			
32.972	12.315	0.208	126	Subunit 2	Sand-like		0.116			
33.136	14.022	0.249	126	Subunit 2	Sand-like		0.117			
33.300	19.231	0.262	126	Subunit 2	Sand-like		0.117			
33.464	18.960	0.198	126	Subunit 2	Sand-like		0.118			
33.628	18.892	0.170	126	Subunit 2	Sand-like		0.119			
33.792	12.530	0.122	126	Subunit 2	Sand-like		0.119			
33.956	9.410	0.136	126	Subunit 2	Sand-like		0.120			
34.120	8.714	0.194	126	Subunit 2	Sand-like		0.120			
34.284	12.067	0.163	126	Subunit 2	Sand-like		0.121			
34.448	15.311	0.240	126	Subunit 2	Sand-like		0.121			
34.612	22.679	0.277	126	Subunit 2	Sand-like		0.122			
34.776	39.390	0.303	126	Subunit 2	Sand-like		0.122			
34.941	42.750	0.326	126	Subunit 2	Sand-like		0.122			

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
35.105	47.867	0.295	131	Subunit 3	Sand-like		0.123			
35.269	51.769	0.267	131	Subunit 3	Sand-like		0.123			
35.433	50.368	0.311	131	Subunit 3	Sand-like		0.124			
35.597	40.759	0.453	131	Subunit 3	Sand-like		0.124			
35.761	29.398	1.363	131	Subunit 3	Sand-like		0.124			
35.925	25.716	1.506	131	Subunit 3	Sand-like		0.125			
36.089	101.028	2.419	131	Subunit 3	Sand-like		0.125			
36.253	96.233	1.758	131	Subunit 3	Sand-like		0.125			
36.417	48.198	1.403	131	Subunit 3	Sand-like		0.126			
36.581	49.612	0.517	131	Subunit 3	Sand-like		0.126			
36.745	43.255	0.491	131	Subunit 3	Sand-like		0.127			
36.909	39.036	0.490	131	Subunit 3	Sand-like		0.127			
37.073	30.465	0.504	131	Subunit 3	Sand-like		0.127			
37.237	24.638	0.460	131	Subunit 3	Sand-like		0.128			
37.401	14.067	0.369	131	Subunit 3	Sand-like		0.128			
37.565	12.200	0.216	131	Subunit 3	Sand-like		0.128			
37.729	18.086	0.076	131	Subunit 3	Sand-like		0.129			
37.893	27.387	0.222	131	Subunit 3	Sand-like		0.129			
38.057	36.078	0.198	131	Subunit 3	Sand-like		0.129			
38.221	39.120	0.230	131	Subunit 3	Sand-like		0.130			
38.385	40.955	0.180	131	Subunit 3	Sand-like		0.130			
38.549	40.009	0.239	131	Subunit 3	Sand-like		0.130			
38.713	34.747	0.247	131	Subunit 3	Sand-like		0.131			
38.877	27.849	0.265	131	Subunit 3	Sand-like		0.131			
39.042	20.863	0.339	131	Subunit 3	Sand-like		0.131			
39.206	22.666	0.337	131	Subunit 3	Sand-like		0.131			
39.370	36.237	0.300	131	Subunit 3	Sand-like		0.132			
39.534	42.779	0.237	131	Subunit 3	Sand-like		0.132			
39.698	35.100	0.412	131	Subunit 3	Sand-like		0.132			
39.862	17.159	0.379	131	Subunit 3	Sand-like		0.132			
40.026	12.185	0.267	131	Subunit 3	Sand-like		0.133			
40.190	13.149	0.084	131	Subunit 3	Sand-like		0.133			
40.354	12.410	0.137	131	Subunit 3	Sand-like		0.133			
40.518	20.986	0.102	131	Subunit 3	Sand-like		0.133			
40.682	22.738	0.074	131	Subunit 3	Sand-like		0.134			
40.846	19.852	0.041	131	Subunit 3	Sand-like		0.134			
41.010	11.093	0.137	131	Subunit 3	Sand-like		0.134			
41.174	8.970	0.313	131	Subunit 3	Sand-like		0.134			
41.338	55.245	0.283	131	Subunit 3	Sand-like		0.135			
41.502	96.740	0.240	131	Subunit 3	Sand-like		0.135			
41.666	111.055	0.476	131	Subunit 3	Sand-like		0.135			
41.830	108.387	0.639	131	Subunit 3	Sand-like		0.135			
41.994	114.268	0.699	131	Subunit 3	Sand-like		0.135			
42.158	120.751	0.724	131	Subunit 3	Sand-like		0.136			
42.322	104.180	0.601	131	Subunit 3	Sand-like		0.136			
42.486	93.936	0.574	131	Subunit 3	Sand-like		0.136			
42.650	83.091	0.569	131	Subunit 3	Sand-like		0.136			
42.814	75.629	0.547	131	Subunit 3	Sand-like		0.136			
42.978	72.662	0.537	131	Subunit 3	Sand-like		0.137			
43.143	69.153	0.514	131	Subunit 3	Sand-like		0.137			
43.307	63.476	0.844	131	Subunit 3	Sand-like		0.137			
43.471	63.320	1.387	131	Subunit 3	Sand-like		0.137			
43.635	95.308	4.301	131	Subunit 3	Sand-like		0.137			
43.799	164.725	2.084	131	Subunit 3	Sand-like		0.136			
43.963	167.339	2.075	131	Subunit 3	Sand-like		0.136			
44.127	138.334	1.274	131	Subunit 3	Sand-like		0.136			
44.291	122.455	1.485	131	Subunit 3	Sand-like		0.135			
44.455	92.499	1.098	131	Subunit 3	Sand-like		0.135			
44.619	58.567	0.557	131	Subunit 3	Sand-like		0.134			
44.783	49.602	0.434	131	Subunit 3	Sand-like		0.134			
44.947	44.768	0.466	131	Subunit 3	Sand-like		0.134			
45.111	46.317	0.348	131	Subunit 3	Sand-like		0.133			
45.275	53.766	0.328	131	Subunit 3	Sand-like		0.133			
45.439	60.496	0.418	131	Subunit 3	Sand-like		0.133			
45.603	79.837	0.587	131	Subunit 3	Sand-like		0.133			
45.767	110.849	0.297	131	Subunit 3	Sand-like		0.133			
45.931	127.592	0.365	131	Subunit 3	Sand-like		0.133			
46.095	121.183	0.492	131	Subunit 3	Sand-like		0.133			
46.259	116.024	0.938	131	Subunit 3	Sand-like		0.133			
46.423	142.473	1.728	131	Subunit 3	Sand-like		0.133			
46.587	238.170	0.010	131	Subunit 3	Sand-like		0.133			
46.751	379.449	0.010	131	Subunit 3	Sand-like		0.133			

LIQUEFACTION POTENTIAL ASSESSMENT FOR COARSE GRAINED SOILS USING CONE PENETRATION TEST DATA

Facility: KIF TDEC Stability
Project No.: 175668043
CPT ID: CPT-05A

Water Elevation during CPT:	751.5	ft
Depth to Water during CPT:	2.5	ft *(relative to ground surface during CPT)*
Water Elevation during Earthquake:	749.0	ft
Depth to Water during Earthquake:	5.0	ft *(relative to ground surface during CPT)*
Final Grade Elevation during EQ:	753	ft *(if no fill, then set this equal to top of CPT hole elev.)*
Height of Final Grade above CPT TOH:	-1.0	ft *(relative to ground surface during CPT, + Fill, - Cut)*
Unit Weight of Cut/Fill to Achieve Final Grade	120	pcf
Cut/Fill Total Stress (+ Fill, - Cut):	-0.06	tsf

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight γ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
754.0				Vertical Stresses above 1st CPT:			**0.01**	**-0.05**	**0.00**	**0.00**	**0.01**	**-0.05**
753.8	0.164	2.41	0.33	112	**0.16**	0.08	0.01	-0.05	0.00	0.00	0.01	-0.05
753.7	0.328	145.34	0.37	112	0.25	0.16	0.02	-0.04	0.00	0.00	0.02	-0.04
753.5	0.492	211.84	1.30	112	0.41	0.16	0.03	-0.03	0.00	0.00	0.03	-0.03
753.3	0.656	262.26	1.36	112	0.57	0.16	0.04	-0.02	0.00	0.00	0.04	-0.02
753.2	0.820	179.44	1.30	112	0.74	0.16	0.05	-0.01	0.00	0.00	0.05	-0.01
753.0	0.984	121.33	1.56	112	0.90	0.16	0.06	0.00	0.00	0.00	0.06	0.00
752.9	1.148	58.11	1.91	112	1.07	0.16	0.06	0.00	0.00	0.00	0.06	0.00
752.7	1.312	93.51	2.27	112	1.23	0.16	0.07	0.01	0.00	0.00	0.07	0.01
752.5	1.476	476.47	3.88	112	1.39	0.16	0.08	0.02	0.00	0.00	0.08	0.02
752.4	1.640	381.35	4.76	112	1.56	0.16	0.09	0.03	0.00	0.00	0.09	0.03
752.2	1.804	395.87	4.97	112	1.72	0.16	0.10	0.04	0.00	0.00	0.10	0.04
752.0	1.968	391.74	3.46	112	1.89	0.16	0.11	0.05	0.00	0.00	0.11	0.05
751.9	2.133	368.62	2.26	112	2.05	0.16	0.12	0.06	0.00	0.00	0.12	0.06
751.7	2.297	295.03	2.04	112	2.21	0.16	0.13	0.07	0.00	0.00	0.13	0.07
751.5	2.461	208.07	1.67	112	2.38	0.16	0.14	0.08	0.00	0.00	0.14	0.08
751.4	2.625	124.13	2.14	112	2.54	0.16	0.15	0.09	0.00	0.00	0.14	0.09
751.2	2.789	75.43	2.50	112	2.71	0.16	0.16	0.10	0.01	0.00	0.15	0.10
751.0	2.953	54.29	2.40	112	2.87	0.16	0.17	0.11	0.01	0.00	0.15	0.11
750.9	3.117	53.63	1.76	112	3.03	0.16	0.18	0.12	0.02	0.00	0.16	0.12
750.7	3.281	237.38	2.14	112	3.20	0.16	0.18	0.12	0.02	0.00	0.16	0.12
750.6	3.445	273.84	1.76	112	3.36	0.16	0.19	0.13	0.03	0.00	0.16	0.13
750.4	3.609	374.48	2.33	112	3.53	0.16	0.20	0.14	0.03	0.00	0.17	0.14
750.2	3.773	299.70	2.56	112	3.69	0.16	0.21	0.15	0.04	0.00	0.17	0.15
750.1	3.937	200.48	3.30	112	3.85	0.16	0.22	0.16	0.04	0.00	0.18	0.16
749.9	4.101	120.48	3.77	112	4.02	0.16	0.23	0.17	0.05	0.00	0.18	0.17
749.7	4.265	82.66	3.90	112	4.18	0.16	0.24	0.18	0.06	0.00	0.18	0.18
749.6	4.429	51.34	4.19	112	4.35	0.16	0.25	0.19	0.06	0.00	0.19	0.19
749.4	4.593	67.92	2.92	112	4.51	0.16	0.26	0.20	0.07	0.00	0.19	0.20
749.2	4.757	124.66	2.23	112	4.68	0.16	0.27	0.21	0.07	0.00	0.20	0.21
749.1	4.921	142.84	2.59	112	4.84	0.16	0.28	0.22	0.08	0.00	0.20	0.22
748.9	5.085	55.97	2.49	128	5.00	0.16	0.29	0.23	0.08	0.00	0.21	0.22
748.8	5.249	252.81	3.10	128	5.17	0.16	0.30	0.24	0.09	0.01	0.21	0.23
748.6	5.413	352.62	5.22	128	5.33	0.16	0.31	0.25	0.09	0.01	0.22	0.23
748.4	5.577	335.34	2.96	128	5.50	0.16	0.32	0.26	0.10	0.02	0.22	0.24
748.3	5.741	394.10	4.31	128	5.66	0.16	0.33	0.27	0.10	0.02	0.23	0.24
748.1	5.905	365.29	5.55	128	5.82	0.16	0.34	0.28	0.11	0.03	0.23	0.25
747.9	6.069	232.03	6.69	128	5.99	0.16	0.35	0.29	0.11	0.03	0.24	0.26
747.8	6.234	208.75	7.28	128	6.15	0.16	0.36	0.30	0.12	0.04	0.24	0.26
747.6	6.398	139.12	5.97	128	6.32	0.16	0.37	0.31	0.12	0.04	0.25	0.27
747.4	6.562	136.10	5.39	128	6.48	0.16	0.38	0.32	0.13	0.05	0.25	0.27
747.3	6.726	132.27	4.52	128	6.64	0.16	0.39	0.33	0.13	0.05	0.26	0.28
747.1	6.890	211.13	4.38	128	6.81	0.16	0.40	0.34	0.14	0.06	0.26	0.28
746.9	7.054	221.13	5.40	128	6.97	0.16	0.41	0.35	0.14	0.06	0.27	0.29
746.8	7.218	228.74	4.80	128	7.14	0.16	0.42	0.36	0.15	0.07	0.28	0.29
746.6	7.382	249.96	4.81	128	7.30	0.16	0.43	0.37	0.15	0.07	0.28	0.30
746.5	7.546	257.93	4.37	128	7.46	0.16	0.44	0.38	0.16	0.08	0.29	0.30
746.3	7.710	345.61	3.73	128	7.63	0.16	0.45	0.39	0.16	0.08	0.29	0.31
746.1	7.874	371.47	4.53	128	7.79	0.16	0.46	0.40	0.17	0.09	0.30	0.31
746.0	8.038	384.18	3.56	128	7.96	0.16	0.48	0.42	0.17	0.09	0.30	0.32
745.8	8.202	423.78	5.36	128	8.12	0.16	0.49	0.43	0.18	0.10	0.31	0.33
745.6	8.366	322.76	4.43	128	8.28	0.16	0.50	0.44	0.18	0.11	0.31	0.33
745.5	8.530	206.50	4.61	128	8.45	0.16	0.51	0.45	0.19	0.11	0.32	0.34
745.3	8.694	178.72	4.57	128	8.61	0.16	0.52	0.46	0.19	0.12	0.32	0.34
745.1	8.858	91.41	3.80	128	8.78	0.16	0.53	0.47	0.20	0.12	0.33	0.35
745.0	9.022	70.33	3.75	128	8.94	0.16	0.54	0.48	0.20	0.13	0.33	0.35
744.8	9.186	61.51	2.68	128	9.10	0.16	0.55	0.49	0.21	0.13	0.34	0.36
744.6	9.350	74.84	2.34	128	9.27	0.16	0.56	0.50	0.21	0.14	0.35	0.36
744.5	9.514	74.49	2.26	128	9.43	0.16	0.57	0.51	0.22	0.14	0.35	0.37

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
744.3	9.678	63.23	1.38	128	9.60	0.16	0.58	0.52	0.22	0.15	0.36	0.37
744.2	9.842	43.36	1.63	128	9.76	0.16	0.59	0.53	0.23	0.15	0.36	0.38
744.0	10.006	36.02	1.47	128	9.92	0.16	0.60	0.54	0.23	0.16	0.37	0.38
743.8	10.170	68.33	1.43	128	10.09	0.16	0.61	0.55	0.24	0.16	0.37	0.39
743.7	10.335	66.19	2.04	128	10.25	0.16	0.62	0.56	0.24	0.17	0.38	0.40
743.5	10.499	60.81	2.12	128	10.42	0.16	0.63	0.57	0.25	0.17	0.38	0.40
743.3	10.663	38.17	2.11	128	10.58	0.16	0.64	0.58	0.25	0.18	0.39	0.41
743.2	10.827	36.97	2.07	128	10.74	0.16	0.65	0.59	0.26	0.18	0.39	0.41
743.0	10.991	53.41	2.10	128	10.91	0.16	0.66	0.60	0.26	0.19	0.40	0.42
742.8	11.155	60.17	2.15	128	11.07	0.16	0.67	0.61	0.27	0.19	0.40	0.42
742.7	11.319	72.69	2.08	128	11.24	0.16	0.69	0.63	0.28	0.20	0.41	0.43
742.5	11.483	112.39	1.92	128	11.40	0.16	0.70	0.64	0.28	0.20	0.42	0.43
742.4	11.647	65.87	2.76	128	11.56	0.16	0.71	0.65	0.29	0.21	0.42	0.44
742.2	11.811	59.01	2.85	128	11.73	0.16	0.72	0.66	0.29	0.21	0.43	0.44
742.0	11.975	42.83	2.78	128	11.89	0.16	0.73	0.67	0.30	0.22	0.43	0.45
741.9	12.139	42.17	2.25	128	12.06	0.16	0.74	0.68	0.30	0.22	0.44	0.45
741.7	12.303	43.46	2.33	128	12.22	0.16	0.75	0.69	0.31	0.23	0.44	0.46
741.5	12.467	84.81	2.67	128	12.39	0.16	0.76	0.70	0.31	0.23	0.45	0.47
741.4	12.631	101.62	3.68	128	12.55	0.16	0.77	0.71	0.32	0.24	0.45	0.47
741.2	12.795	108.92	3.85	128	12.71	0.16	0.78	0.72	0.32	0.24	0.46	0.48
741.0	12.959	79.98	2.78	128	12.88	0.16	0.79	0.73	0.33	0.25	0.46	0.48
740.9	13.123	54.35	2.33	128	13.04	0.16	0.80	0.74	0.33	0.25	0.47	0.49
740.7	13.287	46.59	1.86	128	13.21	0.16	0.81	0.75	0.34	0.26	0.47	0.49
740.5	13.451	33.78	1.41	128	13.37	0.16	0.82	0.76	0.34	0.26	0.48	0.50
740.4	13.615	28.37	1.18	128	13.53	0.16	0.83	0.77	0.35	0.27	0.49	0.50
740.2	13.779	42.09	0.79	128	13.70	0.16	0.84	0.78	0.35	0.27	0.49	0.51
740.1	13.943	46.03	0.70	128	13.86	0.16	0.85	0.79	0.36	0.28	0.50	0.51
739.9	14.107	42.51	0.51	128	14.03	0.16	0.86	0.80	0.36	0.28	0.50	0.52
739.7	14.271	45.61	0.46	128	14.19	0.16	0.87	0.81	0.37	0.29	0.51	0.52
739.6	14.436	46.96	0.54	128	14.35	0.16	0.88	0.82	0.37	0.29	0.51	0.53
739.4	14.600	33.87	0.51	128	14.52	0.16	0.90	0.84	0.38	0.30	0.52	0.54
739.2	14.764	34.70	0.62	128	14.68	0.16	0.91	0.85	0.38	0.30	0.52	0.54
739.1	14.928	18.89	0.41	128	14.85	0.16	0.92	0.86	0.39	0.31	0.53	0.55
738.9	15.092	16.02	0.15	128	15.01	0.16	0.93	0.87	0.39	0.31	0.53	0.55
738.7	15.256	26.95	0.13	128	15.17	0.16	0.94	0.88	0.40	0.32	0.54	0.56
738.6	15.420	34.84	0.16	128	15.34	0.16	0.95	0.89	0.40	0.33	0.54	0.56
738.4	15.584	39.21	0.29	128	15.50	0.16	0.96	0.90	0.41	0.33	0.55	0.57
738.3	15.748	43.16	0.28	128	15.67	0.16	0.97	0.91	0.41	0.34	0.56	0.57
738.1	15.912	44.83	0.38	128	15.83	0.16	0.98	0.92	0.42	0.34	0.56	0.58
737.9	16.076	46.26	0.61	128	15.99	0.16	0.99	0.93	0.42	0.35	0.57	0.58
737.8	16.240	49.13	0.26	128	16.16	0.16	1.00	0.94	0.43	0.35	0.57	0.59
737.6	16.404	39.86	0.23	128	16.32	0.16	1.01	0.95	0.43	0.36	0.58	0.59
737.4	16.568	41.34	0.43	128	16.49	0.16	1.02	0.96	0.44	0.36	0.58	0.60
737.3	16.732	41.25	0.20	128	16.65	0.16	1.03	0.97	0.44	0.37	0.59	0.61
737.1	16.896	41.20	0.14	128	16.81	0.16	1.04	0.98	0.45	0.37	0.59	0.61
736.9	17.060	41.38	0.17	128	16.98	0.16	1.05	0.99	0.45	0.38	0.60	0.62
736.8	17.224	40.17	0.31	128	17.14	0.16	1.06	1.00	0.46	0.38	0.60	0.62
736.6	17.388	47.68	0.76	128	17.31	0.16	1.07	1.01	0.46	0.39	0.61	0.63
736.4	17.552	74.51	0.60	128	17.47	0.16	1.08	1.02	0.47	0.39	0.61	0.63
736.3	17.716	83.75	1.53	128	17.63	0.16	1.09	1.03	0.47	0.40	0.62	0.64
736.1	17.880	66.04	1.35	128	17.80	0.16	1.10	1.04	0.48	0.40	0.63	0.64
736.0	18.044	46.89	1.41	128	17.96	0.16	1.12	1.06	0.48	0.41	0.63	0.65
735.8	18.208	50.51	0.38	128	18.13	0.16	1.13	1.07	0.49	0.41	0.64	0.65
735.6	18.372	42.74	0.30	128	18.29	0.16	1.14	1.08	0.50	0.42	0.64	0.66
735.5	18.537	32.77	0.35	128	18.45	0.16	1.15	1.09	0.50	0.42	0.65	0.66
735.3	18.701	27.47	0.58	128	18.62	0.16	1.16	1.10	0.51	0.43	0.65	0.67
735.1	18.865	20.29	0.74	128	18.78	0.16	1.17	1.11	0.51	0.43	0.66	0.68
735.0	19.029	25.20	0.83	128	18.95	0.16	1.18	1.12	0.52	0.44	0.66	0.68
734.8	19.193	30.93	0.99	128	19.11	0.16	1.19	1.13	0.52	0.44	0.67	0.69
734.6	19.357	32.07	1.09	128	19.27	0.16	1.20	1.14	0.53	0.45	0.67	0.69
734.5	19.521	30.34	0.51	128	19.44	0.16	1.21	1.15	0.53	0.45	0.68	0.70
734.3	19.685	26.77	0.80	128	19.60	0.16	1.22	1.16	0.54	0.46	0.68	0.70
734.2	19.849	25.26	0.72	128	19.77	0.16	1.23	1.17	0.54	0.46	0.69	0.71
734.0	20.013	25.37	0.75	128	19.93	0.16	1.24	1.18	0.55	0.47	0.70	0.71
733.8	20.177	27.43	0.83	128	20.09	0.16	1.25	1.19	0.55	0.47	0.70	0.72
733.7	20.341	28.42	0.62	128	20.26	0.16	1.26	1.20	0.56	0.48	0.71	0.72
733.5	20.505	29.59	0.79	128	20.42	0.16	1.27	1.21	0.56	0.48	0.71	0.73
733.3	20.669	23.37	0.48	128	20.59	0.16	1.28	1.22	0.57	0.49	0.72	0.73
733.2	20.833	9.09	0.48	128	20.75	0.16	1.29	1.23	0.57	0.49	0.72	0.74

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
733.0	20.997	14.14	0.39	128	20.92	0.16	1.30	1.24	0.58	0.50	0.73	0.75
732.8	21.161	8.24	0.31	128	21.08	0.16	1.31	1.25	0.58	0.50	0.73	0.75
732.7	21.325	6.87	0.23	128	21.24	0.16	1.33	1.27	0.59	0.51	0.74	0.76
732.5	21.489	6.68	0.12	128	21.41	0.16	1.34	1.28	0.59	0.51	0.74	0.76
732.3	21.653	6.11	0.08	128	21.57	0.16	1.35	1.29	0.60	0.52	0.75	0.77
732.2	21.817	5.03	0.06	128	21.74	0.16	1.36	1.30	0.60	0.52	0.75	0.77
732.0	21.981	5.25	0.05	128	21.90	0.16	1.37	1.31	0.61	0.53	0.76	0.78
731.9	22.145	5.57	0.05	128	22.06	0.16	1.38	1.32	0.61	0.53	0.76	0.78
731.7	22.309	5.78	0.07	128	22.23	0.16	1.39	1.33	0.62	0.54	0.77	0.79
731.5	22.473	5.90	0.09	128	22.39	0.16	1.40	1.34	0.62	0.55	0.78	0.79
731.4	22.638	6.33	0.09	128	22.56	0.16	1.41	1.35	0.63	0.55	0.78	0.80
731.2	22.802	8.50	0.11	128	22.72	0.16	1.42	1.36	0.63	0.56	0.79	0.80
731.0	22.966	9.05	0.26	128	22.88	0.16	1.43	1.37	0.64	0.56	0.79	0.81
730.9	23.130	11.98	0.28	128	23.05	0.16	1.44	1.38	0.64	0.57	0.80	0.82
730.7	23.294	12.87	0.32	128	23.21	0.16	1.45	1.39	0.65	0.57	0.80	0.82
730.5	23.458	12.59	0.53	128	23.38	0.16	1.46	1.40	0.65	0.58	0.81	0.83
730.4	23.622	11.22	0.99	126	23.54	0.16	1.47	1.41	0.66	0.58	0.81	0.83
730.2	23.786	23.64	0.71	126	23.70	0.16	1.48	1.42	0.66	0.59	0.82	0.84
730.1	23.950	6.95	0.68	126	23.87	0.16	1.49	1.43	0.67	0.59	0.82	0.84
729.9	24.114	12.11	0.23	126	24.03	0.16	1.50	1.44	0.67	0.60	0.83	0.85
729.7	24.278	11.80	0.18	126	24.20	0.16	1.51	1.45	0.68	0.60	0.83	0.85
729.6	24.442	10.46	0.17	126	24.36	0.16	1.52	1.46	0.68	0.61	0.84	0.86
729.4	24.606	12.63	0.16	126	24.52	0.16	1.53	1.47	0.69	0.61	0.84	0.86
729.2	24.770	13.01	0.16	126	24.69	0.16	1.54	1.48	0.69	0.62	0.85	0.87
729.1	24.934	13.04	0.22	126	24.85	0.16	1.56	1.50	0.70	0.62	0.86	0.87
728.9	25.098	14.46	0.22	126	25.02	0.16	1.57	1.51	0.71	0.63	0.86	0.88
728.7	25.262	17.05	0.36	126	25.18	0.16	1.58	1.52	0.71	0.63	0.87	0.88
728.6	25.426	23.96	0.61	126	25.34	0.16	1.59	1.53	0.72	0.64	0.87	0.89
728.4	25.590	34.00	0.71	126	25.51	0.16	1.60	1.54	0.72	0.64	0.88	0.89
728.2	25.754	30.95	0.71	126	25.67	0.16	1.61	1.55	0.73	0.65	0.88	0.90
728.1	25.918	25.19	0.58	126	25.84	0.16	1.62	1.56	0.73	0.65	0.89	0.90
727.9	26.082	21.98	0.99	126	26.00	0.16	1.63	1.57	0.74	0.66	0.89	0.91
727.8	26.246	19.88	1.14	126	26.16	0.16	1.64	1.58	0.74	0.66	0.90	0.91
727.6	26.410	29.56	1.23	126	26.33	0.16	1.65	1.59	0.75	0.67	0.90	0.92
727.4	26.574	26.66	0.97	126	26.49	0.16	1.66	1.60	0.75	0.67	0.91	0.93
727.3	26.739	25.43	0.87	126	26.66	0.16	1.67	1.61	0.76	0.68	0.91	0.93
727.1	26.903	24.87	0.80	126	26.82	0.16	1.68	1.62	0.76	0.68	0.92	0.94
726.9	27.067	24.85	0.84	126	26.98	0.16	1.69	1.63	0.77	0.69	0.92	0.94
726.8	27.231	25.41	0.86	126	27.15	0.16	1.70	1.64	0.77	0.69	0.93	0.95
726.6	27.395	25.49	0.92	126	27.31	0.16	1.71	1.65	0.78	0.70	0.93	0.95
726.4	27.559	24.94	1.00	126	27.48	0.16	1.72	1.66	0.78	0.70	0.94	0.96
726.3	27.723	24.68	1.09	126	27.64	0.16	1.73	1.67	0.79	0.71	0.94	0.96
726.1	27.887	27.07	1.16	126	27.80	0.16	1.74	1.68	0.79	0.71	0.95	0.97
725.9	28.051	27.03	1.23	126	27.97	0.16	1.75	1.69	0.80	0.72	0.95	0.97
725.8	28.215	27.59	1.19	126	28.13	0.16	1.76	1.70	0.80	0.72	0.96	0.98
725.6	28.379	26.60	1.12	126	28.30	0.16	1.77	1.71	0.81	0.73	0.96	0.98
725.5	28.543	25.86	1.07	126	28.46	0.16	1.78	1.72	0.81	0.73	0.97	0.99
725.3	28.707	25.04	1.07	126	28.62	0.16	1.79	1.73	0.82	0.74	0.98	0.99
725.1	28.871	24.64	1.00	126	28.79	0.16	1.80	1.74	0.82	0.74	0.98	1.00
725.0	29.035	24.64	1.01	126	28.95	0.16	1.81	1.75	0.83	0.75	0.99	1.00
724.8	29.199	25.63	1.06	126	29.12	0.16	1.82	1.76	0.83	0.76	0.99	1.01
724.6	29.363	27.51	1.06	126	29.28	0.16	1.83	1.77	0.84	0.76	1.00	1.01
724.5	29.527	30.05	1.86	126	29.45	0.16	1.84	1.78	0.84	0.77	1.00	1.02
724.3	29.691	37.86	1.40	126	29.61	0.16	1.85	1.79	0.85	0.77	1.01	1.02
724.1	29.855	32.12	1.88	126	29.77	0.16	1.87	1.81	0.85	0.78	1.01	1.03
724.0	30.019	42.79	2.34	126	29.94	0.16	1.88	1.82	0.86	0.78	1.02	1.03
723.8	30.183	37.78	2.21	126	30.10	0.16	1.89	1.83	0.86	0.79	1.02	1.04
723.7	30.347	44.36	2.08	126	30.27	0.16	1.90	1.84	0.87	0.79	1.03	1.05
723.5	30.511	31.55	1.77	126	30.43	0.16	1.91	1.85	0.87	0.80	1.03	1.05
723.3	30.675	25.32	1.21	126	30.59	0.16	1.92	1.86	0.88	0.80	1.04	1.06
723.2	30.840	22.28	0.62	126	30.76	0.16	1.93	1.87	0.88	0.81	1.04	1.06
723.0	31.004	22.45	0.65	126	30.92	0.16	1.94	1.88	0.89	0.81	1.05	1.07
722.8	31.168	25.28	0.72	126	31.09	0.16	1.95	1.89	0.89	0.82	1.05	1.07
722.7	31.332	30.00	0.84	126	31.25	0.16	1.96	1.90	0.90	0.82	1.06	1.08
722.5	31.496	35.56	0.72	126	31.41	0.16	1.97	1.91	0.90	0.83	1.06	1.08
722.3	31.660	51.56	0.47	126	31.58	0.16	1.98	1.92	0.91	0.83	1.07	1.09
722.2	31.824	51.32	0.32	126	31.74	0.16	1.99	1.93	0.91	0.84	1.07	1.09
722.0	31.988	46.88	0.25	126	31.91	0.16	2.00	1.94	0.92	0.84	1.08	1.10
721.8	32.152	38.44	0.23	126	32.07	0.16	2.01	1.95	0.93	0.85	1.08	1.10

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
721.7	32.316	23.82	0.25	126	32.23	0.16	2.02	1.96	0.93	0.85	1.09	1.11
721.5	32.480	17.20	0.25	126	32.40	0.16	2.03	1.97	0.94	0.86	1.10	1.11
721.4	32.644	14.55	0.26	126	32.56	0.16	2.04	1.98	0.94	0.86	1.10	1.12
721.2	32.808	13.17	0.19	126	32.73	0.16	2.05	1.99	0.95	0.87	1.11	1.12
721.0	32.972	12.32	0.21	126	32.89	0.16	2.06	2.00	0.95	0.87	1.11	1.13
720.9	33.136	14.02	0.25	126	33.05	0.16	2.07	2.01	0.96	0.88	1.12	1.13
720.7	33.300	19.23	0.26	126	33.22	0.16	2.08	2.02	0.96	0.88	1.12	1.14
720.5	33.464	18.96	0.20	126	33.38	0.16	2.09	2.03	0.97	0.89	1.13	1.14
720.4	33.628	18.89	0.17	126	33.55	0.16	2.10	2.04	0.97	0.89	1.13	1.15
720.2	33.792	12.53	0.12	126	33.71	0.16	2.11	2.05	0.98	0.90	1.14	1.15
720.0	33.956	9.41	0.14	126	33.87	0.16	2.12	2.06	0.98	0.90	1.14	1.16
719.9	34.120	8.71	0.19	126	34.04	0.16	2.13	2.07	0.99	0.91	1.15	1.17
719.7	34.284	12.07	0.16	126	34.20	0.16	2.14	2.08	0.99	0.91	1.15	1.17
719.6	34.448	15.31	0.24	126	34.37	0.16	2.15	2.09	1.00	0.92	1.16	1.18
719.4	34.612	22.68	0.28	126	34.53	0.16	2.16	2.10	1.00	0.92	1.16	1.18
719.2	34.776	39.39	0.30	126	34.69	0.16	2.18	2.12	1.01	0.93	1.17	1.19
719.1	34.941	42.75	0.33	126	34.86	0.16	2.19	2.13	1.01	0.93	1.17	1.19
718.9	35.105	47.87	0.30	131	35.02	0.16	2.20	2.14	1.02	0.94	1.18	1.20
718.7	35.269	51.77	0.27	131	35.19	0.16	2.21	2.15	1.02	0.94	1.18	1.20
718.6	35.433	50.37	0.31	131	35.35	0.16	2.22	2.16	1.03	0.95	1.19	1.21
718.4	35.597	40.76	0.45	131	35.51	0.16	2.23	2.17	1.03	0.95	1.20	1.21
718.2	35.761	29.40	1.36	131	35.68	0.16	2.24	2.18	1.04	0.96	1.20	1.22
718.1	35.925	25.72	1.51	131	35.84	0.16	2.25	2.19	1.04	0.96	1.21	1.22
717.9	36.089	101.03	2.42	131	36.01	0.16	2.26	2.20	1.05	0.97	1.21	1.23
717.7	36.253	96.23	1.76	131	36.17	0.16	2.27	2.21	1.05	0.98	1.22	1.24
717.6	36.417	48.20	1.40	131	36.33	0.16	2.28	2.22	1.06	0.98	1.22	1.24
717.4	36.581	49.61	0.52	131	36.50	0.16	2.29	2.23	1.06	0.99	1.23	1.25
717.3	36.745	43.26	0.49	131	36.66	0.16	2.30	2.24	1.07	0.99	1.23	1.25
717.1	36.909	39.04	0.49	131	36.83	0.16	2.31	2.25	1.07	1.00	1.24	1.26
716.9	37.073	30.46	0.50	131	36.99	0.16	2.32	2.26	1.08	1.00	1.25	1.26
716.8	37.237	24.64	0.46	131	37.16	0.16	2.34	2.28	1.08	1.01	1.25	1.27
716.6	37.401	14.07	0.37	131	37.32	0.16	2.35	2.29	1.09	1.01	1.26	1.28
716.4	37.565	12.20	0.22	131	37.48	0.16	2.36	2.30	1.09	1.02	1.26	1.28
716.3	37.729	18.09	0.08	131	37.65	0.16	2.37	2.31	1.10	1.02	1.27	1.29
716.1	37.893	27.39	0.22	131	37.81	0.16	2.38	2.32	1.10	1.03	1.27	1.29
715.9	38.057	36.08	0.20	131	37.98	0.16	2.39	2.33	1.11	1.03	1.28	1.30
715.8	38.221	39.12	0.23	131	38.14	0.16	2.40	2.34	1.11	1.04	1.29	1.30
715.6	38.385	40.95	0.18	131	38.30	0.16	2.41	2.35	1.12	1.04	1.29	1.31
715.5	38.549	40.01	0.24	131	38.47	0.16	2.42	2.36	1.12	1.05	1.30	1.31
715.3	38.713	34.75	0.25	131	38.63	0.16	2.43	2.37	1.13	1.05	1.30	1.32
715.1	38.877	27.85	0.27	131	38.80	0.16	2.44	2.38	1.13	1.06	1.31	1.33
715.0	39.042	20.86	0.34	131	38.96	0.16	2.45	2.39	1.14	1.06	1.31	1.33
714.8	39.206	22.67	0.34	131	39.12	0.16	2.46	2.40	1.15	1.07	1.32	1.34
714.6	39.370	36.24	0.30	131	39.29	0.16	2.48	2.42	1.15	1.07	1.32	1.34
714.5	39.534	42.78	0.24	131	39.45	0.16	2.49	2.43	1.16	1.08	1.33	1.35
714.3	39.698	35.10	0.41	131	39.62	0.16	2.50	2.44	1.16	1.08	1.34	1.35
714.1	39.862	17.16	0.38	131	39.78	0.16	2.51	2.45	1.17	1.09	1.34	1.36
714.0	40.026	12.19	0.27	131	39.94	0.16	2.52	2.46	1.17	1.09	1.35	1.37
713.8	40.190	13.15	0.08	131	40.11	0.16	2.53	2.47	1.18	1.10	1.35	1.37
713.6	40.354	12.41	0.14	131	40.27	0.16	2.54	2.48	1.18	1.10	1.36	1.38
713.5	40.518	20.99	0.10	131	40.44	0.16	2.55	2.49	1.19	1.11	1.36	1.38
713.3	40.682	22.74	0.07	131	40.60	0.16	2.56	2.50	1.19	1.11	1.37	1.39
713.2	40.846	19.85	0.04	131	40.76	0.16	2.57	2.51	1.20	1.12	1.38	1.39
713.0	41.010	11.09	0.14	131	40.93	0.16	2.58	2.52	1.20	1.12	1.38	1.40
712.8	41.174	8.97	0.31	131	41.09	0.16	2.59	2.53	1.21	1.13	1.39	1.40
712.7	41.338	55.25	0.28	131	41.26	0.16	2.60	2.54	1.21	1.13	1.39	1.41
712.5	41.502	96.74	0.24	131	41.42	0.16	2.62	2.56	1.22	1.14	1.40	1.42
712.3	41.666	111.06	0.48	131	41.58	0.16	2.63	2.57	1.22	1.14	1.40	1.42
712.2	41.830	108.39	0.64	131	41.75	0.16	2.64	2.58	1.23	1.15	1.41	1.43
712.0	41.994	114.27	0.70	131	41.91	0.16	2.65	2.59	1.23	1.15	1.42	1.43
711.8	42.158	120.75	0.72	131	42.08	0.16	2.66	2.60	1.24	1.16	1.42	1.44
711.7	42.322	104.18	0.60	131	42.24	0.16	2.67	2.61	1.24	1.16	1.43	1.44
711.5	42.486	93.94	0.57	131	42.40	0.16	2.68	2.62	1.25	1.17	1.43	1.45
711.3	42.650	83.09	0.57	131	42.57	0.16	2.69	2.63	1.25	1.17	1.44	1.46
711.2	42.814	75.63	0.55	131	42.73	0.16	2.70	2.64	1.26	1.18	1.44	1.46
711.0	42.978	72.66	0.54	131	42.90	0.16	2.71	2.65	1.26	1.18	1.45	1.47
710.9	43.143	69.15	0.51	131	43.06	0.16	2.72	2.66	1.27	1.19	1.45	1.47
710.7	43.307	63.48	0.84	131	43.22	0.16	2.73	2.67	1.27	1.20	1.46	1.48
710.5	43.471	63.32	1.39	131	43.39	0.16	2.74	2.68	1.28	1.20	1.47	1.48

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
710.4	43.635	95.31	4.30	131	43.55	0.16	2.75	2.69	1.28	1.21	1.47	1.49
710.2	43.799	164.73	2.08	131	43.72	0.16	2.77	2.71	1.29	1.21	1.48	1.49
710.0	43.963	167.34	2.08	131	43.88	0.16	2.78	2.72	1.29	1.22	1.48	1.50
709.9	44.127	138.33	1.27	131	44.04	0.16	2.79	2.73	1.30	1.22	1.49	1.51
709.7	44.291	122.45	1.49	131	44.21	0.16	2.80	2.74	1.30	1.23	1.49	1.51
709.5	44.455	92.50	1.10	131	44.37	0.16	2.81	2.75	1.31	1.23	1.50	1.52
709.4	44.619	58.57	0.56	131	44.54	0.16	2.82	2.76	1.31	1.24	1.51	1.52
709.2	44.783	49.60	0.43	131	44.70	0.16	2.83	2.77	1.32	1.24	1.51	1.53
709.1	44.947	44.77	0.47	131	44.86	0.16	2.84	2.78	1.32	1.25	1.52	1.53
708.9	45.111	46.32	0.35	131	45.03	0.16	2.85	2.79	1.33	1.25	1.52	1.54
708.7	45.275	53.77	0.33	131	45.19	0.16	2.86	2.80	1.33	1.26	1.53	1.55
708.6	45.439	60.50	0.42	131	45.36	0.16	2.87	2.81	1.34	1.26	1.53	1.55
708.4	45.603	79.84	0.59	131	45.52	0.16	2.88	2.82	1.34	1.27	1.54	1.56
708.2	45.767	110.85	0.30	131	45.69	0.16	2.89	2.83	1.35	1.27	1.54	1.56
708.1	45.931	127.59	0.37	131	45.85	0.16	2.91	2.85	1.36	1.28	1.55	1.57
707.9	46.095	121.18	0.49	131	46.01	0.16	2.92	2.86	1.36	1.28	1.56	1.57
707.7	46.259	116.02	0.94	131	46.18	0.16	2.93	2.87	1.37	1.29	1.56	1.58
707.6	46.423	142.47	1.73	131	46.34	0.16	2.94	2.88	1.37	1.29	1.57	1.58
707.4	46.587	238.17	0.01	131	46.51	0.16	2.95	2.89	1.38	1.30	1.57	1.59
707.2	46.751	379.45	0.01	131	46.67	0.08	2.96	2.90	1.38	1.30	1.58	1.60

LIQUEFACTION POTENTIAL ASSESSMENT FOR COARSE GRAINED SOILS USING CONE PENETRATION TEST DATA

Project Site: KIF TDEC Stability
Project No.: 175668043
CPT ID: CPT-05A

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
754.0												
753.8	0.164	59.86	13.60	2.90	0.7	1.70	3.87	95	0.00	3.87	0.057	#NUM!
753.7	0.328	1024.21	0.26	0.78	0.5	1.70	233.54	0	0.00	233.54	0.054	#NUM!
753.5	0.492	1225.96	0.61	1.08	0.5	1.70	340.39	0	0.00	340.39	0.052	#NUM!
753.3	0.656	1318.21	0.52	1.00	0.5	1.70	421.40	0	0.00	421.40	0.049	#NUM!
753.2	0.820	808.03	0.72	1.22	0.5	1.70	288.32	0	0.00	288.32	0.046	#NUM!
753.0	0.984	499.24	1.28	1.54	0.5	1.70	194.95	0	0.00	194.95	0.044	#NUM!
752.9	1.148	221.42	3.29	2.07	0.5	1.70	93.38	29	0.00	93.38	0.041	-0.431
752.7	1.312	333.61	2.43	1.86	0.5	1.70	150.26	12	0.00	150.26	0.038	-0.600
752.5	1.476	1604.40	0.81	1.16	0.5	1.70	765.60	0	0.00	765.60	0.035	-0.600
752.4	1.640	1218.60	1.25	1.37	0.5	1.70	612.75	0	0.00	612.75	0.033	-0.600
752.2	1.804	1206.49	1.26	1.37	0.5	1.70	636.08	0	0.00	636.08	0.030	-0.600
752.0	1.968	1143.38	0.88	1.24	0.5	1.70	629.46	0	0.00	629.46	0.027	-0.600
751.9	2.133	1033.88	0.61	1.11	0.5	1.70	592.31	0	0.00	592.31	0.028	-0.600
751.7	2.297	797.43	0.69	1.20	0.5	1.70	474.05	0	0.00	474.05	0.031	-0.600
751.5	2.461	543.30	0.80	1.34	0.5	1.70	334.33	0	0.00	334.33	0.033	-0.600
751.4	2.625	317.93	1.72	1.75	0.5	1.70	199.46	3	0.00	199.46	0.035	-0.600
751.2	2.789	190.35	3.32	2.11	0.5	1.70	121.20	32	0.00	121.20	0.037	-0.512
751.0	2.953	135.02	4.43	2.30	0.5	1.70	87.23	47	0.00	87.23	0.040	-0.369
750.9	3.117	131.60	3.29	2.20	0.5	1.70	86.17	39	0.00	86.17	0.041	-0.363
750.7	3.281	576.48	0.90	1.37	0.5	1.64	368.73	0	0.00	368.73	0.039	-0.600
750.6	3.445	656.77	0.64	1.22	0.5	1.63	422.56	0	0.00	422.56	0.038	-0.600
750.4	3.609	887.36	0.62	1.14	0.5	1.62	574.15	0	0.00	574.15	0.037	-0.600
750.2	3.773	701.60	0.85	1.31	0.5	1.61	456.61	0	0.00	456.61	0.036	-0.600
750.1	3.937	463.70	1.65	1.65	0.5	1.60	303.58	0	0.00	303.58	0.035	-0.600
749.9	4.101	275.27	3.13	2.00	0.5	1.70	193.59	23	0.00	193.59	0.032	-0.600
749.7	4.265	186.59	4.73	2.24	0.5	1.70	132.82	42	0.00	132.82	0.030	-0.543
749.6	4.429	114.40	8.20	2.56	0.5	1.70	82.49	68	0.00	82.49	0.027	-0.337
749.4	4.593	149.90	4.31	2.26	0.5	1.70	109.13	44	0.00	109.13	0.025	-0.454
749.2	4.757	272.73	1.79	1.80	0.5	1.70	200.31	7	0.00	200.31	0.022	-0.600
749.1	4.921	309.39	1.81	1.77	0.5	1.65	222.40	5	0.00	222.40	0.020	-0.600
748.9	5.085	119.45	4.47	2.33	0.5	1.70	89.94	50	69.62	159.56	0.016	-0.600
748.8	5.249	534.68	1.23	1.50	0.5	1.53	365.23	0	0.00	365.23	0.013	-0.600
748.6	5.413	736.66	1.48	1.52	0.5	1.52	506.05	0	0.00	506.05	0.012	-0.600
748.4	5.577	691.95	0.88	1.32	0.5	1.51	478.15	0	0.00	478.15	0.015	-0.600
748.3	5.741	803.60	1.09	1.38	0.5	1.50	558.41	0	0.00	558.41	0.013	-0.600
748.1	5.905	736.10	1.52	1.53	0.5	1.49	514.40	0	0.00	514.40	0.010	-0.600
747.9	6.069	461.97	2.89	1.86	0.5	1.48	324.78	12	25.19	349.97	0.008	-0.600
747.8	6.234	410.92	3.49	1.96	0.5	1.47	290.49	20	61.96	352.45	0.006	-0.600
747.6	6.398	270.62	4.30	2.12	0.5	1.46	192.49	33	79.27	271.75	0.004	-0.600
747.4	6.562	261.88	3.97	2.10	0.5	1.46	187.24	31	75.18	262.41	0.003	-0.600
747.3	6.726	251.82	3.43	2.05	0.5	1.46	182.31	27	67.23	249.55	0.002	-0.600
747.1	6.890	398.26	2.08	1.77	0.5	1.44	287.31	4	0.08	287.39	0.001	-0.600
746.9	7.054	412.97	2.45	1.82	0.5	1.43	299.34	9	7.75	307.09	0.001	-0.600
746.8	7.218	423.00	2.10	1.76	0.5	1.42	308.04	4	0.01	308.05	0.001	-0.600
746.6	7.382	457.83	1.93	1.71	0.5	1.42	334.89	0	0.00	334.89	0.002	-0.600
746.5	7.546	467.98	1.70	1.66	0.5	1.41	343.85	0	0.00	343.85	0.003	-0.600
746.3	7.710	621.51	1.08	1.42	0.5	1.40	458.50	0	0.00	458.50	0.005	-0.600
746.1	7.874	661.97	1.22	1.46	0.5	1.40	490.44	0	0.00	490.44	0.006	-0.600
746.0	8.038	678.50	0.93	1.35	0.5	1.39	504.82	0	0.00	504.82	0.007	-0.600
745.8	8.202	741.94	1.27	1.45	0.5	1.38	554.29	0	0.00	554.29	0.009	-0.600
745.6	8.366	559.97	1.37	1.54	0.5	1.38	420.23	0	0.00	420.23	0.010	-0.600
745.5	8.530	354.90	2.24	1.82	0.5	1.37	267.66	9	6.85	274.51	0.011	-0.600
745.3	8.694	304.46	2.56	1.90	0.5	1.37	230.63	15	35.50	266.14	0.012	-0.600
745.1	8.858	153.99	4.18	2.24	0.5	1.47	126.62	42	74.54	201.16	0.013	-0.600
745.0	9.022	117.30	5.37	2.40	0.5	1.52	100.89	55	75.09	175.98	0.014	-0.600
744.8	9.186	101.65	4.39	2.37	0.5	1.55	90.02	52	71.01	161.03	0.015	-0.600
744.6	9.350	122.90	3.15	2.20	0.5	1.51	106.56	39	67.10	173.65	0.016	-0.600
744.5	9.514	121.36	3.05	2.20	0.5	1.50	105.73	39	66.37	172.10	0.017	-0.600
744.3	9.678	102.07	2.20	2.14	0.5	1.55	92.44	34	58.90	151.34	0.018	-0.590
744.2	9.842	69.16	3.80	2.43	0.5	1.59	65.36	57	66.16	131.52	0.019	-0.524

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
744.0	10.006	56.85	4.15	2.51	0.5	1.62	55.14	64	65.31	120.46	0.020	-0.484
743.8	10.170	107.91	2.11	2.11	0.5	1.51	97.55	32	57.37	154.92	0.021	-0.600
743.7	10.335	103.74	3.11	2.25	0.5	1.49	93.23	43	66.41	159.65	0.022	-0.600
743.5	10.499	94.53	3.52	2.31	0.5	1.50	85.99	48	67.82	153.81	0.023	-0.596
743.3	10.663	71.54	5.63	2.55	0.7	1.57	56.65	67	66.41	123.07	0.024	-0.492
743.2	10.827	68.56	5.69	2.56	0.7	1.57	54.76	68	66.15	120.90	0.026	-0.484
743.0	10.991	81.17	3.99	2.40	0.5	1.50	75.54	55	68.08	143.62	0.027	-0.563
742.8	11.155	90.95	3.61	2.33	0.5	1.47	83.57	50	67.98	151.54	0.028	-0.588
742.7	11.319	109.34	2.88	2.21	0.5	1.43	98.57	40	65.34	163.91	0.029	-0.600
742.5	11.483	168.51	1.72	1.91	0.5	1.40	148.40	16	30.96	179.37	0.030	-0.600
742.4	11.647	97.69	4.23	2.37	0.5	1.43	88.99	52	70.66	159.65	0.031	-0.600
742.2	11.811	86.82	4.88	2.45	0.5	1.44	80.31	59	70.82	151.13	0.032	-0.585
742.0	11.975	74.57	6.60	2.59	0.7	1.48	60.11	70	68.18	128.28	0.033	-0.509
741.9	12.139	60.94	5.44	2.58	0.5	1.48	59.00	69	67.70	126.70	0.034	-0.503
741.7	12.303	62.44	5.46	2.58	0.5	1.47	60.32	69	67.98	128.31	0.034	-0.509
741.5	12.467	122.15	3.17	2.21	0.5	1.36	109.31	40	68.03	177.33	0.035	-0.600
741.4	12.631	145.69	3.65	2.21	0.5	1.32	127.05	40	72.38	199.43	0.036	-0.600
741.2	12.795	155.30	3.56	2.18	0.5	1.31	134.55	38	72.27	206.82	0.037	-0.600
741.0	12.959	113.06	3.51	2.26	0.5	1.35	102.43	44	69.65	172.08	0.038	-0.600
740.9	13.123	76.01	4.36	2.45	0.5	1.41	72.19	59	68.52	140.71	0.039	-0.550
740.7	13.287	64.61	4.06	2.47	0.5	1.42	62.62	61	66.45	129.07	0.039	-0.510
740.5	13.451	46.25	4.28	2.59	0.5	1.46	46.48	70	64.13	110.61	0.040	-0.441
740.4	13.615	44.91	4.27	2.59	0.7	1.47	39.41	71	62.20	101.61	0.041	-0.404
740.2	13.779	57.25	1.92	2.28	0.5	1.43	56.86	45	58.82	115.68	0.041	-0.460
740.1	13.943	62.36	1.56	2.19	0.5	1.42	61.71	38	55.57	117.28	0.042	-0.466
739.9	14.107	57.18	1.22	2.15	0.5	1.43	57.38	35	52.17	109.54	0.043	-0.435
739.7	14.271	61.10	1.03	2.09	0.5	1.42	61.31	30	47.71	109.02	0.043	-0.433
739.6	14.436	62.60	1.16	2.11	0.5	1.41	62.49	32	49.93	112.42	0.044	-0.446
739.4	14.600	44.57	1.55	2.30	0.5	1.42	45.53	47	56.85	102.38	0.045	-0.405
739.2	14.764	45.44	1.83	2.34	0.5	1.41	46.25	50	58.37	104.62	0.046	-0.414
739.1	14.928	27.62	2.25	2.57	0.7	1.45	25.90	68	57.85	83.75	0.046	-0.321
738.9	15.092	20.09	0.96	2.48	0.5	1.46	22.10	61	55.23	77.33	0.047	-0.289
738.7	15.256	34.44	0.50	2.14	0.5	1.44	36.60	34	46.52	83.12	0.048	-0.318
738.6	15.420	44.66	0.48	2.03	0.5	1.42	46.84	26	39.14	85.98	0.049	-0.331
738.4	15.584	50.16	0.75	2.08	0.5	1.39	51.58	29	45.15	96.73	0.050	-0.380
738.3	15.748	55.05	0.66	2.02	0.5	1.39	56.59	24	39.02	95.61	0.051	-0.375
738.1	15.912	56.94	0.86	2.07	0.5	1.37	57.89	28	44.96	102.85	0.052	-0.405
737.9	16.076	58.50	1.35	2.17	0.5	1.34	58.71	37	53.77	112.48	0.052	-0.444
737.8	16.240	61.91	0.54	1.93	0.5	1.38	63.98	17	26.30	90.27	0.053	-0.350
737.6	16.404	49.74	0.60	2.03	0.5	1.37	51.54	26	40.36	91.90	0.054	-0.357
737.4	16.568	51.38	1.07	2.16	0.5	1.34	52.35	36	51.37	103.72	0.055	-0.408
737.3	16.732	51.02	0.49	1.98	0.5	1.36	53.20	22	33.76	86.96	0.056	-0.334
737.1	16.896	50.71	0.36	1.93	0.5	1.38	53.59	17	24.32	77.91	0.056	-0.289
736.9	17.060	50.69	0.41	1.95	0.5	1.36	53.20	19	29.19	82.39	0.056	-0.312
736.8	17.224	48.94	0.80	2.11	0.5	1.33	50.36	31	47.05	97.41	0.056	-0.381
736.6	17.388	58.07	1.63	2.23	0.5	1.29	58.29	41	56.79	115.09	0.056	-0.452
736.4	17.552	91.07	0.82	1.89	0.5	1.29	91.17	14	19.38	110.55	0.056	-0.435
736.3	17.716	102.08	1.85	2.09	0.5	1.24	97.95	30	54.88	152.83	0.055	-0.582
736.1	17.880	79.84	2.07	2.20	0.5	1.25	78.00	39	59.69	137.69	0.055	-0.533
736.0	18.044	56.05	3.08	2.43	0.5	1.27	56.14	57	63.54	119.68	0.055	-0.469
735.8	18.208	60.21	0.77	2.02	0.5	1.29	61.39	25	40.31	101.70	0.056	-0.398
735.6	18.372	50.51	0.72	2.07	0.5	1.29	52.06	28	44.06	96.12	0.058	-0.373
735.5	18.537	38.24	1.12	2.27	0.5	1.29	39.84	45	54.30	94.14	0.059	-0.365
735.3	18.701	31.68	2.21	2.51	0.5	1.28	33.32	64	59.09	92.41	0.061	-0.357
735.1	18.865	29.09	3.87	2.70	1.0	1.29	24.74	79	59.30	84.04	0.062	-0.317
735.0	19.029	31.49	3.47	2.64	0.7	1.27	30.36	74	60.25	90.61	0.064	-0.348
734.8	19.193	35.37	3.33	2.59	0.5	1.26	36.81	70	61.44	98.25	0.065	-0.382
734.6	19.357	40.02	3.54	2.57	0.7	1.25	37.97	69	61.44	99.41	0.065	-0.386
734.5	19.521	34.37	1.76	2.43	0.5	1.25	35.98	57	57.98	93.96	0.066	-0.362
734.3	19.685	32.76	3.13	2.60	0.7	1.25	31.69	71	60.05	91.74	0.067	-0.352
734.2	19.849	30.65	3.00	2.61	0.7	1.25	29.85	72	59.66	89.51	0.068	-0.342
734.0	20.013	30.61	3.12	2.62	0.7	1.24	29.85	73	59.82	89.67	0.068	-0.342
733.8	20.177	33.02	3.17	2.60	0.7	1.24	32.07	71	60.17	92.24	0.069	-0.354
733.7	20.341	31.43	2.29	2.53	0.5	1.23	33.09	65	59.27	92.36	0.070	-0.354
733.5	20.505	32.64	2.78	2.57	0.5	1.22	34.24	68	60.29	94.53	0.071	-0.364
733.3	20.669	25.36	2.17	2.59	0.5	1.23	27.16	70	58.51	85.68	0.071	-0.323

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
733.2	20.833	10.80	6.18	3.16	1.0	1.25	10.72	100	57.26	67.98	0.072	-0.231
733.0	20.997	17.65	3.07	2.80	1.0	1.23	16.49	87	57.83	74.33	0.073	-0.266
732.8	21.161	9.46	4.46	3.12	1.0	1.24	9.65	100	56.93	66.58	0.073	-0.223
732.7	21.325	7.51	4.13	3.18	1.0	1.24	8.03	100	56.43	64.45	0.074	-0.210
732.5	21.489	7.19	2.15	3.04	1.0	1.23	7.78	100	56.35	64.12	0.075	-0.208
732.3	21.653	6.36	1.76	3.04	1.0	1.23	7.09	100	56.13	63.22	0.075	-0.202
732.2	21.817	4.88	1.71	3.14	1.0	1.22	5.83	100	55.74	61.57	0.076	-0.192
732.0	21.981	5.12	1.39	3.08	1.0	1.22	6.05	100	55.81	61.87	0.077	-0.194
731.9	22.145	5.48	1.29	3.04	1.0	1.21	6.39	100	55.92	62.31	0.077	-0.196
731.7	22.309	5.70	1.59	3.06	1.0	1.21	6.60	100	55.98	62.58	0.078	-0.198
731.5	22.473	5.80	1.98	3.10	1.0	1.20	6.71	100	56.02	62.73	0.079	-0.199
731.4	22.638	6.29	1.79	3.05	1.0	1.20	7.16	100	56.16	63.31	0.079	-0.202
731.2	22.802	9.00	1.53	2.88	1.0	1.19	9.55	93	56.34	65.90	0.080	-0.217
731.0	22.966	9.62	3.35	3.04	1.0	1.18	10.12	100	57.08	67.20	0.081	-0.224
730.9	23.130	13.21	2.69	2.87	1.0	1.18	13.30	93	57.41	70.72	0.081	-0.244
730.7	23.294	14.23	2.80	2.85	1.0	1.17	14.24	91	57.58	71.81	0.082	-0.249
730.5	23.458	13.77	4.75	3.01	1.0	1.17	13.87	100	58.24	72.10	0.083	-0.251
730.4	23.622	11.98	10.11	3.27	1.0	1.16	12.32	100	57.76	70.08	0.083	-0.240
730.2	23.786	27.07	3.22	2.67	1.0	1.15	25.62	77	59.21	84.83	0.084	-0.315
730.1	23.950	6.62	12.42	3.52	1.0	1.16	7.61	100	56.30	63.91	0.085	-0.204
729.9	24.114	12.79	2.13	2.83	1.0	1.15	13.16	89	57.01	70.17	0.086	-0.240
729.7	24.278	12.33	1.71	2.79	1.0	1.15	12.79	86	56.57	69.36	0.086	-0.235
729.6	24.442	10.64	1.89	2.87	1.0	1.14	11.30	92	56.76	68.06	0.087	-0.227
729.4	24.606	13.13	1.46	2.73	1.0	1.14	13.58	81	56.25	69.83	0.088	-0.237
729.2	24.770	13.49	1.40	2.71	1.0	1.13	13.94	80	56.17	70.11	0.088	-0.239
729.1	24.934	13.43	1.92	2.78	1.0	1.13	13.92	86	56.87	70.79	0.089	-0.242
728.9	25.098	14.99	1.68	2.71	1.0	1.12	15.37	80	56.60	71.97	0.089	-0.248
728.7	25.262	17.88	2.29	2.72	1.0	1.12	18.03	81	57.53	75.56	0.090	-0.267
728.6	25.426	25.70	2.71	2.64	1.0	1.11	25.14	74	58.69	83.83	0.091	-0.309
728.4	25.590	33.66	2.19	2.49	0.5	1.10	35.38	62	59.25	94.64	0.091	-0.359
728.2	25.754	30.39	2.43	2.55	0.5	1.10	32.15	67	59.46	91.61	0.092	-0.345
728.1	25.918	26.60	2.44	2.60	1.0	1.10	26.17	71	58.44	84.61	0.093	-0.312
727.9	26.082	22.83	4.87	2.85	1.0	1.10	22.78	91	60.12	82.91	0.093	-0.304
727.8	26.246	20.34	6.26	2.96	1.0	1.09	20.55	100	60.27	80.82	0.094	-0.293
727.6	26.410	30.95	4.42	2.72	1.0	1.09	30.34	81	61.19	91.53	0.095	-0.344
727.4	26.574	27.56	3.89	2.72	1.0	1.08	27.33	81	60.28	87.60	0.095	-0.326
727.3	26.739	26.04	3.66	2.72	1.0	1.08	26.00	81	59.89	85.89	0.096	-0.317
727.1	26.903	25.27	3.46	2.71	1.0	1.08	25.36	80	59.63	84.99	0.097	-0.313
726.9	27.067	25.09	3.62	2.73	1.0	1.08	25.26	81	59.77	85.03	0.097	-0.313
726.8	27.231	25.55	3.62	2.72	1.0	1.07	25.75	81	59.85	85.60	0.098	-0.316
726.6	27.395	25.48	3.88	2.74	1.0	1.07	25.75	83	60.07	85.82	0.098	-0.317
726.4	27.559	24.74	4.32	2.78	1.0	1.07	25.12	86	60.29	85.41	0.099	-0.314
726.3	27.723	24.32	4.74	2.82	1.0	1.06	24.79	88	60.49	85.27	0.100	-0.314
726.1	27.887	26.69	4.60	2.78	1.0	1.06	27.09	85	60.82	87.91	0.100	-0.326
725.9	28.051	26.49	4.88	2.80	1.0	1.06	26.97	87	60.98	87.95	0.101	-0.326
725.8	28.215	26.92	4.59	2.78	1.0	1.05	27.45	85	60.90	88.35	0.101	-0.328
725.6	28.379	25.74	4.50	2.78	1.0	1.05	26.40	86	60.66	87.06	0.102	-0.321
725.5	28.543	24.83	4.45	2.79	1.0	1.05	25.60	86	60.50	86.10	0.103	-0.317
725.3	28.707	23.84	4.61	2.82	1.0	1.04	24.72	88	60.45	85.16	0.103	-0.312
725.1	28.871	23.29	4.40	2.81	1.0	1.04	24.25	88	60.25	84.51	0.104	-0.309
725.0	29.035	23.16	4.44	2.81	1.0	1.04	24.19	88	60.27	84.46	0.104	-0.308
724.8	29.199	24.03	4.47	2.80	1.0	1.04	25.08	87	60.46	85.54	0.105	-0.313
724.6	29.363	25.78	4.13	2.76	1.0	1.03	26.84	84	60.55	87.39	0.105	-0.322
724.5	29.527	28.17	6.61	2.87	1.0	1.03	29.23	93	62.31	91.53	0.106	-0.341
724.3	29.691	35.78	3.90	2.64	1.0	1.03	36.69	74	62.03	98.72	0.106	-0.373
724.1	29.855	29.91	6.22	2.83	1.0	1.02	31.06	90	62.55	93.61	0.107	-0.350
724.0	30.019	40.24	5.71	2.72	1.0	1.02	41.23	80	64.42	105.66	0.107	-0.401
723.8	30.183	35.12	6.17	2.78	1.0	1.02	36.33	86	63.66	100.00	0.107	-0.378
723.7	30.347	41.34	4.90	2.66	1.0	1.01	42.53	76	64.10	106.63	0.108	-0.405
723.5	30.511	28.71	5.99	2.83	1.0	1.01	30.20	90	62.29	92.49	0.109	-0.345
723.3	30.675	22.55	5.18	2.87	1.0	1.01	24.18	92	60.73	84.91	0.110	-0.309
723.2	30.840	19.51	3.07	2.77	1.0	1.01	21.22	84	58.95	80.17	0.111	-0.286
723.0	31.004	19.57	3.16	2.78	1.0	1.01	21.33	85	59.05	80.38	0.112	-0.287
722.8	31.168	22.15	3.08	2.73	1.0	1.00	23.95	81	59.34	83.29	0.113	-0.301
722.7	31.332	26.49	3.00	2.66	1.0	1.00	28.35	76	59.86	88.21	0.114	-0.324
722.5	31.496	31.67	2.14	2.51	0.5	1.00	33.52	64	59.00	92.52	0.114	-0.344

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722.3	31.660	46.63	0.94	2.16	0.5	0.99	48.49	36	50.62	99.11	0.115	-0.373
722.2	31.824	46.27	0.65	2.08	0.5	0.99	48.13	29	44.19	92.32	0.115	-0.343
722.0	31.988	42.00	0.55	2.08	0.5	0.99	43.85	29	43.57	87.42	0.115	-0.320
721.8	32.152	34.01	0.64	2.19	0.5	0.99	35.85	39	49.64	85.49	0.115	-0.311
721.7	32.316	20.30	1.16	2.52	0.5	0.98	22.15	64	55.92	78.06	0.116	-0.274
721.5	32.480	13.85	1.64	2.73	1.0	0.98	15.94	82	57.02	72.96	0.116	-0.247
721.4	32.644	11.37	2.05	2.86	1.0	0.98	13.45	92	57.37	70.82	0.116	-0.235
721.2	32.808	10.05	1.66	2.86	1.0	0.98	12.13	92	56.96	69.09	0.116	-0.225
721.0	32.972	9.23	2.03	2.93	1.0	0.97	11.32	98	57.26	68.57	0.116	-0.222
720.9	33.136	10.71	2.08	2.88	1.0	0.97	12.85	94	57.39	70.24	0.117	-0.232
720.7	33.300	15.30	1.53	2.68	1.0	0.97	17.60	78	56.95	74.55	0.117	-0.255
720.5	33.464	14.98	1.17	2.63	1.0	0.97	17.30	74	56.26	73.56	0.118	-0.249
720.4	33.628	14.84	1.01	2.60	1.0	0.96	17.19	71	55.87	73.06	0.119	-0.246
720.2	33.792	9.16	1.17	2.82	1.0	0.96	11.36	89	56.41	67.77	0.119	-0.217
720.0	33.956	6.38	1.87	3.05	1.0	0.96	8.50	100	56.57	65.08	0.120	-0.202
719.9	34.120	5.74	2.95	3.19	1.0	0.95	7.85	100	56.37	64.22	0.120	-0.196
719.7	34.284	8.61	1.64	2.91	1.0	0.95	10.85	96	56.97	67.83	0.121	-0.217
719.6	34.448	11.36	1.82	2.83	1.0	0.95	13.75	90	57.25	71.00	0.121	-0.235
719.4	34.612	17.64	1.35	2.60	1.0	0.95	20.34	71	56.74	77.08	0.122	-0.267
719.2	34.776	33.48	0.81	2.25	0.5	0.95	35.34	43	52.17	87.51	0.122	-0.318
719.1	34.941	36.41	0.80	2.22	0.5	0.95	38.28	40	51.32	89.60	0.122	-0.328
718.9	35.105	40.90	0.65	2.12	0.5	0.95	42.76	33	46.89	89.66	0.123	-0.328
718.7	35.269	44.28	0.54	2.06	0.5	0.94	46.11	28	41.75	87.87	0.123	-0.319
718.6	35.433	42.91	0.65	2.11	0.5	0.94	44.79	32	45.93	90.72	0.124	-0.332
718.4	35.597	34.26	1.18	2.33	0.5	0.94	36.16	49	55.21	91.38	0.124	-0.335
718.2	35.761	22.61	5.02	2.86	1.0	0.94	25.99	92	61.20	87.19	0.124	-0.316
718.1	35.925	19.44	6.42	2.98	1.0	0.93	22.65	100	60.96	83.61	0.125	-0.298
717.9	36.089	87.20	2.45	2.22	0.5	0.95	90.48	41	64.21	154.70	0.125	-0.569
717.7	36.253	82.77	1.87	2.15	0.5	0.94	85.83	35	58.54	144.37	0.125	-0.537
717.6	36.417	40.35	3.06	2.53	0.5	0.93	42.43	65	61.92	104.35	0.126	-0.391
717.4	36.581	41.49	1.09	2.24	0.5	0.93	43.48	42	53.71	97.18	0.126	-0.360
717.3	36.745	35.83	1.20	2.31	0.5	0.92	37.76	48	55.25	93.01	0.127	-0.342
717.1	36.909	32.05	1.33	2.38	0.5	0.92	33.96	53	56.26	90.23	0.127	-0.329
716.9	37.073	24.51	1.79	2.55	0.5	0.92	26.38	67	57.71	84.08	0.127	-0.300
716.8	37.237	17.82	2.06	2.70	1.0	0.91	21.24	79	58.22	79.46	0.128	-0.277
716.6	37.401	9.32	3.15	3.03	1.0	0.91	12.04	100	57.67	69.71	0.128	-0.225
716.4	37.565	7.79	2.19	3.01	1.0	0.90	10.40	100	57.16	67.57	0.128	-0.213
716.3	37.729	13.57	0.48	2.51	0.5	0.90	15.40	64	53.84	69.23	0.129	-0.222
716.1	37.893	21.54	0.89	2.44	0.5	0.90	23.36	58	54.69	78.06	0.129	-0.269
715.9	38.057	28.95	0.59	2.24	0.5	0.90	30.75	42	50.54	81.30	0.129	-0.285
715.8	38.221	31.49	0.63	2.22	0.5	0.90	33.30	40	50.25	83.56	0.130	-0.296
715.6	38.385	32.98	0.47	2.14	0.5	0.90	34.74	35	46.51	81.25	0.130	-0.285
715.5	38.549	32.09	0.64	2.21	0.5	0.90	33.91	40	50.19	84.11	0.130	-0.298
715.3	38.713	27.53	0.76	2.31	0.5	0.89	29.36	48	52.93	82.28	0.131	-0.289
715.1	38.877	21.60	1.04	2.47	0.5	0.89	23.43	60	55.41	78.84	0.131	-0.272
715.0	39.042	14.01	1.84	2.76	1.0	0.89	17.47	84	57.71	75.18	0.131	-0.253
714.8	39.206	15.31	1.67	2.70	1.0	0.88	18.95	79	57.58	76.53	0.131	-0.260
714.6	39.370	28.52	0.89	2.33	0.5	0.89	30.37	49	53.80	84.16	0.132	-0.298
714.5	39.534	33.96	0.59	2.18	0.5	0.88	35.77	37	48.68	84.45	0.132	-0.299
714.3	39.698	27.42	1.26	2.42	0.5	0.88	29.30	57	56.08	85.38	0.132	-0.304
714.1	39.862	10.92	2.59	2.93	1.0	0.87	14.17	97	58.11	72.28	0.132	-0.237
714.0	40.026	7.17	2.76	3.10	1.0	0.87	10.01	100	57.04	67.04	0.133	-0.208
713.8	40.190	7.85	0.79	2.81	1.0	0.87	10.77	88	56.13	66.90	0.133	-0.207
713.6	40.354	7.26	1.39	2.94	1.0	0.86	10.14	98	56.96	67.10	0.133	-0.208
713.5	40.518	15.34	0.55	2.48	0.5	0.86	17.16	61	53.84	70.99	0.133	-0.229
713.3	40.682	16.76	0.37	2.38	0.5	0.86	18.54	53	52.04	70.58	0.134	-0.227
713.2	40.846	14.32	0.24	2.39	0.5	0.86	16.12	54	51.64	67.75	0.134	-0.211
713.0	41.010	6.16	1.61	3.04	1.0	0.86	8.97	100	56.72	65.69	0.134	-0.199
712.8	41.174	4.60	4.91	3.40	1.0	0.85	7.22	100	56.18	63.40	0.134	-0.186
712.7	41.338	43.37	0.54	2.06	0.5	0.87	45.18	28	42.32	87.51	0.135	-0.312
712.5	41.502	77.39	0.25	1.70	0.5	0.86	78.44	0	0.00	78.44	0.135	-0.268
712.3	41.666	88.97	0.44	1.75	0.5	0.86	90.63	3	0.00	90.64	0.135	-0.327
712.2	41.830	86.60	0.60	1.83	0.5	0.86	88.50	9	5.98	94.48	0.135	-0.344
712.0	41.994	91.23	0.63	1.82	0.5	0.86	93.30	9	4.22	97.52	0.135	-0.357
711.8	42.158	96.33	0.61	1.80	0.5	0.86	98.54	7	1.15	99.69	0.136	-0.366
711.7	42.322	82.64	0.59	1.84	0.5	0.86	84.46	10	8.38	92.84	0.136	-0.336

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
711.5	42.486	74.14	0.63	1.90	0.5	0.86	76.19	15	20.30	96.49	0.136	-0.352
711.3	42.650	65.19	0.71	1.97	0.5	0.86	67.50	21	34.11	101.61	0.136	-0.374
711.2	42.814	59.02	0.75	2.02	0.5	0.86	61.32	25	40.45	101.78	0.136	-0.375
711.0	42.978	56.50	0.77	2.04	0.5	0.86	58.79	26	42.58	101.37	0.137	-0.373
710.9	43.143	53.55	0.77	2.06	0.5	0.85	55.79	28	44.33	100.13	0.137	-0.367
710.7	43.307	48.87	1.39	2.24	0.5	0.86	51.37	42	55.82	107.19	0.137	-0.396
710.5	43.471	48.65	2.29	2.38	0.5	0.86	51.32	54	61.01	112.33	0.137	-0.417
710.4	43.635	74.18	4.65	2.47	0.5	0.88	78.88	61	71.12	150.00	0.137	-0.549
710.2	43.799	129.57	1.29	1.90	0.5	0.88	137.09	15	26.20	163.29	0.136	-0.589
710.0	43.963	131.40	1.26	1.89	0.5	0.88	138.99	14	23.37	162.36	0.136	-0.586
709.9	44.127	108.02	0.94	1.87	0.5	0.86	112.48	12	15.49	127.98	0.136	-0.475
709.7	44.291	95.18	1.24	1.99	0.5	0.87	100.26	22	41.69	141.96	0.135	-0.522
709.5	44.455	71.21	1.22	2.08	0.5	0.86	74.79	29	49.69	124.48	0.135	-0.462
709.4	44.619	44.18	1.00	2.19	0.5	0.84	46.40	39	52.18	98.58	0.134	-0.360
709.2	44.783	37.00	0.93	2.24	0.5	0.83	39.00	42	52.73	91.74	0.134	-0.329
709.1	44.947	33.10	1.11	2.32	0.5	0.83	35.08	49	54.90	89.98	0.134	-0.321
708.9	45.111	34.25	0.80	2.24	0.5	0.83	36.16	42	51.83	88.00	0.133	-0.312
708.7	45.275	40.04	0.64	2.13	0.5	0.83	41.94	34	47.25	89.19	0.133	-0.317
708.6	45.439	45.24	0.73	2.11	0.5	0.83	47.31	32	46.89	94.20	0.133	-0.340
708.4	45.603	60.31	0.76	2.02	0.5	0.83	62.78	24	40.19	102.97	0.133	-0.377
708.2	45.767	84.45	0.28	1.68	0.5	0.82	85.70	0	0.00	85.70	0.133	-0.300
708.1	45.931	97.37	0.29	1.63	0.5	0.83	99.70	0	0.00	99.70	0.133	-0.363
707.9	46.095	92.19	0.42	1.72	0.5	0.82	94.05	1	0.00	94.05	0.133	-0.339
707.7	46.259	88.00	0.83	1.90	0.5	0.83	91.45	15	23.21	114.66	0.133	-0.424
707.6	46.423	108.37	1.24	1.95	0.5	0.85	114.98	19	35.26	150.24	0.133	-0.547
707.4	46.587	182.36	0.15	1.27	0.5	0.88	197.32	0	0.00	197.32	0.133	-0.600
707.2	46.751	291.36	0.15	1.08	0.5	0.90	322.84	0	0.00	322.84	0.133	-0.600

LIQUEFACTION POTENTIAL ASSESSMENT FOR COARSE GRAINED SOILS USING CONE PENETRATION TEST DATA

Project Site: **KIF TDEC Stability**
Stantec Project No.: **175668043**
CPT ID: **CPT-05A**

Depth to Water during Earthquake:	5.0	ft
Final Grade Elevation during EQ:	753.0	ft
Height of Final Grade above CPT TOH:	-1.0	ft
Normalize K_σ to:	1.058	tsf
a_{max} at top of ground surface:	0.21	g
Earthquake Magnitude:	6.00	M_W
Earthquake File or Source Zone:	10	Hz

Shear Stress Fit Parameters

m4:	0
m3:	0
m2:	0
m1:	0

Elev. (ft)	Depth *z* (ft)	Cyclic Resistance Ratio *CRR 7.5*	Relative Density *D r* (%)	Correction for Overburden Pressure *K σ*	Correction for Sloping Ground *K α*	Magnitude Scaling Factor *MSF*	Cyclic Resistance Ratio *CRR*	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress *τ Max* (psf)	From Ground Response: Average Cyclic Shear Stress *τ Avg* (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. *(qc 1N) CS ≥ 175*	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
754.0																	
753.8	0.164	0.063	0	#NUM!	N/A	1.05	N/A	1.000	0	0	**0.136**	FALSE	FALSE	TRUE	**N/A**	**Fly Ash**	**B**
753.7	0.328	N/A	95	N/A	N/A	N/A	N/A	1.000	0	0	**0.136**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
753.5	0.492	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.136**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
753.3	0.656	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.136**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
753.2	0.820	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.136**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
753.0	0.984	N/A	86	N/A	N/A	N/A	N/A	1.000	0	0	**0.136**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
752.9	1.148	0.129	52	1.100	N/A	1.14	N/A	1.000	0	0	**0.136**	FALSE	FALSE	TRUE	**N/A**	**Fly Ash**	**A1**
752.7	1.312	0.290	73	1.100	N/A	1.40	N/A	1.000	0	0	**0.136**	FALSE	FALSE	TRUE	**N/A**	**Fly Ash**	**A1**
752.5	1.476	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.136**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
752.4	1.640	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.136**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
752.2	1.804	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.136**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
752.0	1.968	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.136**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
751.9	2.133	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.136**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
751.7	2.297	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.136**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
751.5	2.461	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.136**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
751.4	2.625	N/A	87	N/A	N/A	N/A	N/A	1.000	0	0	**0.136**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
751.2	2.789	0.174	63	1.100	N/A	1.24	N/A	1.000	0	0	**0.136**	FALSE	FALSE	TRUE	**N/A**	**Fly Ash**	**A1**
751.0	2.953	0.123	49	1.100	N/A	1.12	N/A	1.000	0	0	**0.136**	FALSE	FALSE	TRUE	**N/A**	**Fly Ash**	**A1**
750.9	3.117	0.122	49	1.100	N/A	1.12	N/A	0.999	0	0	**0.136**	FALSE	FALSE	TRUE	**N/A**	**Fly Ash**	**A1**
750.7	3.281	N/A	100	N/A	N/A	N/A	N/A	0.999	0	0	**0.136**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
750.6	3.445	N/A	100	N/A	N/A	N/A	N/A	0.998	0	0	**0.136**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
750.4	3.609	N/A	100	N/A	N/A	N/A	N/A	0.997	0	0	**0.136**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
750.2	3.773	N/A	100	N/A	N/A	N/A	N/A	0.996	0	0	**0.136**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
750.1	3.937	N/A	100	N/A	N/A	N/A	N/A	0.996	0	0	**0.136**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
749.9	4.101	N/A	86	N/A	N/A	N/A	N/A	0.995	0	0	**0.136**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
749.7	4.265	0.207	68	1.100	N/A	1.30	N/A	0.994	0	0	**0.135**	FALSE	FALSE	TRUE	**N/A**	**Fly Ash**	**A1**
749.6	4.429	0.118	47	1.100	N/A	1.11	N/A	0.993	0	0	**0.135**	FALSE	FALSE	TRUE	**N/A**	**Fly Ash**	**B**
749.4	4.593	0.151	59	1.100	N/A	1.19	N/A	0.993	0	0	**0.135**	FALSE	FALSE	TRUE	**N/A**	**Fly Ash**	**A1**
749.2	4.757	N/A	87	N/A	N/A	N/A	N/A	0.992	0	0	**0.135**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
749.1	4.921	N/A	93	N/A	N/A	N/A	N/A	0.991	0	0	**0.135**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
748.9	5.085	N/A	76	N/A	N/A	N/A	N/A	0.990	0	0	**0.136**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
748.8	5.249	N/A	100	N/A	N/A	N/A	N/A	0.989	0	0	**0.139**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
748.6	5.413	N/A	100	N/A	N/A	N/A	N/A	0.989	0	0	**0.142**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
748.4	5.577	N/A	100	N/A	N/A	N/A	N/A	0.988	0	0	**0.145**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
748.3	5.741	N/A	100	N/A	N/A	N/A	N/A	0.987	0	0	**0.147**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
748.1	5.905	N/A	100	N/A	N/A	N/A	N/A	0.986	0	0	**0.149**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
747.9	6.069	N/A	100	N/A	N/A	N/A	N/A	0.985	0	0	**0.152**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
747.8	6.234	N/A	100	N/A	N/A	N/A	N/A	0.984	0	0	**0.154**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
747.6	6.398	N/A	100	N/A	N/A	N/A	N/A	0.984	0	0	**0.156**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
747.4	6.562	N/A	100	N/A	N/A	N/A	N/A	0.983	0	0	**0.158**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
747.3	6.726	N/A	99	N/A	N/A	N/A	N/A	0.982	0	0	**0.160**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
747.1	6.890	N/A	100	N/A	N/A	N/A	N/A	0.981	0	0	**0.162**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
746.9	7.054	N/A	100	N/A	N/A	N/A	N/A	0.980	0	0	**0.163**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
746.8	7.218	N/A	100	N/A	N/A	N/A	N/A	0.979	0	0	**0.165**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**

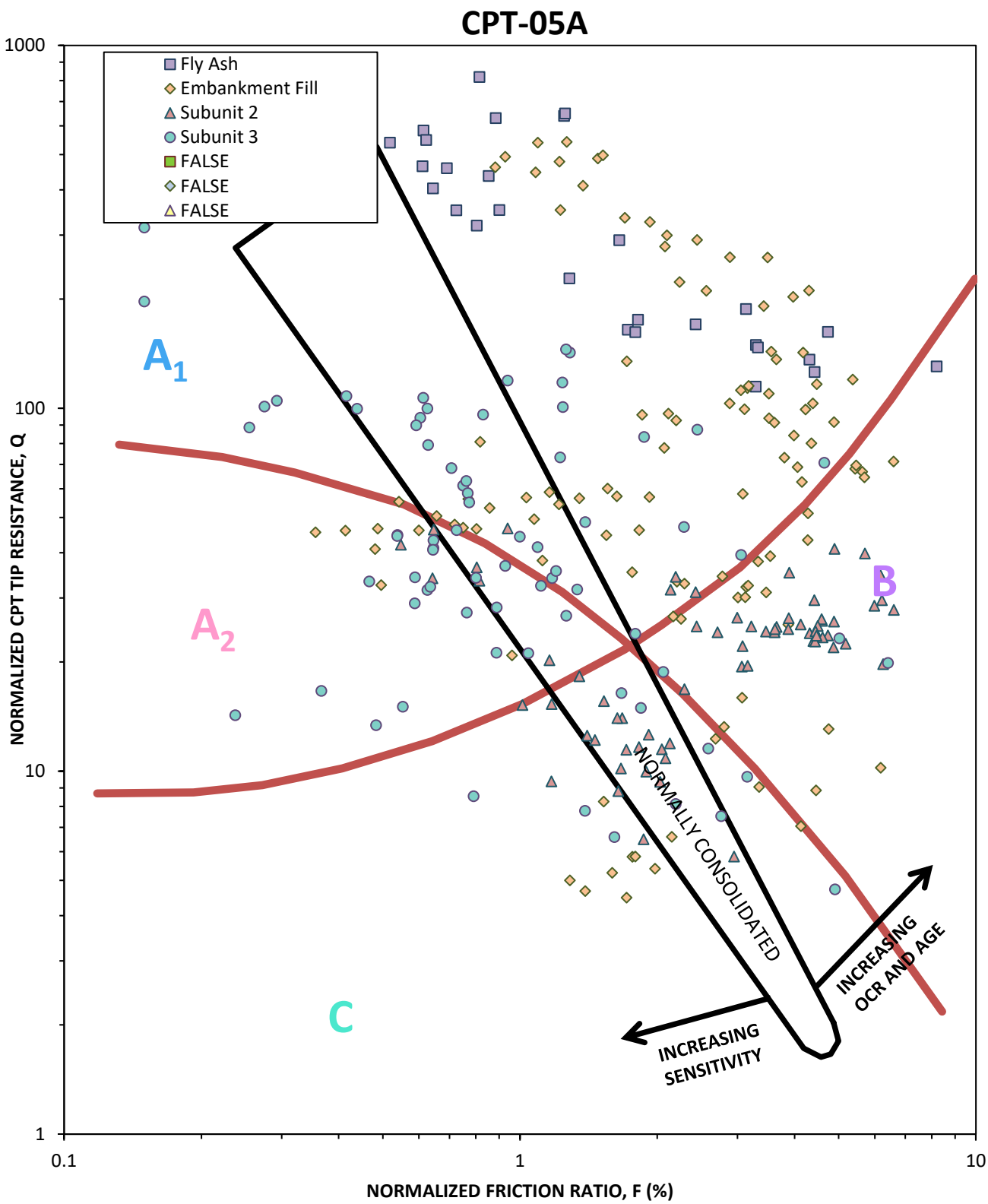
Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
746.6	7.382	N/A	100	N/A	N/A	N/A	N/A	0.979	0	0	**0.166**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
746.5	7.546	N/A	100	N/A	N/A	N/A	N/A	0.978	0	0	**0.168**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
746.3	7.710	N/A	100	N/A	N/A	N/A	N/A	0.977	0	0	**0.169**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
746.1	7.874	N/A	100	N/A	N/A	N/A	N/A	0.976	0	0	**0.171**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
746.0	8.038	N/A	100	N/A	N/A	N/A	N/A	0.975	0	0	**0.172**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
745.8	8.202	N/A	100	N/A	N/A	N/A	N/A	0.974	0	0	**0.173**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
745.6	8.366	N/A	100	N/A	N/A	N/A	N/A	0.973	0	0	**0.175**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
745.5	8.530	N/A	100	N/A	N/A	N/A	N/A	0.972	0	0	**0.176**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
745.3	8.694	N/A	100	N/A	N/A	N/A	N/A	0.972	0	0	**0.177**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
745.1	8.858	N/A	88	N/A	N/A	N/A	N/A	0.971	0	0	**0.178**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
745.0	9.022	N/A	81	N/A	N/A	N/A	N/A	0.970	0	0	**0.179**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
744.8	9.186	N/A	77	N/A	N/A	N/A	N/A	0.969	0	0	**0.180**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
744.6	9.350	N/A	80	N/A	N/A	N/A	N/A	0.968	0	0	**0.181**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
744.5	9.514	N/A	80	N/A	N/A	N/A	N/A	0.967	0	0	**0.182**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
744.3	9.678	N/A	74	N/A	N/A	N/A	N/A	0.966	0	0	**0.183**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
744.2	9.842	N/A	67	N/A	N/A	N/A	N/A	0.965	0	0	**0.184**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
744.0	10.006	N/A	63	N/A	N/A	N/A	N/A	0.964	0	0	**0.185**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
743.8	10.170	N/A	75	N/A	N/A	N/A	N/A	0.963	0	0	**0.185**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
743.7	10.335	N/A	76	N/A	N/A	N/A	N/A	0.962	0	0	**0.186**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
743.5	10.499	N/A	74	N/A	N/A	N/A	N/A	0.961	0	0	**0.187**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
743.3	10.663	N/A	64	N/A	N/A	N/A	N/A	0.960	0	0	**0.188**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
743.2	10.827	N/A	63	N/A	N/A	N/A	N/A	0.960	0	0	**0.188**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
743.0	10.991	N/A	71	N/A	N/A	N/A	N/A	0.959	0	0	**0.189**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
742.8	11.155	N/A	74	N/A	N/A	N/A	N/A	0.958	0	0	**0.190**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
742.7	11.319	N/A	77	N/A	N/A	N/A	N/A	0.957	0	0	**0.190**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
742.5	11.483	N/A	82	N/A	N/A	N/A	N/A	0.956	0	0	**0.191**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
742.4	11.647	N/A	76	N/A	N/A	N/A	N/A	0.955	0	0	**0.192**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
742.2	11.811	N/A	74	N/A	N/A	N/A	N/A	0.954	0	0	**0.192**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
742.0	11.975	N/A	66	N/A	N/A	N/A	N/A	0.953	0	0	**0.193**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
741.9	12.139	N/A	65	N/A	N/A	N/A	N/A	0.952	0	0	**0.193**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
741.7	12.303	N/A	66	N/A	N/A	N/A	N/A	0.951	0	0	**0.194**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
741.5	12.467	N/A	81	N/A	N/A	N/A	N/A	0.950	0	0	**0.194**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
741.4	12.631	N/A	87	N/A	N/A	N/A	N/A	0.949	0	0	**0.195**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
741.2	12.795	N/A	89	N/A	N/A	N/A	N/A	0.948	0	0	**0.195**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
741.0	12.959	N/A	80	N/A	N/A	N/A	N/A	0.947	0	0	**0.195**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
740.9	13.123	N/A	70	N/A	N/A	N/A	N/A	0.946	0	0	**0.196**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
740.7	13.287	N/A	66	N/A	N/A	N/A	N/A	0.945	0	0	**0.196**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
740.5	13.451	N/A	59	N/A	N/A	N/A	N/A	0.944	0	0	**0.197**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
740.4	13.615	N/A	56	N/A	N/A	N/A	N/A	0.943	0	0	**0.197**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
740.2	13.779	N/A	61	N/A	N/A	N/A	N/A	0.942	0	0	**0.197**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
740.1	13.943	N/A	62	N/A	N/A	N/A	N/A	0.941	0	0	**0.198**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
739.9	14.107	N/A	59	N/A	N/A	N/A	N/A	0.940	0	0	**0.198**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
739.7	14.271	N/A	59	N/A	N/A	N/A	N/A	0.939	0	0	**0.198**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
739.6	14.436	N/A	60	N/A	N/A	N/A	N/A	0.938	0	0	**0.199**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
739.4	14.600	N/A	56	N/A	N/A	N/A	N/A	0.937	0	0	**0.199**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
739.2	14.764	N/A	57	N/A	N/A	N/A	N/A	0.936	0	0	**0.199**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
739.1	14.928	N/A	48	N/A	N/A	N/A	N/A	0.935	0	0	**0.199**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
738.9	15.092	N/A	44	N/A	N/A	N/A	N/A	0.933	0	0	**0.200**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A2**
738.7	15.256	N/A	47	N/A	N/A	N/A	N/A	0.932	0	0	**0.200**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A2**
738.6	15.420	N/A	49	N/A	N/A	N/A	N/A	0.931	0	0	**0.200**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A2**
738.4	15.584	N/A	54	N/A	N/A	N/A	N/A	0.930	0	0	**0.200**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
738.3	15.748	N/A	53	N/A	N/A	N/A	N/A	0.929	0	0	**0.201**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
738.1	15.912	N/A	56	N/A	N/A	N/A	N/A	0.928	0	0	**0.201**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
737.9	16.076	N/A	60	N/A	N/A	N/A	N/A	0.927	0	0	**0.201**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
737.8	16.240	N/A	51	N/A	N/A	N/A	N/A	0.926	0	0	**0.201**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**

Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
737.6	16.404	N/A	51	N/A	N/A	N/A	N/A	0.925	0	0	**0.201**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A2**
737.4	16.568	N/A	57	N/A	N/A	N/A	N/A	0.924	0	0	**0.202**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
737.3	16.732	N/A	49	N/A	N/A	N/A	N/A	0.923	0	0	**0.202**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A2**
737.1	16.896	N/A	45	N/A	N/A	N/A	N/A	0.922	0	0	**0.202**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A2**
736.9	17.060	N/A	47	N/A	N/A	N/A	N/A	0.921	0	0	**0.202**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A2**
736.8	17.224	N/A	54	N/A	N/A	N/A	N/A	0.920	0	0	**0.202**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
736.6	17.388	N/A	61	N/A	N/A	N/A	N/A	0.918	0	0	**0.202**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
736.4	17.552	N/A	59	N/A	N/A	N/A	N/A	0.917	0	0	**0.202**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
736.3	17.716	N/A	74	N/A	N/A	N/A	N/A	0.916	0	0	**0.202**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
736.1	17.880	N/A	69	N/A	N/A	N/A	N/A	0.915	0	0	**0.203**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
736.0	18.044	N/A	63	N/A	N/A	N/A	N/A	0.914	0	0	**0.203**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
735.8	18.208	N/A	56	N/A	N/A	N/A	N/A	0.913	0	0	**0.203**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
735.6	18.372	N/A	53	N/A	N/A	N/A	N/A	0.912	0	0	**0.203**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
735.5	18.537	N/A	52	N/A	N/A	N/A	N/A	0.911	0	0	**0.203**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
735.3	18.701	N/A	52	N/A	N/A	N/A	N/A	0.910	0	0	**0.203**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
735.1	18.865	N/A	48	N/A	N/A	N/A	N/A	0.908	0	0	**0.203**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
735.0	19.029	N/A	51	N/A	N/A	N/A	N/A	0.907	0	0	**0.203**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
734.8	19.193	N/A	54	N/A	N/A	N/A	N/A	0.906	0	0	**0.203**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
734.6	19.357	N/A	55	N/A	N/A	N/A	N/A	0.905	0	0	**0.203**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
734.5	19.521	N/A	52	N/A	N/A	N/A	N/A	0.904	0	0	**0.203**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
734.3	19.685	N/A	51	N/A	N/A	N/A	N/A	0.903	0	0	**0.203**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
734.2	19.849	N/A	50	N/A	N/A	N/A	N/A	0.902	0	0	**0.203**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
734.0	20.013	N/A	50	N/A	N/A	N/A	N/A	0.901	0	0	**0.203**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
733.8	20.177	N/A	52	N/A	N/A	N/A	N/A	0.899	0	0	**0.203**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
733.7	20.341	N/A	52	N/A	N/A	N/A	N/A	0.898	0	0	**0.203**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
733.5	20.505	N/A	53	N/A	N/A	N/A	N/A	0.897	0	0	**0.203**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
733.3	20.669	N/A	49	N/A	N/A	N/A	N/A	0.896	0	0	**0.203**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
733.2	20.833	N/A	39	N/A	N/A	N/A	N/A	0.895	0	0	**0.203**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
733.0	20.997	N/A	43	N/A	N/A	N/A	N/A	0.894	0	0	**0.203**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
732.8	21.161	N/A	39	N/A	N/A	N/A	N/A	0.893	0	0	**0.203**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
732.7	21.325	N/A	37	N/A	N/A	N/A	N/A	0.891	0	0	**0.203**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**C**
732.5	21.489	N/A	37	N/A	N/A	N/A	N/A	0.890	0	0	**0.203**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**C**
732.3	21.653	N/A	37	N/A	N/A	N/A	N/A	0.889	0	0	**0.203**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**C**
732.2	21.817	N/A	36	N/A	N/A	N/A	N/A	0.888	0	0	**0.203**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**C**
732.0	21.981	N/A	36	N/A	N/A	N/A	N/A	0.887	0	0	**0.203**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**C**
731.9	22.145	N/A	36	N/A	N/A	N/A	N/A	0.886	0	0	**0.203**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**C**
731.7	22.309	N/A	36	N/A	N/A	N/A	N/A	0.884	0	0	**0.203**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**C**
731.5	22.473	N/A	36	N/A	N/A	N/A	N/A	0.883	0	0	**0.203**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**C**
731.4	22.638	N/A	37	N/A	N/A	N/A	N/A	0.882	0	0	**0.203**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**C**
731.2	22.802	N/A	38	N/A	N/A	N/A	N/A	0.881	0	0	**0.203**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**C**
731.0	22.966	N/A	39	N/A	N/A	N/A	N/A	0.880	0	0	**0.203**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**C**
730.9	23.130	N/A	41	N/A	N/A	N/A	N/A	0.879	0	0	**0.203**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**C**
730.7	23.294	N/A	41	N/A	N/A	N/A	N/A	0.877	0	0	**0.203**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
730.5	23.458	N/A	42	N/A	N/A	N/A	N/A	0.876	0	0	**0.203**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
730.4	23.622	0.107	41	1.020	0.920	1.09	0.110	0.875	0	0	**0.202**	FALSE	FALSE	FALSE	**0.5**	**Subunit 2**	**B**
730.2	23.786	0.120	48	1.022	0.965	1.12	0.133	0.874	0	0	**0.202**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**B**
730.1	23.950	0.102	37	1.018	0.904	1.08	0.102	0.873	0	0	**0.202**	FALSE	FALSE	FALSE	**0.5**	**Subunit 2**	**B**
729.9	24.114	0.107	41	1.019	0.919	1.09	0.110	0.871	0	0	**0.202**	FALSE	FALSE	FALSE	**0.5**	**Subunit 2**	**C**
729.7	24.278	0.107	40	1.018	0.916	1.09	0.108	0.870	0	0	**0.202**	FALSE	FALSE	FALSE	**0.5**	**Subunit 2**	**C**
729.6	24.442	0.106	39	1.017	0.912	1.09	0.107	0.869	0	0	**0.202**	FALSE	FALSE	FALSE	**0.5**	**Subunit 2**	**C**
729.4	24.606	0.107	40	1.017	0.917	1.09	0.109	0.868	0	0	**0.202**	FALSE	FALSE	FALSE	**0.5**	**Subunit 2**	**C**
729.2	24.770	0.107	41	1.017	0.917	1.09	0.109	0.867	0	0	**0.202**	FALSE	FALSE	FALSE	**0.5**	**Subunit 2**	**C**
729.1	24.934	0.108	41	1.016	0.918	1.09	0.110	0.866	0	0	**0.202**	FALSE	FALSE	FALSE	**0.5**	**Subunit 2**	**C**
728.9	25.098	0.109	42	1.016	0.921	1.09	0.111	0.864	0	0	**0.202**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
728.7	25.262	0.112	43	1.016	0.932	1.10	0.116	0.863	0	0	**0.202**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**B**

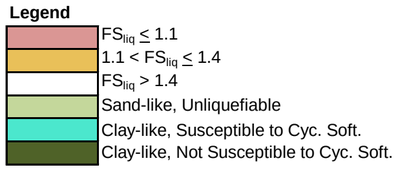
Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
728.6	25.426	0.119	48	1.016	0.961	1.12	0.130	0.862	0	0	**0.202**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**B**
728.4	25.590	0.131	53	1.017	1.009	1.14	0.153	0.861	0	0	**0.201**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**A1**
728.2	25.754	0.127	51	1.016	0.994	1.13	0.146	0.860	0	0	**0.201**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**A1**
728.1	25.918	0.120	48	1.015	0.964	1.12	0.131	0.858	0	0	**0.201**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**B**
727.9	26.082	0.118	47	1.014	0.957	1.11	0.128	0.857	0	0	**0.201**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**B**
727.8	26.246	0.117	46	1.013	0.949	1.11	0.124	0.856	0	0	**0.201**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**B**
727.6	26.410	0.127	51	1.014	0.994	1.13	0.145	0.855	0	0	**0.201**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**B**
727.4	26.574	0.123	49	1.013	0.976	1.12	0.137	0.853	0	0	**0.201**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**B**
727.3	26.739	0.121	49	1.012	0.969	1.12	0.133	0.852	0	0	**0.201**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**B**
727.1	26.903	0.120	48	1.012	0.965	1.12	0.131	0.851	0	0	**0.201**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**B**
726.9	27.067	0.121	48	1.011	0.965	1.12	0.131	0.850	0	0	**0.200**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**B**
726.8	27.231	0.121	48	1.011	0.968	1.12	0.132	0.849	0	0	**0.200**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**B**
726.6	27.395	0.121	49	1.010	0.968	1.12	0.133	0.847	0	0	**0.200**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**B**
726.4	27.559	0.121	48	1.010	0.967	1.12	0.132	0.846	0	0	**0.200**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**B**
726.3	27.723	0.121	48	1.009	0.966	1.12	0.132	0.845	0	0	**0.200**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**B**
726.1	27.887	0.123	50	1.009	0.978	1.12	0.137	0.844	0	0	**0.200**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**B**
725.9	28.051	0.123	50	1.008	0.978	1.12	0.137	0.843	0	0	**0.200**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**B**
725.8	28.215	0.124	50	1.008	0.980	1.13	0.138	0.841	0	0	**0.200**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**B**
725.6	28.379	0.123	49	1.007	0.974	1.12	0.135	0.840	0	0	**0.199**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**B**
725.5	28.543	0.122	49	1.007	0.970	1.12	0.133	0.839	0	0	**0.199**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**B**
725.3	28.707	0.121	48	1.006	0.965	1.12	0.131	0.838	0	0	**0.199**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**B**
725.1	28.871	0.120	48	1.005	0.962	1.12	0.130	0.836	0	0	**0.199**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**B**
725.0	29.035	0.120	48	1.005	0.962	1.12	0.130	0.835	0	0	**0.199**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**B**
724.8	29.199	0.121	48	1.005	0.967	1.12	0.132	0.834	0	0	**0.199**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**B**
724.6	29.363	0.123	49	1.004	0.976	1.12	0.135	0.833	0	0	**0.198**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**B**
724.5	29.527	0.127	51	1.004	0.997	1.13	0.144	0.831	0	0	**0.198**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**B**
724.3	29.691	0.136	54	1.003	1.039	1.15	0.163	0.830	0	0	**0.198**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**B**
724.1	29.855	0.130	52	1.003	1.009	1.14	0.149	0.829	0	0	**0.198**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**B**
724.0	30.019	0.145	57	1.002	1.086	1.18	0.186	0.828	0	0	**0.198**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**B**
723.8	30.183	0.137	55	1.002	1.048	1.16	0.167	0.827	0	0	**0.198**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**B**
723.7	30.347	0.147	58	1.001	1.094	1.18	0.190	0.825	0	0	**0.197**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**B**
723.5	30.511	0.128	52	1.001	1.003	1.14	0.146	0.824	0	0	**0.197**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**B**
723.3	30.675	0.120	48	1.000	0.964	1.12	0.130	0.823	0	0	**0.197**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**B**
723.2	30.840	0.116	46	1.000	0.942	1.11	0.121	0.822	0	0	**0.197**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**B**
723.0	31.004	0.116	46	0.999	0.943	1.11	0.121	0.820	0	0	**0.197**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**B**
722.8	31.168	0.119	47	0.999	0.956	1.11	0.126	0.819	0	0	**0.197**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**B**
722.7	31.332	0.124	50	0.998	0.981	1.13	0.136	0.818	0	0	**0.196**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**B**
722.5	31.496	0.128	52	0.998	1.006	1.14	0.146	0.817	0	0	**0.196**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**A1**
722.3	31.660	0.136	55	0.997	1.048	1.15	0.164	0.815	0	0	**0.196**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**A1**
722.2	31.824	0.128	52	0.997	1.004	1.14	0.146	0.814	0	0	**0.196**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**A2**
722.0	31.988	0.123	49	0.996	0.977	1.12	0.134	0.813	0	0	**0.196**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**A2**
721.8	32.152	0.121	48	0.996	0.967	1.12	0.130	0.812	0	0	**0.196**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**A2**
721.7	32.316	0.114	45	0.996	0.931	1.10	0.117	0.811	0	0	**0.195**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**A2**
721.5	32.480	0.110	42	0.996	0.911	1.09	0.109	0.809	0	0	**0.195**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
721.4	32.644	0.108	41	0.995	0.902	1.09	0.106	0.808	0	0	**0.195**	FALSE	FALSE	FALSE	**0.5**	**Subunit 2**	**C**
721.2	32.808	0.107	40	0.995	0.896	1.09	0.103	0.807	0	0	**0.195**	FALSE	FALSE	FALSE	**0.5**	**Subunit 2**	**C**
721.0	32.972	0.106	40	0.995	0.894	1.09	0.103	0.806	0	0	**0.195**	FALSE	FALSE	FALSE	**0.5**	**Subunit 2**	**C**
720.9	33.136	0.107	41	0.994	0.900	1.09	0.105	0.804	0	0	**0.194**	FALSE	FALSE	FALSE	**0.5**	**Subunit 2**	**C**
720.7	33.300	0.111	43	0.994	0.916	1.10	0.111	0.803	0	0	**0.194**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
720.5	33.464	0.110	42	0.993	0.912	1.10	0.109	0.802	0	0	**0.194**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
720.4	33.628	0.110	42	0.993	0.909	1.09	0.108	0.801	0	0	**0.194**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
720.2	33.792	0.105	39	0.993	0.889	1.09	0.101	0.799	0	0	**0.194**	FALSE	FALSE	FALSE	**0.5**	**Subunit 2**	**C**
720.0	33.956	0.103	38	0.993	0.880	1.08	0.098	0.798	0	0	**0.193**	FALSE	FALSE	FALSE	**0.5**	**Subunit 2**	**C**
719.9	34.120	0.103	37	0.992	0.877	1.08	0.097	0.797	0	0	**0.193**	FALSE	FALSE	FALSE	**0.5**	**Subunit 2**	**C**
719.7	34.284	0.106	39	0.992	0.889	1.09	0.101	0.796	0	0	**0.193**	FALSE	FALSE	FALSE	**0.5**	**Subunit 2**	**C**

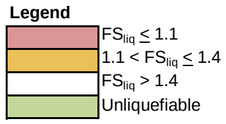
Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
719.6	34.448	0.108	41	0.991	0.900	1.09	0.105	0.794	0	0	**0.193**	FALSE	FALSE	FALSE	**0.5**	**Subunit 2**	**C**
719.4	34.612	0.113	44	0.990	0.925	1.10	0.114	0.793	0	0	**0.193**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
719.2	34.776	0.123	49	0.989	0.977	1.12	0.133	0.792	0	0	**0.192**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**A2**
719.1	34.941	0.125	50	0.988	0.989	1.13	0.138	0.791	0	0	**0.192**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**A2**
718.9	35.105	0.125	50	0.988	0.989	1.13	0.138	0.789	0	0	**0.192**	FALSE	FALSE	FALSE	**0.7**	**Subunit 3**	**A2**
718.7	35.269	0.123	50	0.988	0.979	1.12	0.134	0.788	0	0	**0.192**	FALSE	FALSE	FALSE	**0.7**	**Subunit 3**	**A2**
718.6	35.433	0.126	51	0.987	0.996	1.13	0.140	0.787	0	0	**0.191**	FALSE	FALSE	FALSE	**0.7**	**Subunit 3**	**A2**
718.4	35.597	0.127	51	0.986	1.000	1.13	0.142	0.786	0	0	**0.191**	FALSE	FALSE	FALSE	**0.7**	**Subunit 3**	**A1**
718.2	35.761	0.123	49	0.986	0.975	1.12	0.132	0.784	0	0	**0.191**	FALSE	FALSE	FALSE	**0.7**	**Subunit 3**	**B**
718.1	35.925	0.119	48	0.986	0.955	1.11	0.125	0.783	0	0	**0.191**	FALSE	FALSE	FALSE	**0.7**	**Subunit 3**	**B**
717.9	36.089	0.323	75	0.975	1.734	1.44	0.784	0.782	0	0	**0.190**	FALSE	FALSE	FALSE	**4.1**	**Subunit 3**	**A1**
717.7	36.253	0.255	71	0.976	1.558	1.37	0.530	0.781	0	0	**0.190**	FALSE	FALSE	FALSE	**2.8**	**Subunit 3**	**A1**
717.6	36.417	0.143	57	0.982	1.092	1.17	0.180	0.780	0	0	**0.190**	FALSE	FALSE	FALSE	**0.9**	**Subunit 3**	**A1**
717.4	36.581	0.134	54	0.983	1.038	1.15	0.157	0.778	0	0	**0.190**	FALSE	FALSE	FALSE	**0.8**	**Subunit 3**	**A1**
717.3	36.745	0.129	52	0.983	1.010	1.14	0.146	0.777	0	0	**0.190**	FALSE	FALSE	FALSE	**0.8**	**Subunit 3**	**A1**
717.1	36.909	0.126	51	0.983	0.992	1.13	0.139	0.776	0	0	**0.189**	FALSE	FALSE	FALSE	**0.7**	**Subunit 3**	**A1**
716.9	37.073	0.120	48	0.983	0.957	1.12	0.126	0.775	0	0	**0.189**	FALSE	FALSE	FALSE	**0.7**	**Subunit 3**	**A1**
716.8	37.237	0.115	45	0.983	0.933	1.11	0.117	0.773	0	0	**0.189**	FALSE	FALSE	FALSE	**0.6**	**Subunit 3**	**B**
716.6	37.401	0.107	40	0.984	0.890	1.09	0.102	0.772	0	0	**0.189**	FALSE	FALSE	FALSE	**0.5**	**Subunit 3**	**C**
716.4	37.565	0.105	39	0.984	0.882	1.09	0.099	0.771	0	0	**0.188**	FALSE	FALSE	FALSE	**0.5**	**Subunit 3**	**C**
716.3	37.729	0.107	40	0.984	0.888	1.09	0.101	0.770	0	0	**0.188**	FALSE	FALSE	FALSE	**0.5**	**Subunit 3**	**A2**
716.1	37.893	0.114	45	0.982	0.926	1.10	0.114	0.768	0	0	**0.188**	FALSE	FALSE	FALSE	**0.6**	**Subunit 3**	**A2**
715.9	38.057	0.117	46	0.981	0.942	1.11	0.120	0.767	0	0	**0.188**	FALSE	FALSE	FALSE	**0.6**	**Subunit 3**	**A2**
715.8	38.221	0.119	47	0.980	0.954	1.11	0.124	0.766	0	0	**0.187**	FALSE	FALSE	FALSE	**0.7**	**Subunit 3**	**A2**
715.6	38.385	0.117	46	0.980	0.941	1.11	0.120	0.765	0	0	**0.187**	FALSE	FALSE	FALSE	**0.6**	**Subunit 3**	**A2**
715.5	38.549	0.120	48	0.980	0.956	1.12	0.125	0.763	0	0	**0.187**	FALSE	FALSE	FALSE	**0.7**	**Subunit 3**	**A2**
715.3	38.713	0.118	47	0.979	0.946	1.11	0.121	0.762	0	0	**0.187**	FALSE	FALSE	FALSE	**0.7**	**Subunit 3**	**A2**
715.1	38.877	0.115	45	0.980	0.929	1.10	0.115	0.761	0	0	**0.186**	FALSE	FALSE	FALSE	**0.6**	**Subunit 3**	**A2**
715.0	39.042	0.112	43	0.980	0.911	1.10	0.109	0.760	0	0	**0.186**	FALSE	FALSE	FALSE	**0.6**	**Subunit 3**	**C**
714.8	39.206	0.113	44	0.979	0.917	1.10	0.111	0.759	0	0	**0.186**	FALSE	FALSE	FALSE	**0.6**	**Subunit 3**	**C**
714.6	39.370	0.120	48	0.978	0.956	1.12	0.125	0.757	0	0	**0.186**	FALSE	FALSE	FALSE	**0.7**	**Subunit 3**	**A2**
714.5	39.534	0.120	48	0.977	0.958	1.12	0.125	0.756	0	0	**0.185**	FALSE	FALSE	FALSE	**0.7**	**Subunit 3**	**A2**
714.3	39.698	0.121	48	0.977	0.963	1.12	0.127	0.755	0	0	**0.185**	FALSE	FALSE	FALSE	**0.7**	**Subunit 3**	**A2**
714.1	39.862	0.109	42	0.979	0.898	1.09	0.105	0.754	0	0	**0.185**	FALSE	FALSE	FALSE	**0.6**	**Subunit 3**	**C**
714.0	40.026	0.105	39	0.979	0.876	1.09	0.098	0.752	0	0	**0.185**	FALSE	FALSE	FALSE	**0.5**	**Subunit 3**	**C**
713.8	40.190	0.105	39	0.979	0.876	1.09	0.097	0.751	0	0	**0.184**	FALSE	FALSE	FALSE	**0.5**	**Subunit 3**	**C**
713.6	40.354	0.105	39	0.978	0.876	1.09	0.098	0.750	0	0	**0.184**	FALSE	FALSE	FALSE	**0.5**	**Subunit 3**	**C**
713.5	40.518	0.108	41	0.977	0.891	1.09	0.103	0.749	0	0	**0.184**	FALSE	FALSE	FALSE	**0.6**	**Subunit 3**	**A2**
713.3	40.682	0.108	41	0.977	0.889	1.09	0.102	0.748	0	0	**0.183**	FALSE	FALSE	FALSE	**0.6**	**Subunit 3**	**A2**
713.2	40.846	0.105	39	0.977	0.878	1.09	0.098	0.746	0	0	**0.183**	FALSE	FALSE	FALSE	**0.5**	**Subunit 3**	**A2**
713.0	41.010	0.104	38	0.977	0.870	1.08	0.096	0.745	0	0	**0.183**	FALSE	FALSE	FALSE	**0.5**	**Subunit 3**	**C**
712.8	41.174	0.102	37	0.977	0.861	1.08	0.093	0.744	0	0	**0.183**	FALSE	FALSE	FALSE	**0.5**	**Subunit 3**	**C**
712.7	41.338	0.123	49	0.972	0.974	1.12	0.131	0.743	0	0	**0.182**	FALSE	FALSE	FALSE	**0.7**	**Subunit 3**	**A2**
712.5	41.502	0.114	45	0.974	0.924	1.10	0.114	0.741	0	0	**0.182**	FALSE	FALSE	FALSE	**0.6**	**Subunit 3**	**A1**
712.3	41.666	0.126	51	0.971	0.994	1.13	0.138	0.740	0	0	**0.182**	FALSE	FALSE	FALSE	**0.8**	**Subunit 3**	**A1**
712.2	41.830	0.131	53	0.969	1.019	1.14	0.147	0.739	0	0	**0.182**	FALSE	FALSE	FALSE	**0.8**	**Subunit 3**	**A1**
712.0	41.994	0.134	54	0.968	1.041	1.15	0.156	0.738	0	0	**0.181**	FALSE	FALSE	FALSE	**0.9**	**Subunit 3**	**A1**
711.8	42.158	0.137	55	0.967	1.057	1.16	0.162	0.737	0	0	**0.181**	FALSE	FALSE	FALSE	**0.9**	**Subunit 3**	**A1**
711.7	42.322	0.129	52	0.969	1.008	1.14	0.143	0.735	0	0	**0.181**	FALSE	FALSE	FALSE	**0.8**	**Subunit 3**	**A1**
711.5	42.486	0.133	53	0.967	1.033	1.15	0.152	0.734	0	0	**0.181**	FALSE	FALSE	FALSE	**0.8**	**Subunit 3**	**A1**
711.3	42.650	0.139	56	0.966	1.072	1.16	0.168	0.733	0	0	**0.180**	FALSE	FALSE	FALSE	**0.9**	**Subunit 3**	**A1**
711.2	42.814	0.140	56	0.965	1.074	1.16	0.168	0.732	0	0	**0.180**	FALSE	FALSE	FALSE	**0.9**	**Subunit 3**	**A1**
711.0	42.978	0.139	56	0.965	1.070	1.16	0.167	0.730	0	0	**0.180**	FALSE	FALSE	FALSE	**0.9**	**Subunit 3**	**A1**
710.9	43.143	0.137	55	0.965	1.061	1.16	0.163	0.729	0	0	**0.180**	FALSE	FALSE	FALSE	**0.9**	**Subunit 3**	**A1**
710.7	43.307	0.147	58	0.962	1.120	1.18	0.188	0.728	0	0	**0.179**	FALSE	FALSE	FALSE	**1.0**	**Subunit 3**	**A1**

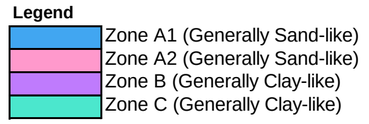
Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
710.5	43.471	0.156	60	0.960	1.167	1.20	0.210	0.727	0	0	**0.179**	FALSE	FALSE	FALSE	**1.2**	**Subunit 3**	**A1**
710.4	43.635	0.289	73	0.945	1.675	1.40	0.641	0.726	0	0	**0.179**	FALSE	FALSE	FALSE	**3.6**	**Subunit 3**	**A1**
710.2	43.799	0.408	77	0.938	1.932	1.50	1.111	0.724	0	0	**0.179**	FALSE	FALSE	FALSE	**6.2**	**Subunit 3**	**A1**
710.0	43.963	0.397	77	0.937	1.909	1.50	1.063	0.723	0	0	**0.178**	FALSE	FALSE	FALSE	**6.0**	**Subunit 3**	**A1**
709.9	44.127	0.191	66	0.953	1.337	1.27	0.310	0.722	0	0	**0.178**	FALSE	FALSE	FALSE	**1.7**	**Subunit 3**	**A1**
709.7	44.291	0.243	71	0.947	1.531	1.35	0.476	0.721	0	0	**0.178**	FALSE	FALSE	FALSE	**2.7**	**Subunit 3**	**A1**
709.5	44.455	0.182	65	0.953	1.291	1.25	0.281	0.720	0	0	**0.178**	FALSE	FALSE	FALSE	**1.6**	**Subunit 3**	**A1**
709.4	44.619	0.135	54	0.962	1.044	1.15	0.157	0.718	0	0	**0.177**	FALSE	FALSE	FALSE	**0.9**	**Subunit 3**	**A1**
709.2	44.783	0.127	51	0.963	0.997	1.13	0.139	0.717	0	0	**0.177**	FALSE	FALSE	FALSE	**0.8**	**Subunit 3**	**A2**
709.1	44.947	0.126	51	0.963	0.985	1.13	0.135	0.716	0	0	**0.177**	FALSE	FALSE	FALSE	**0.8**	**Subunit 3**	**A2**
708.9	45.111	0.123	50	0.964	0.973	1.12	0.130	0.715	0	0	**0.177**	FALSE	FALSE	FALSE	**0.7**	**Subunit 3**	**A2**
708.7	45.275	0.125	50	0.963	0.980	1.13	0.133	0.714	0	0	**0.176**	FALSE	FALSE	FALSE	**0.8**	**Subunit 3**	**A2**
708.6	45.439	0.130	52	0.961	1.011	1.14	0.144	0.713	0	0	**0.176**	FALSE	FALSE	FALSE	**0.8**	**Subunit 3**	**A2**
708.4	45.603	0.141	56	0.958	1.075	1.17	0.170	0.711	0	0	**0.176**	FALSE	FALSE	FALSE	**1.0**	**Subunit 3**	**A1**
708.2	45.767	0.121	49	0.963	0.959	1.12	0.125	0.710	0	0	**0.175**	FALSE	FALSE	FALSE	**0.7**	**Subunit 3**	**A1**
708.1	45.931	0.137	55	0.958	1.050	1.16	0.159	0.709	0	0	**0.175**	FALSE	FALSE	FALSE	**0.9**	**Subunit 3**	**A1**
707.9	46.095	0.130	52	0.960	1.010	1.14	0.144	0.708	0	0	**0.175**	FALSE	FALSE	FALSE	**0.8**	**Subunit 3**	**A1**
707.7	46.259	0.160	61	0.952	1.177	1.21	0.217	0.707	0	0	**0.175**	FALSE	FALSE	FALSE	**1.2**	**Subunit 3**	**A1**
707.6	46.423	0.290	73	0.935	1.650	1.40	0.629	0.705	0	0	**0.174**	FALSE	FALSE	FALSE	**3.6**	**Subunit 3**	**A1**
707.4	46.587	N/A	87	N/A	N/A	N/A	N/A	0.704	0	0	**0.174**	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**	**A1**
707.2	46.751	N/A	100	N/A	N/A	N/A	N/A	0.703	0	0	**0.174**	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**	**A1**



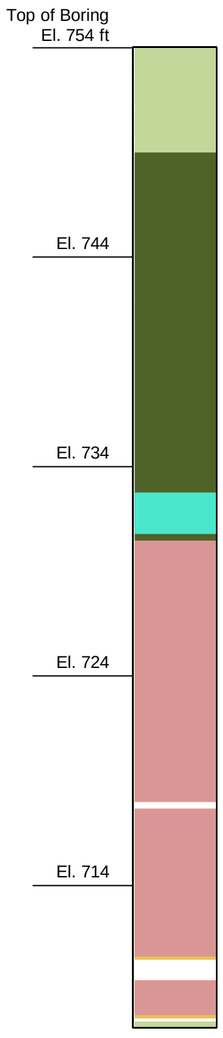
Adapted from "Discussion of 'Liquefaction Potential of Silts from CPTu'" (Robertson 2008). Zone A_1 and Zone A_2 samples are generally sand-like. Zone B samples are generally clay-like and not susceptible to cyclic softening. Zone C samples are generally clay-like and susceptible to cyclic softening. Note that the transition from clay-like to sand-like in this chart does not exactly match the liquefaction calculations herein; that is, some transitional samples in Zone B and Zone C will be treated as sand-like and analyzed for liquefaction if the calculations indicate as such.



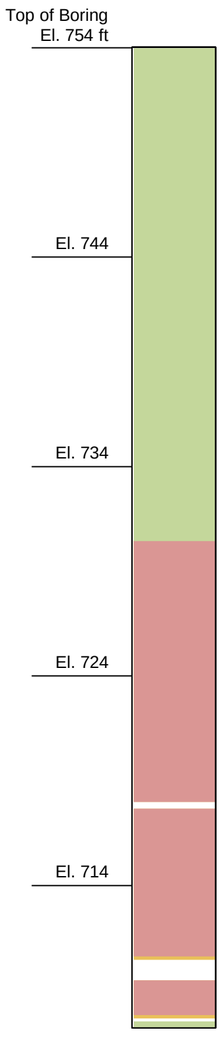




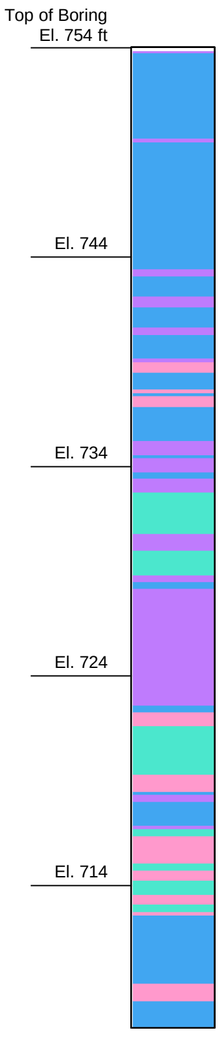
CPT-05A, Liquefaction Triggering Results



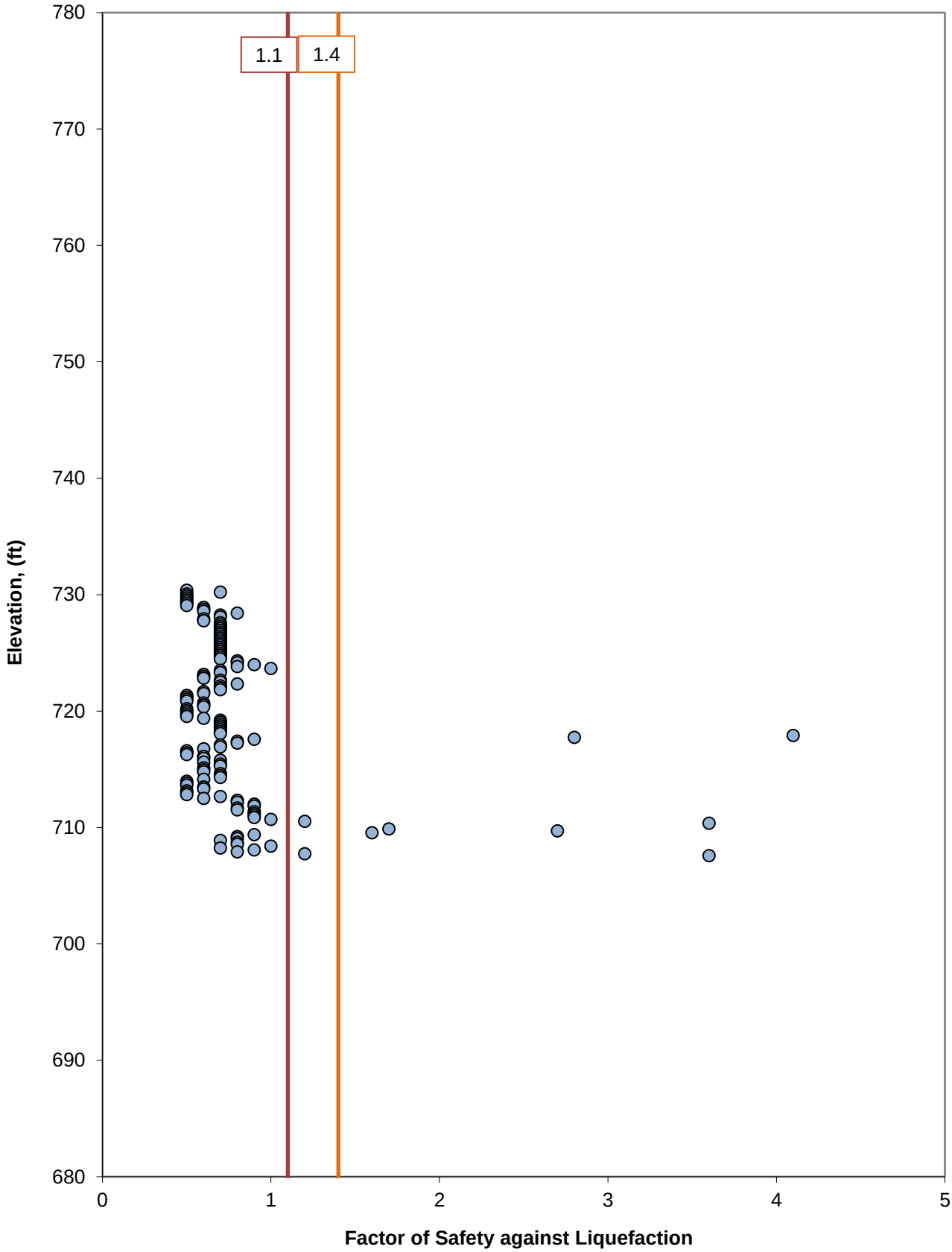
CPT-05A, Liquefaction Triggering Results



CPT-05A, Robertson Soil Type



KIF TDEC Stability, Boring = CPT-05A, Source = 10 Hz, Mw = 6, Event = Design EQ, CPT Data, Simplified Stress-Based Approach



Project Information

Stantec Project Number =	175668043
Project Name =	KIF TDEC Stability
CPT ID =	CPT-07

Boring Location (optional)

Northing =	
Easting =	

OR

Baseline Station =	
Offset (+ Right) =	

Using qt (corrected for u2 PWP) or qc (backcalculated uncorrected field tip)

Cone ID (optional) =	AD184	
Use qc instead of qt?	0	(1: Yes, 0: No)
Cone Area Ratio (a) =	0.80	

Drilling Information

Top of Hole Elevation =	754.0	feet
Water Depth during CPT (negative for U/S borings) =	6.0	feet
Depth data collection began =	0.16	feet
Avg. Total Unit Wt. Above 1st Sample =	120.00	pcf

During Earthquake Information

Water Depth during EQ (relative to CPT TOH, negative for U/S borings) =	5.0	feet
Final Grade Elevation during EQ =	753.0	feet
Avg. Total Unit Wt. of Cut/Fill =	120	pcf

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile?	0	(1: Yes, 0: No)

If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile:	ng_Pond_Section, KIF-BF-SPT3_NOR	
α at each Sample Depth known?	1	(1: Yes, 0: No)

If previous answer is No, then enter curve fit parameters below (α vs. depth curve)

If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_α will be one.

m4:	
m3:	
m2:	
m1:	
m0:	

Associated ground response profile:	shing_Pond_Section, KIF-BF-SPT3	
Get CSR from shear stress envelope?	0	(1: Yes, 0: No)

If previous answer is No, then CSR will be calculated using a_{max} and r_d

Max. Shear Stress at each sample depth known?		(1: Yes, 0: No)

If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4:	
m3:	
m2:	
m1:	

Earthquake Information

EQ Source (e.g., New Madrid)	10 Hz
Event (e.g., MCE, OBE)	Design EQ
a_{max} (g) (top of ground surface)	0.21
EQ Mag (Mw)	6.0

Inputs

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
0.164	86.411	0.020	112	Fly Ash	Sand-like	Do Not Correct for FC	0.057			
0.328	204.281	0.261	112	Fly Ash	Sand-like	Do Not Correct for FC	0.054			
0.492	201.240	0.302	112	Fly Ash	Sand-like	Do Not Correct for FC	0.052			
0.656	198.870	0.206	112	Fly Ash	Sand-like	Do Not Correct for FC	0.049			
0.820	206.036	0.144	112	Fly Ash	Sand-like	Do Not Correct for FC	0.046			
0.984	190.934	0.207	112	Fly Ash	Sand-like	Do Not Correct for FC	0.044			
1.148	183.782	0.149	112	Fly Ash	Sand-like	Do Not Correct for FC	0.041			
1.312	165.537	0.388	112	Fly Ash	Sand-like	Do Not Correct for FC	0.038			
1.476	153.835	0.448	112	Fly Ash	Sand-like	Do Not Correct for FC	0.035			
1.640	162.288	0.253	112	Fly Ash	Sand-like	Do Not Correct for FC	0.033			
1.804	215.621	0.365	112	Fly Ash	Sand-like	Do Not Correct for FC	0.030			
1.968	194.685	0.665	112	Fly Ash	Sand-like	Do Not Correct for FC	0.027			
2.133	179.875	0.995	112	Fly Ash	Sand-like	Do Not Correct for FC	0.028			
2.297	137.639	1.648	112	Fly Ash	Sand-like	Do Not Correct for FC	0.031			
2.461	98.314	1.622	112	Fly Ash	Sand-like	Do Not Correct for FC	0.033			
2.625	99.943	1.644	112	Fly Ash	Sand-like	Do Not Correct for FC	0.035			
2.789	123.064	1.427	112	Fly Ash	Sand-like	Do Not Correct for FC	0.037			
2.953	187.244	1.404	112	Fly Ash	Sand-like	Do Not Correct for FC	0.040			
3.117	166.973	0.718	112	Fly Ash	Sand-like	Do Not Correct for FC	0.041			
3.281	95.594	1.022	112	Fly Ash	Sand-like	Do Not Correct for FC	0.039			
3.445	56.660	1.213	112	Fly Ash	Sand-like	Do Not Correct for FC	0.038			
3.609	37.944	1.072	112	Fly Ash	Sand-like	Do Not Correct for FC	0.037			
3.773	33.569	0.952	112	Fly Ash	Sand-like	Do Not Correct for FC	0.036			
3.937	25.705	0.750	112	Fly Ash	Sand-like	Do Not Correct for FC	0.035			
4.101	22.416	0.586	112	Fly Ash	Sand-like	Do Not Correct for FC	0.032			
4.265	19.933	0.488	112	Fly Ash	Sand-like	Do Not Correct for FC	0.030			
4.429	18.120	0.460	112	Fly Ash	Sand-like	Do Not Correct for FC	0.027			
4.593	15.803	0.462	112	Fly Ash	Sand-like	Do Not Correct for FC	0.025			
4.757	14.629	0.411	112	Fly Ash	Sand-like	Do Not Correct for FC	0.022			
4.921	13.276	0.374	112	Fly Ash	Sand-like	Do Not Correct for FC	0.020			
5.085	32.844	0.304	128	Embankment Fill	Clay-like		0.016			
5.249	33.961	0.336	128	Embankment Fill	Clay-like		0.013			
5.413	27.805	0.472	128	Embankment Fill	Clay-like		0.012			
5.577	21.203	0.573	128	Embankment Fill	Clay-like		0.015			
5.741	13.693	0.538	128	Embankment Fill	Clay-like		0.013			
5.905	12.196	0.391	128	Embankment Fill	Clay-like		0.010			
6.069	12.323	0.312	128	Embankment Fill	Clay-like		0.008			
6.234	10.555	0.331	128	Embankment Fill	Clay-like		0.006			
6.398	10.871	0.343	128	Embankment Fill	Clay-like		0.004			
6.562	11.156	0.429	128	Embankment Fill	Clay-like		0.003			
6.726	11.092	0.438	128	Embankment Fill	Clay-like		0.002			
6.890	9.713	0.426	128	Embankment Fill	Clay-like		0.001			
7.054	9.168	0.382	128	Embankment Fill	Clay-like		0.001			
7.218	8.455	0.324	128	Embankment Fill	Clay-like		0.001			
7.382	9.297	0.309	128	Embankment Fill	Clay-like		0.002			
7.546	10.582	0.365	128	Embankment Fill	Clay-like		0.003			
7.710	10.842	0.293	128	Embankment Fill	Clay-like		0.005			
7.874	9.966	0.287	128	Embankment Fill	Clay-like		0.006			
8.038	10.543	0.290	128	Embankment Fill	Clay-like		0.007			
8.202	11.471	0.473	128	Embankment Fill	Clay-like		0.009			
8.366	19.223	0.589	128	Embankment Fill	Clay-like		0.010			
8.530	34.931	1.087	128	Embankment Fill	Clay-like		0.011			
8.694	34.568	1.358	128	Embankment Fill	Clay-like		0.012			
8.858	25.941	1.296	128	Embankment Fill	Clay-like		0.013			
9.022	27.558	1.167	128	Embankment Fill	Clay-like		0.014			
9.186	32.077	1.157	128	Embankment Fill	Clay-like		0.015			
9.350	40.269	1.050	128	Embankment Fill	Clay-like		0.016			
9.514	25.184	1.104	128	Embankment Fill	Clay-like		0.017			
9.678	49.399	0.403	128	Embankment Fill	Clay-like		0.018			
9.842	32.868	0.528	128	Embankment Fill	Clay-like		0.019			
10.006	40.065	0.174	128	Embankment Fill	Clay-like		0.020			
10.170	293.890	0.243	128	Embankment Fill	Clay-like		0.021			
10.335	205.353	3.344	128	Embankment Fill	Clay-like		0.022			

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
10.499	211.420	4.025	128	Embankment Fill	Clay-like		0.023			
10.663	100.807	3.437	128	Embankment Fill	Clay-like		0.024			
10.827	10.091	2.438	128	Embankment Fill	Clay-like		0.026			
10.991	10.228	0.309	128	Embankment Fill	Clay-like		0.027			
11.155	184.128	0.473	128	Embankment Fill	Clay-like		0.028			
11.319	167.307	0.428	128	Embankment Fill	Clay-like		0.029			
11.483	115.704	2.100	128	Embankment Fill	Clay-like		0.030			
11.647	24.622	1.981	128	Embankment Fill	Clay-like		0.031			
11.811	7.052	1.546	128	Embankment Fill	Clay-like		0.032			
11.975	11.186	0.281	128	Embankment Fill	Clay-like		0.033			
12.139	4.055	0.234	128	Embankment Fill	Clay-like		0.034			
12.303	4.617	0.199	128	Embankment Fill	Clay-like		0.034			
12.467	3.868	0.147	128	Embankment Fill	Clay-like		0.035			
12.631	5.726	0.138	128	Embankment Fill	Clay-like		0.036			
12.795	6.006	0.327	128	Embankment Fill	Clay-like		0.037			
12.959	6.027	0.595	128	Embankment Fill	Clay-like		0.038			
13.123	42.608	0.564	128	Embankment Fill	Clay-like		0.039			
13.287	6.539	0.856	128	Embankment Fill	Clay-like		0.039			
13.451	19.892	0.483	128	Embankment Fill	Clay-like		0.040			
13.615	19.986	0.051	128	Embankment Fill	Clay-like		0.041			
13.779	5.954	0.169	128	Embankment Fill	Clay-like		0.041			
13.943	5.623	0.211	128	Embankment Fill	Clay-like		0.042			
14.107	5.025	0.232	128	Embankment Fill	Clay-like		0.043			
14.271	10.278	0.179	128	Embankment Fill	Clay-like		0.043			
14.436	11.156	0.240	128	Embankment Fill	Clay-like		0.044			
14.600	12.710	0.300	128	Embankment Fill	Clay-like		0.045			
14.764	16.035	0.250	128	Embankment Fill	Clay-like		0.046			
14.928	15.396	0.356	128	Embankment Fill	Clay-like		0.046			
15.092	11.528	0.412	128	Embankment Fill	Clay-like		0.047			
15.256	16.966	0.551	128	Embankment Fill	Clay-like		0.048			
15.420	43.872	0.766	128	Embankment Fill	Clay-like		0.049			
15.584	40.315	0.679	128	Embankment Fill	Clay-like		0.050			
15.748	48.767	1.332	128	Embankment Fill	Clay-like		0.051			
15.912	45.458	0.134	128	Embankment Fill	Clay-like		0.052			
16.076	38.800	0.010	128	Embankment Fill	Clay-like		0.052			
16.240	304.232	0.010	128	Embankment Fill	Clay-like		0.053			

LIQUEFACTION POTENTIAL ASSESSMENT FOR COARSE GRAINED SOILS USING CONE PENETRATION TEST DATA

Facility: KIF TDEC Stability
Project No.: 175668043
CPT ID: CPT-07

Water Elevation during CPT:	748.0	ft
Depth to Water during CPT:	6.0	ft *(relative to ground surface during CPT)*
Water Elevation during Earthquake:	749.0	ft
Depth to Water during Earthquake:	5.0	ft *(relative to ground surface during CPT)*
Final Grade Elevation during EQ:	753	ft *(if no fill, then set this equal to top of CPT hole elev.)*
Height of Final Grade above CPT TOH:	-1.0	ft *(relative to ground surface during CPT, + Fill, - Cut)*
Unit Weight of Cut/Fill to Achieve Final Grade	120	pcf
Cut/Fill Total Stress (+ Fill, - Cut):	-0.06	tsf

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight γ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
754.0				Vertical Stresses above 1st CPT:			**0.01**	**-0.05**	**0.00**	**0.00**	**0.01**	**-0.05**
753.8	0.164	86.41	0.02	112	**0.16**	0.09	0.01	-0.05	0.00	0.00	0.01	-0.05
753.7	0.328	204.28	0.26	112	0.25	0.16	0.02	-0.04	0.00	0.00	0.02	-0.04
753.5	0.492	201.24	0.30	112	0.41	0.16	0.03	-0.03	0.00	0.00	0.03	-0.03
753.3	0.656	198.87	0.21	112	0.57	0.16	0.04	-0.02	0.00	0.00	0.04	-0.02
753.2	0.820	206.04	0.14	112	0.74	0.16	0.05	-0.01	0.00	0.00	0.05	-0.01
753.0	0.984	190.93	0.21	112	0.90	0.16	0.06	0.00	0.00	0.00	0.06	0.00
752.9	1.148	183.78	0.15	112	1.07	0.16	0.06	0.00	0.00	0.00	0.06	0.00
752.7	1.312	165.54	0.39	112	1.23	0.16	0.07	0.01	0.00	0.00	0.07	0.01
752.5	1.476	153.84	0.45	112	1.39	0.16	0.08	0.02	0.00	0.00	0.08	0.02
752.4	1.640	162.29	0.25	112	1.56	0.16	0.09	0.03	0.00	0.00	0.09	0.03
752.2	1.804	215.62	0.37	112	1.72	0.16	0.10	0.04	0.00	0.00	0.10	0.04
752.0	1.968	194.69	0.67	112	1.89	0.16	0.11	0.05	0.00	0.00	0.11	0.05
751.9	2.133	179.87	1.00	112	2.05	0.16	0.12	0.06	0.00	0.00	0.12	0.06
751.7	2.297	137.64	1.65	112	2.21	0.16	0.13	0.07	0.00	0.00	0.13	0.07
751.5	2.461	98.31	1.62	112	2.38	0.16	0.14	0.08	0.00	0.00	0.14	0.08
751.4	2.625	99.94	1.64	112	2.54	0.16	0.15	0.09	0.00	0.00	0.15	0.09
751.2	2.789	123.06	1.43	112	2.71	0.16	0.16	0.10	0.00	0.00	0.16	0.10
751.0	2.953	187.24	1.40	112	2.87	0.16	0.17	0.11	0.00	0.00	0.17	0.11
750.9	3.117	166.97	0.72	112	3.03	0.16	0.18	0.12	0.00	0.00	0.18	0.12
750.7	3.281	95.59	1.02	112	3.20	0.16	0.18	0.12	0.00	0.00	0.18	0.12
750.6	3.445	56.66	1.21	112	3.36	0.16	0.19	0.13	0.00	0.00	0.19	0.13
750.4	3.609	37.94	1.07	112	3.53	0.16	0.20	0.14	0.00	0.00	0.20	0.14
750.2	3.773	33.57	0.95	112	3.69	0.16	0.21	0.15	0.00	0.00	0.21	0.15
750.1	3.937	25.71	0.75	112	3.85	0.16	0.22	0.16	0.00	0.00	0.22	0.16
749.9	4.101	22.42	0.59	112	4.02	0.16	0.23	0.17	0.00	0.00	0.23	0.17
749.7	4.265	19.93	0.49	112	4.18	0.16	0.24	0.18	0.00	0.00	0.24	0.18
749.6	4.429	18.12	0.46	112	4.35	0.16	0.25	0.19	0.00	0.00	0.25	0.19
749.4	4.593	15.80	0.46	112	4.51	0.16	0.26	0.20	0.00	0.00	0.26	0.20
749.2	4.757	14.63	0.41	112	4.68	0.16	0.27	0.21	0.00	0.00	0.27	0.21
749.1	4.921	13.28	0.37	112	4.84	0.16	0.28	0.22	0.00	0.00	0.28	0.22
748.9	5.085	32.84	0.30	128	5.00	0.16	0.29	0.23	0.00	0.00	0.29	0.22
748.8	5.249	33.96	0.34	128	5.17	0.16	0.30	0.24	0.00	0.01	0.30	0.23
748.6	5.413	27.81	0.47	128	5.33	0.16	0.31	0.25	0.00	0.01	0.31	0.23
748.4	5.577	21.20	0.57	128	5.50	0.16	0.32	0.26	0.00	0.02	0.32	0.24
748.3	5.741	13.69	0.54	128	5.66	0.16	0.33	0.27	0.00	0.02	0.33	0.24
748.1	5.905	12.20	0.39	128	5.82	0.16	0.34	0.28	0.00	0.03	0.34	0.25
747.9	6.069	12.32	0.31	128	5.99	0.16	0.35	0.29	0.00	0.03	0.35	0.26
747.8	6.234	10.55	0.33	128	6.15	0.16	0.36	0.30	0.01	0.04	0.35	0.26
747.6	6.398	10.87	0.34	128	6.32	0.16	0.37	0.31	0.01	0.04	0.36	0.27
747.4	6.562	11.16	0.43	128	6.48	0.16	0.38	0.32	0.02	0.05	0.36	0.27
747.3	6.726	11.09	0.44	128	6.64	0.16	0.39	0.33	0.02	0.05	0.37	0.28
747.1	6.890	9.71	0.43	128	6.81	0.16	0.40	0.34	0.03	0.06	0.37	0.28
746.9	7.054	9.17	0.38	128	6.97	0.16	0.41	0.35	0.03	0.06	0.38	0.29
746.8	7.218	8.46	0.32	128	7.14	0.16	0.42	0.36	0.04	0.07	0.38	0.29
746.6	7.382	9.30	0.31	128	7.30	0.16	0.43	0.37	0.04	0.07	0.39	0.30
746.5	7.546	10.58	0.37	128	7.46	0.16	0.44	0.38	0.05	0.08	0.40	0.30
746.3	7.710	10.84	0.29	128	7.63	0.16	0.45	0.39	0.05	0.08	0.40	0.31
746.1	7.874	9.97	0.29	128	7.79	0.16	0.46	0.40	0.06	0.09	0.41	0.31
746.0	8.038	10.54	0.29	128	7.96	0.16	0.48	0.42	0.06	0.09	0.41	0.32
745.8	8.202	11.47	0.47	128	8.12	0.16	0.49	0.43	0.07	0.10	0.42	0.33
745.6	8.366	19.22	0.59	128	8.28	0.16	0.50	0.44	0.07	0.11	0.42	0.33
745.5	8.530	34.93	1.09	128	8.45	0.16	0.51	0.45	0.08	0.11	0.43	0.34
745.3	8.694	34.57	1.36	128	8.61	0.16	0.52	0.46	0.08	0.12	0.43	0.34
745.1	8.858	25.94	1.30	128	8.78	0.16	0.53	0.47	0.09	0.12	0.44	0.35
745.0	9.022	27.56	1.17	128	8.94	0.16	0.54	0.48	0.09	0.13	0.44	0.35
744.8	9.186	32.08	1.16	128	9.10	0.16	0.55	0.49	0.10	0.13	0.45	0.36
744.6	9.350	40.27	1.05	128	9.27	0.16	0.56	0.50	0.10	0.14	0.45	0.36
744.5	9.514	25.18	1.10	128	9.43	0.16	0.57	0.51	0.11	0.14	0.46	0.37

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
744.3	9.678	49.40	0.40	128	9.60	0.16	0.58	0.52	0.11	0.15	0.47	0.37
744.2	9.842	32.87	0.53	128	9.76	0.16	0.59	0.53	0.12	0.15	0.47	0.38
744.0	10.006	40.06	0.17	128	9.92	0.16	0.60	0.54	0.13	0.16	0.48	0.38
743.8	10.170	293.89	0.24	128	10.09	0.16	0.61	0.55	0.13	0.16	0.48	0.39
743.7	10.335	205.35	3.34	128	10.25	0.16	0.62	0.56	0.14	0.17	0.49	0.40
743.5	10.499	211.42	4.03	128	10.42	0.16	0.63	0.57	0.14	0.17	0.49	0.40
743.3	10.663	100.81	3.44	128	10.58	0.16	0.64	0.58	0.15	0.18	0.50	0.41
743.2	10.827	10.09	2.44	128	10.74	0.16	0.65	0.59	0.15	0.18	0.50	0.41
743.0	10.991	10.23	0.31	128	10.91	0.16	0.66	0.60	0.16	0.19	0.51	0.42
742.8	11.155	184.13	0.47	128	11.07	0.16	0.67	0.61	0.16	0.19	0.51	0.42
742.7	11.319	167.31	0.43	128	11.24	0.16	0.69	0.63	0.17	0.20	0.52	0.43
742.5	11.483	115.70	2.10	128	11.40	0.16	0.70	0.64	0.17	0.20	0.52	0.43
742.4	11.647	24.62	1.98	128	11.56	0.16	0.71	0.65	0.18	0.21	0.53	0.44
742.2	11.811	7.05	1.55	128	11.73	0.16	0.72	0.66	0.18	0.21	0.54	0.44
742.0	11.975	11.19	0.28	128	11.89	0.16	0.73	0.67	0.19	0.22	0.54	0.45
741.9	12.139	4.05	0.23	128	12.06	0.16	0.74	0.68	0.19	0.22	0.55	0.45
741.7	12.303	4.62	0.20	128	12.22	0.16	0.75	0.69	0.20	0.23	0.55	0.46
741.5	12.467	3.87	0.15	128	12.39	0.16	0.76	0.70	0.20	0.23	0.56	0.47
741.4	12.631	5.73	0.14	128	12.55	0.16	0.77	0.71	0.21	0.24	0.56	0.47
741.2	12.795	6.01	0.33	128	12.71	0.16	0.78	0.72	0.21	0.24	0.57	0.48
741.0	12.959	6.03	0.60	128	12.88	0.16	0.79	0.73	0.22	0.25	0.57	0.48
740.9	13.123	42.61	0.56	128	13.04	0.16	0.80	0.74	0.22	0.25	0.58	0.49
740.7	13.287	6.54	0.86	128	13.21	0.16	0.81	0.75	0.23	0.26	0.58	0.49
740.5	13.451	19.89	0.48	128	13.37	0.16	0.82	0.76	0.23	0.26	0.59	0.50
740.4	13.615	19.99	0.05	128	13.53	0.16	0.83	0.77	0.24	0.27	0.59	0.50
740.2	13.779	5.95	0.17	128	13.70	0.16	0.84	0.78	0.24	0.27	0.60	0.51
740.1	13.943	5.62	0.21	128	13.86	0.16	0.85	0.79	0.25	0.28	0.61	0.51
739.9	14.107	5.02	0.23	128	14.03	0.16	0.86	0.80	0.25	0.28	0.61	0.52
739.7	14.271	10.28	0.18	128	14.19	0.16	0.87	0.81	0.26	0.29	0.62	0.52
739.6	14.436	11.16	0.24	128	14.35	0.16	0.88	0.82	0.26	0.29	0.62	0.53
739.4	14.600	12.71	0.30	128	14.52	0.16	0.89	0.83	0.27	0.30	0.63	0.54
739.2	14.764	16.03	0.25	128	14.68	0.16	0.91	0.85	0.27	0.30	0.63	0.54
739.1	14.928	15.40	0.36	128	14.85	0.16	0.92	0.86	0.28	0.31	0.64	0.55
738.9	15.092	11.53	0.41	128	15.01	0.16	0.93	0.87	0.28	0.31	0.64	0.55
738.7	15.256	16.97	0.55	128	15.17	0.16	0.94	0.88	0.29	0.32	0.65	0.56
738.6	15.420	43.87	0.77	128	15.34	0.16	0.95	0.89	0.29	0.33	0.65	0.56
738.4	15.584	40.31	0.68	128	15.50	0.16	0.96	0.90	0.30	0.33	0.66	0.57
738.3	15.748	48.77	1.33	128	15.67	0.16	0.97	0.91	0.30	0.34	0.66	0.57
738.1	15.912	45.46	0.13	128	15.83	0.16	0.98	0.92	0.31	0.34	0.67	0.58
737.9	16.076	38.80	0.01	128	15.99	0.16	0.99	0.93	0.31	0.35	0.68	0.58
737.8	16.240	304.23	0.01	128	16.16	0.08	1.00	0.94	0.32	0.35	0.68	0.59

LIQUEFACTION POTENTIAL ASSESSMENT FOR COARSE GRAINED SOILS USING CONE PENETRATION TEST DATA

Project Site: KIF TDEC Stability
Project No.: 175668043
CPT ID: CPT-07

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
754.0												
753.8	0.164	847.39	0.15	0.67	0.5	1.70	138.85	0	0.00	138.85	0.057	#NUM!
753.7	0.328	1440.21	0.15	0.50	0.5	1.70	328.24	0	0.00	328.24	0.054	#NUM!
753.5	0.492	1164.92	0.15	0.57	0.5	1.70	323.35	0	0.00	323.35	0.052	#NUM!
753.3	0.656	999.76	0.15	0.61	0.5	1.70	319.55	0	0.00	319.55	0.049	#NUM!
753.2	0.820	927.99	0.15	0.64	0.5	1.70	331.06	0	0.00	331.06	0.046	#NUM!
753.0	0.984	785.89	0.15	0.70	0.5	1.70	306.79	0	0.00	306.79	0.044	#NUM!
752.9	1.148	700.87	0.15	0.74	0.5	1.70	295.30	0	0.00	295.30	0.041	-0.600
752.7	1.312	590.83	0.23	0.91	0.5	1.70	265.99	0	0.00	265.99	0.038	-0.600
752.5	1.476	517.86	0.29	1.02	0.5	1.70	247.18	0	0.00	247.18	0.035	-0.600
752.4	1.640	518.47	0.16	0.86	0.5	1.70	260.77	0	0.00	260.77	0.033	-0.600
752.2	1.804	657.06	0.17	0.79	0.5	1.70	346.46	0	0.00	346.46	0.030	-0.600
752.0	1.968	568.10	0.34	1.04	0.5	1.70	312.82	0	0.00	312.82	0.027	-0.600
751.9	2.133	504.36	0.55	1.23	0.5	1.70	289.02	0	0.00	289.02	0.028	-0.600
751.7	2.297	371.86	1.20	1.58	0.5	1.70	221.16	0	0.00	221.16	0.031	-0.600
751.5	2.461	256.53	1.65	1.79	0.5	1.70	157.97	6	0.00	157.97	0.033	-0.600
751.4	2.625	252.52	1.65	1.79	0.5	1.70	160.59	6	0.00	160.59	0.035	-0.600
751.2	2.789	301.75	1.16	1.62	0.5	1.70	197.74	0	0.00	197.74	0.037	-0.600
751.0	2.953	446.41	0.75	1.37	0.5	1.63	288.06	0	0.00	288.06	0.040	-0.600
750.9	3.117	387.44	0.43	1.23	0.5	1.61	253.58	0	0.00	253.58	0.041	-0.600
750.7	3.281	216.03	1.07	1.69	0.5	1.70	153.60	0	0.00	153.60	0.039	-0.600
750.6	3.445	124.78	2.15	2.07	0.5	1.70	91.04	29	0.00	91.04	0.038	-0.383
750.4	3.609	81.49	2.84	2.29	0.5	1.70	60.97	46	0.00	60.97	0.037	-0.224
750.2	3.773	70.45	2.85	2.33	0.5	1.70	53.94	50	0.00	53.94	0.036	-0.178
750.1	3.937	52.69	2.94	2.43	0.5	1.70	41.30	57	0.00	41.30	0.035	-0.084
749.9	4.101	44.95	2.64	2.45	0.5	1.70	36.02	59	0.00	36.02	0.032	-0.037
749.7	4.265	39.12	2.48	2.48	0.5	1.70	32.03	61	0.00	32.03	0.030	0.001
749.6	4.429	34.84	2.57	2.53	0.5	1.70	29.12	65	0.00	29.12	0.027	0.032
749.4	4.593	39.47	2.97	2.53	0.7	1.70	25.39	65	0.00	25.39	0.025	0.074
749.2	4.757	35.59	2.86	2.55	0.7	1.70	23.51	67	0.00	23.51	0.022	0.097
749.1	4.921	31.46	2.88	2.59	0.7	1.70	21.33	70	0.00	21.33	0.020	0.100
748.9	5.085	59.18	0.93	2.07	0.5	1.70	52.77	29	44.66	97.43	0.016	-0.403
748.8	5.249	60.10	1.00	2.08	0.5	1.70	54.57	30	46.08	100.65	0.013	-0.416
748.6	5.413	48.24	1.72	2.30	0.5	1.70	44.68	47	56.67	101.35	0.012	-0.419
748.4	5.577	36.03	2.74	2.53	0.5	1.70	34.07	66	59.62	93.69	0.015	-0.385
748.3	5.741	40.74	4.03	2.61	1.0	1.70	22.00	71	57.28	79.29	0.013	-0.316
748.1	5.905	24.88	3.30	2.71	0.7	1.70	19.60	79	57.82	77.41	0.010	-0.306
747.9	6.069	24.70	2.61	2.64	0.7	1.70	19.80	75	57.15	76.95	0.008	-0.303
747.8	6.234	28.94	3.25	2.65	1.0	1.70	16.96	75	56.40	73.36	0.006	-0.284
747.6	6.398	29.36	3.27	2.65	1.0	1.70	17.47	75	56.52	73.98	0.004	-0.287
747.4	6.562	29.68	3.98	2.70	1.0	1.70	17.93	79	57.27	75.20	0.003	-0.293
747.3	6.726	29.05	4.09	2.72	1.0	1.70	17.82	80	57.41	75.23	0.002	-0.293
747.1	6.890	24.91	4.58	2.80	1.0	1.70	15.61	87	57.53	73.14	0.001	-0.281
746.9	7.054	23.09	4.36	2.81	1.0	1.70	14.73	88	57.36	72.09	0.001	-0.275
746.8	7.218	20.89	4.03	2.82	1.0	1.70	13.59	89	57.10	70.69	0.001	-0.267
746.6	7.382	22.73	3.49	2.75	1.0	1.70	14.94	83	56.89	71.83	0.002	-0.273
746.5	7.546	25.65	3.60	2.72	1.0	1.70	17.00	81	57.20	74.20	0.003	-0.286
746.3	7.710	25.93	2.82	2.65	1.0	1.70	17.42	75	56.51	73.93	0.005	-0.284
746.1	7.874	23.40	3.02	2.70	1.0	1.70	16.01	79	56.71	72.72	0.006	-0.277
746.0	8.038	24.47	2.88	2.67	1.0	1.70	16.94	77	56.67	73.61	0.007	-0.281
745.8	8.202	26.35	4.31	2.76	1.0	1.68	18.20	84	57.98	76.18	0.009	-0.295
745.6	8.366	33.67	3.15	2.59	0.7	1.62	29.40	70	59.27	88.67	0.010	-0.356
745.5	8.530	51.18	3.16	2.46	0.5	1.53	50.51	60	62.84	113.36	0.011	-0.460
745.3	8.694	50.31	3.99	2.54	0.5	1.52	49.65	66	64.21	113.86	0.012	-0.462
745.1	8.858	44.51	5.10	2.65	0.7	1.55	37.97	75	62.62	100.59	0.013	-0.408
745.0	9.022	46.92	4.32	2.58	0.7	1.53	39.97	70	62.21	102.18	0.014	-0.414
744.8	9.186	45.74	3.67	2.54	0.5	1.51	45.69	66	63.13	108.83	0.015	-0.441
744.6	9.350	57.27	2.64	2.37	0.5	1.47	56.13	53	62.02	118.15	0.016	-0.477
744.5	9.514	41.69	4.49	2.63	0.7	1.52	36.17	74	61.81	97.98	0.017	-0.395
744.3	9.678	69.58	0.83	1.99	0.5	1.49	69.51	22	36.64	106.14	0.018	-0.429
744.2	9.842	45.74	1.64	2.31	0.5	1.49	46.21	48	57.25	103.46	0.019	-0.418

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
744.0	10.006	55.61	0.44	1.93	0.5	1.54	58.13	17	25.41	83.54	0.020	-0.328
743.8	10.170	410.94	0.15	0.94	0.5	1.23	341.70	0	0.00	341.70	0.021	-0.600
743.7	10.335	285.28	1.63	1.76	0.5	1.24	240.88	3	0.01	240.88	0.022	-0.600
743.5	10.499	292.11	1.91	1.81	0.5	1.23	245.50	7	3.40	248.90	0.023	-0.600
743.3	10.663	138.06	3.43	2.20	0.5	1.29	122.90	39	70.86	193.76	0.024	-0.600
743.2	10.827	18.76	25.83	3.43	1.0	1.52	14.52	100	58.44	72.95	0.026	-0.273
743.0	10.991	18.81	3.23	2.79	1.0	1.52	14.66	87	57.20	71.86	0.027	-0.266
742.8	11.155	248.85	0.26	1.25	0.5	1.25	217.21	0	0.00	217.21	0.028	-0.600
742.7	11.319	224.84	0.26	1.28	0.5	1.26	199.89	0	0.00	199.89	0.029	-0.600
742.5	11.483	154.40	1.83	1.96	0.5	1.28	140.21	20	41.59	181.79	0.030	-0.600
742.4	11.647	45.14	8.28	2.80	1.0	1.42	33.04	87	62.88	95.93	0.031	-0.382
742.2	11.811	11.84	24.40	3.54	1.0	1.49	9.91	100	57.01	66.92	0.032	-0.237
742.0	11.975	19.35	2.69	2.74	1.0	1.46	15.47	82	56.89	72.36	0.033	-0.267
741.9	12.139	6.08	7.05	3.39	1.0	1.49	5.70	100	55.70	61.40	0.034	-0.204
741.7	12.303	7.02	5.14	3.26	1.0	1.47	6.44	100	55.93	62.37	0.034	-0.210
741.5	12.467	5.59	4.73	3.32	1.0	1.47	5.38	100	55.60	60.98	0.035	-0.201
741.4	12.631	8.82	2.78	3.02	1.0	1.45	7.86	100	56.37	64.24	0.036	-0.220
741.2	12.795	9.21	6.26	3.22	1.0	1.44	8.19	100	56.48	64.67	0.037	-0.223
741.0	12.959	9.14	11.36	3.39	1.0	1.44	8.18	100	56.47	64.65	0.038	-0.222
740.9	13.123	53.45	1.35	2.20	0.5	1.34	53.81	39	54.44	108.26	0.039	-0.432
740.7	13.287	9.82	14.94	3.45	1.0	1.42	8.76	100	56.65	65.42	0.039	-0.226
740.5	13.451	27.16	2.53	2.60	0.7	1.37	25.72	71	58.35	84.08	0.040	-0.325
740.4	13.615	24.15	0.27	2.18	0.5	1.38	26.16	38	46.85	73.01	0.041	-0.268
740.2	13.779	8.52	3.31	3.08	1.0	1.40	7.87	100	56.38	64.24	0.041	-0.219
740.1	13.943	7.88	4.42	3.18	1.0	1.39	7.40	100	56.23	63.63	0.042	-0.215
739.9	14.107	6.82	5.58	3.29	1.0	1.39	6.59	100	55.98	62.57	0.043	-0.208
739.7	14.271	15.27	1.90	2.73	1.0	1.36	13.26	82	56.21	69.47	0.043	-0.248
739.6	14.436	16.53	2.34	2.76	1.0	1.35	14.28	83	56.73	71.01	0.044	-0.256
739.4	14.600	18.85	2.54	2.73	1.0	1.34	16.14	81	57.04	73.18	0.045	-0.268
739.2	14.764	20.51	1.65	2.59	0.7	1.33	20.17	70	56.57	76.74	0.046	-0.286
739.1	14.928	22.72	2.46	2.66	1.0	1.32	19.28	76	57.16	76.44	0.046	-0.284
738.9	15.092	16.49	3.89	2.89	1.0	1.33	14.45	94	57.91	72.36	0.047	-0.263
738.7	15.256	24.73	3.44	2.72	1.0	1.31	20.97	81	58.38	79.34	0.048	-0.299
738.6	15.420	51.62	1.78	2.29	0.5	1.26	52.14	46	58.15	110.29	0.049	-0.436
738.4	15.584	47.14	1.73	2.31	0.5	1.26	47.94	48	57.86	105.80	0.050	-0.418
738.3	15.748	57.01	2.79	2.39	0.5	1.24	57.01	54	62.77	119.78	0.051	-0.472
738.1	15.912	52.84	0.30	1.88	0.5	1.30	55.75	14	15.47	71.22	0.052	-0.255
737.9	16.076	44.74	0.15	1.86	0.5	1.31	48.16	12	10.92	59.08	0.052	-0.184
737.8	16.240	357.37	0.15	1.00	0.5	1.12	322.94	0	0.00	322.94	0.053	-0.600

LIQUEFACTION POTENTIAL ASSESSMENT FOR COARSE GRAINED SOILS USING CONE PENETRATION TEST DATA

Project Site: **KIF TDEC Stability**
Stantec Project No.: **175668043**
CPT ID: **CPT-07**

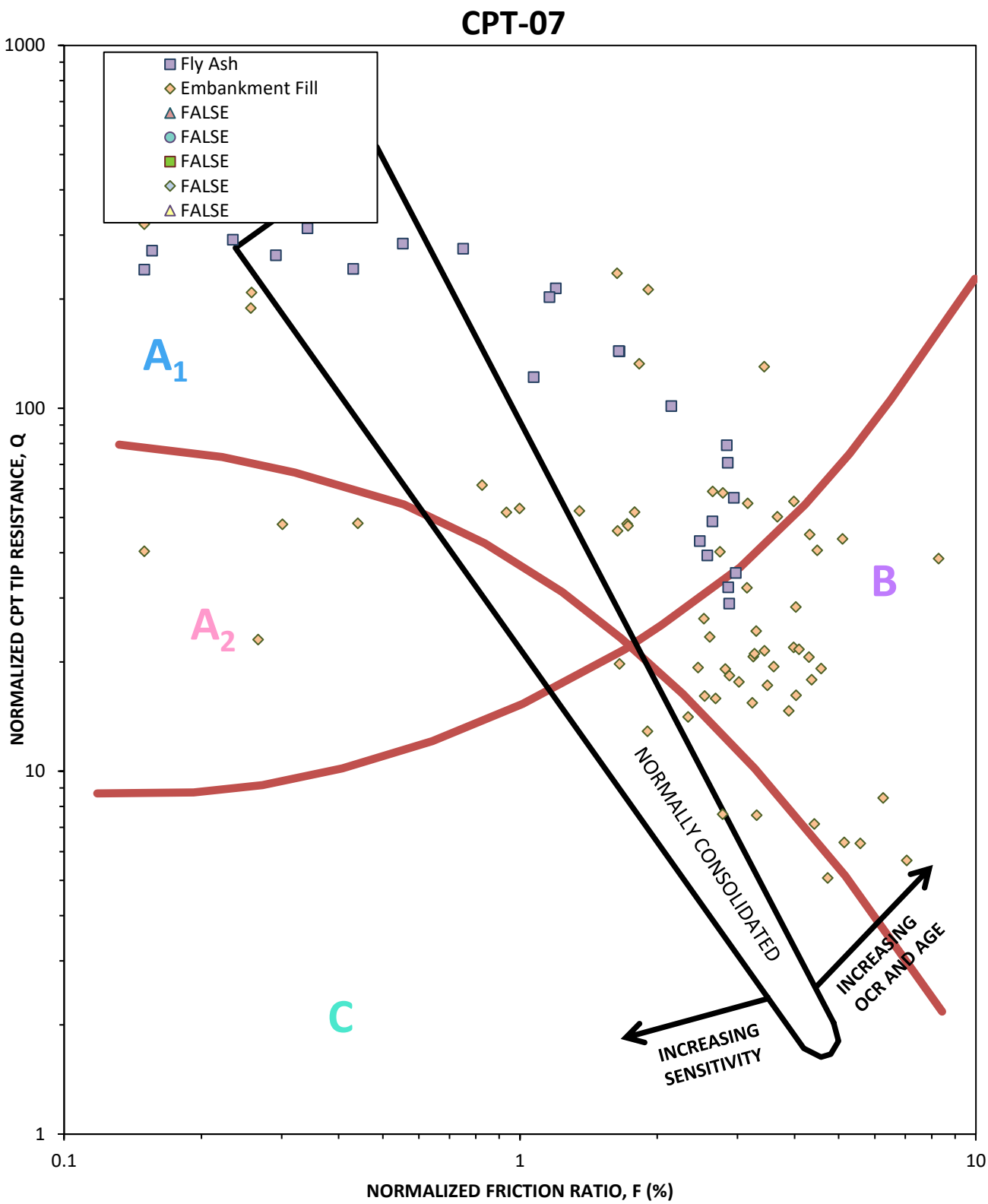
Depth to Water during Earthquake:	5.0	ft
Final Grade Elevation during EQ:	753.0	ft
Height of Final Grade above CPT TOH:	-1.0	ft
Normalize K_σ to:	1.058	tsf
a_{max} at top of ground surface:	0.21	g
Earthquake Magnitude:	6.00	M_W
Earthquake File or Source Zone:	10	Hz

Shear Stress Fit Parameters

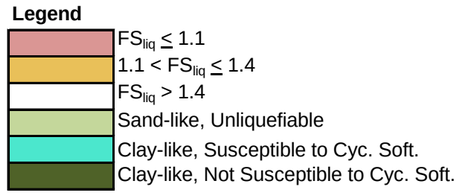
m4:	0
m3:	0
m2:	0
m1:	0

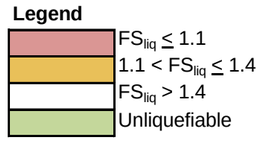
Elev. (ft)	Depth *z* (ft)	Cyclic Resistance Ratio *CRR 7.5*	Relative Density *D r* (%)	Correction for Overburden Pressure *K σ*	Correction for Sloping Ground *K α*	Magnitude Scaling Factor *MSF*	Cyclic Resistance Ratio *CRR*	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress *τ Max* (psf)	From Ground Response: Average Cyclic Shear Stress *τ Avg* (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. *(qc 1N) CS ≥ 175*	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
754.0																	
753.8	0.164	0.229	70	#NUM!	N/A	1.33	N/A	1.000	0	0	**0.136**	FALSE	FALSE	TRUE	**N/A**	**Fly Ash**	**A1**
753.7	0.328	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.136**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
753.5	0.492	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.136**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
753.3	0.656	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.136**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
753.2	0.820	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.136**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
753.0	0.984	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.136**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
752.9	1.148	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.136**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
752.7	1.312	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.136**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
752.5	1.476	N/A	98	N/A	N/A	N/A	N/A	1.000	0	0	**0.136**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
752.4	1.640	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.136**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
752.2	1.804	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.136**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
752.0	1.968	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.136**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
751.9	2.133	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.136**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
751.7	2.297	N/A	93	N/A	N/A	N/A	N/A	1.000	0	0	**0.136**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
751.5	2.461	0.351	76	1.100	N/A	1.46	N/A	1.000	0	0	**0.136**	FALSE	FALSE	TRUE	**N/A**	**Fly Ash**	**A1**
751.4	2.625	0.377	76	1.100	N/A	1.48	N/A	1.000	0	0	**0.136**	FALSE	FALSE	TRUE	**N/A**	**Fly Ash**	**A1**
751.2	2.789	N/A	87	N/A	N/A	N/A	N/A	1.000	0	0	**0.136**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
751.0	2.953	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.136**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
750.9	3.117	N/A	100	N/A	N/A	N/A	N/A	0.999	0	0	**0.136**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
750.7	3.281	0.314	74	1.100	N/A	1.43	N/A	0.999	0	0	**0.136**	FALSE	FALSE	TRUE	**N/A**	**Fly Ash**	**A1**
750.6	3.445	0.127	51	1.100	N/A	1.13	N/A	0.998	0	0	**0.136**	FALSE	FALSE	TRUE	**N/A**	**Fly Ash**	**A1**
750.4	3.609	0.100	35	1.100	N/A	1.08	N/A	0.997	0	0	**0.136**	FALSE	FALSE	TRUE	**N/A**	**Fly Ash**	**A1**
750.2	3.773	0.095	31	1.100	N/A	1.07	N/A	0.996	0	0	**0.136**	FALSE	FALSE	TRUE	**N/A**	**Fly Ash**	**A1**
750.1	3.937	0.086	21	1.100	N/A	1.06	N/A	0.996	0	0	**0.136**	FALSE	FALSE	TRUE	**N/A**	**Fly Ash**	**A1**
749.9	4.101	0.083	17	1.100	N/A	1.06	N/A	0.995	0	0	**0.136**	FALSE	FALSE	TRUE	**N/A**	**Fly Ash**	**A1**
749.7	4.265	0.080	13	1.100	N/A	1.06	N/A	0.994	0	0	**0.135**	FALSE	FALSE	TRUE	**N/A**	**Fly Ash**	**A1**
749.6	4.429	0.078	10	1.100	N/A	1.06	N/A	0.993	0	0	**0.135**	FALSE	FALSE	TRUE	**N/A**	**Fly Ash**	**A1**
749.4	4.593	0.076	6	1.094	N/A	1.06	N/A	0.993	0	0	**0.135**	FALSE	FALSE	TRUE	**N/A**	**Fly Ash**	**B**
749.2	4.757	0.075	4	1.089	N/A	1.06	N/A	0.992	0	0	**0.135**	FALSE	FALSE	TRUE	**N/A**	**Fly Ash**	**B**
749.1	4.921	0.073	1	1.085	N/A	1.06	N/A	0.991	0	0	**0.135**	FALSE	FALSE	TRUE	**N/A**	**Fly Ash**	**B**
748.9	5.085	N/A	54	N/A	N/A	N/A	N/A	0.990	0	0	**0.136**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
748.8	5.249	N/A	55	N/A	N/A	N/A	N/A	0.989	0	0	**0.139**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
748.6	5.413	N/A	56	N/A	N/A	N/A	N/A	0.989	0	0	**0.142**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
748.4	5.577	N/A	52	N/A	N/A	N/A	N/A	0.988	0	0	**0.145**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
748.3	5.741	N/A	45	N/A	N/A	N/A	N/A	0.987	0	0	**0.147**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
748.1	5.905	N/A	44	N/A	N/A	N/A	N/A	0.986	0	0	**0.149**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
747.9	6.069	N/A	44	N/A	N/A	N/A	N/A	0.985	0	0	**0.152**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
747.8	6.234	N/A	42	N/A	N/A	N/A	N/A	0.984	0	0	**0.154**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
747.6	6.398	N/A	43	N/A	N/A	N/A	N/A	0.984	0	0	**0.156**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
747.4	6.562	N/A	43	N/A	N/A	N/A	N/A	0.983	0	0	**0.158**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
747.3	6.726	N/A	43	N/A	N/A	N/A	N/A	0.982	0	0	**0.160**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
747.1	6.890	N/A	42	N/A	N/A	N/A	N/A	0.981	0	0	**0.162**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
746.9	7.054	N/A	42	N/A	N/A	N/A	N/A	0.980	0	0	**0.163**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
746.8	7.218	N/A	41	N/A	N/A	N/A	N/A	0.979	0	0	**0.165**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**

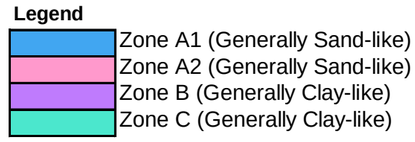
Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
746.6	7.382	N/A	41	N/A	N/A	N/A	N/A	0.979	0	0	**0.166**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
746.5	7.546	N/A	43	N/A	N/A	N/A	N/A	0.978	0	0	**0.168**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
746.3	7.710	N/A	43	N/A	N/A	N/A	N/A	0.977	0	0	**0.169**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
746.1	7.874	N/A	42	N/A	N/A	N/A	N/A	0.976	0	0	**0.171**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
746.0	8.038	N/A	42	N/A	N/A	N/A	N/A	0.975	0	0	**0.172**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
745.8	8.202	N/A	44	N/A	N/A	N/A	N/A	0.974	0	0	**0.173**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
745.6	8.366	N/A	50	N/A	N/A	N/A	N/A	0.973	0	0	**0.175**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
745.5	8.530	N/A	60	N/A	N/A	N/A	N/A	0.972	0	0	**0.176**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
745.3	8.694	N/A	61	N/A	N/A	N/A	N/A	0.972	0	0	**0.177**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
745.1	8.858	N/A	55	N/A	N/A	N/A	N/A	0.971	0	0	**0.178**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
745.0	9.022	N/A	56	N/A	N/A	N/A	N/A	0.970	0	0	**0.179**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
744.8	9.186	N/A	59	N/A	N/A	N/A	N/A	0.969	0	0	**0.180**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
744.6	9.350	N/A	62	N/A	N/A	N/A	N/A	0.968	0	0	**0.181**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
744.5	9.514	N/A	54	N/A	N/A	N/A	N/A	0.967	0	0	**0.182**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
744.3	9.678	N/A	58	N/A	N/A	N/A	N/A	0.966	0	0	**0.183**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
744.2	9.842	N/A	56	N/A	N/A	N/A	N/A	0.965	0	0	**0.184**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
744.0	10.006	N/A	47	N/A	N/A	N/A	N/A	0.964	0	0	**0.185**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A2**
743.8	10.170	N/A	100	N/A	N/A	N/A	N/A	0.963	0	0	**0.185**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
743.7	10.335	N/A	97	N/A	N/A	N/A	N/A	0.962	0	0	**0.186**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
743.5	10.499	N/A	99	N/A	N/A	N/A	N/A	0.961	0	0	**0.187**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
743.3	10.663	N/A	86	N/A	N/A	N/A	N/A	0.960	0	0	**0.188**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
743.2	10.827	N/A	42	N/A	N/A	N/A	N/A	0.960	0	0	**0.188**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
743.0	10.991	N/A	41	N/A	N/A	N/A	N/A	0.959	0	0	**0.189**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
742.8	11.155	N/A	92	N/A	N/A	N/A	N/A	0.958	0	0	**0.190**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
742.7	11.319	N/A	87	N/A	N/A	N/A	N/A	0.957	0	0	**0.190**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
742.5	11.483	N/A	83	N/A	N/A	N/A	N/A	0.956	0	0	**0.191**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**
742.4	11.647	N/A	53	N/A	N/A	N/A	N/A	0.955	0	0	**0.192**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
742.2	11.811	N/A	39	N/A	N/A	N/A	N/A	0.954	0	0	**0.192**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
742.0	11.975	N/A	42	N/A	N/A	N/A	N/A	0.953	0	0	**0.193**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
741.9	12.139	N/A	35	N/A	N/A	N/A	N/A	0.952	0	0	**0.193**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
741.7	12.303	N/A	36	N/A	N/A	N/A	N/A	0.951	0	0	**0.194**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
741.5	12.467	N/A	35	N/A	N/A	N/A	N/A	0.950	0	0	**0.194**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**C**
741.4	12.631	N/A	37	N/A	N/A	N/A	N/A	0.949	0	0	**0.195**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**C**
741.2	12.795	N/A	37	N/A	N/A	N/A	N/A	0.948	0	0	**0.195**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
741.0	12.959	N/A	37	N/A	N/A	N/A	N/A	0.947	0	0	**0.195**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
740.9	13.123	N/A	58	N/A	N/A	N/A	N/A	0.946	0	0	**0.196**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
740.7	13.287	N/A	38	N/A	N/A	N/A	N/A	0.945	0	0	**0.196**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
740.5	13.451	N/A	48	N/A	N/A	N/A	N/A	0.944	0	0	**0.197**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
740.4	13.615	N/A	42	N/A	N/A	N/A	N/A	0.943	0	0	**0.197**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A2**
740.2	13.779	N/A	37	N/A	N/A	N/A	N/A	0.942	0	0	**0.197**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**C**
740.1	13.943	N/A	37	N/A	N/A	N/A	N/A	0.941	0	0	**0.198**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
739.9	14.107	N/A	36	N/A	N/A	N/A	N/A	0.940	0	0	**0.198**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
739.7	14.271	N/A	40	N/A	N/A	N/A	N/A	0.939	0	0	**0.198**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**C**
739.6	14.436	N/A	41	N/A	N/A	N/A	N/A	0.938	0	0	**0.199**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**C**
739.4	14.600	N/A	42	N/A	N/A	N/A	N/A	0.937	0	0	**0.199**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
739.2	14.764	N/A	44	N/A	N/A	N/A	N/A	0.936	0	0	**0.199**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**C**
739.1	14.928	N/A	44	N/A	N/A	N/A	N/A	0.935	0	0	**0.199**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
738.9	15.092	N/A	42	N/A	N/A	N/A	N/A	0.933	0	0	**0.200**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
738.7	15.256	N/A	45	N/A	N/A	N/A	N/A	0.932	0	0	**0.200**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**B**
738.6	15.420	N/A	59	N/A	N/A	N/A	N/A	0.931	0	0	**0.200**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
738.4	15.584	N/A	57	N/A	N/A	N/A	N/A	0.930	0	0	**0.200**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
738.3	15.748	N/A	63	N/A	N/A	N/A	N/A	0.929	0	0	**0.201**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A1**
738.1	15.912	N/A	41	N/A	N/A	N/A	N/A	0.928	0	0	**0.201**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A2**
737.9	16.076	N/A	34	N/A	N/A	N/A	N/A	0.927	0	0	**0.201**	TRUE	FALSE	FALSE	**N/A**	**Embankment Fill**	**A2**
737.8	16.240	N/A	100	N/A	N/A	N/A	N/A	0.926	0	0	**0.201**	TRUE	TRUE	FALSE	**N/A**	**Embankment Fill**	**A1**



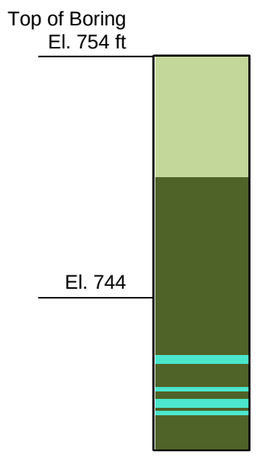
Adapted from "Discussion of 'Liquefaction Potential of Silts from CPTu'" (Robertson 2008). Zone A_1 and Zone A_2 samples are generally sand-like. Zone B samples are generally clay-like and not susceptible to cyclic softening. Zone C samples are generally clay-like and susceptible to cyclic softening. Note that the transition from clay-like to sand-like in this chart does not exactly match the liquefaction calculations herein; that is, some transitional samples in Zone B and Zone C will be treated as sand-like and analyzed for liquefaction if the calculations indicate as such.



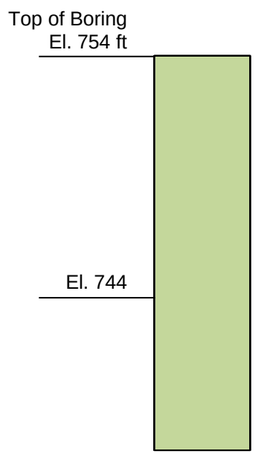




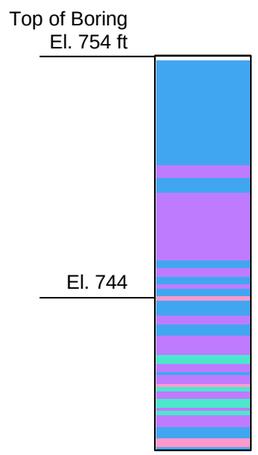
CPT-07, Liquefaction Triggering Results



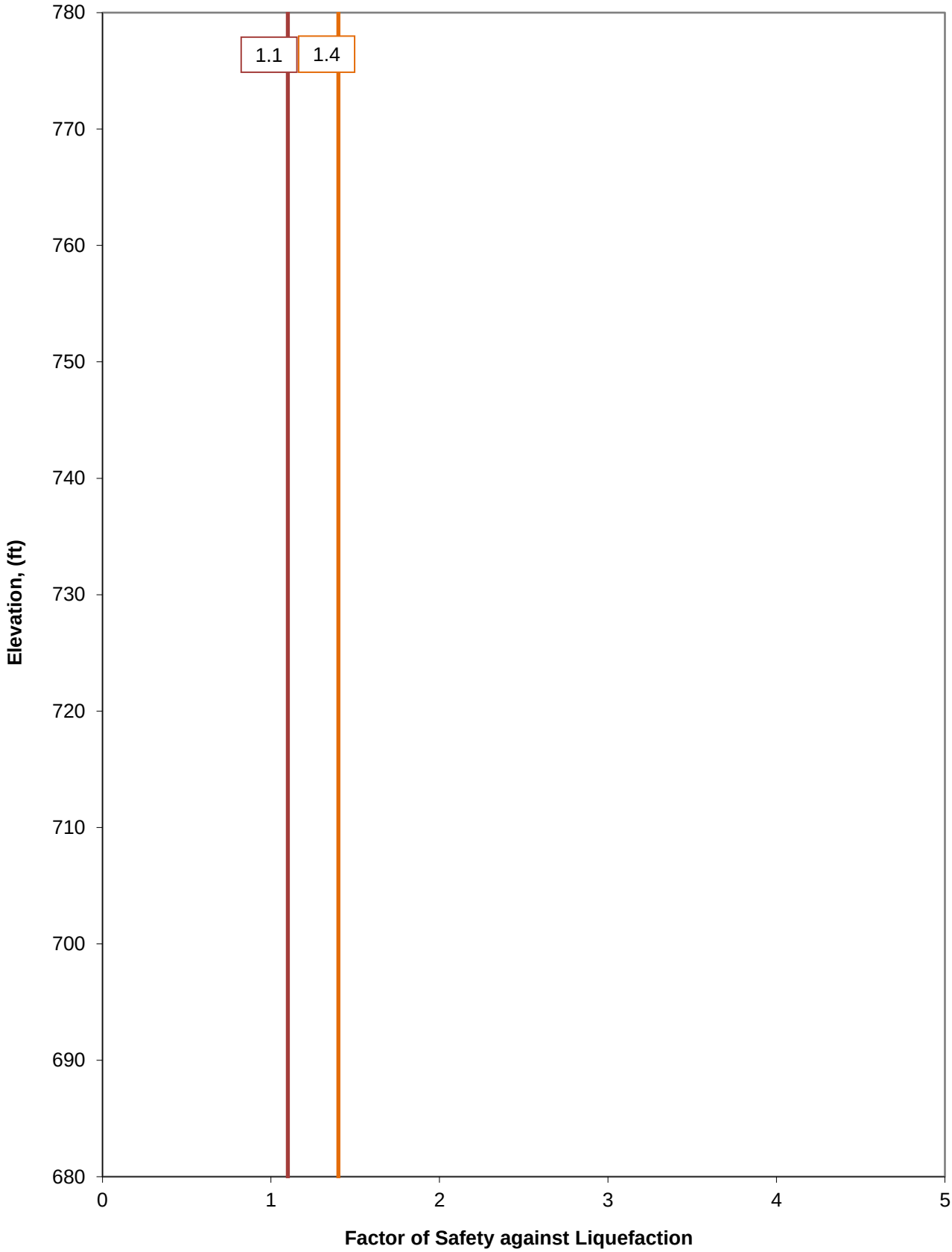
CPT-07, Liquefaction Triggering Results



CPT-07, Robertson Soil Type



KIF TDEC Stability, Boring = CPT-07, Source = 10 Hz, Mw = 6, Event = Design EQ, CPT Data, Simplified Stress-Based Approach



Project Information

Stantec Project Number =	175668043
Project Name =	KIF TDEC Stability
CPT ID =	KIF-BF-CPT-2

Boring Location (optional)

Northing =	
Easting =	

OR

Baseline Station =	
Offset (+ Right) =	

Using qt (corrected for u2 PWP) or qc (backcalculated uncorrected field tip)

Cone ID (optional) =	AD184	
Use qc instead of qt?	0	(1: Yes, 0: No)
Cone Area Ratio (a) =	0.80	

Drilling Information

Top of Hole Elevation =	769.0	feet
Water Depth during CPT (negative for U/S borings) =	14.0	feet
Depth data collection began =	0.16	feet
Avg. Total Unit Wt. Above 1st Sample =	122.00	pcf

During Earthquake Information

Water Depth during EQ (relative to CPT TOH, negative for U/S borings) =	15.0	feet
Final Grade Elevation during EQ =	769.0	feet
Avg. Total Unit Wt. of Cut/Fill =	122	pcf

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile?	0	(1: Yes, 0: No)

If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile:	ng_Pond_Section, KIF-BF-CPT2_NOR	
α at each Sample Depth known?	1	(1: Yes, 0: No)

If previous answer is No, then enter curve fit parameters below (α vs. depth curve)

If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_σ will be one.

m4:	
m3:	
m2:	
m1:	
m0:	

Associated ground response profile:	shing_Pond_Section, KIF-BF-SPT5	
Get CSR from shear stress envelope?	0	(1: Yes, 0: No)

If previous answer is No, then CSR will be calculated using a_{max} and r_d

Max. Shear Stress at each sample depth known?		(1: Yes, 0: No)

If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4:	
m3:	
m2:	
m1:	

Earthquake Information

EQ Source (e.g., New Madrid)	10 Hz
Event (e.g., MCE, OBE)	Design EQ
a_{max} (g) (top of ground surface)	0.19
EQ Mag (Mw)	6.0

Inputs

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
0.164	0.010	0.000	119	Bottom Ash	Sand-like		0.101			
0.328	0.010	0.000	119	Bottom Ash	Sand-like		0.100			
0.492	0.010	0.000	119	Bottom Ash	Sand-like		0.100			
0.656	0.010	0.000	119	Bottom Ash	Sand-like		0.099			
0.820	0.010	0.000	119	Bottom Ash	Sand-like		0.098			
0.984	0.010	0.000	119	Bottom Ash	Sand-like		0.098			
1.148	0.010	0.000	119	Bottom Ash	Sand-like		0.095			
1.312	0.010	0.000	119	Bottom Ash	Sand-like		0.094			
1.476	0.010	0.000	119	Bottom Ash	Sand-like		0.093			
1.640	0.010	0.000	119	Bottom Ash	Sand-like		0.092			
1.804	0.010	0.000	119	Bottom Ash	Sand-like		0.090			
1.968	0.010	0.000	119	Bottom Ash	Sand-like		0.089			
2.133	0.010	0.000	119	Bottom Ash	Sand-like		0.088			
2.297	0.010	0.000	119	Bottom Ash	Sand-like		0.086			
2.461	0.010	0.000	119	Bottom Ash	Sand-like		0.085			
2.625	0.010	0.000	119	Bottom Ash	Sand-like		0.083			
2.789	0.010	0.000	119	Bottom Ash	Sand-like		0.081			
2.953	0.010	0.000	119	Bottom Ash	Sand-like		0.080			
3.117	0.010	0.000	119	Bottom Ash	Sand-like		0.078			
3.281	0.010	0.000	119	Bottom Ash	Sand-like		0.077			
3.445	0.010	0.000	119	Bottom Ash	Sand-like		0.076			
3.609	0.010	0.000	119	Bottom Ash	Sand-like		0.074			
3.773	0.010	0.000	119	Bottom Ash	Sand-like		0.074			
3.937	0.010	0.000	119	Bottom Ash	Sand-like		0.073			
4.101	0.010	0.000	119	Bottom Ash	Sand-like		0.072			
4.265	0.010	0.000	119	Bottom Ash	Sand-like		0.071			
4.429	0.010	0.000	119	Bottom Ash	Sand-like		0.070			
4.593	0.010	0.000	119	Bottom Ash	Sand-like		0.070			
4.757	0.010	0.000	119	Bottom Ash	Sand-like		0.069			
4.921	0.010	0.000	119	Bottom Ash	Sand-like		0.069			
5.085	0.010	0.000	119	Bottom Ash	Sand-like		0.068			
5.249	0.010	0.000	119	Bottom Ash	Sand-like		0.067			
5.413	0.010	0.000	119	Bottom Ash	Sand-like		0.067			
5.577	0.010	0.000	119	Bottom Ash	Sand-like		0.066			
5.741	0.010	0.000	119	Bottom Ash	Sand-like		0.065			
5.905	0.010	0.000	119	Bottom Ash	Sand-like		0.064			
6.069	0.010	0.000	119	Bottom Ash	Sand-like		0.064			
6.234	0.010	0.000	119	Bottom Ash	Sand-like		0.063			
6.398	0.010	0.000	119	Bottom Ash	Sand-like		0.062			
6.562	0.010	0.000	119	Bottom Ash	Sand-like		0.062			
6.726	0.010	0.000	119	Bottom Ash	Sand-like		0.061			
6.890	0.010	0.000	119	Bottom Ash	Sand-like		0.061			
7.054	0.010	0.000	119	Bottom Ash	Sand-like		0.060			
7.218	0.010	0.000	119	Bottom Ash	Sand-like		0.060			
7.382	0.010	0.000	119	Bottom Ash	Sand-like		0.060			
7.546	0.010	0.000	119	Bottom Ash	Sand-like		0.059			
7.710	0.010	0.000	119	Bottom Ash	Sand-like		0.059			
7.874	0.010	0.000	119	Bottom Ash	Sand-like		0.059			
8.038	0.010	0.000	119	Bottom Ash	Sand-like		0.059			
8.202	0.010	0.000	119	Bottom Ash	Sand-like		0.058			
8.366	0.010	0.000	119	Bottom Ash	Sand-like		0.057			
8.530	0.010	0.000	119	Bottom Ash	Sand-like		0.057			
8.694	0.010	0.000	119	Bottom Ash	Sand-like		0.056			
8.858	0.010	0.000	119	Bottom Ash	Sand-like		0.056			
9.022	0.010	0.000	119	Bottom Ash	Sand-like		0.055			
9.186	0.010	0.000	119	Bottom Ash	Sand-like		0.055			
9.350	0.010	0.000	119	Bottom Ash	Sand-like		0.055			
9.514	0.010	0.000	119	Bottom Ash	Sand-like		0.055			
9.678	0.010	0.000	119	Bottom Ash	Sand-like		0.055			
9.842	0.010	0.000	119	Bottom Ash	Sand-like		0.055			
10.006	0.010	0.000	119	Bottom Ash	Sand-like		0.055			
10.170	0.010	0.000	119	Bottom Ash	Sand-like		0.055			
10.335	0.010	0.000	119	Bottom Ash	Sand-like		0.054			

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
10.499	0.010	0.000	119	Bottom Ash	Sand-like		0.054			
10.663	0.010	0.000	119	Bottom Ash	Sand-like		0.054			
10.827	0.010	0.000	119	Bottom Ash	Sand-like		0.053			
10.991	0.010	0.000	119	Bottom Ash	Sand-like		0.053			
11.155	0.010	0.000	119	Bottom Ash	Sand-like		0.053			
11.319	0.010	0.000	119	Bottom Ash	Sand-like		0.052			
11.483	0.010	0.000	119	Bottom Ash	Sand-like		0.052			
11.647	0.010	0.000	119	Bottom Ash	Sand-like		0.052			
11.811	0.010	0.000	119	Bottom Ash	Sand-like		0.052			
11.975	0.010	0.000	119	Bottom Ash	Sand-like		0.051			
12.139	6.137	0.057	119	Bottom Ash	Sand-like		0.051			
12.303	59.036	0.165	119	Bottom Ash	Sand-like		0.051			
12.467	128.016	0.621	119	Bottom Ash	Sand-like		0.051			
12.631	222.971	1.576	119	Bottom Ash	Sand-like		0.051			
12.795	271.677	2.482	119	Bottom Ash	Sand-like		0.050			
12.959	286.505	2.986	119	Bottom Ash	Sand-like		0.050			
13.123	260.882	4.051	119	Bottom Ash	Sand-like		0.050			
13.287	253.202	4.081	119	Bottom Ash	Sand-like		0.050			
13.451	290.517	4.259	119	Bottom Ash	Sand-like		0.050			
13.615	403.436	5.838	119	Bottom Ash	Sand-like		0.050			
13.779	429.561	6.927	119	Bottom Ash	Sand-like		0.050			
13.943	418.999	8.826	119	Bottom Ash	Sand-like		0.050			
14.107	490.270	1.935	119	Bottom Ash	Sand-like		0.050			
14.271	460.511	3.408	119	Bottom Ash	Sand-like		0.050			
14.436	482.099	6.528	119	Bottom Ash	Sand-like		0.049			
14.600	434.327	9.536	119	Bottom Ash	Sand-like		0.049			
14.764	356.870	9.791	119	Bottom Ash	Sand-like		0.049			
14.928	272.838	8.249	119	Bottom Ash	Sand-like		0.049			
15.092	215.395	5.564	119	Bottom Ash	Sand-like		0.049			
15.256	178.804	4.095	119	Bottom Ash	Sand-like		0.049			
15.420	142.760	3.021	119	Bottom Ash	Sand-like		0.049			
15.584	113.920	2.310	119	Bottom Ash	Sand-like		0.049			
15.748	97.382	1.899	119	Bottom Ash	Sand-like		0.049			
15.912	101.646	1.862	119	Bottom Ash	Sand-like		0.049			
16.076	135.352	1.516	119	Bottom Ash	Sand-like		0.049			
16.240	180.304	1.091	119	Bottom Ash	Sand-like		0.049			
16.404	202.500	0.814	119	Bottom Ash	Sand-like		0.049			
16.568	237.378	0.652	119	Bottom Ash	Sand-like		0.049			
16.732	251.227	0.979	119	Bottom Ash	Sand-like		0.049			
16.896	279.920	0.984	119	Bottom Ash	Sand-like		0.049			
17.060	311.636	1.131	119	Bottom Ash	Sand-like		0.049			
17.224	314.588	0.943	119	Bottom Ash	Sand-like		0.049			
17.388	281.112	0.695	119	Bottom Ash	Sand-like		0.050			
17.552	255.150	0.731	119	Bottom Ash	Sand-like		0.050			
17.716	246.382	0.628	119	Bottom Ash	Sand-like		0.051			
17.880	230.179	0.745	119	Bottom Ash	Sand-like		0.051			
18.044	227.783	0.737	119	Bottom Ash	Sand-like		0.052			
18.208	221.997	0.858	119	Bottom Ash	Sand-like		0.049			
18.372	254.522	0.727	119	Bottom Ash	Sand-like		0.046			
18.537	307.782	0.971	119	Bottom Ash	Sand-like		0.043			
18.701	343.547	0.863	119	Bottom Ash	Sand-like		0.039			
18.865	370.354	0.963	119	Bottom Ash	Sand-like		0.036			
19.029	418.192	0.965	119	Bottom Ash	Sand-like		0.033			
19.193	463.571	1.689	119	Bottom Ash	Sand-like		0.032			
19.357	482.248	1.816	119	Bottom Ash	Sand-like		0.031			
19.521	460.198	1.325	119	Bottom Ash	Sand-like		0.031			
19.685	423.377	1.062	119	Bottom Ash	Sand-like		0.031			
19.849	370.111	1.267	119	Bottom Ash	Sand-like		0.031			
20.013	333.342	1.110	119	Bottom Ash	Sand-like		0.031			
20.177	275.821	1.346	119	Bottom Ash	Sand-like		0.030			
20.341	270.361	1.227	119	Bottom Ash	Sand-like		0.030			
20.505	250.670	0.928	119	Bottom Ash	Sand-like		0.029			
20.669	216.932	0.710	119	Bottom Ash	Sand-like		0.029			
20.833	198.533	0.316	119	Bottom Ash	Sand-like		0.028			
20.997	175.392	0.268	119	Bottom Ash	Sand-like		0.028			
21.161	149.702	0.146	119	Bottom Ash	Sand-like		0.027			
21.325	130.360	0.117	119	Bottom Ash	Sand-like		0.027			
21.489	123.138	0.115	119	Bottom Ash	Sand-like		0.027			
21.653	121.421	0.146	119	Bottom Ash	Sand-like		0.026			
21.817	111.725	0.098	119	Bottom Ash	Sand-like		0.026			
21.981	99.944	0.044	119	Bottom Ash	Sand-like		0.025			
22.145	116.803	0.180	112	Fly Ash	Sand-like	Do Not Correct for FC	0.025			
22.309	145.803	0.393	112	Fly Ash	Sand-like	Do Not Correct for FC	0.024			
22.473	141.017	0.729	112	Fly Ash	Sand-like	Do Not Correct for FC	0.024			
22.638	139.933	1.467	112	Fly Ash	Sand-like	Do Not Correct for FC	0.023			

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
22.802	131.435	1.519	112	Fly Ash	Sand-like	Do Not Correct for FC	0.023			
22.966	120.183	1.562	112	Fly Ash	Sand-like	Do Not Correct for FC	0.022			
23.130	106.011	1.232	112	Fly Ash	Sand-like	Do Not Correct for FC	0.022			
23.294	99.030	0.882	112	Fly Ash	Sand-like	Do Not Correct for FC	0.021			
23.458	101.883	0.493	112	Fly Ash	Sand-like	Do Not Correct for FC	0.021			
23.622	100.677	0.340	112	Fly Ash	Sand-like	Do Not Correct for FC	0.020			
23.786	100.617	0.473	112	Fly Ash	Sand-like	Do Not Correct for FC	0.020			
23.950	102.232	0.757	112	Fly Ash	Sand-like	Do Not Correct for FC	0.019			
24.114	102.146	1.061	112	Fly Ash	Sand-like	Do Not Correct for FC	0.019			
24.278	101.168	1.174	112	Fly Ash	Sand-like	Do Not Correct for FC	0.019			
24.442	108.668	1.177	112	Fly Ash	Sand-like	Do Not Correct for FC	0.018			
24.606	131.045	1.058	112	Fly Ash	Sand-like	Do Not Correct for FC	0.018			
24.770	140.487	0.791	112	Fly Ash	Sand-like	Do Not Correct for FC	0.017			
24.934	131.379	0.537	112	Fly Ash	Sand-like	Do Not Correct for FC	0.017			
25.098	121.519	0.234	112	Fly Ash	Sand-like	Do Not Correct for FC	0.016			
25.262	108.903	0.135	112	Fly Ash	Sand-like	Do Not Correct for FC	0.016			
25.426	103.725	0.176	112	Fly Ash	Sand-like	Do Not Correct for FC	0.015			
25.590	107.942	0.126	112	Fly Ash	Sand-like	Do Not Correct for FC	0.015			
25.754	113.350	0.142	112	Fly Ash	Sand-like	Do Not Correct for FC	0.015			
25.918	104.207	0.236	112	Fly Ash	Sand-like	Do Not Correct for FC	0.014			
26.082	88.036	0.186	112	Fly Ash	Sand-like	Do Not Correct for FC	0.014			
26.246	73.048	0.160	112	Fly Ash	Sand-like	Do Not Correct for FC	0.013			
26.410	62.891	0.111	112	Fly Ash	Sand-like	Do Not Correct for FC	0.013			
26.574	61.952	0.072	112	Fly Ash	Sand-like	Do Not Correct for FC	0.013			
26.739	58.923	0.050	112	Fly Ash	Sand-like	Do Not Correct for FC	0.012			
26.903	55.273	0.052	112	Fly Ash	Sand-like	Do Not Correct for FC	0.012			
27.067	55.037	0.058	112	Fly Ash	Sand-like	Do Not Correct for FC	0.012			
27.231	49.267	0.082	112	Fly Ash	Sand-like	Do Not Correct for FC	0.011			
27.395	43.334	0.145	112	Fly Ash	Sand-like	Do Not Correct for FC	0.011			
27.559	39.461	0.207	112	Fly Ash	Sand-like	Do Not Correct for FC	0.010			
27.723	38.263	0.276	112	Fly Ash	Sand-like	Do Not Correct for FC	0.010			
27.887	39.521	0.319	112	Fly Ash	Sand-like	Do Not Correct for FC	0.010			
28.051	40.282	0.371	112	Fly Ash	Sand-like	Do Not Correct for FC	0.009			
28.215	37.511	0.373	112	Fly Ash	Sand-like	Do Not Correct for FC	0.009			
28.379	34.114	0.342	112	Fly Ash	Sand-like	Do Not Correct for FC	0.008			
28.543	30.916	0.311	112	Fly Ash	Sand-like	Do Not Correct for FC	0.008			
28.707	31.370	0.312	112	Fly Ash	Sand-like	Do Not Correct for FC	0.008			
28.871	34.711	0.344	112	Fly Ash	Sand-like	Do Not Correct for FC	0.007			
29.035	37.462	0.403	112	Fly Ash	Sand-like	Do Not Correct for FC	0.007			
29.199	40.393	0.419	112	Fly Ash	Sand-like	Do Not Correct for FC	0.006			
29.363	42.099	0.391	112	Fly Ash	Sand-like	Do Not Correct for FC	0.006			
29.527	42.130	0.401	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
29.691	38.584	0.412	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
29.855	34.095	0.409	112	Fly Ash	Sand-like	Do Not Correct for FC	0.004			
30.019	32.244	0.351	112	Fly Ash	Sand-like	Do Not Correct for FC	0.004			
30.183	31.255	0.290	112	Fly Ash	Sand-like	Do Not Correct for FC	0.003			
30.347	30.598	0.240	112	Fly Ash	Sand-like	Do Not Correct for FC	0.003			
30.511	29.868	0.238	112	Fly Ash	Sand-like	Do Not Correct for FC	0.002			
30.675	29.294	0.264	112	Fly Ash	Sand-like	Do Not Correct for FC	0.002			
30.840	29.455	0.302	112	Fly Ash	Sand-like	Do Not Correct for FC	0.001			
31.004	30.595	0.339	112	Fly Ash	Sand-like	Do Not Correct for FC	0.001			
31.168	34.628	0.355	112	Fly Ash	Sand-like	Do Not Correct for FC	0.000			
31.332	36.800	0.400	112	Fly Ash	Sand-like	Do Not Correct for FC	0.001			
31.496	35.764	0.457	112	Fly Ash	Sand-like	Do Not Correct for FC	0.001			
31.660	35.535	0.486	112	Fly Ash	Sand-like	Do Not Correct for FC	0.001			
31.824	31.996	0.496	112	Fly Ash	Sand-like	Do Not Correct for FC	0.002			
31.988	32.824	0.501	112	Fly Ash	Sand-like	Do Not Correct for FC	0.002			
32.152	37.254	0.542	112	Fly Ash	Sand-like	Do Not Correct for FC	0.003			
32.316	38.274	0.602	112	Fly Ash	Sand-like	Do Not Correct for FC	0.003			
32.480	41.473	0.672	112	Fly Ash	Sand-like	Do Not Correct for FC	0.003			
32.644	46.277	0.601	112	Fly Ash	Sand-like	Do Not Correct for FC	0.004			
32.808	53.984	0.824	112	Fly Ash	Sand-like	Do Not Correct for FC	0.004			
32.972	56.951	1.006	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
33.136	55.086	1.109	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
33.300	50.289	1.114	112	Fly Ash	Sand-like	Do Not Correct for FC	0.006			
33.464	48.639	1.090	112	Fly Ash	Sand-like	Do Not Correct for FC	0.006			
33.628	50.911	1.130	112	Fly Ash	Sand-like	Do Not Correct for FC	0.007			
33.792	52.879	1.198	112	Fly Ash	Sand-like	Do Not Correct for FC	0.007			
33.956	59.232	1.270	112	Fly Ash	Sand-like	Do Not Correct for FC	0.007			
34.120	64.376	1.254	112	Fly Ash	Sand-like	Do Not Correct for FC	0.008			
34.284	64.098	1.343	112	Fly Ash	Sand-like	Do Not Correct for FC	0.008			
34.448	70.000	1.474	112	Fly Ash	Sand-like	Do Not Correct for FC	0.009			
34.612	76.585	1.639	112	Fly Ash	Sand-like	Do Not Correct for FC	0.009			
34.776	81.054	1.695	112	Fly Ash	Sand-like	Do Not Correct for FC	0.010			
34.941	84.137	1.727	112	Fly Ash	Sand-like	Do Not Correct for FC	0.010			

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
35.105	88.802	1.754	112	Fly Ash	Sand-like	Do Not Correct for FC	0.010			
35.269	104.585	1.510	112	Fly Ash	Sand-like	Do Not Correct for FC	0.011			
35.433	97.016	1.018	112	Fly Ash	Sand-like	Do Not Correct for FC	0.011			
35.597	82.927	0.745	112	Fly Ash	Sand-like	Do Not Correct for FC	0.012			
35.761	45.833	0.735	112	Fly Ash	Sand-like	Do Not Correct for FC	0.012			
35.925	24.054	0.690	112	Fly Ash	Sand-like	Do Not Correct for FC	0.013			
36.089	14.338	0.523	112	Fly Ash	Sand-like	Do Not Correct for FC	0.013			
36.253	11.446	0.306	112	Fly Ash	Sand-like	Do Not Correct for FC	0.013			
36.417	9.571	0.145	112	Fly Ash	Sand-like	Do Not Correct for FC	0.014			
36.581	8.606	0.062	112	Fly Ash	Sand-like	Do Not Correct for FC	0.014			
36.745	8.050	0.051	112	Fly Ash	Sand-like	Do Not Correct for FC	0.015			
36.909	7.881	0.056	112	Fly Ash	Sand-like	Do Not Correct for FC	0.015			
37.073	8.096	0.069	112	Fly Ash	Sand-like	Do Not Correct for FC	0.016			
37.237	8.450	0.083	112	Fly Ash	Sand-like	Do Not Correct for FC	0.016			
37.401	8.945	0.098	112	Fly Ash	Sand-like	Do Not Correct for FC	0.016			
37.565	8.917	0.100	112	Fly Ash	Sand-like	Do Not Correct for FC	0.017			
37.729	9.353	0.114	112	Fly Ash	Sand-like	Do Not Correct for FC	0.017			
37.893	9.257	0.178	112	Fly Ash	Sand-like	Do Not Correct for FC	0.018			
38.057	9.350	0.213	112	Fly Ash	Sand-like	Do Not Correct for FC	0.018			
38.221	9.227	0.174	112	Fly Ash	Sand-like	Do Not Correct for FC	0.018			
38.385	8.761	0.150	112	Fly Ash	Sand-like	Do Not Correct for FC	0.019			
38.549	7.913	0.124	112	Fly Ash	Sand-like	Do Not Correct for FC	0.019			
38.713	7.879	0.115	112	Fly Ash	Sand-like	Do Not Correct for FC	0.019			
38.877	7.889	0.110	112	Fly Ash	Sand-like	Do Not Correct for FC	0.020			
39.042	8.066	0.100	112	Fly Ash	Sand-like	Do Not Correct for FC	0.020			
39.206	7.684	0.108	112	Fly Ash	Sand-like	Do Not Correct for FC	0.021			
39.370	8.215	0.126	112	Fly Ash	Sand-like	Do Not Correct for FC	0.021			
39.534	10.277	0.114	126	Subunit 2	Sand-like		0.021			
39.698	9.175	0.112	126	Subunit 2	Sand-like		0.022			
39.862	8.354	0.099	126	Subunit 2	Sand-like		0.022			
40.026	8.233	0.088	126	Subunit 2	Sand-like		0.022			
40.190	8.284	0.089	126	Subunit 2	Sand-like		0.023			
40.354	8.573	0.085	126	Subunit 2	Sand-like		0.023			
40.518	8.975	0.086	126	Subunit 2	Sand-like		0.023			
40.682	8.824	0.080	126	Subunit 2	Sand-like		0.024			
40.846	9.143	0.096	126	Subunit 2	Sand-like		0.024			
41.010	10.141	0.096	126	Subunit 2	Sand-like		0.024			
41.174	10.296	0.104	126	Subunit 2	Sand-like		0.025			
41.338	12.716	0.168	126	Subunit 2	Sand-like		0.025			
41.502	32.375	0.161	126	Subunit 2	Sand-like		0.025			
41.666	26.153	0.192	126	Subunit 2	Sand-like		0.025			
41.830	21.626	0.187	126	Subunit 2	Sand-like		0.026			
41.994	24.671	0.227	126	Subunit 2	Sand-like		0.026			
42.158	28.752	0.343	126	Subunit 2	Sand-like		0.026			
42.322	28.537	0.443	126	Subunit 2	Sand-like		0.027			
42.486	32.352	0.359	126	Subunit 2	Sand-like		0.027			
42.650	46.739	0.474	126	Subunit 2	Sand-like		0.027			
42.814	57.134	0.516	126	Subunit 2	Sand-like		0.027			
42.978	55.125	0.569	126	Subunit 2	Sand-like		0.028			
43.143	52.729	0.598	126	Subunit 2	Sand-like		0.028			
43.307	52.693	0.502	126	Subunit 2	Sand-like		0.028			
43.471	48.765	0.481	126	Subunit 2	Sand-like		0.028			
43.635	44.388	0.415	126	Subunit 2	Sand-like		0.028			
43.799	38.956	0.413	126	Subunit 2	Sand-like		0.029			
43.963	34.084	0.363	126	Subunit 2	Sand-like		0.029			
44.127	27.631	0.319	126	Subunit 2	Sand-like		0.029			
44.291	24.008	0.369	126	Subunit 2	Sand-like		0.029			
44.455	21.999	0.434	126	Subunit 2	Sand-like		0.029			
44.619	22.266	0.706	126	Subunit 2	Sand-like		0.030			
44.783	25.235	0.832	126	Subunit 2	Sand-like		0.030			
44.947	25.652	0.720	126	Subunit 2	Sand-like		0.030			
45.111	19.845	0.502	126	Subunit 2	Sand-like		0.030			
45.275	15.611	0.555	126	Subunit 2	Sand-like		0.030			
45.439	14.361	0.281	126	Subunit 2	Sand-like		0.030			
45.603	13.597	0.192	126	Subunit 2	Sand-like		0.031			
45.767	11.960	0.301	126	Subunit 2	Sand-like		0.031			
45.931	14.726	0.263	126	Subunit 2	Sand-like		0.031			
46.095	22.845	0.293	126	Subunit 2	Sand-like		0.031			
46.259	20.854	0.386	126	Subunit 2	Sand-like		0.031			
46.423	27.585	0.471	126	Subunit 2	Sand-like		0.031			
46.587	44.180	0.673	126	Subunit 2	Sand-like		0.031			
46.751	58.819	0.659	126	Subunit 2	Sand-like		0.031			
46.915	78.019	0.458	126	Subunit 2	Sand-like		0.032			
47.079	83.258	0.341	126	Subunit 2	Sand-like		0.032			
47.244	83.060	0.365	126	Subunit 2	Sand-like		0.032			

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
47.408	81.931	0.453	126	Subunit 2	Sand-like		0.032			
47.572	78.679	0.503	126	Subunit 2	Sand-like		0.032			
47.736	69.074	0.539	126	Subunit 2	Sand-like		0.032			
47.900	61.185	0.466	126	Subunit 2	Sand-like		0.032			
48.064	55.094	0.361	126	Subunit 2	Sand-like		0.033			
48.228	53.076	0.347	126	Subunit 2	Sand-like		0.033			
48.392	47.724	0.355	126	Subunit 2	Sand-like		0.033			
48.556	39.375	0.348	126	Subunit 2	Sand-like		0.033			
48.720	23.763	0.301	126	Subunit 2	Sand-like		0.033			
48.884	16.883	0.156	126	Subunit 2	Sand-like		0.033			
49.048	13.270	0.157	126	Subunit 2	Sand-like		0.033			
49.212	11.813	0.261	126	Subunit 2	Sand-like		0.033			
49.376	20.569	0.268	126	Subunit 2	Sand-like		0.033			
49.540	38.241	0.137	126	Subunit 2	Sand-like		0.033			
49.704	38.466	0.271	126	Subunit 2	Sand-like		0.033			
49.868	30.748	0.460	126	Subunit 2	Sand-like		0.034			
50.032	43.281	0.485	126	Subunit 2	Sand-like		0.034			
50.196	55.806	0.195	126	Subunit 2	Sand-like		0.034			
50.360	53.822	0.242	126	Subunit 2	Sand-like		0.034			
50.524	39.862	0.455	126	Subunit 2	Sand-like		0.034			
50.688	32.881	0.416	126	Subunit 2	Sand-like		0.034			
50.852	38.296	0.264	126	Subunit 2	Sand-like		0.034			
51.016	41.833	0.202	126	Subunit 2	Sand-like		0.034			
51.180	41.937	0.181	126	Subunit 2	Sand-like		0.034			
51.345	28.603	0.324	126	Subunit 2	Sand-like		0.034			
51.509	24.904	0.318	126	Subunit 2	Sand-like		0.034			
51.673	36.859	0.261	126	Subunit 2	Sand-like		0.034			
51.837	46.063	0.236	126	Subunit 2	Sand-like		0.034			
52.001	50.568	0.259	126	Subunit 2	Sand-like		0.034			
52.165	59.727	0.289	126	Subunit 2	Sand-like		0.034			
52.329	70.467	0.243	126	Subunit 2	Sand-like		0.034			
52.493	74.505	0.247	126	Subunit 2	Sand-like		0.035			
52.657	72.950	0.335	126	Subunit 2	Sand-like		0.035			
52.821	69.901	0.382	126	Subunit 2	Sand-like		0.035			
52.985	70.930	0.373	126	Subunit 2	Sand-like		0.035			
53.149	77.849	0.359	126	Subunit 2	Sand-like		0.035			
53.313	79.033	0.400	126	Subunit 2	Sand-like		0.035			
53.477	79.130	0.433	126	Subunit 2	Sand-like		0.035			
53.641	83.409	0.436	126	Subunit 2	Sand-like		0.035			
53.805	93.357	0.379	126	Subunit 2	Sand-like		0.035			
53.969	88.609	0.331	126	Subunit 2	Sand-like		0.035			
54.133	78.458	0.194	126	Subunit 2	Sand-like		0.035			
54.297	64.244	0.132	126	Subunit 2	Sand-like		0.035			
54.461	54.869	0.130	131	Subunit 3	Sand-like		0.035			
54.625	49.322	0.210	131	Subunit 3	Sand-like		0.035			
54.789	48.375	0.277	131	Subunit 3	Sand-like		0.035			
54.953	58.228	0.269	131	Subunit 3	Sand-like		0.035			
55.117	68.048	0.293	131	Subunit 3	Sand-like		0.035			
55.281	68.717	0.333	131	Subunit 3	Sand-like		0.035			
55.446	69.155	0.374	131	Subunit 3	Sand-like		0.035			
55.610	75.230	0.411	131	Subunit 3	Sand-like		0.035			
55.774	82.637	0.321	131	Subunit 3	Sand-like		0.035			
55.938	77.595	0.366	131	Subunit 3	Sand-like		0.036			
56.102	79.840	0.419	131	Subunit 3	Sand-like		0.036			
56.266	90.556	0.437	131	Subunit 3	Sand-like		0.036			
56.430	104.748	0.349	131	Subunit 3	Sand-like		0.036			
56.594	102.134	0.276	131	Subunit 3	Sand-like		0.036			
56.758	90.508	0.141	131	Subunit 3	Sand-like		0.036			
56.922	81.676	0.152	131	Subunit 3	Sand-like		0.036			
57.086	71.151	0.142	131	Subunit 3	Sand-like		0.036			
57.250	58.855	0.168	131	Subunit 3	Sand-like		0.036			
57.414	54.071	0.193	131	Subunit 3	Sand-like		0.036			
57.578	54.439	0.224	131	Subunit 3	Sand-like		0.036			
57.742	53.256	0.258	131	Subunit 3	Sand-like		0.036			
57.906	61.041	0.260	131	Subunit 3	Sand-like		0.036			
58.070	66.812	0.108	131	Subunit 3	Sand-like		0.036			
58.234	64.512	0.280	131	Subunit 3	Sand-like		0.036			
58.398	63.773	2.257	131	Subunit 3	Sand-like		0.036			
58.562	78.920	1.166	131	Subunit 3	Sand-like		0.036			
58.726	127.738	1.554	131	Subunit 3	Sand-like		0.036			
58.890	174.517	0.000	131	Subunit 3	Sand-like		0.036			
59.054	63.752	0.000	131	Subunit 3	Sand-like		0.036			

LIQUEFACTION POTENTIAL ASSESSMENT FOR COARSE GRAINED SOILS USING CONE PENETRATION TEST DATA

Facility: KIF TDEC Stability
Project No.: 175668043
CPT ID: KIF-BF-CPT-2

Water Elevation during CPT:	755.0	ft
Depth to Water during CPT:	14.0	ft *(relative to ground surface during CPT)*
Water Elevation during Earthquake:	754.0	ft
Depth to Water during Earthquake:	15.0	ft *(relative to ground surface during CPT)*
Final Grade Elevation during EQ:	769	ft *(if no fill, then set this equal to top of CPT hole elev.)*
Height of Final Grade above CPT TOH:	0.0	ft *(relative to ground surface during CPT, + Fill, - Cut)*
Unit Weight of Cut/Fill to Achieve Final Grade	122	pcf
Cut/Fill Total Stress (+ Fill, - Cut):	0.00	tsf

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
769.0				Vertical Stresses above 1st CPT:			**0.01**	**0.01**	**0.00**	**0.00**	**0.01**	**0.01**
768.8	0.164	0.10	0.01	119	**0.16**	0.08	0.01	0.01	0.00	0.00	0.01	0.01
768.7	0.328	0.10	0.01	119	0.25	0.16	0.02	0.02	0.00	0.00	0.02	0.02
768.5	0.492	0.10	0.01	119	0.41	0.16	0.03	0.03	0.00	0.00	0.03	0.03
768.3	0.656	0.10	0.01	119	0.57	0.16	0.04	0.04	0.00	0.00	0.04	0.04
768.2	0.820	0.10	0.01	119	0.74	0.16	0.05	0.05	0.00	0.00	0.05	0.05
768.0	0.984	0.10	0.01	119	0.90	0.16	0.06	0.06	0.00	0.00	0.06	0.06
767.9	1.148	0.10	0.01	119	1.07	0.16	0.07	0.07	0.00	0.00	0.07	0.07
767.7	1.312	0.10	0.01	119	1.23	0.16	0.08	0.08	0.00	0.00	0.08	0.08
767.5	1.476	0.10	0.01	119	1.39	0.16	0.09	0.09	0.00	0.00	0.09	0.09
767.4	1.640	0.10	0.01	119	1.56	0.16	0.10	0.10	0.00	0.00	0.10	0.10
767.2	1.804	0.10	0.01	119	1.72	0.16	0.11	0.11	0.00	0.00	0.11	0.11
767.0	1.968	0.10	0.01	119	1.89	0.16	0.12	0.12	0.00	0.00	0.12	0.12
766.9	2.133	0.10	0.01	119	2.05	0.16	0.13	0.13	0.00	0.00	0.13	0.13
766.7	2.297	0.10	0.01	119	2.21	0.16	0.14	0.14	0.00	0.00	0.14	0.14
766.5	2.461	0.10	0.01	119	2.38	0.16	0.15	0.15	0.00	0.00	0.15	0.15
766.4	2.625	0.10	0.01	119	2.54	0.16	0.16	0.16	0.00	0.00	0.16	0.16
766.2	2.789	0.10	0.01	119	2.71	0.16	0.17	0.17	0.00	0.00	0.17	0.17
766.0	2.953	0.10	0.01	119	2.87	0.16	0.18	0.18	0.00	0.00	0.18	0.18
765.9	3.117	0.10	0.01	119	3.03	0.16	0.19	0.19	0.00	0.00	0.19	0.19
765.7	3.281	0.10	0.01	119	3.20	0.16	0.20	0.20	0.00	0.00	0.20	0.20
765.6	3.445	0.10	0.01	119	3.36	0.16	0.21	0.21	0.00	0.00	0.21	0.21
765.4	3.609	0.10	0.01	119	3.53	0.16	0.21	0.21	0.00	0.00	0.21	0.21
765.2	3.773	0.10	0.01	119	3.69	0.16	0.22	0.22	0.00	0.00	0.22	0.22
765.1	3.937	0.10	0.01	119	3.85	0.16	0.23	0.23	0.00	0.00	0.23	0.23
764.9	4.101	0.10	0.01	119	4.02	0.16	0.24	0.24	0.00	0.00	0.24	0.24
764.7	4.265	0.10	0.01	119	4.18	0.16	0.25	0.25	0.00	0.00	0.25	0.25
764.6	4.429	0.10	0.01	119	4.35	0.16	0.26	0.26	0.00	0.00	0.26	0.26
764.4	4.593	0.10	0.01	119	4.51	0.16	0.27	0.27	0.00	0.00	0.27	0.27
764.2	4.757	0.10	0.01	119	4.68	0.16	0.28	0.28	0.00	0.00	0.28	0.28
764.1	4.921	0.10	0.01	119	4.84	0.16	0.29	0.29	0.00	0.00	0.29	0.29
763.9	5.085	0.10	0.01	119	5.00	0.16	0.30	0.30	0.00	0.00	0.30	0.30
763.8	5.249	0.10	0.01	119	5.17	0.16	0.31	0.31	0.00	0.00	0.31	0.31
763.6	5.413	0.10	0.01	119	5.33	0.16	0.32	0.32	0.00	0.00	0.32	0.32
763.4	5.577	0.10	0.01	119	5.50	0.16	0.33	0.33	0.00	0.00	0.33	0.33
763.3	5.741	0.10	0.01	119	5.66	0.16	0.34	0.34	0.00	0.00	0.34	0.34
763.1	5.905	0.10	0.01	119	5.82	0.16	0.35	0.35	0.00	0.00	0.35	0.35
762.9	6.069	0.10	0.01	119	5.99	0.16	0.36	0.36	0.00	0.00	0.36	0.36
762.8	6.234	0.10	0.01	119	6.15	0.16	0.37	0.37	0.00	0.00	0.37	0.37
762.6	6.398	0.10	0.01	119	6.32	0.16	0.38	0.38	0.00	0.00	0.38	0.38
762.4	6.562	0.10	0.01	119	6.48	0.16	0.39	0.39	0.00	0.00	0.39	0.39
762.3	6.726	0.10	0.01	119	6.64	0.16	0.40	0.40	0.00	0.00	0.40	0.40
762.1	6.890	0.10	0.01	119	6.81	0.16	0.41	0.41	0.00	0.00	0.41	0.41
761.9	7.054	0.10	0.01	119	6.97	0.16	0.42	0.42	0.00	0.00	0.42	0.42
761.8	7.218	0.10	0.01	119	7.14	0.16	0.43	0.43	0.00	0.00	0.43	0.43
761.6	7.382	0.10	0.01	119	7.30	0.16	0.44	0.44	0.00	0.00	0.44	0.44
761.5	7.546	0.10	0.01	119	7.46	0.16	0.45	0.45	0.00	0.00	0.45	0.45
761.3	7.710	0.10	0.01	119	7.63	0.16	0.46	0.46	0.00	0.00	0.46	0.46
761.1	7.874	0.10	0.01	119	7.79	0.16	0.47	0.47	0.00	0.00	0.47	0.47
761.0	8.038	0.10	0.01	119	7.96	0.16	0.48	0.48	0.00	0.00	0.48	0.48
760.8	8.202	0.10	0.01	119	8.12	0.16	0.49	0.49	0.00	0.00	0.49	0.49
760.6	8.366	0.10	0.01	119	8.28	0.16	0.50	0.50	0.00	0.00	0.50	0.50
760.5	8.530	0.10	0.01	119	8.45	0.16	0.51	0.51	0.00	0.00	0.51	0.51
760.3	8.694	0.10	0.01	119	8.61	0.16	0.52	0.52	0.00	0.00	0.52	0.52
760.1	8.858	0.10	0.01	119	8.78	0.16	0.53	0.53	0.00	0.00	0.53	0.53
760.0	9.022	0.10	0.01	119	8.94	0.16	0.54	0.54	0.00	0.00	0.54	0.54
759.8	9.186	0.10	0.01	119	9.10	0.16	0.55	0.55	0.00	0.00	0.55	0.55
759.6	9.350	0.10	0.01	119	9.27	0.16	0.56	0.56	0.00	0.00	0.56	0.56
759.5	9.514	0.10	0.01	119	9.43	0.16	0.57	0.57	0.00	0.00	0.57	0.57

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
759.3	9.678	0.10	0.01	119	9.60	0.16	0.58	0.58	0.00	0.00	0.58	0.58
759.2	9.842	0.10	0.01	119	9.76	0.16	0.59	0.59	0.00	0.00	0.59	0.59
759.0	10.006	0.10	0.01	119	9.92	0.16	0.60	0.60	0.00	0.00	0.60	0.60
758.8	10.170	0.10	0.01	119	10.09	0.16	0.61	0.61	0.00	0.00	0.61	0.61
758.7	10.335	0.10	0.01	119	10.25	0.16	0.62	0.62	0.00	0.00	0.62	0.62
758.5	10.499	0.10	0.01	119	10.42	0.16	0.62	0.62	0.00	0.00	0.62	0.62
758.3	10.663	0.10	0.01	119	10.58	0.16	0.63	0.63	0.00	0.00	0.63	0.63
758.2	10.827	0.10	0.01	119	10.74	0.16	0.64	0.64	0.00	0.00	0.64	0.64
758.0	10.991	0.10	0.01	119	10.91	0.16	0.65	0.65	0.00	0.00	0.65	0.65
757.8	11.155	0.10	0.01	119	11.07	0.16	0.66	0.66	0.00	0.00	0.66	0.66
757.7	11.319	0.10	0.01	119	11.24	0.16	0.67	0.67	0.00	0.00	0.67	0.67
757.5	11.483	0.10	0.01	119	11.40	0.16	0.68	0.68	0.00	0.00	0.68	0.68
757.4	11.647	0.10	0.01	119	11.56	0.16	0.69	0.69	0.00	0.00	0.69	0.69
757.2	11.811	0.10	0.01	119	11.73	0.16	0.70	0.70	0.00	0.00	0.70	0.70
757.0	11.975	0.10	0.01	119	11.89	0.16	0.71	0.71	0.00	0.00	0.71	0.71
756.9	12.139	6.14	0.06	119	12.06	0.16	0.72	0.72	0.00	0.00	0.72	0.72
756.7	12.303	59.04	0.17	119	12.22	0.16	0.73	0.73	0.00	0.00	0.73	0.73
756.5	12.467	128.02	0.62	119	12.39	0.16	0.74	0.74	0.00	0.00	0.74	0.74
756.4	12.631	222.97	1.58	119	12.55	0.16	0.75	0.75	0.00	0.00	0.75	0.75
756.2	12.795	271.68	2.48	119	12.71	0.16	0.76	0.76	0.00	0.00	0.76	0.76
756.0	12.959	286.50	2.99	119	12.88	0.16	0.77	0.77	0.00	0.00	0.77	0.77
755.9	13.123	260.88	4.05	119	13.04	0.16	0.78	0.78	0.00	0.00	0.78	0.78
755.7	13.287	253.20	4.08	119	13.21	0.16	0.79	0.79	0.00	0.00	0.79	0.79
755.5	13.451	290.52	4.26	119	13.37	0.16	0.80	0.80	0.00	0.00	0.80	0.80
755.4	13.615	403.44	5.84	119	13.53	0.16	0.81	0.81	0.00	0.00	0.81	0.81
755.2	13.779	429.56	6.93	119	13.70	0.16	0.82	0.82	0.00	0.00	0.82	0.82
755.1	13.943	419.00	8.83	119	13.86	0.16	0.83	0.83	0.00	0.00	0.83	0.83
754.9	14.107	490.27	1.94	119	14.03	0.16	0.84	0.84	0.00	0.00	0.84	0.84
754.7	14.271	460.51	3.41	119	14.19	0.16	0.85	0.85	0.01	0.00	0.84	0.85
754.6	14.436	482.10	6.53	119	14.35	0.16	0.86	0.86	0.01	0.00	0.85	0.86
754.4	14.600	434.33	9.54	119	14.52	0.16	0.87	0.87	0.02	0.00	0.85	0.87
754.2	14.764	356.87	9.79	119	14.68	0.16	0.88	0.88	0.02	0.00	0.85	0.88
754.1	14.928	272.84	8.25	119	14.85	0.16	0.89	0.89	0.03	0.00	0.86	0.89
753.9	15.092	215.40	5.56	119	15.01	0.16	0.90	0.90	0.03	0.00	0.86	0.90
753.7	15.256	178.80	4.10	119	15.17	0.16	0.91	0.91	0.04	0.01	0.87	0.90
753.6	15.420	142.76	3.02	119	15.34	0.16	0.92	0.92	0.04	0.01	0.87	0.90
753.4	15.584	113.92	2.31	119	15.50	0.16	0.93	0.93	0.05	0.02	0.88	0.91
753.3	15.748	97.38	1.90	119	15.67	0.16	0.94	0.94	0.05	0.02	0.88	0.91
753.1	15.912	101.65	1.86	119	15.83	0.16	0.95	0.95	0.06	0.03	0.89	0.92
752.9	16.076	135.35	1.52	119	15.99	0.16	0.96	0.96	0.06	0.03	0.89	0.92
752.8	16.240	180.30	1.09	119	16.16	0.16	0.97	0.97	0.07	0.04	0.90	0.93
752.6	16.404	202.50	0.81	119	16.32	0.16	0.98	0.98	0.08	0.04	0.90	0.93
752.4	16.568	237.38	0.65	119	16.49	0.16	0.99	0.99	0.08	0.05	0.91	0.94
752.3	16.732	251.23	0.98	119	16.65	0.16	1.00	1.00	0.09	0.05	0.91	0.94
752.1	16.896	279.92	0.98	119	16.81	0.16	1.01	1.01	0.09	0.06	0.92	0.95
751.9	17.060	311.64	1.13	119	16.98	0.16	1.02	1.02	0.10	0.06	0.92	0.95
751.8	17.224	314.59	0.94	119	17.14	0.16	1.03	1.03	0.10	0.07	0.92	0.96
751.6	17.388	281.11	0.70	119	17.31	0.16	1.03	1.03	0.11	0.07	0.93	0.96
751.4	17.552	255.15	0.73	119	17.47	0.16	1.04	1.04	0.11	0.08	0.93	0.96
751.3	17.716	246.38	0.63	119	17.63	0.16	1.05	1.05	0.12	0.08	0.94	0.97
751.1	17.880	230.18	0.75	119	17.80	0.16	1.06	1.06	0.12	0.09	0.94	0.97
751.0	18.044	227.78	0.74	119	17.96	0.16	1.07	1.07	0.13	0.09	0.95	0.98
750.8	18.208	222.00	0.86	119	18.13	0.16	1.08	1.08	0.13	0.10	0.95	0.98
750.6	18.372	254.52	0.73	119	18.29	0.16	1.09	1.09	0.14	0.11	0.96	0.99
750.5	18.537	307.78	0.97	119	18.45	0.16	1.10	1.10	0.14	0.11	0.96	0.99
750.3	18.701	343.55	0.86	119	18.62	0.16	1.11	1.11	0.15	0.12	0.97	1.00
750.1	18.865	370.35	0.96	119	18.78	0.16	1.12	1.12	0.15	0.12	0.97	1.00
750.0	19.029	418.19	0.97	119	18.95	0.16	1.13	1.13	0.16	0.13	0.98	1.01
749.8	19.193	463.57	1.69	119	19.11	0.16	1.14	1.14	0.16	0.13	0.98	1.01
749.6	19.357	482.25	1.82	119	19.27	0.16	1.15	1.15	0.17	0.14	0.98	1.02
749.5	19.521	460.20	1.33	119	19.44	0.16	1.16	1.16	0.17	0.14	0.99	1.02
749.3	19.685	423.38	1.06	119	19.60	0.16	1.17	1.17	0.18	0.15	0.99	1.03
749.2	19.849	370.11	1.27	119	19.77	0.16	1.18	1.18	0.18	0.15	1.00	1.03
749.0	20.013	333.34	1.11	119	19.93	0.16	1.19	1.19	0.19	0.16	1.00	1.03
748.8	20.177	275.82	1.35	119	20.09	0.16	1.20	1.20	0.19	0.16	1.01	1.04
748.7	20.341	270.36	1.23	119	20.26	0.16	1.21	1.21	0.20	0.17	1.01	1.04
748.5	20.505	250.67	0.93	119	20.42	0.16	1.22	1.22	0.20	0.17	1.02	1.05
748.3	20.669	216.93	0.71	119	20.59	0.16	1.23	1.23	0.21	0.18	1.02	1.05
748.2	20.833	198.53	0.32	119	20.75	0.16	1.24	1.24	0.21	0.18	1.03	1.06

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
748.0	20.997	175.39	0.27	119	20.92	0.16	1.25	1.25	0.22	0.19	1.03	1.06
747.8	21.161	149.70	0.15	119	21.08	0.16	1.26	1.26	0.22	0.19	1.04	1.07
747.7	21.325	130.36	0.12	119	21.24	0.16	1.27	1.27	0.23	0.20	1.04	1.07
747.5	21.489	123.14	0.12	119	21.41	0.16	1.28	1.28	0.23	0.20	1.05	1.08
747.3	21.653	121.42	0.15	119	21.57	0.16	1.29	1.29	0.24	0.21	1.05	1.08
747.2	21.817	111.72	0.10	119	21.74	0.16	1.30	1.30	0.24	0.21	1.05	1.09
747.0	21.981	99.94	0.04	119	21.90	0.16	1.31	1.31	0.25	0.22	1.06	1.09
746.9	22.145	116.80	0.18	112	22.06	0.16	1.32	1.32	0.25	0.22	1.06	1.09
746.7	22.309	145.80	0.39	112	22.23	0.16	1.33	1.33	0.26	0.23	1.07	1.10
746.5	22.473	141.02	0.73	112	22.39	0.16	1.34	1.34	0.26	0.23	1.07	1.10
746.4	22.638	139.93	1.47	112	22.56	0.16	1.35	1.35	0.27	0.24	1.08	1.11
746.2	22.802	131.43	1.52	112	22.72	0.16	1.35	1.35	0.27	0.24	1.08	1.11
746.0	22.966	120.18	1.56	112	22.88	0.16	1.36	1.36	0.28	0.25	1.08	1.12
745.9	23.130	106.01	1.23	112	23.05	0.16	1.37	1.37	0.28	0.25	1.09	1.12
745.7	23.294	99.03	0.88	112	23.21	0.16	1.38	1.38	0.29	0.26	1.09	1.12
745.5	23.458	101.88	0.49	112	23.38	0.16	1.39	1.39	0.30	0.26	1.10	1.13
745.4	23.622	100.68	0.34	112	23.54	0.16	1.40	1.40	0.30	0.27	1.10	1.13
745.2	23.786	100.62	0.47	112	23.70	0.16	1.41	1.41	0.31	0.27	1.10	1.14
745.1	23.950	102.23	0.76	112	23.87	0.16	1.42	1.42	0.31	0.28	1.11	1.14
744.9	24.114	102.15	1.06	112	24.03	0.16	1.43	1.43	0.32	0.28	1.11	1.14
744.7	24.278	101.17	1.17	112	24.20	0.16	1.44	1.44	0.32	0.29	1.12	1.15
744.6	24.442	108.67	1.18	112	24.36	0.16	1.45	1.45	0.33	0.29	1.12	1.15
744.4	24.606	131.05	1.06	112	24.52	0.16	1.46	1.46	0.33	0.30	1.12	1.16
744.2	24.770	140.49	0.79	112	24.69	0.16	1.46	1.46	0.34	0.30	1.13	1.16
744.1	24.934	131.38	0.54	112	24.85	0.16	1.47	1.47	0.34	0.31	1.13	1.16
743.9	25.098	121.52	0.23	112	25.02	0.16	1.48	1.48	0.35	0.32	1.14	1.17
743.7	25.262	108.90	0.14	112	25.18	0.16	1.49	1.49	0.35	0.32	1.14	1.17
743.6	25.426	103.73	0.18	112	25.34	0.16	1.50	1.50	0.36	0.33	1.14	1.18
743.4	25.590	107.94	0.13	112	25.51	0.16	1.51	1.51	0.36	0.33	1.15	1.18
743.2	25.754	113.35	0.14	112	25.67	0.16	1.52	1.52	0.37	0.34	1.15	1.18
743.1	25.918	104.21	0.24	112	25.84	0.16	1.53	1.53	0.37	0.34	1.16	1.19
742.9	26.082	88.04	0.19	112	26.00	0.16	1.54	1.54	0.38	0.35	1.16	1.19
742.8	26.246	73.05	0.16	112	26.16	0.16	1.55	1.55	0.38	0.35	1.17	1.20
742.6	26.410	62.89	0.11	112	26.33	0.16	1.56	1.56	0.39	0.36	1.17	1.20
742.4	26.574	61.95	0.07	112	26.49	0.16	1.57	1.57	0.39	0.36	1.17	1.20
742.3	26.739	58.92	0.05	112	26.66	0.16	1.57	1.57	0.40	0.37	1.18	1.21
742.1	26.903	55.27	0.05	112	26.82	0.16	1.58	1.58	0.40	0.37	1.18	1.21
741.9	27.067	55.04	0.06	112	26.98	0.16	1.59	1.59	0.41	0.38	1.19	1.22
741.8	27.231	49.27	0.08	112	27.15	0.16	1.60	1.60	0.41	0.38	1.19	1.22
741.6	27.395	43.33	0.15	112	27.31	0.16	1.61	1.61	0.42	0.39	1.19	1.22
741.4	27.559	39.46	0.21	112	27.48	0.16	1.62	1.62	0.42	0.39	1.20	1.23
741.3	27.723	38.26	0.28	112	27.64	0.16	1.63	1.63	0.43	0.40	1.20	1.23
741.1	27.887	39.52	0.32	112	27.80	0.16	1.64	1.64	0.43	0.40	1.21	1.24
740.9	28.051	40.28	0.37	112	27.97	0.16	1.65	1.65	0.44	0.41	1.21	1.24
740.8	28.215	37.51	0.37	112	28.13	0.16	1.66	1.66	0.44	0.41	1.21	1.25
740.6	28.379	34.11	0.34	112	28.30	0.16	1.67	1.67	0.45	0.42	1.22	1.25
740.5	28.543	30.92	0.31	112	28.46	0.16	1.68	1.68	0.45	0.42	1.22	1.25
740.3	28.707	31.37	0.31	112	28.62	0.16	1.69	1.69	0.46	0.43	1.23	1.26
740.1	28.871	34.71	0.34	112	28.79	0.16	1.69	1.69	0.46	0.43	1.23	1.26
740.0	29.035	37.46	0.40	112	28.95	0.16	1.70	1.70	0.47	0.44	1.23	1.27
739.8	29.199	40.39	0.42	112	29.12	0.16	1.71	1.71	0.47	0.44	1.24	1.27
739.6	29.363	42.10	0.39	112	29.28	0.16	1.72	1.72	0.48	0.45	1.24	1.27
739.5	29.527	42.13	0.40	112	29.45	0.16	1.73	1.73	0.48	0.45	1.25	1.28
739.3	29.691	38.58	0.41	112	29.61	0.16	1.74	1.74	0.49	0.46	1.25	1.28
739.1	29.855	34.09	0.41	112	29.77	0.16	1.75	1.75	0.49	0.46	1.25	1.29
739.0	30.019	32.24	0.35	112	29.94	0.16	1.76	1.76	0.50	0.47	1.26	1.29
738.8	30.183	31.26	0.29	112	30.10	0.16	1.77	1.77	0.50	0.47	1.26	1.29
738.7	30.347	30.60	0.24	112	30.27	0.16	1.78	1.78	0.51	0.48	1.27	1.30
738.5	30.511	29.87	0.24	112	30.43	0.16	1.79	1.79	0.52	0.48	1.27	1.30
738.3	30.675	29.29	0.26	112	30.59	0.16	1.80	1.80	0.52	0.49	1.28	1.31
738.2	30.840	29.45	0.30	112	30.76	0.16	1.80	1.80	0.53	0.49	1.28	1.31
738.0	31.004	30.59	0.34	112	30.92	0.16	1.81	1.81	0.53	0.50	1.28	1.31
737.8	31.168	34.63	0.36	112	31.09	0.16	1.82	1.82	0.54	0.50	1.29	1.32
737.7	31.332	36.80	0.40	112	31.25	0.16	1.83	1.83	0.54	0.51	1.29	1.32
737.5	31.496	35.76	0.46	112	31.41	0.16	1.84	1.84	0.55	0.51	1.30	1.33
737.3	31.660	35.53	0.49	112	31.58	0.16	1.85	1.85	0.55	0.52	1.30	1.33
737.2	31.824	32.00	0.50	112	31.74	0.16	1.86	1.86	0.56	0.52	1.30	1.33
737.0	31.988	32.82	0.50	112	31.91	0.16	1.87	1.87	0.56	0.53	1.31	1.34
736.8	32.152	37.25	0.54	112	32.07	0.16	1.88	1.88	0.57	0.54	1.31	1.34

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
736.7	32.316	38.27	0.60	112	32.23	0.16	1.89	1.89	0.57	0.54	1.32	1.35
736.5	32.480	41.47	0.67	112	32.40	0.16	1.90	1.90	0.58	0.55	1.32	1.35
736.4	32.644	46.28	0.60	112	32.56	0.16	1.91	1.91	0.58	0.55	1.32	1.36
736.2	32.808	53.98	0.82	112	32.73	0.16	1.91	1.91	0.59	0.56	1.33	1.36
736.0	32.972	56.95	1.01	112	32.89	0.16	1.92	1.92	0.59	0.56	1.33	1.36
735.9	33.136	55.09	1.11	112	33.05	0.16	1.93	1.93	0.60	0.57	1.34	1.37
735.7	33.300	50.29	1.11	112	33.22	0.16	1.94	1.94	0.60	0.57	1.34	1.37
735.5	33.464	48.64	1.09	112	33.38	0.16	1.95	1.95	0.61	0.58	1.34	1.38
735.4	33.628	50.91	1.13	112	33.55	0.16	1.96	1.96	0.61	0.58	1.35	1.38
735.2	33.792	52.88	1.20	112	33.71	0.16	1.97	1.97	0.62	0.59	1.35	1.38
735.0	33.956	59.23	1.27	112	33.87	0.16	1.98	1.98	0.62	0.59	1.36	1.39
734.9	34.120	64.38	1.25	112	34.04	0.16	1.99	1.99	0.63	0.60	1.36	1.39
734.7	34.284	64.10	1.34	112	34.20	0.16	2.00	2.00	0.63	0.60	1.36	1.40
734.6	34.448	70.00	1.47	112	34.37	0.16	2.01	2.01	0.64	0.61	1.37	1.40
734.4	34.612	76.58	1.64	112	34.53	0.16	2.02	2.02	0.64	0.61	1.37	1.40
734.2	34.776	81.05	1.70	112	34.69	0.16	2.02	2.02	0.65	0.62	1.38	1.41
734.1	34.941	84.14	1.73	112	34.86	0.16	2.03	2.03	0.65	0.62	1.38	1.41
733.9	35.105	88.80	1.75	112	35.02	0.16	2.04	2.04	0.66	0.63	1.38	1.42
733.7	35.269	104.59	1.51	112	35.19	0.16	2.05	2.05	0.66	0.63	1.39	1.42
733.6	35.433	97.02	1.02	112	35.35	0.16	2.06	2.06	0.67	0.64	1.39	1.42
733.4	35.597	82.93	0.75	112	35.51	0.16	2.07	2.07	0.67	0.64	1.40	1.43
733.2	35.761	45.83	0.74	112	35.68	0.16	2.08	2.08	0.68	0.65	1.40	1.43
733.1	35.925	24.05	0.69	112	35.84	0.16	2.09	2.09	0.68	0.65	1.41	1.44
732.9	36.089	14.34	0.52	112	36.01	0.16	2.10	2.10	0.69	0.66	1.41	1.44
732.7	36.253	11.45	0.31	112	36.17	0.16	2.11	2.11	0.69	0.66	1.41	1.44
732.6	36.417	9.57	0.15	112	36.33	0.16	2.12	2.12	0.70	0.67	1.42	1.45
732.4	36.581	8.61	0.06	112	36.50	0.16	2.13	2.13	0.70	0.67	1.42	1.45
732.3	36.745	8.05	0.05	112	36.66	0.16	2.14	2.14	0.71	0.68	1.43	1.46
732.1	36.909	7.88	0.06	112	36.83	0.16	2.14	2.14	0.71	0.68	1.43	1.46
731.9	37.073	8.10	0.07	112	36.99	0.16	2.15	2.15	0.72	0.69	1.43	1.46
731.8	37.237	8.45	0.08	112	37.16	0.16	2.16	2.16	0.72	0.69	1.44	1.47
731.6	37.401	8.95	0.10	112	37.32	0.16	2.17	2.17	0.73	0.70	1.44	1.47
731.4	37.565	8.92	0.10	112	37.48	0.16	2.18	2.18	0.74	0.70	1.45	1.48
731.3	37.729	9.35	0.11	112	37.65	0.16	2.19	2.19	0.74	0.71	1.45	1.48
731.1	37.893	9.26	0.18	112	37.81	0.16	2.20	2.20	0.75	0.71	1.45	1.49
730.9	38.057	9.35	0.21	112	37.98	0.16	2.21	2.21	0.75	0.72	1.46	1.49
730.8	38.221	9.23	0.17	112	38.14	0.16	2.22	2.22	0.76	0.72	1.46	1.49
730.6	38.385	8.76	0.15	112	38.30	0.16	2.23	2.23	0.76	0.73	1.47	1.50
730.5	38.549	7.91	0.12	112	38.47	0.16	2.24	2.24	0.77	0.73	1.47	1.50
730.3	38.713	7.88	0.12	112	38.63	0.16	2.25	2.25	0.77	0.74	1.47	1.51
730.1	38.877	7.89	0.11	112	38.80	0.16	2.25	2.25	0.78	0.74	1.48	1.51
730.0	39.042	8.07	0.10	112	38.96	0.16	2.26	2.26	0.78	0.75	1.48	1.51
729.8	39.206	7.68	0.11	112	39.12	0.16	2.27	2.27	0.79	0.76	1.49	1.52
729.6	39.370	8.22	0.13	112	39.29	0.16	2.28	2.28	0.79	0.76	1.49	1.52
729.5	39.534	10.28	0.11	126	39.45	0.16	2.29	2.29	0.80	0.77	1.50	1.53
729.3	39.698	9.18	0.11	126	39.62	0.16	2.30	2.30	0.80	0.77	1.50	1.53
729.1	39.862	8.35	0.10	126	39.78	0.16	2.31	2.31	0.81	0.78	1.51	1.54
729.0	40.026	8.23	0.09	126	39.94	0.16	2.32	2.32	0.81	0.78	1.51	1.54
728.8	40.190	8.28	0.09	126	40.11	0.16	2.33	2.33	0.82	0.79	1.52	1.55
728.6	40.354	8.57	0.09	126	40.27	0.16	2.34	2.34	0.82	0.79	1.52	1.55
728.5	40.518	8.97	0.09	126	40.44	0.16	2.35	2.35	0.83	0.80	1.53	1.56
728.3	40.682	8.82	0.08	126	40.60	0.16	2.36	2.36	0.83	0.80	1.53	1.56
728.2	40.846	9.14	0.10	126	40.76	0.16	2.37	2.37	0.84	0.81	1.54	1.57
728.0	41.010	10.14	0.10	126	40.93	0.16	2.38	2.38	0.84	0.81	1.54	1.57
727.8	41.174	10.30	0.10	126	41.09	0.16	2.40	2.40	0.85	0.82	1.55	1.58
727.7	41.338	12.72	0.17	126	41.26	0.16	2.41	2.41	0.85	0.82	1.55	1.58
727.5	41.502	32.38	0.16	126	41.42	0.16	2.42	2.42	0.86	0.83	1.56	1.59
727.3	41.666	26.15	0.19	126	41.58	0.16	2.43	2.43	0.86	0.83	1.56	1.59
727.2	41.830	21.63	0.19	126	41.75	0.16	2.44	2.44	0.87	0.84	1.57	1.60
727.0	41.994	24.67	0.23	126	41.91	0.16	2.45	2.45	0.87	0.84	1.57	1.60
726.8	42.158	28.75	0.34	126	42.08	0.16	2.46	2.46	0.88	0.85	1.58	1.61
726.7	42.322	28.54	0.44	126	42.24	0.16	2.47	2.47	0.88	0.85	1.58	1.62
726.5	42.486	32.35	0.36	126	42.40	0.16	2.48	2.48	0.89	0.86	1.59	1.62
726.3	42.650	46.74	0.47	126	42.57	0.16	2.49	2.49	0.89	0.86	1.59	1.63
726.2	42.814	57.13	0.52	126	42.73	0.16	2.50	2.50	0.90	0.87	1.60	1.63
726.0	42.978	55.13	0.57	126	42.90	0.16	2.51	2.51	0.90	0.87	1.60	1.64
725.9	43.143	52.73	0.60	126	43.06	0.16	2.52	2.52	0.91	0.88	1.61	1.64
725.7	43.307	52.69	0.50	126	43.22	0.16	2.53	2.53	0.91	0.88	1.62	1.65
725.5	43.471	48.77	0.48	126	43.39	0.16	2.54	2.54	0.92	0.89	1.62	1.65

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
725.4	43.635	44.39	0.42	126	43.55	0.16	2.55	2.55	0.92	0.89	1.63	1.66
725.2	43.799	38.96	0.41	126	43.72	0.16	2.56	2.56	0.93	0.90	1.63	1.66
725.0	43.963	34.08	0.36	126	43.88	0.16	2.57	2.57	0.93	0.90	1.64	1.67
724.9	44.127	27.63	0.32	126	44.04	0.16	2.58	2.58	0.94	0.91	1.64	1.67
724.7	44.291	24.01	0.37	126	44.21	0.16	2.59	2.59	0.95	0.91	1.65	1.68
724.5	44.455	22.00	0.43	126	44.37	0.16	2.60	2.60	0.95	0.92	1.65	1.68
724.4	44.619	22.27	0.71	126	44.54	0.16	2.61	2.61	0.96	0.92	1.66	1.69
724.2	44.783	25.24	0.83	126	44.70	0.16	2.62	2.62	0.96	0.93	1.66	1.69
724.1	44.947	25.65	0.72	126	44.86	0.16	2.63	2.63	0.97	0.93	1.67	1.70
723.9	45.111	19.84	0.50	126	45.03	0.16	2.64	2.64	0.97	0.94	1.67	1.70
723.7	45.275	15.61	0.56	126	45.19	0.16	2.65	2.65	0.98	0.94	1.68	1.71
723.6	45.439	14.36	0.28	126	45.36	0.16	2.66	2.66	0.98	0.95	1.68	1.71
723.4	45.603	13.60	0.19	126	45.52	0.16	2.67	2.67	0.99	0.95	1.69	1.72
723.2	45.767	11.96	0.30	126	45.69	0.16	2.68	2.68	0.99	0.96	1.69	1.72
723.1	45.931	14.73	0.26	126	45.85	0.16	2.69	2.69	1.00	0.97	1.70	1.73
722.9	46.095	22.84	0.29	126	46.01	0.16	2.71	2.71	1.00	0.97	1.70	1.74
722.7	46.259	20.85	0.39	126	46.18	0.16	2.72	2.72	1.01	0.98	1.71	1.74
722.6	46.423	27.59	0.47	126	46.34	0.16	2.73	2.73	1.01	0.98	1.71	1.75
722.4	46.587	44.18	0.67	126	46.51	0.16	2.74	2.74	1.02	0.99	1.72	1.75
722.2	46.751	58.82	0.66	126	46.67	0.16	2.75	2.75	1.02	0.99	1.72	1.76
722.1	46.915	78.02	0.46	126	46.83	0.16	2.76	2.76	1.03	1.00	1.73	1.76
721.9	47.079	83.26	0.34	126	47.00	0.16	2.77	2.77	1.03	1.00	1.74	1.77
721.8	47.244	83.06	0.37	126	47.16	0.16	2.78	2.78	1.04	1.01	1.74	1.77
721.6	47.408	81.93	0.45	126	47.33	0.16	2.79	2.79	1.04	1.01	1.75	1.78
721.4	47.572	78.68	0.50	126	47.49	0.16	2.80	2.80	1.05	1.02	1.75	1.78
721.3	47.736	69.07	0.54	126	47.65	0.16	2.81	2.81	1.05	1.02	1.76	1.79
721.1	47.900	61.19	0.47	126	47.82	0.16	2.82	2.82	1.06	1.03	1.76	1.79
720.9	48.064	55.09	0.36	126	47.98	0.16	2.83	2.83	1.06	1.03	1.77	1.80
720.8	48.228	53.08	0.35	126	48.15	0.16	2.84	2.84	1.07	1.04	1.77	1.80
720.6	48.392	47.72	0.36	126	48.31	0.16	2.85	2.85	1.07	1.04	1.78	1.81
720.4	48.556	39.38	0.35	126	48.47	0.16	2.86	2.86	1.08	1.05	1.78	1.81
720.3	48.720	23.76	0.30	126	48.64	0.16	2.87	2.87	1.08	1.05	1.79	1.82
720.1	48.884	16.88	0.16	126	48.80	0.16	2.88	2.88	1.09	1.06	1.79	1.82
720.0	49.048	13.27	0.16	126	48.97	0.16	2.89	2.89	1.09	1.06	1.80	1.83
719.8	49.212	11.81	0.26	126	49.13	0.16	2.90	2.90	1.10	1.07	1.80	1.83
719.6	49.376	20.57	0.27	126	49.29	0.16	2.91	2.91	1.10	1.07	1.81	1.84
719.5	49.540	38.24	0.14	126	49.46	0.16	2.92	2.92	1.11	1.08	1.81	1.84
719.3	49.704	38.47	0.27	126	49.62	0.16	2.93	2.93	1.11	1.08	1.82	1.85
719.1	49.868	30.75	0.46	126	49.79	0.16	2.94	2.94	1.12	1.09	1.82	1.86
719.0	50.032	43.28	0.49	126	49.95	0.16	2.95	2.95	1.12	1.09	1.83	1.86
718.8	50.196	55.81	0.20	126	50.11	0.16	2.96	2.96	1.13	1.10	1.83	1.87
718.6	50.360	53.82	0.24	126	50.28	0.16	2.97	2.97	1.13	1.10	1.84	1.87
718.5	50.524	39.86	0.46	126	50.44	0.16	2.98	2.98	1.14	1.11	1.84	1.88
718.3	50.688	32.88	0.42	126	50.61	0.16	2.99	2.99	1.14	1.11	1.85	1.88
718.1	50.852	38.30	0.26	126	50.77	0.16	3.01	3.01	1.15	1.12	1.86	1.89
718.0	51.016	41.83	0.20	126	50.93	0.16	3.02	3.02	1.15	1.12	1.86	1.89
717.8	51.180	41.94	0.18	126	51.10	0.16	3.03	3.03	1.16	1.13	1.87	1.90
717.7	51.345	28.60	0.32	126	51.26	0.16	3.04	3.04	1.17	1.13	1.87	1.90
717.5	51.509	24.90	0.32	126	51.43	0.16	3.05	3.05	1.17	1.14	1.88	1.91
717.3	51.673	36.86	0.26	126	51.59	0.16	3.06	3.06	1.18	1.14	1.88	1.91
717.2	51.837	46.06	0.24	126	51.75	0.16	3.07	3.07	1.18	1.15	1.89	1.92
717.0	52.001	50.57	0.26	126	51.92	0.16	3.08	3.08	1.19	1.15	1.89	1.92
716.8	52.165	59.73	0.29	126	52.08	0.16	3.09	3.09	1.19	1.16	1.90	1.93
716.7	52.329	70.47	0.24	126	52.25	0.16	3.10	3.10	1.20	1.16	1.90	1.93
716.5	52.493	74.50	0.25	126	52.41	0.16	3.11	3.11	1.20	1.17	1.91	1.94
716.3	52.657	72.95	0.34	126	52.57	0.16	3.12	3.12	1.21	1.17	1.91	1.94
716.2	52.821	69.90	0.38	126	52.74	0.16	3.13	3.13	1.21	1.18	1.92	1.95
716.0	52.985	70.93	0.37	126	52.90	0.16	3.14	3.14	1.22	1.19	1.92	1.95
715.9	53.149	77.85	0.36	126	53.07	0.16	3.15	3.15	1.22	1.19	1.93	1.96
715.7	53.313	79.03	0.40	126	53.23	0.16	3.16	3.16	1.23	1.20	1.93	1.96
715.5	53.477	79.13	0.43	126	53.40	0.16	3.17	3.17	1.23	1.20	1.94	1.97
715.4	53.641	83.41	0.44	126	53.56	0.16	3.18	3.18	1.24	1.21	1.94	1.98
715.2	53.805	93.36	0.38	126	53.72	0.16	3.19	3.19	1.24	1.21	1.95	1.98
715.0	53.969	88.61	0.33	126	53.89	0.16	3.20	3.20	1.25	1.22	1.95	1.99
714.9	54.133	78.46	0.19	126	54.05	0.16	3.21	3.21	1.25	1.22	1.96	1.99
714.7	54.297	64.24	0.13	126	54.22	0.16	3.22	3.22	1.26	1.23	1.96	2.00
714.5	54.461	54.87	0.13	131	54.38	0.16	3.23	3.23	1.26	1.23	1.97	2.00
714.4	54.625	49.32	0.21	131	54.54	0.16	3.24	3.24	1.27	1.24	1.98	2.01
714.2	54.789	48.37	0.28	131	54.71	0.16	3.25	3.25	1.27	1.24	1.98	2.01

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
714.0	54.953	58.23	0.27	131	54.87	0.16	3.26	3.26	1.28	1.25	1.99	2.02
713.9	55.117	68.05	0.29	131	55.04	0.16	3.28	3.28	1.28	1.25	1.99	2.02
713.7	55.281	68.72	0.33	131	55.20	0.16	3.29	3.29	1.29	1.26	2.00	2.03
713.6	55.446	69.16	0.37	131	55.36	0.16	3.30	3.30	1.29	1.26	2.00	2.04
713.4	55.610	75.23	0.41	131	55.53	0.16	3.31	3.31	1.30	1.27	2.01	2.04
713.2	55.774	82.64	0.32	131	55.69	0.16	3.32	3.32	1.30	1.27	2.02	2.05
713.1	55.938	77.60	0.37	131	55.86	0.16	3.33	3.33	1.31	1.28	2.02	2.05
712.9	56.102	79.84	0.42	131	56.02	0.16	3.34	3.34	1.31	1.28	2.03	2.06
712.7	56.266	90.56	0.44	131	56.18	0.16	3.35	3.35	1.32	1.29	2.03	2.06
712.6	56.430	104.75	0.35	131	56.35	0.16	3.36	3.36	1.32	1.29	2.04	2.07
712.4	56.594	102.13	0.28	131	56.51	0.16	3.37	3.37	1.33	1.30	2.04	2.07
712.2	56.758	90.51	0.14	131	56.68	0.16	3.38	3.38	1.33	1.30	2.05	2.08
712.1	56.922	81.68	0.15	131	56.84	0.16	3.39	3.39	1.34	1.31	2.05	2.09
711.9	57.086	71.15	0.14	131	57.00	0.16	3.40	3.40	1.34	1.31	2.06	2.09
711.8	57.250	58.86	0.17	131	57.17	0.16	3.42	3.42	1.35	1.32	2.07	2.10
711.6	57.414	54.07	0.19	131	57.33	0.16	3.43	3.43	1.35	1.32	2.07	2.10
711.4	57.578	54.44	0.22	131	57.50	0.16	3.44	3.44	1.36	1.33	2.08	2.11
711.3	57.742	53.26	0.26	131	57.66	0.16	3.45	3.45	1.36	1.33	2.08	2.11
711.1	57.906	61.04	0.26	131	57.82	0.16	3.46	3.46	1.37	1.34	2.09	2.12
710.9	58.070	66.81	0.11	131	57.99	0.16	3.47	3.47	1.37	1.34	2.09	2.13
710.8	58.234	64.51	0.28	131	58.15	0.16	3.48	3.48	1.38	1.35	2.10	2.13
710.6	58.398	63.77	2.26	131	58.32	0.16	3.49	3.49	1.39	1.35	2.11	2.14
710.4	58.562	78.92	1.17	131	58.48	0.16	3.50	3.50	1.39	1.36	2.11	2.14
710.3	58.726	127.74	1.55	131	58.64	0.16	3.51	3.51	1.40	1.36	2.12	2.15
710.1	58.890	174.52	0.01	131	58.81	0.16	3.52	3.52	1.40	1.37	2.12	2.15
709.9	59.054	63.75	0.01	131	58.97	0.08	3.53	3.53	1.41	1.37	2.13	2.16

LIQUEFACTION POTENTIAL ASSESSMENT FOR COARSE GRAINED SOILS USING CONE PENETRATION TEST DATA

Project Site: KIF TDEC Stability
Project No.: 175668043
CPT ID: KIF-BF-CPT-2

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
769.0												
768.8	0.164	8.99	11.11	3.39	1.0	1.70	0.16	100	53.98	54.14	0.101	-0.213
768.7	0.328	4.06	12.46	3.68	1.0	1.70	0.16	100	53.98	54.14	0.100	-0.206
768.5	0.492	2.39	14.19	3.90	1.0	1.70	0.16	100	53.98	54.14	0.100	-0.202
768.3	0.656	1.55	16.47	4.09	1.0	1.70	0.16	100	53.98	54.14	0.099	-0.199
768.2	0.820	1.04	19.63	4.27	1.0	1.70	0.16	100	53.98	54.14	0.098	-0.196
768.0	0.984	0.70	24.28	4.46	1.0	1.70	0.16	100	53.98	54.14	0.098	-0.193
767.9	1.148	0.46	31.82	4.68	1.0	1.70	0.16	100	53.98	54.14	0.095	-0.191
767.7	1.312	0.28	46.14	4.95	1.0	1.70	0.16	100	53.98	54.14	0.094	-0.189
767.5	1.476	0.14	83.96	5.36	1.0	1.70	0.16	100	53.98	54.14	0.093	-0.188
767.4	1.640	0.02	465.07	6.44	1.0	1.70	0.16	100	53.98	54.14	0.092	-0.186
767.2	1.804	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.090	-0.185
767.0	1.968	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.089	-0.183
766.9	2.133	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.088	-0.182
766.7	2.297	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.086	-0.181
766.5	2.461	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.085	-0.180
766.4	2.625	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.083	-0.179
766.2	2.789	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.081	-0.178
766.0	2.953	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.080	-0.177
765.9	3.117	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.078	-0.176
765.7	3.281	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.077	-0.175
765.6	3.445	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.076	-0.174
765.4	3.609	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.074	-0.173
765.2	3.773	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.074	-0.172
765.1	3.937	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.073	-0.172
764.9	4.101	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.072	-0.171
764.7	4.265	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.071	-0.170
764.6	4.429	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.070	-0.169
764.4	4.593	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.070	-0.169
764.2	4.757	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.069	-0.168
764.1	4.921	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.069	-0.167
763.9	5.085	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.068	-0.167
763.8	5.249	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.067	-0.166
763.6	5.413	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.067	-0.165
763.4	5.577	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.066	-0.165
763.3	5.741	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.065	-0.164
763.1	5.905	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.064	-0.164
762.9	6.069	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.064	-0.163
762.8	6.234	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.063	-0.162
762.6	6.398	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.062	-0.162
762.4	6.562	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.062	-0.161
762.3	6.726	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.061	-0.161
762.1	6.890	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.061	-0.160
761.9	7.054	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.060	-0.160
761.8	7.218	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.060	-0.159
761.6	7.382	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.060	-0.159
761.5	7.546	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.059	-0.158
761.3	7.710	0.01	0.15	5.48	1.0	1.68	0.16	100	53.98	54.14	0.059	-0.158
761.1	7.874	0.01	0.15	5.48	1.0	1.66	0.16	100	53.98	54.14	0.059	-0.157
761.0	8.038	0.01	0.15	5.48	1.0	1.64	0.15	100	53.98	54.14	0.059	-0.157
760.8	8.202	0.01	0.15	5.48	1.0	1.62	0.15	100	53.98	54.13	0.058	-0.156
760.6	8.366	0.01	0.15	5.48	1.0	1.60	0.15	100	53.98	54.13	0.057	-0.156
760.5	8.530	0.01	0.15	5.48	1.0	1.58	0.15	100	53.98	54.13	0.057	-0.155
760.3	8.694	0.01	0.15	5.48	1.0	1.56	0.15	100	53.98	54.13	0.056	-0.155
760.1	8.858	0.01	0.15	5.48	1.0	1.54	0.15	100	53.98	54.12	0.056	-0.154
760.0	9.022	0.01	0.15	5.48	1.0	1.53	0.14	100	53.98	54.12	0.055	-0.154
759.8	9.186	0.01	0.15	5.48	1.0	1.51	0.14	100	53.98	54.12	0.055	-0.154
759.6	9.350	0.01	0.15	5.48	1.0	1.49	0.14	100	53.98	54.12	0.055	-0.153
759.5	9.514	0.01	0.15	5.48	1.0	1.48	0.14	100	53.98	54.12	0.055	-0.153
759.3	9.678	0.01	0.15	5.48	1.0	1.46	0.14	100	53.98	54.11	0.055	-0.152
759.2	9.842	0.01	0.15	5.48	1.0	1.45	0.14	100	53.98	54.11	0.055	-0.152

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
759.0	10.006	0.01	0.15	5.48	1.0	1.43	0.14	100	53.98	54.11	0.055	-0.151
758.8	10.170	0.01	0.15	5.48	1.0	1.42	0.13	100	53.97	54.11	0.055	-0.151
758.7	10.335	0.01	0.15	5.48	1.0	1.40	0.13	100	53.97	54.11	0.054	-0.151
758.5	10.499	0.01	0.15	5.48	1.0	1.39	0.13	100	53.97	54.11	0.054	-0.150
758.3	10.663	0.01	0.15	5.48	1.0	1.38	0.13	100	53.97	54.10	0.054	-0.150
758.2	10.827	0.01	0.15	5.48	1.0	1.36	0.13	100	53.97	54.10	0.053	-0.149
758.0	10.991	0.01	0.15	5.48	1.0	1.35	0.13	100	53.97	54.10	0.053	-0.149
757.8	11.155	0.01	0.15	5.48	1.0	1.34	0.13	100	53.97	54.10	0.053	-0.149
757.7	11.319	0.01	0.15	5.48	1.0	1.32	0.13	100	53.97	54.10	0.052	-0.148
757.5	11.483	0.01	0.15	5.48	1.0	1.31	0.12	100	53.97	54.10	0.052	-0.148
757.4	11.647	0.01	0.15	5.48	1.0	1.30	0.12	100	53.97	54.09	0.052	-0.147
757.2	11.811	0.01	0.15	5.48	1.0	1.29	0.12	100	53.97	54.09	0.052	-0.147
757.0	11.975	0.01	0.15	5.48	1.0	1.28	0.12	100	53.97	54.09	0.051	-0.147
756.9	12.139	7.49	1.05	2.88	1.0	1.25	7.28	93	55.61	62.89	0.051	-0.202
756.7	12.303	66.24	0.28	1.78	0.5	1.24	68.96	5	0.27	69.23	0.051	-0.238
756.5	12.467	143.64	0.49	1.60	0.5	1.16	140.38	0	0.00	140.38	0.051	-0.538
756.4	12.631	249.17	0.71	1.52	0.5	1.10	232.54	0	0.00	232.54	0.051	-0.600
756.2	12.795	301.81	0.92	1.54	0.5	1.09	279.97	0	0.00	279.97	0.050	-0.600
756.0	12.959	316.30	1.05	1.57	0.5	1.09	294.27	0	0.00	294.27	0.050	-0.600
755.9	13.123	286.12	1.56	1.74	0.5	1.08	267.07	2	0.00	267.07	0.050	-0.600
755.7	13.287	275.95	1.62	1.76	0.5	1.08	258.36	4	0.02	258.38	0.050	-0.600
755.5	13.451	314.79	1.47	1.69	0.5	1.08	295.48	0	0.00	295.48	0.050	-0.600
755.4	13.615	434.83	1.45	1.61	0.5	1.07	409.02	0	0.00	409.02	0.050	-0.600
755.2	13.779	460.27	1.62	1.64	0.5	1.07	434.14	0	0.00	434.14	0.050	-0.600
755.1	13.943	446.27	2.11	1.75	0.5	1.07	422.15	3	0.00	422.15	0.050	-0.600
754.9	14.107	520.32	0.40	1.11	0.5	1.06	492.96	0	0.00	492.96	0.050	-0.600
754.7	14.271	487.32	0.74	1.34	0.5	1.06	462.36	0	0.00	462.36	0.050	-0.600
754.6	14.436	508.80	1.36	1.55	0.5	1.06	483.34	0	0.00	483.34	0.049	-0.600
754.4	14.600	457.02	2.20	1.76	0.5	1.06	434.82	4	0.03	434.84	0.049	-0.600
754.2	14.764	374.33	2.75	1.89	0.5	1.06	356.76	14	37.98	394.74	0.049	-0.600
754.1	14.928	285.18	3.03	1.98	0.5	1.06	272.37	22	66.13	338.50	0.049	-0.600
753.9	15.092	224.33	2.59	1.98	0.5	1.05	214.72	21	57.32	272.03	0.049	-0.600
753.7	15.256	185.55	2.30	1.99	0.5	1.06	178.88	22	53.44	232.32	0.049	-0.600
753.6	15.420	147.55	2.13	2.02	0.5	1.07	143.77	25	54.82	198.59	0.049	-0.600
753.4	15.584	117.23	2.04	2.07	0.5	1.07	115.31	29	57.17	172.48	0.049	-0.600
753.3	15.748	99.80	1.97	2.11	0.5	1.07	98.82	32	57.73	156.55	0.049	-0.584
753.1	15.912	103.93	1.85	2.08	0.5	1.07	102.89	29	55.21	158.09	0.049	-0.589
752.9	16.076	138.34	1.13	1.84	0.5	1.07	137.17	10	9.34	146.51	0.049	-0.552
752.8	16.240	184.13	0.61	1.57	0.5	1.06	180.75	0	0.00	180.75	0.049	-0.600
752.6	16.404	206.37	0.40	1.42	0.5	1.05	201.69	0	0.00	201.69	0.049	-0.600
752.4	16.568	241.46	0.28	1.27	0.5	1.05	234.53	0	0.00	234.53	0.049	-0.600
752.3	16.732	254.94	0.39	1.34	0.5	1.04	247.30	0	0.00	247.30	0.049	-0.600
752.1	16.896	283.45	0.35	1.27	0.5	1.04	274.86	0	0.00	274.86	0.049	-0.600
751.9	17.060	314.87	0.36	1.25	0.5	1.04	305.59	0	0.00	305.59	0.049	-0.600
751.8	17.224	317.05	0.30	1.19	0.5	1.04	308.08	0	0.00	308.08	0.049	-0.600
751.6	17.388	282.49	0.25	1.19	0.5	1.03	274.93	0	0.00	274.93	0.050	-0.600
751.4	17.552	255.65	0.29	1.26	0.5	1.03	249.38	0	0.00	249.38	0.050	-0.600
751.3	17.716	246.21	0.26	1.25	0.5	1.03	240.78	0	0.00	240.78	0.051	-0.600
751.1	17.880	229.37	0.33	1.33	0.5	1.03	225.12	0	0.00	225.12	0.051	-0.600
751.0	18.044	226.41	0.33	1.33	0.5	1.03	222.53	0	0.00	222.53	0.052	-0.600
750.8	18.208	220.08	0.39	1.39	0.5	1.03	216.72	0	0.00	216.72	0.049	-0.600
750.6	18.372	251.86	0.29	1.27	0.5	1.03	247.20	0	0.00	247.20	0.046	-0.600
750.5	18.537	304.04	0.32	1.22	0.5	1.03	298.31	0	0.00	298.31	0.043	-0.600
750.3	18.701	338.68	0.25	1.13	0.5	1.02	332.55	0	0.00	332.55	0.039	-0.600
750.1	18.865	364.31	0.26	1.11	0.5	1.02	358.05	0	0.00	358.05	0.036	-0.600
750.0	19.029	410.51	0.23	1.04	0.5	1.02	403.79	0	0.00	403.79	0.033	-0.600
749.8	19.193	454.09	0.37	1.13	0.5	1.02	447.05	0	0.00	447.05	0.032	-0.600
749.6	19.357	471.31	0.38	1.13	0.5	1.02	464.48	0	0.00	464.48	0.031	-0.600
749.5	19.521	448.64	0.29	1.06	0.5	1.02	442.70	0	0.00	442.70	0.031	-0.600
749.3	19.685	411.68	0.25	1.06	0.5	1.02	406.77	0	0.00	406.77	0.031	-0.600
749.2	19.849	358.90	0.34	1.19	0.5	1.02	355.16	0	0.00	355.16	0.031	-0.600
749.0	20.013	322.37	0.33	1.22	0.5	1.01	319.49	0	0.00	319.49	0.031	-0.600
748.8	20.177	265.92	0.49	1.39	0.5	1.01	264.04	0	0.00	264.04	0.030	-0.600
748.7	20.341	260.02	0.46	1.37	0.5	1.01	258.50	0	0.00	258.50	0.030	-0.600
748.5	20.505	240.44	0.37	1.35	0.5	1.01	239.54	0	0.00	239.54	0.029	-0.600
748.3	20.669	207.44	0.33	1.37	0.5	1.01	207.32	0	0.00	207.32	0.029	-0.600

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
748.2	20.833	189.31	0.16	1.27	0.5	1.01	189.60	0	0.00	189.60	0.028	-0.600
748.0	20.997	166.72	0.15	1.31	0.5	1.01	167.38	0	0.00	167.38	0.028	-0.600
747.8	21.161	141.79	0.15	1.38	0.5	1.01	142.74	0	0.00	142.74	0.027	-0.536
747.7	21.325	123.03	0.15	1.44	0.5	1.01	124.14	0	0.00	124.14	0.027	-0.472
747.5	21.489	115.88	0.15	1.46	0.5	1.01	117.04	0	0.00	117.04	0.027	-0.445
747.3	21.653	113.99	0.15	1.47	0.5	1.00	115.18	0	0.00	115.18	0.026	-0.438
747.2	21.817	104.55	0.15	1.50	0.5	1.00	105.77	0	0.00	105.77	0.026	-0.401
747.0	21.981	93.18	0.15	1.55	0.5	1.00	94.41	0	0.00	94.41	0.025	-0.352
746.9	22.145	108.87	0.16	1.49	0.5	1.00	110.13	0	0.00	110.13	0.025	-0.418
746.7	22.309	135.94	0.27	1.49	0.5	1.00	137.29	0	0.00	137.29	0.024	-0.517
746.5	22.473	131.18	0.52	1.65	0.5	0.99	132.55	0	0.00	132.55	0.024	-0.501
746.4	22.638	129.91	1.06	1.84	0.5	0.99	131.31	10	0.00	131.31	0.023	-0.496
746.2	22.802	121.71	1.17	1.89	0.5	0.99	123.10	14	0.00	123.10	0.023	-0.467
746.0	22.966	110.96	1.31	1.96	0.5	0.99	112.31	19	0.00	112.31	0.022	-0.426
745.9	23.130	97.53	1.18	1.96	0.5	0.99	98.81	20	0.00	98.81	0.022	-0.370
745.7	23.294	90.85	0.90	1.92	0.5	0.98	92.09	16	0.00	92.09	0.021	-0.341
745.5	23.458	93.32	0.49	1.75	0.5	0.98	94.58	3	0.00	94.58	0.021	-0.352
745.4	23.622	92.02	0.34	1.68	0.5	0.98	93.27	0	0.00	93.27	0.020	-0.346
745.2	23.786	91.79	0.48	1.75	0.5	0.98	93.04	3	0.00	93.04	0.020	-0.345
745.1	23.950	93.10	0.75	1.86	0.5	0.98	94.37	12	0.00	94.37	0.019	-0.350
744.9	24.114	92.84	1.05	1.95	0.5	0.97	94.11	19	0.00	94.11	0.019	-0.349
744.7	24.278	91.77	1.18	1.98	0.5	0.97	93.02	22	0.00	93.02	0.019	-0.344
744.6	24.442	98.48	1.10	1.94	0.5	0.97	99.82	18	0.00	99.82	0.018	-0.374
744.4	24.606	118.81	0.82	1.80	0.5	0.97	120.47	7	0.00	120.47	0.018	-0.456
744.2	24.770	127.23	0.57	1.68	0.5	0.97	129.07	0	0.00	129.07	0.017	-0.487
744.1	24.934	118.67	0.41	1.63	0.5	0.97	120.38	0	0.00	120.38	0.017	-0.455
743.9	25.098	109.46	0.19	1.52	0.5	0.97	111.02	0	0.00	111.02	0.016	-0.419
743.7	25.262	97.77	0.15	1.53	0.5	0.96	99.13	0	0.00	99.13	0.016	-0.370
743.6	25.426	92.88	0.17	1.57	0.5	0.96	94.17	0	0.00	94.17	0.015	-0.349
743.4	25.590	96.53	0.15	1.54	0.5	0.96	97.89	0	0.00	97.89	0.015	-0.365
743.2	25.754	101.25	0.15	1.52	0.5	0.96	102.70	0	0.00	102.70	0.015	-0.385
743.1	25.918	92.80	0.23	1.61	0.5	0.96	94.09	0	0.00	94.09	0.014	-0.348
742.9	26.082	78.04	0.22	1.67	0.5	0.95	79.07	0	0.00	79.07	0.014	-0.277
742.8	26.246	64.40	0.22	1.76	0.5	0.94	65.24	3	0.00	65.24	0.013	-0.202
742.6	26.410	55.15	0.18	1.79	0.5	0.94	55.89	6	0.00	55.89	0.013	-0.144
742.4	26.574	54.20	0.15	1.78	0.5	0.94	54.91	5	0.00	54.91	0.013	-0.137
742.3	26.739	51.38	0.15	1.80	0.5	0.93	52.06	7	0.00	52.06	0.012	-0.118
742.1	26.903	48.02	0.15	1.83	0.5	0.93	48.66	10	0.00	48.66	0.012	-0.094
741.9	27.067	47.72	0.15	1.83	0.5	0.93	48.34	10	0.00	48.34	0.012	-0.091
741.8	27.231	42.49	0.17	1.90	0.5	0.92	43.07	15	0.00	43.07	0.011	-0.051
741.6	27.395	37.13	0.35	2.05	0.5	0.92	37.69	27	0.00	37.69	0.011	-0.007
741.4	27.559	33.61	0.55	2.17	0.5	0.92	34.17	36	0.00	34.17	0.010	0.025
741.3	27.723	32.49	0.75	2.24	0.5	0.91	33.03	43	0.00	33.03	0.010	0.036
741.1	27.887	33.54	0.84	2.26	0.5	0.91	34.06	44	0.00	34.06	0.010	0.027
740.9	28.051	34.15	0.96	2.28	0.5	0.91	34.65	45	0.00	34.65	0.009	0.021
740.8	28.215	31.64	1.04	2.33	0.5	0.91	32.13	49	0.00	32.13	0.009	0.045
740.6	28.379	28.58	1.05	2.37	0.5	0.90	29.09	52	0.00	29.09	0.008	0.077
740.5	28.543	25.71	1.06	2.41	0.5	0.90	26.23	56	0.00	26.23	0.008	0.100
740.3	28.707	26.06	1.05	2.40	0.5	0.90	26.56	55	0.00	26.56	0.008	0.100
740.1	28.871	28.94	1.04	2.36	0.5	0.90	29.39	52	0.00	29.39	0.007	0.074
740.0	29.035	31.29	1.13	2.35	0.5	0.90	31.70	51	0.00	31.70	0.007	0.050
739.8	29.199	33.79	1.08	2.31	0.5	0.89	34.17	48	0.00	34.17	0.006	0.026
739.6	29.363	35.22	0.97	2.27	0.5	0.89	35.57	45	0.00	35.57	0.006	0.014
739.5	29.527	35.18	0.99	2.28	0.5	0.89	35.51	45	0.00	35.51	0.005	0.014
739.3	29.691	32.03	1.12	2.34	0.5	0.89	32.36	50	0.00	32.36	0.005	0.044
739.1	29.855	28.07	1.26	2.42	0.5	0.88	28.43	56	0.00	28.43	0.004	0.084
739.0	30.019	26.42	1.15	2.42	0.5	0.88	26.78	56	0.00	26.78	0.004	0.100
738.8	30.183	25.51	0.98	2.39	0.5	0.88	25.87	54	0.00	25.87	0.003	0.100
738.7	30.347	24.89	0.83	2.37	0.5	0.87	25.25	52	0.00	25.25	0.003	0.100
738.5	30.511	24.22	0.85	2.38	0.5	0.87	24.57	53	0.00	24.57	0.002	0.100
738.3	30.675	23.68	0.96	2.42	0.5	0.87	24.02	56	0.00	24.02	0.002	0.100
738.2	30.840	23.77	1.09	2.44	0.5	0.87	24.10	58	0.00	24.10	0.001	0.100
738.0	31.004	24.70	1.18	2.45	0.5	0.86	25.00	59	0.00	25.00	0.001	0.100
737.8	31.168	28.11	1.08	2.38	0.5	0.87	28.33	53	0.00	28.33	0.000	0.086
737.7	31.332	29.92	1.14	2.37	0.5	0.87	30.10	52	0.00	30.10	0.001	0.068
737.5	31.496	28.98	1.35	2.42	0.5	0.86	29.15	57	0.00	29.15	0.001	0.078

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737.3	31.660	28.73	1.44	2.44	0.5	0.86	28.89	58	0.00	28.89	0.001	0.081
737.2	31.824	25.66	1.65	2.51	0.5	0.86	25.86	64	0.00	25.86	0.002	0.100
737.0	31.988	26.32	1.62	2.50	0.5	0.85	26.49	63	0.00	26.49	0.002	0.100
736.8	32.152	30.03	1.53	2.44	0.5	0.86	30.13	58	0.00	30.13	0.003	0.068
736.7	32.316	30.84	1.65	2.45	0.5	0.85	30.91	59	0.00	30.91	0.003	0.060
736.5	32.480	33.49	1.70	2.43	0.5	0.86	33.52	57	0.00	33.52	0.003	0.035
736.4	32.644	37.49	1.35	2.33	0.5	0.86	37.48	49	0.00	37.48	0.004	-0.001
736.2	32.808	43.93	1.58	2.31	0.5	0.86	43.90	48	0.00	43.90	0.004	-0.054
736.0	32.972	46.35	1.83	2.33	0.5	0.86	46.32	50	0.00	46.32	0.005	-0.073
735.9	33.136	44.71	2.09	2.38	0.5	0.86	44.65	54	0.00	44.65	0.005	-0.060
735.7	33.300	40.60	2.30	2.44	0.5	0.85	40.51	58	0.00	40.51	0.006	-0.027
735.5	33.464	39.15	2.33	2.46	0.5	0.85	39.04	60	0.00	39.04	0.006	-0.014
735.4	33.628	40.99	2.31	2.44	0.5	0.85	40.86	58	0.00	40.86	0.007	-0.030
735.2	33.792	42.56	2.35	2.43	0.5	0.85	42.42	58	0.00	42.42	0.007	-0.042
735.0	33.956	47.79	2.22	2.38	0.5	0.85	47.67	53	0.00	47.67	0.007	-0.082
734.9	34.120	52.00	2.01	2.32	0.5	0.85	51.92	49	0.00	51.92	0.008	-0.112
734.7	34.284	51.68	2.16	2.35	0.5	0.85	51.58	51	0.00	51.58	0.008	-0.110
734.6	34.448	56.51	2.17	2.32	0.5	0.85	56.47	48	0.00	56.47	0.009	-0.143
734.4	34.612	61.88	2.20	2.29	0.5	0.86	61.96	46	0.00	61.96	0.009	-0.177
734.2	34.776	65.48	2.14	2.27	0.5	0.86	65.66	44	0.00	65.66	0.010	-0.199
734.1	34.941	67.93	2.10	2.25	0.5	0.86	68.17	43	0.00	68.17	0.010	-0.213
733.9	35.105	71.67	2.02	2.22	0.5	0.86	72.05	41	0.00	72.05	0.010	-0.234
733.7	35.269	84.58	1.47	2.08	0.5	0.87	85.54	29	0.00	85.54	0.011	-0.303
733.6	35.433	78.22	1.07	2.01	0.5	0.86	78.85	24	0.00	78.85	0.011	-0.270
733.4	35.597	66.51	0.92	2.03	0.5	0.85	66.65	25	0.00	66.65	0.012	-0.204
733.2	35.761	35.94	1.68	2.40	0.5	0.82	35.61	55	0.00	35.61	0.012	0.017
733.1	35.925	15.63	3.14	2.85	1.0	0.80	18.20	91	0.00	18.20	0.013	0.100
732.9	36.089	8.69	4.27	3.14	1.0	0.80	10.82	100	0.00	10.82	0.013	0.100
732.7	36.253	6.61	3.28	3.17	1.0	0.80	8.62	100	0.00	8.62	0.013	0.100
732.6	36.417	5.26	1.95	3.14	1.0	0.80	7.19	100	0.00	7.19	0.014	0.100
732.4	36.581	4.56	0.96	3.06	1.0	0.79	6.45	100	0.00	6.45	0.014	0.100
732.3	36.745	4.15	0.86	3.08	1.0	0.79	6.02	100	0.00	6.02	0.015	0.100
732.1	36.909	4.01	0.98	3.11	1.0	0.79	5.88	100	0.00	5.88	0.015	0.100
731.9	37.073	4.14	1.16	3.13	1.0	0.79	6.03	100	0.00	6.03	0.016	0.100
731.8	37.237	4.37	1.32	3.13	1.0	0.79	6.28	100	0.00	6.28	0.016	0.100
731.6	37.401	4.70	1.45	3.12	1.0	0.78	6.63	100	0.00	6.63	0.016	0.100
731.4	37.565	4.66	1.48	3.13	1.0	0.78	6.60	100	0.00	6.60	0.017	0.100
731.3	37.729	4.94	1.59	3.12	1.0	0.78	6.90	100	0.00	6.90	0.017	0.100
731.1	37.893	4.85	2.52	3.22	1.0	0.78	6.82	100	0.00	6.82	0.018	0.100
730.9	38.057	4.90	2.98	3.26	1.0	0.78	6.87	100	0.00	6.87	0.018	0.100
730.8	38.221	4.79	2.48	3.22	1.0	0.78	6.77	100	0.00	6.77	0.018	0.100
730.6	38.385	4.46	2.30	3.23	1.0	0.77	6.41	100	0.00	6.41	0.019	0.100
730.5	38.549	3.86	2.18	3.28	1.0	0.77	5.78	100	0.00	5.78	0.019	0.100
730.3	38.713	3.82	2.04	3.27	1.0	0.77	5.74	100	0.00	5.74	0.019	0.100
730.1	38.877	3.81	1.95	3.26	1.0	0.77	5.74	100	0.00	5.74	0.020	0.100
730.0	39.042	3.91	1.72	3.22	1.0	0.77	5.85	100	0.00	5.85	0.020	0.100
729.8	39.206	3.64	2.00	3.28	1.0	0.77	5.56	100	0.00	5.56	0.021	0.100
729.6	39.370	3.98	2.12	3.26	1.0	0.76	5.93	100	0.00	5.93	0.021	0.100
729.5	39.534	5.34	1.43	3.07	1.0	0.82	7.92	100	56.39	64.31	0.021	-0.188
729.3	39.698	4.58	1.63	3.15	1.0	0.81	7.05	100	56.12	63.17	0.022	-0.181
729.1	39.862	4.01	1.64	3.21	1.0	0.81	6.40	100	55.92	62.32	0.022	-0.176
729.0	40.026	3.91	1.49	3.20	1.0	0.81	6.29	100	55.89	62.18	0.022	-0.175
728.8	40.190	3.92	1.50	3.20	1.0	0.81	6.32	100	55.89	62.21	0.023	-0.175
728.6	40.354	4.09	1.36	3.16	1.0	0.81	6.53	100	55.96	62.49	0.023	-0.177
728.5	40.518	4.34	1.30	3.13	1.0	0.80	6.82	100	56.05	62.87	0.023	-0.179
728.3	40.682	4.22	1.24	3.13	1.0	0.80	6.69	100	56.01	62.70	0.024	-0.178
728.2	40.846	4.40	1.42	3.14	1.0	0.80	6.92	100	56.08	63.00	0.024	-0.180
728.0	41.010	5.03	1.24	3.06	1.0	0.80	7.67	100	56.31	63.99	0.024	-0.185
727.8	41.174	5.11	1.32	3.07	1.0	0.80	7.77	100	56.35	64.12	0.025	-0.186
727.7	41.338	6.64	1.63	3.01	1.0	0.80	9.61	100	56.92	66.53	0.025	-0.200
727.5	41.502	23.34	0.54	2.31	0.5	0.81	24.68	48	51.58	76.26	0.025	-0.253
727.3	41.666	18.45	0.81	2.48	0.5	0.80	19.86	61	54.55	74.41	0.025	-0.243
727.2	41.830	12.24	0.97	2.67	1.0	0.80	16.36	77	56.46	72.82	0.026	-0.234
727.0	41.994	14.12	1.02	2.63	1.0	0.80	18.68	73	56.58	75.26	0.026	-0.247
726.8	42.158	16.66	1.30	2.62	1.0	0.80	21.83	72	57.36	79.19	0.026	-0.267
726.7	42.322	16.46	1.70	2.68	1.0	0.80	21.64	77	58.13	79.76	0.027	-0.270

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
726.5	42.486	23.04	1.20	2.48	0.5	0.80	24.50	61	55.86	80.36	0.027	-0.273
726.3	42.650	34.07	1.07	2.31	0.5	0.81	35.69	47	54.41	90.09	0.027	-0.320
726.2	42.814	42.00	0.94	2.20	0.5	0.81	43.78	39	51.82	95.60	0.027	-0.344
726.0	42.978	40.38	1.08	2.25	0.5	0.81	42.18	43	53.71	95.90	0.028	-0.345
725.9	43.143	38.47	1.19	2.29	0.5	0.81	40.26	46	54.92	95.17	0.028	-0.342
725.7	43.307	38.37	1.00	2.25	0.5	0.80	40.09	43	53.19	93.28	0.028	-0.334
725.5	43.471	35.30	1.04	2.29	0.5	0.80	36.95	46	54.01	90.97	0.028	-0.323
725.4	43.635	31.90	0.99	2.31	0.5	0.80	33.46	48	54.04	87.50	0.028	-0.307
725.2	43.799	27.71	1.13	2.39	0.5	0.79	29.22	55	55.35	84.57	0.029	-0.293
725.0	43.963	23.95	1.15	2.45	0.5	0.79	25.43	59	55.63	81.05	0.029	-0.276
724.9	44.127	15.26	1.27	2.64	1.0	0.78	20.50	74	57.33	77.83	0.029	-0.259
724.7	44.291	13.01	1.72	2.77	1.0	0.78	17.73	85	57.90	75.64	0.029	-0.248
724.5	44.455	11.74	2.24	2.87	1.0	0.78	16.20	92	58.28	74.48	0.029	-0.242
724.4	44.619	11.86	3.59	2.98	1.0	0.78	16.38	100	59.02	75.40	0.030	-0.246
724.2	44.783	13.60	3.68	2.94	1.0	0.78	18.60	98	59.56	78.16	0.030	-0.260
724.1	44.947	13.81	3.13	2.89	1.0	0.78	18.87	94	59.30	78.18	0.030	-0.260
723.9	45.111	10.28	2.92	2.98	1.0	0.77	14.48	100	58.43	72.91	0.030	-0.233
723.7	45.275	7.72	4.28	3.18	1.0	0.77	11.31	100	57.44	68.75	0.030	-0.210
723.6	45.439	6.95	2.40	3.08	1.0	0.76	10.37	100	57.15	67.52	0.030	-0.203
723.4	45.603	6.47	1.76	3.04	1.0	0.76	9.79	100	56.97	66.76	0.031	-0.198
723.2	45.767	5.48	3.25	3.23	1.0	0.76	8.57	100	56.60	65.17	0.031	-0.189
723.1	45.931	7.08	2.19	3.05	1.0	0.76	10.58	100	57.22	67.80	0.031	-0.204
722.9	46.095	11.82	1.45	2.77	1.0	0.77	16.52	84	57.52	74.04	0.031	-0.238
722.7	46.259	10.61	2.13	2.89	1.0	0.76	15.04	94	58.12	73.16	0.031	-0.233
722.6	46.423	14.50	1.89	2.75	1.0	0.77	20.00	83	58.41	78.41	0.031	-0.261
722.4	46.587	30.73	1.62	2.44	0.5	0.78	32.42	59	57.42	89.84	0.031	-0.316
722.2	46.751	41.51	1.18	2.26	0.5	0.78	43.50	44	54.50	98.00	0.031	-0.352
722.1	46.915	55.63	0.61	2.00	0.5	0.78	57.33	23	36.35	93.68	0.032	-0.333
721.9	47.079	59.40	0.42	1.90	0.5	0.76	59.98	15	18.81	78.79	0.032	-0.262
721.8	47.244	59.16	0.45	1.91	0.5	0.76	59.99	16	22.05	82.04	0.032	-0.278
721.6	47.408	58.24	0.57	1.97	0.5	0.77	59.80	20	32.03	91.82	0.032	-0.324
721.4	47.572	55.75	0.66	2.01	0.5	0.78	57.65	24	38.87	96.52	0.032	-0.345
721.3	47.736	48.61	0.81	2.11	0.5	0.78	50.63	32	47.55	98.18	0.032	-0.352
721.1	47.900	42.76	0.80	2.15	0.5	0.77	44.56	35	49.33	93.88	0.032	-0.333
720.9	48.064	38.23	0.69	2.16	0.5	0.76	39.81	36	48.88	88.69	0.033	-0.310
720.8	48.228	36.69	0.69	2.18	0.5	0.76	38.24	37	49.43	87.68	0.033	-0.305
720.6	48.392	32.73	0.79	2.25	0.5	0.76	34.27	43	52.00	86.27	0.033	-0.298
720.4	48.556	26.59	0.95	2.37	0.5	0.75	28.09	53	54.41	82.50	0.033	-0.280
720.3	48.720	11.69	1.44	2.77	1.0	0.75	16.74	85	57.60	74.34	0.033	-0.238
720.1	48.884	7.81	1.11	2.87	1.0	0.74	11.77	93	56.96	68.73	0.033	-0.207
720.0	49.048	5.77	1.51	3.05	1.0	0.73	9.20	100	56.79	65.99	0.033	-0.192
719.8	49.212	4.94	2.93	3.25	1.0	0.73	8.16	100	56.47	64.62	0.033	-0.184
719.6	49.376	9.76	1.52	2.85	1.0	0.74	14.34	91	57.56	71.90	0.033	-0.225
719.5	49.540	25.50	0.39	2.22	0.5	0.74	26.75	40	48.56	75.31	0.033	-0.243
719.3	49.704	25.62	0.76	2.34	0.5	0.74	27.06	50	53.18	80.24	0.033	-0.268
719.1	49.868	15.24	1.65	2.70	1.0	0.74	21.59	79	58.36	79.95	0.034	-0.266
719.0	50.032	28.99	1.20	2.39	0.5	0.75	30.61	54	55.65	86.26	0.034	-0.297
718.8	50.196	37.93	0.37	2.05	0.5	0.74	38.98	27	39.52	78.50	0.034	-0.259
718.6	50.360	36.45	0.48	2.11	0.5	0.74	37.74	32	44.63	82.38	0.034	-0.278
718.5	50.524	26.40	1.23	2.43	0.5	0.74	27.97	58	55.90	83.87	0.034	-0.285
718.3	50.688	16.15	1.39	2.64	1.0	0.74	22.94	74	58.03	80.98	0.034	-0.271
718.1	50.852	25.19	0.75	2.34	0.5	0.74	26.63	50	53.14	79.78	0.034	-0.265
718.0	51.016	27.67	0.52	2.23	0.5	0.73	29.01	42	49.89	78.90	0.034	-0.260
717.8	51.180	27.70	0.47	2.21	0.5	0.73	29.00	40	48.96	77.96	0.034	-0.255
717.7	51.345	13.67	1.27	2.68	1.0	0.73	19.73	78	57.60	77.32	0.034	-0.252
717.5	51.509	11.65	1.45	2.77	1.0	0.73	17.08	85	57.74	74.82	0.034	-0.239
717.3	51.673	23.96	0.77	2.37	0.5	0.73	25.41	52	53.55	78.96	0.034	-0.260
717.2	51.837	30.43	0.55	2.21	0.5	0.73	31.81	39	49.29	81.10	0.034	-0.271
717.0	52.001	33.57	0.55	2.17	0.5	0.73	34.96	36	47.90	82.86	0.034	-0.279
716.8	52.165	39.98	0.51	2.09	0.5	0.73	41.35	30	43.51	84.86	0.034	-0.289
716.7	52.329	47.49	0.36	1.95	0.5	0.72	48.12	19	28.70	76.82	0.034	-0.249
716.5	52.493	50.26	0.35	1.92	0.5	0.72	50.60	17	23.73	74.33	0.035	-0.236
716.3	52.657	49.09	0.48	1.99	0.5	0.73	50.32	23	35.02	85.34	0.035	-0.291
716.2	52.821	46.88	0.57	2.05	0.5	0.73	48.45	27	41.20	89.65	0.035	-0.311
716.0	52.985	47.53	0.55	2.03	0.5	0.73	49.04	26	39.84	88.88	0.035	-0.307
715.9	53.149	52.30	0.48	1.97	0.5	0.73	53.47	21	31.92	85.39	0.035	-0.291

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
715.7	53.313	53.05	0.53	1.98	0.5	0.73	54.46	22	34.09	88.55	0.035	-0.306
715.5	53.477	53.04	0.57	2.00	0.5	0.73	54.65	23	36.47	91.13	0.035	-0.317
715.4	53.641	55.94	0.54	1.97	0.5	0.73	57.42	21	32.37	89.79	0.035	-0.311
715.2	53.805	62.79	0.42	1.87	0.5	0.71	62.91	13	14.02	76.93	0.035	-0.248
715.0	53.969	59.40	0.39	1.88	0.5	0.71	59.38	13	15.14	74.52	0.035	-0.236
714.9	54.133	52.26	0.26	1.86	0.5	0.69	51.37	12	11.11	62.48	0.035	-0.168
714.7	54.297	42.32	0.22	1.93	0.5	0.70	42.21	17	22.92	65.13	0.035	-0.183
714.5	54.461	35.77	0.25	2.01	0.5	0.70	36.43	24	35.39	71.82	0.035	-0.221
714.4	54.625	31.87	0.46	2.15	0.5	0.71	33.15	35	46.72	79.87	0.035	-0.263
714.2	54.789	31.16	0.61	2.22	0.5	0.71	32.61	40	50.08	82.69	0.035	-0.277
714.0	54.953	37.91	0.49	2.10	0.5	0.71	39.23	31	44.14	83.38	0.035	-0.280
713.9	55.117	44.61	0.45	2.02	0.5	0.71	45.78	25	37.63	83.41	0.035	-0.280
713.7	55.281	45.00	0.51	2.04	0.5	0.71	46.38	26	39.96	86.33	0.035	-0.294
713.6	55.446	45.23	0.57	2.06	0.5	0.72	46.79	28	42.14	88.93	0.035	-0.306
713.4	55.610	49.33	0.57	2.03	0.5	0.72	50.94	25	39.44	90.38	0.035	-0.313
713.2	55.774	54.32	0.40	1.92	0.5	0.70	54.81	17	23.67	78.48	0.035	-0.255
713.1	55.938	50.79	0.49	1.99	0.5	0.71	52.05	22	34.18	86.23	0.036	-0.293
712.9	56.102	52.25	0.55	2.00	0.5	0.71	53.78	23	35.96	89.74	0.036	-0.309
712.7	56.266	59.47	0.50	1.93	0.5	0.71	60.56	17	25.64	86.21	0.036	-0.293
712.6	56.430	69.05	0.34	1.80	0.5	0.69	67.88	7	1.19	69.08	0.036	-0.205
712.4	56.594	67.17	0.28	1.77	0.5	0.68	65.66	5	0.10	65.76	0.036	-0.186
712.2	56.758	59.17	0.16	1.75	0.5	0.67	57.03	3	0.00	57.03	0.036	-0.132
712.1	56.922	53.10	0.19	1.82	0.5	0.66	51.05	8	3.16	54.21	0.036	-0.114
711.9	57.086	45.89	0.21	1.89	0.5	0.67	45.08	14	15.95	61.03	0.036	-0.157
711.8	57.250	37.50	0.30	2.02	0.5	0.69	38.25	25	36.51	74.76	0.036	-0.235
711.6	57.414	34.21	0.38	2.10	0.5	0.69	35.32	31	43.04	78.36	0.036	-0.254
711.4	57.578	34.40	0.44	2.12	0.5	0.69	35.64	32	44.80	80.43	0.036	-0.264
711.3	57.742	33.55	0.52	2.16	0.5	0.69	34.92	36	47.32	82.23	0.036	-0.273
711.1	57.906	38.74	0.45	2.08	0.5	0.69	39.97	29	42.29	82.26	0.036	-0.273
710.9	58.070	42.56	0.17	1.90	0.5	0.66	41.73	15	17.29	59.02	0.036	-0.144
710.8	58.234	40.95	0.46	2.06	0.5	0.69	42.18	28	40.94	83.12	0.036	-0.277
710.6	58.398	28.64	3.74	2.70	1.0	0.72	43.32	79	64.78	108.10	0.036	-0.387
710.4	58.562	50.47	1.55	2.26	0.5	0.72	53.76	44	57.22	110.98	0.036	-0.398
710.3	58.726	83.02	1.25	2.03	0.5	0.75	89.95	26	47.24	137.19	0.036	-0.494
710.1	58.890	114.12	0.15	1.47	0.5	0.73	120.09	0	0.00	120.09	0.036	-0.433
709.9	59.054	40.14	0.15	1.91	0.5	0.65	39.42	16	19.48	58.90	0.036	-0.143

LIQUEFACTION POTENTIAL ASSESSMENT FOR COARSE GRAINED SOILS USING CONE PENETRATION TEST DATA

Project Site: KIF TDEC Stability
Stantec Project No.: 175668043
CPT ID: KIF-BF-CPT-2

Depth to Water during Earthquake:	15.0	ft
Final Grade Elevation during EQ:	769.0	ft
Height of Final Grade above CPT TOH:	0.0	ft
Normalize K_σ to:	1.058	tsf
a_{max} at top of ground surface:	0.19	g
Earthquake Magnitude:	6.00	M_W
Earthquake File or Source Zone:	10	Hz

Shear Stress Fit Parameters

m4:	0
m3:	0
m2:	0
m1:	0

Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
769.0																	
768.8	0.164	0.095	31	1.100	N/A	1.07	N/A	1.000	0	0	**0.124**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**B**
768.7	0.328	0.095	31	1.100	N/A	1.07	N/A	1.000	0	0	**0.124**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**B**
768.5	0.492	0.095	31	1.100	N/A	1.07	N/A	1.000	0	0	**0.124**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**B**
768.3	0.656	0.095	31	1.100	N/A	1.07	N/A	1.000	0	0	**0.124**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**B**
768.2	0.820	0.095	31	1.100	N/A	1.07	N/A	1.000	0	0	**0.124**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**B**
768.0	0.984	0.095	31	1.100	N/A	1.07	N/A	1.000	0	0	**0.124**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**B**
767.9	1.148	0.095	31	1.100	N/A	1.07	N/A	1.000	0	0	**0.124**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**B**
767.7	1.312	0.095	31	1.100	N/A	1.07	N/A	1.000	0	0	**0.124**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**B**
767.5	1.476	0.095	31	1.100	N/A	1.07	N/A	1.000	0	0	**0.124**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**B**
767.4	1.640	0.095	31	1.100	N/A	1.07	N/A	1.000	0	0	**0.124**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**B**
767.2	1.804	0.095	31	1.100	N/A	1.07	N/A	1.000	0	0	**0.124**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
767.0	1.968	0.095	31	1.100	N/A	1.07	N/A	1.000	0	0	**0.124**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
766.9	2.133	0.095	31	1.100	N/A	1.07	N/A	0.999	0	0	**0.124**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
766.7	2.297	0.095	31	1.100	N/A	1.07	N/A	0.998	0	0	**0.124**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
766.5	2.461	0.095	31	1.100	N/A	1.07	N/A	0.998	0	0	**0.124**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
766.4	2.625	0.095	31	1.100	N/A	1.07	N/A	0.997	0	0	**0.124**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
766.2	2.789	0.095	31	1.100	N/A	1.07	N/A	0.996	0	0	**0.124**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
766.0	2.953	0.095	31	1.100	N/A	1.07	N/A	0.995	0	0	**0.124**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
765.9	3.117	0.095	31	1.100	N/A	1.07	N/A	0.995	0	0	**0.123**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
765.7	3.281	0.095	31	1.100	N/A	1.07	N/A	0.994	0	0	**0.123**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
765.6	3.445	0.095	31	1.100	N/A	1.07	N/A	0.993	0	0	**0.123**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
765.4	3.609	0.095	31	1.100	N/A	1.07	N/A	0.992	0	0	**0.123**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
765.2	3.773	0.095	31	1.100	N/A	1.07	N/A	0.992	0	0	**0.123**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
765.1	3.937	0.095	31	1.100	N/A	1.07	N/A	0.991	0	0	**0.123**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
764.9	4.101	0.095	31	1.100	N/A	1.07	N/A	0.990	0	0	**0.123**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
764.7	4.265	0.095	31	1.100	N/A	1.07	N/A	0.989	0	0	**0.123**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
764.6	4.429	0.095	31	1.100	N/A	1.07	N/A	0.988	0	0	**0.123**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
764.4	4.593	0.095	31	1.100	N/A	1.07	N/A	0.988	0	0	**0.123**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
764.2	4.757	0.095	31	1.097	N/A	1.07	N/A	0.987	0	0	**0.123**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
764.1	4.921	0.095	31	1.095	N/A	1.07	N/A	0.986	0	0	**0.122**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
763.9	5.085	0.095	31	1.092	N/A	1.07	N/A	0.985	0	0	**0.122**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
763.8	5.249	0.095	31	1.090	N/A	1.07	N/A	0.984	0	0	**0.122**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
763.6	5.413	0.095	31	1.088	N/A	1.07	N/A	0.984	0	0	**0.122**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
763.4	5.577	0.095	31	1.085	N/A	1.07	N/A	0.983	0	0	**0.122**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
763.3	5.741	0.095	31	1.083	N/A	1.07	N/A	0.982	0	0	**0.122**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
763.1	5.905	0.095	31	1.081	N/A	1.07	N/A	0.981	0	0	**0.122**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
762.9	6.069	0.095	31	1.079	N/A	1.07	N/A	0.980	0	0	**0.122**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
762.8	6.234	0.095	31	1.077	N/A	1.07	N/A	0.979	0	0	**0.122**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
762.6	6.398	0.095	31	1.075	N/A	1.07	N/A	0.978	0	0	**0.121**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
762.4	6.562	0.095	31	1.073	N/A	1.07	N/A	0.978	0	0	**0.121**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
762.3	6.726	0.095	31	1.072	N/A	1.07	N/A	0.977	0	0	**0.121**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
762.1	6.890	0.095	31	1.070	N/A	1.07	N/A	0.976	0	0	**0.121**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
761.9	7.054	0.095	31	1.068	N/A	1.07	N/A	0.975	0	0	**0.121**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
761.8	7.218	0.095	31	1.066	N/A	1.07	N/A	0.974	0	0	**0.121**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**

Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
761.6	7.382	0.095	31	1.065	N/A	1.07	N/A	0.973	0	0	**0.121**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
761.5	7.546	0.095	31	1.063	N/A	1.07	N/A	0.972	0	0	**0.121**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
761.3	7.710	0.095	31	1.062	N/A	1.07	N/A	0.971	0	0	**0.121**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
761.1	7.874	0.095	31	1.060	N/A	1.07	N/A	0.971	0	0	**0.120**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
761.0	8.038	0.095	31	1.058	N/A	1.07	N/A	0.970	0	0	**0.120**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
760.8	8.202	0.095	31	1.057	N/A	1.07	N/A	0.969	0	0	**0.120**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
760.6	8.366	0.095	31	1.056	N/A	1.07	N/A	0.968	0	0	**0.120**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
760.5	8.530	0.095	31	1.054	N/A	1.07	N/A	0.967	0	0	**0.120**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
760.3	8.694	0.095	31	1.053	N/A	1.07	N/A	0.966	0	0	**0.120**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
760.1	8.858	0.095	31	1.051	N/A	1.07	N/A	0.965	0	0	**0.120**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
760.0	9.022	0.095	31	1.050	N/A	1.07	N/A	0.964	0	0	**0.120**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
759.8	9.186	0.095	31	1.049	N/A	1.07	N/A	0.963	0	0	**0.120**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
759.6	9.350	0.095	31	1.047	N/A	1.07	N/A	0.962	0	0	**0.119**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
759.5	9.514	0.095	31	1.046	N/A	1.07	N/A	0.961	0	0	**0.119**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
759.3	9.678	0.095	31	1.045	N/A	1.07	N/A	0.960	0	0	**0.119**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
759.2	9.842	0.095	31	1.044	N/A	1.07	N/A	0.959	0	0	**0.119**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
759.0	10.006	0.095	31	1.042	N/A	1.07	N/A	0.958	0	0	**0.119**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
758.8	10.170	0.095	31	1.041	N/A	1.07	N/A	0.958	0	0	**0.119**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
758.7	10.335	0.095	31	1.040	N/A	1.07	N/A	0.957	0	0	**0.119**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
758.5	10.499	0.095	31	1.039	N/A	1.07	N/A	0.956	0	0	**0.119**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
758.3	10.663	0.095	31	1.038	N/A	1.07	N/A	0.955	0	0	**0.119**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
758.2	10.827	0.095	31	1.037	N/A	1.07	N/A	0.954	0	0	**0.118**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
758.0	10.991	0.095	31	1.035	N/A	1.07	N/A	0.953	0	0	**0.118**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
757.8	11.155	0.095	31	1.034	N/A	1.07	N/A	0.952	0	0	**0.118**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
757.7	11.319	0.095	31	1.033	N/A	1.07	N/A	0.951	0	0	**0.118**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
757.5	11.483	0.095	31	1.032	N/A	1.07	N/A	0.950	0	0	**0.118**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
757.4	11.647	0.095	31	1.031	N/A	1.07	N/A	0.949	0	0	**0.118**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
757.2	11.811	0.095	31	1.030	N/A	1.07	N/A	0.948	0	0	**0.118**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
757.0	11.975	0.095	31	1.029	N/A	1.07	N/A	0.947	0	0	**0.118**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
756.9	12.139	0.102	36	1.030	N/A	1.08	N/A	0.946	0	0	**0.117**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
756.7	12.303	0.107	40	1.031	N/A	1.09	N/A	0.945	0	0	**0.117**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**A2**
756.5	12.467	0.236	70	1.052	N/A	1.34	N/A	0.944	0	0	**0.117**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**A1**
756.4	12.631	N/A	95	N/A	N/A	N/A	N/A	0.943	0	0	**0.117**	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**	**A1**
756.2	12.795	N/A	100	N/A	N/A	N/A	N/A	0.942	0	0	**0.117**	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**	**A1**
756.0	12.959	N/A	100	N/A	N/A	N/A	N/A	0.941	0	0	**0.117**	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**	**A1**
755.9	13.123	N/A	100	N/A	N/A	N/A	N/A	0.940	0	0	**0.117**	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**	**A1**
755.7	13.287	N/A	100	N/A	N/A	N/A	N/A	0.939	0	0	**0.117**	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**	**A1**
755.5	13.451	N/A	100	N/A	N/A	N/A	N/A	0.938	0	0	**0.116**	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**	**A1**
755.4	13.615	N/A	100	N/A	N/A	N/A	N/A	0.936	0	0	**0.116**	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**	**A1**
755.2	13.779	N/A	100	N/A	N/A	N/A	N/A	0.935	0	0	**0.116**	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**	**A1**
755.1	13.943	N/A	100	N/A	N/A	N/A	N/A	0.934	0	0	**0.116**	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**	**A1**
754.9	14.107	N/A	100	N/A	N/A	N/A	N/A	0.933	0	0	**0.116**	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**	**A1**
754.7	14.271	N/A	100	N/A	N/A	N/A	N/A	0.932	0	0	**0.116**	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**	**A1**
754.6	14.436	N/A	100	N/A	N/A	N/A	N/A	0.931	0	0	**0.116**	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**	**A1**
754.4	14.600	N/A	100	N/A	N/A	N/A	N/A	0.930	0	0	**0.115**	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**	**A1**
754.2	14.764	N/A	100	N/A	N/A	N/A	N/A	0.929	0	0	**0.115**	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**	**A1**
754.1	14.928	N/A	100	N/A	N/A	N/A	N/A	0.928	0	0	**0.115**	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**	**A1**
753.9	15.092	N/A	100	N/A	N/A	N/A	N/A	0.927	0	0	**0.115**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
753.7	15.256	N/A	95	N/A	N/A	N/A	N/A	0.926	0	0	**0.116**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
753.6	15.420	N/A	87	N/A	N/A	N/A	N/A	0.925	0	0	**0.116**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
753.4	15.584	0.548	80	1.030	1.325	1.58	1.185	0.924	0	0	**0.117**	FALSE	FALSE	FALSE	**10.1**	**Bottom Ash**	**A1**
753.3	15.748	0.338	75	1.025	1.281	1.45	0.645	0.923	0	0	**0.117**	FALSE	FALSE	FALSE	**5.5**	**Bottom Ash**	**A1**
753.1	15.912	0.353	76	1.024	1.293	1.46	0.683	0.922	0	0	**0.118**	FALSE	FALSE	FALSE	**5.8**	**Bottom Ash**	**A1**
752.9	16.076	0.267	72	1.021	1.208	1.38	0.454	0.921	0	0	**0.118**	FALSE	FALSE	FALSE	**3.8**	**Bottom Ash**	**A1**
752.8	16.240	N/A	82	N/A	N/A	N/A	N/A	0.919	0	0	**0.119**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**

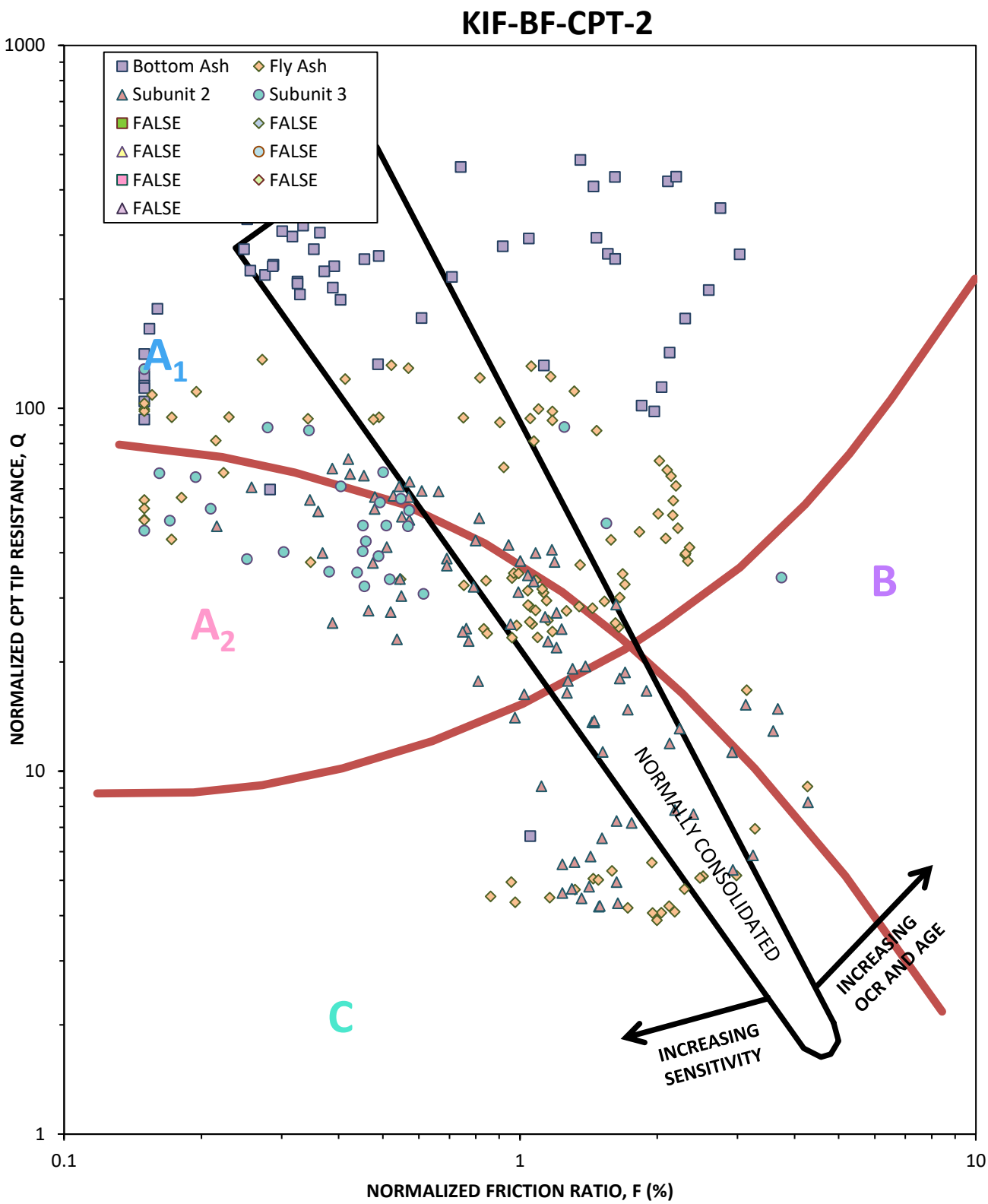
Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
752.6	16.404	N/A	88	N/A	N/A	N/A	N/A	0.918	0	0	**0.119**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
752.4	16.568	N/A	96	N/A	N/A	N/A	N/A	0.917	0	0	**0.120**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
752.3	16.732	N/A	99	N/A	N/A	N/A	N/A	0.916	0	0	**0.120**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
752.1	16.896	N/A	100	N/A	N/A	N/A	N/A	0.915	0	0	**0.121**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
751.9	17.060	N/A	100	N/A	N/A	N/A	N/A	0.914	0	0	**0.121**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
751.8	17.224	N/A	100	N/A	N/A	N/A	N/A	0.913	0	0	**0.122**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
751.6	17.388	N/A	100	N/A	N/A	N/A	N/A	0.912	0	0	**0.122**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
751.4	17.552	N/A	99	N/A	N/A	N/A	N/A	0.911	0	0	**0.122**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
751.3	17.716	N/A	97	N/A	N/A	N/A	N/A	0.909	0	0	**0.123**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
751.1	17.880	N/A	93	N/A	N/A	N/A	N/A	0.908	0	0	**0.123**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
751.0	18.044	N/A	93	N/A	N/A	N/A	N/A	0.907	0	0	**0.124**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
750.8	18.208	N/A	91	N/A	N/A	N/A	N/A	0.906	0	0	**0.124**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
750.6	18.372	N/A	98	N/A	N/A	N/A	N/A	0.905	0	0	**0.124**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
750.5	18.537	N/A	100	N/A	N/A	N/A	N/A	0.904	0	0	**0.125**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
750.3	18.701	N/A	100	N/A	N/A	N/A	N/A	0.903	0	0	**0.125**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
750.1	18.865	N/A	100	N/A	N/A	N/A	N/A	0.902	0	0	**0.125**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
750.0	19.029	N/A	100	N/A	N/A	N/A	N/A	0.900	0	0	**0.126**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
749.8	19.193	N/A	100	N/A	N/A	N/A	N/A	0.899	0	0	**0.126**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
749.6	19.357	N/A	100	N/A	N/A	N/A	N/A	0.898	0	0	**0.126**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
749.5	19.521	N/A	100	N/A	N/A	N/A	N/A	0.897	0	0	**0.127**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
749.3	19.685	N/A	100	N/A	N/A	N/A	N/A	0.896	0	0	**0.127**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
749.2	19.849	N/A	100	N/A	N/A	N/A	N/A	0.895	0	0	**0.127**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
749.0	20.013	N/A	100	N/A	N/A	N/A	N/A	0.894	0	0	**0.128**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
748.8	20.177	N/A	100	N/A	N/A	N/A	N/A	0.892	0	0	**0.128**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
748.7	20.341	N/A	100	N/A	N/A	N/A	N/A	0.891	0	0	**0.128**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
748.5	20.505	N/A	97	N/A	N/A	N/A	N/A	0.890	0	0	**0.129**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
748.3	20.669	N/A	89	N/A	N/A	N/A	N/A	0.889	0	0	**0.129**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
748.2	20.833	N/A	85	N/A	N/A	N/A	N/A	0.888	0	0	**0.129**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
748.0	20.997	0.462	78	0.999	1.160	1.54	0.825	0.887	0	0	**0.129**	FALSE	FALSE	FALSE	**6.4**	**Bottom Ash**	**A1**
747.8	21.161	0.247	71	0.999	1.080	1.35	0.361	0.885	0	0	**0.130**	FALSE	FALSE	FALSE	**2.8**	**Bottom Ash**	**A1**
747.7	21.325	0.181	64	0.998	1.031	1.25	0.233	0.884	0	0	**0.130**	FALSE	FALSE	FALSE	**1.8**	**Bottom Ash**	**A1**
747.5	21.489	0.165	62	0.998	1.016	1.22	0.204	0.883	0	0	**0.130**	FALSE	FALSE	FALSE	**1.6**	**Bottom Ash**	**A1**
747.3	21.653	0.161	61	0.997	1.012	1.21	0.197	0.882	0	0	**0.131**	FALSE	FALSE	FALSE	**1.5**	**Bottom Ash**	**A1**
747.2	21.817	0.145	57	0.997	0.997	1.18	0.170	0.881	0	0	**0.131**	FALSE	FALSE	FALSE	**1.3**	**Bottom Ash**	**A1**
747.0	21.981	0.130	53	0.997	0.984	1.14	0.146	0.880	0	0	**0.131**	FALSE	FALSE	FALSE	**1.1**	**Bottom Ash**	**A1**
746.9	22.145	0.152	59	0.996	1.003	1.19	0.181	0.878	0	0	**0.131**	FALSE	FALSE	FALSE	**1.4**	**Fly Ash**	**A1**
746.7	22.309	0.223	69	0.995	1.052	1.32	0.308	0.877	0	0	**0.132**	FALSE	FALSE	FALSE	**2.3**	**Fly Ash**	**A1**
746.5	22.473	0.206	67	0.994	1.040	1.29	0.275	0.876	0	0	**0.132**	FALSE	FALSE	FALSE	**2.1**	**Fly Ash**	**A1**
746.4	22.638	0.202	67	0.994	1.036	1.29	0.267	0.875	0	0	**0.132**	FALSE	FALSE	FALSE	**2.0**	**Fly Ash**	**A1**
746.2	22.802	0.178	64	0.994	1.020	1.25	0.226	0.874	0	0	**0.132**	FALSE	FALSE	FALSE	**1.7**	**Fly Ash**	**A1**
746.0	22.966	0.156	60	0.994	1.004	1.20	0.187	0.873	0	0	**0.132**	FALSE	FALSE	FALSE	**1.4**	**Fly Ash**	**A1**
745.9	23.130	0.136	54	0.994	0.989	1.15	0.154	0.871	0	0	**0.133**	FALSE	FALSE	FALSE	**1.2**	**Fly Ash**	**A1**
745.7	23.294	0.128	51	0.994	0.983	1.13	0.142	0.870	0	0	**0.133**	FALSE	FALSE	FALSE	**1.1**	**Fly Ash**	**A1**
745.5	23.458	0.131	53	0.994	0.985	1.14	0.146	0.869	0	0	**0.133**	FALSE	FALSE	FALSE	**1.1**	**Fly Ash**	**A1**
745.4	23.622	0.129	52	0.993	0.984	1.14	0.144	0.868	0	0	**0.133**	FALSE	FALSE	FALSE	**1.1**	**Fly Ash**	**A1**
745.2	23.786	0.129	52	0.993	0.984	1.14	0.143	0.867	0	0	**0.134**	FALSE	FALSE	FALSE	**1.1**	**Fly Ash**	**A1**
745.1	23.950	0.130	53	0.992	0.985	1.14	0.146	0.865	0	0	**0.134**	FALSE	FALSE	FALSE	**1.1**	**Fly Ash**	**A1**
744.9	24.114	0.130	52	0.992	0.985	1.14	0.145	0.864	0	0	**0.134**	FALSE	FALSE	FALSE	**1.1**	**Fly Ash**	**A1**
744.7	24.278	0.129	52	0.992	0.985	1.14	0.143	0.863	0	0	**0.134**	FALSE	FALSE	FALSE	**1.1**	**Fly Ash**	**A1**
744.6	24.442	0.137	55	0.991	0.990	1.16	0.156	0.862	0	0	**0.134**	FALSE	FALSE	FALSE	**1.2**	**Fly Ash**	**A1**
744.4	24.606	0.172	63	0.989	1.009	1.23	0.212	0.861	0	0	**0.135**	FALSE	FALSE	FALSE	**1.6**	**Fly Ash**	**A1**
744.2	24.770	0.195	66	0.988	1.019	1.28	0.250	0.859	0	0	**0.135**	FALSE	FALSE	FALSE	**1.9**	**Fly Ash**	**A1**
744.1	24.934	0.172	63	0.988	1.008	1.23	0.212	0.858	0	0	**0.135**	FALSE	FALSE	FALSE	**1.6**	**Fly Ash**	**A1**
743.9	25.098	0.154	59	0.989	0.998	1.20	0.181	0.857	0	0	**0.135**	FALSE	FALSE	FALSE	**1.3**	**Fly Ash**	**A1**
743.7	25.262	0.136	55	0.989	0.990	1.15	0.154	0.856	0	0	**0.135**	FALSE	FALSE	FALSE	**1.1**	**Fly Ash**	**A1**

Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
743.6	25.426	0.130	52	0.989	0.987	1.14	0.145	0.855	0	0	**0.135**	FALSE	FALSE	FALSE	**1.1**	**Fly Ash**	**A1**
743.4	25.590	0.135	54	0.989	0.989	1.15	0.152	0.853	0	0	**0.136**	FALSE	FALSE	FALSE	**1.1**	**Fly Ash**	**A1**
743.2	25.754	0.141	56	0.988	0.992	1.17	0.161	0.852	0	0	**0.136**	FALSE	FALSE	FALSE	**1.2**	**Fly Ash**	**A1**
743.1	25.918	0.130	52	0.988	0.988	1.14	0.145	0.851	0	0	**0.136**	FALSE	FALSE	FALSE	**1.1**	**Fly Ash**	**A1**
742.9	26.082	0.115	45	0.989	0.982	1.11	0.123	0.850	0	0	**0.136**	FALSE	FALSE	FALSE	**0.9**	**Fly Ash**	**A1**
742.8	26.246	0.104	38	0.990	0.979	1.08	0.109	0.848	0	0	**0.136**	FALSE	FALSE	FALSE	**0.8**	**Fly Ash**	**A2**
742.6	26.410	0.096	32	0.991	0.978	1.07	0.100	0.847	0	0	**0.136**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**A2**
742.4	26.574	0.096	31	0.990	0.978	1.07	0.099	0.846	0	0	**0.137**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**A2**
742.3	26.739	0.094	29	0.990	0.978	1.07	0.097	0.845	0	0	**0.137**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**A2**
742.1	26.903	0.091	27	0.990	0.979	1.07	0.094	0.844	0	0	**0.137**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**A2**
741.9	27.067	0.091	27	0.990	0.979	1.07	0.094	0.842	0	0	**0.137**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**A2**
741.8	27.231	0.087	23	0.990	0.979	1.06	0.090	0.841	0	0	**0.137**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**A2**
741.6	27.395	0.084	18	0.991	0.980	1.06	0.086	0.840	0	0	**0.137**	FALSE	FALSE	FALSE	**0.6**	**Fly Ash**	**A2**
741.4	27.559	0.082	15	0.991	0.980	1.06	0.084	0.839	0	0	**0.137**	FALSE	FALSE	FALSE	**0.6**	**Fly Ash**	**A2**
741.3	27.723	0.081	14	0.991	0.981	1.06	0.083	0.838	0	0	**0.137**	FALSE	FALSE	FALSE	**0.6**	**Fly Ash**	**A2**
741.1	27.887	0.081	15	0.990	0.981	1.06	0.084	0.836	0	0	**0.138**	FALSE	FALSE	FALSE	**0.6**	**Fly Ash**	**A2**
740.9	28.051	0.082	16	0.990	0.982	1.06	0.084	0.835	0	0	**0.138**	FALSE	FALSE	FALSE	**0.6**	**Fly Ash**	**A2**
740.8	28.215	0.080	13	0.990	0.983	1.06	0.083	0.834	0	0	**0.138**	FALSE	FALSE	FALSE	**0.6**	**Fly Ash**	**A2**
740.6	28.379	0.078	10	0.990	0.984	1.06	0.080	0.833	0	0	**0.138**	FALSE	FALSE	FALSE	**0.6**	**Fly Ash**	**A2**
740.5	28.543	0.076	7	0.990	0.984	1.06	0.079	0.831	0	0	**0.138**	FALSE	FALSE	FALSE	**0.6**	**Fly Ash**	**A2**
740.3	28.707	0.077	7	0.990	0.985	1.06	0.079	0.830	0	0	**0.138**	FALSE	FALSE	FALSE	**0.6**	**Fly Ash**	**A2**
740.1	28.871	0.078	10	0.990	0.986	1.06	0.081	0.829	0	0	**0.138**	FALSE	FALSE	FALSE	**0.6**	**Fly Ash**	**A2**
740.0	29.035	0.080	13	0.989	0.987	1.06	0.083	0.828	0	0	**0.138**	FALSE	FALSE	FALSE	**0.6**	**Fly Ash**	**A2**
739.8	29.199	0.082	15	0.989	0.988	1.06	0.084	0.826	0	0	**0.138**	FALSE	FALSE	FALSE	**0.6**	**Fly Ash**	**A2**
739.6	29.363	0.082	16	0.988	0.989	1.06	0.085	0.825	0	0	**0.138**	FALSE	FALSE	FALSE	**0.6**	**Fly Ash**	**A2**
739.5	29.527	0.082	16	0.988	0.990	1.06	0.085	0.824	0	0	**0.139**	FALSE	FALSE	FALSE	**0.6**	**Fly Ash**	**A2**
739.3	29.691	0.080	13	0.988	0.991	1.06	0.083	0.823	0	0	**0.139**	FALSE	FALSE	FALSE	**0.6**	**Fly Ash**	**A2**
739.1	29.855	0.078	9	0.989	0.992	1.06	0.081	0.822	0	0	**0.139**	FALSE	FALSE	FALSE	**0.6**	**Fly Ash**	**A2**
739.0	30.019	0.077	8	0.989	0.993	1.06	0.080	0.820	0	0	**0.139**	FALSE	FALSE	FALSE	**0.6**	**Fly Ash**	**A2**
738.8	30.183	0.076	7	0.989	0.994	1.06	0.079	0.819	0	0	**0.139**	FALSE	FALSE	FALSE	**0.6**	**Fly Ash**	**A2**
738.7	30.347	0.076	6	0.989	0.995	1.06	0.079	0.818	0	0	**0.139**	FALSE	FALSE	FALSE	**0.6**	**Fly Ash**	**A2**
738.5	30.511	0.075	5	0.988	0.996	1.06	0.078	0.817	0	0	**0.139**	FALSE	FALSE	FALSE	**0.6**	**Fly Ash**	**A2**
738.3	30.675	0.075	4	0.988	0.997	1.06	0.078	0.815	0	0	**0.139**	FALSE	FALSE	FALSE	**0.6**	**Fly Ash**	**A2**
738.2	30.840	0.075	4	0.988	0.997	1.06	0.078	0.814	0	0	**0.139**	FALSE	FALSE	FALSE	**0.6**	**Fly Ash**	**A2**
738.0	31.004	0.076	6	0.988	0.998	1.06	0.079	0.813	0	0	**0.139**	FALSE	FALSE	FALSE	**0.6**	**Fly Ash**	**A2**
737.8	31.168	0.078	9	0.987	0.999	1.06	0.081	0.812	0	0	**0.139**	FALSE	FALSE	FALSE	**0.6**	**Fly Ash**	**A2**
737.7	31.332	0.079	11	0.987	0.998	1.06	0.082	0.810	0	0	**0.139**	FALSE	FALSE	FALSE	**0.6**	**Fly Ash**	**A2**
737.5	31.496	0.078	10	0.987	0.998	1.06	0.081	0.809	0	0	**0.139**	FALSE	FALSE	FALSE	**0.6**	**Fly Ash**	**A2**
737.3	31.660	0.078	10	0.987	0.997	1.06	0.081	0.808	0	0	**0.139**	FALSE	FALSE	FALSE	**0.6**	**Fly Ash**	**A1**
737.2	31.824	0.076	7	0.987	0.996	1.06	0.079	0.807	0	0	**0.140**	FALSE	FALSE	FALSE	**0.6**	**Fly Ash**	**A1**
737.0	31.988	0.077	7	0.987	0.996	1.06	0.079	0.805	0	0	**0.140**	FALSE	FALSE	FALSE	**0.6**	**Fly Ash**	**A1**
736.8	32.152	0.079	11	0.986	0.995	1.06	0.082	0.804	0	0	**0.140**	FALSE	FALSE	FALSE	**0.6**	**Fly Ash**	**A1**
736.7	32.316	0.079	12	0.986	0.994	1.06	0.082	0.803	0	0	**0.140**	FALSE	FALSE	FALSE	**0.6**	**Fly Ash**	**A1**
736.5	32.480	0.081	15	0.985	0.993	1.06	0.084	0.802	0	0	**0.140**	FALSE	FALSE	FALSE	**0.6**	**Fly Ash**	**A1**
736.4	32.644	0.084	18	0.984	0.992	1.06	0.087	0.800	0	0	**0.140**	FALSE	FALSE	FALSE	**0.6**	**Fly Ash**	**A1**
736.2	32.808	0.088	23	0.983	0.992	1.06	0.091	0.799	0	0	**0.140**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**A1**
736.0	32.972	0.090	25	0.983	0.991	1.06	0.093	0.798	0	0	**0.140**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**A1**
735.9	33.136	0.089	24	0.983	0.990	1.06	0.092	0.797	0	0	**0.140**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**A1**
735.7	33.300	0.086	21	0.983	0.989	1.06	0.088	0.796	0	0	**0.140**	FALSE	FALSE	FALSE	**0.6**	**Fly Ash**	**A1**
735.5	33.464	0.085	20	0.983	0.988	1.06	0.087	0.794	0	0	**0.140**	FALSE	FALSE	FALSE	**0.6**	**Fly Ash**	**A1**
735.4	33.628	0.086	21	0.983	0.988	1.06	0.089	0.793	0	0	**0.140**	FALSE	FALSE	FALSE	**0.6**	**Fly Ash**	**A1**
735.2	33.792	0.087	22	0.982	0.987	1.06	0.090	0.792	0	0	**0.140**	FALSE	FALSE	FALSE	**0.6**	**Fly Ash**	**A1**
735.0	33.956	0.091	26	0.981	0.986	1.07	0.093	0.791	0	0	**0.140**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**A1**
734.9	34.120	0.094	29	0.980	0.986	1.07	0.097	0.789	0	0	**0.140**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**A1**
734.7	34.284	0.093	29	0.980	0.985	1.07	0.096	0.788	0	0	**0.140**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**A1**

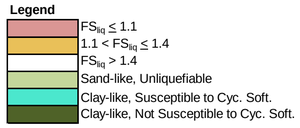
Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
734.6	34.448	0.097	32	0.979	0.985	1.07	0.100	0.787	0	0	**0.140**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**A1**
734.4	34.612	0.101	36	0.978	0.984	1.08	0.105	0.786	0	0	**0.140**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**A1**
734.2	34.776	0.104	38	0.977	0.984	1.08	0.108	0.784	0	0	**0.140**	FALSE	FALSE	FALSE	**0.8**	**Fly Ash**	**A1**
734.1	34.941	0.106	39	0.976	0.984	1.09	0.110	0.783	0	0	**0.140**	FALSE	FALSE	FALSE	**0.8**	**Fly Ash**	**A1**
733.9	35.105	0.109	42	0.975	0.984	1.09	0.114	0.782	0	0	**0.140**	FALSE	FALSE	FALSE	**0.8**	**Fly Ash**	**A1**
733.7	35.269	0.121	48	0.972	0.986	1.12	0.130	0.781	0	0	**0.140**	FALSE	FALSE	FALSE	**0.9**	**Fly Ash**	**A1**
733.6	35.433	0.115	45	0.973	0.984	1.10	0.121	0.779	0	0	**0.140**	FALSE	FALSE	FALSE	**0.9**	**Fly Ash**	**A1**
733.4	35.597	0.105	39	0.975	0.981	1.08	0.109	0.778	0	0	**0.140**	FALSE	FALSE	FALSE	**0.8**	**Fly Ash**	**A1**
733.2	35.761	0.082	16	0.981	0.977	1.06	0.084	0.777	0	0	**0.140**	FALSE	FALSE	FALSE	**0.6**	**Fly Ash**	**A1**
733.1	35.925	0.071	0	0.984	0.976	1.05	0.072	0.776	0	0	**0.140**	FALSE	FALSE	FALSE	**0.5**	**Fly Ash**	**B**
732.9	36.089	0.067	0	0.984	0.975	1.05	0.068	0.774	0	0	**0.140**	FALSE	FALSE	FALSE	**0.5**	**Fly Ash**	**B**
732.7	36.253	0.066	0	0.984	0.974	1.05	0.066	0.773	0	0	**0.140**	FALSE	FALSE	FALSE	**0.5**	**Fly Ash**	**C**
732.6	36.417	0.065	0	0.983	0.973	1.05	0.065	0.772	0	0	**0.140**	FALSE	FALSE	FALSE	**0.5**	**Fly Ash**	**C**
732.4	36.581	0.064	0	0.983	0.973	1.05	0.065	0.771	0	0	**0.140**	FALSE	FALSE	FALSE	**0.5**	**Fly Ash**	**C**
732.3	36.745	0.064	0	0.983	0.972	1.05	0.065	0.770	0	0	**0.140**	FALSE	FALSE	FALSE	**0.5**	**Fly Ash**	**C**
732.1	36.909	0.064	0	0.983	0.971	1.05	0.064	0.768	0	0	**0.140**	FALSE	FALSE	FALSE	**0.5**	**Fly Ash**	**C**
731.9	37.073	0.064	0	0.983	0.970	1.05	0.064	0.767	0	0	**0.140**	FALSE	FALSE	FALSE	**0.5**	**Fly Ash**	**C**
731.8	37.237	0.064	0	0.983	0.970	1.05	0.065	0.766	0	0	**0.140**	FALSE	FALSE	FALSE	**0.5**	**Fly Ash**	**C**
731.6	37.401	0.064	0	0.982	0.969	1.05	0.065	0.765	0	0	**0.140**	FALSE	FALSE	FALSE	**0.5**	**Fly Ash**	**C**
731.4	37.565	0.064	0	0.982	0.968	1.05	0.065	0.763	0	0	**0.140**	FALSE	FALSE	FALSE	**0.5**	**Fly Ash**	**C**
731.3	37.729	0.065	0	0.982	0.967	1.05	0.065	0.762	0	0	**0.140**	FALSE	FALSE	FALSE	**0.5**	**Fly Ash**	**C**
731.1	37.893	0.065	0	0.982	0.967	1.05	0.065	0.761	0	0	**0.140**	FALSE	FALSE	FALSE	**0.5**	**Fly Ash**	**C**
730.9	38.057	0.065	0	0.982	0.966	1.05	0.065	0.760	0	0	**0.140**	FALSE	FALSE	FALSE	**0.5**	**Fly Ash**	**C**
730.8	38.221	0.065	0	0.982	0.965	1.05	0.064	0.758	0	0	**0.140**	FALSE	FALSE	FALSE	**0.5**	**Fly Ash**	**C**
730.6	38.385	0.064	0	0.982	0.965	1.05	0.064	0.757	0	0	**0.140**	FALSE	FALSE	FALSE	**0.5**	**Fly Ash**	**C**
730.5	38.549	0.064	0	0.981	0.964	1.05	0.064	0.756	0	0	**0.140**	FALSE	FALSE	FALSE	**0.5**	**Fly Ash**	**C**
730.3	38.713	0.064	0	0.981	0.963	1.05	0.064	0.755	0	0	**0.140**	FALSE	FALSE	FALSE	**0.5**	**Fly Ash**	**C**
730.1	38.877	0.064	0	0.981	0.963	1.05	0.064	0.754	0	0	**0.140**	FALSE	FALSE	FALSE	**0.5**	**Fly Ash**	**C**
730.0	39.042	0.064	0	0.981	0.962	1.05	0.064	0.752	0	0	**0.140**	FALSE	FALSE	FALSE	**0.5**	**Fly Ash**	**C**
729.8	39.206	0.064	0	0.981	0.961	1.05	0.063	0.751	0	0	**0.140**	FALSE	FALSE	FALSE	**0.5**	**Fly Ash**	**C**
729.6	39.370	0.064	0	0.981	0.961	1.05	0.064	0.750	0	0	**0.140**	FALSE	FALSE	FALSE	**0.5**	**Fly Ash**	**C**
729.5	39.534	0.103	37	0.971	0.967	1.08	0.104	0.749	0	0	**0.140**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**C**
729.3	39.698	0.102	37	0.971	0.966	1.08	0.103	0.747	0	0	**0.139**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**C**
729.1	39.862	0.101	36	0.971	0.965	1.08	0.102	0.746	0	0	**0.139**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**C**
729.0	40.026	0.101	36	0.970	0.965	1.08	0.102	0.745	0	0	**0.139**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**C**
728.8	40.190	0.101	36	0.970	0.964	1.08	0.102	0.744	0	0	**0.139**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**C**
728.6	40.354	0.101	36	0.970	0.964	1.08	0.102	0.743	0	0	**0.139**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**C**
728.5	40.518	0.102	36	0.969	0.964	1.08	0.103	0.741	0	0	**0.139**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**C**
728.3	40.682	0.102	36	0.969	0.963	1.08	0.102	0.740	0	0	**0.139**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**C**
728.2	40.846	0.102	36	0.969	0.963	1.08	0.103	0.739	0	0	**0.139**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**C**
728.0	41.010	0.103	37	0.968	0.963	1.08	0.103	0.738	0	0	**0.139**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**C**
727.8	41.174	0.103	37	0.968	0.962	1.08	0.103	0.736	0	0	**0.139**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**C**
727.7	41.338	0.105	39	0.967	0.963	1.08	0.106	0.735	0	0	**0.139**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**C**
727.5	41.502	0.112	44	0.964	0.968	1.10	0.115	0.734	0	0	**0.139**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**A2**
727.3	41.666	0.111	43	0.964	0.966	1.10	0.113	0.733	0	0	**0.138**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**A2**
727.2	41.830	0.110	42	0.964	0.965	1.09	0.112	0.732	0	0	**0.138**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**C**
727.0	41.994	0.112	43	0.963	0.966	1.10	0.114	0.730	0	0	**0.138**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**A2**
726.8	42.158	0.115	45	0.962	0.968	1.11	0.119	0.729	0	0	**0.138**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**A2**
726.7	42.322	0.116	46	0.962	0.968	1.11	0.119	0.728	0	0	**0.138**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**C**
726.5	42.486	0.116	46	0.961	0.969	1.11	0.120	0.727	0	0	**0.138**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**A2**
726.3	42.650	0.126	51	0.958	0.976	1.13	0.133	0.726	0	0	**0.138**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**A2**
726.2	42.814	0.132	53	0.955	0.982	1.14	0.142	0.724	0	0	**0.138**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**A1**
726.0	42.978	0.132	53	0.955	0.982	1.15	0.142	0.723	0	0	**0.138**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**A1**
725.9	43.143	0.131	53	0.955	0.981	1.14	0.141	0.722	0	0	**0.138**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**A1**
725.7	43.307	0.129	52	0.955	0.979	1.14	0.137	0.721	0	0	**0.137**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**A1**

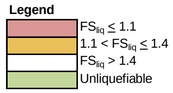
Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
725.5	43.471	0.127	51	0.956	0.976	1.13	0.134	0.720	0	0	**0.137**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**A2**
725.4	43.635	0.123	49	0.957	0.973	1.12	0.129	0.718	0	0	**0.137**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**A2**
725.2	43.799	0.120	48	0.957	0.970	1.12	0.125	0.717	0	0	**0.137**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**A2**
725.0	43.963	0.117	46	0.958	0.967	1.11	0.120	0.716	0	0	**0.137**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**A2**
724.9	44.127	0.114	45	0.959	0.965	1.10	0.116	0.715	0	0	**0.137**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**C**
724.7	44.291	0.112	44	0.959	0.963	1.10	0.114	0.714	0	0	**0.137**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**C**
724.5	44.455	0.111	43	0.960	0.962	1.10	0.112	0.712	0	0	**0.137**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**C**
724.4	44.619	0.112	43	0.959	0.962	1.10	0.113	0.711	0	0	**0.137**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**B**
724.2	44.783	0.114	45	0.958	0.964	1.10	0.116	0.710	0	0	**0.137**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**B**
724.1	44.947	0.114	45	0.958	0.964	1.10	0.116	0.709	0	0	**0.136**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**B**
723.9	45.111	0.110	42	0.959	0.960	1.09	0.110	0.708	0	0	**0.136**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**C**
723.7	45.275	0.106	40	0.960	0.957	1.09	0.106	0.706	0	0	**0.136**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**B**
723.6	45.439	0.105	39	0.960	0.956	1.09	0.105	0.705	0	0	**0.136**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**C**
723.4	45.603	0.105	39	0.960	0.956	1.09	0.104	0.704	0	0	**0.136**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**C**
723.2	45.767	0.103	38	0.961	0.955	1.08	0.103	0.703	0	0	**0.136**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**C**
723.1	45.931	0.106	39	0.959	0.956	1.09	0.105	0.702	0	0	**0.136**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**C**
722.9	46.095	0.111	43	0.957	0.960	1.10	0.111	0.701	0	0	**0.136**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**C**
722.7	46.259	0.110	42	0.957	0.959	1.09	0.110	0.699	0	0	**0.135**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**C**
722.6	46.423	0.114	45	0.955	0.963	1.10	0.116	0.698	0	0	**0.135**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**C**
722.4	46.587	0.125	50	0.950	0.973	1.13	0.131	0.697	0	0	**0.135**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**A1**
722.2	46.751	0.135	54	0.947	0.983	1.15	0.144	0.696	0	0	**0.135**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**A1**
722.1	46.915	0.130	52	0.948	0.978	1.14	0.137	0.695	0	0	**0.135**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**A1**
721.9	47.079	0.115	45	0.954	0.963	1.10	0.116	0.694	0	0	**0.135**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**A1**
721.8	47.244	0.118	47	0.952	0.965	1.11	0.120	0.692	0	0	**0.135**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**A1**
721.6	47.408	0.128	51	0.948	0.975	1.13	0.134	0.691	0	0	**0.135**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**A1**
721.4	47.572	0.133	53	0.946	0.981	1.15	0.142	0.690	0	0	**0.135**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**A1**
721.3	47.736	0.135	54	0.945	0.983	1.15	0.144	0.689	0	0	**0.134**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**A1**
721.1	47.900	0.130	52	0.946	0.977	1.14	0.137	0.688	0	0	**0.134**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**A2**
720.9	48.064	0.124	50	0.948	0.971	1.13	0.129	0.687	0	0	**0.134**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**A2**
720.8	48.228	0.123	49	0.948	0.970	1.12	0.127	0.686	0	0	**0.134**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**A2**
720.6	48.392	0.122	49	0.949	0.968	1.12	0.125	0.684	0	0	**0.134**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**A2**
720.4	48.556	0.118	47	0.950	0.965	1.11	0.120	0.683	0	0	**0.134**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**A2**
720.3	48.720	0.111	43	0.953	0.958	1.10	0.111	0.682	0	0	**0.134**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**C**
720.1	48.884	0.106	40	0.955	0.954	1.09	0.105	0.681	0	0	**0.134**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**C**
720.0	49.048	0.104	38	0.955	0.952	1.08	0.103	0.680	0	0	**0.133**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**C**
719.8	49.212	0.103	37	0.956	0.951	1.08	0.101	0.679	0	0	**0.133**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**C**
719.6	49.376	0.109	42	0.953	0.955	1.09	0.108	0.678	0	0	**0.133**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**C**
719.5	49.540	0.112	43	0.951	0.958	1.10	0.112	0.676	0	0	**0.133**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**A2**
719.3	49.704	0.116	46	0.949	0.962	1.11	0.117	0.675	0	0	**0.133**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**A2**
719.1	49.868	0.116	46	0.949	0.962	1.11	0.117	0.674	0	0	**0.133**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**C**
719.0	50.032	0.122	49	0.946	0.968	1.12	0.125	0.673	0	0	**0.133**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**A2**
718.8	50.196	0.114	45	0.949	0.960	1.10	0.115	0.672	0	0	**0.133**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**A2**
718.6	50.360	0.118	47	0.947	0.964	1.11	0.120	0.671	0	0	**0.132**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**A2**
718.5	50.524	0.119	48	0.946	0.965	1.12	0.122	0.670	0	0	**0.132**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**A2**
718.3	50.688	0.117	46	0.947	0.962	1.11	0.118	0.668	0	0	**0.132**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**A2**
718.1	50.852	0.116	46	0.947	0.961	1.11	0.116	0.667	0	0	**0.132**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**A2**
718.0	51.016	0.115	45	0.948	0.960	1.11	0.115	0.666	0	0	**0.132**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**A2**
717.8	51.180	0.114	45	0.948	0.959	1.10	0.114	0.665	0	0	**0.132**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**A2**
717.7	51.345	0.113	44	0.948	0.959	1.10	0.114	0.664	0	0	**0.132**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**C**
717.5	51.509	0.111	43	0.949	0.957	1.10	0.111	0.663	0	0	**0.131**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**C**
717.3	51.673	0.115	45	0.947	0.960	1.11	0.115	0.662	0	0	**0.131**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**A2**
717.2	51.837	0.117	46	0.945	0.962	1.11	0.118	0.661	0	0	**0.131**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**A2**
717.0	52.001	0.118	47	0.944	0.964	1.11	0.120	0.660	0	0	**0.131**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**A2**
716.8	52.165	0.120	48	0.943	0.966	1.12	0.122	0.658	0	0	**0.131**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**A2**
716.7	52.329	0.113	44	0.946	0.958	1.10	0.113	0.657	0	0	**0.131**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**A2**

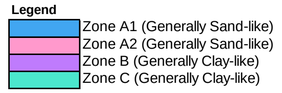
Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
716.5	52.493	0.111	43	0.947	0.956	1.10	0.110	0.656	0	0	**0.131**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**A2**
716.3	52.657	0.121	48	0.942	0.966	1.12	0.123	0.655	0	0	**0.130**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**A2**
716.2	52.821	0.125	50	0.940	0.971	1.13	0.129	0.654	0	0	**0.130**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**A2**
716.0	52.985	0.124	50	0.940	0.970	1.13	0.128	0.653	0	0	**0.130**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**A2**
715.9	53.149	0.121	48	0.941	0.966	1.12	0.123	0.652	0	0	**0.130**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**A2**
715.7	53.313	0.124	50	0.940	0.969	1.13	0.127	0.651	0	0	**0.130**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**A1**
715.5	53.477	0.127	51	0.938	0.972	1.13	0.131	0.650	0	0	**0.130**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**A1**
715.4	53.641	0.125	50	0.939	0.971	1.13	0.129	0.649	0	0	**0.130**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**A1**
715.2	53.805	0.113	44	0.944	0.957	1.10	0.113	0.648	0	0	**0.130**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**A1**
715.0	53.969	0.111	43	0.945	0.955	1.10	0.110	0.647	0	0	**0.129**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**A1**
714.9	54.133	0.101	36	0.950	0.947	1.08	0.098	0.645	0	0	**0.129**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**A2**
714.7	54.297	0.103	38	0.949	0.948	1.08	0.101	0.644	0	0	**0.129**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**A2**
714.5	54.461	0.109	41	0.946	0.953	1.09	0.107	0.643	0	0	**0.129**	FALSE	FALSE	FALSE	**0.8**	**Subunit 3**	**A2**
714.4	54.625	0.116	46	0.942	0.960	1.11	0.116	0.642	0	0	**0.129**	FALSE	FALSE	FALSE	**0.9**	**Subunit 3**	**A2**
714.2	54.789	0.118	47	0.940	0.962	1.11	0.119	0.641	0	0	**0.129**	FALSE	FALSE	FALSE	**0.9**	**Subunit 3**	**A2**
714.0	54.953	0.119	47	0.940	0.963	1.11	0.120	0.640	0	0	**0.129**	FALSE	FALSE	FALSE	**0.9**	**Subunit 3**	**A2**
713.9	55.117	0.119	47	0.939	0.963	1.11	0.120	0.639	0	0	**0.128**	FALSE	FALSE	FALSE	**0.9**	**Subunit 3**	**A2**
713.7	55.281	0.122	49	0.938	0.966	1.12	0.124	0.638	0	0	**0.128**	FALSE	FALSE	FALSE	**1.0**	**Subunit 3**	**A2**
713.6	55.446	0.124	50	0.936	0.969	1.13	0.127	0.637	0	0	**0.128**	FALSE	FALSE	FALSE	**1.0**	**Subunit 3**	**A2**
713.4	55.610	0.126	51	0.935	0.971	1.13	0.129	0.636	0	0	**0.128**	FALSE	FALSE	FALSE	**1.0**	**Subunit 3**	**A2**
713.2	55.774	0.114	45	0.941	0.958	1.10	0.114	0.635	0	0	**0.128**	FALSE	FALSE	FALSE	**0.9**	**Subunit 3**	**A2**
713.1	55.938	0.122	49	0.937	0.966	1.12	0.123	0.634	0	0	**0.128**	FALSE	FALSE	FALSE	**1.0**	**Subunit 3**	**A2**
712.9	56.102	0.125	50	0.935	0.970	1.13	0.128	0.633	0	0	**0.127**	FALSE	FALSE	FALSE	**1.0**	**Subunit 3**	**A1**
712.7	56.266	0.122	49	0.936	0.966	1.12	0.123	0.632	0	0	**0.127**	FALSE	FALSE	FALSE	**1.0**	**Subunit 3**	**A1**
712.6	56.430	0.107	40	0.944	0.950	1.09	0.104	0.631	0	0	**0.127**	FALSE	FALSE	FALSE	**0.8**	**Subunit 3**	**A1**
712.4	56.594	0.104	38	0.945	0.948	1.08	0.101	0.630	0	0	**0.127**	FALSE	FALSE	FALSE	**0.8**	**Subunit 3**	**A1**
712.2	56.758	0.097	33	0.949	0.943	1.07	0.094	0.629	0	0	**0.127**	FALSE	FALSE	FALSE	**0.7**	**Subunit 3**	**A2**
712.1	56.922	0.095	31	0.950	0.942	1.07	0.091	0.627	0	0	**0.127**	FALSE	FALSE	FALSE	**0.7**	**Subunit 3**	**A2**
711.9	57.086	0.100	35	0.947	0.945	1.08	0.097	0.626	0	0	**0.127**	FALSE	FALSE	FALSE	**0.8**	**Subunit 3**	**A2**
711.8	57.250	0.111	43	0.940	0.954	1.10	0.110	0.625	0	0	**0.126**	FALSE	FALSE	FALSE	**0.9**	**Subunit 3**	**A2**
711.6	57.414	0.114	45	0.938	0.957	1.10	0.113	0.624	0	0	**0.126**	FALSE	FALSE	FALSE	**0.9**	**Subunit 3**	**A2**
711.4	57.578	0.116	46	0.937	0.959	1.11	0.116	0.623	0	0	**0.126**	FALSE	FALSE	FALSE	**0.9**	**Subunit 3**	**A2**
711.3	57.742	0.118	47	0.936	0.961	1.11	0.118	0.622	0	0	**0.126**	FALSE	FALSE	FALSE	**0.9**	**Subunit 3**	**A2**
711.1	57.906	0.118	47	0.936	0.961	1.11	0.118	0.621	0	0	**0.126**	FALSE	FALSE	FALSE	**0.9**	**Subunit 3**	**A2**
710.9	58.070	0.099	34	0.946	0.944	1.08	0.095	0.620	0	0	**0.126**	FALSE	FALSE	FALSE	**0.8**	**Subunit 3**	**A2**
710.8	58.234	0.119	47	0.935	0.962	1.11	0.119	0.619	0	0	**0.126**	FALSE	FALSE	FALSE	**0.9**	**Subunit 3**	**A2**
710.6	58.398	0.149	58	0.920	0.997	1.18	0.162	0.618	0	0	**0.125**	FALSE	FALSE	FALSE	**1.3**	**Subunit 3**	**B**
710.4	58.562	0.154	59	0.918	1.002	1.20	0.169	0.617	0	0	**0.125**	FALSE	FALSE	FALSE	**1.3**	**Subunit 3**	**A1**
710.3	58.726	0.223	69	0.898	1.069	1.32	0.282	0.616	0	0	**0.125**	FALSE	FALSE	FALSE	**2.3**	**Subunit 3**	**A1**
710.1	58.890	0.171	63	0.911	1.022	1.23	0.197	0.615	0	0	**0.125**	FALSE	FALSE	FALSE	**1.6**	**Subunit 3**	**A1**
709.9	59.054	0.099	34	0.945	0.944	1.08	0.095	0.614	0	0	**0.125**	FALSE	FALSE	FALSE	**0.8**	**Subunit 3**	**A2**



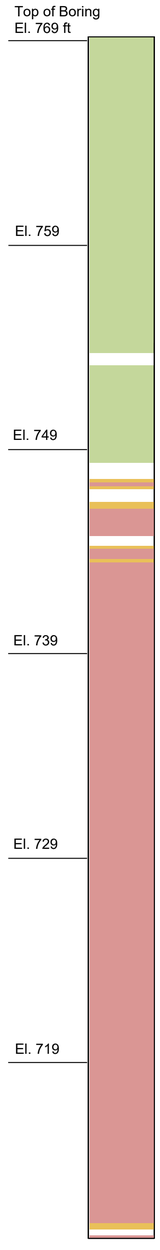
Adapted from "Discussion of 'Liquefaction Potential of Silts from CPTu'" (Robertson 2008). Zone A_1 and Zone A_2 samples are generally sand-like. Zone B samples are generally clay-like and not susceptible to cyclic softening. Zone C samples are generally clay-like and susceptible to cyclic softening. Note that the transition from clay-like to sand-like in this chart does not exactly match the liquefaction calculations herein; that is, some transitional samples in Zone B and Zone C will be treated as sand-like and analyzed for liquefaction if the calculations indicate as such.



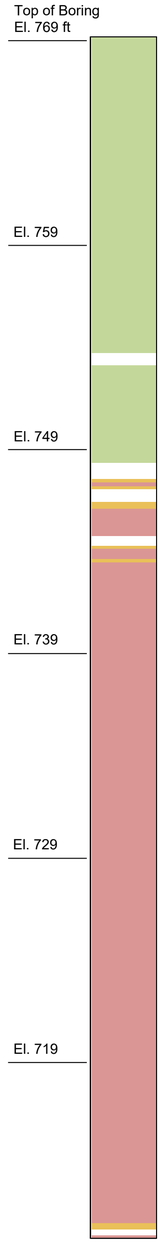




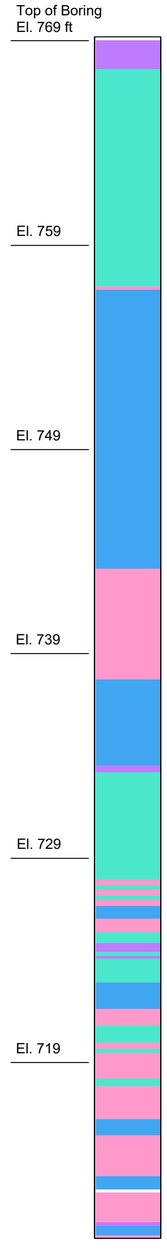
KIF-BF-CPT-2, Liquefaction Triggering Results



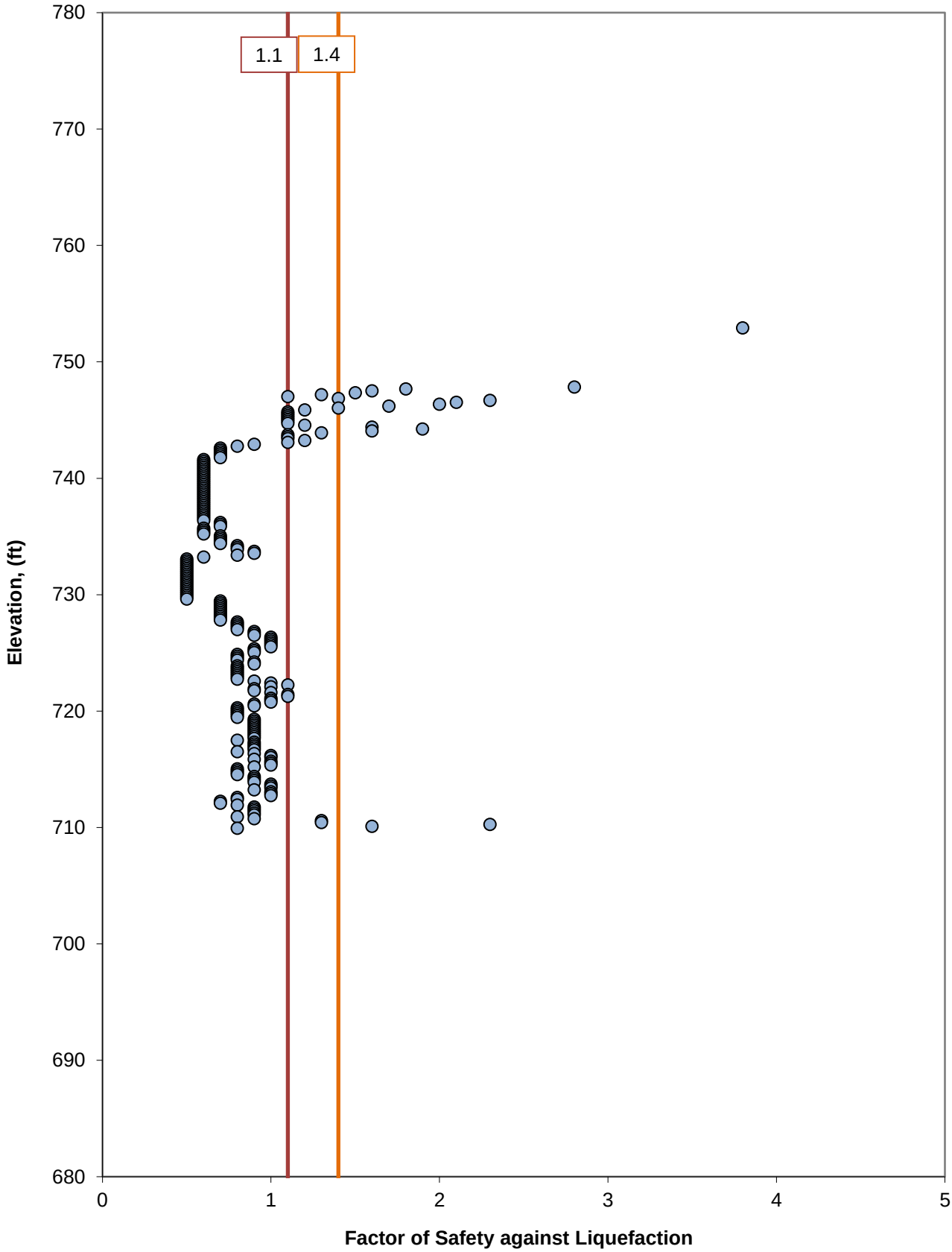
KIF-BF-CPT-2, Liquefaction Triggering Results



KIF-BF-CPT-2, Robertson Soil Type



KIF TDEC Stability, Boring = KIF-BF-CPT-2, Source = 10 Hz, Mw = 6, Event = Design EQ,
CPT Data, Simplified Stress-Based Approach



Project Information

Stantec Project Number =	175668043
Project Name =	KIF TDEC Stability
CPT ID =	KIF-BF-CPT-3A

Boring Location (optional)

Northing =	
Easting =	

OR

Baseline Station =	
Offset (+ Right) =	

Using qt (corrected for u2 PWP) or qc (backcalculated uncorrected field tip)

Cone ID (optional) =	AD184	
Use qc instead of qt?	0	(1: Yes, 0: No)
Cone Area Ratio (a) =	0.80	

Drilling Information

Top of Hole Elevation =	748.0	feet
Water Depth during CPT (negative for U/S borings) =	9.0	feet
Depth data collection began =	0.16	feet
Avg. Total Unit Wt. Above 1st Sample =	120.00	pcf

During Earthquake Information

Water Depth during EQ (relative to CPT TOH, negative for U/S borings) =	6.5	feet
Final Grade Elevation during EQ =	748.0	feet
Avg. Total Unit Wt. of Cut/Fill =		pcf

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile?	0	(1: Yes, 0: No)

If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile:	g_Pond_Section, KIF-BF-CPT3A_NOR	
α at each Sample Depth known?	1	(1: Yes, 0: No)

If previous answer is No, then enter curve fit parameters below (α vs. depth curve)

If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_α will be one.

m4:	
m3:	
m2:	
m1:	
m0:	

Associated ground response profile:	shing_Pond_Section, KIF-BF-SPT3	
Get CSR from shear stress envelope?	0	(1: Yes, 0: No)

If previous answer is No, then CSR will be calculated using a_{max} and r_d

Max. Shear Stress at each sample depth known?		(1: Yes, 0: No)

If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4:	
m3:	
m2:	
m1:	

Earthquake Information

EQ Source (e.g., New Madrid)	10 Hz
Event (e.g., MCE, OBE)	Design EQ
a_{max} (g) (top of ground surface)	0.21
EQ Mag (Mw)	6.0

Inputs

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
0.164	26.316	0.056	112	Fly Ash	Sand-like	Do Not Correct for FC	0.198			
0.328	185.305	0.419	112	Fly Ash	Sand-like	Do Not Correct for FC	0.199			
0.492	214.180	0.336	112	Fly Ash	Sand-like	Do Not Correct for FC	0.200			
0.656	272.354	0.571	112	Fly Ash	Sand-like	Do Not Correct for FC	0.200			
0.820	327.450	0.690	112	Fly Ash	Sand-like	Do Not Correct for FC	0.200			
0.984	251.957	1.359	112	Fly Ash	Sand-like	Do Not Correct for FC	0.199			
1.148	157.059	1.747	112	Fly Ash	Sand-like	Do Not Correct for FC	0.200			
1.312	353.338	2.010	112	Fly Ash	Sand-like	Do Not Correct for FC	0.200			
1.476	416.192	2.802	112	Fly Ash	Sand-like	Do Not Correct for FC	0.201			
1.640	376.382	2.955	112	Fly Ash	Sand-like	Do Not Correct for FC	0.200			
1.804	399.242	2.176	112	Fly Ash	Sand-like	Do Not Correct for FC	0.199			
1.968	454.909	1.843	112	Fly Ash	Sand-like	Do Not Correct for FC	0.197			
2.133	487.422	2.053	112	Fly Ash	Sand-like	Do Not Correct for FC	0.195			
2.297	447.556	2.523	112	Fly Ash	Sand-like	Do Not Correct for FC	0.193			
2.461	315.717	3.060	112	Fly Ash	Sand-like	Do Not Correct for FC	0.190			
2.625	189.215	3.173	112	Fly Ash	Sand-like	Do Not Correct for FC	0.188			
2.789	115.976	3.547	112	Fly Ash	Sand-like	Do Not Correct for FC	0.186			
2.953	131.980	3.444	112	Fly Ash	Sand-like	Do Not Correct for FC	0.186			
3.117	90.529	2.768	112	Fly Ash	Sand-like	Do Not Correct for FC	0.185			
3.281	185.620	3.126	112	Fly Ash	Sand-like	Do Not Correct for FC	0.185			
3.445	240.267	3.335	112	Fly Ash	Sand-like	Do Not Correct for FC	0.184			
3.609	220.756	2.994	112	Fly Ash	Sand-like	Do Not Correct for FC	0.183			
3.773	300.374	3.272	112	Fly Ash	Sand-like	Do Not Correct for FC	0.183			
3.937	222.044	3.365	112	Fly Ash	Sand-like	Do Not Correct for FC	0.182			
4.101	119.173	2.818	112	Fly Ash	Sand-like	Do Not Correct for FC	0.181			
4.265	85.936	2.799	112	Fly Ash	Sand-like	Do Not Correct for FC	0.180			
4.429	57.539	3.051	112	Fly Ash	Sand-like	Do Not Correct for FC	0.180			
4.593	46.239	2.830	112	Fly Ash	Sand-like	Do Not Correct for FC	0.179			
4.757	41.435	2.356	112	Fly Ash	Sand-like	Do Not Correct for FC	0.179			
4.921	41.050	2.082	112	Fly Ash	Sand-like	Do Not Correct for FC	0.178			
5.085	69.986	2.148	128	Embankment Clay	Clay-like		0.178			
5.249	136.601	2.720	128	Embankment Clay	Clay-like		0.178			
5.413	126.635	3.376	128	Embankment Clay	Clay-like		0.178			
5.577	110.182	4.335	128	Embankment Clay	Clay-like		0.178			
5.741	193.056	4.715	128	Embankment Clay	Clay-like		0.177			
5.905	248.145	5.992	128	Embankment Clay	Clay-like		0.175			
6.069	195.588	5.145	128	Embankment Clay	Clay-like		0.174			
6.234	326.489	6.142	128	Embankment Clay	Clay-like		0.173			
6.398	330.906	7.887	128	Embankment Clay	Clay-like		0.171			
6.562	242.195	8.164	128	Embankment Clay	Clay-like		0.170			
6.726	341.526	5.403	128	Embankment Clay	Clay-like		0.169			
6.890	327.141	4.671	128	Embankment Clay	Clay-like		0.169			
7.054	199.033	7.547	128	Embankment Clay	Clay-like		0.169			
7.218	521.910	6.128	128	Embankment Clay	Clay-like		0.169			
7.382	470.988	5.179	128	Embankment Clay	Clay-like		0.169			
7.546	290.131	4.243	128	Embankment Clay	Clay-like		0.169			
7.710	205.756	3.897	128	Embankment Clay	Clay-like		0.169			
7.874	198.168	3.714	128	Embankment Clay	Clay-like		0.169			
8.038	146.944	3.855	128	Embankment Clay	Clay-like		0.169			
8.202	145.164	3.432	128	Embankment Clay	Clay-like		0.168			
8.366	136.831	3.013	128	Embankment Clay	Clay-like		0.168			
8.530	156.217	2.347	128	Embankment Clay	Clay-like		0.168			
8.694	112.657	2.425	128	Embankment Clay	Clay-like		0.167			
8.858	62.657	2.086	128	Embankment Clay	Clay-like		0.167			
9.022	42.509	1.450	128	Embankment Clay	Clay-like		0.166			
9.186	26.654	1.411	128	Embankment Clay	Clay-like		0.166			
9.350	24.337	1.175	128	Embankment Clay	Clay-like		0.166			
9.514	38.493	2.298	128	Embankment Clay	Clay-like		0.165			
9.678	52.131	2.983	128	Embankment Clay	Clay-like		0.165			
9.842	36.571	3.701	128	Embankment Clay	Clay-like		0.164			
10.006	56.360	1.319	128	Embankment Clay	Clay-like		0.164			
10.170	102.100	2.306	128	Embankment Clay	Clay-like		0.164			
10.335	140.249	3.889	128	Embankment Clay	Clay-like		0.163			

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
10.499	177.103	4.475	128	Embankment Clay	Clay-like		0.163			
10.663	112.201	5.226	128	Embankment Clay	Clay-like		0.163			
10.827	92.780	3.585	128	Embankment Clay	Clay-like		0.162			
10.991	203.926	2.350	128	Embankment Clay	Clay-like		0.162			
11.155	151.421	1.934	128	Embankment Clay	Clay-like		0.162			
11.319	129.463	3.854	128	Embankment Clay	Clay-like		0.162			
11.483	140.653	3.818	128	Embankment Clay	Clay-like		0.163			
11.647	87.342	3.996	128	Embankment Clay	Clay-like		0.164			
11.811	67.214	3.699	128	Embankment Clay	Clay-like		0.164			
11.975	80.407	3.394	128	Embankment Clay	Clay-like		0.165			
12.139	73.671	3.205	128	Embankment Clay	Clay-like		0.166			
12.303	79.570	3.533	128	Embankment Clay	Clay-like		0.166			
12.467	93.049	3.789	128	Embankment Clay	Clay-like		0.167			
12.631	95.095	4.692	128	Embankment Clay	Clay-like		0.166			
12.795	97.788	3.285	128	Embankment Clay	Clay-like		0.165			
12.959	144.811	2.711	128	Embankment Clay	Clay-like		0.164			
13.123	157.485	2.351	128	Embankment Clay	Clay-like		0.164			
13.287	90.553	2.275	128	Embankment Clay	Clay-like		0.163			
13.451	66.018	2.335	128	Embankment Clay	Clay-like		0.162			
13.615	61.482	2.236	128	Embankment Clay	Clay-like		0.162			
13.779	65.983	1.975	128	Embankment Clay	Clay-like		0.162			
13.943	66.741	1.513	128	Embankment Clay	Clay-like		0.162			
14.107	68.144	1.160	128	Embankment Clay	Clay-like		0.161			
14.271	71.768	1.026	128	Embankment Clay	Clay-like		0.161			
14.436	65.545	0.609	128	Embankment Clay	Clay-like		0.161			
14.600	54.027	0.581	128	Embankment Clay	Clay-like		0.161			
14.764	37.901	0.936	128	Embankment Clay	Clay-like		0.162			
14.928	23.641	0.868	128	Embankment Clay	Clay-like		0.162			
15.092	12.796	0.746	128	Embankment Clay	Clay-like		0.162			
15.256	10.842	0.493	128	Embankment Clay	Clay-like		0.162			
15.420	9.835	0.338	128	Embankment Clay	Clay-like		0.162			
15.584	8.329	0.246	128	Embankment Clay	Clay-like		0.162			
15.748	7.092	0.189	128	Embankment Clay	Clay-like		0.163			
15.912	7.367	0.132	128	Embankment Clay	Clay-like		0.163			
16.076	6.701	0.182	128	Embankment Clay	Clay-like		0.163			
16.240	8.651	0.204	128	Embankment Clay	Clay-like		0.163			
16.404	10.531	0.266	128	Embankment Clay	Clay-like		0.164			
16.568	8.633	0.284	128	Embankment Clay	Clay-like		0.164			
16.732	26.327	0.282	128	Embankment Clay	Clay-like		0.164			
16.896	37.798	0.608	128	Embankment Clay	Clay-like		0.164			
17.060	29.248	0.725	128	Embankment Clay	Clay-like		0.165			
17.224	33.175	0.765	128	Embankment Clay	Clay-like		0.165			
17.388	25.502	0.765	128	Embankment Clay	Clay-like		0.165			
17.552	26.932	0.677	128	Embankment Clay	Clay-like		0.165			
17.716	24.847	0.531	128	Embankment Clay	Clay-like		0.166			
17.880	20.606	0.529	128	Embankment Clay	Clay-like		0.166			
18.044	21.353	0.621	128	Embankment Clay	Clay-like		0.166			
18.208	15.162	0.570	128	Embankment Clay	Clay-like		0.167			
18.372	5.735	0.508	128	Embankment Clay	Clay-like		0.167			
18.537	4.140	0.277	128	Embankment Clay	Clay-like		0.167			
18.701	3.213	0.130	128	Embankment Clay	Clay-like		0.168			
18.865	2.677	0.103	128	Embankment Clay	Clay-like		0.168			
19.029	3.371	0.128	128	Embankment Clay	Clay-like		0.169			
19.193	7.617	0.214	128	Embankment Clay	Clay-like		0.169			
19.357	11.721	0.400	128	Embankment Clay	Clay-like		0.169			
19.521	14.089	0.374	128	Embankment Clay	Clay-like		0.170			
19.685	18.850	0.402	128	Embankment Clay	Clay-like		0.170			
19.849	15.287	0.393	128	Embankment Clay	Clay-like		0.171			
20.013	27.328	0.482	128	Embankment Clay	Clay-like		0.171			
20.177	36.102	0.526	128	Embankment Clay	Clay-like		0.172			
20.341	33.723	0.502	128	Embankment Clay	Clay-like		0.172			
20.505	21.793	0.674	128	Embankment Clay	Clay-like		0.172			
20.669	11.105	0.669	128	Embankment Clay	Clay-like		0.173			
20.833	7.247	0.426	128	Embankment Clay	Clay-like		0.173			
20.997	6.686	0.311	128	Embankment Clay	Clay-like		0.174			
21.161	9.361	0.281	128	Embankment Clay	Clay-like		0.174			
21.325	7.012	0.206	128	Embankment Clay	Clay-like		0.175			
21.489	5.946	0.143	128	Embankment Clay	Clay-like		0.175			
21.653	4.268	0.102	128	Embankment Clay	Clay-like		0.176			
21.817	3.725	0.061	128	Embankment Clay	Clay-like		0.176			
21.981	3.189	0.050	128	Embankment Clay	Clay-like		0.177			
22.145	3.005	0.046	128	Embankment Clay	Clay-like		0.177			
22.309	3.123	0.044	128	Embankment Clay	Clay-like		0.178			
22.473	3.580	0.048	128	Embankment Clay	Clay-like		0.178			
22.638	3.739	0.053	128	Embankment Clay	Clay-like		0.179			

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
22.802	4.009	0.068	128	Embankment Clay	Clay-like		0.179			
22.966	4.845	0.096	128	Embankment Clay	Clay-like		0.180			
23.130	8.662	0.137	128	Embankment Clay	Clay-like		0.181			
23.294	9.736	0.162	128	Embankment Clay	Clay-like		0.181			
23.458	9.518	0.190	128	Embankment Clay	Clay-like		0.182			
23.622	9.569	0.198	128	Embankment Clay	Clay-like		0.182			
23.786	10.304	0.210	128	Embankment Clay	Clay-like		0.183			
23.950	10.483	0.262	128	Embankment Clay	Clay-like		0.183			
24.114	9.787	0.249	128	Embankment Clay	Clay-like		0.184			
24.278	9.233	0.197	128	Embankment Clay	Clay-like		0.184			
24.442	8.482	0.142	128	Embankment Clay	Clay-like		0.185			
24.606	7.823	0.112	126	Subunit 2	Sand-like		0.185			
24.770	8.025	0.097	126	Subunit 2	Sand-like		0.186			
24.934	9.588	0.110	126	Subunit 2	Sand-like		0.186			
25.098	11.479	0.128	126	Subunit 2	Sand-like		0.187			
25.262	12.504	0.139	126	Subunit 2	Sand-like		0.187			
25.426	14.486	0.178	126	Subunit 2	Sand-like		0.188			
25.590	15.372	0.177	126	Subunit 2	Sand-like		0.188			
25.754	15.729	0.160	126	Subunit 2	Sand-like		0.189			
25.918	15.926	0.160	126	Subunit 2	Sand-like		0.189			
26.082	15.858	0.268	126	Subunit 2	Sand-like		0.190			
26.246	18.014	0.426	126	Subunit 2	Sand-like		0.190			
26.410	26.829	0.413	126	Subunit 2	Sand-like		0.191			
26.574	20.987	0.386	126	Subunit 2	Sand-like		0.191			
26.739	20.078	0.337	126	Subunit 2	Sand-like		0.192			
26.903	20.532	0.324	126	Subunit 2	Sand-like		0.192			
27.067	23.178	0.372	126	Subunit 2	Sand-like		0.193			
27.231	27.443	0.582	126	Subunit 2	Sand-like		0.193			
27.395	30.232	0.678	126	Subunit 2	Sand-like		0.194			
27.559	35.839	0.470	126	Subunit 2	Sand-like		0.194			
27.723	37.290	0.455	126	Subunit 2	Sand-like		0.195			
27.887	36.821	0.743	126	Subunit 2	Sand-like		0.195			
28.051	37.756	0.996	126	Subunit 2	Sand-like		0.196			
28.215	42.386	1.170	126	Subunit 2	Sand-like		0.196			
28.379	40.263	1.319	126	Subunit 2	Sand-like		0.197			
28.543	34.155	1.191	126	Subunit 2	Sand-like		0.197			
28.707	32.568	1.123	126	Subunit 2	Sand-like		0.197			
28.871	30.585	0.820	126	Subunit 2	Sand-like		0.198			
29.035	26.138	0.830	126	Subunit 2	Sand-like		0.198			
29.199	21.807	0.789	126	Subunit 2	Sand-like		0.199			
29.363	24.107	0.686	126	Subunit 2	Sand-like		0.199			
29.527	23.391	1.003	126	Subunit 2	Sand-like		0.199			
29.691	30.816	0.906	126	Subunit 2	Sand-like		0.200			
29.855	27.709	0.708	126	Subunit 2	Sand-like		0.200			
30.019	28.156	0.757	126	Subunit 2	Sand-like		0.201			
30.183	29.178	0.784	126	Subunit 2	Sand-like		0.201			
30.347	26.819	0.682	126	Subunit 2	Sand-like		0.201			
30.511	25.021	0.556	126	Subunit 2	Sand-like		0.202			
30.675	22.150	0.669	126	Subunit 2	Sand-like		0.202			
30.840	22.949	0.729	126	Subunit 2	Sand-like		0.202			
31.004	40.683	0.784	126	Subunit 2	Sand-like		0.203			
31.168	65.454	0.764	126	Subunit 2	Sand-like		0.203			
31.332	83.503	0.611	126	Subunit 2	Sand-like		0.203			
31.496	84.684	0.637	126	Subunit 2	Sand-like		0.204			
31.660	81.596	0.722	126	Subunit 2	Sand-like		0.204			
31.824	75.235	0.712	126	Subunit 2	Sand-like		0.204			
31.988	66.627	0.962	126	Subunit 2	Sand-like		0.205			
32.152	62.659	0.827	126	Subunit 2	Sand-like		0.205			
32.316	114.132	1.133	126	Subunit 2	Sand-like		0.205			
32.480	88.315	1.450	126	Subunit 2	Sand-like		0.206			
32.644	68.141	0.803	126	Subunit 2	Sand-like		0.206			
32.808	58.668	1.079	126	Subunit 2	Sand-like		0.206			
32.972	55.335	1.085	126	Subunit 2	Sand-like		0.206			
33.136	49.204	0.908	126	Subunit 2	Sand-like		0.207			
33.300	44.234	0.639	126	Subunit 2	Sand-like		0.207			
33.464	44.563	0.445	126	Subunit 2	Sand-like		0.207			
33.628	44.285	0.489	126	Subunit 2	Sand-like		0.207			
33.792	43.101	0.566	126	Subunit 2	Sand-like		0.207			
33.956	43.585	0.807	126	Subunit 2	Sand-like		0.208			
34.120	41.799	1.156	126	Subunit 2	Sand-like		0.208			
34.284	32.892	0.914	126	Subunit 2	Sand-like		0.208			
34.448	29.383	0.489	126	Subunit 2	Sand-like		0.208			
34.612	28.326	0.459	126	Subunit 2	Sand-like		0.208			
34.776	29.292	0.370	126	Subunit 2	Sand-like		0.208			
34.941	37.438	0.242	126	Subunit 2	Sand-like		0.209			

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
35.105	25.932	0.291	126	Subunit 2	Sand-like		0.209			
35.269	18.655	0.449	126	Subunit 2	Sand-like		0.209			
35.433	16.013	0.382	126	Subunit 2	Sand-like		0.209			
35.597	21.641	0.238	126	Subunit 2	Sand-like		0.209			
35.761	22.206	0.248	126	Subunit 2	Sand-like		0.209			
35.925	19.245	0.091	126	Subunit 2	Sand-like		0.209			
36.089	18.779	0.131	126	Subunit 2	Sand-like		0.209			
36.253	16.141	0.137	126	Subunit 2	Sand-like		0.210			
36.417	18.232	0.143	126	Subunit 2	Sand-like		0.210			
36.581	14.492	0.164	126	Subunit 2	Sand-like		0.210			
36.745	16.345	0.264	126	Subunit 2	Sand-like		0.210			
36.909	22.683	0.569	126	Subunit 2	Sand-like		0.210			
37.073	32.497	0.828	126	Subunit 2	Sand-like		0.210			
37.237	41.215	1.215	126	Subunit 2	Sand-like		0.210			
37.401	51.071	1.519	126	Subunit 2	Sand-like		0.210			
37.565	62.020	1.989	126	Subunit 2	Sand-like		0.210			
37.729	47.326	2.135	126	Subunit 2	Sand-like		0.210			
37.893	38.195	1.799	126	Subunit 2	Sand-like		0.210			
38.057	42.719	0.890	126	Subunit 2	Sand-like		0.210			
38.221	48.720	0.499	126	Subunit 2	Sand-like		0.210			
38.385	45.218	0.242	126	Subunit 2	Sand-like		0.210			
38.549	34.289	0.191	126	Subunit 2	Sand-like		0.210			
38.713	23.882	0.253	126	Subunit 2	Sand-like		0.210			
38.877	20.327	0.315	126	Subunit 2	Sand-like		0.210			
39.042	25.262	0.248	126	Subunit 2	Sand-like		0.210			
39.206	28.801	0.129	126	Subunit 2	Sand-like		0.210			
39.370	23.571	0.122	126	Subunit 2	Sand-like		0.210			
39.534	21.369	0.182	131	Subunit 3	Sand-like		0.209			
39.698	25.690	0.165	131	Subunit 3	Sand-like		0.209			
39.862	36.026	0.153	131	Subunit 3	Sand-like		0.209			
40.026	42.441	0.123	131	Subunit 3	Sand-like		0.209			
40.190	48.085	0.102	131	Subunit 3	Sand-like		0.209			
40.354	47.323	0.122	131	Subunit 3	Sand-like		0.208			
40.518	44.724	0.144	131	Subunit 3	Sand-like		0.208			
40.682	43.724	0.151	131	Subunit 3	Sand-like		0.208			
40.846	41.095	0.187	131	Subunit 3	Sand-like		0.208			
41.010	33.386	0.269	131	Subunit 3	Sand-like		0.207			
41.174	30.868	0.345	131	Subunit 3	Sand-like		0.207			
41.338	48.766	0.239	131	Subunit 3	Sand-like		0.207			
41.502	70.309	0.210	131	Subunit 3	Sand-like		0.207			
41.666	90.323	0.186	131	Subunit 3	Sand-like		0.206			
41.830	97.782	0.233	131	Subunit 3	Sand-like		0.206			
41.994	92.868	0.312	131	Subunit 3	Sand-like		0.206			
42.158	90.547	0.352	131	Subunit 3	Sand-like		0.206			
42.322	77.880	0.380	131	Subunit 3	Sand-like		0.205			
42.486	64.944	0.461	131	Subunit 3	Sand-like		0.205			
42.650	60.520	0.357	131	Subunit 3	Sand-like		0.205			
42.814	68.304	0.234	131	Subunit 3	Sand-like		0.205			
42.978	71.635	0.534	131	Subunit 3	Sand-like		0.204			
43.143	66.141	0.308	131	Subunit 3	Sand-like		0.204			
43.307	63.674	0.553	131	Subunit 3	Sand-like		0.204			
43.471	41.595	0.534	131	Subunit 3	Sand-like		0.203			
43.635	33.387	0.704	131	Subunit 3	Sand-like		0.203			
43.799	31.227	0.592	131	Subunit 3	Sand-like		0.203			
43.963	28.366	0.750	131	Subunit 3	Sand-like		0.203			
44.127	27.147	1.116	131	Subunit 3	Sand-like		0.202			
44.291	27.564	1.472	131	Subunit 3	Sand-like		0.202			
44.455	37.463	1.081	131	Subunit 3	Sand-like		0.202			
44.619	91.187	1.681	131	Subunit 3	Sand-like		0.201			
44.783	65.050	1.569	131	Subunit 3	Sand-like		0.201			
44.947	89.372	1.358	131	Subunit 3	Sand-like		0.201			
45.111	90.420	0.413	131	Subunit 3	Sand-like		0.201			
45.275	86.406	0.307	131	Subunit 3	Sand-like		0.200			
45.439	74.402	0.272	131	Subunit 3	Sand-like		0.200			
45.603	72.334	0.438	131	Subunit 3	Sand-like		0.200			
45.767	79.964	0.349	131	Subunit 3	Sand-like		0.199			
45.931	86.323	0.631	131	Subunit 3	Sand-like		0.199			
46.095	82.340	0.986	131	Subunit 3	Sand-like		0.199			
46.259	118.528	0.838	131	Subunit 3	Sand-like		0.199			
46.423	175.346	1.367	131	Subunit 3	Sand-like		0.198			
46.587	143.579	1.543	131	Subunit 3	Sand-like		0.198			
46.751	125.575	1.628	131	Subunit 3	Sand-like		0.198			
46.915	115.790	1.058	131	Subunit 3	Sand-like		0.197			
47.079	136.797	0.639	131	Subunit 3	Sand-like		0.197			
47.244	186.216	1.984	131	Subunit 3	Sand-like		0.197			

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
47.408	197.546	2.840	131	Subunit 3	Sand-like		0.196			
47.572	141.018	2.562	131	Subunit 3	Sand-like		0.196			
47.736	126.966	1.380	131	Subunit 3	Sand-like		0.196			
47.900	135.704	2.656	131	Subunit 3	Sand-like		0.196			
48.064	193.976	5.203	131	Subunit 3	Sand-like		0.195			
48.228	400.004	0.000	131	Subunit 3	Sand-like		0.195			
48.392	469.813	0.000	131	Subunit 3	Sand-like		0.195			

LIQUEFACTION POTENTIAL ASSESSMENT FOR COARSE GRAINED SOILS USING CONE PENETRATION TEST DATA

Facility: KIF TDEC Stability
Project No.: 175668043
CPT ID: KIF-BF-CPT-3A

Water Elevation during CPT:	739.0	ft
Depth to Water during CPT:	9.0	ft *(relative to ground surface during CPT)*
Water Elevation during Earthquake:	741.5	ft
Depth to Water during Earthquake:	6.5	ft *(relative to ground surface during CPT)*
Final Grade Elevation during EQ:	748	ft *(if no fill, then set this equal to top of CPT hole elev.)*
Height of Final Grade above CPT TOH:	0.0	ft *(relative to ground surface during CPT, + Fill, - Cut)*
Unit Weight of Cut/Fill to Achieve Final Grade	0	pcf
Cut/Fill Total Stress (+ Fill, - Cut):	0.00	tsf

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
748.0				Vertical Stresses above 1st CPT:			**0.01**	**0.01**	**0.00**	**0.00**	**0.01**	**0.01**
747.8	0.164	26.32	0.06	112	**0.16**	0.08	0.01	0.01	0.00	0.00	0.01	0.01
747.7	0.328	185.31	0.42	112	0.25	0.16	0.02	0.02	0.00	0.00	0.02	0.02
747.5	0.492	214.18	0.34	112	0.41	0.16	0.03	0.03	0.00	0.00	0.03	0.03
747.3	0.656	272.35	0.57	112	0.57	0.16	0.04	0.04	0.00	0.00	0.04	0.04
747.2	0.820	327.45	0.69	112	0.74	0.16	0.05	0.05	0.00	0.00	0.05	0.05
747.0	0.984	251.96	1.36	112	0.90	0.16	0.06	0.06	0.00	0.00	0.06	0.06
746.9	1.148	157.06	1.75	112	1.07	0.16	0.06	0.06	0.00	0.00	0.06	0.06
746.7	1.312	353.34	2.01	112	1.23	0.16	0.07	0.07	0.00	0.00	0.07	0.07
746.5	1.476	416.19	2.80	112	1.39	0.16	0.08	0.08	0.00	0.00	0.08	0.08
746.4	1.640	376.38	2.96	112	1.56	0.16	0.09	0.09	0.00	0.00	0.09	0.09
746.2	1.804	399.24	2.18	112	1.72	0.16	0.10	0.10	0.00	0.00	0.10	0.10
746.0	1.968	454.91	1.84	112	1.89	0.16	0.11	0.11	0.00	0.00	0.11	0.11
745.9	2.133	487.42	2.05	112	2.05	0.16	0.12	0.12	0.00	0.00	0.12	0.12
745.7	2.297	447.56	2.52	112	2.21	0.16	0.13	0.13	0.00	0.00	0.13	0.13
745.5	2.461	315.72	3.06	112	2.38	0.16	0.14	0.14	0.00	0.00	0.14	0.14
745.4	2.625	189.21	3.17	112	2.54	0.16	0.15	0.15	0.00	0.00	0.15	0.15
745.2	2.789	115.98	3.55	112	2.71	0.16	0.16	0.16	0.00	0.00	0.16	0.16
745.0	2.953	131.98	3.44	112	2.87	0.16	0.17	0.17	0.00	0.00	0.17	0.17
744.9	3.117	90.53	2.77	112	3.03	0.16	0.18	0.18	0.00	0.00	0.18	0.18
744.7	3.281	185.62	3.13	112	3.20	0.16	0.18	0.18	0.00	0.00	0.18	0.18
744.6	3.445	240.27	3.34	112	3.36	0.16	0.19	0.19	0.00	0.00	0.19	0.19
744.4	3.609	220.76	2.99	112	3.53	0.16	0.20	0.20	0.00	0.00	0.20	0.20
744.2	3.773	300.37	3.27	112	3.69	0.16	0.21	0.21	0.00	0.00	0.21	0.21
744.1	3.937	222.04	3.37	112	3.85	0.16	0.22	0.22	0.00	0.00	0.22	0.22
743.9	4.101	119.17	2.82	112	4.02	0.16	0.23	0.23	0.00	0.00	0.23	0.23
743.7	4.265	85.94	2.80	112	4.18	0.16	0.24	0.24	0.00	0.00	0.24	0.24
743.6	4.429	57.54	3.05	112	4.35	0.16	0.25	0.25	0.00	0.00	0.25	0.25
743.4	4.593	46.24	2.83	112	4.51	0.16	0.26	0.26	0.00	0.00	0.26	0.26
743.2	4.757	41.43	2.36	112	4.68	0.16	0.27	0.27	0.00	0.00	0.27	0.27
743.1	4.921	41.05	2.08	112	4.84	0.16	0.28	0.28	0.00	0.00	0.28	0.28
742.9	5.085	69.99	2.15	128	5.00	0.16	0.29	0.29	0.00	0.00	0.29	0.29
742.8	5.249	136.60	2.72	128	5.17	0.16	0.30	0.30	0.00	0.00	0.30	0.30
742.6	5.413	126.64	3.38	128	5.33	0.16	0.31	0.31	0.00	0.00	0.31	0.31
742.4	5.577	110.18	4.34	128	5.50	0.16	0.32	0.32	0.00	0.00	0.32	0.32
742.3	5.741	193.06	4.72	128	5.66	0.16	0.33	0.33	0.00	0.00	0.33	0.33
742.1	5.905	248.14	5.99	128	5.82	0.16	0.34	0.34	0.00	0.00	0.34	0.34
741.9	6.069	195.59	5.15	128	5.99	0.16	0.35	0.35	0.00	0.00	0.35	0.35
741.8	6.234	326.49	6.14	128	6.15	0.16	0.36	0.36	0.00	0.00	0.36	0.36
741.6	6.398	330.91	7.89	128	6.32	0.16	0.37	0.37	0.00	0.00	0.37	0.37
741.4	6.562	242.19	8.16	128	6.48	0.16	0.38	0.38	0.00	0.00	0.38	0.38
741.3	6.726	341.53	5.40	128	6.64	0.16	0.39	0.39	0.00	0.01	0.39	0.38
741.1	6.890	327.14	4.67	128	6.81	0.16	0.40	0.40	0.00	0.01	0.40	0.39
740.9	7.054	199.03	7.55	128	6.97	0.16	0.41	0.41	0.00	0.02	0.41	0.39
740.8	7.218	521.91	6.13	128	7.14	0.16	0.42	0.42	0.00	0.02	0.42	0.40
740.6	7.382	470.99	5.18	128	7.30	0.16	0.43	0.43	0.00	0.03	0.43	0.41
740.5	7.546	290.13	4.24	128	7.46	0.16	0.44	0.44	0.00	0.03	0.44	0.41
740.3	7.710	205.76	3.90	128	7.63	0.16	0.45	0.45	0.00	0.04	0.45	0.42
740.1	7.874	198.17	3.71	128	7.79	0.16	0.46	0.46	0.00	0.04	0.46	0.42
740.0	8.038	146.94	3.86	128	7.96	0.16	0.48	0.48	0.00	0.05	0.48	0.43
739.8	8.202	145.16	3.43	128	8.12	0.16	0.49	0.49	0.00	0.05	0.49	0.43
739.6	8.366	136.83	3.01	128	8.28	0.16	0.50	0.50	0.00	0.06	0.50	0.44
739.5	8.530	156.22	2.35	128	8.45	0.16	0.51	0.51	0.00	0.06	0.51	0.44
739.3	8.694	112.66	2.43	128	8.61	0.16	0.52	0.52	0.00	0.07	0.52	0.45
739.1	8.858	62.66	2.09	128	8.78	0.16	0.53	0.53	0.00	0.07	0.53	0.45
739.0	9.022	42.51	1.45	128	8.94	0.16	0.54	0.54	0.00	0.08	0.54	0.46
738.8	9.186	26.65	1.41	128	9.10	0.16	0.55	0.55	0.01	0.08	0.54	0.46
738.6	9.350	24.34	1.18	128	9.27	0.16	0.56	0.56	0.01	0.09	0.55	0.47
738.5	9.514	38.49	2.30	128	9.43	0.16	0.57	0.57	0.02	0.09	0.55	0.48

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
738.3	9.678	52.13	2.98	128	9.60	0.16	0.58	0.58	0.02	0.10	0.56	0.48
738.2	9.842	36.57	3.70	128	9.76	0.16	0.59	0.59	0.03	0.10	0.56	0.49
738.0	10.006	56.36	1.32	128	9.92	0.16	0.60	0.60	0.03	0.11	0.57	0.49
737.8	10.170	102.10	2.31	128	10.09	0.16	0.61	0.61	0.04	0.11	0.58	0.50
737.7	10.335	140.25	3.89	128	10.25	0.16	0.62	0.62	0.04	0.12	0.58	0.50
737.5	10.499	177.10	4.48	128	10.42	0.16	0.63	0.63	0.05	0.12	0.59	0.51
737.3	10.663	112.20	5.23	128	10.58	0.16	0.64	0.64	0.05	0.13	0.59	0.51
737.2	10.827	92.78	3.59	128	10.74	0.16	0.65	0.65	0.06	0.13	0.60	0.52
737.0	10.991	203.93	2.35	128	10.91	0.16	0.66	0.66	0.06	0.14	0.60	0.52
736.8	11.155	151.42	1.93	128	11.07	0.16	0.67	0.67	0.07	0.15	0.61	0.53
736.7	11.319	129.46	3.85	128	11.24	0.16	0.69	0.69	0.07	0.15	0.61	0.53
736.5	11.483	140.65	3.82	128	11.40	0.16	0.70	0.70	0.08	0.16	0.62	0.54
736.4	11.647	87.34	4.00	128	11.56	0.16	0.71	0.71	0.08	0.16	0.62	0.55
736.2	11.811	67.21	3.70	128	11.73	0.16	0.72	0.72	0.09	0.17	0.63	0.55
736.0	11.975	80.41	3.39	128	11.89	0.16	0.73	0.73	0.09	0.17	0.63	0.56
735.9	12.139	73.67	3.21	128	12.06	0.16	0.74	0.74	0.10	0.18	0.64	0.56
735.7	12.303	79.57	3.53	128	12.22	0.16	0.75	0.75	0.10	0.18	0.64	0.57
735.5	12.467	93.05	3.79	128	12.39	0.16	0.76	0.76	0.11	0.19	0.65	0.57
735.4	12.631	95.09	4.69	128	12.55	0.16	0.77	0.77	0.11	0.19	0.66	0.58
735.2	12.795	97.79	3.29	128	12.71	0.16	0.78	0.78	0.12	0.20	0.66	0.58
735.0	12.959	144.81	2.71	128	12.88	0.16	0.79	0.79	0.12	0.20	0.67	0.59
734.9	13.123	157.48	2.35	128	13.04	0.16	0.80	0.80	0.13	0.21	0.67	0.59
734.7	13.287	90.55	2.28	128	13.21	0.16	0.81	0.81	0.13	0.21	0.68	0.60
734.5	13.451	66.02	2.34	128	13.37	0.16	0.82	0.82	0.14	0.22	0.68	0.60
734.4	13.615	61.48	2.24	128	13.53	0.16	0.83	0.83	0.14	0.22	0.69	0.61
734.2	13.779	65.98	1.98	128	13.70	0.16	0.84	0.84	0.15	0.23	0.69	0.62
734.1	13.943	66.74	1.51	128	13.86	0.16	0.85	0.85	0.15	0.23	0.70	0.62
733.9	14.107	68.14	1.16	128	14.03	0.16	0.86	0.86	0.16	0.24	0.70	0.63
733.7	14.271	71.77	1.03	128	14.19	0.16	0.87	0.87	0.16	0.24	0.71	0.63
733.6	14.436	65.55	0.61	128	14.35	0.16	0.88	0.88	0.17	0.25	0.71	0.64
733.4	14.600	54.03	0.58	128	14.52	0.16	0.90	0.90	0.17	0.25	0.72	0.64
733.2	14.764	37.90	0.94	128	14.68	0.16	0.91	0.91	0.18	0.26	0.73	0.65
733.1	14.928	23.64	0.87	128	14.85	0.16	0.92	0.92	0.18	0.26	0.73	0.65
732.9	15.092	12.80	0.75	128	15.01	0.16	0.93	0.93	0.19	0.27	0.74	0.66
732.7	15.256	10.84	0.49	128	15.17	0.16	0.94	0.94	0.20	0.27	0.74	0.66
732.6	15.420	9.84	0.34	128	15.34	0.16	0.95	0.95	0.20	0.28	0.75	0.67
732.4	15.584	8.33	0.25	128	15.50	0.16	0.96	0.96	0.21	0.28	0.75	0.67
732.3	15.748	7.09	0.19	128	15.67	0.16	0.97	0.97	0.21	0.29	0.76	0.68
732.1	15.912	7.37	0.13	128	15.83	0.16	0.98	0.98	0.22	0.29	0.76	0.69
731.9	16.076	6.70	0.18	128	15.99	0.16	0.99	0.99	0.22	0.30	0.77	0.69
731.8	16.240	8.65	0.20	128	16.16	0.16	1.00	1.00	0.23	0.30	0.77	0.70
731.6	16.404	10.53	0.27	128	16.32	0.16	1.01	1.01	0.23	0.31	0.78	0.70
731.4	16.568	8.63	0.28	128	16.49	0.16	1.02	1.02	0.24	0.31	0.78	0.71
731.3	16.732	26.33	0.28	128	16.65	0.16	1.03	1.03	0.24	0.32	0.79	0.71
731.1	16.896	37.80	0.61	128	16.81	0.16	1.04	1.04	0.25	0.32	0.80	0.72
730.9	17.060	29.25	0.73	128	16.98	0.16	1.05	1.05	0.25	0.33	0.80	0.72
730.8	17.224	33.18	0.77	128	17.14	0.16	1.06	1.06	0.26	0.33	0.81	0.73
730.6	17.388	25.50	0.77	128	17.31	0.16	1.07	1.07	0.26	0.34	0.81	0.73
730.4	17.552	26.93	0.68	128	17.47	0.16	1.08	1.08	0.27	0.34	0.82	0.74
730.3	17.716	24.85	0.53	128	17.63	0.16	1.09	1.09	0.27	0.35	0.82	0.74
730.1	17.880	20.61	0.53	128	17.80	0.16	1.10	1.10	0.28	0.36	0.83	0.75
730.0	18.044	21.35	0.62	128	17.96	0.16	1.12	1.12	0.28	0.36	0.83	0.76
729.8	18.208	15.16	0.57	128	18.13	0.16	1.13	1.13	0.29	0.37	0.84	0.76
729.6	18.372	5.73	0.51	128	18.29	0.16	1.14	1.14	0.29	0.37	0.84	0.77
729.5	18.537	4.14	0.28	128	18.45	0.16	1.15	1.15	0.30	0.38	0.85	0.77
729.3	18.701	3.21	0.13	128	18.62	0.16	1.16	1.16	0.30	0.38	0.85	0.78
729.1	18.865	2.68	0.10	128	18.78	0.16	1.17	1.17	0.31	0.39	0.86	0.78
729.0	19.029	3.37	0.13	128	18.95	0.16	1.18	1.18	0.31	0.39	0.87	0.79
728.8	19.193	7.62	0.21	128	19.11	0.16	1.19	1.19	0.32	0.40	0.87	0.79
728.6	19.357	11.72	0.40	128	19.27	0.16	1.20	1.20	0.32	0.40	0.88	0.80
728.5	19.521	14.09	0.37	128	19.44	0.16	1.21	1.21	0.33	0.41	0.88	0.80
728.3	19.685	18.85	0.40	128	19.60	0.16	1.22	1.22	0.33	0.41	0.89	0.81
728.2	19.849	15.29	0.39	128	19.77	0.16	1.23	1.23	0.34	0.42	0.89	0.81
728.0	20.013	27.33	0.48	128	19.93	0.16	1.24	1.24	0.34	0.42	0.90	0.82
727.8	20.177	36.10	0.53	128	20.09	0.16	1.25	1.25	0.35	0.43	0.90	0.83
727.7	20.341	33.72	0.50	128	20.26	0.16	1.26	1.26	0.35	0.43	0.91	0.83
727.5	20.505	21.79	0.67	128	20.42	0.16	1.27	1.27	0.36	0.44	0.91	0.84
727.3	20.669	11.11	0.67	128	20.59	0.16	1.28	1.28	0.36	0.44	0.92	0.84
727.2	20.833	7.25	0.43	128	20.75	0.16	1.29	1.29	0.37	0.45	0.92	0.85

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
727.0	20.997	6.69	0.31	128	20.92	0.16	1.30	1.30	0.37	0.45	0.93	0.85
726.8	21.161	9.36	0.28	128	21.08	0.16	1.31	1.31	0.38	0.46	0.94	0.86
726.7	21.325	7.01	0.21	128	21.24	0.16	1.33	1.33	0.38	0.46	0.94	0.86
726.5	21.489	5.95	0.14	128	21.41	0.16	1.34	1.34	0.39	0.47	0.95	0.87
726.3	21.653	4.27	0.10	128	21.57	0.16	1.35	1.35	0.39	0.47	0.95	0.87
726.2	21.817	3.72	0.06	128	21.74	0.16	1.36	1.36	0.40	0.48	0.96	0.88
726.0	21.981	3.19	0.05	128	21.90	0.16	1.37	1.37	0.41	0.48	0.96	0.88
725.9	22.145	3.00	0.05	128	22.06	0.16	1.38	1.38	0.41	0.49	0.97	0.89
725.7	22.309	3.12	0.04	128	22.23	0.16	1.39	1.39	0.42	0.49	0.97	0.90
725.5	22.473	3.58	0.05	128	22.39	0.16	1.40	1.40	0.42	0.50	0.98	0.90
725.4	22.638	3.74	0.05	128	22.56	0.16	1.41	1.41	0.43	0.50	0.98	0.91
725.2	22.802	4.01	0.07	128	22.72	0.16	1.42	1.42	0.43	0.51	0.99	0.91
725.0	22.966	4.84	0.10	128	22.88	0.16	1.43	1.43	0.44	0.51	0.99	0.92
724.9	23.130	8.66	0.14	128	23.05	0.16	1.44	1.44	0.44	0.52	1.00	0.92
724.7	23.294	9.74	0.16	128	23.21	0.16	1.45	1.45	0.45	0.52	1.01	0.93
724.5	23.458	9.52	0.19	128	23.38	0.16	1.46	1.46	0.45	0.53	1.01	0.93
724.4	23.622	9.57	0.20	128	23.54	0.16	1.47	1.47	0.46	0.53	1.02	0.94
724.2	23.786	10.30	0.21	128	23.70	0.16	1.48	1.48	0.46	0.54	1.02	0.94
724.1	23.950	10.48	0.26	128	23.87	0.16	1.49	1.49	0.47	0.54	1.03	0.95
723.9	24.114	9.79	0.25	128	24.03	0.16	1.50	1.50	0.47	0.55	1.03	0.95
723.7	24.278	9.23	0.20	128	24.20	0.16	1.51	1.51	0.48	0.55	1.04	0.96
723.6	24.442	8.48	0.14	128	24.36	0.16	1.52	1.52	0.48	0.56	1.04	0.97
723.4	24.606	7.82	0.11	126	24.52	0.16	1.54	1.54	0.49	0.56	1.05	0.97
723.2	24.770	8.02	0.10	126	24.69	0.16	1.55	1.55	0.49	0.57	1.05	0.98
723.1	24.934	9.59	0.11	126	24.85	0.16	1.56	1.56	0.50	0.58	1.06	0.98
722.9	25.098	11.48	0.13	126	25.02	0.16	1.57	1.57	0.50	0.58	1.06	0.99
722.7	25.262	12.50	0.14	126	25.18	0.16	1.58	1.58	0.51	0.59	1.07	0.99
722.6	25.426	14.49	0.18	126	25.34	0.16	1.59	1.59	0.51	0.59	1.07	1.00
722.4	25.590	15.37	0.18	126	25.51	0.16	1.60	1.60	0.52	0.60	1.08	1.00
722.2	25.754	15.73	0.16	126	25.67	0.16	1.61	1.61	0.52	0.60	1.08	1.01
722.1	25.918	15.93	0.16	126	25.84	0.16	1.62	1.62	0.53	0.61	1.09	1.01
721.9	26.082	15.86	0.27	126	26.00	0.16	1.63	1.63	0.53	0.61	1.10	1.02
721.8	26.246	18.01	0.43	126	26.16	0.16	1.64	1.64	0.54	0.62	1.10	1.02
721.6	26.410	26.83	0.41	126	26.33	0.16	1.65	1.65	0.54	0.62	1.11	1.03
721.4	26.574	20.99	0.39	126	26.49	0.16	1.66	1.66	0.55	0.63	1.11	1.03
721.3	26.739	20.08	0.34	126	26.66	0.16	1.67	1.67	0.55	0.63	1.12	1.04
721.1	26.903	20.53	0.32	126	26.82	0.16	1.68	1.68	0.56	0.64	1.12	1.04
720.9	27.067	23.18	0.37	126	26.98	0.16	1.69	1.69	0.56	0.64	1.13	1.05
720.8	27.231	27.44	0.58	126	27.15	0.16	1.70	1.70	0.57	0.65	1.13	1.05
720.6	27.395	30.23	0.68	126	27.31	0.16	1.71	1.71	0.57	0.65	1.14	1.06
720.4	27.559	35.84	0.47	126	27.48	0.16	1.72	1.72	0.58	0.66	1.14	1.06
720.3	27.723	37.29	0.46	126	27.64	0.16	1.73	1.73	0.58	0.66	1.15	1.07
720.1	27.887	36.82	0.74	126	27.80	0.16	1.74	1.74	0.59	0.67	1.15	1.07
719.9	28.051	37.76	1.00	126	27.97	0.16	1.75	1.75	0.59	0.67	1.16	1.08
719.8	28.215	42.39	1.17	126	28.13	0.16	1.76	1.76	0.60	0.68	1.16	1.09
719.6	28.379	40.26	1.32	126	28.30	0.16	1.77	1.77	0.60	0.68	1.17	1.09
719.5	28.543	34.16	1.19	126	28.46	0.16	1.78	1.78	0.61	0.69	1.17	1.10
719.3	28.707	32.57	1.12	126	28.62	0.16	1.79	1.79	0.61	0.69	1.18	1.10
719.1	28.871	30.58	0.82	126	28.79	0.16	1.80	1.80	0.62	0.70	1.18	1.11
719.0	29.035	26.14	0.83	126	28.95	0.16	1.81	1.81	0.63	0.70	1.19	1.11
718.8	29.199	21.81	0.79	126	29.12	0.16	1.82	1.82	0.63	0.71	1.19	1.12
718.6	29.363	24.11	0.69	126	29.28	0.16	1.84	1.84	0.64	0.71	1.20	1.12
718.5	29.527	23.39	1.00	126	29.45	0.16	1.85	1.85	0.64	0.72	1.20	1.13
718.3	29.691	30.82	0.91	126	29.61	0.16	1.86	1.86	0.65	0.72	1.21	1.13
718.1	29.855	27.71	0.71	126	29.77	0.16	1.87	1.87	0.65	0.73	1.22	1.14
718.0	30.019	28.16	0.76	126	29.94	0.16	1.88	1.88	0.66	0.73	1.22	1.14
717.8	30.183	29.18	0.78	126	30.10	0.16	1.89	1.89	0.66	0.74	1.23	1.15
717.7	30.347	26.82	0.68	126	30.27	0.16	1.90	1.90	0.67	0.74	1.23	1.15
717.5	30.511	25.02	0.56	126	30.43	0.16	1.91	1.91	0.67	0.75	1.24	1.16
717.3	30.675	22.15	0.67	126	30.59	0.16	1.92	1.92	0.68	0.75	1.24	1.16
717.2	30.840	22.95	0.73	126	30.76	0.16	1.93	1.93	0.68	0.76	1.25	1.17
717.0	31.004	40.68	0.78	126	30.92	0.16	1.94	1.94	0.69	0.76	1.25	1.17
716.8	31.168	65.45	0.76	126	31.09	0.16	1.95	1.95	0.69	0.77	1.26	1.18
716.7	31.332	83.50	0.61	126	31.25	0.16	1.96	1.96	0.70	0.77	1.26	1.18
716.5	31.496	84.68	0.64	126	31.41	0.16	1.97	1.97	0.70	0.78	1.27	1.19
716.3	31.660	81.60	0.72	126	31.58	0.16	1.98	1.98	0.71	0.78	1.27	1.19
716.2	31.824	75.24	0.71	126	31.74	0.16	1.99	1.99	0.71	0.79	1.28	1.20
716.0	31.988	66.63	0.96	126	31.91	0.16	2.00	2.00	0.72	0.80	1.28	1.21
715.8	32.152	62.66	0.83	126	32.07	0.16	2.01	2.01	0.72	0.80	1.29	1.21

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
715.7	32.316	114.13	1.13	126	32.23	0.16	2.02	2.02	0.73	0.81	1.29	1.22
715.5	32.480	88.32	1.45	126	32.40	0.16	2.03	2.03	0.73	0.81	1.30	1.22
715.4	32.644	68.14	0.80	126	32.56	0.16	2.04	2.04	0.74	0.82	1.30	1.23
715.2	32.808	58.67	1.08	126	32.73	0.16	2.05	2.05	0.74	0.82	1.31	1.23
715.0	32.972	55.34	1.09	126	32.89	0.16	2.06	2.06	0.75	0.83	1.31	1.24
714.9	33.136	49.20	0.91	126	33.05	0.16	2.07	2.07	0.75	0.83	1.32	1.24
714.7	33.300	44.23	0.64	126	33.22	0.16	2.08	2.08	0.76	0.84	1.32	1.25
714.5	33.464	44.56	0.45	126	33.38	0.16	2.09	2.09	0.76	0.84	1.33	1.25
714.4	33.628	44.28	0.49	126	33.55	0.16	2.10	2.10	0.77	0.85	1.34	1.26
714.2	33.792	43.10	0.57	126	33.71	0.16	2.11	2.11	0.77	0.85	1.34	1.26
714.0	33.956	43.59	0.81	126	33.87	0.16	2.12	2.12	0.78	0.86	1.35	1.27
713.9	34.120	41.80	1.16	126	34.04	0.16	2.13	2.13	0.78	0.86	1.35	1.27
713.7	34.284	32.89	0.91	126	34.20	0.16	2.15	2.15	0.79	0.87	1.36	1.28
713.6	34.448	29.38	0.49	126	34.37	0.16	2.16	2.16	0.79	0.87	1.36	1.28
713.4	34.612	28.33	0.46	126	34.53	0.16	2.17	2.17	0.80	0.88	1.37	1.29
713.2	34.776	29.29	0.37	126	34.69	0.16	2.18	2.18	0.80	0.88	1.37	1.29
713.1	34.941	37.44	0.24	126	34.86	0.16	2.19	2.19	0.81	0.89	1.38	1.30
712.9	35.105	25.93	0.29	126	35.02	0.16	2.20	2.20	0.81	0.89	1.38	1.30
712.7	35.269	18.65	0.45	126	35.19	0.16	2.21	2.21	0.82	0.90	1.39	1.31
712.6	35.433	16.01	0.38	126	35.35	0.16	2.22	2.22	0.82	0.90	1.39	1.31
712.4	35.597	21.64	0.24	126	35.51	0.16	2.23	2.23	0.83	0.91	1.40	1.32
712.2	35.761	22.21	0.25	126	35.68	0.16	2.24	2.24	0.83	0.91	1.40	1.33
712.1	35.925	19.25	0.09	126	35.84	0.16	2.25	2.25	0.84	0.92	1.41	1.33
711.9	36.089	18.78	0.13	126	36.01	0.16	2.26	2.26	0.85	0.92	1.41	1.34
711.7	36.253	16.14	0.14	126	36.17	0.16	2.27	2.27	0.85	0.93	1.42	1.34
711.6	36.417	18.23	0.14	126	36.33	0.16	2.28	2.28	0.86	0.93	1.42	1.35
711.4	36.581	14.49	0.16	126	36.50	0.16	2.29	2.29	0.86	0.94	1.43	1.35
711.3	36.745	16.34	0.26	126	36.66	0.16	2.30	2.30	0.87	0.94	1.43	1.36
711.1	36.909	22.68	0.57	126	36.83	0.16	2.31	2.31	0.87	0.95	1.44	1.36
710.9	37.073	32.50	0.83	126	36.99	0.16	2.32	2.32	0.88	0.95	1.44	1.37
710.8	37.237	41.21	1.22	126	37.16	0.16	2.33	2.33	0.88	0.96	1.45	1.37
710.6	37.401	51.07	1.52	126	37.32	0.16	2.34	2.34	0.89	0.96	1.46	1.38
710.4	37.565	62.02	1.99	126	37.48	0.16	2.35	2.35	0.89	0.97	1.46	1.38
710.3	37.729	47.33	2.14	126	37.65	0.16	2.36	2.36	0.90	0.97	1.47	1.39
710.1	37.893	38.19	1.80	126	37.81	0.16	2.37	2.37	0.90	0.98	1.47	1.39
709.9	38.057	42.72	0.89	126	37.98	0.16	2.38	2.38	0.91	0.98	1.48	1.40
709.8	38.221	48.72	0.50	126	38.14	0.16	2.39	2.39	0.91	0.99	1.48	1.40
709.6	38.385	45.22	0.24	126	38.30	0.16	2.40	2.40	0.92	0.99	1.49	1.41
709.5	38.549	34.29	0.19	126	38.47	0.16	2.41	2.41	0.92	1.00	1.49	1.41
709.3	38.713	23.88	0.25	126	38.63	0.16	2.42	2.42	0.93	1.01	1.50	1.42
709.1	38.877	20.33	0.32	126	38.80	0.16	2.43	2.43	0.93	1.01	1.50	1.42
709.0	39.042	25.26	0.25	126	38.96	0.16	2.44	2.44	0.94	1.02	1.51	1.43
708.8	39.206	28.80	0.13	126	39.12	0.16	2.46	2.46	0.94	1.02	1.51	1.43
708.6	39.370	23.57	0.12	126	39.29	0.16	2.47	2.47	0.95	1.03	1.52	1.44
708.5	39.534	21.37	0.18	131	39.45	0.16	2.48	2.48	0.95	1.03	1.52	1.45
708.3	39.698	25.69	0.17	131	39.62	0.16	2.49	2.49	0.96	1.04	1.53	1.45
708.1	39.862	36.03	0.15	131	39.78	0.16	2.50	2.50	0.96	1.04	1.53	1.46
708.0	40.026	42.44	0.12	131	39.94	0.16	2.51	2.51	0.97	1.05	1.54	1.46
707.8	40.190	48.08	0.10	131	40.11	0.16	2.52	2.52	0.97	1.05	1.55	1.47
707.6	40.354	47.32	0.12	131	40.27	0.16	2.53	2.53	0.98	1.06	1.55	1.47
707.5	40.518	44.72	0.14	131	40.44	0.16	2.54	2.54	0.98	1.06	1.56	1.48
707.3	40.682	43.72	0.15	131	40.60	0.16	2.55	2.55	0.99	1.07	1.56	1.48
707.2	40.846	41.10	0.19	131	40.76	0.16	2.56	2.56	0.99	1.07	1.57	1.49
707.0	41.010	33.39	0.27	131	40.93	0.16	2.57	2.57	1.00	1.08	1.57	1.50
706.8	41.174	30.87	0.35	131	41.09	0.16	2.58	2.58	1.00	1.08	1.58	1.50
706.7	41.338	48.77	0.24	131	41.26	0.16	2.59	2.59	1.01	1.09	1.59	1.51
706.5	41.502	70.31	0.21	131	41.42	0.16	2.60	2.60	1.01	1.09	1.59	1.51
706.3	41.666	90.32	0.19	131	41.58	0.16	2.62	2.62	1.02	1.10	1.60	1.52
706.2	41.830	97.78	0.23	131	41.75	0.16	2.63	2.63	1.02	1.10	1.60	1.52
706.0	41.994	92.87	0.31	131	41.91	0.16	2.64	2.64	1.03	1.11	1.61	1.53
705.8	42.158	90.55	0.35	131	42.08	0.16	2.65	2.65	1.03	1.11	1.61	1.54
705.7	42.322	77.88	0.38	131	42.24	0.16	2.66	2.66	1.04	1.12	1.62	1.54
705.5	42.486	64.94	0.46	131	42.40	0.16	2.67	2.67	1.04	1.12	1.62	1.55
705.3	42.650	60.52	0.36	131	42.57	0.16	2.68	2.68	1.05	1.13	1.63	1.55
705.2	42.814	68.30	0.23	131	42.73	0.16	2.69	2.69	1.06	1.13	1.64	1.56
705.0	42.978	71.63	0.53	131	42.90	0.16	2.70	2.70	1.06	1.14	1.64	1.56
704.9	43.143	66.14	0.31	131	43.06	0.16	2.71	2.71	1.07	1.14	1.65	1.57
704.7	43.307	63.67	0.55	131	43.22	0.16	2.72	2.72	1.07	1.15	1.65	1.57
704.5	43.471	41.59	0.53	131	43.39	0.16	2.73	2.73	1.08	1.15	1.66	1.58

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
704.4	43.635	33.39	0.70	131	43.55	0.16	2.74	2.74	1.08	1.16	1.66	1.59
704.2	43.799	31.23	0.59	131	43.72	0.16	2.76	2.76	1.09	1.16	1.67	1.59
704.0	43.963	28.37	0.75	131	43.88	0.16	2.77	2.77	1.09	1.17	1.68	1.60
703.9	44.127	27.15	1.12	131	44.04	0.16	2.78	2.78	1.10	1.17	1.68	1.60
703.7	44.291	27.56	1.47	131	44.21	0.16	2.79	2.79	1.10	1.18	1.69	1.61
703.5	44.455	37.46	1.08	131	44.37	0.16	2.80	2.80	1.11	1.18	1.69	1.61
703.4	44.619	91.19	1.68	131	44.54	0.16	2.81	2.81	1.11	1.19	1.70	1.62
703.2	44.783	65.05	1.57	131	44.70	0.16	2.82	2.82	1.12	1.19	1.70	1.63
703.1	44.947	89.37	1.36	131	44.86	0.16	2.83	2.83	1.12	1.20	1.71	1.63
702.9	45.111	90.42	0.41	131	45.03	0.16	2.84	2.84	1.13	1.20	1.71	1.64
702.7	45.275	86.41	0.31	131	45.19	0.16	2.85	2.85	1.13	1.21	1.72	1.64
702.6	45.439	74.40	0.27	131	45.36	0.16	2.86	2.86	1.14	1.21	1.73	1.65
702.4	45.603	72.33	0.44	131	45.52	0.16	2.87	2.87	1.14	1.22	1.73	1.65
702.2	45.767	79.96	0.35	131	45.69	0.16	2.88	2.88	1.15	1.23	1.74	1.66
702.1	45.931	86.32	0.63	131	45.85	0.16	2.90	2.90	1.15	1.23	1.74	1.66
701.9	46.095	82.34	0.99	131	46.01	0.16	2.91	2.91	1.16	1.24	1.75	1.67
701.7	46.259	118.53	0.84	131	46.18	0.16	2.92	2.92	1.16	1.24	1.75	1.68
701.6	46.423	175.35	1.37	131	46.34	0.16	2.93	2.93	1.17	1.25	1.76	1.68
701.4	46.587	143.58	1.54	131	46.51	0.16	2.94	2.94	1.17	1.25	1.77	1.69
701.2	46.751	125.58	1.63	131	46.67	0.16	2.95	2.95	1.18	1.26	1.77	1.69
701.1	46.915	115.79	1.06	131	46.83	0.16	2.96	2.96	1.18	1.26	1.78	1.70
700.9	47.079	136.80	0.64	131	47.00	0.16	2.97	2.97	1.19	1.27	1.78	1.70
700.8	47.244	186.22	1.98	131	47.16	0.16	2.98	2.98	1.19	1.27	1.79	1.71
700.6	47.408	197.55	2.84	131	47.33	0.16	2.99	2.99	1.20	1.28	1.79	1.72
700.4	47.572	141.02	2.56	131	47.49	0.16	3.00	3.00	1.20	1.28	1.80	1.72
700.3	47.736	126.97	1.38	131	47.65	0.16	3.01	3.01	1.21	1.29	1.80	1.73
700.1	47.900	135.70	2.66	131	47.82	0.16	3.02	3.02	1.21	1.29	1.81	1.73
699.9	48.064	193.98	5.20	131	47.98	0.16	3.03	3.03	1.22	1.30	1.82	1.74
699.8	48.228	400.00	0.01	131	48.15	0.16	3.05	3.05	1.22	1.30	1.82	1.74
699.6	48.392	469.81	0.01	131	48.31	0.08	3.06	3.06	1.23	1.31	1.83	1.75

LIQUEFACTION POTENTIAL ASSESSMENT FOR COARSE GRAINED SOILS USING CONE PENETRATION TEST DATA

Project Site: KIF TDEC Stability
Project No.: 175668043
CPT ID: KIF-BF-CPT-3A

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
748.0												
747.8	0.164	257.79	0.21	1.19	0.5	1.70	42.28	0	0.00	42.28	0.198	-0.126
747.7	0.328	1305.87	0.23	0.67	0.5	1.70	297.75	0	0.00	297.75	0.199	-0.600
747.5	0.492	1239.49	0.16	0.56	0.5	1.70	344.15	0	0.00	344.15	0.200	-0.600
747.3	0.656	1368.96	0.21	0.64	0.5	1.70	437.62	0	0.00	437.62	0.200	-0.600
747.2	0.820	1474.71	0.21	0.62	0.5	1.70	526.15	0	0.00	526.15	0.200	-0.600
747.0	0.984	1036.99	0.54	1.05	0.5	1.70	404.85	0	0.00	404.85	0.199	-0.600
746.9	1.148	598.85	1.11	1.44	0.5	1.70	252.36	0	0.00	252.36	0.200	-0.600
746.7	1.312	1261.28	0.57	1.04	0.5	1.70	567.75	0	0.00	567.75	0.200	-0.600
746.5	1.476	1401.39	0.67	1.10	0.5	1.70	668.74	0	0.00	668.74	0.201	-0.600
746.4	1.640	1202.72	0.79	1.18	0.5	1.70	604.77	0	0.00	604.77	0.200	-0.600
746.2	1.804	1216.78	0.55	1.03	0.5	1.70	641.50	0	0.00	641.50	0.199	-0.600
746.0	1.968	1327.79	0.41	0.90	0.5	1.70	730.95	0	0.00	730.95	0.197	-0.600
745.9	2.133	1367.18	0.42	0.91	0.5	1.70	783.19	0	0.00	783.19	0.195	-0.600
745.7	2.297	1209.88	0.56	1.05	0.5	1.70	719.13	0	0.00	719.13	0.193	-0.600
745.5	2.461	824.55	0.97	1.33	0.5	1.70	507.30	0	0.00	507.30	0.190	-0.600
745.4	2.625	478.38	1.68	1.65	0.5	1.68	300.20	0	0.00	300.20	0.188	-0.600
745.2	2.789	284.34	3.06	1.99	0.5	1.70	186.35	22	0.00	186.35	0.186	-0.600
745.0	2.953	314.52	2.61	1.90	0.5	1.70	212.07	15	0.00	212.07	0.186	-0.600
744.9	3.117	209.87	3.06	2.06	0.5	1.70	145.46	28	0.00	145.46	0.185	-0.586
744.7	3.281	419.85	1.69	1.68	0.5	1.58	277.78	0	0.00	277.78	0.185	-0.600
744.6	3.445	530.50	1.39	1.55	0.5	1.56	354.99	0	0.00	354.99	0.184	-0.600
744.4	3.609	476.20	1.36	1.57	0.5	1.54	322.21	0	0.00	322.21	0.183	-0.600
744.2	3.773	633.88	1.09	1.42	0.5	1.53	433.33	0	0.00	433.33	0.183	-0.600
744.1	3.937	458.61	1.52	1.62	0.5	1.51	316.78	0	0.00	316.78	0.182	-0.600
743.9	4.101	240.96	2.37	1.93	0.5	1.69	189.92	17	0.00	189.92	0.181	-0.600
743.7	4.265	170.24	3.27	2.13	0.5	1.70	138.08	33	0.00	138.08	0.180	-0.556
743.6	4.429	111.69	5.33	2.41	0.5	1.70	92.45	56	0.00	92.45	0.180	-0.379
743.4	4.593	88.03	6.15	2.52	0.5	1.70	74.30	65	0.00	74.30	0.179	-0.289
743.2	4.757	77.45	5.72	2.53	0.5	1.70	66.58	66	0.00	66.58	0.179	-0.246
743.1	4.921	75.42	5.11	2.50	0.5	1.70	65.96	63	0.00	65.96	0.178	-0.242
742.9	5.085	126.69	3.08	2.19	0.5	1.62	106.89	38	66.06	172.94	0.178	-0.600
742.8	5.249	243.33	2.00	1.87	0.5	1.49	192.32	12	19.66	211.98	0.178	-0.600
742.6	5.413	221.63	2.67	1.99	0.5	1.44	172.45	23	54.10	226.55	0.178	-0.600
742.4	5.577	189.53	3.95	2.17	0.5	1.43	149.16	37	74.64	223.80	0.178	-0.600
742.3	5.741	327.12	2.45	1.87	0.5	1.36	248.28	13	24.20	272.48	0.177	-0.600
742.1	5.905	414.04	2.42	1.82	0.5	1.35	316.49	8	6.53	323.02	0.175	-0.600
741.9	6.069	321.26	2.64	1.90	0.5	1.34	247.46	15	36.46	283.92	0.174	-0.600
741.8	6.234	528.75	1.88	1.67	0.5	1.33	409.87	0	0.00	409.87	0.173	-0.600
741.6	6.398	528.24	2.39	1.76	0.5	1.32	412.29	4	0.06	412.34	0.171	-0.600
741.4	6.562	381.08	3.38	1.96	0.5	1.31	299.55	20	63.62	363.16	0.170	-0.600
741.3	6.726	530.34	1.58	1.60	0.5	1.30	419.39	0	0.00	419.39	0.169	-0.600
741.1	6.890	501.28	1.43	1.58	0.5	1.29	398.93	0	0.00	398.93	0.169	-0.600
740.9	7.054	300.81	3.80	2.05	0.5	1.28	241.07	27	78.37	319.44	0.169	-0.600
740.8	7.218	779.93	1.18	1.41	0.5	1.27	627.97	0	0.00	627.97	0.169	-0.600
740.6	7.382	695.17	1.10	1.41	0.5	1.26	563.05	0	0.00	563.05	0.169	-0.600
740.5	7.546	422.87	1.46	1.62	0.5	1.26	344.67	0	0.00	344.67	0.169	-0.600
740.3	7.710	296.20	1.90	1.80	0.5	1.26	244.60	7	2.45	247.05	0.169	-0.600
740.1	7.874	282.00	1.88	1.81	0.5	1.26	235.78	8	3.83	239.61	0.169	-0.600
740.0	8.038	206.60	2.63	2.01	0.5	1.26	175.00	23	57.00	232.00	0.169	-0.600
739.8	8.202	201.85	2.37	1.98	0.5	1.26	173.22	21	49.98	223.20	0.168	-0.600
739.6	8.366	188.19	2.21	1.97	0.5	1.27	164.09	21	47.18	211.26	0.168	-0.600
739.5	8.530	212.70	1.51	1.81	0.5	1.28	189.56	7	2.85	192.41	0.168	-0.600
739.3	8.694	151.62	2.16	2.02	0.5	1.28	136.17	25	53.09	189.26	0.167	-0.600
739.1	8.858	83.16	3.36	2.33	0.5	1.33	78.78	50	66.77	145.55	0.167	-0.567
739.0	9.022	55.66	3.45	2.46	0.5	1.36	54.81	60	64.09	118.90	0.166	-0.474
738.8	9.186	48.10	5.40	2.65	1.0	1.40	35.28	75	61.76	97.04	0.166	-0.386
738.6	9.350	43.38	4.94	2.65	1.0	1.40	32.24	75	60.90	93.13	0.166	-0.368
738.5	9.514	56.41	6.06	2.64	0.7	1.35	49.21	74	65.75	114.96	0.165	-0.459
738.3	9.678	67.04	5.79	2.58	0.5	1.32	64.83	69	69.28	134.11	0.165	-0.528
738.2	9.842	63.77	10.29	2.79	1.0	1.34	46.44	86	66.75	113.19	0.164	-0.451

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
738.0	10.006	71.82	2.37	2.27	0.5	1.31	69.73	44	61.62	131.35	0.164	-0.518
737.8	10.170	130.12	2.27	2.08	0.5	1.24	120.08	29	58.64	178.71	0.164	-0.600
737.7	10.335	178.18	2.79	2.06	0.5	1.20	158.70	28	64.11	222.81	0.163	-0.600
737.5	10.499	224.16	2.54	1.97	0.5	1.17	196.25	21	52.62	248.87	0.163	-0.600
737.3	10.663	141.06	4.68	2.31	0.5	1.21	127.82	47	78.36	206.18	0.163	-0.600
737.2	10.827	115.96	3.89	2.29	0.5	1.23	107.58	46	72.41	179.99	0.162	-0.600
737.0	10.991	254.71	1.16	1.67	0.5	1.18	227.51	0	0.00	227.51	0.162	-0.600
736.8	11.155	188.06	1.28	1.79	0.5	1.22	175.04	6	0.75	175.79	0.162	-0.600
736.7	11.319	159.95	2.99	2.12	0.5	1.19	145.08	32	68.15	213.23	0.162	-0.600
736.5	11.483	173.08	2.73	2.06	0.5	1.18	156.46	28	63.71	220.17	0.163	-0.600
736.4	11.647	106.67	4.61	2.37	0.5	1.21	100.15	53	73.89	174.04	0.164	-0.600
736.2	11.811	81.53	5.56	2.51	0.5	1.23	78.33	64	71.79	150.12	0.164	-0.577
736.0	11.975	97.27	4.26	2.37	0.5	1.21	92.33	53	71.69	164.02	0.165	-0.600
735.9	12.139	88.66	4.39	2.41	0.5	1.22	84.88	55	70.87	155.75	0.166	-0.594
735.7	12.303	95.42	4.48	2.39	0.5	1.21	90.86	54	72.07	162.94	0.166	-0.600
735.5	12.467	111.26	4.11	2.32	0.5	1.19	104.77	49	73.06	177.83	0.167	-0.600
735.4	12.631	113.25	4.97	2.38	0.5	1.18	106.43	54	75.98	182.40	0.166	-0.600
735.2	12.795	115.99	3.39	2.24	0.5	1.18	109.33	43	70.30	179.63	0.165	-0.600
735.0	12.959	171.51	1.88	1.94	0.5	1.17	159.47	18	39.22	198.69	0.164	-0.600
734.9	13.123	185.84	1.50	1.84	0.5	1.17	174.41	10	10.95	185.36	0.164	-0.600
734.7	13.287	106.02	2.54	2.17	0.5	1.18	101.35	37	63.66	165.01	0.163	-0.600
734.5	13.451	76.72	3.58	2.38	0.5	1.20	74.87	53	67.29	142.16	0.162	-0.549
734.4	13.615	71.09	3.69	2.41	0.5	1.20	69.79	56	66.88	136.66	0.162	-0.531
734.2	13.779	76.05	3.03	2.33	0.5	1.19	74.47	49	65.38	139.85	0.162	-0.541
734.1	13.943	76.63	2.30	2.24	0.5	1.19	75.25	42	61.56	136.81	0.162	-0.531
733.9	14.107	77.95	1.72	2.15	0.5	1.19	76.80	35	56.10	132.90	0.161	-0.517
733.7	14.271	81.82	1.45	2.08	0.5	1.19	80.69	29	50.96	131.65	0.161	-0.513
733.6	14.436	74.35	0.94	2.00	0.5	1.20	74.46	23	38.98	113.44	0.161	-0.446
733.4	14.600	60.86	1.09	2.10	0.5	1.20	61.30	31	49.17	110.47	0.161	-0.434
733.2	14.764	42.22	2.53	2.46	0.5	1.20	43.08	60	60.67	103.75	0.162	-0.406
733.1	14.928	31.09	3.82	2.68	1.0	1.22	27.16	77	59.72	86.88	0.162	-0.332
732.9	15.092	16.12	6.28	3.03	1.0	1.23	14.83	100	58.54	73.37	0.162	-0.264
732.7	15.256	13.35	4.98	3.03	1.0	1.23	12.55	100	57.83	70.39	0.162	-0.247
732.6	15.420	11.89	3.80	3.00	1.0	1.22	11.36	100	57.46	68.82	0.162	-0.238
732.4	15.584	9.79	3.34	3.03	1.0	1.22	9.60	100	56.91	66.52	0.162	-0.225
732.3	15.748	8.08	3.09	3.08	1.0	1.22	8.16	100	56.47	64.63	0.163	-0.214
732.1	15.912	8.37	2.07	2.97	1.0	1.21	8.44	100	56.55	64.99	0.163	-0.216
731.9	16.076	7.43	3.19	3.12	1.0	1.21	7.65	100	56.31	63.96	0.163	-0.210
731.8	16.240	9.88	2.67	2.97	1.0	1.20	9.81	100	56.98	66.79	0.163	-0.226
731.6	16.404	12.21	2.79	2.91	1.0	1.19	11.87	96	57.25	69.12	0.164	-0.239
731.4	16.568	9.70	3.73	3.06	1.0	1.19	9.71	100	56.95	66.66	0.164	-0.225
731.3	16.732	27.66	1.11	2.39	0.5	1.17	29.09	54	55.22	84.31	0.164	-0.317
731.1	16.896	40.06	1.65	2.36	0.5	1.15	41.20	52	57.54	98.74	0.164	-0.383
730.9	17.060	30.63	2.57	2.57	0.5	1.15	31.92	68	59.61	91.53	0.165	-0.351
730.8	17.224	34.77	2.38	2.50	0.5	1.15	35.99	63	59.66	95.64	0.165	-0.369
730.6	17.388	30.09	3.13	2.63	1.0	1.15	27.72	73	59.28	87.00	0.165	-0.329
730.4	17.552	29.27	2.62	2.59	0.7	1.15	29.15	70	59.12	88.27	0.165	-0.335
730.3	17.716	25.46	2.24	2.59	0.5	1.14	26.85	70	58.52	85.37	0.166	-0.321
730.1	17.880	23.55	2.71	2.67	1.0	1.14	22.26	77	58.21	80.47	0.166	-0.297
730.0	18.044	24.29	3.07	2.69	1.0	1.14	22.97	79	58.69	81.66	0.166	-0.303
729.8	18.208	16.74	4.06	2.90	1.0	1.14	16.32	95	58.54	74.86	0.167	-0.268
729.6	18.372	5.45	11.05	3.55	1.0	1.14	6.20	100	55.86	62.06	0.167	-0.195
729.5	18.537	3.52	9.26	3.65	1.0	1.14	4.47	100	55.32	59.79	0.167	-0.181
729.3	18.701	2.40	6.32	3.69	1.0	1.14	3.46	100	55.01	58.46	0.168	-0.173
729.1	18.865	1.75	6.83	3.82	1.0	1.13	2.87	100	54.82	57.70	0.168	-0.168
729.0	19.029	2.53	5.84	3.65	1.0	1.13	3.60	100	55.05	58.65	0.169	-0.174
728.8	19.193	7.38	3.33	3.13	1.0	1.12	8.07	100	56.44	64.51	0.169	-0.209
728.6	19.357	12.01	3.80	2.99	1.0	1.11	12.34	100	57.76	70.11	0.169	-0.241
728.5	19.521	14.61	2.90	2.85	1.0	1.11	14.76	91	57.74	72.50	0.170	-0.254
728.3	19.685	19.87	2.28	2.68	1.0	1.10	19.64	78	57.59	77.23	0.170	-0.278
728.2	19.849	15.75	2.80	2.82	1.0	1.10	15.90	88	57.79	73.69	0.171	-0.260
728.0	20.013	26.77	1.85	2.53	0.5	1.09	28.18	65	57.83	86.01	0.171	-0.322
727.8	20.177	35.65	1.51	2.37	0.5	1.08	37.00	53	56.89	93.89	0.172	-0.358
727.7	20.341	33.11	1.55	2.41	0.5	1.08	34.48	55	57.07	91.55	0.172	-0.347
727.5	20.505	22.45	3.28	2.74	1.0	1.08	22.30	82	58.98	81.28	0.172	-0.298
727.3	20.669	10.68	6.81	3.19	1.0	1.08	11.38	100	57.47	68.85	0.173	-0.232

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
727.2	20.833	6.44	7.16	3.37	1.0	1.08	7.42	100	56.24	63.65	0.173	-0.202
727.0	20.997	5.79	5.78	3.36	1.0	1.08	6.82	100	56.05	62.87	0.174	-0.197
726.8	21.161	8.60	3.49	3.09	1.0	1.07	9.51	100	56.88	66.39	0.174	-0.218
726.7	21.325	6.04	3.62	3.22	1.0	1.07	7.11	100	56.14	63.24	0.175	-0.199
726.5	21.489	4.87	3.10	3.27	1.0	1.07	6.01	100	55.80	61.81	0.175	-0.191
726.3	21.653	3.07	3.49	3.46	1.0	1.07	4.30	100	55.27	59.57	0.176	-0.177
726.2	21.817	2.47	2.58	3.48	1.0	1.06	3.74	100	55.09	58.84	0.176	-0.172
726.0	21.981	1.89	2.74	3.60	1.0	1.06	3.19	100	54.92	58.12	0.177	-0.167
725.9	22.145	1.68	2.83	3.65	1.0	1.06	3.00	100	54.86	57.86	0.177	-0.165
725.7	22.309	1.78	2.54	3.61	1.0	1.05	3.11	100	54.90	58.00	0.178	-0.166
725.5	22.473	2.23	2.20	3.49	1.0	1.05	3.55	100	55.03	58.58	0.178	-0.170
725.4	22.638	2.37	2.27	3.47	1.0	1.05	3.69	100	55.08	58.77	0.179	-0.171
725.2	22.802	2.62	2.63	3.46	1.0	1.04	3.95	100	55.16	59.10	0.179	-0.173
725.0	22.966	3.43	2.81	3.38	1.0	1.04	4.75	100	55.41	60.16	0.180	-0.179
724.9	23.130	7.22	1.90	3.01	1.0	1.03	8.46	100	56.56	65.02	0.181	-0.208
724.7	23.294	8.24	1.96	2.97	1.0	1.03	9.48	100	56.88	66.36	0.181	-0.216
724.5	23.458	7.97	2.36	3.02	1.0	1.03	9.24	100	56.80	66.04	0.182	-0.214
724.4	23.622	7.97	2.45	3.03	1.0	1.02	9.26	100	56.81	66.07	0.182	-0.214
724.2	23.786	8.63	2.38	2.99	1.0	1.02	9.94	100	57.02	66.96	0.183	-0.219
724.1	23.950	8.75	2.91	3.04	1.0	1.02	10.08	100	57.06	67.14	0.183	-0.219
723.9	24.114	8.02	3.01	3.08	1.0	1.01	9.38	100	56.85	66.23	0.184	-0.214
723.7	24.278	7.44	2.55	3.07	1.0	1.01	8.83	100	56.67	65.50	0.184	-0.210
723.6	24.442	6.67	2.04	3.06	1.0	1.01	8.08	100	56.44	64.53	0.185	-0.204
723.4	24.606	6.00	1.78	3.07	1.0	1.01	7.43	100	56.24	63.68	0.185	-0.199
723.2	24.770	6.15	1.50	3.02	1.0	1.00	7.60	100	56.29	63.90	0.186	-0.200
723.1	24.934	7.59	1.37	2.92	1.0	1.00	9.06	97	56.49	65.55	0.186	-0.209
722.9	25.098	9.32	1.29	2.83	1.0	1.00	10.81	90	56.36	67.17	0.187	-0.218
722.7	25.262	10.22	1.27	2.79	1.0	0.99	11.75	87	56.32	68.06	0.187	-0.223
722.6	25.426	12.00	1.38	2.75	1.0	0.99	13.57	83	56.46	70.03	0.188	-0.234
722.4	25.590	12.76	1.28	2.71	1.0	0.99	14.36	80	56.31	70.68	0.188	-0.238
722.2	25.754	13.02	1.13	2.68	1.0	0.99	14.65	77	56.03	70.68	0.189	-0.238
722.1	25.918	13.13	1.12	2.67	1.0	0.98	14.80	77	56.00	70.80	0.189	-0.238
721.9	26.082	12.99	1.88	2.79	1.0	0.98	14.70	86	57.18	71.87	0.190	-0.244
721.8	26.246	14.88	2.60	2.82	1.0	0.98	16.65	89	58.03	74.69	0.190	-0.259
721.6	26.410	23.28	1.64	2.55	0.5	0.98	24.76	67	57.18	81.94	0.191	-0.295
721.4	26.574	17.40	2.00	2.70	1.0	0.97	19.31	79	57.65	76.95	0.191	-0.270
721.3	26.739	16.49	1.83	2.70	1.0	0.97	18.42	79	57.36	75.78	0.192	-0.264
721.1	26.903	16.81	1.72	2.67	1.0	0.97	18.79	77	57.22	76.01	0.192	-0.265
720.9	27.067	19.07	1.73	2.63	1.0	0.97	21.16	73	57.38	78.54	0.193	-0.278
720.8	27.231	22.74	2.26	2.64	1.0	0.96	25.02	74	58.57	83.59	0.193	-0.303
720.6	27.395	25.08	2.38	2.61	1.0	0.96	27.51	72	59.02	86.52	0.194	-0.317
720.4	27.559	31.03	1.38	2.40	0.5	0.96	32.54	55	56.39	88.93	0.194	-0.328
720.3	27.723	32.27	1.28	2.37	0.5	0.96	33.78	52	55.86	89.64	0.195	-0.331
720.1	27.887	31.76	2.12	2.50	0.5	0.96	33.30	63	58.86	92.16	0.195	-0.342
719.9	28.051	32.53	2.77	2.57	0.5	0.95	34.08	68	60.24	94.31	0.196	-0.352
719.8	28.215	36.62	2.88	2.54	0.5	0.95	38.21	66	60.96	99.17	0.196	-0.373
719.6	28.379	32.94	3.43	2.63	1.0	0.95	36.21	73	61.72	97.93	0.197	-0.367
719.5	28.543	27.58	3.68	2.70	1.0	0.95	30.60	79	61.07	91.67	0.197	-0.340
719.3	28.707	26.11	3.65	2.72	1.0	0.95	29.10	81	60.80	89.90	0.197	-0.331
719.1	28.871	24.31	2.85	2.67	1.0	0.94	27.24	77	59.72	86.96	0.198	-0.317
719.0	29.035	20.45	3.41	2.78	1.0	0.94	23.20	86	59.67	82.87	0.198	-0.298
718.8	29.199	16.73	3.95	2.89	1.0	0.94	19.28	94	59.39	78.68	0.199	-0.277
718.6	29.363	18.56	3.08	2.79	1.0	0.93	21.28	86	59.14	80.42	0.199	-0.285
718.5	29.527	17.88	4.66	2.91	1.0	0.93	20.60	96	59.97	80.57	0.199	-0.286
718.3	29.691	23.93	3.13	2.70	1.0	0.93	27.13	79	60.05	87.19	0.200	-0.318
718.1	29.855	21.26	2.74	2.71	1.0	0.93	24.31	80	59.26	83.57	0.200	-0.300
718.0	30.019	21.53	2.88	2.72	1.0	0.93	24.65	80	59.46	84.11	0.201	-0.303
717.8	30.183	22.26	2.87	2.71	1.0	0.92	25.50	79	59.58	85.07	0.201	-0.307
717.7	30.347	20.25	2.74	2.73	1.0	0.92	23.36	81	59.15	82.51	0.201	-0.295
717.5	30.511	18.70	2.41	2.72	1.0	0.92	21.73	81	58.60	80.33	0.202	-0.284
717.3	30.675	16.30	3.31	2.85	1.0	0.92	19.17	91	59.05	78.23	0.202	-0.273
717.2	30.840	16.86	3.47	2.85	1.0	0.91	19.83	91	59.26	79.09	0.202	-0.277
717.0	31.004	33.67	2.02	2.47	0.5	0.92	35.28	61	58.78	94.06	0.203	-0.348
716.8	31.168	55.07	1.20	2.16	0.5	0.92	56.98	36	52.74	109.73	0.203	-0.414
716.7	31.332	70.56	0.75	1.96	0.5	0.92	72.41	20	32.17	104.59	0.203	-0.393
716.5	31.496	71.43	0.77	1.96	0.5	0.92	73.33	20	32.71	106.04	0.204	-0.399

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716.3	31.660	68.61	0.91	2.01	0.5	0.92	70.67	24	41.03	111.71	0.204	-0.421
716.2	31.824	62.99	0.97	2.06	0.5	0.91	65.01	28	45.83	110.84	0.204	-0.418
716.0	31.988	55.47	1.49	2.22	0.5	0.91	57.53	40	56.09	113.62	0.205	-0.429
715.8	32.152	51.95	1.36	2.22	0.5	0.91	53.90	40	55.15	109.05	0.205	-0.410
715.7	32.316	95.83	1.01	1.93	0.5	0.92	98.73	17	29.45	128.17	0.205	-0.482
715.5	32.480	73.61	1.68	2.16	0.5	0.92	76.40	36	56.83	133.23	0.206	-0.500
715.4	32.644	56.27	1.21	2.16	0.5	0.91	58.33	36	52.72	111.05	0.206	-0.418
715.2	32.808	48.10	1.91	2.33	0.5	0.90	50.08	50	59.15	109.23	0.206	-0.411
715.0	32.972	45.17	2.04	2.37	0.5	0.90	47.09	53	59.60	106.70	0.206	-0.400
714.9	33.136	39.89	1.93	2.40	0.5	0.90	41.67	55	58.87	100.54	0.207	-0.375
714.7	33.300	35.60	1.52	2.38	0.5	0.89	37.27	53	57.01	94.28	0.207	-0.347
714.5	33.464	35.80	1.05	2.28	0.5	0.89	37.42	46	54.00	91.42	0.207	-0.334
714.4	33.628	35.49	1.16	2.31	0.5	0.89	37.12	48	54.92	92.04	0.207	-0.337
714.2	33.792	34.42	1.38	2.36	0.5	0.89	36.06	52	56.35	92.42	0.207	-0.339
714.0	33.956	34.75	1.95	2.45	0.5	0.88	36.45	59	58.64	95.09	0.208	-0.350
713.9	34.120	29.36	2.91	2.62	1.0	0.88	34.91	72	61.22	96.13	0.208	-0.355
713.7	34.284	22.67	2.97	2.71	1.0	0.88	27.28	80	60.14	87.42	0.208	-0.315
713.6	34.448	20.00	1.80	2.62	1.0	0.87	24.24	73	58.17	82.41	0.208	-0.291
713.4	34.612	19.14	1.75	2.63	1.0	0.87	23.30	74	58.03	81.34	0.208	-0.286
713.2	34.776	22.51	1.36	2.51	0.5	0.87	24.03	64	56.43	80.47	0.208	-0.281
713.1	34.941	29.21	0.69	2.27	0.5	0.87	30.69	44	51.65	82.35	0.209	-0.290
712.9	35.105	19.63	1.23	2.54	0.5	0.86	21.14	66	56.05	77.19	0.209	-0.264
712.7	35.269	11.85	2.73	2.91	1.0	0.86	15.13	96	58.29	73.43	0.209	-0.244
712.6	35.433	9.91	2.77	2.98	1.0	0.85	12.94	100	57.95	70.89	0.209	-0.230
712.4	35.597	13.89	1.23	2.67	1.0	0.86	17.49	77	56.78	74.27	0.209	-0.249
712.2	35.761	14.23	1.24	2.66	1.0	0.85	17.92	76	56.83	74.75	0.209	-0.251
712.1	35.925	13.92	0.54	2.51	0.5	0.85	15.43	64	53.95	69.38	0.209	-0.222
711.9	36.089	11.69	0.79	2.65	1.0	0.85	15.04	75	55.82	70.86	0.209	-0.230
711.7	36.253	9.78	0.99	2.76	1.0	0.84	12.89	84	56.36	69.25	0.210	-0.221
711.6	36.417	11.20	0.90	2.69	1.0	0.84	14.54	78	56.13	70.67	0.210	-0.229
711.4	36.581	8.54	1.34	2.87	1.0	0.84	11.51	93	56.90	68.41	0.210	-0.216
711.3	36.745	9.79	1.88	2.89	1.0	0.84	12.98	95	57.50	70.48	0.210	-0.227
711.1	36.909	14.15	2.79	2.86	1.0	0.84	18.08	91	58.76	76.84	0.210	-0.261
710.9	37.073	20.89	2.74	2.72	1.0	0.85	26.03	80	59.84	85.88	0.210	-0.306
710.8	37.237	26.81	3.12	2.67	1.0	0.85	33.17	76	61.39	94.56	0.210	-0.345
710.6	37.401	39.27	3.12	2.54	0.5	0.86	41.28	66	61.85	103.13	0.210	-0.382
710.4	37.565	48.00	3.33	2.50	0.5	0.86	50.41	63	63.62	114.03	0.210	-0.426
710.3	37.729	30.68	4.75	2.74	1.0	0.85	38.08	83	63.78	101.87	0.210	-0.377
710.1	37.893	24.35	5.02	2.83	1.0	0.84	30.48	90	62.37	92.85	0.210	-0.337
709.9	38.057	32.28	2.21	2.51	0.5	0.84	34.03	64	59.18	93.21	0.210	-0.339
709.8	38.221	37.00	1.08	2.28	0.5	0.84	38.73	45	54.13	92.86	0.210	-0.337
709.6	38.385	34.14	0.57	2.17	0.5	0.83	35.61	36	48.07	83.69	0.210	-0.294
709.5	38.549	25.37	0.60	2.29	0.5	0.83	26.83	47	51.70	78.53	0.210	-0.268
709.3	38.713	14.33	1.18	2.65	1.0	0.82	18.60	75	56.86	75.46	0.210	-0.253
709.1	38.877	11.91	1.76	2.81	1.0	0.82	15.77	88	57.65	73.42	0.210	-0.242
709.0	39.042	15.14	1.09	2.61	1.0	0.82	19.61	72	56.67	76.28	0.210	-0.257
708.8	39.206	20.83	0.49	2.34	0.5	0.82	22.27	50	51.86	74.13	0.210	-0.245
708.6	39.370	16.65	0.58	2.45	0.5	0.81	18.15	59	53.62	71.77	0.210	-0.232
708.5	39.534	12.40	0.96	2.66	1.0	0.81	16.44	76	56.39	72.83	0.209	-0.238
708.3	39.698	18.24	0.71	2.46	0.5	0.81	19.74	59	54.10	73.84	0.209	-0.243
708.1	39.862	26.31	0.46	2.23	0.5	0.81	27.72	41	49.43	77.15	0.209	-0.260
708.0	40.026	31.28	0.31	2.10	0.5	0.81	32.53	31	42.70	75.22	0.209	-0.250
707.8	40.190	35.63	0.22	2.00	0.5	0.80	36.58	23	33.76	70.34	0.209	-0.224
707.6	40.354	34.96	0.27	2.03	0.5	0.81	36.06	26	37.58	73.64	0.208	-0.242
707.5	40.518	32.87	0.34	2.09	0.5	0.81	34.12	30	42.67	76.79	0.208	-0.258
707.3	40.682	32.02	0.37	2.12	0.5	0.81	33.32	32	44.18	77.49	0.208	-0.262
707.2	40.846	29.91	0.49	2.19	0.5	0.81	31.32	38	48.37	79.69	0.208	-0.273
707.0	41.010	23.88	0.87	2.39	0.5	0.80	25.40	54	54.25	79.64	0.207	-0.272
706.8	41.174	21.88	1.22	2.50	0.5	0.80	23.43	63	55.98	79.41	0.207	-0.271
706.7	41.338	35.65	0.52	2.13	0.5	0.80	37.09	34	46.26	83.35	0.207	-0.290
706.5	41.502	52.19	0.31	1.89	0.5	0.79	52.59	14	17.29	69.88	0.207	-0.220
706.3	41.666	67.49	0.21	1.73	0.5	0.79	67.21	1	0.00	67.21	0.206	-0.205
706.2	41.830	73.09	0.24	1.72	0.5	0.79	73.13	0	0.00	73.13	0.206	-0.238
706.0	41.994	69.18	0.35	1.80	0.5	0.79	69.08	7	1.21	70.29	0.206	-0.222
705.8	42.158	67.28	0.40	1.84	0.5	0.79	67.53	10	6.62	74.15	0.206	-0.243
705.7	42.322	57.47	0.51	1.94	0.5	0.80	58.80	19	28.19	87.00	0.205	-0.307

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
705.5	42.486	47.50	0.74	2.10	0.5	0.80	49.37	31	46.21	95.59	0.205	-0.346
705.3	42.650	44.04	0.62	2.09	0.5	0.80	45.68	30	44.49	90.17	0.205	-0.322
705.2	42.814	49.87	0.36	1.93	0.5	0.78	50.66	18	25.28	75.93	0.205	-0.252
705.0	42.978	52.31	0.77	2.07	0.5	0.80	54.38	29	44.94	99.32	0.204	-0.362
704.9	43.143	48.05	0.49	2.00	0.5	0.79	49.42	23	36.32	85.74	0.204	-0.300
704.7	43.307	46.09	0.91	2.16	0.5	0.80	48.13	36	50.26	98.39	0.204	-0.358
704.5	43.471	29.34	1.37	2.42	0.5	0.79	31.03	57	56.45	87.48	0.203	-0.308
704.4	43.635	18.42	2.30	2.71	1.0	0.78	24.77	80	59.44	84.21	0.203	-0.293
704.2	43.799	17.05	2.08	2.72	1.0	0.78	23.07	80	58.96	82.02	0.203	-0.282
704.0	43.963	15.28	2.93	2.84	1.0	0.78	20.87	90	59.50	80.37	0.203	-0.274
703.9	44.127	14.50	4.58	2.98	1.0	0.78	19.93	100	60.12	80.05	0.202	-0.272
703.7	44.291	14.69	5.94	3.05	1.0	0.78	20.21	100	60.21	80.42	0.202	-0.274
703.5	44.455	20.49	3.12	2.76	1.0	0.78	27.68	83	60.78	88.46	0.202	-0.312
703.4	44.619	65.94	1.90	2.23	0.5	0.81	70.08	41	59.80	129.88	0.201	-0.479
703.2	44.783	46.36	2.52	2.43	0.5	0.80	49.04	57	61.57	110.61	0.201	-0.407
703.1	44.947	64.36	1.57	2.18	0.5	0.81	68.17	38	56.58	124.75	0.201	-0.460
702.9	45.111	65.02	0.47	1.88	0.5	0.77	65.85	14	16.34	82.18	0.201	-0.282
702.7	45.275	61.93	0.37	1.85	0.5	0.76	61.95	11	9.64	71.59	0.200	-0.227
702.6	45.439	52.94	0.38	1.92	0.5	0.76	53.63	17	23.28	76.91	0.200	-0.255
702.4	45.603	51.32	0.63	2.03	0.5	0.78	53.13	26	40.53	93.66	0.200	-0.335
702.2	45.767	56.86	0.45	1.93	0.5	0.77	57.85	17	24.73	82.58	0.199	-0.283
702.1	45.931	61.44	0.76	2.01	0.5	0.78	63.86	24	39.20	103.06	0.199	-0.375
701.9	46.095	58.40	1.24	2.15	0.5	0.79	61.55	35	52.95	114.50	0.199	-0.421
701.7	46.259	84.87	0.72	1.88	0.5	0.78	87.63	14	17.73	105.35	0.199	-0.385
701.6	46.423	126.37	0.79	1.77	0.5	0.80	133.05	4	0.06	133.11	0.198	-0.489
701.4	46.587	102.91	1.10	1.93	0.5	0.81	109.47	17	30.45	139.92	0.198	-0.512
701.2	46.751	89.59	1.33	2.03	0.5	0.81	95.88	25	47.17	143.05	0.198	-0.522
701.1	46.915	82.30	0.94	1.96	0.5	0.79	86.48	20	34.52	121.01	0.197	-0.445
700.9	47.079	97.46	0.48	1.73	0.5	0.77	99.71	2	0.00	99.71	0.197	-0.361
700.8	47.244	133.23	1.08	1.84	0.5	0.81	142.76	10	9.42	152.18	0.197	-0.551
700.6	47.408	141.24	1.46	1.91	0.5	0.83	155.49	16	31.46	186.95	0.196	-0.600
700.4	47.572	100.04	1.86	2.09	0.5	0.82	109.19	30	57.92	167.11	0.196	-0.596
700.3	47.736	89.71	1.11	1.98	0.5	0.80	95.41	21	38.98	134.40	0.196	-0.492
700.1	47.900	95.87	2.00	2.13	0.5	0.82	104.67	33	60.63	165.31	0.196	-0.590
699.9	48.064	137.76	2.72	2.12	0.5	0.85	156.46	33	71.43	227.89	0.195	-0.600
699.8	48.228	285.95	0.15	1.09	0.5	0.87	327.74	0	0.00	327.74	0.195	-0.600
699.6	48.392	335.71	0.15	1.02	0.5	0.87	384.62	0	0.00	384.62	0.195	-0.600

LIQUEFACTION POTENTIAL ASSESSMENT FOR COARSE GRAINED SOILS USING CONE PENETRATION TEST DATA

Project Site: KIF TDEC Stability
Stantec Project No.: 175668043
CPT ID: KIF-BF-CPT-3A

Depth to Water during Earthquake:	6.5	ft
Final Grade Elevation during EQ:	748.0	ft
Height of Final Grade above CPT TOH:	0.0	ft
Normalize K_σ to:	1.058	tsf
a_{max} at top of ground surface:	0.21	g
Earthquake Magnitude:	6.00	M_W
Earthquake File or Source Zone:	10	Hz

Shear Stress Fit Parameters

m4:	0
m3:	0
m2:	0
m1:	0

Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
748.0																	
747.8	0.164	0.087	22	1.100	N/A	1.06	N/A	1.000	0	0	**0.136**	FALSE	FALSE	TRUE	**N/A**	**Fly Ash**	**A2**
747.7	0.328	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.136**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
747.5	0.492	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.136**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
747.3	0.656	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.136**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
747.2	0.820	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.136**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
747.0	0.984	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.136**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
746.9	1.148	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.136**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
746.7	1.312	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.136**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
746.5	1.476	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.136**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
746.4	1.640	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.136**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
746.2	1.804	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.136**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
746.0	1.968	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.136**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
745.9	2.133	N/A	100	N/A	N/A	N/A	N/A	0.999	0	0	**0.136**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
745.7	2.297	N/A	100	N/A	N/A	N/A	N/A	0.998	0	0	**0.136**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
745.5	2.461	N/A	100	N/A	N/A	N/A	N/A	0.998	0	0	**0.136**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
745.4	2.625	N/A	100	N/A	N/A	N/A	N/A	0.997	0	0	**0.136**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
745.2	2.789	N/A	84	N/A	N/A	N/A	N/A	0.996	0	0	**0.136**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
745.0	2.953	N/A	90	N/A	N/A	N/A	N/A	0.995	0	0	**0.136**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
744.9	3.117	0.261	72	1.100	N/A	1.37	N/A	0.995	0	0	**0.135**	FALSE	FALSE	TRUE	**N/A**	**Fly Ash**	**A1**
744.7	3.281	N/A	100	N/A	N/A	N/A	N/A	0.994	0	0	**0.135**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
744.6	3.445	N/A	100	N/A	N/A	N/A	N/A	0.993	0	0	**0.135**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
744.4	3.609	N/A	100	N/A	N/A	N/A	N/A	0.992	0	0	**0.135**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
744.2	3.773	N/A	100	N/A	N/A	N/A	N/A	0.992	0	0	**0.135**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
744.1	3.937	N/A	100	N/A	N/A	N/A	N/A	0.991	0	0	**0.135**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
743.9	4.101	N/A	85	N/A	N/A	N/A	N/A	0.990	0	0	**0.135**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
743.7	4.265	0.226	69	1.100	N/A	1.33	N/A	0.989	0	0	**0.135**	FALSE	FALSE	TRUE	**N/A**	**Fly Ash**	**A1**
743.6	4.429	0.128	52	1.100	N/A	1.14	N/A	0.988	0	0	**0.135**	FALSE	FALSE	TRUE	**N/A**	**Fly Ash**	**A1**
743.4	4.593	0.111	43	1.100	N/A	1.10	N/A	0.988	0	0	**0.135**	FALSE	FALSE	TRUE	**N/A**	**Fly Ash**	**A1**
743.2	4.757	0.105	39	1.100	N/A	1.08	N/A	0.987	0	0	**0.134**	FALSE	FALSE	TRUE	**N/A**	**Fly Ash**	**A1**
743.1	4.921	0.104	38	1.100	N/A	1.08	N/A	0.986	0	0	**0.134**	FALSE	FALSE	TRUE	**N/A**	**Fly Ash**	**A1**
742.9	5.085	N/A	80	N/A	N/A	N/A	N/A	0.985	0	0	**0.134**	TRUE	FALSE	TRUE	**N/A**	**Embankment Clay**	**A1**
742.8	5.249	N/A	90	N/A	N/A	N/A	N/A	0.984	0	0	**0.134**	TRUE	TRUE	TRUE	**N/A**	**Embankment Clay**	**A1**
742.6	5.413	N/A	94	N/A	N/A	N/A	N/A	0.984	0	0	**0.134**	TRUE	TRUE	TRUE	**N/A**	**Embankment Clay**	**A1**
742.4	5.577	N/A	93	N/A	N/A	N/A	N/A	0.983	0	0	**0.134**	TRUE	TRUE	TRUE	**N/A**	**Embankment Clay**	**A1**
742.3	5.741	N/A	100	N/A	N/A	N/A	N/A	0.982	0	0	**0.134**	TRUE	TRUE	TRUE	**N/A**	**Embankment Clay**	**A1**
742.1	5.905	N/A	100	N/A	N/A	N/A	N/A	0.981	0	0	**0.134**	TRUE	TRUE	TRUE	**N/A**	**Embankment Clay**	**A1**
741.9	6.069	N/A	100	N/A	N/A	N/A	N/A	0.980	0	0	**0.134**	TRUE	TRUE	TRUE	**N/A**	**Embankment Clay**	**A1**
741.8	6.234	N/A	100	N/A	N/A	N/A	N/A	0.979	0	0	**0.133**	TRUE	TRUE	TRUE	**N/A**	**Embankment Clay**	**A1**
741.6	6.398	N/A	100	N/A	N/A	N/A	N/A	0.978	0	0	**0.133**	TRUE	TRUE	TRUE	**N/A**	**Embankment Clay**	**A1**
741.4	6.562	N/A	100	N/A	N/A	N/A	N/A	0.978	0	0	**0.134**	TRUE	TRUE	FALSE	**N/A**	**Embankment Clay**	**A1**
741.3	6.726	N/A	100	N/A	N/A	N/A	N/A	0.977	0	0	**0.135**	TRUE	TRUE	FALSE	**N/A**	**Embankment Clay**	**A1**
741.1	6.890	N/A	100	N/A	N/A	N/A	N/A	0.976	0	0	**0.137**	TRUE	TRUE	FALSE	**N/A**	**Embankment Clay**	**A1**
740.9	7.054	N/A	100	N/A	N/A	N/A	N/A	0.975	0	0	**0.139**	TRUE	TRUE	FALSE	**N/A**	**Embankment Clay**	**A1**
740.8	7.218	N/A	100	N/A	N/A	N/A	N/A	0.974	0	0	**0.140**	TRUE	TRUE	FALSE	**N/A**	**Embankment Clay**	**A1**

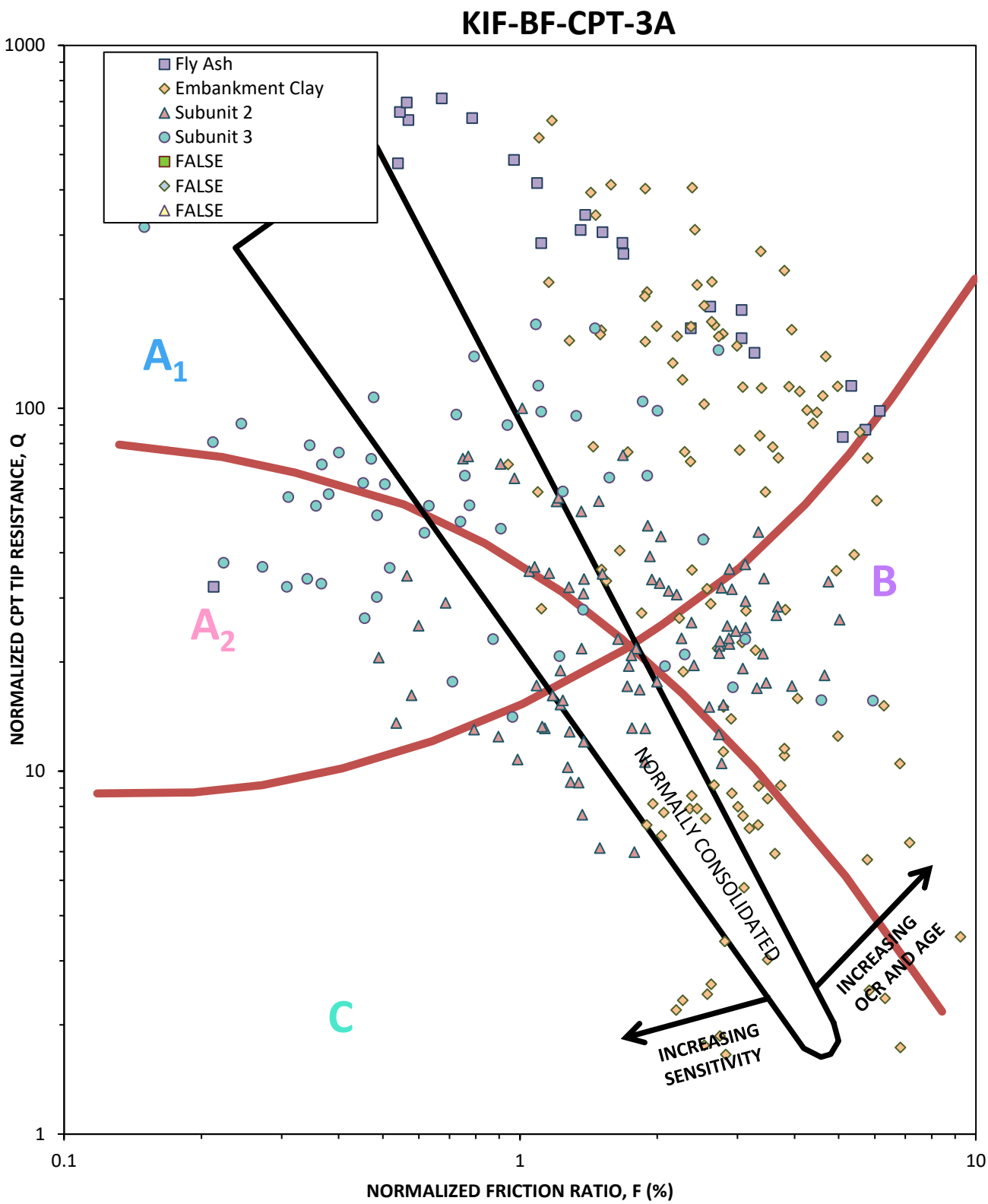
Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
740.6	7.382	N/A	100	N/A	N/A	N/A	N/A	0.973	0	0	**0.142**	TRUE	TRUE	FALSE	**N/A**	**Embankment Clay**	**A1**
740.5	7.546	N/A	100	N/A	N/A	N/A	N/A	0.972	0	0	**0.143**	TRUE	TRUE	FALSE	**N/A**	**Embankment Clay**	**A1**
740.3	7.710	N/A	98	N/A	N/A	N/A	N/A	0.971	0	0	**0.144**	TRUE	TRUE	FALSE	**N/A**	**Embankment Clay**	**A1**
740.1	7.874	N/A	97	N/A	N/A	N/A	N/A	0.971	0	0	**0.146**	TRUE	TRUE	FALSE	**N/A**	**Embankment Clay**	**A1**
740.0	8.038	N/A	95	N/A	N/A	N/A	N/A	0.970	0	0	**0.147**	TRUE	TRUE	FALSE	**N/A**	**Embankment Clay**	**A1**
739.8	8.202	N/A	93	N/A	N/A	N/A	N/A	0.969	0	0	**0.148**	TRUE	TRUE	FALSE	**N/A**	**Embankment Clay**	**A1**
739.6	8.366	N/A	90	N/A	N/A	N/A	N/A	0.968	0	0	**0.149**	TRUE	TRUE	FALSE	**N/A**	**Embankment Clay**	**A1**
739.5	8.530	N/A	85	N/A	N/A	N/A	N/A	0.967	0	0	**0.151**	TRUE	TRUE	FALSE	**N/A**	**Embankment Clay**	**A1**
739.3	8.694	N/A	85	N/A	N/A	N/A	N/A	0.966	0	0	**0.152**	TRUE	TRUE	FALSE	**N/A**	**Embankment Clay**	**A1**
739.1	8.858	N/A	72	N/A	N/A	N/A	N/A	0.965	0	0	**0.153**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**A1**
739.0	9.022	N/A	63	N/A	N/A	N/A	N/A	0.964	0	0	**0.154**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**A1**
738.8	9.186	N/A	54	N/A	N/A	N/A	N/A	0.963	0	0	**0.155**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**B**
738.6	9.350	N/A	52	N/A	N/A	N/A	N/A	0.962	0	0	**0.156**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**B**
738.5	9.514	N/A	61	N/A	N/A	N/A	N/A	0.961	0	0	**0.157**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**B**
738.3	9.678	N/A	68	N/A	N/A	N/A	N/A	0.960	0	0	**0.158**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**B**
738.2	9.842	N/A	60	N/A	N/A	N/A	N/A	0.959	0	0	**0.159**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**B**
738.0	10.006	N/A	67	N/A	N/A	N/A	N/A	0.958	0	0	**0.160**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**A1**
737.8	10.170	N/A	82	N/A	N/A	N/A	N/A	0.958	0	0	**0.160**	TRUE	TRUE	FALSE	**N/A**	**Embankment Clay**	**A1**
737.7	10.335	N/A	93	N/A	N/A	N/A	N/A	0.957	0	0	**0.161**	TRUE	TRUE	FALSE	**N/A**	**Embankment Clay**	**A1**
737.5	10.499	N/A	99	N/A	N/A	N/A	N/A	0.956	0	0	**0.162**	TRUE	TRUE	FALSE	**N/A**	**Embankment Clay**	**A1**
737.3	10.663	N/A	89	N/A	N/A	N/A	N/A	0.955	0	0	**0.163**	TRUE	TRUE	FALSE	**N/A**	**Embankment Clay**	**A1**
737.2	10.827	N/A	82	N/A	N/A	N/A	N/A	0.954	0	0	**0.164**	TRUE	TRUE	FALSE	**N/A**	**Embankment Clay**	**A1**
737.0	10.991	N/A	94	N/A	N/A	N/A	N/A	0.953	0	0	**0.164**	TRUE	TRUE	FALSE	**N/A**	**Embankment Clay**	**A1**
736.8	11.155	N/A	81	N/A	N/A	N/A	N/A	0.952	0	0	**0.165**	TRUE	TRUE	FALSE	**N/A**	**Embankment Clay**	**A1**
736.7	11.319	N/A	91	N/A	N/A	N/A	N/A	0.951	0	0	**0.166**	TRUE	TRUE	FALSE	**N/A**	**Embankment Clay**	**A1**
736.5	11.483	N/A	92	N/A	N/A	N/A	N/A	0.950	0	0	**0.167**	TRUE	TRUE	FALSE	**N/A**	**Embankment Clay**	**A1**
736.4	11.647	N/A	80	N/A	N/A	N/A	N/A	0.949	0	0	**0.167**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**A1**
736.2	11.811	N/A	73	N/A	N/A	N/A	N/A	0.948	0	0	**0.168**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**A1**
736.0	11.975	N/A	77	N/A	N/A	N/A	N/A	0.947	0	0	**0.169**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**A1**
735.9	12.139	N/A	75	N/A	N/A	N/A	N/A	0.946	0	0	**0.169**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**A1**
735.7	12.303	N/A	77	N/A	N/A	N/A	N/A	0.945	0	0	**0.170**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**A1**
735.5	12.467	N/A	81	N/A	N/A	N/A	N/A	0.944	0	0	**0.170**	TRUE	TRUE	FALSE	**N/A**	**Embankment Clay**	**A1**
735.4	12.631	N/A	83	N/A	N/A	N/A	N/A	0.943	0	0	**0.171**	TRUE	TRUE	FALSE	**N/A**	**Embankment Clay**	**A1**
735.2	12.795	N/A	82	N/A	N/A	N/A	N/A	0.942	0	0	**0.171**	TRUE	TRUE	FALSE	**N/A**	**Embankment Clay**	**A1**
735.0	12.959	N/A	87	N/A	N/A	N/A	N/A	0.941	0	0	**0.172**	TRUE	TRUE	FALSE	**N/A**	**Embankment Clay**	**A1**
734.9	13.123	N/A	83	N/A	N/A	N/A	N/A	0.940	0	0	**0.173**	TRUE	TRUE	FALSE	**N/A**	**Embankment Clay**	**A1**
734.7	13.287	N/A	78	N/A	N/A	N/A	N/A	0.939	0	0	**0.173**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**A1**
734.5	13.451	N/A	71	N/A	N/A	N/A	N/A	0.938	0	0	**0.174**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**A1**
734.4	13.615	N/A	69	N/A	N/A	N/A	N/A	0.936	0	0	**0.174**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**A1**
734.2	13.779	N/A	70	N/A	N/A	N/A	N/A	0.935	0	0	**0.174**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**A1**
734.1	13.943	N/A	69	N/A	N/A	N/A	N/A	0.934	0	0	**0.175**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**A1**
733.9	14.107	N/A	68	N/A	N/A	N/A	N/A	0.933	0	0	**0.175**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**A1**
733.7	14.271	N/A	67	N/A	N/A	N/A	N/A	0.932	0	0	**0.176**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**A1**
733.6	14.436	N/A	60	N/A	N/A	N/A	N/A	0.931	0	0	**0.176**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**A1**
733.4	14.600	N/A	59	N/A	N/A	N/A	N/A	0.930	0	0	**0.177**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**A1**
733.2	14.764	N/A	57	N/A	N/A	N/A	N/A	0.929	0	0	**0.177**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**A1**
733.1	14.928	N/A	49	N/A	N/A	N/A	N/A	0.928	0	0	**0.177**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**B**
732.9	15.092	N/A	42	N/A	N/A	N/A	N/A	0.927	0	0	**0.178**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**B**
732.7	15.256	N/A	41	N/A	N/A	N/A	N/A	0.926	0	0	**0.178**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**B**
732.6	15.420	N/A	40	N/A	N/A	N/A	N/A	0.925	0	0	**0.178**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**B**
732.4	15.584	N/A	39	N/A	N/A	N/A	N/A	0.924	0	0	**0.179**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**C**
732.3	15.748	N/A	37	N/A	N/A	N/A	N/A	0.923	0	0	**0.179**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**C**
732.1	15.912	N/A	38	N/A	N/A	N/A	N/A	0.922	0	0	**0.179**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**C**
731.9	16.076	N/A	37	N/A	N/A	N/A	N/A	0.921	0	0	**0.180**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**C**
731.8	16.240	N/A	39	N/A	N/A	N/A	N/A	0.919	0	0	**0.180**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**C**

Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
731.6	16.404	N/A	40	N/A	N/A	N/A	N/A	0.918	0	0	**0.180**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**C**
731.4	16.568	N/A	39	N/A	N/A	N/A	N/A	0.917	0	0	**0.180**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**B**
731.3	16.732	N/A	48	N/A	N/A	N/A	N/A	0.916	0	0	**0.181**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**A2**
731.1	16.896	N/A	54	N/A	N/A	N/A	N/A	0.915	0	0	**0.181**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**A1**
730.9	17.060	N/A	51	N/A	N/A	N/A	N/A	0.914	0	0	**0.181**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**A1**
730.8	17.224	N/A	53	N/A	N/A	N/A	N/A	0.913	0	0	**0.181**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**A1**
730.6	17.388	N/A	49	N/A	N/A	N/A	N/A	0.912	0	0	**0.182**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**B**
730.4	17.552	N/A	50	N/A	N/A	N/A	N/A	0.911	0	0	**0.182**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**B**
730.3	17.716	N/A	48	N/A	N/A	N/A	N/A	0.909	0	0	**0.182**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**B**
730.1	17.880	N/A	46	N/A	N/A	N/A	N/A	0.908	0	0	**0.182**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**B**
730.0	18.044	N/A	47	N/A	N/A	N/A	N/A	0.907	0	0	**0.183**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**B**
729.8	18.208	N/A	43	N/A	N/A	N/A	N/A	0.906	0	0	**0.183**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**B**
729.6	18.372	N/A	36	N/A	N/A	N/A	N/A	0.905	0	0	**0.183**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**B**
729.5	18.537	N/A	34	N/A	N/A	N/A	N/A	0.904	0	0	**0.183**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**B**
729.3	18.701	N/A	34	N/A	N/A	N/A	N/A	0.903	0	0	**0.183**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**C**
729.1	18.865	N/A	33	N/A	N/A	N/A	N/A	0.902	0	0	**0.183**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**C**
729.0	19.029	N/A	34	N/A	N/A	N/A	N/A	0.900	0	0	**0.184**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**C**
728.8	19.193	N/A	37	N/A	N/A	N/A	N/A	0.899	0	0	**0.184**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**C**
728.6	19.357	N/A	41	N/A	N/A	N/A	N/A	0.898	0	0	**0.184**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**B**
728.5	19.521	N/A	42	N/A	N/A	N/A	N/A	0.897	0	0	**0.184**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**B**
728.3	19.685	N/A	44	N/A	N/A	N/A	N/A	0.896	0	0	**0.184**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**B**
728.2	19.849	N/A	42	N/A	N/A	N/A	N/A	0.895	0	0	**0.184**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**B**
728.0	20.013	N/A	49	N/A	N/A	N/A	N/A	0.894	0	0	**0.184**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**A1**
727.8	20.177	N/A	52	N/A	N/A	N/A	N/A	0.892	0	0	**0.184**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**A1**
727.7	20.341	N/A	51	N/A	N/A	N/A	N/A	0.891	0	0	**0.185**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**A1**
727.5	20.505	N/A	46	N/A	N/A	N/A	N/A	0.890	0	0	**0.185**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**B**
727.3	20.669	N/A	40	N/A	N/A	N/A	N/A	0.889	0	0	**0.185**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**B**
727.2	20.833	N/A	37	N/A	N/A	N/A	N/A	0.888	0	0	**0.185**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**B**
727.0	20.997	N/A	36	N/A	N/A	N/A	N/A	0.887	0	0	**0.185**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**B**
726.8	21.161	N/A	38	N/A	N/A	N/A	N/A	0.885	0	0	**0.185**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**C**
726.7	21.325	N/A	37	N/A	N/A	N/A	N/A	0.884	0	0	**0.185**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**C**
726.5	21.489	N/A	36	N/A	N/A	N/A	N/A	0.883	0	0	**0.185**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**C**
726.3	21.653	N/A	34	N/A	N/A	N/A	N/A	0.882	0	0	**0.185**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**C**
726.2	21.817	N/A	34	N/A	N/A	N/A	N/A	0.881	0	0	**0.185**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**C**
726.0	21.981	N/A	33	N/A	N/A	N/A	N/A	0.880	0	0	**0.185**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**C**
725.9	22.145	N/A	33	N/A	N/A	N/A	N/A	0.878	0	0	**0.185**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**C**
725.7	22.309	N/A	33	N/A	N/A	N/A	N/A	0.877	0	0	**0.185**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**C**
725.5	22.473	N/A	34	N/A	N/A	N/A	N/A	0.876	0	0	**0.185**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**C**
725.4	22.638	N/A	34	N/A	N/A	N/A	N/A	0.875	0	0	**0.185**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**C**
725.2	22.802	N/A	34	N/A	N/A	N/A	N/A	0.874	0	0	**0.185**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**C**
725.0	22.966	N/A	35	N/A	N/A	N/A	N/A	0.873	0	0	**0.185**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**C**
724.9	23.130	N/A	38	N/A	N/A	N/A	N/A	0.871	0	0	**0.185**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**C**
724.7	23.294	N/A	38	N/A	N/A	N/A	N/A	0.870	0	0	**0.185**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**C**
724.5	23.458	N/A	38	N/A	N/A	N/A	N/A	0.869	0	0	**0.186**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**C**
724.4	23.622	N/A	38	N/A	N/A	N/A	N/A	0.868	0	0	**0.186**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**C**
724.2	23.786	N/A	39	N/A	N/A	N/A	N/A	0.867	0	0	**0.186**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**C**
724.1	23.950	N/A	39	N/A	N/A	N/A	N/A	0.865	0	0	**0.186**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**C**
723.9	24.114	N/A	38	N/A	N/A	N/A	N/A	0.864	0	0	**0.186**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**C**
723.7	24.278	N/A	38	N/A	N/A	N/A	N/A	0.863	0	0	**0.185**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**C**
723.6	24.442	N/A	37	N/A	N/A	N/A	N/A	0.862	0	0	**0.185**	TRUE	FALSE	FALSE	**N/A**	**Embankment Clay**	**C**
723.4	24.606	0.102	37	1.007	0.837	1.08	0.093	0.861	0	0	**0.185**	FALSE	FALSE	FALSE	**0.5**	**Subunit 2**	**C**
723.2	24.770	0.102	37	1.006	0.838	1.08	0.093	0.859	0	0	**0.185**	FALSE	FALSE	FALSE	**0.5**	**Subunit 2**	**C**
723.1	24.934	0.104	38	1.006	0.847	1.08	0.096	0.858	0	0	**0.185**	FALSE	FALSE	FALSE	**0.5**	**Subunit 2**	**C**
722.9	25.098	0.105	39	1.006	0.857	1.09	0.098	0.857	0	0	**0.185**	FALSE	FALSE	FALSE	**0.5**	**Subunit 2**	**C**
722.7	25.262	0.106	39	1.005	0.862	1.09	0.100	0.856	0	0	**0.185**	FALSE	FALSE	FALSE	**0.5**	**Subunit 2**	**C**

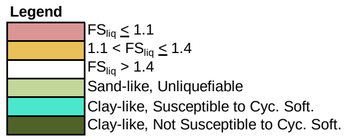
Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
722.6	25.426	0.107	40	1.005	0.874	1.09	0.103	0.855	0	0	**0.185**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
722.4	25.590	0.108	41	1.005	0.878	1.09	0.104	0.853	0	0	**0.185**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
722.2	25.754	0.108	41	1.004	0.877	1.09	0.104	0.852	0	0	**0.185**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
722.1	25.918	0.108	41	1.004	0.878	1.09	0.104	0.851	0	0	**0.185**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
721.9	26.082	0.109	41	1.003	0.885	1.09	0.106	0.850	0	0	**0.185**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
721.8	26.246	0.111	43	1.003	0.904	1.10	0.111	0.848	0	0	**0.185**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**B**
721.6	26.410	0.118	47	1.003	0.961	1.11	0.126	0.847	0	0	**0.185**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**A2**
721.4	26.574	0.113	44	1.002	0.921	1.10	0.115	0.846	0	0	**0.185**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
721.3	26.739	0.112	44	1.002	0.911	1.10	0.112	0.845	0	0	**0.185**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
721.1	26.903	0.112	44	1.001	0.913	1.10	0.113	0.844	0	0	**0.185**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
720.9	27.067	0.114	45	1.001	0.932	1.10	0.118	0.842	0	0	**0.185**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
720.8	27.231	0.119	48	1.000	0.974	1.11	0.129	0.841	0	0	**0.185**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**B**
720.6	27.395	0.122	49	1.000	1.000	1.12	0.137	0.840	0	0	**0.185**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**B**
720.4	27.559	0.124	50	0.999	1.022	1.13	0.143	0.839	0	0	**0.185**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**A1**
720.3	27.723	0.125	50	0.999	1.029	1.13	0.145	0.838	0	0	**0.185**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**A1**
720.1	27.887	0.128	52	0.998	1.054	1.14	0.153	0.836	0	0	**0.185**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**A1**
719.9	28.051	0.130	52	0.998	1.077	1.14	0.160	0.835	0	0	**0.185**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**B**
719.8	28.215	0.136	55	0.997	1.130	1.16	0.177	0.834	0	0	**0.184**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**A1**
719.6	28.379	0.135	54	0.997	1.116	1.15	0.172	0.833	0	0	**0.184**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**B**
719.5	28.543	0.127	51	0.997	1.049	1.13	0.151	0.831	0	0	**0.184**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**B**
719.3	28.707	0.125	50	0.996	1.031	1.13	0.145	0.830	0	0	**0.184**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**B**
719.1	28.871	0.122	49	0.996	1.002	1.12	0.137	0.829	0	0	**0.184**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**B**
719.0	29.035	0.118	47	0.995	0.965	1.11	0.127	0.828	0	0	**0.184**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**B**
718.8	29.199	0.115	45	0.995	0.929	1.10	0.117	0.826	0	0	**0.184**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**B**
718.6	29.363	0.116	46	0.995	0.943	1.11	0.121	0.825	0	0	**0.184**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**B**
718.5	29.527	0.116	46	0.994	0.944	1.11	0.121	0.824	0	0	**0.184**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**B**
718.3	29.691	0.123	49	0.993	1.004	1.12	0.137	0.823	0	0	**0.184**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**B**
718.1	29.855	0.119	47	0.993	0.970	1.11	0.128	0.822	0	0	**0.184**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**B**
718.0	30.019	0.120	48	0.993	0.975	1.12	0.129	0.820	0	0	**0.183**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**B**
717.8	30.183	0.121	48	0.992	0.983	1.12	0.131	0.819	0	0	**0.183**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**B**
717.7	30.347	0.118	47	0.992	0.960	1.11	0.125	0.818	0	0	**0.183**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**B**
717.5	30.511	0.116	46	0.992	0.941	1.11	0.120	0.817	0	0	**0.183**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**B**
717.3	30.675	0.114	45	0.991	0.923	1.10	0.115	0.815	0	0	**0.183**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**B**
717.2	30.840	0.115	45	0.991	0.930	1.11	0.117	0.814	0	0	**0.183**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**B**
717.0	31.004	0.130	52	0.989	1.072	1.14	0.157	0.813	0	0	**0.183**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**A1**
716.8	31.168	0.152	59	0.988	1.263	1.19	0.225	0.812	0	0	**0.183**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**A1**
716.7	31.332	0.144	57	0.988	1.195	1.17	0.199	0.810	0	0	**0.183**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**A1**
716.5	31.496	0.146	57	0.987	1.214	1.18	0.206	0.809	0	0	**0.182**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**A1**
716.3	31.660	0.155	60	0.986	1.291	1.20	0.236	0.808	0	0	**0.182**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**A1**
716.2	31.824	0.153	59	0.985	1.278	1.20	0.231	0.807	0	0	**0.182**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**A1**
716.0	31.988	0.158	60	0.985	1.318	1.21	0.248	0.805	0	0	**0.182**	FALSE	FALSE	FALSE	**1.4**	**Subunit 2**	**A1**
715.8	32.152	0.150	59	0.985	1.253	1.19	0.221	0.804	0	0	**0.182**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**A1**
715.7	32.316	0.192	66	0.981	1.553	1.27	0.372	0.803	0	0	**0.182**	FALSE	FALSE	FALSE	**2.0**	**Subunit 2**	**A1**
715.5	32.480	0.208	68	0.980	1.647	1.30	0.436	0.802	0	0	**0.182**	FALSE	FALSE	FALSE	**2.4**	**Subunit 2**	**A1**
715.4	32.644	0.154	59	0.983	1.281	1.20	0.231	0.800	0	0	**0.182**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**A1**
715.2	32.808	0.151	59	0.983	1.256	1.19	0.221	0.799	0	0	**0.181**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**A1**
715.0	32.972	0.147	58	0.983	1.221	1.18	0.208	0.798	0	0	**0.181**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**A1**
714.9	33.136	0.138	55	0.983	1.144	1.16	0.180	0.797	0	0	**0.181**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**A1**
714.7	33.300	0.130	52	0.983	1.072	1.14	0.157	0.796	0	0	**0.181**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**A1**
714.5	33.464	0.127	51	0.983	1.041	1.13	0.147	0.794	0	0	**0.181**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**A2**
714.4	33.628	0.128	51	0.983	1.047	1.13	0.149	0.793	0	0	**0.181**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**A1**
714.2	33.792	0.128	52	0.982	1.051	1.14	0.150	0.792	0	0	**0.181**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**A1**
714.0	33.956	0.131	53	0.981	1.080	1.14	0.159	0.791	0	0	**0.180**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**A1**
713.9	34.120	0.132	53	0.981	1.091	1.15	0.162	0.789	0	0	**0.180**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**B**
713.7	34.284	0.123	49	0.982	1.000	1.12	0.135	0.788	0	0	**0.180**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**B**

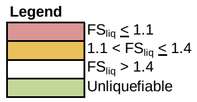
Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
713.6	34.448	0.118	47	0.982	0.952	1.11	0.123	0.787	0	0	**0.180**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**B**
713.4	34.612	0.117	46	0.982	0.943	1.11	0.120	0.786	0	0	**0.180**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**C**
713.2	34.776	0.116	46	0.982	0.935	1.11	0.118	0.784	0	0	**0.180**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**A2**
713.1	34.941	0.118	47	0.981	0.951	1.11	0.122	0.783	0	0	**0.180**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**A2**
712.9	35.105	0.113	44	0.981	0.907	1.10	0.111	0.782	0	0	**0.179**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**A2**
712.7	35.269	0.110	42	0.982	0.877	1.10	0.104	0.781	0	0	**0.179**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
712.6	35.433	0.108	41	0.982	0.858	1.09	0.099	0.779	0	0	**0.179**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
712.4	35.597	0.111	43	0.981	0.883	1.10	0.105	0.778	0	0	**0.179**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
712.2	35.761	0.111	43	0.980	0.886	1.10	0.106	0.777	0	0	**0.179**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
712.1	35.925	0.107	40	0.981	0.846	1.09	0.096	0.776	0	0	**0.179**	FALSE	FALSE	FALSE	**0.5**	**Subunit 2**	**A2**
711.9	36.089	0.108	41	0.980	0.856	1.09	0.099	0.774	0	0	**0.178**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
711.7	36.253	0.107	40	0.980	0.845	1.09	0.096	0.773	0	0	**0.178**	FALSE	FALSE	FALSE	**0.5**	**Subunit 2**	**C**
711.6	36.417	0.108	41	0.980	0.855	1.09	0.098	0.772	0	0	**0.178**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
711.4	36.581	0.106	40	0.980	0.838	1.09	0.095	0.771	0	0	**0.178**	FALSE	FALSE	FALSE	**0.5**	**Subunit 2**	**C**
711.3	36.745	0.108	41	0.979	0.853	1.09	0.098	0.770	0	0	**0.178**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
711.1	36.909	0.113	44	0.978	0.901	1.10	0.110	0.768	0	0	**0.178**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**B**
710.9	37.073	0.121	49	0.976	0.980	1.12	0.130	0.767	0	0	**0.177**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**B**
710.8	37.237	0.131	53	0.973	1.069	1.14	0.155	0.766	0	0	**0.177**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**B**
710.6	37.401	0.142	56	0.971	1.169	1.17	0.188	0.765	0	0	**0.177**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**B**
710.4	37.565	0.159	61	0.968	1.315	1.21	0.245	0.763	0	0	**0.177**	FALSE	FALSE	FALSE	**1.4**	**Subunit 2**	**A1**
710.3	37.729	0.140	56	0.971	1.152	1.16	0.182	0.762	0	0	**0.177**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**B**
710.1	37.893	0.129	52	0.972	1.049	1.14	0.149	0.761	0	0	**0.177**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**B**
709.9	38.057	0.129	52	0.972	1.053	1.14	0.150	0.760	0	0	**0.176**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**A1**
709.8	38.221	0.129	52	0.972	1.049	1.14	0.149	0.758	0	0	**0.176**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**A1**
709.6	38.385	0.119	48	0.973	0.958	1.11	0.124	0.757	0	0	**0.176**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**A2**
709.5	38.549	0.114	45	0.974	0.913	1.10	0.112	0.756	0	0	**0.176**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**A2**
709.3	38.713	0.112	43	0.974	0.888	1.10	0.106	0.755	0	0	**0.176**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
709.1	38.877	0.110	42	0.974	0.872	1.10	0.102	0.754	0	0	**0.175**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
709.0	39.042	0.113	44	0.973	0.894	1.10	0.108	0.752	0	0	**0.175**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**A2**
708.8	39.206	0.111	43	0.974	0.877	1.10	0.104	0.751	0	0	**0.175**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**A2**
708.6	39.370	0.109	41	0.974	0.860	1.09	0.099	0.750	0	0	**0.175**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**A2**
708.5	39.534	0.110	42	0.973	0.867	1.09	0.101	0.749	0	0	**0.175**	FALSE	FALSE	FALSE	**0.6**	**Subunit 3**	**C**
708.3	39.698	0.110	43	0.973	0.875	1.10	0.103	0.747	0	0	**0.174**	FALSE	FALSE	FALSE	**0.6**	**Subunit 3**	**A2**
708.1	39.862	0.113	44	0.972	0.901	1.10	0.109	0.746	0	0	**0.174**	FALSE	FALSE	FALSE	**0.6**	**Subunit 3**	**A2**
708.0	40.026	0.112	43	0.972	0.885	1.10	0.105	0.745	0	0	**0.174**	FALSE	FALSE	FALSE	**0.6**	**Subunit 3**	**A2**
707.8	40.190	0.108	41	0.972	0.849	1.09	0.097	0.744	0	0	**0.174**	FALSE	FALSE	FALSE	**0.6**	**Subunit 3**	**A2**
707.6	40.354	0.110	42	0.971	0.873	1.10	0.102	0.743	0	0	**0.174**	FALSE	FALSE	FALSE	**0.6**	**Subunit 3**	**A2**
707.5	40.518	0.113	44	0.970	0.897	1.10	0.108	0.741	0	0	**0.173**	FALSE	FALSE	FALSE	**0.6**	**Subunit 3**	**A2**
707.3	40.682	0.114	44	0.970	0.903	1.10	0.110	0.740	0	0	**0.173**	FALSE	FALSE	FALSE	**0.6**	**Subunit 3**	**A2**
707.2	40.846	0.116	46	0.969	0.921	1.11	0.114	0.739	0	0	**0.173**	FALSE	FALSE	FALSE	**0.7**	**Subunit 3**	**A2**
707.0	41.010	0.115	46	0.969	0.920	1.11	0.114	0.738	0	0	**0.173**	FALSE	FALSE	FALSE	**0.7**	**Subunit 3**	**A2**
706.8	41.174	0.115	45	0.968	0.918	1.11	0.113	0.736	0	0	**0.173**	FALSE	FALSE	FALSE	**0.7**	**Subunit 3**	**A2**
706.7	41.338	0.119	47	0.967	0.951	1.11	0.122	0.735	0	0	**0.172**	FALSE	FALSE	FALSE	**0.7**	**Subunit 3**	**A2**
706.5	41.502	0.107	40	0.970	0.846	1.09	0.096	0.734	0	0	**0.172**	FALSE	FALSE	FALSE	**0.6**	**Subunit 3**	**A2**
706.3	41.666	0.105	39	0.970	0.828	1.09	0.092	0.733	0	0	**0.172**	FALSE	FALSE	FALSE	**0.5**	**Subunit 3**	**A1**
706.2	41.830	0.110	42	0.969	0.869	1.09	0.101	0.732	0	0	**0.172**	FALSE	FALSE	FALSE	**0.6**	**Subunit 3**	**A1**
706.0	41.994	0.107	41	0.969	0.849	1.09	0.096	0.730	0	0	**0.172**	FALSE	FALSE	FALSE	**0.6**	**Subunit 3**	**A1**
705.8	42.158	0.111	43	0.968	0.877	1.10	0.103	0.729	0	0	**0.171**	FALSE	FALSE	FALSE	**0.6**	**Subunit 3**	**A1**
705.7	42.322	0.122	49	0.964	0.983	1.12	0.130	0.728	0	0	**0.171**	FALSE	FALSE	FALSE	**0.8**	**Subunit 3**	**A1**
705.5	42.486	0.132	53	0.961	1.068	1.14	0.155	0.727	0	0	**0.171**	FALSE	FALSE	FALSE	**0.9**	**Subunit 3**	**A1**
705.3	42.650	0.126	51	0.962	1.012	1.13	0.138	0.726	0	0	**0.171**	FALSE	FALSE	FALSE	**0.8**	**Subunit 3**	**A2**
705.2	42.814	0.112	44	0.966	0.890	1.10	0.106	0.724	0	0	**0.170**	FALSE	FALSE	FALSE	**0.6**	**Subunit 3**	**A2**
705.0	42.978	0.136	55	0.959	1.107	1.16	0.167	0.723	0	0	**0.170**	FALSE	FALSE	FALSE	**1.0**	**Subunit 3**	**A1**
704.9	43.143	0.121	49	0.962	0.970	1.12	0.127	0.722	0	0	**0.170**	FALSE	FALSE	FALSE	**0.7**	**Subunit 3**	**A2**
704.7	43.307	0.135	54	0.958	1.096	1.15	0.164	0.721	0	0	**0.170**	FALSE	FALSE	FALSE	**1.0**	**Subunit 3**	**A1**

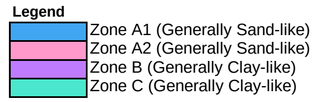
Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
704.5	43.471	0.123	49	0.961	0.985	1.12	0.131	0.720	0	0	**0.170**	FALSE	FALSE	FALSE	**0.8**	**Subunit 3**	**A2**
704.4	43.635	0.120	48	0.962	0.956	1.12	0.123	0.718	0	0	**0.169**	FALSE	FALSE	FALSE	**0.7**	**Subunit 3**	**B**
704.2	43.799	0.118	47	0.962	0.937	1.11	0.118	0.717	0	0	**0.169**	FALSE	FALSE	FALSE	**0.7**	**Subunit 3**	**B**
704.0	43.963	0.116	46	0.962	0.924	1.11	0.114	0.716	0	0	**0.169**	FALSE	FALSE	FALSE	**0.7**	**Subunit 3**	**B**
703.9	44.127	0.116	46	0.962	0.921	1.11	0.114	0.715	0	0	**0.169**	FALSE	FALSE	FALSE	**0.7**	**Subunit 3**	**B**
703.7	44.291	0.116	46	0.962	0.924	1.11	0.114	0.714	0	0	**0.168**	FALSE	FALSE	FALSE	**0.7**	**Subunit 3**	**B**
703.5	44.455	0.124	50	0.959	0.993	1.13	0.133	0.712	0	0	**0.168**	FALSE	FALSE	FALSE	**0.8**	**Subunit 3**	**B**
703.4	44.619	0.197	66	0.942	1.528	1.28	0.363	0.711	0	0	**0.168**	FALSE	FALSE	FALSE	**2.2**	**Subunit 3**	**A1**
703.2	44.783	0.153	59	0.950	1.237	1.19	0.215	0.710	0	0	**0.168**	FALSE	FALSE	FALSE	**1.3**	**Subunit 3**	**A1**
703.1	44.947	0.183	65	0.944	1.441	1.25	0.312	0.709	0	0	**0.168**	FALSE	FALSE	FALSE	**1.9**	**Subunit 3**	**A1**
702.9	45.111	0.118	47	0.960	0.937	1.11	0.118	0.708	0	0	**0.167**	FALSE	FALSE	FALSE	**0.7**	**Subunit 3**	**A1**
702.7	45.275	0.109	41	0.963	0.858	1.09	0.098	0.706	0	0	**0.167**	FALSE	FALSE	FALSE	**0.6**	**Subunit 3**	**A1**
702.6	45.439	0.113	44	0.961	0.896	1.10	0.107	0.705	0	0	**0.167**	FALSE	FALSE	FALSE	**0.6**	**Subunit 3**	**A2**
702.4	45.603	0.130	52	0.955	1.040	1.14	0.147	0.704	0	0	**0.167**	FALSE	FALSE	FALSE	**0.9**	**Subunit 3**	**A1**
702.2	45.767	0.118	47	0.958	0.940	1.11	0.118	0.703	0	0	**0.166**	FALSE	FALSE	FALSE	**0.7**	**Subunit 3**	**A1**
702.1	45.931	0.141	56	0.951	1.140	1.17	0.179	0.702	0	0	**0.166**	FALSE	FALSE	FALSE	**1.1**	**Subunit 3**	**A1**
701.9	46.095	0.160	61	0.945	1.283	1.21	0.235	0.701	0	0	**0.166**	FALSE	FALSE	FALSE	**1.4**	**Subunit 3**	**A1**
701.7	46.259	0.145	57	0.949	1.165	1.18	0.188	0.699	0	0	**0.166**	FALSE	FALSE	FALSE	**1.1**	**Subunit 3**	**A1**
701.6	46.423	0.207	68	0.936	1.570	1.30	0.396	0.698	0	0	**0.166**	FALSE	FALSE	FALSE	**2.4**	**Subunit 3**	**A1**
701.4	46.587	0.234	70	0.931	1.694	1.34	0.494	0.697	0	0	**0.165**	FALSE	FALSE	FALSE	**3.0**	**Subunit 3**	**A1**
701.2	46.751	0.249	71	0.929	1.754	1.36	0.550	0.696	0	0	**0.165**	FALSE	FALSE	FALSE	**3.3**	**Subunit 3**	**A1**
701.1	46.915	0.173	63	0.940	1.370	1.24	0.277	0.695	0	0	**0.165**	FALSE	FALSE	FALSE	**1.7**	**Subunit 3**	**A1**
700.9	47.079	0.137	55	0.949	1.099	1.16	0.165	0.694	0	0	**0.165**	FALSE	FALSE	FALSE	**1.0**	**Subunit 3**	**A1**
700.8	47.244	0.304	74	0.922	1.942	1.42	0.771	0.692	0	0	**0.164**	FALSE	FALSE	FALSE	**4.7**	**Subunit 3**	**A1**
700.6	47.408	N/A	84	N/A	N/A	N/A	N/A	0.691	0	0	**0.164**	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**	**A1**
700.4	47.572	0.458	78	0.909	2.303	1.54	1.474	0.690	0	0	**0.164**	FALSE	FALSE	FALSE	**9.0**	**Subunit 3**	**A1**
700.3	47.736	0.212	68	0.931	1.582	1.31	0.408	0.689	0	0	**0.164**	FALSE	FALSE	FALSE	**2.5**	**Subunit 3**	**A1**
700.1	47.900	0.433	78	0.909	2.251	1.52	1.349	0.688	0	0	**0.164**	FALSE	FALSE	FALSE	**8.2**	**Subunit 3**	**A1**
699.9	48.064	N/A	94	N/A	N/A	N/A	N/A	0.687	0	0	**0.163**	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**	**A1**
699.8	48.228	N/A	100	N/A	N/A	N/A	N/A	0.686	0	0	**0.163**	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**	**A1**
699.6	48.392	N/A	100	N/A	N/A	N/A	N/A	0.684	0	0	**0.163**	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**	**A1**



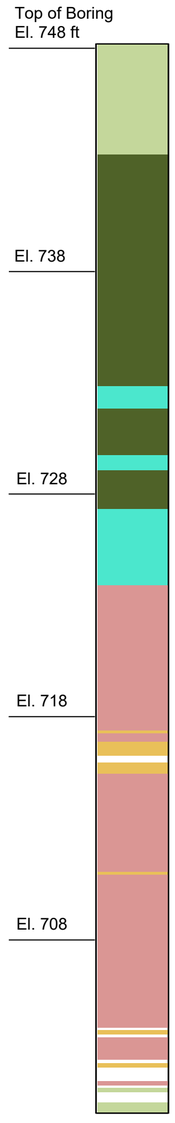
Adapted from "Discussion of 'Liquefaction Potential of Silts from CPTu'" (Robertson 2008). Zone A_1 and Zone A_2 samples are generally sand-like. Zone B samples are generally clay-like and not susceptible to cyclic softening. Zone C samples are generally clay-like and susceptible to cyclic softening. Note that the transition from clay-like to sand-like in this chart does not exactly match the liquefaction calculations herein; that is, some transitional samples in Zone B and Zone C will be treated as sand-like and analyzed for liquefaction if the calculations indicate as such.



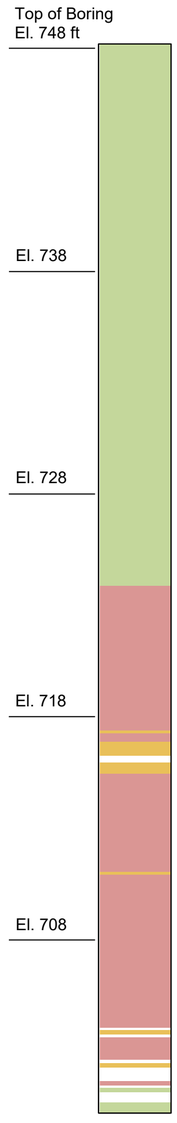




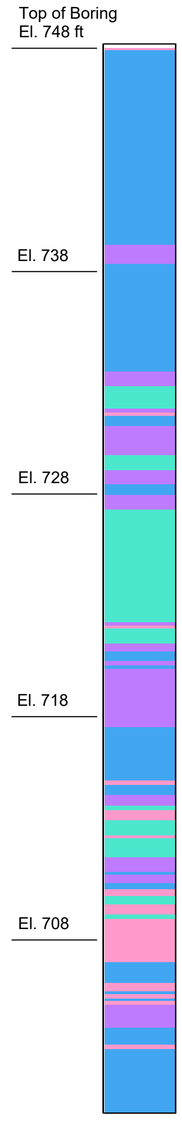
KIF-BF-CPT-3A, Liquefaction Triggering Results



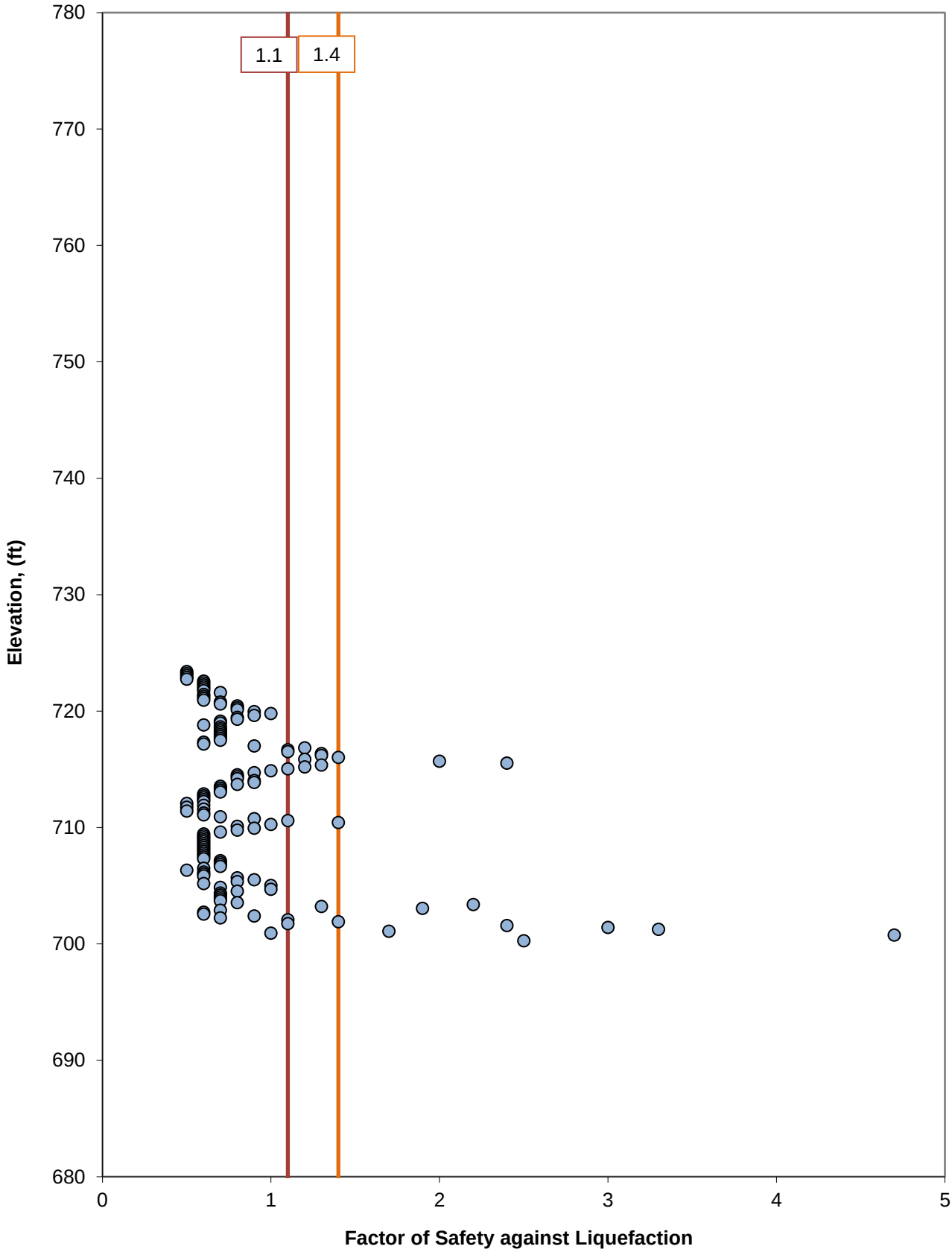
KIF-BF-CPT-3A, Liquefaction Triggering Results



KIF-BF-CPT-3A, Robertson Soil Type



KIF TDEC Stability, Boring = KIF-BF-CPT-3A, Source = 10 Hz, Mw = 6, Event = Design EQ, CPT Data, Simplified Stress-Based Approach



Project Information

Stantec Project Number =	175668043
Project Name =	KIF TDEC Stability
CPT ID =	KIF-BF-CPT-4AA

Boring Location (optional)

Northing =	
Easting =	

OR

Baseline Station =	
Offset (+ Right) =	

Using qt (corrected for u2 PWP) or qc (backcalculated uncorrected field tip)

Cone ID (optional) =	AD184	
Use qc instead of qt?	0	(1: Yes, 0: No)
Cone Area Ratio (a) =	0.80	

Drilling Information

Top of Hole Elevation =	769.0	feet
Water Depth during CPT (negative for U/S borings) =	10.0	feet
Depth data collection began =	0.16	feet
Avg. Total Unit Wt. Above 1st Sample =	120.00	pcf

During Earthquake Information

Water Depth during EQ (relative to CPT TOH, negative for U/S borings) =	6.5	feet
Final Grade Elevation during EQ =	769.0	feet
Avg. Total Unit Wt. of Cut/Fill =	120	pcf

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile?	0	(1: Yes, 0: No)

If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile:	ng_Pond_Section, KIF-BF-SPT5_NOR	
α at each Sample Depth known?	1	(1: Yes, 0: No)

If previous answer is No, then enter curve fit parameters below (α vs. depth curve)

If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_α will be one.

m4:	
m3:	
m2:	
m1:	
m0:	

Associated ground response profile:	hing_Pond_Section, KIF-BF-CPT4AA	
Get CSR from shear stress envelope?	0	(1: Yes, 0: No)

If previous answer is No, then CSR will be calculated using a_{max} and r_d

Max. Shear Stress at each sample depth known?		(1: Yes, 0: No)

If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4:	
m3:	
m2:	
m1:	

Earthquake Information

EQ Source (e.g., New Madrid)	10 Hz
Event (e.g., MCE, OBE)	Design EQ
a_{max} (g) (top of ground surface)	0.20
EQ Mag (Mw)	6.0

Inputs

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
0.164	2.639	0.020	120	Irrelevant Fill	Sand-like		0.004			
0.328	130.019	0.083	120	Irrelevant Fill	Sand-like		0.005			
0.492	183.257	0.182	120	Irrelevant Fill	Sand-like		0.005			
0.656	232.246	0.325	120	Irrelevant Fill	Sand-like		0.006			
0.820	220.213	0.820	120	Irrelevant Fill	Sand-like		0.006			
0.984	282.529	1.053	120	Irrelevant Fill	Sand-like		0.007			
1.148	299.954	1.483	120	Irrelevant Fill	Sand-like		0.007			
1.312	315.940	2.294	120	Irrelevant Fill	Sand-like		0.008			
1.476	364.677	3.785	120	Irrelevant Fill	Sand-like		0.008			
1.640	388.790	5.553	120	Irrelevant Fill	Sand-like		0.008			
1.804	457.090	6.271	120	Irrelevant Fill	Sand-like		0.009			
1.968	453.147	7.046	120	Irrelevant Fill	Sand-like		0.009			
2.133	444.885	8.377	120	Irrelevant Fill	Sand-like		0.009			
2.297	403.562	8.090	120	Irrelevant Fill	Sand-like		0.009			
2.461	328.364	7.781	120	Irrelevant Fill	Sand-like		0.010			
2.625	278.385	6.935	120	Irrelevant Fill	Sand-like		0.010			
2.789	256.133	5.790	120	Irrelevant Fill	Sand-like		0.010			
2.953	332.414	5.400	120	Irrelevant Fill	Sand-like		0.010			
3.117	415.701	5.518	120	Irrelevant Fill	Sand-like		0.010			
3.281	460.816	5.618	120	Irrelevant Fill	Sand-like		0.010			
3.445	480.138	6.269	120	Irrelevant Fill	Sand-like		0.010			
3.609	496.246	7.052	120	Irrelevant Fill	Sand-like		0.010			
3.773	524.725	8.021	120	Irrelevant Fill	Sand-like		0.010			
3.937	528.234	8.202	120	Irrelevant Fill	Sand-like		0.009			
4.101	508.828	8.800	120	Irrelevant Fill	Sand-like		0.009			
4.265	493.653	9.608	120	Irrelevant Fill	Sand-like		0.009			
4.429	465.634	10.015	120	Irrelevant Fill	Sand-like		0.009			
4.593	449.198	9.647	112	Fly Ash	Sand-like	Do Not Correct for FC	0.009			
4.757	407.646	9.147	112	Fly Ash	Sand-like	Do Not Correct for FC	0.009			
4.921	328.346	8.494	112	Fly Ash	Sand-like	Do Not Correct for FC	0.009			
5.085	267.177	7.785	112	Fly Ash	Sand-like	Do Not Correct for FC	0.009			
5.249	190.688	6.836	112	Fly Ash	Sand-like	Do Not Correct for FC	0.009			
5.413	125.602	4.996	112	Fly Ash	Sand-like	Do Not Correct for FC	0.009			
5.577	147.780	4.286	112	Fly Ash	Sand-like	Do Not Correct for FC	0.008			
5.741	248.404	5.139	112	Fly Ash	Sand-like	Do Not Correct for FC	0.008			
5.905	248.429	5.755	112	Fly Ash	Sand-like	Do Not Correct for FC	0.008			
6.069	316.011	5.464	112	Fly Ash	Sand-like	Do Not Correct for FC	0.008			
6.234	319.327	4.646	112	Fly Ash	Sand-like	Do Not Correct for FC	0.008			
6.398	317.945	3.765	112	Fly Ash	Sand-like	Do Not Correct for FC	0.007			
6.562	301.081	3.001	112	Fly Ash	Sand-like	Do Not Correct for FC	0.007			
6.726	300.363	3.039	112	Fly Ash	Sand-like	Do Not Correct for FC	0.007			
6.890	301.438	3.555	112	Fly Ash	Sand-like	Do Not Correct for FC	0.007			
7.054	297.550	3.316	112	Fly Ash	Sand-like	Do Not Correct for FC	0.007			
7.218	268.580	3.119	112	Fly Ash	Sand-like	Do Not Correct for FC	0.006			
7.382	255.644	2.264	112	Fly Ash	Sand-like	Do Not Correct for FC	0.006			
7.546	250.272	1.914	112	Fly Ash	Sand-like	Do Not Correct for FC	0.006			
7.710	233.543	1.881	112	Fly Ash	Sand-like	Do Not Correct for FC	0.006			
7.874	229.895	2.002	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
8.038	220.607	1.900	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
8.202	207.647	1.731	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
8.366	164.967	1.780	112	Fly Ash	Sand-like	Do Not Correct for FC	0.004			
8.530	116.873	1.970	112	Fly Ash	Sand-like	Do Not Correct for FC	0.004			
8.694	108.490	1.956	112	Fly Ash	Sand-like	Do Not Correct for FC	0.004			
8.858	103.345	1.401	112	Fly Ash	Sand-like	Do Not Correct for FC	0.003			
9.022	82.273	0.862	112	Fly Ash	Sand-like	Do Not Correct for FC	0.003			
9.186	77.669	0.486	112	Fly Ash	Sand-like	Do Not Correct for FC	0.003			
9.350	78.671	0.372	112	Fly Ash	Sand-like	Do Not Correct for FC	0.002			
9.514	81.215	0.405	112	Fly Ash	Sand-like	Do Not Correct for FC	0.002			
9.678	86.453	0.156	112	Fly Ash	Sand-like	Do Not Correct for FC	0.001			
9.842	88.027	0.392	112	Fly Ash	Sand-like	Do Not Correct for FC	0.001			
10.006	43.776	0.560	112	Fly Ash	Sand-like	Do Not Correct for FC	0.001			
10.170	103.070	0.546	112	Fly Ash	Sand-like	Do Not Correct for FC	0.001			
10.335	94.959	0.581	112	Fly Ash	Sand-like	Do Not Correct for FC	0.001			

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
10.499	92.425	0.523	112	Fly Ash	Sand-like	Do Not Correct for FC	0.001			
10.663	90.477	0.588	112	Fly Ash	Sand-like	Do Not Correct for FC	0.002			
10.827	88.391	0.524	112	Fly Ash	Sand-like	Do Not Correct for FC	0.002			
10.991	91.209	0.490	112	Fly Ash	Sand-like	Do Not Correct for FC	0.002			
11.155	107.069	0.500	112	Fly Ash	Sand-like	Do Not Correct for FC	0.002			
11.319	116.255	0.530	112	Fly Ash	Sand-like	Do Not Correct for FC	0.003			
11.483	112.922	0.705	112	Fly Ash	Sand-like	Do Not Correct for FC	0.003			
11.647	97.791	0.899	112	Fly Ash	Sand-like	Do Not Correct for FC	0.003			
11.811	82.742	1.031	112	Fly Ash	Sand-like	Do Not Correct for FC	0.003			
11.975	73.257	0.925	112	Fly Ash	Sand-like	Do Not Correct for FC	0.004			
12.139	66.123	0.778	112	Fly Ash	Sand-like	Do Not Correct for FC	0.004			
12.303	61.142	0.601	112	Fly Ash	Sand-like	Do Not Correct for FC	0.004			
12.467	55.972	0.398	112	Fly Ash	Sand-like	Do Not Correct for FC	0.004			
12.631	48.353	0.242	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
12.795	42.712	0.141	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
12.959	36.379	0.099	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
13.123	32.913	0.059	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
13.287	54.900	0.100	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
13.451	120.421	0.190	112	Fly Ash	Sand-like	Do Not Correct for FC	0.006			
13.615	99.886	0.701	112	Fly Ash	Sand-like	Do Not Correct for FC	0.006			
13.779	77.508	1.008	112	Fly Ash	Sand-like	Do Not Correct for FC	0.006			
13.943	62.712	1.210	112	Fly Ash	Sand-like	Do Not Correct for FC	0.006			
14.107	66.189	1.157	112	Fly Ash	Sand-like	Do Not Correct for FC	0.006			
14.271	99.477	1.320	112	Fly Ash	Sand-like	Do Not Correct for FC	0.006			
14.436	154.070	2.136	112	Fly Ash	Sand-like	Do Not Correct for FC	0.006			
14.600	234.558	2.897	112	Fly Ash	Sand-like	Do Not Correct for FC	0.006			
14.764	190.759	3.604	112	Fly Ash	Sand-like	Do Not Correct for FC	0.006			
14.928	155.299	3.518	112	Fly Ash	Sand-like	Do Not Correct for FC	0.007			
15.092	112.502	2.937	112	Fly Ash	Sand-like	Do Not Correct for FC	0.007			
15.256	91.782	1.995	112	Fly Ash	Sand-like	Do Not Correct for FC	0.007			
15.420	84.900	1.437	112	Fly Ash	Sand-like	Do Not Correct for FC	0.007			
15.584	78.789	1.203	112	Fly Ash	Sand-like	Do Not Correct for FC	0.007			
15.748	70.817	1.020	112	Fly Ash	Sand-like	Do Not Correct for FC	0.007			
15.912	60.783	0.976	112	Fly Ash	Sand-like	Do Not Correct for FC	0.007			
16.076	54.713	0.982	112	Fly Ash	Sand-like	Do Not Correct for FC	0.007			
16.240	47.934	0.959	112	Fly Ash	Sand-like	Do Not Correct for FC	0.006			
16.404	39.838	0.798	112	Fly Ash	Sand-like	Do Not Correct for FC	0.006			
16.568	37.786	0.717	112	Fly Ash	Sand-like	Do Not Correct for FC	0.006			
16.732	37.945	0.672	112	Fly Ash	Sand-like	Do Not Correct for FC	0.006			
16.896	35.533	0.613	112	Fly Ash	Sand-like	Do Not Correct for FC	0.006			
17.060	35.606	0.556	112	Fly Ash	Sand-like	Do Not Correct for FC	0.006			
17.224	43.062	0.565	112	Fly Ash	Sand-like	Do Not Correct for FC	0.006			
17.388	55.266	0.928	112	Fly Ash	Sand-like	Do Not Correct for FC	0.006			
17.552	99.014	1.475	112	Fly Ash	Sand-like	Do Not Correct for FC	0.006			
17.716	123.457	2.063	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
17.880	123.671	2.039	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
18.044	86.475	2.015	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
18.208	66.529	1.642	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
18.372	66.264	1.542	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
18.537	72.606	1.556	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
18.701	70.176	1.527	112	Fly Ash	Sand-like	Do Not Correct for FC	0.004			
18.865	66.242	1.495	112	Fly Ash	Sand-like	Do Not Correct for FC	0.004			
19.029	65.650	1.556	112	Fly Ash	Sand-like	Do Not Correct for FC	0.004			
19.193	82.708	2.042	112	Fly Ash	Sand-like	Do Not Correct for FC	0.004			
19.357	110.413	2.322	112	Fly Ash	Sand-like	Do Not Correct for FC	0.004			
19.521	100.416	2.697	122	Bottom Ash	Sand-like		0.004			
19.685	84.846	1.466	122	Bottom Ash	Sand-like		0.003			
19.849	63.346	1.578	122	Bottom Ash	Sand-like		0.003			
20.013	44.247	1.243	122	Bottom Ash	Sand-like		0.003			
20.177	119.002	1.342	122	Bottom Ash	Sand-like		0.003			
20.341	176.829	1.618	122	Bottom Ash	Sand-like		0.003			
20.505	249.068	2.700	122	Bottom Ash	Sand-like		0.003			
20.669	230.746	3.233	122	Bottom Ash	Sand-like		0.002			
20.833	204.365	3.523	122	Bottom Ash	Sand-like		0.002			
20.997	190.621	2.948	122	Bottom Ash	Sand-like		0.002			
21.161	163.201	2.386	126	Subunit 2	Sand-like		0.002			
21.325	150.862	1.741	126	Subunit 2	Sand-like		0.001			
21.489	148.996	1.378	126	Subunit 2	Sand-like		0.001			
21.653	150.169	0.968	126	Subunit 2	Sand-like		0.001			
21.817	149.996	0.611	126	Subunit 2	Sand-like		0.000			
21.981	127.240	0.534	126	Subunit 2	Sand-like		0.000			
22.145	101.706	0.481	126	Subunit 2	Sand-like		0.001			
22.309	87.542	0.378	126	Subunit 2	Sand-like		0.001			
22.473	90.373	0.259	126	Subunit 2	Sand-like		0.002			
22.638	97.322	0.162	126	Subunit 2	Sand-like		0.002			

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
22.802	107.255	0.300	126	Subunit 2	Sand-like		0.002			
22.966	93.901	0.654	126	Subunit 2	Sand-like		0.003			
23.130	80.397	0.819	126	Subunit 2	Sand-like		0.003			
23.294	105.311	1.179	126	Subunit 2	Sand-like		0.004			
23.458	109.322	1.243	126	Subunit 2	Sand-like		0.004			
23.622	116.918	1.056	126	Subunit 2	Sand-like		0.005			
23.786	124.485	0.762	126	Subunit 2	Sand-like		0.005			
23.950	107.057	0.401	126	Subunit 2	Sand-like		0.006			
24.114	96.440	0.287	126	Subunit 2	Sand-like		0.006			
24.278	81.198	0.201	126	Subunit 2	Sand-like		0.006			
24.442	68.630	0.170	126	Subunit 2	Sand-like		0.007			
24.606	62.767	0.140	126	Subunit 2	Sand-like		0.007			
24.770	64.754	0.203	126	Subunit 2	Sand-like		0.008			
24.934	61.114	0.337	126	Subunit 2	Sand-like		0.008			
25.098	57.917	0.554	126	Subunit 2	Sand-like		0.009			
25.262	56.157	0.727	126	Subunit 2	Sand-like		0.009			
25.426	55.222	0.842	126	Subunit 2	Sand-like		0.010			
25.590	59.185	1.044	126	Subunit 2	Sand-like		0.010			
25.754	66.318	1.289	126	Subunit 2	Sand-like		0.011			
25.918	67.090	1.523	126	Subunit 2	Sand-like		0.011			
26.082	66.376	1.307	126	Subunit 2	Sand-like		0.012			
26.246	75.867	1.481	126	Subunit 2	Sand-like		0.012			
26.410	82.494	1.665	126	Subunit 2	Sand-like		0.013			
26.574	85.527	1.909	126	Subunit 2	Sand-like		0.013			
26.739	94.386	1.972	126	Subunit 2	Sand-like		0.014			
26.903	117.598	2.087	126	Subunit 2	Sand-like		0.014			
27.067	105.614	2.200	126	Subunit 2	Sand-like		0.015			
27.231	98.900	2.109	126	Subunit 2	Sand-like		0.015			
27.395	90.685	2.141	126	Subunit 2	Sand-like		0.016			
27.559	88.420	2.098	126	Subunit 2	Sand-like		0.017			
27.723	83.355	2.098	126	Subunit 2	Sand-like		0.017			
27.887	76.178	1.960	126	Subunit 2	Sand-like		0.018			
28.051	73.250	1.854	126	Subunit 2	Sand-like		0.018			
28.215	67.814	1.670	126	Subunit 2	Sand-like		0.019			
28.379	63.587	1.547	126	Subunit 2	Sand-like		0.019			
28.543	63.430	1.437	131	Subunit 3	Sand-like		0.020			
28.707	57.258	1.341	131	Subunit 3	Sand-like		0.020			
28.871	53.062	1.228	131	Subunit 3	Sand-like		0.021			
29.035	53.712	1.108	131	Subunit 3	Sand-like		0.021			
29.199	55.586	1.084	131	Subunit 3	Sand-like		0.022			
29.363	61.570	0.914	131	Subunit 3	Sand-like		0.022			
29.527	68.145	1.142	131	Subunit 3	Sand-like		0.023			
29.691	62.571	1.319	131	Subunit 3	Sand-like		0.023			
29.855	57.236	1.402	131	Subunit 3	Sand-like		0.024			
30.019	60.460	1.445	131	Subunit 3	Sand-like		0.024			
30.183	61.873	1.525	131	Subunit 3	Sand-like		0.025			
30.347	62.897	1.621	131	Subunit 3	Sand-like		0.025			
30.511	64.073	1.657	131	Subunit 3	Sand-like		0.026			
30.675	62.966	1.676	131	Subunit 3	Sand-like		0.026			
30.840	61.062	1.701	131	Subunit 3	Sand-like		0.027			
31.004	60.665	1.706	131	Subunit 3	Sand-like		0.027			
31.168	65.176	1.756	131	Subunit 3	Sand-like		0.028			
31.332	71.652	1.845	131	Subunit 3	Sand-like		0.028			
31.496	75.213	1.974	131	Subunit 3	Sand-like		0.028			
31.660	69.316	1.980	131	Subunit 3	Sand-like		0.029			
31.824	64.978	1.863	131	Subunit 3	Sand-like		0.029			
31.988	60.561	1.720	131	Subunit 3	Sand-like		0.030			
32.152	59.665	1.657	131	Subunit 3	Sand-like		0.030			
32.316	61.876	1.635	131	Subunit 3	Sand-like		0.030			
32.480	65.290	1.706	131	Subunit 3	Sand-like		0.031			
32.644	68.998	1.264	131	Subunit 3	Sand-like		0.031			
32.808	69.815	1.440	131	Subunit 3	Sand-like		0.032			
32.972	77.170	1.758	131	Subunit 3	Sand-like		0.032			
33.136	74.776	1.855	131	Subunit 3	Sand-like		0.032			
33.300	71.406	1.684	131	Subunit 3	Sand-like		0.033			
33.464	63.715	1.381	131	Subunit 3	Sand-like		0.033			
33.628	45.326	1.144	126	Subunit 2	Sand-like		0.033			
33.792	31.534	0.936	126	Subunit 2	Sand-like		0.033			
33.956	17.565	0.755	126	Subunit 2	Sand-like		0.034			
34.120	12.897	0.405	126	Subunit 2	Sand-like		0.034			
34.284	11.226	0.180	126	Subunit 2	Sand-like		0.034			
34.448	9.533	0.070	126	Subunit 2	Sand-like		0.035			
34.612	8.887	0.059	126	Subunit 2	Sand-like		0.035			
34.776	9.119	0.061	126	Subunit 2	Sand-like		0.035			
34.941	9.377	0.062	126	Subunit 2	Sand-like		0.035			

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
35.105	8.482	0.059	126	Subunit 2	Sand-like		0.036			
35.269	7.629	0.046	126	Subunit 2	Sand-like		0.036			
35.433	7.210	0.034	126	Subunit 2	Sand-like		0.036			
35.597	6.952	0.026	126	Subunit 2	Sand-like		0.036			
35.761	6.400	0.018	126	Subunit 2	Sand-like		0.037			
35.925	6.113	0.018	126	Subunit 2	Sand-like		0.037			
36.089	5.884	0.015	126	Subunit 2	Sand-like		0.037			
36.253	5.439	0.017	126	Subunit 2	Sand-like		0.037			
36.417	5.571	0.016	126	Subunit 2	Sand-like		0.037			
36.581	5.573	0.020	126	Subunit 2	Sand-like		0.038			
36.745	6.611	0.031	126	Subunit 2	Sand-like		0.038			
36.909	7.785	0.048	126	Subunit 2	Sand-like		0.038			
37.073	8.188	0.076	126	Subunit 2	Sand-like		0.038			
37.237	8.505	0.083	126	Subunit 2	Sand-like		0.038			
37.401	7.939	0.092	126	Subunit 2	Sand-like		0.038			
37.565	7.724	0.129	126	Subunit 2	Sand-like		0.038			
37.729	6.566	0.124	126	Subunit 2	Sand-like		0.039			
37.893	6.174	0.115	126	Subunit 2	Sand-like		0.039			
38.057	6.672	0.095	126	Subunit 2	Sand-like		0.039			
38.221	7.042	0.096	126	Subunit 2	Sand-like		0.039			
38.385	7.296	0.092	126	Subunit 2	Sand-like		0.039			
38.549	7.634	0.086	126	Subunit 2	Sand-like		0.039			
38.713	7.383	0.069	126	Subunit 2	Sand-like		0.039			
38.877	7.025	0.075	126	Subunit 2	Sand-like		0.039			
39.042	7.030	0.085	126	Subunit 2	Sand-like		0.039			
39.206	8.417	0.099	126	Subunit 2	Sand-like		0.039			
39.370	9.609	0.120	126	Subunit 2	Sand-like		0.039			
39.534	12.506	0.134	126	Subunit 2	Sand-like		0.039			
39.698	16.396	0.224	126	Subunit 2	Sand-like		0.039			
39.862	18.038	0.269	126	Subunit 2	Sand-like		0.039			
40.026	19.109	0.312	126	Subunit 2	Sand-like		0.039			
40.190	20.413	0.338	126	Subunit 2	Sand-like		0.039			
40.354	22.849	0.358	126	Subunit 2	Sand-like		0.039			
40.518	23.069	0.352	126	Subunit 2	Sand-like		0.039			
40.682	22.827	0.354	126	Subunit 2	Sand-like		0.039			
40.846	22.404	0.343	126	Subunit 2	Sand-like		0.039			
41.010	21.454	0.325	126	Subunit 2	Sand-like		0.039			
41.174	21.392	0.314	126	Subunit 2	Sand-like		0.039			
41.338	20.389	0.310	126	Subunit 2	Sand-like		0.039			
41.502	19.372	0.291	126	Subunit 2	Sand-like		0.039			
41.666	16.935	0.254	126	Subunit 2	Sand-like		0.039			
41.830	15.243	0.213	126	Subunit 2	Sand-like		0.039			
41.994	12.940	0.175	126	Subunit 2	Sand-like		0.039			
42.158	9.641	0.135	126	Subunit 2	Sand-like		0.039			
42.322	8.587	0.098	126	Subunit 2	Sand-like		0.039			
42.486	6.644	0.045	126	Subunit 2	Sand-like		0.039			
42.650	6.214	0.029	126	Subunit 2	Sand-like		0.039			
42.814	6.027	0.010	126	Subunit 2	Sand-like		0.039			
42.978	5.616	0.010	126	Subunit 2	Sand-like		0.039			
43.143	5.444	0.010	126	Subunit 2	Sand-like		0.039			
43.307	5.401	0.010	126	Subunit 2	Sand-like		0.039			
43.471	5.656	0.010	126	Subunit 2	Sand-like		0.039			
43.635	6.041	0.016	126	Subunit 2	Sand-like		0.038			
43.799	6.546	0.108	126	Subunit 2	Sand-like		0.038			
43.963	22.931	0.163	126	Subunit 2	Sand-like		0.038			
44.127	113.873	0.370	126	Subunit 2	Sand-like		0.038			
44.291	156.685	0.630	126	Subunit 2	Sand-like		0.038			
44.455	149.127	0.825	126	Subunit 2	Sand-like		0.038			
44.619	105.675	0.874	126	Subunit 2	Sand-like		0.038			
44.783	60.451	0.844	126	Subunit 2	Sand-like		0.038			
44.947	43.417	0.548	126	Subunit 2	Sand-like		0.038			
45.111	32.268	0.357	126	Subunit 2	Sand-like		0.038			
45.275	26.010	0.176	126	Subunit 2	Sand-like		0.037			
45.439	20.238	0.149	126	Subunit 2	Sand-like		0.037			
45.603	17.060	0.146	126	Subunit 2	Sand-like		0.037			
45.767	13.975	0.108	126	Subunit 2	Sand-like		0.037			
45.931	12.382	0.073	126	Subunit 2	Sand-like		0.037			
46.095	13.347	0.108	126	Subunit 2	Sand-like		0.037			
46.259	12.529	0.182	126	Subunit 2	Sand-like		0.037			
46.423	17.504	0.253	126	Subunit 2	Sand-like		0.037			
46.587	15.365	0.182	126	Subunit 2	Sand-like		0.037			
46.751	18.427	0.299	126	Subunit 2	Sand-like		0.036			
46.915	18.163	0.245	126	Subunit 2	Sand-like		0.036			
47.079	25.941	0.326	126	Subunit 2	Sand-like		0.036			
47.244	26.022	0.495	126	Subunit 2	Sand-like		0.036			

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
47.408	35.160	0.468	126	Subunit 2	Sand-like		0.036			
47.572	58.274	0.252	126	Subunit 2	Sand-like		0.036			
47.736	56.127	0.142	126	Subunit 2	Sand-like		0.036			
47.900	40.388	0.116	126	Subunit 2	Sand-like		0.035			
48.064	27.362	0.113	126	Subunit 2	Sand-like		0.035			
48.228	19.865	0.155	126	Subunit 2	Sand-like		0.035			
48.392	20.471	0.143	126	Subunit 2	Sand-like		0.035			
48.556	25.798	0.236	126	Subunit 2	Sand-like		0.035			
48.720	27.708	0.346	126	Subunit 2	Sand-like		0.035			
48.884	35.627	0.459	126	Subunit 2	Sand-like		0.035			
49.048	64.370	0.525	126	Subunit 2	Sand-like		0.034			
49.212	95.218	0.464	126	Subunit 2	Sand-like		0.034			
49.376	114.575	0.631	126	Subunit 2	Sand-like		0.034			
49.540	139.740	0.900	126	Subunit 2	Sand-like		0.034			
49.704	148.264	1.315	126	Subunit 2	Sand-like		0.034			
49.868	169.830	1.500	126	Subunit 2	Sand-like		0.034			
50.032	206.122	1.847	126	Subunit 2	Sand-like		0.034			
50.196	232.649	2.079	126	Subunit 2	Sand-like		0.033			
50.360	274.765	2.601	126	Subunit 2	Sand-like		0.033			
50.524	290.766	3.127	126	Subunit 2	Sand-like		0.033			
50.688	278.857	3.383	126	Subunit 2	Sand-like		0.033			
50.852	268.156	3.530	126	Subunit 2	Sand-like		0.033			
51.016	246.548	3.490	126	Subunit 2	Sand-like		0.033			
51.180	219.938	3.264	126	Subunit 2	Sand-like		0.033			
51.345	199.443	2.850	126	Subunit 2	Sand-like		0.032			
51.509	191.033	2.440	126	Subunit 2	Sand-like		0.032			
51.673	187.086	2.071	126	Subunit 2	Sand-like		0.032			
51.837	181.640	1.876	126	Subunit 2	Sand-like		0.032			
52.001	170.652	1.779	126	Subunit 2	Sand-like		0.032			
52.165	151.634	1.656	126	Subunit 2	Sand-like		0.032			
52.329	139.106	1.507	126	Subunit 2	Sand-like		0.032			
52.493	137.025	1.133	126	Subunit 2	Sand-like		0.031			
52.657	135.482	1.063	126	Subunit 2	Sand-like		0.031			
52.821	135.838	1.076	126	Subunit 2	Sand-like		0.031			
52.985	139.957	1.222	126	Subunit 2	Sand-like		0.031			
53.149	147.425	1.250	126	Subunit 2	Sand-like		0.031			
53.313	160.763	1.200	126	Subunit 2	Sand-like		0.031			
53.477	166.239	1.111	126	Subunit 2	Sand-like		0.031			
53.641	141.620	1.041	126	Subunit 2	Sand-like		0.030			
53.805	99.093	1.044	126	Subunit 2	Sand-like		0.030			
53.969	65.002	1.147	126	Subunit 2	Sand-like		0.030			
54.133	49.276	1.470	126	Subunit 2	Sand-like		0.030			
54.297	41.924	1.494	126	Subunit 2	Sand-like		0.030			
54.461	86.513	1.352	126	Subunit 2	Sand-like		0.030			
54.625	187.063	1.812	126	Subunit 2	Sand-like		0.030			
54.789	209.754	2.610	126	Subunit 2	Sand-like		0.029			
54.953	243.932	3.353	126	Subunit 2	Sand-like		0.029			
55.117	380.557	3.943	126	Subunit 2	Sand-like		0.029			
55.281	426.676	4.060	126	Subunit 2	Sand-like		0.029			
55.446	364.165	4.565	126	Subunit 2	Sand-like		0.029			
55.610	259.736	4.111	126	Subunit 2	Sand-like		0.029			
55.774	156.185	4.481	126	Subunit 2	Sand-like		0.029			
55.938	140.327	4.417	126	Subunit 2	Sand-like		0.028			
56.102	141.012	4.856	126	Subunit 2	Sand-like		0.028			
56.266	150.276	5.486	126	Subunit 2	Sand-like		0.028			
56.430	165.085	6.011	126	Subunit 2	Sand-like		0.028			
56.594	162.286	5.835	126	Subunit 2	Sand-like		0.028			
56.758	185.670	5.775	126	Subunit 2	Sand-like		0.028			
56.922	185.290	6.359	126	Subunit 2	Sand-like		0.028			
57.086	191.478	7.096	126	Subunit 2	Sand-like		0.028			
57.250	184.174	7.872	126	Subunit 2	Sand-like		0.028			
57.414	197.641	8.618	126	Subunit 2	Sand-like		0.028			
57.578	240.047	9.487	126	Subunit 2	Sand-like		0.027			
57.742	228.254	9.153	126	Subunit 2	Sand-like		0.027			
57.906	204.934	8.391	126	Subunit 2	Sand-like		0.027			
58.070	214.208	8.029	126	Subunit 2	Sand-like		0.027			
58.234	222.245	7.923	126	Subunit 2	Sand-like		0.027			
58.398	238.266	8.661	126	Subunit 2	Sand-like		0.027			
58.562	237.901	8.659	126	Subunit 2	Sand-like		0.027			
58.726	213.407	8.714	126	Subunit 2	Sand-like		0.027			
58.890	237.858	4.280	126	Subunit 2	Sand-like		0.027			
59.054	269.769	8.482	126	Subunit 2	Sand-like		0.026			
59.218	165.543	9.981	126	Subunit 2	Sand-like		0.026			
59.382	304.614	11.326	126	Subunit 2	Sand-like		0.026			
59.547	262.839	10.653	126	Subunit 2	Sand-like		0.026			

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
59.711	213.755	9.677	126	Subunit 2	Sand-like		0.026			
59.875	204.927	9.438	126	Subunit 2	Sand-like		0.026			
60.039	242.923	9.587	126	Subunit 2	Sand-like		0.026			
60.203	270.338	11.132	126	Subunit 2	Sand-like		0.026			
60.367	300.951	12.281	126	Subunit 2	Sand-like		0.026			
60.531	261.076	12.633	126	Subunit 2	Sand-like		0.026			
60.695	259.840	11.426	126	Subunit 2	Sand-like		0.025			
60.859	228.048	10.154	126	Subunit 2	Sand-like		0.025			
61.023	179.627	10.011	126	Subunit 2	Sand-like		0.025			
61.187	189.049	9.129	126	Subunit 2	Sand-like		0.025			
61.351	189.237	9.032	126	Subunit 2	Sand-like		0.025			
61.515	240.542	10.145	126	Subunit 2	Sand-like		0.025			
61.679	233.121	10.263	126	Subunit 2	Sand-like		0.025			
61.843	223.737	10.245	126	Subunit 2	Sand-like		0.025			
62.007	213.284	9.649	126	Subunit 2	Sand-like		0.025			
62.171	188.642	7.383	126	Subunit 2	Sand-like		0.025			
62.335	163.960	6.942	126	Subunit 2	Sand-like		0.025			
62.499	144.568	5.689	126	Subunit 2	Sand-like		0.024			
62.663	105.808	5.016	126	Subunit 2	Sand-like		0.024			
62.827	60.789	5.024	126	Subunit 2	Sand-like		0.024			
62.991	230.631	5.040	126	Subunit 2	Sand-like		0.024			
63.155	273.555	5.648	126	Subunit 2	Sand-like		0.024			
63.319	306.372	7.573	126	Subunit 2	Sand-like		0.024			
63.483	433.621	8.433	126	Subunit 2	Sand-like		0.024			
63.648	424.555	8.954	126	Subunit 2	Sand-like		0.024			
63.812	339.376	9.063	126	Subunit 2	Sand-like		0.024			
63.976	348.035	9.735	126	Subunit 2	Sand-like		0.024			
64.140	422.922	10.462	126	Subunit 2	Sand-like		0.024			
64.304	492.193	11.026	126	Subunit 2	Sand-like		0.023			
64.468	554.480	0.000	126	Subunit 2	Sand-like		0.023			
64.632	526.363	0.000	126	Subunit 2	Sand-like		0.023			

LIQUEFACTION POTENTIAL ASSESSMENT FOR COARSE GRAINED SOILS USING CONE PENETRATION TEST DATA

Facility: KIF TDEC Stability
Project No.: 175668043
CPT ID: KIF-BF-CPT-4AA

Water Elevation during CPT:	759.0	ft
Depth to Water during CPT:	10.0	ft *(relative to ground surface during CPT)*
Water Elevation during Earthquake:	762.5	ft
Depth to Water during Earthquake:	6.5	ft *(relative to ground surface during CPT)*
Final Grade Elevation during EQ:	769	ft *(if no fill, then set this equal to top of CPT hole elev.)*
Height of Final Grade above CPT TOH:	0.0	ft *(relative to ground surface during CPT, + Fill, - Cut)*
Unit Weight of Cut/Fill to Achieve Final Grade	120	pcf
Cut/Fill Total Stress (+ Fill, - Cut):	0.00	tsf

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v}'_{CPT}$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v}'_{EQ}$ (tsf)
769.0				Vertical Stresses above 1st CPT:			**0.01**	**0.01**	**0.00**	**0.00**	**0.01**	**0.01**
768.8	0.164	2.64	0.02	120	**0.16**	0.08	0.01	0.01	0.00	0.00	0.01	0.01
768.7	0.328	130.02	0.08	120	0.25	0.16	0.02	0.02	0.00	0.00	0.02	0.02
768.5	0.492	183.26	0.18	120	0.41	0.16	0.03	0.03	0.00	0.00	0.03	0.03
768.3	0.656	232.25	0.33	120	0.57	0.16	0.04	0.04	0.00	0.00	0.04	0.04
768.2	0.820	220.21	0.82	120	0.74	0.16	0.05	0.05	0.00	0.00	0.05	0.05
768.0	0.984	282.53	1.05	120	0.90	0.16	0.06	0.06	0.00	0.00	0.06	0.06
767.9	1.148	299.95	1.48	120	1.07	0.16	0.07	0.07	0.00	0.00	0.07	0.07
767.7	1.312	315.94	2.29	120	1.23	0.16	0.08	0.08	0.00	0.00	0.08	0.08
767.5	1.476	364.68	3.79	120	1.39	0.16	0.09	0.09	0.00	0.00	0.09	0.09
767.4	1.640	388.79	5.55	120	1.56	0.16	0.10	0.10	0.00	0.00	0.10	0.10
767.2	1.804	457.09	6.27	120	1.72	0.16	0.11	0.11	0.00	0.00	0.11	0.11
767.0	1.968	453.15	7.05	120	1.89	0.16	0.12	0.12	0.00	0.00	0.12	0.12
766.9	2.133	444.88	8.38	120	2.05	0.16	0.13	0.13	0.00	0.00	0.13	0.13
766.7	2.297	403.56	8.09	120	2.21	0.16	0.14	0.14	0.00	0.00	0.14	0.14
766.5	2.461	328.36	7.78	120	2.38	0.16	0.15	0.15	0.00	0.00	0.15	0.15
766.4	2.625	278.38	6.94	120	2.54	0.16	0.16	0.16	0.00	0.00	0.16	0.16
766.2	2.789	256.13	5.79	120	2.71	0.16	0.17	0.17	0.00	0.00	0.17	0.17
766.0	2.953	332.41	5.40	120	2.87	0.16	0.18	0.18	0.00	0.00	0.18	0.18
765.9	3.117	415.70	5.52	120	3.03	0.16	0.19	0.19	0.00	0.00	0.19	0.19
765.7	3.281	460.82	5.62	120	3.20	0.16	0.20	0.20	0.00	0.00	0.20	0.20
765.6	3.445	480.14	6.27	120	3.36	0.16	0.21	0.21	0.00	0.00	0.21	0.21
765.4	3.609	496.25	7.05	120	3.53	0.16	0.22	0.22	0.00	0.00	0.22	0.22
765.2	3.773	524.72	8.02	120	3.69	0.16	0.23	0.23	0.00	0.00	0.23	0.23
765.1	3.937	528.23	8.20	120	3.85	0.16	0.24	0.24	0.00	0.00	0.24	0.24
764.9	4.101	508.83	8.80	120	4.02	0.16	0.25	0.25	0.00	0.00	0.25	0.25
764.7	4.265	493.65	9.61	120	4.18	0.16	0.26	0.26	0.00	0.00	0.26	0.26
764.6	4.429	465.63	10.02	120	4.35	0.16	0.27	0.27	0.00	0.00	0.27	0.27
764.4	4.593	449.20	9.65	112	4.51	0.16	0.28	0.28	0.00	0.00	0.28	0.28
764.2	4.757	407.65	9.15	112	4.68	0.16	0.28	0.28	0.00	0.00	0.28	0.28
764.1	4.921	328.35	8.49	112	4.84	0.16	0.29	0.29	0.00	0.00	0.29	0.29
763.9	5.085	267.18	7.79	112	5.00	0.16	0.30	0.30	0.00	0.00	0.30	0.30
763.8	5.249	190.69	6.84	112	5.17	0.16	0.31	0.31	0.00	0.00	0.31	0.31
763.6	5.413	125.60	5.00	112	5.33	0.16	0.32	0.32	0.00	0.00	0.32	0.32
763.4	5.577	147.78	4.29	112	5.50	0.16	0.33	0.33	0.00	0.00	0.33	0.33
763.3	5.741	248.40	5.14	112	5.66	0.16	0.34	0.34	0.00	0.00	0.34	0.34
763.1	5.905	248.43	5.76	112	5.82	0.16	0.35	0.35	0.00	0.00	0.35	0.35
762.9	6.069	316.01	5.46	112	5.99	0.16	0.36	0.36	0.00	0.00	0.36	0.36
762.8	6.234	319.33	4.65	112	6.15	0.16	0.37	0.37	0.00	0.00	0.37	0.37
762.6	6.398	317.94	3.77	112	6.32	0.16	0.38	0.38	0.00	0.00	0.38	0.38
762.4	6.562	301.08	3.00	112	6.48	0.16	0.39	0.39	0.00	0.00	0.39	0.38
762.3	6.726	300.36	3.04	112	6.64	0.16	0.39	0.39	0.00	0.01	0.39	0.39
762.1	6.890	301.44	3.56	112	6.81	0.16	0.40	0.40	0.00	0.01	0.40	0.39
761.9	7.054	297.55	3.32	112	6.97	0.16	0.41	0.41	0.00	0.02	0.41	0.40
761.8	7.218	268.58	3.12	112	7.14	0.16	0.42	0.42	0.00	0.02	0.42	0.40
761.6	7.382	255.64	2.26	112	7.30	0.16	0.43	0.43	0.00	0.03	0.43	0.40
761.5	7.546	250.27	1.91	112	7.46	0.16	0.44	0.44	0.00	0.03	0.44	0.41
761.3	7.710	233.54	1.88	112	7.63	0.16	0.45	0.45	0.00	0.04	0.45	0.41
761.1	7.874	229.89	2.00	112	7.79	0.16	0.46	0.46	0.00	0.04	0.46	0.42
761.0	8.038	220.61	1.90	112	7.96	0.16	0.47	0.47	0.00	0.05	0.47	0.42
760.8	8.202	207.65	1.73	112	8.12	0.16	0.48	0.48	0.00	0.05	0.48	0.42
760.6	8.366	164.97	1.78	112	8.28	0.16	0.49	0.49	0.00	0.06	0.49	0.43
760.5	8.530	116.87	1.97	112	8.45	0.16	0.50	0.50	0.00	0.06	0.50	0.43
760.3	8.694	108.49	1.96	112	8.61	0.16	0.50	0.50	0.00	0.07	0.50	0.44
760.1	8.858	103.34	1.40	112	8.78	0.16	0.51	0.51	0.00	0.07	0.51	0.44
760.0	9.022	82.27	0.86	112	8.94	0.16	0.52	0.52	0.00	0.08	0.52	0.44
759.8	9.186	77.67	0.49	112	9.10	0.16	0.53	0.53	0.00	0.08	0.53	0.45
759.6	9.350	78.67	0.37	112	9.27	0.16	0.54	0.54	0.00	0.09	0.54	0.45
759.5	9.514	81.22	0.41	112	9.43	0.16	0.55	0.55	0.00	0.09	0.55	0.46

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
759.3	9.678	86.45	0.16	112	9.60	0.16	0.56	0.56	0.00	0.10	0.56	0.46
759.2	9.842	88.03	0.39	112	9.76	0.16	0.57	0.57	0.00	0.10	0.57	0.46
759.0	10.006	43.78	0.56	112	9.92	0.16	0.58	0.58	0.00	0.11	0.58	0.47
758.8	10.170	103.07	0.55	112	10.09	0.16	0.59	0.59	0.01	0.11	0.58	0.47
758.7	10.335	94.96	0.58	112	10.25	0.16	0.60	0.60	0.01	0.12	0.59	0.48
758.5	10.499	92.42	0.52	112	10.42	0.16	0.61	0.61	0.02	0.12	0.59	0.48
758.3	10.663	90.48	0.59	112	10.58	0.16	0.62	0.62	0.02	0.13	0.59	0.49
758.2	10.827	88.39	0.52	112	10.74	0.16	0.62	0.62	0.03	0.13	0.60	0.49
758.0	10.991	91.21	0.49	112	10.91	0.16	0.63	0.63	0.03	0.14	0.60	0.49
757.8	11.155	107.07	0.50	112	11.07	0.16	0.64	0.64	0.04	0.15	0.61	0.50
757.7	11.319	116.26	0.53	112	11.24	0.16	0.65	0.65	0.04	0.15	0.61	0.50
757.5	11.483	112.92	0.71	112	11.40	0.16	0.66	0.66	0.05	0.16	0.61	0.51
757.4	11.647	97.79	0.90	112	11.56	0.16	0.67	0.67	0.05	0.16	0.62	0.51
757.2	11.811	82.74	1.03	112	11.73	0.16	0.68	0.68	0.06	0.17	0.62	0.51
757.0	11.975	73.26	0.93	112	11.89	0.16	0.69	0.69	0.06	0.17	0.63	0.52
756.9	12.139	66.12	0.78	112	12.06	0.16	0.70	0.70	0.07	0.18	0.63	0.52
756.7	12.303	61.14	0.60	112	12.22	0.16	0.71	0.71	0.07	0.18	0.64	0.53
756.5	12.467	55.97	0.40	112	12.39	0.16	0.72	0.72	0.08	0.19	0.64	0.53
756.4	12.631	48.35	0.24	112	12.55	0.16	0.73	0.73	0.08	0.19	0.64	0.53
756.2	12.795	42.71	0.14	112	12.71	0.16	0.73	0.73	0.09	0.20	0.65	0.54
756.0	12.959	36.38	0.10	112	12.88	0.16	0.74	0.74	0.09	0.20	0.65	0.54
755.9	13.123	32.91	0.06	112	13.04	0.16	0.75	0.75	0.10	0.21	0.66	0.55
755.7	13.287	54.90	0.10	112	13.21	0.16	0.76	0.76	0.10	0.21	0.66	0.55
755.5	13.451	120.42	0.19	112	13.37	0.16	0.77	0.77	0.11	0.22	0.66	0.55
755.4	13.615	99.89	0.70	112	13.53	0.16	0.78	0.78	0.11	0.22	0.67	0.56
755.2	13.779	77.51	1.01	112	13.70	0.16	0.79	0.79	0.12	0.23	0.67	0.56
755.1	13.943	62.71	1.21	112	13.86	0.16	0.80	0.80	0.12	0.23	0.68	0.57
754.9	14.107	66.19	1.16	112	14.03	0.16	0.81	0.81	0.13	0.24	0.68	0.57
754.7	14.271	99.48	1.32	112	14.19	0.16	0.82	0.82	0.13	0.24	0.68	0.57
754.6	14.436	154.07	2.14	112	14.35	0.16	0.83	0.83	0.14	0.25	0.69	0.58
754.4	14.600	234.56	2.90	112	14.52	0.16	0.84	0.84	0.14	0.25	0.69	0.58
754.2	14.764	190.76	3.60	112	14.68	0.16	0.84	0.84	0.15	0.26	0.70	0.59
754.1	14.928	155.30	3.52	112	14.85	0.16	0.85	0.85	0.15	0.26	0.70	0.59
753.9	15.092	112.50	2.94	112	15.01	0.16	0.86	0.86	0.16	0.27	0.70	0.60
753.7	15.256	91.78	2.00	112	15.17	0.16	0.87	0.87	0.16	0.27	0.71	0.60
753.6	15.420	84.90	1.44	112	15.34	0.16	0.88	0.88	0.17	0.28	0.71	0.60
753.4	15.584	78.79	1.20	112	15.50	0.16	0.89	0.89	0.17	0.28	0.72	0.61
753.3	15.748	70.82	1.02	112	15.67	0.16	0.90	0.90	0.18	0.29	0.72	0.61
753.1	15.912	60.78	0.98	112	15.83	0.16	0.91	0.91	0.18	0.29	0.72	0.62
752.9	16.076	54.71	0.98	112	15.99	0.16	0.92	0.92	0.19	0.30	0.73	0.62
752.8	16.240	47.93	0.96	112	16.16	0.16	0.93	0.93	0.19	0.30	0.73	0.62
752.6	16.404	39.84	0.80	112	16.32	0.16	0.94	0.94	0.20	0.31	0.74	0.63
752.4	16.568	37.79	0.72	112	16.49	0.16	0.95	0.95	0.20	0.31	0.74	0.63
752.3	16.732	37.95	0.67	112	16.65	0.16	0.96	0.96	0.21	0.32	0.74	0.64
752.1	16.896	35.53	0.61	112	16.81	0.16	0.96	0.96	0.22	0.32	0.75	0.64
751.9	17.060	35.61	0.56	112	16.98	0.16	0.97	0.97	0.22	0.33	0.75	0.64
751.8	17.224	43.06	0.57	112	17.14	0.16	0.98	0.98	0.23	0.33	0.76	0.65
751.6	17.388	55.27	0.93	112	17.31	0.16	0.99	0.99	0.23	0.34	0.76	0.65
751.4	17.552	99.01	1.48	112	17.47	0.16	1.00	1.00	0.24	0.34	0.77	0.66
751.3	17.716	123.46	2.06	112	17.63	0.16	1.01	1.01	0.24	0.35	0.77	0.66
751.1	17.880	123.67	2.04	112	17.80	0.16	1.02	1.02	0.25	0.36	0.77	0.66
751.0	18.044	86.47	2.02	112	17.96	0.16	1.03	1.03	0.25	0.36	0.78	0.67
750.8	18.208	66.53	1.64	112	18.13	0.16	1.04	1.04	0.26	0.37	0.78	0.67
750.6	18.372	66.26	1.54	112	18.29	0.16	1.05	1.05	0.26	0.37	0.79	0.68
750.5	18.537	72.61	1.56	112	18.45	0.16	1.06	1.06	0.27	0.38	0.79	0.68
750.3	18.701	70.18	1.53	112	18.62	0.16	1.07	1.07	0.27	0.38	0.79	0.68
750.1	18.865	66.24	1.50	112	18.78	0.16	1.07	1.07	0.28	0.39	0.80	0.69
750.0	19.029	65.65	1.56	112	18.95	0.16	1.08	1.08	0.28	0.39	0.80	0.69
749.8	19.193	82.71	2.04	112	19.11	0.16	1.09	1.09	0.29	0.40	0.81	0.70
749.6	19.357	110.41	2.32	112	19.27	0.16	1.10	1.10	0.29	0.40	0.81	0.70
749.5	19.521	100.42	2.70	122	19.44	0.16	1.11	1.11	0.30	0.41	0.81	0.71
749.3	19.685	84.85	1.47	122	19.60	0.16	1.12	1.12	0.30	0.41	0.82	0.71
749.2	19.849	63.35	1.58	122	19.77	0.16	1.13	1.13	0.31	0.42	0.82	0.72
749.0	20.013	44.25	1.24	122	19.93	0.16	1.14	1.14	0.31	0.42	0.83	0.72
748.8	20.177	119.00	1.34	122	20.09	0.16	1.15	1.15	0.32	0.43	0.83	0.72
748.7	20.341	176.83	1.62	122	20.26	0.16	1.16	1.16	0.32	0.43	0.84	0.73
748.5	20.505	249.07	2.70	122	20.42	0.16	1.17	1.17	0.33	0.44	0.84	0.73
748.3	20.669	230.75	3.23	122	20.59	0.16	1.18	1.18	0.33	0.44	0.85	0.74
748.2	20.833	204.36	3.52	122	20.75	0.16	1.19	1.19	0.34	0.45	0.85	0.74

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
748.0	20.997	190.62	2.95	122	20.92	0.16	1.20	1.20	0.34	0.45	0.86	0.75
747.8	21.161	163.20	2.39	126	21.08	0.16	1.21	1.21	0.35	0.46	0.86	0.75
747.7	21.325	150.86	1.74	126	21.24	0.16	1.22	1.22	0.35	0.46	0.87	0.76
747.5	21.489	149.00	1.38	126	21.41	0.16	1.23	1.23	0.36	0.47	0.87	0.76
747.3	21.653	150.17	0.97	126	21.57	0.16	1.24	1.24	0.36	0.47	0.88	0.77
747.2	21.817	150.00	0.61	126	21.74	0.16	1.25	1.25	0.37	0.48	0.88	0.78
747.0	21.981	127.24	0.53	126	21.90	0.16	1.26	1.26	0.37	0.48	0.89	0.78
746.9	22.145	101.71	0.48	126	22.06	0.16	1.27	1.27	0.38	0.49	0.89	0.79
746.7	22.309	87.54	0.38	126	22.23	0.16	1.28	1.28	0.38	0.49	0.90	0.79
746.5	22.473	90.37	0.26	126	22.39	0.16	1.29	1.29	0.39	0.50	0.91	0.80
746.4	22.638	97.32	0.16	126	22.56	0.16	1.30	1.30	0.39	0.50	0.91	0.80
746.2	22.802	107.26	0.30	126	22.72	0.16	1.32	1.32	0.40	0.51	0.92	0.81
746.0	22.966	93.90	0.65	126	22.88	0.16	1.33	1.33	0.40	0.51	0.92	0.81
745.9	23.130	80.40	0.82	126	23.05	0.16	1.34	1.34	0.41	0.52	0.93	0.82
745.7	23.294	105.31	1.18	126	23.21	0.16	1.35	1.35	0.41	0.52	0.93	0.82
745.5	23.458	109.32	1.24	126	23.38	0.16	1.36	1.36	0.42	0.53	0.94	0.83
745.4	23.622	116.92	1.06	126	23.54	0.16	1.37	1.37	0.42	0.53	0.94	0.83
745.2	23.786	124.49	0.76	126	23.70	0.16	1.38	1.38	0.43	0.54	0.95	0.84
745.1	23.950	107.06	0.40	126	23.87	0.16	1.39	1.39	0.44	0.54	0.95	0.84
744.9	24.114	96.44	0.29	126	24.03	0.16	1.40	1.40	0.44	0.55	0.96	0.85
744.7	24.278	81.20	0.20	126	24.20	0.16	1.41	1.41	0.45	0.55	0.96	0.85
744.6	24.442	68.63	0.17	126	24.36	0.16	1.42	1.42	0.45	0.56	0.97	0.86
744.4	24.606	62.77	0.14	126	24.52	0.16	1.43	1.43	0.46	0.56	0.97	0.86
744.2	24.770	64.75	0.20	126	24.69	0.16	1.44	1.44	0.46	0.57	0.98	0.87
744.1	24.934	61.11	0.34	126	24.85	0.16	1.45	1.45	0.47	0.58	0.98	0.87
743.9	25.098	57.92	0.55	126	25.02	0.16	1.46	1.46	0.47	0.58	0.99	0.88
743.7	25.262	56.16	0.73	126	25.18	0.16	1.47	1.47	0.48	0.59	0.99	0.88
743.6	25.426	55.22	0.84	126	25.34	0.16	1.48	1.48	0.48	0.59	1.00	0.89
743.4	25.590	59.18	1.04	126	25.51	0.16	1.49	1.49	0.49	0.60	1.00	0.90
743.2	25.754	66.32	1.29	126	25.67	0.16	1.50	1.50	0.49	0.60	1.01	0.90
743.1	25.918	67.09	1.52	126	25.84	0.16	1.51	1.51	0.50	0.61	1.01	0.91
742.9	26.082	66.38	1.31	126	26.00	0.16	1.52	1.52	0.50	0.61	1.02	0.91
742.8	26.246	75.87	1.48	126	26.16	0.16	1.53	1.53	0.51	0.62	1.03	0.92
742.6	26.410	82.49	1.67	126	26.33	0.16	1.54	1.54	0.51	0.62	1.03	0.92
742.4	26.574	85.53	1.91	126	26.49	0.16	1.55	1.55	0.52	0.63	1.04	0.93
742.3	26.739	94.39	1.97	126	26.66	0.16	1.56	1.56	0.52	0.63	1.04	0.93
742.1	26.903	117.60	2.09	126	26.82	0.16	1.57	1.57	0.53	0.64	1.05	0.94
741.9	27.067	105.61	2.20	126	26.98	0.16	1.58	1.58	0.53	0.64	1.05	0.94
741.8	27.231	98.90	2.11	126	27.15	0.16	1.59	1.59	0.54	0.65	1.06	0.95
741.6	27.395	90.69	2.14	126	27.31	0.16	1.60	1.60	0.54	0.65	1.06	0.95
741.4	27.559	88.42	2.10	126	27.48	0.16	1.61	1.61	0.55	0.66	1.07	0.96
741.3	27.723	83.36	2.10	126	27.64	0.16	1.63	1.63	0.55	0.66	1.07	0.96
741.1	27.887	76.18	1.96	126	27.80	0.16	1.64	1.64	0.56	0.67	1.08	0.97
740.9	28.051	73.25	1.85	126	27.97	0.16	1.65	1.65	0.56	0.67	1.08	0.97
740.8	28.215	67.81	1.67	126	28.13	0.16	1.66	1.66	0.57	0.68	1.09	0.98
740.6	28.379	63.59	1.55	126	28.30	0.16	1.67	1.67	0.57	0.68	1.09	0.98
740.5	28.543	63.43	1.44	131	28.46	0.16	1.68	1.68	0.58	0.69	1.10	0.99
740.3	28.707	57.26	1.34	131	28.62	0.16	1.69	1.69	0.58	0.69	1.10	0.99
740.1	28.871	53.06	1.23	131	28.79	0.16	1.70	1.70	0.59	0.70	1.11	1.00
740.0	29.035	53.71	1.11	131	28.95	0.16	1.71	1.71	0.59	0.70	1.12	1.01
739.8	29.199	55.59	1.08	131	29.12	0.16	1.72	1.72	0.60	0.71	1.12	1.01
739.6	29.363	61.57	0.91	131	29.28	0.16	1.73	1.73	0.60	0.71	1.13	1.02
739.5	29.527	68.15	1.14	131	29.45	0.16	1.74	1.74	0.61	0.72	1.13	1.02
739.3	29.691	62.57	1.32	131	29.61	0.16	1.75	1.75	0.61	0.72	1.14	1.03
739.1	29.855	57.24	1.40	131	29.77	0.16	1.76	1.76	0.62	0.73	1.14	1.03
739.0	30.019	60.46	1.45	131	29.94	0.16	1.77	1.77	0.62	0.73	1.15	1.04
738.8	30.183	61.87	1.53	131	30.10	0.16	1.78	1.78	0.63	0.74	1.15	1.05
738.7	30.347	62.90	1.62	131	30.27	0.16	1.80	1.80	0.63	0.74	1.16	1.05
738.5	30.511	64.07	1.66	131	30.43	0.16	1.81	1.81	0.64	0.75	1.17	1.06
738.3	30.675	62.97	1.68	131	30.59	0.16	1.82	1.82	0.65	0.75	1.17	1.06
738.2	30.840	61.06	1.70	131	30.76	0.16	1.83	1.83	0.65	0.76	1.18	1.07
738.0	31.004	60.66	1.71	131	30.92	0.16	1.84	1.84	0.66	0.76	1.18	1.07
737.8	31.168	65.18	1.76	131	31.09	0.16	1.85	1.85	0.66	0.77	1.19	1.08
737.7	31.332	71.65	1.85	131	31.25	0.16	1.86	1.86	0.67	0.77	1.19	1.09
737.5	31.496	75.21	1.97	131	31.41	0.16	1.87	1.87	0.67	0.78	1.20	1.09
737.3	31.660	69.32	1.98	131	31.58	0.16	1.88	1.88	0.68	0.78	1.21	1.10
737.2	31.824	64.98	1.86	131	31.74	0.16	1.89	1.89	0.68	0.79	1.21	1.10
737.0	31.988	60.56	1.72	131	31.91	0.16	1.90	1.90	0.69	0.80	1.22	1.11
736.8	32.152	59.67	1.66	131	32.07	0.16	1.91	1.91	0.69	0.80	1.22	1.11

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
736.7	32.316	61.88	1.64	131	32.23	0.16	1.92	1.92	0.70	0.81	1.23	1.12
736.5	32.480	65.29	1.71	131	32.40	0.16	1.93	1.93	0.70	0.81	1.23	1.12
736.4	32.644	69.00	1.26	131	32.56	0.16	1.95	1.95	0.71	0.82	1.24	1.13
736.2	32.808	69.82	1.44	131	32.73	0.16	1.96	1.96	0.71	0.82	1.24	1.14
736.0	32.972	77.17	1.76	131	32.89	0.16	1.97	1.97	0.72	0.83	1.25	1.14
735.9	33.136	74.78	1.86	131	33.05	0.16	1.98	1.98	0.72	0.83	1.26	1.15
735.7	33.300	71.41	1.68	131	33.22	0.16	1.99	1.99	0.73	0.84	1.26	1.15
735.5	33.464	63.71	1.38	131	33.38	0.16	2.00	2.00	0.73	0.84	1.27	1.16
735.4	33.628	45.33	1.14	126	33.55	0.16	2.01	2.01	0.74	0.85	1.27	1.16
735.2	33.792	31.53	0.94	126	33.71	0.16	2.02	2.02	0.74	0.85	1.28	1.17
735.0	33.956	17.57	0.76	126	33.87	0.16	2.03	2.03	0.75	0.86	1.28	1.17
734.9	34.120	12.90	0.41	126	34.04	0.16	2.04	2.04	0.75	0.86	1.29	1.18
734.7	34.284	11.23	0.18	126	34.20	0.16	2.05	2.05	0.76	0.87	1.29	1.18
734.6	34.448	9.53	0.07	126	34.37	0.16	2.06	2.06	0.76	0.87	1.30	1.19
734.4	34.612	8.89	0.06	126	34.53	0.16	2.07	2.07	0.77	0.88	1.30	1.19
734.2	34.776	9.12	0.06	126	34.69	0.16	2.08	2.08	0.77	0.88	1.31	1.20
734.1	34.941	9.38	0.06	126	34.86	0.16	2.09	2.09	0.78	0.89	1.31	1.21
733.9	35.105	8.48	0.06	126	35.02	0.16	2.10	2.10	0.78	0.89	1.32	1.21
733.7	35.269	7.63	0.05	126	35.19	0.16	2.11	2.11	0.79	0.90	1.32	1.22
733.6	35.433	7.21	0.03	126	35.35	0.16	2.12	2.12	0.79	0.90	1.33	1.22
733.4	35.597	6.95	0.03	126	35.51	0.16	2.13	2.13	0.80	0.91	1.34	1.23
733.2	35.761	6.40	0.02	126	35.68	0.16	2.14	2.14	0.80	0.91	1.34	1.23
733.1	35.925	6.11	0.02	126	35.84	0.16	2.15	2.15	0.81	0.92	1.35	1.24
732.9	36.089	5.88	0.02	126	36.01	0.16	2.16	2.16	0.81	0.92	1.35	1.24
732.7	36.253	5.44	0.02	126	36.17	0.16	2.18	2.18	0.82	0.93	1.36	1.25
732.6	36.417	5.57	0.02	126	36.33	0.16	2.19	2.19	0.82	0.93	1.36	1.25
732.4	36.581	5.57	0.02	126	36.50	0.16	2.20	2.20	0.83	0.94	1.37	1.26
732.3	36.745	6.61	0.03	126	36.66	0.16	2.21	2.21	0.83	0.94	1.37	1.26
732.1	36.909	7.78	0.05	126	36.83	0.16	2.22	2.22	0.84	0.95	1.38	1.27
731.9	37.073	8.19	0.08	126	36.99	0.16	2.23	2.23	0.84	0.95	1.38	1.27
731.8	37.237	8.50	0.08	126	37.16	0.16	2.24	2.24	0.85	0.96	1.39	1.28
731.6	37.401	7.94	0.09	126	37.32	0.16	2.25	2.25	0.85	0.96	1.39	1.28
731.4	37.565	7.72	0.13	126	37.48	0.16	2.26	2.26	0.86	0.97	1.40	1.29
731.3	37.729	6.57	0.12	126	37.65	0.16	2.27	2.27	0.87	0.97	1.40	1.29
731.1	37.893	6.17	0.12	126	37.81	0.16	2.28	2.28	0.87	0.98	1.41	1.30
730.9	38.057	6.67	0.10	126	37.98	0.16	2.29	2.29	0.88	0.98	1.41	1.30
730.8	38.221	7.04	0.10	126	38.14	0.16	2.30	2.30	0.88	0.99	1.42	1.31
730.6	38.385	7.30	0.09	126	38.30	0.16	2.31	2.31	0.89	0.99	1.42	1.31
730.5	38.549	7.63	0.09	126	38.47	0.16	2.32	2.32	0.89	1.00	1.43	1.32
730.3	38.713	7.38	0.07	126	38.63	0.16	2.33	2.33	0.90	1.01	1.43	1.33
730.1	38.877	7.03	0.08	126	38.80	0.16	2.34	2.34	0.90	1.01	1.44	1.33
730.0	39.042	7.03	0.09	126	38.96	0.16	2.35	2.35	0.91	1.02	1.44	1.34
729.8	39.206	8.42	0.10	126	39.12	0.16	2.36	2.36	0.91	1.02	1.45	1.34
729.6	39.370	9.61	0.12	126	39.29	0.16	2.37	2.37	0.92	1.03	1.46	1.35
729.5	39.534	12.51	0.13	126	39.45	0.16	2.38	2.38	0.92	1.03	1.46	1.35
729.3	39.698	16.40	0.22	126	39.62	0.16	2.39	2.39	0.93	1.04	1.47	1.36
729.1	39.862	18.04	0.27	126	39.78	0.16	2.40	2.40	0.93	1.04	1.47	1.36
729.0	40.026	19.11	0.31	126	39.94	0.16	2.41	2.41	0.94	1.05	1.48	1.37
728.8	40.190	20.41	0.34	126	40.11	0.16	2.42	2.42	0.94	1.05	1.48	1.37
728.6	40.354	22.85	0.36	126	40.27	0.16	2.43	2.43	0.95	1.06	1.49	1.38
728.5	40.518	23.07	0.35	126	40.44	0.16	2.44	2.44	0.95	1.06	1.49	1.38
728.3	40.682	22.83	0.35	126	40.60	0.16	2.45	2.45	0.96	1.07	1.50	1.39
728.2	40.846	22.40	0.34	126	40.76	0.16	2.46	2.46	0.96	1.07	1.50	1.39
728.0	41.010	21.45	0.33	126	40.93	0.16	2.48	2.48	0.97	1.08	1.51	1.40
727.8	41.174	21.39	0.31	126	41.09	0.16	2.49	2.49	0.97	1.08	1.51	1.40
727.7	41.338	20.39	0.31	126	41.26	0.16	2.50	2.50	0.98	1.09	1.52	1.41
727.5	41.502	19.37	0.29	126	41.42	0.16	2.51	2.51	0.98	1.09	1.52	1.41
727.3	41.666	16.93	0.25	126	41.58	0.16	2.52	2.52	0.99	1.10	1.53	1.42
727.2	41.830	15.24	0.21	126	41.75	0.16	2.53	2.53	0.99	1.10	1.53	1.42
727.0	41.994	12.94	0.18	126	41.91	0.16	2.54	2.54	1.00	1.11	1.54	1.43
726.8	42.158	9.64	0.14	126	42.08	0.16	2.55	2.55	1.00	1.11	1.54	1.43
726.7	42.322	8.59	0.10	126	42.24	0.16	2.56	2.56	1.01	1.12	1.55	1.44
726.5	42.486	6.64	0.05	126	42.40	0.16	2.57	2.57	1.01	1.12	1.55	1.45
726.3	42.650	6.21	0.03	126	42.57	0.16	2.58	2.58	1.02	1.13	1.56	1.45
726.2	42.814	6.03	0.01	126	42.73	0.16	2.59	2.59	1.02	1.13	1.56	1.46
726.0	42.978	5.62	0.01	126	42.90	0.16	2.60	2.60	1.03	1.14	1.57	1.46
725.9	43.143	5.44	0.01	126	43.06	0.16	2.61	2.61	1.03	1.14	1.58	1.47
725.7	43.307	5.40	0.01	126	43.22	0.16	2.62	2.62	1.04	1.15	1.58	1.47
725.5	43.471	5.66	0.01	126	43.39	0.16	2.63	2.63	1.04	1.15	1.59	1.48

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
725.4	43.635	6.04	0.02	126	43.55	0.16	2.64	2.64	1.05	1.16	1.59	1.48
725.2	43.799	6.55	0.11	126	43.72	0.16	2.65	2.65	1.05	1.16	1.60	1.49
725.0	43.963	22.93	0.16	126	43.88	0.16	2.66	2.66	1.06	1.17	1.60	1.49
724.9	44.127	113.87	0.37	126	44.04	0.16	2.67	2.67	1.06	1.17	1.61	1.50
724.7	44.291	156.68	0.63	126	44.21	0.16	2.68	2.68	1.07	1.18	1.61	1.50
724.5	44.455	149.13	0.83	126	44.37	0.16	2.69	2.69	1.07	1.18	1.62	1.51
724.4	44.619	105.67	0.87	126	44.54	0.16	2.70	2.70	1.08	1.19	1.62	1.51
724.2	44.783	60.45	0.84	126	44.70	0.16	2.71	2.71	1.09	1.19	1.63	1.52
724.1	44.947	43.42	0.55	126	44.86	0.16	2.72	2.72	1.09	1.20	1.63	1.52
723.9	45.111	32.27	0.36	126	45.03	0.16	2.73	2.73	1.10	1.20	1.64	1.53
723.7	45.275	26.01	0.18	126	45.19	0.16	2.74	2.74	1.10	1.21	1.64	1.53
723.6	45.439	20.24	0.15	126	45.36	0.16	2.75	2.75	1.11	1.21	1.65	1.54
723.4	45.603	17.06	0.15	126	45.52	0.16	2.76	2.76	1.11	1.22	1.65	1.54
723.2	45.767	13.97	0.11	126	45.69	0.16	2.77	2.77	1.12	1.23	1.66	1.55
723.1	45.931	12.38	0.07	126	45.85	0.16	2.79	2.79	1.12	1.23	1.66	1.55
722.9	46.095	13.35	0.11	126	46.01	0.16	2.80	2.80	1.13	1.24	1.67	1.56
722.7	46.259	12.53	0.18	126	46.18	0.16	2.81	2.81	1.13	1.24	1.67	1.57
722.6	46.423	17.50	0.25	126	46.34	0.16	2.82	2.82	1.14	1.25	1.68	1.57
722.4	46.587	15.37	0.18	126	46.51	0.16	2.83	2.83	1.14	1.25	1.68	1.58
722.2	46.751	18.43	0.30	126	46.67	0.16	2.84	2.84	1.15	1.26	1.69	1.58
722.1	46.915	18.16	0.25	126	46.83	0.16	2.85	2.85	1.15	1.26	1.70	1.59
721.9	47.079	25.94	0.33	126	47.00	0.16	2.86	2.86	1.16	1.27	1.70	1.59
721.8	47.244	26.02	0.50	126	47.16	0.16	2.87	2.87	1.16	1.27	1.71	1.60
721.6	47.408	35.16	0.47	126	47.33	0.16	2.88	2.88	1.17	1.28	1.71	1.60
721.4	47.572	58.27	0.25	126	47.49	0.16	2.89	2.89	1.17	1.28	1.72	1.61
721.3	47.736	56.13	0.14	126	47.65	0.16	2.90	2.90	1.18	1.29	1.72	1.61
721.1	47.900	40.39	0.12	126	47.82	0.16	2.91	2.91	1.18	1.29	1.73	1.62
720.9	48.064	27.36	0.11	126	47.98	0.16	2.92	2.92	1.19	1.30	1.73	1.62
720.8	48.228	19.87	0.16	126	48.15	0.16	2.93	2.93	1.19	1.30	1.74	1.63
720.6	48.392	20.47	0.14	126	48.31	0.16	2.94	2.94	1.20	1.31	1.74	1.63
720.4	48.556	25.80	0.24	126	48.47	0.16	2.95	2.95	1.20	1.31	1.75	1.64
720.3	48.720	27.71	0.35	126	48.64	0.16	2.96	2.96	1.21	1.32	1.75	1.64
720.1	48.884	35.63	0.46	126	48.80	0.16	2.97	2.97	1.21	1.32	1.76	1.65
720.0	49.048	64.37	0.53	126	48.97	0.16	2.98	2.98	1.22	1.33	1.76	1.65
719.8	49.212	95.22	0.46	126	49.13	0.16	2.99	2.99	1.22	1.33	1.77	1.66
719.6	49.376	114.58	0.63	126	49.29	0.16	3.00	3.00	1.23	1.34	1.77	1.66
719.5	49.540	139.74	0.90	126	49.46	0.16	3.01	3.01	1.23	1.34	1.78	1.67
719.3	49.704	148.26	1.32	126	49.62	0.16	3.02	3.02	1.24	1.35	1.78	1.67
719.1	49.868	169.83	1.50	126	49.79	0.16	3.03	3.03	1.24	1.35	1.79	1.68
719.0	50.032	206.12	1.85	126	49.95	0.16	3.04	3.04	1.25	1.36	1.79	1.69
718.8	50.196	232.65	2.08	126	50.11	0.16	3.05	3.05	1.25	1.36	1.80	1.69
718.6	50.360	274.76	2.60	126	50.28	0.16	3.06	3.06	1.26	1.37	1.80	1.70
718.5	50.524	290.77	3.13	126	50.44	0.16	3.07	3.07	1.26	1.37	1.81	1.70
718.3	50.688	278.86	3.38	126	50.61	0.16	3.08	3.08	1.27	1.38	1.82	1.71
718.1	50.852	268.16	3.53	126	50.77	0.16	3.10	3.10	1.27	1.38	1.82	1.71
718.0	51.016	246.55	3.49	126	50.93	0.16	3.11	3.11	1.28	1.39	1.83	1.72
717.8	51.180	219.94	3.26	126	51.10	0.16	3.12	3.12	1.28	1.39	1.83	1.72
717.7	51.345	199.44	2.85	126	51.26	0.16	3.13	3.13	1.29	1.40	1.84	1.73
717.5	51.509	191.03	2.44	126	51.43	0.16	3.14	3.14	1.30	1.40	1.84	1.73
717.3	51.673	187.09	2.07	126	51.59	0.16	3.15	3.15	1.30	1.41	1.85	1.74
717.2	51.837	181.64	1.88	126	51.75	0.16	3.16	3.16	1.31	1.41	1.85	1.74
717.0	52.001	170.65	1.78	126	51.92	0.16	3.17	3.17	1.31	1.42	1.86	1.75
716.8	52.165	151.63	1.66	126	52.08	0.16	3.18	3.18	1.32	1.42	1.86	1.75
716.7	52.329	139.11	1.51	126	52.25	0.16	3.19	3.19	1.32	1.43	1.87	1.76
716.5	52.493	137.02	1.13	126	52.41	0.16	3.20	3.20	1.33	1.43	1.87	1.76
716.3	52.657	135.48	1.06	126	52.57	0.16	3.21	3.21	1.33	1.44	1.88	1.77
716.2	52.821	135.84	1.08	126	52.74	0.16	3.22	3.22	1.34	1.45	1.88	1.77
716.0	52.985	139.96	1.22	126	52.90	0.16	3.23	3.23	1.34	1.45	1.89	1.78
715.9	53.149	147.42	1.25	126	53.07	0.16	3.24	3.24	1.35	1.46	1.89	1.78
715.7	53.313	160.76	1.20	126	53.23	0.16	3.25	3.25	1.35	1.46	1.90	1.79
715.5	53.477	166.24	1.11	126	53.40	0.16	3.26	3.26	1.36	1.47	1.90	1.79
715.4	53.641	141.62	1.04	126	53.56	0.16	3.27	3.27	1.36	1.47	1.91	1.80
715.2	53.805	99.09	1.04	126	53.72	0.16	3.28	3.28	1.37	1.48	1.91	1.81
715.0	53.969	65.00	1.15	126	53.89	0.16	3.29	3.29	1.37	1.48	1.92	1.81
714.9	54.133	49.28	1.47	126	54.05	0.16	3.30	3.30	1.38	1.49	1.92	1.82
714.7	54.297	41.92	1.49	126	54.22	0.16	3.31	3.31	1.38	1.49	1.93	1.82
714.5	54.461	86.51	1.35	126	54.38	0.16	3.32	3.32	1.39	1.50	1.94	1.83
714.4	54.625	187.06	1.81	126	54.54	0.16	3.33	3.33	1.39	1.50	1.94	1.83
714.2	54.789	209.75	2.61	126	54.71	0.16	3.34	3.34	1.40	1.51	1.95	1.84

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
714.0	54.953	243.93	3.35	126	54.87	0.16	3.35	3.35	1.40	1.51	1.95	1.84
713.9	55.117	380.56	3.94	126	55.04	0.16	3.36	3.36	1.41	1.52	1.96	1.85
713.7	55.281	426.68	4.06	126	55.20	0.16	3.37	3.37	1.41	1.52	1.96	1.85
713.6	55.446	364.17	4.57	126	55.36	0.16	3.38	3.38	1.42	1.53	1.97	1.86
713.4	55.610	259.74	4.11	126	55.53	0.16	3.39	3.39	1.42	1.53	1.97	1.86
713.2	55.774	156.18	4.48	126	55.69	0.16	3.41	3.41	1.43	1.54	1.98	1.87
713.1	55.938	140.33	4.42	126	55.86	0.16	3.42	3.42	1.43	1.54	1.98	1.87
712.9	56.102	141.01	4.86	126	56.02	0.16	3.43	3.43	1.44	1.55	1.99	1.88
712.7	56.266	150.28	5.49	126	56.18	0.16	3.44	3.44	1.44	1.55	1.99	1.88
712.6	56.430	165.09	6.01	126	56.35	0.16	3.45	3.45	1.45	1.56	2.00	1.89
712.4	56.594	162.29	5.84	126	56.51	0.16	3.46	3.46	1.45	1.56	2.00	1.89
712.2	56.758	185.67	5.78	126	56.68	0.16	3.47	3.47	1.46	1.57	2.01	1.90
712.1	56.922	185.29	6.36	126	56.84	0.16	3.48	3.48	1.46	1.57	2.01	1.90
711.9	57.086	191.48	7.10	126	57.00	0.16	3.49	3.49	1.47	1.58	2.02	1.91
711.8	57.250	184.17	7.87	126	57.17	0.16	3.50	3.50	1.47	1.58	2.02	1.91
711.6	57.414	197.64	8.62	126	57.33	0.16	3.51	3.51	1.48	1.59	2.03	1.92
711.4	57.578	240.05	9.49	126	57.50	0.16	3.52	3.52	1.48	1.59	2.03	1.93
711.3	57.742	228.25	9.15	126	57.66	0.16	3.53	3.53	1.49	1.60	2.04	1.93
711.1	57.906	204.93	8.39	126	57.82	0.16	3.54	3.54	1.49	1.60	2.04	1.94
710.9	58.070	214.21	8.03	126	57.99	0.16	3.55	3.55	1.50	1.61	2.05	1.94
710.8	58.234	222.25	7.92	126	58.15	0.16	3.56	3.56	1.50	1.61	2.06	1.95
710.6	58.398	238.27	8.66	126	58.32	0.16	3.57	3.57	1.51	1.62	2.06	1.95
710.4	58.562	237.90	8.66	126	58.48	0.16	3.58	3.58	1.52	1.62	2.07	1.96
710.3	58.726	213.41	8.71	126	58.64	0.16	3.59	3.59	1.52	1.63	2.07	1.96
710.1	58.890	237.86	4.28	126	58.81	0.16	3.60	3.60	1.53	1.63	2.08	1.97
709.9	59.054	269.77	8.48	126	58.97	0.16	3.61	3.61	1.53	1.64	2.08	1.97
709.8	59.218	165.54	9.98	126	59.14	0.16	3.62	3.62	1.54	1.64	2.09	1.98
709.6	59.382	304.61	11.33	126	59.30	0.16	3.63	3.63	1.54	1.65	2.09	1.98
709.5	59.547	262.84	10.65	126	59.46	0.16	3.64	3.64	1.55	1.66	2.10	1.99
709.3	59.711	213.75	9.68	126	59.63	0.16	3.65	3.65	1.55	1.66	2.10	1.99
709.1	59.875	204.93	9.44	126	59.79	0.16	3.66	3.66	1.56	1.67	2.11	2.00
709.0	60.039	242.92	9.59	126	59.96	0.16	3.67	3.67	1.56	1.67	2.11	2.00
708.8	60.203	270.34	11.13	126	60.12	0.16	3.68	3.68	1.57	1.68	2.12	2.01
708.6	60.367	300.95	12.28	126	60.28	0.16	3.69	3.69	1.57	1.68	2.12	2.01
708.5	60.531	261.08	12.63	126	60.45	0.16	3.70	3.70	1.58	1.69	2.13	2.02
708.3	60.695	259.84	11.43	126	60.61	0.16	3.72	3.72	1.58	1.69	2.13	2.02
708.1	60.859	228.05	10.15	126	60.78	0.16	3.73	3.73	1.59	1.70	2.14	2.03
708.0	61.023	179.63	10.01	126	60.94	0.16	3.74	3.74	1.59	1.70	2.14	2.03
707.8	61.187	189.05	9.13	126	61.10	0.16	3.75	3.75	1.60	1.71	2.15	2.04
707.6	61.351	189.24	9.03	126	61.27	0.16	3.76	3.76	1.60	1.71	2.15	2.05
707.5	61.515	240.54	10.15	126	61.43	0.16	3.77	3.77	1.61	1.72	2.16	2.05
707.3	61.679	233.12	10.26	126	61.60	0.16	3.78	3.78	1.61	1.72	2.16	2.06
707.2	61.843	223.74	10.25	126	61.76	0.16	3.79	3.79	1.62	1.73	2.17	2.06
707.0	62.007	213.28	9.65	126	61.93	0.16	3.80	3.80	1.62	1.73	2.18	2.07
706.8	62.171	188.64	7.38	126	62.09	0.16	3.81	3.81	1.63	1.74	2.18	2.07
706.7	62.335	163.96	6.94	126	62.25	0.16	3.82	3.82	1.63	1.74	2.19	2.08
706.5	62.499	144.57	5.69	126	62.42	0.16	3.83	3.83	1.64	1.75	2.19	2.08
706.3	62.663	105.81	5.02	126	62.58	0.16	3.84	3.84	1.64	1.75	2.20	2.09
706.2	62.827	60.79	5.02	126	62.75	0.16	3.85	3.85	1.65	1.76	2.20	2.09
706.0	62.991	230.63	5.04	126	62.91	0.16	3.86	3.86	1.65	1.76	2.21	2.10
705.8	63.155	273.55	5.65	126	63.07	0.16	3.87	3.87	1.66	1.77	2.21	2.10
705.7	63.319	306.37	7.57	126	63.24	0.16	3.88	3.88	1.66	1.77	2.22	2.11
705.5	63.483	433.62	8.43	126	63.40	0.16	3.89	3.89	1.67	1.78	2.22	2.11
705.4	63.648	424.56	8.95	126	63.57	0.16	3.90	3.90	1.67	1.78	2.23	2.12
705.2	63.812	339.38	9.06	126	63.73	0.16	3.91	3.91	1.68	1.79	2.23	2.12
705.0	63.976	348.04	9.74	126	63.89	0.16	3.92	3.92	1.68	1.79	2.24	2.13
704.9	64.140	422.92	10.46	126	64.06	0.16	3.93	3.93	1.69	1.80	2.24	2.13
704.7	64.304	492.19	11.03	126	64.22	0.16	3.94	3.94	1.69	1.80	2.25	2.14
704.5	64.468	554.48	0.01	126	64.39	0.16	3.95	3.95	1.70	1.81	2.25	2.14
704.4	64.632	526.36	0.01	126	64.55	0.08	3.96	3.96	1.70	1.81	2.26	2.15

LIQUEFACTION POTENTIAL ASSESSMENT FOR COARSE GRAINED SOILS USING CONE PENETRATION TEST DATA

Project Site: KIF TDEC Stability
Project No.: 175668043
CPT ID: KIF-BF-CPT-4AA

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
769.0												
768.8	0.164	25.76	0.76	2.34	0.5	1.70	4.24	50	47.07	51.31	0.004	-0.194
768.7	0.328	900.81	0.15	0.65	0.5	1.70	208.92	0	0.00	208.92	0.005	-0.600
768.5	0.492	1036.66	0.15	0.60	0.5	1.70	294.46	0	0.00	294.46	0.005	-0.600
768.3	0.656	1137.76	0.15	0.57	0.5	1.70	373.17	0	0.00	373.17	0.006	-0.600
768.2	0.820	964.87	0.37	0.93	0.5	1.70	353.84	0	0.00	353.84	0.006	-0.600
768.0	0.984	1130.06	0.37	0.89	0.5	1.70	453.97	0	0.00	453.97	0.007	-0.600
767.9	1.148	1110.74	0.49	1.01	0.5	1.70	481.97	0	0.00	481.97	0.007	-0.600
767.7	1.312	1094.36	0.73	1.16	0.5	1.70	507.65	0	0.00	507.65	0.008	-0.600
767.5	1.476	1190.94	1.04	1.30	0.5	1.70	585.96	0	0.00	585.96	0.008	-0.600
767.4	1.640	1204.51	1.43	1.43	0.5	1.70	624.71	0	0.00	624.71	0.008	-0.600
767.2	1.804	1350.24	1.37	1.40	0.5	1.70	734.46	0	0.00	734.46	0.009	-0.600
767.0	1.968	1281.57	1.56	1.46	0.5	1.70	728.12	0	0.00	728.12	0.009	-0.600
766.9	2.133	1208.81	1.88	1.54	0.5	1.70	714.84	0	0.00	714.84	0.009	-0.600
766.7	2.297	1056.58	2.01	1.59	0.5	1.70	648.45	0	0.00	648.45	0.009	-0.600
766.5	2.461	830.46	2.37	1.69	0.5	1.68	520.97	0	0.00	520.97	0.010	-0.600
766.4	2.625	681.63	2.49	1.74	0.5	1.65	434.24	2	0.00	434.24	0.010	-0.600
766.2	2.789	608.37	2.26	1.72	0.5	1.62	393.21	0	0.00	393.21	0.010	-0.600
766.0	2.953	767.39	1.63	1.55	0.5	1.60	502.70	0	0.00	502.70	0.010	-0.600
765.9	3.117	934.15	1.33	1.43	0.5	1.58	619.78	0	0.00	619.78	0.010	-0.600
765.7	3.281	1009.33	1.22	1.39	0.5	1.56	677.84	0	0.00	677.84	0.010	-0.600
765.6	3.445	1026.30	1.31	1.41	0.5	1.54	697.25	0	0.00	697.25	0.010	-0.600
765.4	3.609	1036.34	1.42	1.45	0.5	1.52	711.88	0	0.00	711.88	0.010	-0.600
765.2	3.773	1071.73	1.53	1.47	0.5	1.50	743.99	0	0.00	743.99	0.010	-0.600
765.1	3.937	1056.17	1.55	1.48	0.5	1.48	740.63	0	0.00	740.63	0.009	-0.600
764.9	4.101	996.78	1.73	1.53	0.5	1.47	705.80	0	0.00	705.80	0.009	-0.600
764.7	4.265	948.24	1.95	1.59	0.5	1.45	677.72	0	0.00	677.72	0.009	-0.600
764.6	4.429	877.65	2.15	1.64	0.5	1.44	632.94	0	0.00	632.94	0.009	-0.600
764.4	4.593	831.88	2.15	1.65	0.5	1.42	604.98	0	0.00	604.98	0.009	-0.600
764.2	4.757	742.57	2.25	1.68	0.5	1.41	544.30	0	0.00	544.30	0.009	-0.600
764.1	4.921	588.57	2.59	1.78	0.5	1.40	434.76	5	0.00	434.76	0.009	-0.600
763.9	5.085	471.49	2.92	1.86	0.5	1.39	350.92	12	0.00	350.92	0.009	-0.600
763.8	5.249	331.35	3.59	2.01	0.5	1.39	249.95	24	0.00	249.95	0.009	-0.600
763.6	5.413	214.91	3.99	2.15	0.5	1.53	181.23	35	0.00	181.23	0.009	-0.600
763.4	5.577	249.40	2.91	2.00	0.5	1.46	203.68	23	0.00	203.68	0.008	-0.600
763.3	5.741	413.87	2.07	1.76	0.5	1.35	316.58	4	0.00	316.58	0.008	-0.600
763.1	5.905	408.41	2.32	1.80	0.5	1.34	314.39	7	0.00	314.39	0.008	-0.600
762.9	6.069	512.94	1.73	1.64	0.5	1.33	397.20	0	0.00	397.20	0.008	-0.600
762.8	6.234	511.79	1.46	1.58	0.5	1.32	398.70	0	0.00	398.70	0.008	-0.600
762.6	6.398	503.30	1.19	1.50	0.5	1.31	394.40	0	0.00	394.40	0.007	-0.600
762.4	6.562	470.84	1.00	1.46	0.5	1.30	371.12	0	0.00	371.12	0.007	-0.600
762.3	6.726	464.21	1.01	1.47	0.5	1.30	367.95	0	0.00	367.95	0.007	-0.600
762.1	6.890	460.53	1.18	1.52	0.5	1.29	367.04	0	0.00	367.04	0.007	-0.600
761.9	7.054	449.48	1.12	1.51	0.5	1.28	360.17	0	0.00	360.17	0.007	-0.600
761.8	7.218	401.21	1.16	1.55	0.5	1.27	323.23	0	0.00	323.23	0.006	-0.600
761.6	7.382	377.75	0.89	1.47	0.5	1.27	305.92	0	0.00	305.92	0.006	-0.600
761.5	7.546	365.91	0.77	1.43	0.5	1.26	297.84	0	0.00	297.84	0.006	-0.600
761.3	7.710	337.89	0.81	1.47	0.5	1.25	276.43	0	0.00	276.43	0.006	-0.600
761.1	7.874	329.25	0.87	1.50	0.5	1.25	270.66	0	0.00	270.66	0.005	-0.600
761.0	8.038	312.79	0.86	1.51	0.5	1.24	258.38	0	0.00	258.38	0.005	-0.600
760.8	8.202	291.52	0.84	1.52	0.5	1.24	244.16	0	0.00	244.16	0.005	-0.600
760.6	8.366	229.25	1.08	1.67	0.5	1.29	201.09	0	0.00	201.09	0.004	-0.600
760.5	8.530	160.70	1.69	1.92	0.5	1.36	149.92	17	0.00	149.92	0.004	-0.582
760.3	8.694	147.74	1.81	1.97	0.5	1.36	139.88	20	0.00	139.88	0.004	-0.549
760.1	8.858	139.43	1.36	1.90	0.5	1.37	133.35	15	0.00	133.35	0.003	-0.527
760.0	9.022	109.87	1.05	1.89	0.5	1.40	108.91	15	0.00	108.91	0.003	-0.436
759.8	9.186	102.77	0.63	1.78	0.5	1.40	102.87	5	0.00	102.87	0.003	-0.412
759.6	9.350	103.21	0.48	1.71	0.5	1.39	103.26	0	0.00	103.26	0.002	-0.413
759.5	9.514	105.66	0.50	1.71	0.5	1.37	105.41	0	0.00	105.41	0.002	-0.422
759.3	9.678	111.59	0.18	1.50	0.5	1.35	110.55	0	0.00	110.55	0.001	-0.442
759.2	9.842	112.70	0.45	1.66	0.5	1.34	111.55	0	0.00	111.55	0.001	-0.446

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
759.0	10.006	55.23	1.30	2.18	0.5	1.44	59.63	38	0.00	59.63	0.001	-0.193
758.8	10.170	130.57	0.53	1.65	0.5	1.30	126.93	0	0.00	126.93	0.001	-0.503
758.7	10.335	119.81	0.62	1.72	0.5	1.31	117.79	1	0.00	117.79	0.001	-0.469
758.5	10.499	116.18	0.57	1.71	0.5	1.31	114.69	0	0.00	114.69	0.001	-0.457
758.3	10.663	113.31	0.65	1.75	0.5	1.31	112.24	3	0.00	112.24	0.002	-0.448
758.2	10.827	110.29	0.60	1.74	0.5	1.31	109.63	2	0.00	109.63	0.002	-0.437
758.0	10.991	113.43	0.54	1.71	0.5	1.30	112.40	0	0.00	112.40	0.002	-0.448
757.8	11.155	132.84	0.47	1.62	0.5	1.28	129.18	0	0.00	129.18	0.002	-0.510
757.7	11.319	143.81	0.46	1.58	0.5	1.26	138.56	0	0.00	138.56	0.003	-0.542
757.5	11.483	139.19	0.63	1.67	0.5	1.26	134.71	0	0.00	134.71	0.003	-0.529
757.4	11.647	120.02	0.93	1.83	0.5	1.28	118.26	9	0.00	118.26	0.003	-0.470
757.2	11.811	101.08	1.26	1.97	0.5	1.30	101.60	21	0.00	101.60	0.003	-0.403
757.0	11.975	89.10	1.27	2.02	0.5	1.31	90.83	24	0.00	90.83	0.004	-0.356
756.9	12.139	80.07	1.19	2.03	0.5	1.32	82.57	26	0.00	82.57	0.004	-0.316
756.7	12.303	73.72	0.99	2.01	0.5	1.33	76.69	24	0.00	76.69	0.004	-0.287
756.5	12.467	67.19	0.72	1.96	0.5	1.33	70.56	20	0.00	70.56	0.004	-0.254
756.4	12.631	57.73	0.51	1.94	0.5	1.35	61.56	18	0.00	61.56	0.005	-0.202
756.2	12.795	50.72	0.34	1.92	0.5	1.36	54.77	16	0.00	54.77	0.005	-0.158
756.0	12.959	42.92	0.28	1.95	0.5	1.37	47.11	19	0.00	47.11	0.005	-0.104
755.9	13.123	38.62	0.18	1.94	0.5	1.38	42.80	19	0.00	42.80	0.005	-0.071
755.7	13.287	64.81	0.18	1.73	0.5	1.31	68.20	1	0.00	68.20	0.005	-0.240
755.5	13.451	142.79	0.16	1.38	0.5	1.22	138.58	0	0.00	138.58	0.006	-0.540
755.4	13.615	117.91	0.71	1.76	0.5	1.24	116.81	4	0.00	116.81	0.006	-0.462
755.2	13.779	91.00	1.31	2.02	0.5	1.26	92.55	24	0.00	92.55	0.006	-0.362
755.1	13.943	73.22	1.95	2.20	0.5	1.28	76.05	39	0.00	76.05	0.006	-0.282
754.9	14.107	77.09	1.77	2.16	0.5	1.27	79.66	36	0.00	79.66	0.006	-0.300
754.7	14.271	115.98	1.34	1.95	0.5	1.23	115.20	19	0.00	115.20	0.006	-0.455
754.6	14.436	179.61	1.39	1.83	0.5	1.17	170.77	9	0.00	170.77	0.006	-0.600
754.4	14.600	273.13	1.24	1.67	0.5	1.12	248.55	0	0.00	248.55	0.006	-0.600
754.2	14.764	221.29	1.90	1.87	0.5	1.14	206.21	13	0.00	206.21	0.006	-0.600
754.1	14.928	179.43	2.28	1.99	0.5	1.16	170.99	22	0.00	170.99	0.007	-0.600
753.9	15.092	129.33	2.63	2.13	0.5	1.20	127.30	33	0.00	127.30	0.007	-0.499
753.7	15.256	105.01	2.19	2.13	0.5	1.22	105.42	33	0.00	105.42	0.007	-0.415
753.6	15.420	96.77	1.71	2.08	0.5	1.22	97.88	29	0.00	97.88	0.007	-0.383
753.4	15.584	89.47	1.54	2.07	0.5	1.22	91.13	29	0.00	91.13	0.007	-0.353
753.3	15.748	80.07	1.46	2.09	0.5	1.23	82.35	30	0.00	82.35	0.007	-0.312
753.1	15.912	68.38	1.63	2.17	0.5	1.24	71.27	37	0.00	71.27	0.007	-0.254
752.9	16.076	61.26	1.83	2.24	0.5	1.25	64.43	42	0.00	64.43	0.007	-0.215
752.8	16.240	53.39	2.04	2.32	0.5	1.25	56.77	48	0.00	56.77	0.006	-0.168
752.6	16.404	44.06	2.05	2.38	0.5	1.26	47.59	54	0.00	47.59	0.006	-0.104
752.4	16.568	41.61	1.95	2.39	0.5	1.26	45.13	54	0.00	45.13	0.006	-0.086
752.3	16.732	41.66	1.82	2.37	0.5	1.26	45.16	53	0.00	45.16	0.006	-0.086
752.1	16.896	38.83	1.77	2.39	0.5	1.26	42.30	54	0.00	42.30	0.006	-0.063
751.9	17.060	38.80	1.61	2.36	0.5	1.26	42.24	52	0.00	42.24	0.006	-0.063
751.8	17.224	47.01	1.34	2.25	0.5	1.24	50.36	43	0.00	50.36	0.006	-0.124
751.6	17.388	60.48	1.71	2.23	0.5	1.22	63.49	41	0.00	63.49	0.006	-0.208
751.4	17.552	108.92	1.50	2.00	0.5	1.17	109.25	23	0.00	109.25	0.006	-0.428
751.3	17.716	135.71	1.68	1.97	0.5	1.15	133.84	21	0.00	133.84	0.005	-0.519
751.1	17.880	135.58	1.66	1.97	0.5	1.14	133.77	20	0.00	133.77	0.005	-0.519
751.0	18.044	94.21	2.36	2.18	0.5	1.17	95.57	38	0.00	95.57	0.005	-0.371
750.8	18.208	72.02	2.51	2.29	0.5	1.18	74.51	46	0.00	74.51	0.005	-0.269
750.6	18.372	71.53	2.36	2.27	0.5	1.18	74.03	45	0.00	74.03	0.005	-0.266
750.5	18.537	78.27	2.17	2.22	0.5	1.17	80.47	40	0.00	80.47	0.005	-0.300
750.3	18.701	75.41	2.21	2.23	0.5	1.17	77.72	42	0.00	77.72	0.004	-0.285
750.1	18.865	70.93	2.29	2.26	0.5	1.17	73.40	44	0.00	73.40	0.004	-0.263
750.0	19.029	70.10	2.41	2.28	0.5	1.17	72.58	46	0.00	72.58	0.004	-0.258
749.8	19.193	88.38	2.50	2.22	0.5	1.15	90.07	41	0.00	90.07	0.004	-0.345
749.6	19.357	118.07	2.12	2.09	0.5	1.13	118.00	30	0.00	118.00	0.004	-0.461
749.5	19.521	106.97	2.72	2.19	0.5	1.10	104.57	38	65.86	170.43	0.004	-0.600
749.3	19.685	89.92	1.75	2.11	0.5	1.11	89.10	32	55.30	144.40	0.003	-0.553
749.2	19.849	66.62	2.54	2.31	0.5	1.12	66.79	48	62.76	129.56	0.003	-0.502
749.0	20.013	46.02	2.88	2.47	0.5	1.12	46.99	60	62.00	108.99	0.003	-0.425
748.8	20.177	125.45	1.14	1.87	0.5	1.10	124.18	13	17.85	142.03	0.003	-0.544
748.7	20.341	186.45	0.92	1.69	0.5	1.09	181.46	0	0.00	181.46	0.003	-0.600
748.5	20.505	262.35	1.09	1.64	0.5	1.06	250.10	0	0.00	250.10	0.003	-0.600
748.3	20.669	242.25	1.41	1.75	0.5	1.07	232.39	3	0.00	232.39	0.002	-0.600

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748.2	20.833	213.78	1.73	1.85	0.5	1.07	206.08	11	15.18	221.26	0.002	-0.600
748.0	20.997	198.74	1.56	1.83	0.5	1.07	192.86	10	9.57	202.42	0.002	-0.600
747.8	21.161	169.47	1.47	1.86	0.5	1.07	165.72	12	16.71	182.43	0.002	-0.600
747.7	21.325	156.08	1.16	1.81	0.5	1.08	153.99	8	3.59	157.58	0.001	-0.592
747.5	21.489	153.66	0.93	1.75	0.5	1.08	151.99	3	0.00	151.99	0.001	-0.575
747.3	21.653	154.41	0.65	1.65	0.5	1.08	152.79	0	0.00	152.79	0.001	-0.577
747.2	21.817	153.76	0.41	1.53	0.5	1.07	152.28	0	0.00	152.28	0.000	-0.575
747.0	21.981	129.85	0.42	1.60	0.5	1.08	129.74	0	0.00	129.74	0.000	-0.501
746.9	22.145	103.21	0.48	1.71	0.5	1.09	104.32	0	0.00	104.32	0.001	-0.404
746.7	22.309	88.39	0.44	1.75	0.5	1.09	90.01	3	0.00	90.01	0.001	-0.341
746.5	22.473	91.02	0.29	1.66	0.5	1.08	92.55	0	0.00	92.55	0.002	-0.353
746.4	22.638	97.82	0.17	1.55	0.5	1.08	99.15	0	0.00	99.15	0.002	-0.381
746.2	22.802	107.63	0.28	1.59	0.5	1.07	108.63	0	0.00	108.63	0.002	-0.421
746.0	22.966	93.78	0.71	1.84	0.5	1.07	95.00	10	8.16	103.16	0.003	-0.398
745.9	23.130	79.87	1.04	2.00	0.5	1.06	80.73	23	40.04	120.77	0.003	-0.467
745.7	23.294	104.73	1.13	1.93	0.5	1.06	105.10	17	30.84	135.94	0.004	-0.521
745.5	23.458	108.46	1.15	1.92	0.5	1.05	108.79	17	29.60	138.38	0.004	-0.529
745.4	23.622	115.75	0.91	1.84	0.5	1.05	116.42	10	7.93	124.34	0.005	-0.480
745.2	23.786	122.98	0.62	1.71	0.5	1.05	123.66	0	0.00	123.66	0.005	-0.477
745.1	23.950	105.27	0.38	1.65	0.5	1.05	106.47	0	0.00	106.47	0.006	-0.411
744.9	24.114	94.43	0.30	1.65	0.5	1.05	95.88	0	0.00	95.88	0.006	-0.366
744.7	24.278	79.06	0.25	1.69	0.5	1.05	80.79	0	0.00	80.79	0.006	-0.295
744.6	24.442	66.42	0.25	1.76	0.5	1.05	68.29	4	0.01	68.31	0.007	-0.229
744.4	24.606	60.45	0.23	1.78	0.5	1.05	62.35	6	0.41	62.76	0.007	-0.196
744.2	24.770	62.23	0.32	1.83	0.5	1.05	64.03	9	4.73	68.76	0.008	-0.231
744.1	24.934	58.49	0.56	1.96	0.5	1.04	59.99	20	31.30	91.29	0.008	-0.344
743.9	25.098	55.20	0.98	2.11	0.5	1.03	56.57	32	48.75	105.32	0.009	-0.405
743.7	25.262	53.33	1.33	2.20	0.5	1.03	54.68	39	54.48	109.16	0.009	-0.420
743.6	25.426	52.27	1.57	2.25	0.5	1.03	53.63	43	56.82	110.45	0.010	-0.425
743.4	25.590	55.97	1.81	2.27	0.5	1.02	57.31	45	58.51	115.82	0.010	-0.446
743.2	25.754	62.71	1.99	2.26	0.5	1.02	64.01	44	59.75	123.77	0.011	-0.475
743.1	25.918	63.29	2.32	2.30	0.5	1.02	64.59	47	61.77	126.36	0.011	-0.484
742.9	26.082	62.43	2.02	2.26	0.5	1.02	63.77	44	59.94	123.72	0.012	-0.475
742.8	26.246	71.37	1.99	2.22	0.5	1.01	72.69	40	59.80	132.49	0.012	-0.506
742.6	26.410	77.53	2.06	2.20	0.5	1.01	78.84	39	60.31	139.15	0.013	-0.528
742.4	26.574	80.22	2.27	2.22	0.5	1.01	81.55	41	62.16	143.71	0.013	-0.543
742.3	26.739	88.45	2.12	2.17	0.5	1.01	89.80	37	60.82	150.62	0.014	-0.565
742.1	26.903	110.28	1.80	2.05	0.5	1.00	111.62	27	53.61	165.24	0.014	-0.600
741.9	27.067	98.63	2.11	2.14	0.5	1.00	100.07	34	60.39	160.46	0.015	-0.595
741.8	27.231	92.03	2.17	2.17	0.5	1.00	93.53	36	61.25	154.77	0.015	-0.578
741.6	27.395	84.04	2.40	2.23	0.5	1.00	85.59	41	63.33	148.91	0.016	-0.559
741.4	27.559	81.70	2.42	2.24	0.5	1.00	83.28	42	63.34	146.63	0.017	-0.552
741.3	27.723	76.73	2.57	2.27	0.5	0.99	78.35	45	64.04	142.38	0.017	-0.538
741.1	27.887	69.82	2.63	2.31	0.5	0.99	71.44	48	63.84	135.28	0.018	-0.514
740.9	28.051	66.90	2.59	2.32	0.5	0.99	68.54	48	63.42	131.96	0.018	-0.502
740.8	28.215	61.67	2.52	2.34	0.5	0.99	63.31	50	62.69	126.00	0.019	-0.481
740.6	28.379	57.58	2.50	2.35	0.5	0.99	59.22	51	62.24	121.46	0.019	-0.464
740.5	28.543	57.28	2.33	2.33	0.5	0.98	58.93	50	61.50	120.44	0.020	-0.460
740.3	28.707	51.41	2.41	2.38	0.5	0.98	53.05	53	61.40	114.45	0.020	-0.438
740.1	28.871	47.40	2.39	2.40	0.5	0.98	49.02	55	60.97	110.00	0.021	-0.420
740.0	29.035	47.87	2.13	2.37	0.5	0.98	49.50	52	60.06	109.56	0.021	-0.418
739.8	29.199	49.46	2.01	2.34	0.5	0.97	51.11	50	59.62	110.74	0.022	-0.423
739.6	29.363	54.81	1.53	2.23	0.5	0.97	56.50	41	56.42	112.91	0.022	-0.431
739.5	29.527	60.67	1.72	2.23	0.5	0.97	62.45	41	57.83	120.28	0.023	-0.459
739.3	29.691	55.43	2.17	2.32	0.5	0.97	57.19	49	60.68	117.87	0.023	-0.450
739.1	29.855	50.43	2.53	2.40	0.5	0.96	52.16	55	61.73	113.89	0.024	-0.434
739.0	30.019	53.22	2.46	2.37	0.5	0.96	55.00	53	61.77	116.77	0.024	-0.445
738.8	30.183	54.36	2.54	2.38	0.5	0.96	56.17	53	62.15	118.33	0.025	-0.451
738.7	30.347	55.14	2.65	2.39	0.5	0.96	56.99	54	62.64	119.63	0.025	-0.456
738.5	30.511	56.06	2.66	2.38	0.5	0.96	57.94	53	62.77	120.71	0.026	-0.459
738.3	30.675	54.92	2.74	2.40	0.5	0.95	56.80	55	62.91	119.71	0.026	-0.456
738.2	30.840	53.07	2.87	2.42	0.5	0.95	54.95	57	63.08	118.03	0.027	-0.449
738.0	31.004	52.58	2.90	2.43	0.5	0.95	54.46	57	63.10	117.57	0.027	-0.447
737.8	31.168	56.47	2.77	2.39	0.5	0.95	58.44	54	63.20	121.64	0.028	-0.462
737.7	31.332	62.09	2.64	2.35	0.5	0.95	64.19	51	63.35	127.54	0.028	-0.483
737.5	31.496	65.10	2.69	2.34	0.5	0.95	67.30	50	63.85	131.15	0.028	-0.496

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
737.3	31.660	59.71	2.94	2.39	0.5	0.94	61.82	54	64.13	125.95	0.029	-0.477
737.2	31.824	55.73	2.95	2.41	0.5	0.94	57.77	56	63.68	121.44	0.029	-0.461
737.0	31.988	51.70	2.93	2.44	0.5	0.94	53.66	58	63.10	116.76	0.030	-0.443
736.8	32.152	50.78	2.87	2.43	0.5	0.94	52.73	58	62.82	115.56	0.030	-0.438
736.7	32.316	52.60	2.73	2.41	0.5	0.93	54.60	56	62.65	117.24	0.030	-0.445
736.5	32.480	55.46	2.69	2.39	0.5	0.93	57.54	54	62.87	120.41	0.031	-0.456
736.4	32.644	58.56	1.89	2.27	0.5	0.93	60.67	44	59.22	119.90	0.031	-0.454
736.2	32.808	59.13	2.12	2.30	0.5	0.93	61.31	47	60.71	122.02	0.032	-0.462
736.0	32.972	65.38	2.34	2.29	0.5	0.93	67.80	47	62.26	130.06	0.032	-0.491
735.9	33.136	63.15	2.55	2.33	0.5	0.93	65.54	49	63.12	128.66	0.032	-0.486
735.7	33.300	60.08	2.43	2.33	0.5	0.92	62.38	50	62.31	124.69	0.033	-0.471
735.5	33.464	53.30	2.24	2.35	0.5	0.92	55.39	51	60.96	116.35	0.033	-0.440
735.4	33.628	37.33	2.64	2.51	0.5	0.91	39.07	64	60.64	99.71	0.033	-0.373
735.2	33.792	23.09	3.17	2.72	1.0	0.91	26.98	81	60.18	87.16	0.033	-0.317
735.0	33.956	12.11	4.86	3.06	1.0	0.90	14.89	100	58.56	73.45	0.034	-0.248
734.9	34.120	8.43	3.73	3.11	1.0	0.89	10.88	100	57.31	68.19	0.034	-0.219
734.7	34.284	7.09	1.96	3.02	1.0	0.89	9.44	100	56.86	66.30	0.034	-0.208
734.6	34.448	5.75	0.94	2.96	1.0	0.89	7.98	100	56.40	64.38	0.035	-0.197
734.4	34.612	5.23	0.87	2.99	1.0	0.88	7.42	100	56.24	63.66	0.035	-0.192
734.2	34.776	5.37	0.87	2.97	1.0	0.88	7.60	100	56.29	63.89	0.035	-0.194
734.1	34.941	5.54	0.85	2.96	1.0	0.88	7.80	100	56.33	64.13	0.035	-0.195
733.9	35.105	4.83	0.92	3.03	1.0	0.88	7.03	100	56.12	63.15	0.036	-0.189
733.7	35.269	4.16	0.83	3.07	1.0	0.87	6.30	100	55.89	62.20	0.036	-0.183
733.6	35.433	3.82	0.67	3.07	1.0	0.87	5.94	100	55.78	61.72	0.036	-0.180
733.4	35.597	3.61	0.54	3.06	1.0	0.87	5.72	100	55.71	61.42	0.036	-0.178
733.2	35.761	3.17	0.42	3.09	1.0	0.87	5.25	100	55.56	60.81	0.037	-0.174
733.1	35.925	2.94	0.45	3.13	1.0	0.87	5.00	100	55.49	60.48	0.037	-0.172
732.9	36.089	2.75	0.40	3.14	1.0	0.86	4.80	100	55.42	60.22	0.037	-0.170
732.7	36.253	2.41	0.52	3.23	1.0	0.86	4.42	100	55.31	59.73	0.037	-0.167
732.6	36.417	2.49	0.47	3.20	1.0	0.86	4.52	100	55.34	59.86	0.037	-0.168
732.4	36.581	2.47	0.59	3.23	1.0	0.86	4.51	100	55.33	59.85	0.038	-0.168
732.3	36.745	3.21	0.70	3.15	1.0	0.86	5.35	100	55.59	60.94	0.038	-0.174
732.1	36.909	4.04	0.86	3.09	1.0	0.85	6.29	100	55.89	62.17	0.038	-0.182
731.9	37.073	4.31	1.27	3.13	1.0	0.85	6.60	100	55.98	62.58	0.038	-0.184
731.8	37.237	4.52	1.32	3.12	1.0	0.85	6.84	100	56.06	62.90	0.038	-0.186
731.6	37.401	4.09	1.62	3.20	1.0	0.85	6.37	100	55.91	62.28	0.038	-0.182
731.4	37.565	3.91	2.36	3.29	1.0	0.85	6.18	100	55.85	62.03	0.038	-0.180
731.3	37.729	3.06	2.89	3.42	1.0	0.84	5.24	100	55.56	60.80	0.039	-0.172
731.1	37.893	2.77	2.95	3.47	1.0	0.84	4.91	100	55.46	60.37	0.039	-0.170
730.9	38.057	3.10	2.17	3.36	1.0	0.84	5.30	100	55.58	60.88	0.039	-0.173
730.8	38.221	3.34	2.02	3.32	1.0	0.84	5.58	100	55.67	61.25	0.039	-0.175
730.6	38.385	3.50	1.85	3.28	1.0	0.84	5.77	100	55.73	61.50	0.039	-0.176
730.5	38.549	3.72	1.62	3.23	1.0	0.84	6.03	100	55.80	61.83	0.039	-0.178
730.3	38.713	3.52	1.37	3.22	1.0	0.83	5.82	100	55.74	61.55	0.039	-0.176
730.1	38.877	3.25	1.60	3.28	1.0	0.83	5.52	100	55.65	61.17	0.039	-0.174
730.0	39.042	3.24	1.82	3.31	1.0	0.83	5.51	100	55.64	61.16	0.039	-0.174
729.8	39.206	4.18	1.63	3.19	1.0	0.83	6.59	100	55.98	62.57	0.039	-0.182
729.6	39.370	4.97	1.66	3.12	1.0	0.83	7.52	100	56.27	63.79	0.039	-0.189
729.5	39.534	6.93	1.32	2.95	1.0	0.83	9.80	99	56.90	66.70	0.039	-0.206
729.3	39.698	9.55	1.60	2.87	1.0	0.83	12.86	92	57.26	70.12	0.039	-0.225
729.1	39.862	10.63	1.72	2.84	1.0	0.83	14.14	91	57.46	71.60	0.039	-0.233
729.0	40.026	11.31	1.87	2.84	1.0	0.83	14.96	90	57.68	72.64	0.039	-0.239
728.8	40.190	12.14	1.88	2.81	1.0	0.83	15.96	88	57.78	73.74	0.039	-0.245
728.6	40.354	13.73	1.75	2.75	1.0	0.83	17.87	83	57.79	75.66	0.039	-0.255
728.5	40.518	13.83	1.71	2.74	1.0	0.83	18.01	83	57.74	75.75	0.039	-0.255
728.3	40.682	13.61	1.74	2.75	1.0	0.82	17.78	83	57.78	75.55	0.039	-0.254
728.2	40.846	13.27	1.72	2.76	1.0	0.82	17.41	84	57.73	75.14	0.039	-0.251
728.0	41.010	12.59	1.71	2.78	1.0	0.82	16.62	85	57.67	74.29	0.039	-0.247
727.8	41.174	12.50	1.66	2.78	1.0	0.82	16.54	85	57.60	74.15	0.039	-0.246
727.7	41.338	11.79	1.73	2.81	1.0	0.82	15.72	88	57.64	73.36	0.039	-0.242
727.5	41.502	11.07	1.73	2.83	1.0	0.81	14.90	89	57.58	72.47	0.039	-0.237
727.3	41.666	9.43	1.76	2.89	1.0	0.81	12.97	95	57.49	70.46	0.039	-0.226
727.2	41.830	8.29	1.68	2.93	1.0	0.81	11.63	98	57.34	68.97	0.039	-0.217
727.0	41.994	6.76	1.68	3.01	1.0	0.80	9.83	100	56.99	66.82	0.039	-0.205
726.8	42.158	4.59	1.90	3.18	1.0	0.80	7.28	100	56.19	63.48	0.039	-0.185
726.7	42.322	3.89	1.63	3.22	1.0	0.80	6.47	100	55.94	62.41	0.039	-0.179

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726.5	42.486	2.62	1.10	3.30	1.0	0.79	4.98	100	55.48	60.46	0.039	-0.167
726.3	42.650	2.33	0.80	3.30	1.0	0.79	4.65	100	55.38	60.02	0.039	-0.164
726.2	42.814	2.20	0.29	3.20	1.0	0.79	4.50	100	55.33	59.83	0.039	-0.163
726.0	42.978	1.92	0.33	3.27	1.0	0.79	4.18	100	55.23	59.41	0.039	-0.160
725.9	43.143	1.80	0.35	3.31	1.0	0.79	4.04	100	55.19	59.23	0.039	-0.159
725.7	43.307	1.76	0.36	3.32	1.0	0.78	4.00	100	55.18	59.18	0.039	-0.158
725.5	43.471	1.91	0.33	3.27	1.0	0.78	4.18	100	55.23	59.42	0.039	-0.160
725.4	43.635	2.14	0.47	3.26	1.0	0.78	4.46	100	55.32	59.78	0.038	-0.162
725.2	43.799	2.44	2.77	3.50	1.0	0.78	4.83	100	55.43	60.26	0.038	-0.165
725.0	43.963	12.66	0.80	2.62	1.0	0.79	17.16	73	56.08	73.23	0.038	-0.239
724.9	44.127	85.29	0.33	1.71	0.5	0.80	86.26	0	0.00	86.26	0.038	-0.305
724.7	44.291	117.93	0.41	1.63	0.5	0.83	122.46	0	0.00	122.46	0.038	-0.455
724.5	44.455	111.95	0.56	1.72	0.5	0.82	115.74	1	0.00	115.74	0.038	-0.429
724.4	44.619	78.60	0.85	1.95	0.5	0.82	81.75	19	32.01	113.76	0.038	-0.422
724.2	44.783	44.00	1.46	2.29	0.5	0.81	46.24	46	56.64	102.88	0.038	-0.378
724.1	44.947	30.96	1.35	2.40	0.5	0.80	32.70	55	56.31	89.01	0.038	-0.317
723.9	45.111	22.44	1.21	2.49	0.5	0.79	24.03	62	55.94	79.96	0.038	-0.273
723.7	45.275	17.65	0.76	2.48	0.5	0.78	19.19	61	54.43	73.62	0.037	-0.240
723.6	45.439	10.61	0.85	2.70	1.0	0.78	14.86	79	56.35	71.21	0.037	-0.227
723.4	45.603	8.65	1.02	2.82	1.0	0.77	12.47	88	56.72	69.19	0.037	-0.216
723.2	45.767	6.75	0.96	2.90	1.0	0.77	10.17	95	56.68	66.85	0.037	-0.202
723.1	45.931	5.77	0.76	2.92	1.0	0.77	8.97	97	56.47	65.44	0.037	-0.194
722.9	46.095	6.32	1.02	2.94	1.0	0.77	9.67	98	56.78	66.45	0.037	-0.200
722.7	46.259	5.81	1.87	3.09	1.0	0.76	9.05	100	56.74	65.79	0.037	-0.196
722.6	46.423	8.74	1.72	2.92	1.0	0.77	12.70	96	57.57	70.27	0.037	-0.221
722.4	46.587	7.44	1.45	2.94	1.0	0.76	11.10	98	57.25	68.35	0.037	-0.210
722.2	46.751	9.22	1.92	2.92	1.0	0.77	13.34	97	57.80	71.13	0.036	-0.226
722.1	46.915	9.03	1.60	2.89	1.0	0.76	13.11	94	57.50	70.61	0.036	-0.223
721.9	47.079	13.57	1.41	2.71	1.0	0.77	18.84	80	57.62	76.46	0.036	-0.254
721.8	47.244	13.57	2.14	2.80	1.0	0.77	18.89	87	58.58	77.47	0.036	-0.259
721.6	47.408	23.99	1.45	2.51	0.5	0.77	25.64	63	56.73	82.37	0.036	-0.283
721.4	47.572	41.10	0.45	2.05	0.5	0.77	42.47	27	40.69	83.16	0.036	-0.287
721.3	47.736	39.44	0.27	1.98	0.5	0.76	40.25	22	31.83	72.08	0.036	-0.230
721.1	47.900	27.73	0.31	2.15	0.5	0.76	29.01	35	45.42	74.43	0.035	-0.243
720.9	48.064	18.06	0.46	2.38	0.5	0.76	19.55	54	52.43	71.99	0.035	-0.229
720.8	48.228	9.75	0.92	2.75	1.0	0.75	14.15	83	56.61	70.76	0.035	-0.223
720.6	48.392	10.06	0.82	2.71	1.0	0.75	14.56	80	56.40	70.95	0.035	-0.224
720.4	48.556	13.07	1.03	2.66	1.0	0.76	18.43	76	56.91	75.33	0.035	-0.247
720.3	48.720	14.12	1.40	2.69	1.0	0.76	19.82	78	57.73	77.54	0.035	-0.258
720.1	48.884	23.95	1.41	2.50	0.5	0.76	25.60	63	56.59	82.19	0.035	-0.282
720.0	49.048	44.95	0.86	2.15	0.5	0.77	47.01	35	49.70	96.71	0.034	-0.349
719.8	49.212	67.43	0.50	1.88	0.5	0.76	68.44	14	16.46	84.89	0.034	-0.294
719.6	49.376	81.45	0.57	1.84	0.5	0.76	82.75	10	7.22	89.97	0.034	-0.318
719.5	49.540	99.67	0.66	1.80	0.5	0.78	102.47	7	1.66	104.13	0.034	-0.380
719.3	49.704	105.72	0.91	1.86	0.5	0.79	111.04	12	14.61	125.65	0.034	-0.463
719.1	49.868	121.23	0.90	1.82	0.5	0.80	127.79	8	4.09	131.88	0.034	-0.485
719.0	50.032	147.39	0.91	1.76	0.5	0.81	158.65	3	0.01	158.66	0.034	-0.571
718.8	50.196	166.39	0.91	1.72	0.5	0.83	182.26	0	0.00	182.26	0.033	-0.600
718.6	50.360	196.62	0.96	1.68	0.5	0.85	221.02	0	0.00	221.02	0.033	-0.600
718.5	50.524	207.89	1.09	1.70	0.5	0.86	235.96	0	0.00	235.96	0.033	-0.600
718.3	50.688	198.99	1.23	1.76	0.5	0.85	224.43	4	0.01	224.44	0.033	-0.600
718.1	50.852	190.99	1.33	1.79	0.5	0.85	214.40	7	1.54	215.95	0.033	-0.600
718.0	51.016	175.16	1.43	1.84	0.5	0.84	195.89	10	12.25	208.13	0.033	-0.600
717.8	51.180	155.78	1.51	1.89	0.5	0.84	173.68	14	27.20	200.88	0.033	-0.600
717.7	51.345	140.85	1.45	1.91	0.5	0.83	155.71	16	31.22	186.93	0.032	-0.600
717.5	51.509	134.62	1.30	1.89	0.5	0.82	147.18	14	24.41	171.59	0.032	-0.600
717.3	51.673	131.60	1.13	1.86	0.5	0.80	142.02	11	13.58	155.60	0.032	-0.561
717.2	51.837	127.51	1.05	1.84	0.5	0.80	136.69	11	10.59	147.28	0.032	-0.535
717.0	52.001	119.49	1.06	1.87	0.5	0.79	127.96	13	16.75	144.71	0.032	-0.526
716.8	52.165	105.76	1.12	1.92	0.5	0.79	113.41	17	29.86	143.27	0.032	-0.521
716.7	52.329	96.70	1.11	1.95	0.5	0.79	103.43	19	34.98	138.41	0.032	-0.505
716.5	52.493	95.08	0.85	1.88	0.5	0.77	99.61	14	18.58	118.20	0.031	-0.433
716.3	52.657	93.84	0.80	1.87	0.5	0.76	97.90	13	16.16	114.06	0.031	-0.417
716.2	52.821	93.96	0.81	1.88	0.5	0.76	98.12	13	16.69	114.81	0.031	-0.420
716.0	52.985	96.73	0.89	1.89	0.5	0.77	101.88	14	20.91	122.79	0.031	-0.450
715.9	53.149	101.87	0.87	1.87	0.5	0.77	107.04	12	14.60	121.65	0.031	-0.446

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
715.7	53.313	111.13	0.76	1.80	0.5	0.76	116.07	7	1.71	117.79	0.031	-0.431
715.5	53.477	114.83	0.68	1.76	0.5	0.77	120.21	4	0.01	120.22	0.031	-0.440
715.4	53.641	97.34	0.75	1.84	0.5	0.76	101.06	10	9.02	110.08	0.030	-0.401
715.2	53.805	67.32	1.09	2.07	0.5	0.76	71.39	28	47.75	119.14	0.030	-0.436
715.0	53.969	43.30	1.86	2.36	0.5	0.75	45.97	52	58.96	104.93	0.030	-0.380
714.9	54.133	23.88	3.20	2.71	1.0	0.74	34.43	80	62.31	96.74	0.030	-0.345
714.7	54.297	20.01	3.87	2.82	1.0	0.73	29.01	89	61.83	90.84	0.030	-0.319
714.5	54.461	58.14	1.63	2.23	0.5	0.76	62.06	41	57.64	119.70	0.030	-0.438
714.4	54.625	128.23	0.99	1.82	0.5	0.78	137.55	9	5.77	143.33	0.030	-0.520
714.2	54.789	143.86	1.26	1.86	0.5	0.80	158.90	12	16.54	175.43	0.029	-0.600
714.0	54.953	167.45	1.39	1.85	0.5	0.82	188.84	11	13.24	202.08	0.029	-0.600
713.9	55.117	262.19	1.05	1.63	0.5	0.85	306.01	0	0.00	306.01	0.029	-0.600
713.7	55.281	293.85	0.96	1.56	0.5	0.85	342.85	0	0.00	342.85	0.029	-0.600
713.6	55.446	250.12	1.27	1.70	0.5	0.85	292.42	0	0.00	292.42	0.029	-0.600
713.4	55.610	177.48	1.60	1.88	0.5	0.83	204.55	13	23.71	228.26	0.029	-0.600
713.2	55.774	105.64	2.93	2.22	0.5	0.81	119.23	41	71.35	190.58	0.029	-0.600
713.1	55.938	94.54	3.23	2.29	0.5	0.80	105.78	46	71.61	177.39	0.028	-0.600
712.9	56.102	94.88	3.53	2.31	0.5	0.80	106.40	48	73.14	179.55	0.028	-0.600
712.7	56.266	101.13	3.74	2.32	0.5	0.80	114.31	48	75.27	189.58	0.028	-0.600
712.6	56.430	111.18	3.72	2.29	0.5	0.81	127.05	46	77.20	204.25	0.028	-0.600
712.4	56.594	109.10	3.67	2.29	0.5	0.81	124.45	46	76.59	201.03	0.028	-0.600
712.2	56.758	125.00	3.17	2.20	0.5	0.82	144.56	39	75.98	220.53	0.028	-0.600
712.1	56.922	124.57	3.50	2.24	0.5	0.82	144.42	42	78.46	222.88	0.028	-0.600
711.9	57.086	128.63	3.77	2.25	0.5	0.83	150.09	43	81.05	231.15	0.028	-0.600
711.8	57.250	123.47	4.36	2.31	0.5	0.83	143.76	48	82.94	226.69	0.028	-0.600
711.6	57.414	132.49	4.44	2.30	0.5	0.83	155.92	47	85.48	241.40	0.028	-0.600
711.4	57.578	161.22	4.01	2.22	0.5	0.84	191.04	40	88.47	279.51	0.027	-0.600
711.3	57.742	152.98	4.07	2.24	0.5	0.84	181.54	42	87.62	269.16	0.027	-0.600
711.1	57.906	136.92	4.17	2.27	0.5	0.84	162.04	45	85.24	247.28	0.027	-0.600
710.9	58.070	143.04	3.81	2.23	0.5	0.84	170.14	41	84.33	254.46	0.027	-0.600
710.8	58.234	148.30	3.62	2.20	0.5	0.84	176.40	39	83.67	260.08	0.027	-0.600
710.6	58.398	158.96	3.69	2.19	0.5	0.84	188.99	38	85.68	274.67	0.027	-0.600
710.4	58.562	158.50	3.70	2.19	0.5	0.84	188.58	38	85.69	274.27	0.027	-0.600
710.3	58.726	141.75	4.15	2.26	0.5	0.84	169.05	44	86.37	255.41	0.027	-0.600
710.1	58.890	158.06	1.83	1.95	0.5	0.82	184.87	19	45.79	230.66	0.027	-0.600
709.9	59.054	179.36	3.19	2.11	0.5	0.84	213.41	32	81.77	295.18	0.026	-0.600
709.8	59.218	108.98	6.16	2.47	0.5	0.81	126.33	60	84.31	210.64	0.026	-0.600
709.6	59.382	202.32	3.76	2.14	0.5	0.84	240.66	34	91.79	332.45	0.026	-0.600
709.5	59.547	174.02	4.11	2.21	0.5	0.84	207.52	40	91.58	299.10	0.026	-0.600
709.3	59.711	140.88	4.61	2.30	0.5	0.83	168.66	47	88.65	257.30	0.026	-0.600
709.1	59.875	134.79	4.69	2.32	0.5	0.83	160.87	48	87.59	248.46	0.026	-0.600
709.0	60.039	160.03	4.01	2.22	0.5	0.83	191.42	41	88.68	280.11	0.026	-0.600
708.8	60.203	178.14	4.17	2.21	0.5	0.83	212.89	40	92.87	305.75	0.026	-0.600
708.6	60.367	198.34	4.13	2.18	0.5	0.83	236.84	37	95.58	332.42	0.026	-0.600
708.5	60.531	171.52	4.91	2.28	0.5	0.83	205.33	45	96.47	301.80	0.026	-0.600
708.3	60.695	170.48	4.46	2.24	0.5	0.83	204.23	42	93.71	297.93	0.025	-0.600
708.1	60.859	149.13	4.53	2.28	0.5	0.83	179.12	45	90.09	269.22	0.025	-0.600
708.0	61.023	116.79	5.69	2.42	0.5	0.81	137.45	57	85.90	223.35	0.025	-0.600
707.8	61.187	122.89	4.93	2.36	0.5	0.81	145.51	52	85.53	231.04	0.025	-0.600
707.6	61.351	122.86	4.87	2.35	0.5	0.81	145.54	51	85.35	230.89	0.025	-0.600
707.5	61.515	156.64	4.28	2.25	0.5	0.83	188.45	43	90.25	278.71	0.025	-0.600
707.3	61.679	151.54	4.47	2.27	0.5	0.83	182.52	45	90.43	272.95	0.025	-0.600
707.2	61.843	145.16	4.66	2.30	0.5	0.83	175.07	47	90.10	265.17	0.025	-0.600
707.0	62.007	138.09	4.61	2.31	0.5	0.83	166.78	47	88.45	255.23	0.025	-0.600
706.8	62.171	121.69	3.99	2.29	0.5	0.81	143.89	46	81.55	225.43	0.025	-0.600
706.7	62.335	105.31	4.33	2.35	0.5	0.79	122.23	51	79.11	201.34	0.025	-0.600
706.5	62.499	92.44	4.04	2.37	0.5	0.77	105.46	52	75.09	180.55	0.024	-0.600
706.3	62.663	46.43	4.92	2.63	1.0	0.74	74.28	73	72.97	147.25	0.024	-0.528
706.2	62.827	25.87	8.82	2.99	1.0	0.70	40.33	100	66.45	106.79	0.024	-0.382
706.0	62.991	148.42	2.22	2.03	0.5	0.81	177.64	26	62.99	240.63	0.024	-0.600
705.8	63.155	176.30	2.09	1.97	0.5	0.82	212.98	20	53.74	266.71	0.024	-0.600
705.7	63.319	197.51	2.50	2.00	0.5	0.82	238.38	23	65.82	304.20	0.024	-0.600
705.5	63.483	280.26	1.96	1.83	0.5	0.82	337.18	9	9.96	347.14	0.024	-0.600
705.4	63.648	274.02	2.13	1.86	0.5	0.82	329.93	12	24.20	354.12	0.024	-0.600
705.2	63.812	218.27	2.70	2.00	0.5	0.82	263.57	23	70.37	333.94	0.024	-0.600
705.0	63.976	223.64	2.83	2.01	0.5	0.82	270.13	24	74.18	344.31	0.024	-0.600

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
704.9	64.140	271.98	2.50	1.92	0.5	0.82	328.05	17	51.27	379.32	0.024	-0.600
704.7	64.304	316.57	2.26	1.85	0.5	0.82	381.55	11	20.66	402.21	0.023	-0.600
704.5	64.468	356.54	0.15	1.00	0.5	0.82	429.58	0	0.00	429.58	0.023	-0.600
704.4	64.632	337.93	0.15	1.02	0.5	0.82	407.54	0	0.00	407.54	0.023	-0.600

LIQUEFACTION POTENTIAL ASSESSMENT FOR COARSE GRAINED SOILS USING CONE PENETRATION TEST DATA

	Depth to Water during Earthquake:	6.5	ft	Shear Stress Fit Parameters
	Final Grade Elevation during EQ:	769.0	ft	m4: 0
	Height of Final Grade above CPT TOH:	0.0	ft	m3: 0
Project Site: KIF TDEC Stability	Normalize K_σ to:	1.058	tsf	m2: 0
Stantec Project No.: 175668043	a_{max} at top of ground surface:	0.20	g	m1: 0
CPT ID: KIF-BF-CPT-4AA	Earthquake Magnitude:	6.00	M_W	
	Earthquake File or Source Zone:	10	Hz	

Elev. (ft)	Depth *z* (ft)	Cyclic Resistance Ratio *CRR 7.5*	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor *MSF*	Cyclic Resistance Ratio *CRR*	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
769.0																	
768.8	0.164	0.093	29	1.100	N/A	1.07	N/A	1.000	0	0	**0.128**	FALSE	FALSE	TRUE	**N/A**	**Irrelevant Fill**	**A2**
768.7	0.328	N/A	90	N/A	N/A	N/A	N/A	1.000	0	0	**0.128**	FALSE	TRUE	TRUE	**N/A**	**Irrelevant Fill**	**A1**
768.5	0.492	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.128**	FALSE	TRUE	TRUE	**N/A**	**Irrelevant Fill**	**A1**
768.3	0.656	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.128**	FALSE	TRUE	TRUE	**N/A**	**Irrelevant Fill**	**A1**
768.2	0.820	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.128**	FALSE	TRUE	TRUE	**N/A**	**Irrelevant Fill**	**A1**
768.0	0.984	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.128**	FALSE	TRUE	TRUE	**N/A**	**Irrelevant Fill**	**A1**
767.9	1.148	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.128**	FALSE	TRUE	TRUE	**N/A**	**Irrelevant Fill**	**A1**
767.7	1.312	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.128**	FALSE	TRUE	TRUE	**N/A**	**Irrelevant Fill**	**A1**
767.5	1.476	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.128**	FALSE	TRUE	TRUE	**N/A**	**Irrelevant Fill**	**A1**
767.4	1.640	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.128**	FALSE	TRUE	TRUE	**N/A**	**Irrelevant Fill**	**A1**
767.2	1.804	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.128**	FALSE	TRUE	TRUE	**N/A**	**Irrelevant Fill**	**A1**
767.0	1.968	N/A	100	N/A	N/A	N/A	N/A	1.000	0	0	**0.128**	FALSE	TRUE	TRUE	**N/A**	**Irrelevant Fill**	**A1**
766.9	2.133	N/A	100	N/A	N/A	N/A	N/A	0.999	0	0	**0.128**	FALSE	TRUE	TRUE	**N/A**	**Irrelevant Fill**	**A1**
766.7	2.297	N/A	100	N/A	N/A	N/A	N/A	0.998	0	0	**0.128**	FALSE	TRUE	TRUE	**N/A**	**Irrelevant Fill**	**A1**
766.5	2.461	N/A	100	N/A	N/A	N/A	N/A	0.998	0	0	**0.128**	FALSE	TRUE	TRUE	**N/A**	**Irrelevant Fill**	**A1**
766.4	2.625	N/A	100	N/A	N/A	N/A	N/A	0.997	0	0	**0.128**	FALSE	TRUE	TRUE	**N/A**	**Irrelevant Fill**	**A1**
766.2	2.789	N/A	100	N/A	N/A	N/A	N/A	0.996	0	0	**0.127**	FALSE	TRUE	TRUE	**N/A**	**Irrelevant Fill**	**A1**
766.0	2.953	N/A	100	N/A	N/A	N/A	N/A	0.995	0	0	**0.127**	FALSE	TRUE	TRUE	**N/A**	**Irrelevant Fill**	**A1**
765.9	3.117	N/A	100	N/A	N/A	N/A	N/A	0.995	0	0	**0.127**	FALSE	TRUE	TRUE	**N/A**	**Irrelevant Fill**	**A1**
765.7	3.281	N/A	100	N/A	N/A	N/A	N/A	0.994	0	0	**0.127**	FALSE	TRUE	TRUE	**N/A**	**Irrelevant Fill**	**A1**
765.6	3.445	N/A	100	N/A	N/A	N/A	N/A	0.993	0	0	**0.127**	FALSE	TRUE	TRUE	**N/A**	**Irrelevant Fill**	**A1**
765.4	3.609	N/A	100	N/A	N/A	N/A	N/A	0.992	0	0	**0.127**	FALSE	TRUE	TRUE	**N/A**	**Irrelevant Fill**	**A1**
765.2	3.773	N/A	100	N/A	N/A	N/A	N/A	0.992	0	0	**0.127**	FALSE	TRUE	TRUE	**N/A**	**Irrelevant Fill**	**A1**
765.1	3.937	N/A	100	N/A	N/A	N/A	N/A	0.991	0	0	**0.127**	FALSE	TRUE	TRUE	**N/A**	**Irrelevant Fill**	**A1**
764.9	4.101	N/A	100	N/A	N/A	N/A	N/A	0.990	0	0	**0.127**	FALSE	TRUE	TRUE	**N/A**	**Irrelevant Fill**	**A1**
764.7	4.265	N/A	100	N/A	N/A	N/A	N/A	0.989	0	0	**0.127**	FALSE	TRUE	TRUE	**N/A**	**Irrelevant Fill**	**A1**
764.6	4.429	N/A	100	N/A	N/A	N/A	N/A	0.988	0	0	**0.126**	FALSE	TRUE	TRUE	**N/A**	**Irrelevant Fill**	**A1**
764.4	4.593	N/A	100	N/A	N/A	N/A	N/A	0.988	0	0	**0.126**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
764.2	4.757	N/A	100	N/A	N/A	N/A	N/A	0.987	0	0	**0.126**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
764.1	4.921	N/A	100	N/A	N/A	N/A	N/A	0.986	0	0	**0.126**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
763.9	5.085	N/A	100	N/A	N/A	N/A	N/A	0.985	0	0	**0.126**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
763.8	5.249	N/A	99	N/A	N/A	N/A	N/A	0.984	0	0	**0.126**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
763.6	5.413	N/A	82	N/A	N/A	N/A	N/A	0.984	0	0	**0.126**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
763.4	5.577	N/A	88	N/A	N/A	N/A	N/A	0.983	0	0	**0.126**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
763.3	5.741	N/A	100	N/A	N/A	N/A	N/A	0.982	0	0	**0.126**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
763.1	5.905	N/A	100	N/A	N/A	N/A	N/A	0.981	0	0	**0.126**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
762.9	6.069	N/A	100	N/A	N/A	N/A	N/A	0.980	0	0	**0.125**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
762.8	6.234	N/A	100	N/A	N/A	N/A	N/A	0.979	0	0	**0.125**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
762.6	6.398	N/A	100	N/A	N/A	N/A	N/A	0.978	0	0	**0.125**	FALSE	TRUE	TRUE	**N/A**	**Fly Ash**	**A1**
762.4	6.562	N/A	100	N/A	N/A	N/A	N/A	0.978	0	0	**0.126**	FALSE	TRUE	FALSE	**N/A**	**Fly Ash**	**A1**
762.3	6.726	N/A	100	N/A	N/A	N/A	N/A	0.977	0	0	**0.127**	FALSE	TRUE	FALSE	**N/A**	**Fly Ash**	**A1**
762.1	6.890	N/A	100	N/A	N/A	N/A	N/A	0.976	0	0	**0.129**	FALSE	TRUE	FALSE	**N/A**	**Fly Ash**	**A1**
761.9	7.054	N/A	100	N/A	N/A	N/A	N/A	0.975	0	0	**0.130**	FALSE	TRUE	FALSE	**N/A**	**Fly Ash**	**A1**
761.8	7.218	N/A	100	N/A	N/A	N/A	N/A	0.974	0	0	**0.132**	FALSE	TRUE	FALSE	**N/A**	**Fly Ash**	**A1**

Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
761.6	7.382	N/A	100	N/A	N/A	N/A	N/A	0.973	0	0	**0.133**	FALSE	TRUE	FALSE	**N/A**	**Fly Ash**	**A1**
761.5	7.546	N/A	100	N/A	N/A	N/A	N/A	0.972	0	0	**0.134**	FALSE	TRUE	FALSE	**N/A**	**Fly Ash**	**A1**
761.3	7.710	N/A	100	N/A	N/A	N/A	N/A	0.971	0	0	**0.136**	FALSE	TRUE	FALSE	**N/A**	**Fly Ash**	**A1**
761.1	7.874	N/A	100	N/A	N/A	N/A	N/A	0.971	0	0	**0.137**	FALSE	TRUE	FALSE	**N/A**	**Fly Ash**	**A1**
761.0	8.038	N/A	100	N/A	N/A	N/A	N/A	0.970	0	0	**0.138**	FALSE	TRUE	FALSE	**N/A**	**Fly Ash**	**A1**
760.8	8.202	N/A	98	N/A	N/A	N/A	N/A	0.969	0	0	**0.139**	FALSE	TRUE	FALSE	**N/A**	**Fly Ash**	**A1**
760.6	8.366	N/A	88	N/A	N/A	N/A	N/A	0.968	0	0	**0.141**	FALSE	TRUE	FALSE	**N/A**	**Fly Ash**	**A1**
760.5	8.530	0.288	73	1.100	1.009	1.40	0.448	0.967	0	0	**0.142**	FALSE	FALSE	FALSE	**3.2**	**Fly Ash**	**A1**
760.3	8.694	0.234	70	1.100	1.005	1.34	0.346	0.966	0	0	**0.143**	FALSE	FALSE	FALSE	**2.4**	**Fly Ash**	**A1**
760.1	8.858	0.208	68	1.100	1.002	1.30	0.298	0.965	0	0	**0.144**	FALSE	FALSE	FALSE	**2.1**	**Fly Ash**	**A1**
760.0	9.022	0.150	59	1.099	0.998	1.19	0.196	0.964	0	0	**0.145**	FALSE	FALSE	FALSE	**1.3**	**Fly Ash**	**A1**
759.8	9.186	0.141	56	1.093	0.998	1.17	0.180	0.963	0	0	**0.146**	FALSE	FALSE	FALSE	**1.2**	**Fly Ash**	**A1**
759.6	9.350	0.142	56	1.093	0.998	1.17	0.180	0.962	0	0	**0.147**	FALSE	FALSE	FALSE	**1.2**	**Fly Ash**	**A1**
759.5	9.514	0.145	57	1.093	0.998	1.18	0.186	0.961	0	0	**0.148**	FALSE	FALSE	FALSE	**1.3**	**Fly Ash**	**A1**
759.3	9.678	0.153	59	1.096	0.999	1.19	0.200	0.960	0	0	**0.149**	FALSE	FALSE	FALSE	**1.3**	**Fly Ash**	**A1**
759.2	9.842	0.155	60	1.096	0.999	1.20	0.203	0.959	0	0	**0.150**	FALSE	FALSE	FALSE	**1.3**	**Fly Ash**	**A1**
759.0	10.006	0.099	34	1.063	0.999	1.08	0.113	0.958	0	0	**0.151**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**A1**
758.8	10.170	0.188	65	1.100	1.000	1.27	0.262	0.958	0	0	**0.152**	FALSE	FALSE	FALSE	**1.7**	**Fly Ash**	**A1**
758.7	10.335	0.166	62	1.098	0.999	1.22	0.223	0.957	0	0	**0.153**	FALSE	FALSE	FALSE	**1.5**	**Fly Ash**	**A1**
758.5	10.499	0.160	61	1.094	0.999	1.21	0.212	0.956	0	0	**0.154**	FALSE	FALSE	FALSE	**1.4**	**Fly Ash**	**A1**
758.3	10.663	0.156	60	1.091	0.999	1.20	0.204	0.955	0	0	**0.155**	FALSE	FALSE	FALSE	**1.3**	**Fly Ash**	**A1**
758.2	10.827	0.151	59	1.089	0.999	1.19	0.196	0.954	0	0	**0.156**	FALSE	FALSE	FALSE	**1.3**	**Fly Ash**	**A1**
758.0	10.991	0.156	60	1.090	0.999	1.20	0.204	0.953	0	0	**0.157**	FALSE	FALSE	FALSE	**1.3**	**Fly Ash**	**A1**
757.8	11.155	0.195	66	1.100	1.000	1.28	0.274	0.952	0	0	**0.157**	FALSE	FALSE	FALSE	**1.7**	**Fly Ash**	**A1**
757.7	11.319	0.228	69	1.100	1.002	1.33	0.334	0.951	0	0	**0.158**	FALSE	FALSE	FALSE	**2.1**	**Fly Ash**	**A1**
757.5	11.483	0.213	68	1.100	1.002	1.31	0.307	0.950	0	0	**0.159**	FALSE	FALSE	FALSE	**1.9**	**Fly Ash**	**A1**
757.4	11.647	0.167	62	1.090	0.999	1.23	0.223	0.949	0	0	**0.160**	FALSE	FALSE	FALSE	**1.4**	**Fly Ash**	**A1**
757.2	11.811	0.139	56	1.078	0.997	1.16	0.174	0.948	0	0	**0.160**	FALSE	FALSE	FALSE	**1.1**	**Fly Ash**	**A1**
757.0	11.975	0.126	51	1.071	0.996	1.13	0.153	0.947	0	0	**0.161**	FALSE	FALSE	FALSE	**0.9**	**Fly Ash**	**A1**
756.9	12.139	0.118	47	1.066	0.995	1.11	0.139	0.946	0	0	**0.162**	FALSE	FALSE	FALSE	**0.9**	**Fly Ash**	**A1**
756.7	12.303	0.113	44	1.062	0.994	1.10	0.131	0.945	0	0	**0.163**	FALSE	FALSE	FALSE	**0.8**	**Fly Ash**	**A1**
756.5	12.467	0.108	41	1.058	0.993	1.09	0.123	0.944	0	0	**0.163**	FALSE	FALSE	FALSE	**0.8**	**Fly Ash**	**A1**
756.4	12.631	0.101	36	1.054	0.992	1.08	0.113	0.943	0	0	**0.164**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**A2**
756.2	12.795	0.096	31	1.050	0.991	1.07	0.107	0.942	0	0	**0.164**	FALSE	FALSE	FALSE	**0.6**	**Fly Ash**	**A2**
756.0	12.959	0.090	26	1.046	0.991	1.07	0.100	0.941	0	0	**0.165**	FALSE	FALSE	FALSE	**0.6**	**Fly Ash**	**A2**
755.9	13.123	0.087	23	1.044	0.990	1.06	0.096	0.940	0	0	**0.166**	FALSE	FALSE	FALSE	**0.6**	**Fly Ash**	**A2**
755.7	13.287	0.106	39	1.054	0.991	1.09	0.120	0.939	0	0	**0.166**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**A2**
755.5	13.451	0.228	69	1.094	1.007	1.33	0.334	0.938	0	0	**0.167**	FALSE	FALSE	FALSE	**2.0**	**Fly Ash**	**A1**
755.4	13.615	0.164	62	1.078	1.000	1.22	0.216	0.936	0	0	**0.167**	FALSE	FALSE	FALSE	**1.3**	**Fly Ash**	**A1**
755.2	13.779	0.128	52	1.063	0.994	1.14	0.154	0.935	0	0	**0.168**	FALSE	FALSE	FALSE	**0.9**	**Fly Ash**	**A1**
755.1	13.943	0.112	44	1.055	0.991	1.10	0.129	0.934	0	0	**0.169**	FALSE	FALSE	FALSE	**0.8**	**Fly Ash**	**A1**
754.9	14.107	0.115	46	1.056	0.992	1.11	0.134	0.933	0	0	**0.169**	FALSE	FALSE	FALSE	**0.8**	**Fly Ash**	**A1**
754.7	14.271	0.161	61	1.073	0.999	1.21	0.210	0.932	0	0	**0.170**	FALSE	FALSE	FALSE	**1.2**	**Fly Ash**	**A1**
754.6	14.436	0.517	79	1.100	1.021	1.57	0.910	0.931	0	0	**0.170**	FALSE	FALSE	FALSE	**5.3**	**Fly Ash**	**A1**
754.4	14.600	N/A	99	N/A	N/A	N/A	N/A	0.930	0	0	**0.171**	FALSE	TRUE	FALSE	**N/A**	**Fly Ash**	**A1**
754.2	14.764	N/A	89	N/A	N/A	N/A	N/A	0.929	0	0	**0.171**	FALSE	TRUE	FALSE	**N/A**	**Fly Ash**	**A1**
754.1	14.928	0.521	79	1.100	1.022	1.57	0.919	0.928	0	0	**0.172**	FALSE	FALSE	FALSE	**5.4**	**Fly Ash**	**A1**
753.9	15.092	0.189	66	1.076	1.004	1.27	0.259	0.927	0	0	**0.172**	FALSE	FALSE	FALSE	**1.5**	**Fly Ash**	**A1**
753.7	15.256	0.145	57	1.063	0.996	1.18	0.180	0.926	0	0	**0.173**	FALSE	FALSE	FALSE	**1.0**	**Fly Ash**	**A1**
753.6	15.420	0.135	54	1.059	0.994	1.15	0.163	0.925	0	0	**0.173**	FALSE	FALSE	FALSE	**0.9**	**Fly Ash**	**A1**
753.4	15.584	0.127	51	1.055	0.993	1.13	0.150	0.924	0	0	**0.173**	FALSE	FALSE	FALSE	**0.9**	**Fly Ash**	**A1**
753.3	15.748	0.118	47	1.051	0.991	1.11	0.137	0.923	0	0	**0.174**	FALSE	FALSE	FALSE	**0.8**	**Fly Ash**	**A1**
753.1	15.912	0.108	41	1.046	0.990	1.09	0.122	0.922	0	0	**0.174**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**A1**
752.9	16.076	0.103	37	1.043	0.989	1.08	0.115	0.921	0	0	**0.175**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**A1**
752.8	16.240	0.097	33	1.040	0.989	1.07	0.107	0.919	0	0	**0.175**	FALSE	FALSE	FALSE	**0.6**	**Fly Ash**	**A1**

Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
752.6	16.404	0.091	26	1.036	0.988	1.07	0.099	0.918	0	0	**0.175**	FALSE	FALSE	FALSE	**0.6**	**Fly Ash**	**A1**
752.4	16.568	0.089	24	1.035	0.988	1.06	0.097	0.917	0	0	**0.176**	FALSE	FALSE	FALSE	**0.6**	**Fly Ash**	**A1**
752.3	16.732	0.089	24	1.035	0.989	1.06	0.097	0.916	0	0	**0.176**	FALSE	FALSE	FALSE	**0.5**	**Fly Ash**	**A1**
752.1	16.896	0.087	22	1.033	0.989	1.06	0.094	0.915	0	0	**0.176**	FALSE	FALSE	FALSE	**0.5**	**Fly Ash**	**A1**
751.9	17.060	0.087	22	1.033	0.989	1.06	0.094	0.914	0	0	**0.177**	FALSE	FALSE	FALSE	**0.5**	**Fly Ash**	**A1**
751.8	17.224	0.093	28	1.035	0.989	1.07	0.101	0.913	0	0	**0.177**	FALSE	FALSE	FALSE	**0.6**	**Fly Ash**	**A1**
751.6	17.388	0.102	37	1.039	0.990	1.08	0.114	0.912	0	0	**0.177**	FALSE	FALSE	FALSE	**0.6**	**Fly Ash**	**A1**
751.4	17.552	0.151	59	1.055	0.997	1.19	0.189	0.911	0	0	**0.178**	FALSE	FALSE	FALSE	**1.1**	**Fly Ash**	**A1**
751.3	17.716	0.210	68	1.066	1.005	1.30	0.293	0.909	0	0	**0.178**	FALSE	FALSE	FALSE	**1.6**	**Fly Ash**	**A1**
751.1	17.880	0.210	68	1.065	1.004	1.30	0.292	0.908	0	0	**0.178**	FALSE	FALSE	FALSE	**1.6**	**Fly Ash**	**A1**
751.0	18.044	0.132	53	1.047	0.995	1.14	0.157	0.907	0	0	**0.179**	FALSE	FALSE	FALSE	**0.9**	**Fly Ash**	**A1**
750.8	18.208	0.111	43	1.039	0.992	1.10	0.126	0.906	0	0	**0.179**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**A1**
750.6	18.372	0.111	43	1.039	0.993	1.10	0.125	0.905	0	0	**0.179**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**A1**
750.5	18.537	0.116	46	1.040	0.993	1.11	0.133	0.904	0	0	**0.179**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**A1**
750.3	18.701	0.114	45	1.039	0.993	1.10	0.129	0.903	0	0	**0.180**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**A1**
750.1	18.865	0.110	42	1.037	0.993	1.10	0.124	0.902	0	0	**0.180**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**A1**
750.0	19.029	0.109	42	1.036	0.994	1.09	0.123	0.900	0	0	**0.180**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**A1**
749.8	19.193	0.126	51	1.041	0.995	1.13	0.147	0.899	0	0	**0.180**	FALSE	FALSE	FALSE	**0.8**	**Fly Ash**	**A1**
749.6	19.357	0.167	62	1.051	0.999	1.22	0.214	0.898	0	0	**0.181**	FALSE	FALSE	FALSE	**1.2**	**Fly Ash**	**A1**
749.5	19.521	0.511	79	1.078	1.009	1.57	0.871	0.897	0	0	**0.181**	FALSE	FALSE	FALSE	**4.8**	**Bottom Ash**	**A1**
749.3	19.685	0.256	71	1.061	1.004	1.37	0.372	0.896	0	0	**0.181**	FALSE	FALSE	FALSE	**2.1**	**Bottom Ash**	**A1**
749.2	19.849	0.196	66	1.053	1.001	1.28	0.264	0.895	0	0	**0.181**	FALSE	FALSE	FALSE	**1.5**	**Bottom Ash**	**A1**
749.0	20.013	0.150	59	1.044	0.998	1.19	0.186	0.894	0	0	**0.181**	FALSE	FALSE	FALSE	**1.0**	**Bottom Ash**	**A1**
748.8	20.177	0.244	71	1.057	1.003	1.35	0.349	0.892	0	0	**0.181**	FALSE	FALSE	FALSE	**1.9**	**Bottom Ash**	**A1**
748.7	20.341	N/A	82	N/A	N/A	N/A	N/A	0.891	0	0	**0.182**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
748.5	20.505	N/A	99	N/A	N/A	N/A	N/A	0.890	0	0	**0.182**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
748.3	20.669	N/A	95	N/A	N/A	N/A	N/A	0.889	0	0	**0.182**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
748.2	20.833	N/A	93	N/A	N/A	N/A	N/A	0.888	0	0	**0.182**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
748.0	20.997	N/A	88	N/A	N/A	N/A	N/A	0.887	0	0	**0.182**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
747.8	21.161	N/A	83	N/A	N/A	N/A	N/A	0.885	0	0	**0.182**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
747.7	21.325	0.348	76	1.057	1.002	1.46	0.537	0.884	0	0	**0.182**	FALSE	FALSE	FALSE	**2.9**	**Subunit 2**	**A1**
747.5	21.489	0.302	74	1.053	1.001	1.42	0.451	0.883	0	0	**0.182**	FALSE	FALSE	FALSE	**2.5**	**Subunit 2**	**A1**
747.3	21.653	0.308	74	1.052	1.000	1.42	0.461	0.882	0	0	**0.182**	FALSE	FALSE	FALSE	**2.5**	**Subunit 2**	**A1**
747.2	21.817	0.304	74	1.051	1.000	1.42	0.454	0.881	0	0	**0.182**	FALSE	FALSE	FALSE	**2.5**	**Subunit 2**	**A1**
747.0	21.981	0.197	66	1.041	1.000	1.28	0.262	0.880	0	0	**0.182**	FALSE	FALSE	FALSE	**1.4**	**Subunit 2**	**A1**
746.9	22.145	0.143	57	1.033	0.999	1.17	0.173	0.878	0	0	**0.182**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**A1**
746.7	22.309	0.126	51	1.029	0.998	1.13	0.146	0.877	0	0	**0.182**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**A1**
746.5	22.473	0.128	52	1.029	0.998	1.14	0.150	0.876	0	0	**0.182**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**A1**
746.4	22.638	0.136	55	1.029	0.998	1.16	0.162	0.875	0	0	**0.182**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**A1**
746.2	22.802	0.150	59	1.031	0.998	1.19	0.183	0.874	0	0	**0.182**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**A1**
746.0	22.966	0.142	56	1.029	0.997	1.17	0.170	0.873	0	0	**0.182**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**A1**
745.9	23.130	0.173	63	1.032	0.999	1.24	0.221	0.871	0	0	**0.182**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**A1**
745.7	23.294	0.218	69	1.036	1.002	1.31	0.297	0.870	0	0	**0.182**	FALSE	FALSE	FALSE	**1.6**	**Subunit 2**	**A1**
745.5	23.458	0.227	69	1.036	1.003	1.33	0.314	0.869	0	0	**0.182**	FALSE	FALSE	FALSE	**1.7**	**Subunit 2**	**A1**
745.4	23.622	0.182	65	1.031	1.000	1.25	0.235	0.868	0	0	**0.182**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**A1**
745.2	23.786	0.180	64	1.030	1.000	1.25	0.232	0.867	0	0	**0.182**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**A1**
745.1	23.950	0.146	58	1.025	0.996	1.18	0.176	0.865	0	0	**0.182**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**A1**
744.9	24.114	0.132	53	1.023	0.994	1.15	0.154	0.864	0	0	**0.182**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**A1**
744.7	24.278	0.117	46	1.020	0.991	1.11	0.131	0.863	0	0	**0.182**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**A1**
744.6	24.442	0.106	40	1.017	0.989	1.09	0.116	0.862	0	0	**0.182**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**A2**
744.4	24.606	0.102	36	1.016	0.988	1.08	0.110	0.861	0	0	**0.182**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**A2**
744.2	24.770	0.106	40	1.016	0.987	1.09	0.116	0.859	0	0	**0.182**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**A2**
744.1	24.934	0.127	51	1.019	0.991	1.13	0.145	0.858	0	0	**0.182**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**A1**
743.9	25.098	0.145	57	1.021	0.995	1.18	0.173	0.857	0	0	**0.182**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**A1**
743.7	25.262	0.151	59	1.020	0.997	1.19	0.182	0.856	0	0	**0.182**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**A1**

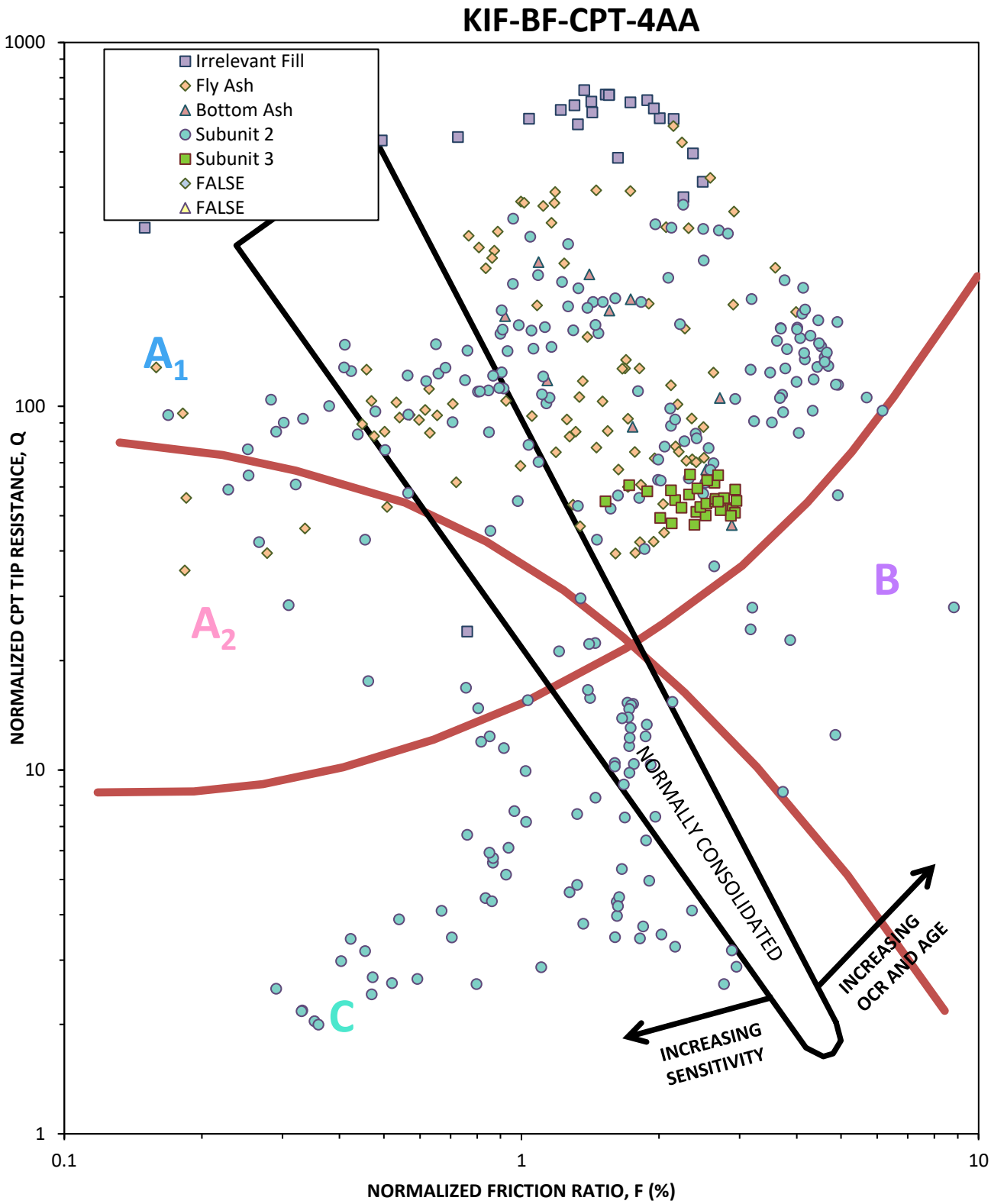
Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
743.6	25.426	0.153	59	1.020	0.997	1.19	0.185	0.855	0	0	**0.182**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**A1**
743.4	25.590	0.163	61	1.020	1.000	1.21	0.201	0.853	0	0	**0.182**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**A1**
743.2	25.754	0.180	64	1.021	1.006	1.25	0.231	0.852	0	0	**0.182**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**A1**
743.1	25.918	0.187	65	1.020	1.008	1.26	0.243	0.851	0	0	**0.182**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**A1**
742.9	26.082	0.180	64	1.019	1.007	1.25	0.231	0.850	0	0	**0.182**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**A1**
742.8	26.246	0.205	67	1.020	1.015	1.29	0.275	0.848	0	0	**0.182**	FALSE	FALSE	FALSE	**1.5**	**Subunit 2**	**A1**
742.6	26.410	0.231	70	1.020	1.023	1.33	0.321	0.847	0	0	**0.182**	FALSE	FALSE	FALSE	**1.8**	**Subunit 2**	**A1**
742.4	26.574	0.252	71	1.020	1.031	1.36	0.361	0.846	0	0	**0.181**	FALSE	FALSE	FALSE	**2.0**	**Subunit 2**	**A1**
742.3	26.739	0.293	73	1.020	1.043	1.41	0.438	0.845	0	0	**0.181**	FALSE	FALSE	FALSE	**2.4**	**Subunit 2**	**A1**
742.1	26.903	0.432	78	1.022	1.066	1.52	0.717	0.844	0	0	**0.181**	FALSE	FALSE	FALSE	**4.0**	**Subunit 2**	**A1**
741.9	27.067	0.376	76	1.020	1.066	1.48	0.606	0.842	0	0	**0.181**	FALSE	FALSE	FALSE	**3.3**	**Subunit 2**	**A1**
741.8	27.231	0.323	75	1.018	1.058	1.44	0.501	0.841	0	0	**0.181**	FALSE	FALSE	FALSE	**2.8**	**Subunit 2**	**A1**
741.6	27.395	0.282	73	1.017	1.049	1.40	0.419	0.840	0	0	**0.181**	FALSE	FALSE	FALSE	**2.3**	**Subunit 2**	**A1**
741.4	27.559	0.268	72	1.015	1.047	1.38	0.393	0.839	0	0	**0.181**	FALSE	FALSE	FALSE	**2.2**	**Subunit 2**	**A1**
741.3	27.723	0.245	71	1.014	1.042	1.35	0.351	0.838	0	0	**0.181**	FALSE	FALSE	FALSE	**1.9**	**Subunit 2**	**A1**
741.1	27.887	0.215	68	1.013	1.031	1.31	0.294	0.836	0	0	**0.181**	FALSE	FALSE	FALSE	**1.6**	**Subunit 2**	**A1**
740.9	28.051	0.204	67	1.011	1.027	1.29	0.273	0.835	0	0	**0.181**	FALSE	FALSE	FALSE	**1.5**	**Subunit 2**	**A1**
740.8	28.215	0.186	65	1.010	1.020	1.26	0.241	0.834	0	0	**0.181**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**A1**
740.6	28.379	0.175	63	1.009	1.014	1.24	0.221	0.833	0	0	**0.180**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**A1**
740.5	28.543	0.172	63	1.008	1.013	1.23	0.217	0.831	0	0	**0.180**	FALSE	FALSE	FALSE	**1.2**	**Subunit 3**	**A1**
740.3	28.707	0.160	61	1.007	1.006	1.21	0.196	0.830	0	0	**0.180**	FALSE	FALSE	FALSE	**1.1**	**Subunit 3**	**A1**
740.1	28.871	0.152	59	1.006	1.001	1.19	0.182	0.829	0	0	**0.180**	FALSE	FALSE	FALSE	**1.0**	**Subunit 3**	**A1**
740.0	29.035	0.151	59	1.006	1.001	1.19	0.181	0.828	0	0	**0.180**	FALSE	FALSE	FALSE	**1.0**	**Subunit 3**	**A1**
739.8	29.199	0.153	59	1.005	1.003	1.19	0.184	0.826	0	0	**0.180**	FALSE	FALSE	FALSE	**1.0**	**Subunit 3**	**A1**
739.6	29.363	0.157	60	1.005	1.006	1.20	0.191	0.825	0	0	**0.180**	FALSE	FALSE	FALSE	**1.1**	**Subunit 3**	**A1**
739.5	29.527	0.172	63	1.004	1.017	1.23	0.217	0.824	0	0	**0.179**	FALSE	FALSE	FALSE	**1.2**	**Subunit 3**	**A1**
739.3	29.691	0.167	62	1.003	1.014	1.22	0.207	0.823	0	0	**0.179**	FALSE	FALSE	FALSE	**1.2**	**Subunit 3**	**A1**
739.1	29.855	0.159	61	1.003	1.008	1.21	0.194	0.822	0	0	**0.179**	FALSE	FALSE	FALSE	**1.1**	**Subunit 3**	**A1**
739.0	30.019	0.164	62	1.002	1.013	1.22	0.203	0.820	0	0	**0.179**	FALSE	FALSE	FALSE	**1.1**	**Subunit 3**	**A1**
738.8	30.183	0.168	62	1.001	1.016	1.23	0.209	0.819	0	0	**0.179**	FALSE	FALSE	FALSE	**1.2**	**Subunit 3**	**A1**
738.7	30.347	0.170	63	1.001	1.019	1.23	0.214	0.818	0	0	**0.179**	FALSE	FALSE	FALSE	**1.2**	**Subunit 3**	**A1**
738.5	30.511	0.173	63	1.000	1.022	1.24	0.218	0.817	0	0	**0.179**	FALSE	FALSE	FALSE	**1.2**	**Subunit 3**	**A1**
738.3	30.675	0.171	63	0.999	1.021	1.23	0.214	0.815	0	0	**0.178**	FALSE	FALSE	FALSE	**1.2**	**Subunit 3**	**A1**
738.2	30.840	0.167	62	0.999	1.018	1.22	0.208	0.814	0	0	**0.178**	FALSE	FALSE	FALSE	**1.2**	**Subunit 3**	**A1**
738.0	31.004	0.166	62	0.998	1.018	1.22	0.206	0.813	0	0	**0.178**	FALSE	FALSE	FALSE	**1.2**	**Subunit 3**	**A1**
737.8	31.168	0.175	64	0.997	1.026	1.24	0.222	0.812	0	0	**0.178**	FALSE	FALSE	FALSE	**1.2**	**Subunit 3**	**A1**
737.7	31.332	0.190	66	0.997	1.040	1.27	0.250	0.810	0	0	**0.178**	FALSE	FALSE	FALSE	**1.4**	**Subunit 3**	**A1**
737.5	31.496	0.201	67	0.996	1.050	1.29	0.271	0.809	0	0	**0.178**	FALSE	FALSE	FALSE	**1.5**	**Subunit 3**	**A1**
737.3	31.660	0.186	65	0.995	1.038	1.26	0.242	0.808	0	0	**0.177**	FALSE	FALSE	FALSE	**1.4**	**Subunit 3**	**A1**
737.2	31.824	0.175	63	0.995	1.029	1.24	0.221	0.807	0	0	**0.177**	FALSE	FALSE	FALSE	**1.2**	**Subunit 3**	**A1**
737.0	31.988	0.164	62	0.994	1.019	1.22	0.203	0.805	0	0	**0.177**	FALSE	FALSE	FALSE	**1.1**	**Subunit 3**	**A1**
736.8	32.152	0.162	61	0.994	1.017	1.21	0.199	0.804	0	0	**0.177**	FALSE	FALSE	FALSE	**1.1**	**Subunit 3**	**A1**
736.7	32.316	0.165	62	0.993	1.021	1.22	0.205	0.803	0	0	**0.177**	FALSE	FALSE	FALSE	**1.2**	**Subunit 3**	**A1**
736.5	32.480	0.172	63	0.992	1.028	1.23	0.217	0.802	0	0	**0.177**	FALSE	FALSE	FALSE	**1.2**	**Subunit 3**	**A1**
736.4	32.644	0.171	63	0.992	1.028	1.23	0.215	0.800	0	0	**0.176**	FALSE	FALSE	FALSE	**1.2**	**Subunit 3**	**A1**
736.2	32.808	0.176	64	0.991	1.033	1.24	0.224	0.799	0	0	**0.176**	FALSE	FALSE	FALSE	**1.3**	**Subunit 3**	**A1**
736.0	32.972	0.198	67	0.990	1.055	1.28	0.264	0.798	0	0	**0.176**	FALSE	FALSE	FALSE	**1.5**	**Subunit 3**	**A1**
735.9	33.136	0.193	66	0.989	1.052	1.27	0.256	0.797	0	0	**0.176**	FALSE	FALSE	FALSE	**1.5**	**Subunit 3**	**A1**
735.7	33.300	0.182	65	0.989	1.042	1.25	0.236	0.796	0	0	**0.176**	FALSE	FALSE	FALSE	**1.3**	**Subunit 3**	**A1**
735.5	33.464	0.164	62	0.989	1.022	1.22	0.201	0.794	0	0	**0.175**	FALSE	FALSE	FALSE	**1.1**	**Subunit 3**	**A1**
735.4	33.628	0.137	55	0.990	0.990	1.16	0.155	0.793	0	0	**0.175**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**A1**
735.2	33.792	0.123	49	0.990	0.973	1.12	0.133	0.792	0	0	**0.175**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**B**
735.0	33.956	0.110	42	0.991	0.958	1.10	0.115	0.791	0	0	**0.175**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**B**
734.9	34.120	0.106	39	0.991	0.954	1.09	0.109	0.789	0	0	**0.175**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**B**
734.7	34.284	0.104	38	0.991	0.952	1.08	0.107	0.788	0	0	**0.175**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**

Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
734.6	34.448	0.103	37	0.991	0.951	1.08	0.105	0.787	0	0	**0.174**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
734.4	34.612	0.102	37	0.990	0.950	1.08	0.104	0.786	0	0	**0.174**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
734.2	34.776	0.102	37	0.990	0.950	1.08	0.104	0.784	0	0	**0.174**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
734.1	34.941	0.103	37	0.990	0.949	1.08	0.104	0.783	0	0	**0.174**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
733.9	35.105	0.102	37	0.989	0.948	1.08	0.103	0.782	0	0	**0.174**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
733.7	35.269	0.101	36	0.989	0.947	1.08	0.102	0.781	0	0	**0.174**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
733.6	35.433	0.101	36	0.989	0.947	1.08	0.102	0.779	0	0	**0.173**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
733.4	35.597	0.101	35	0.988	0.946	1.08	0.101	0.778	0	0	**0.173**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
733.2	35.761	0.100	35	0.988	0.946	1.08	0.101	0.777	0	0	**0.173**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
733.1	35.925	0.100	35	0.988	0.945	1.08	0.100	0.776	0	0	**0.173**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
732.9	36.089	0.100	35	0.988	0.945	1.08	0.100	0.774	0	0	**0.173**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
732.7	36.253	0.099	34	0.987	0.944	1.08	0.100	0.773	0	0	**0.173**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
732.6	36.417	0.099	35	0.987	0.944	1.08	0.100	0.772	0	0	**0.172**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
732.4	36.581	0.099	35	0.987	0.944	1.08	0.100	0.771	0	0	**0.172**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
732.3	36.745	0.100	35	0.986	0.944	1.08	0.101	0.770	0	0	**0.172**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
732.1	36.909	0.101	36	0.986	0.945	1.08	0.102	0.768	0	0	**0.172**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
731.9	37.073	0.101	36	0.985	0.945	1.08	0.102	0.767	0	0	**0.172**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
731.8	37.237	0.102	36	0.985	0.945	1.08	0.102	0.766	0	0	**0.172**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
731.6	37.401	0.101	36	0.985	0.944	1.08	0.102	0.765	0	0	**0.171**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
731.4	37.565	0.101	36	0.984	0.944	1.08	0.101	0.763	0	0	**0.171**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
731.3	37.729	0.100	35	0.984	0.943	1.08	0.100	0.762	0	0	**0.171**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
731.1	37.893	0.100	35	0.984	0.943	1.08	0.100	0.761	0	0	**0.171**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
730.9	38.057	0.100	35	0.984	0.943	1.08	0.100	0.760	0	0	**0.171**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
730.8	38.221	0.100	35	0.983	0.943	1.08	0.100	0.758	0	0	**0.170**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
730.6	38.385	0.101	36	0.983	0.943	1.08	0.101	0.757	0	0	**0.170**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
730.5	38.549	0.101	36	0.983	0.943	1.08	0.101	0.756	0	0	**0.170**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
730.3	38.713	0.101	36	0.982	0.943	1.08	0.101	0.755	0	0	**0.170**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
730.1	38.877	0.100	35	0.982	0.943	1.08	0.100	0.754	0	0	**0.170**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
730.0	39.042	0.100	35	0.982	0.943	1.08	0.100	0.752	0	0	**0.169**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
729.8	39.206	0.101	36	0.981	0.943	1.08	0.101	0.751	0	0	**0.169**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
729.6	39.370	0.102	37	0.981	0.944	1.08	0.103	0.750	0	0	**0.169**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
729.5	39.534	0.105	39	0.980	0.947	1.08	0.105	0.749	0	0	**0.169**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
729.3	39.698	0.107	41	0.979	0.949	1.09	0.109	0.747	0	0	**0.169**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
729.1	39.862	0.109	41	0.979	0.951	1.09	0.110	0.746	0	0	**0.168**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**C**
729.0	40.026	0.109	42	0.978	0.952	1.09	0.111	0.745	0	0	**0.168**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**C**
728.8	40.190	0.110	43	0.977	0.953	1.10	0.113	0.744	0	0	**0.168**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**C**
728.6	40.354	0.112	44	0.977	0.955	1.10	0.115	0.743	0	0	**0.168**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**C**
728.5	40.518	0.112	44	0.976	0.955	1.10	0.115	0.741	0	0	**0.168**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**C**
728.3	40.682	0.112	43	0.976	0.955	1.10	0.115	0.740	0	0	**0.167**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**C**
728.2	40.846	0.112	43	0.976	0.954	1.10	0.114	0.739	0	0	**0.167**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**C**
728.0	41.010	0.111	43	0.976	0.953	1.10	0.113	0.738	0	0	**0.167**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**C**
727.8	41.174	0.111	43	0.975	0.953	1.10	0.113	0.736	0	0	**0.167**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**C**
727.7	41.338	0.110	42	0.975	0.952	1.10	0.112	0.735	0	0	**0.167**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**C**
727.5	41.502	0.109	42	0.975	0.951	1.09	0.111	0.734	0	0	**0.166**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**C**
727.3	41.666	0.108	41	0.975	0.950	1.09	0.109	0.733	0	0	**0.166**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**C**
727.2	41.830	0.106	40	0.975	0.948	1.09	0.107	0.732	0	0	**0.166**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
727.0	41.994	0.105	39	0.975	0.946	1.09	0.105	0.730	0	0	**0.166**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
726.8	42.158	0.102	37	0.976	0.944	1.08	0.102	0.729	0	0	**0.166**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
726.7	42.322	0.101	36	0.976	0.943	1.08	0.101	0.728	0	0	**0.165**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
726.5	42.486	0.100	35	0.976	0.942	1.08	0.099	0.727	0	0	**0.165**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
726.3	42.650	0.100	35	0.976	0.942	1.08	0.098	0.726	0	0	**0.165**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
726.2	42.814	0.099	35	0.975	0.942	1.08	0.098	0.724	0	0	**0.165**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
726.0	42.978	0.099	34	0.975	0.941	1.08	0.098	0.723	0	0	**0.165**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
725.9	43.143	0.099	34	0.975	0.941	1.08	0.098	0.722	0	0	**0.164**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
725.7	43.307	0.099	34	0.975	0.941	1.08	0.098	0.721	0	0	**0.164**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**

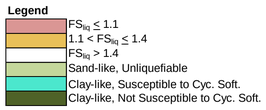
Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
725.5	43.471	0.099	34	0.974	0.942	1.08	0.098	0.720	0	0	**0.164**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
725.4	43.635	0.099	34	0.974	0.942	1.08	0.098	0.718	0	0	**0.164**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
725.2	43.799	0.100	35	0.974	0.942	1.08	0.099	0.717	0	0	**0.164**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
725.0	43.963	0.110	42	0.970	0.953	1.09	0.111	0.716	0	0	**0.163**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**A2**
724.9	44.127	0.122	49	0.967	0.967	1.12	0.128	0.715	0	0	**0.163**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**A1**
724.7	44.291	0.177	64	0.955	1.040	1.24	0.219	0.714	0	0	**0.163**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**A1**
724.5	44.455	0.162	61	0.957	1.022	1.21	0.193	0.712	0	0	**0.163**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**A1**
724.4	44.619	0.159	61	0.958	1.017	1.21	0.186	0.711	0	0	**0.163**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**A1**
724.2	44.783	0.141	56	0.961	0.993	1.17	0.157	0.710	0	0	**0.162**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**A1**
724.1	44.947	0.125	50	0.964	0.971	1.13	0.131	0.709	0	0	**0.162**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**A1**
723.9	45.111	0.116	46	0.967	0.960	1.11	0.119	0.708	0	0	**0.162**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**A2**
723.7	45.275	0.110	42	0.968	0.954	1.10	0.111	0.706	0	0	**0.162**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**A2**
723.6	45.439	0.108	41	0.968	0.952	1.09	0.109	0.705	0	0	**0.162**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**C**
723.4	45.603	0.107	40	0.968	0.950	1.09	0.107	0.704	0	0	**0.161**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**C**
723.2	45.767	0.105	39	0.969	0.948	1.09	0.104	0.703	0	0	**0.161**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
723.1	45.931	0.104	38	0.969	0.947	1.08	0.103	0.702	0	0	**0.161**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
722.9	46.095	0.104	38	0.968	0.948	1.08	0.104	0.701	0	0	**0.161**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
722.7	46.259	0.104	38	0.968	0.948	1.08	0.103	0.699	0	0	**0.160**	FALSE	FALSE	FALSE	**0.6**	**Subunit 2**	**C**
722.6	46.423	0.107	41	0.967	0.951	1.09	0.108	0.698	0	0	**0.160**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**C**
722.4	46.587	0.106	40	0.967	0.950	1.09	0.106	0.697	0	0	**0.160**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**C**
722.2	46.751	0.108	41	0.966	0.952	1.09	0.109	0.696	0	0	**0.160**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**C**
722.1	46.915	0.108	41	0.966	0.952	1.09	0.108	0.695	0	0	**0.160**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**C**
721.9	47.079	0.113	44	0.964	0.957	1.10	0.114	0.694	0	0	**0.159**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**C**
721.8	47.244	0.114	44	0.963	0.958	1.10	0.116	0.692	0	0	**0.159**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**C**
721.6	47.408	0.118	47	0.962	0.963	1.11	0.122	0.691	0	0	**0.159**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**A2**
721.4	47.572	0.119	47	0.961	0.964	1.11	0.123	0.690	0	0	**0.159**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**A2**
721.3	47.736	0.109	42	0.964	0.954	1.09	0.110	0.689	0	0	**0.159**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**A2**
721.1	47.900	0.111	43	0.963	0.956	1.10	0.112	0.688	0	0	**0.158**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**A2**
720.9	48.064	0.109	42	0.963	0.954	1.09	0.109	0.687	0	0	**0.158**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**A2**
720.8	48.228	0.108	41	0.964	0.953	1.09	0.108	0.686	0	0	**0.158**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**C**
720.6	48.392	0.108	41	0.963	0.954	1.09	0.108	0.684	0	0	**0.158**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**C**
720.4	48.556	0.112	43	0.962	0.957	1.10	0.113	0.683	0	0	**0.157**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**A2**
720.3	48.720	0.114	44	0.961	0.959	1.10	0.115	0.682	0	0	**0.157**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**C**
720.1	48.884	0.118	47	0.959	0.964	1.11	0.121	0.681	0	0	**0.157**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**A2**
720.0	49.048	0.133	54	0.954	0.982	1.15	0.143	0.680	0	0	**0.157**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**A1**
719.8	49.212	0.120	48	0.957	0.967	1.12	0.125	0.679	0	0	**0.157**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**A1**
719.6	49.376	0.126	51	0.955	0.973	1.13	0.132	0.678	0	0	**0.156**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**A1**
719.5	49.540	0.143	57	0.950	0.993	1.17	0.158	0.676	0	0	**0.156**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**A1**
719.3	49.704	0.185	65	0.940	1.038	1.26	0.227	0.675	0	0	**0.156**	FALSE	FALSE	FALSE	**1.5**	**Subunit 2**	**A1**
719.1	49.868	0.203	67	0.936	1.055	1.29	0.259	0.674	0	0	**0.156**	FALSE	FALSE	FALSE	**1.7**	**Subunit 2**	**A1**
719.0	50.032	0.358	76	0.919	1.154	1.47	0.557	0.673	0	0	**0.156**	FALSE	FALSE	FALSE	**3.6**	**Subunit 2**	**A1**
718.8	50.196	N/A	83	N/A	N/A	N/A	N/A	0.672	0	0	**0.155**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
718.6	50.360	N/A	93	N/A	N/A	N/A	N/A	0.671	0	0	**0.155**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
718.5	50.524	N/A	96	N/A	N/A	N/A	N/A	0.670	0	0	**0.155**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
718.3	50.688	N/A	93	N/A	N/A	N/A	N/A	0.668	0	0	**0.155**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
718.1	50.852	N/A	91	N/A	N/A	N/A	N/A	0.667	0	0	**0.154**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
718.0	51.016	N/A	89	N/A	N/A	N/A	N/A	0.666	0	0	**0.154**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
717.8	51.180	N/A	88	N/A	N/A	N/A	N/A	0.665	0	0	**0.154**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
717.7	51.345	N/A	84	N/A	N/A	N/A	N/A	0.664	0	0	**0.154**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
717.5	51.509	0.531	80	0.904	1.193	1.58	0.903	0.663	0	0	**0.154**	FALSE	FALSE	FALSE	**5.9**	**Subunit 2**	**A1**
717.3	51.673	0.330	75	0.916	1.131	1.44	0.494	0.662	0	0	**0.153**	FALSE	FALSE	FALSE	**3.2**	**Subunit 2**	**A1**
717.2	51.837	0.272	72	0.922	1.098	1.38	0.380	0.661	0	0	**0.153**	FALSE	FALSE	FALSE	**2.5**	**Subunit 2**	**A1**
717.0	52.001	0.257	71	0.923	1.088	1.37	0.353	0.660	0	0	**0.153**	FALSE	FALSE	FALSE	**2.3**	**Subunit 2**	**A1**
716.8	52.165	0.250	71	0.924	1.083	1.36	0.339	0.658	0	0	**0.153**	FALSE	FALSE	FALSE	**2.2**	**Subunit 2**	**A1**
716.7	52.329	0.228	69	0.926	1.067	1.33	0.299	0.657	0	0	**0.153**	FALSE	FALSE	FALSE	**2.0**	**Subunit 2**	**A1**

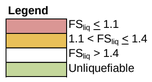
Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
716.5	52.493	0.167	62	0.937	1.016	1.22	0.195	0.656	0	0	**0.152**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**A1**
716.3	52.657	0.159	61	0.939	1.008	1.21	0.182	0.655	0	0	**0.152**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**A1**
716.2	52.821	0.161	61	0.938	1.009	1.21	0.184	0.654	0	0	**0.152**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**A1**
716.0	52.985	0.178	64	0.934	1.025	1.25	0.212	0.653	0	0	**0.152**	FALSE	FALSE	FALSE	**1.4**	**Subunit 2**	**A1**
715.9	53.149	0.175	64	0.934	1.022	1.24	0.207	0.652	0	0	**0.151**	FALSE	FALSE	FALSE	**1.4**	**Subunit 2**	**A1**
715.7	53.313	0.166	62	0.936	1.014	1.22	0.193	0.651	0	0	**0.151**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**A1**
715.5	53.477	0.172	63	0.934	1.019	1.23	0.202	0.650	0	0	**0.151**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**A1**
715.4	53.641	0.152	59	0.939	1.000	1.19	0.170	0.649	0	0	**0.151**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**A1**
715.2	53.805	0.169	63	0.934	1.016	1.23	0.197	0.648	0	0	**0.151**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**A1**
715.0	53.969	0.144	57	0.941	0.992	1.17	0.158	0.647	0	0	**0.150**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**A1**
714.9	54.133	0.133	54	0.944	0.981	1.15	0.142	0.645	0	0	**0.150**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**B**
714.7	54.297	0.126	51	0.946	0.975	1.13	0.132	0.644	0	0	**0.150**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**B**
714.5	54.461	0.171	63	0.932	1.016	1.23	0.199	0.643	0	0	**0.150**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**A1**
714.4	54.625	0.250	71	0.917	1.073	1.36	0.334	0.642	0	0	**0.150**	FALSE	FALSE	FALSE	**2.2**	**Subunit 2**	**A1**
714.2	54.789	N/A	81	N/A	N/A	N/A	N/A	0.641	0	0	**0.149**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
714.0	54.953	N/A	88	N/A	N/A	N/A	N/A	0.640	0	0	**0.149**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
713.9	55.117	N/A	100	N/A	N/A	N/A	N/A	0.639	0	0	**0.149**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
713.7	55.281	N/A	100	N/A	N/A	N/A	N/A	0.638	0	0	**0.149**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
713.6	55.446	N/A	100	N/A	N/A	N/A	N/A	0.637	0	0	**0.149**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
713.4	55.610	N/A	94	N/A	N/A	N/A	N/A	0.636	0	0	**0.148**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
713.2	55.774	N/A	85	N/A	N/A	N/A	N/A	0.635	0	0	**0.148**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
713.1	55.938	N/A	81	N/A	N/A	N/A	N/A	0.634	0	0	**0.148**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
712.9	56.102	N/A	82	N/A	N/A	N/A	N/A	0.633	0	0	**0.148**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
712.7	56.266	N/A	85	N/A	N/A	N/A	N/A	0.632	0	0	**0.147**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
712.6	56.430	N/A	88	N/A	N/A	N/A	N/A	0.631	0	0	**0.147**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
712.4	56.594	N/A	88	N/A	N/A	N/A	N/A	0.630	0	0	**0.147**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
712.2	56.758	N/A	92	N/A	N/A	N/A	N/A	0.629	0	0	**0.147**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
712.1	56.922	N/A	93	N/A	N/A	N/A	N/A	0.627	0	0	**0.147**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
711.9	57.086	N/A	95	N/A	N/A	N/A	N/A	0.626	0	0	**0.146**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
711.8	57.250	N/A	94	N/A	N/A	N/A	N/A	0.625	0	0	**0.146**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
711.6	57.414	N/A	97	N/A	N/A	N/A	N/A	0.624	0	0	**0.146**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
711.4	57.578	N/A	100	N/A	N/A	N/A	N/A	0.623	0	0	**0.146**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
711.3	57.742	N/A	100	N/A	N/A	N/A	N/A	0.622	0	0	**0.146**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
711.1	57.906	N/A	99	N/A	N/A	N/A	N/A	0.621	0	0	**0.145**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
710.9	58.070	N/A	100	N/A	N/A	N/A	N/A	0.620	0	0	**0.145**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
710.8	58.234	N/A	100	N/A	N/A	N/A	N/A	0.619	0	0	**0.145**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
710.6	58.398	N/A	100	N/A	N/A	N/A	N/A	0.618	0	0	**0.145**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
710.4	58.562	N/A	100	N/A	N/A	N/A	N/A	0.617	0	0	**0.145**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
710.3	58.726	N/A	100	N/A	N/A	N/A	N/A	0.616	0	0	**0.144**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
710.1	58.890	N/A	95	N/A	N/A	N/A	N/A	0.615	0	0	**0.144**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
709.9	59.054	N/A	100	N/A	N/A	N/A	N/A	0.614	0	0	**0.144**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
709.8	59.218	N/A	90	N/A	N/A	N/A	N/A	0.613	0	0	**0.144**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
709.6	59.382	N/A	100	N/A	N/A	N/A	N/A	0.612	0	0	**0.144**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
709.5	59.547	N/A	100	N/A	N/A	N/A	N/A	0.611	0	0	**0.143**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
709.3	59.711	N/A	100	N/A	N/A	N/A	N/A	0.610	0	0	**0.143**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
709.1	59.875	N/A	99	N/A	N/A	N/A	N/A	0.609	0	0	**0.143**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
709.0	60.039	N/A	100	N/A	N/A	N/A	N/A	0.608	0	0	**0.143**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
708.8	60.203	N/A	100	N/A	N/A	N/A	N/A	0.607	0	0	**0.143**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
708.6	60.367	N/A	100	N/A	N/A	N/A	N/A	0.606	0	0	**0.142**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
708.5	60.531	N/A	100	N/A	N/A	N/A	N/A	0.605	0	0	**0.142**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
708.3	60.695	N/A	100	N/A	N/A	N/A	N/A	0.604	0	0	**0.142**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
708.1	60.859	N/A	100	N/A	N/A	N/A	N/A	0.603	0	0	**0.142**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
708.0	61.023	N/A	93	N/A	N/A	N/A	N/A	0.602	0	0	**0.142**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
707.8	61.187	N/A	95	N/A	N/A	N/A	N/A	0.601	0	0	**0.141**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
707.6	61.351	N/A	95	N/A	N/A	N/A	N/A	0.601	0	0	**0.141**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**

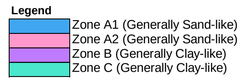
Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
707.5	61.515	N/A	100	N/A	N/A	N/A	N/A	0.600	0	0	**0.141**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
707.3	61.679	N/A	100	N/A	N/A	N/A	N/A	0.599	0	0	**0.141**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
707.2	61.843	N/A	100	N/A	N/A	N/A	N/A	0.598	0	0	**0.141**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
707.0	62.007	N/A	100	N/A	N/A	N/A	N/A	0.597	0	0	**0.140**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
706.8	62.171	N/A	94	N/A	N/A	N/A	N/A	0.596	0	0	**0.140**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
706.7	62.335	N/A	88	N/A	N/A	N/A	N/A	0.595	0	0	**0.140**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
706.5	62.499	N/A	82	N/A	N/A	N/A	N/A	0.594	0	0	**0.140**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
706.3	62.663	0.271	72	0.894	1.061	1.38	0.356	0.593	0	0	**0.140**	FALSE	FALSE	FALSE	**2.6**	**Subunit 2**	**B**
706.2	62.827	0.147	58	0.923	0.992	1.18	0.159	0.592	0	0	**0.139**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**B**
706.0	62.991	N/A	97	N/A	N/A	N/A	N/A	0.591	0	0	**0.139**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
705.8	63.155	N/A	100	N/A	N/A	N/A	N/A	0.590	0	0	**0.139**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
705.7	63.319	N/A	100	N/A	N/A	N/A	N/A	0.589	0	0	**0.139**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
705.5	63.483	N/A	100	N/A	N/A	N/A	N/A	0.588	0	0	**0.139**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
705.4	63.648	N/A	100	N/A	N/A	N/A	N/A	0.587	0	0	**0.138**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
705.2	63.812	N/A	100	N/A	N/A	N/A	N/A	0.586	0	0	**0.138**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
705.0	63.976	N/A	100	N/A	N/A	N/A	N/A	0.585	0	0	**0.138**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
704.9	64.140	N/A	100	N/A	N/A	N/A	N/A	0.585	0	0	**0.138**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
704.7	64.304	N/A	100	N/A	N/A	N/A	N/A	0.584	0	0	**0.138**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
704.5	64.468	N/A	100	N/A	N/A	N/A	N/A	0.583	0	0	**0.137**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**
704.4	64.632	N/A	100	N/A	N/A	N/A	N/A	0.582	0	0	**0.137**	FALSE	TRUE	FALSE	**N/A**	**Subunit 2**	**A1**



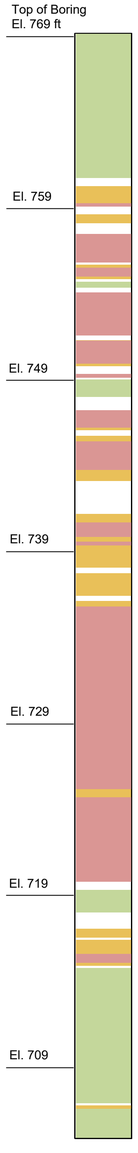
Adapted from "Discussion of 'Liquefaction Potential of Silts from CPTu'" (Robertson 2008). Zone A_1 and Zone A_2 samples are generally sand-like. Zone B samples are generally clay-like and not susceptible to cyclic softening. Zone C samples are generally clay-like and susceptible to cyclic softening. Note that the transition from clay-like to sand-like in this chart does not exactly match the liquefaction calculations herein; that is, some transitional samples in Zone B and Zone C will be treated as sand-like and analyzed for liquefaction if the calculations indicate as such.



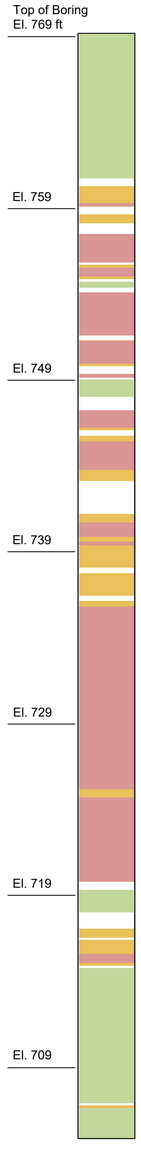




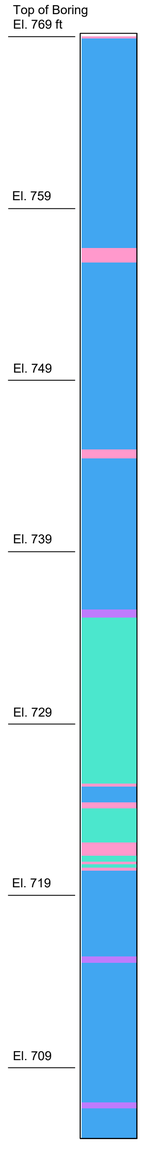
KIF-BF-CPT-4AA, Liquefaction Triggering Results



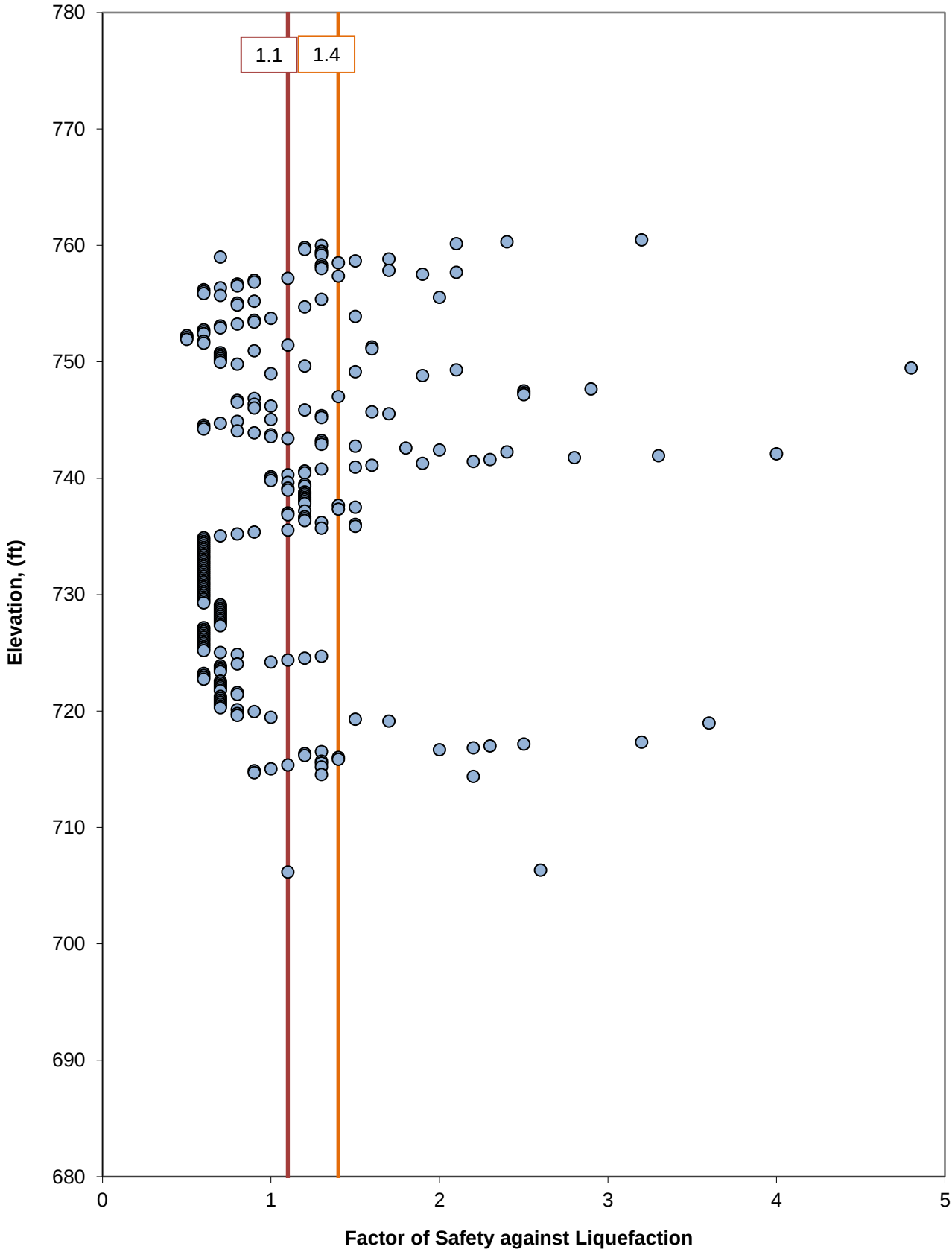
KIF-BF-CPT-4AA, Liquefaction Triggering Results



KIF-BF-CPT-4AA, Robertson Soil Type



KIF TDEC Stability, Boring = KIF-BF-CPT-4AA, Source = 10 Hz, Mw = 6, Event = Design EQ, CPT Data, Simplified Stress-Based Approach



Inputs

Project Information

Stantec Project Number =	175668043
Project Name =	KIF TDEC Stability
CPT ID =	KIF-BF-CPT-5B

Boring Location (optional)

Northing =	
Easting =	
OR	
Baseline Station =	
Offset (+ Right) =	

Using qt (corrected for u2 PWP) or qc (backcalculated uncorrected field tip)

Cone ID (optional) =	AD184	
Use qc instead of qt?	0	(1: Yes, 0: No)
Cone Area Ratio (a) =	0.80	

Drilling Information

Top of Hole Elevation =	769.0	feet
Water Depth during CPT (negative for U/S borings) =	13.0	feet
Depth data collection began =	0.16	feet
Avg. Total Unit Wt. Above 1st Sample =	122.00	pcf

During Earthquake Information

Water Depth during EQ (relative to CPT TOH, negative for U/S borings) =	15.0	feet
Final Grade Elevation during EQ =	766.0	feet
Avg. Total Unit Wt. of Cut/Fill =	122	pcf

Nonlinear Pore Water Pressure Profile

Custom Pore Water Pressure Profile?	0	(1: Yes, 0: No)

If previous answer is No, hydrostatic pressures are assumed.

α Curve Fit Parameters

Associated α profile:	g_Pond_Section, KIF-BF-CPT5B_NOR	
α at each Sample Depth known?	1	(1: Yes, 0: No)

If previous answer is No, then enter curve fit parameters below (α vs. depth curve)
If defaulting to K_α=1 (i.e., level ground), assign values of zero to all curve fit parameters below to make alpha zero and thus, K_α will be one.

m4:	
m3:	
m2:	
m1:	
m0:	

Associated ground response profile:	shing_Pond_Section, KIF-BF-SPT5	
Get CSR from shear stress envelope?	0	(1: Yes, 0: No)

If previous answer is No, then CSR will be calculated using a_{max} and r_d

Max. Shear Stress at each sample depth known?		(1: Yes, 0: No)

If previous answer is No, then enter curve fit parameters below (shear stress vs. depth curve)

Max. Shear Stress Curve Fit Parameters (from ground response analysis)

m4:	
m3:	
m2:	
m1:	

Earthquake Information

EQ Source (e.g., New Madrid)	10 Hz
Event (e.g., MCE, OBE)	Design EQ
a_{max} (g) (top of ground surface)	0.19
EQ Mag (Mw)	6.0

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
0.164	0.010	0.000	119	Bottom Ash	Sand-like		-0.010			
0.328	0.010	0.000	119	Bottom Ash	Sand-like		-0.006			
0.492	0.010	0.000	119	Bottom Ash	Sand-like		-0.003			
0.656	0.010	0.000	119	Bottom Ash	Sand-like		0.001			
0.820	0.010	0.000	119	Bottom Ash	Sand-like		0.005			
0.984	0.010	0.000	119	Bottom Ash	Sand-like		0.008			
1.148	0.010	0.000	119	Bottom Ash	Sand-like		0.012			
1.312	0.010	0.000	119	Bottom Ash	Sand-like		0.016			
1.476	0.010	0.000	119	Bottom Ash	Sand-like		0.019			
1.640	0.010	0.000	119	Bottom Ash	Sand-like		0.023			
1.804	0.010	0.000	119	Bottom Ash	Sand-like		0.026			
1.968	0.010	0.000	119	Bottom Ash	Sand-like		0.030			
2.133	0.010	0.000	119	Bottom Ash	Sand-like		0.034			
2.297	0.010	0.000	119	Bottom Ash	Sand-like		0.037			
2.461	0.010	0.000	119	Bottom Ash	Sand-like		0.041			
2.625	0.010	0.000	119	Bottom Ash	Sand-like		0.045			
2.789	0.010	0.000	119	Bottom Ash	Sand-like		0.048			
2.953	0.010	0.000	119	Bottom Ash	Sand-like		0.052			
3.117	0.010	0.000	119	Bottom Ash	Sand-like		0.056			
3.281	0.010	0.000	119	Bottom Ash	Sand-like		0.059			
3.445	0.010	0.000	119	Bottom Ash	Sand-like		0.063			
3.609	0.010	0.000	119	Bottom Ash	Sand-like		0.067			
3.773	0.010	0.000	119	Bottom Ash	Sand-like		0.070			
3.937	0.010	0.000	119	Bottom Ash	Sand-like		0.074			
4.101	0.010	0.000	119	Bottom Ash	Sand-like		0.078			
4.265	0.010	0.000	119	Bottom Ash	Sand-like		0.081			
4.429	0.010	0.000	119	Bottom Ash	Sand-like		0.085			
4.593	0.010	0.000	119	Bottom Ash	Sand-like		0.089			
4.757	0.010	0.000	119	Bottom Ash	Sand-like		0.093			
4.921	0.010	0.000	119	Bottom Ash	Sand-like		0.097			
5.085	0.010	0.000	119	Bottom Ash	Sand-like		0.100			
5.249	0.010	0.000	119	Bottom Ash	Sand-like		0.102			
5.413	0.010	0.000	119	Bottom Ash	Sand-like		0.104			
5.577	0.010	0.000	119	Bottom Ash	Sand-like		0.106			
5.741	0.010	0.000	119	Bottom Ash	Sand-like		0.108			
5.905	0.010	0.000	119	Bottom Ash	Sand-like		0.110			
6.069	0.010	0.000	119	Bottom Ash	Sand-like		0.112			
6.234	0.010	0.000	119	Bottom Ash	Sand-like		0.113			
6.398	0.010	0.000	119	Bottom Ash	Sand-like		0.114			
6.562	0.010	0.000	119	Bottom Ash	Sand-like		0.115			
6.726	0.010	0.000	119	Bottom Ash	Sand-like		0.116			
6.890	0.010	0.000	119	Bottom Ash	Sand-like		0.117			
7.054	0.010	0.000	119	Bottom Ash	Sand-like		0.118			
7.218	0.010	0.000	119	Bottom Ash	Sand-like		0.118			
7.382	0.010	0.000	119	Bottom Ash	Sand-like		0.119			
7.546	0.010	0.000	119	Bottom Ash	Sand-like		0.119			
7.710	0.010	0.000	119	Bottom Ash	Sand-like		0.119			
7.874	0.010	0.000	119	Bottom Ash	Sand-like		0.119			
8.038	0.010	0.000	119	Bottom Ash	Sand-like		0.120			
8.202	0.010	0.000	119	Bottom Ash	Sand-like		0.120			
8.366	0.010	0.000	119	Bottom Ash	Sand-like		0.120			
8.530	0.010	0.000	119	Bottom Ash	Sand-like		0.120			
8.694	0.010	0.000	119	Bottom Ash	Sand-like		0.120			
8.858	0.010	0.000	119	Bottom Ash	Sand-like		0.119			
9.022	0.010	0.000	119	Bottom Ash	Sand-like		0.119			
9.186	0.010	0.000	119	Bottom Ash	Sand-like		0.119			
9.350	0.010	0.000	119	Bottom Ash	Sand-like		0.119			
9.514	0.010	0.000	119	Bottom Ash	Sand-like		0.119			
9.678	0.010	0.000	119	Bottom Ash	Sand-like		0.119			
9.842	0.010	0.000	119	Bottom Ash	Sand-like		0.120			
10.006	0.010	0.000	119	Bottom Ash	Sand-like		0.120			
10.170	0.010	0.000	119	Bottom Ash	Sand-like		0.120			
10.335	0.010	0.000	119	Bottom Ash	Sand-like		0.120			

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
10.499	0.010	0.000	119	Bottom Ash	Sand-like		0.120			
10.663	0.010	0.000	119	Bottom Ash	Sand-like		0.121			
10.827	0.010	0.000	119	Bottom Ash	Sand-like		0.121			
10.991	0.010	0.000	119	Bottom Ash	Sand-like		0.121			
11.155	0.010	0.000	119	Bottom Ash	Sand-like		0.122			
11.319	0.010	0.000	119	Bottom Ash	Sand-like		0.122			
11.483	0.010	0.000	119	Bottom Ash	Sand-like		0.122			
11.647	0.010	0.000	119	Bottom Ash	Sand-like		0.122			
11.811	0.010	0.000	119	Bottom Ash	Sand-like		0.122			
11.975	0.010	0.000	119	Bottom Ash	Sand-like		0.122			
12.139	0.010	0.000	119	Bottom Ash	Sand-like		0.122			
12.303	0.010	0.000	119	Bottom Ash	Sand-like		0.122			
12.467	17.931	0.229	119	Bottom Ash	Sand-like		0.123			
12.631	88.712	0.318	119	Bottom Ash	Sand-like		0.123			
12.795	135.437	0.482	119	Bottom Ash	Sand-like		0.123			
12.959	162.552	1.078	119	Bottom Ash	Sand-like		0.123			
13.123	146.638	1.257	119	Bottom Ash	Sand-like		0.123			
13.287	135.162	1.602	119	Bottom Ash	Sand-like		0.123			
13.451	160.380	2.054	119	Bottom Ash	Sand-like		0.126			
13.615	182.750	2.800	119	Bottom Ash	Sand-like		0.130			
13.779	175.539	3.537	119	Bottom Ash	Sand-like		0.134			
13.943	139.731	3.409	119	Bottom Ash	Sand-like		0.138			
14.107	111.945	2.841	119	Bottom Ash	Sand-like		0.142			
14.271	101.047	2.192	119	Bottom Ash	Sand-like		0.141			
14.436	105.200	1.958	119	Bottom Ash	Sand-like		0.120			
14.600	113.450	1.839	119	Bottom Ash	Sand-like		0.098			
14.764	116.511	1.906	119	Bottom Ash	Sand-like		0.077			
14.928	108.389	1.887	119	Bottom Ash	Sand-like		0.056			
15.092	108.025	1.827	119	Bottom Ash	Sand-like		0.035			
15.256	94.543	1.660	119	Bottom Ash	Sand-like		0.023			
15.420	77.147	1.783	119	Bottom Ash	Sand-like		0.019			
15.584	70.599	1.525	119	Bottom Ash	Sand-like		0.015			
15.748	73.152	1.214	119	Bottom Ash	Sand-like		0.011			
15.912	70.365	0.955	119	Bottom Ash	Sand-like		0.008			
16.076	56.715	0.824	119	Bottom Ash	Sand-like		0.004			
16.240	44.747	0.621	119	Bottom Ash	Sand-like		0.002			
16.404	34.805	0.569	119	Bottom Ash	Sand-like		0.002			
16.568	48.743	0.577	119	Bottom Ash	Sand-like		0.002			
16.732	47.148	0.647	119	Bottom Ash	Sand-like		0.002			
16.896	50.857	0.832	119	Bottom Ash	Sand-like		0.002			
17.060	47.953	0.924	119	Bottom Ash	Sand-like		0.002			
17.224	50.698	0.911	119	Bottom Ash	Sand-like		0.002			
17.388	45.435	0.796	119	Bottom Ash	Sand-like		0.002			
17.552	38.702	0.662	119	Bottom Ash	Sand-like		0.002			
17.716	32.245	0.548	119	Bottom Ash	Sand-like		0.002			
17.880	30.530	0.481	119	Bottom Ash	Sand-like		0.002			
18.044	33.904	0.462	119	Bottom Ash	Sand-like		0.002			
18.208	41.593	0.555	119	Bottom Ash	Sand-like		0.002			
18.372	41.570	0.625	119	Bottom Ash	Sand-like		0.002			
18.537	41.843	0.647	119	Bottom Ash	Sand-like		0.002			
18.701	36.818	0.627	119	Bottom Ash	Sand-like		0.003			
18.865	29.479	0.642	119	Bottom Ash	Sand-like		0.003			
19.029	26.797	0.708	119	Bottom Ash	Sand-like		0.003			
19.193	53.782	0.828	119	Bottom Ash	Sand-like		0.003			
19.357	167.541	0.906	119	Bottom Ash	Sand-like		0.003			
19.521	241.380	0.440	119	Bottom Ash	Sand-like		0.003			
19.685	283.056	0.949	119	Bottom Ash	Sand-like		0.003			
19.849	286.448	1.056	119	Bottom Ash	Sand-like		0.003			
20.013	381.474	1.163	119	Bottom Ash	Sand-like		0.003			
20.177	399.587	1.871	119	Bottom Ash	Sand-like		0.003			
20.341	402.329	2.095	119	Bottom Ash	Sand-like		0.003			
20.505	372.969	2.316	119	Bottom Ash	Sand-like		0.003			
20.669	367.470	2.616	119	Bottom Ash	Sand-like		0.004			
20.833	348.424	2.601	119	Bottom Ash	Sand-like		0.004			
20.997	310.413	3.065	119	Bottom Ash	Sand-like		0.004			
21.161	290.527	2.812	119	Bottom Ash	Sand-like		0.004			
21.325	261.470	2.076	119	Bottom Ash	Sand-like		0.004			
21.489	227.354	1.285	119	Bottom Ash	Sand-like		0.004			
21.653	192.912	0.614	119	Bottom Ash	Sand-like		0.004			
21.817	172.948	0.297	119	Bottom Ash	Sand-like		0.004			
21.981	158.248	0.298	119	Bottom Ash	Sand-like		0.004			
22.145	160.432	0.289	112	Fly Ash	Sand-like	Do Not Correct for FC	0.004			
22.309	160.563	0.252	112	Fly Ash	Sand-like	Do Not Correct for FC	0.004			
22.473	136.171	0.222	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
22.638	123.864	0.214	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
22.802	117.618	0.058	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
22.966	104.441	0.052	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
23.130	89.032	0.179	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
23.294	84.830	0.078	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
23.458	82.804	0.047	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
23.622	67.479	0.046	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
23.786	51.672	0.068	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
23.950	43.568	0.056	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
24.114	37.835	0.036	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
24.278	40.195	0.060	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
24.442	45.128	0.086	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
24.606	60.393	0.171	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
24.770	73.947	0.273	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
24.934	76.810	0.608	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
25.098	74.902	0.905	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
25.262	68.969	1.129	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
25.426	72.855	1.056	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
25.590	79.321	0.803	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
25.754	74.141	0.615	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
25.918	59.699	0.404	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
26.082	46.241	0.107	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
26.246	37.122	0.060	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
26.410	31.389	0.077	112	Fly Ash	Sand-like	Do Not Correct for FC	0.005			
26.574	31.556	0.055	112	Fly Ash	Sand-like	Do Not Correct for FC	0.006			
26.739	33.968	0.060	112	Fly Ash	Sand-like	Do Not Correct for FC	0.006			
26.903	36.993	0.089	112	Fly Ash	Sand-like	Do Not Correct for FC	0.006			
27.067	37.781	0.164	112	Fly Ash	Sand-like	Do Not Correct for FC	0.006			
27.231	43.966	0.254	112	Fly Ash	Sand-like	Do Not Correct for FC	0.006			
27.395	46.759	0.329	112	Fly Ash	Sand-like	Do Not Correct for FC	0.006			
27.559	51.232	0.403	112	Fly Ash	Sand-like	Do Not Correct for FC	0.006			
27.723	51.715	0.523	112	Fly Ash	Sand-like	Do Not Correct for FC	0.006			
27.887	53.230	0.648	112	Fly Ash	Sand-like	Do Not Correct for FC	0.006			
28.051	53.294	0.766	112	Fly Ash	Sand-like	Do Not Correct for FC	0.007			
28.215	52.733	0.807	112	Fly Ash	Sand-like	Do Not Correct for FC	0.007			
28.379	49.692	0.815	112	Fly Ash	Sand-like	Do Not Correct for FC	0.007			
28.543	46.993	0.787	112	Fly Ash	Sand-like	Do Not Correct for FC	0.007			
28.707	45.002	0.757	112	Fly Ash	Sand-like	Do Not Correct for FC	0.007			
28.871	44.380	0.712	112	Fly Ash	Sand-like	Do Not Correct for FC	0.007			
29.035	49.942	0.630	112	Fly Ash	Sand-like	Do Not Correct for FC	0.007			
29.199	60.132	0.621	112	Fly Ash	Sand-like	Do Not Correct for FC	0.007			
29.363	63.157	0.498	112	Fly Ash	Sand-like	Do Not Correct for FC	0.007			
29.527	57.901	0.604	112	Fly Ash	Sand-like	Do Not Correct for FC	0.007			
29.691	51.286	0.730	112	Fly Ash	Sand-like	Do Not Correct for FC	0.007			
29.855	49.810	0.820	112	Fly Ash	Sand-like	Do Not Correct for FC	0.008			
30.019	53.881	0.944	112	Fly Ash	Sand-like	Do Not Correct for FC	0.008			
30.183	62.668	1.141	112	Fly Ash	Sand-like	Do Not Correct for FC	0.008			
30.347	75.854	1.406	112	Fly Ash	Sand-like	Do Not Correct for FC	0.008			
30.511	78.345	1.737	112	Fly Ash	Sand-like	Do Not Correct for FC	0.008			
30.675	79.271	1.920	112	Fly Ash	Sand-like	Do Not Correct for FC	0.008			
30.840	73.417	1.950	112	Fly Ash	Sand-like	Do Not Correct for FC	0.008			
31.004	73.528	1.872	112	Fly Ash	Sand-like	Do Not Correct for FC	0.008			
31.168	79.680	1.895	112	Fly Ash	Sand-like	Do Not Correct for FC	0.008			
31.332	82.725	2.040	112	Fly Ash	Sand-like	Do Not Correct for FC	0.008			
31.496	73.444	2.144	112	Fly Ash	Sand-like	Do Not Correct for FC	0.008			
31.660	70.184	2.060	112	Fly Ash	Sand-like	Do Not Correct for FC	0.008			
31.824	69.401	2.028	112	Fly Ash	Sand-like	Do Not Correct for FC	0.008			
31.988	69.361	1.974	112	Fly Ash	Sand-like	Do Not Correct for FC	0.009			
32.152	70.906	1.959	112	Fly Ash	Sand-like	Do Not Correct for FC	0.009			
32.316	69.099	1.954	112	Fly Ash	Sand-like	Do Not Correct for FC	0.009			
32.480	70.980	1.934	112	Fly Ash	Sand-like	Do Not Correct for FC	0.009			
32.644	73.010	1.449	112	Fly Ash	Sand-like	Do Not Correct for FC	0.009			
32.808	68.149	1.479	112	Fly Ash	Sand-like	Do Not Correct for FC	0.009			
32.972	66.202	1.594	112	Fly Ash	Sand-like	Do Not Correct for FC	0.009			
33.136	69.194	1.811	112	Fly Ash	Sand-like	Do Not Correct for FC	0.009			
33.300	71.300	1.945	112	Fly Ash	Sand-like	Do Not Correct for FC	0.009			
33.464	76.257	2.079	112	Fly Ash	Sand-like	Do Not Correct for FC	0.009			
33.628	80.456	2.062	112	Fly Ash	Sand-like	Do Not Correct for FC	0.009			
33.792	69.872	1.938	112	Fly Ash	Sand-like	Do Not Correct for FC	0.009			
33.956	58.049	1.629	112	Fly Ash	Sand-like	Do Not Correct for FC	0.010			
34.120	39.371	1.365	112	Fly Ash	Sand-like	Do Not Correct for FC	0.010			
34.284	27.171	1.049	112	Fly Ash	Sand-like	Do Not Correct for FC	0.010			
34.448	18.431	0.745	112	Fly Ash	Sand-like	Do Not Correct for FC	0.010			
34.612	13.321	0.487	112	Fly Ash	Sand-like	Do Not Correct for FC	0.010			
34.776	11.156	0.245	112	Fly Ash	Sand-like	Do Not Correct for FC	0.010			
34.941	10.166	0.137	112	Fly Ash	Sand-like	Do Not Correct for FC	0.010			

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
35.105	9.307	0.094	112	Fly Ash	Sand-like	Do Not Correct for FC	0.010			
35.269	9.205	0.107	112	Fly Ash	Sand-like	Do Not Correct for FC	0.010			
35.433	10.071	0.137	112	Fly Ash	Sand-like	Do Not Correct for FC	0.010			
35.597	11.085	0.165	112	Fly Ash	Sand-like	Do Not Correct for FC	0.010			
35.761	12.643	0.333	112	Fly Ash	Sand-like	Do Not Correct for FC	0.010			
35.925	15.196	0.324	112	Fly Ash	Sand-like	Do Not Correct for FC	0.010			
36.089	14.972	0.619	112	Fly Ash	Sand-like	Do Not Correct for FC	0.010			
36.253	15.353	0.600	112	Fly Ash	Sand-like	Do Not Correct for FC	0.010			
36.417	14.102	0.516	112	Fly Ash	Sand-like	Do Not Correct for FC	0.010			
36.581	13.491	0.370	112	Fly Ash	Sand-like	Do Not Correct for FC	0.010			
36.745	11.058	0.303	112	Fly Ash	Sand-like	Do Not Correct for FC	0.010			
36.909	9.715	0.248	112	Fly Ash	Sand-like	Do Not Correct for FC	0.011			
37.073	8.069	0.243	112	Fly Ash	Sand-like	Do Not Correct for FC	0.011			
37.237	7.503	0.223	112	Fly Ash	Sand-like	Do Not Correct for FC	0.011			
37.401	7.265	0.195	112	Fly Ash	Sand-like	Do Not Correct for FC	0.011			
37.565	8.463	0.169	112	Fly Ash	Sand-like	Do Not Correct for FC	0.011			
37.729	8.790	0.144	112	Fly Ash	Sand-like	Do Not Correct for FC	0.011			
37.893	8.113	0.124	112	Fly Ash	Sand-like	Do Not Correct for FC	0.011			
38.057	9.472	0.133	112	Fly Ash	Sand-like	Do Not Correct for FC	0.011			
38.221	11.195	0.169	112	Fly Ash	Sand-like	Do Not Correct for FC	0.011			
38.385	21.383	0.280	112	Fly Ash	Sand-like	Do Not Correct for FC	0.011			
38.549	19.437	0.270	112	Fly Ash	Sand-like	Do Not Correct for FC	0.011			
38.713	18.100	0.248	112	Fly Ash	Sand-like	Do Not Correct for FC	0.011			
38.877	17.821	0.226	112	Fly Ash	Sand-like	Do Not Correct for FC	0.011			
39.042	18.718	0.246	112	Fly Ash	Sand-like	Do Not Correct for FC	0.011			
39.206	21.084	0.386	112	Fly Ash	Sand-like	Do Not Correct for FC	0.011			
39.370	21.695	0.575	112	Fly Ash	Sand-like	Do Not Correct for FC	0.011			
39.534	25.800	0.529	126	Subunit 2	Sand-like		0.012			
39.698	21.238	0.423	126	Subunit 2	Sand-like		0.012			
39.862	19.163	0.311	126	Subunit 2	Sand-like		0.012			
40.026	18.708	0.236	126	Subunit 2	Sand-like		0.012			
40.190	20.284	0.261	126	Subunit 2	Sand-like		0.012			
40.354	20.949	0.326	126	Subunit 2	Sand-like		0.012			
40.518	22.109	0.277	126	Subunit 2	Sand-like		0.012			
40.682	22.658	0.250	126	Subunit 2	Sand-like		0.012			
40.846	22.606	0.256	126	Subunit 2	Sand-like		0.012			
41.010	24.108	0.352	126	Subunit 2	Sand-like		0.012			
41.174	26.634	0.345	126	Subunit 2	Sand-like		0.012			
41.338	28.246	0.452	126	Subunit 2	Sand-like		0.012			
41.502	30.147	0.570	126	Subunit 2	Sand-like		0.012			
41.666	33.673	0.624	126	Subunit 2	Sand-like		0.013			
41.830	58.309	0.665	126	Subunit 2	Sand-like		0.013			
41.994	49.492	1.029	126	Subunit 2	Sand-like		0.013			
42.158	57.778	1.304	126	Subunit 2	Sand-like		0.013			
42.322	68.440	1.545	126	Subunit 2	Sand-like		0.013			
42.486	74.254	0.857	126	Subunit 2	Sand-like		0.013			
42.650	72.622	0.776	126	Subunit 2	Sand-like		0.013			
42.814	69.133	1.028	126	Subunit 2	Sand-like		0.013			
42.978	63.519	1.151	126	Subunit 2	Sand-like		0.013			
43.143	66.505	1.365	126	Subunit 2	Sand-like		0.013			
43.307	71.220	1.058	126	Subunit 2	Sand-like		0.013			
43.471	73.497	0.424	126	Subunit 2	Sand-like		0.014			
43.635	62.797	0.402	126	Subunit 2	Sand-like		0.014			
43.799	47.159	0.346	126	Subunit 2	Sand-like		0.014			
43.963	33.705	0.288	126	Subunit 2	Sand-like		0.014			
44.127	25.404	0.218	126	Subunit 2	Sand-like		0.014			
44.291	20.567	0.389	126	Subunit 2	Sand-like		0.014			
44.455	22.579	0.589	126	Subunit 2	Sand-like		0.014			
44.619	51.241	0.672	126	Subunit 2	Sand-like		0.014			
44.783	73.627	0.442	126	Subunit 2	Sand-like		0.014			
44.947	92.759	0.401	126	Subunit 2	Sand-like		0.015			
45.111	95.950	0.480	126	Subunit 2	Sand-like		0.015			
45.275	89.858	0.538	126	Subunit 2	Sand-like		0.015			
45.439	83.712	0.560	126	Subunit 2	Sand-like		0.015			
45.603	76.073	0.524	126	Subunit 2	Sand-like		0.015			
45.767	65.308	0.523	126	Subunit 2	Sand-like		0.015			
45.931	47.331	0.445	126	Subunit 2	Sand-like		0.015			
46.095	38.311	0.360	126	Subunit 2	Sand-like		0.015			
46.259	25.885	0.297	126	Subunit 2	Sand-like		0.015			
46.423	25.277	0.232	126	Subunit 2	Sand-like		0.015			
46.587	45.311	0.129	126	Subunit 2	Sand-like		0.015			
46.751	32.461	0.213	126	Subunit 2	Sand-like		0.015			
46.915	19.400	0.210	126	Subunit 2	Sand-like		0.016			
47.079	12.929	0.200	126	Subunit 2	Sand-like		0.016			
47.244	10.615	0.133	126	Subunit 2	Sand-like		0.016			

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
47.408	11.062	0.287	126	Subunit 2	Sand-like		0.016			
47.572	13.682	0.439	126	Subunit 2	Sand-like		0.016			
47.736	21.014	0.498	126	Subunit 2	Sand-like		0.016			
47.900	26.688	0.515	126	Subunit 2	Sand-like		0.016			
48.064	30.544	0.310	126	Subunit 2	Sand-like		0.016			
48.228	33.880	0.214	126	Subunit 2	Sand-like		0.016			
48.392	28.839	0.195	126	Subunit 2	Sand-like		0.016			
48.556	26.461	0.290	126	Subunit 2	Sand-like		0.016			
48.720	34.273	0.212	126	Subunit 2	Sand-like		0.017			
48.884	44.742	0.122	126	Subunit 2	Sand-like		0.017			
49.048	41.566	0.395	126	Subunit 2	Sand-like		0.017			
49.212	31.155	0.579	126	Subunit 2	Sand-like		0.017			
49.376	29.126	0.573	126	Subunit 2	Sand-like		0.017			
49.540	30.515	0.167	126	Subunit 2	Sand-like		0.017			
49.704	33.498	0.124	126	Subunit 2	Sand-like		0.017			
49.868	32.293	0.137	126	Subunit 2	Sand-like		0.017			
50.032	34.894	0.217	126	Subunit 2	Sand-like		0.017			
50.196	44.197	0.253	126	Subunit 2	Sand-like		0.017			
50.360	52.645	0.346	126	Subunit 2	Sand-like		0.017			
50.524	57.737	0.467	126	Subunit 2	Sand-like		0.018			
50.688	60.398	0.450	126	Subunit 2	Sand-like		0.018			
50.852	56.834	0.442	126	Subunit 2	Sand-like		0.018			
51.016	49.976	0.454	126	Subunit 2	Sand-like		0.018			
51.180	46.073	0.455	126	Subunit 2	Sand-like		0.018			
51.345	46.468	0.357	126	Subunit 2	Sand-like		0.018			
51.509	50.912	0.268	126	Subunit 2	Sand-like		0.018			
51.673	53.955	0.310	126	Subunit 2	Sand-like		0.018			
51.837	54.385	0.468	126	Subunit 2	Sand-like		0.018			
52.001	50.528	0.552	126	Subunit 2	Sand-like		0.018			
52.165	44.204	0.471	126	Subunit 2	Sand-like		0.018			
52.329	39.553	0.631	126	Subunit 2	Sand-like		0.018			
52.493	33.291	0.510	126	Subunit 2	Sand-like		0.018			
52.657	38.922	0.424	126	Subunit 2	Sand-like		0.019			
52.821	44.540	0.213	126	Subunit 2	Sand-like		0.019			
52.985	46.299	0.155	126	Subunit 2	Sand-like		0.019			
53.149	47.457	0.208	126	Subunit 2	Sand-like		0.019			
53.313	45.169	0.370	126	Subunit 2	Sand-like		0.019			
53.477	45.052	0.406	126	Subunit 2	Sand-like		0.019			
53.641	46.340	0.382	126	Subunit 2	Sand-like		0.019			
53.805	45.754	0.344	126	Subunit 2	Sand-like		0.019			
53.969	44.819	0.340	126	Subunit 2	Sand-like		0.019			
54.133	42.533	0.363	126	Subunit 2	Sand-like		0.019			
54.297	40.227	0.437	126	Subunit 2	Sand-like		0.019			
54.461	33.525	0.569	131	Subunit 3	Sand-like		0.019			
54.625	23.837	0.594	131	Subunit 3	Sand-like		0.019			
54.789	26.710	0.303	131	Subunit 3	Sand-like		0.019			
54.953	34.982	0.095	131	Subunit 3	Sand-like		0.019			
55.117	31.291	0.121	131	Subunit 3	Sand-like		0.019			
55.281	22.222	0.235	131	Subunit 3	Sand-like		0.019			
55.446	19.118	0.263	131	Subunit 3	Sand-like		0.020			
55.610	30.554	0.186	131	Subunit 3	Sand-like		0.020			
55.774	48.548	0.094	131	Subunit 3	Sand-like		0.020			
55.938	54.301	0.175	131	Subunit 3	Sand-like		0.020			
56.102	49.762	0.357	131	Subunit 3	Sand-like		0.020			
56.266	42.638	0.506	131	Subunit 3	Sand-like		0.020			
56.430	37.649	0.451	131	Subunit 3	Sand-like		0.020			
56.594	36.967	0.416	131	Subunit 3	Sand-like		0.020			
56.758	39.911	0.460	131	Subunit 3	Sand-like		0.020			
56.922	49.947	0.425	131	Subunit 3	Sand-like		0.020			
57.086	58.979	0.422	131	Subunit 3	Sand-like		0.020			
57.250	65.707	0.485	131	Subunit 3	Sand-like		0.020			
57.414	69.788	0.569	131	Subunit 3	Sand-like		0.020			
57.578	75.909	0.695	131	Subunit 3	Sand-like		0.020			
57.742	89.334	0.732	131	Subunit 3	Sand-like		0.020			
57.906	114.272	0.848	131	Subunit 3	Sand-like		0.020			
58.070	137.604	1.050	131	Subunit 3	Sand-like		0.020			
58.234	143.225	1.251	131	Subunit 3	Sand-like		0.020			
58.398	133.266	1.310	131	Subunit 3	Sand-like		0.020			
58.562	118.803	1.157	131	Subunit 3	Sand-like		0.020			
58.726	105.343	1.064	131	Subunit 3	Sand-like		0.020			
58.890	102.739	0.884	131	Subunit 3	Sand-like		0.020			
59.054	113.993	0.751	131	Subunit 3	Sand-like		0.020			
59.218	131.800	0.719	131	Subunit 3	Sand-like		0.020			
59.382	145.328	0.737	131	Subunit 3	Sand-like		0.020			
59.547	145.059	0.827	131	Subunit 3	Sand-like		0.020			

Depth (ft)	Corrected Cone Tip Resistance, q_t (tsf)	Sleeve Friction, f_s (tsf)	Total Unit Weight (pcf)	Material (optional)	Clay-like/ Sand-like Override (optional)	Fines Content Correction Override (optional)	Static Shear Stress Ratio, α	Maximum Shear Stress (psf)	Static Pore Water Pressure During CPT (psf)	Static Pore Water Pressure During EQ (psf)
59.711	135.883	0.865	131	Subunit 3	Sand-like		0.020			
59.875	129.120	0.801	131	Subunit 3	Sand-like		0.020			
60.039	131.301	0.767	131	Subunit 3	Sand-like		0.020			
60.203	129.044	0.799	131	Subunit 3	Sand-like		0.020			
60.367	116.341	0.793	131	Subunit 3	Sand-like		0.020			
60.531	103.776	0.779	131	Subunit 3	Sand-like		0.020			
60.695	95.162	0.727	131	Subunit 3	Sand-like		0.020			
60.859	90.063	0.683	131	Subunit 3	Sand-like		0.020			
61.023	87.759	0.678	131	Subunit 3	Sand-like		0.020			
61.187	77.282	0.769	131	Subunit 3	Sand-like		0.020			
61.351	68.845	0.846	131	Subunit 3	Sand-like		0.020			
61.515	76.318	0.857	131	Subunit 3	Sand-like		0.020			
61.679	76.946	0.950	131	Subunit 3	Sand-like		0.020			
61.843	80.389	1.040	131	Subunit 3	Sand-like		0.020			
62.007	87.948	1.749	131	Subunit 3	Sand-like		0.020			
62.171	112.346	1.103	131	Subunit 3	Sand-like		0.021			
62.335	155.480	2.242	131	Subunit 3	Sand-like		0.021			
62.499	177.065	1.445	131	Subunit 3	Sand-like		0.021			
62.663	288.143	2.127	131	Subunit 3	Sand-like		0.021			
62.827	336.696	3.061	131	Subunit 3	Sand-like		0.021			
62.991	285.423	3.404	131	Subunit 3	Sand-like		0.021			
63.155	222.918	2.307	131	Subunit 3	Sand-like		0.021			
63.319	193.018	1.174	131	Subunit 3	Sand-like		0.021			
63.483	176.729	1.469	131	Subunit 3	Sand-like		0.021			
63.648	117.892	1.890	131	Subunit 3	Sand-like		0.021			
63.812	94.721	2.164	131	Subunit 3	Sand-like		0.021			
63.976	99.018	2.508	131	Subunit 3	Sand-like		0.021			
64.140	104.055	2.813	131	Subunit 3	Sand-like		0.021			
64.304	109.286	3.331	131	Subunit 3	Sand-like		0.021			
64.468	139.211	3.717	131	Subunit 3	Sand-like		0.021			
64.632	168.607	3.687	131	Subunit 3	Sand-like		0.021			
64.796	190.960	3.939	131	Subunit 3	Sand-like		0.021			
64.960	220.243	4.450	131	Subunit 3	Sand-like		0.021			
65.124	227.791	4.877	131	Subunit 3	Sand-like		0.021			
65.288	245.795	5.148	131	Subunit 3	Sand-like		0.021			
65.452	253.501	4.120	131	Subunit 3	Sand-like		0.021			
65.616	4.381	3.430	131	Subunit 3	Sand-like		0.021			
65.780	91.407	2.527	131	Subunit 3	Sand-like		0.021			
65.944	140.406	2.453	131	Subunit 3	Sand-like		0.021			
66.108	143.600	2.957	131	Subunit 3	Sand-like		0.021			
66.272	173.878	2.323	131	Subunit 3	Sand-like		0.021			
66.436	248.994	3.879	131	Subunit 3	Sand-like		0.021			
66.600	293.835	4.192	131	Subunit 3	Sand-like		0.021			
66.764	321.004	4.798	131	Subunit 3	Sand-like		0.021			
66.928	393.972	5.474	131	Subunit 3	Sand-like		0.021			
67.092	460.614	6.029	131	Subunit 3	Sand-like		0.021			
67.256	465.253	0.000	131	Subunit 3	Sand-like		0.021			
67.420	441.381	0.000	131	Subunit 3	Sand-like		0.021			

LIQUEFACTION POTENTIAL ASSESSMENT FOR COARSE GRAINED SOILS USING CONE PENETRATION TEST DATA

Facility: KIF TDEC Stability
Project No.: 175668043
CPT ID: KIF-BF-CPT-5B

Water Elevation during CPT:	756.0	ft
Depth to Water during CPT:	13.0	ft *(relative to ground surface during CPT)*
Water Elevation during Earthquake:	754.0	ft
Depth to Water during Earthquake:	15.0	ft *(relative to ground surface during CPT)*
Final Grade Elevation during EQ:	766	ft *(if no fill, then set this equal to top of CPT hole elev.)*
Height of Final Grade above CPT TOH:	-3.0	ft *(relative to ground surface during CPT, + Fill, - Cut)*
Unit Weight of Cut/Fill to Achieve Final Grade	122	pcf
Cut/Fill Total Stress (+ Fill, - Cut):	-0.18	tsf

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
769.0				Vertical Stresses above 1st CPT:			**0.01**	**-0.17**	**0.00**	**0.00**	**0.01**	**-0.17**
768.8	0.164	0.10	0.01	119	**0.16**	0.09	0.01	-0.17	0.00	0.00	0.01	-0.17
768.7	0.328	0.10	0.01	119	0.25	0.16	0.02	-0.16	0.00	0.00	0.02	-0.16
768.5	0.492	0.10	0.01	119	0.41	0.16	0.03	-0.15	0.00	0.00	0.03	-0.15
768.3	0.656	0.10	0.01	119	0.57	0.16	0.04	-0.14	0.00	0.00	0.04	-0.14
768.2	0.820	0.10	0.01	119	0.74	0.16	0.05	-0.13	0.00	0.00	0.05	-0.13
768.0	0.984	0.10	0.01	119	0.90	0.16	0.06	-0.12	0.00	0.00	0.06	-0.12
767.9	1.148	0.10	0.01	119	1.07	0.16	0.07	-0.11	0.00	0.00	0.07	-0.11
767.7	1.312	0.10	0.01	119	1.23	0.16	0.08	-0.10	0.00	0.00	0.08	-0.10
767.5	1.476	0.10	0.01	119	1.39	0.16	0.09	-0.09	0.00	0.00	0.09	-0.09
767.4	1.640	0.10	0.01	119	1.56	0.16	0.10	-0.09	0.00	0.00	0.10	-0.09
767.2	1.804	0.10	0.01	119	1.72	0.16	0.11	-0.08	0.00	0.00	0.11	-0.08
767.0	1.968	0.10	0.01	119	1.89	0.16	0.12	-0.07	0.00	0.00	0.12	-0.07
766.9	2.133	0.10	0.01	119	2.05	0.16	0.13	-0.06	0.00	0.00	0.13	-0.06
766.7	2.297	0.10	0.01	119	2.21	0.16	0.14	-0.05	0.00	0.00	0.14	-0.05
766.5	2.461	0.10	0.01	119	2.38	0.16	0.15	-0.04	0.00	0.00	0.15	-0.04
766.4	2.625	0.10	0.01	119	2.54	0.16	0.16	-0.03	0.00	0.00	0.16	-0.03
766.2	2.789	0.10	0.01	119	2.71	0.16	0.17	-0.02	0.00	0.00	0.17	-0.02
766.0	2.953	0.10	0.01	119	2.87	0.16	0.18	-0.01	0.00	0.00	0.18	-0.01
765.9	3.117	0.10	0.01	119	3.03	0.16	0.19	0.00	0.00	0.00	0.19	0.00
765.7	3.281	0.10	0.01	119	3.20	0.16	0.20	0.01	0.00	0.00	0.20	0.01
765.6	3.445	0.10	0.01	119	3.36	0.16	0.21	0.02	0.00	0.00	0.21	0.02
765.4	3.609	0.10	0.01	119	3.53	0.16	0.21	0.03	0.00	0.00	0.21	0.03
765.2	3.773	0.10	0.01	119	3.69	0.16	0.22	0.04	0.00	0.00	0.22	0.04
765.1	3.937	0.10	0.01	119	3.85	0.16	0.23	0.05	0.00	0.00	0.23	0.05
764.9	4.101	0.10	0.01	119	4.02	0.16	0.24	0.06	0.00	0.00	0.24	0.06
764.7	4.265	0.10	0.01	119	4.18	0.16	0.25	0.07	0.00	0.00	0.25	0.07
764.6	4.429	0.10	0.01	119	4.35	0.16	0.26	0.08	0.00	0.00	0.26	0.08
764.4	4.593	0.10	0.01	119	4.51	0.16	0.27	0.09	0.00	0.00	0.27	0.09
764.2	4.757	0.10	0.01	119	4.68	0.16	0.28	0.10	0.00	0.00	0.28	0.10
764.1	4.921	0.10	0.01	119	4.84	0.16	0.29	0.11	0.00	0.00	0.29	0.11
763.9	5.085	0.10	0.01	119	5.00	0.16	0.30	0.12	0.00	0.00	0.30	0.12
763.8	5.249	0.10	0.01	119	5.17	0.16	0.31	0.13	0.00	0.00	0.31	0.13
763.6	5.413	0.10	0.01	119	5.33	0.16	0.32	0.14	0.00	0.00	0.32	0.14
763.4	5.577	0.10	0.01	119	5.50	0.16	0.33	0.15	0.00	0.00	0.33	0.15
763.3	5.741	0.10	0.01	119	5.66	0.16	0.34	0.16	0.00	0.00	0.34	0.16
763.1	5.905	0.10	0.01	119	5.82	0.16	0.35	0.17	0.00	0.00	0.35	0.17
762.9	6.069	0.10	0.01	119	5.99	0.16	0.36	0.18	0.00	0.00	0.36	0.18
762.8	6.234	0.10	0.01	119	6.15	0.16	0.37	0.19	0.00	0.00	0.37	0.19
762.6	6.398	0.10	0.01	119	6.32	0.16	0.38	0.20	0.00	0.00	0.38	0.20
762.4	6.562	0.10	0.01	119	6.48	0.16	0.39	0.21	0.00	0.00	0.39	0.21
762.3	6.726	0.10	0.01	119	6.64	0.16	0.40	0.22	0.00	0.00	0.40	0.22
762.1	6.890	0.10	0.01	119	6.81	0.16	0.41	0.23	0.00	0.00	0.41	0.23
761.9	7.054	0.10	0.01	119	6.97	0.16	0.42	0.24	0.00	0.00	0.42	0.24
761.8	7.218	0.10	0.01	119	7.14	0.16	0.43	0.25	0.00	0.00	0.43	0.25
761.6	7.382	0.10	0.01	119	7.30	0.16	0.44	0.26	0.00	0.00	0.44	0.26
761.5	7.546	0.10	0.01	119	7.46	0.16	0.45	0.27	0.00	0.00	0.45	0.27
761.3	7.710	0.10	0.01	119	7.63	0.16	0.46	0.28	0.00	0.00	0.46	0.28
761.1	7.874	0.10	0.01	119	7.79	0.16	0.47	0.29	0.00	0.00	0.47	0.29
761.0	8.038	0.10	0.01	119	7.96	0.16	0.48	0.30	0.00	0.00	0.48	0.30
760.8	8.202	0.10	0.01	119	8.12	0.16	0.49	0.31	0.00	0.00	0.49	0.31
760.6	8.366	0.10	0.01	119	8.28	0.16	0.50	0.32	0.00	0.00	0.50	0.32
760.5	8.530	0.10	0.01	119	8.45	0.16	0.51	0.32	0.00	0.00	0.51	0.32
760.3	8.694	0.10	0.01	119	8.61	0.16	0.52	0.33	0.00	0.00	0.52	0.33
760.1	8.858	0.10	0.01	119	8.78	0.16	0.53	0.34	0.00	0.00	0.53	0.34
760.0	9.022	0.10	0.01	119	8.94	0.16	0.54	0.35	0.00	0.00	0.54	0.35
759.8	9.186	0.10	0.01	119	9.10	0.16	0.55	0.36	0.00	0.00	0.55	0.36
759.6	9.350	0.10	0.01	119	9.27	0.16	0.56	0.37	0.00	0.00	0.56	0.37
759.5	9.514	0.10	0.01	119	9.43	0.16	0.57	0.38	0.00	0.00	0.57	0.38

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
759.3	9.678	0.10	0.01	119	9.60	0.16	0.58	0.39	0.00	0.00	0.58	0.39
759.2	9.842	0.10	0.01	119	9.76	0.16	0.59	0.40	0.00	0.00	0.59	0.40
759.0	10.006	0.10	0.01	119	9.92	0.16	0.60	0.41	0.00	0.00	0.60	0.41
758.8	10.170	0.10	0.01	119	10.09	0.16	0.61	0.42	0.00	0.00	0.61	0.42
758.7	10.335	0.10	0.01	119	10.25	0.16	0.62	0.43	0.00	0.00	0.62	0.43
758.5	10.499	0.10	0.01	119	10.42	0.16	0.62	0.44	0.00	0.00	0.62	0.44
758.3	10.663	0.10	0.01	119	10.58	0.16	0.63	0.45	0.00	0.00	0.63	0.45
758.2	10.827	0.10	0.01	119	10.74	0.16	0.64	0.46	0.00	0.00	0.64	0.46
758.0	10.991	0.10	0.01	119	10.91	0.16	0.65	0.47	0.00	0.00	0.65	0.47
757.8	11.155	0.10	0.01	119	11.07	0.16	0.66	0.48	0.00	0.00	0.66	0.48
757.7	11.319	0.10	0.01	119	11.24	0.16	0.67	0.49	0.00	0.00	0.67	0.49
757.5	11.483	0.10	0.01	119	11.40	0.16	0.68	0.50	0.00	0.00	0.68	0.50
757.4	11.647	0.10	0.01	119	11.56	0.16	0.69	0.51	0.00	0.00	0.69	0.51
757.2	11.811	0.10	0.01	119	11.73	0.16	0.70	0.52	0.00	0.00	0.70	0.52
757.0	11.975	0.10	0.01	119	11.89	0.16	0.71	0.53	0.00	0.00	0.71	0.53
756.9	12.139	0.10	0.01	119	12.06	0.16	0.72	0.54	0.00	0.00	0.72	0.54
756.7	12.303	0.10	0.01	119	12.22	0.16	0.73	0.55	0.00	0.00	0.73	0.55
756.5	12.467	17.93	0.23	119	12.39	0.16	0.74	0.56	0.00	0.00	0.74	0.56
756.4	12.631	88.71	0.32	119	12.55	0.16	0.75	0.57	0.00	0.00	0.75	0.57
756.2	12.795	135.44	0.48	119	12.71	0.16	0.76	0.58	0.00	0.00	0.76	0.58
756.0	12.959	162.55	1.08	119	12.88	0.16	0.77	0.59	0.00	0.00	0.77	0.59
755.9	13.123	146.64	1.26	119	13.04	0.16	0.78	0.60	0.00	0.00	0.78	0.60
755.7	13.287	135.16	1.60	119	13.21	0.16	0.79	0.61	0.01	0.00	0.78	0.61
755.5	13.451	160.38	2.05	119	13.37	0.16	0.80	0.62	0.01	0.00	0.79	0.62
755.4	13.615	182.75	2.80	119	13.53	0.16	0.81	0.63	0.02	0.00	0.79	0.63
755.2	13.779	175.54	3.54	119	13.70	0.16	0.82	0.64	0.02	0.00	0.80	0.64
755.1	13.943	139.73	3.41	119	13.86	0.16	0.83	0.65	0.03	0.00	0.80	0.65
754.9	14.107	111.94	2.84	119	14.03	0.16	0.84	0.66	0.03	0.00	0.81	0.66
754.7	14.271	101.05	2.19	119	14.19	0.16	0.85	0.67	0.04	0.00	0.81	0.67
754.6	14.436	105.20	1.96	119	14.35	0.16	0.86	0.68	0.04	0.00	0.81	0.68
754.4	14.600	113.45	1.84	119	14.52	0.16	0.87	0.69	0.05	0.00	0.82	0.69
754.2	14.764	116.51	1.91	119	14.68	0.16	0.88	0.70	0.06	0.00	0.82	0.70
754.1	14.928	108.39	1.89	119	14.85	0.16	0.89	0.71	0.06	0.00	0.83	0.71
753.9	15.092	108.02	1.83	119	15.01	0.16	0.90	0.72	0.07	0.00	0.83	0.71
753.7	15.256	94.54	1.66	119	15.17	0.16	0.91	0.72	0.07	0.01	0.84	0.72
753.6	15.420	77.15	1.78	119	15.34	0.16	0.92	0.73	0.08	0.01	0.84	0.72
753.4	15.584	70.60	1.53	119	15.50	0.16	0.93	0.74	0.08	0.02	0.85	0.73
753.3	15.748	73.15	1.21	119	15.67	0.16	0.94	0.75	0.09	0.02	0.85	0.73
753.1	15.912	70.36	0.96	119	15.83	0.16	0.95	0.76	0.09	0.03	0.86	0.74
752.9	16.076	56.72	0.82	119	15.99	0.16	0.96	0.77	0.10	0.03	0.86	0.74
752.8	16.240	44.75	0.62	119	16.16	0.16	0.97	0.78	0.10	0.04	0.87	0.74
752.6	16.404	34.81	0.57	119	16.32	0.16	0.98	0.79	0.11	0.04	0.87	0.75
752.4	16.568	48.74	0.58	119	16.49	0.16	0.99	0.80	0.11	0.05	0.87	0.75
752.3	16.732	47.15	0.65	119	16.65	0.16	1.00	0.81	0.12	0.05	0.88	0.76
752.1	16.896	50.86	0.83	119	16.81	0.16	1.01	0.82	0.12	0.06	0.88	0.76
751.9	17.060	47.95	0.92	119	16.98	0.16	1.02	0.83	0.13	0.06	0.89	0.77
751.8	17.224	50.70	0.91	119	17.14	0.16	1.03	0.84	0.13	0.07	0.89	0.77
751.6	17.388	45.44	0.80	119	17.31	0.16	1.03	0.85	0.14	0.07	0.90	0.78
751.4	17.552	38.70	0.66	119	17.47	0.16	1.04	0.86	0.14	0.08	0.90	0.78
751.3	17.716	32.25	0.55	119	17.63	0.16	1.05	0.87	0.15	0.08	0.91	0.79
751.1	17.880	30.53	0.48	119	17.80	0.16	1.06	0.88	0.15	0.09	0.91	0.79
751.0	18.044	33.90	0.46	119	17.96	0.16	1.07	0.89	0.16	0.09	0.92	0.80
750.8	18.208	41.59	0.56	119	18.13	0.16	1.08	0.90	0.16	0.10	0.92	0.80
750.6	18.372	41.57	0.63	119	18.29	0.16	1.09	0.91	0.17	0.11	0.93	0.81
750.5	18.537	41.84	0.65	119	18.45	0.16	1.10	0.92	0.17	0.11	0.93	0.81
750.3	18.701	36.82	0.63	119	18.62	0.16	1.11	0.93	0.18	0.12	0.94	0.81
750.1	18.865	29.48	0.64	119	18.78	0.16	1.12	0.94	0.18	0.12	0.94	0.82
750.0	19.029	26.80	0.71	119	18.95	0.16	1.13	0.95	0.19	0.13	0.94	0.82
749.8	19.193	53.78	0.83	119	19.11	0.16	1.14	0.96	0.19	0.13	0.95	0.83
749.6	19.357	167.54	0.91	119	19.27	0.16	1.15	0.97	0.20	0.14	0.95	0.83
749.5	19.521	241.38	0.44	119	19.44	0.16	1.16	0.98	0.20	0.14	0.96	0.84
749.3	19.685	283.06	0.95	119	19.60	0.16	1.17	0.99	0.21	0.15	0.96	0.84
749.2	19.849	286.45	1.06	119	19.77	0.16	1.18	1.00	0.21	0.15	0.97	0.85
749.0	20.013	381.47	1.16	119	19.93	0.16	1.19	1.01	0.22	0.16	0.97	0.85
748.8	20.177	399.59	1.87	119	20.09	0.16	1.20	1.02	0.22	0.16	0.98	0.86
748.7	20.341	402.33	2.10	119	20.26	0.16	1.21	1.03	0.23	0.17	0.98	0.86
748.5	20.505	372.97	2.32	119	20.42	0.16	1.22	1.04	0.23	0.17	0.99	0.87
748.3	20.669	367.47	2.62	119	20.59	0.16	1.23	1.05	0.24	0.18	0.99	0.87
748.2	20.833	348.42	2.60	119	20.75	0.16	1.24	1.06	0.24	0.18	1.00	0.87

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
748.0	20.997	310.41	3.07	119	20.92	0.16	1.25	1.07	0.25	0.19	1.00	0.88
747.8	21.161	290.53	2.81	119	21.08	0.16	1.26	1.08	0.25	0.19	1.00	0.88
747.7	21.325	261.47	2.08	119	21.24	0.16	1.27	1.09	0.26	0.20	1.01	0.89
747.5	21.489	227.35	1.29	119	21.41	0.16	1.28	1.10	0.26	0.20	1.01	0.89
747.3	21.653	192.91	0.61	119	21.57	0.16	1.29	1.11	0.27	0.21	1.02	0.90
747.2	21.817	172.95	0.30	119	21.74	0.16	1.30	1.12	0.28	0.21	1.02	0.90
747.0	21.981	158.25	0.30	119	21.90	0.16	1.31	1.13	0.28	0.22	1.03	0.91
746.9	22.145	160.43	0.29	112	22.06	0.16	1.32	1.13	0.29	0.22	1.03	0.91
746.7	22.309	160.56	0.25	112	22.23	0.16	1.33	1.14	0.29	0.23	1.04	0.92
746.5	22.473	136.17	0.22	112	22.39	0.16	1.34	1.15	0.30	0.23	1.04	0.92
746.4	22.638	123.86	0.21	112	22.56	0.16	1.35	1.16	0.30	0.24	1.04	0.92
746.2	22.802	117.62	0.06	112	22.72	0.16	1.35	1.17	0.31	0.24	1.05	0.93
746.0	22.966	104.44	0.05	112	22.88	0.16	1.36	1.18	0.31	0.25	1.05	0.93
745.9	23.130	89.03	0.18	112	23.05	0.16	1.37	1.19	0.32	0.25	1.06	0.94
745.7	23.294	84.83	0.08	112	23.21	0.16	1.38	1.20	0.32	0.26	1.06	0.94
745.5	23.458	82.80	0.05	112	23.38	0.16	1.39	1.21	0.33	0.26	1.06	0.94
745.4	23.622	67.48	0.05	112	23.54	0.16	1.40	1.22	0.33	0.27	1.07	0.95
745.2	23.786	51.67	0.07	112	23.70	0.16	1.41	1.23	0.34	0.27	1.07	0.95
745.1	23.950	43.57	0.06	112	23.87	0.16	1.42	1.24	0.34	0.28	1.08	0.96
744.9	24.114	37.84	0.04	112	24.03	0.16	1.43	1.24	0.35	0.28	1.08	0.96
744.7	24.278	40.20	0.06	112	24.20	0.16	1.44	1.25	0.35	0.29	1.09	0.96
744.6	24.442	45.13	0.09	112	24.36	0.16	1.45	1.26	0.36	0.29	1.09	0.97
744.4	24.606	60.39	0.17	112	24.52	0.16	1.46	1.27	0.36	0.30	1.09	0.97
744.2	24.770	73.95	0.27	112	24.69	0.16	1.46	1.28	0.37	0.30	1.10	0.98
744.1	24.934	76.81	0.61	112	24.85	0.16	1.47	1.29	0.37	0.31	1.10	0.98
743.9	25.098	74.90	0.91	112	25.02	0.16	1.48	1.30	0.38	0.32	1.11	0.98
743.7	25.262	68.97	1.13	112	25.18	0.16	1.49	1.31	0.38	0.32	1.11	0.99
743.6	25.426	72.86	1.06	112	25.34	0.16	1.50	1.32	0.39	0.33	1.11	0.99
743.4	25.590	79.32	0.80	112	25.51	0.16	1.51	1.33	0.39	0.33	1.12	1.00
743.2	25.754	74.14	0.62	112	25.67	0.16	1.52	1.34	0.40	0.34	1.12	1.00
743.1	25.918	59.70	0.40	112	25.84	0.16	1.53	1.35	0.40	0.34	1.13	1.01
742.9	26.082	46.24	0.11	112	26.00	0.16	1.54	1.36	0.41	0.35	1.13	1.01
742.8	26.246	37.12	0.06	112	26.16	0.16	1.55	1.36	0.41	0.35	1.13	1.01
742.6	26.410	31.39	0.08	112	26.33	0.16	1.56	1.37	0.42	0.36	1.14	1.02
742.4	26.574	31.56	0.06	112	26.49	0.16	1.57	1.38	0.42	0.36	1.14	1.02
742.3	26.739	33.97	0.06	112	26.66	0.16	1.57	1.39	0.43	0.37	1.15	1.03
742.1	26.903	36.99	0.09	112	26.82	0.16	1.58	1.40	0.43	0.37	1.15	1.03
741.9	27.067	37.78	0.16	112	26.98	0.16	1.59	1.41	0.44	0.38	1.15	1.03
741.8	27.231	43.97	0.25	112	27.15	0.16	1.60	1.42	0.44	0.38	1.16	1.04
741.6	27.395	46.76	0.33	112	27.31	0.16	1.61	1.43	0.45	0.39	1.16	1.04
741.4	27.559	51.23	0.40	112	27.48	0.16	1.62	1.44	0.45	0.39	1.17	1.05
741.3	27.723	51.71	0.52	112	27.64	0.16	1.63	1.45	0.46	0.40	1.17	1.05
741.1	27.887	53.23	0.65	112	27.80	0.16	1.64	1.46	0.46	0.40	1.17	1.05
740.9	28.051	53.29	0.77	112	27.97	0.16	1.65	1.47	0.47	0.41	1.18	1.06
740.8	28.215	52.73	0.81	112	28.13	0.16	1.66	1.47	0.47	0.41	1.18	1.06
740.6	28.379	49.69	0.82	112	28.30	0.16	1.67	1.48	0.48	0.42	1.19	1.07
740.5	28.543	46.99	0.79	112	28.46	0.16	1.68	1.49	0.48	0.42	1.19	1.07
740.3	28.707	45.00	0.76	112	28.62	0.16	1.69	1.50	0.49	0.43	1.19	1.07
740.1	28.871	44.38	0.71	112	28.79	0.16	1.69	1.51	0.50	0.43	1.20	1.08
740.0	29.035	49.94	0.63	112	28.95	0.16	1.70	1.52	0.50	0.44	1.20	1.08
739.8	29.199	60.13	0.62	112	29.12	0.16	1.71	1.53	0.51	0.44	1.21	1.09
739.6	29.363	63.16	0.50	112	29.28	0.16	1.72	1.54	0.51	0.45	1.21	1.09
739.5	29.527	57.90	0.60	112	29.45	0.16	1.73	1.55	0.52	0.45	1.22	1.09
739.3	29.691	51.29	0.73	112	29.61	0.16	1.74	1.56	0.52	0.46	1.22	1.10
739.1	29.855	49.81	0.82	112	29.77	0.16	1.75	1.57	0.53	0.46	1.22	1.10
739.0	30.019	53.88	0.94	112	29.94	0.16	1.76	1.58	0.53	0.47	1.23	1.11
738.8	30.183	62.67	1.14	112	30.10	0.16	1.77	1.58	0.54	0.47	1.23	1.11
738.7	30.347	75.85	1.41	112	30.27	0.16	1.78	1.59	0.54	0.48	1.24	1.12
738.5	30.511	78.34	1.74	112	30.43	0.16	1.79	1.60	0.55	0.48	1.24	1.12
738.3	30.675	79.27	1.92	112	30.59	0.16	1.80	1.61	0.55	0.49	1.24	1.12
738.2	30.840	73.42	1.95	112	30.76	0.16	1.80	1.62	0.56	0.49	1.25	1.13
738.0	31.004	73.53	1.87	112	30.92	0.16	1.81	1.63	0.56	0.50	1.25	1.13
737.8	31.168	79.68	1.90	112	31.09	0.16	1.82	1.64	0.57	0.50	1.26	1.14
737.7	31.332	82.73	2.04	112	31.25	0.16	1.83	1.65	0.57	0.51	1.26	1.14
737.5	31.496	73.44	2.14	112	31.41	0.16	1.84	1.66	0.58	0.51	1.26	1.14
737.3	31.660	70.18	2.06	112	31.58	0.16	1.85	1.67	0.58	0.52	1.27	1.15
737.2	31.824	69.40	2.03	112	31.74	0.16	1.86	1.68	0.59	0.52	1.27	1.15
737.0	31.988	69.36	1.97	112	31.91	0.16	1.87	1.69	0.59	0.53	1.28	1.16
736.8	32.152	70.91	1.96	112	32.07	0.16	1.88	1.69	0.60	0.54	1.28	1.16

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
736.7	32.316	69.10	1.95	112	32.23	0.16	1.89	1.70	0.60	0.54	1.28	1.16
736.5	32.480	70.98	1.93	112	32.40	0.16	1.90	1.71	0.61	0.55	1.29	1.17
736.4	32.644	73.01	1.45	112	32.56	0.16	1.91	1.72	0.61	0.55	1.29	1.17
736.2	32.808	68.15	1.48	112	32.73	0.16	1.91	1.73	0.62	0.56	1.30	1.18
736.0	32.972	66.20	1.59	112	32.89	0.16	1.92	1.74	0.62	0.56	1.30	1.18
735.9	33.136	69.19	1.81	112	33.05	0.16	1.93	1.75	0.63	0.57	1.30	1.18
735.7	33.300	71.30	1.95	112	33.22	0.16	1.94	1.76	0.63	0.57	1.31	1.19
735.5	33.464	76.26	2.08	112	33.38	0.16	1.95	1.77	0.64	0.58	1.31	1.19
735.4	33.628	80.46	2.06	112	33.55	0.16	1.96	1.78	0.64	0.58	1.32	1.20
735.2	33.792	69.87	1.94	112	33.71	0.16	1.97	1.79	0.65	0.59	1.32	1.20
735.0	33.956	58.05	1.63	112	33.87	0.16	1.98	1.80	0.65	0.59	1.33	1.20
734.9	34.120	39.37	1.37	112	34.04	0.16	1.99	1.81	0.66	0.60	1.33	1.21
734.7	34.284	27.17	1.05	112	34.20	0.16	2.00	1.81	0.66	0.60	1.33	1.21
734.6	34.448	18.43	0.75	112	34.37	0.16	2.01	1.82	0.67	0.61	1.34	1.22
734.4	34.612	13.32	0.49	112	34.53	0.16	2.02	1.83	0.67	0.61	1.34	1.22
734.2	34.776	11.16	0.25	112	34.69	0.16	2.02	1.84	0.68	0.62	1.35	1.22
734.1	34.941	10.17	0.14	112	34.86	0.16	2.03	1.85	0.68	0.62	1.35	1.23
733.9	35.105	9.31	0.09	112	35.02	0.16	2.04	1.86	0.69	0.63	1.35	1.23
733.7	35.269	9.20	0.11	112	35.19	0.16	2.05	1.87	0.69	0.63	1.36	1.24
733.6	35.433	10.07	0.14	112	35.35	0.16	2.06	1.88	0.70	0.64	1.36	1.24
733.4	35.597	11.09	0.17	112	35.51	0.16	2.07	1.89	0.71	0.64	1.37	1.25
733.2	35.761	12.64	0.33	112	35.68	0.16	2.08	1.90	0.71	0.65	1.37	1.25
733.1	35.925	15.20	0.32	112	35.84	0.16	2.09	1.91	0.72	0.65	1.37	1.25
732.9	36.089	14.97	0.62	112	36.01	0.16	2.10	1.92	0.72	0.66	1.38	1.26
732.7	36.253	15.35	0.60	112	36.17	0.16	2.11	1.92	0.73	0.66	1.38	1.26
732.6	36.417	14.10	0.52	112	36.33	0.16	2.12	1.93	0.73	0.67	1.39	1.27
732.4	36.581	13.49	0.37	112	36.50	0.16	2.13	1.94	0.74	0.67	1.39	1.27
732.3	36.745	11.06	0.30	112	36.66	0.16	2.14	1.95	0.74	0.68	1.39	1.27
732.1	36.909	9.72	0.25	112	36.83	0.16	2.14	1.96	0.75	0.68	1.40	1.28
731.9	37.073	8.07	0.24	112	36.99	0.16	2.15	1.97	0.75	0.69	1.40	1.28
731.8	37.237	7.50	0.22	112	37.16	0.16	2.16	1.98	0.76	0.69	1.41	1.29
731.6	37.401	7.26	0.20	112	37.32	0.16	2.17	1.99	0.76	0.70	1.41	1.29
731.4	37.565	8.46	0.17	112	37.48	0.16	2.18	2.00	0.77	0.70	1.41	1.29
731.3	37.729	8.79	0.14	112	37.65	0.16	2.19	2.01	0.77	0.71	1.42	1.30
731.1	37.893	8.11	0.12	112	37.81	0.16	2.20	2.02	0.78	0.71	1.42	1.30
730.9	38.057	9.47	0.13	112	37.98	0.16	2.21	2.03	0.78	0.72	1.43	1.31
730.8	38.221	11.19	0.17	112	38.14	0.16	2.22	2.03	0.79	0.72	1.43	1.31
730.6	38.385	21.38	0.28	112	38.30	0.16	2.23	2.04	0.79	0.73	1.44	1.31
730.5	38.549	19.44	0.27	112	38.47	0.16	2.24	2.05	0.80	0.73	1.44	1.32
730.3	38.713	18.10	0.25	112	38.63	0.16	2.25	2.06	0.80	0.74	1.44	1.32
730.1	38.877	17.82	0.23	112	38.80	0.16	2.25	2.07	0.81	0.74	1.45	1.33
730.0	39.042	18.72	0.25	112	38.96	0.16	2.26	2.08	0.81	0.75	1.45	1.33
729.8	39.206	21.08	0.39	112	39.12	0.16	2.27	2.09	0.82	0.76	1.46	1.33
729.6	39.370	21.69	0.58	112	39.29	0.16	2.28	2.10	0.82	0.76	1.46	1.34
729.5	39.534	25.80	0.53	126	39.45	0.16	2.29	2.11	0.83	0.77	1.46	1.34
729.3	39.698	21.24	0.42	126	39.62	0.16	2.30	2.12	0.83	0.77	1.47	1.35
729.1	39.862	19.16	0.31	126	39.78	0.16	2.31	2.13	0.84	0.78	1.47	1.35
729.0	40.026	18.71	0.24	126	39.94	0.16	2.32	2.14	0.84	0.78	1.48	1.36
728.8	40.190	20.28	0.26	126	40.11	0.16	2.33	2.15	0.85	0.79	1.48	1.36
728.6	40.354	20.95	0.33	126	40.27	0.16	2.34	2.16	0.85	0.79	1.49	1.37
728.5	40.518	22.11	0.28	126	40.44	0.16	2.35	2.17	0.86	0.80	1.50	1.37
728.3	40.682	22.66	0.25	126	40.60	0.16	2.36	2.18	0.86	0.80	1.50	1.38
728.2	40.846	22.61	0.26	126	40.76	0.16	2.37	2.19	0.87	0.81	1.51	1.39
728.0	41.010	24.11	0.35	126	40.93	0.16	2.38	2.20	0.87	0.81	1.51	1.39
727.8	41.174	26.63	0.35	126	41.09	0.16	2.40	2.21	0.88	0.82	1.52	1.40
727.7	41.338	28.25	0.45	126	41.26	0.16	2.41	2.22	0.88	0.82	1.52	1.40
727.5	41.502	30.15	0.57	126	41.42	0.16	2.42	2.23	0.89	0.83	1.53	1.41
727.3	41.666	33.67	0.62	126	41.58	0.16	2.43	2.24	0.89	0.83	1.53	1.41
727.2	41.830	58.31	0.67	126	41.75	0.16	2.44	2.25	0.90	0.84	1.54	1.42
727.0	41.994	49.49	1.03	126	41.91	0.16	2.45	2.26	0.90	0.84	1.54	1.42
726.8	42.158	57.78	1.30	126	42.08	0.16	2.46	2.27	0.91	0.85	1.55	1.43
726.7	42.322	68.44	1.55	126	42.24	0.16	2.47	2.28	0.91	0.85	1.55	1.43
726.5	42.486	74.25	0.86	126	42.40	0.16	2.48	2.29	0.92	0.86	1.56	1.44
726.3	42.650	72.62	0.78	126	42.57	0.16	2.49	2.31	0.93	0.86	1.56	1.44
726.2	42.814	69.13	1.03	126	42.73	0.16	2.50	2.32	0.93	0.87	1.57	1.45
726.0	42.978	63.52	1.15	126	42.90	0.16	2.51	2.33	0.94	0.87	1.57	1.45
725.9	43.143	66.51	1.37	126	43.06	0.16	2.52	2.34	0.94	0.88	1.58	1.46
725.7	43.307	71.22	1.06	126	43.22	0.16	2.53	2.35	0.95	0.88	1.58	1.46
725.5	43.471	73.50	0.42	126	43.39	0.16	2.54	2.36	0.95	0.89	1.59	1.47

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
725.4	43.635	62.80	0.40	126	43.55	0.16	2.55	2.37	0.96	0.89	1.59	1.47
725.2	43.799	47.16	0.35	126	43.72	0.16	2.56	2.38	0.96	0.90	1.60	1.48
725.0	43.963	33.70	0.29	126	43.88	0.16	2.57	2.39	0.97	0.90	1.60	1.48
724.9	44.127	25.40	0.22	126	44.04	0.16	2.58	2.40	0.97	0.91	1.61	1.49
724.7	44.291	20.57	0.39	126	44.21	0.16	2.59	2.41	0.98	0.91	1.62	1.49
724.5	44.455	22.58	0.59	126	44.37	0.16	2.60	2.42	0.98	0.92	1.62	1.50
724.4	44.619	51.24	0.67	126	44.54	0.16	2.61	2.43	0.99	0.92	1.63	1.51
724.2	44.783	73.63	0.44	126	44.70	0.16	2.62	2.44	0.99	0.93	1.63	1.51
724.1	44.947	92.76	0.40	126	44.86	0.16	2.63	2.45	1.00	0.93	1.64	1.52
723.9	45.111	95.95	0.48	126	45.03	0.16	2.64	2.46	1.00	0.94	1.64	1.52
723.7	45.275	89.86	0.54	126	45.19	0.16	2.65	2.47	1.01	0.94	1.65	1.53
723.6	45.439	83.71	0.56	126	45.36	0.16	2.66	2.48	1.01	0.95	1.65	1.53
723.4	45.603	76.07	0.52	126	45.52	0.16	2.67	2.49	1.02	0.95	1.66	1.54
723.2	45.767	65.31	0.52	126	45.69	0.16	2.68	2.50	1.02	0.96	1.66	1.54
723.1	45.931	47.33	0.45	126	45.85	0.16	2.69	2.51	1.03	0.97	1.67	1.55
722.9	46.095	38.31	0.36	126	46.01	0.16	2.71	2.52	1.03	0.97	1.67	1.55
722.7	46.259	25.89	0.30	126	46.18	0.16	2.72	2.53	1.04	0.98	1.68	1.56
722.6	46.423	25.28	0.23	126	46.34	0.16	2.73	2.54	1.04	0.98	1.68	1.56
722.4	46.587	45.31	0.13	126	46.51	0.16	2.74	2.55	1.05	0.99	1.69	1.57
722.2	46.751	32.46	0.21	126	46.67	0.16	2.75	2.56	1.05	0.99	1.69	1.57
722.1	46.915	19.40	0.21	126	46.83	0.16	2.76	2.57	1.06	1.00	1.70	1.58
721.9	47.079	12.93	0.20	126	47.00	0.16	2.77	2.58	1.06	1.00	1.70	1.58
721.8	47.244	10.61	0.13	126	47.16	0.16	2.78	2.59	1.07	1.01	1.71	1.59
721.6	47.408	11.06	0.29	126	47.33	0.16	2.79	2.60	1.07	1.01	1.71	1.59
721.4	47.572	13.68	0.44	126	47.49	0.16	2.80	2.62	1.08	1.02	1.72	1.60
721.3	47.736	21.01	0.50	126	47.65	0.16	2.81	2.63	1.08	1.02	1.72	1.60
721.1	47.900	26.69	0.52	126	47.82	0.16	2.82	2.64	1.09	1.03	1.73	1.61
720.9	48.064	30.54	0.31	126	47.98	0.16	2.83	2.65	1.09	1.03	1.74	1.61
720.8	48.228	33.88	0.21	126	48.15	0.16	2.84	2.66	1.10	1.04	1.74	1.62
720.6	48.392	28.84	0.20	126	48.31	0.16	2.85	2.67	1.10	1.04	1.75	1.63
720.4	48.556	26.46	0.29	126	48.47	0.16	2.86	2.68	1.11	1.05	1.75	1.63
720.3	48.720	34.27	0.21	126	48.64	0.16	2.87	2.69	1.11	1.05	1.76	1.64
720.1	48.884	44.74	0.12	126	48.80	0.16	2.88	2.70	1.12	1.06	1.76	1.64
720.0	49.048	41.57	0.40	126	48.97	0.16	2.89	2.71	1.12	1.06	1.77	1.65
719.8	49.212	31.16	0.58	126	49.13	0.16	2.90	2.72	1.13	1.07	1.77	1.65
719.6	49.376	29.13	0.57	126	49.29	0.16	2.91	2.73	1.13	1.07	1.78	1.66
719.5	49.540	30.51	0.17	126	49.46	0.16	2.92	2.74	1.14	1.08	1.78	1.66
719.3	49.704	33.50	0.12	126	49.62	0.16	2.93	2.75	1.15	1.08	1.79	1.67
719.1	49.868	32.29	0.14	126	49.79	0.16	2.94	2.76	1.15	1.09	1.79	1.67
719.0	50.032	34.89	0.22	126	49.95	0.16	2.95	2.77	1.16	1.09	1.80	1.68
718.8	50.196	44.20	0.25	126	50.11	0.16	2.96	2.78	1.16	1.10	1.80	1.68
718.6	50.360	52.65	0.35	126	50.28	0.16	2.97	2.79	1.17	1.10	1.81	1.69
718.5	50.524	57.74	0.47	126	50.44	0.16	2.98	2.80	1.17	1.11	1.81	1.69
718.3	50.688	60.40	0.45	126	50.61	0.16	2.99	2.81	1.18	1.11	1.82	1.70
718.1	50.852	56.83	0.44	126	50.77	0.16	3.01	2.82	1.18	1.12	1.82	1.70
718.0	51.016	49.98	0.45	126	50.93	0.16	3.02	2.83	1.19	1.12	1.83	1.71
717.8	51.180	46.07	0.46	126	51.10	0.16	3.03	2.84	1.19	1.13	1.83	1.71
717.7	51.345	46.47	0.36	126	51.26	0.16	3.04	2.85	1.20	1.13	1.84	1.72
717.5	51.509	50.91	0.27	126	51.43	0.16	3.05	2.86	1.20	1.14	1.84	1.72
717.3	51.673	53.95	0.31	126	51.59	0.16	3.06	2.87	1.21	1.14	1.85	1.73
717.2	51.837	54.39	0.47	126	51.75	0.16	3.07	2.88	1.21	1.15	1.86	1.73
717.0	52.001	50.53	0.55	126	51.92	0.16	3.08	2.89	1.22	1.15	1.86	1.74
716.8	52.165	44.20	0.47	126	52.08	0.16	3.09	2.90	1.22	1.16	1.87	1.75
716.7	52.329	39.55	0.63	126	52.25	0.16	3.10	2.92	1.23	1.16	1.87	1.75
716.5	52.493	33.29	0.51	126	52.41	0.16	3.11	2.93	1.23	1.17	1.88	1.76
716.3	52.657	38.92	0.42	126	52.57	0.16	3.12	2.94	1.24	1.17	1.88	1.76
716.2	52.821	44.54	0.21	126	52.74	0.16	3.13	2.95	1.24	1.18	1.89	1.77
716.0	52.985	46.30	0.16	126	52.90	0.16	3.14	2.96	1.25	1.19	1.89	1.77
715.9	53.149	47.46	0.21	126	53.07	0.16	3.15	2.97	1.25	1.19	1.90	1.78
715.7	53.313	45.17	0.37	126	53.23	0.16	3.16	2.98	1.26	1.20	1.90	1.78
715.5	53.477	45.05	0.41	126	53.40	0.16	3.17	2.99	1.26	1.20	1.91	1.79
715.4	53.641	46.34	0.38	126	53.56	0.16	3.18	3.00	1.27	1.21	1.91	1.79
715.2	53.805	45.75	0.34	126	53.72	0.16	3.19	3.01	1.27	1.21	1.92	1.80
715.0	53.969	44.82	0.34	126	53.89	0.16	3.20	3.02	1.28	1.22	1.92	1.80
714.9	54.133	42.53	0.36	126	54.05	0.16	3.21	3.03	1.28	1.22	1.93	1.81
714.7	54.297	40.23	0.44	126	54.22	0.16	3.22	3.04	1.29	1.23	1.93	1.81
714.5	54.461	33.52	0.57	131	54.38	0.16	3.23	3.05	1.29	1.23	1.94	1.82
714.4	54.625	23.84	0.59	131	54.54	0.16	3.24	3.06	1.30	1.24	1.94	1.82
714.2	54.789	26.71	0.30	131	54.71	0.16	3.25	3.07	1.30	1.24	1.95	1.83

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
714.0	54.953	34.98	0.10	131	54.87	0.16	3.26	3.08	1.31	1.25	1.96	1.84
713.9	55.117	31.29	0.12	131	55.04	0.16	3.28	3.09	1.31	1.25	1.96	1.84
713.7	55.281	22.22	0.24	131	55.20	0.16	3.29	3.10	1.32	1.26	1.97	1.85
713.6	55.446	19.12	0.26	131	55.36	0.16	3.30	3.11	1.32	1.26	1.97	1.85
713.4	55.610	30.55	0.19	131	55.53	0.16	3.31	3.12	1.33	1.27	1.98	1.86
713.2	55.774	48.55	0.09	131	55.69	0.16	3.32	3.14	1.33	1.27	1.98	1.86
713.1	55.938	54.30	0.18	131	55.86	0.16	3.33	3.15	1.34	1.28	1.99	1.87
712.9	56.102	49.76	0.36	131	56.02	0.16	3.34	3.16	1.34	1.28	2.00	1.87
712.7	56.266	42.64	0.51	131	56.18	0.16	3.35	3.17	1.35	1.29	2.00	1.88
712.6	56.430	37.65	0.45	131	56.35	0.16	3.36	3.18	1.36	1.29	2.01	1.89
712.4	56.594	36.97	0.42	131	56.51	0.16	3.37	3.19	1.36	1.30	2.01	1.89
712.2	56.758	39.91	0.46	131	56.68	0.16	3.38	3.20	1.37	1.30	2.02	1.90
712.1	56.922	49.95	0.43	131	56.84	0.16	3.39	3.21	1.37	1.31	2.02	1.90
711.9	57.086	58.98	0.42	131	57.00	0.16	3.40	3.22	1.38	1.31	2.03	1.91
711.8	57.250	65.71	0.49	131	57.17	0.16	3.42	3.23	1.38	1.32	2.03	1.91
711.6	57.414	69.79	0.57	131	57.33	0.16	3.43	3.24	1.39	1.32	2.04	1.92
711.4	57.578	75.91	0.70	131	57.50	0.16	3.44	3.25	1.39	1.33	2.05	1.93
711.3	57.742	89.33	0.73	131	57.66	0.16	3.45	3.26	1.40	1.33	2.05	1.93
711.1	57.906	114.27	0.85	131	57.82	0.16	3.46	3.28	1.40	1.34	2.06	1.94
710.9	58.070	137.60	1.05	131	57.99	0.16	3.47	3.29	1.41	1.34	2.06	1.94
710.8	58.234	143.22	1.25	131	58.15	0.16	3.48	3.30	1.41	1.35	2.07	1.95
710.6	58.398	133.27	1.31	131	58.32	0.16	3.49	3.31	1.42	1.35	2.07	1.95
710.4	58.562	118.80	1.16	131	58.48	0.16	3.50	3.32	1.42	1.36	2.08	1.96
710.3	58.726	105.34	1.06	131	58.64	0.16	3.51	3.33	1.43	1.36	2.09	1.96
710.1	58.890	102.74	0.88	131	58.81	0.16	3.52	3.34	1.43	1.37	2.09	1.97
709.9	59.054	113.99	0.75	131	58.97	0.16	3.53	3.35	1.44	1.37	2.10	1.98
709.8	59.218	131.80	0.72	131	59.14	0.16	3.54	3.36	1.44	1.38	2.10	1.98
709.6	59.382	145.33	0.74	131	59.30	0.16	3.55	3.37	1.45	1.38	2.11	1.99
709.5	59.547	145.06	0.83	131	59.46	0.16	3.57	3.38	1.45	1.39	2.11	1.99
709.3	59.711	135.88	0.87	131	59.63	0.16	3.58	3.39	1.46	1.39	2.12	2.00
709.1	59.875	129.12	0.80	131	59.79	0.16	3.59	3.40	1.46	1.40	2.12	2.00
709.0	60.039	131.30	0.77	131	59.96	0.16	3.60	3.41	1.47	1.41	2.13	2.01
708.8	60.203	129.04	0.80	131	60.12	0.16	3.61	3.43	1.47	1.41	2.14	2.02
708.6	60.367	116.34	0.79	131	60.28	0.16	3.62	3.44	1.48	1.42	2.14	2.02
708.5	60.531	103.78	0.78	131	60.45	0.16	3.63	3.45	1.48	1.42	2.15	2.03
708.3	60.695	95.16	0.73	131	60.61	0.16	3.64	3.46	1.49	1.43	2.15	2.03
708.1	60.859	90.06	0.68	131	60.78	0.16	3.65	3.47	1.49	1.43	2.16	2.04
708.0	61.023	87.76	0.68	131	60.94	0.16	3.66	3.48	1.50	1.44	2.16	2.04
707.8	61.187	77.28	0.77	131	61.10	0.16	3.67	3.49	1.50	1.44	2.17	2.05
707.6	61.351	68.84	0.85	131	61.27	0.16	3.68	3.50	1.51	1.45	2.18	2.05
707.5	61.515	76.32	0.86	131	61.43	0.16	3.69	3.51	1.51	1.45	2.18	2.06
707.3	61.679	76.95	0.95	131	61.60	0.16	3.71	3.52	1.52	1.46	2.19	2.07
707.2	61.843	80.39	1.04	131	61.76	0.16	3.72	3.53	1.52	1.46	2.19	2.07
707.0	62.007	87.95	1.75	131	61.93	0.16	3.73	3.54	1.53	1.47	2.20	2.08
706.8	62.171	112.35	1.10	131	62.09	0.16	3.74	3.55	1.53	1.47	2.20	2.08
706.7	62.335	155.48	2.24	131	62.25	0.16	3.75	3.57	1.54	1.48	2.21	2.09
706.5	62.499	177.07	1.45	131	62.42	0.16	3.76	3.58	1.54	1.48	2.21	2.09
706.3	62.663	288.14	2.13	131	62.58	0.16	3.77	3.59	1.55	1.49	2.22	2.10
706.2	62.827	336.70	3.06	131	62.75	0.16	3.78	3.60	1.55	1.49	2.23	2.11
706.0	62.991	285.42	3.40	131	62.91	0.16	3.79	3.61	1.56	1.50	2.23	2.11
705.8	63.155	222.92	2.31	131	63.07	0.16	3.80	3.62	1.56	1.50	2.24	2.12
705.7	63.319	193.02	1.17	131	63.24	0.16	3.81	3.63	1.57	1.51	2.24	2.12
705.5	63.483	176.73	1.47	131	63.40	0.16	3.82	3.64	1.58	1.51	2.25	2.13
705.4	63.648	117.89	1.89	131	63.57	0.16	3.83	3.65	1.58	1.52	2.25	2.13
705.2	63.812	94.72	2.16	131	63.73	0.16	3.85	3.66	1.59	1.52	2.26	2.14
705.0	63.976	99.02	2.51	131	63.89	0.16	3.86	3.67	1.59	1.53	2.27	2.14
704.9	64.140	104.06	2.81	131	64.06	0.16	3.87	3.68	1.60	1.53	2.27	2.15
704.7	64.304	109.29	3.33	131	64.22	0.16	3.88	3.69	1.60	1.54	2.28	2.16
704.5	64.468	139.21	3.72	131	64.39	0.16	3.89	3.70	1.61	1.54	2.28	2.16
704.4	64.632	168.61	3.69	131	64.55	0.16	3.90	3.72	1.61	1.55	2.29	2.17
704.2	64.796	190.96	3.94	131	64.71	0.16	3.91	3.73	1.62	1.55	2.29	2.17
704.0	64.960	220.24	4.45	131	64.88	0.16	3.92	3.74	1.62	1.56	2.30	2.18
703.9	65.124	227.79	4.88	131	65.04	0.16	3.93	3.75	1.63	1.56	2.30	2.18
703.7	65.288	245.80	5.15	131	65.21	0.16	3.94	3.76	1.63	1.57	2.31	2.19
703.5	65.452	253.50	4.12	131	65.37	0.16	3.95	3.77	1.64	1.57	2.32	2.20
703.4	65.616	4.38	3.43	131	65.53	0.16	3.96	3.78	1.64	1.58	2.32	2.20
703.2	65.780	91.41	2.53	131	65.70	0.16	3.97	3.79	1.65	1.58	2.33	2.21
703.1	65.944	140.41	2.45	131	65.86	0.16	3.98	3.80	1.65	1.59	2.33	2.21
702.9	66.108	143.60	2.96	131	66.03	0.16	4.00	3.81	1.66	1.59	2.34	2.22

Elev. (ft)	Depth z (ft)	Cone Tip Resistance qt (tsf)	Sleeve Friction f_s (tsf)	Unit Weight Υ (pcf)	Top of Sampling Interval (ft)	Thickness of Sampling Interval (ft)	Total Vertical Stress during CPT $\sigma_{v\,CPT}$ (tsf)	Total Vertical Stress during EQ $\sigma_{v\,EQ}$ (tsf)	Static Pore Water Pressure during CPT $u_{S\,CPT}$ (tsf)	Static Pore Water Pressure during EQ $u_{S\,EQ}$ (tsf)	Effective Vertical Stress during CPT $\sigma_{v\,CPT}'$ (tsf)	Effective Vertical Stress during EQ $\sigma_{v\,EQ}'$ (tsf)
702.7	66.272	173.88	2.32	131	66.19	0.16	4.01	3.82	1.66	1.60	2.34	2.22
702.6	66.436	248.99	3.88	131	66.35	0.16	4.02	3.83	1.67	1.60	2.35	2.23
702.4	66.600	293.83	4.19	131	66.52	0.16	4.03	3.84	1.67	1.61	2.36	2.23
702.2	66.764	321.00	4.80	131	66.68	0.16	4.04	3.86	1.68	1.62	2.36	2.24
702.1	66.928	393.97	5.47	131	66.85	0.16	4.05	3.87	1.68	1.62	2.37	2.25
701.9	67.092	460.61	6.03	131	67.01	0.16	4.06	3.88	1.69	1.63	2.37	2.25
701.7	67.256	465.25	0.01	131	67.17	0.16	4.07	3.89	1.69	1.63	2.38	2.26
701.6	67.420	441.38	0.01	131	67.34	0.08	4.08	3.90	1.70	1.64	2.38	2.26

LIQUEFACTION POTENTIAL ASSESSMENT FOR COARSE GRAINED SOILS USING CONE PENETRATION TEST DATA

Project Site: KIF TDEC Stability
Project No.: 175668043
CPT ID: KIF-BF-CPT-5B

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
769.0												
768.8	0.164	9.00	11.11	3.39	1.0	1.70	0.16	100	53.98	54.14	0.000	#NUM!
768.7	0.328	4.06	12.46	3.68	1.0	1.70	0.16	100	53.98	54.14	0.000	#NUM!
768.5	0.492	2.39	14.19	3.90	1.0	1.70	0.16	100	53.98	54.14	0.000	#NUM!
768.3	0.656	1.55	16.47	4.09	1.0	1.70	0.16	100	53.98	54.14	0.001	#NUM!
768.2	0.820	1.04	19.62	4.27	1.0	1.70	0.16	100	53.98	54.14	0.005	#NUM!
768.0	0.984	0.70	24.27	4.46	1.0	1.70	0.16	100	53.98	54.14	0.008	#NUM!
767.9	1.148	0.46	31.81	4.68	1.0	1.70	0.16	100	53.98	54.14	0.012	#NUM!
767.7	1.312	0.28	46.13	4.95	1.0	1.70	0.16	100	53.98	54.14	0.016	#NUM!
767.5	1.476	0.14	83.92	5.36	1.0	1.70	0.16	100	53.98	54.14	0.019	#NUM!
767.4	1.640	0.02	463.78	6.43	1.0	1.70	0.16	100	53.98	54.14	0.023	#NUM!
767.2	1.804	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.026	#NUM!
767.0	1.968	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.030	#NUM!
766.9	2.133	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.034	#NUM!
766.7	2.297	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.037	#NUM!
766.5	2.461	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.041	#NUM!
766.4	2.625	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.045	#NUM!
766.2	2.789	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.048	#NUM!
766.0	2.953	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.052	#NUM!
765.9	3.117	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.056	-0.224
765.7	3.281	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.059	-0.211
765.6	3.445	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.063	-0.205
765.4	3.609	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.067	-0.201
765.2	3.773	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.070	-0.198
765.1	3.937	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.074	-0.195
764.9	4.101	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.078	-0.193
764.7	4.265	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.081	-0.191
764.6	4.429	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.085	-0.189
764.4	4.593	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.089	-0.187
764.2	4.757	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.093	-0.186
764.1	4.921	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.097	-0.184
763.9	5.085	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.100	-0.183
763.8	5.249	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.102	-0.182
763.6	5.413	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.104	-0.181
763.4	5.577	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.106	-0.180
763.3	5.741	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.108	-0.179
763.1	5.905	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.110	-0.178
762.9	6.069	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.112	-0.177
762.8	6.234	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.113	-0.176
762.6	6.398	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.114	-0.175
762.4	6.562	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.115	-0.174
762.3	6.726	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.116	-0.173
762.1	6.890	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.117	-0.172
761.9	7.054	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.118	-0.171
761.8	7.218	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.118	-0.171
761.6	7.382	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.119	-0.170
761.5	7.546	0.01	0.15	5.48	1.0	1.70	0.16	100	53.98	54.14	0.119	-0.169
761.3	7.710	0.01	0.15	5.48	1.0	1.68	0.16	100	53.98	54.14	0.119	-0.168
761.1	7.874	0.01	0.15	5.48	1.0	1.66	0.16	100	53.98	54.14	0.119	-0.168
761.0	8.038	0.01	0.15	5.48	1.0	1.64	0.15	100	53.98	54.14	0.120	-0.167
760.8	8.202	0.01	0.15	5.48	1.0	1.62	0.15	100	53.98	54.13	0.120	-0.166
760.6	8.366	0.01	0.15	5.48	1.0	1.60	0.15	100	53.98	54.13	0.120	-0.166
760.5	8.530	0.01	0.15	5.48	1.0	1.58	0.15	100	53.98	54.13	0.120	-0.165
760.3	8.694	0.01	0.15	5.48	1.0	1.56	0.15	100	53.98	54.13	0.120	-0.165
760.1	8.858	0.01	0.15	5.48	1.0	1.54	0.15	100	53.98	54.12	0.119	-0.164
760.0	9.022	0.01	0.15	5.48	1.0	1.53	0.14	100	53.98	54.12	0.119	-0.163
759.8	9.186	0.01	0.15	5.48	1.0	1.51	0.14	100	53.98	54.12	0.119	-0.163
759.6	9.350	0.01	0.15	5.48	1.0	1.49	0.14	100	53.98	54.12	0.119	-0.162
759.5	9.514	0.01	0.15	5.48	1.0	1.48	0.14	100	53.98	54.12	0.119	-0.162
759.3	9.678	0.01	0.15	5.48	1.0	1.46	0.14	100	53.98	54.11	0.119	-0.161
759.2	9.842	0.01	0.15	5.48	1.0	1.45	0.14	100	53.98	54.11	0.120	-0.160

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
759.0	10.006	0.01	0.15	5.48	1.0	1.43	0.14	100	53.98	54.11	0.120	-0.160
758.8	10.170	0.01	0.15	5.48	1.0	1.42	0.13	100	53.97	54.11	0.120	-0.159
758.7	10.335	0.01	0.15	5.48	1.0	1.40	0.13	100	53.97	54.11	0.120	-0.159
758.5	10.499	0.01	0.15	5.48	1.0	1.39	0.13	100	53.97	54.11	0.120	-0.158
758.3	10.663	0.01	0.15	5.48	1.0	1.38	0.13	100	53.97	54.10	0.121	-0.158
758.2	10.827	0.01	0.15	5.48	1.0	1.36	0.13	100	53.97	54.10	0.121	-0.157
758.0	10.991	0.01	0.15	5.48	1.0	1.35	0.13	100	53.97	54.10	0.121	-0.157
757.8	11.155	0.01	0.15	5.48	1.0	1.34	0.13	100	53.97	54.10	0.122	-0.156
757.7	11.319	0.01	0.15	5.48	1.0	1.32	0.13	100	53.97	54.10	0.122	-0.156
757.5	11.483	0.01	0.15	5.48	1.0	1.31	0.12	100	53.97	54.10	0.122	-0.155
757.4	11.647	0.01	0.15	5.48	1.0	1.30	0.12	100	53.97	54.09	0.122	-0.155
757.2	11.811	0.01	0.15	5.48	1.0	1.29	0.12	100	53.97	54.09	0.122	-0.155
757.0	11.975	0.01	0.15	5.48	1.0	1.28	0.12	100	53.97	54.09	0.122	-0.154
756.9	12.139	0.01	0.15	5.48	1.0	1.27	0.12	100	53.97	54.09	0.122	-0.154
756.7	12.303	0.01	0.15	5.48	1.0	1.26	0.12	100	53.97	54.09	0.122	-0.153
756.5	12.467	19.40	1.33	2.56	0.5	1.22	20.63	68	56.26	76.89	0.123	-0.286
756.4	12.631	98.63	0.36	1.67	0.5	1.19	99.43	0	0.00	99.43	0.123	-0.391
756.2	12.795	150.04	0.36	1.51	0.5	1.14	146.42	0	0.00	146.42	0.123	-0.564
756.0	12.959	179.09	0.67	1.60	0.5	1.12	172.56	0	0.00	172.56	0.123	-0.600
755.9	13.123	160.85	0.86	1.71	0.5	1.13	156.42	0	0.00	156.42	0.123	-0.595
755.7	13.287	147.74	1.19	1.84	0.5	1.13	144.11	10	8.63	152.73	0.123	-0.583
755.5	13.451	174.94	1.29	1.81	0.5	1.12	169.06	8	3.31	172.36	0.126	-0.600
755.4	13.615	198.86	1.54	1.83	0.5	1.10	190.16	9	8.42	198.59	0.130	-0.600
755.2	13.779	190.41	2.02	1.94	0.5	1.09	180.79	18	40.65	221.44	0.134	-0.600
755.1	13.943	150.94	2.45	2.06	0.5	1.09	144.45	28	61.39	205.85	0.138	-0.600
754.9	14.107	120.38	2.56	2.14	0.5	1.10	116.59	34	64.33	180.93	0.142	-0.600
754.7	14.271	108.25	2.19	2.12	0.5	1.11	105.66	33	60.06	165.72	0.141	-0.600
754.6	14.436	112.41	1.88	2.06	0.5	1.10	109.84	28	54.26	164.10	0.120	-0.600
754.4	14.600	120.94	1.63	1.99	0.5	1.10	118.20	23	45.73	163.93	0.098	-0.600
754.2	14.764	123.87	1.65	1.99	0.5	1.10	121.02	22	45.36	166.38	0.077	-0.600
754.1	14.928	114.84	1.76	2.03	0.5	1.10	112.47	26	50.98	163.45	0.056	-0.600
753.9	15.092	114.12	1.71	2.03	0.5	1.10	111.92	25	49.83	161.75	0.035	-0.600
753.7	15.256	99.47	1.77	2.08	0.5	1.10	98.09	29	54.29	152.38	0.023	-0.578
753.6	15.420	80.75	2.34	2.23	0.5	1.10	80.17	41	62.21	142.37	0.019	-0.546
753.4	15.584	73.61	2.19	2.24	0.5	1.10	73.42	42	61.00	134.42	0.015	-0.519
753.3	15.748	76.08	1.68	2.15	0.5	1.10	75.97	35	55.94	131.91	0.011	-0.510
753.1	15.912	72.94	1.38	2.10	0.5	1.10	73.11	31	51.69	124.80	0.008	-0.485
752.9	16.076	58.43	1.48	2.20	0.5	1.10	59.03	39	55.37	114.40	0.004	-0.446
752.8	16.240	45.75	1.42	2.27	0.5	1.10	46.69	45	55.89	102.58	0.002	-0.398
752.6	16.404	35.26	1.68	2.41	0.5	1.11	36.36	55	57.57	93.93	0.002	-0.360
752.4	16.568	49.64	1.21	2.20	0.5	1.10	50.56	39	53.49	104.05	0.002	-0.404
752.3	16.732	47.85	1.40	2.25	0.5	1.09	48.77	43	55.62	104.39	0.002	-0.405
752.1	16.896	51.55	1.67	2.27	0.5	1.09	52.37	45	57.47	109.83	0.002	-0.427
751.9	17.060	48.41	1.97	2.34	0.5	1.09	49.28	50	59.17	108.45	0.002	-0.421
751.8	17.224	51.10	1.83	2.30	0.5	1.08	51.93	47	58.52	110.45	0.002	-0.429
751.6	17.388	45.55	1.79	2.34	0.5	1.08	46.52	50	58.25	104.77	0.002	-0.406
751.4	17.552	38.54	1.76	2.39	0.5	1.08	39.62	54	57.96	97.59	0.002	-0.375
751.3	17.716	31.84	1.76	2.45	0.5	1.08	33.01	59	57.75	90.76	0.002	-0.345
751.1	17.880	30.00	1.63	2.45	0.5	1.08	31.20	59	57.29	88.49	0.002	-0.334
751.0	18.044	33.34	1.41	2.38	0.5	1.08	34.52	53	56.39	90.91	0.002	-0.345
750.8	18.208	41.03	1.37	2.30	0.5	1.07	42.14	47	55.86	98.01	0.002	-0.377
750.6	18.372	40.90	1.54	2.33	0.5	1.07	42.00	50	56.95	98.95	0.002	-0.380
750.5	18.537	41.06	1.59	2.34	0.5	1.07	42.17	50	57.19	99.36	0.002	-0.382
750.3	18.701	35.90	1.76	2.41	0.5	1.06	37.06	56	57.89	94.95	0.003	-0.363
750.1	18.865	28.44	2.26	2.56	0.5	1.06	29.65	68	58.80	88.45	0.003	-0.333
750.0	19.029	27.18	2.76	2.63	1.0	1.06	26.90	73	59.02	85.92	0.003	-0.321
749.8	19.193	52.53	1.57	2.25	0.5	1.05	53.53	43	56.76	110.29	0.003	-0.426
749.6	19.357	165.65	0.54	1.57	0.5	1.04	164.72	0	0.00	164.72	0.003	-0.600
749.5	19.521	238.57	0.18	1.19	0.5	1.03	234.69	0	0.00	234.69	0.003	-0.600
749.3	19.685	279.28	0.34	1.27	0.5	1.03	274.25	0	0.00	274.25	0.003	-0.600
749.2	19.849	281.95	0.37	1.29	0.5	1.02	277.18	0	0.00	277.18	0.003	-0.600
749.0	20.013	374.96	0.31	1.14	0.5	1.02	368.67	0	0.00	368.67	0.003	-0.600
748.8	20.177	391.88	0.47	1.25	0.5	1.02	385.69	0	0.00	385.69	0.003	-0.600
748.7	20.341	393.63	0.52	1.28	0.5	1.02	387.85	0	0.00	387.85	0.003	-0.600
748.5	20.505	363.95	0.62	1.36	0.5	1.02	359.11	0	0.00	359.11	0.003	-0.600
748.3	20.669	357.71	0.71	1.41	0.5	1.02	353.37	0	0.00	353.37	0.004	-0.600

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
748.2	20.833	338.31	0.75	1.44	0.5	1.02	334.65	0	0.00	334.65	0.004	-0.600
748.0	20.997	300.56	0.99	1.57	0.5	1.01	297.77	0	0.00	297.77	0.004	-0.600
747.8	21.161	280.57	0.97	1.58	0.5	1.01	278.36	0	0.00	278.36	0.004	-0.600
747.7	21.325	251.79	0.80	1.55	0.5	1.01	250.27	0	0.00	250.27	0.004	-0.600
747.5	21.489	218.27	0.57	1.49	0.5	1.01	217.70	0	0.00	217.70	0.004	-0.600
747.3	21.653	184.59	0.32	1.41	0.5	1.01	184.77	0	0.00	184.77	0.004	-0.600
747.2	21.817	164.97	0.17	1.33	0.5	1.01	165.54	0	0.00	165.54	0.004	-0.600
747.0	21.981	150.49	0.19	1.39	0.5	1.01	151.31	0	0.00	151.31	0.004	-0.568
746.9	22.145	152.25	0.18	1.37	0.5	1.01	153.13	0	0.00	153.13	0.004	-0.574
746.7	22.309	152.07	0.16	1.35	0.5	1.01	153.02	0	0.00	153.02	0.004	-0.573
746.5	22.473	128.52	0.16	1.43	0.5	1.01	129.65	0	0.00	129.65	0.005	-0.496
746.4	22.638	116.55	0.17	1.48	0.5	1.01	117.77	0	0.00	117.77	0.005	-0.452
746.2	22.802	110.38	0.15	1.48	0.5	1.00	111.64	0	0.00	111.64	0.005	-0.429
746.0	22.966	97.68	0.15	1.53	0.5	1.00	98.97	0	0.00	98.97	0.005	-0.376
745.9	23.130	82.91	0.20	1.64	0.5	1.00	84.21	0	0.00	84.21	0.005	-0.309
745.7	23.294	78.77	0.15	1.62	0.5	1.00	80.07	0	0.00	80.07	0.005	-0.289
745.5	23.458	76.70	0.15	1.63	0.5	1.00	77.99	0	0.00	77.99	0.005	-0.278
745.4	23.622	62.14	0.15	1.72	0.5	0.99	63.39	1	0.00	63.39	0.005	-0.198
745.2	23.786	47.17	0.15	1.84	0.5	0.99	48.40	10	0.00	48.40	0.005	-0.099
745.1	23.950	39.49	0.15	1.91	0.5	0.99	40.69	16	0.00	40.69	0.005	-0.039
744.9	24.114	34.04	0.15	1.98	0.5	0.99	35.22	21	0.00	35.22	0.005	0.008
744.7	24.278	36.17	0.15	1.96	0.5	0.98	37.33	19	0.00	37.33	0.005	-0.011
744.6	24.442	40.69	0.20	1.93	0.5	0.98	41.83	17	0.00	41.83	0.005	-0.048
744.4	24.606	54.80	0.29	1.86	0.5	0.98	55.94	12	0.00	55.94	0.005	-0.150
744.2	24.770	67.27	0.38	1.82	0.5	0.98	68.43	9	0.00	68.43	0.005	-0.226
744.1	24.934	69.79	0.81	1.98	0.5	0.98	70.95	21	0.00	70.95	0.005	-0.240
743.9	25.098	67.89	1.23	2.10	0.5	0.98	69.03	31	0.00	69.03	0.005	-0.229
743.7	25.262	62.28	1.67	2.21	0.5	0.97	63.37	40	0.00	63.37	0.005	-0.196
743.6	25.426	65.74	1.48	2.16	0.5	0.97	66.84	36	0.00	66.84	0.005	-0.216
743.4	25.590	71.55	1.03	2.03	0.5	0.97	72.68	26	0.00	72.68	0.005	-0.249
743.2	25.754	66.66	0.85	2.01	0.5	0.97	67.74	24	0.00	67.74	0.005	-0.221
743.1	25.918	53.30	0.69	2.04	0.5	0.96	54.28	26	0.00	54.28	0.005	-0.139
742.9	26.082	40.89	0.24	1.95	0.5	0.96	41.82	19	0.00	41.82	0.005	-0.047
742.8	26.246	32.48	0.17	2.01	0.5	0.95	33.40	24	0.00	33.40	0.005	0.027
742.6	26.410	27.19	0.26	2.13	0.5	0.95	28.12	34	0.00	28.12	0.005	0.081
742.4	26.574	27.28	0.18	2.09	0.5	0.95	28.19	30	0.00	28.19	0.006	0.080
742.3	26.739	29.42	0.19	2.06	0.5	0.94	30.30	28	0.00	30.30	0.006	0.058
742.1	26.903	32.10	0.25	2.06	0.5	0.94	32.95	28	0.00	32.95	0.006	0.032
741.9	27.067	32.75	0.45	2.14	0.5	0.94	33.57	34	0.00	33.57	0.006	0.026
741.8	27.231	38.27	0.60	2.13	0.5	0.94	39.06	34	0.00	39.06	0.006	-0.023
741.6	27.395	40.71	0.73	2.15	0.5	0.94	41.49	35	0.00	41.49	0.006	-0.043
741.4	27.559	44.66	0.81	2.14	0.5	0.94	45.42	34	0.00	45.42	0.006	-0.074
741.3	27.723	45.00	1.04	2.20	0.5	0.94	45.75	39	0.00	45.75	0.006	-0.077
741.1	27.887	46.28	1.26	2.24	0.5	0.93	47.01	42	0.00	47.01	0.006	-0.086
740.9	28.051	46.25	1.48	2.28	0.5	0.93	46.96	45	0.00	46.96	0.007	-0.085
740.8	28.215	45.66	1.58	2.30	0.5	0.93	46.35	47	0.00	46.35	0.007	-0.081
740.6	28.379	42.86	1.70	2.34	0.5	0.93	43.52	50	0.00	43.52	0.007	-0.059
740.5	28.543	40.37	1.74	2.37	0.5	0.92	41.01	52	0.00	41.01	0.007	-0.039
740.3	28.707	38.52	1.75	2.39	0.5	0.92	39.15	54	0.00	39.15	0.007	-0.023
740.1	28.871	37.90	1.67	2.38	0.5	0.92	38.50	53	0.00	38.50	0.007	-0.017
740.0	29.035	42.76	1.31	2.27	0.5	0.92	43.34	45	0.00	43.34	0.007	-0.057
739.8	29.199	51.69	1.06	2.15	0.5	0.92	52.30	35	0.00	52.30	0.007	-0.123
739.6	29.363	54.27	0.81	2.07	0.5	0.92	54.89	29	0.00	54.89	0.007	-0.140
739.5	29.527	49.54	1.08	2.17	0.5	0.92	50.10	37	0.00	50.10	0.007	-0.107
739.3	29.691	43.62	1.47	2.30	0.5	0.91	44.13	47	0.00	44.13	0.007	-0.063
739.1	29.855	42.24	1.71	2.35	0.5	0.91	42.73	51	0.00	42.73	0.008	-0.052
739.0	30.019	45.74	1.81	2.34	0.5	0.91	46.22	50	0.00	46.22	0.008	-0.079
738.8	30.183	53.35	1.87	2.29	0.5	0.91	53.87	47	0.00	53.87	0.008	-0.133
738.7	30.347	64.79	1.90	2.24	0.5	0.91	65.46	42	0.00	65.46	0.008	-0.205
738.5	30.511	66.85	2.27	2.28	0.5	0.91	67.54	45	0.00	67.54	0.008	-0.217
738.3	30.675	67.54	2.48	2.30	0.5	0.91	68.23	47	0.00	68.23	0.008	-0.221
738.2	30.840	62.32	2.72	2.35	0.5	0.91	62.91	51	0.00	62.91	0.008	-0.190
738.0	31.004	62.31	2.61	2.34	0.5	0.90	62.88	50	0.00	62.88	0.008	-0.189
737.8	31.168	67.54	2.43	2.30	0.5	0.91	68.20	47	0.00	68.20	0.008	-0.220
737.7	31.332	70.06	2.52	2.30	0.5	0.91	70.76	47	0.00	70.76	0.008	-0.234
737.5	31.496	61.91	2.99	2.39	0.5	0.90	62.43	54	0.00	62.43	0.008	-0.186

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
737.3	31.660	58.99	3.01	2.40	0.5	0.90	59.44	55	0.00	59.44	0.008	-0.168
737.2	31.824	58.21	3.00	2.41	0.5	0.89	58.64	55	0.00	58.64	0.008	-0.163
737.0	31.988	58.08	2.92	2.40	0.5	0.89	58.48	55	0.00	58.48	0.009	-0.162
736.8	32.152	59.31	2.84	2.38	0.5	0.89	59.72	54	0.00	59.72	0.009	-0.169
736.7	32.316	57.66	2.91	2.40	0.5	0.89	58.02	55	0.00	58.02	0.009	-0.158
736.5	32.480	59.17	2.80	2.38	0.5	0.89	59.54	53	0.00	59.54	0.009	-0.168
736.4	32.644	60.80	2.04	2.28	0.5	0.89	61.20	45	0.00	61.20	0.009	-0.178
736.2	32.808	56.55	2.23	2.33	0.5	0.88	56.85	49	0.00	56.85	0.009	-0.151
736.0	32.972	54.79	2.48	2.37	0.5	0.88	55.05	52	0.00	55.05	0.009	-0.139
735.9	33.136	57.25	2.69	2.38	0.5	0.88	57.53	53	0.00	57.53	0.009	-0.155
735.7	33.300	58.94	2.80	2.38	0.5	0.88	59.24	53	0.00	59.24	0.009	-0.165
735.5	33.464	63.05	2.80	2.36	0.5	0.88	63.42	52	0.00	63.42	0.009	-0.191
735.4	33.628	66.50	2.63	2.32	0.5	0.88	66.94	49	0.00	66.94	0.009	-0.211
735.2	33.792	57.43	2.85	2.39	0.5	0.87	57.66	55	0.00	57.66	0.009	-0.155
735.0	33.956	47.35	2.91	2.46	0.5	0.86	47.42	60	0.00	47.42	0.010	-0.085
734.9	34.120	28.12	3.65	2.69	1.0	0.85	31.59	79	0.00	31.59	0.010	0.050
734.7	34.284	18.88	4.17	2.86	1.0	0.84	21.45	92	0.00	21.45	0.010	0.100
734.6	34.448	12.28	4.54	3.03	1.0	0.83	14.50	100	0.00	14.50	0.010	0.100
734.4	34.612	8.43	4.31	3.15	1.0	0.83	10.45	100	0.00	10.45	0.010	0.100
734.2	34.776	6.79	2.68	3.11	1.0	0.83	8.73	100	0.00	8.73	0.010	0.100
734.1	34.941	6.03	1.68	3.05	1.0	0.83	7.94	100	0.00	7.94	0.010	0.100
733.9	35.105	5.37	1.29	3.05	1.0	0.82	7.25	100	0.00	7.25	0.010	0.100
733.7	35.269	5.27	1.50	3.08	1.0	0.82	7.15	100	0.00	7.15	0.010	0.100
733.6	35.433	5.88	1.71	3.07	1.0	0.82	7.81	100	0.00	7.81	0.010	0.100
733.4	35.597	6.60	1.83	3.04	1.0	0.82	8.58	100	0.00	8.58	0.010	0.100
733.2	35.761	7.71	3.15	3.10	1.0	0.82	9.76	100	0.00	9.76	0.010	0.100
733.1	35.925	9.54	2.47	2.97	1.0	0.81	11.70	100	0.00	11.70	0.010	0.100
732.9	36.089	9.34	4.81	3.14	1.0	0.81	11.50	100	0.00	11.50	0.010	0.100
732.7	36.253	9.58	4.53	3.12	1.0	0.81	11.77	100	0.00	11.77	0.010	0.100
732.6	36.417	8.65	4.31	3.14	1.0	0.81	10.78	100	0.00	10.78	0.010	0.100
732.4	36.581	8.17	3.26	3.09	1.0	0.81	10.29	100	0.00	10.29	0.010	0.100
732.3	36.745	6.40	3.40	3.19	1.0	0.81	8.42	100	0.00	8.42	0.010	0.100
732.1	36.909	5.41	3.28	3.24	1.0	0.80	7.38	100	0.00	7.38	0.011	0.100
731.9	37.073	4.22	4.11	3.38	1.0	0.80	6.11	100	0.00	6.11	0.011	0.100
731.8	37.237	3.80	4.18	3.43	1.0	0.80	5.67	100	0.00	5.67	0.011	0.100
731.6	37.401	3.61	3.83	3.43	1.0	0.80	5.48	100	0.00	5.48	0.011	0.100
731.4	37.565	4.44	2.69	3.27	1.0	0.80	6.37	100	0.00	6.37	0.011	0.100
731.3	37.729	4.65	2.18	3.21	1.0	0.79	6.60	100	0.00	6.60	0.011	0.100
731.1	37.893	4.16	2.10	3.24	1.0	0.79	6.08	100	0.00	6.08	0.011	0.100
730.9	38.057	5.09	1.83	3.14	1.0	0.79	7.08	100	0.00	7.08	0.011	0.100
730.8	38.221	6.27	1.88	3.06	1.0	0.79	8.35	100	0.00	8.35	0.011	0.100
730.6	38.385	13.35	1.46	2.72	1.0	0.79	15.91	81	0.00	15.91	0.011	0.100
730.5	38.549	11.95	1.57	2.78	1.0	0.79	14.43	85	0.00	14.43	0.011	0.100
730.3	38.713	10.99	1.56	2.81	1.0	0.78	13.41	88	0.00	13.41	0.011	0.100
730.1	38.877	10.76	1.45	2.80	1.0	0.78	13.18	87	0.00	13.18	0.011	0.100
730.0	39.042	11.34	1.50	2.79	1.0	0.78	13.81	86	0.00	13.81	0.011	0.100
729.8	39.206	12.93	2.05	2.81	1.0	0.78	15.52	88	0.00	15.52	0.011	0.100
729.6	39.370	13.30	2.96	2.89	1.0	0.78	15.93	94	0.00	15.93	0.011	0.100
729.5	39.534	16.06	2.25	2.76	1.0	0.84	20.41	84	58.59	78.99	0.012	-0.272
729.3	39.698	12.89	2.23	2.83	1.0	0.83	16.70	90	58.16	74.87	0.012	-0.251
729.1	39.862	11.43	1.85	2.83	1.0	0.83	15.01	90	57.64	72.65	0.012	-0.239
729.0	40.026	11.07	1.44	2.79	1.0	0.83	14.61	86	57.15	71.76	0.012	-0.234
728.8	40.190	12.09	1.45	2.76	1.0	0.83	15.83	84	57.23	73.06	0.012	-0.241
728.6	40.354	12.49	1.75	2.79	1.0	0.82	16.33	86	57.66	73.99	0.012	-0.246
728.5	40.518	13.21	1.40	2.72	1.0	0.82	17.21	80	57.23	74.44	0.012	-0.248
728.3	40.682	13.52	1.23	2.68	1.0	0.82	17.61	77	56.94	74.55	0.012	-0.249
728.2	40.846	13.44	1.27	2.69	1.0	0.82	17.53	78	57.01	74.54	0.012	-0.248
728.0	41.010	14.38	1.62	2.72	1.0	0.82	18.69	80	57.68	76.37	0.012	-0.258
727.8	41.174	15.99	1.42	2.65	1.0	0.82	20.65	75	57.47	78.12	0.012	-0.267
727.7	41.338	16.98	1.75	2.68	1.0	0.82	21.90	77	58.15	80.05	0.012	-0.276
727.5	41.502	18.16	2.06	2.69	1.0	0.82	23.37	78	58.76	82.14	0.012	-0.287
727.3	41.666	20.40	2.00	2.64	1.0	0.82	26.13	74	58.99	85.12	0.013	-0.301
727.2	41.830	43.81	1.19	2.24	0.5	0.83	45.77	42	54.35	100.12	0.013	-0.369
727.0	41.994	36.83	2.19	2.46	0.5	0.83	38.72	60	59.54	98.27	0.013	-0.361
726.8	42.158	43.23	2.36	2.43	0.5	0.83	45.42	57	60.66	106.08	0.013	-0.393
726.7	42.322	51.47	2.34	2.37	0.5	0.84	54.12	53	61.41	115.53	0.013	-0.430

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
726.5	42.486	55.91	1.19	2.16	0.5	0.83	58.42	35	52.58	111.00	0.013	-0.413
726.3	42.650	54.54	1.11	2.15	0.5	0.83	56.92	35	51.48	108.40	0.013	-0.402
726.2	42.814	51.73	1.54	2.25	0.5	0.83	54.22	43	56.93	111.15	0.013	-0.413
726.0	42.978	47.28	1.89	2.34	0.5	0.83	49.64	50	59.13	108.77	0.013	-0.403
725.9	43.143	49.51	2.13	2.36	0.5	0.83	52.05	51	60.41	112.46	0.013	-0.418
725.7	43.307	53.06	1.54	2.24	0.5	0.83	55.66	42	56.86	112.52	0.013	-0.418
725.5	43.471	54.72	0.60	2.00	0.5	0.81	56.36	23	36.51	92.87	0.014	-0.336
725.4	43.635	46.38	0.67	2.08	0.5	0.81	48.07	30	44.71	92.78	0.014	-0.335
725.2	43.799	34.28	0.78	2.23	0.5	0.80	35.84	41	51.43	87.28	0.014	-0.310
725.0	43.963	23.89	0.93	2.40	0.5	0.80	25.38	55	54.54	79.91	0.014	-0.274
724.9	44.127	14.17	0.96	2.61	1.0	0.79	19.00	72	56.47	75.47	0.014	-0.251
724.7	44.291	11.13	2.16	2.88	1.0	0.79	15.32	93	58.10	73.42	0.014	-0.240
724.5	44.455	12.33	2.95	2.92	1.0	0.79	16.83	96	58.85	75.68	0.014	-0.252
724.4	44.619	37.08	1.38	2.34	0.5	0.80	38.93	50	56.32	95.25	0.014	-0.345
724.2	44.783	54.05	0.62	2.01	0.5	0.80	55.78	24	38.24	94.02	0.014	-0.340
724.1	44.947	68.50	0.44	1.85	0.5	0.79	68.99	11	9.50	78.49	0.015	-0.266
723.9	45.111	70.80	0.51	1.87	0.5	0.79	71.79	12	13.57	85.37	0.015	-0.300
723.7	45.275	66.07	0.62	1.93	0.5	0.80	67.84	18	27.54	95.37	0.015	-0.346
723.6	45.439	61.31	0.69	1.99	0.5	0.80	63.36	22	36.18	99.54	0.015	-0.364
723.4	45.603	55.43	0.71	2.03	0.5	0.80	57.44	26	41.19	98.63	0.015	-0.359
723.2	45.767	47.22	0.84	2.13	0.5	0.80	49.18	33	48.53	97.72	0.015	-0.355
723.1	45.931	33.61	1.00	2.29	0.5	0.79	35.27	47	53.88	89.15	0.015	-0.317
722.9	46.095	26.76	1.01	2.38	0.5	0.78	28.30	54	54.75	83.05	0.015	-0.288
722.7	46.259	13.81	1.28	2.68	1.0	0.77	18.94	78	57.34	76.28	0.015	-0.254
722.6	46.423	13.40	1.03	2.65	1.0	0.77	18.43	75	56.78	75.22	0.015	-0.248
722.4	46.587	31.85	0.30	2.09	0.5	0.77	32.98	30	42.01	74.98	0.015	-0.247
722.2	46.751	22.20	0.72	2.38	0.5	0.77	23.65	53	53.46	77.11	0.015	-0.258
722.1	46.915	9.80	1.26	2.81	1.0	0.76	14.00	88	57.13	71.13	0.016	-0.226
721.9	47.079	5.96	1.97	3.09	1.0	0.76	9.25	100	56.80	66.05	0.016	-0.197
721.8	47.244	4.59	1.70	3.16	1.0	0.75	7.55	100	56.28	63.83	0.016	-0.184
721.6	47.408	4.83	3.47	3.30	1.0	0.75	7.86	100	56.37	64.24	0.016	-0.186
721.4	47.572	6.33	4.03	3.23	1.0	0.75	9.74	100	56.96	66.70	0.016	-0.200
721.3	47.736	10.55	2.74	2.95	1.0	0.76	15.09	99	58.57	73.65	0.016	-0.239
721.1	47.900	13.80	2.16	2.80	1.0	0.76	19.23	87	58.65	77.88	0.016	-0.261
720.9	48.064	20.45	1.12	2.50	0.5	0.76	21.97	63	55.67	77.64	0.016	-0.259
720.8	48.228	22.87	0.69	2.36	0.5	0.76	24.32	52	53.13	77.45	0.016	-0.258
720.6	48.392	19.12	0.75	2.45	0.5	0.76	20.59	59	54.18	74.77	0.016	-0.244
720.4	48.556	13.48	1.23	2.68	1.0	0.76	18.90	78	57.34	76.24	0.016	-0.252
720.3	48.720	23.04	0.68	2.35	0.5	0.76	24.48	51	52.98	77.47	0.017	-0.258
720.1	48.884	30.66	0.29	2.10	0.5	0.75	31.77	31	42.56	74.33	0.017	-0.242
720.0	49.048	28.29	1.02	2.36	0.5	0.76	29.88	52	54.68	84.55	0.017	-0.293
719.8	49.212	15.95	2.05	2.74	1.0	0.76	22.26	82	58.94	81.20	0.017	-0.277
719.6	49.376	14.75	2.19	2.78	1.0	0.75	20.73	85	58.91	79.64	0.017	-0.269
719.5	49.540	20.09	0.61	2.39	0.5	0.75	21.54	54	53.06	74.60	0.017	-0.243
719.3	49.704	22.23	0.41	2.28	0.5	0.74	23.58	45	50.33	73.91	0.017	-0.239
719.1	49.868	21.31	0.47	2.32	0.5	0.74	22.70	48	51.45	74.15	0.017	-0.240
719.0	50.032	23.16	0.68	2.35	0.5	0.75	24.61	51	52.99	77.60	0.017	-0.258
718.8	50.196	29.85	0.61	2.24	0.5	0.75	31.31	42	50.52	81.83	0.017	-0.279
718.6	50.360	35.91	0.70	2.19	0.5	0.75	37.51	38	49.81	87.32	0.017	-0.305
718.5	50.524	39.53	0.85	2.20	0.5	0.76	41.35	39	51.17	92.53	0.018	-0.329
718.3	50.688	41.38	0.78	2.16	0.5	0.76	43.21	36	49.53	92.73	0.018	-0.330
718.1	50.852	38.75	0.82	2.20	0.5	0.75	40.53	39	50.91	91.44	0.018	-0.324
718.0	51.016	33.76	0.97	2.29	0.5	0.75	35.48	46	53.61	89.09	0.018	-0.313
717.8	51.180	30.90	1.06	2.34	0.5	0.75	32.58	50	54.67	87.24	0.018	-0.305
717.7	51.345	31.13	0.82	2.28	0.5	0.75	32.72	45	52.68	85.41	0.018	-0.296
717.5	51.509	34.26	0.56	2.16	0.5	0.74	35.71	36	47.90	83.61	0.018	-0.287
717.3	51.673	36.38	0.61	2.16	0.5	0.74	37.91	36	48.01	85.92	0.018	-0.298
717.2	51.837	36.63	0.91	2.24	0.5	0.75	38.42	42	52.58	91.00	0.018	-0.321
717.0	52.001	33.82	1.16	2.33	0.5	0.75	35.63	49	55.14	90.78	0.018	-0.320
716.8	52.165	29.26	1.15	2.38	0.5	0.74	30.94	53	55.34	86.28	0.018	-0.299
716.7	52.329	19.48	1.73	2.62	1.0	0.74	27.66	73	59.19	86.85	0.018	-0.302
716.5	52.493	16.09	1.69	2.69	1.0	0.73	23.08	78	58.64	81.71	0.018	-0.277
716.3	52.657	25.38	1.18	2.44	0.5	0.73	26.98	58	55.73	82.71	0.019	-0.282
716.2	52.821	29.31	0.51	2.21	0.5	0.73	30.70	40	49.16	79.85	0.019	-0.268
716.0	52.985	30.51	0.36	2.13	0.5	0.72	31.70	34	44.96	76.67	0.019	-0.251
715.9	53.149	31.28	0.47	2.17	0.5	0.73	32.62	36	47.36	79.98	0.019	-0.268

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715.7	53.313	29.61	0.88	2.31	0.5	0.73	31.22	48	53.50	84.71	0.019	-0.291
715.5	53.477	29.48	0.97	2.34	0.5	0.73	31.12	50	54.21	85.33	0.019	-0.294
715.4	53.641	30.34	0.89	2.31	0.5	0.73	31.96	47	53.42	85.39	0.019	-0.294
715.2	53.805	29.88	0.81	2.29	0.5	0.73	31.46	46	52.80	84.26	0.019	-0.289
715.0	53.969	29.18	0.82	2.30	0.5	0.73	30.75	47	53.01	83.77	0.019	-0.286
714.9	54.133	27.53	0.92	2.35	0.5	0.72	29.12	51	54.12	83.24	0.019	-0.283
714.7	54.297	25.87	1.18	2.43	0.5	0.72	27.50	57	55.70	83.20	0.019	-0.283
714.5	54.461	15.62	1.88	2.72	1.0	0.72	22.83	81	58.96	81.80	0.019	-0.276
714.4	54.625	10.59	2.88	2.97	1.0	0.71	16.03	100	58.91	74.94	0.019	-0.241
714.2	54.789	12.03	1.29	2.74	1.0	0.71	17.95	82	57.63	75.59	0.019	-0.244
714.0	54.953	22.05	0.30	2.24	0.5	0.71	23.33	42	48.67	72.00	0.019	-0.225
713.9	55.117	19.45	0.43	2.34	0.5	0.71	20.85	50	51.69	72.54	0.019	-0.228
713.7	55.281	9.63	1.24	2.81	1.0	0.70	14.78	88	57.39	72.17	0.019	-0.226
713.6	55.446	8.02	1.66	2.94	1.0	0.70	12.65	98	57.73	70.38	0.020	-0.216
713.4	55.610	18.83	0.68	2.44	0.5	0.70	20.32	58	53.84	74.17	0.020	-0.236
713.2	55.774	31.22	0.21	2.05	0.5	0.70	32.01	27	38.15	70.16	0.020	-0.215
713.1	55.938	35.13	0.34	2.07	0.5	0.70	36.18	28	40.84	77.02	0.020	-0.251
712.9	56.102	31.95	0.77	2.26	0.5	0.71	33.57	43	51.94	85.51	0.020	-0.293
712.7	56.266	27.00	1.29	2.43	0.5	0.71	28.69	58	56.14	84.83	0.020	-0.290
712.6	56.430	17.09	1.32	2.61	1.0	0.71	25.24	72	58.26	83.50	0.020	-0.283
712.4	56.594	16.70	1.24	2.60	1.0	0.71	24.72	71	58.04	82.75	0.020	-0.279
712.2	56.758	25.00	1.26	2.46	0.5	0.71	26.64	60	56.07	82.71	0.020	-0.279
712.1	56.922	31.82	0.91	2.29	0.5	0.71	33.52	47	53.44	86.96	0.020	-0.299
711.9	57.086	37.93	0.76	2.19	0.5	0.71	39.71	38	50.21	89.92	0.020	-0.313
711.8	57.250	42.46	0.78	2.15	0.5	0.72	44.42	35	49.10	93.52	0.020	-0.329
711.6	57.414	45.17	0.86	2.15	0.5	0.72	47.37	35	49.70	97.07	0.020	-0.345
711.4	57.578	49.26	0.96	2.15	0.5	0.72	51.84	35	50.38	102.22	0.020	-0.367
711.3	57.742	58.30	0.85	2.06	0.5	0.73	61.24	28	44.55	105.79	0.020	-0.381
711.1	57.906	75.11	0.77	1.94	0.5	0.73	78.49	18	29.64	108.12	0.020	-0.391
710.9	58.070	90.80	0.78	1.88	0.5	0.73	94.90	13	17.14	112.05	0.020	-0.406
710.8	58.234	94.47	0.90	1.90	0.5	0.74	100.09	15	22.90	122.99	0.020	-0.447
710.6	58.398	87.61	1.01	1.96	0.5	0.74	93.71	20	35.16	128.87	0.020	-0.469
710.4	58.562	77.73	1.00	2.00	0.5	0.74	82.86	23	40.50	123.36	0.020	-0.449
710.3	58.726	68.56	1.04	2.05	0.5	0.73	72.97	27	46.12	119.09	0.020	-0.433
710.1	58.890	66.71	0.89	2.02	0.5	0.73	70.41	25	41.73	112.15	0.020	-0.406
709.9	59.054	74.17	0.68	1.91	0.5	0.71	76.80	16	24.41	101.21	0.020	-0.362
709.8	59.218	86.00	0.56	1.82	0.5	0.70	87.21	8	3.37	90.59	0.020	-0.315
709.6	59.382	94.94	0.52	1.76	0.5	0.71	97.03	4	0.02	97.05	0.020	-0.343
709.5	59.547	94.62	0.58	1.79	0.5	0.71	96.80	6	0.77	97.57	0.020	-0.346
709.3	59.711	88.36	0.65	1.84	0.5	0.71	90.79	10	8.46	99.25	0.020	-0.353
709.1	59.875	83.73	0.64	1.86	0.5	0.70	85.89	11	11.34	97.22	0.020	-0.344
709.0	60.039	85.06	0.60	1.84	0.5	0.70	86.73	10	6.95	93.67	0.020	-0.328
708.8	60.203	83.44	0.64	1.86	0.5	0.70	85.59	12	11.51	97.11	0.020	-0.343
708.6	60.367	74.89	0.70	1.92	0.5	0.71	77.82	17	25.52	103.34	0.020	-0.370
708.5	60.531	66.44	0.78	1.99	0.5	0.71	69.67	22	36.96	106.63	0.020	-0.383
708.3	60.695	60.64	0.79	2.03	0.5	0.71	63.65	25	41.33	104.98	0.020	-0.376
708.1	60.859	57.18	0.79	2.05	0.5	0.70	59.99	27	43.09	103.08	0.020	-0.368
708.0	61.023	55.58	0.81	2.06	0.5	0.70	58.35	28	44.42	102.77	0.020	-0.367
707.8	61.187	48.58	1.04	2.17	0.5	0.70	51.36	37	51.98	103.34	0.020	-0.369
707.6	61.351	42.95	1.30	2.27	0.5	0.70	45.54	45	55.57	101.10	0.020	-0.360
707.5	61.515	47.81	1.18	2.21	0.5	0.70	50.69	40	53.91	104.61	0.020	-0.374
707.3	61.679	48.15	1.30	2.23	0.5	0.70	51.18	41	55.15	106.34	0.020	-0.381
707.2	61.843	50.35	1.36	2.23	0.5	0.71	53.64	41	55.57	109.21	0.020	-0.393
707.0	62.007	55.23	2.08	2.31	0.5	0.72	59.59	48	60.89	120.48	0.020	-0.436
706.8	62.171	71.13	1.02	2.03	0.5	0.72	76.00	25	44.18	120.18	0.021	-0.435
706.7	62.335	99.25	1.48	2.03	0.5	0.75	110.56	25	49.51	160.07	0.021	-0.568
706.5	62.499	113.22	0.83	1.82	0.5	0.72	120.25	8	4.33	124.59	0.021	-0.451
706.3	62.663	185.54	0.75	1.62	0.5	0.80	216.90	0	0.00	216.90	0.021	-0.600
706.2	62.827	216.94	0.92	1.64	0.5	0.82	261.70	0	0.00	261.70	0.021	-0.600
706.0	62.991	183.29	1.21	1.78	0.5	0.79	213.98	5	0.24	214.22	0.021	-0.600
705.8	63.155	142.42	1.05	1.81	0.5	0.75	157.97	8	3.33	161.30	0.021	-0.571
705.7	63.319	122.83	0.62	1.71	0.5	0.72	131.63	0	0.00	131.63	0.021	-0.475
705.5	63.483	112.11	0.85	1.83	0.5	0.71	119.33	9	5.95	125.28	0.021	-0.452
705.4	63.648	73.86	1.66	2.15	0.5	0.73	80.96	35	57.47	138.43	0.021	-0.498
705.2	63.812	58.77	2.38	2.33	0.5	0.71	63.95	50	62.78	126.73	0.021	-0.457
705.0	63.976	61.47	2.64	2.35	0.5	0.72	67.22	51	64.23	131.45	0.021	-0.474

Elev. (ft)	Depth z (ft)	Normalized Cone Resistance Q	Normalized Friction Ratio F (%)	Soil Behavior Type Index I_C	Soil Type Exponent n	Normalizing Factor for CPT Resistance C_N	Normalized Average Cone Tip Resistance qc_{1N}	Fines Content FC (%)	Clean Sand Correction $\Delta qc1N$	Clean Sand Normalized Average Cone Tip Resistance $(qc_{1N})_{CS}$	Static Shear Stress Ratio α	Relative State Parameter Index ξ_R
704.9	64.140	64.64	2.81	2.35	0.5	0.72	71.04	51	65.38	136.43	0.021	-0.491
704.7	64.304	67.92	3.16	2.37	0.5	0.73	75.12	53	67.22	142.35	0.021	-0.511
704.5	64.468	87.09	2.75	2.26	0.5	0.75	98.54	44	68.30	166.85	0.021	-0.586
704.4	64.632	105.87	2.24	2.13	0.5	0.77	121.96	34	64.94	186.90	0.021	-0.600
704.2	64.796	120.08	2.11	2.08	0.5	0.78	140.34	29	62.45	202.79	0.021	-0.600
704.0	64.960	138.70	2.06	2.03	0.5	0.79	165.29	25	59.61	224.90	0.021	-0.600
703.9	65.124	143.36	2.18	2.04	0.5	0.80	172.46	26	62.58	235.04	0.021	-0.600
703.7	65.288	154.69	2.13	2.01	0.5	0.81	188.14	24	59.78	247.93	0.021	-0.600
703.5	65.452	159.42	1.65	1.92	0.5	0.79	190.04	16	35.98	226.01	0.021	-0.600
703.4	65.616	0.18	820.67	5.90	1.0	0.62	2.56	100	54.73	57.29	0.021	-0.132
703.2	65.780	55.72	2.89	2.41	0.5	0.70	60.76	56	64.32	125.08	0.021	-0.450
703.1	65.944	86.84	1.80	2.13	0.5	0.73	97.27	33	58.81	156.09	0.021	-0.553
702.9	66.108	88.75	2.12	2.17	0.5	0.74	100.30	37	63.10	163.40	0.021	-0.575
702.7	66.272	107.87	1.37	1.98	0.5	0.74	121.44	21	42.63	164.08	0.021	-0.577
702.6	66.436	155.37	1.58	1.91	0.5	0.78	184.38	16	33.51	217.89	0.021	-0.600
702.4	66.600	183.59	1.45	1.83	0.5	0.79	219.95	10	9.71	229.67	0.021	-0.600
702.2	66.764	200.55	1.51	1.82	0.5	0.81	245.34	9	7.39	252.73	0.021	-0.600
702.1	66.928	246.42	1.40	1.74	0.5	0.81	301.32	2	0.00	301.32	0.021	-0.600
701.9	67.092	288.19	1.32	1.68	0.5	0.81	352.07	0	0.00	352.07	0.021	-0.600
701.7	67.256	290.76	0.15	1.08	0.5	0.81	355.39	0	0.00	355.39	0.021	-0.600
701.6	67.420	275.38	0.15	1.10	0.5	0.81	336.95	0	0.00	336.95	0.021	-0.600

LIQUEFACTION POTENTIAL ASSESSMENT FOR COARSE GRAINED SOILS USING CONE PENETRATION TEST DATA

Project Site: **KIF TDEC Stability**
Stantec Project No.: **175668043**
CPT ID: **KIF-BF-CPT-5B**

Depth to Water during Earthquake:	15.0	ft
Final Grade Elevation during EQ:	766.0	ft
Height of Final Grade above CPT TOH:	-3.0	ft
Normalize K_σ to:	1.058	tsf
a_{max} at top of ground surface:	0.19	g
Earthquake Magnitude:	6.00	M_W
Earthquake File or Source Zone:	10	Hz

Shear Stress Fit Parameters

m4:	0
m3:	0
m2:	0
m1:	0

Elev. (ft)	Depth *z* (ft)	Cyclic Resistance Ratio *CRR 7.5*	Relative Density *D r* (%)	Correction for Overburden Pressure *K σ*	Correction for Sloping Ground *K α*	Magnitude Scaling Factor *MSF*	Cyclic Resistance Ratio *CRR*	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress *τ Max* (psf)	From Ground Response: Average Cyclic Shear Stress *τ Avg* (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. *(qc 1N) CS ≥ 175*	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
769.0																	
768.8	0.164	0.095	31	#NUM!	N/A	1.07	N/A	1.000	0	0	**0.124**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**B**
768.7	0.328	0.095	31	#NUM!	N/A	1.07	N/A	1.000	0	0	**0.124**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**B**
768.5	0.492	0.095	31	#NUM!	N/A	1.07	N/A	1.000	0	0	**0.124**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**B**
768.3	0.656	0.095	31	#NUM!	N/A	1.07	N/A	1.000	0	0	**0.124**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**B**
768.2	0.820	0.095	31	#NUM!	N/A	1.07	N/A	1.000	0	0	**0.124**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**B**
768.0	0.984	0.095	31	#NUM!	N/A	1.07	N/A	1.000	0	0	**0.124**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**B**
767.9	1.148	0.095	31	#NUM!	N/A	1.07	N/A	1.000	0	0	**0.124**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**B**
767.7	1.312	0.095	31	#NUM!	N/A	1.07	N/A	1.000	0	0	**0.124**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**B**
767.5	1.476	0.095	31	#NUM!	N/A	1.07	N/A	1.000	0	0	**0.124**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**B**
767.4	1.640	0.095	31	#NUM!	N/A	1.07	N/A	1.000	0	0	**0.124**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**B**
767.2	1.804	0.095	31	#NUM!	N/A	1.07	N/A	1.000	0	0	**0.124**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
767.0	1.968	0.095	31	#NUM!	N/A	1.07	N/A	1.000	0	0	**0.124**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
766.9	2.133	0.095	31	#NUM!	N/A	1.07	N/A	1.000	0	0	**0.124**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
766.7	2.297	0.095	31	#NUM!	N/A	1.07	N/A	1.000	0	0	**0.124**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
766.5	2.461	0.095	31	#NUM!	N/A	1.07	N/A	1.000	0	0	**0.124**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
766.4	2.625	0.095	31	#NUM!	N/A	1.07	N/A	1.000	0	0	**0.124**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
766.2	2.789	0.095	31	#NUM!	N/A	1.07	N/A	1.000	0	0	**0.124**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
766.0	2.953	0.095	31	#NUM!	N/A	1.07	N/A	1.000	0	0	**0.124**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
765.9	3.117	0.095	31	1.100	N/A	1.07	N/A	1.000	0	0	**0.124**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
765.7	3.281	0.095	31	1.100	N/A	1.07	N/A	1.000	0	0	**0.124**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
765.6	3.445	0.095	31	1.100	N/A	1.07	N/A	1.000	0	0	**0.124**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
765.4	3.609	0.095	31	1.100	N/A	1.07	N/A	1.000	0	0	**0.124**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
765.2	3.773	0.095	31	1.100	N/A	1.07	N/A	1.000	0	0	**0.124**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
765.1	3.937	0.095	31	1.100	N/A	1.07	N/A	1.000	0	0	**0.124**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
764.9	4.101	0.095	31	1.100	N/A	1.07	N/A	1.000	0	0	**0.124**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
764.7	4.265	0.095	31	1.100	N/A	1.07	N/A	1.000	0	0	**0.124**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
764.6	4.429	0.095	31	1.100	N/A	1.07	N/A	1.000	0	0	**0.124**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
764.4	4.593	0.095	31	1.100	N/A	1.07	N/A	1.000	0	0	**0.124**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
764.2	4.757	0.095	31	1.100	N/A	1.07	N/A	1.000	0	0	**0.124**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
764.1	4.921	0.095	31	1.100	N/A	1.07	N/A	1.000	0	0	**0.124**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
763.9	5.085	0.095	31	1.100	N/A	1.07	N/A	0.999	0	0	**0.124**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
763.8	5.249	0.095	31	1.100	N/A	1.07	N/A	0.999	0	0	**0.124**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
763.6	5.413	0.095	31	1.100	N/A	1.07	N/A	0.998	0	0	**0.124**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
763.4	5.577	0.095	31	1.100	N/A	1.07	N/A	0.997	0	0	**0.124**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
763.3	5.741	0.095	31	1.100	N/A	1.07	N/A	0.996	0	0	**0.124**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
763.1	5.905	0.095	31	1.100	N/A	1.07	N/A	0.996	0	0	**0.124**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
762.9	6.069	0.095	31	1.100	N/A	1.07	N/A	0.995	0	0	**0.124**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
762.8	6.234	0.095	31	1.100	N/A	1.07	N/A	0.994	0	0	**0.123**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
762.6	6.398	0.095	31	1.100	N/A	1.07	N/A	0.993	0	0	**0.123**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
762.4	6.562	0.095	31	1.100	N/A	1.07	N/A	0.993	0	0	**0.123**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
762.3	6.726	0.095	31	1.100	N/A	1.07	N/A	0.992	0	0	**0.123**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
762.1	6.890	0.095	31	1.100	N/A	1.07	N/A	0.991	0	0	**0.123**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
761.9	7.054	0.095	31	1.100	N/A	1.07	N/A	0.990	0	0	**0.123**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
761.8	7.218	0.095	31	1.100	N/A	1.07	N/A	0.990	0	0	**0.123**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**

Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
761.6	7.382	0.095	31	1.100	N/A	1.07	N/A	0.989	0	0	**0.123**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
761.5	7.546	0.095	31	1.100	N/A	1.07	N/A	0.988	0	0	**0.123**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
761.3	7.710	0.095	31	1.099	N/A	1.07	N/A	0.987	0	0	**0.123**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
761.1	7.874	0.095	31	1.097	N/A	1.07	N/A	0.986	0	0	**0.122**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
761.0	8.038	0.095	31	1.094	N/A	1.07	N/A	0.985	0	0	**0.122**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
760.8	8.202	0.095	31	1.092	N/A	1.07	N/A	0.985	0	0	**0.122**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
760.6	8.366	0.095	31	1.089	N/A	1.07	N/A	0.984	0	0	**0.122**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
760.5	8.530	0.095	31	1.087	N/A	1.07	N/A	0.983	0	0	**0.122**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
760.3	8.694	0.095	31	1.085	N/A	1.07	N/A	0.982	0	0	**0.122**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
760.1	8.858	0.095	31	1.083	N/A	1.07	N/A	0.981	0	0	**0.122**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
760.0	9.022	0.095	31	1.081	N/A	1.07	N/A	0.980	0	0	**0.122**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
759.8	9.186	0.095	31	1.079	N/A	1.07	N/A	0.980	0	0	**0.122**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
759.6	9.350	0.095	31	1.077	N/A	1.07	N/A	0.979	0	0	**0.122**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
759.5	9.514	0.095	31	1.075	N/A	1.07	N/A	0.978	0	0	**0.121**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
759.3	9.678	0.095	31	1.073	N/A	1.07	N/A	0.977	0	0	**0.121**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
759.2	9.842	0.095	31	1.071	N/A	1.07	N/A	0.976	0	0	**0.121**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
759.0	10.006	0.095	31	1.069	N/A	1.07	N/A	0.975	0	0	**0.121**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
758.8	10.170	0.095	31	1.068	N/A	1.07	N/A	0.974	0	0	**0.121**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
758.7	10.335	0.095	31	1.066	N/A	1.07	N/A	0.974	0	0	**0.121**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
758.5	10.499	0.095	31	1.064	N/A	1.07	N/A	0.973	0	0	**0.121**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
758.3	10.663	0.095	31	1.063	N/A	1.07	N/A	0.972	0	0	**0.121**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
758.2	10.827	0.095	31	1.061	N/A	1.07	N/A	0.971	0	0	**0.121**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
758.0	10.991	0.095	31	1.060	N/A	1.07	N/A	0.970	0	0	**0.120**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
757.8	11.155	0.095	31	1.058	N/A	1.07	N/A	0.969	0	0	**0.120**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
757.7	11.319	0.095	31	1.057	N/A	1.07	N/A	0.968	0	0	**0.120**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
757.5	11.483	0.095	31	1.055	N/A	1.07	N/A	0.967	0	0	**0.120**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
757.4	11.647	0.095	31	1.054	N/A	1.07	N/A	0.966	0	0	**0.120**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
757.2	11.811	0.095	31	1.052	N/A	1.07	N/A	0.965	0	0	**0.120**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
757.0	11.975	0.095	31	1.051	N/A	1.07	N/A	0.964	0	0	**0.120**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
756.9	12.139	0.095	31	1.050	N/A	1.07	N/A	0.963	0	0	**0.120**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
756.7	12.303	0.095	31	1.048	N/A	1.07	N/A	0.963	0	0	**0.119**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**C**
756.5	12.467	0.113	44	1.057	N/A	1.10	N/A	0.962	0	0	**0.119**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**A2**
756.4	12.631	0.137	55	1.066	N/A	1.16	N/A	0.961	0	0	**0.119**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**A1**
756.2	12.795	0.267	72	1.094	N/A	1.38	N/A	0.960	0	0	**0.119**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**A1**
756.0	12.959	0.550	80	1.100	N/A	1.59	N/A	0.959	0	0	**0.119**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**A1**
755.9	13.123	0.337	75	1.097	N/A	1.45	N/A	0.958	0	0	**0.119**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**A1**
755.7	13.287	0.308	74	1.091	N/A	1.42	N/A	0.957	0	0	**0.119**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**A1**
755.5	13.451	0.546	80	1.100	N/A	1.58	N/A	0.956	0	0	**0.119**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**A1**
755.4	13.615	N/A	87	N/A	N/A	N/A	N/A	0.955	0	0	**0.119**	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**	**A1**
755.2	13.779	N/A	93	N/A	N/A	N/A	N/A	0.954	0	0	**0.118**	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**	**A1**
755.1	13.943	N/A	89	N/A	N/A	N/A	N/A	0.953	0	0	**0.118**	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**	**A1**
754.9	14.107	N/A	82	N/A	N/A	N/A	N/A	0.952	0	0	**0.118**	FALSE	TRUE	TRUE	**N/A**	**Bottom Ash**	**A1**
754.7	14.271	0.439	78	1.085	N/A	1.52	N/A	0.951	0	0	**0.118**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**A1**
754.6	14.436	0.418	77	1.081	N/A	1.51	N/A	0.950	0	0	**0.118**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**A1**
754.4	14.600	0.416	77	1.079	N/A	1.51	N/A	0.949	0	0	**0.118**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**A1**
754.2	14.764	0.448	78	1.078	N/A	1.53	N/A	0.948	0	0	**0.118**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**A1**
754.1	14.928	0.410	77	1.073	N/A	1.51	N/A	0.947	0	0	**0.118**	FALSE	FALSE	TRUE	**N/A**	**Bottom Ash**	**A1**
753.9	15.092	0.390	77	1.070	1.210	1.49	0.754	0.946	0	0	**0.118**	FALSE	FALSE	FALSE	**6.4**	**Bottom Ash**	**A1**
753.7	15.256	0.305	74	1.064	1.097	1.42	0.505	0.945	0	0	**0.119**	FALSE	FALSE	FALSE	**4.3**	**Bottom Ash**	**A1**
753.6	15.420	0.245	71	1.057	1.053	1.35	0.369	0.944	0	0	**0.119**	FALSE	FALSE	FALSE	**3.1**	**Bottom Ash**	**A1**
753.4	15.584	0.212	68	1.053	1.027	1.31	0.299	0.943	0	0	**0.120**	FALSE	FALSE	FALSE	**2.5**	**Bottom Ash**	**A1**
753.3	15.748	0.203	67	1.051	1.014	1.29	0.280	0.942	0	0	**0.121**	FALSE	FALSE	FALSE	**2.3**	**Bottom Ash**	**A1**
753.1	15.912	0.183	65	1.047	1.003	1.26	0.241	0.941	0	0	**0.121**	FALSE	FALSE	FALSE	**2.0**	**Bottom Ash**	**A1**
752.9	16.076	0.160	61	1.043	0.998	1.21	0.201	0.940	0	0	**0.122**	FALSE	FALSE	FALSE	**1.6**	**Bottom Ash**	**A1**
752.8	16.240	0.141	56	1.038	0.998	1.17	0.170	0.939	0	0	**0.123**	FALSE	FALSE	FALSE	**1.4**	**Bottom Ash**	**A1**

Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
752.6	16.404	0.130	52	1.035	0.997	1.14	0.153	0.938	0	0	**0.123**	FALSE	FALSE	FALSE	**1.2**	**Bottom Ash**	**A1**
752.4	16.568	0.143	57	1.037	0.998	1.17	0.173	0.937	0	0	**0.124**	FALSE	FALSE	FALSE	**1.4**	**Bottom Ash**	**A1**
752.3	16.732	0.143	57	1.037	0.998	1.17	0.174	0.936	0	0	**0.124**	FALSE	FALSE	FALSE	**1.4**	**Bottom Ash**	**A1**
752.1	16.896	0.152	59	1.038	0.998	1.19	0.187	0.935	0	0	**0.125**	FALSE	FALSE	FALSE	**1.5**	**Bottom Ash**	**A1**
751.9	17.060	0.149	58	1.036	0.998	1.19	0.183	0.934	0	0	**0.126**	FALSE	FALSE	FALSE	**1.5**	**Bottom Ash**	**A1**
751.8	17.224	0.153	59	1.036	0.998	1.19	0.189	0.933	0	0	**0.126**	FALSE	FALSE	FALSE	**1.5**	**Bottom Ash**	**A1**
751.6	17.388	0.144	57	1.034	0.998	1.17	0.174	0.932	0	0	**0.127**	FALSE	FALSE	FALSE	**1.4**	**Bottom Ash**	**A1**
751.4	17.552	0.134	54	1.032	0.997	1.15	0.159	0.930	0	0	**0.127**	FALSE	FALSE	FALSE	**1.2**	**Bottom Ash**	**A1**
751.3	17.716	0.126	51	1.029	0.997	1.13	0.147	0.929	0	0	**0.128**	FALSE	FALSE	FALSE	**1.1**	**Bottom Ash**	**A1**
751.1	17.880	0.124	50	1.028	0.997	1.13	0.143	0.928	0	0	**0.128**	FALSE	FALSE	FALSE	**1.1**	**Bottom Ash**	**A1**
751.0	18.044	0.127	51	1.028	0.997	1.13	0.147	0.927	0	0	**0.129**	FALSE	FALSE	FALSE	**1.1**	**Bottom Ash**	**A1**
750.8	18.208	0.135	54	1.029	0.997	1.15	0.159	0.926	0	0	**0.129**	FALSE	FALSE	FALSE	**1.2**	**Bottom Ash**	**A1**
750.6	18.372	0.136	55	1.029	0.997	1.15	0.161	0.925	0	0	**0.130**	FALSE	FALSE	FALSE	**1.2**	**Bottom Ash**	**A1**
750.5	18.537	0.136	55	1.028	0.997	1.16	0.162	0.924	0	0	**0.130**	FALSE	FALSE	FALSE	**1.2**	**Bottom Ash**	**A1**
750.3	18.701	0.131	53	1.027	0.997	1.14	0.153	0.923	0	0	**0.131**	FALSE	FALSE	FALSE	**1.2**	**Bottom Ash**	**A1**
750.1	18.865	0.124	50	1.025	0.996	1.13	0.142	0.922	0	0	**0.131**	FALSE	FALSE	FALSE	**1.1**	**Bottom Ash**	**A1**
750.0	19.029	0.121	49	1.024	0.996	1.12	0.139	0.921	0	0	**0.132**	FALSE	FALSE	FALSE	**1.1**	**Bottom Ash**	**B**
749.8	19.193	0.152	59	1.028	0.998	1.19	0.187	0.920	0	0	**0.132**	FALSE	FALSE	FALSE	**1.4**	**Bottom Ash**	**A1**
749.6	19.357	0.426	78	1.044	1.007	1.52	0.678	0.919	0	0	**0.133**	FALSE	FALSE	FALSE	**5.1**	**Bottom Ash**	**A1**
749.5	19.521	N/A	96	N/A	N/A	N/A	N/A	0.918	0	0	**0.133**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
749.3	19.685	N/A	100	N/A	N/A	N/A	N/A	0.916	0	0	**0.134**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
749.2	19.849	N/A	100	N/A	N/A	N/A	N/A	0.915	0	0	**0.134**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
749.0	20.013	N/A	100	N/A	N/A	N/A	N/A	0.914	0	0	**0.134**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
748.8	20.177	N/A	100	N/A	N/A	N/A	N/A	0.913	0	0	**0.135**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
748.7	20.341	N/A	100	N/A	N/A	N/A	N/A	0.912	0	0	**0.135**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
748.5	20.505	N/A	100	N/A	N/A	N/A	N/A	0.911	0	0	**0.136**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
748.3	20.669	N/A	100	N/A	N/A	N/A	N/A	0.910	0	0	**0.136**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
748.2	20.833	N/A	100	N/A	N/A	N/A	N/A	0.909	0	0	**0.136**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
748.0	20.997	N/A	100	N/A	N/A	N/A	N/A	0.908	0	0	**0.137**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
747.8	21.161	N/A	100	N/A	N/A	N/A	N/A	0.906	0	0	**0.137**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
747.7	21.325	N/A	99	N/A	N/A	N/A	N/A	0.905	0	0	**0.137**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
747.5	21.489	N/A	92	N/A	N/A	N/A	N/A	0.904	0	0	**0.138**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
747.3	21.653	N/A	83	N/A	N/A	N/A	N/A	0.903	0	0	**0.138**	FALSE	TRUE	FALSE	**N/A**	**Bottom Ash**	**A1**
747.2	21.817	0.436	78	1.029	1.011	1.52	0.692	0.902	0	0	**0.138**	FALSE	FALSE	FALSE	**5.0**	**Bottom Ash**	**A1**
747.0	21.981	0.297	74	1.025	1.008	1.41	0.434	0.901	0	0	**0.139**	FALSE	FALSE	FALSE	**3.1**	**Bottom Ash**	**A1**
746.9	22.145	0.311	74	1.025	1.009	1.43	0.458	0.900	0	0	**0.139**	FALSE	FALSE	FALSE	**3.3**	**Fly Ash**	**A1**
746.7	22.309	0.310	74	1.024	1.009	1.42	0.456	0.899	0	0	**0.139**	FALSE	FALSE	FALSE	**3.3**	**Fly Ash**	**A1**
746.5	22.473	0.196	66	1.019	1.001	1.28	0.256	0.897	0	0	**0.140**	FALSE	FALSE	FALSE	**1.8**	**Fly Ash**	**A1**
746.4	22.638	0.166	62	1.017	0.999	1.22	0.207	0.896	0	0	**0.140**	FALSE	FALSE	FALSE	**1.5**	**Fly Ash**	**A1**
746.2	22.802	0.155	60	1.015	0.997	1.20	0.188	0.895	0	0	**0.140**	FALSE	FALSE	FALSE	**1.3**	**Fly Ash**	**A1**
746.0	22.966	0.136	55	1.013	0.995	1.15	0.158	0.894	0	0	**0.141**	FALSE	FALSE	FALSE	**1.1**	**Fly Ash**	**A1**
745.9	23.130	0.120	48	1.012	0.993	1.12	0.134	0.893	0	0	**0.141**	FALSE	FALSE	FALSE	**1.0**	**Fly Ash**	**A1**
745.7	23.294	0.116	46	1.011	0.993	1.11	0.129	0.892	0	0	**0.141**	FALSE	FALSE	FALSE	**0.9**	**Fly Ash**	**A1**
745.5	23.458	0.114	45	1.010	0.993	1.10	0.126	0.890	0	0	**0.141**	FALSE	FALSE	FALSE	**0.9**	**Fly Ash**	**A2**
745.4	23.622	0.102	37	1.009	0.992	1.08	0.110	0.889	0	0	**0.142**	FALSE	FALSE	FALSE	**0.8**	**Fly Ash**	**A2**
745.2	23.786	0.091	27	1.007	0.991	1.07	0.097	0.888	0	0	**0.142**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**A2**
745.1	23.950	0.086	21	1.007	0.991	1.06	0.091	0.887	0	0	**0.142**	FALSE	FALSE	FALSE	**0.6**	**Fly Ash**	**A2**
744.9	24.114	0.082	16	1.006	0.991	1.06	0.087	0.886	0	0	**0.143**	FALSE	FALSE	FALSE	**0.6**	**Fly Ash**	**A2**
744.7	24.278	0.084	18	1.006	0.991	1.06	0.088	0.885	0	0	**0.143**	FALSE	FALSE	FALSE	**0.6**	**Fly Ash**	**A2**
744.6	24.442	0.087	22	1.006	0.991	1.06	0.092	0.883	0	0	**0.143**	FALSE	FALSE	FALSE	**0.6**	**Fly Ash**	**A2**
744.4	24.606	0.097	32	1.006	0.991	1.07	0.103	0.882	0	0	**0.143**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**A2**
744.2	24.770	0.106	40	1.007	0.992	1.09	0.115	0.881	0	0	**0.144**	FALSE	FALSE	FALSE	**0.8**	**Fly Ash**	**A1**
744.1	24.934	0.108	41	1.006	0.992	1.09	0.118	0.880	0	0	**0.144**	FALSE	FALSE	FALSE	**0.8**	**Fly Ash**	**A1**
743.9	25.098	0.106	40	1.006	0.992	1.09	0.116	0.879	0	0	**0.144**	FALSE	FALSE	FALSE	**0.8**	**Fly Ash**	**A1**
743.7	25.262	0.102	37	1.005	0.992	1.08	0.110	0.878	0	0	**0.144**	FALSE	FALSE	FALSE	**0.8**	**Fly Ash**	**A1**

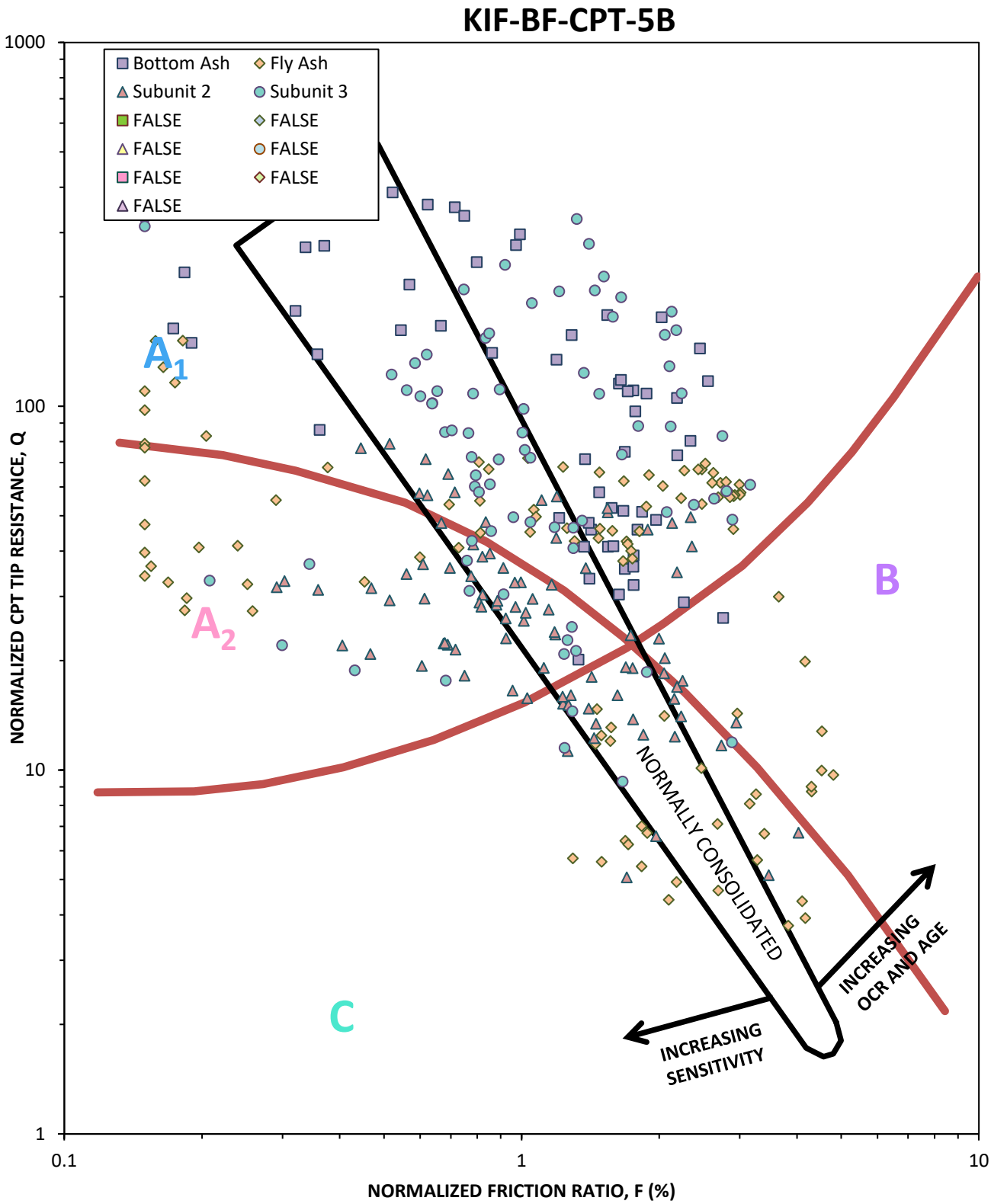
Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
743.6	25.426	0.105	39	1.005	0.992	1.09	0.113	0.876	0	0	**0.144**	FALSE	FALSE	FALSE	**0.8**	**Fly Ash**	**A1**
743.4	25.590	0.109	42	1.005	0.992	1.09	0.119	0.875	0	0	**0.145**	FALSE	FALSE	FALSE	**0.8**	**Fly Ash**	**A1**
743.2	25.754	0.105	39	1.005	0.992	1.09	0.114	0.874	0	0	**0.145**	FALSE	FALSE	FALSE	**0.8**	**Fly Ash**	**A1**
743.1	25.918	0.095	31	1.004	0.991	1.07	0.102	0.873	0	0	**0.145**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**A1**
742.9	26.082	0.087	22	1.003	0.990	1.06	0.091	0.872	0	0	**0.145**	FALSE	FALSE	FALSE	**0.6**	**Fly Ash**	**A2**
742.8	26.246	0.081	14	1.003	0.990	1.06	0.085	0.871	0	0	**0.145**	FALSE	FALSE	FALSE	**0.6**	**Fly Ash**	**A2**
742.6	26.410	0.078	9	1.002	0.989	1.06	0.081	0.869	0	0	**0.146**	FALSE	FALSE	FALSE	**0.6**	**Fly Ash**	**A2**
742.4	26.574	0.078	9	1.002	0.989	1.06	0.081	0.868	0	0	**0.146**	FALSE	FALSE	FALSE	**0.6**	**Fly Ash**	**A2**
742.3	26.739	0.079	11	1.002	0.989	1.06	0.083	0.867	0	0	**0.146**	FALSE	FALSE	FALSE	**0.6**	**Fly Ash**	**A2**
742.1	26.903	0.081	14	1.002	0.989	1.06	0.085	0.866	0	0	**0.146**	FALSE	FALSE	FALSE	**0.6**	**Fly Ash**	**A2**
741.9	27.067	0.081	15	1.001	0.989	1.06	0.085	0.865	0	0	**0.146**	FALSE	FALSE	FALSE	**0.6**	**Fly Ash**	**A2**
741.8	27.231	0.085	20	1.001	0.989	1.06	0.089	0.863	0	0	**0.147**	FALSE	FALSE	FALSE	**0.6**	**Fly Ash**	**A2**
741.6	27.395	0.086	22	1.001	0.988	1.06	0.091	0.862	0	0	**0.147**	FALSE	FALSE	FALSE	**0.6**	**Fly Ash**	**A2**
741.4	27.559	0.089	25	1.001	0.988	1.06	0.094	0.861	0	0	**0.147**	FALSE	FALSE	FALSE	**0.6**	**Fly Ash**	**A1**
741.3	27.723	0.089	25	1.001	0.988	1.06	0.094	0.860	0	0	**0.147**	FALSE	FALSE	FALSE	**0.6**	**Fly Ash**	**A1**
741.1	27.887	0.090	26	1.000	0.988	1.06	0.095	0.859	0	0	**0.147**	FALSE	FALSE	FALSE	**0.6**	**Fly Ash**	**A1**
740.9	28.051	0.090	26	1.000	0.988	1.06	0.095	0.857	0	0	**0.147**	FALSE	FALSE	FALSE	**0.6**	**Fly Ash**	**A1**
740.8	28.215	0.090	25	1.000	0.988	1.06	0.094	0.856	0	0	**0.148**	FALSE	FALSE	FALSE	**0.6**	**Fly Ash**	**A1**
740.6	28.379	0.088	23	0.999	0.987	1.06	0.092	0.855	0	0	**0.148**	FALSE	FALSE	FALSE	**0.6**	**Fly Ash**	**A1**
740.5	28.543	0.086	21	0.999	0.987	1.06	0.090	0.854	0	0	**0.148**	FALSE	FALSE	FALSE	**0.6**	**Fly Ash**	**A1**
740.3	28.707	0.085	20	0.999	0.987	1.06	0.089	0.852	0	0	**0.148**	FALSE	FALSE	FALSE	**0.6**	**Fly Ash**	**A1**
740.1	28.871	0.084	19	0.999	0.987	1.06	0.088	0.851	0	0	**0.148**	FALSE	FALSE	FALSE	**0.6**	**Fly Ash**	**A1**
740.0	29.035	0.088	23	0.998	0.987	1.06	0.092	0.850	0	0	**0.148**	FALSE	FALSE	FALSE	**0.6**	**Fly Ash**	**A1**
739.8	29.199	0.094	30	0.998	0.987	1.07	0.099	0.849	0	0	**0.148**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**A1**
739.6	29.363	0.096	31	0.998	0.987	1.07	0.101	0.848	0	0	**0.148**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**A1**
739.5	29.527	0.092	28	0.998	0.987	1.07	0.097	0.846	0	0	**0.149**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**A1**
739.3	29.691	0.088	24	0.997	0.986	1.06	0.092	0.845	0	0	**0.149**	FALSE	FALSE	FALSE	**0.6**	**Fly Ash**	**A1**
739.1	29.855	0.087	23	0.997	0.986	1.06	0.091	0.844	0	0	**0.149**	FALSE	FALSE	FALSE	**0.6**	**Fly Ash**	**A1**
739.0	30.019	0.090	25	0.997	0.986	1.06	0.094	0.843	0	0	**0.149**	FALSE	FALSE	FALSE	**0.6**	**Fly Ash**	**A1**
738.8	30.183	0.095	31	0.996	0.986	1.07	0.100	0.842	0	0	**0.149**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**A1**
738.7	30.347	0.104	38	0.996	0.987	1.08	0.110	0.840	0	0	**0.149**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**A1**
738.5	30.511	0.105	39	0.995	0.987	1.09	0.112	0.839	0	0	**0.149**	FALSE	FALSE	FALSE	**0.8**	**Fly Ash**	**A1**
738.3	30.675	0.106	39	0.995	0.987	1.09	0.113	0.838	0	0	**0.149**	FALSE	FALSE	FALSE	**0.8**	**Fly Ash**	**A1**
738.2	30.840	0.102	36	0.995	0.987	1.08	0.108	0.837	0	0	**0.149**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**A1**
738.0	31.004	0.102	36	0.995	0.987	1.08	0.108	0.835	0	0	**0.149**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**A1**
737.8	31.168	0.106	39	0.994	0.987	1.09	0.113	0.834	0	0	**0.150**	FALSE	FALSE	FALSE	**0.8**	**Fly Ash**	**A1**
737.7	31.332	0.108	41	0.994	0.987	1.09	0.115	0.833	0	0	**0.150**	FALSE	FALSE	FALSE	**0.8**	**Fly Ash**	**A1**
737.5	31.496	0.101	36	0.994	0.986	1.08	0.107	0.832	0	0	**0.150**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**A1**
737.3	31.660	0.099	34	0.994	0.986	1.08	0.104	0.830	0	0	**0.150**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**A1**
737.2	31.824	0.099	34	0.994	0.985	1.08	0.104	0.829	0	0	**0.150**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**A1**
737.0	31.988	0.098	34	0.993	0.985	1.07	0.104	0.828	0	0	**0.150**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**A1**
736.8	32.152	0.099	34	0.993	0.985	1.08	0.105	0.827	0	0	**0.150**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**A1**
736.7	32.316	0.098	33	0.993	0.985	1.07	0.103	0.826	0	0	**0.150**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**A1**
736.5	32.480	0.099	34	0.992	0.985	1.08	0.104	0.824	0	0	**0.150**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**A1**
736.4	32.644	0.100	35	0.992	0.985	1.08	0.106	0.823	0	0	**0.150**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**A1**
736.2	32.808	0.097	33	0.992	0.984	1.07	0.102	0.822	0	0	**0.150**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**A1**
736.0	32.972	0.096	31	0.992	0.984	1.07	0.100	0.821	0	0	**0.150**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**A1**
735.9	33.136	0.098	33	0.991	0.984	1.07	0.102	0.819	0	0	**0.150**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**A1**
735.7	33.300	0.099	34	0.991	0.984	1.08	0.104	0.818	0	0	**0.150**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**A1**
735.5	33.464	0.102	37	0.990	0.984	1.08	0.108	0.817	0	0	**0.150**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**A1**
735.4	33.628	0.105	39	0.990	0.985	1.09	0.111	0.816	0	0	**0.150**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**A1**
735.2	33.792	0.098	33	0.990	0.984	1.07	0.102	0.814	0	0	**0.150**	FALSE	FALSE	FALSE	**0.7**	**Fly Ash**	**A1**
735.0	33.956	0.090	26	0.991	0.983	1.07	0.094	0.813	0	0	**0.151**	FALSE	FALSE	FALSE	**0.6**	**Fly Ash**	**A1**
734.9	34.120	0.080	13	0.992	0.982	1.06	0.082	0.812	0	0	**0.151**	FALSE	FALSE	FALSE	**0.5**	**Fly Ash**	**B**
734.7	34.284	0.073	1	0.993	0.981	1.06	0.075	0.811	0	0	**0.151**	FALSE	FALSE	FALSE	**0.5**	**Fly Ash**	**B**

Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
734.6	34.448	0.069	0	0.993	0.981	1.05	0.071	0.810	0	0	**0.151**	FALSE	FALSE	FALSE	**0.5**	**Fly Ash**	**B**
734.4	34.612	0.067	0	0.992	0.981	1.05	0.068	0.808	0	0	**0.151**	FALSE	FALSE	FALSE	**0.5**	**Fly Ash**	**B**
734.2	34.776	0.066	0	0.992	0.981	1.05	0.067	0.807	0	0	**0.151**	FALSE	FALSE	FALSE	**0.4**	**Fly Ash**	**C**
734.1	34.941	0.065	0	0.992	0.981	1.05	0.067	0.806	0	0	**0.151**	FALSE	FALSE	FALSE	**0.4**	**Fly Ash**	**C**
733.9	35.105	0.065	0	0.992	0.981	1.05	0.067	0.805	0	0	**0.151**	FALSE	FALSE	FALSE	**0.4**	**Fly Ash**	**C**
733.7	35.269	0.065	0	0.992	0.981	1.05	0.066	0.803	0	0	**0.151**	FALSE	FALSE	FALSE	**0.4**	**Fly Ash**	**C**
733.6	35.433	0.065	0	0.992	0.981	1.05	0.067	0.802	0	0	**0.151**	FALSE	FALSE	FALSE	**0.4**	**Fly Ash**	**C**
733.4	35.597	0.066	0	0.991	0.981	1.05	0.067	0.801	0	0	**0.151**	FALSE	FALSE	FALSE	**0.4**	**Fly Ash**	**C**
733.2	35.761	0.066	0	0.991	0.980	1.05	0.068	0.800	0	0	**0.151**	FALSE	FALSE	FALSE	**0.5**	**Fly Ash**	**C**
733.1	35.925	0.067	0	0.991	0.980	1.05	0.069	0.798	0	0	**0.151**	FALSE	FALSE	FALSE	**0.5**	**Fly Ash**	**C**
732.9	36.089	0.067	0	0.991	0.980	1.05	0.069	0.797	0	0	**0.151**	FALSE	FALSE	FALSE	**0.5**	**Fly Ash**	**B**
732.7	36.253	0.067	0	0.991	0.980	1.05	0.069	0.796	0	0	**0.151**	FALSE	FALSE	FALSE	**0.5**	**Fly Ash**	**B**
732.6	36.417	0.067	0	0.991	0.980	1.05	0.068	0.795	0	0	**0.151**	FALSE	FALSE	FALSE	**0.5**	**Fly Ash**	**B**
732.4	36.581	0.067	0	0.990	0.980	1.05	0.068	0.793	0	0	**0.151**	FALSE	FALSE	FALSE	**0.5**	**Fly Ash**	**C**
732.3	36.745	0.066	0	0.990	0.980	1.05	0.067	0.792	0	0	**0.151**	FALSE	FALSE	FALSE	**0.4**	**Fly Ash**	**C**
732.1	36.909	0.065	0	0.990	0.980	1.05	0.066	0.791	0	0	**0.151**	FALSE	FALSE	FALSE	**0.4**	**Fly Ash**	**C**
731.9	37.073	0.064	0	0.990	0.980	1.05	0.066	0.790	0	0	**0.151**	FALSE	FALSE	FALSE	**0.4**	**Fly Ash**	**C**
731.8	37.237	0.064	0	0.990	0.980	1.05	0.065	0.788	0	0	**0.151**	FALSE	FALSE	FALSE	**0.4**	**Fly Ash**	**C**
731.6	37.401	0.064	0	0.990	0.979	1.05	0.065	0.787	0	0	**0.151**	FALSE	FALSE	FALSE	**0.4**	**Fly Ash**	**C**
731.4	37.565	0.064	0	0.989	0.979	1.05	0.066	0.786	0	0	**0.151**	FALSE	FALSE	FALSE	**0.4**	**Fly Ash**	**C**
731.3	37.729	0.064	0	0.989	0.979	1.05	0.066	0.785	0	0	**0.151**	FALSE	FALSE	FALSE	**0.4**	**Fly Ash**	**C**
731.1	37.893	0.064	0	0.989	0.979	1.05	0.066	0.783	0	0	**0.151**	FALSE	FALSE	FALSE	**0.4**	**Fly Ash**	**C**
730.9	38.057	0.065	0	0.989	0.979	1.05	0.066	0.782	0	0	**0.151**	FALSE	FALSE	FALSE	**0.4**	**Fly Ash**	**C**
730.8	38.221	0.065	0	0.989	0.979	1.05	0.067	0.781	0	0	**0.151**	FALSE	FALSE	FALSE	**0.4**	**Fly Ash**	**C**
730.6	38.385	0.070	0	0.989	0.979	1.05	0.071	0.780	0	0	**0.151**	FALSE	FALSE	FALSE	**0.5**	**Fly Ash**	**C**
730.5	38.549	0.069	0	0.988	0.979	1.05	0.070	0.779	0	0	**0.151**	FALSE	FALSE	FALSE	**0.5**	**Fly Ash**	**C**
730.3	38.713	0.068	0	0.988	0.978	1.05	0.070	0.777	0	0	**0.150**	FALSE	FALSE	FALSE	**0.5**	**Fly Ash**	**C**
730.1	38.877	0.068	0	0.988	0.978	1.05	0.070	0.776	0	0	**0.150**	FALSE	FALSE	FALSE	**0.5**	**Fly Ash**	**C**
730.0	39.042	0.069	0	0.988	0.978	1.05	0.070	0.775	0	0	**0.150**	FALSE	FALSE	FALSE	**0.5**	**Fly Ash**	**C**
729.8	39.206	0.070	0	0.988	0.978	1.05	0.071	0.774	0	0	**0.150**	FALSE	FALSE	FALSE	**0.5**	**Fly Ash**	**C**
729.6	39.370	0.070	0	0.988	0.978	1.05	0.071	0.772	0	0	**0.150**	FALSE	FALSE	FALSE	**0.5**	**Fly Ash**	**B**
729.5	39.534	0.115	45	0.978	0.984	1.11	0.122	0.771	0	0	**0.150**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**B**
729.3	39.698	0.111	43	0.979	0.983	1.10	0.118	0.770	0	0	**0.150**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**C**
729.1	39.862	0.109	42	0.979	0.983	1.09	0.115	0.769	0	0	**0.150**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**C**
729.0	40.026	0.109	41	0.979	0.982	1.09	0.114	0.767	0	0	**0.150**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**C**
728.8	40.190	0.110	42	0.978	0.982	1.09	0.115	0.766	0	0	**0.150**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**C**
728.6	40.354	0.111	43	0.978	0.983	1.10	0.116	0.765	0	0	**0.150**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**C**
728.5	40.518	0.111	43	0.977	0.983	1.10	0.117	0.764	0	0	**0.150**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**C**
728.3	40.682	0.111	43	0.977	0.982	1.10	0.117	0.762	0	0	**0.150**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**C**
728.2	40.846	0.111	43	0.977	0.982	1.10	0.117	0.761	0	0	**0.150**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**C**
728.0	41.010	0.113	44	0.976	0.983	1.10	0.119	0.760	0	0	**0.149**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**C**
727.8	41.174	0.114	45	0.975	0.983	1.10	0.121	0.759	0	0	**0.149**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**C**
727.7	41.338	0.116	46	0.974	0.983	1.11	0.123	0.758	0	0	**0.149**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**C**
727.5	41.502	0.118	47	0.974	0.984	1.11	0.125	0.756	0	0	**0.149**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**B**
727.3	41.666	0.121	48	0.973	0.985	1.12	0.129	0.755	0	0	**0.149**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**B**
727.2	41.830	0.137	55	0.969	0.990	1.16	0.153	0.754	0	0	**0.149**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**A1**
727.0	41.994	0.135	54	0.969	0.990	1.15	0.149	0.753	0	0	**0.149**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**A1**
726.8	42.158	0.146	57	0.967	0.993	1.18	0.165	0.751	0	0	**0.149**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**A1**
726.7	42.322	0.162	61	0.964	0.999	1.21	0.189	0.750	0	0	**0.149**	FALSE	FALSE	FALSE	**1.3**	**Subunit 2**	**A1**
726.5	42.486	0.154	59	0.964	0.996	1.20	0.177	0.749	0	0	**0.148**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**A1**
726.3	42.650	0.149	58	0.965	0.995	1.19	0.170	0.748	0	0	**0.148**	FALSE	FALSE	FALSE	**1.1**	**Subunit 2**	**A1**
726.2	42.814	0.154	60	0.964	0.996	1.20	0.177	0.747	0	0	**0.148**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**A1**
726.0	42.978	0.150	59	0.964	0.995	1.19	0.171	0.745	0	0	**0.148**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**A1**
725.9	43.143	0.156	60	0.962	0.997	1.20	0.180	0.744	0	0	**0.148**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**A1**
725.7	43.307	0.156	60	0.962	0.997	1.20	0.180	0.743	0	0	**0.148**	FALSE	FALSE	FALSE	**1.2**	**Subunit 2**	**A1**

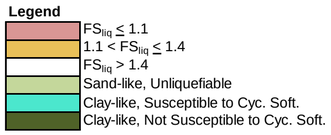
Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
725.5	43.471	0.129	52	0.967	0.987	1.14	0.140	0.742	0	0	**0.148**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**A1**
725.4	43.635	0.129	52	0.967	0.986	1.14	0.139	0.740	0	0	**0.148**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**A2**
725.2	43.799	0.123	49	0.968	0.984	1.12	0.131	0.739	0	0	**0.148**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**A2**
725.0	43.963	0.116	46	0.969	0.981	1.11	0.122	0.738	0	0	**0.147**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**A2**
724.9	44.127	0.112	43	0.970	0.980	1.10	0.117	0.737	0	0	**0.147**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**A2**
724.7	44.291	0.110	42	0.970	0.979	1.10	0.115	0.736	0	0	**0.147**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**C**
724.5	44.455	0.112	44	0.969	0.980	1.10	0.117	0.734	0	0	**0.147**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**B**
724.4	44.619	0.131	53	0.964	0.987	1.14	0.143	0.733	0	0	**0.147**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**A1**
724.2	44.783	0.130	52	0.964	0.986	1.14	0.141	0.732	0	0	**0.147**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**A1**
724.1	44.947	0.114	45	0.968	0.980	1.10	0.120	0.731	0	0	**0.147**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**A1**
723.9	45.111	0.121	48	0.966	0.983	1.12	0.128	0.730	0	0	**0.147**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**A1**
723.7	45.275	0.132	53	0.962	0.987	1.14	0.143	0.728	0	0	**0.146**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**A1**
723.6	45.439	0.137	55	0.961	0.989	1.16	0.150	0.727	0	0	**0.146**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**A1**
723.4	45.603	0.136	54	0.961	0.988	1.15	0.148	0.726	0	0	**0.146**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**A1**
723.2	45.767	0.134	54	0.961	0.988	1.15	0.147	0.725	0	0	**0.146**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**A1**
723.1	45.931	0.125	50	0.963	0.984	1.13	0.133	0.724	0	0	**0.146**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**A2**
722.9	46.095	0.119	47	0.964	0.981	1.11	0.125	0.722	0	0	**0.146**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**A2**
722.7	46.259	0.113	44	0.966	0.979	1.10	0.117	0.721	0	0	**0.146**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**C**
722.6	46.423	0.112	43	0.966	0.978	1.10	0.116	0.720	0	0	**0.145**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**A2**
722.4	46.587	0.111	43	0.966	0.978	1.10	0.116	0.719	0	0	**0.145**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**A2**
722.2	46.751	0.113	44	0.965	0.979	1.10	0.118	0.718	0	0	**0.145**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**A2**
722.1	46.915	0.108	41	0.966	0.977	1.09	0.111	0.716	0	0	**0.145**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**C**
721.9	47.079	0.104	38	0.967	0.975	1.08	0.106	0.715	0	0	**0.145**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**C**
721.8	47.244	0.102	37	0.968	0.975	1.08	0.104	0.714	0	0	**0.145**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**C**
721.6	47.408	0.103	37	0.967	0.975	1.08	0.105	0.713	0	0	**0.145**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**C**
721.4	47.572	0.105	39	0.966	0.975	1.08	0.107	0.712	0	0	**0.144**	FALSE	FALSE	FALSE	**0.7**	**Subunit 2**	**C**
721.3	47.736	0.110	42	0.964	0.977	1.10	0.114	0.710	0	0	**0.144**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**C**
721.1	47.900	0.114	45	0.962	0.978	1.10	0.118	0.709	0	0	**0.144**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**C**
720.9	48.064	0.114	45	0.962	0.978	1.10	0.118	0.708	0	0	**0.144**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**A2**
720.8	48.228	0.114	44	0.962	0.978	1.10	0.118	0.707	0	0	**0.144**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**A2**
720.6	48.392	0.111	43	0.963	0.977	1.10	0.115	0.706	0	0	**0.144**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**A2**
720.4	48.556	0.112	44	0.962	0.977	1.10	0.116	0.704	0	0	**0.144**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**C**
720.3	48.720	0.114	44	0.961	0.977	1.10	0.118	0.703	0	0	**0.143**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**A2**
720.1	48.884	0.111	43	0.962	0.976	1.10	0.114	0.702	0	0	**0.143**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**A2**
720.0	49.048	0.120	48	0.958	0.980	1.12	0.126	0.701	0	0	**0.143**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**A2**
719.8	49.212	0.117	46	0.959	0.979	1.11	0.122	0.700	0	0	**0.143**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**B**
719.6	49.376	0.115	46	0.959	0.978	1.11	0.120	0.699	0	0	**0.143**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**C**
719.5	49.540	0.111	43	0.961	0.976	1.10	0.114	0.697	0	0	**0.143**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**A2**
719.3	49.704	0.110	43	0.961	0.976	1.10	0.113	0.696	0	0	**0.143**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**A2**
719.1	49.868	0.111	43	0.960	0.975	1.10	0.114	0.695	0	0	**0.142**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**A2**
719.0	50.032	0.114	45	0.959	0.977	1.10	0.117	0.694	0	0	**0.142**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**A2**
718.8	50.196	0.117	47	0.957	0.978	1.11	0.122	0.693	0	0	**0.142**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**A2**
718.6	50.360	0.123	49	0.955	0.981	1.12	0.129	0.692	0	0	**0.142**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**A2**
718.5	50.524	0.128	52	0.953	0.983	1.14	0.137	0.690	0	0	**0.142**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**A2**
718.3	50.688	0.129	52	0.952	0.983	1.14	0.137	0.689	0	0	**0.142**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**A2**
718.1	50.852	0.127	51	0.953	0.983	1.13	0.135	0.688	0	0	**0.142**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**A2**
718.0	51.016	0.125	50	0.953	0.981	1.13	0.131	0.687	0	0	**0.141**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**A2**
717.8	51.180	0.123	49	0.954	0.980	1.12	0.129	0.686	0	0	**0.141**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**A2**
717.7	51.345	0.121	48	0.954	0.979	1.12	0.126	0.685	0	0	**0.141**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**A2**
717.5	51.509	0.119	48	0.954	0.978	1.11	0.124	0.684	0	0	**0.141**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**A2**
717.3	51.673	0.121	49	0.953	0.979	1.12	0.127	0.682	0	0	**0.141**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**A2**
717.2	51.837	0.127	51	0.951	0.982	1.13	0.134	0.681	0	0	**0.141**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**A2**
717.0	52.001	0.126	51	0.951	0.982	1.13	0.134	0.680	0	0	**0.140**	FALSE	FALSE	FALSE	**1.0**	**Subunit 2**	**A2**
716.8	52.165	0.122	49	0.952	0.979	1.12	0.127	0.679	0	0	**0.140**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**A2**
716.7	52.329	0.122	49	0.952	0.979	1.12	0.128	0.678	0	0	**0.140**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**A1**

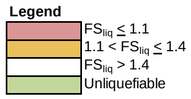
Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
716.5	52.493	0.117	47	0.953	0.977	1.11	0.121	0.677	0	0	**0.140**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**C**
716.3	52.657	0.118	47	0.953	0.977	1.11	0.123	0.676	0	0	**0.140**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**A2**
716.2	52.821	0.116	46	0.953	0.976	1.11	0.119	0.674	0	0	**0.140**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**A2**
716.0	52.985	0.113	44	0.954	0.975	1.10	0.116	0.673	0	0	**0.140**	FALSE	FALSE	FALSE	**0.8**	**Subunit 2**	**A2**
715.9	53.149	0.116	46	0.953	0.976	1.11	0.119	0.672	0	0	**0.139**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**A2**
715.7	53.313	0.120	48	0.951	0.978	1.12	0.125	0.671	0	0	**0.139**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**A2**
715.5	53.477	0.121	48	0.950	0.978	1.12	0.126	0.670	0	0	**0.139**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**A2**
715.4	53.641	0.121	48	0.950	0.978	1.12	0.126	0.669	0	0	**0.139**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**A2**
715.2	53.805	0.120	48	0.950	0.978	1.12	0.124	0.668	0	0	**0.139**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**A2**
715.0	53.969	0.119	48	0.950	0.977	1.12	0.123	0.667	0	0	**0.139**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**A2**
714.9	54.133	0.119	47	0.950	0.977	1.11	0.123	0.665	0	0	**0.138**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**A2**
714.7	54.297	0.119	47	0.950	0.977	1.11	0.123	0.664	0	0	**0.138**	FALSE	FALSE	FALSE	**0.9**	**Subunit 2**	**A2**
714.5	54.461	0.117	47	0.950	0.976	1.11	0.121	0.663	0	0	**0.138**	FALSE	FALSE	FALSE	**0.9**	**Subunit 3**	**C**
714.4	54.625	0.111	43	0.952	0.973	1.10	0.113	0.662	0	0	**0.138**	FALSE	FALSE	FALSE	**0.8**	**Subunit 3**	**C**
714.2	54.789	0.112	43	0.952	0.973	1.10	0.114	0.661	0	0	**0.138**	FALSE	FALSE	FALSE	**0.8**	**Subunit 3**	**C**
714.0	54.953	0.109	42	0.953	0.972	1.09	0.110	0.660	0	0	**0.138**	FALSE	FALSE	FALSE	**0.8**	**Subunit 3**	**A2**
713.9	55.117	0.109	42	0.952	0.972	1.09	0.111	0.659	0	0	**0.137**	FALSE	FALSE	FALSE	**0.8**	**Subunit 3**	**A2**
713.7	55.281	0.109	42	0.952	0.972	1.09	0.110	0.658	0	0	**0.137**	FALSE	FALSE	FALSE	**0.8**	**Subunit 3**	**C**
713.6	55.446	0.108	41	0.953	0.971	1.09	0.109	0.657	0	0	**0.137**	FALSE	FALSE	FALSE	**0.8**	**Subunit 3**	**C**
713.4	55.610	0.111	43	0.951	0.972	1.10	0.112	0.656	0	0	**0.137**	FALSE	FALSE	FALSE	**0.8**	**Subunit 3**	**A2**
713.2	55.774	0.107	41	0.952	0.971	1.09	0.108	0.654	0	0	**0.137**	FALSE	FALSE	FALSE	**0.8**	**Subunit 3**	**A2**
713.1	55.938	0.113	44	0.949	0.973	1.10	0.115	0.653	0	0	**0.137**	FALSE	FALSE	FALSE	**0.8**	**Subunit 3**	**A2**
712.9	56.102	0.121	48	0.946	0.977	1.12	0.125	0.652	0	0	**0.136**	FALSE	FALSE	FALSE	**0.9**	**Subunit 3**	**A2**
712.7	56.266	0.120	48	0.946	0.977	1.12	0.124	0.651	0	0	**0.136**	FALSE	FALSE	FALSE	**0.9**	**Subunit 3**	**A2**
712.6	56.430	0.119	47	0.946	0.976	1.11	0.123	0.650	0	0	**0.136**	FALSE	FALSE	FALSE	**0.9**	**Subunit 3**	**A2**
712.4	56.594	0.118	47	0.946	0.976	1.11	0.122	0.649	0	0	**0.136**	FALSE	FALSE	FALSE	**0.9**	**Subunit 3**	**A2**
712.2	56.758	0.118	47	0.946	0.976	1.11	0.121	0.648	0	0	**0.136**	FALSE	FALSE	FALSE	**0.9**	**Subunit 3**	**A2**
712.1	56.922	0.122	49	0.944	0.978	1.12	0.127	0.647	0	0	**0.135**	FALSE	FALSE	FALSE	**0.9**	**Subunit 3**	**A2**
711.9	57.086	0.125	51	0.942	0.980	1.13	0.131	0.646	0	0	**0.135**	FALSE	FALSE	FALSE	**1.0**	**Subunit 3**	**A2**
711.8	57.250	0.129	52	0.940	0.982	1.14	0.136	0.645	0	0	**0.135**	FALSE	FALSE	FALSE	**1.0**	**Subunit 3**	**A2**
711.6	57.414	0.134	54	0.938	0.984	1.15	0.142	0.644	0	0	**0.135**	FALSE	FALSE	FALSE	**1.0**	**Subunit 3**	**A1**
711.4	57.578	0.140	56	0.935	0.988	1.16	0.151	0.643	0	0	**0.135**	FALSE	FALSE	FALSE	**1.1**	**Subunit 3**	**A1**
711.3	57.742	0.145	57	0.933	0.991	1.18	0.158	0.641	0	0	**0.135**	FALSE	FALSE	FALSE	**1.2**	**Subunit 3**	**A1**
711.1	57.906	0.149	58	0.931	0.993	1.18	0.163	0.640	0	0	**0.134**	FALSE	FALSE	FALSE	**1.2**	**Subunit 3**	**A1**
710.9	58.070	0.155	60	0.929	0.997	1.20	0.173	0.639	0	0	**0.134**	FALSE	FALSE	FALSE	**1.3**	**Subunit 3**	**A1**
710.8	58.234	0.178	64	0.922	1.009	1.25	0.207	0.638	0	0	**0.134**	FALSE	FALSE	FALSE	**1.5**	**Subunit 3**	**A1**
710.6	58.398	0.194	66	0.918	1.017	1.28	0.231	0.637	0	0	**0.134**	FALSE	FALSE	FALSE	**1.7**	**Subunit 3**	**A1**
710.4	58.562	0.179	64	0.921	1.010	1.25	0.208	0.636	0	0	**0.134**	FALSE	FALSE	FALSE	**1.6**	**Subunit 3**	**A1**
710.3	58.726	0.169	63	0.923	1.004	1.23	0.193	0.635	0	0	**0.134**	FALSE	FALSE	FALSE	**1.4**	**Subunit 3**	**A1**
710.1	58.890	0.156	60	0.927	0.997	1.20	0.173	0.634	0	0	**0.133**	FALSE	FALSE	FALSE	**1.3**	**Subunit 3**	**A1**
709.9	59.054	0.139	55	0.933	0.987	1.16	0.149	0.633	0	0	**0.133**	FALSE	FALSE	FALSE	**1.1**	**Subunit 3**	**A1**
709.8	59.218	0.126	51	0.938	0.980	1.13	0.131	0.632	0	0	**0.133**	FALSE	FALSE	FALSE	**1.0**	**Subunit 3**	**A1**
709.6	59.382	0.134	54	0.934	0.984	1.15	0.141	0.631	0	0	**0.133**	FALSE	FALSE	FALSE	**1.1**	**Subunit 3**	**A1**
709.5	59.547	0.134	54	0.934	0.984	1.15	0.142	0.630	0	0	**0.133**	FALSE	FALSE	FALSE	**1.1**	**Subunit 3**	**A1**
709.3	59.711	0.136	55	0.933	0.986	1.16	0.145	0.629	0	0	**0.133**	FALSE	FALSE	FALSE	**1.1**	**Subunit 3**	**A1**
709.1	59.875	0.134	54	0.933	0.984	1.15	0.141	0.628	0	0	**0.132**	FALSE	FALSE	FALSE	**1.1**	**Subunit 3**	**A1**
709.0	60.039	0.130	52	0.935	0.982	1.14	0.136	0.627	0	0	**0.132**	FALSE	FALSE	FALSE	**1.0**	**Subunit 3**	**A1**
708.8	60.203	0.134	54	0.933	0.984	1.15	0.141	0.626	0	0	**0.132**	FALSE	FALSE	FALSE	**1.1**	**Subunit 3**	**A1**
708.6	60.367	0.142	56	0.929	0.989	1.17	0.152	0.625	0	0	**0.132**	FALSE	FALSE	FALSE	**1.2**	**Subunit 3**	**A1**
708.5	60.531	0.147	58	0.927	0.991	1.18	0.159	0.624	0	0	**0.132**	FALSE	FALSE	FALSE	**1.2**	**Subunit 3**	**A1**
708.3	60.695	0.144	57	0.928	0.990	1.17	0.155	0.623	0	0	**0.132**	FALSE	FALSE	FALSE	**1.2**	**Subunit 3**	**A1**
708.1	60.859	0.141	56	0.928	0.988	1.17	0.152	0.622	0	0	**0.131**	FALSE	FALSE	FALSE	**1.2**	**Subunit 3**	**A1**
708.0	61.023	0.141	56	0.928	0.988	1.17	0.151	0.621	0	0	**0.131**	FALSE	FALSE	FALSE	**1.2**	**Subunit 3**	**A1**
707.8	61.187	0.142	56	0.928	0.989	1.17	0.152	0.620	0	0	**0.131**	FALSE	FALSE	FALSE	**1.2**	**Subunit 3**	**A1**
707.6	61.351	0.139	55	0.929	0.987	1.16	0.148	0.619	0	0	**0.131**	FALSE	FALSE	FALSE	**1.1**	**Subunit 3**	**A1**

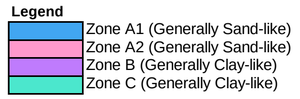
Elev. (ft)	Depth z (ft)	Cyclic Resistance Ratio $CRR_{7.5}$	Relative Density D_r (%)	Correction for Overburden Pressure K_σ	Correction for Sloping Ground K_α	Magnitude Scaling Factor MSF	Cyclic Resistance Ratio CRR	Stress Reduction Coeff., r_d	From Ground Response: Maximum Induced Shear Stress τ_{Max} (psf)	From Ground Response: Average Cyclic Shear Stress τ_{Avg} (psf)	Cyclic Stress Ratio CSR	Sample Screened for: Clay-like	Sample Screened for: High Tip Res. $(qc_{1N})_{CS} \geq 175$	Sample Screened for: Unsaturated	Factor of Safety FS_{liq}	Material (optional)	Soil Type (see note on on following chart)
707.5	61.515	0.144	57	0.926	0.990	1.17	0.154	0.618	0	0	**0.131**	FALSE	FALSE	FALSE	**1.2**	**Subunit 3**	**A1**
707.3	61.679	0.146	58	0.925	0.991	1.18	0.158	0.617	0	0	**0.130**	FALSE	FALSE	FALSE	**1.2**	**Subunit 3**	**A1**
707.2	61.843	0.151	59	0.923	0.994	1.19	0.164	0.616	0	0	**0.130**	FALSE	FALSE	FALSE	**1.3**	**Subunit 3**	**A1**
707.0	62.007	0.172	63	0.916	1.006	1.24	0.196	0.615	0	0	**0.130**	FALSE	FALSE	FALSE	**1.5**	**Subunit 3**	**A1**
706.8	62.171	0.172	63	0.915	1.005	1.23	0.195	0.614	0	0	**0.130**	FALSE	FALSE	FALSE	**1.5**	**Subunit 3**	**A1**
706.7	62.335	0.372	76	0.881	1.077	1.48	0.521	0.613	0	0	**0.130**	FALSE	FALSE	FALSE	**4.0**	**Subunit 3**	**A1**
706.5	62.499	0.182	65	0.912	1.011	1.25	0.211	0.612	0	0	**0.130**	FALSE	FALSE	FALSE	**1.6**	**Subunit 3**	**A1**
706.3	62.663	N/A	92	N/A	N/A	N/A	N/A	0.611	0	0	**0.129**	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**	**A1**
706.2	62.827	N/A	100	N/A	N/A	N/A	N/A	0.610	0	0	**0.129**	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**	**A1**
706.0	62.991	N/A	91	N/A	N/A	N/A	N/A	0.609	0	0	**0.129**	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**	**A1**
705.8	63.155	0.385	77	0.877	1.080	1.49	0.543	0.608	0	0	**0.129**	FALSE	FALSE	FALSE	**4.2**	**Subunit 3**	**A1**
705.7	63.319	0.203	67	0.905	1.021	1.29	0.241	0.607	0	0	**0.129**	FALSE	FALSE	FALSE	**1.9**	**Subunit 3**	**A1**
705.5	63.483	0.184	65	0.909	1.012	1.26	0.213	0.606	0	0	**0.129**	FALSE	FALSE	FALSE	**1.7**	**Subunit 3**	**A1**
705.4	63.648	0.228	69	0.898	1.032	1.33	0.280	0.605	0	0	**0.128**	FALSE	FALSE	FALSE	**2.2**	**Subunit 3**	**A1**
705.2	63.812	0.188	65	0.907	1.014	1.26	0.219	0.604	0	0	**0.128**	FALSE	FALSE	FALSE	**1.7**	**Subunit 3**	**A1**
705.0	63.976	0.202	67	0.903	1.021	1.29	0.240	0.603	0	0	**0.128**	FALSE	FALSE	FALSE	**1.9**	**Subunit 3**	**A1**
704.9	64.140	0.220	69	0.899	1.028	1.32	0.267	0.602	0	0	**0.128**	FALSE	FALSE	FALSE	**2.1**	**Subunit 3**	**A1**
704.7	64.304	0.245	71	0.893	1.039	1.35	0.308	0.601	0	0	**0.128**	FALSE	FALSE	FALSE	**2.4**	**Subunit 3**	**A1**
704.5	64.468	0.455	78	0.867	1.095	1.53	0.662	0.600	0	0	**0.128**	FALSE	FALSE	FALSE	**5.2**	**Subunit 3**	**A1**
704.4	64.632	N/A	84	N/A	N/A	N/A	N/A	0.599	0	0	**0.127**	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**	**A1**
704.2	64.796	N/A	88	N/A	N/A	N/A	N/A	0.598	0	0	**0.127**	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**	**A1**
704.0	64.960	N/A	93	N/A	N/A	N/A	N/A	0.597	0	0	**0.127**	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**	**A1**
703.9	65.124	N/A	96	N/A	N/A	N/A	N/A	0.596	0	0	**0.127**	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**	**A1**
703.7	65.288	N/A	99	N/A	N/A	N/A	N/A	0.595	0	0	**0.127**	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**	**A1**
703.5	65.452	N/A	94	N/A	N/A	N/A	N/A	0.594	0	0	**0.127**	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**	**A1**
703.4	65.616	0.098	33	0.945	0.965	1.07	0.095	0.593	0	0	**0.126**	FALSE	FALSE	FALSE	**0.8**	**Subunit 3**	**B**
703.2	65.780	0.183	65	0.904	1.011	1.26	0.211	0.592	0	0	**0.126**	FALSE	FALSE	FALSE	**1.7**	**Subunit 3**	**A1**
703.1	65.944	0.334	75	0.875	1.068	1.45	0.452	0.591	0	0	**0.126**	FALSE	FALSE	FALSE	**3.6**	**Subunit 3**	**A1**
702.9	66.108	0.409	77	0.866	1.086	1.51	0.579	0.590	0	0	**0.126**	FALSE	FALSE	FALSE	**4.6**	**Subunit 3**	**A1**
702.7	66.272	0.417	77	0.865	1.088	1.51	0.593	0.589	0	0	**0.126**	FALSE	FALSE	FALSE	**4.7**	**Subunit 3**	**A1**
702.6	66.436	N/A	92	N/A	N/A	N/A	N/A	0.588	0	0	**0.126**	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**	**A1**
702.4	66.600	N/A	95	N/A	N/A	N/A	N/A	0.588	0	0	**0.125**	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**	**A1**
702.2	66.764	N/A	100	N/A	N/A	N/A	N/A	0.587	0	0	**0.125**	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**	**A1**
702.1	66.928	N/A	100	N/A	N/A	N/A	N/A	0.586	0	0	**0.125**	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**	**A1**
701.9	67.092	N/A	100	N/A	N/A	N/A	N/A	0.585	0	0	**0.125**	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**	**A1**
701.7	67.256	N/A	100	N/A	N/A	N/A	N/A	0.584	0	0	**0.125**	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**	**A1**
701.6	67.420	N/A	100	N/A	N/A	N/A	N/A	0.583	0	0	**0.125**	FALSE	TRUE	FALSE	**N/A**	**Subunit 3**	**A1**



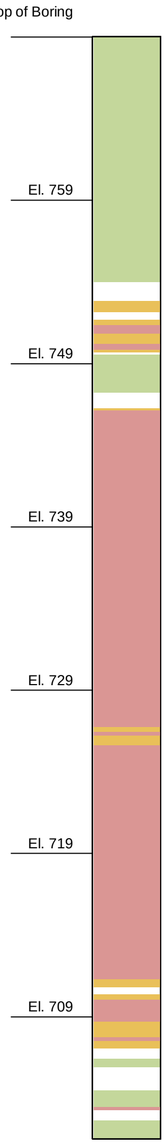
Adapted from "Discussion of 'Liquefaction Potential of Silts from CPTu'" (Robertson 2008). Zone A_1 and Zone A_2 samples are generally sand-like. Zone B samples are generally clay-like and not susceptible to cyclic softening. Zone C samples are generally clay-like and susceptible to cyclic softening. Note that the transition from clay-like to sand-like in this chart does not exactly match the liquefaction calculations herein; that is, some transitional samples in Zone B and Zone C will be treated as sand-like and analyzed for liquefaction if the calculations indicate as such.



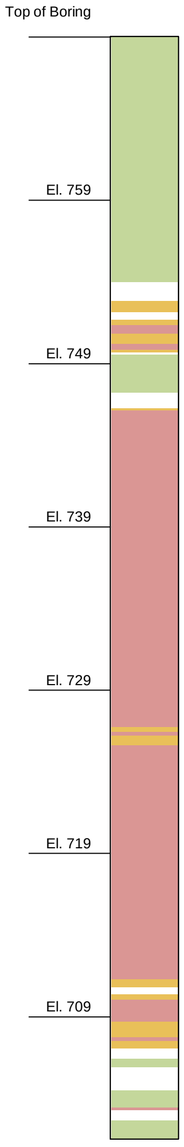




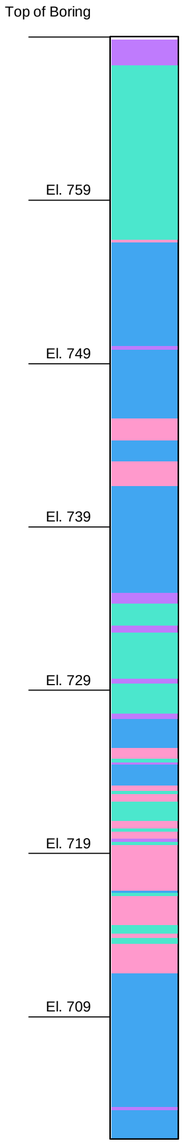
KIF-BF-CPT-5B, Liquefaction Triggering Results



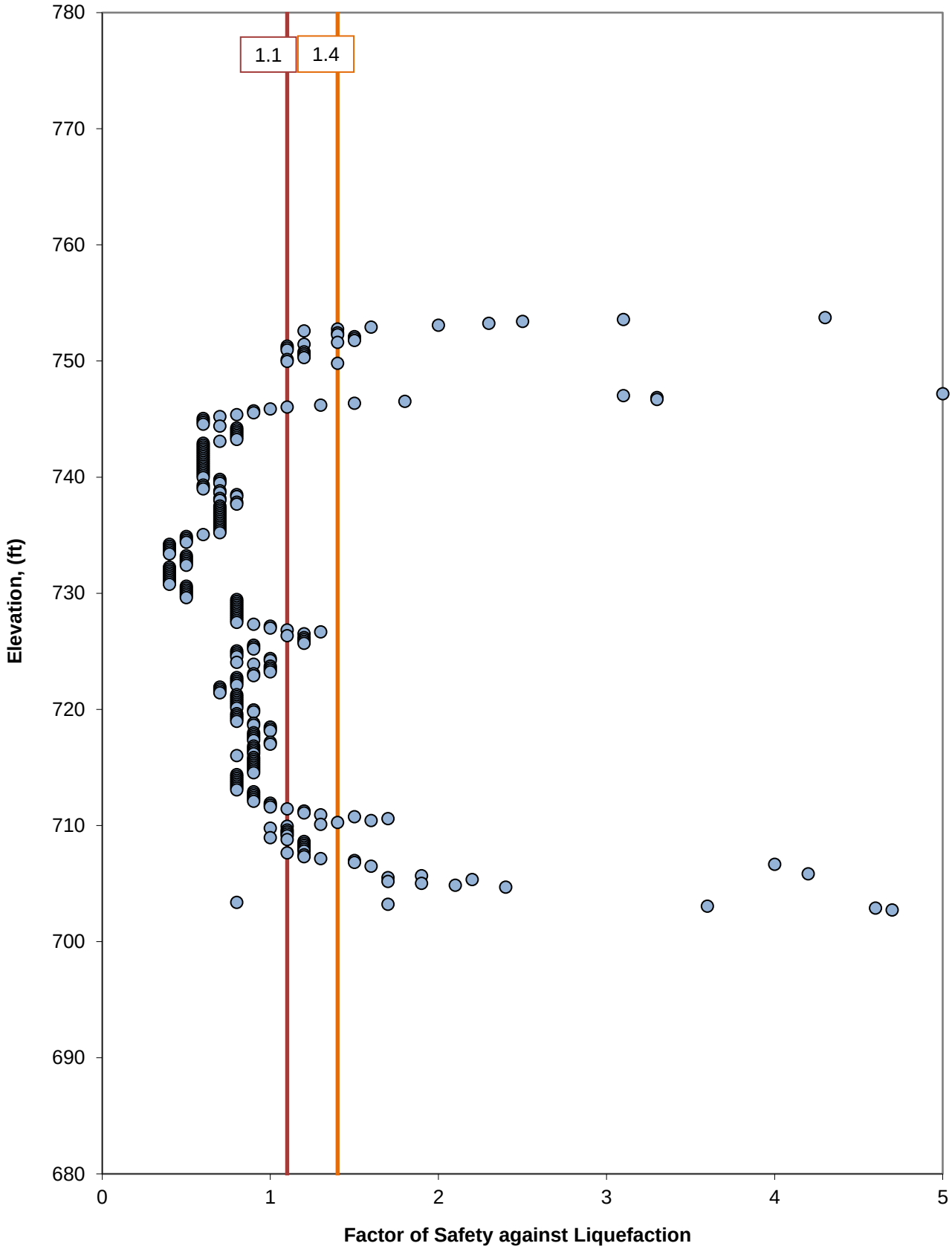
KIF-BF-CPT-5B, Liquefaction Triggering Results



KIF-BF-CPT-5B, Robertson Soil Type



KIF TDEC Stability, Boring = KIF-BF-CPT-5B, Source = 10 Hz, Mw = 6, Event = Design EQ, CPT Data, Simplified Stress-Based Approach



3.5 GRAPHICAL DEPICTIONS OF CLAY-LIKE / SAND-LIKE BEHAVIOR AND LIQUEFACTION RESULTS

3.5.1 All Materials

3.5.1.1 Section A-A'

Kingston Fossil Plant (KIF) TDEC Order

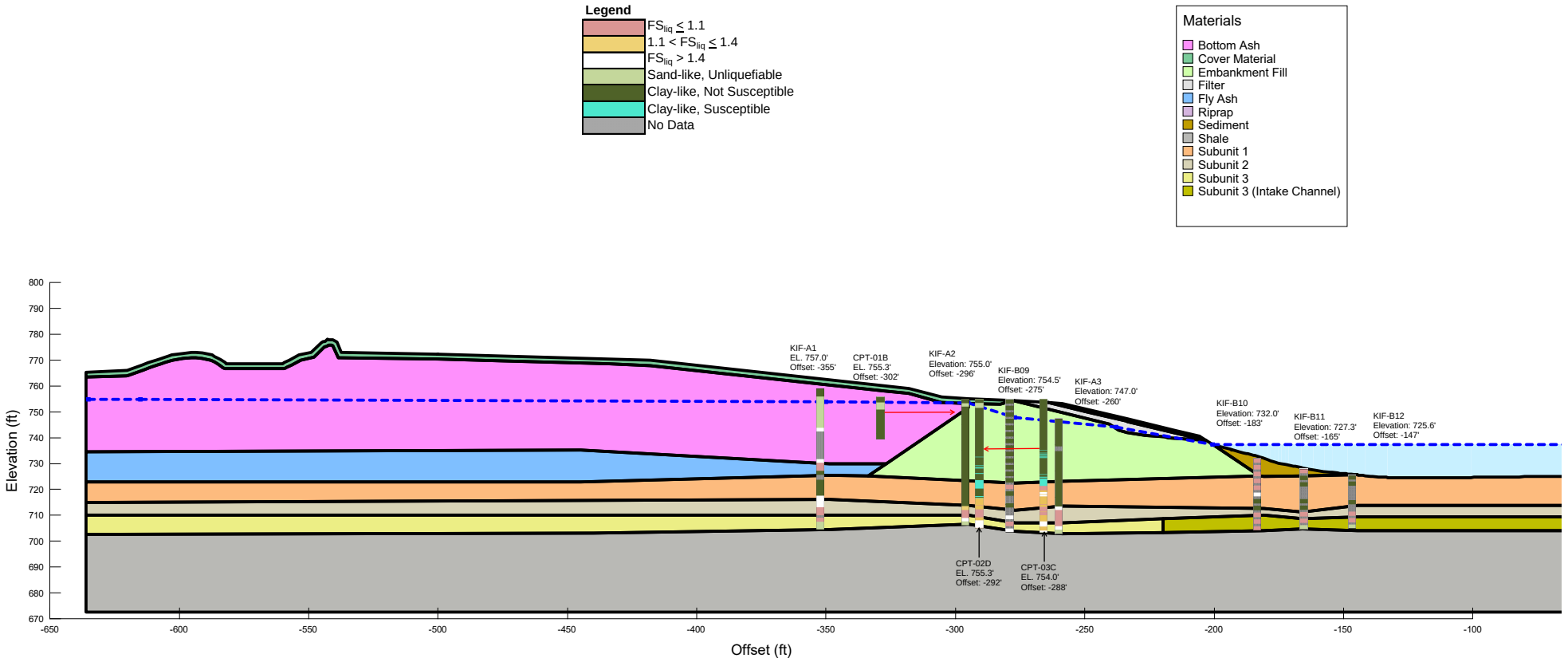
Sluice Trench and Ballfield East of Sluice Trench

Section A-A'

Section Geometry
Liquefaction Analysis Locations

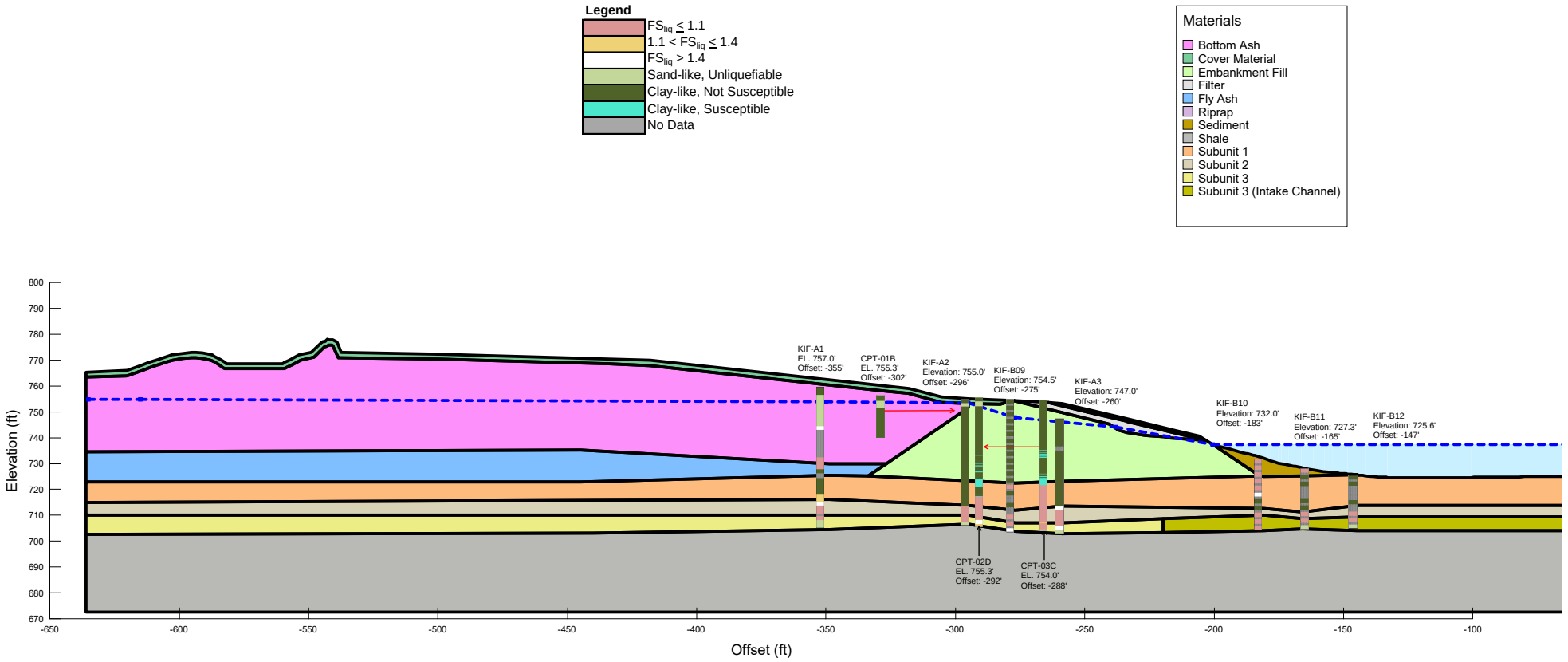
Note: The results of the analysis shown here are based on available subsurface information, laboratory test results and approximate soil properties. The drawing depicts approximate subsurface conditions based on historical drawings or specific borings at the time of drilling. No warranties can be made regarding the continuity of subsurface conditions.

All Layers for the 1 Hz Design Earthquake
Borings near Section A-A'



Kingston Fossil Plant (KIF) TDEC Order		Note: The results of the analysis shown here are based on available subsurface information, laboratory test results and approximate soil properties. The drawing depicts approximate subsurface conditions based on historical drawings or specific borings at the time of drilling. No warranties can be made regarding the continuity of subsurface conditions.
Sluice Trench and Ballfield East of Sluice Trench	Section Geometry Liquefaction Analysis Locations	
Section A-A'		

All Layers for the 10 Hz Design Earthquake
Borings near Section A-A'



3.5.1.2 Polishing Pond Section

Kingston Fossil Plant (KIF) TDEC Order

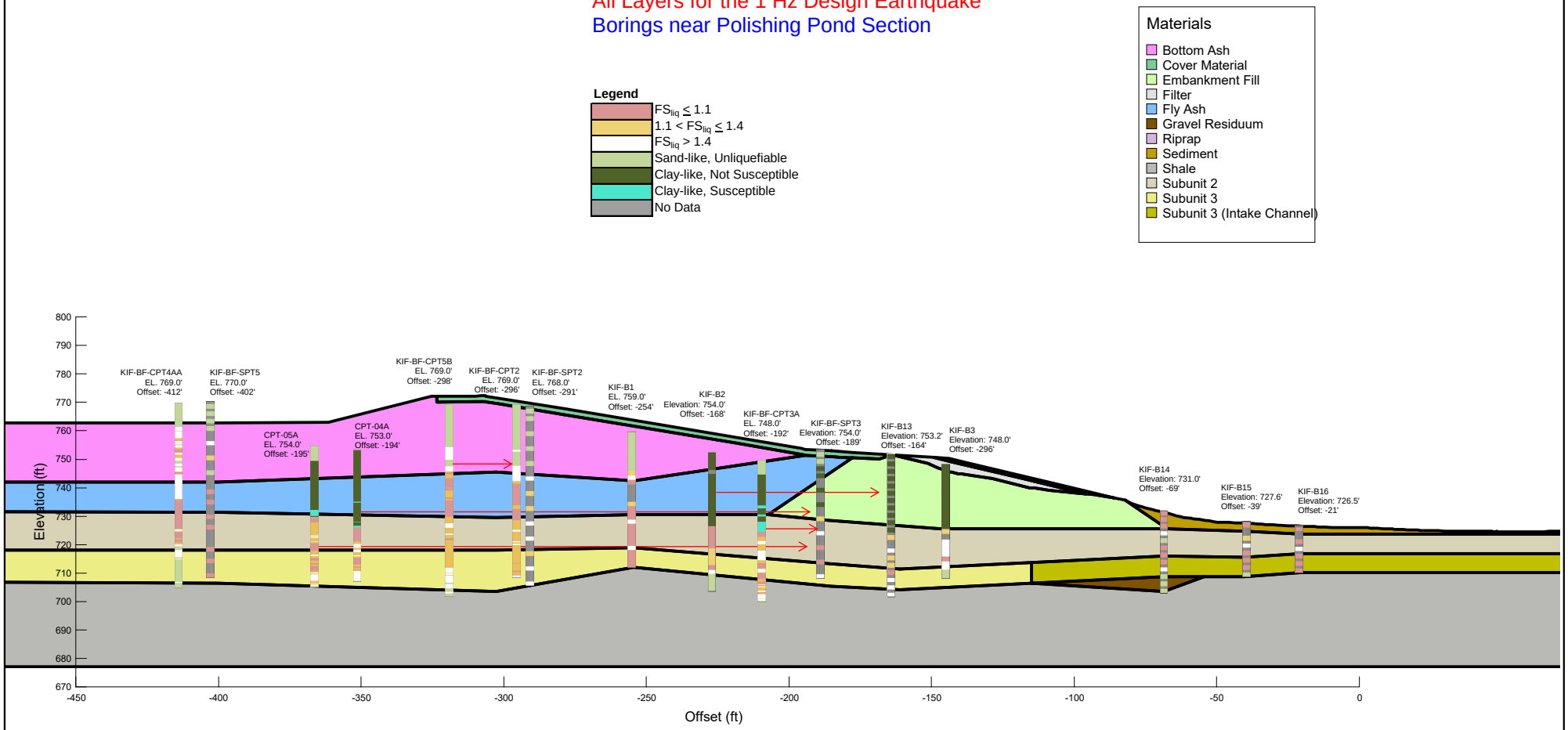
Sluice Trench and Ballfield East of Sluice Trench

Polishing Pond Section

Section Geometry
Liquefaction Analysis Locations

Note: The results of the analysis shown here are based on available subsurface information, laboratory test results and approximate soil properties. The drawing depicts approximate subsurface conditions based on historical drawings or specific borings at the time of drilling. No warranties can be made regarding the continuity of subsurface conditions.

All Layers for the 1 Hz Design Earthquake
Borings near Polishing Pond Section



Kingston Fossil Plant (KIF) TDEC Order

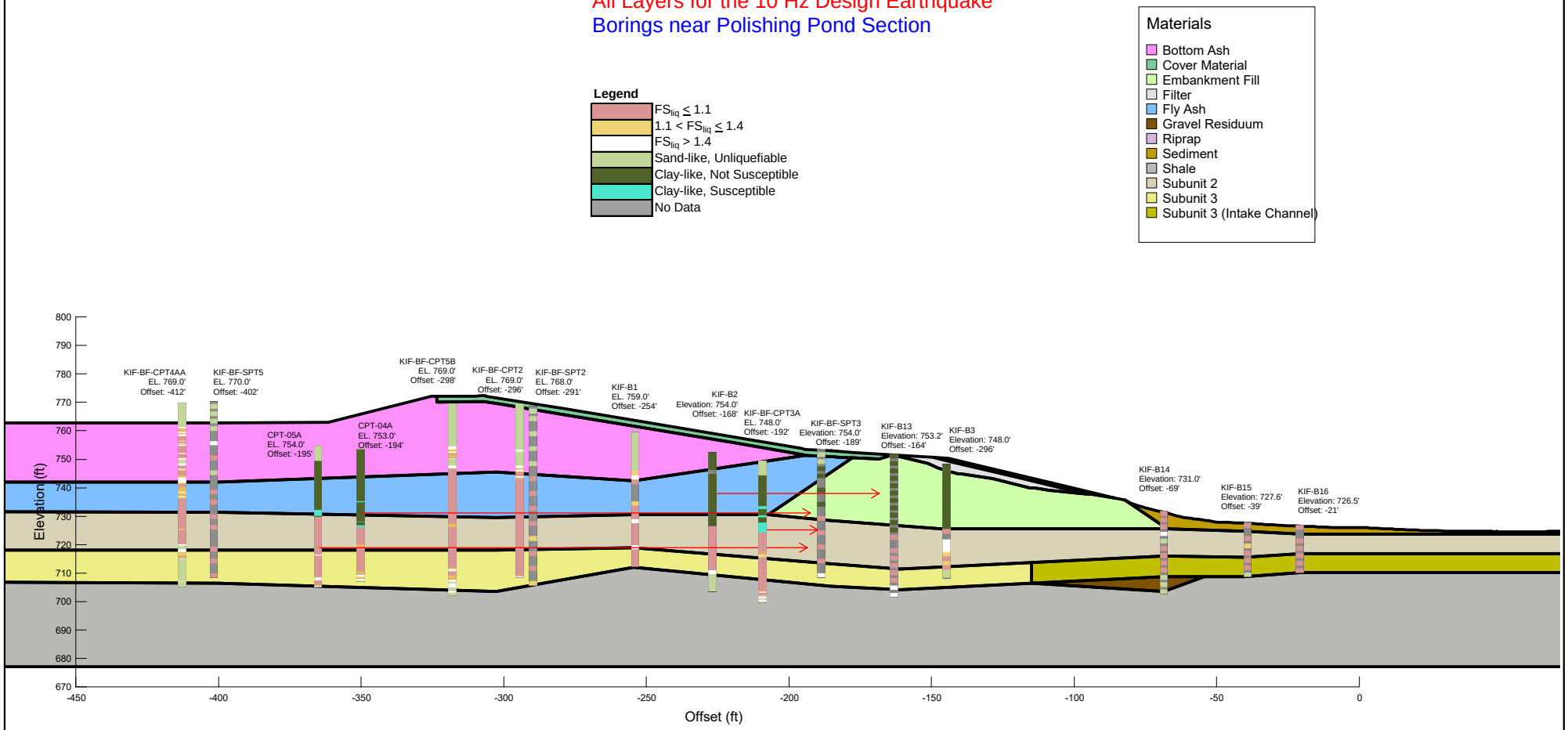
Sluice Trench and Ballfield East of Sluice Trench

Polishing Pond Section

Section Geometry
Liquefaction Analysis Locations

Note: The results of the analysis shown here are based on available subsurface information, laboratory test results and approximate soil properties. The drawing depicts approximate subsurface conditions based on historical drawings or specific borings at the time of drilling. No warranties can be made regarding the continuity of subsurface conditions.

All Layers for the 10 Hz Design Earthquake
Borings near Polishing Pond Section



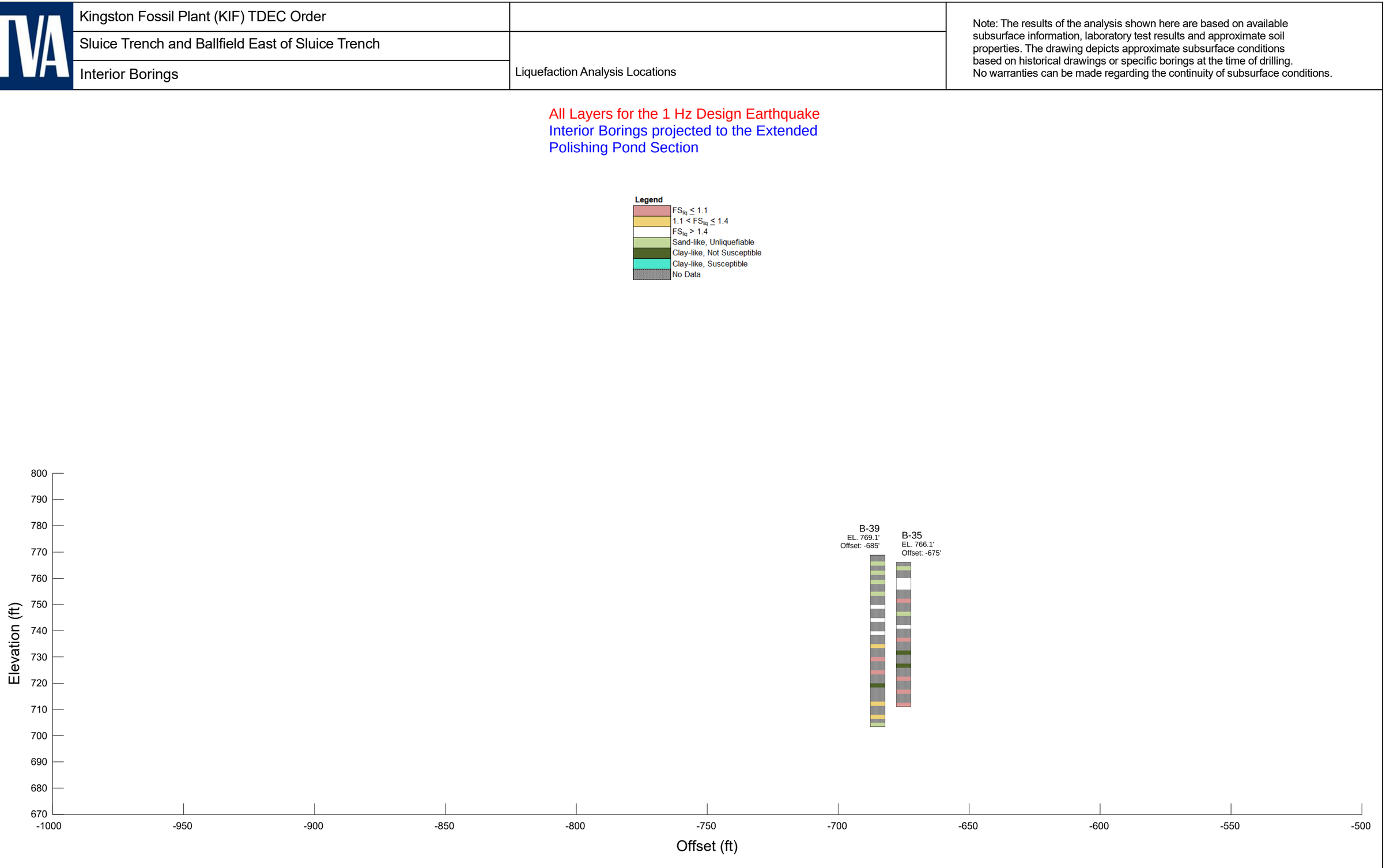
Project No. 175668043

10/4/2021: 12:07:14 PM

3.5.1.3 Interior Borings

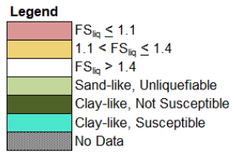
Kingston Fossil Plant (KIF) TDEC Order		Note: The results of the analysis shown here are based on available subsurface information, laboratory test results and approximate soil properties. The drawing depicts approximate subsurface conditions based on historical drawings or specific borings at the time of drilling. No warranties can be made regarding the continuity of subsurface conditions.
Sluice Trench and Ballfield East of Sluice Trench		
Interior Borings	Liquefaction Analysis Locations	

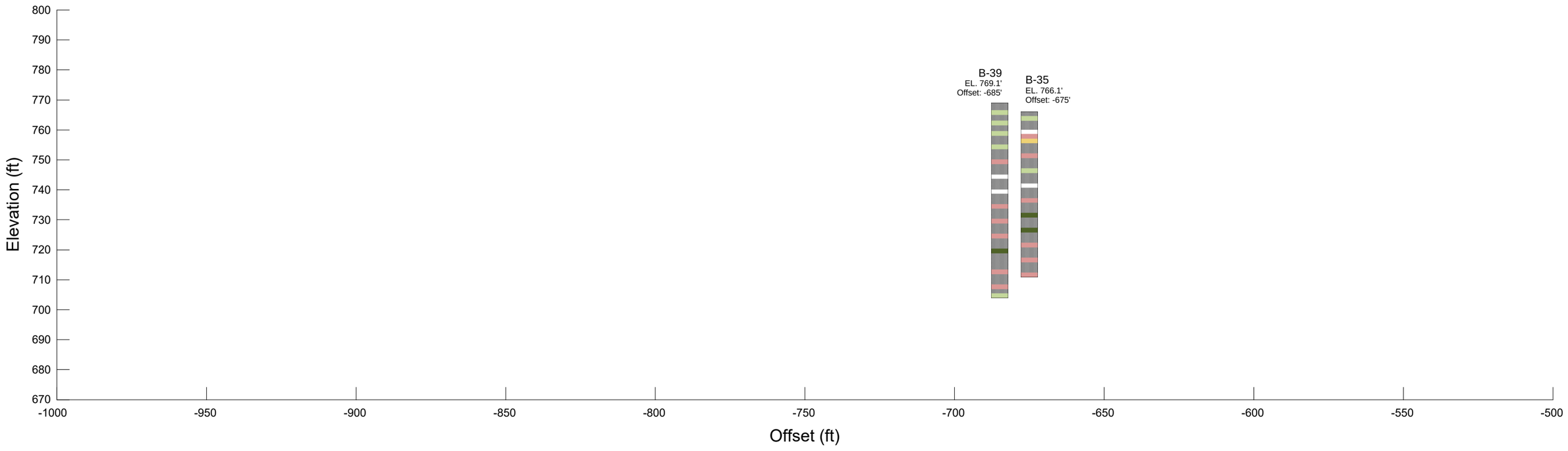
All Layers for the 1 Hz Design Earthquake
Interior Borings projected to the Extended Polishing Pond Section



TVA	Kingston Fossil Plant (KIF) TDEC Order		Note: The results of the analysis shown here are based on available subsurface information, laboratory test results and approximate soil properties. The drawing depicts approximate subsurface conditions based on historical drawings or specific borings at the time of drilling. No warranties can be made regarding the continuity of subsurface conditions.
	Sluice Trench and Ballfield East of Sluice Trench		
	Interior Borings	Liquefaction Analysis Locations	

All Layers for the 10 Hz Design Earthquake
Interior Borings projected to the Extended
Polishing Pond Section

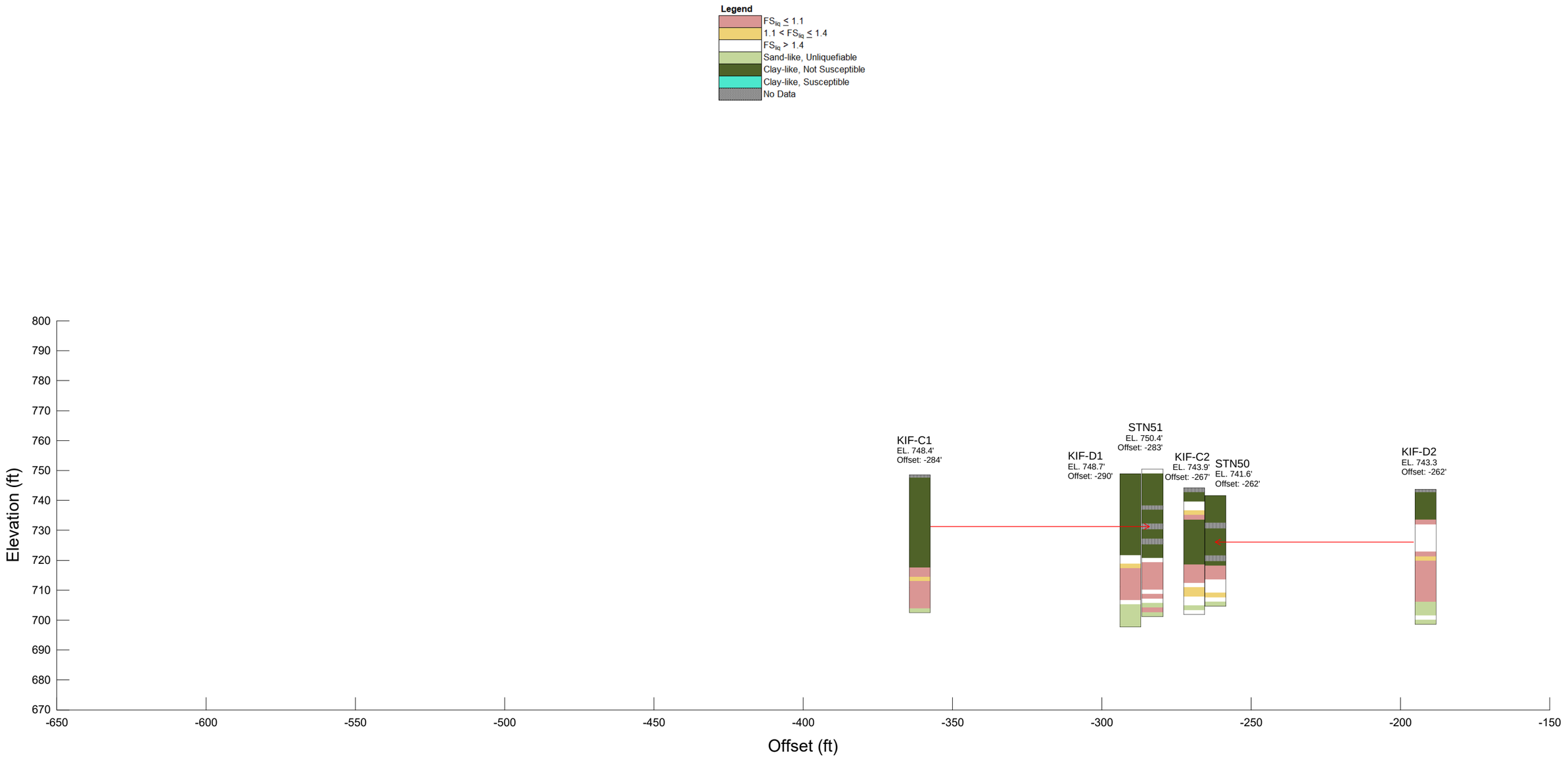




3.5.1.4 Engineered Wetlands Borings

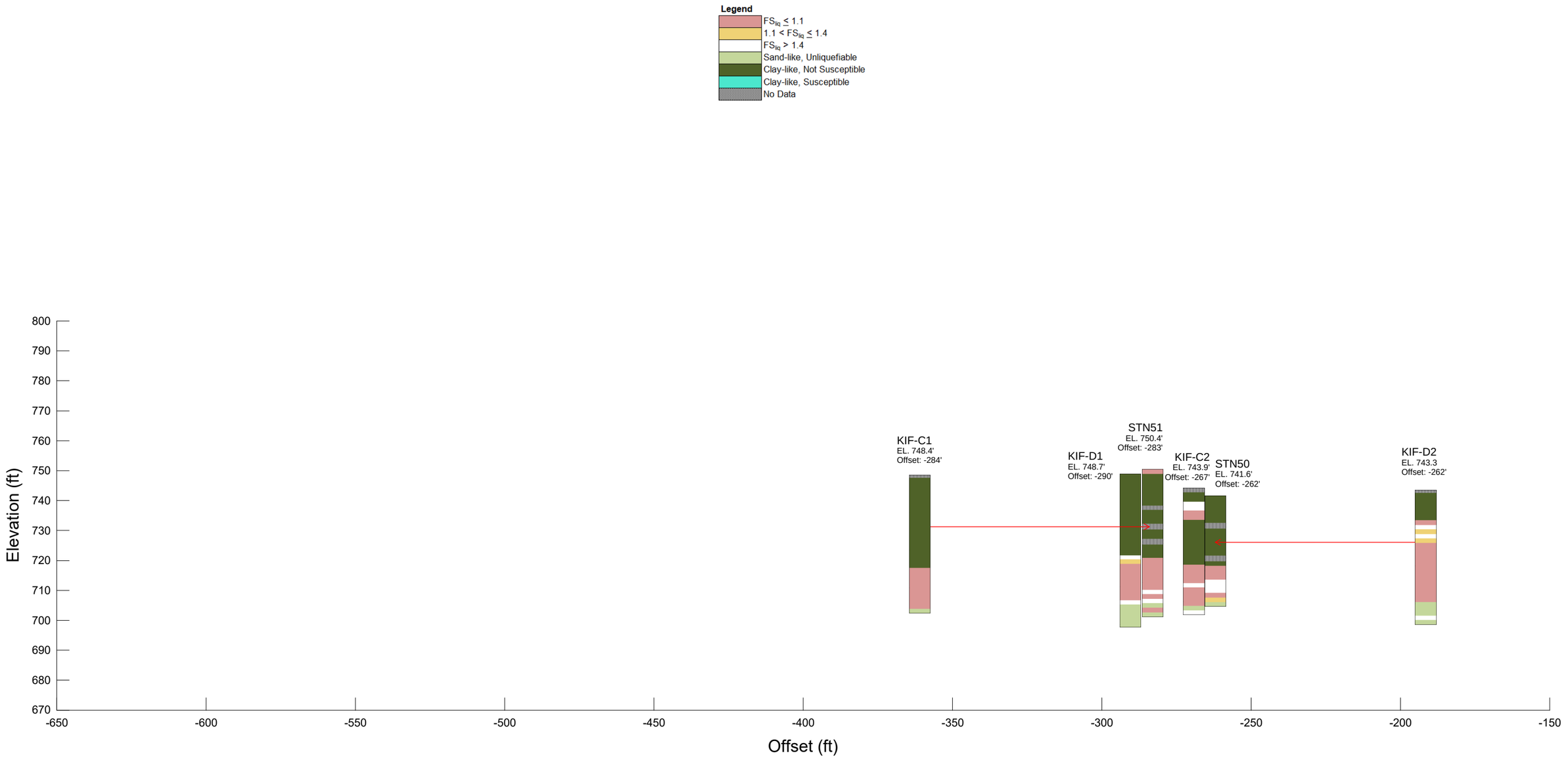
Kingston Fossil Plant (KIF) TDEC Order		Note: The results of the analysis shown here are based on available subsurface information, laboratory test results and approximate soil properties. The drawing depicts approximate subsurface conditions based on historical drawings or specific borings at the time of drilling. No warranties can be made regarding the continuity of subsurface conditions.
Sluice Trench and Ballfield East of Sluice Trench		
Engineered Wetlands Borings	Liquefaction Analysis Locations	

All Layers for the 1 Hz Design Earthquake
Borings near the Engineered Wetlands



Kingston Fossil Plant (KIF) TDEC Order		Note: The results of the analysis shown here are based on available subsurface information, laboratory test results and approximate soil properties. The drawing depicts approximate subsurface conditions based on historical drawings or specific borings at the time of drilling. No warranties can be made regarding the continuity of subsurface conditions.
Sluice Trench and Ballfield East of Sluice Trench		
Engineered Wetlands Borings	Liquefaction Analysis Locations	

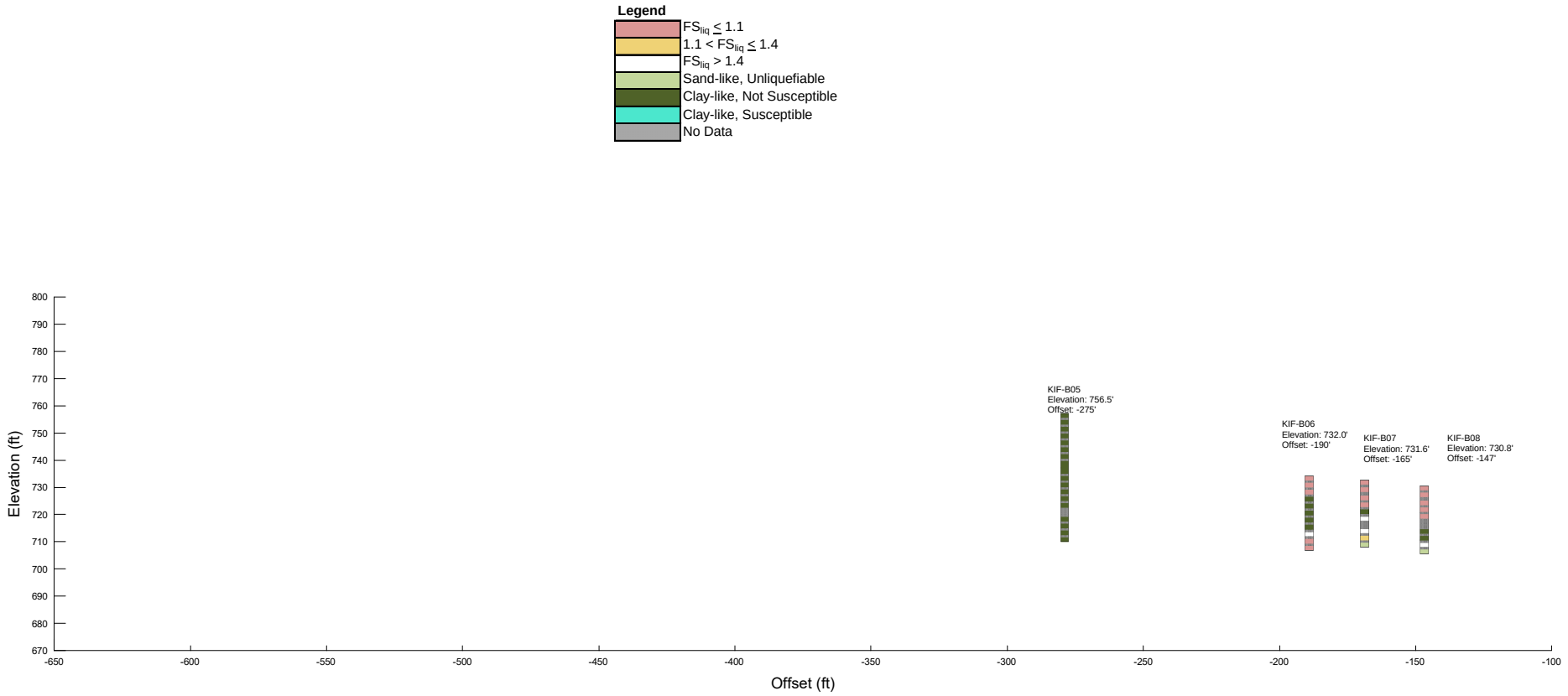
All Layers for the 10 Hz Design Earthquake
Borings near the Engineered Wetlands



3.5.1.5 Alternate Section Borings

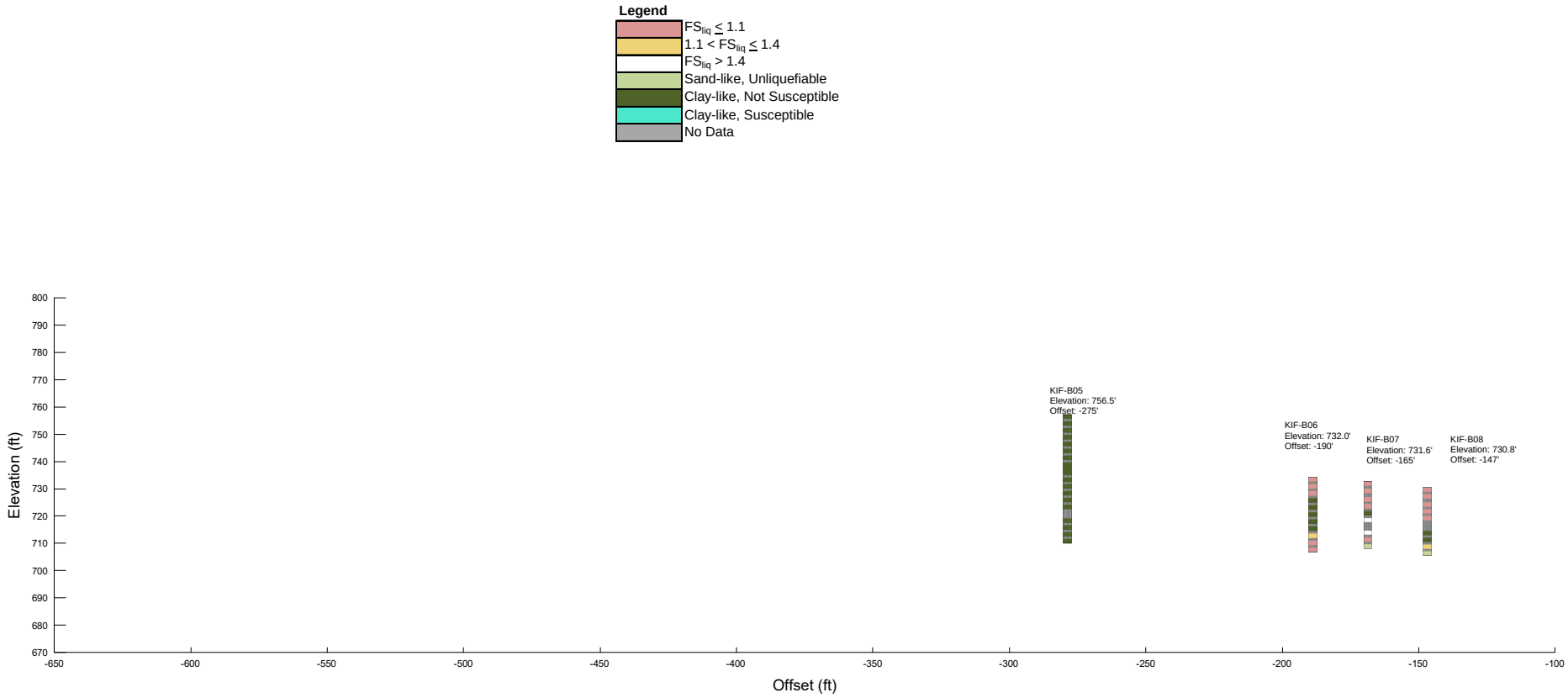
Kingston Fossil Plant (KIF) TDEC Order		Note: The results of the analysis shown here are based on available subsurface information, laboratory test results and approximate soil properties. The drawing depicts approximate subsurface conditions based on historical drawings or specific borings at the time of drilling. No warranties can be made regarding the continuity of subsurface conditions.
Sluice Trench and Ballfield East of Sluice Trench	Section Geometry Liquefaction Analysis Locations	
Alternate Section		

All Layers for the 1 Hz Design Earthquake
Borings for Alternate Section



Kingston Fossil Plant (KIF) TDEC Order		Note: The results of the analysis shown here are based on available subsurface information, laboratory test results and approximate soil properties. The drawing depicts approximate subsurface conditions based on historical drawings or specific borings at the time of drilling. No warranties can be made regarding the continuity of subsurface conditions.
Sluice Trench and Ballfield East of Sluice Trench	Section Geometry Liquefaction Analysis Locations	
Alternate Section		

All Layers for the 10 Hz Design Earthquake
Borings for Alternate Section



3.5.2 Embankment Fill

3.5.2.1 Plan View

All Borings Embankment Fill
1 Hz Design Earthquake

LEGEND:
BORING ID
No. of Samples with $FS_{liq} \leq 1.4$ / No. of Samples in Material
Percentage of Samples with $FS_{liq} \leq 1.4$

N

KRP Ash Landfill
Interim Ash Staging Area
Polishing Pond
Engineered Wetlands
Sluice Trench and Ballfield East of Sluice Trench
East Dike

MacB-35
MacB-39
KIF-BF-SPT-5
KIF-BF-SPT-2
KIF-BF-SPT-3
0/4
0%
KIF-BF-SPT-3
KIF-B13
KIF-B13
0/11
0%
B-1
B-2
B-3
B-2
0/16
0%
KIF-B14
KIF-B16
KIF-B15
B-3
0/15
0%
A-1
A-2
A-2
0/18
0%
KIF-B09
A-3
KIF-B05
0/14
0%
KIF-B09
0/13
0%
KIF-B10
KIF-B12
KIF-B11
KIF-B05
A-3
0/13
0%
KIF-B06
KIF-B07
KIF-B08
KIF-B06
0/2
0%
D-1
D-2
STN-51
C-1
C-2
STN-50

Exhibit No.
D.1

Title
Selected Borings for Liquefaction Analysis

Client/Project
Tennessee Valley Authority
Kingston Fossil Plant (KIF) TDEC Order

Project Location
Roane County, Tennessee

175668043
Prepared by MB on 2021-10-11
Technical Review by ND on 2021-10-11

0 100 200 300 400 Feet
1:1,200 (At original document size of 22x34)

Legend

- Existing Borings
- 2018 Imagery Boundary
- CCR Unit Area (Approximate)
- Engineered Wetlands (Approximate)
- Polishing Pond (Approximate)

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Imagery provided by TVA and flown by Tuck Mapping on March 16, 2017; 2018 Imagery provided by TVA and is dated September 12, 2018

Stantec TVA

U:\TVA-SP\175668043_KF_Phase2\gis\mxd\Stability_SAR\KF_D1_SelectedBoringsLiquefactionAnalysis.mxd Revised: 2021-10-11 By: lblackmann

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All Soundings Embankment Fill
1 Hz Design Earthquake

LEGEND:
CPT ID
No. of Samples with $FS_{liq} \leq 1.4$ / No. of Samples in Material
Percentage of Samples with $FS_{liq} \leq 1.4$

N

KRP Ash Landfill
Interim Ash Staging Area
Polishing Pond
Engineered Wetlands
Sluice Trench and Ballfield East of Sluice Trench
East Dike

KIF-BF-CPT-4AA
KIF-BF-CPT-5B
KIF-BF-CPT-2
KIF-BF-CPT-3A
0/119
0%
CPT-05A
0/113
0%
CPT-05A
0/69
0%
CPT-07
CPT-05A
KIF-BF-CPT-3A
CPT-04A
0/158
0%
CPT-04A
CPT-03C
0/177
0%
CPT-03C
CPT-02D
0/161
0%
CPT-02D
CPT-01B
0/49
0%
CPT-01B

Exhibit No.
D.2

Title
Selected Soundings for Liquefaction Analysis

Client/Project
Tennessee Valley Authority
Kingston Fossil Plant (KIF) TDEC Order

Project Location
Roane County, Tennessee

175668043
Prepared by MB on 2021-10-11
Technical Review by ND on 2021-10-11

0 100 200 300 400 Feet
1:1,200 (At original document size of 22x34)

Legend

- Existing Sounding (CPT)
- 2018 Imagery Boundary
- CCR Unit Area (Approximate)
- Engineered Wetlands (Approximate)
- Polishing Pond (Approximate)

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Imagery provided by TVA and flown by Tuck Mapping on March 16, 2017; 2018 Imagery provided by TVA and is dated September 12, 2018

Stantec TVA

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All Borings Embankment Fill
10 Hz Design Earthquake

LEGEND:
BORING ID
No. of Samples with $FS_{liq} \leq 1.4$ / No. of Samples in Material
Percentage of Samples with $FS_{liq} \leq 1.4$

N

KRP Ash Landfill
Interim Ash Staging Area
Polishing Pond
Engineered Wetlands
Sluice Trench and Ballfield East of Sluice Trench
East Dike

MacB-35
MacB-39
KIF-BF-SPT-5
KIF-BF-SPT-2
KIF-BF-SPT-3
KIF-BF-SPT-1
KIF-BF-SPT-4
KIF-B13
KIF-B14
KIF-B15
KIF-B16
KIF-B10
KIF-B11
KIF-B12
KIF-B09
KIF-B05
KIF-B06
KIF-B07
KIF-B08
A-1
A-2
A-3
B-1
B-2
B-3
C-1
C-2
D-1
D-2
STN-50
STN-51

KIF-BF-SPT-3
0/4
0%

KIF-B13
0/11
0%

B-2
0/16
0%

B-3
0/15
0%

A-2
0/18
0%

A-3
0/13
0%

KIF-B09
0/13
0%

KIF-B05
0/14
0%

KIF-B06
0/2
0%

Exhibit No.
D.1

Title
Selected Borings for Liquefaction Analysis

Client/Project
Tennessee Valley Authority
Kingston Fossil Plant (KIF) TDEC Order

Project Location
Roane County, Tennessee

175668043
Prepared by MB on 2021-10-11
Technical Review by ND on 2021-10-11

0 100 200 300 400 Feet
1:1,200 (At original document size of 22x34)

Legend

- Existing Borings
- 2018 Imagery Boundary
- CCR Unit Area (Approximate)
- Engineered Wetlands (Approximate)
- Polishing Pond (Approximate)

Notes

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Stantec TVA

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All Soundings Embankment Fill
10 Hz Design Earthquake

LEGEND:
CPT ID
No. of Samples with $FS_{liq} \leq 1.4$ / No. of Samples in Material
Percentage of Samples with $FS_{liq} \leq 1.4$

N

KRP Ash Landfill
Interim Ash Staging Area
Polishing Pond
Engineered Wetlands
Sluice Trench and Ballfield East of Sluice Trench
East Dike

KIF-BF-CPT-4AA
KIF-BF-CPT-5B
KIF-BF-CPT-2
KIF-BF-CPT-3A
0/119
0%
KIF-BF-CPT-3A
CPT-05A
0/113
0%
CPT-05A
CPT-05A
0/69
0%
CPT-07
CPT-04A
0/158
0%
CPT-04A
CPT-03C
0/177
0%
CPT-03C
CPT-02D
0/161
0%
CPT-02D
CPT-01B
0/49
0%
CPT-01B

Exhibit No.
D.2

Title
Selected Soundings for Liquefaction Analysis

Client/Project
Tennessee Valley Authority
Kingston Fossil Plant (KIF) TDEC Order

Project Location
Roane County, Tennessee

175668043
Prepared by MB on 2021-10-11
Technical Review by ND on 2021-10-11

0 100 200 300 400 Feet
1:1,200 (At original document size of 22x34)

Legend

- Existing Sounding (CPT)
- 2018 Imagery Boundary
- CCR Unit Area (Approximate)
- Engineered Wetlands (Approximate)
- Polishing Pond (Approximate)

Notes

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Stantec TVA

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3.5.3 Fly Ash

3.5.3.1 Plan View

All Borings Fly Ash
1 Hz Design Earthquake

LEGEND:
BORING ID
No. of Samples with $FS_{liq} \leq 1.4$ / No. of Samples in Material
Percentage of Samples with $FS_{liq} \leq 1.4$

N

KRP Ash Landfill
Interim Ash Staging Area
Polishing Pond
Engineered Wetlands
Sluice Trench and Ballfield East of Sluice Trench
East Dike

MacB-35
B-35
1/5
20%
KIF-BF-SPT-5
2/2
100%
KIF-BF-SPT-5
KIF-BF-SPT-2
2/3
67%
KIF-BF-SPT-2
B-39
2/5
40%
MacB-39
B-1
2/4
50%
B-1
KIF-BF-SPT-3
KIF-B13
KIF-BF-SPT-3
0/2
0%
B-2
B-3
KIF-B14
KIF-B15
KIF-B16
A-1
2/3
67%
A-1
A-2
KIF-B09
A-3
KIF-B10
KIF-B11
KIF-B12
KIF-B05
KIF-B06
KIF-B07
KIF-B08
D-1
D-2
STN-51
C-1
C-2
STN-50

Exhibit No.
D.1

Title
Selected Borings for Liquefaction Analysis

Client/Project
Tennessee Valley Authority
Kingston Fossil Plant (KIF) TDEC Order

Project Location
Roane County, Tennessee

175668043
Prepared by MB on 2021-10-11
Technical Review by ND on 2021-10-11

0 100 200 300 400 Feet
1:1,200 (At original document size of 22x34)

Legend

- Existing Borings
- 2018 Imagery Boundary
- CCR Unit Area (Approximate)
- Engineered Wetlands (Approximate)
- Polishing Pond (Approximate)

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
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All Soundings Fly Ash
1 Hz Design Earthquake

LEGEND:
CPT ID
No. of Samples with $FS_{liq} \leq 1.4$ / No. of Samples in Material
Percentage of Samples with $FS_{liq} \leq 1.4$

N

KRP Ash Landfill

Interim Ash Staging Area

KIF-BF-CPT-4AA
26/91
29%

KIF-BF-CPT-4AA

Polishing Pond

KIF-BF-CPT-5B
97/106
92%

KIF-BF-CPT-5B

KIF-BF-CPT-2

KIF-BF-CPT-2
81/106
76%

Engineered Wetlands

CPT-05A
0/30
0%

KIF-BF-CPT-3A
0/30
0%

CPT-07

CPT-05A

CPT-07
0/30
0%

Sluice Trench and Ballfield East of Sluice Trench

KIF-BF-CPT-3A

CPT-04A

CPT-03C

East Dike

CPT-02D

CPT-01B

Exhibit No.
D.2

Title
Selected Soundings for Liquefaction Analysis

Client/Project
Tennessee Valley Authority
Kingston Fossil Plant (KIF) TDEC Order

Project Location
Roane County, Tennessee

175668043
Prepared by MB on 2021-10-11
Technical Review by ND on 2021-10-11

0 100 200 300 400 Feet
1:1,200 (At original document size of 22x34)

Legend

- Existing Sounding (CPT)
- 2018 Imagery Boundary
- CCR Unit Area (Approximate)
- Engineered Wetlands (Approximate)
- Polishing Pond (Approximate)

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
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All Borings Fly Ash
10 Hz Design Earthquake

LEGEND:
BORING ID
No. of Samples with $FS_{liq} \leq 1.4$ / No. of Samples in Material
Percentage of Samples with $FS_{liq} \leq 1.4$

N

KRP Ash Landfill
Interim Ash Staging Area
Polishing Pond
Engineered Wetlands
Sluice Trench and Ballfield East of Sluice Trench
East Dike

MacB-35
B-35
3/5
60%
KIF-BF-SPT-5
2/2
100%
KIF-BF-SPT-5
KIF-BF-SPT-2
3/3
100%
KIF-BF-SPT-2
B-39
2/5
40%
MacB-39
B-1
4/4
100%
B-1
KIF-BF-SPT-3
KIF-B13
KIF-BF-SPT-3
0/2
0%
B-2
B-3
KIF-B14
KIF-B15
KIF-B16
A-1
3/3
100%
A-1
A-2
KIF-B09
A-3
KIF-B10
KIF-B11
KIF-B12
KIF-B05
KIF-B06
KIF-B07
KIF-B08
D-1
D-2
STN-51
C-1
C-2
STN-50

Exhibit No.
D.1

Title
Selected Borings for Liquefaction Analysis

Client/Project
Tennessee Valley Authority
Kingston Fossil Plant (KIF) TDEC Order

Project Location
Roane County, Tennessee

175668043
Prepared by MB on 2021-10-11
Technical Review by ND on 2021-10-11

0 100 200 300 400 Feet
1:1,200 (At original document size of 22x34)

Legend

- Existing Borings
- 2018 Imagery Boundary
- CCR Unit Area (Approximate)
- Engineered Wetlands (Approximate)
- Polishing Pond (Approximate)

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
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All Soundings Fly Ash
10 Hz Design Earthquake

LEGEND:
CPT ID
No. of Samples with $FS_{liq} \leq 1.4$ / No. of Samples in Material
Percentage of Samples with $FS_{liq} \leq 1.4$

N

KRP Ash Landfill

Interim Ash Staging Area

KIF-BF-CPT-4AA
49/91
54%

KIF-BF-CPT-4AA

Polishing Pond

KIF-BF-CPT-5B
102/106
96%

KIF-BF-CPT-5B

KIF-BF-CPT-2

KIF-BF-CPT-2
99/106
93%

Engineered Wetlands

CPT-05A
0/30
0%

KIF-BF-CPT-3A
0/30
0%

CPT-07

CPT-05A

CPT-07
0/30
0%

Sluice Trench and Ballfield East of Sluice Trench

KIF-BF-CPT-3A

CPT-04A

CPT-03C

East Dike

CPT-02D

CPT-01B

Exhibit No.
D.2

Title
Selected Soundings for Liquefaction Analysis

Client/Project
Tennessee Valley Authority
Kingston Fossil Plant (KIF) TDEC Order

Project Location
Roane County, Tennessee

175668043
Prepared by MB on 2021-10-11
Technical Review by ND on 2021-10-11

0 100 200 300 400 Feet
1:1,200 (At original document size of 22x34)

Legend

- Existing Sounding (CPT)
- 2018 Imagery Boundary
- CCR Unit Area (Approximate)
- Engineered Wetlands (Approximate)
- Polishing Pond (Approximate)

Notes

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2. Imagery provided by TVA and flown by Tuck Mapping on March 16, 2017; 2018 Imagery provided by TVA and is dated September 12, 2018

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3.5.4 Bottom Ash

3.5.4.1 Plan View

All Borings Bottom Ash
1 Hz Design Earthquake

LEGEND:
BORING ID
No. of Samples with $FS_{liq} \leq 1.4$ / No. of Samples in Material
Percentage of Samples with $FS_{liq} \leq 1.4$

N

KRP Ash Landfill
Interim Ash Staging Area
Polishing Pond
Engineered Wetlands
East Dike
Sluice Trench and Ballfield East of Sluice Trench

MacB-35
B-35
1/3
33%
KIF-BF-SPT-5
1/7
14%
KIF-BF-SPT-5
KIF-BF-SPT-2
0/5
0%
KIF-BF-SPT-2
B-39
1/5
20%
MacB-39
B-1
0/11
0%
B-1
KIF-BF-SPT-3
KIF-B13
B-2
B-3
KIF-B14
KIF-B15
KIF-B16
A-1
0/9
0%
A-1
A-2
A-2
0/1
0%
KIF-B09
A-3
KIF-B10
KIF-B11
KIF-B12
KIF-B05
KIF-B06
KIF-B07
KIF-B08
D-1
D-2
STN-51
C-1
C-2
STN-50

Exhibit No.
D.1

Title
Selected Borings for Liquefaction Analysis

Client/Project
Tennessee Valley Authority
Kingston Fossil Plant (KIF) TDEC Order

Project Location
Roane County, Tennessee

175668043
Prepared by MB on 2021-10-11
Technical Review by ND on 2021-10-11

0 100 200 300 400 Feet
1:1,200 (At original document size of 22x34)

Legend

- Existing Borings
- 2018 Imagery Boundary
- CCR Unit Area (Approximate)
- Engineered Wetlands (Approximate)
- Polishing Pond (Approximate)

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
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All Soundings Bottom Ash
1 Hz Design Earthquake

LEGEND:
CPT ID
No. of Samples with $FS_{liq} \leq 1.4$ / No. of Samples in Material
Percentage of Samples with $FS_{liq} \leq 1.4$

N

KRP Ash Landfill

Interim Ash Staging Area

KIF-BF-CPT-4AA
0/10
0%

KIF-BF-CPT-4AA

Polishing Pond

KIF-BF-CPT-5B
0/134
0%

KIF-BF-CPT-5B
KIF-BF-CPT-2

KIF-BF-CPT-2
0/134
0%

Engineered Wetlands

CPT-07

CPT-05A

Sluice Trench and Ballfield East of Sluice Trench

KIF-BF-CPT-3A

CPT-04A

CPT-03C

East Dike

CPT-02D
0/12
0%

CPT-02D

CPT-01B
0/12
0%

CPT-01B

0 100 200 300 400 Feet

1:1,200 (At original document size of 22x34)

Legend

- Existing Sounding (CPT)
- 2018 Imagery Boundary
- CCR Unit Area (Approximate)
- Engineered Wetlands (Approximate)
- Polishing Pond (Approximate)

Exhibit No.
D.2

Title
Selected Soundings for Liquefaction Analysis

Client/Project
Tennessee Valley Authority
Kingston Fossil Plant (KIF) TDEC Order

Project Location
Roane County, Tennessee

175668043
Prepared by MB on 2021-10-11
Technical Review by ND on 2021-10-11

Notes

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TVA

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All Borings Bottom Ash
10 Hz Design Earthquake

LEGEND:
BORING ID
No. of Samples with $FS_{liq} \leq 1.4$ / No. of Samples in Material
Percentage of Samples with $FS_{liq} \leq 1.4$

N

KRP Ash Landfill
Interim Ash Staging Area
Polishing Pond
Engineered Wetlands
East Dike
Sluice Trench and Ballfield East of Sluice Trench

MacB-35
B-35
1/3
33%
KIF-BF-SPT-5
1/7
14%
KIF-BF-SPT-5
KIF-BF-SPT-2
0/5
0%
KIF-BF-SPT-2
B-39
2/5
40%
MacB-39
B-1
1/11
9%
B-1
KIF-BF-SPT-3
KIF-B13
B-2
B-3
KIF-B14
KIF-B15
KIF-B16
A-1
0/9
0%
A-1
A-2
0/1
0%
A-2
KIF-B09
A-3
KIF-B10
KIF-B11
KIF-B12
KIF-B05
KIF-B06
KIF-B07
KIF-B08
D-1
D-2
STN-51
C-1
C-2
STN-50

Exhibit No.
D.1

Title
Selected Borings for Liquefaction Analysis

Client/Project
Tennessee Valley Authority
Kingston Fossil Plant (KIF) TDEC Order

Project Location
Roane County, Tennessee

175668043
Prepared by MB on 2021-10-11
Technical Review by ND on 2021-10-11

0 100 200 300 400 Feet
1:1,200 (At original document size of 22x34)

Legend

- Existing Borings
- 2018 Imagery Boundary
- CCR Unit Area (Approximate)
- Engineered Wetlands (Approximate)
- Polishing Pond (Approximate)

Notes

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All Soundings Bottom Ash
10 Hz Design Earthquake

LEGEND:
CPT ID
No. of Samples with $FS_{liq} \leq 1.4$ / No. of Samples in Material
Percentage of Samples with $FS_{liq} \leq 1.4$

N

Interim Ash Staging Area

KRP Ash Landfill

KIF-BF-CPT-4AA
1/10
10%

KIF-BF-CPT-4AA

Polishing Pond

KIF-BF-CPT-5B
16/134
12%

KIF-BF-CPT-5B
KIF-BF-CPT-2

KIF-BF-CPT-2
2/134
1%

Engineered Wetlands

CPT-07

CPT-05A

Sluice Trench and Ballfield East of Sluice Trench

KIF-BF-CPT-3A

CPT-04A

CPT-03C

East Dike

CPT-02D
0/12
0%

CPT-02D

CPT-01B
0/12
0%

CPT-01B

Exhibit No.
D.2

Title
Selected Soundings for Liquefaction Analysis

Client/Project
Tennessee Valley Authority
Kingston Fossil Plant (KIF) TDEC Order

Project Location
Roane County, Tennessee

175668043
Prepared by MB on 2021-10-11
Technical Review by ND on 2021-10-11

0 100 200 300 400 Feet
1:1,200 (At original document size of 22x34)

Legend

- Existing Sounding (CPT)
- 2018 Imagery Boundary
- CCR Unit Area (Approximate)
- Engineered Wetlands (Approximate)
- Polishing Pond (Approximate)

Notes

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3.5.5 Sediment

3.5.5.1 Plan View

All Borings Sediment
1 Hz Design Earthquake

LEGEND:
BORING ID
No. of Samples with $FS_{liq} \leq 1.4$ / No. of Samples in Material
Percentage of Samples with $FS_{liq} \leq 1.4$

N

KRP Ash Landfill
Interim Ash Staging Area
Polishing Pond
Engineered Wetlands
Sluice Trench and Ballfield East of Sluice Trench
East Dike

MacB-35
MacB-39
KIF-BF-SPT-5
KIF-BF-SPT-2
KIF-BF-SPT-3
D-1
D-2
STN-51
C-1
C-2
STN-50
KIF-B13
B-1
B-2
B-3
KIF-B14
KIF-B15
KIF-B16
KIF-B14 2/2 100%
KIF-B15 1/1 100%
KIF-B16 1/1 100%
A-1
A-2
A-3
KIF-B09
KIF-B10
KIF-B11
KIF-B12
KIF-B10 3/3 100%
KIF-B11 1/1 100%
KIF-B05
KIF-B06
KIF-B07
KIF-B08
KIF-B06 3/3 100%
KIF-B07 4/4 100%
KIF-B08 5/5 100%

Exhibit No.
D.1

Title
Selected Borings for Liquefaction Analysis

Client/Project
Tennessee Valley Authority
Kingston Fossil Plant (KIF) TDEC Order

Project Location
Roane County, Tennessee

175668043
Prepared by MB on 2021-10-11
Technical Review by ND on 2021-10-11

0 100 200 300 400 Feet
1:1,200 (At original document size of 22x34)

Legend

- Existing Borings
- 2018 Imagery Boundary
- CCR Unit Area (Approximate)
- Engineered Wetlands (Approximate)
- Polishing Pond (Approximate)

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Imagery provided by TVA and flown by Tuck Mapping on March 16, 2017; 2018 Imagery provided by TVA and is dated September 12, 2018

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All Borings Sediment
10 Hz Design Earthquake

LEGEND:
BORING ID
No. of Samples with $FS_{liq} \leq 1.4$ / No. of Samples in Material
Percentage of Samples with $FS_{liq} \leq 1.4$

N

KRP Ash Landfill
Interim Ash Staging Area
Polishing Pond
Engineered Wetlands
Sluice Trench and Ballfield East of Sluice Trench
East Dike

MacB-35
MacB-39
KIF-BF-SPT-5
KIF-BF-SPT-2
KIF-BF-SPT-3
D-1
D-2
STN-51
C-1
C-2
STN-50
KIF-B13
B-1
B-2
B-3
KIF-B14
KIF-B15
KIF-B16
KIF-B14 2/2 100%
KIF-B15 1/1 100%
KIF-B16 1/1 100%
A-1
A-2
A-3
KIF-B09
KIF-B10
KIF-B11
KIF-B12
KIF-B10 3/3 100%
KIF-B11 1/1 100%
KIF-B05
KIF-B06
KIF-B07
KIF-B08
KIF-B06 3/3 100%
KIF-B07 4/4 100%
KIF-B08 5/5 100%

Exhibit No.
D.1

Title
Selected Borings for Liquefaction Analysis

Client/Project
Tennessee Valley Authority
Kingston Fossil Plant (KIF) TDEC Order

Project Location
Roane County, Tennessee

175668043
Prepared by MB on 2021-10-11
Technical Review by ND on 2021-10-11

0 100 200 300 400 Feet
1:1,200 (At original document size of 22x34)

Legend

- Existing Borings
- 2018 Imagery Boundary
- CCR Unit Area (Approximate)
- Engineered Wetlands (Approximate)
- Polishing Pond (Approximate)

Notes

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3.5.6 Subunit 1

3.5.6.1 Plan View

All Borings Subunit 1
1 Hz Design Earthquake

LEGEND:
BORING ID
No. of Samples with $FS_{liq} \leq 1.4$ / No. of Samples in Material
Percentage of Samples with $FS_{liq} \leq 1.4$

N

KRP Ash Landfill
Interim Ash Staging Area
Polishing Pond
Engineered Wetlands
Sluice Trench and Ballfield East of Sluice Trench
East Dike

MacB-35
B-35 0/2 0%
B-39 0/1 0%
MacB-39
KIF-BF-SPT-5
KIF-BF-SPT-2
KIF-BF-SPT-3
KIF-B13
B-1
B-2
B-3
KIF-B14
KIF-B15
KIF-B16
C-1 0/10 0%
STN-51 0/2 0%
D-1 0/8 0%
C-2 0/10 0%
STN-50 0/2 0%
D-1
D-2
STN-51
C-1
C-2
STN-50
A-1 0/5 0%
A-2 0/6 0%
A-3 0/5 0%
KIF-B09 1/3 33%
KIF-B10 2/5 40%
KIF-B11 0/4 0%
KIF-B12 0/3 0%
A-1
A-2
A-3
KIF-B09
KIF-B10
KIF-B11
KIF-B12
KIF-B05
KIF-B05 0/5 0%
KIF-B06 0/3 0%
KIF-B07 0/1 0%
KIF-B08 0/2 0%
KIF-B06
KIF-B07
KIF-B08

Exhibit No.
D.1

Title
Selected Borings for Liquefaction Analysis

Client/Project
Tennessee Valley Authority
Kingston Fossil Plant (KIF) TDEC Order

Project Location
Roane County, Tennessee

175668043
Prepared by MB on 2021-10-11
Technical Review by ND on 2021-10-11

0 100 200 300 400 Feet
1:1,200 (At original document size of 22x34)

Legend

- Existing Borings
- 2018 Imagery Boundary
- CCR Unit Area (Approximate)
- Engineered Wetlands (Approximate)
- Polishing Pond (Approximate)

Notes

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2. Imagery provided by TVA and flown by Tuck Mapping on March 16, 2017; 2018 Imagery provided by TVA and is dated September 12, 2018

Stantec TVA

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All Soundings Subunit 1
1 Hz Design Earthquake

LEGEND:
CPT ID
No. of Samples with $FS_{liq} \leq 1.4$ / No. of Samples in Material
Percentage of Samples with $FS_{liq} \leq 1.4$

N

KRP Ash Landfill
Interim Ash Staging Area
Polishing Pond
Engineered Wetlands
Sluice Trench and Ballfield East of Sluice Trench
East Dike

KIF-BF-CPT-4AA
KIF-BF-CPT-5B
KIF-BF-CPT-2
CPT-07
CPT-05A
KIF-BF-CPT-3A
CPT-04A
CPT-03C
0/17
0%
CPT-03C
CPT-02D
0/55
0%
CPT-02D
CPT-01B

Exhibit No.
D.2

Title
Selected Soundings for Liquefaction Analysis

Client/Project
Tennessee Valley Authority
Kingston Fossil Plant (KIF) TDEC Order

Project Location
Roane County, Tennessee

175668043
Prepared by MB on 2021-10-11
Technical Review by ND on 2021-10-11

0 100 200 300 400 Feet
1:1,200 (At original document size of 22x34)

Legend

- Existing Sounding (CPT)
- 2018 Imagery Boundary
- CCR Unit Area (Approximate)
- Engineered Wetlands (Approximate)
- Polishing Pond (Approximate)

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Imagery provided by TVA and flown by Tuck Mapping on March 16, 2017; 2018 Imagery provided by TVA and is dated September 12, 2018

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All Borings Subunit 1
10 Hz Design Earthquake

LEGEND:
BORING ID
No. of Samples with $FS_{liq} \leq 1.4$ / No. of Samples in Material
Percentage of Samples with $FS_{liq} \leq 1.4$

N

KRP Ash Landfill
Interim Ash Staging Area
Polishing Pond
Engineered Wetlands
Sluice Trench and Ballfield East of Sluice Trench
East Dike

MacB-35
B-35 0/2 0%
B-39 0/1 0%
MacB-39
KIF-BF-SPT-5
KIF-BF-SPT-2
KIF-BF-SPT-3
B-1
B-2
B-3
KIF-B13
KIF-B14
KIF-B15
KIF-B16
D-1 0/8 0%
D-1
D-2
STN-51 0/2 0%
STN-51
C-1 0/10 0%
C-1
C-2 0/10 0%
C-2
STN-50
STN-50 0/2 0%
A-1 0/5 0%
A-1
A-2 0/6 0%
A-2
A-3 0/5 0%
A-3
KIF-B09 1/3 33%
KIF-B09
KIF-B10 2/5 40%
KIF-B10
KIF-B11 0/4 0%
KIF-B11
KIF-B12 0/3 0%
KIF-B12
KIF-B05 0/5 0%
KIF-B05
KIF-B06 0/3 0%
KIF-B06
KIF-B07 0/1 0%
KIF-B07
KIF-B08 0/2 0%
KIF-B08

Exhibit No.
D.1

Title
Selected Borings for Liquefaction Analysis

Client/Project
Tennessee Valley Authority
Kingston Fossil Plant (KIF) TDEC Order

Project Location
Roane County, Tennessee

175668043
Prepared by MB on 2021-10-11
Technical Review by ND on 2021-10-11

0 100 200 300 400 Feet
1:1,200 (At original document size of 22x34)

Legend

- Existing Borings
- 2018 Imagery Boundary
- CCR Unit Area (Approximate)
- Engineered Wetlands (Approximate)
- Polishing Pond (Approximate)

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Imagery provided by TVA and flown by Tuck Mapping on March 16, 2017; 2018 Imagery provided by TVA and is dated September 12, 2018

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All Soundings Subunit 1
10 Hz Design Earthquake

LEGEND:
CPT ID
No. of Samples with $FS_{liq} \leq 1.4$ / No. of Samples in Material
Percentage of Samples with $FS_{liq} \leq 1.4$

N

KRP Ash Landfill
Interim Ash Staging Area
Polishing Pond
Engineered Wetlands
Sluice Trench and Ballfield East of Sluice Trench
East Dike

KIF-BF-CPT-4AA
KIF-BF-CPT-5B
KIF-BF-CPT-2
CPT-07
CPT-05A
KIF-BF-CPT-3A
CPT-04A
CPT-03C
0/17
0%
CPT-03C
CPT-02D
0/55
0%
CPT-02D
CPT-01B

Exhibit No.
D.2

Title
Selected Soundings for Liquefaction Analysis

Client/Project
Tennessee Valley Authority
Kingston Fossil Plant (KIF) TDEC Order

Project Location
Roane County, Tennessee

175668043
Prepared by MB on 2021-10-11
Technical Review by ND on 2021-10-11

0 100 200 300 400 Feet
1:1,200 (At original document size of 22x34)

Legend

- Existing Sounding (CPT)
- 2018 Imagery Boundary
- CCR Unit Area (Approximate)
- Engineered Wetlands (Approximate)
- Polishing Pond (Approximate)

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Imagery provided by TVA and flown by Tuck Mapping on March 16, 2017; 2018 Imagery provided by TVA and is dated September 12, 2018

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3.5.7 Subunit 2

3.5.7.1 Plan View

All Borings Subunit 2
1 Hz Design Earthquake

LEGEND:
BORING ID
No. of Samples with $FS_{liq} \leq 1.4$ / No. of Samples in Material
Percentage of Samples with $FS_{liq} \leq 1.4$

N

KRP Ash Landfill
Interim Ash Staging Area
Polishing Pond
Engineered Wetlands
Sluice Trench and Ballfield East of Sluice Trench
East Dike

MacB-35
B-35 1/1 100%
MacB-39
B-39 2/2 100%
KIF-BF-SPT-5
KIF-BF-SPT-5 4/4 100%
KIF-BF-SPT-2
KIF-BF-SPT-2 1/3 33%
KIF-BF-SPT-3
KIF-BF-SPT-3 2/3 67%
B-1
B-1 6/11 54%
KIF-B13
KIF-B13 4/6 67%
KIF-BF-SPT-3
B-2
B-2 6/9 67%
KIF-B14
KIF-B14 2/4 50%
KIF-B14
KIF-B15
KIF-B15 2/3 67%
KIF-B15
KIF-B16
KIF-B16 1/2 50%
B-3
B-3 1/4 25%
A-1
A-1 3/7 43%
A-2
A-2 3/6 50%
KIF-B09
A-3
KIF-B10
KIF-B10 1/1 100%
KIF-B11
KIF-B11 1/1 100%
KIF-B09 1/2 50%
KIF-B10
KIF-B12
KIF-B11
KIF-B12 1/1 100%
KIF-B05
KIF-B06
KIF-B07
KIF-B08
KIF-B06 1/2 50%
KIF-B07 1/3 33%
KIF-B08 0/1 0%
D-1
D-1 5/13 39%
D-2
D-2 1/4 25%
C-1
STN-51
C-2
STN-50
C-2 6/9 67%

Exhibit No.
D.1

Title
Selected Borings for Liquefaction Analysis

Client/Project
Tennessee Valley Authority
Kingston Fossil Plant (KIF) TDEC Order

Project Location
Roane County, Tennessee

175668043
Prepared by MB on 2021-10-11
Technical Review by ND on 2021-10-11

0 100 200 300 400 Feet
1:1,200 (At original document size of 22x34)

Legend

- Existing Borings
- 2018 Imagery Boundary
- CCR Unit Area (Approximate)
- Engineered Wetlands (Approximate)
- Polishing Pond (Approximate)

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Imagery provided by TVA and flown by Tuck Mapping on March 16, 2017; 2018 Imagery provided by TVA and is dated September 12, 2018

Stantec TVA

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All Soundings Subunit 2
1 Hz Design Earthquake

LEGEND:
CPT ID
No. of Samples with $FS_{liq} \leq 1.4$ / No. of Samples in Material
Percentage of Samples with $FS_{liq} \leq 1.4$

N

KRP Ash Landfill

Interim Ash Staging Area

KIF-BF-CPT-4AA
103/235
44%

KIF-BF-CPT-4AA

Polishing Pond

KIF-BF-CPT-5B
78/91
86%

KIF-BF-CPT-5B

KIF-BF-CPT-2
82/91
90%

KIF-BF-CPT-2

Engineered Wetlands

CPT-05A
65/70
93%

CPT-07

KIF-BF-CPT-3A
57/91
63%

CPT-05A

Sluice Trench and Ballfield East of Sluice Trench

KIF-BF-CPT-3A

CPT-04A
67/82
82%

CPT-04A

CPT-03C
65/74
88%

CPT-03C

East Dike

CPT-02D
53/55
96%

CPT-02D

CPT-01B

Exhibit No.
D.2

Title
Selected Soundings for Liquefaction Analysis

Client/Project
Tennessee Valley Authority
Kingston Fossil Plant (KIF) TDEC Order

Project Location
Roane County, Tennessee

175668043
Prepared by MB on 2021-10-11
Technical Review by ND on 2021-10-11

0 100 200 300 400 Feet
1:1,200 (At original document size of 22x34)

Legend

- Existing Sounding (CPT)
- 2018 Imagery Boundary
- CCR Unit Area (Approximate)
- Engineered Wetlands (Approximate)
- Polishing Pond (Approximate)

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
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All Borings Subunit 2
10 Hz Design Earthquake

LEGEND:
BORING ID
No. of Samples with $FS_{liq} \leq 1.4$ / No. of Samples in Material
Percentage of Samples with $FS_{liq} \leq 1.4$

N

KRP Ash Landfill
Interim Ash Staging Area
Polishing Pond
Engineered Wetlands
Sluice Trench and Ballfield East of Sluice Trench
East Dike

MacB-35
B-35 1/1 100%
MacB-39
B-39 2/2 100%
KIF-BF-SPT-5
KIF-BF-SPT-5 4/4 100%
KIF-BF-SPT-2
KIF-BF-SPT-2 3/3 100%
KIF-BF-SPT-3
KIF-BF-SPT-3 3/3 100%
B-1
B-1 9/11 82%
KIF-B13
KIF-B13 6/6 100%
B-2
B-2 9/9 100%
B-3
B-3 1/4 25%
KIF-B14
KIF-B14 2/4 50%
KIF-B15
KIF-B15 3/3 100%
KIF-B16
KIF-B16 2/2 100%
A-1
A-1 5/7 71%
A-2
A-2 5/6 83%
A-3
KIF-B09
KIF-B09 2/2 100%
KIF-B10
KIF-B10 1/1 100%
KIF-B11
KIF-B11 1/1 100%
KIF-B12
KIF-B12 1/1 100%
KIF-B05
KIF-B06
KIF-B06 2/2 100%
KIF-B07
KIF-B07 1/3 33%
KIF-B08
KIF-B08 1/1 100%
D-1
D-1 6/13 46%
D-2
D-2 2/4 50%
STN-51
C-1
C-2
STN-50
C-2 8/9 89%

Exhibit No.
D.1

Title
Selected Borings for Liquefaction Analysis

Client/Project
Tennessee Valley Authority
Kingston Fossil Plant (KIF) TDEC Order

Project Location
Roane County, Tennessee

175668043
Prepared by MB on 2021-10-11
Technical Review by ND on 2021-10-11

0 100 200 300 400 Feet
1:1,200 (At original document size of 22x34)

Legend

- Existing Borings
- 2018 Imagery Boundary
- CCR Unit Area (Approximate)
- Engineered Wetlands (Approximate)
- Polishing Pond (Approximate)

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Imagery provided by TVA and flown by Tuck Mapping on March 16, 2017; 2018 Imagery provided by TVA and is dated September 12, 2018

Stantec TVA

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All Soundings Subunit 2
10 Hz Design Earthquake

LEGEND:
CPT ID
No. of Samples with $FS_{liq} \leq 1.4$ / No. of Samples in Material
Percentage of Samples with $FS_{liq} \leq 1.4$

N

KRP Ash Landfill

Interim Ash Staging Area

KIF-BF-CPT-4AA
136/235
58%

KIF-BF-CPT-4AA

Polishing Pond

KIF-BF-CPT-5B
91/91
100%

KIF-BF-CPT-5B

KIF-BF-CPT-2
91/91
100%

KIF-BF-CPT-2

Engineered Wetlands

CPT-05A
70/70
100%

CPT-07

KIF-BF-CPT-3A
89/91
98%

CPT-05A

Sluice Trench and Ballfield East of Sluice Trench

KIF-BF-CPT-3A

CPT-04A
82/82
100%

CPT-04A

CPT-03C
74/74
100%

CPT-03C

East Dike

CPT-02D
55/55
100%

CPT-02D

CPT-01B

Exhibit No.
D.2

Title
Selected Soundings for Liquefaction Analysis

Client/Project
Tennessee Valley Authority
Kingston Fossil Plant (KIF) TDEC Order

Project Location
Roane County, Tennessee

175668043
Prepared by MB on 2021-10-11
Technical Review by ND on 2021-10-11

0 100 200 300 400 Feet
1:1,200 (At original document size of 22x34)

Legend

- Existing Sounding (CPT)
- 2018 Imagery Boundary
- CCR Unit Area (Approximate)
- Engineered Wetlands (Approximate)
- Polishing Pond (Approximate)

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Imagery provided by TVA and flown by Tuck Mapping on March 16, 2017; 2018 Imagery provided by TVA and is dated September 12, 2018

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3.5.8 Subunit 3

3.5.8.1 Plan View

All Borings Subunit 3
1 Hz Design Earthquake

LEGEND:
BORING ID
No. of Samples with $FS_{liq} \leq 1.4$ / No. of Samples in Material
Percentage of Samples with $FS_{liq} \leq 1.4$

N

KRP Ash Landfill
Interim Ash Staging Area
Polishing Pond
Engineered Wetlands
Sluice Trench and Ballfield East of Sluice Trench
East Dike

MacB-35
B-35 2/2 100%
B-39 0/1 0%
MacB-39
KIF-BF-SPT-5 1/1 100%
KIF-BF-SPT-5
KIF-BF-SPT-2 0/2 0%
KIF-BF-SPT-2
KIF-BF-SPT-3 1/2 50%
B-1 0/1 0%
B-1
KIF-BF-SPT-3
KIF-B13 0/2 0%
KIF-B13
B-2 1/6 17%
B-2
KIF-B14 2/3 67%
KIF-B14
KIF-B15 2/3 67%
KIF-B15
KIF-B16
B-3
B-3 1/6 17%
KIF-B16 3/3 100%
A-1 0/1 0%
A-1
A-2 0/1 0%
A-2
KIF-B09 0/1 0%
KIF-B09
A-3
KIF-B10 2/2 100%
A-3 4/10 40%
KIF-B11 1/2 50%
KIF-B10
KIF-B12
KIF-B11
KIF-B12 1/2 50%
KIF-B05
KIF-B06
KIF-B07
KIF-B08
KIF-B06 1/1 100%
KIF-B07 0/1 0%
KIF-B08 0/1 0%
D-1 3/3 100%
D-1
D-2
D-2 11/19 58%
C-1 9/10 90%
C-1
STN-51
STN-51 8/13 62%
C-2
STN-50
STN-50 4/9 44%
C-2 2/6 33%

Exhibit No.
D.1

Title
Selected Borings for Liquefaction Analysis

Client/Project
Tennessee Valley Authority
Kingston Fossil Plant (KIF) TDEC Order

Project Location
Roane County, Tennessee

175668043
Prepared by MB on 2021-10-11
Technical Review by ND on 2021-10-11

0 100 200 300 400 Feet
1:1,200 (At original document size of 22x34)

Legend

- Existing Borings
- 2018 Imagery Boundary
- CCR Unit Area (Approximate)
- Engineered Wetlands (Approximate)
- Polishing Pond (Approximate)

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Imagery provided by TVA and flown by Tuck Mapping on March 16, 2017; 2018 Imagery provided by TVA and is dated September 12, 2018

Stantec TVA

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All Soundings Subunit 3
1 Hz Design Earthquake

LEGEND:
CPT ID
No. of Samples with $FS_{liq} \leq 1.4$ / No. of Samples in Material
Percentage of Samples with $FS_{liq} \leq 1.4$

N

KRP Ash Landfill
Interim Ash Staging Area
Polishing Pond
Engineered Wetlands
Sluice Trench and Ballfield East of Sluice Trench
East Dike

KIF-BF-CPT-4AA
0/31
0%

KIF-BF-CPT-5B
21/80
26%

KIF-BF-CPT-2
25/29
86%

CPT-05A
48/72
67%

KIF-BF-CPT-3A
32/55
58%

CPT-04A
6/28
21%

CPT-03C
16/33
48%

CPT-02D
1/18
6%

KIF-BF-CPT-4AA
KIF-BF-CPT-5B
KIF-BF-CPT-2
CPT-07
CPT-05A
KIF-BF-CPT-3A
CPT-04A
CPT-03C
CPT-02D
CPT-01B

Exhibit No.
D.2

Title
Selected Soundings for Liquefaction Analysis

Client/Project
Tennessee Valley Authority
Kingston Fossil Plant (KIF) TDEC Order

Project Location
Roane County, Tennessee

175668043
Prepared by MB on 2021-10-11
Technical Review by ND on 2021-10-11

0 100 200 300 400 Feet
1:1,200 (At original document size of 22x34)

Legend

- Existing Sounding (CPT)
- 2018 Imagery Boundary
- CCR Unit Area (Approximate)
- Engineered Wetlands (Approximate)
- Polishing Pond (Approximate)

Notes

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All Borings Subunit 3
10 Hz Design Earthquake

LEGEND:
BORING ID
No. of Samples with $FS_{liq} \leq 1.4$ / No. of Samples in Material
Percentage of Samples with $FS_{liq} \leq 1.4$

N

KRP Ash Landfill
Interim Ash Staging Area
Polishing Pond
Engineered Wetlands
Sluice Trench and Ballfield East of Sluice Trench
East Dike

MacB-35
B-35 2/2 100%
B-39 0/1 0%
MacB-39
KIF-BF-SPT-5 1/1 100%
KIF-BF-SPT-5
KIF-BF-SPT-2 2/2 100%
KIF-BF-SPT-2
KIF-BF-SPT-3 1/2 50%
KIF-BF-SPT-3
B-1 1/1 0%
B-1
KIF-B13 0/2 0%
KIF-B13
B-2 1/6 17%
B-2
KIF-B14 3/3 100%
KIF-B14
KIF-B15 2/3 67%
KIF-B15
KIF-B16 3/3 100%
KIF-B16
B-3 4/6 67%
B-3
A-1 0/1 0%
A-1
KIF-B09 0/1 0%
KIF-B09
A-2 0/1 0%
A-2
KIF-B10 2/2 100%
KIF-B10
A-3 4/10 40%
A-3
KIF-B11 1/2 50%
KIF-B11
KIF-B12 1/2 50%
KIF-B12
KIF-B05
KIF-B06 1/1 100%
KIF-B06
KIF-B07 0/1 0%
KIF-B07
KIF-B08 0/1 0%
KIF-B08
D-1 3/3 100%
D-1
D-2 14/19 74%
D-2
C-1 9/10 90%
C-1
STN-51 9/13 69%
STN-51
C-2 2/6 33%
C-2
STN-50 5/9 55%
STN-50

Exhibit No.
D.1

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Tennessee Valley Authority
Kingston Fossil Plant (KIF) TDEC Order

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175668043
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1:1,200 (At original document size of 22x34)

Legend

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All Soundings Subunit 3
10 Hz Design Earthquake

LEGEND:
CPT ID
No. of Samples with $FS_{liq} \leq 1.4$ / No. of Samples in Material
Percentage of Samples with $FS_{liq} \leq 1.4$

N

KRP Ash Landfill
Interim Ash Staging Area
Polishing Pond
Engineered Wetlands
Sluice Trench and Ballfield East of Sluice Trench
East Dike

KIF-BF-CPT-4AA
27/31
87%

KIF-BF-CPT-5B
43/80
54%

KIF-BF-CPT-2
27/29
93%

CPT-05A
61/72
85%

KIF-BF-CPT-3A
40/55
73%

CPT-04A
18/28
64%

CPT-03C
31/33
94%

CPT-02D
6/18
33%

KIF-BF-CPT-4AA
KIF-BF-CPT-5B
KIF-BF-CPT-2
CPT-07
CPT-05A
KIF-BF-CPT-3A
CPT-04A
CPT-03C
CPT-02D
CPT-01B

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Notes

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3.5.9 Gravel Residuum

3.5.9.1 Plan View

All Borings Gravel Residuum
1 Hz Design Earthquake

LEGEND:
BORING ID
No. of Samples with $FS_{liq} \leq 1.4$ / No. of Samples in Material
Percentage of Samples with $FS_{liq} \leq 1.4$

N

KRP Ash Landfill
Interim Ash Staging Area
Polishing Pond
Engineered Wetlands
Sluice Trench and Ballfield East of Sluice Trench
East Dike

MacB-35
MacB-39
KIF-BF-SPT-5
KIF-BF-SPT-2
KIF-BF-SPT-3
KIF-B13
B-1
B-2
B-3
KIF-B14
0/3
0%
KIF-B15
KIF-B16
D-1
D-2
STN-51
C-1
C-2
STN-50
A-1
A-2
A-3
KIF-B09
KIF-B10
KIF-B11
KIF-B12
KIF-B05
KIF-B06
KIF-B07
KIF-B08

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- Existing Borings
- 2018 Imagery Boundary
- CCR Unit Area (Approximate)
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- Polishing Pond (Approximate)

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All Borings Gravel Residuum
10 Hz Design Earthquake

LEGEND:
BORING ID
No. of Samples with $FS_{liq} \leq 1.4$ / No. of Samples in Material
Percentage of Samples with $FS_{liq} \leq 1.4$

N

KRP Ash Landfill
Interim Ash Staging Area
Polishing Pond
Engineered Wetlands
Sluice Trench and Ballfield East of Sluice Trench
East Dike

MacB-35
MacB-39
KIF-BF-SPT-5
KIF-BF-SPT-2
KIF-BF-SPT-3
KIF-B13
KIF-B14
0/3
0%
KIF-B15
KIF-B16
B-1
B-2
B-3
D-1
D-2
STN-51
C-1
C-2
STN-50
A-1
A-2
A-3
KIF-B09
KIF-B10
KIF-B11
KIF-B12
KIF-B05
KIF-B06
KIF-B07
KIF-B08

Exhibit No.
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Legend

- Existing Borings
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Notes

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3.6 SAMPLE CALCULATIONS

3.6.1 SPT Liquefaction Sample Calculation

SPT Liquefaction Analysis, Example Calculation

An example calculation for the factor of safety against liquefaction at a SPT sample point follows. Inputs and calculations are grouped by the sheets on which they appear in the calculation workbooks. A brief description is provided for each calculation/variable definition. Additionally, the cell reference associated with the calculation/definition is provided.

Example Calculations

Workbook Name: MCE-New Madrid_SiSALT_SPT_BEH-B1.xlsm
Workbook Sheet Name: Inputs & Constants
Calculations are not performed in this sheet; however, all inputs from field and laboratory data and ground response analyses are keyed-in here.

Calculation/Variable Definition:	Description:	Cell Location
Generic Inputs: **The following are keyed in for each boring**		
tsf := 2000psf	Variable definition for Mathcad calculations. No associated location in workbook.	
BoringID:= "BEH-B1"	The Stantec boring ID associated with the calculation.	B2
ID := 4.25in	The inside diameter of the boring.	B14
El_{TOH} := 476.6ft	The top of hole elevation of the boring during drilling.	B15
$D_{H20,drilling}$:= 20.5ft	The depth to water during drilling. Typically estimated from seepage analyses rather than field-measured values.	B16
$D_{samplingBegan}$:= 0.0ft	The depth SPT sampling began.	B17
$\gamma_{above1stSPT}$:= 0pcf	The total unit weight of material located above the first SPT sample.	B18
AssumedRodStickup:= 5ft	The assumed rod stickup during SPT testing.	B19
FvMethod := 1	Cell used to specify if the hammer efficiency measurement was based on the Fv method. A value of 1 indicates "Yes"; a value of 0 indicates "No". A value of 1 here results in a value of 1 for the "Rod Length Correction" value in sheet "part1".	B20
SampleLiners := 0	Cell used to specify if the SPT sampler contained liners. A value of 1 indicates "Yes"; a value of 0 indicates "No".	B21
$D_{H20,EQ}$:= 20.5ft	The depth to water (relative to the SPT top of hole) during the earthquake.	B24
$El_{FinalGrade}$:= 476.6ft	Final grade surface elevation during earthquake at the SPT boring location.	B25
$\gamma_{cut/fill}$:= 0pcf	Average unit weight of cut/fill to achieve final grade. Value is 0 if the final grade is unchanged from the grade during drilling.	B26

NonlinearPWP := 0	Cell used to specify if nonlinear pore water pressure distributions are used in the analysis. A value of 1 indicates Yes; a value of 0 indicates No. If 1 is keyed in, pore water pressure during drilling and during earthquake must be keyed in for each sample.	B29
AlphaAtEachSample := 1	Cell used to specify if alpha values at each sample depth are known. A value of 1 indicates "Yes"; a value of 0 indicates "No". If 1 is keyed in, alpha values must be keyed in for each sample. If 0 is keyed in, curve fit parameters must be keyed in for each sample.	B34
CSRFromShearStress := 0	Cell used to specify if CSR will be calculated from shear stress envelopes. A value of 1 indicates Yes"; a value of 0 indicates "No". If 1 is keyed in, shear stress values or curve fits must be keyed in. If 0 is keyed in, CSR will be calculated using rd method.	B45
$K_o := 0.5$	At rest lateral earth pressure coefficient.	X47 (Hidden)
$a_{max} := 0.4333g$	Peak ground acceleration at ground surface, from ground response analysis.	B58
$M_w := 7.8$	Magnitude (Mw) of analyzed earthquake.	B59
$\gamma_w := 62.4pcf$	Unit weight of water.	X3 (Hidden)
$p_a := 1.058tsf$	Atmospheric pressure.	X8 (Hidden)

Sample Inputs:
The following information is keyed in for each SPT sample.

$D_{aboveSample} := 27.3ft$	The depth of the sample immediately above the sample of interest.	E28
$D_{sample} := 28.8ft$	Midpoint depth of the sample of interest.	E29
$D_{belowSample} := 30.3ft$	The depth of the sample immediately below the sample of interest.	E30
$NValue := 12$	SPT N blow count associated with sample.	F29
$E_m := 93.8\%$	The measured or assumed hammer efficiency, for use in blow count correction.	G29
$USCS\_Class := "SM"$	The measured or assumed USCS soil classification associated with the sample.	H29
$FinesContent := 32.4\%$	The measured or assumed fines content associated with the sample.	I29
$\gamma_{sampleAbove} := 122pcf$	The unit weight associated with the sample immediately above the sample of interest.	J28
$\gamma_{sample} := 122pcf$	The unit weight associated with the sample.	J29
$MaterialName := "Abutment sand"$	The material name associated with the sample.	M29
$ClaySandOverride := "Sand-like"$	Must be either "clay-like", "sand-like", or blank. If blank, clay-like or sand-like determination will be made based on soil classification. Overrides are typically keyed-in to account for the results of the clay-like/sand-like determination performed using laboratory and/or CPT data.	N29
$ClayLikeSusc := ""$	Must be "susceptible", "not susceptible", or blank. Value should be blank for sand-like samples. This value is only used in plotting features and not in the calculations presented herein.	O29
$\alpha := 0.018$	Static shear stress ratio associated with the sample. Value is calculated from SIGMA/W data for each sample.	P29

Workbook Sheet Name: part1

Calculations related to stress during sampling, blow count correction, and relative density are located in this sheet. Note that some stress calculations rely on values from adjacent samples. To simplify the presentation of these calculations, stresses and soil thicknesses of adjacent samples are defined here; though, they are calculated in a similar manner to the sample of interest. Some calculations from 'part2' are presented here as they are part of an iterative calculation. The relative state parameter is calculated in this sheet in the workbook; however, it is shown in 'part2' in this example calculation.

Calculation/Variable Definition:	Description:	Cell Location
Generic Calculations:		
The following is calculated for each boring.		
$El_{H20,drilling} := El_{TOH} - D_{H20,drilling}$ $El_{H20,drilling} = 456.1\,ft$	The calculated elevation of the water table during sampling.	H12
$El_{H20,EQ} := El_{TOH} - D_{H20,EQ}$ $El_{H20,EQ} = 456.1\,ft$	The calculated elevation of the water table during the associated earthquake.	H14
$\sigma_{v,above1st,soil,drilling} := \gamma_{above1stSPT} \cdot D_{samplingBegan}$ $\sigma_{v,above1st,soil,drilling} = 0 \cdot tsf$	The calculated total stress due to soil above the 1st SPT.	F16 (Hidden)
$\sigma_{v,H20} := \max\left(0, -1 \cdot D_{H20,drilling} \cdot \gamma_w\right)$ $\sigma_{v,H20} = 0 \cdot tsf$	The calculated total stress due to standing water above the ground surface. Value is 0 if depth to water is positive.	G17 (Hidden)
$\sigma_{v,above1st,drilling} := \sigma_{v,above1st,soil,drilling} + \sigma_{v,H20}$ $\sigma_{v,above1st,drilling} = 0 \cdot tsf$	The calculated total stress due to soil and water above the 1st SPT sample.	H16
$u_{above1st,drilling} := \max\left[0, \left(D_{samplingBegan} - D_{H20,drilling}\right) \cdot \gamma_w\right]$ $u_{above1st,drilling} = 0 \cdot tsf$	The calculated pore water pressure at the depth sampling began.	I16
$\sigma'_{v,above1st,drilling} := \sigma_{v,above1st,drilling} - u_{above1st,drilling}$ $\sigma'_{v,above1st,drilling} = 0 \cdot tsf$	The calculated vertical effective stress at the depth sampling began.	J16

Sample Calculations:
The following information is calculated for each SPT sample.

Calculation/Variable Definition:	Description:	Cell Location
$El_{sample} := El_{TOH} - D_{sample}$	The calculated elevation of the sample.	A33
$El_{sample} := 447.9ft$		
$D_{topInterval} := \frac{(D_{sample} + D_{aboveSample})}{2}$		
$D_{topInterval} := 28ft$	The calculated depth of the top of the "sampling interval", which corresponds to the depth halfway between adjacent samples.	D33 (Hidden)
$D_{bottomInterval} := \frac{(D_{sample} + D_{belowSample})}{2}$		
$D_{bottomInterval} := 29.5ft$	The calculated depth of the bottom of the "sampling interval", which corresponds to the depth halfway between adjacent samples.	D34 (Hidden)
$T_{interval} := D_{bottomInterval} - D_{topInterval}$		
$T_{interval} = 1.5 \cdot ft$	The calculated thickness of the "sampling interval".	E33 (Hidden)
$\sigma_{v,aboveSample,drilling} := 1.79475tsf$	The total stress during drilling at the midpoint of the sample above the sample of interest.	F32
$D_{topInterval,aboveSample} := 26.5ft$	The top of the "sampling interval" of the sample above the sample of interest.	D32 (Hidden)
$T_{interval.aboveSample} := 1.5ft$	The thickness of the "sampling interval" of the sample above the sample of interest.	E32 (Hidden)
$\sigma_{v,soil,sample,drilling} := \sigma_{v,aboveSample,drilling} \cdots + \left[\begin{pmatrix} D_{topInterval,aboveSample} + T_{interval.aboveSample} \cdots \\ + -D_{aboveSample} \end{pmatrix} \cdot \gamma_{sampleAbove} \cdots + \left(D_{sample} - D_{topInterval}\right) \cdot \gamma_{sample} \right]$		
$\sigma_{v,soil,sample,drilling} := 1.88625tsf$	The total stress during drilling due to soil at the midpoint of the sample of interest.	F33 (Hidden)

$\sigma_{v,sample,drilling} := \sigma_{v,soil,sample,drilling} + \sigma_{v,H20}$

$\sigma_{v,sample,drilling} := 1.89tsf$ The total stress during drilling due to soil and standing water at the midpoint of the sample of interest. H33

$u_{sample,drilling} := \max\left(0, D_{sample} - D_{H20,drilling}\right) \cdot \gamma_w$

$u_{sample,drilling} := 0.26tsf$ The pore water pressure during drilling at the midpoint of the sample of interest. I33

$\sigma'_{v,sample,drilling} := \sigma_{v,sample,drilling} - u_{sample,drilling}$

$\sigma'_{v,sample,drilling} = 1.63 \cdot tsf$ The vertical effective stress during drilling at the midpoint of the sample of interest. J33

$$C_B := \text{if}\left(ID > 8in, 1.150, \text{if}\left(ID > 6in, \frac{ID}{in \cdot 20} + 0.75, \text{if}\left(ID > 4.5in, \frac{ID}{in \cdot 30} + .85, 1\right)\right)\right)$$

$C_B = 1$ Borehole diameter correction. M33

$C_R := 1$ Rod length correction. Value is 1 if Fv energy measurement is specified. O33

$$C_E := \frac{E_m}{60\%} = 1.563$$ Hammer energy correction factor Q33

$$\Delta N_{1,60cs} := \exp\left[1.63 - \left(\frac{15.7}{FinesContent \cdot 100 + .01}\right)^2 + \frac{9.7}{FinesContent \cdot 100 + .01}\right]$$

$\Delta N_{1,60cs} := 5.44$ Clean sand correction value. Note that this value is calculated in 'part2' but presented here as it is part of the iterative calculation shown below. part2,I33 (hidden)

The following parameters require iterative calculations. In the Excel workbook, iterative calculations are enabled, and a macro is used to provide initial guesses.

$$C_S = \min\left(1.3, \max\left(1.1, 1 + \frac{N_{1,60}}{100}\right)\right)$$

$C_S := 1.19$ Sampler correction factor. N33

$$C_N = \min\left[\left(\frac{p_a}{\sigma'_{v,sample,drilling}}\right)^{0.784 - 0.521 \cdot D_r}, 1.7\right]$$

$C_N := 0.84$ Overburden stress correction factor P33

$N_{60} := NValue \cdot C_E \cdot C_B \cdot C_R \cdot C_S$

$N_{60} := 22.265$

Corrected blow count for the sample of interest. R33

$N_{1,60} := C_N \cdot N_{60}$

$N_{1,60} := 18.681$

Normalized blow count for the sample of interest. S33

$N_{1,60cs} := N_{1,60} + \Delta N_{1,60cs}$

$N_{1,60cs} := 24.126$

Equivalent clean sand N-value for the sample of interest. Note that this calculation appears on 'part2' but is included here since it is a part of the iterative calculation. part2, J33

$D_r := \min\left(1, \sqrt{\frac{N_{1,60cs}}{46}}\right) = 72.421\,\%$

Relative density of the sample of interest. T33

End of iterative calculation

Workbook Sheet Name: part2

Calculations related to stresses during the earthquake event, cyclic stress ratio (CSR), cyclic resistance ratio (CRR), and factor of safety against liquefaction are located in this sheet. Note that the relative state parameter is also calculated here, as it relies on the effective stress during the earthquake event.

Generic Calculations:

The following is calculated for each boring.

Calculation/Variable Definition:	Description:	Cell Location
$\sigma_{v,fill} := \left(El_{FinalGrade} - El_{TOH}\right)\cdot\gamma_{cut/fill}$		
$\sigma_{v,fill} = 0$	The added total stress due to cut/fill after drilling but before the earthquake event.	F14
$\sigma_{v,above1st,soil,EQ} := \sigma_{v,above1st,soil,drilling} + \sigma_{v,fill}$		
$\sigma_{v,above1st,soil,EQ} = 0\cdot tsf$	The calculated total stress due to soil above the 1st SPT during the earthquake.	B16 (Hidden)
$\sigma_{v,H20,EQ} := \max\left(0, -1\cdot D_{H20,EQ}\cdot\gamma_w\right)$ $\sigma_{v,H20,EQ} = 0\cdot tsf$	The calculated total stress due to standing water above the ground surface during the earthquake. Value is 0 if depth to water is positive.	C16 (Hidden)
$\sigma_{v,above1st,EQ} := \sigma_{v,above1st,soil,EQ} + \sigma_{v,H20,EQ}$		
$\sigma_{v,above1st,EQ} = 0\cdot tsf$	The calculated total stress due to soil and water above the 1st SPT sample.	D16
$u_{above1st,EQ} := \max\left[0, \left(D_{samplingBegan} - D_{H20,EQ}\right)\cdot\gamma_w\right]$		
$u_{above1st,EQ} = 0\cdot tsf$	The calculated pore water pressure at the depth sampling began during the earthquake.	E16
$\sigma'_{v,above1st,EQ} := \sigma_{v,above1st,EQ} - u_{above1st,EQ}$		
$\sigma'_{v,above1st,EQ} = 0\cdot tsf$	The calculated vertical effective stress at the depth sampling began during the earthquake.	F16

Sample Calculations:
The following information is calculated for each SPT sample.

Calculation/Variable Definition:	Description:	Cell Location

$\sigma_{v,soil,sample,EQ} := \sigma_{v,soil,sample,drilling} + \sigma_{v,fill}$

$\sigma_{v,soil,sample,EQ} := 1.89tsf$ — The total stress during the earthquake due to soil at the midpoint of the sample of interest. — B33

$\sigma_{v,sample,EQ} := \sigma_{v,soil,sample,EQ} + \sigma_{v,H20,EQ}$

$\sigma_{v,sample,EQ} = 1.89 \cdot tsf$ — The total stress during the earthquake due to soil and standing water at the midpoint of the sample of interest. — D33

$u_{sample,EQ} := \max\left(0, D_{sample} - D_{H20,EQ}\right) \cdot \gamma_w$

$u_{sample,EQ} := 0.26tsf$ — The pore water pressure during the earthquake at the sample of interest. — E33

$\sigma'_{v,sample,EQ} := \sigma_{v,sample,EQ} - u_{sample,EQ}$

$\sigma'_{v,sample,EQ} = 1.63 \cdot tsf$ — The vertical effective stress during the earthquake at the midpoint of the sample of interest. — F33

$$\Delta N_{1,60cs} = \exp\left[1.63 - \left(\frac{15.7}{FinesContent \cdot 100 + .01}\right)^2 + \frac{9.7}{FinesContent \cdot 100 + .01}\right]$$

$\Delta N_{1,60cs} := 5.44$ — Clean sand correction value. (Also presented in 'part1' as part of iterative calculations.) — I33

$N_{1,60cs} = N_{1,60} + \Delta N_{1,60cs}$

$N_{1,60cs} := 24.126$ — Equivalent clean sand N-value for the sample of interest. (Also presented in 'part1' as part of iterative calculations.) — J33

$$\xi_R := \max\left[-0.6, \min\left[\frac{1}{\left[10 - \ln\left[100 \cdot \left(1 + 2 \cdot K_o\right) \cdot \frac{\sigma'_{v,sample,EQ}}{3 \cdot p_a}\right]\right]} - D_r, 0.1\right]\right]$$

$\xi_R := -0.54$ — Relative state parameter index calculation at the sample of interest. Note that this is from part1, but shown here since it relies on effective stress calculations during the EQ — part1, X33

$$CRR_{7.5} := \exp\left[\frac{N_{1,60cs}}{14.1} + \left(\frac{N_{1,60cs}}{126}\right)^2 - \left(\frac{N_{1,60cs}}{23.6}\right)^3 + \left(\frac{N_{1,60cs}}{25.4}\right)^4 - 2.8\right]$$

$CRR_{7.5} = 0.271$ — Cyclic Resistance Ratio of the sample of interest. — K33

$$C_\sigma := \min\left(0.3, \frac{1}{18.9 - 17.3 \cdot D_r}\right)$$ Supporting parameter for overburden correction factor. L33 (Hidden)

$C_\sigma := 0.157$

$$K_\sigma := \min\left(1.1, 1 - C_\sigma \cdot \ln\left(\frac{\sigma'_{v,sample,EQ}}{p_a}\right)\right)$$

$K_\sigma := 0.932$ Overburden correction factor at the sample of interest. M33

$$a := 1267 + 636 \cdot \alpha^2 - 634 \cdot \exp(\alpha) - 632 \exp(-\alpha)$$

$a := 0.965$ Supporting parameter for static shear stress correction. N33 (Hidden)

$$b := \exp\left(-1.11 + 12.3\alpha^2 + 1.31 \ln(\alpha + .0001)\right)$$

$b := 0.002$ Supporting parameter for static shear stress correction. O33 (Hidden)

$c_\alpha := 0.138 + .126\alpha + 2.52\alpha^3$ Supporting parameter for static shear stress correction. P33 (Hidden)

$c_\alpha := 0.140$

$$K_\alpha := a + b \cdot \exp\left(\frac{-\xi_R}{c_\alpha}\right)$$ Static shear stress correction factor at the sample of interest. Q33

$K_\alpha := 1.044$

$$MSF_{max} := \min\left[2.2, 1.09 + \left(\frac{N_{1,60cs}}{31.5}\right)^2\right]$$

$MSF_{max} := 1.6766$ Supporting parameter for magnitude scaling factor. R33 (Hidden)

$$MSF := 1 + \left(MSF_{max} - 1\right) \cdot \left(8.64 \cdot \exp\left(\frac{-M_w}{4}\right) - 1.325\right)$$

$MSF := 0.94$ Magnitude scaling factor at the sample of interest. S33

$CRR := CRR_{7.5} \cdot MSF \cdot K_\sigma \cdot K_\alpha$

$CRR := 0.246$ Corrected cyclic resistance ratio at the sample of interest. T33

$$\alpha_z := -1.012 - 1.126 \cdot \sin\left[\left(\frac{D_{sample} + El_{FinalGrade} - El_{TOH}}{11.73m}\right) + 5.133\right]$$

$\alpha_{zz} := -0.570$ Supporting parameter for the stress reduction coefficient. U33 (Hidden)

$$\beta_z := .106 + .118 \cdot \sin\left[\left(\frac{D_{sample} + El_{FinalGrade} - El_{TOH}}{11.28m}\right) + 5.142\right]$$

$\beta_{zz} := 0.064$ Supporting parameter for the stress reduction coefficient. V33 (Hidden)

$r_d := \exp(\alpha_z + \beta_z \cdot M_w)$

$r_{dv} := 0.931$ Stress reduction coefficient at the sample of interest. W33

$$CSR := 0.65 \cdot \left(\frac{\sigma_{v,sample,EQ}}{\sigma'_{v,sample,EQ}}\right) \cdot \left(\frac{a_{max}}{g}\right) \cdot r_d$$

$CSR := 0.304$ Cyclic stress ratio at the sample of interest. X33 (Hidden), also shown in AD33

$Screen_{clay\text{-}like} := if(ClaySandOverride = "Clay\text{-}like", "TRUE", "FALSE")$

$Screen_{clay\text{-}like} = "FALSE"$ Boolean to determine if sample has been classified as clay-like or sand-like. If sample is clay-like, it is screened out from liquefaction. AE33

$Screen_{HighN} := if(N_{1,60cs} \geq 32, "TRUE", "FALSE")$

$Screen_{HighN} = "FALSE"$ Boolean to determine if sample has a sufficiently high clear sand equivalent blow count. If N1,60cs exceeds 32, the sample is screened out from liquefaction. AF33

$Screen_{unsat} := if(D_{H20,EQ} > D_{sample}, "TRUE", "FALSE")$

$Screen_{unsat} = "FALSE"$ Boolean to determine if sample is unsaturated. Unsaturated samples are screened out from liquefaction. AG33

$$FS_{liq} := \begin{cases} \text{"N/A"} & \text{if } Screen_{unsat} = \text{"TRUE"} \\ \text{"N/A"} & \text{if } Screen_{HighN} = \text{"TRUE"} \\ \text{"N/A"} & \text{if } Screen_{clay\text{-}like} = \text{"TRUE"} \\ \text{round}\left[\left(\frac{CRR}{CSR}\right), 1\right] & \text{otherwise} \end{cases}$$

Factor of safety against liquefaction calculation. Factor of safety is not calculated if the material was screened out. Additionally, the value is rounded to the nearest tenth.

AH33

$FS_{liq} := 0.8$

3.6.2 CPT Liquefaction Sample Calculation

CPT Liquefaction Analysis, Example Calculation

An example calculation for the factor of safety against liquefaction at a CPT sample point follows. Inputs and calculations are grouped by the sheets on which they appear in the calculation workbooks. A brief description is provided for each calculation/variable definition. Additionally, the cell reference associated with the calculation/definition is provided.

Example Calculations

Workbook Name: MCE-New Madrid_SiSALT_CPT_BEH-C1.xlsm
Workbook Sheet Name: Inputs & Constants
Calculations are not performed in this sheet; however, all inputs from field and laboratory data and ground response analyses are keyed-in here.

Calculation/Variable Definition:	Description:	Cell Location
Generic Inputs: **The following are keyed in for each sounding**		
tsf := 2000psf	Variable definition for Mathcad calculations. No associated location in workbook	
CPT_ID := "BEH-C1"	The Stantec CPT ID associated with the calculation.	B4
El_{TOH} := 476.9ft	The top of hole elevation during CPT.	B21
$D_{H20,CPT}$:= 21.6ft	The depth to water during CPT. Typically estimated from seepage analyses rather than field-measured values.	B22
$D_{samplingBegan}$:= 0.0ft	The depth CPT sampling began.	B23
$\gamma_{above1stSample}$:= 0pcf	The total unit weight of material located above the first CPT sample. Value is 0 if sampling began at the surface.	B24
$D_{H20,EQ}$:= 21.6ft	The depth to water (relative to the CPT top of hole) during the earthquake.	B27
$El_{FinalGrade}$:= 476.9ft	Final grade suface elevation during earthquake at the CPT boring location.	B28
$\gamma_{cut/fill}$:= 0pcf	Average unit weight of cut/fill to achieve final grade. Value is 0 if the final grade is unchanged from the grade during drilling.	B29
NonlinearPWP := 0	Cell used to specify if nonlinear pore water pressure distributions are used in the analysis. A value of 1 indicates Yes; a value of 0 indicates No. If 1 is keyed in, pore water pressure during drilling and during earthquake must be keyed in for each sample.	B32
AlphaAtEachSample := 1	Cell used to specify if alpha values at each sample depth are known. A value of 1 indicates "Yes"; a value of 0 indicates "No". If 1 is keyed in, alpha values must be keyed in for each sample. If 0 is keyed in, curve fit parameters must be keyed in for each sample.	B37

CSRFromShearStress := 0	Cell used to specify if CSR will be calculated from shear stress envelopes. A value of 1 indicates Yes"; a value of 0 indicates "No". If 1 is keyed in, shear stress values or curve fits must be keyed in. If 0 is keyed in, CSR will be calculated using rd method.	B48
$K_o := 0.5$	At rest lateral earth pressure coefficient.	V25 (Hidden)
$a_{max} := 0.4577g$	Peak ground acceleration value at ground surface, from ground response analysis.	B61
$M_w := 7.8$	Magnitude (Mw) of analyzed earthquake.	B62
$\gamma_w := 62.4pcf$	Unit weight of water.	V21 (Hidden)
$p_a := 1.058tsf$	Atmospheric pressure.	V22 (Hidden)

Sample Inputs:
The following information is keyed in for each CPT sample.

$D_{aboveSample} := 70.487ft$	The depth of the sample immediately above the sample of interest.	E564
$D_{sample} := 70.565ft$	Midpoint depth of the sample of interest.	E565
$D_{belowSample} := 70.645ft$	The depth of the sample immediately below the sample of interest.	E566
$q_t := 105.197tsf$	Corrected cone tip resistance associated with sample.	F565
$f_s := 3.011tsf$	Sleeve friction associated with sample.	G565
$\gamma_{sampleAbove} := 122pcf$	The unit weight associated with the sample immediately above the sample of interest.	I564
$\gamma_{sample} := 122pcf$	The unit weight associated with the sample.	I565
MaterialName := "Foundation Sands"	The material name associated with the sample.	J565
ClaySandOverride := ""	Must be either "clay-like", "sand-like" or blank. If blank, clay-like or sand-like determination will be made based on soil behavior type. Overrides are typically keyed-in to account for the results of the clay-like/sand-like determination performed using laboratory and/or CPT data.	K565
$\alpha := 0.07719$	Static shear stress ratio associated with the sample. Value is calculated from SIGMA/W data for each sample.	M565

Workbook Sheet Name: Field Data & Stresses

Calculations related to stress during sampling and during earthquake are located in this sheet. Note that some stress calculations rely on values from adjacent samples. To simplify the presentation of these calculations, stresses and soil thicknesses of adjacent samples are defined here; though, they are actually calculated in a similar manner to the sample of interest in the workbook.

Calculation/Variable Definition:	Description:	Cell Location
Generic Calculations:		
The following is calculated for each boring.		
$El_{H20,CPT} := El_{TOH} - D_{H20,CPT}$ $El_{H20,CPT} = 455.3 \cdot ft$	The calculated elevation of the water table during CPT sampling.	J3
$El_{H20,EQ} := El_{TOH} - D_{H20,EQ}$ $El_{H20,EQ} = 455.3 \cdot ft$	The calculated elevation of the water table during the associated earthquake.	J5
$\sigma_{v,above1st,soil,CPT} := \gamma_{above1stSample} \cdot D_{samplingBegan}$ $\sigma_{v,above1st,soil,CPT} = 0 \cdot tsf$	The calculated total stress due to soil above the 1st sample during CPT sampling.	H17 (Hidden)
$\sigma_{v,H20} := \max(0, -1 \cdot D_{H20,CPT} \cdot \gamma_w)$ $\sigma_{v,H20} = 0 \cdot tsf$	The calculated total stress due to standing water above the ground surface during CPT sampling. Value is 0 if depth to water is positive.	I17 (Hidden)
$\sigma_{v,above1st,CPT} := \sigma_{v,above1st,soil,CPT} + \sigma_{v,H20}$ $\sigma_{v,above1st,CPT} = 0 \cdot tsf$	The calculated total stress due to soil and water above the 1st CPT sample during CPT sampling.	J17
$u_{above1st,CPT} := \max[0, (D_{samplingBegan} - D_{H20,CPT}) \cdot \gamma_w]$ $u_{above1st,CPT} = 0 \cdot tsf$	The calculated pore water pressure at the depth sampling began during CPT sampling.	N17
$\sigma'_{v,above1st,CPT} := \sigma_{v,above1st,CPT} - u_{above1st,CPT}$ $\sigma'_{v,above1st,CPT} = 0 \cdot tsf$	The calculated vertical effective stress at the depth sampling began during CPT sampling.	P17

$\sigma_{v,fill} := \left(El_{FinalGrade} - El_{TOH}\right) \cdot \gamma_{cut/fill}$

$\sigma_{v,fill} = 0$ The added total stress due to cut/fill after drilling but before the earthquake event. J10

$\sigma_{v,above1st,soil,EQ} := \sigma_{v,above1st,soil,CPT} + \sigma_{v,fill}$

$\sigma_{v,above1st,soil,EQ} = 0 \cdot tsf$ The calculated total stress due to soil above the 1st CPT during the earthquake. K17 (Hidden)

$\sigma_{v,H20,EQ} := \max\left(0, -1 \cdot D_{H20,EQ} \cdot \gamma_w\right)$

$\sigma_{v,H20,EQ} = 0 \cdot tsf$ The calculated total stress due to standing water above the ground surface during the earthquake. Value is 0 if depth to water is positive. L17 (Hidden)

$\sigma_{v,above1st,EQ} := \sigma_{v,above1st,soil,EQ} + \sigma_{v,H20,EQ}$

$\sigma_{v,above1st,EQ} = 0 \cdot tsf$ The calculated total stress due to soil and water above the 1st CPT sample during the earthquake. M17

$u_{above1st,EQ} := \max\left[0, \left(D_{samplingBegan} - D_{H20,EQ}\right) \cdot \gamma_w\right]$

$u_{above1st,EQ} = 0 \cdot tsf$ The calculated pore water pressure at the depth sampling began during the earthquake. O17

$\sigma'_{v,above1st,EQ} := \sigma_{v,above1st,EQ} - u_{above1st,EQ}$

$\sigma'_{v,above1st,EQ} = 0 \cdot tsf$ The calculated vertical effective stress at the depth sampling began during the earthquake. Q17

Sample Calculations:
The following information is calculated for each CPT sample.

Calculation/Variable Definition:	Description:	Cell Location
$El_{sample} := El_{TOH} - D_{sample}$	The calculated elevation of the sample.	A568

El.sample := 406.3 ft

$$D_{topInterval} := \frac{\left(D_{sample} + D_{aboveSample}\right)}{2}$$

$D_{topInterval} = 70.526 \cdot ft$	The calculated depth of the top of the "sampling interval", which corresponds to the depth halfway between adjacent samples.	F568

$$D_{bottomInterval} := \frac{\left(D_{sample} + D_{belowSample}\right)}{2}$$

$D_{bottomInterval} = 70.605 \cdot ft$	The calculated depth of the bottom of the "sampling interval", which corresponds to the depth halfway between adjacent samples.	F569

$T_{interval} := D_{bottomInterval} - D_{topInterval}$

$T_{interval} = 0.079 \cdot ft$	The calculated thickness of the "sampling interval".	G568

$\sigma_{v,aboveSample,CPT} := 4.5593tsf$	The total stress during CPT at the midpoint of the sample above the sample of interest.	H567 (Hidden)
$D_{topInterval,aboveSample} := 70.4504ft$	The top of the "sampling interval" of the sample above the sample of interest.	F567
$T_{interval.aboveSample} := 0.0755ft$	The thickness of the "sampling interval" of the sample above the sample of interest.	G567

$$\sigma_{v,soil,sample,CPT} := \sigma_{v,aboveSample,CPT} \cdots + \left[\begin{pmatrix} D_{topInterval,aboveSample} + T_{interval.aboveSample} \cdots \\ + -D_{aboveSample} \end{pmatrix} \cdot \gamma_{sampleAbove} \cdots + \left(D_{sample} - D_{topInterval}\right) \cdot \gamma_{sample}\right]$$

$\sigma_{v,soil,sample,CPT} = 4.564 \cdot tsf$	The total stress during drilling due to soil at the midpoint of the sample of interest.	H568

$\sigma_{v,sample,CPT} := \sigma_{v,soil,sample,CPT} + \sigma_{v,H20}$

$\sigma_{v,sample,CPT} = 4.564 \cdot tsf$ The total stress during drilling due to soil and standing water at the midpoint of the sample of interest. J568

$u_{sample,CPT} := \max\left(0, D_{sample} - D_{H20,CPT}\right) \cdot \gamma_w$

$u_{sample,CPT} = 1.528 \cdot tsf$ The pore water pressure during drilling at the midpoint of the sample of interest. N568

$\sigma'_{v,sample,CPT} := \sigma_{v,sample,CPT} - u_{sample,CPT}$

$\sigma'_{v,sample,CPT} = 3.036 \cdot tsf$ The vertical effective stress during drilling at the midpoint of the sample of interest. P568

$\sigma_{v,soil,sample,EQ} := \sigma_{v,soil,sample,CPT} + \sigma_{v,fill}$

$\sigma_{v,soil,sample,EQ} = 4.564 \cdot tsf$ The total stress during the earthquake due to soil at the midpoint of the sample of interest. K568

$\sigma_{v,sample,EQ} := \sigma_{v,soil,sample,EQ} + \sigma_{v,H20,EQ}$

$\sigma_{v,sample,EQ} = 4.564 \cdot tsf$ The total stress during the earthquake due to soil and standing water at the midpoint of the sample of interest. M568

$u_{sample,EQ} := \max\left(0, D_{sample} - D_{H20,EQ}\right) \cdot \gamma_w$

$u_{sample,EQ} = 1.528 \cdot tsf$ The pore water pressure during the earthquake at the sample of interest. O568

$\sigma'_{v,sample,EQ} := \sigma_{v,sample,EQ} - u_{sample,EQ}$

$\sigma'_{v,sample,EQ} = 3.036 \cdot tsf$ The vertical effective stress during the earthquake at the midpoint of the sample of interest. Q568

Workbook Sheet Name: qc1n, F, Ic

Calculations related to tip resistance correction and normalization are in this sheet. The relative state parameter is also calculated here.

Sample Calculations:
The following information is calculated for each CPT sample.

Calculation/Variable Definition:	Description:	Cell Location
$F := \frac{f_s}{q_t - \sigma_{v,sample,CPT}}$	The normalized friction ratio.	G568

$F = 2.992 \cdot \%$

Calculation of the the normalized cone resistance (Q) is calculated below. As part of the calculation, three values of 'n' are selected. For each assumed value of n, Q and the soil behavior type index (Ic) are calculated. First, n is assumed to be 1.0 and then Q and Ic are calculated. If the calculated Ic value is greater than 2.6, then n = 1.0 is selected. If this Ic value is less than 2.6, then Q and Ic are calculated assuming n is 0.5. If this Ic value is less than 2.6, then n = 0.5 is selected. If this Ic is greater than 2.6, then n = 0.7 is selected. Q and Ic are reported for the selected n value at each sample.

$n := 1.0$ Assumed value of n for use in calculation of Q and Ic. H16 (Hidden)

$$Q_1 := \left[\frac{\left(q_t - \sigma_{v,sample,CPT}\right)}{p_a}\right] \cdot \left(\frac{p_a}{\sigma'_{v,sample,CPT}}\right)^n$$

$Q_1 = 33.143$ Test Q value assuming n = 1.0. C568 (Hidden)

$$I_{c1} := \left[\left(3.47 - \log\left(Q_1\right)\right)^2 + (1.22 + \log(F \cdot 100))^2\right]^{0.5}$$

$I_{c1} = 2.584$ Test Ic value assuming n = 1.0. H568 (Hidden)

$n := 0.5$ Assumed value of n for use in calculation of Q and Ic. I16 (Hidden)

$$Q_5 := \left[\frac{\left(q_t - \sigma_{v,sample,CPT}\right)}{p_a}\right] \cdot \left(\frac{p_a}{\sigma'_{v,sample,CPT}}\right)^n$$

$Q_5 = 56.146$ Test Q value assuming n = 0.5. D568 (Hidden)

$$I_{c5} := \left[\left(3.47 - \log\left(Q_5\right)\right)^2 + (1.22 + \log(F \cdot 100))^2\right]^{0.5}$$

$I_{c5} = 2.416$ Test Ic value assuming n = 0.5. I568 (Hidden)

$n := 0.7$ Assumed value of n for use in calculation of Q and Ic. J16 (Hidden)

$$Q_7 := \left[\frac{\left(q_t - \sigma_{v,sample,CPT}\right)}{p_a}\right] \cdot \left(\frac{p_a}{\sigma'_{v,sample,CPT}}\right)^n$$

$Q_7 = 45.472$ Test Q value assuming n = 0.7. E568 (Hidden)

$$I_{c7} := \left[\left(3.47 - \log\left(Q_7\right)\right)^2 + (1.22 + \log(F \cdot 100))^2\right]^{0.5}$$

$I_{c7} = 2.482$ Test Ic value assuming n = 0.7. J568 (Hidden)

$$n := \begin{cases} 1.0 & \text{if } I_{c1} > 2.6 \\ 0.5 & \text{if } I_{c5} < 2.6 \\ 0.7 & \text{otherwise} \end{cases}$$

Selected n value. L568

$n = 0.5$

$$Q := \left[\frac{\left(q_t - \sigma_{v,sample,CPT}\right)}{p_a}\right] \cdot \left(\frac{p_a}{\sigma'_{v,sample,CPT}}\right)^n$$

$Q = 56.146$ Q value using assigned n value. F568

$$I_c := \left[(3.47 - \log(Q))^2 + (1.22 + \log(F \cdot 100))^2\right]^{0.5}$$

$I_c = 2.416$ Ic value using assigned n value K568

End of Ic, Q calculation

$FC := 80 \cdot I_c - 137$ Fines content calculation O568

$FC = 56.28$

The following parameters require iterative calculations. In the Excel workbook, iterative calculations are enabled, and a macro is used to provide initial guesses.

$$C_N = \min\left[1.7, \left[\frac{p_a}{\left(\sigma_{v,sample,CPT}\right)}\right]^{0.784 - 0.521 D_r}\right]$$

$C_N := 0.6$ Normalizing factor for CPT resistance. M568

$$q_{c1N} := C_N \cdot \frac{q_t}{p_a}$$

Normalized average cone tip resistance. N568

$q_{c1N} := 62.379$

$$\Delta q_{c1N} := \left(11.9 + \frac{q_{c1N}}{14.6}\right) \exp\left[1.63 - \left(\frac{9.7}{FC + 2}\right) - \left(\frac{15.7}{FC + 2}\right)^2\right]$$

$\Delta q_{c1N} = 64.995$ Clean sand correction. P568 (Hidden)

$$q_{c1Ncs} := q_{c1N} + \Delta q_{c1N}$$

$q_{c1Ncs} = 127.374$ Clean sand normalized average cone tip resistance Q568

$$D_r := \min\left[1, 0.465\left(\frac{q_{c1Ncs}}{0.9}\right)^{0.264} - 1.063\right] = 65.599 \cdot \%$$

$D_r = 65.599 \cdot \%$ Relative density of the sample of interest. From sheet "FS LIQ" but shown here to support calculations in this sheet. Sheet: FS LIQ Cell: D568

End of iterative calculation

$$\xi_R := \max\left[-0.6, \min\left[\frac{1}{\left[10 - \ln\left[100 \cdot \left(1 + 2 \cdot K_o\right) \cdot \frac{\sigma'_{v,sample,EQ}}{3 \cdot p_a}\right]\right]} - D_r, 0.1\right]\right]$$

$\xi_R = -0.445$ Relative state parameter index calculation at the sample of interest. S568

Workbook Sheet Name: FS LIQ

Calculations related to stresses during the earthquake event, cyclic stress ratio (CSR), cyclic resistance ratio (CRR), and factor of safety against liquefaction are located in this sheet.

Sample Calculations:

The following information is calculated for each CPT sample.

Calculation/Variable Definition:	Description:	Cell Location

$$CRR_{7.5} := \exp\left[-2.8 + \left(\frac{q_{c1Ncs}}{137}\right)^4 + \left[-\left(\frac{q_{c1Ncs}}{140}\right)\right]^3 + \left(\frac{q_{c1Ncs}}{1000}\right)^2 + \frac{q_{c1Ncs}}{113}\right]$$

$CRR_{7.5} = 0.19$ Cyclic resistance ratio for the sample of interest. C568

$$D_r := \min\left[1, 0.465\left(\frac{q_{c1Ncs}}{0.9}\right)^{0.264} - 1.063\right] = 65.599\cdot\%$$

$D_r = 65.599\cdot\%$ Relative density of the sample of interest. D568

$$C_\sigma := \min\left(0.3, \frac{1}{18.9 - 17.3\cdot D_r}\right)$$

Supporting parameter for overburden correction factor. E568 (Hidden)

$C_\sigma = 0.132$

$$K_\sigma := \min\left(1.1, 1 - C_\sigma\cdot\ln\left(\frac{\sigma'_{v,sample,EQ}}{p_a}\right)\right)$$

$K_\sigma = 0.86$ Overburden correction factor at the sample of interest. F568

$$a := 1267 + 636\cdot\alpha^2 - 634\cdot\exp(\alpha) - 632\exp(-\alpha)$$

$a = 0.861$ Supporting parameter for static shear stress correction. G568 (Hidden)

$$b := \exp\left(-1.11 + 12.3\alpha^2 + 1.31\ln(\alpha + .0001)\right)$$

$b = 0.012$ Supporting parameter for static shear stress correction. H568 (Hidden)

$c_\alpha := 0.138 + .126\alpha + 2.52\alpha^3$ Supporting parameter for static shear stress correction. I568 (Hidden)

$c_\alpha = 0.149$

$$K_\alpha := a + b \cdot \exp\left(\frac{-\xi_R}{c_\alpha}\right)$$

$K_\alpha = 1.108$

Static shear stress correction factor at the sample of interest. J568

$$MSF_{max} := \min\left[2.2, 1.09 + \left(\frac{q_{c1Ncs}}{180}\right)^3\right]$$

$MSF_{max} = 1.444$

Supporting parameter for magnitude scaling factor. K568 (Hidden

$$MSF := 1 + \left(MSF_{max} - 1\right) \cdot \left(8.64 \cdot \exp\left(\frac{-M_w}{4}\right) - 1.325\right)$$

$MSF = 0.957$

Magnitude scaling factor at the sample of interest. L568

$$CRR := CRR_{7.5} \cdot MSF \cdot K_\sigma \cdot K_\alpha$$

$CRR = 0.173$

Corrected cyclic resistance ratio at the sample of interest. M568

$$\alpha_z := -1.012 - 1.126 \cdot \sin\left[\left(\frac{D_{sample} + El_{FinalGrade} - El_{TOH}}{11.73m}\right) + 5.133\right]$$

$\alpha_z = -1.723$

Supporting parameter for the stress reduction coefficient. N568

$$\beta_z := .106 + .118 \cdot \sin\left[\left(\frac{D_{sample} + El_{FinalGrade} - El_{TOH}}{11.28m}\right) + 5.142\right]$$

$\beta_z = 0.188$

Supporting parameter for the stress reduction coefficient. O568

$$r_d := \min\left(1, \exp\left(\alpha_z + \beta_z \cdot M_w\right)\right)$$

$r_d = 0.772$

Stress reduction coefficient at the sample of interest. P568

$$CSR := 0.65 \cdot \left(\frac{\sigma_{v,sample,EQ}}{\sigma'_{v,sample,EQ}}\right) \cdot \left(\frac{a_{max}}{g}\right) \cdot r_d$$

$CSR = 0.345$

Cyclic stress ratio at the sample of interest. W568

$Screen_{clay\text{-}like} := if(n = 1.0, "TRUE", "FALSE")$

$Screen_{clay\text{-}like} = "FALSE"$ Boolean to determine if sample has been classified as clay-like or sand-like. If sample is clay-like, it is screened out from liquefaction. X568

$Screen_{HighTipRes} := if(q_{c1Ncs} \geq 175, "TRUE", "FALSE")$

$Screen_{HighTipRes} = "FALSE"$ Boolean to determine if sample has a sufficiently high clear sand equivalent blow count. If qc1Ncs exceeds 175, the sample is screened out from liquefaction. Y568

$Screen_{unsat} := if(D_{H20,EQ} > D_{sample}, "TRUE", "FALSE")$

$Screen_{unsat} = "FALSE"$ Boolean to determine if sample is unsaturated. Unsaturated samples are screened out from liquefaction. Z568

$$FS_{liq} := \begin{cases} "N/A" & \text{if } Screen_{unsat} = "TRUE" \\ "N/A" & \text{if } Screen_{HighTipRes} = "TRUE" \\ "N/A" & \text{if } Screen_{clay\text{-}like} = "TRUE" \\ round\left[\left(\frac{CRR}{CSR}\right), 1\right] & \text{otherwise} \end{cases}$$

Factor of safety against liquefaction calculation. Factor of safety is not calculated if the material was screened out. Additionally, the value is rounded to the nearest tenth. AA568

$FS_{liq} = 0.5$

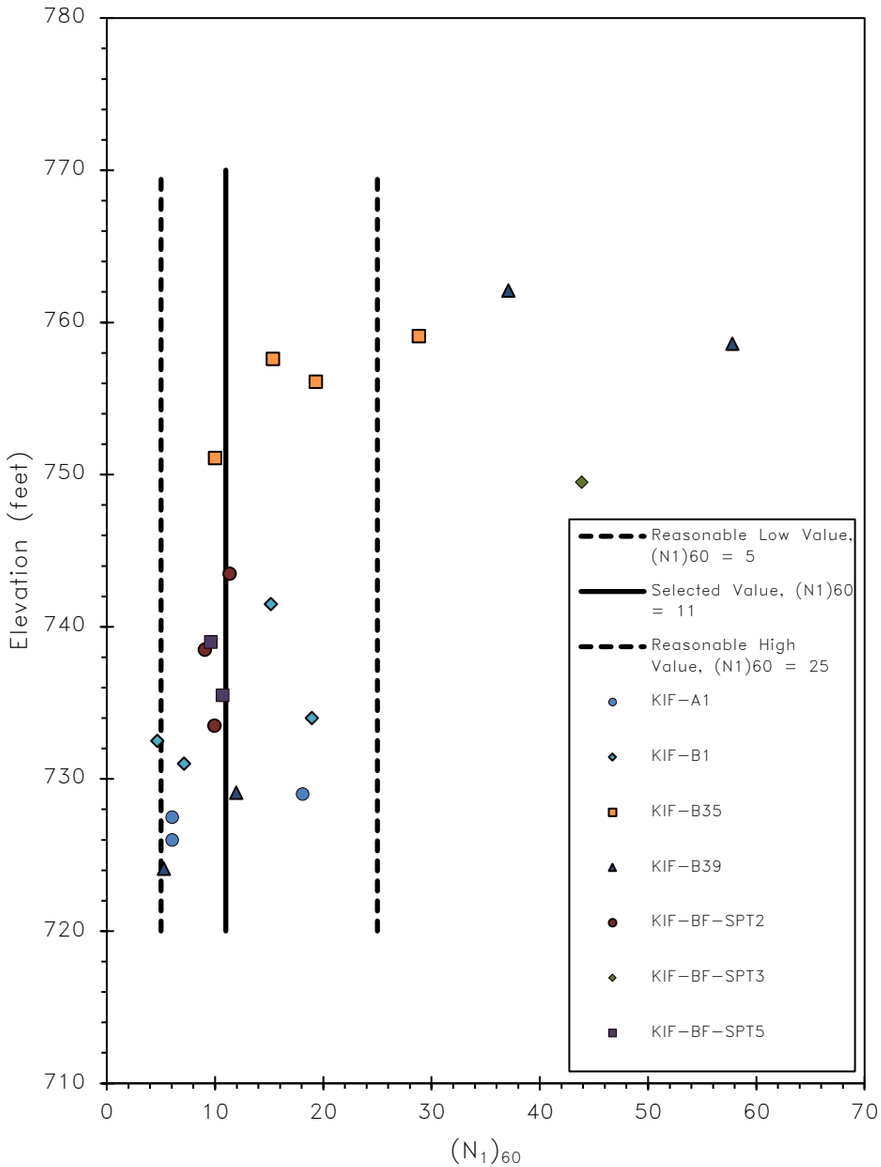
4 RESIDUAL STRENGTH DERIVATION

4.1 FLY ASH

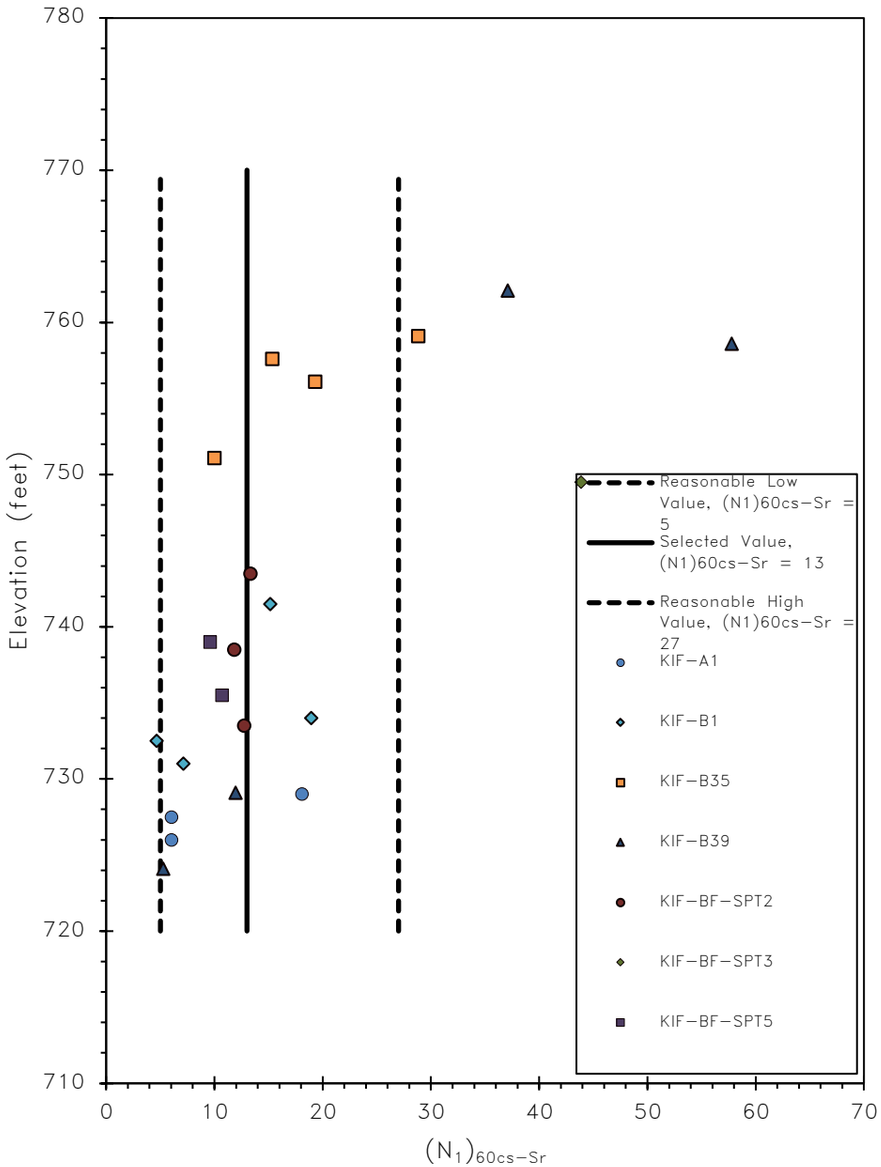
KIF, Fly Ash

Parameter	Sample Count	Minimum	Maximum	Mean	Median	Std. Dev.	Reasonable Low Value	Selected Value	Reasonable High Value
$(N_1)_{60}$	21	5	58	17	11	14	5	11	25
$(N_1)_{60cs\text{-}Sr}$		5	58	17	13	14	5	13	27
q_{c1} (tsf)	393	5	976	152	71	191	5	71	262
$q_{c1ncs\text{-}Sr}$		4	783	138	97	147	4	97	244

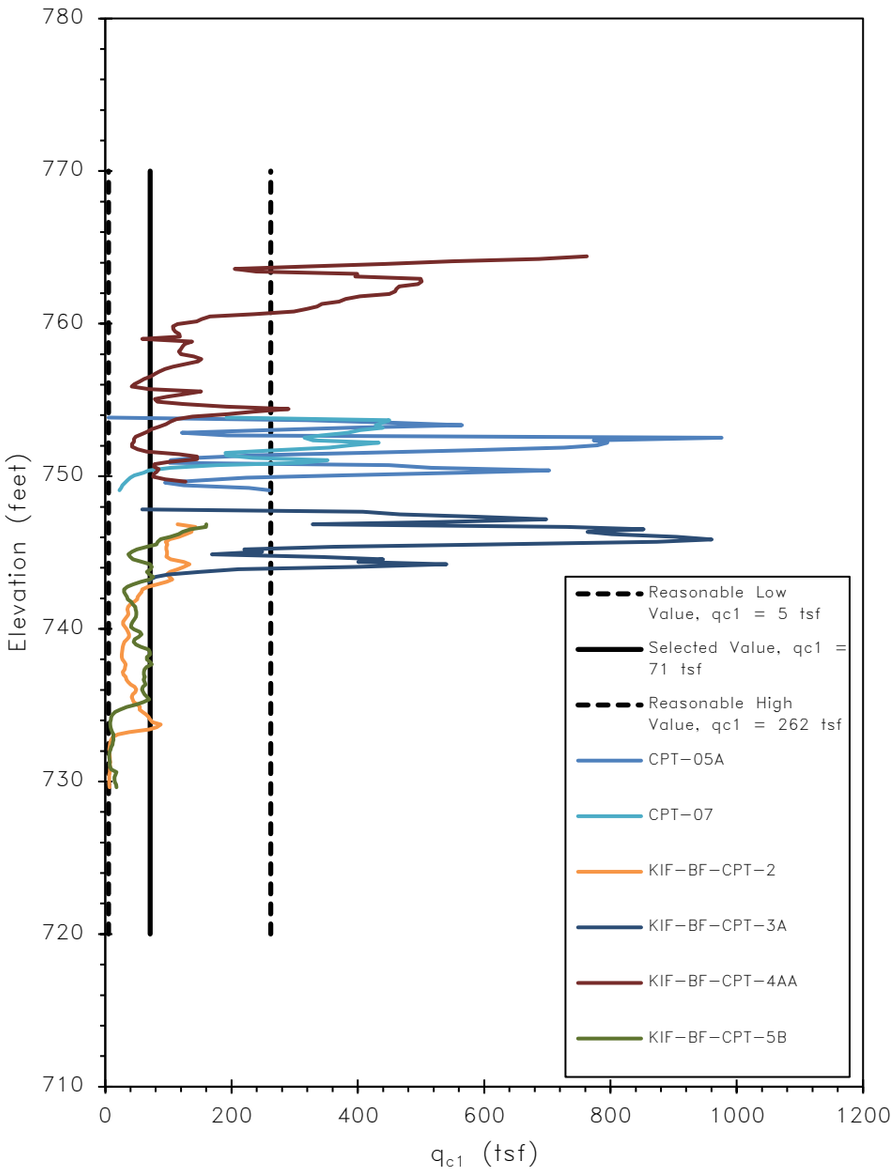
KIF, Fly Ash



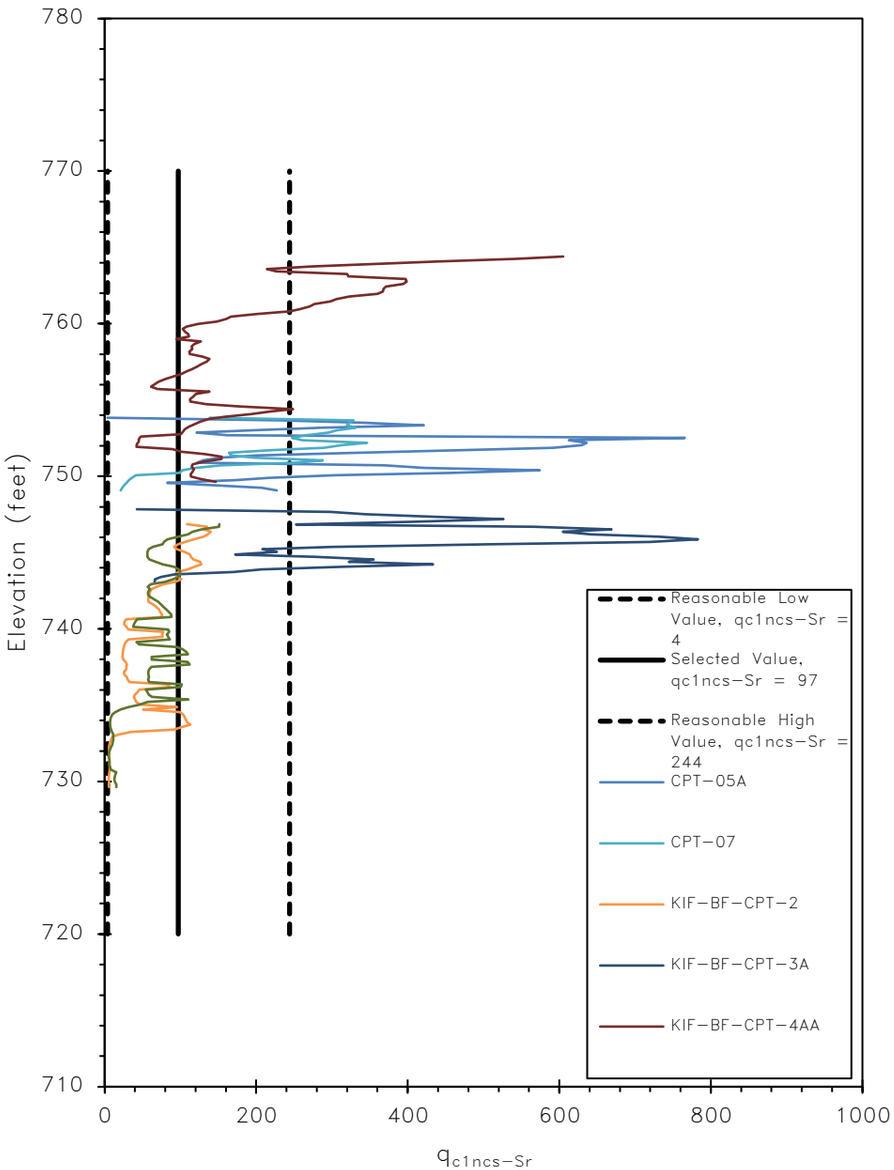
KIF, Fly Ash



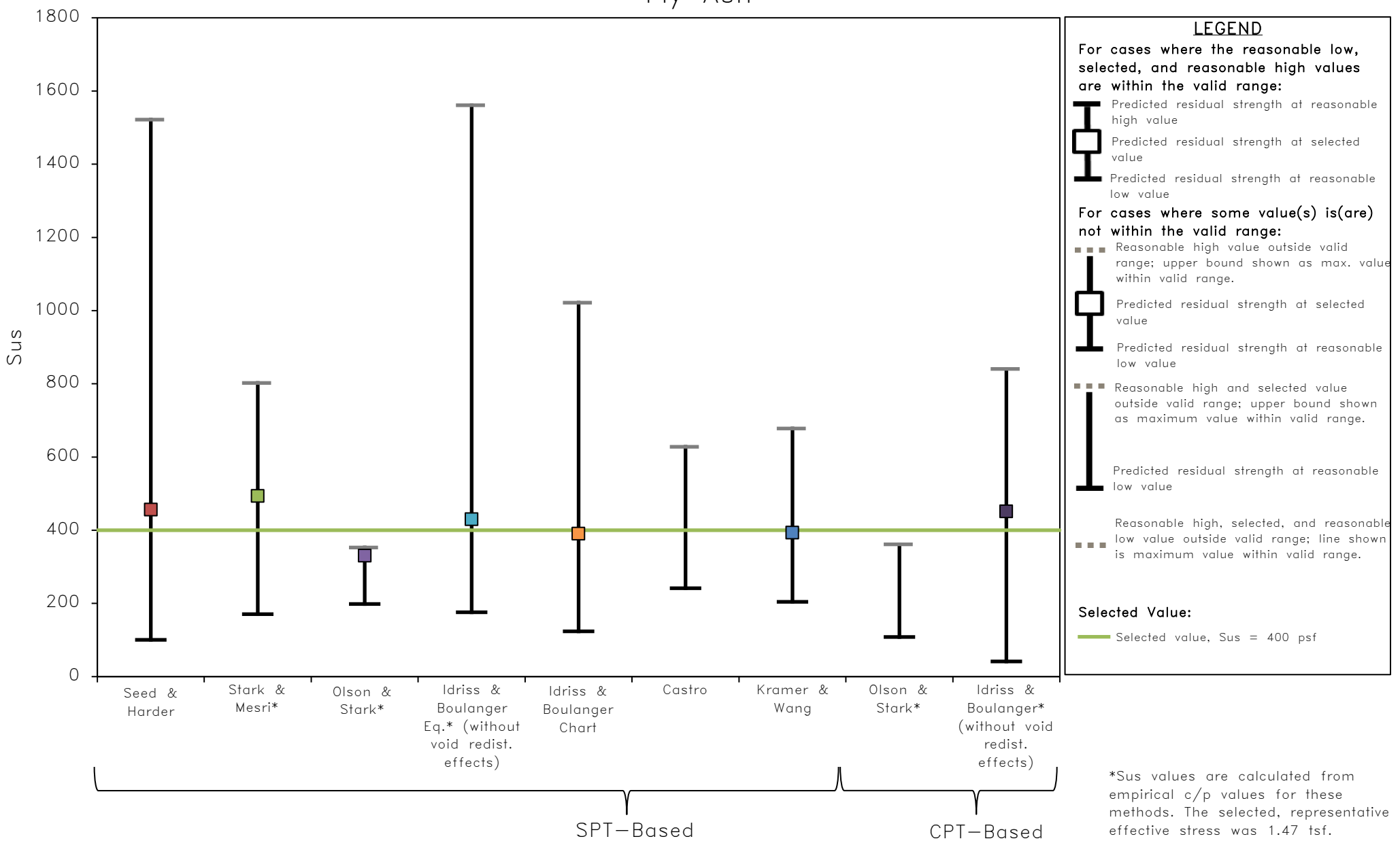
KIF, Fly Ash



KIF, Fly Ash



Fly Ash



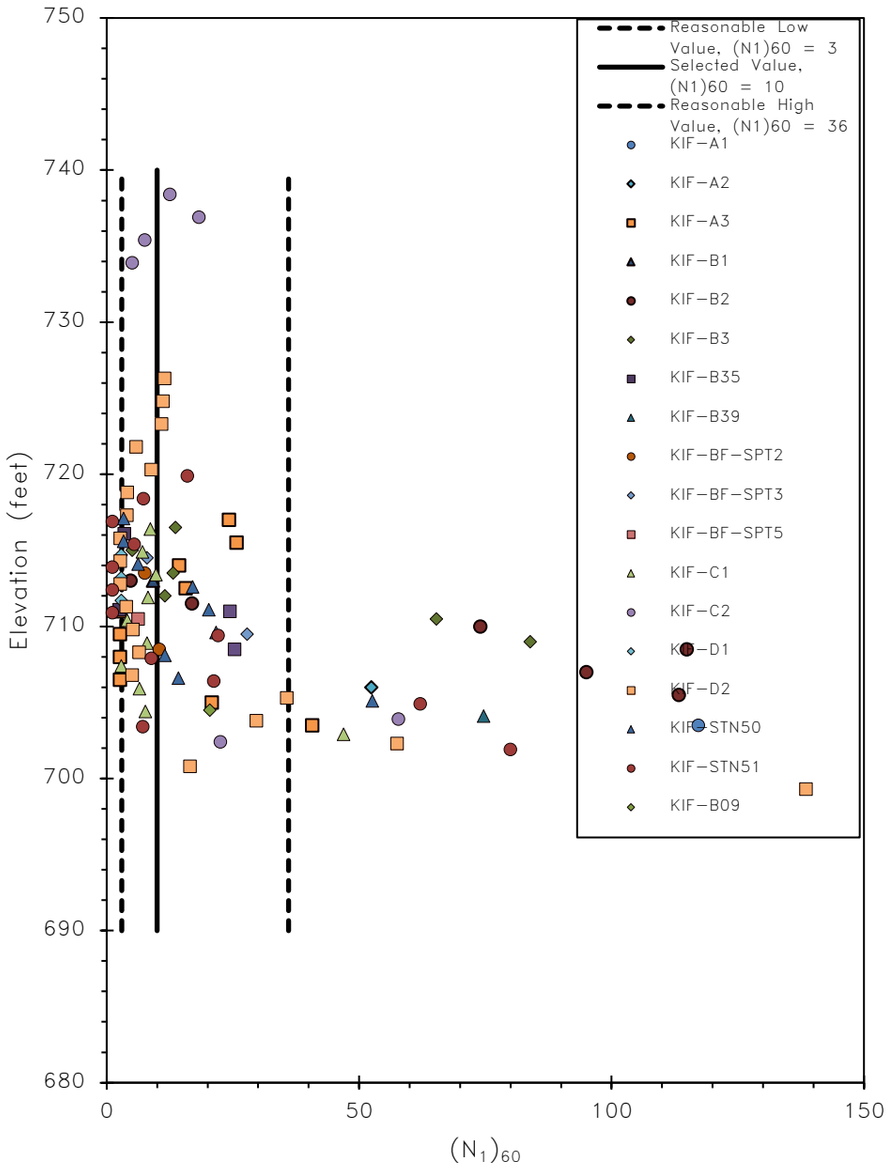
*Sus values are calculated from empirical c/p values for these methods. The selected, representative effective stress was 1.47 tsf.

4.2 SUBUNIT 3

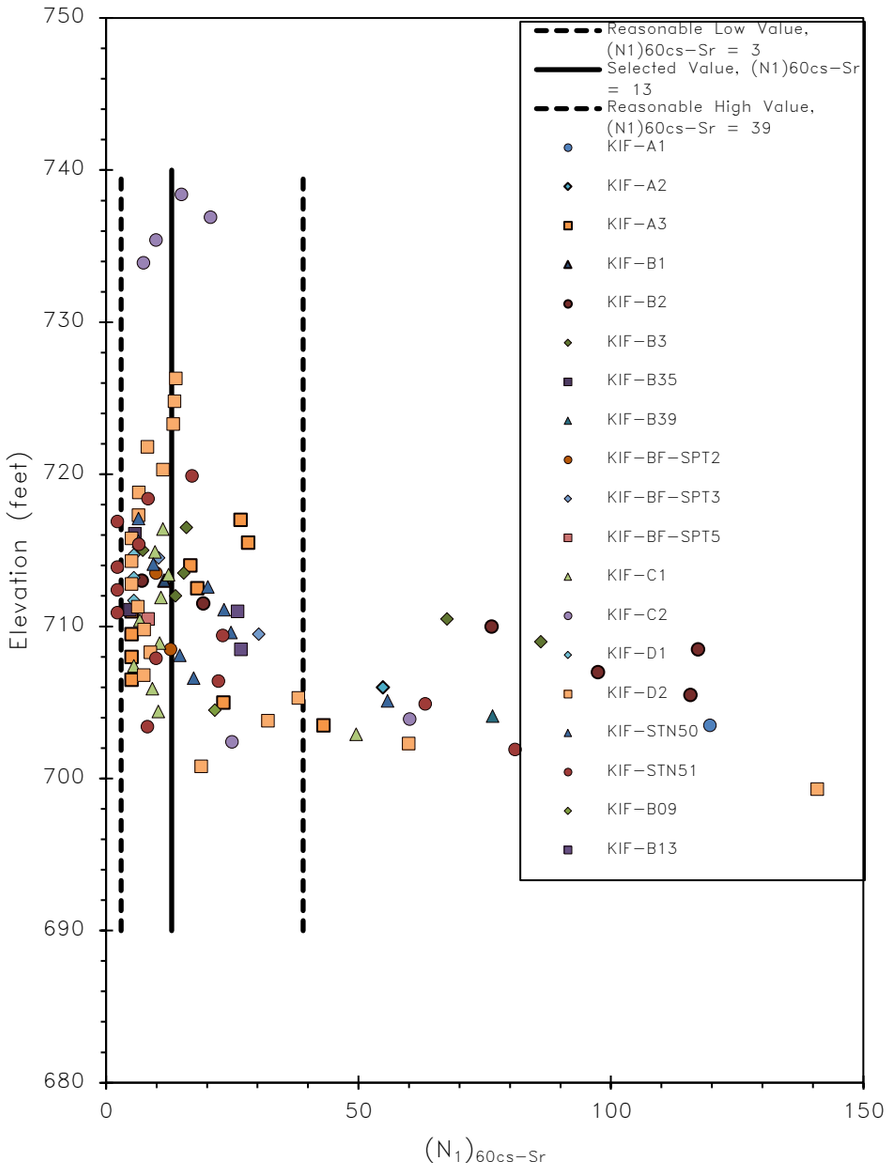
KIF East Dike, Subunit 3

Parameter	Sample Count	Minimum	Maximum	Mean	Median	Std. Dev.	Reasonable Low Value	Selected Value	Reasonable High Value
$(N_1)_{60}$	96	1	138	22	10	29	3	10	36
$(N_1)_{60cs\text{-}Sr}$		2	141	25	13	29	3	13	39
q_{c1} (tsf)	346	3	377	69	59	51	8	59	110
$q_{c1ncs\text{-}Sr}$		55	412	102	88	52	55	88	140

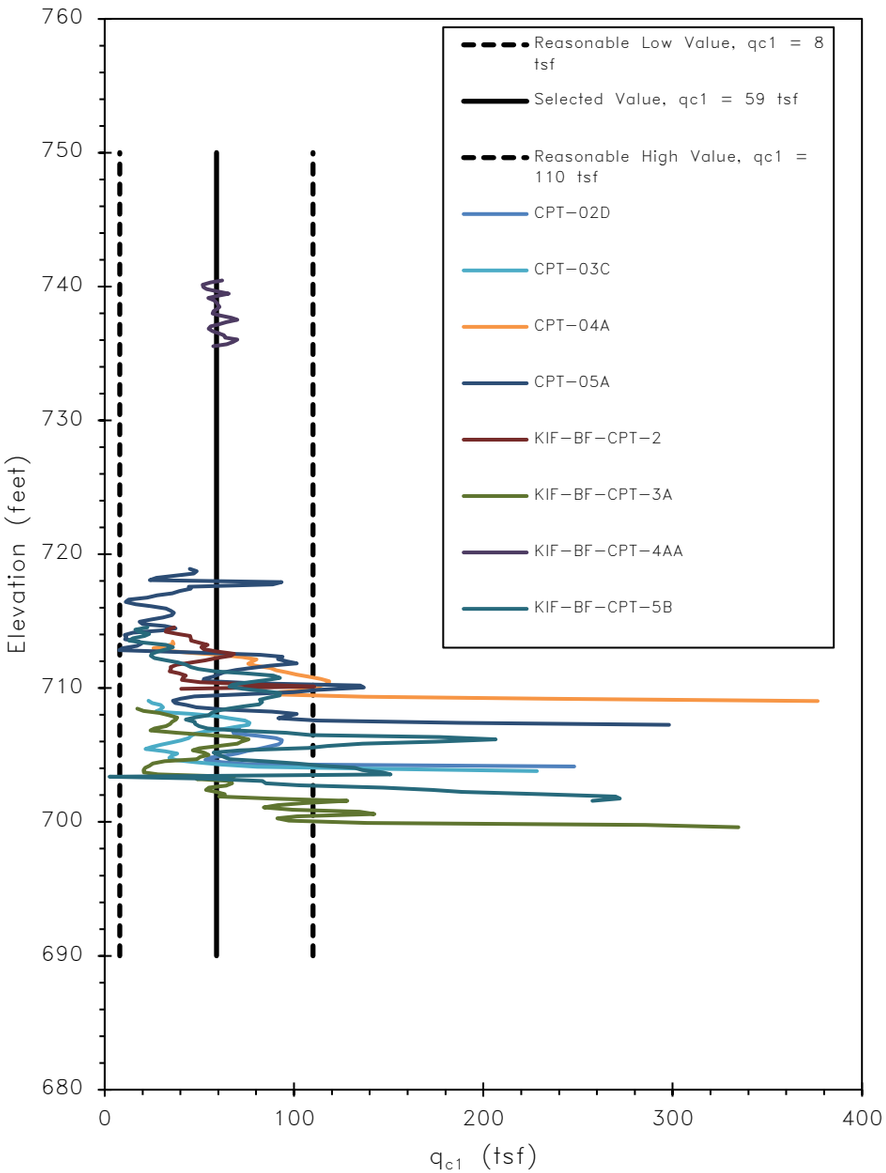
KIF East Dike, Subunit 3



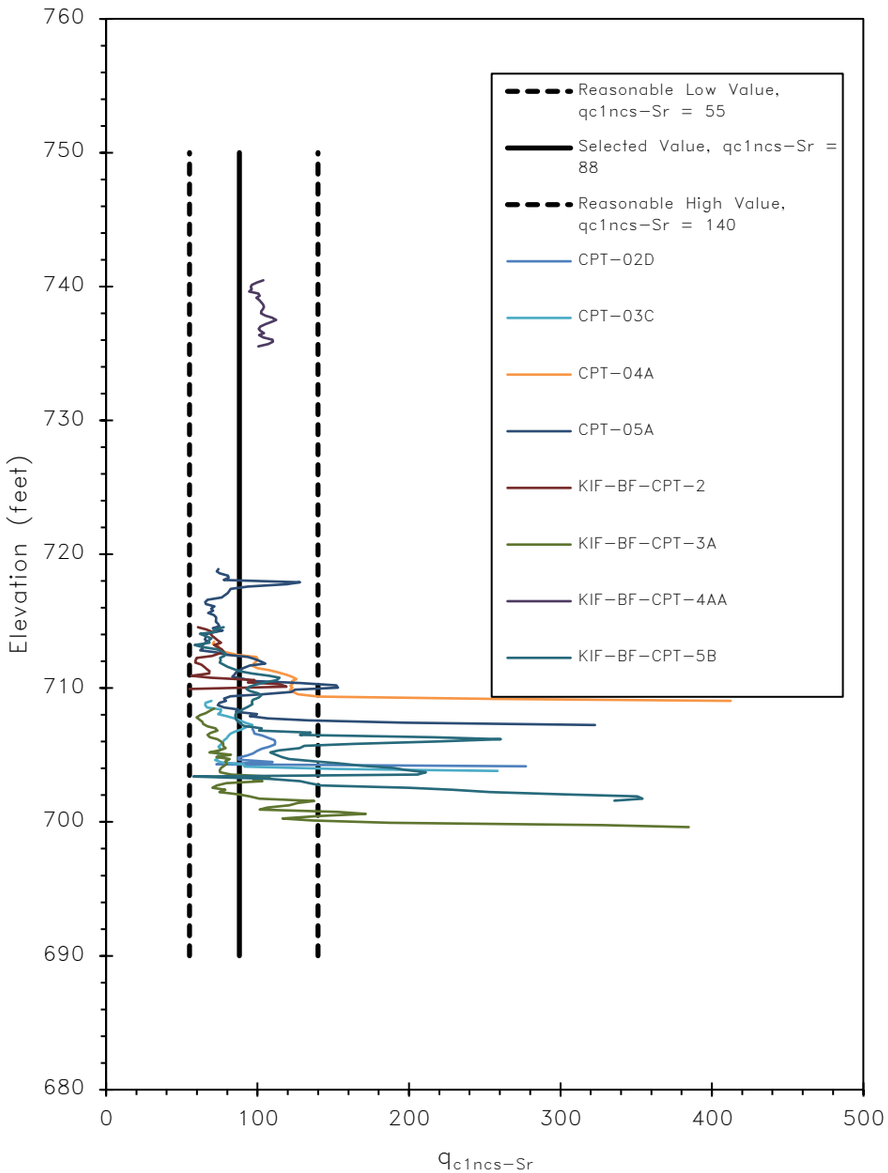
KIF East Dike, Subunit 3



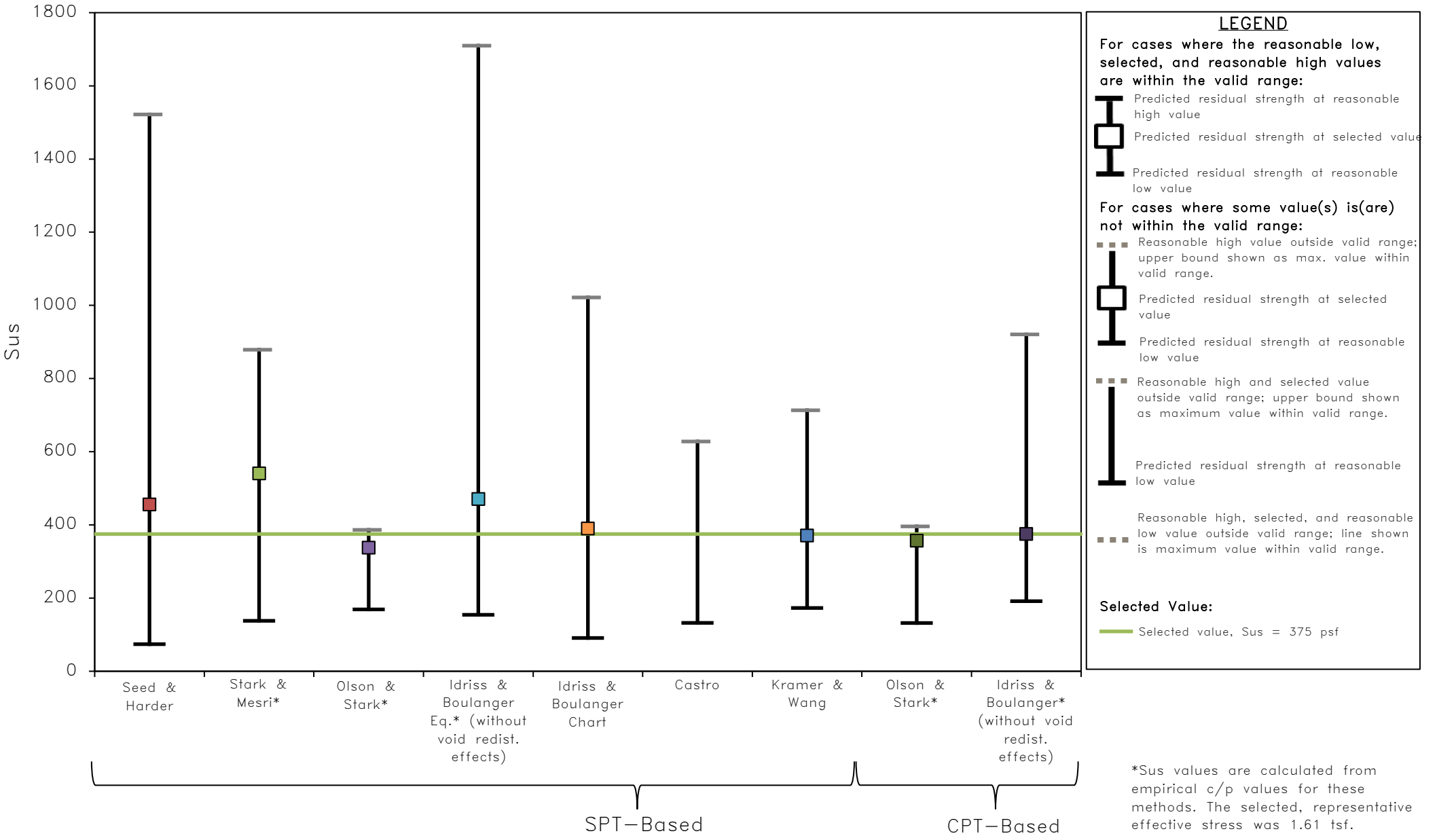
KIF East Dike, Subunit 3



KIF East Dike, Subunit 3



Subunit 3



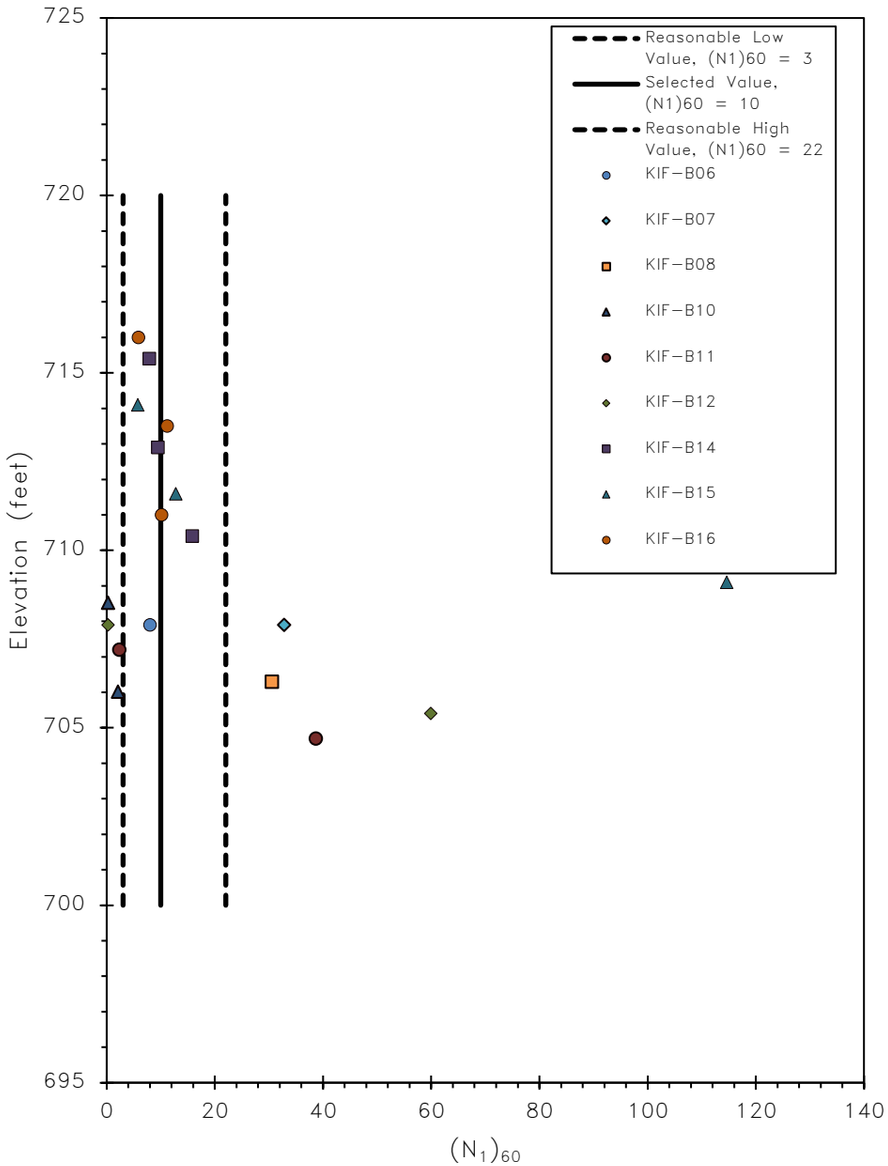
*Sus values are calculated from empirical c/p values for these methods. The selected, representative effective stress was 1.61 tsf.

4.3 SUBUNIT 3 (INTAKE CHANNEL)

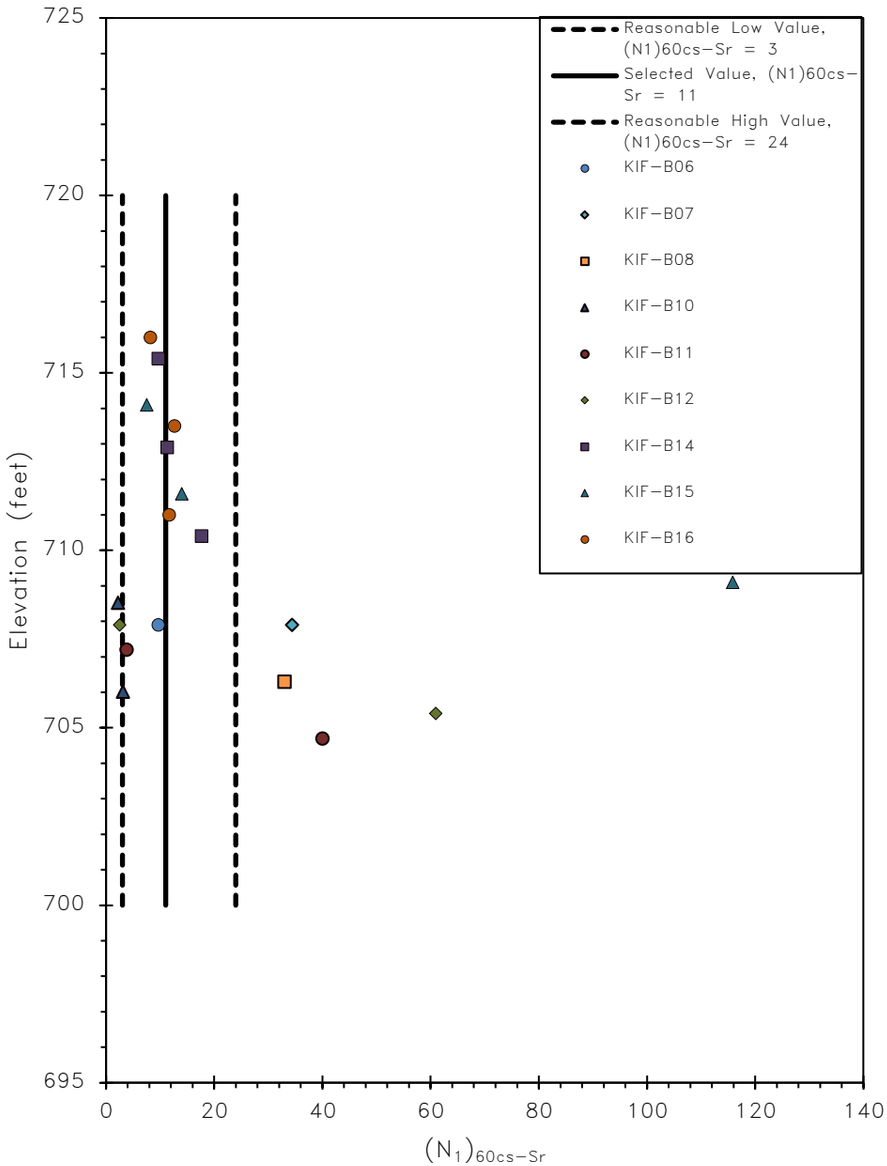
KIF East Dike, Subunit 3 (Intake Chanel)

Parameter	Sample Count	Minimum	Maximum	Mean	Median	Std. Dev.	Reasonable Low Value	Selected Value	Reasonable High Value
$(N_1)_{60}$	18	0	115	20	10	28	3	10	22
$(N_1)_{60cs\text{-}Sr}$		2	116	22	11	28	3	11	24
q_{c1} (tsf)	2	0	0	0	0	0	0	0	0
$q_{c1ncs\text{-}Sr}$		0	0	0	0	0	0	0	0

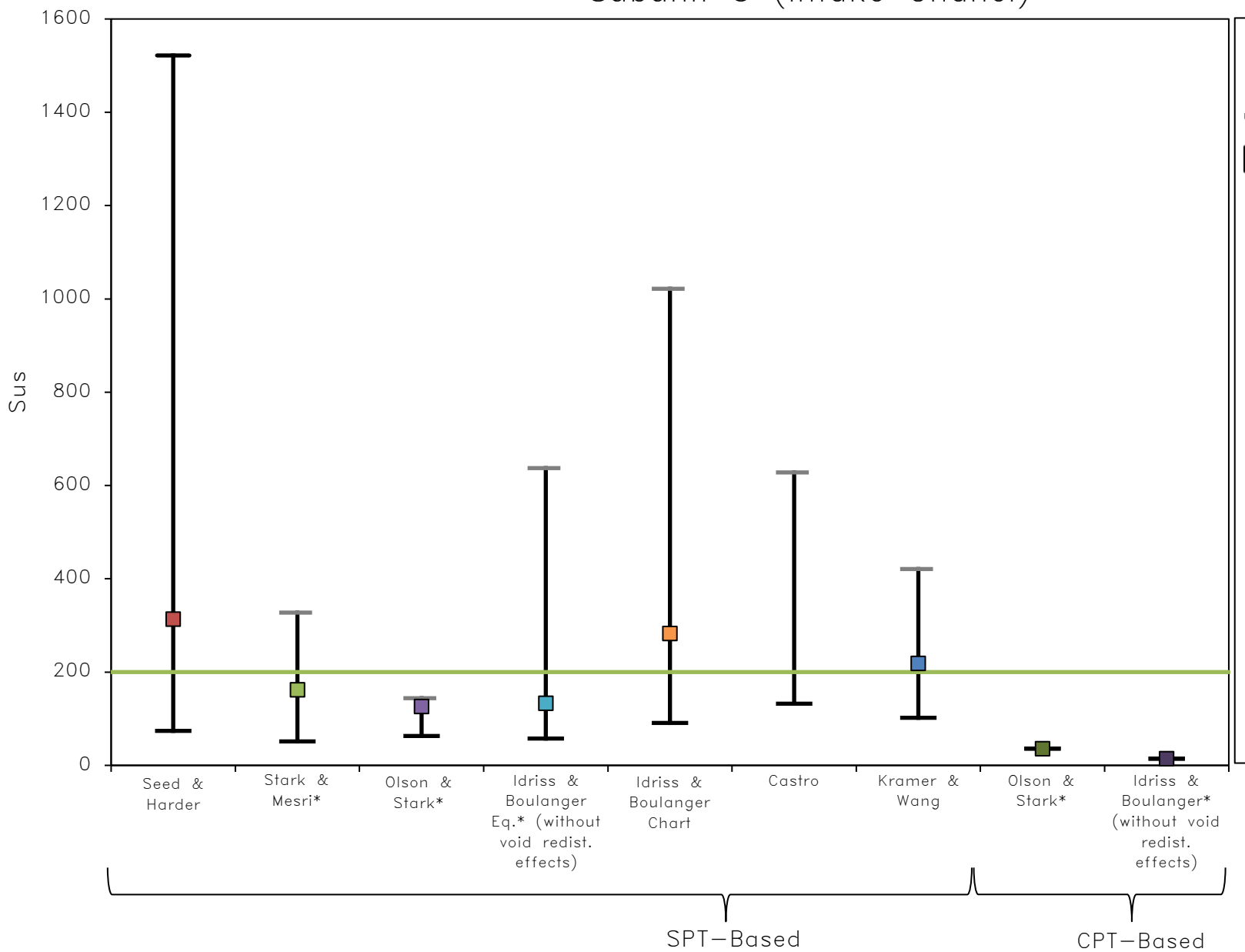
KIF East Dike, Subunit 3 (Intake Chanel)



KIF East Dike, Subunit 3 (Intake Chanel)



Subunit 3 (Intake Chanel)



LEGEND

For cases where the reasonable low, selected, and reasonable high values are within the valid range:

- Predicted residual strength at reasonable high value
- Predicted residual strength at selected value
- Predicted residual strength at reasonable low value

For cases where some value(s) is(are) not within the valid range:

- Reasonable high value outside valid range; upper bound shown as max. value within valid range.
- Predicted residual strength at selected value
- Predicted residual strength at reasonable low value
- Reasonable high and selected value outside valid range; upper bound shown as maximum value within valid range.
- Predicted residual strength at reasonable low value
- Reasonable high, selected, and reasonable low value outside valid range; line shown is maximum value within valid range.

Selected Value:

- Selected value, Sus = 200 psf

*Sus values are calculated from empirical c/p values for these methods. The selected, representative effective stress was 0.6 tsf.

APPENDIX E – A REFERENCE FOR CHARACTERIZING THE ENGINEERING PROPERTIES OF SOILS

A Reference for Characterizing the Engineering Properties of Soils

Purpose:

- This document provides focused background discussion, typical values, empirical correlations, and guidance for selecting engineering soil properties.

Developed by: Stantec Consulting Services Inc.	
Prepared by: Alan Rauch	*Reviewed by:* Jeff Dingrando
Date: 4/16/2020	

Table of Contents

Section **Page No.**

1. Introduction 7

2. Density Parameters 8

3. Hydraulic Conductivity 12
3.1. Saturated Soil Permeability 12
3.2. Permeability from Slug Tests 13
3.3. Permeability from CPT Dissipation Tests 15
3.4. Anisotropic Permeability 16
3.5. Seepage in Unsaturated Soils 22
3.5.1. Soil-Water Characteristic Curve 23
3.5.2. Hydraulic Conductivity Function 24

4. Small-Strain Shear Stiffness 29
4.1. Elastic Stiffness and Wave Velocity 29
4.2. G_{max} Correlations Based on Void Ratio 29
4.3. G_{max} Correlations Based on Penetration Resistance 30
4.4. G_{max} Correlations Based on Site-Specific Data 31

5. Strength Parameters from Laboratory Test Data 33
5.1. Definition of Failure 33
5.2. Fitting Strength Envelopes 34

6. Drained Strength Parameters for Static, Long Term Conditions 35
6.1. Basis 35
6.2. Effective Stress Cohesion Intercept 35
6.3. Fully Softened Strengths of Overconsolidated Clays 36
6.4. Depth of Surficial Softening 39
6.5. Laboratory and Field Measurement 39
6.6. Typical Values 39
6.7. Recommended Practice 40

7. Undrained Strength Parameters for Static, Short Term Conditions 46
7.1. Basis 46
7.2. When to Use Undrained Strengths 47
7.3. Undrained Strength Parameters 49
7.3.1. UU Strengths 49
7.3.2. c/p Ratios 50
7.3.3. Undrained c and ϕ 51
7.4. Laboratory Measurements of Undrained Soil Strengths 51
7.4.1. Specimen Consolidation 51
7.4.2. Loading Path 52

Section **Page No.**

7.4.3. Interpretation of Triaxial Test Data 53
7.4.3.1. UU Tests - Maximum Shear Stress, $(S_U)_{ms}$ 53
7.4.3.2. CU Tests - Maximum Shear Stress, $(S_U)_{ms}$ 54
7.4.3.3. CU Tests - Shear Stress from R-envelope, $(S_U)_R$ 54
7.4.3.4. CU Tests - Shear Stress on the Failure Plane, $(S_U)_{ff}$ .. 55
7.4.3.5. Comparison of Shear Strengths from CU Tests..... 55
7.5. In Situ Measurements of Undrained Soil Strengths 59
7.5.1. Standard Penetration Test Blowcounts 59
7.5.2. Cone Penetration Resistance 59
7.5.3. Field Vane Shear Tests 60
7.6. Typical Values 60
7.7. Recommended Practice 64
7.8. Composite Drained-Undrained Strength Envelopes 66

8. Strength of Unsaturated Soils 68
8.1. Saturation and Excess Pore Pressures 68
8.2. Conditions above the Water Table 68
8.3. Selection of Strength Parameters 69

9. Undrained Strength Parameters for Seismic Conditions 70
9.1. Basis 70
9.2. Estimation of Dynamic Strengths 70
9.3. Dynamic Strengths for Granular Soils 72
9.4. Undrained Strengths for Pseudostatic Analyses 73

10. Residual Strength Parameters for Liquefied Soils 74
10.1. Basis 74
10.2. Correlations based on SPT Blowcount 74
10.3. Correlations based on CPT Tip Resistance 77
10.4. Recommended Practice 78

11. Residual Strength Parameters for Cyclic Softened Soils 83
11.1. Field and Laboratory Measurements of Remolded Strength 83

12. Properties of Rockfill 84
12.1. Basis 84
12.2. Historical Data 85
12.3. Published Research 85
12.4. Curved Strength Envelopes in Slope/W 87

13. References 94

List of Figures

Figure **Page No.**

Figure 1. Density Properties for Typical Soils 9
Figure 2. Typical Index Properties for Soils (NAVFAC DM 7.01 1986) 10
Figure 3. Typical Properties of Compacted Soils (NAVFAC DM 7.02 1986) 11
Figure 4. Hydraulic conductivity and classification of soils (from Terzaghi and Peck 1967). 17
Figure 5. Typical values of hydraulic conductivity for natural soils (from Lambe and Whitman 1969) 18
Figure 6. Typical permeability parameters for natural soils and rock (from USBR 2011b). 19
Figure 7. Typical permeability parameters for various embankment materials (from USBR 2011b). 20
Figure 8. Geometry and symbols of a partially penetrating, partially perforated well in an unconfined aquifer with gravel pack or developed zone around the perforated section (from Bouwer and Rice 1976). 21
Figure 9. Charts for estimating saturated hydraulic conductivity from piezo-CPT dissipation tests. 22
Figure 10. Example Soil-Water Characteristic Curve (GEO-SLOPE 2010) 25
Figure 11. Tables of SWCC fitting parameters for typical soils. 26
Figure 12. SWCC and fitting parameters for coarse soils. 27
Figure 13. SEEP/W Library of Soil-Water Characteristic Curves (GEO-SLOPE 2010) 28
Figure 14. Example Hydraulic Conductivity Function (GEO-SLOPE 2010) 28
Figure 15. Example site-specific empirical correlation for shear wave velocity 32
Figure 16. (a) Stress-displacement curves for overconsolidated and fully softened (normally consolidated) natural stiff fissured clays, and (b) overconsolidated peak, fully softened peak and residual strength envelopes (from VandenBerge et al. 2013). 37
Figure 17. Correlations for effective stress friction angle in sands from SPT data. 42
Figure 18. Correlations for effective stress friction angle in sands from CPT data. 43

Figure **Page No.**

Figure 19. Typical values of effective stress friction angle for granular soils. 44
Figure 20. Typical values of effective stress friction angle for clay soils. 45
Figure 21. Selection of appropriate shear strength parameters for stability analyses. 48
Figure 22. Undrained shear strength determined from UU triaxial test results fit with a c/p ratio. 56
Figure 23. Undrained strength envelope representing the maximum shear stress measured in CU triaxial tests (this method is not recommended). 57
Figure 24. Undrained shear strengths determined from an R-envelope fit to CU triaxial test results. 57
Figure 25. Undrained strength envelope representing the failure plane shear stresses measured in CU triaxial tests. 58
Figure 26. Drained, undrained, and R strength envelopes from CU triaxial tests (after FERC 2006; USBR 2011a) 58
Figure 27. Comparison of undrained shear strengths, characterized using three different definitions, from CU triaxial tests. 59
Figure 28. Consistency of clays based on undrained strength (based on values from Peck et al. 1974) 61
Figure 29. Correction factor for the interpretation of undrained shear strengths from field vane shear tests (from Ladd and DeGroot 2003). 62
Figure 30. Correlations for c/p ratio in normally consolidated clays (from Duncan et al. 1989). 63
Figure 31. Typical values for estimating the c/p ratio using Equation 30. 64
Figure 32. Specification of a composite strength envelope to avoid undrained shearing resistance due to negative pore pressures. 67
Figure 33. Correlations between residual strength of liquefied soil and SPT penetration resistance. 79
Figure 34. Correlations for the residual strength of liquefied soil by Olson and Stark (2002). 80
Figure 35. Correlations for the residual strength of liquefied soil by Idriss and Boulanger (2008) 81
Figure 36. Correlation for the residual strength of liquefied soil by Castro (1995). 82

Figure **Page No.**

Figure 37. Definition of secant friction angle for representing curved strength envelopes. 88

Figure 38. Shearing strength of three rockfills from large-scale triaxial tests (from Marachi et al. 1972). 89

Figure 39. Data on rockfill properties compiled by Leps (1970). 90

Figure 40. Shearing strength of rockfill from large-scale triaxial tests (from Leps 1970) 93

A Reference for Characterizing the Engineering Properties of Soils

1. Introduction

This document provides focused background discussion, typical values, empirical correlations, and guidance for selecting engineering soil properties. The emphasis is on the soil parameters needed for slope stability analyses. The measurement and selection of soil properties is a broad subject, and this document does not provide a comprehensive review. Good textbook treatments are provided in Lambe and Whitman (1969), Holtz and Kovacs (1981), Terzaghi et al. (1996), and Duncan et al. (2014).

It is impossible to anticipate the conditions that will be encountered at a particular site or project. The engineering team must select the appropriate methods for characterizing each soil, based on the available data, specific characteristics of the material, geologic setting, application of the parameter in the analysis, and professional judgment.

2. Density Parameters

The unit weight of a given soil varies with water content, with different values in a deposit above or below the water table. Unit weights for various moisture conditions can be computed as follows:

Dry unit weight $$\gamma_d = \frac{G_s}{1+e}\,\gamma_w$$ **Equation 1**

Moist unit weight $$\gamma_m = \gamma_d(1+w)$$ **Equation 2**

Saturated unit weight $$\gamma_{sat} = \frac{G_s + e}{1+e}\,\gamma_w$$ **Equation 3**

where G_s is the specific gravity of the solids, e is the void ratio, w is the gravimetric moisture content, and γ_w is the unit weight of water (62.4 pcf). Specific gravity is typically about 2.65 for sands, and about 2.7 for clays.

The gravimetric water content (w) is the ratio of the water weight over dry weight of solids in the soil. The volumetric water content (θ), defined as the ratio of water volume over total soil volume, is used in some analyses. These two measures of moisture content can be related:

$$\theta = \frac{G_s\, w}{1+e} = \frac{S\, e}{1+e} = S\, n$$ **Equation 4**

where e is void ratio, S is saturation, and n is porosity. In a saturated soil (S = 100%), the volumetric water content is equal to the porosity.

Direct measurements of density properties are obtained from field and laboratory testing. When direct measurements are not available, these properties can be estimated using typical values for similar materials, such as those tabulated in Figure 1 through Figure 3. In granular soils, unit weights can be estimated based on penetration resistance, which can be correlated to relative density (see Figure 19).

	Density (Mg/m³)†						
	Dry Density, ρ_d			Wet Density, ρ		Submerged Density, ρ'	
	Min. (loose)	100% Mod. Proctor	Max. (dense)	Min. (loose)	Max. (dense)	Min. (loose)	Max. (dense)
1. Uniform materials:							
(a) Equal spheres (theoretical values)	—	—	—	—	—	—	—
(b) Standard Ottawa sand	1.49	—	1.78	1.51	2.12	0.93	1.12
(c) Clean, uniform sand (fine or medium)	1.35	1.86	1.92	1.37	2.20	0.85	1.18
(d) Uniform, inorganic silt	1.29	—	1.92	1.31	2.20	0.83	1.18
2. Well-graded materials:							
(a) Silty sand	1.41	1.98	2.06	1.43	2.30	0.88	1.28
(b) Clean, fine to course sand	1.38	2.14	2.23	1.40	2.39	0.86	1.40
(c) Micaceous sand	1.23	—	1.95	1.24	2.23	0.77	1.23
(d) Silty sand and gravel	1.44	—	2.36	1.46	2.51	0.91	1.49

†Tabulation is based on $\rho_s = 2.65$ Mg/m³. Multiply by 62.4 to obtain lbf/ft³.

From Holtz and Kovacs (1981)

Description	Porosity, n (%)	Void ratio (e)	Water content, w (%)	Density (Mg/m³)		Unit Weight (kN/m³)	
				ρ_d	ρ_{sat}	γ_d	γ_{sat}
1. Uniform sand, loose	46	0.85	32	1.43	1.89	14.0	18.5
2. Uniform sand, dense	34	0.51	19	1.75	2.09	17.2	20.5
3. Mixed-grained sand, loose	40	0.67	25	1.59	1.99	15.6	19.5
4. Mixed-grained sand, dense	30	0.43	16	1.86	2.16	18.2	21.2
5. Glacial till, very mixed-grained	20	0.25	9	2.12	2.32	20.8	22.7
6. Soft glacial clay	55	1.2	45		1.77	12.0	17.4
7. Stiff glacial clay	37	0.6	22		2.07	16.7	20.3
8. Soft slightly organic clay	66	1.9	70		1.58	9.1	15.5
9. Soft very organic clay	75	3.0	110		1.43	6.7	14.4
10. Soft bentonite	84	5.2	194		1.27	4.2	12.5

w = water content when saturated, in percent of dry weight.
ρ_d = density in dry state.
ρ_{sat} = density in saturated state.
γ_d = unit weight in dry state.
γ_{sat} = unit weight in saturated state.

From Terzaghi et al. (1996)

Figure 1. Density Properties for Typical Soils

Particle Size and Gradation					Voids[1]					Unit Weight[2] (lb./cu.ft.)						
	Approximate Size Range (mm)		Approx. D_{10} (mm)	Approx. Range Uniform Coefficient C_u	Void Ratio			Porosity (%)		Dry Weight			Wet Weight		Submerged Weight	
	D_{max}	D_{min}			e_{max} loose	e_{cr}	e_{min} dense	n_{max} loose	n_{min} dense	Min loose	100% Mod. AASHO	Max dense	Min loose	Max dense	Min loose	Max dense
GRANULAR MATERIALS																
Uniform Materials																
a. Equal spheres (theoretical values)	-	-	-	1.0	0.92	-	0.35	47.6	26	-	-	-	-	-	-	-
b. Standard Ottawa SAND	0.84	0.59	0.67	1.1	0.80	0.75	0.50	44	33	92	-	110	93	131	57	69
c. Clean, uniform SAND (fine or medium)	-	-	-	1.2 to 2.0	1.0	0.80	0.40	50	29	83	115	118	84	136	52	73
d. Uniform, inorganic SILT	0.05	0.005	0.012	1.2 to 2.0	1.1	-	0.40	52	29	80	-	118	81	136	51	73
Well-graded Materials																
a. Silty SAND	2.0	0.005	0.02	5 to 10	0.90	-	0.30	47	23	87	122	127	88	142	54	79
b. Clean, fine to coarse SAND	2.0	0.05	0.09	4 to 6	0.95	0.70	0.20	49	17	85	132	138	86	148	53	86
c. Micaceous SAND	-	-	-	-	1.2	-	0.40	55	29	76	-	120	77	138	48	76
d. Silty SAND & GRAVEL	100	0.005	0.02	15 to 300	0.85	-	0.14	46	12	89	-	146[3]	90	155[3]	56	92
MIXED SOILS																
Sandy or Silty CLAY	2.0	0.001	0.003	10 to 30	1.8	-	0.25	64	20	60	130	135	100	147	38	85
Skip-graded Silty CLAY with stones or rk fgmts	250	0.001	-	-	1.0	-	0.20	50	17	84	-	140	115	151	53	89
Well-graded GRAVEL, SAND, SILT & CLAY mixture	250	0.001	0.002	25 to 1000	0.70	-	0.13	41	11	100	140	148[4]	125	156[4]	62	94
CLAY SOILS																
CLAY (30%-50% clay sizes)	0.05	0.5μ	0.001	-	2.4	-	0.50	71	33	50	105	112	94	133	31	71
Colloidal CLAY (-0.002 mm: 50%)	0.01	10Å	-	-	12	-	0.60	92	37	13	90	106	71	128	8	66
ORGANIC SOILS																
Organic SILT	-	-	-	-	3.0	-	0.55	75	35	40	-	110	87	131	25	69
Organic CLAY (30% - 50% clay sizes)	-	-	-	-	4.4	-	0.70	81	41	30		100	81	125	18	62

Figure 2. Typical Index Properties for Soils (NAVFAC DM 7.01 1986)

Figure 3. Typical Properties of Compacted Soils (NAVFAC DM 7.02 1986)

Group Symbol	Soil Type	Range of Maximum Dry Unit Weight, pcf	Range of Optimum Moisture, Percent	Typical Value of Compression		Typical Strength Characteristics				Typical Coefficient of Permeability ft./min.	Range of CBR Values	Range of Subgrade Modulus k lbs/cu in.
				At 1.4 tsf (20 psi)	At 3.6 tsf (50 psi)	Cohesion (as compacted) psf	Cohesion (saturated) psf	ϕ (Effective Stress Envelope Degrees)	Tan ϕ			
				Percent of Original Height								
GW	Well graded clean gravels, gravel-sand mixtures.	125 - 135	11 - 8	0.3	0.6	0	0	>38	>0.79	5×10^{-2}	40 - 80	300 - 500
GP	Poorly graded clean gravels, gravel-sand mix	115 - 125	14 - 11	0.4	0.9	0	0	>37	>0.74	10^{-1}	30 - 60	250 - 400
GM	Silty gravels, poorly graded gravel-sand-silt.	120 - 135	12 - 8	0.5	1.1	.....	.....	>34	>0.67	$>10^{-6}$	20 - 60	100 - 400
GC	Clayey gravels, poorly graded gravel-sand-clay.	115 - 130	14 - 9	0.7	1.6	.....	.....	>31	>0.60	$>10^{-7}$	20 - 40	100 - 300
SW	Well graded clean sands, gravelly sands.	110 - 130	16 - 9	0.6	1.2	0	0	38	0.79	$>10^{-3}$	20 - 40	200 - 300
SP	Poorly graded clean sands, sand-gravel mix.	100 - 120	21 - 12	0.8	1.4	0	0	37	0.74	$>10^{-3}$	10 - 40	200 - 300
SM	Silty sands, poorly graded sand-silt mix.	110 - 125	16 - 11	0.8	1.6	1050	420	34	0.67	$5 \times >10^{-5}$	10 - 40	100 - 300
SM-SC	Sand-silt clay mix with slightly plastic fines.	110 - 130	15 - 11	0.8	1.4	1050	300	33	0.66	$2 \times >10^{-6}$	5 - 30	100 - 300
SC	Clayey sands, poorly graded sand-clay-mix.	105 - 125	19 - 11	1.1	2.2	1550	230	31	0.60	$5 \times >10^{-7}$	5 - 20	100 - 300
ML	Inorganic silts and clayey silts.	95 - 120	24 - 12	0.9	1.7	1400	190	32	0.62	$>10^{-5}$	15 or less	100 - 200
ML-CL	Mixture of inorganic silt and clay.	100 - 120	22 - 12	1.0	2.2	1350	460	32	0.62	$5 \times >10^{-7}$	.....	
CL	Inorganic clays of low to medium plasticity.	95 - 120	24 - 12	1.3	2.5	1800	270	28	0.54	$>10^{-7}$	15 or less	50 - 200
OL	Organic silts and silt-clays, low plasticity.	80 - 100	33 - 21	.....	.....	.....	.....	.....	.....	.....	5 or less	50 - 100
MH	Inorganic clayey silts, elastic silts.	70 - 95	40 - 24	2.0	3.8	1500	420	25	0.47	$5 \times >10^{-7}$	10 or less	50 - 100
CH	Inorganic clays of high plasticity	75 - 105	36 - 19	2.6	3.9	2150	230	19	0.35	$>10^{-7}$	15 or less	50 - 150
OH	Organic clays and silty clays	65 - 100	45 - 21	.....	.....	.....	.....	.....	.....	.....	5 or less	25 - 100

Notes:

1. All properties are for condition of "Standard Proctor" maximum density, except values of k and CBR which are for "modified Proctor" maximum density.
2. Typical stength characteristics are for effective strength envelopes and are obtained from USBR data.
3. Compression values are for vertical loading with complete lateral confinement.
4. (>) indicates that typical property is greater than the value shown.
   (..) indicates insufficient data available for an estimate.

3. Hydraulic Conductivity

This discussion relates to the seepage of water through soil per Darcy's law, wherein the seepage flow rate is proportional to the hydraulic gradient. The key soil parameter is the hydraulic conductivity (k); here, the generic term "permeability" is assumed to be synonymous with hydraulic conductivity.

Hydraulic conductivity varies over an extremely wide range for different soils, and the permeability of a large soil mass is difficult to determine with precision. Measurements made with discrete soil samples will fail to capture the influence of macro seepage features (fissures, discontinuities, inclusions, thin beds of different material, etc.) that may have a major impact on seepage through the soil mass. More representative values can sometimes be obtained through field testing, but such tests are expensive and difficult to interpret. The characterization of soil permeability parameters requires significant engineering judgment.

Seepage analyses may be performed to characterize the distribution of pore water pressures in an earth slope, without regard to seepage flow rates. For this type of problem, the relative permeabilities between the various soil strata and/or the ratio of horizontal to vertical permeability (anisotropy ratio) within a given soil zone, are more important to the model solution than the absolute permeability of any particular soil. Thinking about the flownet for a uniform, isotropic seepage problem, the head (or pressure) at any location is independent of the hydraulic conductivity. Also, if the permeability in one material is more than about two orders of magnitude higher than the adjacent soil, then the first will act like a drain and can be modeled as a boundary condition.

The engineer should consider these issues in selecting appropriate permeability parameters for a particular analysis, recognizing that the needed solution may not be sensitive to the permeability of some materials. Permeability estimates, based on typical values for similar soils, are often sufficient and appropriate for developing a reasonable seepage model. Testing and evaluation should be concentrated on the soil zones that are critical to the problem.

3.1. Saturated Soil Permeability

The tables and charts provided below are useful when estimating hydraulic conductivity for saturated soils, or when checking the validity of permeability measurements. The charts in Figure 4 classify soil behavior in terms of permeability ranges, while data for common soils and embankment materials are provided in Figure 3 and Figure 5 though Figure 7.

The hydraulic conductivity of clean, loose, uniform sands can be estimated using Hazen's empirical equation:

$$k \approx C\ (D_{10})^2 \qquad \textbf{Equation 5}$$

where k is the hydraulic conductivity (cm/sec), D_{10} (mm) is the effective grain size (10% of soil particles are smaller than D_{10}), and C is an empirical constant that typically varies between 0.8 and 1.2. This empirical correlation illustrates that permeability is strongly affected by the finer particles in a soil. However, Hazen's equation was developed for filter sands, and is thus limited in applicability to loose, uniform sands with less than 5% fines.

Hydraulic conductivity is also affected by how densely the soil particles are packed together. The change in permeability with the change in density, for a particular soil, can be estimated using:

$$k_1\left(\frac{e_2^3}{1+e_2}\right) = k_2\left(\frac{e_1^3}{1+e_1}\right) \qquad \textbf{Equation 6}$$

where k_1 is the permeability at a void ratio of e_1, and k_2 is the permeability of the same soil at a void ratio of e_2. Equation 6 is based on the Kozeny-Carman equation (Lambe and Whitman 1969).

In the laboratory, hydraulic conductivity can be measured directly from constant head permeability tests (preferred for soils with $k > 10^{-3}$ cm/sec) or falling head permeability tests (preferred for soils with $k < 10^{-5}$ cm/sec). The permeability of fine-grained soils can also be determined from the results of one-dimensional consolidation tests. The accuracy of laboratory permeability measurements is limited, in all cases, by how well the test specimen represents the in situ soil deposit.

In the field, hydraulic conductivity can be measured with borehole or well infiltration (slug) tests, with variations of constant head, falling head, and pumping. Large-scale aquifer pumping tests, with arrays of piezometer instrumentation, can also be used to characterize the permeability characteristics of large soil masses. Double ring infiltrometer tests are commonly used to measure vertical permeability on soil liners. Further discussion of all available test methods is beyond the scope of this document.

3.2. Permeability from Slug Tests

Hydraulic conductivity parameters can be determined from slug tests in screened wells or piezometers. In the field, water is either poured into or removed from the well, causing a nearly instantaneous increase or decrease in the water level. The water levels are then recorded at regular intervals until returning to the initial static level. The Bouwer-Rice solution is then fit to this data to estimate the saturated permeability, for horizontal seepage in the soil or rock strata surrounding the screened interval.

The Bouwer-Rice solution (Bouwer and Rice 1976; Bouwer 1989) for estimating the coefficient of saturated hydraulic conductivity assumes a volume of water is instantaneously removed from a well and the return of the water level is measured. The method is based on a solution of the Thiem equation for steady-state, radial water flow to a well (see Figure 8):

$$Q = 2\pi \cdot k \cdot L_e \frac{y}{\ln\left(\frac{R_e}{r_w}\right)}$$ **Equation 7**

where: Q = volumetric flow rate
k = coefficient of saturated hydraulic conductivity
L_e = length of open section of the well (screened interval)
y = vertical distance between water level in the well and static water level of groundwater aquifer
R_e = effective radial distance over which y is dissipated
r_w= radial distance of the undisturbed portion of the aquifer

The change in water elevation within a well over a change in time is:

$$\frac{dy}{dt} = \frac{-Q}{\pi r_c^2}$$ **Equation 8**

where r_c is the inside radius of the well casing if above the open portion of the well (the porosity of the surrounding material may need to be considered if the water level is changing in the open portion of the well)

Bouwer and Rice assumed that the draw-down of the water table around the well is negligible, flow in the vadose (unsaturated) zone can be ignored, head losses are negligible, and the aquifer is both homogeneous and isotropic. Bouwer and Rice combined the two equations and solved for the coefficient of saturated hydraulic conductivity assuming boundary conditions of y_o at t = 0.0 and y_t at t:

$$k = \frac{r_c^2 \cdot \ln\left(\frac{R_e}{r_w}\right)}{2 \cdot L} \cdot \frac{1}{t} \cdot \ln\frac{y_o}{y_t}$$ **Equation 9**

The effective radial distance over which y is dissipated (R_e) was determined by Bouwer and Rice for different geometries based on an electrical resistance network analog. Thus, the value must be determined from their literature (Bouwer and Rice, 1976). This form of the equation allows k to be calculated from the rise in water level after suddenly removing a slug of water from the well. The term $\frac{1}{t} \cdot \ln\frac{y_o}{y_t}$ may be determined from a best fit linear regression of field data plotted as ln(y) versus t.

Bouwer (1989) explained the applicability of using the method to determine the coefficient of saturated hydraulic conductivity from a slug test where water is added to the well.

3.3. Permeability from CPT Dissipation Tests

In situ soil permeability can be estimated from pore pressure dissipation data acquired during cone penetration testing (CPT). When the piezocone probe is stopped, at selected depths or intervals in a saturated deposit, the excess pore water pressures induced by pushing the cone will begin to dissipate. Based on consolidation theory, the rate of pore pressure dissipation can be related to the lateral hydraulic conductivity of the soil surrounding the probe. The method presented below assumes the penetration pore pressures are measured immediately behind the conical tip, at the "u_2" location.

The horizontal permeability (k_h) of a soil is determined from a CPT dissipation test as follows:

(1) Halt advancement of the piezocone and record the soil water pore pressures (u_t) as a function of time (t).

(2) From the data, determine the initial pore pressure (u_i) measured when the piezocone was halted, at t = 0.0.

(3) Estimate the static pore pressure (u_o) at the test location before penetration of the cone. This may be determined from knowledge of the ground water table in relation to the depth of the CPT probe, piezometric readings, or data from piezocone tests in adjacent sand layers.

(4) Compute the normalized excess pore pressure (U) for each measurement of u_t:

$$U = \frac{u_t - u_o}{u_i - u_o} \qquad \textbf{Equation 10}$$

(5) Plot the normalized excess pore pressure dissipation as a function of time, using a log scale for the time axis.

(6) From the plot of data, determine the measured time for 50% pore pressure dissipation (t_{50}, measured at U = 0.5).

(7) Alternatively, t_{50} may be determined from a square root of time plot, using the graphical construction technique commonly used to interpret soil consolidation test data.

(8) The coefficient of saturated, horizontal hydraulic conductivity can then be estimated using either of the charts in Figure 9 (note the difference in time units between the two charts).

The resulting estimates of soil permeability are only approximate and subject to significant uncertainty (Lunne et al. 1997).

3.4. Anisotropic Permeability

Most natural soils and embankment materials are anisotropic, typically with horizontal stratification due to horizontal bedding in natural deposits or the construction of fills in horizontal lifts. This usually results in a horizontal permeability (k_h) greater than the vertical permeability (k_v). Anisotropic permeability is characterized with the ratio of k_h/k_v (Note: SEEP/W uses the inverse ratio of k_v/k_h).

The magnitude of k_h/k_v is an important parameter to consider in a seepage analysis, but can be difficult to characterize. Vertical permeability is usually measured in laboratory tests, consistent with the orientation of borehole samples. Laboratory testing is less effective for measuring horizontal permeability, due to the difficulty of obtaining representative samples suitable for such tests. Field tests, including slug tests in screened wells (Section 3.2) and CPT dissipation tests (Section 3.3), induce mostly radial seepage; horizontal permeability is inferred, but some vertical seepage will occur. There are limitations associated with each of these measurements. The anisotropy of the materials is not measured directly, thus, the value of k_h/k_v must be approximated by combining different test results and considering knowledge of the subsurface stratigraphy.

The U.S. Army Corps of Engineers suggests that values of $k_h/k_v = 1, 10, 25, 100$ should be considered for parametric evaluations of underseepage (EM 1110-2-1901, USACE 1986). Typical ranges of k_h/k_v for various natural soils and embankment fills, as suggested by the U.S. Bureau of Reclamation (USBR 2011b), are listed in Figure 6 and Figure 7.

Selection of an appropriate value of k_h/k_v should consider the depositional environment for the material. Wind-blown soils (dune sands, loess) are relatively uniform, with k_h/k_v values in the range of 0.2 to 2. Residual soils may also have low k_h/k_v, depending on the structure of the parent rock. Deposition in water (alluvial, fluvial, and lacustrine environments) usually leads to highly stratified and variable soil deposits, with relatively high k_h/k_v. These classes of soils may have $k_h/k_v > 100$ (USBR 2011b). Anisotropy in bedrock is generally controlled by the degree of stratification and jointing.

The USBR (2011b) indicates that compacted embankment soils typically have k_h/k_v ratios in the range of 2 to 10. Older dams (built in early 20th century) and hydraulic fill dams may have k_h/k_v up to 50, due to older construction procedures that did not adequately scarify and mix the surface of each compacted soil lift. Coarse grained embankment zones, including drains, filters, and rockfill shells, can be assumed to have $k_h/k_v = 1$.

Degree of Permeability	Hydraulic Conductivity (cm/sec)
High	Greater than 10^{-1}
Medium	10^{-1} to 10^{-3}
Low	10^{-3} to 10^{-5}
Very Low	10^{-5} to 10^{-7}
Practically Impermeable	Less than 10^{-7}

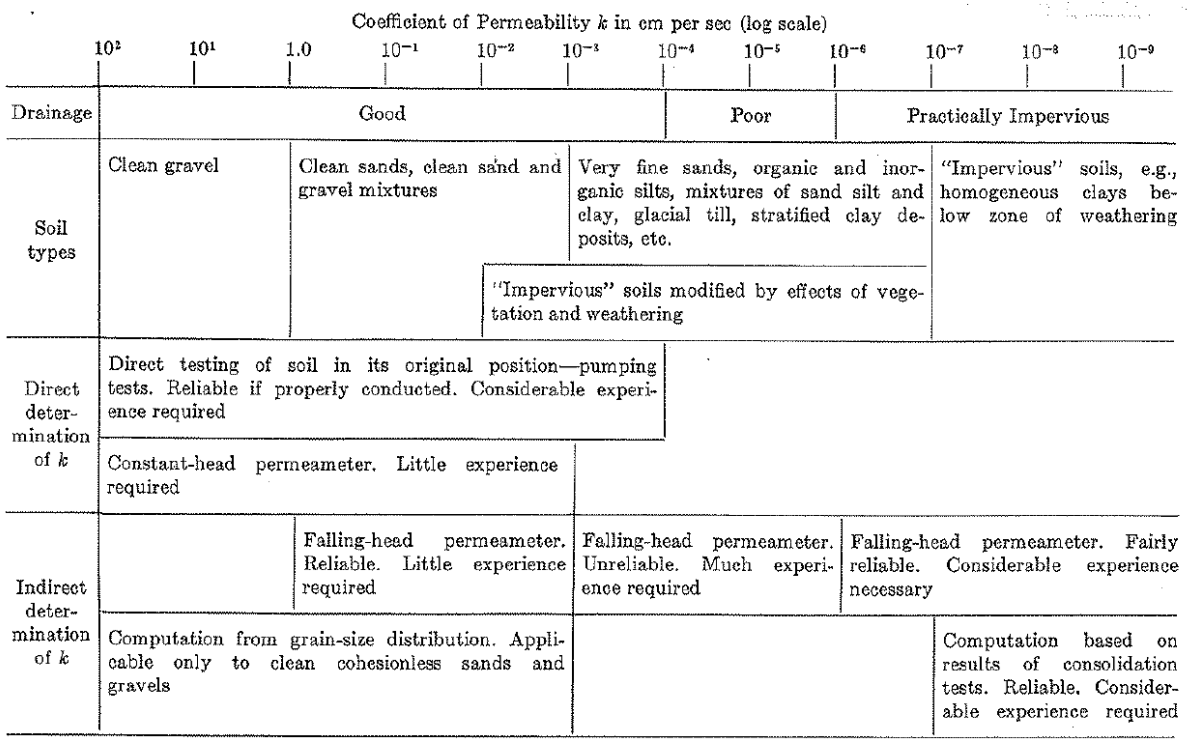
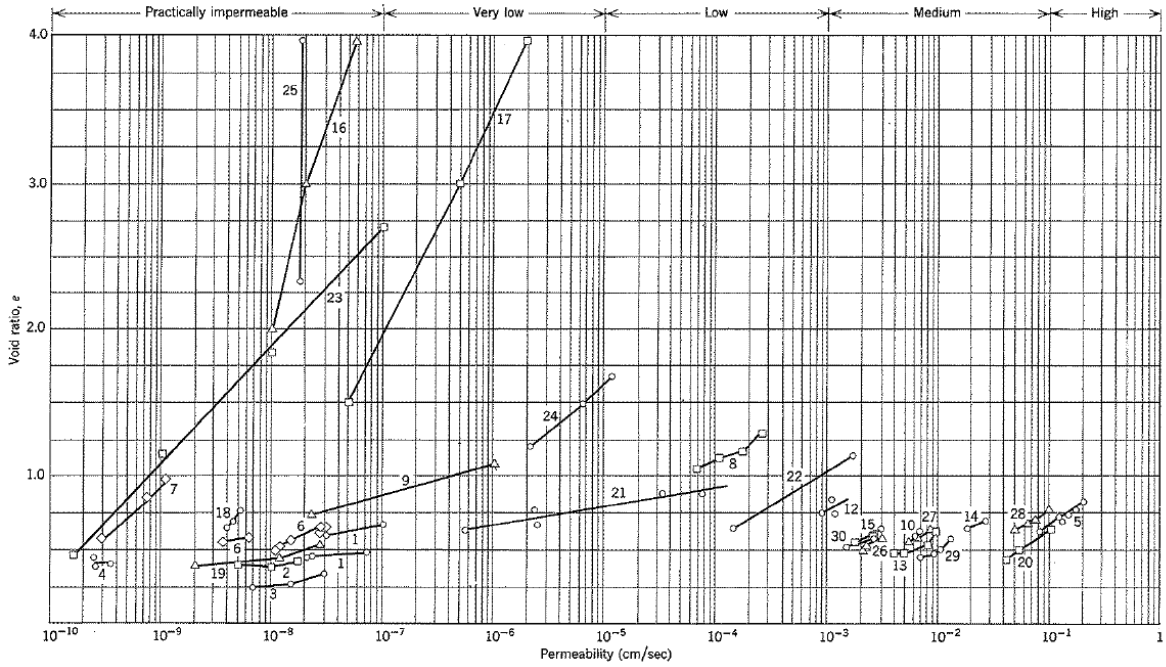


Figure 4. Hydraulic conductivity and classification of soils (from Terzaghi and Peck 1967).

Formation	Value of k (cm/sec)
River deposits	
Rhone at Genissiat	Up to 0.40
Small streams, eastern Alps	0.02–0.16
Missouri	0.02–0.20
Mississippi	0.02–0.12
Glacial deposits	
Outwash plains	0.05–2.00
Esker, Westfield, Mass.	0.01–0.13
Delta, Chicopee, Mass.	0.0001–0.015
Till	Less than 0.0001
Wind deposits	
Dune sand	0.1–0.3
Loess	0.001 ±
Loess loam	0.0001 ±
Lacustrine and marine offshore deposits	
Very fine uniform sand, U^a = 5–2	0.0001–0.0064
Bull's liver, Sixth Ave., N.Y., U = 5–2	0.0001–0.0050
Bull's liver, Brooklyn, U = 5	0.00001–0.0001
Clay	Less than 0.0000001

[a] U = uniformity coefficient.



Soil Identification Code

1 Compacted caliche	10 Ottawa sand	19 Lean clay
2 Compacted caliche	11 Sand—Gaspee Point	20 Sand—Union Falls
3 Silty sand	12 Sand—Franklin Falls	21 Silt—North Carolina
4 Sandy clay	13 Sand—Scituate	22 Sand from dike
5 Beach sand	14 Sand—Plum Island	23 Sodium—Boston blue clay
6 Compacted Boston blue clay	15 Sand—Fort Peck	24 Calcium kaolinite
7 Vicksburg buckshot clay	16 Silt—Boston	25 Sodium montmorillonite
8 Sandy clay	17 Silt—Boston	26–30 Sand (dam filter)
9 Silt—Boston	18 Loess	

Figure 5. Typical values of hydraulic conductivity for natural soils (from Lambe and Whitman 1969)

Permeability k_H of Unconsolidated Natural Soils (k_H inversely related to % finer grains)

Soil	k_H Range (ft/yr or 10^{-6} cm/s)
Gravel, open-work	>2,000,000
Gravel (GP)	200,000 to 2,000,000
Gravel (GW)	10,000 to 1,000,000
Sand, coarse (SP)	10,000 to 500,000
Sand, medium (SP)	1,000 to 100,000
Sand, fine (SP)	500 to 50,000
Sand (SW)	100 to 50,000
Sand, silty (SM)	100 to 10,000
Sand, clayey (SC)	1 to 1,000
Silt (ML)	1 to 1,000
Clay (CL)	~0 to 3

References: [15], [18], [22-29], [33-36]

Permeability k_H of Unfractured Rock (k_H increases with pore size)

Rock	k_H Range (ft/yr or 10^{-6} cm/s)
Sandstone, medium	100 to 200,000
Sandstone, silty	~0 to 5,000
Limestone	~0 to 15,000
Granite, weathered	200 to 10,000
Schist	~0 to 2,000
Tuff	~0 to 1,000
Gabbro, weathered	50 to 500
Basalt	~0 to 50
Dolomite	~0 to 5
Gneiss	~0 to 2

References: [15], [25], [27-28], [34], [36]

Anisotropy of Natural Soil and Rock

Formation	k_H/k_V	Remarks
Stratified deposits	10 to 1,000	k_H/k_V depends on grain size of substrata
Massive soil or rock	1 to 3	Depends on particle shape and orientation
Fractured rock	0.1 to 10	Depends on aperture arrangement
Eolian soil (loess and dune)	0.02 to 2	Depends on consolidation

References: [3], [15], [17], [19-21], [24], [30-31], [35-42]

Figure 6. Typical permeability parameters for natural soils and rock (from USBR 2011b).

Permeability (k_V) of Embankment Core Materials (k_V inversely related to % fines)

Unified Soil Classification	k_V Range (ft/yr or $x10^{-6}$ cm/s)*
GM-SM	0.0 to 10.0
GM or GC	0.0 to 10.0
SP-SM	0.0 to 10.0
SM	0.0 to 10.0
SM-SC	0.0 to 3.0
SM-ML	0.0 to 10.0
SC	0.0 to 3.0
ML	0.0 to 10.0
ML-CL	0.0 to 1.0
CL	0.0 to 1.0
MH	0.0 to 0.1

References: [31-32], [34], [44-45]
* Based primarily on Reclamation laboratory test data

Permeability (k_V) of Embankment Shell Materials (k_V inversely related to % fines)

Unified Soil Classification	k_V Range (ft/yr or $x10^{-6}$ cm/s)
GP	2,000 to 1,000,000
GW	1,000 to 100,000
GP-SP	1,000 to 50,000
GW-SW	500 to 5,000
GM	10 to 500
SP (medium to coarse)	10,000 to 20,000
SP (fine to medium)	5,000 to 10,000
SP (very fine to fine)	500 to 5,000
SW	300 to 5,000
SP-SM	10 to 1,000
SM	10 to 500

References: [18], [26], [33], [36], [44-45]

Permeability (k_V) of Washed Embankment Drain Materials (k_V increases with grain size)

Material	k_V Range (ft/yr or $x10^{-6}$ cm/s)
Coarse sand and gravel	150,000 to 500,000
Medium to coarse sand	50,000 to 150,000
Fine to medium sand	10,000 to 50,000

References: [18], [26], [33], [36], [45]

Anisotropy (k_H/k_V) of embankment materials (k_H/k_V increases with placement water content)

Material	k_H/k_V Range
Embankment core Reclamation standard placement	4 to 9
Nonstandard placement	9 to 36
Hydraulic fill	64 to 225
Embankment shell Reclamation standard	4 to 9
Embankment drains Reclamation standard	1 to 4

References: [3], [17], [21], [31], [37]

Figure 7. Typical permeability parameters for various embankment materials (from USBR 2011b).

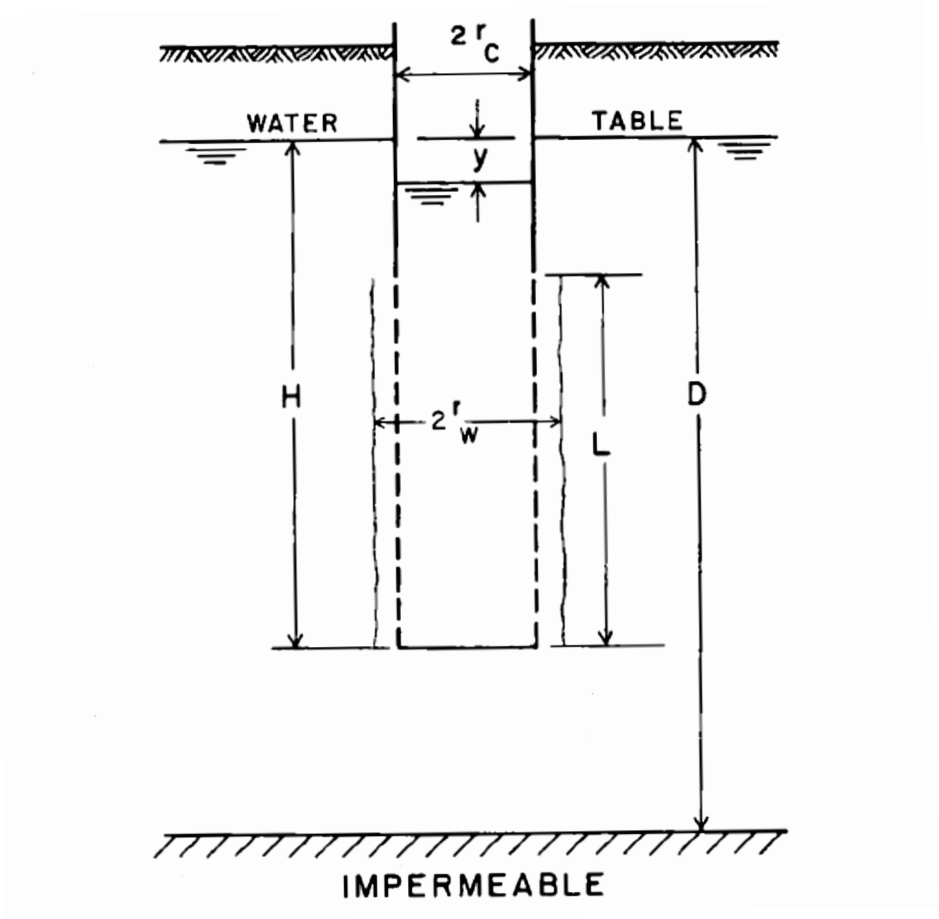
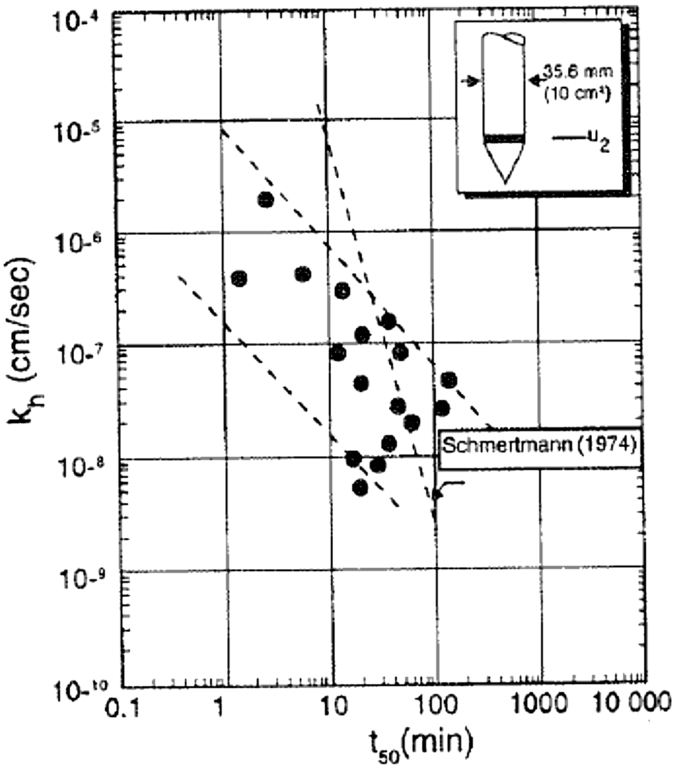


Figure 8. Geometry and symbols of a partially penetrating, partially perforated well in an unconfined aquifer with gravel pack or developed zone around the perforated section (from Bouwer and Rice 1976).

(a) From Lunne et al. (1997)



(b) From NCHRP (2007)

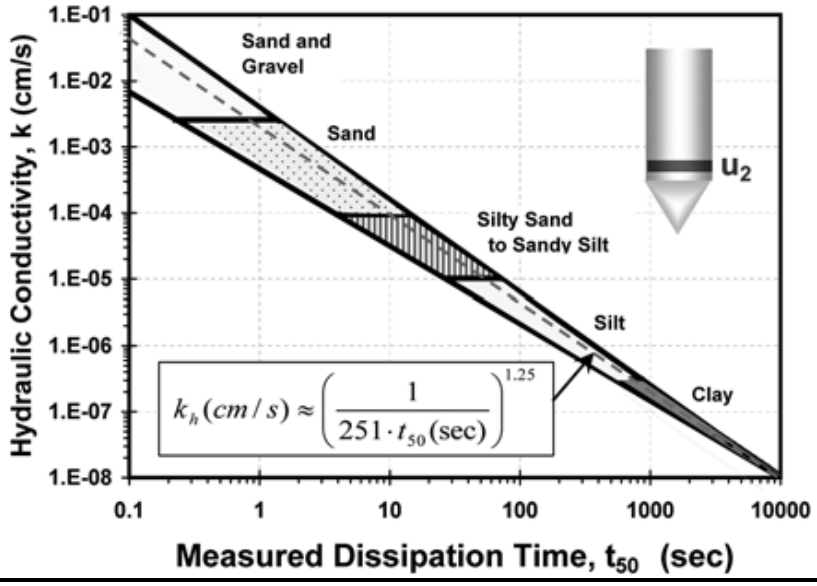


Figure 9. Charts for estimating saturated hydraulic conductivity from piezo-CPT dissipation tests.

3.5. Seepage in Unsaturated Soils

For unconfined seepage through an embankment, SEEP/W locates the phreatic line or water table (where the pressure head is zero) using an iterative process (GEO-SLOPE

2010). To find a rational solution, the software models the reduction in hydraulic conductivity with decreasing degrees of saturation (increasing matric suction) using the soil-water characteristic curve and hydraulic conductivity function described here.

These models are defined in terms of the *volumetric* water content (θ), which is related to the gravimetric water content (w) per Equation 4. Suction pore pressures are quantified in terms of the matric suction, which is the difference between the pore air pressure and the water pressure in an unsaturated soil (Fredlund and Rahardjo 1993).

3.5.1. Soil-Water Characteristic Curve

The Soil-Water Characteristic Curve (SWCC) represents the amount of water within the soil structure at various applied suctions (Fredlund and Rahardjo 1993). Figure 10 shows a typical soil-water characteristic curve, also known as a volumetric water content curve, plotted over a range of pore water pressure (negative to positive). Soils exhibit hysteresis in this relationship for wetting and drying, but only the SWCC curve for drainage (desorption) is discussed here. The SWCC is characterized by four parameters: the air entry pressure (described using a curve-fitting parameter α), the slope of the function for changes in pore water pressure (described using a curve-fitting parameter n), the residual volumetric water content (θ_r), and the saturated volumetric moisture content (θ_s).

The air entry value (AEV), represents the matric suction pressure where a saturated soil begins to de-saturate (where air enters the pores). At pore pressures above the AEV, the water within the soil mass can be removed by compressing the sample; therefore, the slope of the curve under positive pore pressures is equal to the coefficient of volume compressibility (M_v) for one-dimensional consolidation (GEO-SLOPE 2010). Once the pore water pressure falls below the AEV, water cannot be compressed out of the sample; rather, water can only be removed from the voids by applying suction pressure. Therefore, the SWCC for pressures below the AEV indicates how much water can be removed as the matric suction is increased, until the residual water content is reached. The residual volumetric water content (θ_r) occurs where further increases in matric suction do not result in significant changes in water content (Fredlund and Rahardjo 1993). The saturated volumetric moisture content (θ_s), defines the intersection of the SWCC and the x-axis (i.e. pore water pressure equals zero).

Within SEEP/W, the user can define the SWCC using direct measurements from laboratory tests, the built-in library of curves based on material classification, or one of the models proposed by Aubertin at al. (2003), van Genuchten (1980), and Fredlund and Xing (1994).

When available, laboratory test data should be used to define the soil-water characteristic curve in the SEEP/W model. Five standardized test methods, which vary in applicability based on fines content and pressure ranges, are presented in ASTM D6836. Method C, for finer soils and intermediate suctions (100 to 1000 kPa), can be used for most soil samples. When using laboratory data, it may be necessary to augment the data for the higher and lower suction pressures not tested. The Aubertin,

van Genuchten, or SEEP/W soil type models can be used to develop a standard curve shape, which can then be modified to fit the available laboratory data.

In the absence of laboratory testing, the following methods can be used to develop the SWCC:

- The "Modified Kovacs" method (Aubertin et al. 2003) develops the curve using standard laboratory test data such as grain size distribution, Atterberg limits (if applicable), and the saturated volumetric water content.

- SWCC parameters can be estimated from empirical relationships using soil index properties or using typical published values. Figure 11 provides some tables of typical values. Typical van Genuchten model parameters (α, n) including residual (θ_r) and saturated (θ_s) water contents are compiled from the UNSODA database (Leij et al., 1996). N indicates the number of soils or samples of a given textural class from which the mean values are compiled. During desorption, large pores drain more freely than smaller pores. Materials with larger particles and larger pores (e.g., sand and gravel) will retain less water under higher suction pressures. SWCC for coarse soils are difficult to measure in the laboratory. Figure 12 provides published values of curve fitting parameters for coarse soils and illustrates the corresponding SWCC.

- The SWCC can be approximated by choosing one of the functions developed by GEO-SLOPE for a given soil texture, which are based on functions taken from published literature (GEO-SLOPE 2010). The six available models are based on the soil type: Clay, Silty Clay, Silt, Silty Sand, Sand, and Gravel (shown in Figure 13). The models shown are for illustration purposes only and are dependent on the saturated volumetric water content.

3.5.2. Hydraulic Conductivity Function

When the soil is saturated, water flows through the pores easily, but as the water content decreases, the hydraulic conductivity drops rapidly as the water in the soil pores is no longer contiguous. Hence, the hydraulic conductivity of an unsaturated soil is dependent on the volumetric water content. SEEP/W estimates the hydraulic conductivity of unsaturated soils by using the SWCC, the suction pressure within the soil, and the saturated hydraulic conductivity of the soil.

A Hydraulic Conductivity Function can be derived to estimate the hydraulic conductivity over a range of suction pressures. The two methods available in SEEP/W to derive the Hydraulic Conductivity Function are from Fredlund and Xing (1994) and van Genuchten (1980). The saturated hydraulic conductivity (Section 3.1) and the SWCC are required to create the hydraulic conductivity curve. Figure 14 shows an example Hydraulic Conductivity Function for various saturated hydraulic conductivity values.

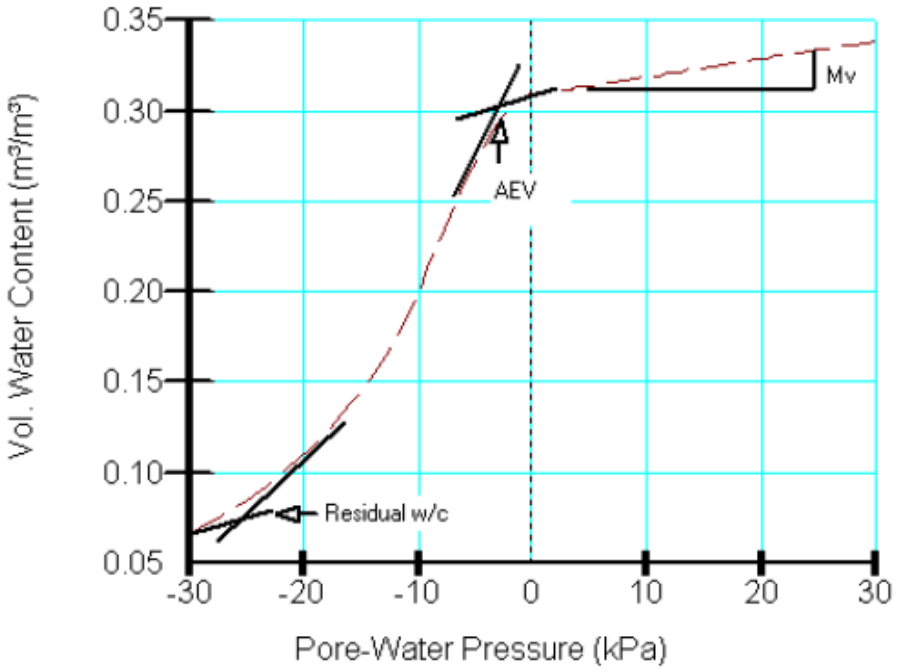


Figure 10. Example Soil-Water Characteristic Curve (GEO-SLOPE 2010)

No.	Texture class	Horizon	θ_s	θ_r	a	n
			------cm^3/cm^3------		cm^{-1}	
1	Medium Sand	C, G, B	0373	0.0304	0.0363	3.03
2	Fiie Sand	C, G	0386	0.0361	0.0251	355
3	Slightly Loamy Sand	C	0339	0.0405	0.0599	151
4	Slightly Loamy Sand	Bv	0362	0.0385	0.0793	1.48
5	Heavy Loamy Sand	C	0.315	0	0.0618	1.225
6	Heavy Loamy Sand	Bg, Cg	0.298	0	0.0131	1.231
7	Heavy Loamy Sand	Go, Gr	0.351	0	0.0538	1.215
8	Silty Sand .	Bg, Cg	0.288	0	0.00440	132
9	Sandy Loam	Bv, Bvt	0.363	0	0.0902	1.188
10	Sandy Loam	Bt, Bvg	0.279	0	0.00199	1.197
11	Sandy Loam	Bg	0320	0	0.0331	1.132
12	Sandy Loam	c, cc	0.322	0	0.0928	1.127
13	Sandy Loam	Cg	0.299	0	0.00185	1.154
14	Loam	Bvt	0.378	0	0.206	1.090
15	Loam	Bt	0.287	0	0.00451	1.142
16	Loam	Bg	0.290	0 --	0.00244	1.153
17	Loam	C, Cg	0.282	0	0.00185	1.154
18	Loamy silt	c, cc	0.382	0.0330	0.00622	1344
19	Loamy silt	Cg	0361	0	0.00245	1.313
20	silty Loam	c, cc	0367	0	0.00608	1.167
21	Silty Loam	Cg	0.363	0	0.00150	1.229
22	Silty Clay	Bvt	0345	0	0.00157	1.160
23	Silty Clay	Bt, Bg	0371	0	0.00090	1.160
24	Silty Clay	c, cc, cg	0347	0	0.00038	1.222

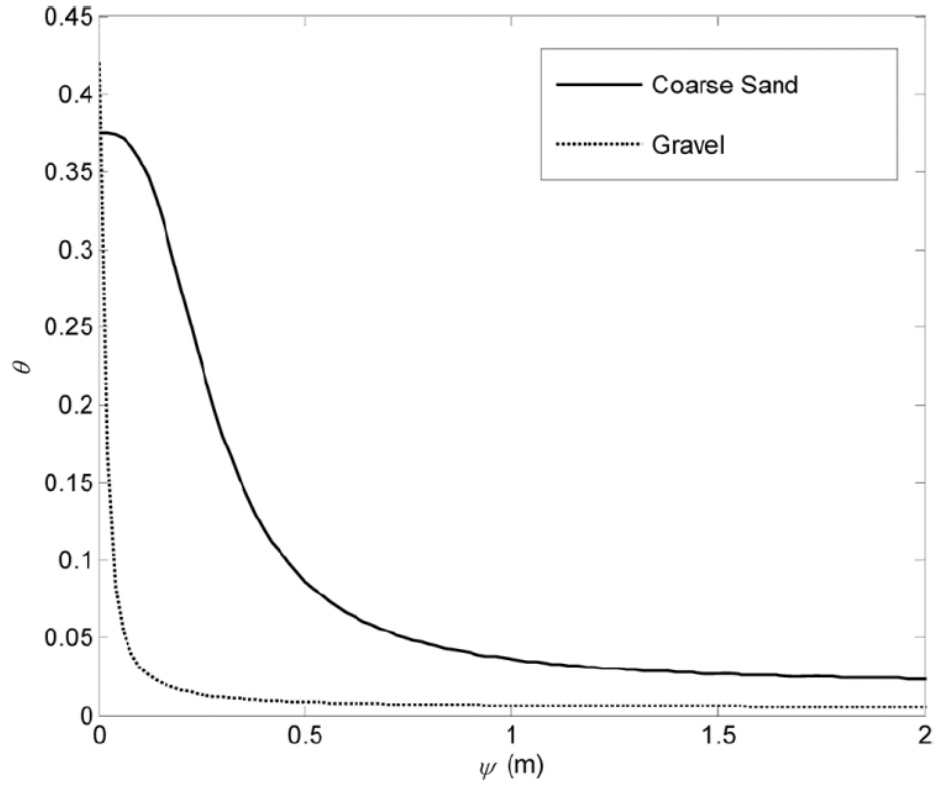
(from van Genuchten et. al. 1992)

Textural Class	N	θ_r [cm^3/cm^3]	θ_s [cm^3/cm^3]	α [1/cm]	n
Sand	126	0.058	0.37	0.035	3.19
Loamy Sand	51	0.074	0.39	0.035	2.39
Sandy Loam	78	0.067	0.37	0.021	1.61
Loam	61	0.083	0.46	0.025	1.31
Silt	3	0.123	0.48	0.006	1.53
Silt Loam	101	0.061	0.43	0.012	1.39
Sandy Clay Loam	37	0.086	0.40	0.033	1.49
Clay Loam	23	0.129	0.47	0.030	1.37
Silty Clay Loam	20	0.098	0.55	0.027	1.41
Silty Clay	12	0.163	0.47	0.023	1.39
Clay	25	0.102	0.51	0.021	1.20

(from Leij, et. al., 1996)

Figure 11. Tables of SWCC fitting parameters for typical soils.

Drianage layer type	K_S (m/s)	α_{vG} (m^{-1})	n (-)	θ_s (-)	θ_r (-)
Coarse sand	0.00463	4.31	3.1	0.375	0.02
Gravel	0.020	100	2.19	0.42	0.005



(from Han-Cheng Dan et. al. 2012)

Figure 12. SWCC and fitting parameters for coarse soils.

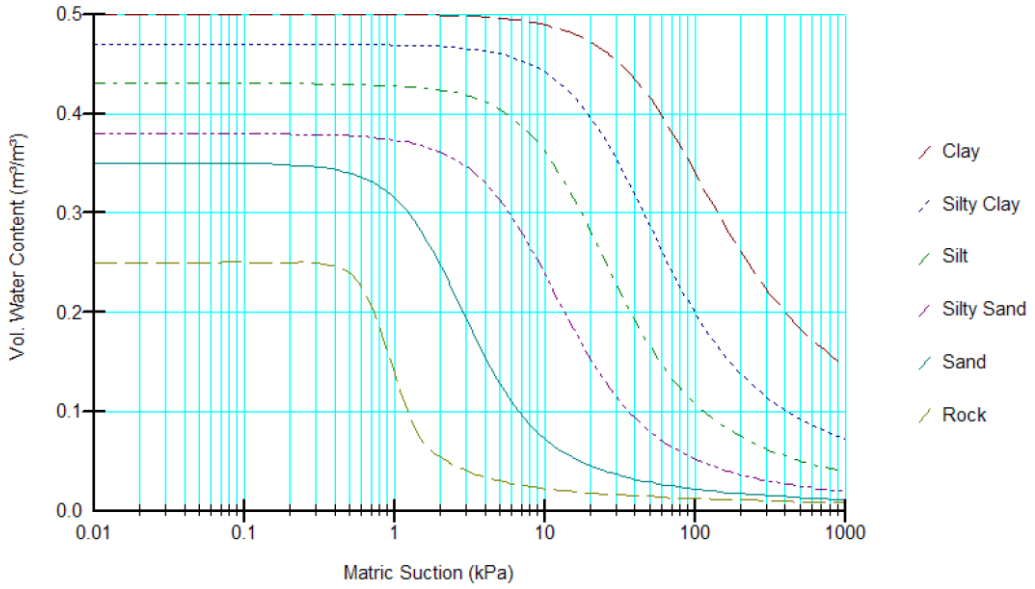


Figure 13. SEEP/W Library of Soil-Water Characteristic Curves (GEO-SLOPE 2010)

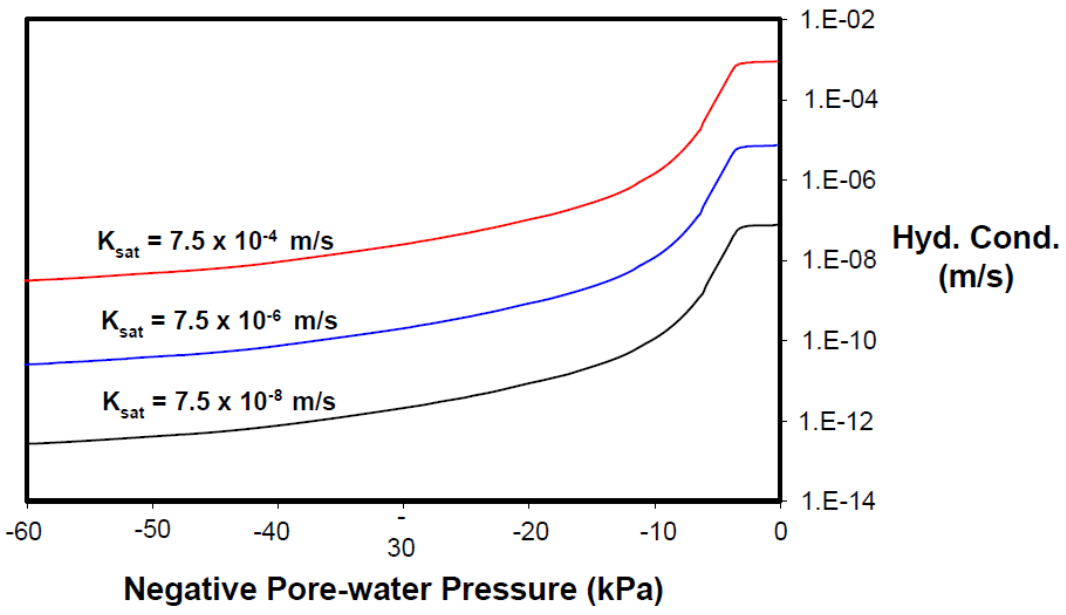


Figure 14. Example Hydraulic Conductivity Function (GEO-SLOPE 2010)

4. Small-Strain Shear Stiffness

4.1. Elastic Stiffness and Wave Velocity

In an elastic medium, the velocity of a stress wave is equal to the square root of the ratio of elastic modulus over mass density. For a shear wave, the velocity (V_s) is related to the shear modulus (G). The shear response of soils is nonlinear, such that the shear modulus declines at increasing shear strains (softening). The elastic response is limited to very small strains, where the shear modulus is maximum. Hence, the maximum shear modulus (G_{max}) in a soil at small strains is proportional to the square of the shear wave velocity in that soil:

$$G_{max} = \rho \, V_s^2 \qquad \textbf{Equation 11}$$

where ρ is the mass density (total unit weight divided by acceleration due to gravity, 32 ft/sec^2).

Shear wave velocities can be measured in multiple ways. Resonant column or cyclic triaxial testing can be used in the laboratory, but in situ field measurements are preferred. Field techniques include cross-hole testing in boreholes, down-hole testing during cone penetration tests, seismic refraction methods, and other surface and downhole geophysical methods. Direct, field measurements of shear wave velocity are the best method for characterizing the small-strain shear modulus of a soil mass.

When shear wave measurements are not available, G_{max} can be estimated using various empirical correlations. Such correlations have been published by Ishihara (1996) and Kramer (1996). A few select correlations are presented below.

4.2. G_{max} Correlations Based on Void Ratio

Seed and Idriss (1970) proposed this correlation for sand:

$$G_{max} = 1{,}000 \, K_{2,max} \, (\sigma'_m)^{0.5} \qquad \textbf{Equation 12}$$

where G_{max} is the small-strain shear modulus (psf) and σ'_m is the mean effective stress (psf). The correlation factor $K_{2,max}$ in Equation 12 is estimated based on the void ratio (e) or relative density (D_r) of the sand:

e	$K_{2,max}$	D_r (%)	$K_{2,max}$
0.4	70	30	34
0.5	60	40	40
0.6	51	45	43
0.7	44	60	52
0.8	39	75	59
0.9	34	90	70

Another relationship, more generally applicable to various soil types, was proposed by Hardin (1978):

$$\frac{G_{max}}{P_a} = \frac{625}{0.3 + 0.7\,e^2}\,OCR^k\left(\frac{\sigma'_m}{P_a}\right)^{0.5} \qquad \textbf{Equation 13}$$

where e is the void ratio and OCR is the overconsolidation ratio. P_a is one atmospheric pressure (101.3 kPa or 2,116 psf), in the same units as G_{max} and the mean effective stress (σ'_m). The exponent k in Equation 13 is related to plasticity index (PI), and can be interpolated between these values (Hardin and Drnevich 1972):

PI	k
0	0.00
20	0.18
40	0.30
60	0.41
80	0.48
≥ 100	0.50

In these correlations, the mean effective stress is defined as

$$\sigma'_m = \frac{1}{3}(\sigma'_1 + \sigma'_2 + \sigma'_3) \approx \frac{2}{3}\,\sigma'_v \qquad \textbf{Equation 14}$$

where σ'_1, σ'_2, and σ'_3 are the principal effective stresses. In most applications, assuming at-rest conditions and $K_o = 0.5$ will provide sufficient accuracy. The mean stress is then about two-thirds of the vertical effective stress, as indicated in Equation 14.

4.3. G_{max} Correlations Based on Penetration Resistance

The value of G_{max} may be estimated on the basis of correlations with in situ penetration resistance. For sand, Seed et al. (1986) suggest:

$$G_{max} = 20{,}000\,(N_1)_{60}^{0.333}\,(\sigma'_m)^{0.5} \qquad \textbf{Equation 15}$$

where G_{max} is the small-strain shear modulus (psf), σ'_m is the mean effective stress (psf), and $(N_1)_{60}$ is the normalized, corrected Standard Penetration Test (SPT) blowcount.

When cone penetration test (CPT) data is available, G_{max} in sands may be estimated using (Rix and Stokoe 1991):

$$G_{max} = 1{,}634\,(q_c)^{0.250}\,(\sigma'_v)^{0.375} \qquad \textbf{Equation 16}$$

where G_{max} is the small-strain shear modulus, q_c is the CPT tip resistance, and σ'_v is the vertical effective stress, all expressed in units of kPa. In clays, G_{max} may be estimated from CPT data using (Mayne and Rix 1993):

$$G_{max} = 406\,(q_c)^{0.695}\,(e)^{-1.130} \qquad \textbf{Equation 17}$$

G_{max} and σ'_v are expressed in units of kPa, and e is initial void ratio of the soil.

4.4. G_{max} Correlations Based on Site-Specific Data

Maximum shear modulus (G_{max}) typically varies with effective stress level and can be generally defined as follows:

$$G_{max} = G_o \left(\frac{\sigma'_m}{P_a}\right)^{0.5} \qquad \textbf{Equation 18}$$

Shear wave velocity measurements obtained from field or lab testing are often available over a limited range of effective stresses that may not encompass the range of stresses of interest in ground response analyses. In this scenario, site-specific data can be extrapolated to a broader stress range by selecting a representative G_o value for a given material. The representative G_o value should be selected such that shear wave velocities calculated using Equation 18 and Equation 11 match field or lab measurements reasonably well over the stress range where data is available. In effect, this creates a site-specific empirical correlation. An example correlation and the associated field data are shown in Figure 15.

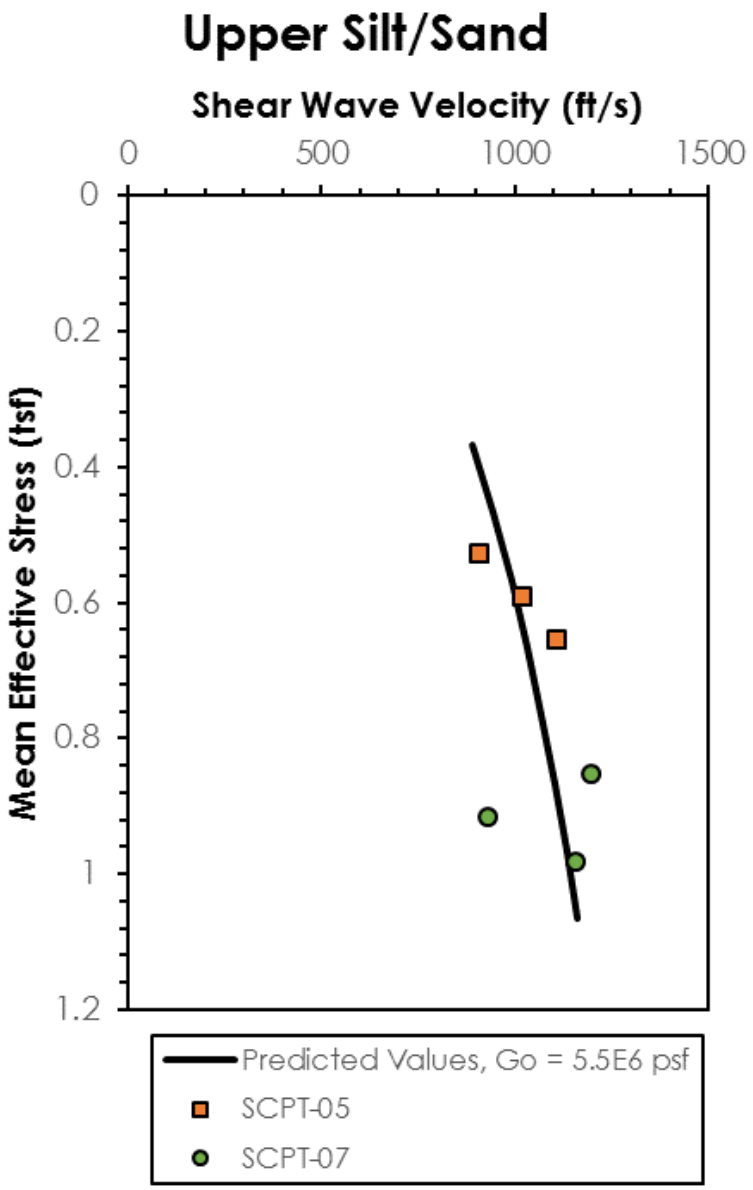


Figure 15. Example site-specific empirical correlation for shear wave velocity

5. Strength Parameters from Laboratory Test Data

Soil strengths can be determined from the results of laboratory tests, including direct shear, triaxial compression, triaxial extension, and direct simple shear tests. From the measured soil response to loading, the "failure" stresses are plotted and a Mohr-Coulomb failure envelope is fit to the data. In geotechnical engineering practice, soil shear strengths (S) are commonly characterized in terms of the intercept (c) and slope (tan ϕ) of the Mohr-Coulomb envelope:

$$S = c + \sigma \tan\phi \qquad \textbf{Equation 19}$$

5.1. Definition of Failure

Selecting the point of failure in a laboratory test record requires some engineering judgment. Criteria that are commonly used to define "failure" include:

- The point of maximum or peak applied shear stress.
- The shearing resistance at some arbitrary, limiting strain level (usually 15% axial strain in triaxial compression).
- The maximum principal effective stress ratio (maximum value of σ'_1/σ'_3); sometimes identified as the point of maximum obliquity, this stress condition is one where the slope of a failure envelope through the origin of stress has a maximum slope (maximum ϕ for c = 0).
- The residual shearing resistance at large strain.

When selecting the point of failure in a particular test, the following guidelines should be followed:

- When considering data from drained (CD) tests, failure can be defined as the point of maximum shear stress or 15% axial strain, whichever occurs first. In a drained triaxial test, the maximum value of σ'_1/σ'_3 occurs at the point of maximum applied shear stress, so both criteria will give the same result.

- In evaluating effective stress parameters (c' and ϕ') from CU test data, failure should be assumed at the maximum principal effective stress ratio.

- When analyzing data from undrained (UU or CU) laboratory tests, the peak axial stress should be assumed to represent failure when determining undrained strength parameters (c and ϕ). If the test data does not exhibit a peak stress prior to 15% axial strain (for triaxial testing), then the stresses at 15% strain should be used as failure.

Note that the drained and undrained failure stresses will occur at different points in a given CU test, due to the different definitions of failure used in each case.

5.2. Fitting Strength Envelopes

Values of c and ϕ are determined from a straight line, tangent envelope fit to Mohr's circles representing failure stresses. When working with data from multiple laboratory tests, fitting of the failure envelope may be facilitated by plotting the failure points on a "p-q plot", where:

$$p = \frac{\sigma_1 + \sigma_3}{2} \qquad \textbf{Equation 20}$$

$$q = \frac{\sigma_1 - \sigma_3}{2} \qquad \textbf{Equation 21}$$

A "best-fit" line through the p-q failure points (identified as the K_f line) will then have an intercept of "d" and a slope of "tan a". Equivalent Mohr-Coulomb parameters can then be computed as:

$$\sin\phi = \tan\alpha \qquad \textbf{Equation 22}$$

$$c = \frac{d}{\cos\phi} \qquad \textbf{Equation 23}$$

Equation 20 through Equation 23 can be used with either drained strengths (c' and ϕ') or undrained strengths (c_R and ϕ_R for R-envelopes).

Note that the Mohr-Coulomb failure model (Equation 19) corresponds to a linear increase in shearing resistance with higher normal stress. Actual failure envelopes for soils are curved, with significant curvature in the effective stress envelopes for granular soils over large pressure ranges and for overconsolidated clays. In practice, values of c and ϕ are determined for soils from straight line envelopes fit to specific ranges of stress.

In fitting strength parameters to multiple test results, the practice of the U.S. Army Corps of Engineers is to select design values of c' and ϕ' (or c and ϕ) so that data from about two-thirds of the tests are above the failure envelope (USACE 2003). This guidance can also be used in selecting design values of undrained shear strength (S_U) or c/p ratios; that is, about two-thirds of the measured strengths should be above the strength used in design.

6. Drained Strength Parameters for Static, Long Term Conditions

6.1. Basis

Excess (or deficient) pore water pressures, generated by changes in mean stress or shearing stress, will dissipate under static, long term conditions. Pore pressures within a soil can then be computed assuming hydrostatic conditions or from a solution for steady state seepage. As long as the distribution of pore pressure within the cross section can be quantified, effective stresses can be computed and the drained shear strength (S_d) of the soils can be determined from effective stress strength parameters (c' and ϕ'):

$$S_d = c' + \sigma' \tan \phi' \qquad \textbf{Equation 24}$$

6.2. Effective Stress Cohesion Intercept

Uncemented, granular soils exhibit no strength at zero effective stress ($\sigma' = 0$), corresponding to c' = 0. Over a wide pressure range, granular soils have a curved strength envelope. Fitting a straight line through segments of a curved failure envelope can result in c' > 0, but these values are applicable only for modeling the shear strength over the specified range of effective stress. In the case of unsaturated soils with fines, suction creates an apparent cohesion, but this component of strength is lost when the soil becomes saturated. In general, zero cohesion (c' = 0) should be assumed for uncemented, granular soils.

Normally consolidated, saturated clays also have no shear strength at zero effective stress. The drained, Mohr-Coulomb failure envelope for the peak strength of a normally consolidated clay will have c' = 0.

The peak strength envelope for an overconsolidated clay will exhibit drained cohesion. Below the effective preconsolidation pressure, the drained strength envelope for an overconsolidated clay is above the envelope for the normally consolidated condition. The overconsolidated, peak strength envelope is nonlinear, and curves toward the origin at very small effective stresses (Figure 16). Linear Mohr-Coulomb failure parameters (with c' > 0) can be fit to the curved strength envelope for overconsolidated soils; however, envelopes fit with c' > 0 will tend to overestimate the drained shearing resistance at shallow depths.

Moderately to heavily overconsolidated clays in the field are often fissured, especially at shallow depths. Because test specimens tend to be taken between the fissures, laboratory tests on smaller specimens tend to yield larger values of c', compared to tests on larger samples of such soils. For overconsolidated soils, c' determined from laboratory testing thus tends to be larger than the in situ cohesion of the soil mass, and thus potentially unconservative. In addition, cycles of shrinking (drying) and swelling (wetting) lead to softening and a loss of stress history over time along the fissures. Fully softened strengths (Section 6.3) with c' = 0 (Stark et al. 2005) are thus appropriate for characterizing the drained strength of stiff, fissured, overconsolidated clayey soils.

Fell et al. (2005) point out that measured values of drained cohesion may be adversely affected by potential shortcomings in the laboratory test results. For example, if tests are run at confining stresses higher than experienced in the field, a straight line fit through that data may overpredict the drained strength at lower effective stresses. If the soil sample is not completely saturated, or if the strain rate is too high to allow equilibration of pore pressures within the sample during the test, then the pore pressure data will not accurately reflect the pore pressures at failure. This will tend to shift the Mohr's failure stress circles, which can result in a misleading indication of drained cohesion.

At very large shear strains, clay particles will align with the slip surface and a residual shearing resistance is realized. Drained, residual strength envelopes (Figure 16) are independent of overconsolidation and have no cohesion (c' = 0). Residual strength parameters should be used when evaluating stability where sliding has previously occurred.

In the absence of particle cementation/bonding, long term (drained) shearing resistance related to c' > 0 may be unreliable. In routine geotechnical design practice, values of c' = 0 are usually assumed for both normally and overconsolidated saturated clays, and for uncemented granular soils. In the evaluation of long-term stability, Stark et al. (2005) recommend using zero effective stress cohesion (c' = 0) for soft to stiff clays, unless back-analysis of local case histories support a greater value. However, this recommendation considers the potential for softening of stiff clays, and may not apply to full depth (See Section 6.3).

Detailed testing and characterization of a particular soil, coupled with careful application of the fitted strength envelopes, are necessary where values of c' are used in a stability evaluation. Fell et al. (2005) recommend that design values of c' for peak strength should not exceed about 200 psf (or 20 psf for residual strengths) without definitive evidence for higher values.

When surficial soils have c' = 0, shallow sliding parallel to the ground surface will be the critical failure mechanism (lowest factor of safety) found in a slope stability analysis. This mode of failure, which might require periodic regrading and maintenance, is often considered to be less critical in a stability analysis.

Specific guidance on the selection of c' values is provided in Section 6.7.

6.3. Fully Softened Strengths of Overconsolidated Clays

In excavations and embankments, long-term failures may develop in overconsolidated clays at shear stresses below the peak drained strength. Seasonal moisture changes near the ground surface, or lateral stress relief in deep excavations, will cause fissures to open, swelling of the soil along the fissures, and the gradual loss of the beneficial effects of overconsolidation. Over time (years to decades), the peak strength of the overconsolidated soil mass may degrade to the lower strength of the soil when normally consolidated (Skempton 1970). "Fully softened strengths" (Figure 16) are appropriate for characterizing the drained strength of such soils. The understanding of this behavior, and the appropriate application of this concept for

design, is an evolving area within geotechnical engineering. Duncan et al. (2011) and VandenBerge et al. (2013) provide an overview of current geotechnical engineering practice, based on the outcomes of a 2011 industry workshop.

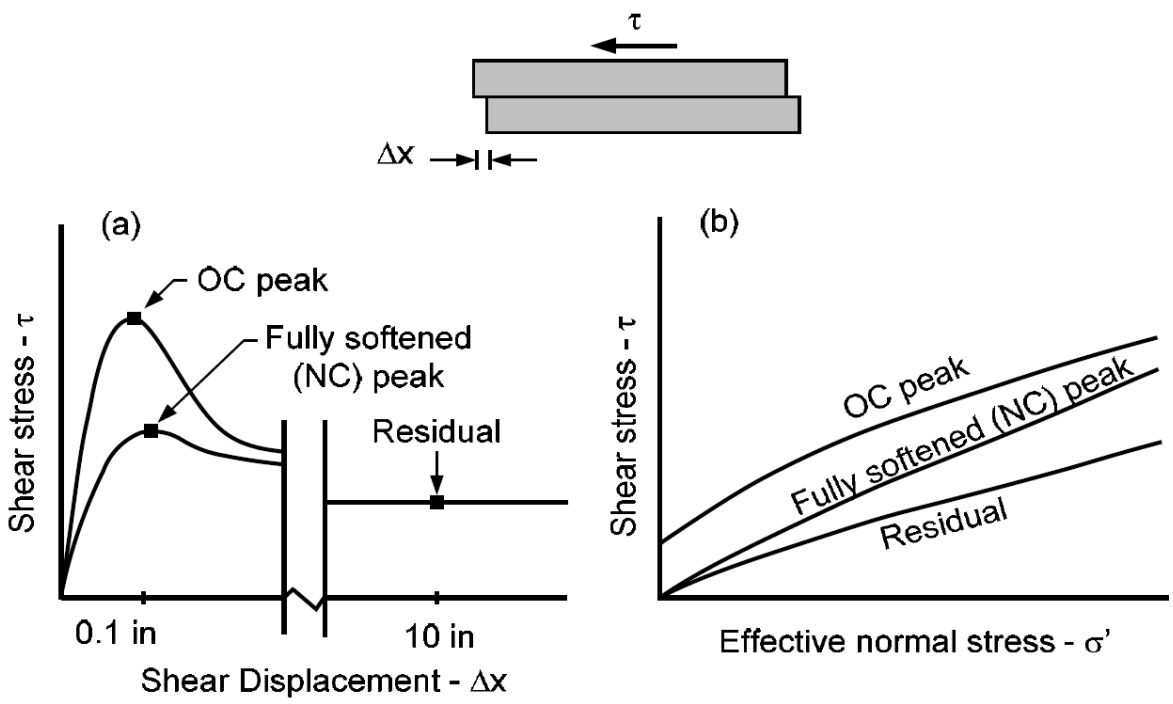


Figure 16. (a) Stress-displacement curves for overconsolidated and fully softened (normally consolidated) natural stiff fissured clays, and (b) overconsolidated peak, fully softened peak and residual strength envelopes (from VandenBerge et al. 2013).

The softening behavior, under drained long-term conditions, may occur in any clayey soil, but is most pronounced in highly plastic clays. The need to consider fully softened, drained strengths is greater in soils with higher plasticity index, the existence of fissures or shrinkage cracks, water contents above the shrinkage limit, higher clay fractions, lower silt or sand content, and higher activity (Duncan et al. 2011; VandenBerge et al. 2013). Long-term instability due to softening should be considered for (1) excavations in stiff fissured clays, where the stress relief caused by the excavation can lead to swelling, and (2) shallow sliding in compacted clay embankments, due to the formation of desiccation cracks from seasonal wetting-drying and freeze-thaw.

Fully softened strengths may be measured in triaxial or ring shear tests, but direct shear tests are preferred (Duncan et al. 2011; VandenBerge et al. 2013). Tests are conducted on remolded, normally consolidated samples that are initially mixed to water contents near the liquid limit, then consolidated back to void ratios matching the field conditions. Peak shear stresses from tests on the remolded samples are used to define the fully softened strength envelope, which should be the same as the drained, peak

strength of the soil when it is normally consolidated (Skempton 1970). When test data are unavailable, the fully softened strength can be approximated by using estimated, drained strength parameters (with c' = 0) for the soil in a normally consolidated condition.

In overconsolidated clays, the fully softened strength envelope is intermediate between the peak and residual drained strength envelopes (Figure 16). The fully softened strength envelope is curved, with essentially no cohesion (c' = 0 at σ' = 0). Hence, when using Mohr-Coulomb parameters for a linear fit, an envelope with c' > 0 will overestimate strengths at very low stress levels (shallow depths). Using an envelope with c' = 0 is conservative, but may be overly conservative when applied to soils at greater depths (higher stress ranges). An alternative is to model the nonlinear strength envelope, using secant friction angles, in the stability analysis (Stark et al. 2005).

In a slope, shear stresses along a potential failure surface are not uniform, and overstressed areas that lose shearing resistance past the peak strength will cause increasing shear stresses on other parts of the slip surface. This can lead to a progressive failure over time. The use of fully softened strengths in design, instead of relying upon the peak strength in strain softening soils, helps to avoid progressive failures (Skempton 1970).

When looking at the stress-strain test data, it is important to note if the laboratory tests were drained or undrained. Stiff, moderately to heavily overconsolidated clays usually exhibit significant strain softening behavior in drained shear. These soils are dilative, resulting in a loss of shearing resistance with localized expansion along the failure surface. Most laboratory tests on clayey soils are conducted using consolidated-undrained conditions. When dilative soils are subjected to undrained testing, a strain hardening behavior will be observed, because the dilative response will cause decreasing pore pressures and increasing effective stresses. Hence, strain hardening in undrained shear is an indicator of expected strain softening under long-term, drained shear.

Fully softened strengths are an important consideration when evaluating the stability of compacted embankments constructed of highly plastic soils. However, it is overly conservative to assume fully softened strengths throughout the full depth of an overconsolidated clay (Duncan et al. 2011; VandenBerge et al. 2013). One exception may be where an embankment is built over an earlier embankment, or foundation soil, that previously experienced softening.

The depth of softening is related to the depth of the excavation, the depth of seasonal moisture change, and/or the depth of desiccation cracking. The appropriate depth will depend on the characteristics of the soil, the climate at the site, and the geologic history. For embankments, the depth of softening may be limited to 2 to 3 meters at most sites, and up to 4 meters in some cases (Duncan et al. 2011; VandenBerge et al. 2013). Lesser depths of softening may be expected in regions without extreme wet and dry seasonal climates.

6.4. Depth of Surficial Softening

A compacted soil near the surface of an embankment may lose some of its drained shear strength (soften) over time. Softening in overconsolidated, fine-grained soils is associated with shrink and swell, due to seasonal variations in moisture content at shallow depths, and freeze-thaw. The development of fully softened strengths is discussed in Section 6.3.

For TVA dams, fully softened strengths are assumed to apply only in highly plastic CH or MH soils having a plasticity index greater than 40 (fine grained soils with LL > 50 and PI > 40). In these soils, the depth of softening is assumed to be 5 feet (measured normal to the ground surface). No softening is assumed on armored slopes that are covered with stone riprap.

6.5. Laboratory and Field Measurement

In the laboratory, values of c' and ϕ' can be measured in consolidated drained (CD) tests, or consolidated undrained (CU) tests with pore pressure measurements. CD tests are preferred, but CU tests are usually specified for low permeability soils where the time required for drained testing becomes excessively long. Effective stress failure envelopes measured with CU tests are typically close to those measured in CD tests, and the two test methods are usually assumed to give equivalent values of c' and ϕ'.

Triaxial compression tests are commonly specified for both CD and CU tests. Consolidated-drained tests can also be run in a direct shear apparatus, which is a valid option for measuring the drained strength of low permeability clays. Because relatively thin samples can be tested in direct shear, the time required for consolidation and loading to failure will be much less than in drained triaxial tests. Direct shear tests force failure along a horizontal plane, which may not be the weakest plane in an anisotropic soil, but can be used to measure the shearing resistance along carefully aligned bedding planes. Direct shear tests, especially those conducted using ring-shear devices, are particularly useful for measuring residual strengths at large shear displacements. These considerations can be usually neglected when coarse grained soils are tested in direct shear.

Effective stress parameters can also be estimated using empirical correlations with in situ penetration resistance. Correlations between ϕ' and Standard Penetration Test (SPT) blowcounts in sands are presented in Figure 17. Correlations with Cone Penetration Test (CPT) tip resistance are given in Figure 18.

6.6. Typical Values

Typical values of drained friction angles (ϕ') for sands and clays are given, respectively, in Figure 19 and Figure 20. Typical drained strengths in compacted soils are listed in Figure 3. These typical values are helpful in judging the veracity of results from laboratory tests or in situ penetration tests. Note that there is significant scatter in these correlations, particularly for the clay strengths in Figure 20.

Estimated strength parameters, estimated on the basis of these typical values, are sometimes used for non-critical soil materials in a stability analysis. However, where the strength parameters assigned to a soil layer are critical to the computed stability of the slope, those values should be backed up by testing.

6.7. Recommended Practice

Natural deposits of granular soils are often highly variable, as a result of their geologic history and means of deposition. Laboratory tests on a few discrete samples from such a deposit are valuable, but may not yield a complete understanding of the variability in shearing resistance in that deposit. Correlations to in situ, field penetration tests (SPT or CPT) may be preferred for characterizing the drained strength of a granular soil deposit, because one can consider many more data points and better understand variability across the deposit. The reasonableness of the results should be checked by comparison to typical values for similar soils, and may be verified with laboratory testing.

Significant variability may also be encountered in clayey soils, particularly in residual soils. However, whether formed in place by weathering or deposited in water, clay soils tend to be more uniform than granular soil deposits. Laboratory testing of field samples will give a useful measure of drained strength parameters for such soils. Consolidated undrained (CU) tests, with the measurement of pore water pressures, can be used to obtain drained, effective stress strength parameters.

In many (but not all) design problems involving fine grained or clay soils, the short term, undrained conditions will govern stability. In those cases, attention should focus on the accurate assessment of undrained strengths, and reasonable estimates of drained strength parameters based on published, typical values may be sufficient for checking long-term stability. In other design problems, long-term, drained conditions may govern, and careful attention must be given to the selection of appropriate effective stress strength parameters.

When determining drained strength parameters, the following practice is recommended:

(1) A cohesion intercept may be appropriate for cemented soils, as long as the cementation is permanent, and not apparent cohesion due to matric suction in an unsaturated soil.

(2) Values of $c' > 0$ may be used to represent segments of curved strength envelopes over specified pressure ranges.

(3) When fitting envelopes through scattered test data, a line forced through $c' = 0$ should be considered first (as opposed to mathematical regression fits). If a good fit to the data is obtained, then the values of $c' = 0$ and ϕ' from that fit should be used.

(4) Values of c' > 0 may be used, but only if supported by adequate test data. If there is little or no test data, and the drained strength parameters are estimated based on typical values, assume c' = 0.

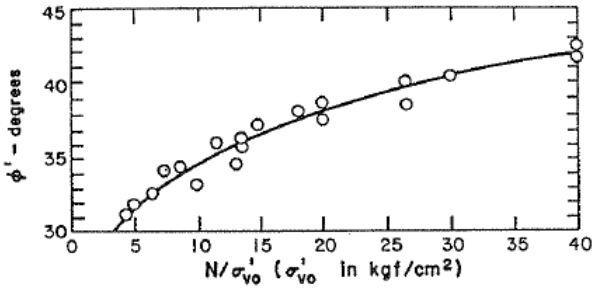
(5) Cohesion may be neglected to avoid progressive failures and/or instability due to softening. Because a fissured soil mass often has a lower strength than laboratory test samples, design values of c' (for peak strengths) should not exceed about 200 psf in overconsolidated clays that may be fissured.

(6) Fully softened strengths may be appropriate for highly plastic, clayey or silty soils in compacted embankments, or in excavations in overconsolidated soils. Fully softened strengths are applicable only for shallow depths along an embankment surface, perhaps to a maximum depth of about 10 feet (measured perpendicular to the ground surface).

(7) Where test data indicates a strength envelope with c' > 0, the value of ϕ' fit to the data may be used with an assumed value of c' = 0. Setting c' = 0 in this manner for an overconsolidated clay provides a conservative approximation of the fully softened strength envelope.

(8) If a value of c' > 0 is critical to the stability of the slope, drained shear tests and/or tests on fully softened samples should be considered to support the selection of an appropriate drained cohesion intercept.

Correlation between normalized SPT blowcount (N) and peak friction angle (ϕ') for sands (after Parry 1977)



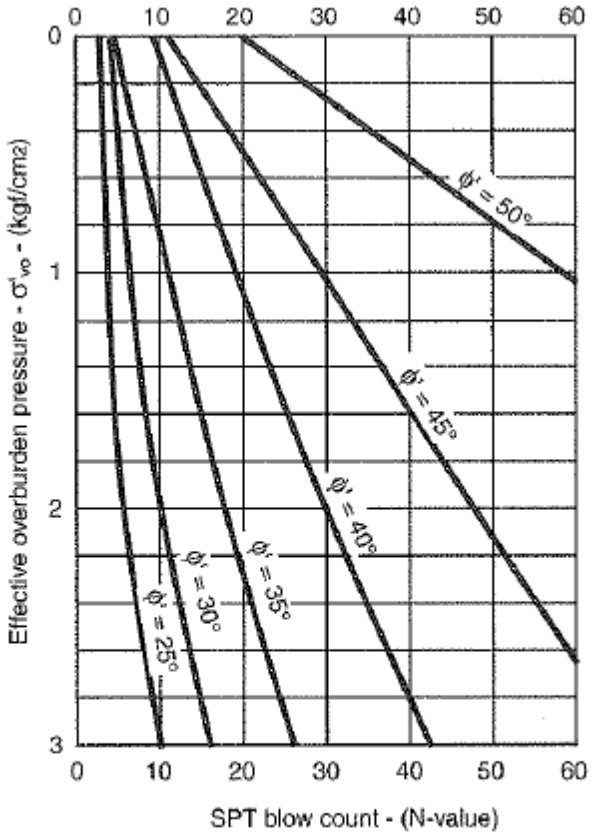
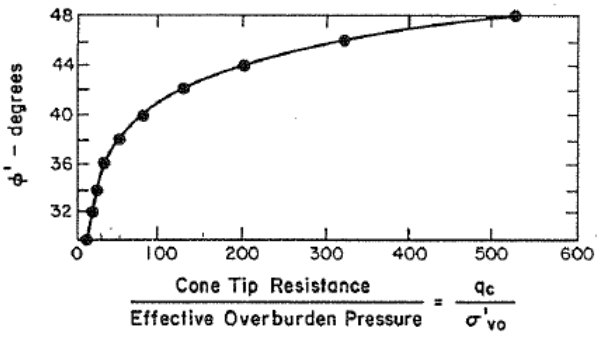


Figure 5.7 Relationship among SPT blow count, overburden pressure, and ϕ' for sands. (After DeMello, 1971, and Schmertmann, 1975.)

From Duncan and Wright (2005)

Figure 17. Correlations for effective stress friction angle in sands from SPT data.

Correlation between normalized CPT tip resistance (q_c) and peak friction angle (ϕ') for normally consolidated, uncemented, quartz sands (after Robertson and Campanella 1983).



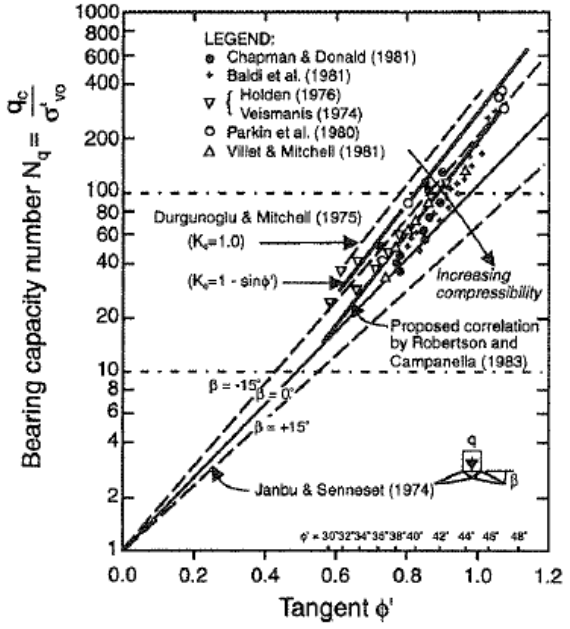


Figure 5.55 Relationship between bearing capacity number and friction angle from large calibration chamber tests (after Robertson and Campanella, 1983b).

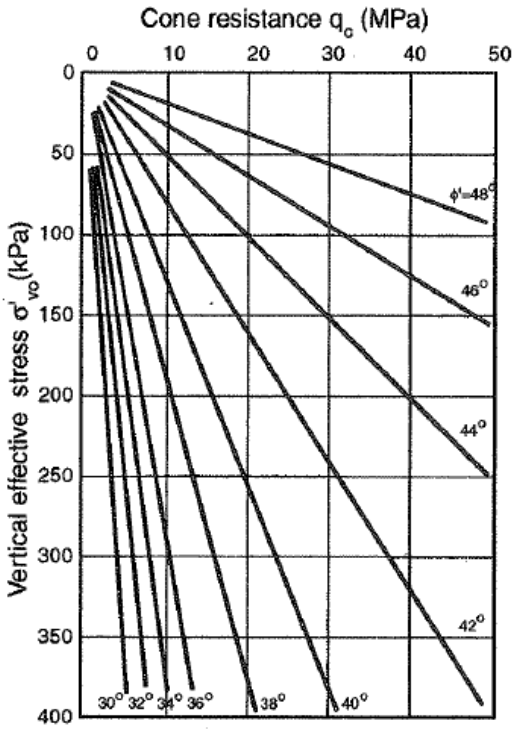


Figure 5.56 σ'_{vo}, q_c, ϕ' relationships (after Robertson and Campanella, 1983b).

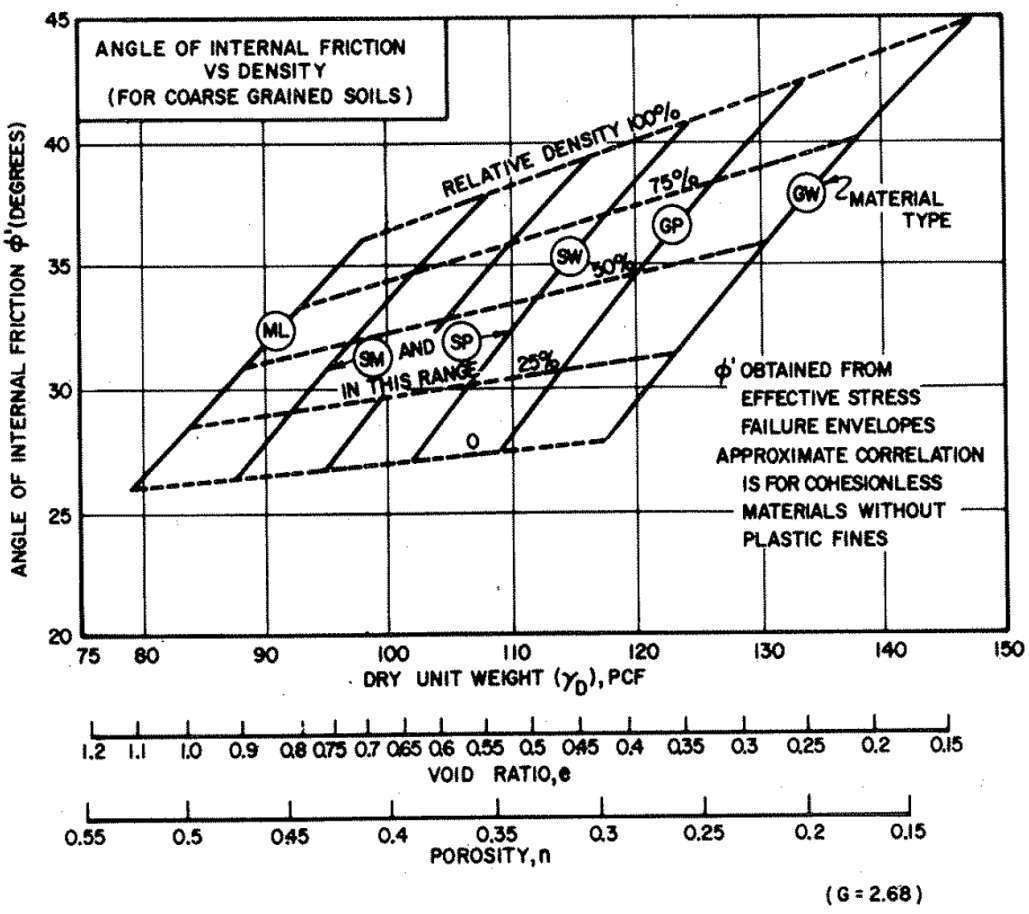
From Lunne et al. (1997)

Figure 18. Correlations for effective stress friction angle in sands from CPT data.

Approximate correlation among density, penetration resistance, and shear strength of normally consolidated, granular soils (after Mitchell and Katti 1981)

Description	Relative Density D_R (%)	Dry Unit Weight γ_{dry} (pcf)	Standard Penetration Test N_1 (blows/foot)	Cone Penetrometer Tip Resistance q_c (tsf)	Friction Angle ϕ' (degrees)
Very Loose	0 - 15	< 90	< 4	< 50	< 30
Loose	15 - 35	90 - 100	4 - 10	50 - 100	30 - 32
Medium Dense	35 - 65	100 - 115	10 – 30	100 - 150	32 - 35
Dense	65 - 85	115 - 127	30 - 50	150 - 200	35 - 38
Very Dense	85 - 100	> 127	> 50	> 200	> 38

Note: N_1 is the SPT blowcount normalized to 1 atmosphere (1 tsf or 100 kPa) of vertical effective stress



From NAVFAC DM 7.01 (1986)

Figure 19. Typical values of effective stress friction angle for granular soils.

Table 5.7 Typical Values of Peak Friction Angle (ϕ') for Normally Consolidated Clays[a]

Plasticity index	ϕ' (deg)
10	33 ± 5
20	31 ± 5
30	29 ± 5
40	27 ± 5
60	24 ± 5
80	22 ± 5

Source: Data from Bjerrum and Simons (1960).
[a] $c' = 0$ for these materials.

From Duncan and Wright (2005)

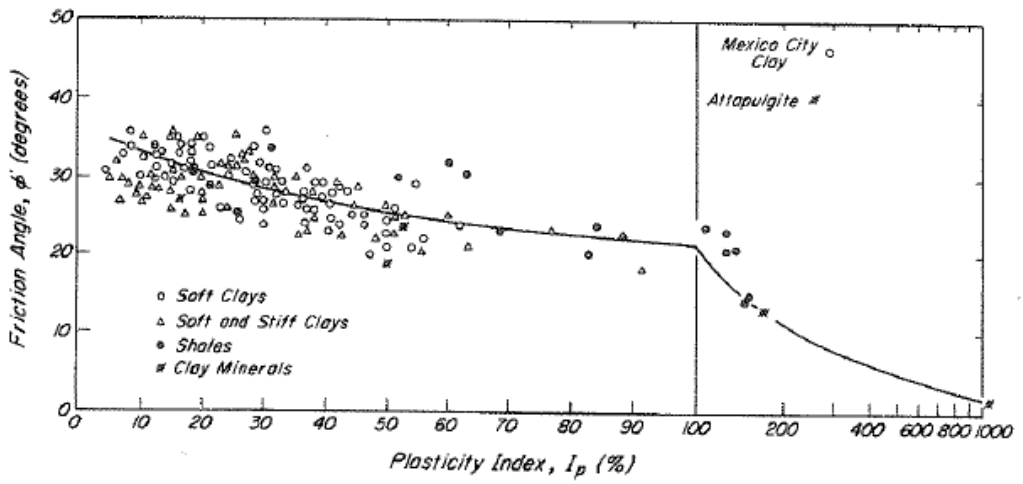


Figure 19.7 Values of friction angle ϕ′ for clays of various compositions as reflected in plasticity index.

From Terzaghi et al. (1996)

Figure 20. Typical values of effective stress friction angle for clay soils.

7. Undrained Strength Parameters for Static, Short Term Conditions

7.1. Basis

Soil shear strengths are characterized using undrained strength parameters where or when pore water pressures are unknown or cannot be predicted with confidence. Typically representing conditions where shear induced pore water pressures (excess or deficient) have not dissipated, the undrained shear strength (S_U) of a soil is expressed using undrained strength parameters (c and ϕ):

$$S_u = c + \sigma'_{con} \tan\phi \qquad \textbf{Equation 25}$$

In practice, the undrained shear strength of a soil may be expressed using UU strengths (Section 7.3.1), "c/p" ratios (Section 7.3.2), or R-envelopes (Section 7.3.3). In each case, undrained strengths are characterized as a function of effective consolidation stress (σ'_{con}), or sometimes approximated as a constant within a soil zone.

Undrained strength parameters are used in "total stress" stability analyses, where excess pore water pressures generated by shearing are unknown. The effective stresses prior to loading (σ'_{con}) are used to quantify the soil strength, but the analysis is carried out using total stresses (pore pressures and effective stresses in the soil under load are not estimated). The underlying assumption is that excess pore pressures generated in a laboratory test specimen are similar to those encountered in the field, so that the fundamental effective stress is similar in both cases. Undrained strength parameters fit to test data implicitly represent the effects of excess pore water pressure on the soil strength in the field.

Some engineers refer to S_U, c, and ϕ as "total stress strength parameters." This causes confusion, because effective consolidation stresses are used with the parameters to compute the shearing resistance (FERC 2006). The term "undrained strength parameters" is thus recommended for S_U, c, and ϕ.

It is challenging to measure and quantify undrained shear strengths that accurately represent the behavior of soils in the field. The assessment of undrained shear strengths is discussed extensively by Ladd (1991), Terzaghi et al. (1996), Ladd and DeGroot (2003), and Duncan et al. (2014). Undrained strengths are dependent on a number of factors, including:

- structural anisotropy in the soil (bedding planes, fissuring, etc.),
- stress history (preconsolidation stress or overconsolidation ratio),
- water content, void ratio, and degree of saturation in the soil,
- sampling disturbance in test specimens,
- mode of shearing (stress path or stress induced anisotropy),
- strain rate dependency, including creep effects, and
- potential for progressive failure in sensitive soils.

7.2. When to Use Undrained Strengths

Shearing resistance is fundamentally related to the effective stress in a soil, and drained strength parameters should be used with effective stress analyses any time the pore pressures (including shear-induced pore pressures) can be reliably predicted. However, when the soil is loaded rapidly, or any time when the shear induced pore water pressures are difficult to accurately predict, effective stress analyses are impractical and undrained analyses are necessary.

Under static conditions, pore pressures equilibrate fairly quickly in high permeability soils, such that undrained shear strengths are usually associated only with clayey or silty soil deposits. Coarse grained soils (sands, gravels, etc.) are often permeable enough that excess pore pressures will rapidly dissipate, even under short term loading conditions. For pervious soils, whether saturated or unsaturated, drained effective stress strength parameters may be used to represent short-term, undrained conditions. This assumes the static or steady-state pore water pressures in the soil are unchanged by the short-term loading, and the shear strength in an "undrained analysis" can be modeled using the drained, effective stress strength parameters.

Earthquakes are an exception, however. Dynamic loading will usually cause excess pore pressures to accumulate even in coarse grained soils. Undrained strengths for seismic conditions (Section 9) are needed for most soils.

To determine if a particular soil will be "drained" under a static load, the Time Factor (T) can be computed:

$$T = \frac{c_v t}{D^2} \qquad \textbf{Equation 26}$$

where c_v is the coefficient of consolidation, t is the elapsed time for the loading condition, and D is the drainage distance. If the Time Factor is greater than or equal to about three ($T \geq 3$), the soil can be assumed to drain; otherwise the soil should be treated as undrained (Duncan et al. 2014). Judgment is usually required to estimate a representative drainage distance when computing the time factor. In most rapid drawdown analyses, full drainage can be assumed in soils having a hydraulic conductivity greater than 10^{-4} cm/sec (USACE 2003; Duncan et al. 2014). These guidelines are reasonable for judging if a soil zone should be modeled as drained or undrained in most slope stability analyses, except for seismic or impact load cases.

The flowchart in Figure 21 provides guidance in the selection of drained versus undrained strength parameters for different soil conditions, based on the assumptions for the analysis. Clean, coarse sands are usually assumed to be fully drained under most loading conditions, but should be treated as undrained under dynamic, seismic, or impact loads. Clean rockfill, including riprap, can generally be assumed to drain even in an earthquake. Drained or undrained strength parameters may be appropriate to represent the strength of unsaturated soils, as discussed in Section 8.

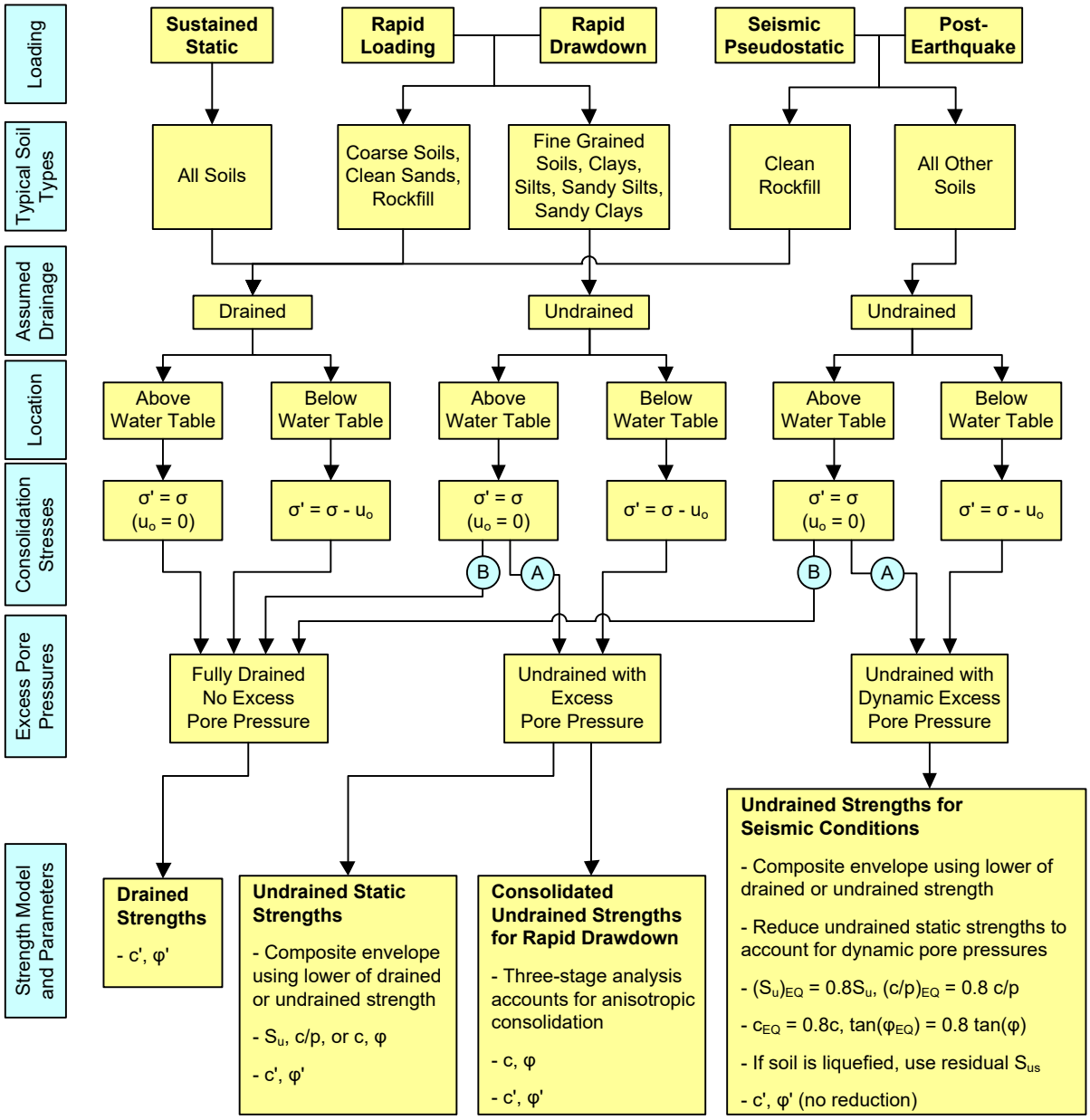


Figure 21. Selection of appropriate shear strength parameters for stability analyses.

7.3. Undrained Strength Parameters

7.3.1. UU Strengths

In unconsolidated undrained (UU) triaxial compression tests, soil samples are subjected to varying confining pressures and then loaded to failure. The samples are unconsolidated, in that no drainage from the soil is allowed as the confinement is increased. If the test samples are saturated, the applied confining pressure will cause a corresponding increase in pore pressure. Then, assuming all test samples are identical (same density), the effective stresses will be the same (in theory) regardless of the confining pressure. The undrained strength (S_U) is then independent of the confining stress ($\phi = 0$):

$$S_u = \text{constant} \qquad \textbf{Equation 27}$$

In practice, the void ratio of soil samples will decrease with depth and effective consolidation pressure, in samples taken from an otherwise uniform deposit. The undrained shear strength from UU tests will thus vary with the depth of the soil sample. In relatively thin or noncritical soil layers, a constant value of S_U may be used to model the entire deposit. In thicker deposits, values of S_U may be determined at various depths and the undrained strength profile might be modeled as a simple function of depth (z):

$$S_u = f(z) \qquad \textbf{Equation 28}$$

Unfortunately, the measurement of S_U in UU triaxial compression tests is fraught with problems, even when the tests are carefully executed in accordance with applicable standards. As detailed by Ladd (1991) and Ladd and DeGroot (2003):

- Unavoidable sample disturbance leads to S_U values that are too low.
- The high rate of shearing results in S_U values that are too high.
- Triaxial compression mode of shearing gives S_U values that are too high.

To get the "right" answer, these errors would have to offset one another. Engineering practice has generally assumed that the effects of sample disturbance dominate, leading to conservative measurements of S_U from UU tests. Ladd (1991) points out that this assumption may not be valid when better quality samples are obtained with modern tools and methods.

A value of S_U determined from a UU triaxial test is more appropriately viewed as an index of the soil's undrained strength, instead of a direct measurement. The relatively low cost of UU tests allows for conducting more laboratory runs, and can provide for a good compromise between testing costs and data quality. In addition, there is an extensive history of satisfactory performance when UU strengths are used in geotechnical design.

Historically, routine practice involved the use of unconfined compression tests to characterize the undrained shear strength (S_U = one half of the unconfined compressive strength) of clayey soils. However, unconfined compression testing

provides a poor, often low measure of soil strength. Specimens tend to dry during testing and, without confinement, dilatant soils are more apt to cavitate; both can cause desaturation of the soil. Unconfined tests should not be used with fissured clays, because of premature failure along the fissures (Terzaghi et al. 1996). UU triaxial tests, which involve little additional cost or effort, are nearly always preferred over unconfined compression tests.

7.3.2. c/p Ratios

To represent the variation in shear resistance with consolidation pressure, the undrained strength can be characterized using the "c/p ratio" ($c/p = S_u/ \sigma'_{1,con}$):

$$S_u = \left(\frac{c}{p}\right)\sigma'_{1,con} \qquad \textbf{Equation 29}$$

where $\sigma'_{1,con}$ is the major principal effective stress to which the soil has been consolidated. The c/p ratio concept is consistent with the experimental observation that the undrained strength of saturated clays varies with the water content (void ratio), which varies with the major principal effective stress to which the soil has been consolidated. The formulation in Equation 29, which avoids the theoretical limitations associated with R-envelopes (Section 7.4.3.3), is the preferred method for representing the undrained strength of soft, saturated soils.

The key to using this approach for a stability analysis is the determination of an appropriate, representative c/p ratio for the conditions of interest. Like S_U in general, values of the c/p ratio depend on the mode of shearing, stress history, sample disturbance, strain rate effects, etc. How these factors may be addressed in a laboratory testing program is outlined in Section 7.4.

For most normally consolidated soils, values of $c/p = 0.22 \pm 0.03$ are typical (Ladd and DeGroot 2003). The ratio will be larger for overconsolidated soils, and can be represented by the following empirical expression (Ladd 1991):

$$\left(\frac{c}{p}\right) = S \cdot OCR^{m} \qquad \textbf{Equation 30}$$

where S is an intercept value (where OCR = 1) and m is an empirical exponent (typical values of 0.75 to 1). Empirical values for estimating c/p ratios are presented in Section 7.6.

Here, the stress history of the soil deposit is represented by the OCR (overconsolidation ratio = preconsolidation pressure / effective stress). Application of Equation 30 in a stability analysis, and use of the c/p ratio in general, thus requires knowledge of the stress history. Accurate characterization of the preconsolidation stress (due to mechanical reductions in stress, desiccation, aging, or other physical-chemical process) is thus needed. Ladd and DeGroot (2003) provide specific recommendations for one dimensional consolidation testing to better quantify the preconsolidation stress.

The c/p approach works well for characterizing the undrained strength of soft clay deposits that are normally to moderately overconsolidated. In compacted embankments, where the preconsolidation stress is highly variable and difficult to quantify, the selection of a representative c/p ratio will be problematic. For unsaturated soils, the undrained strength measured in a UU test will vary with confining pressure, violating the assumption of $\phi = 0$. Therefore, c/p ratios are not recommended for modeling compacted embankment soils or unsaturated soils. Mohr-Coulomb strength parameters, or a single value of S_U (for layers or sublayers of moderate thickness), are usually better choices for such materials.

7.3.3. Undrained c and ϕ

The variation in undrained shear strength with consolidation pressure can also be represented using the Mohr-Coulomb envelope (Equation 19):

$$S_u = c + \sigma'_{con} \tan\phi \qquad \textbf{Equation 31}$$

where σ'_{con} is the effective consolidation pressure, and c and ϕ are undrained strength parameters (cohesion and friction angle, respectively).

This relationship gives the undrained strength on a potential slip surface as a function of the effective consolidation stress normal to the failure plane. When applied in a slope stability analysis, care must be taken to compute the undrained shearing resistance based on the normal stresses to which the soil has been consolidated (σ'_{con} in Equation 31). The steady state pore water pressures should be used in this calculation.

Traditionally, undrained strengths have been characterized using data from consolidated undrained (CU) laboratory tests that are fit with an "R-envelope" (traditional terminology employed by the U.S. Army Corps of Engineers). The undrained R-envelope (Figure 24) is a tangent line to "total stress" Mohr's circles, which are drawn for the consolidation pressure (σ'_{con}) and deviator stress at failure [$\sigma_{df} = (\sigma_1-\sigma_3)_f$]. When used to specifically represent R-envelopes, the undrained parameters are designated as c_R and ϕ_R.

The undrained shear strength obtained from a traditional R-envelope is less than the shear strength that would be measured in a CU test specimen at the same consolidation stress. This effect, and alternate definitions of the undrained strength envelope that may be employed, are discussed in Section 7.4.3.

7.4. Laboratory Measurements of Undrained Soil Strengths

7.4.1. Specimen Consolidation

Key details for handling soil samples and testing in the laboratory to measure undrained shear strengths in soft soils are provided in Ladd (1991) and Ladd and DeGroot (2003). High quality samples with minimal disturbance, generally obtained with thin-walled piston tube samplers, are essential for obtaining representative undrained strengths from laboratory tests. Even with careful handling of the field

sample and preparation of test specimens, the specimen will be affected by changes in stress during the extrusion process and the removal of the in situ stresses. Two methods may be employed during CU testing, to compensate for these effects:

- The Recompression technique (Bjerrum 1973) involves reconsolidating the test specimen back to the in situ stress conditions, prior to undrained shearing.

- The SHANSEP method (Ladd and Foott 1974) involves consolidating test specimens to stresses high enough to achieve virgin compression, then rebounding some so that the strength ratio can be characterized as a function of OCR (Equation 30).

The choice of methods depends on the nature of the soil being tested, as discussed by Ladd (1991), Ladd and DeGroot (2003), and Duncan et al. (2014). Where high quality block samples are available, the Recompression method is usually preferred. The SHANSEP method is preferred for normally to slightly overconsolidated clays, where Recompression to the in situ stress condition induces volumetric compression and a shearing resistance that is too high. The SHANSEP approach is often not practical for heavily overconsolidated soils, because of the high test pressures required; the Recompression technique should be used for such soils. Moreover, the Recompression technique should be chosen for highly structured, sensitive soils, where consolidation to virgin compression in the SHANSEP method will alter the soil structure and give undrained strengths that are too low.

Conventional laboratory triaxial tests consolidate test specimens under isotropic stress prior to undrained shear (designated as ICU or CIU tests). Testing anisotropically consolidated specimens (ACU tests) will generally produce higher and more accurate measurements of undrained shear strength. To simulate typical in situ stress conditions, Ladd (1991; Ladd and Foot 1974; Ladd and DeGroot 2003) advocates consolidating the test soils to K_o conditions ($\sigma'_h = K_o \sigma'_v$) in undrained tests designated as CK_oU.

Consolidated undrained test specimens are pressure-saturated prior to loading, to allow accurate measurement of pore water pressures. This eliminates suction pore pressures in unsaturated samples, but the absence of suction leads to conservative, lower shear strengths. Alternatively, the undrained shear strength of unsaturated soils can be characterized using UU triaxial tests.

7.4.2. Loading Path

The undrained strength also varies with the stress path imposed during shearing. The most commonly followed stress paths are triaxial compression (TC), triaxial extension (TE), and direct simple shear (DSS). Data presented in Terzaghi et al. (1996) and Ladd and DeGroot (2003) show that, for normally consolidated silts and clays:

$$\left(\frac{c}{p}\right)_{TC} > \left(\frac{c}{p}\right)_{DSS} > \left(\frac{c}{p}\right)_{TE} \qquad \textbf{Equation 32}$$

Duncan et al. (2014) point out that all three stress paths yield strengths that are lower than what would be measured under plane strain conditions. However, considering

the various modes of shearing in a slope stability problem, Ladd and Foott (1974) argue that DSS tests provide the best measure of the "average" shearing resistance along a potential slip surface.

Ladd (1991; Ladd and DeGroot 2003) favors the use of K_o-consolidated, direct simple shear (CK_oU-DSS) tests for providing the best measurement of undrained strength. Where DSS test data are not available, K_o-consolidated triaxial compression and triaxial extension tests (CK_oU-TC and CK_oU-TE) can be used. The average value of S_u from the TC and TE tests would then be used in the analyses. More importantly, Ladd argues that undrained strengths determined from CIU triaxial compression tests are too high and unsafe for design (see also Section 7.4.3).

7.4.3. Interpretation of Triaxial Test Data

When using data from laboratory triaxial tests, three different methods can be used to quantify the measured undrained shear strength. As described below, the undrained strength may represent the maximum shear stress $(S_u)_{ms}$, the shear stress from the R-envelope $(S_u)_R$, or the shear stress on the failure plane $(S_u)_{ff}$.

7.4.3.1. UU Tests - Maximum Shear Stress, $(S_u)_{ms}$

The shear strength measured in an unconsolidated undrained (UU) triaxial compression test represents the maximum shear stress in the soil at the time of failure. This shear strength, denoted $(S_u)_{ms}$, is the shear stress on a 45˚ plane in the triaxial test specimen. As depicted in Figure 22, $(S_u)_{ms}$ represents the top of the Mohr's circle of stress at failure, and is equal to one half of the applied deviator stress [$\sigma_{df} = (\sigma_1-\sigma_3)_f$]:

$$(S_u)_{ms} = \frac{\sigma_{df}}{2} \qquad \textbf{Equation 33}$$

The value of $(S_u)_{ms}$ is greater than the shear stress on the failure plane within the triaxial specimen. There are numerous other practical limitations associated with characterizing undrained strengths using UU test data, as outlined in Section 7.3.1. Strengths determined from UU triaxial compression tests represent an index of a soil's undrained shear strength. Hence, using $(S_u)_{ms}$ from a UU triaxial test is an acceptable means of characterizing the undrained shearing resistance on a potential failure surface in the field.

When using data from UU triaxial tests, the undrained shear strength in each test should be determined per Equation 33. Then, using the results from multiple tests, the undrained strength of the deposit may be characterized using:

- a constant value (Equation 27),
- a value that varies with depth (Equation 28), or
- a c/p ratio (Equation 29).

Depending on the quality and consistency of the samples, significant scatter or variation in the $(S_u)_{ms}$ values may be observed. A lower one-third value (where two-thirds of the values are higher), or perhaps the median value of $(S_u)_{ms}$, may be used to represent the soil. When using c/p ratios, a median or lower one-third value of the c/p ratio may be used.

7.4.3.2. CU Tests - Maximum Shear Stress, $(S_u)_{ms}$

To compensate for sample disturbance effects, undrained strengths can be measured using consolidated undrained (CU) triaxial tests. The undrained shear strength is sometimes taken as the maximum shear stress (Equation 33) in the test specimen at failure. The value of $(S_u)_{ms}$ is then plotted as a function of the effective consolidation stress (Figure 23). This interpretation is depicted on Figure 5.31 in Duncan et al. (2014).

However, values of $(S_u)_{ms}$ from CU triaxial compression results tend to be higher than the average shear strength that develops along a field failure surface, as discussed in Section 7.4.2. Therefore, the method shown in Figure 23 is <u>not</u> recommended for characterizing undrained strengths from CU test data.

7.4.3.3. CU Tests - Shear Stress from R-envelope, $(S_u)_R$

An R-envelope is developed by fitting a tangent line to Mohr's circles for the failure stresses measured in CU triaxial tests. The circles are drawn using the effective consolidation stress (σ'_{con}) as the minor principal stress and the deviator stress at failure (σ_{df}). The tangent R-envelope is then fit as shown in Figure 24, and characterized using Mohr-Coulomb parameters (c_R and ϕ_R).

$$(S_u)_R = c_R + \sigma'_{con} \tan \phi_R \qquad \textbf{Equation 34}$$

The strength parameters can also be determined by fitting a line to p-q points, as described in Section 5.2.

There are theoretical objections to the R-envelope formulation in Equation 34. The "Mohr's circles" are plotted using the effective stresses at the start of shearing and the stress difference at failure. Since these stresses do not exist at the same point in time, the plot is not actually a Mohr's circle (Duncan et al. 2014). Furthermore, Ladd (1991) argues that the R-envelope approach does not correctly represent the variation in undrained strength with the direction of the normal consolidation stress along a circular slip surface. The resulting errors are difficult to quantify.

On the other hand, R-envelopes have been widely used in past practice to represent the shear strength of soils under short-term conditions. This approach provides a conservative number for the undrained strength at a given consolidation pressure, as demonstrated in Section 7.4.3.5. For these reasons, a traditional R-envelope remains a valid approach for representing the variation in undrained shear strength with effective consolidation pressure. In particular, using the more conservative R-envelope may be preferred when characterizing the strength of a soil zone based on a limited number of CU test results.

R-envelope strength parameters (c_R, ϕ_R) are required for some analyses, such as for three-stage rapid drawdown calculations. That method explicitly accounts for the shear stress acting on the failure plane in a triaxial test sample.

7.4.3.4. CU Tests - Shear Stress on the Failure Plane, $(S_u)_{ff}$

In a triaxial compression test, failure should develop on a plane that is oriented at (45° + ϕ'/2) above horizontal (Duncan et al. 2014). The shear stresses on the failure plane can be determined using Mohr's circle. As depicted in Figure 25, a line drawn from σ'_{con} at (45° + ϕ'/2) above horizontal will intersect the Mohr's circle at the stresses on the failure plane. The shear stress on the failure plane at failure $(S_u)_{ff}$ can be computed using:

$$(S_u)_{ff} = \frac{\sigma_{df}}{2}\cos\phi' \qquad \textbf{Equation 35}$$

where σ_{df} is the measured deviator stress at failure. The shear stresses on the failure plane are employed explicitly in the three-stage calculation for rapid drawdown analyses.

The drained friction angle (ϕ') is required in Equation 35 to compute the shear stress on the failure plane in a CU test. Assuming pore pressures are measured, ϕ' can be obtained by fitting a drained strength envelope to data from the same CU test results. For a typical drained friction angle in the range of 30° to 35°, $(S_u)_{ff}$ will be 82% to 87% of the maximum shear stress $(S_u)_{ms}$.

Using data from several CU tests, the "undrained strength envelope" (FERC 2006; USBR 2011a) is fit to a plot of $(S_u)_{ff}$ versus specimen consolidation pressure (σ'_{con}). As illustrated in Figure 25, the undrained strength envelope is represented by Mohr-Coulomb parameters (c and ϕ).

Direct simple shear tests directly measure the consolidation pressure and shear stress on the (horizontal) failure plane. Hence, direct simple shear data can be fit directly to obtain c and ϕ.

Drained, undrained, and R strength envelopes are compared in Figure 26. Note that the values of c and ϕ for the undrained strength envelope are greater than c_R and ϕ_R for an R-envelope, which is tangent to the Mohr's circles of stress. Moreover, the undrained strength envelope should not be fit using p-q plots (Section 5.2).

7.4.3.5. Comparison of Shear Strengths from CU Tests

Three definitions for the undrained shear strength in a CU test are discussed above. For a certain consolidation pressure, these strengths will differ in magnitude as illustrated on Figure 27:

$$(S_u)_{ms} > (S_u)_{ff} > (S_u)_R \qquad \textbf{Equation 36}$$

Values of $(S_U)_{ms}$ from CU triaxial tests are unconservative and should not be used for design (Ladd 1991).

Values of $(S_U)_R$ may be obtained from R-envelopes fit to CU triaxial test results. This traditional approach tends to be conservative, in that the shear stresses within the triaxial sample are higher than the corresponding values of $(S_U)_R$ computed for the same consolidation pressure. This definition may be preferred when little test data is available to fit the strength envelope and a more conservative treatment is justified.

Values of $(S_U)_{ff}$ are rational and representative of the undrained strength measured in a CU triaxial test. The value $(S_U)_{ff}$ will always be higher than the corresponding value of $(S_U)_R$, and typically 80% to 90% of $(S_U)_{ms}$. This definition is justified when sufficient test data is available to perform a detailed or refined undrained analysis.

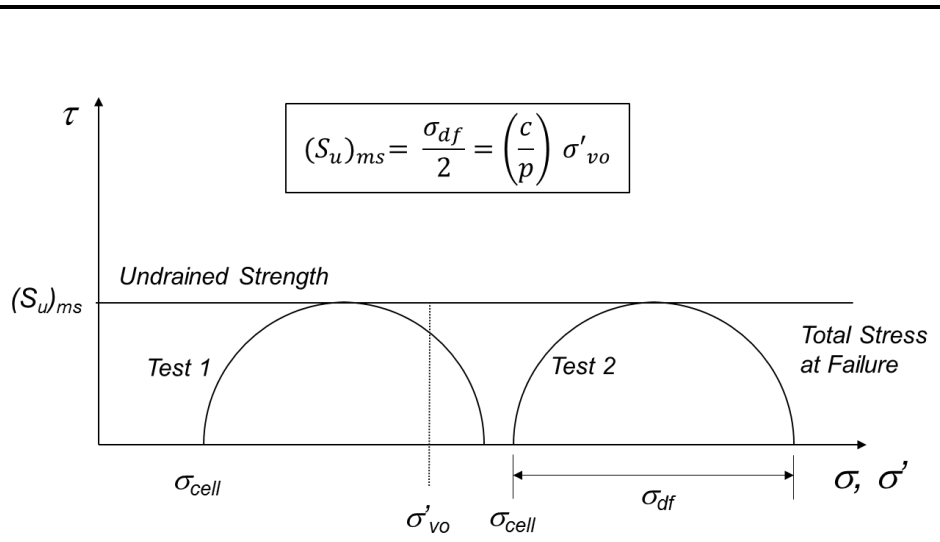


Figure 22. Undrained shear strength determined from UU triaxial test results fit with a c/p ratio.

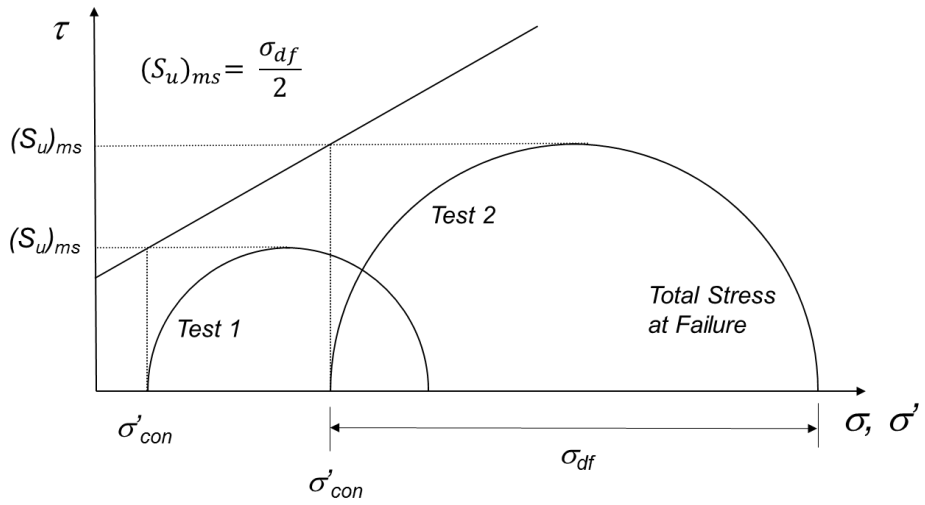


Figure 23. Undrained strength envelope representing the maximum shear stress measured in CU triaxial tests (this method is <u>not</u> recommended).

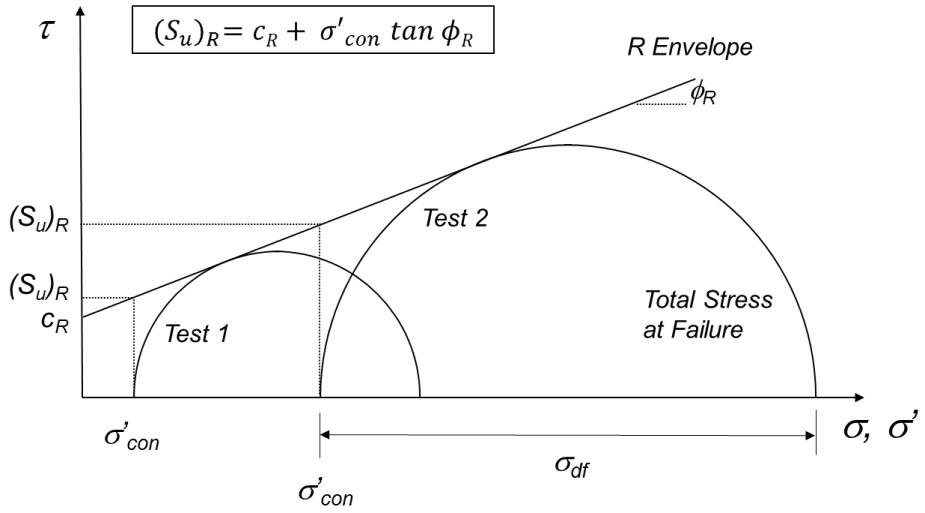


Figure 24. Undrained shear strengths determined from an R-envelope fit to CU triaxial test results.

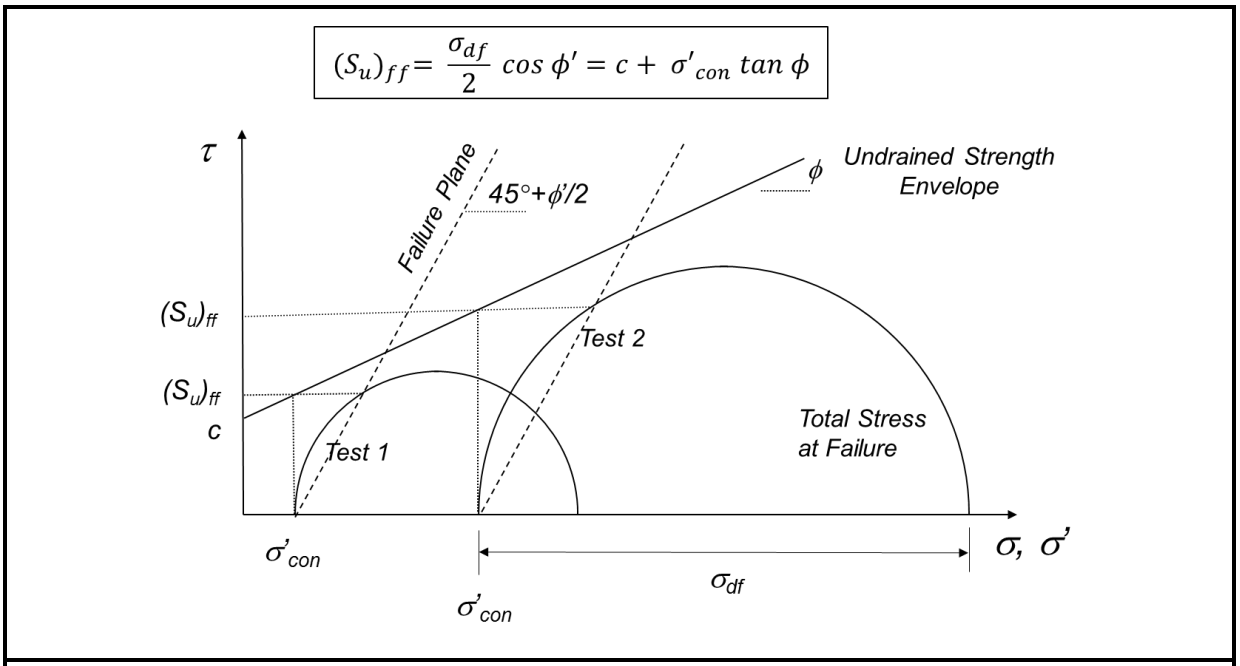


Figure 25. Undrained strength envelope representing the failure plane shear stresses measured in CU triaxial tests.

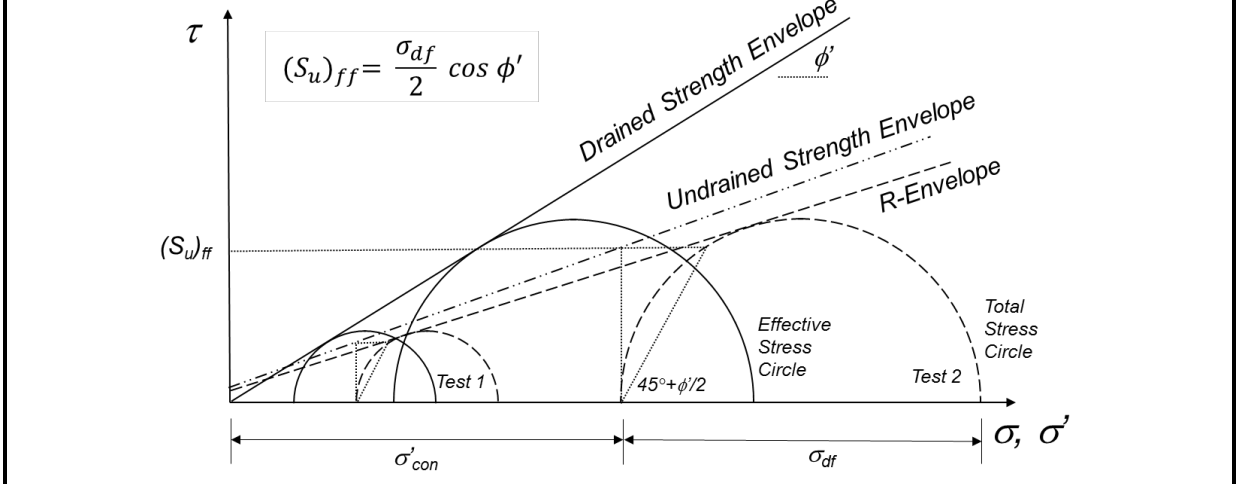


Figure 26. Drained, undrained, and R strength envelopes from CU triaxial tests (after FERC 2006; USBR 2011a).

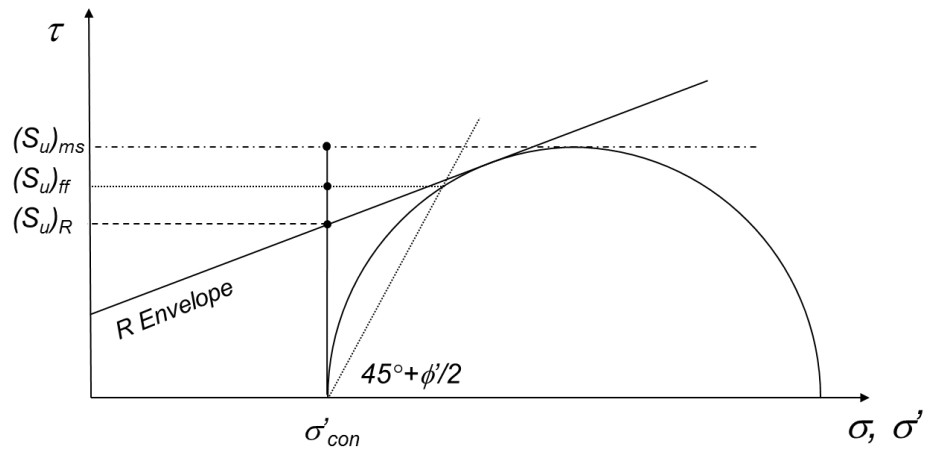


Figure 27. Comparison of undrained shear strengths, characterized using three different definitions, from CU triaxial tests.

7.5. In Situ Measurements of Undrained Soil Strengths

Undrained shear strengths can also be assessed using in situ test methods, which avoid some of the problems related to sample disturbance in laboratory test specimens.

7.5.1. Standard Penetration Test Blowcounts

While values of S_U have been empirically related to Standard Penetration Test (SPT) data (Terzaghi et al. 1996), there is considerable uncertainty in such correlations. The rough correlation in Figure 28, from Peck et al. (1974), is qualitative in nature and should only be used to gauge the reasonableness of measured strengths. In very soft soils, SPT blowcounts (typically $N_{SPT} < 2$) are simply too insensitive for quantifying undrained strengths.

7.5.2. Cone Penetration Resistance

The tip resistance measured in a Cone Penetration Test (CPT) provides a better measurement of undrained shear strength in soft soils. The correlation is usually expressed as (Lunne et al. 1997):

$$S_u = \frac{q_t - \sigma_v}{N_{kt}} \qquad \textbf{Equation 37}$$

where q_t is the corrected CPT tip resistance, σ_v is the total overburden pressure, and N_{kt} is an empirical factor.

Unfortunately, the available empirical data show significant scatter, making the accurate quantification of S_U from CPT data difficult. Lunne et al. (1997) recommend

using N_{kt} = 15 to 20 as a preliminary estimate, while recognizing that values as low as N_{kt} = 10 may be appropriate for normally consolidated clays, and stiff fissured clays may exhibit N_{kt} = 30. To reduce this uncertainty, site-specific correlations between q_t and S_U (from field vane or laboratory testing) should be developed and used.

Ladd and DeGroot (2003) warn that poor quality CPT data, especially misleading pore pressure data, may undermine the reliability of such results. However, when used in conjunction with other site-specific measurements of undrained shear strength, CPT data can provide valuable knowledge on the variation of strength with location and elevation across the site.

7.5.3. Field Vane Shear Tests

The field vane (FV) shear test is generally considered the most reliable means of measuring undrained shear strength in situ. Recommended practice for FV testing includes the use of a thin vane blades with square ends, a gear system at the borehole surface (to rotate the vane at a controlled rate while accurately measuring the torque), and assessment of rod friction (Ladd and DeGroot 2003). To account for the effects of installation disturbance, fast rate of shearing, and the unique mode of failure, FV results should be adjusted using the Bjerrum's vane shear correction factor, μ (Figure 29). Values of μ were empirically determined using shear strengths back-calculated from slope failures.

Considering the scatter apparent in Figure 29, vane shear testing does not provide a precise measure of undrained shear strength. Despite this limitation, the vane shear test is the preferred test for measuring S_U in normally consolidated to moderately overconsolidated clays. The test results are less reliable where coarse inclusions (such as shells) are encountered (Ladd and DeGroot 2003). In silt deposits, which may be one to two orders of magnitude more permeable than clay, partial drainage is likely to occur in a vane shear test run at the standard rate of rotation. The measured shear resistance will then be higher than would be realized under fully undrained loading conditions.

7.6. Typical Values

Typical values and correlations are useful for making preliminary estimates of shear strengths, as well as for checking the reasonableness of field or laboratory test results. The table in Figure 28 indicates the range in S_U associated with the qualitative consistency of clays.

Mesri (1989) suggested this empirical relationship for S_U:

$$S_u = 0.22\,\sigma'_p \qquad \textbf{Equation 38}$$

where σ'_p is the preconsolidation pressure.

For soils with OCR = 1, the c/p ratio (Equation 29) has been empirically correlated to index properties as shown in Figure 30. Hansbo (1957) related the strength ratio in normally consolidated clays to liquid limit (LL):

$$\frac{c}{p} = 0.0045 \cdot LL \qquad \textbf{Equation 39}$$

Skempton (1957) related the strength ratio in normally consolidated clays to plasticity index (PI):

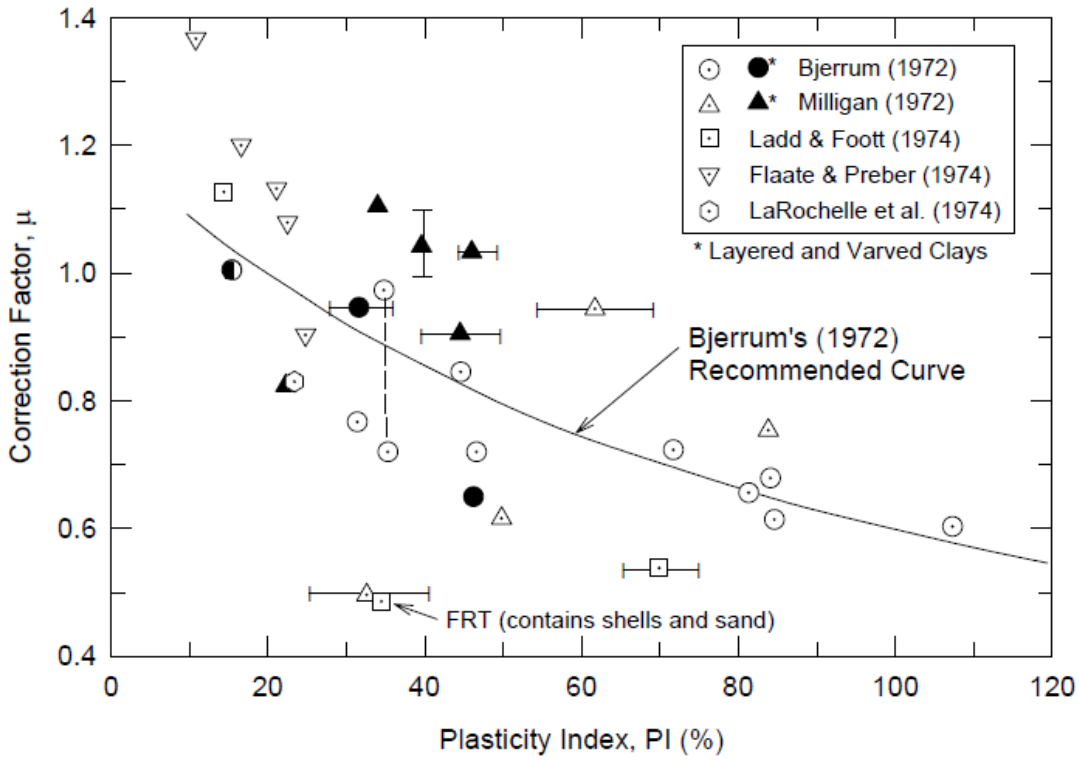
$$\frac{c}{p} = 0.11 + 0.0037 \cdot PI \qquad \textbf{Equation 40}$$

For normally consolidated to overconsolidated soils, typical values and correlations for S and m can be used with Equation 30 to estimate values of the c/p ratio. Suggested values of S and m for typical soils are listed in Figure 31.

Consistency	Field Identification	Undrained Shear Strength, S_u (psf)	Standard Penetration Test Blowcount* (blows/foot)
Very soft	Easily penetrated several inches by fist	< 250	< 2
Soft	Easily penetrated several inches by thumb	250 - 500	2 - 4
Medium	Can be penetrated several inches by thumb with moderate effort	500 - 1000	4 - 8
Stiff	Readily indented by thumb but penetrated only with great effort	1000 - 2000	8 - 15
Very stiff	Readily indented by thumbnail	2000 - 4000	15 - 30
Hard	Indented with difficulty by thumbnail	> 4000	> 30

** The correlation between undrained strength and SPT blowcount is rather unreliable*

Figure 28. Consistency of clays based on undrained strength (based on values from Peck et al. 1974).



$$S_u = \mu \left(S_u\right)_{vane}$$

Figure 29. Correction factor for the interpretation of undrained shear strengths from field vane shear tests (from Ladd and DeGroot 2003).

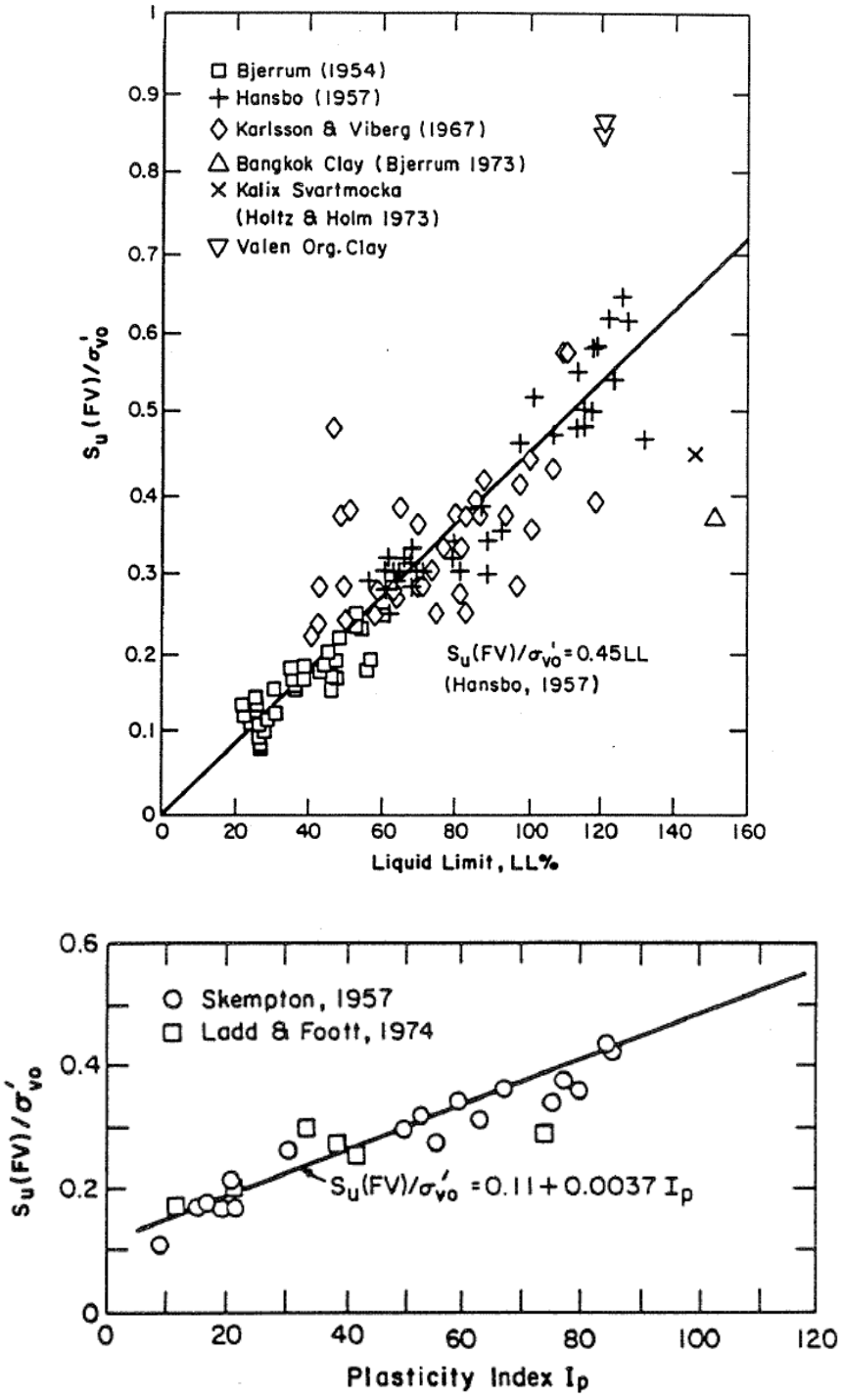


Figure 30. Correlations for c/p ratio in normally consolidated clays (from Duncan et al. 1989).

$$\left(\frac{c}{p}\right) = S \cdot OCR^{m}$$

Suggested, average values for most soils:

	S	m
Jamiolkowski et al. (1985)	0.23	0.8
Ladd (1991); Ladd and DeGroot (2003)	0.22 ± 0.03	0.8 ± 0.1

Suggested values for selected soils (Ladd and DeGroot 2003):

Soil Description	S	m[a]	Remarks
1. Sensitive cemented marine clays (PI < 30%, LI > 1.5)	0.20 Nominal SD = 0.015	1.00	Champlain clays of Canada
2. Homogeneous CL and CH sedimentary clays of low to moderate sensitivity (PI = 20 to 80%)	S = 0.20 + 0.05(PI/100) or Simply 0.22	$0.88(1 - C_s/C_c)$ ± 0.06 SD or simply 0.8	No shells or sand lenses-layers
3. Northeastern US varved clays	0.16	0.75	Assumes that DSS mode of failure predominates
4. Sedimentary deposits of silts and organic soils (Atterberg Limits plot below A-line) and clays with shells	0.25 Nominal SD = 0.05	$0.88(1 - C_s/C_c)$ ± 0.06 SD or simply 0.8	Excludes peat

[a] $m = 0.88(1 - C_s/C_c)$ based on analysis of CK_0UDSS data on 13 soils with max. OCR = 5 - 10

SD = standard deviation
C_s = swell index
C_c = compression index

Figure 31. Typical values for estimating the c/p ratio using Equation 30.

7.7. Recommended Practice

Accurately quantifying the shearing resistance of soils, when subjected to undrained loading, is a challenge. Where the stability of a slope depends on the behavior of soft or weak underlying soils, reasonable estimates of the undrained shear strength are

critical to the analysis and evaluation of the slope. This has been an active area for research throughout the history of modern geotechnical engineering, with disagreements and conflicting advice found in the literature. Moreover, there is usually a need to balance the need for accuracy and safety against the demands for engineering economy in the investigation, analysis, and design of earth structures. In these situations, the engineer must use appropriate judgment when specifying tests and selecting strength parameters for a stability analysis. It is neither feasible nor desirable to define a "recipe" procedure for selecting undrained soil strengths.

Based on the review outlined in this section, the following methods are recommended for the assessment of undrained soil strengths:

(1) Correlations and typical values for S_U and/or c/p ratios.

(2) Unconsolidated undrained (UU) triaxial compression tests:

- Perform numerous tests, measure S_U as one half of the deviator stress at failure, and expect significant scatter.
- Characterize S_U as a median value within a soil deposit, or as a function of depth.
- If there are sufficient data to characterize the consolidation pressure and stress history, characterize the variation in S_U using c/p ratios.

(3) Isotropically consolidated, undrained, triaxial compression tests (CIU TC):

- Fit a tangent line to Mohr's circles (or fit a line using p-q points), to define R-envelope parameters (c_R and ϕ_R). This is a traditional method that results in conservative values for the undrained shear strength, and is thus appropriate where few test results are available.
- Fit a line to the consolidation and shear stresses on the failure plane (Equation 35), to define parameters (c and ϕ) for the undrained strength envelope. This method is less conservative, and is recommended for refined analyses and where many test results are available.

(4) In situ field tests:

- Cone penetration tests (CPT) with site-specific correlations for S_U.
- Field vane (FV) shear tests, with empirical corrections (Figure 29) to obtain S_U.
- Characterize the results using a constant or representative S_U value, S_U expressed as a function of depth, or c/p ratios.

(5) Advanced laboratory testing:

- K_o-consolidated undrained triaxial compression (CK_oU TC) and triaxial extension (CK_oU TE) tests; use the average of S_U values measured in the two tests to define c/p ratios.

- K_o-consolidated direct simple shear (CK_oU DSS) tests, with results used to define c/p ratios.

Note that the use of c/p ratios requires knowledge of the stress history. In critical layers, one-dimensional consolidation tests are thus needed to define the variation in preconsolidation pressure with depth in the deposit. While c/p ratios work well for soft clay deposits, this approach is not recommended for characterizing unsaturated soils and/or compacted embankment soils.

In a roughly general sense, the costs and accuracy of the strength determination increases as one moves down the above list. Based on engineering judgment, more costly and better methods should be employed when characterizing more critical soil layers. Preliminary analyses accomplished with less expensive strength estimates may indicate the need for more in-depth considerations of stability, and the need for more sophisticated characterization of the undrained shear strength. More data from advanced testing can increase one's confidence in the strength parameters, which can also justify the use of smaller factors of safety and more economical designs.

7.8. Composite Drained-Undrained Strength Envelopes

Most soils will exhibit dilative shear behavior at low confining pressures. When saturated soils are consolidated to low effective stress and then sheared without drainage, the tendency to expand will cause decreasing pore pressures (suction). This results in increasing effective stress and shearing resistance, and an undrained strength that exceeds the drained strength. As indicated in Figure 32, the undrained strength envelope will be above the drained strength envelope in the regime of effective stress where the soil is dilative (generates suction pressures). Above a certain transition stress, the undrained strength will be less than the drained strength; in this higher stress range, the soil is contractive, creates increasing pressures in undrained shear, and the undrained strength is less than the drained strength.

The additional shearing resistance due to negative pore pressures may not be sustainable in the field. Over time, water will be drawn toward areas with suction pore pressures, the beneficial effects of the higher effective stress will be lost, and the soil strength will reduce to the drained shearing resistance. Hence, computed factors of safety for stability may be unconservative if some part of the slip surface has an undrained strength greater than the drained strength.

To avoid this issue, a composite (bi-linear) strength envelope (Figure 32) can be specified for undrained analyses. The undrained strength is then taken as the lesser of the undrained or drained strength envelopes at any given normal stress.

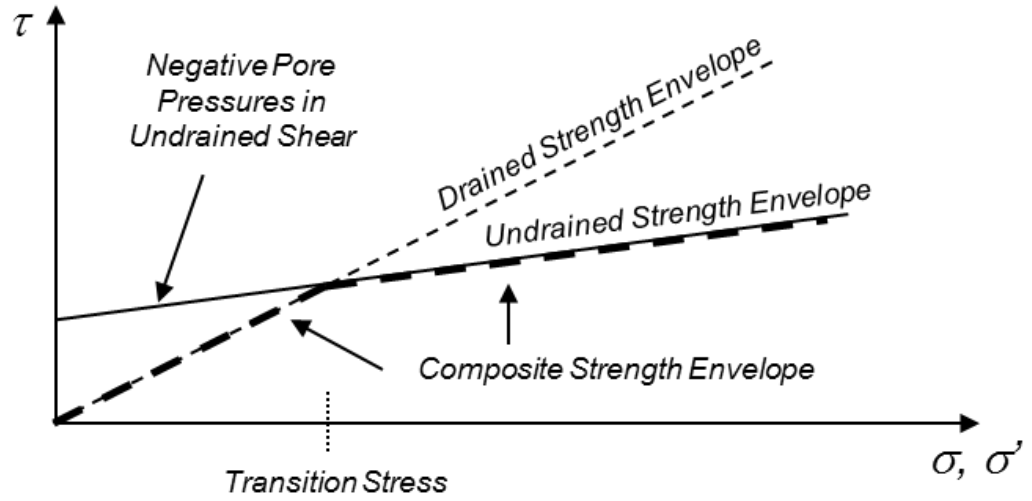


Figure 32. Specification of a composite strength envelope to avoid undrained shearing resistance due to negative pore pressures.

8. Strength of Unsaturated Soils

8.1. Saturation and Excess Pore Pressures

Shear-induced changes in pore pressure result from the movement of soil particles and the redistribution of stress between the soil skeleton and the pore fluid. Air is highly compressible, such that compression (or dilation) of pore space containing air does not generate significant changes in pore water pressure. In many unsaturated soils, shear induced volumetric changes will be accommodated by compression (or expansion) of the pore air. One might assume undrained loadings, including dynamic loadings, will not generate significant excess pore water pressures in these soils.

However, the actual behavior depends on the degree of saturation. Excess pore pressures are likely to occur in soils that are close to being saturated (perhaps at saturations greater than about 90 to 95%). For some soils above the water table, it will be appropriate and prudent to assume undrained loading will cause excess pore pressures and strength parameters should be assigned accordingly (Section 8.3).

Models of unsaturated soil behavior, including shear strength, can be formulated using the concept of "matric suction" (Fredlund and Rahardjo 1993). In most traditional geotechnical engineering problems, however, satisfactory results can be obtained without formal modeling of matric suction. Unsaturated soils may be modeled using conventional, drained or undrained strength parameters, as discussed below.

8.2. Conditions above the Water Table

The water table (phreatic surface) is defined as the line in the ground where pore water pressures are zero. Steady state pore pressures are positive beneath the water table and negative above.

Technically, the water table does not correspond to the top of the saturated zone. In the capillary fringe above the water table, the soils will be saturated or close to saturated. The height of capillary rise can range from a few inches in coarse sands to tens of feet in clayey soils.

In addition, soils above the water table may be saturated with retained water. For example, an embankment dam is subject to a changing phreatic surface as the reservoir rises and falls with dam operations. The phreatic surface drops when the pool is drawn down, inducing drainage from saturated zones above the new, lower water table. Significant water is retained in the pore spaces as the soil drains, with greater retention in finer grained soils. The infiltration and percolation of surface water will also increase the water content and degree of saturation in areas above the phreatic surface.

In assigning strength parameters for soils above the water table, it helps to consider how close to saturation the soil may be. Fine grained soils (silts, clays, sandy silts, sandy clays, etc.) are subject to greater heights of capillary rise, plus greater retention of draining or percolating ground water. Such soils may be close to saturation for

significant heights above the water table. Coarse sands with little fines experience less capillary rise and retain less water. The consideration of soil type is thus an important factor when selecting strength parameters for the unsaturated zone.

Regardless of saturation, the static pore pressures above the water table are negative (suction). Suction pressures increase the inter-particle stresses in the soil (represented by the effective stress) and the shearing resistance. However, in conventional stability calculations, pore pressures are assumed to be zero (absolute pressures equal to the atmospheric pressure) above the phreatic surface. Neglecting the suction pressures results in a conservative computation of consolidation stress and shearing resistance along the slip surface in the unsaturated zone.

8.3. Selection of Strength Parameters

The flowchart in Figure 21 helps to guide the selection of appropriate strength parameters for saturated and unsaturated soils. The chart is entered at the top, based on the loading condition that is being analyzed. Based on the loading rate and type of soil (see Section 7.2), each soil zone is judged to behave as fully drained or fully undrained. How the strengths are modeled may then depend on the whether the soil is found above or below the water table.

Under long-term, static loading conditions, the strength of all soils can be modeled using drained effective stress parameters. For clean, coarse soils, above or below the water table, drained strength parameters may be appropriate for all loads except dynamic, earthquake, or impact loads.

Rapid loading of fine grained soil induces undrained conditions in all cases, but the assigned strengths may differ if the soil is above or below the water table. Above the water table, the engineer has two options for the computing the strength under rapid or dynamic loads. The alternate paths are denoted A and B in Figure 21.

Along path A, excess pore pressures are assumed and undrained strengths are assigned (consolidation stresses are computed assuming zero static pore pressure). This path assumes the soil above the water table behaves as if it was saturated, and reduces the undrained strengths to account for dynamic pressures induced under seismic loading. This path leads to lower strengths and is thus conservative.

Path B in Figure 21 represents a less conservative approach that may be justified in some cases. For example, if the soil zone is well above the capillary fringe, the degree of saturation may be low enough to preclude the generation of excess pore pressures under load. This assumption may be valid for coarser soils that are closer to the water table. Along path B, drained strength parameters are assigned to zones above the water table.

For soils that are not located entirely above or below the phreatic surface, following path B will require specification of different soil zones above and below the water table (so that drained strengths can be assigned above, and undrained strengths can be applied below). The additional modeling effort may or may not be warranted or necessary, depending on the conditions under evaluation.

9. Undrained Strength Parameters for Seismic Conditions

9.1. Basis

Earthquakes generate cycles of shear stress that are rapid and transient. The stability of an earthen slope during an earthquake can be evaluated using pseudostatic analyses, simplified dynamic methods, or sophisticated numerical modeling. In each case, appropriate shear strength parameters must be estimated or measured for the undrained, seismic response of each soil.

To evaluate stability under these conditions, effective stress analyses (using c' and ϕ' strength parameters) are possible, but require a model for predicting the generation of excess pore water pressures under cyclic loading. A relatively high level of model sophistication is needed, along with good test data, to understand the volumetric response of the soil and track changes in effective stress during dynamic shearing.

A simpler approach is to use undrained stability analyses without predicting dynamic, excess pore pressures. Undrained shear strengths during an earthquake (S_{EQ}) can be characterized using undrained strength parameters, UU strengths, or c/p ratios:

$$S_{EQ} = c_{EQ} + \sigma'_{con} \tan\phi_{EQ} \qquad \textbf{Equation 41}$$

$$S_{EQ} = c_{EQ}, \text{ for } \phi_{EQ} = 0 \qquad \textbf{Equation 42}$$

$$S_{EQ} = \left(\frac{c}{p}\right)_{EQ} \sigma'_{1,con} \qquad \textbf{Equation 43}$$

Here, the "EQ" subscript designates parameters representing seismic (earthquake) loading conditions. Because cyclic shearing will generate additional pore pressures, above what might be expected under static shearing, undrained strengths for seismic loads (S_{EQ}) should be lower than for short-term static conditions (S_U). Much lower residual strengths (Section 10) are associated with soils that liquefy in an earthquake.

In most soils, the application of seismic shear stresses generates excess pore water pressures faster than they can dissipate. Undrained strength parameters are thus needed for most soils, even for granular soils that might be treated as fully drained under short-term, static loads. Exceptions might include clean gravels, rockfill, and stone riprap, all of which can usually be characterized using drained strength parameters in a seismic analysis.

9.2. Estimation of Dynamic Strengths

Cyclic shearing during an earthquake will generate additional pore water pressures in a soil. Higher pore pressures lead to softening and reduced shearing resistance, but soils that do not liquefy will retain most of their strength. Estimating appropriate strength parameters to represent these conditions is challenging. Given the inherent difficulties and incomplete knowledge of undrained soil behavior under dynamic loading,

geotechnical engineers have generally used judgment to arrive at appropriate strength parameters.

In their classic work on the seismic deformations of embankment dams, Makdisi and Seed (1977; 1978) recommended using a percentage of the static undrained shear strength to account for the potential loss of shearing resistance in unliquefiable soils during dynamic loading. They found that unliquefiable soils (clayey soils, unsaturated cohesionless soils, and very dense saturated cohesionless soils) exhibit essentially elastic behavior (no yielding) when subjected to many (> 100) cycles of stress at 80% or less of their static undrained shear strength. Substantial deformations generally result when these soils are loaded at higher cyclic shear stresses approaching their undrained shear strength. They thus concluded that for unliquefiable soils (i.e., soils that exhibit no more than small increases in pore pressure when loaded cyclically), the "cyclic yield strength" is, conservatively, at least 80% of the static undrained strength. Others have since used similar strength reductions to characterize the dynamic strength of unliquefied soils, in general.

Within the U.S. Army Corps of Engineers, Hynes-Griffin and Franklin (1984) recommend using reduced, undrained soil strengths in pseudostatic slope stability analyses. Specifically, they recommend using dynamic strengths equal to 80% of the undrained strength for both clays and unliquefied, pervious soils. While a reduced consolidated-undrained (R-type) strength envelope should be used for clayey soils, they recommend using a reduced, composite (bi-linear) drained-undrained (S-R type) envelope for pervious soils, to avoid relying on the increased shearing resistance due to decreasing pore pressures in dilative, granular soils (in this case, the drained strength parameters are not reduced).

Seed and Harder (1990) concluded that soils with a factor of safety against triggering of liquefaction (FS_{liq}) greater than 1.4 would experience only minor pore pressure generation under cyclic loading. Moreover, such soils could be represented in stability and deformation analyses using some large fraction of their static shear strength. For their analysis of the Lower San Fernando Dam failure, Seed and Harder (1990) assumed that granular soils with $FS_{liq} \geq 1.4$ retained 75% of their static strength (determined based on drained conditions) during the earthquake.

In summary, there is precedence for assuming that unliquefied soils will retain at least 80% of their static strength if they do not approach a liquefied state in an earthquake (U.S. Bureau of Reclamation 1999). This condition can be assumed to apply as long as $FS_{liq} \geq 1.4$ (the residual strength of liquefied soils is addressed in Section 10). A 20% reduction in strength can be represented using reduced short-term strength parameters:

$$c_{EQ} = 0.8\, c \qquad \textbf{Equation 44}$$

$$\tan(\phi_{EQ}) = 0.8 \tan(\phi) \qquad \textbf{Equation 45}$$

$$\left(\frac{c}{p}\right)_{EQ} = 0.8\left(\frac{c}{p}\right) \qquad \textbf{Equation 46}$$

When composite drained-undrained strength envelopes are used to avoid relying upon suction pressures for shearing resistance (Section 7.8), the drained strength parameters are not reduced.

9.3. Dynamic Strengths for Granular Soils

The residual strength of liquefied soils is discussed in Section 10.

As discussed in Section 7, undrained peak strengths are sensitive to a number of important details and can be difficult to accurately characterize. These difficulties are managed through the use of standardized test methods and prudent factors of safety, which have been established based on field experience. For fine-grained soils, there is a substantial base of experience, developed over the last century, to support the estimation, measurement, and appropriate application of undrained shear strengths to achieve acceptable field performance.

There is much less field or laboratory data, research, or design experience to support the selection of undrained strength parameters for unliquefied, clean, granular materials. Undrained loadings of such soils are uncommon, with the notable exception of seismic events. Laboratory determinations of in situ strengths are further inhibited by the great difficulty in obtaining undisturbed samples of these soils. Like clays, the determination of undrained yield strengths for sands from laboratory tests will be sensitive to details such as:

- relative density or void ratio of the test specimens,
- grain characteristics, including particle shape and gradation,
- effects of disturbance in "undisturbed" field samples,
- soil fabric resulting from the method of sample formation,
- consolidation stresses, including static shear stress,
- loading stress path (triaxial compression, extension, simple shear, etc.), and
- monotonic versus cyclic loading.

For sandy soils, the pre-earthquake shear strength under drained conditions (S_d, computed using effective stress) can be used to estimate the undrained shearing resistance (for undrained stability analyses) during and immediately after seismic loading. The 20% reduction in strength from the fully drained value is meant to account, in a simplistic manner, for the reduction in the undrained shearing resistance due to the generation of modest pore pressures during dynamic loading for unliquefied sands ($FS_{liq} \geq 1.4$). This approach has the advantage of indexing undrained strengths to ϕ', which can be estimated with relatively good confidence.

In addition, it is more difficult to reliably estimate peak undrained strength (S_U) than residual undrained strength (S_{us}) in a granular soil. Steady state concepts and back-analysis of liquefaction failures have been used to characterize residual strengths (Section 10.2), but ascertaining peak undrained strengths in field case histories is more difficult, and steady state concepts do not apply at the peak shear resistance. Hence, while considerable uncertainty remains in the estimation of residual strengths, peak undrained yield strengths can be estimated even less reliably. There is also a lack of field experience to judge what factors of safety should be considered adequate to ensure satisfactory performance, if that performance is predicted from such strength estimates.

9.4. Undrained Strengths for Pseudostatic Analyses

Pseudostatic stability calculations are carried out using limit equilibrium and the method of slices to compute a factor of safety for slope stability. The shearing resistance on the base of each slice can be computed using an undrained strength envelope (Equation 31), developed from consolidated undrained (CU) laboratory tests with a reduction for dynamic pore pressures (Section 9.2). The effective normal stresses on the base of each slice (σ'_{con} in Equation 31), representing the stresses to which the soil has been consolidated, should be computed using the steady state pore pressures prior to the earthquake.

In a simplified, single stage pseudostatic analysis, the value of σ'_{con} is computed from the total normal stress during the earthquake, which includes the inertial force (applied pseudostatic force). A more rigorous formulation involves a two-stage analysis (Duncan et al. 2014). The effective consolidation stresses normal to the failure surface (σ'_{fc}) are calculated in the first stage (without the pseudostatic force), and the undrained shear strength on that surface (τ_{ff}) is computed in the second stage calculations (with the pseudostatic force). A two-stage analysis requires a modified failure envelope:

$$\tau_{ff} = d_{EQ} + \sigma'_{fc} \tan\psi_{EQ} \qquad \textbf{Equation 47}$$

which can be derived from ϕ' and the seismic undrained strength parameters (c_{EQ} and ϕ_{EQ}):

$$d_{EQ} = c_{EQ}\left(\frac{\cos\phi_{EQ}\ \cos\phi'}{1-\sin\phi_{EQ}}\right) \qquad \textbf{Equation 48}$$

$$\psi_{EQ} = \arctan\left(\frac{\sin\phi_{EQ}\ \cos\phi'}{1-\sin\phi_{EQ}}\right) \qquad \textbf{Equation 49}$$

Duncan et al. (2014) considered a few typical cases, and concluded that a simplified, single-stage pseudostatic analysis should give a conservative estimate of the pseudostatic factor of safety in many cases.

10. Residual Strength Parameters for Liquefied Soils

10.1. Basis

A contractive, saturated sand sheared without drainage will exhibit a peak strength (S_u) followed by a residual shearing resistance with liquefaction at large strains. The residual strength (S_{us}), representing the shearing resistance of a liquefied soil in a steady state of deformation, may be very low. Some authors choose to identify the residual strength as S_r, to differentiate the residual, liquefied soil strength in the field from the steady-state strength in laboratory samples (Idriss and Boulanger 2008).

Soils are typically assumed to liquefy if the factor of safety against triggering of liquefaction (FS_{liq}) is less than or equal to 1.1. In their analysis of the Lower San Fernando Dam failure, for example, Seed and Harder (1990) assigned S_{us} values to soil zones that were indicated to have liquefied, based on $FS_{liq} \leq 1.1$.

The residual or steady state strength can be determined from laboratory tests on high quality "undisturbed" field specimens and reconstituted laboratory samples (Poulos et al. 1985). However, laboratory testing has been shown to give S_{us} values that are unconservatively high, compared to values back-calculated from field conditions (Castro et al. 1992; U. S. Bureau of Reclamation 1999). Correlations developed from liquefaction case histories and in situ penetration resistance (Section 10.2 and Section 10.3) are thus preferred for estimating S_{us} (USACE 2004).

10.2. Correlations based on SPT Blowcount

In the correlations presented in this subsection, the residual strength (S_{us}) or residual strength ratio (S_{us}/σ'_v) is related to SPT blowcount. Each of these correlations uses the corrected, normalized blowcount, $(N_1)_{60}$. The field blowcounts are normalized to one atmosphere of overburden pressure, corrected to 60% hammer efficiency, and adjusted for borehole diameter, short-rod energy loss, and sampler liner effects. The value of $(N_1)_{60}$ is the same as used to evaluate liquefaction triggering.

Some of the correlations presented below use SPT blowcounts that are also adjusted for the fines content of the soil. The corrected, clean-sand equivalent blowcount, $(N_1)_{60cs}$, is defined as:

$$(N_1)_{60cs} = (N_1)_{60} + \Delta(N_1)_{60cs} \qquad \textbf{Equation 50}$$

Approximate values of the fines content adjustment $\Delta(N_1)_{60cs}$ are:

% passing No. 200 sieve	$\Delta(N_1)_{60}$
10	1
25	2
50	4
75	5

Note that the above fines content correction, used in the residual strength correlations, is different than the fines content correction generally used in liquefaction triggering assessments.

Two published correlations for obtaining S_{us} from SPT blowcounts, both developed from limited case history data, are shown in Figure 33. Seed and Harder (1990) related S_{us} to the clean sand equivalent blowcount, while Stark and Mesri (1992) developed a correlation for the ratio of S_{us}/σ'_v. Seed et al. (2003) assert that Stark and Mesri's correlation is overly conservative at low pressure (σ'_v < 1 atm) and somewhat unconservative at high pressure (σ'_v > 3 atm). Seed et al. (2003) also acknowledge that the Seed and Harder (1990) correlation understates the influence of σ'_v on S_{us}.

According to Finn (1998), the practice at the U. S. Bureau of Reclamation has been to determine S_{us} at about the 35th percentile of Seed and Harder's (1990) correlation, using a line sketched between the upper and lower bounds. For $(N_1)_{60CS}$ greater than 15, Seed et al. (2003) recommend extrapolating the correlations in Figure 33 at constant slope. In addition, Seed et al. (2003) recommend that S_{us} should be limited to not exceed the fully drained shear strength (at the residual friction angle), which would require a reliance on significant negative pore pressures from the dilative response of soils at low pressures.

Olson and Stark (2002) used a larger case history dataset to develop correlations between the residual strength ratio and SPT blowcount (upper plot in Figure 34). The average trend line through the data is (Olson and Stark 2002):

$$\frac{S_{us}}{\sigma'_v} = 0.03 + 0.0075\,(N_1)_{60} \pm 0.03 \quad \text{for } (N_1)_{60} \le 12 \qquad \textbf{Equation 51}$$

where $(N_1)_{60}$ is the corrected, normalized SPT blowcount. The penetration resistance is not adjusted for fines content. A significant shortcoming of this correlation is the lack of field data for moderate to large confining pressures, corresponding to $(N_1)_{60}$ > 12.

Idriss and Boulanger (2008) examined the available case history data with the goal of providing better guidance on selecting strength ratios at higher penetration resistance. Among the challenges in developing these correlations, Idriss and Boulanger (2008) note the influence of "void redistribution" in a liquefied deposit, resulting from the migration of pore water within the soil during a liquefaction failure. Using the results from laboratory studies as a guide in extrapolating the case history data, Idriss and Boulanger proposed the two bounding relationships shown in the upper plot in Figure 35.

Where significant void redistribution might be expected, Idriss and Boulanger (2008) recommend a lower-bound estimate of residual strength ratio given by:

$$\frac{S_{us}}{\sigma'_v} = \exp\left[\frac{(N_1)_{60cs}}{16} + \left(\frac{(N_1)_{60cs} - 16}{21.2}\right)^3 - 3.0\right] \leq \tan\phi' \qquad \textbf{Equation 52}$$

Here, $(N_1)_{60CS}$ is the normalized, corrected SPT blowcount with the adjustment for fines content (Equation 50). The strength ratio is limited by the drained strength (tan ϕ'), based on the assumption that negative pore pressures (inferred by $S_{us} > \sigma'$ tanϕ') cannot be sustained. Significant void redistribution might be expected at "*. . . sites with relatively thick layers of liquefiable soil that are overlain by lower-permeability soils that would impede the post-earthquake dissipation of earthquake-induced excess pore water pressures*" (Idriss and Boulanger 2008). For example, Equation 52 would be appropriate for a thick layer of liquefied soil overlain by a clayey embankment.

Where void redistribution is judged to be unlikely, Idriss and Boulanger (2008) recommend an upper-bound estimate of residual strength ratio given by:

$$\frac{S_{us}}{\sigma'_v} = \exp\left[\frac{(N_1)_{60cs}}{16} + \left(\frac{(N_1)_{60cs} - 16}{21.2}\right)^3 - 3.0\right]\left[1 + \exp\left(\frac{(N_1)_{60cs}}{2.4} - 6.6\right)\right] \leq \tan\phi' \qquad \textbf{Equation 53}$$

This relationship is appropriately used for sites where void redistribution effects will be negligible. "*This condition could include sites where the stratigraphy would not impede post-earthquake dissipation of excess pore water pressures, [which] would be accompanied by densification of the soils at all depths*" (Idriss and Boulanger 2008). Where a rockfill dam is built over a relatively thin layer of liquefiable soil, for example, Equation 53 would be appropriate.

Various authors have preferred relationships between S_{us}/σ'_v and SPT blowcount. One can argue that penetration resistance should be correlated to S_{us}, instead of S_{us}/σ'_v. Steady state strengths measured in the laboratory have been shown to vary with void ratio (Poulos et al. 1985). After normalizing SPT blowcounts for the effects of overburden pressure, the value of $(N_1)_{60}$ should also correlate with the void ratio of a sandy soil. Hence, $(N_1)_{60}$ should correlate directly with S_{us}.

Three correlations for S_{us} in terms of $(N_1)_{60}$ or $(N_1)_{60cs}$ are shown in Figure 33a (Seed and Harder 1990), in the lower plot in Figure 35 (Idriss and Boulanger 2008), and in Figure 36 (Castro 1995). In Figure 36, the lower bound curve should be used to estimate liquefied strengths. Another correlation has been recently proposed by Kramer and Wang (2015):

$$\ln S_{us} = -8.444 + 0.109\,(N_1)_{60} + 5.379\,(\sigma'_v)^{0.1} \qquad \textbf{Equation 54}$$

where S_{us} and σ'_v are expressed in units of atmospheres.

10.3. Correlations based on CPT Tip Resistance

In addition to their correlation based on SPT blowcount, Olson and Stark (2002) used their database to develop a correlation between the residual strength ratio and CPT tip resistance (lower plot in Figure 34). The average trend line through the data is (Olson and Stark 2002):

$$\frac{S_{us}}{\sigma'_v} = 0.03 + 0.0143\,(q_{c1}) \pm 0.03 \quad \text{for } (q_{c1}) \le 6.5 \text{ MPa} \qquad \textbf{Equation 55}$$

Here, the normalized CPT tip resistance (MPa) is given by: $q_{c1} = 1.8 \cdot q_c / (0.8 + \sigma'_v/P_a)$. The penetration resistance is not adjusted for fines content. A significant shortcoming of this correlation is the lack of field data for moderate to large confining pressures, corresponding to $q_{c1} > 6.5$ MPa.

Idriss and Boulanger (2008) also used their database (Figure 35) to develop correlations based on CPT tip resistance. For sites without CPT data, they used empirical correlations to estimate the CPT resistance from the available SPT blowcounts. In these correlations, they use a CPT tip resistance (q_{c1N}) that is corrected for the effects of overburden pressure and normalized to a dimensionless value. The value of q_{c1N} is the same as used to evaluate liquefaction triggering.

Idriss and Boulanger (2008) also made an adjustment to account for the fines content of the soil. The normalized, clean-sand tip resistance, q_{c1Ncs}, is defined as:

$$q_{c1Ncs} = q_{c1N} + \Delta q_{c1N} \qquad \textbf{Equation 56}$$

Approximate values of the fines content adjustment Δq_{c1N} are:

% passing No. 200 sieve	Δq_{c1N}
10	10
25	25
50	45
75	55

Where significant void redistribution might be expected, Idriss and Boulanger (2008) recommend a lower-bound estimate of residual strength ratio given by:

$$\frac{S_{us}}{\sigma'_{vo}} = exp\left[\frac{q_{c1Ncs}}{24.5} - \left(\frac{q_{c1Ncs}}{61.7}\right)^2 + \left(\frac{q_{c1Ncs}}{106}\right)^3 - 4.42\right] \le tan\phi' \qquad \textbf{Equation 57}$$

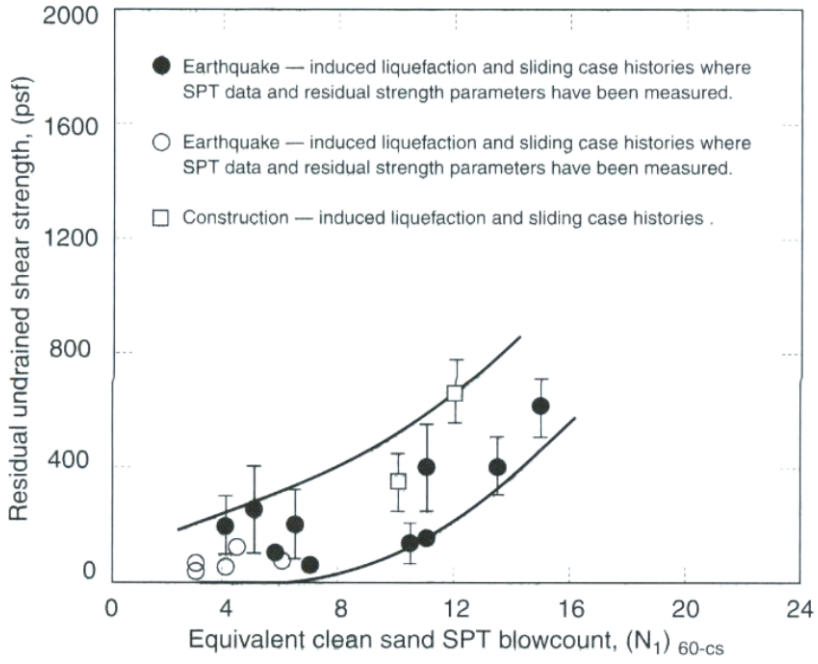
Where void redistribution is judged to be unlikely, Idriss and Boulanger (2008) recommend an upper-bound estimate of residual strength ratio given by:

$$\frac{S_{us}}{\sigma'_{vo}} = exp\left[\frac{q_{c1Ncs}}{24.5} - \left(\frac{q_{c1Ncs}}{61.7}\right)^2 + \left(\frac{q_{c1Ncs}}{106}\right)^3 - 4.42\right]\left[1 + exp\left(\frac{q_{c1Ncs}}{11.1} - 9.82\right)\right] \le tan\phi' \qquad \textbf{Equation 58}$$

10.4. Recommended Practice

Considering the number of published correlations, and the uncertainty associated with each one, the recommended practice is to estimate S_{us} from all applicable correlations. The average or representative blowcount (or CPT tip resistance) in the soil layer should be used in the correlations to estimate S_{us}. Then, engineering judgment should be used to select an appropriate, representative value. Caution is needed to avoid over- or under-estimating S_{us} at confining pressures that are significantly higher or lower than the data set used to derive the correlations.

(a) Seed and Harder (1990)



(b) Stark and Mesri (1992)

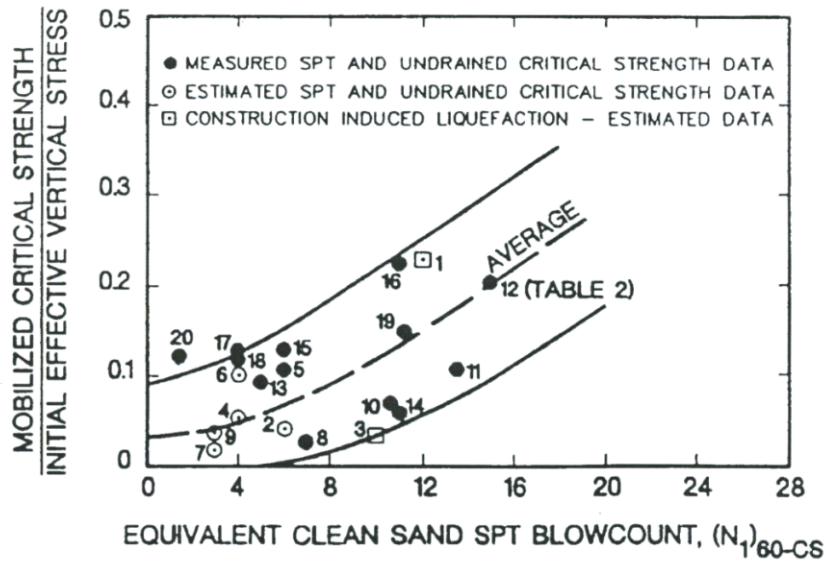


Figure 33. Correlations between residual strength of liquefied soil and SPT penetration resistance.

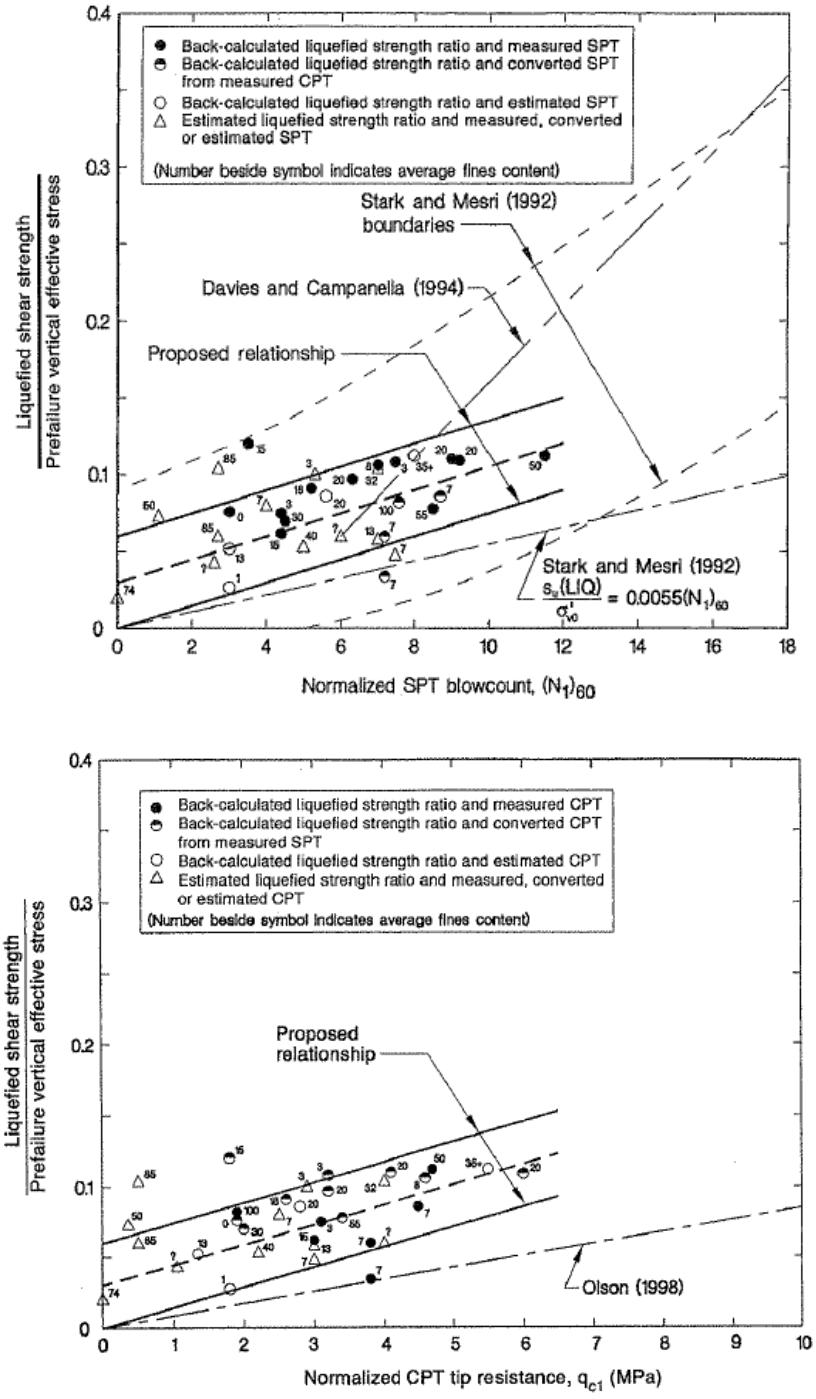


Figure 34. Correlations for the residual strength of liquefied soil by Olson and Stark (2002).

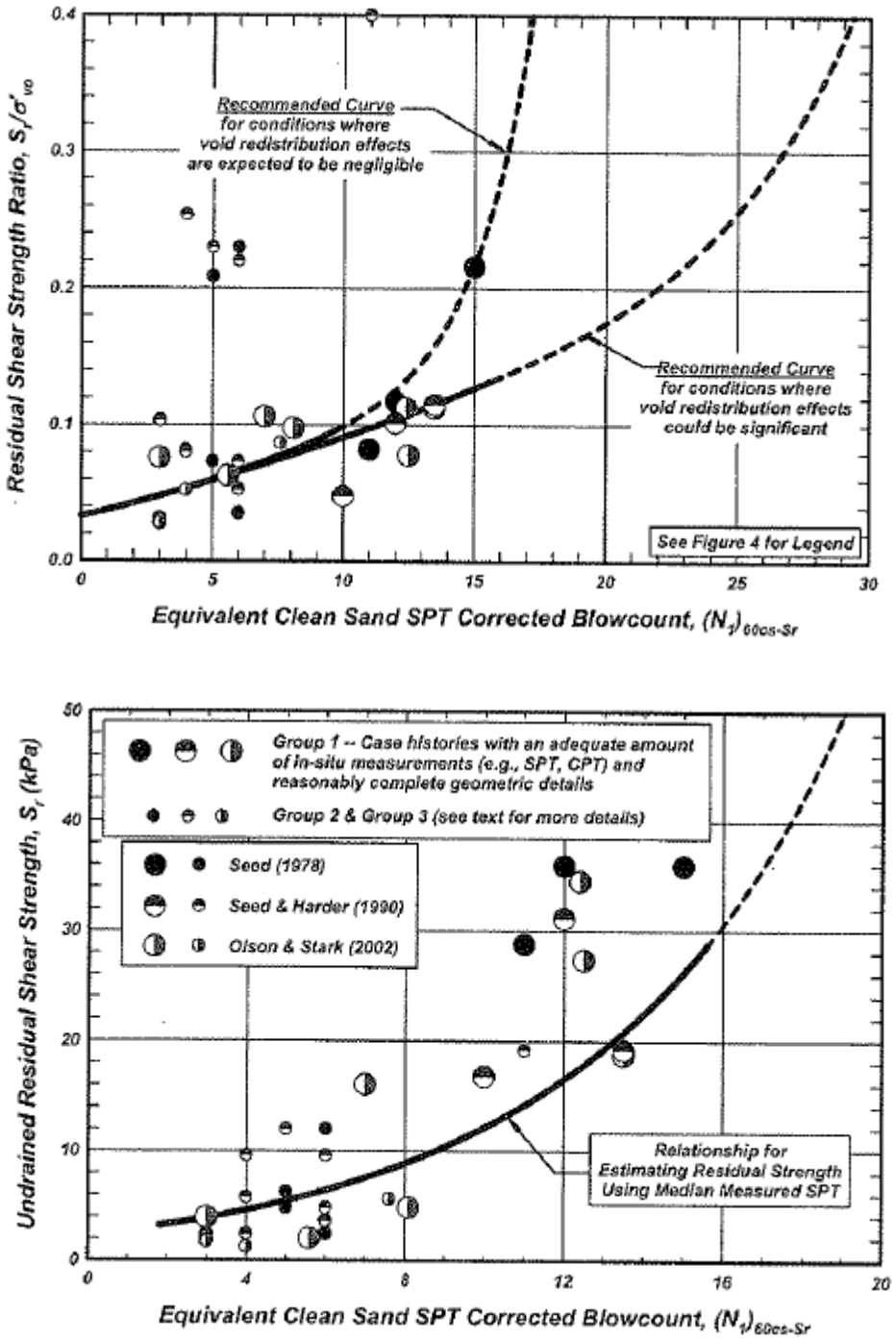


Figure 35. Correlations for the residual strength of liquefied soil by Idriss and Boulanger (2008).

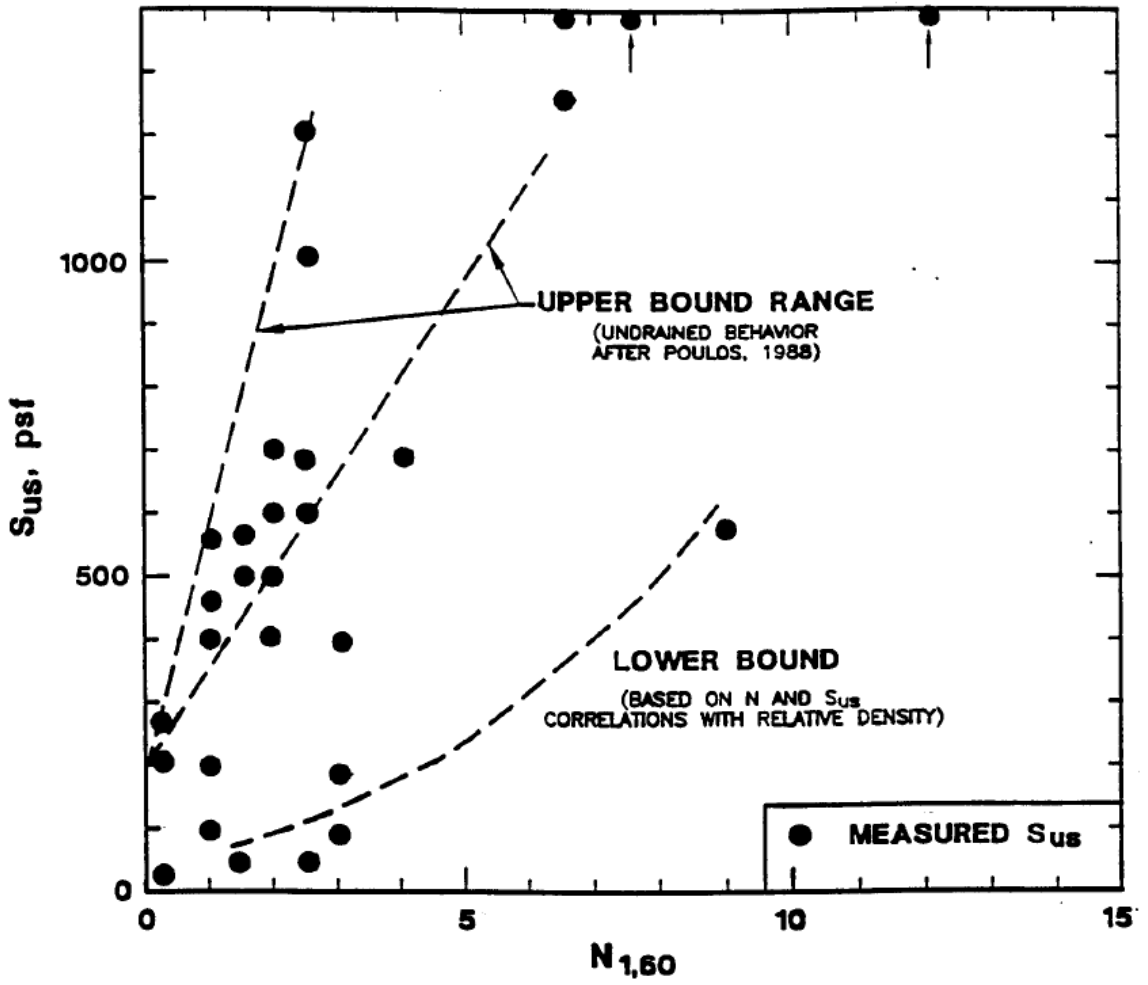


Figure 36. Correlation for the residual strength of liquefied soil by Castro (1995).

11. Residual Strength Parameters for Cyclic Softened Soils

For $FS_{\gamma=3\%}$ estimates less than one, the undrained strength may degrade during earthquake shaking. This behavior may be significant in deformation analyses. The post-earthquake strength of cyclic softened soils may range from the peak undrained strength (S_u) for small cyclic shear strains to the undrained, remolded strength (S_{ur}) at large cyclic shear strains. For clay-like soils with $FS_{\gamma=3\%}$ estimates less than one, using S_{ur} for softened soil horizons in an initial post-earthquake stability or deformation analysis can identify if the softened layers are a concern for post-earthquake stability. If this simple evaluation indicates a potential stability problem, additional evaluation is required to determine if S_{ur} or a greater strength is appropriate.

Laboratory strength tests for S_u and S_{ur} are typically required for high-consequence projects. Post-cyclic monotonic triaxial compression and direct simple shear tests are also valuable in identifying the degradation in peak undrained strength for modest strains. A more extensive discussion of laboratory test methods is provided in MSHA (2010).

11.1. Field and Laboratory Measurements of Remolded Strength

Measurement of S_{ur} requires a device that can achieve large strains, such as a field vane shear apparatus. Field tests are often performed adjacent to CPTs with pore pressure measurements to permit selection of suitable soil layers for testing. Field vane tests should follow accepted procedures, must be performed to high enough strains to mobilize S_{ur}, and must be conducted rapidly enough to capture the undrained behavior of the soil. Laboratory tests on saturated, remolded samples tested at the in situ water content may also be used.

Data from CPT can also be used to estimate remolded strength of clays. According to Lunne et. al (1997), the undrained, remolded shear strength (S_{ur}) of a clay is approximately equal to the sleeve friction measured with a CPT.

12. Properties of Rockfill

12.1. Basis

Coarse rockfill is difficult to characterize by testing. When a material contains cobbles or boulders, it is difficult to obtain representative samples and conduct meaningful tests with conventional laboratory equipment. Large-scale tests reported in the literature provide valuable data on the engineering properties of rockfill (Figure 39), but relatively few such tests have been published. However, appropriate properties can be usually selected on the basis of engineering judgment, where that judgment is supported by the performance of similar materials in other projects.

In the laboratory, the diameter of triaxial test specimens should be at least six times the size of the largest particle (Duncan et al. 2014). Most geotechnical laboratories have equipment for testing 4-inch diameter specimens, and a few facilities can test up to 12-inch samples. The largest particle size that can be tested in this equipment is then 0.7 to 2 inches. For gravelly soils, test samples re-mixed to have parallel grain-size distributions, or scalped to remove particles larger than one-sixth the specimen diameter, will generally have friction angles similar to the original material; however the relative density and gradation of the original material must be known with some confidence.

Testing samples without the largest particles is not recommended for rockfill with cobbles and boulders. There is a tendency for smaller particles to be stronger than larger particles (which may have internal fractures or discontinuities), and removing the larger particles may result in unconservative measurements of strength. Direct measurements on rockfill require testing large volumes of representative material. Few large triaxial compression apparatuses have been developed, and those were generally used for a specific project and are no longer in operation.

Fortunately, rockfill materials exhibit favorable engineering behavior. If the rockfill is relatively clean (voids between the larger rock particles are open), potential excess pore pressures will quickly dissipate. Depending on the gradation, fully drained conditions can often be assumed in rockfill under a variety of loading conditions, including under dynamic or seismic loads. Interlocking between large, angular pieces of durable rock will result in relatively high shear strength. Satisfactory performance in these materials can usually be demonstrated, even when conservative estimates of strength are used.

Published results from large-scale testing show how certain conditions affect the strength of rockfill. In general, friction angles decrease with increasing confining pressure, increasing particle size, and weathering over time. Well graded material generally has higher friction angles than poorly graded material. Angular to sub-angular material generally has higher friction angles than rounded to sub-rounded material. Mineralogy has little effect on friction angle.

Over a large pressure range, rockfill materials exhibit curved strength envelopes. This can be represented using secant friction angles that vary with confining pressure, as

discussed below. The secant friction angle (ϕ'_{sec}) is the slope of a tangent line to the Mohr's circle of stress at failure, with zero cohesion intercept, as depicted in Figure 37.

12.2. Historical Data

During construction of South Holston Dam, TVA performed large-scale tests to determine the friction angle of the quarried and dumped rockfill. Those tests, discussed by Leonard and Raine (1958), consisted of filling a 9.3-feet by 9.3-feet shear box with 6 to 12-inch diameter, quarried rock. The rockfill was vibrated during placement, and was about 3 feet thick when tested. Concrete slabs (total thickness of 6 feet) were placed on top of the apparatus for added confining load. Hydraulic jacks were used to apply a horizontal force until lateral displacement occurred. Three materials were tested: cemented sandstone, uncemented sandstone, and shale.

Data from the specific tests were not published, but Leonard and Raine (1958) reported measured friction angles of 45 degrees for the cemented sandstone, and about 30 degrees for the uncemented sandstone and shale. For design, a friction angle of 45 degrees was used for the downstream slope, where durable sandstone was placed. On the upstream face, a mix of the quarried rock was placed and a friction angle of 40 degrees was assumed. Although the method of measurement is unknown, Leonard and Raine (1958) report that dry unit weights for the rockfill were between 105 and 120 pounds per cubic foot.

The large-scale tests at South Holston Dam were conducted at rather low confining pressures (less than 900 psf). Granular materials, including rockfill, are known to exhibit curved failure envelopes, with secant friction angles that decrease at higher confining pressures. Hence, the South Holston friction angles reported by Leonard and Raine (1958) may be unconservatively high for representing the material strength under significantly higher confining pressures.

12.3. Published Research

Marachi et al. (1972) performed tests on 36-, 12-, and 2.8-inch diameter specimens of rockfill in drained triaxial compression equipment. Three types of rockfill were tested; argillite from Pyramid Dam, quarry blasted crushed basalt, and amphibolite from Oroville Dam. The test specimens were prepared to have grading curves parallel to the field gradation curves. The confining pressures for the tests ranged from 30 to 650 psi. The results of these tests (Figure 38) show a nonlinear Mohr-Coulomb strength envelope, with decreasing secant friction angles over the range of confining pressures tested. The results also show that for larger maximum particle size, the secant friction angle is less at a given confining pressure.

Leps (1970) compiled the database of rockfill test results in Figure 39, and showed the effects of normal pressure on drained friction angle. The data are plotted in Figure 40 on a semi-log graph of secant friction angle versus normal pressure. The data shows that at lower normal pressure, the decrease in friction angle is greater with increasing normal pressure than at higher pressures. The three trend lines in Figure 40 were defined by Leps (1970) for the range of typical rockfill; the trend lines can be represented by the following equations:

- Low density, poorly graded rockfill, with weak particles (unconfined compressive strength between 500 and 2,500 psi)

$$\phi'_{sec} = 41.8° - 6.8° \log\left(\frac{\sigma'_n}{P_a}\right) \quad \textbf{Equation 59}$$

- Average rockfill, with average strength particles (unconfined compressive strength between 2,500 and 10,000 psi)

$$\phi'_{sec} = 47.1° - 6.8° \log\left(\frac{\sigma'_n}{P_a}\right) \quad \textbf{Equation 60}$$

- High density, well graded rockfill with strong particles (unconfined compressive strength between 10,000 and 30,000 psi)

$$\phi'_{sec} = 52.1° - 6.8° \log\left(\frac{\sigma'_n}{P_a}\right) \quad \textbf{Equation 61}$$

Here, ϕ'_{sec} is the secant, effective stress friction angle (slope of a tangent line to the Mohr's circle of stress at failure, with zero cohesion intercept), σ'_n is the effective normal pressure on the failure plane, and P_a is one atmosphere of pressure in the units of σ'_n (P_a = 14.69 psi = 2,116 psf = 101.3 kPa).

Fell et al. (2005) present an empirical correlation, developed by Douglas (2003), for the secant friction angle of rockfill. This equation can be used to estimate the friction angle of the material using gradation data, normal stress, and unconfined compressive strength of the rock.

$$\phi'_{sec} = a + b\,{\sigma'_n}^{c} \quad \textbf{Equation 62}$$

$$a = 36.43 - 0.267ANG - 0.172FINES + 0.756(c_c - 2) + 0.0459(UCS - 150) \quad \textbf{Equation 63}$$

$$b = 69.51 + 10.27ANG + 0.549FINES - 5.105(c_c - 2) - 0.408(UCS - 150) - 0.408 \quad \textbf{Equation 64}$$

$$c = -0.3974 \quad \textbf{Equation 65}$$

ANG is a subjective rating for angularity; use ANG = 3 for crushed angular rock, ANG = 0 for rounded stone. FINES is the percentage of particles passing the No. 200 sieve (< 0.075 mm). From the gradation curve, c_c is the coefficient of curvature ($d_{30}^2/d_{10}d_{60}$). UCS is the unconfined compressive strength of the rock, in MPa, and σ'_n is the effective normal stress in kPa.

With this method, a multi-linear strength envelope can be used to represent the curved Mohr-Coulomb envelope typical of rockfill. This can be plotted by calculating ϕ'_{sec} at varying σ'_n applicable to the stability analysis. Loose dumped rockfill at low normal

pressures will have a secant friction angle approximately 4 degrees lower than calculated using this approach (Fell et al. 2005).

The method proposed by Douglas (2003) may be difficult to implement, because rockfill can be difficult to sample and the gradation may be unknown. If the rock is not durable, weathering may lead to significant changes in gradation over time after construction. The unconfined compressive strength may have to be estimated, if intact samples are not obtained. Finally, the subjective definition of "angularity" introduces additional uncertainty.

12.4. Curved Strength Envelopes in Slope/W

A single, representative friction angle can be selected to model the strength of a relatively thin or shallow rockfill layer. In deep rockfills, such as in the shell of a large rockfill dam, the confining pressure varies over a wide range and the strength model should represent a curved envelope, consistent with the test data discussed in Section 12.3. Some computer codes include an option for directly modeling variable secant friction angles, using equations like those in Equation 59 through Equation 61. The SLOPE/W code (from GEO-SLOPE International, Ltd) does not include this option, but will allow the user to specify points on a curved strength envelope. This can be accomplished using the procedure outlined below.

A curved strength envelope and a secant friction angle (for the Mohr's failure circle at one confining stress) are depicted schematically in Figure 37. Technically, the line at ϕ'_{sec} is not tangent to the Mohr's circle of stress at the same point as for the curved strength envelope, but the difference is not significant. Points on the curved strength envelope can be computed as follows:

(1) Select a range of normal stresses (σ'_n) that span and bracket the problem of interest.

(2) At each σ'_n, determine an appropriate ϕ'_{sec} for the material (for example, using the empirical equations in Section 12.3).

(3) At each σ'_n, compute the shear stress on the failure surface (τ_f) using:

$$\tau_f = \sigma'_n \tan \phi'_{sec} \qquad \textbf{Equation 66}$$

(4) Include a point at the origin ($\sigma'_n = 0$, $\tau_f = 0$), even if ϕ'_{sec} is not defined at zero stress.

These values of (σ'_n, τ_f) are then entered into SLOPE/W, which will interpolate between the entered values (using a spline function) to obtain the shear resistance at any normal effective stress.

SLOPE/W requires linear strength envelopes for three-stage rapid drawdown analyses. In this case, the needed strength parameters can be obtained from an approximate, straight line fit to values of (σ'_n, τ_f) in the appropriate stress range.

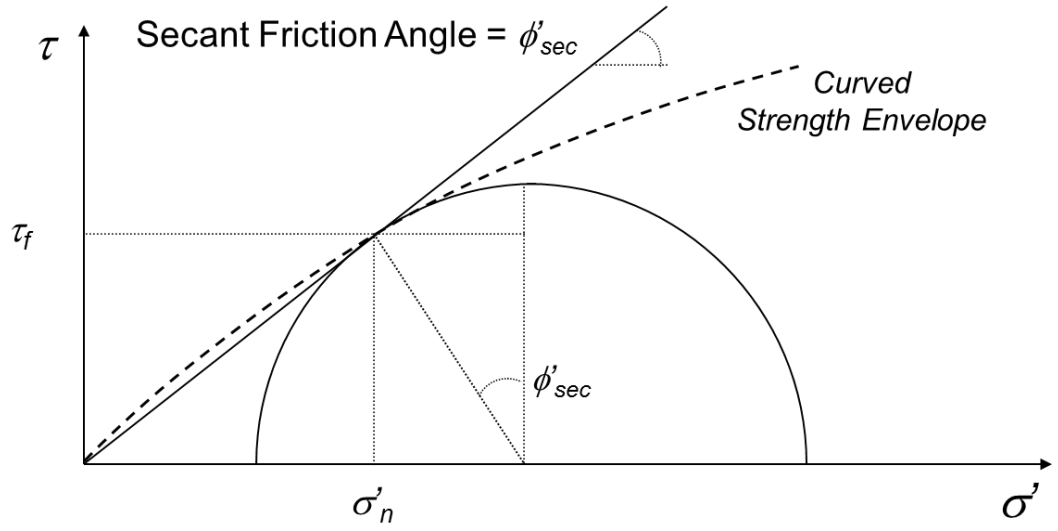


Figure 37. Definition of secant friction angle for representing curved strength envelopes.

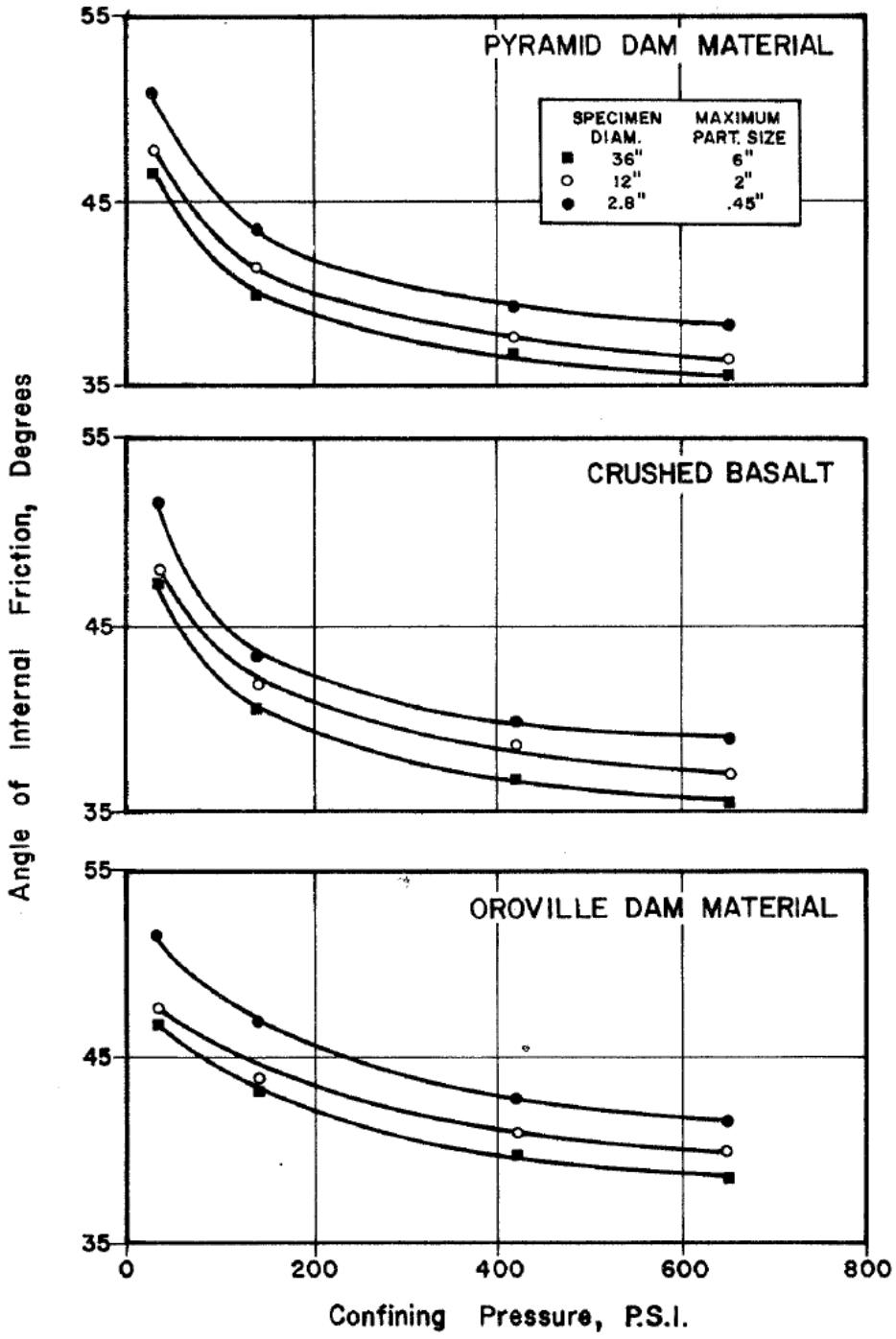


Figure 38. Shearing strength of three rockfills from large-scale triaxial tests (from Marachi et al. 1972).

Location (1)	Material (2)	Maximum particle, in inches (3)	Dry density, in pounds per cubic foot (4)	Normal pressure, in pounds per square inch (5)	Maximum friction angle, in degrees (6)
Isabella	Granite	4	97.0	7.5	47.0
		4	95.0	23.0	43.5
Cachuma	Gravel	0.75	126.0	6.3	54.7
		0.75	125.0	11.3	49.5
		0.75	123.0	21.5	44.5
		0.75	125.0	43.0	45.0
		0.75	124.0	84.0	41.0
		0.75	124.0	165.0	39.5
		0.75	125.0	162.0	38.5
Cachuma	Gravel	3	126.0	6.2	54.0
		3	124.0	11.8	49.5
		3	124.0	22.1	47.0
		3	127.0	45.0	46.5
		3	125.0	86.0	43.5
		3	127.0	167.0	41.5
Cachuma	Quartz Monz.	3	122.0	20.0	40.0
		3	123.0	65.0	39.5
		3	122.0	123.0	39.0
		3	129.0	22.0	44.0
		3	128.0	60.0	42.0
		3	130.0	125.0	41.0
Cachuma	Quartz Monz.	3	117.0	42.0	44.0
		3	117.0	59.0	41.0
		3	127.0	44.0	47.0
		3	127.0	63.0	46.0
Oroville	Tailings	1.5	144.0	490.0	40.0
		1.5	142.0	484.0	38.8
		1.5	148.0	424.0	43.0
		1.5	147.0	700.0	40.5
		1.5	148.0	1160.0	40.0
		3	143.0	208.0	42.0
		3	143.0	206.0	41.3
		3	150.0	213.0	45.0
Soledad	Gravel	3.5	1.02[a]	8.2	44.8
		3.5	0.88	16.6	42.8
		3.5	0.64	8.8	50.0
		3.5	0.69	16.9	47.2
Infiernillo	Diorite	7	0.82	8.3	44.0
		7	0.86	16.1	44.0
		7	0.69	9.1	49.5
		7	0.70	17.2	46.5
		7	0.65	8.7	49.0
		7	0.70	11.7	46.5
		7	0.60	16.0	46.5
Infiernillo	Diorite	8	0.45	9.8	50.0
		8	0.61	21.4	46.1
		8	0.62	44.5	44.4
		8	0.73	114.0	40.7
		8	0.55	230.0	38.0
		8	0.51	385.0	35.0
		8	0.50	567.0	34.7

Figure 39. Data on rockfill properties compiled by Leps (1970).

Location (1)	Material (2)	Maximum particle, in inches (3)	Dry density, in pounds per cubic foot (4)	Normal pressure, in pounds per square inch (5)	Maximum friction angle, in degrees (6)
Infiernillo	Conglomerate	8	0.62[a]	16.1	46.1
		8	0.55	45.0	45.5
		8	0.55	113.0	41.0
		8	0.62	230.0	39.4
		8	0.51	390.0	37.8
		8	0.45	570.0	37.1
		8	0.51	44.8	45.6
		8	0.50	114.0	42.2
		8	0.40	232.0	39.5
		8	0.40	390.0	37.6
		8	0.46	570.0	36.3
Malpaso	Conglomerate	8	0.42	9.8	50.0
		8	0.35	21.9	49.2
		8	0.42	45.5	48.0
		8	0.32	116.0	45.2
		8	0.44	230.0	39.0
		8	0.38	390.0	39.0
		8	0.40	570.0	36.9
		8	0.43	570.0	37.2
		8	0.42	570.0	37.4
		8	0.33	570.0	38.9
		8	0.33	575.0	39.5
Pinzandaran	Gravel	8	0.33	10.2	53.1
		8	0.36	22.3	52.3
		8	0.32	45.6	48.5
		8	0.32	116.0	45.5
		8	0.32	233.0	42.5
		8	0.34	390.0	39.3
		8	0.35	573.0	38.9
Infiernillo	Basalt	7	0.30	10.4	60.0
		7	0.30	25.6	55.0
		7	0.30	122.0	45.7
		7	0.30	239.0	42.7
Infiernillo	Gneiss X	7	0.32	10.0	51.0
		7	0.32	23.0	45.0
Infiernillo	Gneiss Y	7	0.62	6.3	45.0
		7	0.62	20.4	41.3
Contreras	Gravel	7	0.68	8.0	41.6
		7	0.65	8.4	41.6
		7	0.68	17.3	41.0
		7	0.54	8.4	45.5
		7	0.53	17.0	45.5
Santa Fe	Andesite	7	1.06	8.0	42.7
		7	1.07	15.9	40.2
		7	0.92	8.7	48.0
		7	0.84	17.0	46.8
Fort Peck	Sand	No. 20	0.70	27.8	37.9
		No. 20	0.70	55.5	37.1
		No. 20	0.70	83.0	36.3
		No. 20	0.70	111.0	35.3

Figure 39 (continued). Data on rockfill properties compiled by Leps (1970).

Location	Material	Maximum particle, in inches	Dry density, in pounds per cubic foot	Normal pressure, in pounds per square inch	Maximum friction angle, in degrees
(1)	(2)	(3)	(4)	(5)	(6)
Scituate	Sand	No. 8	0.57[a]	27.8	38.0
		No. 8	0.57	55.5	37.5
		No. 8	0.57	111.0	35.5
Ottawa Std.	Sand	No. 14	0.59	6.9	33.6
		No. 14	0.59	13.9	33.0
		No. 14	0.59	27.8	31.8
		No. 14	0.59	41.6	30.8
		No. 14	0.59	55.5	30.0

[a] All subsequent numbers in this column are void ratios.

Figure 39 (continued). Data on rockfill properties compiled by Leps (1970).

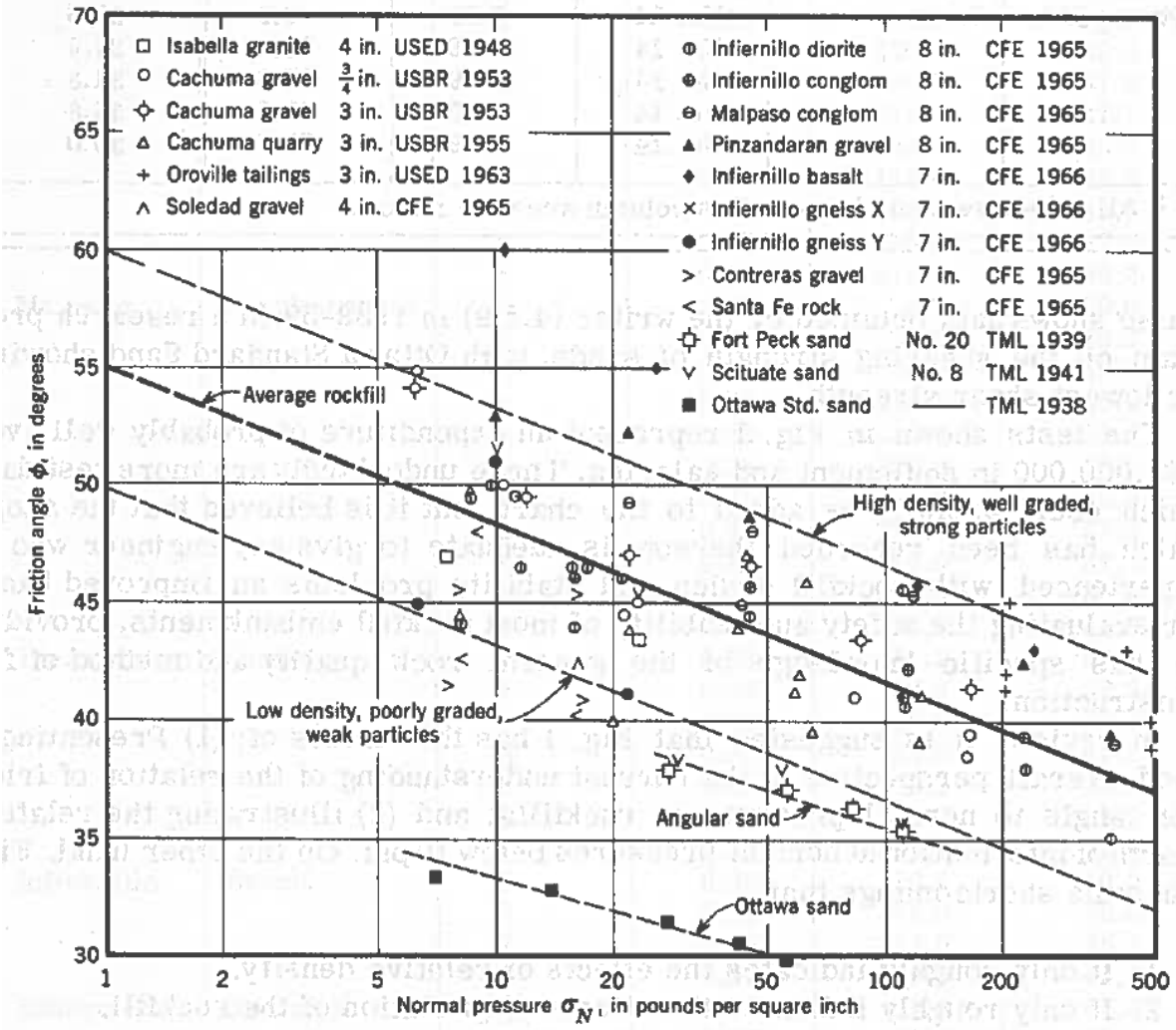


Figure 40. Shearing strength of rockfill from large-scale triaxial tests (from Leps 1970).

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APPENDIX F – COMMON PROCEDURES IN SEISMIC ANALYSIS OF SOIL AND ROCK

Common Procedures in Seismic Analysis of Soil and Rock

Purpose:

- This appendix presents common procedures for the seismic analysis of soil and rock, such as Ground Response Analysis, Liquefaction Analysis, Cyclic Softening of Clay-Like Soils, and Seismic Deformation Analyses.

Developed by: Stantec Consulting Services Inc.	
Prepared by: Kirk Jenkins	*Reviewed by:* Jeff Dingrando
Date: 4/16/2020	

Table of Contents

TABLE OF CONTENTS **2**

LIST OF FIGURES **3**

1. INTRODUCTION **4**

2. GROUND RESPONSE ANALYSIS **5**
2.1. HARD ROCK SEISMIC MOTIONS 6
2.2. MODULUS REDUCTION AND DAMPING CURVES FOR SOIL 7
2.3. MODULUS REDUCTION AND DAMPING FOR ROCK 12
2.4. PROFILES ANALYZED 13
2.5. GROUND RESPONSE OUTPUTS 14

3. LIQUEFACTION ANALYSIS **16**
3.1. INITIAL SCREENING FOR SOIL BEHAVIOR 16
3.1.1. Effect of Soil Fines on Liquefaction Susceptibility 16
3.1.2. Sand-Like versus Clay-Like Soils 16
3.2. LIQUEFACTION OF SAND-LIKE SOILS 18
3.2.1. Factor of Safety for Liquefaction 19
3.2.2. Cyclic Stress Ratio 19
3.2.3. Cyclic Resistance Ratio for Sand-Like Soils 20
3.2.4. Corrected Standard Penetration Test Blowcounts 24
3.2.4.1. SPT Blowcount Correction for Drilling and Sampling Techniques 24
3.2.4.2. SPT Blowcount Correction for Overburden Stress 27
3.2.5. Clean-Sand Equivalent SPT Blowcounts 28
3.2.6. Corrected Cone Penetration Tip Resistance 30
3.2.7. Clean-Sand Equivalent CPT Tip Resistance 33
3.2.8. Magnitude Scaling Factor for Sand-Like Soils 35
3.2.9. CRR Correction for Overburden Stress in Sand-Like Soils 36
3.2.10. CRR Correction for Static Shear Stress in Sand-Like Soils 39
3.2.11. Liquefaction Resistance based on Shear Wave Velocity 42
3.3. CYCLIC SOFTENING OF CLAY-LIKE SOILS 42
3.3.1. Screening for Susceptibility to Cyclic Softening 42
3.3.2. Factor of Safety for Cyclic Softening 44
3.3.3. Cyclic Resistance Ratio for Clay-Like Soils 45
3.3.4. Magnitude Scaling Factor for Clay-Like Soils 45
3.3.5. CRR Correction for Static Shear Stress in Clay-Like Soils 45

4. SEISMIC DEFORMATION ANALYSIS **47**
4.1. CONDITIONS REQUIRING DEFORMATION ANALYSIS 47
4.2. DEFORMATION OF STABLE SLOPES 47
4.2.1. Newmark Analyses 47
4.2.2. Equivalent Acceleration Time History 49
4.2.3. Summary of Procedure 50
4.3. DEFORMATION OF UNSTABLE SLOPES 50

5. REFERENCES..... 51

LIST OF FIGURES

Figure 1. Conceptual Sketch of 1D Ground Response Analyses..... 6
Figure 2. Normalized Shear Modulus (G/G_{max}) Reduction Curves Computed using the Empirical Equations from Ishibashi and Zhang (1993).....11
Figure 3. Normalized Shear Modulus (G/G_{max}) Reduction Curves for Soft Rock from Silva et al. (1996), as presented in Stewart et al. (2008) 13
Figure 4. Example of Criteria for Assessing Liquefaction or Cyclic Softening in Fine Grained Soils (after Seed et al. 2003) 18
Figure 5. Field data and empirical relationship between liquefaction resistance and corrected SPT blowcount (Boulanger and Idriss 2014).....22
Figure 6. Field data and empirical relationship between liquefaction resistance and corrected CPT tip resistance (Boulanger and Idriss 2014).....23
Figure 7. Correction Factor for Overburden Stress (Boulanger and Idriss 2014). 28
Figure 8. Equivalent clean sand adjustment for SPT-based liquefaction triggering procedures (Boulanger and Idriss 2014).....29
Figure 9. Soil Behavior-Type Chart for Classifying Soils from CPT Data (Boulanger and Idriss 2014, after Robertson 1990). 32
Figure 10. Equivalent clean sand adjustment for CPT-based liquefaction triggering procedures (solid lines per Boulanger and Idriss 2016). 34
Figure 11. Correlation between I_c and FC (Boulanger and Idriss 2016).....35
Figure 12. MSF relationship for sand-like soils (Boulanger and Idriss 2014).....36
Figure 13. CRR Correction Factor for Overburden Stress (Boulanger and Idriss 2014). 38
Figure 14. CRR Correction Factor for Static Driving Shear Stress (from Idriss and Boulanger 2008).....41
Figure 15. Screening Criteria for Assessing Cyclic Softening in Clay-like Soils (Bray and Sancio 2006).....43
Figure 16. Screening Criteria for Assessing Cyclic Softening in Clay-like Soils (D'Appolonia 2010; adapted from Robertson 2008).....44
Figure 17. MSF relationship for clay-like soils (Idriss and Boulanger 2008).....46
Figure 18. Calculation of Permanent Displacement in a Newmark Type Analysis (after Kramer 1996).....48

1. INTRODUCTION

This appendix presents common procedures for the seismic analysis of soil and rock, such as Ground Response Analysis, Liquefaction Analysis, Cyclic Softening of Clay-Like Soils, and Seismic Deformation Analyses.

2. GROUND RESPONSE ANALYSIS

One-dimensional, equivalent linear ground response analyses were performed to predict ground motions (acceleration time histories) at points within the unit and foundation during a seismic event. As depicted schematically in Figure 1, the analysis involves the numerical propagation of an earthquake ground motion time history, input at the top of hard rock, upward through the one-dimensional, vertical profile of firm rock, soft rock, foundation soil, and embankment materials at a particular location. The nonlinear behavior of soil is represented with strain compatible elastic properties.

The following assumptions are made in one-dimensional ground response analyses:

- The soil and rock system extends infinitely in all horizontal directions.
- Each soil and rock deposit in the system is completely defined by its thickness, unit weight, secant shear modulus, and damping ratio.
- The strain dependence of modulus and damping is accounted for by an equivalent linear procedure, based on an average effective strain level computed for each layer.
- The responses in the system are caused by the upward propagation of shear waves from the underlying hard rock formation.
- The shear waves are given as acceleration values at equally spaced time intervals; cyclic repetition of the acceleration time history is implied in the solution.

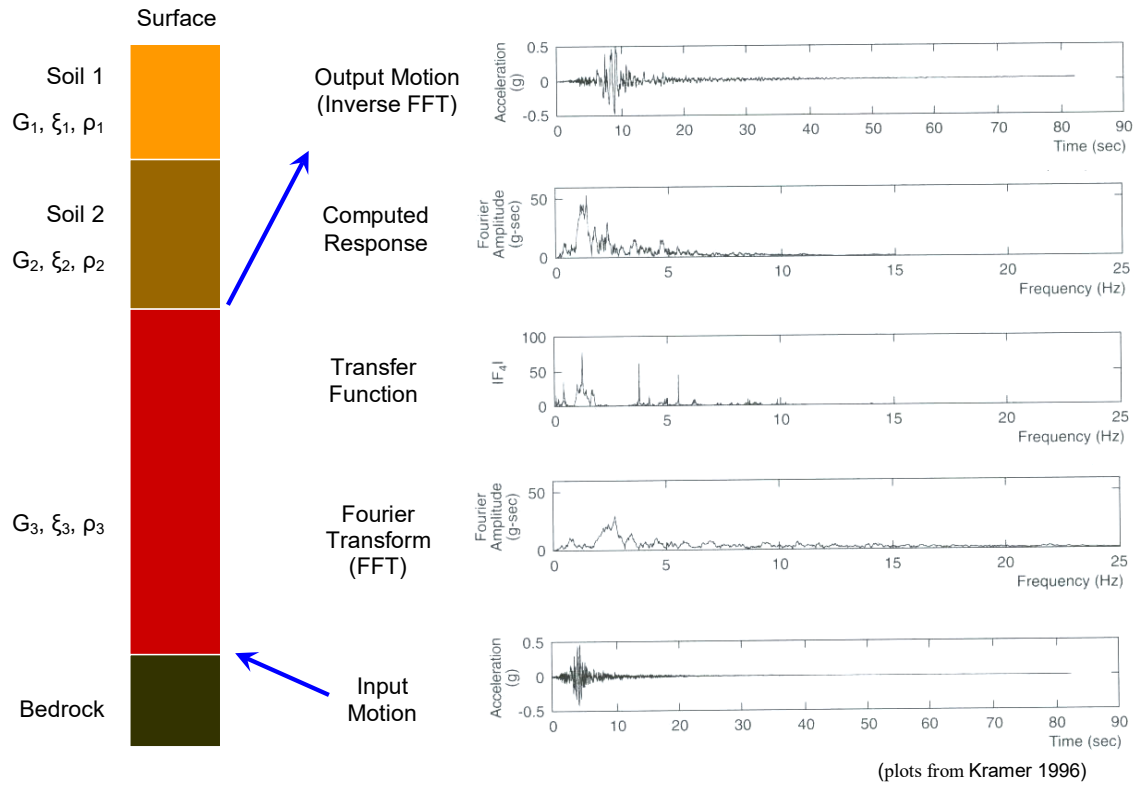


Figure 1. Conceptual Sketch of 1D Ground Response Analyses

2.1. HARD ROCK SEISMIC MOTIONS

The ground response analyses model the upward propagation of shear waves, from the time history of seismic accelerations in hard basement rock up to the ground surface. Multiple acceleration time histories, representing the expected ground motions for each of the scenario earthquakes, were obtained for this specific site.

In attenuation models, seismologists (including those employed by TVA for this study) commonly define “hard rock” as material with a shear-wave velocity of 9,200 ft/sec or greater, at the surface or very shallow depths. In the Central and Eastern North America (CENA), seismologists often treat the Pre-Cambrian basement rock as "hard rock"; all rock above that is assumed to be "firm rock", which is modeled in the site response analysis. At TVA’s plant sites, the top of hard basement rock is thousands of feet below the surface. Depending on the site geology, certain layers above the basement may have shear wave velocities greater than 9,200 ft/sec, but these layers are not the basement hard rock.

Unfortunately, there is significant uncertainty associated with the shear wave velocities, modulus reduction, and damping properties over the great thickness of firm rock units, above the very deep hard

basement rock. Assumptions for these firm rock properties, particularly the damping, can strongly influence the results from the ground response analyses (high frequency motions may be significantly attenuated by damping over the substantial thickness of firm rock). To reduce the impact of this uncertainty, the input motions were applied at a shallower point in the firm rock column. Specifically, per TVA (2016) the input acceleration time histories were applied in the bedrock profile where there are continuous layer(s) of underlying rock, at least 1,000 feet thick, with an average shear wave velocity of 8,000 ft/sec or greater.

Multiple time histories are considered for a specific design earthquake, to account for the significant uncertainty in predicting acceleration time histories in a future seismic event. For each of these ground motions, three orthogonal components are provided (two horizontal and one vertical). While all three components are considered for concrete structures, only the two horizontal components are evaluated for earth embankment structures.

The vertical loading is typically neglected in the dynamic analysis of embankments, because:

- horizontal motions are usually of greater amplitude than the vertical motions (except in close proximity to the seismic source);
- vertical ground motions induce significantly smaller shearing strains than horizontal motions; and
- transient isotropic-compression strains associated with vertical ground motions do not generate significant excess pore pressures and soil strength degradation.

In current engineering practice, multiple ground motions are also used to evaluate the seismic response of buildings. Per ASCE (2010), structural performance is judged based on the mean prediction if seven or more ground motion pairs or sets are analyzed. If less than seven ground motion sets are evaluated, the maximum prediction is used to judge performance of a structure for a particular design earthquake. This framework is adopted here for the evaluation of earth structures. For a given scenario earthquake:

- If seven or more ground motion sets are evaluated, the mean predicted seismic response may be used to assess performance.
- If less than seven ground motion sets are evaluated, the maximum predicted seismic response should be used to assess performance.

These criteria apply for the calculation of maximum or mean displacement, cyclic stress, or other measure of seismic response for the earth structure.

2.2. MODULUS REDUCTION AND DAMPING CURVES FOR SOIL

Soils begin to soften at shear strains exceeding some small threshold level. The softening dynamic response can be represented with shear modulus reduction and damping ratio curves, expressed as functions of the cyclic shear strain (Kramer 1996). Normalized shear moduli (G/G_{max}) are used, where G is the secant shear modulus and G_{max} is the shear modulus at very small strains (G_{max} is related to mass density and shear wave velocity).

To represent the cyclic response of soil in a ground response analysis, the following material parameters are thus required:

- Small-strain shear modulus (or shear wave velocity and mass density).
- Relationship between normalized shear modulus and cyclic shear strain.
- Relationship between the critical damping ratio and cyclic shear strain.

A number of modulus reduction and damping curves have been published for various material types. In this analysis, the empirical equations developed by Darendeli and Stokoe (2001) were used to estimate the modulus and damping curves for each soil. These empirical relationships, detailed in Equation 1 through Equation 12, are written as functions of plasticity index (PI) and mean effective stress (σ'_m). Overconsolidation ratio, frequency, and number of cycles are all assumed to be 1, 1 Hz, and 10 cycles, respectively, as recommended by Darendeli and Stokoe (2001). The modeled dynamic stiffness thus varies with stress level, as needed when analyzing deep soil profiles (greater than about 100 feet).

Modulus reduction curves are calculated as follows:

$$\frac{G}{G_{max}} = \frac{1}{1 + \left(\frac{\gamma}{\gamma_r}\right)^a} \quad \textbf{Equation 1}$$

where γ is shearing strain, γ_r is reference strain, and a is a curvature coefficient. γ_r and a are calculated as follows:

$$\gamma_r = \left(\phi_1 + \phi_2 * PI * OCR^{\phi_3}\right) * {\sigma'_o}^{\phi_4} \quad \textbf{Equation 2}$$

$$a = \phi_5 \quad \textbf{Equation 3}$$

$$\phi_1 = 0.0352 \quad \textbf{Equation 4}$$

$$\phi_2 = 0.0010$$

$$\phi_3 = 0.3246$$

$$\phi_4 = 0.3483$$

$$\phi_5 = 0.9190$$

where σ'_o is mean effective confining stress in atmospheres, PI is soil plasticity index in percent, OCR is overconsolidation ratio (assumed to be 1), and ϕ_1 through ϕ_5 are parameters that relate the normalized modulus reduction curves to soil type and loading conditions.

Damping curves are calculated as follows:

$$D = F * D_{Masing} + D_{min} \quad \textbf{Equation 5}$$

$$D_{Masing} = c_1 D_{Masing,a=1.0} + c_2 {D_{Masing,a=1.0}}^2 + c_3 {D_{Masing,a=1.0}}^3 \quad \textbf{Equation 6}$$

$$D_{Masing,a=1.0} = \frac{1}{\pi}\left[4\frac{\gamma - \gamma_r \ln\left(\frac{\gamma+\gamma_r}{\gamma_r}\right)}{\frac{\gamma^2}{\gamma+\gamma_r}} - 2\right] \quad \textbf{Equation 7}$$

$$c_1 = -1.1143a^2 + 1.8618a + 0.2523 \quad \textbf{Equation 8}$$

$$c_2 = 0.0805a^2 - 0.0710a - 0.0095$$

$$c_3 = -0.0005a^2 + 0.0002a + 0.0003$$

$$F = b * \left(\frac{G}{G_{max}}\right)^{0.1} \quad \textbf{Equation 9}$$

where *b* is a scaling coefficient, D_{Masing} is damping estimated based on Masing Behavior, and D_{min} is small strain material damping ratio. *b* and D_{min} are defined as follows:

$$D_{min} = \left(\phi_6 + \phi_7 * PI * OCR^{\phi_8}\right) * \sigma_o'^{\phi_9} * [1 + \phi_{10} * \ln(frq)] \quad \textbf{Equation 10}$$

$$b = \phi_{11} + \phi_{12} * \ln(N) \quad \textbf{Equation 11}$$

$$\phi_6 = 0.8005 \quad \textbf{Equation 12}$$

$$\phi_7 = 0.0129$$

$$\phi_8 = -0.1069$$

$$\phi_9 = -0.2889$$

$$\phi_{10} = 0.2919$$

$$\phi_{11} = 0.6329$$

$$\phi_{12} = -0.0057$$

where *frq* is loading frequency (assumed to be 1 Hz), *N* is number of loading cycles (assumed to be 10), and ϕ_6 through ϕ_{12} are parameters that relate material damping curve to soil type and loading conditions.

To implement Darendeli and Stokoe's (2001) modulus reduction and damping curves in Strata (Kottke et al. 2013), several modulus reduction and damping curves, each one characterizing a range of plasticity index (PI) and mean effective stress (σ'_m) values, were added to the software's curve library. Ten "bins" of PI and σ'_m (in pounds per square foot, psf) were defined, for these ranges in value:

Range in Plasticity Index	Range in Mean Effective Stress (psf)
0	0 - 400
0 - 10	400 - 800
10 - 15	800 - 1,600
15 - 20	1,600 - 2,500
20 - 25	2,500 - 5,000
25 - 30	5,000 - 7,500
30 - 40	7,500 - 10,000
40 - 55	10,000 - 17,000
55 - 70	17,000 - 25,000
70 - 100	25,000 - 42,000

In total, 100 curves were generated (ten PI bins, each associated with ten σ'_m bins). Average values, at the midpoint of the bin ranges, were used in the calculation of each curve. For example, PI = 5 and σ'_m = 200 psf were used to calculate the modulus reduction and damping curves representing a soil with a PI between 0 and 10, at a mean stress between 0 psf and 400 psf. Bin ranges were selected such that the intervals between modulus reduction and damping curves would be well distributed over the full range of PI and σ'_m.

Ishibashi and Zhang (1993) modulus reduction curves can yield a G/G_{max} value greater than 1.0. The curves implemented in Strata truncate the G/G_{max} curves at a maximum value of 1.0. This constrained value of G/G_{max} was then used when developing the damping ratio curves implemented in Strata. The effective mean pressure is computed assuming the at-rest earth pressure coefficient (K_o) is 0.5.

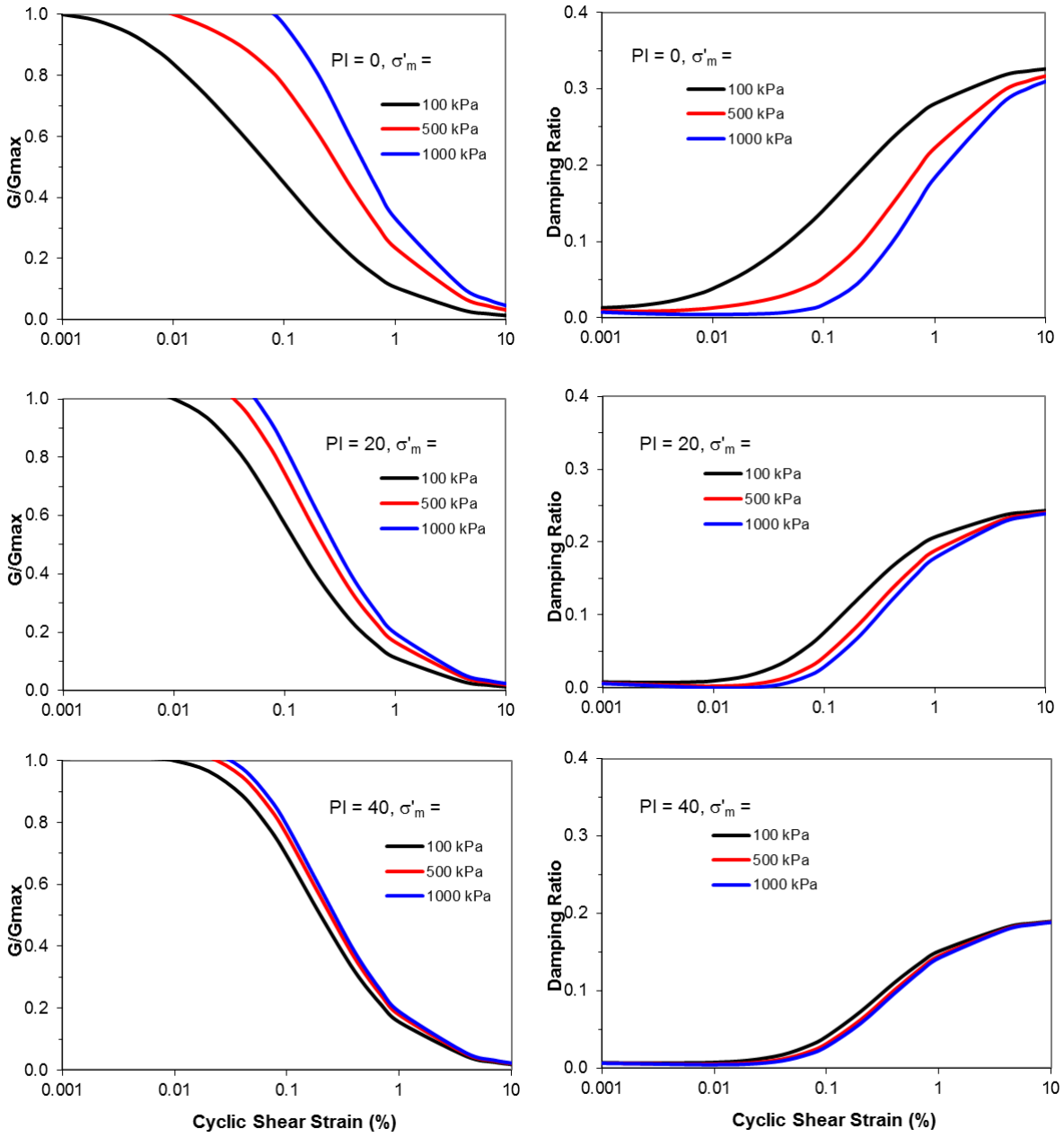


Figure 2. Normalized Shear Modulus (G/G_{max}) Reduction Curves Computed using the Empirical Equations from Ishibashi and Zhang (1993)

2.3. MODULUS REDUCTION AND DAMPING FOR ROCK

The ground response analysis models the propagation of seismic motions through a substantial thickness of “soft rock” and “firm rock”, above the hard basement rock (Section 2.4). Seismologists commonly define hard rock as material with a shear-wave velocity of 9,200 ft/sec or greater. However, for the purposes of this project:

- Hard rock is defined as rock having shear wave velocities of 8,000 ft/sec or greater.
- Firm rock is defined as rock having shear wave velocities between 3,000 and 8,000 ft/sec.
- Soft rock is defined as rock, weathered rock, and/or saprolite having shear wave velocities of 3,000 ft/sec or less.

Consistent with TVA (2016), firm rock and hard rock are modeled as linear elastic materials, with G/G_{max} = 1.0 at all strain levels. A constant damping ratio of 0.50% is assumed for firm and hard rock. This degree of damping is judged to be in a reasonable range for CENA geology, when compared to guidance from EPRI (2012).

The dynamic response of the soft rock is modeled using published modulus reduction and damping relationships developed by Silva et al. (1996), as presented in Stewart et al. (2008). These curves are plotted in Figure 3.

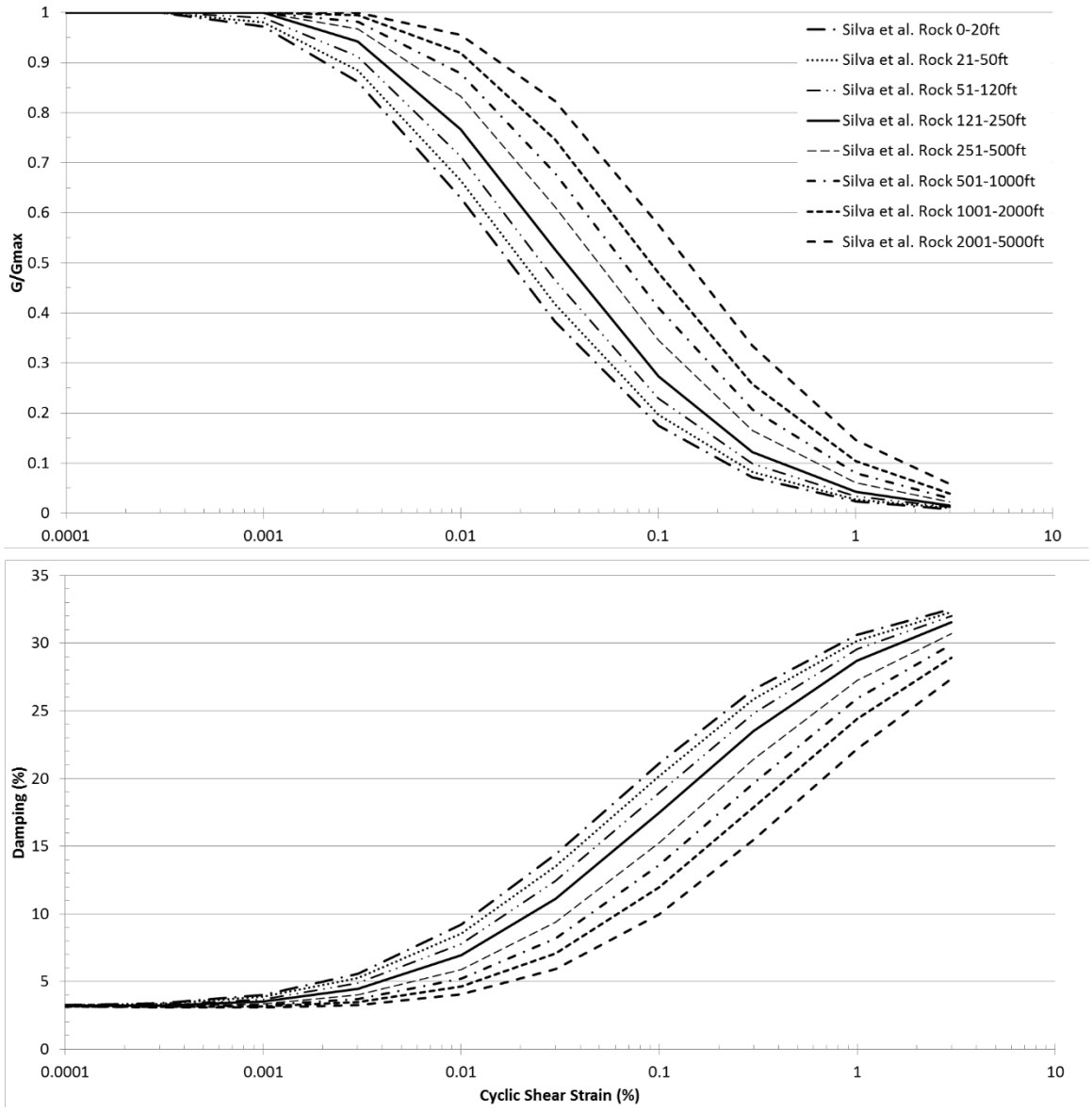


Figure 3. Normalized Shear Modulus (G/G_{max}) Reduction Curves for Soft Rock from Silva et al. (1996), as presented in Stewart et al. (2008)

2.4. PROFILES ANALYZED

In the ground response analysis, the acceleration time histories at the top of bedrock (top of firm rock) and top of ground surface are predicted. A Strata analysis is used to model the propagation of the

earthquake motion from the top of hard basement rock, through the firm rock and soil column at the site. Specifics include:

- The input acceleration time histories are treated as the earthquake motions of a rock outcrop; transfer functions are applied to obtain the corresponding motion within the rock profile, at the top of hard rock.

- The input motions are applied at the top elevation of hard rock, as defined in Section 2.1.

- For deep geologic strata that were not encountered in the geotechnical exploration program, site-specific cross sections prepared by Hatcher (2016) were used. Hatcher's report presents deep structural geology and typical values of shear wave velocity down to the Precambrian basement for multiple TVA dam sites. However, for shallow strata that were encountered in the geotechnical exploration, preference was given to the field data for thickness and shear wave velocity.

- The analysis models the upward propagation of the ground motions through the sequence of rock layers, to the top of bedrock beneath the site.

- The firm rock is modeled as an elastic material with low damping, while soft rock is modeled with non-linear modulus reduction and damping (see Section 2.3). For a particular structure, the firm rock and soft rock column is identical for each profile.

- Each profile includes a representative soil column, suitable for the particular location (top, mid-slope, etc.). Refer to Section 2.2 for the modulus reduction and damping parameters for soil.

- Liquefaction and/or cyclic softening are not modeled in the analysis, so that results represent the ground motions that would occur in the absence of triggering.

- In firm rock, a maximum layer thickness of 100 feet was used. In soft rock and soil, a maximum layer thickness of one-quarter of the wavelength of interest was used. The wavelength of interest is equal to the shear wave velocity divided by the cutoff frequency (taken as 100 Hz for this project). The materials modeled with non-linear behavior require much thinner layering to adequately propagate the ground motions and yield representative results.

The ground response analyses are completed for the subsurface profiles at specific locations (cross section and offsets), as needed to support the pseudostatic, liquefaction, and seismic deformation analyses. These locations are indicated in Table 1.

2.5. GROUND RESPONSE OUTPUTS

Results from the ground response analyses are needed as input for liquefaction analyses and seismic deformation analyses. Table 1 summarizes the location of the profiles, the input ground motions, and the results that are recorded for each analysis. The last row indicates what results are carried forward for input to the subsequent seismic analysis.

For the liquefaction analyses (Section 3), the peak horizontal acceleration at the ground surface (a_{max}) is needed for each analyzed profile. For a given scenario earthquake, both horizontal components of each acceleration time history are analyzed using Strata. The results are plotted to examine the profiles of predicted peak acceleration over the depth of the soil/rock column. The maximum (or mean, depending on the number of time histories considered; see Section 2.1) of the predicted horizontal accelerations at

the ground surface is then selected as a_{max}, with a different value of a_{max} for each profile and scenario earthquake. In the liquefaction analysis, a_{max} is used to compute the Cyclic Stress Ratio (CSR, Section 3.2.2) at each SPT or CPT data point.

For the seismic deformation analyses (Section 4.2), acceleration time histories are recorded at specific elevations in the analyzed profile. These acceleration time histories correspond to the accelerations of the overburden above the slip surface, which are equal to the shear stress time histories at the location of the slip surface divided by the overburden pressure (total vertical stress). The time history elevations correspond to the intersection of the soil profile with the slip surface being evaluated. These time histories are needed for each of the available hard rock ground motions (using both horizontal components of each motion), for each scenario earthquake.

Table 1. Ground Response Analyses to Support other Seismic Analyses

	Liquefaction Triggering	Seismic Deformation
Location of Soil/Rock Profiles Analyzed:	Offsets such as crest, mid-slope, toe, etc., corresponding to groups of SPT or CPT profiles	Offsets corresponding to the top, middle, and bottom of the critical slide mass
Input Ground Motions:	Both horizontal components of each provided hard rock ground motion	Both horizontal components of each provided hard rock ground motion
Recorded Numerical Results:	Peak horizontal acceleration at the ground surface	Time histories of shear stress along slip surface of interest
Results Used in Further Analysis:	Peak horizontal acceleration at ground surface, for each scenario earthquake	Average, horizontal equivalent acceleration for each time history

3. LIQUEFACTION ANALYSIS

Quantitative methods for evaluating whether or not a soil deposit will liquefy during an earthquake (liquefaction triggering analyses) are presented in this section. The resistance to liquefaction or cyclic softening in different soil types (sands to clays) is considered. The methods discussed were developed using empirical data on the performance of similar materials in past earthquakes.

3.1. INITIAL SCREENING FOR SOIL BEHAVIOR

3.1.1. Effect of Soil Fines on Liquefaction Susceptibility

Liquefaction is usually associated with sandy soils, including clean sands and silty sands. The fines content (percent passing the No. 200 sieve) of sandy soils can have a significant impact on liquefaction susceptibility. At the same in situ penetration resistance, liquefaction resistance increases as the fines content of a soil increases. For silty sands, “clean-sand equivalent” SPT blowcounts (Section 3.2.5) or CPT tip resistances (Section 3.2.7) are computed in the assessment methodology. These adjustments for fines content account for the differences observed in the field data base for sands having between about 5 and 35% fines.

While less common, some silts and clays (fine-grained soils with more than 50% fines) have been observed to “liquefy” in large earthquakes. The generation of excess pore pressures under dynamic load leads to significant strength loss and may, depending on the shear stress, result in large ground deformations. For fine grained soils, this behavior is identified as cyclic softening.

The assessment of potential soil liquefaction or cyclic softening is completed in steps:

- For fine-grained soils, index properties are used to identify the behavior as either “sand-like” or “clay-like” (Section 3.1.2).
- For coarse soils (less than about 20% fines) and other “sand-like” soils, the factor of safety against liquefaction is computed using in situ penetration resistance (Section 3.2).
- For “clay-like” fine-grained soils, additional screening criteria are applied to determine if the soil might be susceptible to cyclic softening (Section 3.3.1).
- For “clay-like” soils that are susceptible, the factor of safety against cyclic softening is computed based on the undrained shear strength (Section 3.3.2).

3.1.2. Sand-Like versus Clay-Like Soils

“Sand-like” soils are subject to liquefaction and can be evaluated using a simplified stress-based approach (Sections 3.2), while “clay-like” soils should be evaluated further for cyclic softening (Section 3.3). Various guidance criteria have been proposed for separating soil behavior with respect to cyclic loading, liquefaction, and stress-strain response:

(1) Seed et al. (2003) proposed considering the fines content, liquid limit, plasticity index, and natural water content with respect to Figure 4.

- "Sand-like" soils fall in Zone A on Figure 4. Further, if these soils also meet the water content and fines content requirements indicated, they should be considered potentially liquefiable.
- "Clay-like" soils fall in Zone B on Figure 4. Further, if these soils also meet the water content and fines content requirements indicated, they should be considered susceptible to cyclic softening.
- Soils that fall in Zone C (i.e., anywhere else on the chart) are not usually subject to liquefaction or cyclic softening.

(2) Idriss and Boulanger (2008) offer the following screening criteria based on Atterberg limits:

- "Sand-like" soils have Plasticity Index (PI) < 7.
- "Clay-like" soils have PI ≥ 7.
- Some soils with PI between 3 and 7 could be clay-like, but should be treated as liquefiable (sand-like), unless stress-strain behavior from laboratory testing indicates otherwise.

(3) Design guidance for coal refuse facilities (D'Appolonia Engineering 2010), published by the U.S. Mine Safety and Health Administration (MSHA), suggests differentiating sand-like and clay-like behavior as follows:

- "Sand-like" soils have Plasticity Index (PI) ≤ 7
- "Clay-like" soils have (all three criteria must be satisfied):
  - Percent finer than the No. 40 sieve ≥ 35%
  - Percent finer than the No. 200 sieve ≥ 20%
  - Plasticity Index (PI) ≥ 10
- Borderline soils should be treated as sand-like, unless stress-strain behavior from laboratory testing indicates otherwise. The MSHA guidance document suggests:
  - Loose or soft material with a shear strain less than 2 percent at the peak strength in an undrained monotonic test, and a rapid drop-off in the post-peak shearing resistance, should be considered sand-like.
  - Loose or soft material with a shear strain more than about 5 percent at the peak strength in an undrained monotonic test, and a gradual drop-off in the post-peak shearing resistance, may be considered clay-like.

The three sets of guidance criteria presented above may provide conflicting indications of behavior under dynamic load. All of these criteria are used together, with engineering judgment, to determine if a particular soil stratum is subject to liquefaction or cyclic softening.

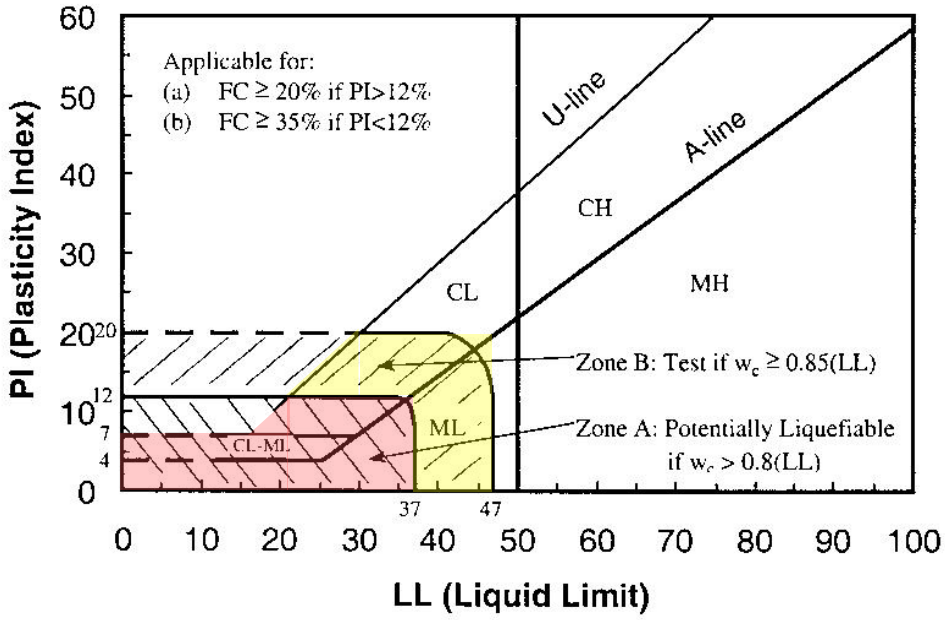


Figure 4. Example of Criteria for Assessing Liquefaction or Cyclic Softening in Fine Grained Soils (after Seed et al. 2003)

3.2. LIQUEFACTION OF SAND-LIKE SOILS

Seed and Idriss (1971) proposed a simplified, empirical procedure for evaluating liquefaction potential of sands based on in situ penetration resistance (indicative of relative density), initial confining stress, and intensity of ground shaking. This methodology has undergone continued development and refinement since its initial inception. The procedures were evaluated in detail and summarized by a workshop of experts organized by the National Center for Earthquake Engineering Research (NCEER) (Youd and Idriss 1997). They updated details of the liquefaction assessment method, which is now often referred to as the "NCEER Method" (Youd et al. 2001). The National Academies (2016) refers to this method as a "simplified stress-based approach"; this term will be used within this document.

In recent years, various researchers have published variations or updates to the simplified stress-based approach. Often these updates relate to the case histories that serve as the basis for correlating in situ penetration resistance to the potential for liquefaction triggering. New case histories (documentation of sites that did or did not liquefy due to an earthquake) may be added and/or previously published case histories may be reinterpreted. The National Academies (2016) report emphasizes the importance of

implementing such methods in a manner consistent with how they were developed. Analysts should avoid using techniques and adjustment factors from one variant of the method with other variants.

The approach below is based on methodology of Idriss and Boulanger (2008), with updates per Boulanger and Idriss (2014; 2016). This provides an approach that is internally consistent and generally accepted per the current state of the practice.

3.2.1. Factor of Safety for Liquefaction

The liquefaction resistance of a soil is evaluated in terms of a cyclic resistance ratio (CRR), and the load induced by the earthquake is quantified using a cyclic stress ratio (CSR). Both the CRR and CSR represent a shear stress normalized with respect to the vertical effective stress in the soil. The factor of safety against liquefaction (FS_{liq}) is then computed by taking the ratio of CRR over CSR:

$$FS_{liq} = \frac{CRR}{CSR} \qquad \textbf{Equation 13}$$

Details for the computation of CRR and CSR, as implemented in spreadsheet calculations, are described below.

Unsaturated soils do not liquefy. The factor of safety against liquefaction is thus assumed to be very high (although numerically undefined) in soils above the phreatic surface.

3.2.2. Cyclic Stress Ratio

The cyclic stress ratio (CSR) is the average cyclic shear stress induced by the earthquake, at a particular location in the soil, normalized with respect to the vertical effective stress (σ'_v). The average shear stress at a point in the soil profile is assumed to be 65% of the maximum induced cyclic shear stress ($\tau_{cyc,max}$) (Seed and Idriss 1971):

$$CSR = 0.65 \cdot \frac{\tau_{cyc,max}}{\sigma'_v} \qquad \textbf{Equation 14}$$

CSR values can be computed directly from the maximum shear stress predicted with ground response analyses. However, CSR is often computed using a simplified equation originally developed by Seed and Idriss (1971). They computed CSR based on the peak acceleration at the ground surface (a_{max}, expressed as a fraction of gravity) and a stress reduction factor (r_d), which accounts for the dynamic response of the soil profile:

$$CSR = 0.65 \cdot \frac{\sigma_v}{\sigma'_v} \cdot \frac{a_{max}}{g} \cdot r_d \qquad \textbf{Equation 15}$$

Boulanger and Idriss (2016) acknowledge that the maximum shear stress can be computed directly from ground response analyses, instead of using the simplified approach based on a_{max} and r_d. The former approach takes advantage of site-specific (or boring-specific) ground response results (maximum shear

stress versus depth profiles), whereas the latter applies a single value of acceleration (which could be boring-specific) and the published, empirical stress reduction factor.

While using shear stress profiles from site-specific ground response analyses would appear to be more precise, the National Academies (2016) notes that "…the use of site response analysis to estimate the earthquake-induced CSR is appropriate if, and only if, the r_d factors used in the development of the CRR curve are unbiased relative to the values expected at liquefaction sites." In the event that "biased" methods are employed, "…the results of site response analyses should be used only to refine the estimate of the PGA at the ground surface [a_{max}]." In this context, the procedure developed by Idriss and Boulanger (2008) is considered a biased method. Using site-specific ground response to directly compute induced shear stresses can introduce "…additional and unquantifiable uncertainty into the liquefaction assessment."

Therefore, site-specific ground response analyses are used to obtain a_{max} at the ground surface. To quantify the CSR at depth, the r_d factor from Boulanger and Idriss (2016) is used:

$$r_d = \exp\left[\alpha(z) + \beta(z) \cdot M\right] \qquad \textbf{Equation 16}$$

$$\alpha(z) = -1.012 - 1.126 \cdot \sin\left(\frac{z}{11.73} + 5.133\right)$$

$$\beta(z) = 0.106 + 0.118 \cdot \sin\left(\frac{z}{11.28} + 5.142\right)$$

Where z is the depth below the ground surface in meters, the arguments inside the sin terms are in radians, and M is the moment magnitude of the earthquake.

CSR values are computed at each SPT or CPT data point, to match the calculation of CRR (Section 3.2.3). The value of a_{max} is taken from the ground response analyses for the various ground motions considered (Section 2.5). The ground response analyses are defined for groups of borings with similar conditions (for example, one analysis may represent multiple borings).

3.2.3. Cyclic Resistance Ratio for Sand-Like Soils

The cyclic resistance ratio (CRR) is the average cyclic shear stress that would cause liquefaction, divided by the vertical effective stress at that location. Using the field performance correlations, CRR is estimated conservatively based on in situ penetration resistance (SPT blowcounts or CPT tip stress).

As discussed in this section, the CRR for a M = 7.5 earthquake ($CRR_{7.5}$) is computed from the clean-sand equivalent, normalized SPT blowcount or CPT tip resistance [$(N_1)_{60CS}$ or $(q_{c1N})_{cs}$]. To account for other earthquake magnitudes, $CRR_{7.5}$ is modified using a magnitude scaling factor (MSF). Adjustments are also made to account for high overburden pressures (K_σ) and static driving shear stresses (K_α). The CRR is then computed as:

$$CRR = CRR_{7.5} \cdot MSF \cdot K_\sigma \cdot K_\alpha \qquad \textbf{Equation 17}$$

The correction factors MSF, K_σ, and K_α are discussed below in Sections 3.2.8, 3.2.9, and 3.2.10, respectively.

When using SPT blowcounts, the field measurements of N_{SPT} are first adjusted and corrected to account for variations in the field test procedures, equipment, and fines content as discussed in Section 3.2.4. $CRR_{7.5}$ is then estimated from the $(N_1)_{60CS}$ using the bounding curve in Figure 5. For values of $(N_1)_{60\text{-}CS}$ less than about 32, the following equation is used for the base curve (Idriss and Boulanger 2008; Boulanger and Idriss 2014):

$$CRR_{7.5} = \exp\left(\frac{(N_1)_{60CS}}{14.1} + \left(\frac{(N_1)_{60CS}}{126}\right)^2 - \left(\frac{(N_1)_{60CS}}{23.6}\right)^3 + \left(\frac{(N_1)_{60CS}}{25.4}\right)^4 - 2.8\right) \qquad \textbf{Equation 18}$$

For values of $(N_1)_{60\text{-}CS}$ greater than or equal to about 32, clean granular soils are considered too dense to liquefy and are classified as unliquefiable.

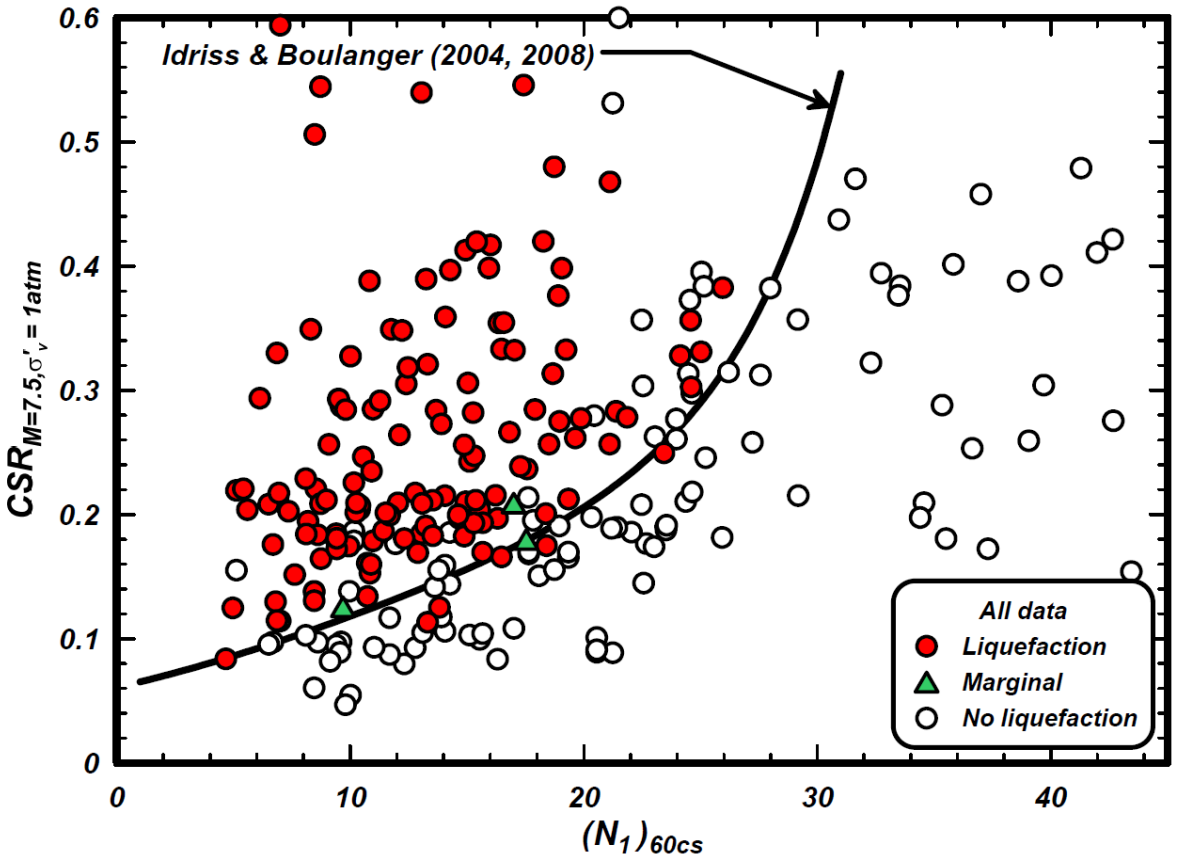


Figure 5. Field data and empirical relationship between liquefaction resistance and corrected SPT blowcount (Boulanger and Idriss 2014).

The value of $CRR_{7.5}$ can also be computed from the measured CPT tip resistance and the field performance correlation in Figure 6 (Boulanger and Idriss 2014; 2016). Field measurements of CPT tip stress are first normalized and adjusted to account for the effects of overburden pressure and fines content, as described in Section 3.2.6. The remaining calculation procedure uses the parameter q_{c1Ncs}, which is the computed clean-sand equivalent penetration resistance normalized to one atmosphere of overburden pressure. The following equations represent the CPT-based clean sand base curve for the correlation shown in Figure 6, and can be used to compute $CRR_{7.5}$:

$$CRR_{7.5} = \exp\left(\frac{q_{c1Ncs}}{113} + \left(\frac{q_{c1Ncs}}{1000}\right)^2 - \left(\frac{q_{c1Ncs}}{140}\right)^3 + \left(\frac{q_{c1Ncs}}{137}\right)^4 - 2.80\right) \qquad \textbf{Equation 19}$$

For values of q_{c1Ncs} greater than or equal to about 175, clean granular soils are considered too dense to liquefy and are classified as unliquefiable.

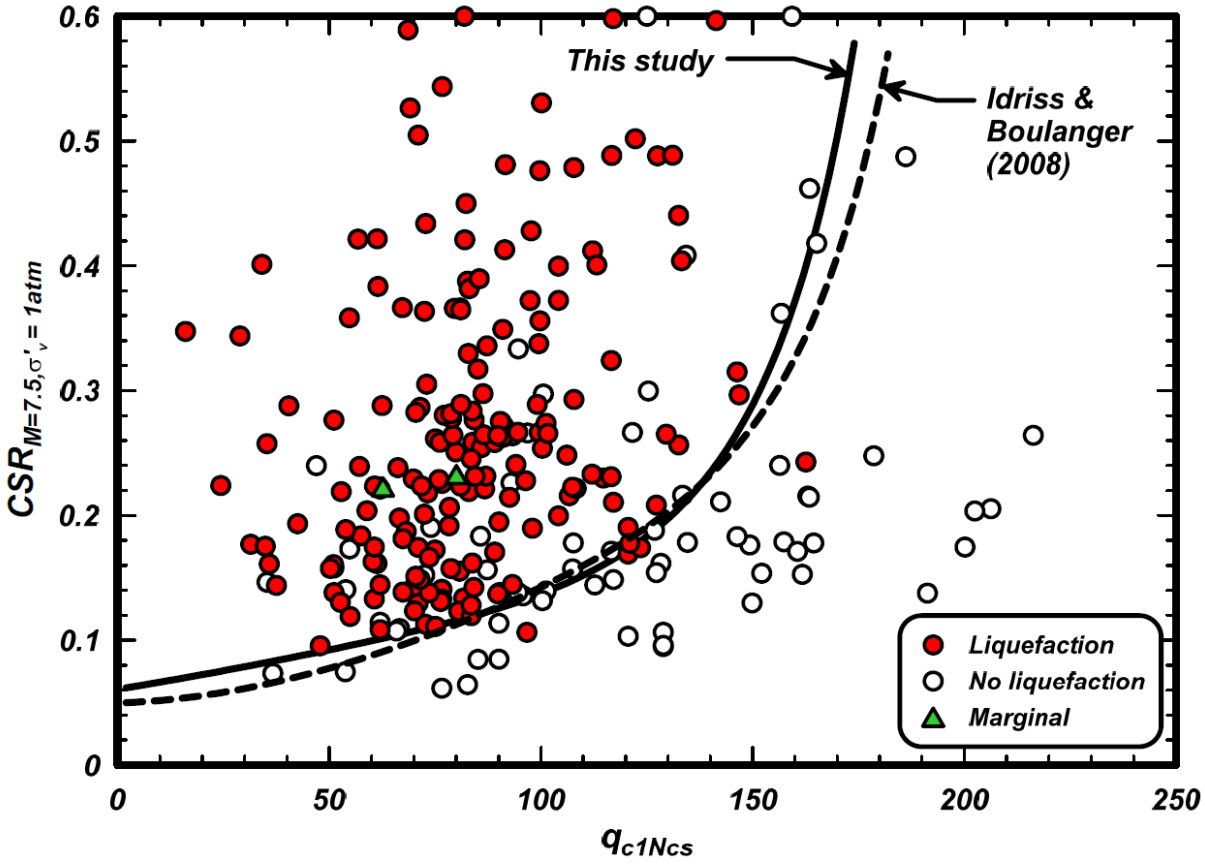


Figure 6. Field data and empirical relationship between liquefaction resistance and corrected CPT tip resistance (Boulanger and Idriss 2014).

3.2.4. Corrected Standard Penetration Test Blowcounts

The field-measured Standard Penetration Test (SPT) blowcounts (N_{SPT} values) are corrected as needed for use in various parameter correlations and analyses. As described in the SEDR, hammer energy calibrations were performed for each drill rig used at the site; the subsequent data were used to correct the SPT N-values. N-values were also normalized and corrected for overburden pressures, rod length, borehole diameter, and sampler type. The corrected blow counts are presented in Exhibit D.2.

3.2.4.1. SPT Blowcount Correction for Drilling and Sampling Techniques

The N_{SPT} values must be corrected, adjusted, and/or normalized to account for the effects of hammer energy, borehole diameter, length of drill rods, and nonstandard samplers. This results in "corrected" blowcounts (N_{60}). Corrected blowcounts are used for liquefaction analyses, but they can also be correlated to other engineering properties. The methodology described below to derive N_{60} is consistent with Idriss and Boulanger (2008). Further normalization to correct for overburden stress ($(N_1)_{60}$) and fines content ($(N_1)_{60CS}$) is specific to liquefaction triggering analyses, and is discussed in Sections 3.2.4.2 and 3.2.5, respectively.

The corrected blowcount, N_{60}, is computed as:

$$N_{60} = N_{SPT} \cdot C_E \cdot C_B \cdot C_R \cdot C_S \qquad \textbf{Equation 20}$$

The correction parameters C_E, C_B, C_R, and C_S are defined as follows.

C_E corrects N_{SPT} for differences in SPT hammer energy, using as a standard reference a hammer that delivers 60% of the maximum theoretical energy (2.5-foot drop x 140-lbs = 350 foot-lbs per blow). Defining the hammer efficiency, or energy ratio (ER), as the actual energy delivered by the SPT hammer over the maximum theoretical energy, the value of C_E is then:

$$C_E = \frac{ER}{60\%} \qquad \textbf{Equation 21}$$

Typical ranges for two common hammer types are given in Table 2. Here, the SPT hammer energy was measured directly during the field explorations, using instrumentation mounted at the top of the drill rods, to determine C_E factors specific to the equipment and site conditions. Energy measurements were made in selected borings at the site, and the hammer efficiency measured for a particular hammer is assumed representative of the energy imparted with the same equipment at other, similar borings at the site.

Table 2. Typical Correction Factors for SPT Hammer Energy (Youd et al. 2001; Idriss and Boulanger 2008)

Hammer Type	ER	C_E
Safety Hammer	42 to 72%	0.7 to 1.2
Automatic-Trip (Donut) Hammer	48 to 78%	0.8 to 1.3

C_B corrects for the influence of borehole diameter on the measured blowcount. The effect is related to the surface area of the exposed soil at the bottom of the borehole, relative to the size of the standard sampler. The borehole diameter is assumed equal to the internal diameter of the casing or hollow stem auger, if used. Recommended values are given in Table 3(a). To apply this correction without sharp jumps in C_B for small differences in diameter, the values in Table 3(a) are linearly interpolated for diameters in the range of 4.5 to 8 inches, as presented in Table 3(b).

Table 3. Correction Factors for Borehole Diameter

Inner Diameter (ID) of Borehole, Casing, or Auger (inches)	C_B
(a) Typical values (Skempton 1986; Idriss and Boulanger 2008)	
2.5 to 4.5	1.00
6	1.05
8	1.15
(b) Interpolated values	
$ID \leq 4.5$	$C_B = 1.00$
$4.5 < ID \leq 6$	$C_B = (ID/30) + 0.85$
$6 < ID \leq 8$	$C_B = (ID/20) + 0.75$
$8 < ID$	$C_B = 1.15$

C_R corrects for energy losses in short drilling rods, due to reflections of energy from the bottom of the drill stem. Values of the rod length correction factor (Table 4) were recommended by Youd et al. (2001) and Idriss and Boulanger (2008). In applying the C_R correction, the length of drill rod is assumed to equal the depth to the sampling location, plus 5 feet to account for the typical length of drill rod sticking up above the ground surface. For deeper sample locations (rod lengths exceeding 30 m), no correction is applied ($C_R = 1.0$).

The values of C_R in Table 4 are based on the work of Schmertmann and Palacios (1979). Due to limitations in the instrumentation available at the time of their work, Schmertmann and Palacios were unable to accurately measure accelerations in the drill rod after each impact. They measured hammer energy using the "F^2" method and proposed the rod-length correction based on theoretical considerations

of wave propagation. With modern instrumentation, the delivered hammer energy can be measured using the "Fv" method. This provides a more reliable measure of hammer energy (Butler et al. 1998) and obviates the need to make corrections for short rods (personal communications, Frank Rausche, April 15, 2005, and Ray B. Seed, April 20, 2005). Daniel et al. (2005) point out the need for more research on this question. Sancio and Bray (2005) concluded that short rod lengths have only a small effect on ER when measured using the "Fv" method.

Additional insights into the application of C_R are provided by Youd et al. (2001):

> "*Although application of rod-length correction factors will give more precise $(N_1)_{60}$ values, these corrections may be neglected for liquefaction resistance calculations for rod lengths between 3 and 10 m because rod-length corrections were not applied to SPT test data from these depths in compiling the original liquefaction case history databases. Thus, rod-length corrections are implicitly incorporated into the empirical SPT procedure.*"

Because the hammer energy is measured using the "Fv" method and the C_E is based on those field measurements, the C_R correction factor is *not* applied here to the SPT blowcounts (C_R = 1.0 is used in the calculations).

Table 4. Correction Factors for Energy Losses in the Drill Rods (Youd et al. 2001; Idriss and Boulanger 2008)

Length of Drill Rod (m)	Length of Drill Rod (feet)	C_R
< 3	< 10	0.75
3 to 4	10 to 13	0.8
4 to 6	13 to 20	0.85
6 to 10	20 to 33	0.95
10 to 30	33 to 100	1.0

Split-spoon samplers are often designed to hold an internal tube, or liner, for containing the retrieved soil sample. However, the split spoons are often used without the liners in place, thereby reducing the interior friction as the sampler is advanced (the inside diameter of the sampler is greater than that of the driving shoe). To account for this effect, the C_S correction factor is applied when a sampler is used without the liners. Recommended values are shown in Table 5. When liners are not used, the correction ranges from 10 to 30 percent, and increases linearly as the blowcount increases. Here, samplers were used without the liners and the correction in Table 5 is applied. Note that the value of C_S is a function of $(N_1)_{60}$ (Section 3.2.4.2), which requires an iterative/trial solution scheme to determine the sampler correction factor for a given SPT blowcount.

Table 5. Correction Factors for Non-Standard Split-Spoon Samplers (Seed et al. 2001; Idriss and Boulanger 2008)

Sampler	C_S
Standard sampler with liners	1.0
Standard sampler without liners	$1.1 \leq (1+(N_1)_{60}/100) \leq 1.3$

3.2.4.2. SPT Blowcount Correction for Overburden Stress

Section 3.2.4.1 documents correction of field-measured Standard Penetration Test (SPT) blowcounts (N_{SPT}) for the effects of hammer energy, borehole diameter, length of drill rods, and nonstandard samplers. The result is designated N_{60}. For liquefaction triggering analysis, blowcounts are also normalized to a standard, effective overburden stress of one atmosphere. The overburden correction factor is designated C_N and the resulting normalized blowcount is designated $(N_1)_{60}$.

$$(N_1)_{60} = C_N \cdot N_{60} \qquad \textbf{Equation 22}$$

The C_N correction factor from Boulanger and Idriss (2014) is used in this analysis and is shown graphically in Figure 7.

$$C_N = \left(\frac{P_a}{\sigma'_v}\right)^{0.784-0.0768\sqrt{(N_1)_{60CS}}} \leq 1.7 \qquad \textbf{Equation 23}$$

Here, σ'_v is the vertical effective stress at the depth of $(N_1)_{60CS}$ and P_a is one atmosphere (atm) of pressure in the units of σ'_v (P_a = 14.69 psi = 2,116 psf = 101.3 kPa). This expression of C_N is limited to $(N_1)_{60CS}$ values less than or equal to 46 (Boulanger and Idriss 2014). Also, at low effective stresses (σ'_v less than about 0.35 atm), C_N is limited to 1.7 to avoid excessively large adjustments at shallow depths. The correction factor is not defined for effective stresses greater than 10 atmospheres, but the curves in Figure 7 are approaching an asymptote at this limit. Note that the value of C_N is a function of $(N_1)_{60CS}$ (Section 3.2.5), which requires an iterative/trial solution scheme to determine the overburden correction factor for a given SPT blowcount.

Note that labels on plots should read "$(N_1)_{60CS}$" and "q_{c1Ncs}" instead of "$(N_1)_{60}$" and "q_{c1N}".

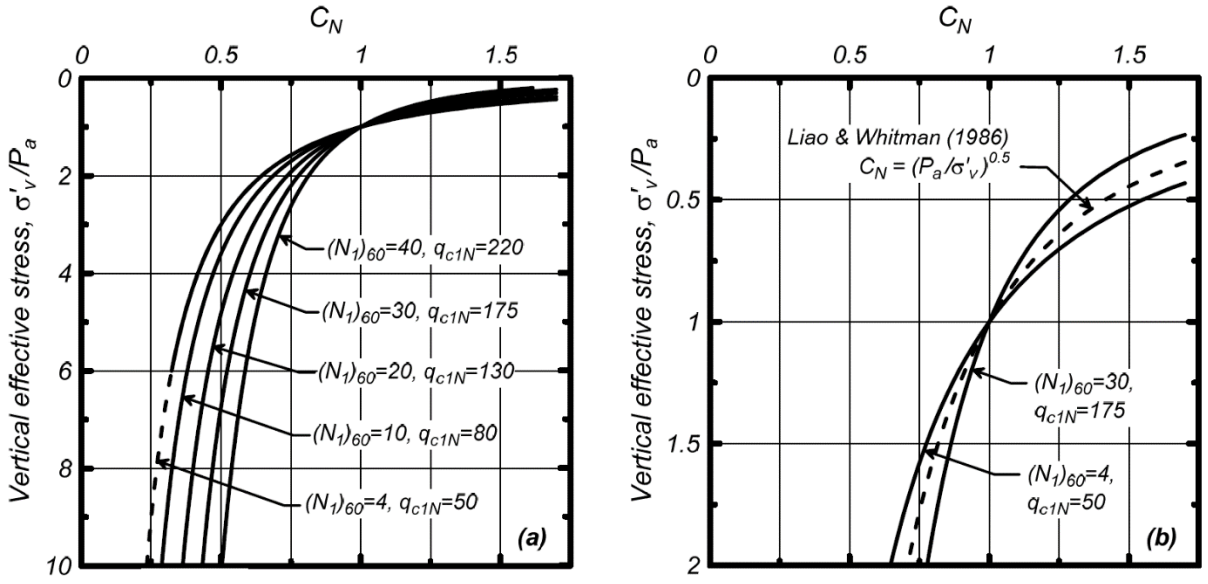


Figure 7. Correction Factor for Overburden Stress (Boulanger and Idriss 2014).

3.2.5. Clean-Sand Equivalent SPT Blowcounts

The liquefaction triggering potential of sand-like soils varies with fines content. The simplified stress-based approach includes an adjustment in $(N_1)_{60}$ to account for the fines content. The "clean-sand equivalent blowcount", $(N_1)_{60CS}$, is computed per Boulanger and Idriss (2014) as:

$$(N_1)_{60CS} = (N_1)_{60} + \Delta(N_1)_{60} \qquad \textbf{Equation 24}$$

$$\Delta(N_1)_{60} = \exp\left(1.63 + \frac{9.7}{FC + 0.01} - \left(\frac{15.7}{FC + 0.01}\right)^2\right)$$

where FC is the fines content in percent (percent by weight passing the No. 200 sieve, value ranging from 0 to 100). The adjustment (Figure 8) approaches a fairly constant value for FC values exceeding about 35% because the soil matrix becomes fines-dominated (Boulanger and Idriss 2014).

The adjustment from $(N_1)_{60}$ to $(N_1)_{60CS}$ was developed using data on liquefaction resistance. Hence, $(N_1)_{60CS}$ reflects both the increase in liquefaction resistance and decrease in penetration resistance due to a fines content greater than about 5 percent (Youd et al. 2001).

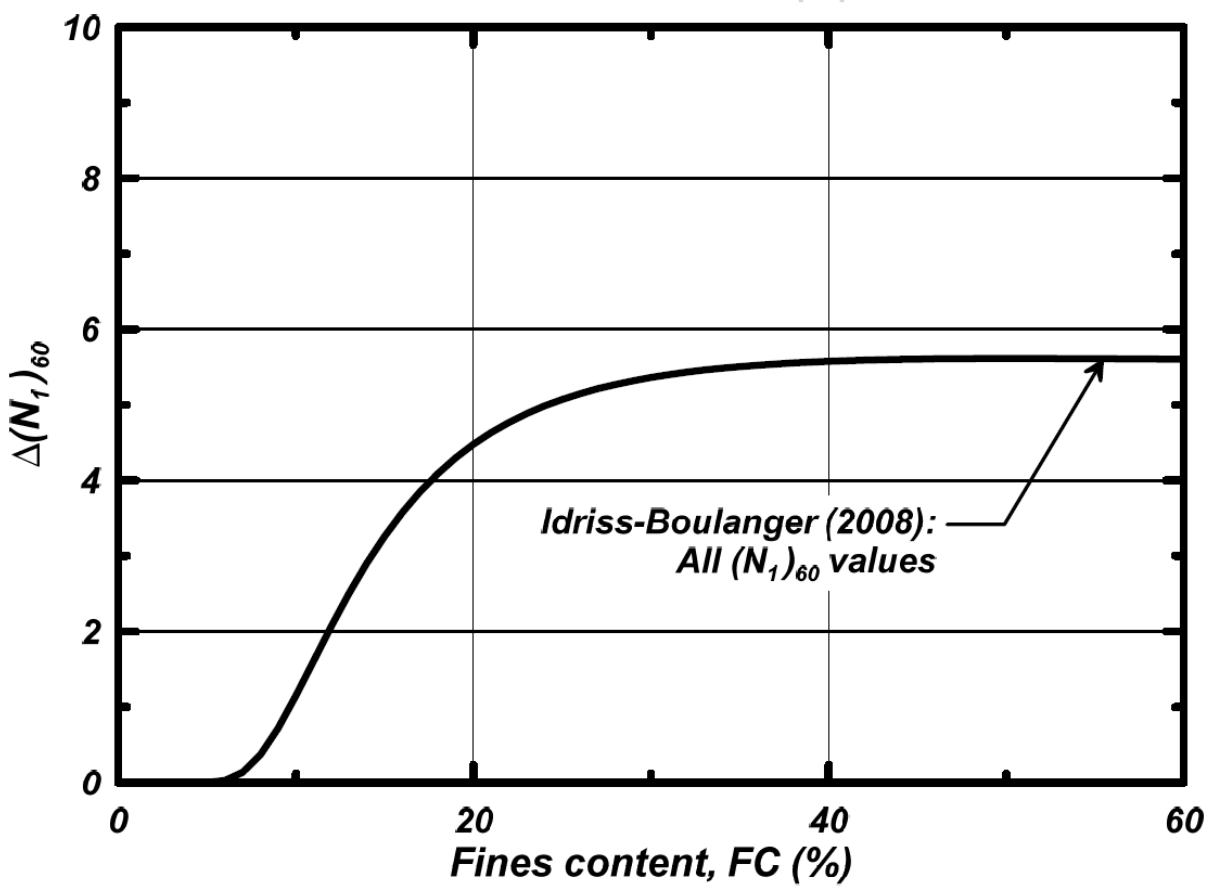


Figure 8. Equivalent clean sand adjustment for SPT-based liquefaction triggering procedures (Boulanger and Idriss 2014).

Where the gradation of an individual SPT sample is not directly measured in the laboratory, the calculation of $(N_1)_{60CS}$ must rely on an interpolated or estimated fines content. The fines content associated with a specific N_{SPT} value is thus determined, in decreasing order of preference, as:

- Where SPT samples are subjected to particle size analysis, FC is taken from the laboratory value.
- When the gradation is not measured on a given sample, FC is estimated based on measurements from other samples in the same soil horizon and/or soil boring.
- When no gradation data is available for a given soil horizon, the fines content is assigned based on the USCS classification, assuming the minimum fines content for that soil classification. This

yields a conservative correction (smallest corrected $(N_1)_{60CS}$) for determining liquefaction resistance.

3.2.6. Corrected Cone Penetration Tip Resistance

The measured resistance to penetration of the conical CPT tip (q_c), in units of stress, is recorded as the cone penetrometer probe is advanced into the soil. Due to details of the probe design, pore water pressures acting behind the cone tip affect the measurement of tip resistance. A corrected cone tip resistance (q_t) is computed as:

$$q_t = q_c + (1 - a_r) \cdot u_2 \qquad \textbf{Equation 25}$$

where a_r is the net area ratio and u_2 is the pore water pressure measured just behind the cone tip. The differences between q_c and q_t are usually small in granular soils, while the effect of the correction is more significant in soft, clayey soils where q_c is small and u_2 is large. In some cases, this correction is performed within the data acquisition system, and only q_t is provided in the CPT raw data files. In the referenced methodology (i.e., Boulanger and Idriss 2014; 2016), the term q_c is used in equations, with the understanding that the raw data has been corrected to q_t whenever the u_2 data are available. For consistency, this convention is used in the formulas below.

The tip resistance is corrected for the effects of overburden pressure and normalized to a dimensionless value per Boulanger and Idriss (2016):

$$q_{c1N} = C_N \cdot \frac{q_c}{P_a} \qquad \textbf{Equation 26}$$

where P_a is one atmosphere of pressure in the units of q_c (P_a = 14.69 psi = 2,116 psf = 101.3 kPa). The C_N correction factor from Boulanger and Idriss (2016) is used in this analysis and is shown graphically in Figure 7.

$$C_N = \left(\frac{P_a}{\sigma'_v}\right)^{1.338 - 0.249 \cdot (q_{c1Ncs})^{0.264}} \leq 1.7 \qquad \textbf{Equation 27}$$

Here, σ'_v is the vertical effective stress at the depth of q_{c1Ncs} and P_a is one atmosphere of pressure in the units of σ'_v (P_a = 14.69 psi = 2,116 psf = 101.3 kPa). This expression of C_N is limited to q_{c1Ncs} values between 21 and 254 (Boulanger and Idriss 2016). Also, at low effective stresses (σ'_v less than about 0.35 atm), C_N is limited to 1.7 to avoid excessively large adjustments at shallow depths. The correction factor is not defined for effective stresses greater than 10 atmospheres, but the curves in Figure 7 are approaching an asymptote at this limit. Note that the value of C_N is a function of q_{c1Ncs} (Section 3.2.7), which requires an iterative/trial solution scheme to determine the overburden correction factor for a given CPT tip resistance.

Using CPT data, soil behavior can be classified using the chart in Figure 9 (Robertson 1990; Boulanger and Idriss 2016). The classification is based on a normalized cone resistance (Q):

$$Q = \left(\frac{q_c - \sigma_v}{P_a}\right) \cdot \left(\frac{P_a}{\sigma'_v}\right)^n \qquad \textbf{Equation 28}$$

where the variables are as defined previously, except the exponent n which is defined below. The classification chart also uses the normalized sleeve friction ratio (F):

$$F = \left(\frac{f_s}{q_c - \sigma_v}\right) \cdot 100\% \qquad \textbf{Equation 29}$$

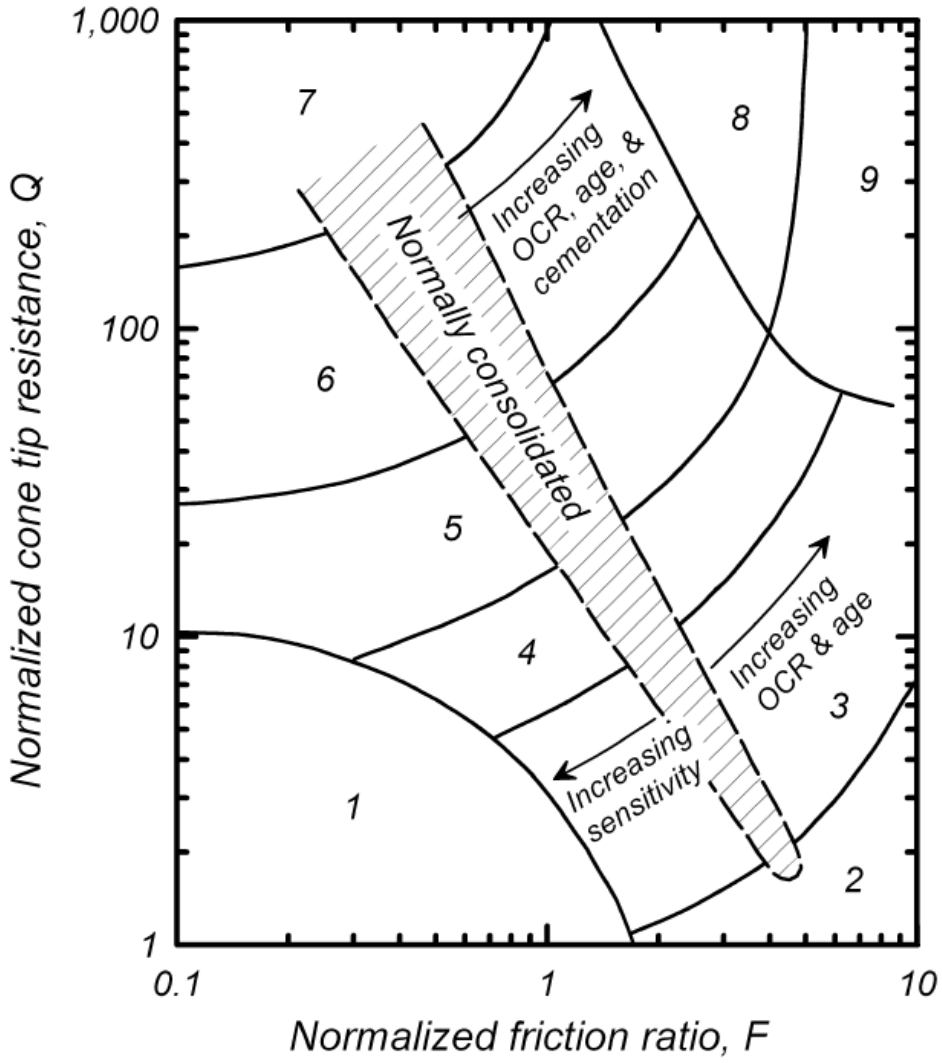
where f_s is the measured sleeve resistance (units of stress). The boundaries between soil types 2 to 7 in Figure 9 can be approximated using concentric circles having radii equal to the soil behavior type index (I_c):

$$I_c = [\,(3.47 - \log(Q))^2 + (1.22 + \log(F))^2\,]^{0.5} \qquad \textbf{Equation 30}$$

The value of the exponent (n) in Equation 28 depends on the soil type, necessitating a three-step iterative solution scheme (Robertson and Wride 1998; Boulanger and Idriss 2016):

- *Step 1*: Assume n = 1.0 (characteristic of clays) and compute I_c. If $I_c > 2.6$, the soil is classified as clayey and n = 1.0 is used. Such soils are typically clay-like.
- *Step 2*: If $I_c < 2.6$ in Step 1, assume n = 0.5 (characteristic of granular soils) and re-compute I_c. If $I_c < 2.6$, then use n = 0.5 to further evaluate sand-like liquefaction resistance.
- *Step 3*: If $I_c > 2.6$ in Step 2, the soil is probably very silty and possibly plastic. In this case, evaluate the liquefaction resistance using an intermediate value of n = 0.7.

In addition, soils with $I_c > 2.6$ and $F < 1\%$ will plot in region 1 of Figure 9; such soils may be very sensitive and should be appropriately evaluated for liquefaction resistance.



1. Sensitive, fine grained
2. Organic soils - peats
3. Clays - silty clay to clay
4. Silt mixtures - clayey silt to silty clay
5. Sand mixtures - silty sand to sandy silt
6. Sands - clean sand to silty sand
7. Gravelly sand to dense sand
8. Very stiff sand to clayey sand *
9. Very stiff, fine grained *

* Heavily overconsidated or cemented

Figure 9. Soil Behavior-Type Chart for Classifying Soils from CPT Data (Boulanger and Idriss 2014, after Robertson 1990).

3.2.7. Clean-Sand Equivalent CPT Tip Resistance

The fines content (percent passing the No. 200 sieve) of a soil can have a significant impact on liquefaction resistance. For sand-like soils with significant fines, the simplified stress-based approach (Boulanger and Idriss 2016) includes the calculation of a “clean-sand equivalent penetration resistance", q_{c1Ncs}:

$$q_{c1Ncs} = q_{c1N} + \Delta q_{c1N} \qquad \textbf{Equation 31}$$

$$\Delta q_{c1N} = \left(11.9 + \frac{q_{c1N}}{14.6}\right) \exp\left(1.63 - \frac{9.7}{FC + 2} - \left(\frac{15.7}{FC + 2}\right)^2\right)$$

where FC is the fines content in percent (percent by weight passing the No. 200 sieve, value ranging from 0 to 100). The adjustment factor is shown in Figure 10.

If sufficient laboratory data or other site-specific information are not available to estimate the fines content, Boulanger and Idriss (2016) provide a correlation of fines content to I_c (Equation 30). Note that such general correlations exhibit large scatter, as shown in Figure 11.

$$FC = 80 \cdot (I_c + C_{FC}) - 137 \qquad \textbf{Equation 32}$$

where the resulting value of FC (in percent) ranges from 0 to 100 and C_{FC} is a fitting parameter. The default value of C_{FC} is zero, but one standard deviation of the data shown in Figure 11 yields C_{FC} of -0.29 to 0.29. If site-specific data are available for calibration, the value of C_{FC} could be adjusted to improve the correlation.

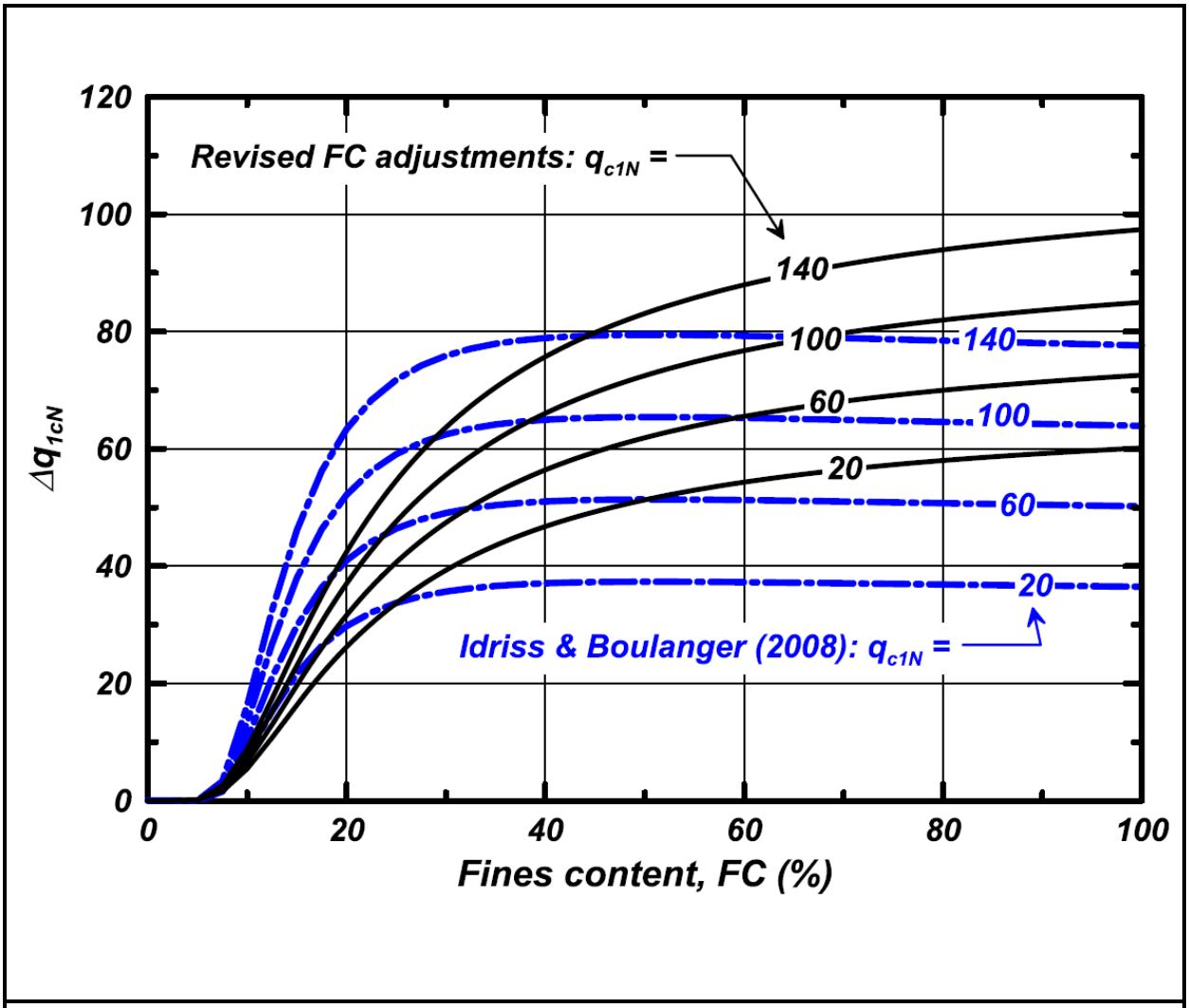


Figure 10. Equivalent clean sand adjustment for CPT-based liquefaction triggering procedures (solid lines per Boulanger and Idriss 2016).

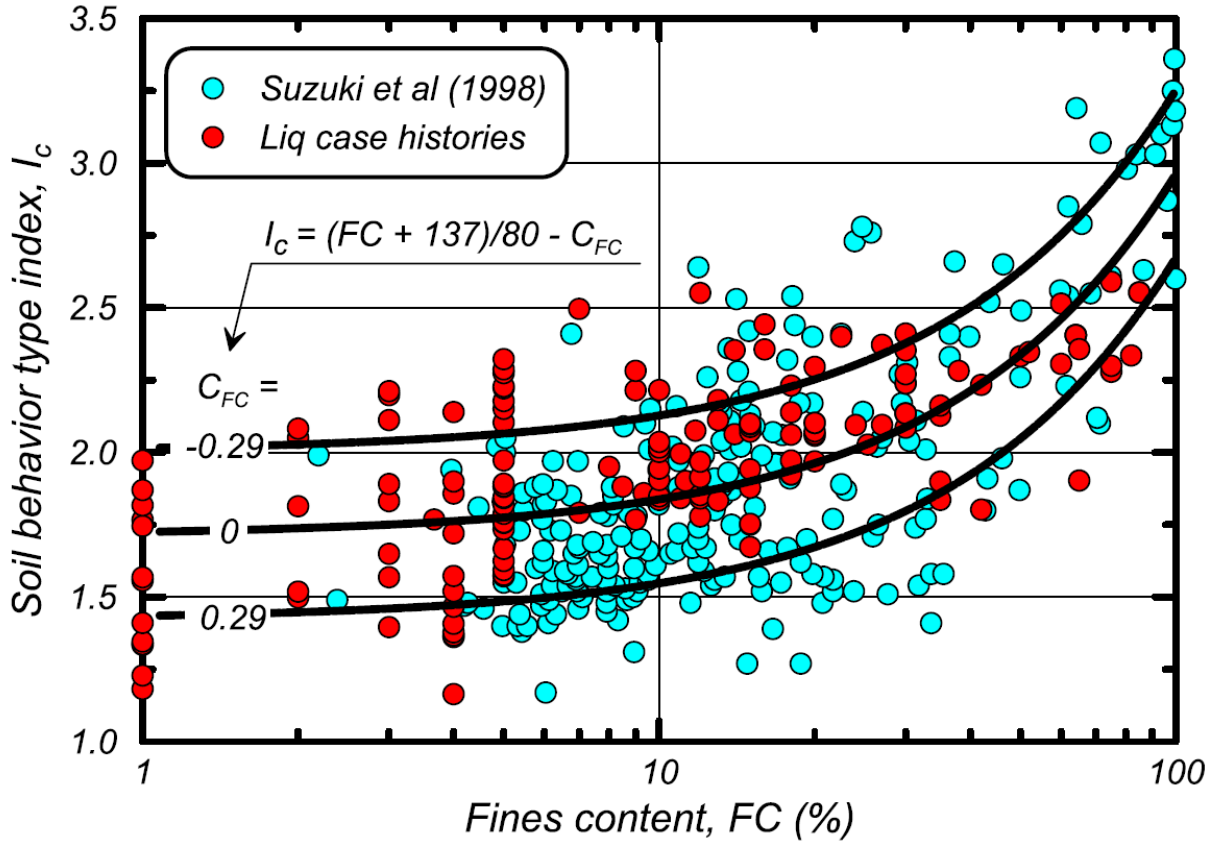


Figure 11. Correlation between I_c and FC (Boulanger and Idriss 2016).

3.2.8. Magnitude Scaling Factor for Sand-Like Soils

The simplified stress-based approach was originally developed using a database of case histories from earthquakes near magnitude 7.5. A magnitude scaling factor (MSF) is applied to the CRR to account for the greater (or lesser) number of significant stress cycles experienced in larger (or smaller) magnitude earthquakes. Boulanger and Idriss (2014; 2016) performed additional studies that indicate MSF is not only a function of earthquake magnitude, but also of soil characteristics. They express this dependency in terms of $(N_1)_{60CS}$ or q_{c1Ncs}, for SPT or CPT based analyses, respectively.

$$MSF = 1 + (MSF_{max} - 1) \cdot \left[8.64 \cdot \exp\left(\frac{-M}{4}\right) - 1.325\right]$$ **Equation 33**

$$MSF_{max} = 1.09 + \left(\frac{(N_1)_{60CS}}{31.5}\right)^2 \leq 2.2$$

$$MSF_{max} = 1.09 + \left(\frac{q_{c1Ncs}}{180}\right)^3 \leq 2.2$$

where M is the moment magnitude of the earthquake. This magnitude scaling factor for the assessment of sand-like soil liquefaction is plotted in Figure 12. The magnitude scaling factor for cyclic softening of clay-like soils is discussed in Section 3.3.2.

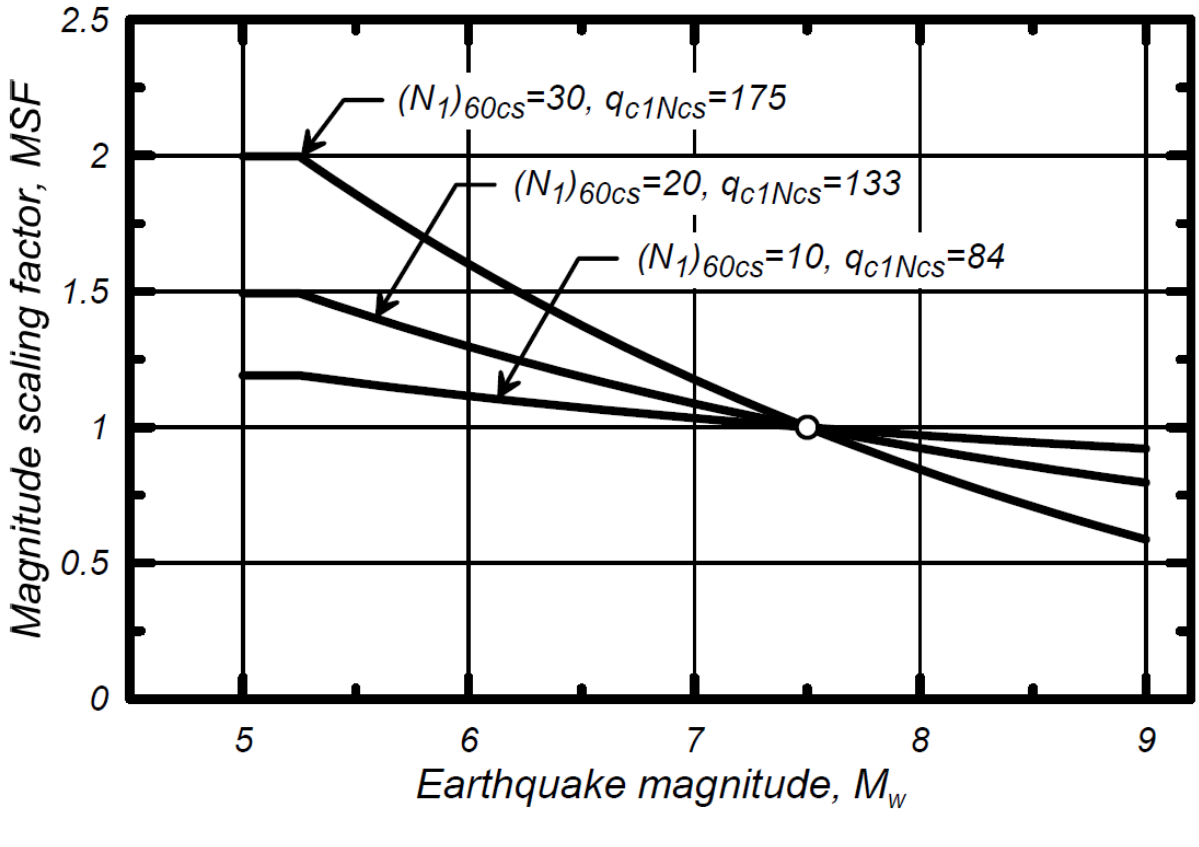


Figure 12. MSF relationship for sand-like soils (Boulanger and Idriss 2014).

3.2.9. CRR Correction for Overburden Stress in Sand-Like Soils

The simplified stress-based approach was originally developed using data from sites with a level to gently sloping surface and soil depths less than about 45 feet (Seed and Idriss 1971). Using laboratory test data,

Seed (1983) proposed two corrections to adjust the CRR for high static overburden stress and static shear stress imposed by a sloping ground surface. The K_σ correction factor extends the simplified procedure to higher overburden stresses and the K_α correction factor permits the consideration of more steeply sloping ground conditions. Both factors, when used to compute CRR per Section 3.2.3, can be significant when considering the liquefaction resistance of soils beneath large embankment dams. The K_σ factor is discussed here, while K_α is discussed separately in Section 3.2.10.

Laboratory data show a nonlinear increase in liquefaction resistance with an increase in effective confining pressure. The K_σ correction factor is thus a function of vertical effective stress, as well as relative density. The K_σ curves in Figure 13 were developed by Boulanger and Idriss (2014), and apply to both SPT and CPT-based analyses. The overburden correction factors in Figure 13 can be expressed as:

Equation 34

$$K_\sigma = 1 - C_\sigma \cdot \ln\left(\frac{\sigma'_v}{P_a}\right) \leq 1.1$$

$$C_\sigma = \frac{1}{18.9 - 2.55 \cdot \sqrt{(N_1)_{60CS}}} \leq 0.3$$

$$C_\sigma = \frac{1}{37.3 - 8.27 \cdot (q_{c1Ncs})^{0.264}} \leq 0.3$$

where P_a is one atmosphere of pressure in the units of the vertical effective stress, σ'_v. C_σ is a coefficient that is a function of relative density (D_R), which Boulanger and Idriss (2014) correlated to SPT blowcount or CPT tip resistance as shown above.

Note that labels on plots should read "$(N_1)_{60CS}$" and "q_{c1Ncs}" instead of "$(N_1)_{60}$" and "q_{c1N}".

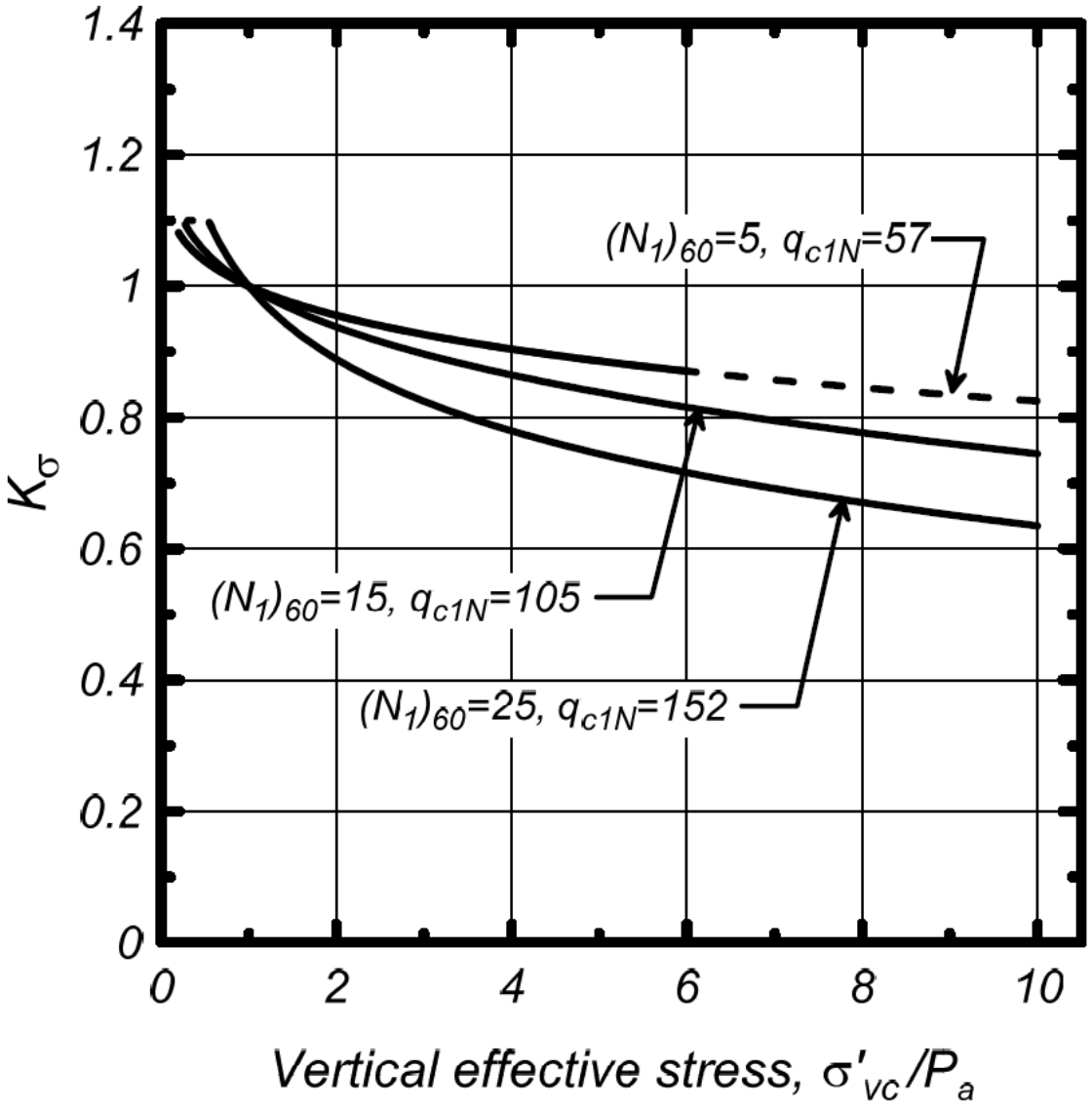


Figure 13. CRR Correction Factor for Overburden Stress (Boulanger and Idriss 2014).

3.2.10. CRR Correction for Static Shear Stress in Sand-Like Soils

A sloping ground surface creates static driving shear stresses in the underlying soil. The magnitude of these stresses is represented by the static shear stress ratio (α), which is defined as:

$$\alpha = \frac{\tau_h}{\sigma'_{vo}} \qquad \textbf{Equation 35}$$

where τ_h is the static shear stress on a horizontal plane, and σ'_{vo} is the vertical effective stress on that plane. The value of α will vary throughout the cross section of an embankment and its foundation. The value depends, in part, on the steepness of the surface slope.

To quantify α, an elastic finite element model is used to estimate and map the distribution of stresses in the cross section. Linear elasticity (with no plastic yielding) is assumed for all material zones in this model. For the initial in-situ stress state, the computed stresses are not sensitive to soil modulus, and a Young's modulus of 1×10^6 psf is assigned to all materials. Poisson's ratios (ν) for each material are approximated using the at-rest lateral earth pressure coefficient (K_o), and the correlation with drained friction angle (ϕ') suggested by Jaky (1944):

$$\nu = \frac{K_o}{1 + K_o} \approx \frac{1 - sin\phi'}{2 - sin\phi'} \qquad \textbf{Equation 36}$$

The elastic stress calculations are completed using the SIGMA/W finite element module in the GeoStudio analysis software package. This analysis is used only to obtain contours of the static stresses; the predicted displacements are of no interest and are ignored. Using the post-processing features in SIGMA/W, vertical profiles of the computed stresses are extracted from the finite element output at the location of an SPT boring or CPT sounding. The shear stress ratio (α) at each depth interval is computed from the shear and normal stresses. Interpolation or a polynomial curve is then used to obtain an estimate of α at the elevation of each SPT blowcount or CPT tip resistance.

The K_α parameter, which is used to modify the CRR (Section 3.2.3) for the effects of static shear stress, can vary widely depending upon the value of α and the relative density of the soil. Static shear stress increases the cyclic resistance of a dense soil under low confining pressure, because higher induced shear stresses are required to cause stress reversal. However, loose soils and some soils under high confining pressures have lower cyclic resistance due to strain softening behavior.

Idriss and Boulanger (2008) present K_α as a function of α and a relative state parameter index (ξ_R), which is the difference between the actual relative density (D_R) and an empirical critical state relative density ($D_{R,CS}$). The critical state relative density is a function of grain type (as it relates to particle crushing) and mean effective stress. For a given α, the value of K_α is computed from these equations (Idriss and Boulanger 2008):

$$K_\alpha = a + b \exp\left(\frac{-\xi_R}{c}\right)$$ **Equation 37**

$$a = 1267 + 636\,\alpha^2 - 634\exp(\alpha) - 632\exp(-\alpha)$$

$$b = \exp[-1.11 + 12.3\,\alpha^2 + 1.31\ln(\alpha + 0.0001)]$$

$$c = 0.138 + 0.126\,\alpha + 2.52\,\alpha^3$$

$$\xi_R = D_{R,CS} - D_R$$ **Equation 38**

$$D_{R,CS} = \frac{1}{Q - \ln\left[\frac{100\,(1 + 2K_o)\,\sigma'_{vo}}{3\,P_a}\right]}$$ **Equation 39**

$$D_R = \sqrt{\frac{(N_1)_{60CS}}{C_d}}$$ **Equation 40**

$$D_R = 0.465\left(\frac{q_{c1Ncs}}{C_{dq}}\right)^{0.264} - 1.063$$

where Q is a function of grain type (assumed to be 10, corresponding to quartz sand), at-rest lateral earth pressure coefficient K_o is assumed to be 0.5, C_d = 46 and C_{dq} = 0.9 (Idriss and Boulanger 2008). Note that the relative density correlations are a function of clean-sand equivalent blow count and tip resistance to be consistent with updated methodology (Boulanger and Idriss 2014). Equation 37 is based on data shown in Figure 14 and thus should be constrained within the following limits: $\alpha \leq 0.35$ and $-0.6 \leq \xi_R \leq 0.1$. Example values of K_α computed in this manner (for Q = 10, K_o = 0.45, and σ'_{vo} = 1 and 4 atm) are presented in the lower plots in Figure 14.

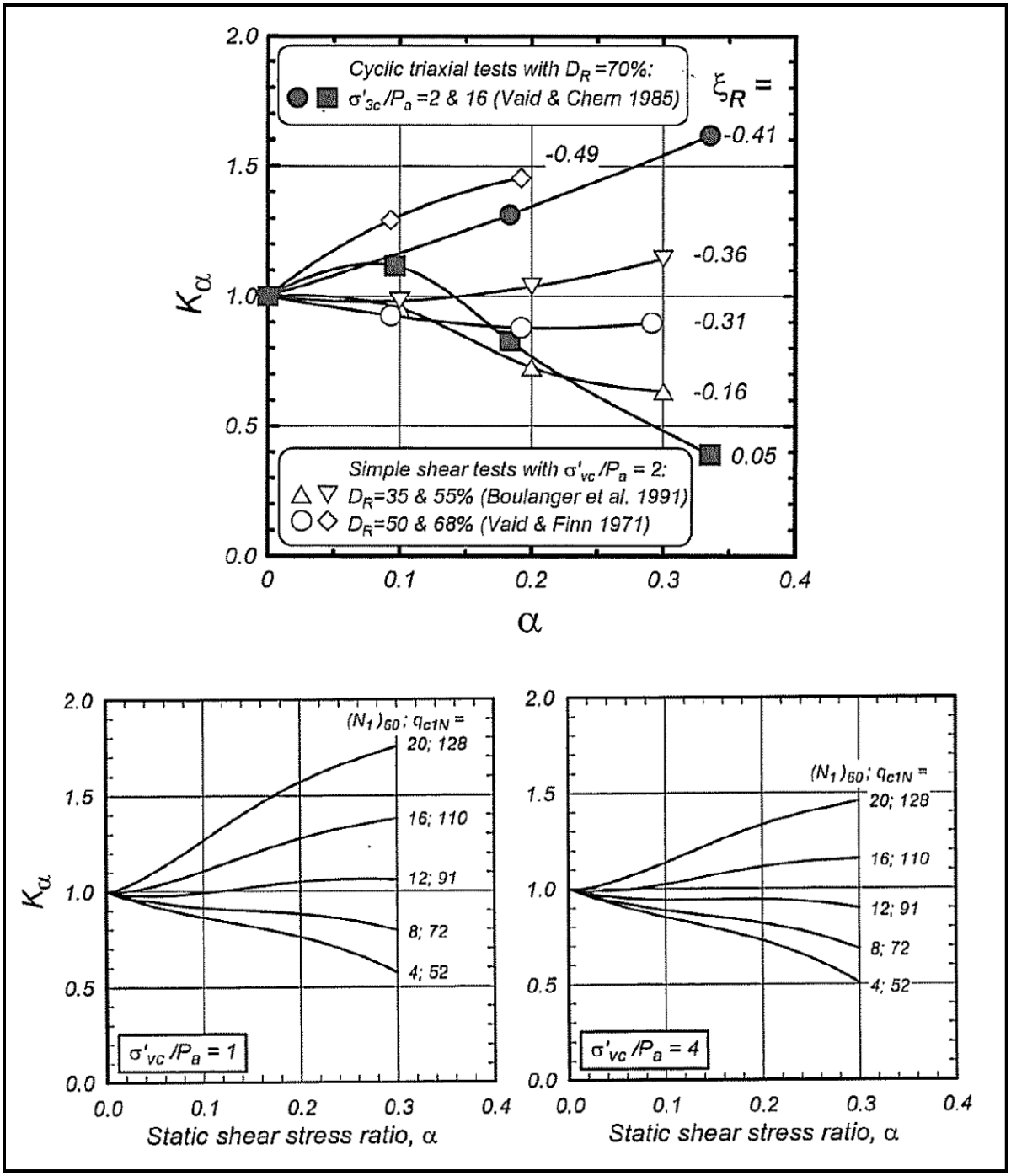


Figure 14. CRR Correction Factor for Static Driving Shear Stress (from Idriss and Boulanger 2008).

3.2.11. Liquefaction Resistance based on Shear Wave Velocity

Empirical correlations with in situ shear wave velocity V_S (Andrus and Stokoe 2000; Youd et al. 2001; Kayen et al. 2013) may be used to quantify liquefaction resistance. These methods are typically used to supplement evaluations based on penetration resistance, or where SPT or CPT data are considered unreliable (for example, in gravelly soil deposits). These approaches may also provide insight into the effects of soil cementation and aging on liquefaction potential, because the materials are not disturbed during testing as with SPT and CPT methods.

The use of V_S to estimate CRR involves several sources of uncertainty. Prior to the work by Kayen et al. (2013), a relatively small database of field case histories was available to develop these methods. The approach requires extrapolating the soil behavior measured under very small cyclic shear strains to predict behavior under much larger strains where pore pressure generation would occur. Finally, in the current relationships, the predicted CRR is sensitive to relatively small changes in V_S. In light of these uncertainties, Idriss and Boulanger (2008) recommend that greater weight be given to results of SPT and/or CPT-based liquefaction triggering analyses.

Shear wave velocities were not used to assess liquefaction in this study.

3.3. CYCLIC SOFTENING OF CLAY-LIKE SOILS

3.3.1. Screening for Susceptibility to Cyclic Softening

For soils identified as having clay-like behavior (Section 3.1.2), additional criteria should be considered to determine if significant strength loss is likely due to cyclic loading. Note that the evaluation for cyclic softening in clay-like soils is often completed for the whole layer or deposit, and not for individual data points of penetration resistance as done for sandy soils.

Three publications provide screening criteria as follows:

(1) Seed et al. (2003), in reference to Figure 4, suggest that fine-grained soils that fall in Zone B and meet the water content requirement may be susceptible to cyclic softening. Soils that fall in Zone C are clay-like, but generally not subject to cyclic softening.

(2) Bray and Sancio (2006) offer a screening method based on plasticity index (PI) and the ratio of the natural moisture content (w_c) to the liquid limit (LL), as shown in Figure 15:

- Susceptible to cyclic softening: PI ≤ 12 and $w_c \geq 0.85$ LL
- Not susceptible: PI > 18 or $w_c < 0.8$ LL
- Moderately susceptible: Intermediate conditions

(3) The MSHA design guidance (D'Appolonia 2010) presents these screening criteria for clay-like soils:

- Susceptible to cyclic softening: SPT $N_{60} < 6$, where the SPT blowcounts are corrected for hammer energy and other test details (Section 3.2.4.1), but not corrected for overburden pressure.
- Susceptible to cyclic softening: CPT results plotting in Zone C of Figure 16.

- Not susceptible: CPT results plotting in Zone B of Figure 16 (note that Zones A_1 and A_2 are sand-like soils).

For clay-like soils, the three sets of screening criteria presented above may provide conflicting indications of behavior under dynamic load. All of these criteria are used together, with engineering judgment, to determine if a particular soil stratum is susceptible to cyclic softening.

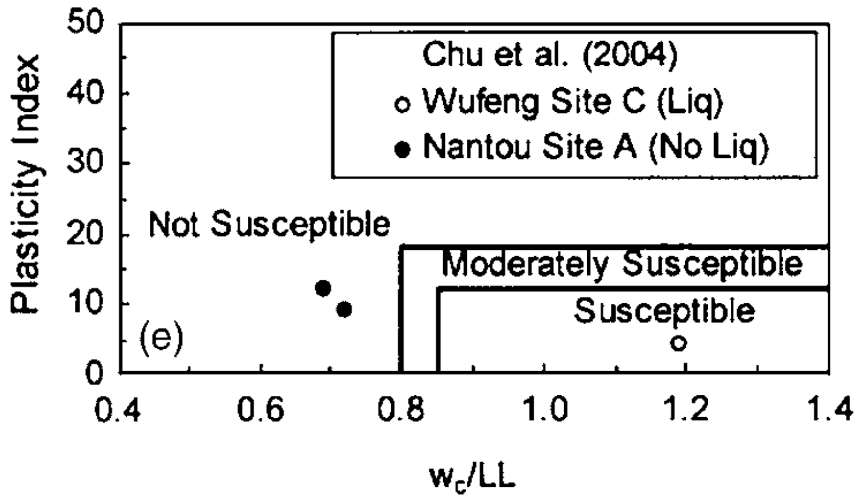
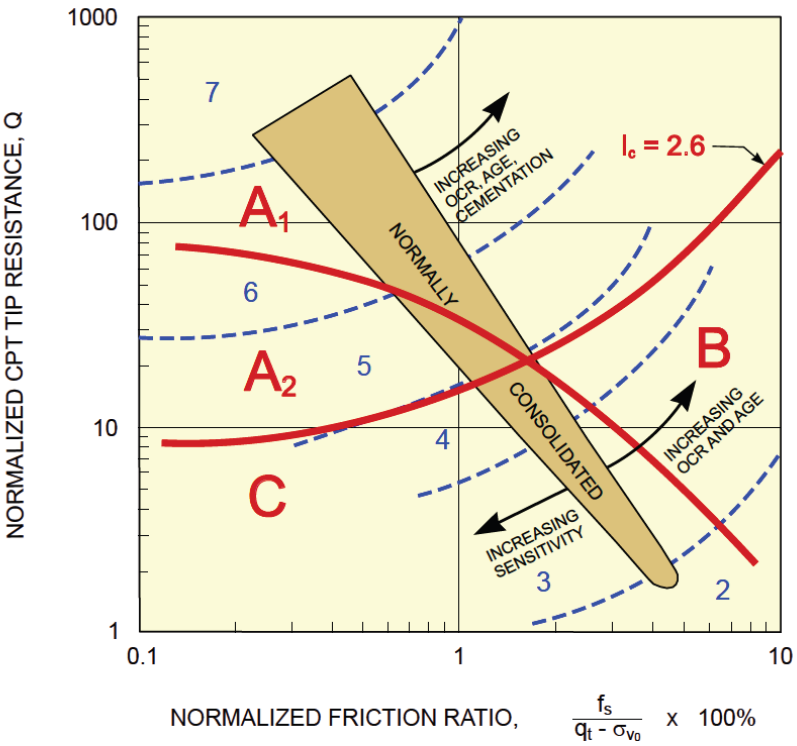


Figure 15. Screening Criteria for Assessing Cyclic Softening in Clay-like Soils (Bray and Sancio 2006).



NOTE:
1. VALUES OF Q AND F ARE COMPUTED FROM CPT DATA AT THE DEPTHS OF INTEREST, AS DESCRIBED IN YOUD ET AL. (2001).
2. CPT DATA THAT PLOT IN ZONES A_1 AND A_2 INDICATE MATERIAL THAT IS NOT CONSIDERED CLAY-LIKE, SO THIS SCREENING METHOD IS NOT APPLICABLE.
3. CPT DATA THAT PLOT IN ZONE B INDICATE CLAY-LIKE MATERIAL THAT IS NOT SUSCEPTIBLE TO STRENGTH LOSS.
4. CPT DATA THAT PLOT IN ZONE C INDICATE CLAY-LIKE MATERIAL THAT MAY BE SUSCEPTIBLE TO STRENGTH LOSS.
5. NUMBERED ZONES SEPARATED BY DASHED BLUE LINES ARE FOR REFERENCE ONLY AND ARE A GUIDE TO SOIL TYPES, AS DESCRIBED IN YOUD ET AL. (2001). FOR EXAMPLE, DATA IN ZONE 3 INDICATE SILTY CLAY TO CLAY WHILE DATA IN ZONE 6 INDICATE CLEAN SAND TO SILTY SAND. THE LINE SEPARATING SAND-LIKE FROM CLAY-LIKE MATERIAL CORRESPONDS TO A SOIL BEHAVIOR TYPE INDEX (I_c) OF 2.6, AS ALSO DESCRIBED IN YOUD ET AL. (2001).

Figure 16. Screening Criteria for Assessing Cyclic Softening in Clay-like Soils (D'Appolonia 2010; adapted from Robertson 2008).

3.3.2. Factor of Safety for Cyclic Softening

If a clay-like soil is screened as susceptible to cyclic softening, further analysis is performed to evaluate the potential for triggering in a given earthquake. Using the empirical method developed by Idriss and Boulanger (2008), the cyclic resistance of a clay-like soil is estimated based on the static undrained strength ratio. The evaluation is made using a strength ratio that is representative of the entire soil layer, instead of using SPT or CPT data for certain depth increments. Key aspects of this method are summarized below.

The factor of safety for triggering cyclic softening in clay-like soils is analogous to the factor of safety for liquefaction in sand-like soils (Equation 13). For characterizing clay-like soils, failure due to cyclic softening is assumed to occur at 3% cyclic shear strain (γ = 3%). The factor of safety for cyclic softening of clay-like soils is then defined as:

$$\left(FS_{\gamma=3\%}\right)_{clay} = \frac{(CRR)_{clay}}{CSR} \qquad \textbf{Equation 41}$$

The CSR is the cyclic stress ratio (Section 3.2.2). The CSR for evaluating cyclic softening in clay-like soils is the same as used to evaluate liquefaction in sand-like soils (see Equation 15).

3.3.3. Cyclic Resistance Ratio for Clay-Like Soils

The cyclic resistance ratio (CRR) for a reference earthquake of M = 7.5 is 80% of the "c/p ratio" for the clay-like soil (see Exhibit J.4). That is:

$$(CRR_{7.5})_{clay} = 0.80 \cdot \frac{S_u}{\sigma'_{vo}} \qquad \textbf{Equation 42}$$

S_u is the static undrained shear strength and σ'_{vo} is the vertical effective stress during consolidation.

The reference CRR is modified for earthquake magnitude and initial static shear stress:

$$(CRR)_{clay} = (CRR_{7.5})_{clay} \cdot MSF_{clay} \cdot (K_\alpha)_{clay} \qquad \textbf{Equation 43}$$

3.3.4. Magnitude Scaling Factor for Clay-Like Soils

Cyclic laboratory testing on clay-like soils has shown that the typical relationships between CSR and number of uniform cycles to failure are much flatter than for sands. Thus, the relationship between MSF and earthquake moment magnitude (M) is also much flatter, as shown in Figure 17 (Idriss and Boulanger 2008):

$$MSF_{clay} = 1.12 \cdot \exp(-0.25M) + 0.828 \leq 1.13 \qquad \textbf{Equation 44}$$

3.3.5. CRR Correction for Static Shear Stress in Clay-Like Soils

The effects of initial static shear stress on the cyclic strength of clay can be expressed using a K_α factor, as with sands. The correction factor for clays is (Idriss and Boulanger 2008):

$$(K_\alpha)_{clay} = 1.344 - \frac{0.344}{\left(1 - \frac{\alpha}{0.22 \cdot (OCR^{0.8})}\right)^{0.638}} \qquad \textbf{Equation 45}$$

The static driving shear stress is represented by the shear stress ratio, α (Equation 35), and OCR is the overconsolidation ratio.

Note that MSF equation for sand shown in this figure has been superseded. See Figure 12.

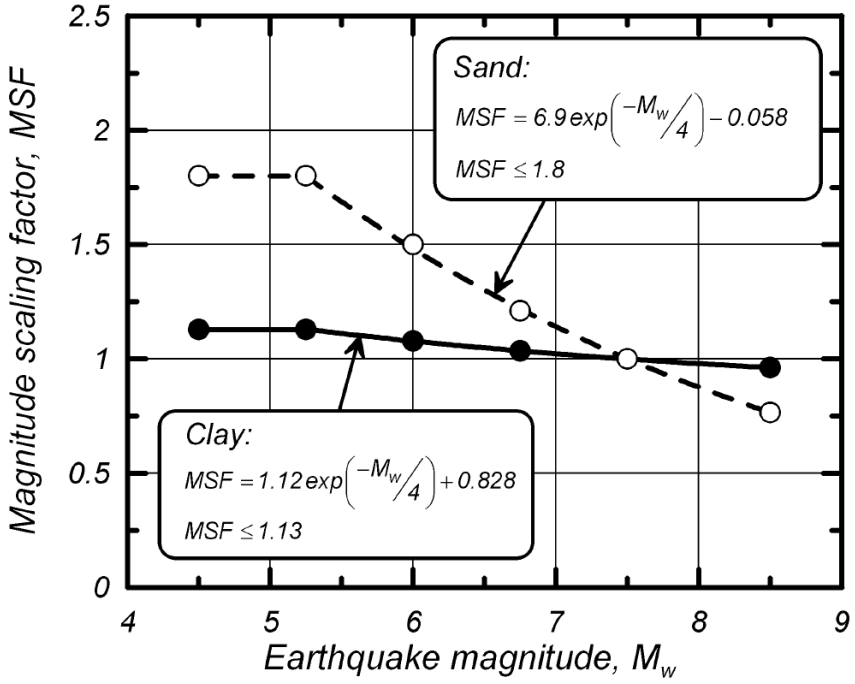


Figure 17. MSF relationship for clay-like soils (Idriss and Boulanger 2008).

4. SEISMIC DEFORMATION ANALYSIS

4.1. CONDITIONS REQUIRING DEFORMATION ANALYSIS

An earthquake may cause excessive embankment deformations, even if the slopes are otherwise stable. Embankment displacements resulting from an earthquake are predicted if both of the following conditions are met:

- Soil liquefaction is not predicted,
- The post-earthquake static stability analysis indicates a factor of safety greater than or equal to 1.0.

In this case, the seismic deformations are estimated using Newmark displacement analyses, as described in Section 4.2.

More advanced methods (Section 4.3) are required to estimate seismic deformations if the slopes are not seismically stable. The embankment slopes should be treated as unstable if significant liquefaction occurs and the post-earthquake factor of safety is less than 1.0.

Note that SRME-SPP-27.001 requires deformation analyses when the post-earthquake factor of safety is greater than or equal to 1.1. However, in accordance with TVA's scope of work for this project, deformation analyses are required when the post-earthquake factor of safety is greater than or equal to 1.0.

4.2. DEFORMATION OF STABLE SLOPES

4.2.1. Newmark Analyses

If an earth slope is seismically stable, the magnitude of earthquake-induced permanent deformations can be estimated using a Newmark sliding block analysis (Newmark 1965). The Newmark displacement analysis is based on the analogy of a block sliding down an inclined plane. When the plane is shaken, the block accelerates down the plane whenever the static and dynamic sliding forces exceed the sliding resistance. Movement of the block slows (de-accelerates) when the sliding resistance is greater than the sliding forces. The block thus moves down the plane in pulses, and the accumulated displacements can be computed by double integration of the input acceleration record (Figure 18).

In a slope stability problem, this analogy translates to the failure mass sliding whenever the horizontal, downslope ground acceleration exceeds the horizontal yield acceleration for the failure surface. The failure surface geometry and associated yield acceleration for a soil mass are found from pseudostatic, limit equilibrium, slope stability analyses. The input ground motion is estimated by performing ground response analyses at multiple locations along the failure surface and averaging these motions. Finally, the acceleration time history of the input motion is compared to the yield acceleration. Where the input, downslope acceleration exceeds the yield acceleration, the time history is integrated twice to calculate displacements (Figure 18). Displacements accumulate over the time history to produce an estimate of the total permanent deformation due to the earthquake. Slope displacements are assumed to stop when the earthquake ends, consistent with the assumption of post-earthquake stability.

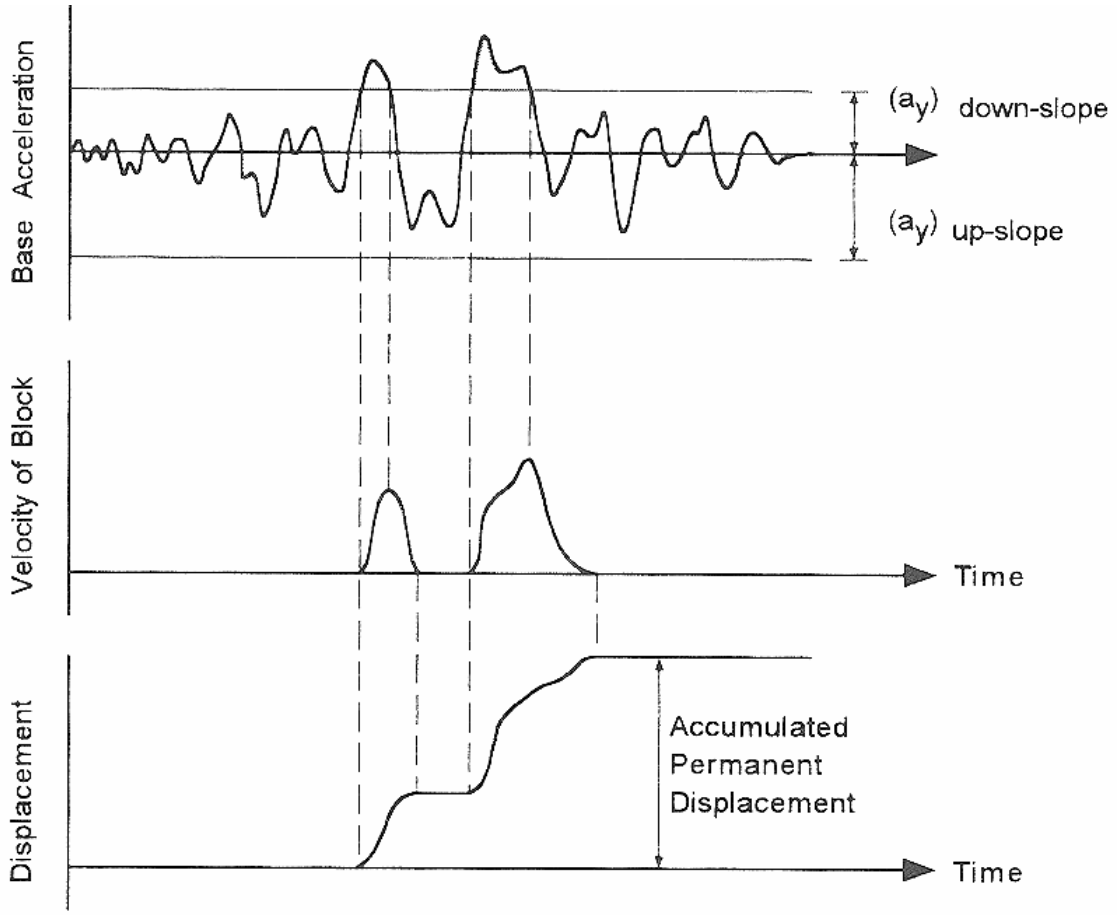


Figure 18. Calculation of Permanent Displacement in a Newmark Type Analysis (after Kramer 1996).

The yield acceleration (k_y) for a given slope is determined from a series of pseudostatic slope stability analyses, in which the horizontal pseudostatic coefficient (k_h) is varied in each trial. For each trial k_h, the critical slip surface is located and the factor of safety (FS_{slope}) is computed in a two-stage, limit equilibrium analysis. The yield acceleration (k_y), expressed as a fraction of the acceleration due to gravity, is equal to the value of k_h that results in FS_{slope} equal to one.

Where the surficial embankment materials are cohesionless, an infinite slope mechanism (with a shallow slip surface) will be critical. However, shallow sloughing could be repaired after an earthquake. This seismic assessment is focused on mechanisms that might result in an unacceptable condition; hence, the deformation analyses consider only slip surfaces that are deep enough to intercept the CCR stored within the unit. This treatment is consistent with the evaluations of static slope stability.

Assuming no liquefaction, the predicted slope displacements are somewhat conservative because the yield acceleration is computed with reduced, undrained soil strengths. In reality, the yield acceleration declines in successive cycles of seismic loading, as pore pressures accumulate and saturated soils become weaker. The analysis outlined here assumes reduced strengths at the start of the earthquake, so the computed yield acceleration is lower than the initial value in the slope.

4.2.2. Equivalent Acceleration Time History

A conventional Newmark displacement analysis assumes that the soil above the failure surface behaves as a rigid mass, when the soil mass is actually flexible. As a result, different ground motion time histories occur at different elevations, and those motions are out of phase. The flexibility of the soil profile above the failure plane can be modeled using equivalent-linear ground response analyses, and partly accounted for in a Newmark analysis by using a "horizontal equivalent acceleration" (HEA). The HEA is the acceleration in a flexible soil profile that would cause the same time history of shear stress if the materials above the failure plane were rigid. Equation 46, derived using Newton's second law for the horizontal acceleration of a rigid block (Kramer and Smith 1997), expresses the HEA time history as a function of the shear stress time history on a failure surface.

$$HEA(t) = \frac{\tau_h(t)}{\sigma_v} \cdot g \qquad \textbf{Equation 46}$$

Here, $\tau_h(t)$ is the time history of shear stress on the failure surface, σ_v is the total vertical stress at the failure surface, and g is the acceleration due to gravity. When computed at different points along a failure surface, the HEA will vary with position. Abramson et al. (2002) suggest computing HEA at different offsets and computing a weighted average:

$$HEA_{avg}(t) = \frac{\sum_{i=1}^{i=n} m_i \cdot HEA_i(t)}{\sum_{i=1}^{i=n} m_i} = \frac{\sum_{i=1}^{i=n} \sigma_{vi} \cdot HEA_i(t)}{\sum_{i=1}^{i=n} \sigma_{vi}} \qquad \textbf{Equation 47}$$

Here, m_i is the mass of the overlying column above point i, σ_{vi} is total vertical stress at point i, and $HEA_i(t)$ is the horizontal equivalent acceleration time history at point i. If we consider three different points (A, B, and C) along the failure surface, and substitute Equation 46 for $HEA_i(t)$ in Equation 47, the relationship simplifies to:

$$HEA_{avg}(t) = \frac{\tau_{hA}(t) + \tau_{hB}(t) + \tau_{hC}(t)}{\sigma_{VA} + \sigma_{VB} + \sigma_{VC}} \cdot g \qquad \textbf{Equation 48}$$

For estimating the displacement on a slope, $HEA_{avg}(t)$ is computed using ground response analyses for vertical soil profiles at the crest, mid-height, and toe of the slope (locations A, B, and C in Equation 48). That is, three separate ground response analyses (Section 2) are completed for soil profiles at the crest, mid-height, and toe of the slope. Where the slip surface (corresponding to the yield acceleration) does not extend to the crest or toe, the profiles may be moved to locations near the top, middle, and bottom of the slide mass. More than three profile locations may be needed to adequately represent large slide masses or complex failure mechanisms. For each ground response analysis, the shear stress time histories and total vertical stresses ($\tau_h(t)$ and σ_v) are recorded at the elevation of the slip surface for the yield acceleration. The results are then combined to compute the average HEA time history, per Equation 48.

The resulting average HEA time history is then compared to the yield acceleration, and any periods of exceedance are double integrated to calculate permanent displacements along the critical slip surface. The computation of the HEA time history and the double integration is completed in a spreadsheet calculation.

4.2.3. Summary of Procedure

Displacements are computed and reported for each cross section, for upstream and downstream slope movements, and for each earthquake time history. To summarize, the displacement calculation for each case involves the following steps:

(1) Run a series of pseudostatic slope stability analyses, varying the horizontal pseudostatic coefficient (k_h) and searching for the critical slip surface in each run. Ignore shallow slip surfaces that do not encompass the full width of the dam crest.

(2) The value of k_h that results in $FS_{slope} = 1.0$ is the yield acceleration (k_y); record the yield acceleration and the geometry of the associated slip surface.

(3) Select three (possibly more) offset locations for computing acceleration time histories, usually at the crest/mid-slope/toe of the slope, or the top/middle/bottom of the slide mass.

(4) Run a ground response analysis (Section 2) for each of the selected profiles, recording the time history of shear stresses at the elevation where the slip surface crosses the profile.

(5) Compute the average time history, $HEA_{avg}(t)$ per Equation 48, using the shear stress time histories and vertical stresses on the slip surface at the selected offset locations.

(6) Compute the predicted displacement using the average HEA time history and the yield acceleration.

4.3. DEFORMATION OF UNSTABLE SLOPES

Earth slopes should be considered seismically unstable if significant liquefaction occurs and the post-earthquake factor of safety for slope stability is less than the limit stated in Section 4.1. In this case, large deformations and a slope failure should be expected. If the factor of safety is low enough, slope movements may continue after the seismic ground motions stop. The methods described in Section 4.2 are inadequate for modeling this case, and more advanced methods of analysis are required.

If significant soil liquefaction is triggered by an earthquake, the acceleration time histories at points above the liquefied zone, as predicted by the ground response analysis, will be unreliable. Hence, the methods described in Section 4.2 are not suitable if liquefaction occurs.

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APPENDIX G.5

CCR MATERIAL CHARACTERISTICS INVESTIGATION SAMPLING AND ANALYSIS REPORT

Kingston Fossil Plant
CCR Material Characteristics Investigation
Sampling and Analysis Report

TDEC Commissioner's Order
Environmental Investigation Plan
Kingston Fossil Plant
Harriman, Tennessee

September 1, 2020

Prepared for:

Tennessee Valley Authority
Chattanooga, Tennessee

Prepared by:

Stantec Consulting Services Inc.
Lexington, Kentucky

Revision Record

Revision	Description	Date
0	Submittal to TDEC	June 29, 2020
1	Addresses August 18, 2020 TDEC Review Comments and Issued for TDEC	September 1, 2020

Sign-off Sheet

This document entitled Kingston Fossil Plant CCR Material Characteristics Investigation Sampling and Analysis Report was prepared by Stantec Consulting Services Inc. (“Stantec”) for the account of Tennessee Valley Authority (the “Client”). Any reliance on this document by any third party is strictly prohibited. The material in it reflects Stantec’s professional judgment in light of the scope, schedule and other limitations stated in the document and in the contract between Stantec and the Client. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. In preparing the document, Stantec did not verify information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions taken based on this document.

Prepared by Rachel Norman

Rachel Norman, Engineer In Training

Reviewed by Rebekah Brooks

Rebekah Brooks, Principal Hydrogeologist

Approved by J. M. Kerr, Jr.

James M. Kerr, Jr., Senior Principal Geologist

Table of Contents

ABBREVIATIONS ..... **III**

1.0 INTRODUCTION **1**

2.0 OBJECTIVE AND SCOPE **2**

3.0 FIELD ACTIVITIES **3**
3.1 WORK LOCATIONS 4
3.2 DOCUMENTATION 5
3.2.1 Field Forms 5
3.2.2 Equipment Calibration 8
3.2.3 Photographs 8
3.3 SAMPLING METHODS 8
3.3.1 Drilling 8
3.3.2 CCR Material Sampling 9
3.3.3 Pore Water Gauging and Sampling 10
3.4 INVESTIGATION DERIVED WASTE 11
3.5 SAMPLE SHIPMENT 12
3.6 VARIATIONS 12
3.6.1 Variations in Scope 12
3.6.2 Variations in Procedures 13

4.0 SUMMARY **14**

5.0 REFERENCES **15**

LIST OF TABLES

Table 1 - Summary of Boring and Temporary Well Locations 4

LIST OF APPENDICES

APPENDIX A EXHIBITS

Exhibit A.1. Temporary Well and Boring Location Map

APPENDIX B TABLES

Table B.1. Summary of CCR Material Samples
Table B.2. CCR Material Analytical Results for Metals, Anions, and General Chemistry
Table B.3. CCR Material Analytical Results for Radiological Parameters
Table B.4. CCR Material pH Field Results
Table B.5. Pore Water Level Measurements
Table B.6. Summary of Pore Water Samples
Table B.7. Summary of Pore Water Quality Parameters
Table B.8. Pore Water Analytical Results for Metals, Anions, and General Chemistry
Table B.9. Pore Water Analytical Results for Radiological Parameters

APPENDIX C SUBSURFACE LOGS

APPENDIX D PHOTOGRAPHIC LOGS

Attachment D.1. Photographic Logs of CCR Material Cores - Temporary Wells
Attachment D.2. Photographic Logs of CCR Material Cores - Additional Borings

Abbreviations

ASTM	American Society for Testing and Materials
CCR Parameters	Constituents listed in Appendices III and IV of 40 CFR 257 and five inorganic constituents included in Appendix I of Tennessee Rule 0400-11-01-.04
CCR	Coal Combustion Residuals
CFR	Code of Federal Regulations
COC	Chain of Custody
DO	Dissolved Oxygen
EAR	Environmental Assessment Report
EIP	Environmental Investigation Plan
ENV	Environmental
EnvStds	Environmental Standards, Inc.
FSP	Field Sampling Personnel
HSA	Hollow Stem Auger
ID	Identification
IDW	Investigation Derived Waste
KIF Plant	Kingston Fossil Plant
mg/L	Milligrams per liter
NIST	National Institute of Standards and Technology
NTU	Nephelometric Turbidity Units
ORP	Oxidation Reduction Potential
PG	Professional Geologist
PPE	Personal protective equipment
QAPP	Quality Assurance Project Plan
QC	Quality Control
SAP	Sampling and Analysis Plan
SAR	Sampling and Analysis Report
Stantec	Stantec Consulting Services Inc.
TDEC	Tennessee Department of Environment and Conservation
TDEC Order	Commissioner's Order No. OGC15-0177
TestAmerica	TestAmerica Laboratories, Inc.
TI	Technical Instruction
TVA	Tennessee Valley Authority

1.0 INTRODUCTION

Stantec Consulting Services Inc. (Stantec) has prepared this Sampling and Analysis Report (SAR) on behalf of the Tennessee Valley Authority (TVA) to document the activities related to a coal combustion residuals (CCR) material characteristics investigation at TVA's Kingston Fossil (KIF) Plant located at 714 Swan Pond Road in Harriman, Tennessee.

The purpose of the CCR material characteristics investigation is to characterize leachability of CCR-related constituents from material within two CCR units at the KIF Plant, in support of fulfilling the requirements for the Tennessee Department of Environment and Conservation (TDEC) issued Commissioner's Order No. OGC15-0177 (TDEC Order) to TVA (TDEC 2015). The TDEC Order sets forth a "process for the investigation, assessment, and remediation of unacceptable risks" at the TVA's coal ash disposal sites in Tennessee.

The purpose of this SAR is to document the work completed during the CCR material characteristics investigation and to present the information and data collected during the execution of the CCR Material Characteristics Sampling and Analysis Plan (SAP) (Stantec 2018a). This SAR is not intended to provide conclusions or evaluations of results. The scope of the CCR material characteristics investigation represented herein was conducted pursuant to the SAP and is part of a larger environmental investigation at the KIF Plant. The evaluation of the results will consider other aspects of the environmental investigation, as well as data collected under other State and/or CCR programs, and be presented in the Environmental Assessment Report (EAR).

The CCR material characteristics investigation activities were performed in conjunction with the exploratory drilling investigation at the KIF Plant in general accordance with the following documents developed by TVA to support fulfilling the requirements of the TDEC Order:

- *CCR Material Characteristics SAP* (Stantec 2018a)
- *Environmental Investigation Plan (EIP)* (Stantec 2018b)
- *Exploratory Drilling SAP* (Stantec 2018c*)*
- *Quality Assurance Project Plan (QAPP)* (Environmental Standards, Inc. 2018).

The CCR Material Characteristics SAP was implemented in accordance with TVA- and TDEC- approved Programmatic- and Project-specific changes. Minor variations in scope and procedures from those outlined in the CCR Material Characteristics SAP occurred during field activities due to field conditions and programmatic updates and are referenced in Section 3.6.

Laboratory analysis of constituents was performed by TestAmerica Laboratories, Inc. (TestAmerica) in St. Louis, Missouri (radium samples only), and in Pittsburgh, Pennsylvania (all other analytes). Additional Quality Assurance oversight on data acquisition protocols, sampling practices, and data validation and/or verification was performed by Environmental Standards, Inc. (EnvStds) under direct contract to TVA.

2.0 OBJECTIVE AND SCOPE

The primary objective of the CCR material characteristics investigation conducted pursuant to the CCR Material Characteristics SAP at the KIF Plant was to collect CCR material and pore water samples for characterization related to the leachability of CCR-related constituents from material within two CCR units: the Interim Ash Staging Area and the Sluice Trench and Ballfield East of Sluice Trench. The approach for the investigation was to:

- Collect CCR material samples for chemical analyses from the temporary well borings and other borings drilled as part of the KIF Plant exploratory drilling investigation
- Following installation and development of the temporary wells, measure pore water levels and collect pore water samples for chemical analyses.

The scope of work of the CCR material characteristics investigation consisted of the following tasks:

- Collecting CCR material samples and associated quality control (QC) samples at the temporary well borings for laboratory analysis of CCR-related constituents and to identify the interface between the CCR material and underlying foundation soils during drilling
- Collecting pore water level measurements
- Collecting pore water samples and associated QC samples from the temporary wells for analysis of CCR-related constituents and water quality parameters.

These activities were carried out concurrently with advancement of borings and after the installation of temporary wells conducted as part of the KIF Plant exploratory drilling investigation. Drilling, geotechnical sampling, and temporary well installation and development activities were performed in accordance with the Exploratory Drilling SAP and reported in the KIF Plant Exploratory Drilling SAR.

3.0 FIELD ACTIVITIES

CCR material characteristics investigation field activities were conducted between November 12, 2018 and April 12, 2019, and between December 2 and 5, 2019. Stantec performed field activities for the CCR material characteristics investigation based on guidance and specifications listed in TVA's Environmental (ENV) Technical Instructions (TIs), the SAP, and the QAPP, except as noted in the Variations section of this report. As part of TVA's commitment to generate representative and reliable data, data validation and/or verification of laboratory analytical data was performed by EnvStds under direct contract with TVA. EnvStds also conducted audits of field activities and provided quality reviews of field documentation. In addition, on behalf of TDEC, Civil and Environmental Consultants, Inc. (CEC) collected split CCR material samples during this sampling event. Additional information regarding CEC split sample collection is provided in Sections 3.3.2 and 3.3.3.2.

During the CCR material characteristics investigation, Stantec conducted the following field activities:

- Collected CCR material samples at the five temporary well borings and seven additional borings during drilling
- Recorded field measurements of CCR material pH at the 12 sampled boring locations (see Section 3.3.2 for more detail)
- Following temporary well installation and development activities, collected pore water level measurements from the five temporary wells prior to sampling
- Recorded field measurements of pore water quality parameters during purging and stabilization at the five sampled temporary wells
- Collected filtered and unfiltered pore water samples from the five temporary well locations
- Collected QC samples including four matrix spike/matrix spike duplicates, five field duplicates, 18 field blanks, four equipment blanks, one liner blank, one tubing blank, and one filter blank
- Conveyed collected samples via a laboratory-provided courier service to TestAmerica for analysis.

Details on each activity are presented in the sections below. The CCR material characteristics investigation temporary wells and additional boring locations are shown on Exhibit A.1 in Appendix A. Appendix B provides tabulated information collected during the investigation, including summaries of samples collected, pore water measurements, field measurements, and analytical results in Tables B.1 through B.9. Subsurface boring logs and photographic logs of the CCR material cores are provided in Appendices C and D, respectively.

3.1 WORK LOCATIONS

The CCR material characteristics investigation field activities were initially completed at five temporary well locations (KIF-TW01 through KIF-TW05) at the KIF Plant under the CCR material characteristics investigation scope of work. Following analysis of the CCR material samples from the five temporary wells, seven additional borings (KIF-B01a, KIF-B01b, KIF-B02a, KIF-B02b, KIF-B03a, KIF-B03b, and KIF-B04a) were advanced and sampled to fulfill the scope for both the exploratory drilling and CCR material characteristics investigations. The objective of the additional borings was to drill and sample the uppermost foundation soils underlying the two CCR units and identify the CCR material and foundation soil interface. Temporary well and additional boring locations are shown on Exhibit A.1 in Appendix A.

Prior to the successful completion of boring KIF-TW03, two other drilling attempts (KIF-TW03a and KIF-TW03b) were made near the northeast boundary of the Interim Ash Staging Area. During drilling and sampling at boring KIF-TW03a, the hollow stem auger (HSA) drill rig and split spoon sampler were unable to be advanced and the location was moved to boring KIF-TW03b, where the same issue was encountered. Based on review of available information, the locations of borings KIF-TW03a and KIF-TW03b had been advanced in a previously decommissioned area partially filled with rock and gravel. The location was then moved outside of the decommissioned area footprint and boring KIF-TW03 was completed, as shown on Exhibit A.1 in Appendix A. Analytical samples were not submitted for analysis from boring locations KIF-TW03a and KIF-TW03b.

A summary of the boring and temporary well locations is provided in Table 1 below.

Table 1 - Summary of Boring and Temporary Well Locations

Boring ID	Temporary Well ID	Location	Rationale
KIF-TW01	KIF-TW01	Northwest boundary of Interim Ash Staging Area	To assess CCR material characteristics and pore water quality
KIF-TW02	KIF-TW02	Southwest boundary of Interim Ash Staging Area	To assess CCR material characteristics and pore water quality
KIF-TW03	KIF-TW03	Northeast boundary of Interim Ash Staging Area	To assess CCR material characteristics and pore water quality
KIF-TW03a	NA	Attempted near Northeast boundary of Interim Ash Staging Area, within decommissioned area partially filled with rock and gravel	Attempted to assess CCR material characteristics and pore water quality. Hit refusal before reaching planned depth
KIF-TW03b	NA	Attempted near Northeast boundary of Interim Ash Staging Area, within decommissioned area partially filled with rock and gravel	Attempted to assess CCR material characteristics and pore water quality. Hit refusal before reaching planned depth
KIF-TW04	KIF-TW04	Southwest boundary of Sluice Trench and Ballfield East of the Sluice Trench	To assess CCR material characteristics and pore water quality

Table 1 - Summary of Boring and Temporary Well Locations (continued)

Boring ID	Temporary Well ID	Location	Rationale
KIF-TW05	KIF-TW05	Northeast boundary of Sluice Trench and Ballfield East of the Sluice Trench	To assess CCR material characteristics and pore water quality
KIF-B01a	NA	Northwest boundary of Interim Ash Staging Area, within 50 feet of temporary well KIF-TW01	To identify the interface between the CCR material and foundation soil
KIF-B01b	NA	Northwest boundary of Interim Ash Staging Area, within 50 feet of temporary well KIF-TW01	To identify the interface between the CCR material and foundation soil. Second boring was necessary for adequate sample volume
KIF-B02a	NA	Southwest boundary of Interim Ash Staging Area, within 50 feet of temporary well KIF-TW02	To identify the interface between CCR material and foundation soil
KIF-B02b	NA	Southwest boundary of Interim Ash Staging Area, within 50 feet of temporary well KIF-TW02	To identify the interface between CCR material and foundation soil. Second boring was necessary for adequate sample volume
KIF-B03a	NA	Northeast boundary of Interim Ash Staging Area, within 50 feet of temporary well KIF-TW03	To identify the interface between CCR material and foundation soil
KIF-B03b	NA	Northeast boundary of Interim Ash Staging Area, within 50 feet of temporary well KIF-TW03	To identify the interface between CCR material and foundation soil. Second boring was necessary for adequate sample volume
KIF-B04a	NA	Southwest boundary of Sluice Trench and Ballfield East of the Sluice Trench, within 50 feet of temporary well KIF-TW04	To identify the interface between CCR material and foundation soil

Notes:
ID Identification
NA Not Applicable (temporary well not installed)

3.2 DOCUMENTATION

Stantec planned the CCR material characteristics investigation activities per ENV-TI-05.08.01, *Planning Sampling Events* and maintained field documentation in general accordance with ENV-TI-05.80.03, *Field Record Keeping* and the QAPP. Field activities and data were recorded on program-specific field forms. Health and safety forms were completed in accordance with TVA and Stantec health and safety requirements. Additional information regarding each activity is presented in the sections below.

3.2.1 Field Forms

Stantec used program-specific field forms to record field observations and data for specific activities. Field forms used during the CCR material characteristics investigation included:

- *Daily Field Activity Log*
- *Subsurface Log*
- *Soil pH Calibration and Inspection Log*
- *Soil pH Data Form*
- *Monitoring Well Inspection Checklist*
- *Equipment Calibration Form*
- *Water Level Measurement Form*
- *Water Sampling Form*
- *Chain-of-Custody (COC).*

Documentation for the temporary well installation and well development is described in the KIF Plant Exploratory Drilling SAR.

3.2.1.1 Daily Field Activity Log

Stantec field sampling personnel (FSP) recorded daily field activities, observations and data on a *Daily Field Activity Log* to chronologically document the field program. Deviations from the SAP, TIs, or QAPP were documented on the *Daily Field Activity Log*.

3.2.1.2 Subsurface Log

A Professional Geologist (PG) licensed in the State of Tennessee, prepared a *Subsurface Log* for each boring. The log documented time, boring location, drilling personnel, tooling/equipment used, depth to water, sample number, sample recovery, Standard Penetration Test blow counts, subsurface lithology and other relevant observations. CCR material color was logged per the appropriate Munsell Soil Color Chart (Munsell Color 2009). The *Subsurface Logs* are provided in Appendix C.

3.2.1.3 Soil pH Calibration and Inspection Log

Stantec FSP recorded daily soil pH meter calibrations and inspections on a *Soil pH Calibration and Inspection Log*. The log documented temperature, temperature verification, temperature-adjusted calibration values, post calibration pH values, and calibration solution details. Additional information on equipment calibration is provided in Section 3.2.2.

3.2.1.4 Soil pH Data Form

Stantec FSP prepared a *Soil pH Data Form* for each day that pH measurements were taken of the CCR material samples. The form documented the sample identification (ID), boring ID, the depth range, pH measurement date and time, and the field pH value.

3.2.1.5 Monitoring Well Inspection Checklist

Prior to measuring water levels, Stantec FSP inspected each temporary well for damage or indications that the well integrity had been compromised in accordance with ENV-TI-05.80.21, *Monitoring Well Inspection and Maintenance*. Inspection results were documented on a *Monitoring Well Inspection Checklist*. No signs of damage or repairs were noted.

3.2.1.6 Equipment Calibration Form

Stantec FSP performed daily equipment calibrations of the water quality meter and documented the results on an *Equipment Calibration Form*. The form documented the calibration test results for temperature, turbidity, specific conductance, pH, dissolved oxygen (DO), and oxidation-reduction potential (ORP), and verified that the field instruments' sensors were operating within acceptable criteria. Refer to Section 3.2.2 for additional details on equipment calibration procedures.

3.2.1.7 Water Level Measurement Form

Stantec FSP recorded pore water level measurement data on a *Water Level Measurement Form* in accordance with ENV-TI-05.80.44, *Groundwater Level and Well Depth Measurement*. The form includes the temporary well ID, time, and depth to water measured from a standardized reference point on the top of each well casing, recorded in feet below top of casing.

3.2.1.8 Water Sampling Form

Stantec FPS recorded the depth to water, purge flow rate, volume of water purged, temperature, pH, specific conductance, DO, ORP, turbidity, color of water, and other observations during temporary well purging and pore water sampling activities in accordance with ENV-TI-05.80.42, *Groundwater Sampling*. Field measurements were recorded on a *Water Sampling Form*. The form also documents the time intervals between measurement of field parameters, low-flow extraction rates, water level drawdown, and water quality parameter measurements during purging and after stabilization criteria were met.

3.2.1.9 Chain-of-Custody

Stantec FSP completed *COC* documentation for each CCR material and pore water sample collected during the CCR material characteristics investigation. The sample ID, sample location, sample depth (if applicable), type of sample, sampling date and time, analyses requested, and sample custody record were recorded on the *COC*. The Field Team Leader reviewed the *COCs* for completeness and accuracy and the FSP conducted a QC check of samples in each cooler compared to sample IDs on the corresponding *COC* prior to submittal to the laboratory. *COCs* were completed in accordance with ENV-TI-05.80.02*: Sample Labeling and Custody*.

3.2.2 Equipment Calibration

3.2.2.1 CCR Material Equipment Calibration

The pH meter used to collect, generate, or measure environmental data for the CCR material were calibrated each day prior to sampling as specified by the SAP, QAPP, and Stantec Standard Operating Procedure - Rev 1 for the ExTech ExStik 110 meter (Stantec 2018d). Temperature was recorded using a calibrated National Institute of Standards and Technology (NIST) traceable thermometer. Additional details regarding equipment calibration were recorded on the *Soil pH Calibration and Inspection Log*, as described in Section 3.2.1.3.

3.2.2.2 Pore Water Equipment Calibration

Field instruments used to collect, generate, or measure water quality parameters data were calibrated each day prior to sampling as specified by the SAP, QAPP, and ENV-TI-05.80-.46, *Field Measurement Using a Multi-Parameter Sonde*. Afternoon calibration verifications were performed to evaluate if instruments remained within acceptable criteria during sampling. Temperature and barometric pressure were recorded using a calibrated NIST traceable thermometer and the National Weather Service (via mesowest.utah.edu) barometric pressure readings for Oak Ridge National Laboratory (KOQT), Oak Ridge, Tennessee, respectively. Additional details regarding equipment calibration were recorded on the *Equipment Calibration Form*, as described in Section 3.2.1.6.

3.2.3 Photographs

Photographs of the CCR material cores from boring drilling activities were taken during the CCR material characteristics investigation. Photographic logs of CCR material cores from temporary well borings and additional borings are provided in Attachments D.1 and D.2, respectively, in Appendix D.

3.3 SAMPLING METHODS

The following sections present soil sampling procedures used in the CCR material characteristics investigation. Additional information regarding drilling and sampling procedures for temporary well locations is provided in the Exploratory Drilling SAR. Drilling and sampling activities were performed under the direction of a Stantec PG licensed in the State of Tennessee.

3.3.1 Drilling

The temporary well borings were advanced by Stantec drillers licensed in Tennessee using HSA techniques in general accordance with American Society for Testing and Materials [ASTM] D6151: *Standard Practice for Using Hollow-Stem Augers for Geotechnical Exploration and Soil Sampling*. Drilling details are reported in the KIF Plant Exploratory Drilling SAR.

The additional boring locations near the temporary well locations were advanced by Hawkston Drilling, LLC, licensed in Tennessee, using a direct-push technology rig. The borings were advanced from the ground surface through the CCR materials to the targeted depth within the uppermost foundation soil for

sample collection and to identify the interface between the CCR materials and the foundation soil. Drilling details are reported in the KIF Plant Exploratory Drilling SAR.

The CCR material characteristics investigation temporary well and boring locations are shown on Exhibit A.1 in Appendix A.

3.3.2 CCR Material Sampling

During advancement of the boring, a Stantec Tennessee-licensed PG prepared field subsurface logs using a mobile data collection platform. Inputs included a description of subsurface lithology, sample recovery, color using the Munsell Soil Color Charts and other relevant parameters as required by the SAPs and TIs. As part of the logging process, each sample was photographed by FSP with sample interval data presented on a white board. Analytical and duplicate samples were collected from the CCR material characteristics investigation borings and documented in the *Daily Field Activity Log* and *COC*. A list of the CCR material samples are provided on Table B.1 in Appendix B. Split CCR material samples collected by CEC are also identified in Table B.1.

So that sufficient volume was available for CCR material sampling and other exploratory drilling investigation sampling activities, samples from the same depth intervals at the “a” and “b” boring locations were combined at boring locations KIF-B01a and KIF-B01b, KIF-B02a and KIF-B02b, and KIF-B03a and KIF-B03b (e.g., the sample from 36.5 to 38.5 ft bgs from KIF-B01a was combined with the sample from 36.5 to 38.5 ft bgs from KIF-B01b). Sufficient sample volume was available from boring KIF-B04a for analysis, so an additional boring at this location was not necessary and this boring became boring location KIF-B04. The samples were homogenized for CCR material analysis as described below.

The FSP typically collected approximately a two-foot grab sample from the midpoint of each five-foot boring interval where sampling was planned based on recovery. The collected sample was placed in clean, resealable bags and homogenized using gloved hands and when necessary, clean, disposable, or decontaminated sampling tools. The samples from borings KIF-B01a and KIF-B01b were homogenized and identified as KIF-B01; KIF-02a and KIF-02b were homogenized and identified as KIF-B02; and KIF-03a and KIF-03b were homogenized and identified as KIF-B03. CCR material for the sample intervals at the “a” locations (KIF-B01a, KIF-B02a, and KIF-B03a) were collected in a new, clean plastic bag and placed on ice within 15 minutes. The sample intervals remained on ice until they could be homogenized with the second sample interval at the “b” locations (KIF-B01b, KIF-B02b, and KIF-B03b). Once the sample was sufficiently homogenized, an aliquot of the homogenized sample and deionized water was used to create a paste for measurement of the CCR material pH with the ExTech ExStik 110 pH meter according to Stantec Operating Procedure – Rev 1. The measurements were recorded on the *Soil pH Data Form* within 15 minutes after creating the CCR material paste.

Afterwards, the CCR material sample was placed in an appropriate laboratory-supplied sample jar. CCR material samples were collected in accordance with ENV-TI-05.80.50, *Soil and Sediment Sampling.* Sample containers were labeled and handled in accordance with ENV-TI-05.80.02, *Sample Labeling and Custody*. FSP secured caps on each bottle and attached a custody seal across the cap before placing the sample container in a cooler with ice (within 15 minutes of sample collection) for transport to the

laboratory. QC samples were collected in accordance with ENV-TI-05.80.04, *Field Sampling Quality Control.*

The samples were analyzed for CCR-related constituents listed in Appendices III and IV of Title 40 of the Code of Federal Regulations Part 257 (40 CFR Part 257). In addition, five inorganic constituents listed in Appendix I of Tennessee Rule 0400-11-01-.04 and not included in the 40 CFR 257 Appendices III and IV were analyzed to maintain continuity with the TDEC environmental programs. These additional TDEC Appendix I constituents included copper, nickel, silver, vanadium, and zinc. The combined federal CCR Appendices III and IV constituents and TDEC Appendix I inorganic constituents are hereafter referred to as "CCR Parameters." In addition to the CCR Parameters, total organic carbon, iron, and manganese were added as specific parameters of interest to be analyzed per the CCR Materials Characteristics Investigation SAP. Also Synthetic Precipitation Leaching Procedure analyses were performed for metals and radiological parameters.

The CCR material analytical data for CCR Parameters and additional parameters of interest are presented in Tables B.2 and B.3, respectively, in Appendix B. The field pH data are summarized in Table B.4.

3.3.3 Pore Water Gauging and Sampling

The following sections present temporary well data collection and sampling procedures used during the CCR material characteristics investigation. The pore water sampling activities were conducted at the KIF Plant on April 9 through 12, 2019, following temporary well installation and development activities. Temporary well installation and well development information are reported in the KIF Plant Exploratory Drilling SAR.

3.3.3.1 Pore Water Level Measurements

Static pore water levels were measured at the five temporary wells in accordance with ENV-TI-05.80.44, *Groundwater Level and Well Depth Measurement* prior to sampling. On April 9, 2019, static water level readings were measured and recorded to the nearest 0.01 feet from a reference point on the top of each polyvinyl chloride well casing using an electronic water level indicator. Water level indicator probes were decontaminated prior to the first use and between measurements, and the decontamination was documented as specified in ENV-TI-05.80.05, *Field Sampling Equipment Cleaning and Decontamination*. Depth to pore water measurements were recorded on a *Water Level Measurement Form*. Pore water level data are shown in Table B.5 in Appendix B.

3.3.3.2 Pore Water Purging and Sampling

Analytical and field duplicate pore water samples were collected from the five temporary wells during a single sampling event. The temporary wells were purged using non-dedicated bladder pumps with dedicated tubing and low-flow purging and sampling techniques as specified in ENV-TI-05.80.42, *Groundwater Sampling*. Analytical and duplicate samples were collected from the temporary wells and

documented in the *Daily Field Activity Log* and *COC* as shown on Table B.6 in Appendix B. Split pore water samples collected by CEC are also identified in Table B.6.

During the purging process, water quality field parameters including pH, specific conductance, temperature, ORP, and DO were measured using water quality meters (YSI ProPlus with flow-through cell) and recorded on field forms. Depth to water and turbidity were measured and recorded using decontaminated electronic water-level indicators (Heron Dipper-T) and calibrated turbidimeters (Hach 2100Q). Water quality parameters were measured and recorded on a *Water Sampling Form* during purging until readings were stabilized as specified in the SAP and/or applicable TI. Well purging was considered complete when three consecutive readings met the following stabilization criteria:

- pH – ± 0.1 Standard Units
- Specific Conductance – ± 5% microSiemens per centimeter
- Turbidity – Less than 10 Nephelometric Turbidity Units (NTUs) or ± 10% for values above 10 NTUs
- DO – Less than 0.5 milligrams per Liter (mg/L) or ± 10% for values above 0.5 mg/L.

After water quality stabilization criteria were achieved, the final water quality parameter results were recorded, purging was discontinued, and a sample was collected as specified in the SAP. Final water quality parameter results are shown in Table B.7 in Appendix B.

Laboratory-provided, pre-preserved sample containers were filled directly from the pump discharge line with the exception of the dissolved metals samples, which were collected via a 0.45-micron disposable inline filter attached to the end of the discharge line to field filter the sample. FSP wore new, clean nitrile gloves when handling sample containers and did not touch the interior of containers or container caps. New gloves were used when handling each sample. When filling sample bottles, care was taken to minimize sample aeration (i.e., water was directed down the inner walls of the sample bottle) and to avoid overfilling and diluting preservatives. Each sample bottle was capped before filling the next bottle. Following completion of sampling, final turbidity measurements were made.

Sample containers were labeled and handled in accordance with ENV-TI-05.80.02, *Sample Labeling and Custody*. FSP secured caps on each bottle, attached a custody seal across the cap, and placed in a cooler on ice within 15 minutes of collection. QC samples were collected in accordance with ENV-TI-05.80.04, *Field Sampling Quality Control*

Pore water samples were analyzed for CCR Parameters and additional parameters of interest as defined in Section 3.3.2; the pore water analytical data are presented in Tables B.8 and B.9, in Appendix B.

3.4 INVESTIGATION DERIVED WASTE

Investigation derived waste (IDW) generated during the CCR material characteristics investigation included:

- CCR material cuttings
- Temporary well purge water
- Used calibration solutions
- Decontamination fluids
- Personal protective equipment (PPE)
- General trash.

IDW was handled in accordance with ENV-TI-05.80.05, *Field Sampling Equipment Cleaning and Decontamination* and ENV-TI-05.80.42, *Groundwater Sampling* (purge water); the KIF Plant-specific waste management plan; and local, state, and federal regulations. Transportation and disposal of IDW was coordinated with TVA Plant facility management. CCR material cuttings not kept for laboratory analysis, temporary well purge water, used calibration solutions, and decontamination fluids were managed as authorized by KIF Plant facility management and in accordance with the CCR Material Characteristics SAP. Used disposable PPE (e.g., nitrile gloves) and general trash generated throughout the day were placed in garbage bags and disposed of in a general trash dumpster onsite at the end of each day.

3.5 SAMPLE SHIPMENT

Samples were packed and transported under *COC* procedures as specified in ENV-TI-05.80.06, *Handling and Shipping of Samples*. The samples were delivered via courier to TestAmerica in Nashville, Tennessee and then subsequently shipped to St. Louis, Missouri (radium samples only), and to Pittsburgh, Pennsylvania (all other analytes). TestAmerica submitted sample receipt forms to EnvStds for review and confirmation.

3.6 VARIATIONS

The proposed scope and procedures for the CCR material characteristics investigation were outlined in the SAP, QAPP, and applicable TVA TIs and ASTM standards, as detailed in the sections above. Variations in scope or procedures discussed with TDEC and/or TVA, changes based on field conditions, or additional field sampling performed to complete the scope of work in the SAPs are described in the following sections. As discussed below, these variations do not impact the overall usability and representativeness of the dataset provided in this SAR for the CCR materials characteristics investigation at the KIF Plant.

3.6.1 Variations in Scope

Variations in scope from the SAP are provided below.

- After the completion of drilling and laboratory testing of samples from the temporary well borings, review of the data showed that borings KIF-TW01 through KIF-TW04 did not reach the foundation soils as originally logged in the field. These borings were inadvertently terminated within the CCR. Therefore, the supplemental direct push borings were added to extend the material profiles into the foundation soils and obtain the deeper samples adjacent to temporary wells KIF-TW01 through KIF-TW04. During the supplemental drilling, boring KIF-B04b was determined not to be necessary since adequate information and sample volume were obtained from boring KIF-B04a.

3.6.2 Variations in Procedures

Variations from the SAP, QAPP, and applicable TVA TI procedures occuring in the field are provided below.

- CCR material pH measurements for the samples collected from KIF-TW05 on November 13, 2018 were obtained after the analytical samples were placed in the sample containers rather than before; however, the pH was measured on the homogenized sample in accordance with the SAP.
- The sample ID nomenclature of the field blank sample collected on February 8, 2019 during CCR material sampling varied from the QAPP; however, this variance did not impact assessment of data quality during data validation.
- Photographs of boring cores from borings KIF-TW03a and KIF-TW03b are not available. These borings were terminated due to refusal at depths of 15.3 and 13.5 feet, respectively, and no analytical samples were submitted to the laboratory.

4.0 SUMMARY

The data presented in this report are from the CCR material characteristics investigation at the KIF Plant. The scope of work during this investigation included drilling five temporary well borings and seven additional borings to collect CCR material and pore water analytical samples for analysis of CCR Parameters and additional parameters of interest.

A summary of boring and temporary well locations drilled during this investigation is presented in Table 1. A total of 54 CCR material samples, including four duplicate samples, were collected from the five temporary well borings and the seven additional borings for analysis of CCR Parameters and additional parameters of interest. A summary of the CCR material samples collected during this investigation are presented in Table B.1, and sample analytical data are presented in Tables B.2 and B.3, respectively. The field pH data are summarized in Table B.4.

Following temporary well installation and development, pore water levels were measured prior to sampling, and five pore water samples and one duplicate sample were collected from the five temporary wells. Water quality parameters were recorded during well purging. Stabilization criteria for pH, specific conductance, turbidity, and DO were achieved at each sampling location. Pore water level measurements and a summary of the pore water samples collected are presented in Tables B.5 and B.6, respectively. The final pore water quality parameter measurements prior to initiating sample collection are presented in Table B.7. Pore water analytical data for CCR Parameters and additional parameters of interest are presented in Tables B.8 and B.9.

CCR material and pore water analytical data were reported by TestAmerica and validated by EnvStds.

Stantec has completed a CCR material characteristics investigation at the KIF Plant in Harriman, Tennessee, in accordance with the CCR Material Characteristics SAP as documented herein. The data collected during the investigation are usable for reporting and evaluation in the EAR and meet the objectives of the TDEC Order EIP. The CCR materials characterization data will be evaluated along with data collected under other TDEC Order SAPs, including but not limited to, the exploratory drilling investigation, as well as data collected under other State and CCR programs. This evaluation will be provided in the EAR.

5.0 REFERENCES

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TVA. ENV-TI-05.80.04, *Field Sampling Quality Control*.

TVA. ENV-TI-05.80.05, *Field Sampling Equipment Cleaning and Decontamination*.

TVA. ENV-TI-05.80.06, *Handling and Shipping of Samples*.

TVA. ENV-TI-05.80.21, *Monitoring Well Inspection and Maintenance.*

TVA. ENV-TI-05.80.42, *Groundwater Sampling*.

TVA. ENV-TI-05.80.44, *Groundwater Level and Well Depth Measurement*.

TVA. ENV-TI-05.80.46, *Field Measurement Using a Multiparameter Sonde.*

TVA. ENV-TI-05.80.50, *Soil and Sediment Sampling*.

APPENDIX A - EXHIBITS

Exhibit No.

A.1

Title

Temporary Well and Boring Location Map

Client/Project

Tennessee Valley Authority
Kingston Fossil Plant (KIF) TDEC Order

Project Location

Roane County, Tennessee

175668043

Prepared by DMB on 2020-05-20
Technical Review by RN on 2020-05-20

0 200 400 600 800 Feet

1:2,400 (At original document size of 22x34)

Legend

- Boring
- Drilled and Abandoned Borehole
- Temporary Well
- 2018 Imagery Boundary
- CCR Unit Area (Approximate)
- Engineered Wetlands (Approximate)
- Polishing Pond (Approximate)

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. 2017 Imagery provided by TVA and flown by Tuck Mapping on March 16, 2017; 2018 Imagery provided by TVA and is dated September 12, 2018.
3. Temporary Well locations shown correspond to survey data provided by the RLS Group on May 15, 2019.
4. Borings surveyed by TVA on January 9, 2020.
5. As-drilled boring location not surveyed. Horizontal coordinates based on proposed boring location.
6. Adjacent boring locations shown as single boring symbol due to close proximity.

Stantec TVA

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APPENDIX B - TABLES

TABLE B.1 – Summary of CCR Material Samples
Kingston Fossil Plant
November 2018 - December 2019

			Analysis Type											
Location ID	**Sample ID**	**Sample Type**	Field Parameters	Total Metals	SPLP Metals	Total Mercury	SPLP Mercury	Anions	pH (laboratory)	Total Organic Carbon	Radium-226, Radium-228, Radium-226+228	SPLP Radium-226	SPLP Radium-228	SPLP Radium-226+228
KIF-B01	KIF-CCR-B01-36.5/38.5-20191203	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	KIF-CCR-B01-41.5/43.5-20191203	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	KIF-CCR-B01-46.5/48.5-20191203	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
KIF-B02	KIF-CCR-B02-36.0/39.0-20191204	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	KIF-CCR-B02-41.0/44.0-20191204	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	KIF-CCR-DUP01-20191204	Field Duplicate Sample		x	x	x	x	x	x	x	x	x	x	x
	KIF-CCR-B02-46.5/48.5-20191204	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	KIF-CCR-B02-50.7/52.3-20191204	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
KIF-B03	KIF-CCR-B03-41.5/43.5-20191205	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	KIF-CCR-B03-46.5/48.5-20191205	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	KIF-CCR-B03-51.5/53.5-20191205	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
KIF-B04	KIF-CCR-B04-36.5/38.5-20191205	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	KIF-CCR-B04-41.5/43.5-20191205	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
KIF-TW01	KIF-CCR-TW01-2.0/4.0-20190124	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	KIF-CCR-TW01-7.0/9.0-20190124	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	KIF-CCR-TW01-11.5/13.5-20190124	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	KIF-CCR-TW01-16.5/18.5-20190125	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	KIF-CCR-DUP01-20190125	Field Duplicate Sample		x	x	x	x	x	x	x	x	x	x	x
	KIF-CCR-TW01-21.5/23.5-20190125	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	KIF-CCR-TW01-26.5/28.5-20190128	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	KIF-CCR-TW01-31.5/33.5-20190128	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	KIF-CCR-TW01-36.5/38.5-20190128	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
KIF-TW02	KIF-CCR-TW02-2.25/4.0-20190205	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	KIF-CCR-TW02-6.5/8.5-20190205	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	KIF-CCR-TW02-11.5/13.5-20190205	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	KIF-CCR-TW02-16.5/18.5-20190205	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	KIF-CCR-TW02-26.5/28.5-20190205	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	KIF-CCR-TW02-31.5/33.5-20190205	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	KIF-CCR-TW02-36.5/38.5-20190205	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
KIF-TW03	KIF-CCR-TW03-1.5/3.5-20190225	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	KIF-CCR-TW03-6.5/8.5-20190225	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	KIF-CCR-TW03-11.5/13.5-20190225	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	KIF-CCR-TW03-16.5/18.5-20190225	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	KIF-CCR-TW03-23.0/26.0-20190226	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	KIF-CCR-DUP02-20190226	Field Duplicate Sample		x	x	x	x	x	x	x	x	x	x	x
	KIF-CCR-TW03-31.5/33.5-20190226	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	KIF-CCR-TW03-36.5/38.5-20190226	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	KIF-CCR-TW03-41.5/43.5-20190226	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
KIF-TW04	KIF-CCR-TW04-3.5/5.5-20190208	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	KIF-CCR-TW04-6.5/8.5-20190208	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	KIF-CCR-TW04-11.5/13.5-20190211	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	KIF-CCR-TW04-16.5/18.5-20190211	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	KIF-CCR-TW04-21.5/23.5-20190211	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	KIF-CCR-TW04-26.5/28.5-20190211	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	KIF-CCR-TW04-31.5/33.5-20190213	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	KIF-CCR-TW04-36.5/38.5-20190213	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x

See notes on last page.

TABLE B.1 – Summary of CCR Material Samples
Kingston Fossil Plant
November 2018 - December 2019

			Analysis Type											
Location ID	**Sample ID**	**Sample Type**	Field Parameters	Total Metals	SPLP Metals	Total Mercury	SPLP Mercury	Anions	pH (laboratory)	Total Organic Carbon	Radium-226, Radium-228, Radium-226+228	SPLP Radium-226	SPLP Radium-228	SPLP Radium-226+228
KIF-TW05	KIF-CCR-TW05-1.5/3.5-20181113	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	KIF-CCR-TW05-6.5/8.5-20181113	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	KIF-CCR-TW05-11.5/13.5-20181113	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	KIF-CCR-TW05-16.5/19.5-20181113	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	KIF-CCR-TW05-22.5/24.5-20181113	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	KIF-CCR-DUP01-20181113	Field Duplicate Sample		x	x	x	x	x	x	x	x	x	x	x
	KIF-CCR-TW05-26.5/28.5-20181113	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	KIF-CCR-TW05-31.5/33.5-20181113	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x

Notes

Total Metals	SW-846 6020A
SPLP Metals	SW-846 6020A
Total Mercury	SW-846 7471B
SPLP Mercury	SW-846 7470A
Anions	SW-846 9056A
pH (laboratory)	SW-846 9045D
Total Organic Carbon	Lloyd Kahn / SW-846 9060A
Radium-226, Radium-228, Radium-226+228	EPA 901.1
SPLP Radium-226	EPA 903.0
SPLP Radium-228	EPA 904.0
SPLP Radium-226+228	CALC
ID	identification
SPLP	Synthetic Precipitation Leaching Procedure

1. Field and laboratory quality control sample results except for field duplicates are not included in report tables but were used for data validation.
2. CEC collected split samples from KIF-TW04 at depth intervals of 11.5-13.5 and 21.5-23.5 feet below ground surface

TABLE B.2 - CCR Material Analytical Results for Metals, Anions, and General Chemistry
Kingston Fossil Plant
November 2018 - December 2019

Sample Location		KIF-B01			KIF-B02				
Sample Date		3-Dec-19	3-Dec-19	3-Dec-19	4-Dec-19	4-Dec-19	4-Dec-19	4-Dec-19	4-Dec-19
Sample ID		KIF-CCR-B01-36.5/38.5-20191203	KIF-CCR-B01-41.5/43.5-20191203	KIF-CCR-B01-46.5/48.5-20191203	KIF-CCR-B02-36.0/39.0-20191204	KIF-CCR-B02-41.0/44.0-20191204	KIF-CCR-DUP01-20191204	KIF-CCR-B02-46.5/48.5-20191204	KIF-CCR-B02-50.7/52.3-20191204
Sample Depth		36.5 - 38.5 ft	41.5 - 43.5 ft	46.5 - 48.5 ft	36 - 39 ft	41 - 44 ft	41 - 44 ft	46.5 - 48.5 ft	50.7 - 52.3 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample
Level of Review	Units	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified
Total Metals									
Antimony	MG/KG	0.854 J	1.15 J	0.836 J	0.341 J	0.340 J	0.327 J	0.623 J	1.07 J
Arsenic	MG/KG	72.8	89.6	81.3	18.6	24.4	29.5	53.5	97.1
Barium	MG/KG	377	428	363	217	211	201	352	418
Beryllium	MG/KG	2.33	2.82	2.18	1.15	1.23	1.15	2.15	3.86
Boron	MG/KG	37.5 J	49.5 J	39.7 J	20.6 J	22.8 J	21.9 J	38.2 J	57.6 J
Cadmium	MG/KG	0.265	0.346	0.250	0.0867 J	0.102 J	0.114 J	0.210	0.271
Calcium	MG/KG	5,700	6,580	5,330	3,140	3,320	3,180	5,470	6,840
Chromium	MG/KG	31.8	33.3	31.9	22.0	17.9	16.8	24.4	35.3
Cobalt	MG/KG	12.9	13.9	12.4	9.55	7.82	6.88	11.2	16.4
Copper	MG/KG	38.2	47.7	38.1	20.2	18.7	19.0	30.3	39.8
Iron	MG/KG	45,000	52,100	60,200	55,600	34,700	25,500	43,000	64,000
Lead	MG/KG	12.9	17.1	12.3	3.49	4.62	5.53	10.6	16.8
Lithium	MG/KG	30.3	38.8	29.9	16.8	17.7	18.0	26.8	34.9
Manganese	MG/KG	111	104	98.4	70.2	56.1	48.3	79.3	105
Mercury	MG/KG	0.124	0.127	0.112	<0.0305	0.0502	0.0400 J	0.0720	0.145
Molybdenum	MG/KG	3.36	5.02	8.51	2.46	2.00	1.93	2.58	2.24
Nickel	MG/KG	29.6	32.4	29.7	24.3	18.7	16.4	26.1	33.4
Selenium	MG/KG	2.69	3.25	2.95	1.51	1.70	2.11	2.44	2.60
Silver	MG/KG	0.0724 J	0.105 J	0.0669 J	<0.0359	<0.0382	<0.0353	0.0570 J	0.0740 J
Thallium	MG/KG	1.15	1.38	1.09	0.475	0.719	0.762	1.12	1.91
Vanadium	MG/KG	62.1	73.5	57.9	31.8	31.6	31.3	51.6	76.7
Zinc	MG/KG	35.5	43.2	33.8	15.9	16.3	16.2	26.4	41.3
SPLP - Metals									
Antimony	UG/L	0.740 J	0.847 J	0.827 J	<0.378	0.460 J	0.497 J	1.08 J	6.19
Arsenic	UG/L	42.1	94.8	18.0	7.83	14.7	15.2	79.0	92.3
Barium	UG/L	47.3	22.7	48.7	58.1	74.3	80.0	34.3	26.6
Beryllium	UG/L	0.218 J	<0.182	<0.182	<0.182	<0.182	<0.182	<0.182	<0.182
Boron	UG/L	173	180	159	105	104	131	160	140
Cadmium	UG/L	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125
Calcium	UG/L	12,200	11,900	15,100	8,760	14,100	14,200	12,600	9,890
Chromium	UG/L	<1.53	<1.53	<1.53	<1.53	<1.53	<1.53	<1.53	<1.53
Cobalt	UG/L	0.0910 J	<0.0750	<0.0750	<0.0750	<0.0750	<0.0750	<0.0750	<0.0750
Copper	UG/L	4.04	6.91	<0.627	<0.627	1.75 J	2.96	<0.627	<0.627
Iron	UG/L	234	<19.5	<19.5	51.5	<19.5	20.8 J	<19.5	<19.5
Lead	UG/L	0.451 J	<0.128	<0.128	<0.128	1.09	<0.128	<0.128	<0.128
Lithium	UG/L	15.8	16.9	10.8	5.04	11.6	11.9	15.9	7.70
Manganese	UG/L	8.50	3.10 J	2.73 J	4.33 J	4.83 J	5.20	2.56 J	9.13
Mercury	UG/L	<0.101	<0.101	<0.101	<0.101	<0.101	<0.101	<0.101	<0.101
Molybdenum	UG/L	19.5	29.9	42.4	9.97	20.6	22.4	21.3	203
Nickel	UG/L	1.06 U*	0.787 U*	0.671 U*	0.771 U*	1.11 U*	0.685 U*	1.02 U*	1.32 U*
Selenium	UG/L	8.97	10.3	9.18	1.97 J	4.21 J	3.95 J	8.19	3.97 J
Silver	UG/L	<0.177	<0.177	<0.177	<0.177	<0.177	<0.177	<0.177	<0.177
Thallium	UG/L	0.825 J	0.342 J	0.152 J	<0.148	<0.148	<0.148	<0.148	0.232 J
Vanadium	UG/L	15.4	28.7	7.94	2.55	4.72	5.07	16.4	6.16
Zinc	UG/L	4.66 J	<3.22	<3.22	3.91 J	4.23 J	<3.22	<3.22	<3.22
Anions									
Chloride	MG/KG	<5.39	104	<5.26	11.1 J	7.43 J	6.56 J	6.65 J	<5.42
Fluoride	MG/KG	<0.945	<0.954	<0.921	<0.926	<0.956	<0.950	<0.893	<0.951
Sulfate	MG/KG	695	572	504	320	661	684	581	111
General Chemistry									
pH (lab)	SU	7.9	8.0	7.8	7.8	7.7	7.8	8.2	7.9
Total Organic Carbon	MG/KG	42,300	22,000	9,540	19,500 J	41,300 J	16,300 J	23,100 J	28,200 J

See notes on last page.

TABLE B.2 - CCR Material Analytical Results for Metals, Anions, and General Chemistry
Kingston Fossil Plant
November 2018 - December 2019

Sample Location		KIF-B03			KIF-B04		KIF-TW01			
Sample Date		5-Dec-19	5-Dec-19	5-Dec-19	5-Dec-19	5-Dec-19	24-Jan-19	24-Jan-19	24-Jan-19	25-Jan-19
Sample ID		KIF-CCR-B03-41.5/43.5-20191205	KIF-CCR-B03-46.5/48.5-20191205	KIF-CCR-B03-51.5/53.5-20191205	KIF-CCR-B04-36.5/38.5-20191205	KIF-CCR-B04-41.5/43.5-20191205	KIF-CCR-TW01-2.0/4.0-20190124	KIF-CCR-TW01-7.0/9.0-20190124	KIF-CCR-TW01-11.5/13.5-20190124	KIF-CCR-TW01-16.5/18.5-20190125
Sample Depth		41.5 - 43.5 ft	46.5 - 48.5 ft	51.5 - 53.5 ft	36.5 - 38.5 ft	41.5 - 43.5 ft	2 - 4 ft	7 - 9 ft	11.5 - 13.5 ft	16.5 - 18.5 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Level of Review		Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified
	Units									
Total Metals										
Antimony	MG/KG	0.362 J	0.724 J	0.780 J	0.352 J	0.532 J	1.15	0.408	0.391	0.885
Arsenic	MG/KG	30.1	53.5	56.1	24.7	33.5	43.5	49.3	34.0	69.7
Barium	MG/KG	278	378	405	129	235	350	151	155	243
Beryllium	MG/KG	1.50	2.36	2.53	1.08	2.22	3.56	0.812	1.01	2.24
Boron	MG/KG	19.1 J	29.7 J	40.8 J	24.3 J	35.8 J	52.5	9.67	17.8	48.5
Cadmium	MG/KG	0.134 J	0.230	0.214	0.0602 J	0.127 J	0.334	0.0664 J	0.109 J	0.508
Calcium	MG/KG	3,680	5,000	6,790	2,290	4,550	16,600	6,880	5,320	2,870
Chromium	MG/KG	18.9	31.5	33.6	13.9	26.7	20.5 J	14.8 J	13.9 J	20.9 J
Cobalt	MG/KG	8.84	12.5	13.3	6.88	12.4	10.0 J	3.93 J	5.18 J	6.60 J
Copper	MG/KG	22.9	39.7	33.9	18.8	22.7	36.9 J	18.0 J	19.4 J	36.4 J
Iron	MG/KG	46,900	69,500	67,400	34,600	64,900	13,600	32,400	17,800	9,950
Lead	MG/KG	4.09	9.62	12.0	4.56	8.58	21.0	17.7	8.89	20.8
Lithium	MG/KG	15.4	25.9	30.3	11.7	22.4	18.8	12.1	12.5	27.5
Manganese	MG/KG	77.3	116	117	37.2	124	157	111	107	73.3
Mercury	MG/KG	0.0852	0.0753	0.0899	0.140	0.0821	0.0986	0.545	0.0506	0.0880
Molybdenum	MG/KG	1.82	1.86	2.15	2.07	0.990	6.07	3.70	1.89	2.79
Nickel	MG/KG	21.1	31.4	30.9	15.8	26.6	21.2 J	11.2 J	15.2 J	18.2 J
Selenium	MG/KG	2.10	2.14	2.23	3.16	1.88	3.93	3.03	2.78	6.11 J
Silver	MG/KG	<0.0397	0.0463 J	0.0592 J	<0.0430	<0.0376	0.0850 J	0.0422 J	0.0287 J	0.0918 J
Thallium	MG/KG	0.624	0.947	1.29	0.791	1.15	1.22	1.61	0.655	1.75
Vanadium	MG/KG	38.0	61.4	63.7	28.8	50.5	51.7 J	26.5 J	21.4 J	46.9 J
Zinc	MG/KG	15.5	30.0	30.8	14.8	27.1	37.2 J	21.8 J	18.4 J	34.9 J
SPLP - Metals										
Antimony	UG/L	0.657 J	1.12 J	2.96	1.18 J	2.37	3.40	<1.12	<1.12	1.20 J
Arsenic	UG/L	15.3	32.2	143	12.0	40.7	26.5	6.27	2.57	18.9
Barium	UG/L	43.7	87.2	14.8	26.9	6.55 J	47.5	10.4	31.7	94.4
Beryllium	UG/L	0.433 J	0.344 J	0.202 J	0.187 J	0.208 J	<0.0570	<0.0570	<0.0570	<0.0570
Boron	UG/L	113	95.6	164	<38.6	70.3 J	700	62.5 U*	76.6 U*	73.9 U*
Cadmium	UG/L	<0.125	<0.125	<0.125	<0.125	<0.125	0.241 J	0.396 J	<0.125	<0.125
Calcium	UG/L	6,640	12,100	10,600	4,780	7,750	15,800	385,000	33,000	13,000
Chromium	UG/L	<1.53	<1.53	<1.53	<1.53	<1.53	2.62	<0.631	0.938 J	<0.631
Cobalt	UG/L	<0.0750	<0.0750	<0.0750	<0.0750	<0.0750	0.523	12.2	0.207 J	0.915
Copper	UG/L	<0.627	<0.627	<0.627	<0.627	<0.627	6.49	1.76 J	<1.30	<1.30
Iron	UG/L	89.8	24.2 J	<19.5	<19.5	72.7	2,410	<14.1	1,250	277 J
Lead	UG/L	0.130 J	<0.128	<0.128	<0.128	0.161 J	0.376 J	0.146 J	<0.0940	<0.0940
Lithium	UG/L	6.70	12.4	11.6	4.54 J	4.20 J	<2.56	8.82	<2.56	9.28
Manganese	UG/L	2.59 J	10.5	2.44 J	2.34 J	1.67 J	10.9	2,090	87.0	351
Mercury	UG/L	<0.101	<0.101	<0.101	<0.101	<0.101	<0.101	0.114 J	<0.101	<0.101
Molybdenum	UG/L	7.66	17.7	9.87	7.04	24.4	129	0.787 J	5.93	11.9 J
Nickel	UG/L	0.652 U*	0.479 U*	0.543 U*	0.560 U*	0.573 U*	1.38	11.6	<0.312	2.27
Selenium	UG/L	3.83 J	6.28	9.71	8.00	6.71	6.51	3.20 J	3.36 J	1.28 J
Silver	UG/L	<0.177	<0.177	<0.177	<0.177	<0.177	<0.121	<0.121	<0.121	<0.121
Thallium	UG/L	0.701 J	0.381 J	0.347 J	0.174 J	<0.148	0.312 J	0.289 J	<0.0630	0.488 J
Vanadium	UG/L	5.62	8.85	34.1	12.8	7.10	26.3	<0.899	<0.899	<0.899
Zinc	UG/L	3.65 J	<3.22	<3.22	<3.22	6.79	5.04	5.48	<2.42	<2.42
Anions										
Chloride	MG/KG	<5.71	<5.60	<5.79	9.88 J	<5.24	9.57 J	6.06 J	5.48 J	9.25 J
Fluoride	MG/KG	<1.00	<0.982	<1.02	<1.18	<0.919	4.29	<0.756	3.72	1.52
Sulfate	MG/KG	508	511	224	193	49.7	510	16,400	2,240	1,580
General Chemistry										
pH (lab)	SU	7.9	7.9	8.3	8.0	8.1	8.0	4.9	7.5	6.4
Total Organic Carbon	MG/KG	28,100 J	33,600 J	20,900	55,300 J	93,900 J	19,600	34,900	34,900	45,600

See notes on last page.

TABLE B.2 - CCR Material Analytical Results for Metals, Anions, and General Chemistry
Kingston Fossil Plant
November 2018 - December 2019

Sample Location		KIF-TW01					KIF-TW02			
Sample Date		25-Jan-19	25-Jan-19	28-Jan-19	28-Jan-19	28-Jan-19	5-Feb-19	5-Feb-19	5-Feb-19	5-Feb-19
Sample ID		KIF-CCR-DUP01-20190125	KIF-CCR-TW01-21.5/23.5-20190125	KIF-CCR-TW01-26.5/28.5-20190128	KIF-CCR-TW01-31.5/33.5-20190128	KIF-CCR-TW01-36.5/38.5-20190128	KIF-CCR-TW02-2.25/4.0-20190205	KIF-CCR-TW02-6.5/8.5-20190205	KIF-CCR-TW02-11.5/13.5-20190205	KIF-CCR-TW02-16.5/18.5-20190205
Sample Depth		16.5 - 18.5 ft	21.5 - 23.5 ft	26.5 - 28.5 ft	31.5 - 33.5 ft	36.5 - 38.5 ft	2.25 - 4 ft	6.5 - 8.5 ft	11.5 - 13.5 ft	16.5 - 18.5 ft
Sample Type		Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Level of Review		Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified
	Units									
Total Metals										
Antimony	MG/KG	0.737	0.810	0.624	0.341	0.628	1.06	0.567	0.469	0.939
Arsenic	MG/KG	62.0	64.3	43.6	26.3	45.3	40.6	41.2	26.8	65.6
Barium	MG/KG	258	249	168	179	298	268	174	125	276
Beryllium	MG/KG	2.01	1.97	1.24	1.27	1.63	2.37	1.26	0.862	2.17
Boron	MG/KG	44.8	42.3	23.4	17.7	26.8	32.1	26.4	17.8	42.1
Cadmium	MG/KG	0.421	0.489	0.214	0.109 J	0.191	0.348	0.879	0.170	0.490
Calcium	MG/KG	3,330	3,500	2,630	2,270	4,270	23,800	6,910	1,610	3,290
Chromium	MG/KG	21.8 J	20.4 J	13.6	10.2	18.2	19.3	17.8	12.1	27.5
Cobalt	MG/KG	6.80 J	6.92 J	5.71	4.53	7.48	10.6	5.63	4.09	9.06
Copper	MG/KG	33.4 J	31.6 J	21.5	16.6	26.1	33.2	27.5	18.8	40.7
Iron	MG/KG	14,000	14,600	19,800	16,100	29,000	14,800	21,600	17,100	16,400
Lead	MG/KG	18.4	15.3	8.97	4.58	8.21	19.8	9.49	6.90	23.1
Lithium	MG/KG	25.5	23.5	17.7	12.8	17.7	19.7	12.9	13.7	35.6
Manganese	MG/KG	75.0	50.9	53.3	44.7	80.9	242	38.3	50.6	56.4
Mercury	MG/KG	0.0788	0.0668	0.0858	1.22	0.0614	0.0980	0.0477	0.0481	0.0931
Molybdenum	MG/KG	2.93	2.91	4.36	2.35	3.38	7.79	2.64	2.56	2.21
Nickel	MG/KG	19.1 J	18.4 J	14.8	11.6	18.5	21.1	18.2	12.9	23.6
Selenium	MG/KG	3.52 J	6.92	2.24	1.62	2.51	3.47	3.20	2.31	5.00
Silver	MG/KG	0.0761 J	0.0747 J	0.0364 J	0.0235 J	0.0427 J	0.0687 J	0.0374 J	<0.0330	0.0991 J
Thallium	MG/KG	1.45	1.22	0.699	0.426	0.843	1.32	1.03	0.608	1.79
Vanadium	MG/KG	45.2 J	46.0 J	28.8	23.5	36.5	44.1	29.6	22.5	56.4
Zinc	MG/KG	34.2 J	38.0 J	20.0	12.0	23.1	40.2	30.0	15.7	37.7
SPLP - Metals										
Antimony	UG/L	<1.12	1.83 J	<1.12	<1.12	<1.12	1.20 J	0.499 J	<0.378	1.13 J
Arsenic	UG/L	17.3	17.5	6.85	3.72	5.81	31.3	1.18	1.83	32.1
Barium	UG/L	89.9	97.0	60.6	94.1	134	61.6	98.4	199	88.0
Beryllium	UG/L	<0.0570	<0.0570	<0.0570	<0.0570	<0.0570	<0.155	<0.155	<0.155	<0.155
Boron	UG/L	91.7 U*	619	1,010	886	930	1,020	955	973	946
Cadmium	UG/L	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125	0.377 J	<0.125
Calcium	UG/L	12,900	28,600	15,100	8,500	34,900	18,500	23,700	10,200	15,200
Chromium	UG/L	<0.631	6.88	0.914 J	0.804 J	<0.631	1.63 J	<1.53	<1.53	<1.53
Cobalt	UG/L	1.17	0.480 J	1.15	1.99	<0.0750	<0.0750	0.435 J	5.37	<0.0750
Copper	UG/L	<1.30	9.03	<1.30	<1.30	<1.30	1.08 J	<0.627	1.40 J	<0.627
Iron	UG/L	14.1 UJ	8,940	<14.1	23.0 J	<14.1	58.8	<14.1	253	<14.1
Lead	UG/L	<0.0940	<0.0940	<0.0940	<0.0940	<0.0940	0.149 J	<0.128	0.157 J	<0.128
Lithium	UG/L	10.4	7.38	12.4	19.9	7.40	3.17 J	11.7	17.1	9.22
Manganese	UG/L	371	60.9	39.0	45.1	20.5	<1.35	1.74 J	91.2	2.62 J
Mercury	UG/L	<0.101	<0.101	<0.101	<0.101	<0.101	<0.101	<0.101	<0.101	<0.101
Molybdenum	UG/L	5.96 J	6.73	10.4	6.91	29.0	142	5.29	<0.610	3.02 J
Nickel	UG/L	3.04	2.78	6.05	6.37	<0.312	<0.312	0.978 J	23.3	<0.312
Selenium	UG/L	2.17 J	8.29	8.31	2.13 J	3.82 J	5.11	<2.62	<2.62	10.3
Silver	UG/L	<0.121	<0.121	<0.121	<0.121	<0.121	0.128 J	0.215 J	<0.121	0.134 J
Thallium	UG/L	0.325 J	<0.0630	<0.0630	<0.0630	0.234 J	<0.128	0.231 J	0.208 J	0.176 J
Vanadium	UG/L	0.928 J	10.5	<0.899	1.35	<0.899	31.8	2.61	1.03	39.1
Zinc	UG/L	<2.42	24.8	<2.42	<2.42	<2.42	<3.22	<3.22	26.1	<3.22
Anions										
Chloride	MG/KG	8.28 J	5.86 J	<4.88	<5.19	<5.60	6.08 J	8.17 J	8.92 J	9.28 J
Fluoride	MG/KG	1.58	3.04	3.30	3.54	1.44	3.58	1.46	2.57	3.80
Sulfate	MG/KG	1,460	1,620	1,070	821	2,270	235	675	367	531
General Chemistry										
pH (lab)	SU	6.1	6.8	7.3	6.8	7.5	8.1	7.6	7.4	7.7
Total Organic Carbon	MG/KG	51,100	29,300	6,810 J	9,850	27,500	16,400	23,100	17,200	27,500

See notes on last page.

TABLE B.2 - CCR Material Analytical Results for Metals, Anions, and General Chemistry
Kingston Fossil Plant
November 2018 - December 2019

Sample Location		KIF-TW02			KIF-TW03						
Sample Date		5-Feb-19	5-Feb-19	5-Feb-19	25-Feb-19	25-Feb-19	25-Feb-19	25-Feb-19	26-Feb-19	26-Feb-19
Sample ID		KIF-CCR-TW02-26.5/28.5-20190205	KIF-CCR-TW02-31.5/33.5-20190205	KIF-CCR-TW02-36.5/38.5-20190205	KIF-CCR-TW03-1.5/3.5-20190225	KIF-CCR-TW03-6.5/8.5-20190225	KIF-CCR-TW03-11.5/13.5-20190225	KIF-CCR-TW03-16.5/18.5-20190225	KIF-CCR-TW03-23.0/26.0-20190226	KIF-CCR-DUP02-20190226
Sample Depth		26.5 - 28.5 ft	31.5 - 33.5 ft	36.5 - 38.5 ft	1.5 - 3.5 ft	6.5 - 8.5 ft	11.5 - 13.5 ft	16.5 - 18.5 ft	23 - 26 ft	23 - 26 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample
Level of Review		Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified
	Units									
Total Metals										
Antimony	MG/KG	0.386	0.292	0.353	1.05	1.08	0.540	0.533	0.912	0.879
Arsenic	MG/KG	30.6	18.1	21.2	47.3	119	57.3	39.9	69.5	73.9
Barium	MG/KG	105	114	189	300	266	141	136	269	252
Beryllium	MG/KG	0.678	0.732	1.01	2.10	1.76	0.596	0.799	1.97	1.94
Boron	MG/KG	10.5	12.9	19.4	35.9	49.2	11.3	14.5	32.7	30.2
Cadmium	MG/KG	0.0845 J	0.0881 J	0.0831 J	0.307	0.623	0.0964 J	0.250	0.362	0.339
Calcium	MG/KG	1,090	1,510	2,620	24,500	16,500	1,060	1,250	2,750	2,520
Chromium	MG/KG	12.5	8.78	14.1	23.1 J	21.9 J	31.4 J	16.4 J	34.6 J	33.7 J
Cobalt	MG/KG	4.89	4.12	7.21	10.1	35.6	3.88	4.63	9.03	8.68
Copper	MG/KG	16.0	13.4	19.5	35.5	41.8	17.9	21.6	43.4	45.1
Iron	MG/KG	44,400	18,700	39,300	17,000	110,000	26,300	21,800	17,300	17,500
Lead	MG/KG	2.83	3.70	4.39	18.6	27.4	10.4	8.35	26.1	24.1
Lithium	MG/KG	11.9	12.0	12.3	17.8 J	13.7 J	10.2 J	12.1 J	36.6 J	32.3 J
Manganese	MG/KG	52.3	37.9	73.6	135	175	91.1	45.7	42.5	43.3
Mercury	MG/KG	0.0464	0.0307 J	0.0607	0.102 J	0.103 J	0.0644 J	0.0954 J	0.0493 J	0.0597 J
Molybdenum	MG/KG	4.24	2.15	3.22	3.39	9.31	3.83	3.88	3.02	3.04
Nickel	MG/KG	14.6	11.7	18.3	21.5	37.5	10.3	13.0	23.7	23.1
Selenium	MG/KG	1.55	1.59	1.11	3.47	8.88	2.57	2.35	5.75	6.38
Silver	MG/KG	<0.0324	<0.0360	<0.0418	0.0830 J	0.0763 J	0.0443 J	0.0366 J	0.116 J	0.105 J
Thallium	MG/KG	0.547	0.395	0.680	1.34	7.31	1.21	0.930	1.56	1.61
Vanadium	MG/KG	17.4	15.5	23.4	57.9	54.8	36.8	31.1	73.2	68.7
Zinc	MG/KG	10.8	13.8	15.8	33.3	42.4	15.1	13.3	37.8	37.7
SPLP - Metals										
Antimony	UG/L	<0.378	0.616 J	0.483 J	1.93 J	5.84	<0.378	0.781 J	0.466 J	0.435 J
Arsenic	UG/L	0.917 J	4.92	10.1	42.6	53.2	2.04	1.62	1.01	0.632 J
Barium	UG/L	127	94.8	73.5	33.7	49.7	75.9	61.5	97.6 J	75.8 J
Beryllium	UG/L	<0.155	<0.155	<0.155	<0.155	<0.155	<0.155	<0.155	<0.155	<0.155
Boron	UG/L	919	909	970	149	864	45.1 J	105	82.8	87.4
Cadmium	UG/L	<0.125	<0.125	<0.125	<0.125	<0.125	0.133 J	<0.125	<0.125	<0.125
Calcium	UG/L	6,420	7,930	13,400	29,100	25,000	7,750	41,000	4,580	4,170
Chromium	UG/L	<1.53	<1.53	<1.53	2.17	2.78	<1.53	1.92 J	1.81 J	1.60 J
Cobalt	UG/L	3.57	0.362 J	<0.0750	0.0970 J	<0.0750	6.42	0.378 J	2.07 J	0.984 J
Copper	UG/L	0.962 J	2.90	0.685 J	1.16 J	1.23 J	<0.627	0.829 J	<0.627	<0.627
Iron	UG/L	26.7 J	54.5	40.1 J	<14.1	29.7 J	14.8 J	63.8	<14.1	<14.1
Lead	UG/L	<0.128	0.198 J	<0.128	<0.128	<0.128	<0.128	<0.128	<0.128	<0.128
Lithium	UG/L	16.0	14.3	14.7	<3.14	<3.14	5.79	3.15 J	14.9	16.4
Manganese	UG/L	42.9	21.4	7.08	1.35 UJ	1.47 J	977 J	15.4 J	28.2 J	9.14 J
Mercury	UG/L	<0.101	<0.101	<0.101	<0.101	<0.101	<0.101	<0.101	<0.101	<0.101
Molybdenum	UG/L	<0.610	9.22	35.8	9.37	45.9	<0.610	9.40	0.759 J	0.844 J
Nickel	UG/L	9.44	2.66	0.382 J	0.477 J	<0.312	6.11	1.22	6.67 J	5.23 J
Selenium	UG/L	<2.62	<2.62	<2.62	10.6	8.15	<2.62	3.45 J	<2.62	<2.62
Silver	UG/L	0.176 J	<0.121	<0.121	<0.121	<0.121	<0.121	<0.121	<0.121	<0.121
Thallium	UG/L	<0.128	<0.128	<0.128	<0.128	<0.128	1.23	<0.128	<0.128	<0.128
Vanadium	UG/L	<0.899	2.92	6.98	46.9	100	<0.899	2.11	2.68	2.49
Zinc	UG/L	<3.22	3.97 J	<3.22	<3.22	<3.22	<3.22	<3.22	<3.22	<3.22
Anions										
Chloride	MG/KG	7.47 J	16.4	11.6 J	9.59 J	6.83 J	8.30 J	<4.62	7.40 J	10.5 J
Fluoride	MG/KG	1.13 J	1.21 J	<1.05	2.73 J	2.79 J	0.779 UR	<0.809	<0.899	<0.898
Sulfate	MG/KG	172	214	567	697 J	1,080 J	419 J	394	277	295
General Chemistry										
pH (lab)	SU	6.8	7.3	7.5	8.7	8.3	5.4	5.5	5.8	6.0
Total Organic Carbon	MG/KG	21,700 J	8,020	14,000	11,700 J	16,600	12,700 J	23,300	22,600	15,400

See notes on last page.

TABLE B.2 - CCR Material Analytical Results for Metals, Anions, and General Chemistry
Kingston Fossil Plant
November 2018 - December 2019

Sample Location		KIF-TW03			KIF-TW04				
Sample Date		26-Feb-19	26-Feb-19	26-Feb-19	8-Feb-19	8-Feb-19	11-Feb-19	11-Feb-19	11-Feb-19
Sample ID		KIF-CCR-TW03-31.5/33.5-20190226	KIF-CCR-TW03-36.5/38.5-20190226	KIF-CCR-TW03-41.5/43.5-20190226	KIF-CCR-TW04-3.5/5.5-20190208	KIF-CCR-TW04-6.5/8.5-20190208	KIF-CCR-TW04-11.5/13.5-20190211	KIF-CCR-TW04-16.5/18.5-20190211	KIF-CCR-TW04-21.5/23.5-20190211
Sample Depth		31.5 - 33.5 ft	36.5 - 38.5 ft	41.5 - 43.5 ft	3.5 - 5.5 ft	6.5 - 8.5 ft	11.5 - 13.5 ft	16.5 - 18.5 ft	21.5 - 23.5 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Level of Review	Units	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Validated	Validated	Validated
Total Metals									
Antimony	MG/KG	0.432	0.474	0.351	2.01	1.76	1.78	1.83	0.795
Arsenic	MG/KG	30.0	35.4	25.4	30.7	25.5	28.1	52.6	16.2
Barium	MG/KG	141	235	224	1,430	1,520	1,430	952	586
Beryllium	MG/KG	0.846	1.18	1.05	5.49	5.25	5.42	4.78	2.79
Boron	MG/KG	16.9	23.2	19.0	200	211	190	108	67.8
Cadmium	MG/KG	0.331	0.241	0.154 J	0.575	0.577	0.574	0.594	0.202
Calcium	MG/KG	1,810	3,890	3,550	27,900	30,200	27,800	16,700	14,200
Chromium	MG/KG	15.7 J	18.2 J	16.1 J	41.0	38.2	38.3	38.3	20.9
Cobalt	MG/KG	5.46	7.26	6.89	20.2	21.0	22.1	20.4	8.76
Copper	MG/KG	20.1	25.7	21.8	72.9	76.8	79.3	73.3	34.6
Iron	MG/KG	30,700	30,900	35,700	15,300	13,600	13,900	15,700	8,810
Lead	MG/KG	6.78	7.05	4.57	22.8	23.1	23.9	27.4	10.0
Lithium	MG/KG	14.6 J	15.3 J	12.2 J	20.5	20.3	20.2	22.9	10.9
Manganese	MG/KG	43.6	64.0	69.6	181	120	128	124	75.4
Mercury	MG/KG	<0.0148	0.0786 J	0.0669 J	0.0895	0.133	0.120	0.133	0.0351 J
Molybdenum	MG/KG	4.31	2.71	2.03	4.92	5.74	6.34	5.21	2.63
Nickel	MG/KG	14.9	17.8	16.3	36.4	37.5	40.0	39.1	17.1
Selenium	MG/KG	1.71	1.19	1.00	4.97	5.77	6.02	6.12	3.84
Silver	MG/KG	0.110 J	0.0436 J	<0.0424	0.355	0.271	0.333 U*	0.299 U*	0.248 U*
Thallium	MG/KG	0.653	0.809	0.541	1.16	0.902	1.03	1.68	0.471
Vanadium	MG/KG	29.0	38.9	33.3	117	119	121	113	52.5
Zinc	MG/KG	15.3	15.7	12.5	54.5	56.6	57.3	61.5	23.0
SPLP - Metals									
Antimony	UG/L	0.643 J	0.839 J	0.752 J	2.58	1.75 U*	2.96	5.67	2.50
Arsenic	UG/L	3.43	18.7	24.6	6.53	5.36	4.68	24.5	18.0
Barium	UG/L	86.4	116	101	162	141	377	260	25.4
Beryllium	UG/L	<0.155	<0.155	<0.155	<0.155	<0.155	<0.155	<0.155	<0.155
Boron	UG/L	89.7	92.4	142	1,110	1,150	1,180	716	291 U*
Cadmium	UG/L	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125
Calcium	UG/L	5,810	13,800	14,800	32,500	32,400	42,000	29,800	7,890
Chromium	UG/L	<1.53	<1.53	<1.53	3.26	12.0	22.7	11.2	3.67
Cobalt	UG/L	2.26	<0.0750	<0.0750	<0.0750	0.151 U*	0.0880 U*	0.0830 U*	0.160 U*
Copper	UG/L	<0.627	<0.627	<0.627	9.91	7.75 U*	17.3	14.1	13.7
Iron	UG/L	<14.1	<14.1	<14.1	<14.1	16.8 J	<14.1	<14.1	127
Lead	UG/L	<0.128	0.229 J	<0.128	<0.128	0.167 U*	<0.128	<0.128	0.245 U*
Lithium	UG/L	6.10	3.80 J	5.85	5.46	4.62 J	4.18 J	<3.14	4.37 J
Manganese	UG/L	33.3 J	5.16 J	6.83 J	<1.35	<1.35	<1.35	<1.35	3.14 J
Mercury	UG/L	<0.101	<0.101	<0.101	<0.101	<0.101	<0.101	<0.101	<0.101
Molybdenum	UG/L	4.94 J	16.1	14.5	3.81 U*	15.5	24.1	49.2	19.5
Nickel	UG/L	7.01	<0.312	<0.312	0.817 J	0.866 J	1.44	2.16	1.33
Selenium	UG/L	3.91 J	5.28	5.18	11.3	22.0	35.0	42.3	13.0
Silver	UG/L	<0.121	<0.121	<0.121	<0.121	<0.121	<0.121	<0.121	<0.121
Thallium	UG/L	<0.128	<0.128	<0.128	<0.128	<0.128	<0.128	<0.128	<0.128
Vanadium	UG/L	1.86	9.95	9.18	68.7	76.9	123	187	114
Zinc	UG/L	<3.22	<3.22	3.89 J	4.16 U*	4.84 U*	3.22 U*	<3.22	5.29 U*
Anions									
Chloride	MG/KG	6.56 J	8.74 J	8.86 J	<6.07	<5.91	<5.74	<5.72	<6.03
Fluoride	MG/KG	1.25	1.67	<1.05	1.57	<1.04	1.08 J	1.10 J	<1.06
Sulfate	MG/KG	242	455	657	433	425	228	103	69.9
General Chemistry									
pH (lab)	SU	6.7	7.4	7.6	10.4 J	10.9 J	10.9	11.0	9.7
Total Organic Carbon	MG/KG	10,700	22,500 J	41,600	34,100	31,900	46,100	28,800	29,200

See notes on last page.

TABLE B.2 - CCR Material Analytical Results for Metals, Anions, and General Chemistry
Kingston Fossil Plant
November 2018 - December 2019

Sample Location		KIF-TW04			KIF-TW05			
Sample Date		11-Feb-19	13-Feb-19	13-Feb-19	13-Nov-18	13-Nov-18	13-Nov-18	13-Nov-18
Sample ID		KIF-CCR-TW04-26.5/28.5-20190211	KIF-CCR-TW04-31.5/33.5-20190213	KIF-CCR-TW04-36.5/38.5-20190213	KIF-CCR-TW05-1.5/3.5-20181113	KIF-CCR-TW05-6.5/8.5-20181113	KIF-CCR-TW05-11.5/13.5-20181113	KIF-CCR-TW05-16.5/19.5-20181113
Sample Depth		26.5 - 28.5 ft	31.5 - 33.5 ft	36.5 - 38.5 ft	1.5 - 3.5 ft	6.5 - 8.5 ft	11.5 - 13.5 ft	16.5 - 19.5 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Level of Review	Units	Validated	Final-Verified	Final-Verified	Validated	Validated	Validated	Validated
Total Metals								
Antimony	MG/KG	0.413	0.464	0.687	0.475	0.225 J	0.296	0.240 J
Arsenic	MG/KG	22.5	21.0	43.5	15.9	49.2	68.3	37.0 J
Barium	MG/KG	218	217	217	209	124	85.2	79.7
Beryllium	MG/KG	1.25	1.27	1.61	1.54	0.386	0.575	0.321
Boron	MG/KG	26.7	30.4	36.0	31.7	4.44 J	5.50 J	3.92 J
Cadmium	MG/KG	0.101 J	0.103 J	0.153 J	0.203	0.0707 J	0.0781 J	0.0520 J
Calcium	MG/KG	4,110	4,530	4,270	51,100	32,600	935	770 J
Chromium	MG/KG	22.9	18.9	22.7	14.4	12.9	11.6	8.73 J
Cobalt	MG/KG	11.8	8.37	9.62	5.69	5.00	4.61	3.15 J
Copper	MG/KG	28.0	22.7	25.2	18.2	12.3	17.6	13.0 J
Iron	MG/KG	107,000	48,300	39,200	11,800	35,400	66,100	44,200 J
Lead	MG/KG	3.22	5.15	8.12	7.80	11.2	4.43	4.65
Lithium	MG/KG	13.1	10.2	13.9	9.32 J	9.10 J	7.72 J	5.75 J
Manganese	MG/KG	128	69.3	70.1	132 J	216 J	38.4 J	26.1 J
Mercury	MG/KG	0.0551	0.0662	0.244	0.0931 J	0.175	0.458	0.611
Molybdenum	MG/KG	3.24	2.62	2.09	2.72	3.32	6.84	5.75 J
Nickel	MG/KG	31.8	19.4	20.0	14.2	10.5	12.3	10.2 J
Selenium	MG/KG	1.62	2.21	3.68	1.82 J	2.78 J	13.5 J	3.45 J
Silver	MG/KG	0.163 U*	0.220 U*	0.122 U*	0.0439 J	0.0278 J	0.0273 J	0.0202 J
Thallium	MG/KG	0.689	0.735	1.75	0.353 J	1.29 J	1.18 J	1.05 J
Vanadium	MG/KG	38.3	35.2	46.4	33.2	21.3	15.4	11.1 J
Zinc	MG/KG	19.0	20.3	24.6	23.4	17.6	5.43	5.78 J
SPLP - Metals								
Antimony	UG/L	0.879 U*	1.51 U*	1.55 U*	1.35 J	<1.12	<1.12	<1.12
Arsenic	UG/L	12.9	21.8	32.4	6.11	0.438 J	4.37	5.03
Barium	UG/L	15.8	16.6	17.4	122	23.6	87.5	62.1 J
Beryllium	UG/L	<0.155	<0.155	<0.155	<0.057	<0.057	3.31	1.43
Boron	UG/L	66.7 U*	111 U*	76.5 U*	170	42.9 J	44.2 J	40 J
Cadmium	UG/L	<0.125	<0.125	<0.125	<0.125	<0.125	1.88	1.07
Calcium	UG/L	5,830	6,360	3,570	38,100	32,900	16,600	24,300
Chromium	UG/L	1.67 J	4.22	2.34	2.14	1.24 J	1.83 J	1.95 J
Cobalt	UG/L	0.0830 U*	0.245 U*	0.162 U*	0.1 J	<0.075	54.5	17.2
Copper	UG/L	3.75 U*	9.17 U*	5.99 U*	<1.3	<1.3	21.7	19.4 J
Iron	UG/L	79.5	313	235	<14.1	15.7 J	18,400	21,700 J
Lead	UG/L	<0.128	0.516 U*	0.348 U*	<0.094	<0.094	6.62	1.06
Lithium	UG/L	3.33 J	3.52 J	5.74	3.13 J	<2.56	13.5	13.4
Manganese	UG/L	1.43 J	3.45 J	3.64 J	<1.35	2.88 J	46.5	53.2
Mercury	UG/L	<0.101	<0.101	<0.101	<0.100	<0.100	<0.100	<0.100
Molybdenum	UG/L	2.11 U*	6.11	3.24 U*	5.3	1.34 J	<0.474	<0.474
Nickel	UG/L	0.467 J	1.16	0.733 J	<0.312	<0.312	111	50.7
Selenium	UG/L	5.74	9.45	18.8	3.7 J	1.14 J	1.14 J	1.04 J
Silver	UG/L	<0.121	<0.121	<0.121	<0.121	<0.121	<0.121	<0.121
Thallium	UG/L	<0.128	0.142 U*	<0.128	<0.063	<0.063	4.45	3.01 J
Vanadium	UG/L	20.8	35.6	40.1	9.83	0.926 J	1.17	0.943 J
Zinc	UG/L	5.31 U*	6.29 U*	5.76 U*	10.6	3.66 J	69.3	58.6 J
Anions								
Chloride	MG/KG	<5.07	6.04 J	<5.90	<7.51	<8.08	<7.42	<7.90
Fluoride	MG/KG	<0.888	<0.987	1.07 J	1.24 J	1.65 J	0.848 UJ	0.902 UJ
Sulfate	MG/KG	129	153	88.1	1,090	258	880	1,460
General Chemistry								
pH (lab)	SU	8.7	8.9	8.4	8.2	7.8	4.3	3.9
Total Organic Carbon	MG/KG	78,900	36,500	56,600	31,800	15,400	16,100	18,200

See notes on last page.

TABLE B.2 - CCR Material Analytical Results for Metals, Anions, and General Chemistry
Kingston Fossil Plant
November 2018 - December 2019

Sample Location		KIF-TW05			
Sample Date		13-Nov-18	13-Nov-18	13-Nov-18	13-Nov-18
Sample ID		KIF-CCR-TW05-22.5/24.5-20181113	KIF-CCR-DUP01-20181113	KIF-CCR-TW05-26.5/28.5-20181113	KIF-CCR-TW05-31.5/33.5-20181113
Sample Depth		22.5 - 24.5 ft	22.5 - 24.5 ft	26.5 - 28.5 ft	31.5 - 33.5 ft
Sample Type		Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample
Level of Review		Validated	Validated	Validated	Validated
	Units				
Total Metals					
Antimony	MG/KG	0.732	0.326 J	0.538	0.605 J
Arsenic	MG/KG	115	36.6 J	35.0 J	41.2 J
Barium	MG/KG	284	83.1	139	230
Beryllium	MG/KG	1.97	0.327	0.905	1.37
Boron	MG/KG	39.8	3.98 J	13.7	25.0
Cadmium	MG/KG	0.197	0.0456 J	0.162	0.135 J
Calcium	MG/KG	2,100	858 J	1,660	3,700 J
Chromium	MG/KG	36.8	9.67 J	12.5	23.0 J
Cobalt	MG/KG	8.53	3.72 J	6.13	10.3 J
Copper	MG/KG	43.6	13.8 J	16.6	26.4 J
Iron	MG/KG	39,000	50,700 J	38,800	50,100 J
Lead	MG/KG	26.4	4.96	2.82	6.34
Lithium	MG/KG	23.1 J	6.21 J	10.8 J	15.6 J
Manganese	MG/KG	45.6 J	38.2 J	60.6 J	88.2 J
Mercury	MG/KG	0.246	0.588	0.0537 J	0.0938 J
Molybdenum	MG/KG	6.47	5.52 J	6.65 J	3.74 J
Nickel	MG/KG	20.7	11.9 J	14.7	23.5 J
Selenium	MG/KG	4.81 J	3.61 J	1.32 J	1.84 J
Silver	MG/KG	0.128 J	0.0280 J	0.0229 J	0.0468 J
Thallium	MG/KG	1.23 J	1.34 J	0.926 J	1.08 J
Vanadium	MG/KG	62.1	11.8 J	19.6	37.9 J
Zinc	MG/KG	29.3	6.34 J	9.87	20.7 J
SPLP - Metals					
Antimony	UG/L	<1.12	<1.12	<1.12	<1.12
Arsenic	UG/L	0.351 J	5.11	4.81	16.2
Barium	UG/L	192	19.3 J	148	115
Beryllium	UG/L	0.06 J	1.67	<0.057	<0.057
Boron	UG/L	200	40.3 J	87.5	128
Cadmium	UG/L	0.192 J	1.09	<0.125	<0.125
Calcium	UG/L	37,500	25,200	11,500	17,100
Chromium	UG/L	1.2 J	2.54	1.06 J	1.08 J
Cobalt	UG/L	8.55	20.3	1.26	<0.075
Copper	UG/L	5.97	11 J	<1.3	<1.3
Iron	UG/L	37 J	35,600 J	<14.1	<14.1
Lead	UG/L	<0.094	0.607 J	<0.094	<0.094
Lithium	UG/L	30.7	14.8	8.93	4.95 J
Manganese	UG/L	138	59.7	27.2	6.62
Mercury	UG/L	<0.100	<0.100	<0.100	<0.100
Molybdenum	UG/L	<0.474	<0.474	11.5	15.9
Nickel	UG/L	16.8	60.7	6.73	<0.312
Selenium	UG/L	1.74 J	0.999 J	1.49 J	4.96 J
Silver	UG/L	<0.121	<0.121	<0.121	<0.121
Thallium	UG/L	0.513 J	4.19 J	<0.063	<0.063
Vanadium	UG/L	1.2	<0.899	2.41	12.4
Zinc	UG/L	29.1	26.2 J	3.96 J	<2.42
Anions					
Chloride	MG/KG	<8.96	<7.91	<8.53	<10.2
Fluoride	MG/KG	1.02 UJ	0.904 UJ	2.37 J	1.37 U*
Sulfate	MG/KG	1,130	1,460	268	415
General Chemistry					
pH (lab)	SU	5.3	3.9	6.8	7.5
Total Organic Carbon	MG/KG	17,300	16,200	25,800	11,400

Notes:
Please note that units have been converted automatically in this table, and significant figures may not have been maintained.

<0.03	analyte was not detected at a concentration greater than the Method Detection Limit
-	parameter not analyzed / not available
ft	feet below ground surface
ID	identification
J	quantitation is approximate due to limitations identified during data validation
mg/kg	milligrams per kilogram
SPLP	Synthetic Precipitation Leaching Procedure
SU	Standard Unit
U*	this result should be considered “not detected” because it was detected in an associated field or laboratory blank at a similar level
ug/L	micrograms per Liter
UJ	this compound was not detected, but the reporting or detection limit should be considered estimated due to a bias identified during data validation
UR	Unreliable reporting or detection limit; compound may or may not be present in sample.

1. Level of review is defined in the Quality Assurance Project Plan.

TABLE B.3 – CCR Material Analytical Results for Radiological Parameters
Kingston Fossil Plant
November 2018 - December 2019

Sample Location		KIF-B01			KIF-B02				
Sample Date		3-Dec-19	3-Dec-19	3-Dec-19	4-Dec-19	4-Dec-19	4-Dec-19	4-Dec-19	4-Dec-19
Sample ID		KIF-CCR-B01-36.5/38.5-20191203	KIF-CCR-B01-41.5/43.5-20191203	KIF-CCR-B01-46.5/48.5-20191203	KIF-CCR-B02-36.0/39.0-20191204	KIF-CCR-B02-41.0/44.0-20191204	KIF-CCR-DUP01-20191204	KIF-CCR-B02-46.5/48.5-20191204	KIF-CCR-B02-50.7/52.3-20191204
Sample Depth		36.5 - 38.5 ft	41.5 - 43.5 ft	46.5 - 48.5 ft	36 - 39 ft	41 - 44 ft	41 - 44 ft	46.5 - 48.5 ft	50.7 - 52.3 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample
Level of Review	Units	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified
Radiological Parameters									
Radium-226	pCi/g	4.49 +/-(0.649)	4.14 +/-(0.676)	3.72 +/-(0.564)	4.18 +/-(0.612)	4.23 +/-(0.620)	3.92 +/-(0.589)	3.96 +/-(0.647)	4.24 +/-(0.651)
Radium-228	pCi/g	3.58 +/-(0.627)	2.45 +/-(0.833)	2.54 +/-(0.479)	3.14 +/-(0.564)	3.02 +/-(0.546)	2.98 +/-(0.580)	2.80 +/-(0.518)	3.11 +/-(0.552)
Radium-226+228	pCi/g	8.07 +/-(0.902)	6.59 +/-(1.07)	6.26 +/-(0.740)	7.32 +/-(0.832)	7.25 +/-(0.826)	6.90 +/-(0.827)	6.76 +/-(0.829)	7.35 +/-(0.854)
Radiological Parameters - SPLP									
Radium-226	pCi/L	0.00222 +/-(0.0537)U	0.00855 +/-(0.0557)U	-0.00892 +/-(0.0626)U	0.0298 +/-(0.0659)U	-0.00143 +/-(0.0423)U	0.0384 +/-(0.0507)U	0.000700 +/-(0.0568)U	0.0273 +/-(0.0537)U
Radium-228	pCi/L	0.151 +/-(0.228)U	0.0813 +/-(0.222)U	0.0420 +/-(0.218)U	0.177 +/-(0.209)U	0.179 +/-(0.228)U	-0.0871 +/-(0.224)U	0.249 +/-(0.215)U	-0.136 +/-(0.185)U
Radium-226+228	pCi/L	0.153 +/-(0.234)U	0.0899 +/-(0.229)U	0.0420 +/-(0.227)U	0.207 +/-(0.219)U	0.179 +/-(0.232)U	0.0384 +/-(0.230)U	0.250 +/-(0.222)U	0.0273 +/-(0.193)U

See notes on last page.

TABLE B.3 – CCR Material Analytical Results for Radiological Parameters
Kingston Fossil Plant
November 2018 - December 2019

Sample Location		KIF-B03			KIF-B04		KIF-TW01			
Sample Date		5-Dec-19	5-Dec-19	5-Dec-19	5-Dec-19	5-Dec-19	24-Jan-19	24-Jan-19	24-Jan-19	25-Jan-19
Sample ID		KIF-CCR-B03-41.5/43.5-20191205	KIF-CCR-B03-46.5/48.5-20191205	KIF-CCR-B03-51.5/53.5-20191205	KIF-CCR-B04-36.5/38.5-20191205	KIF-CCR-B04-41.5/43.5-20191205	KIF-CCR-TW01-2.0/4.0-20190124	KIF-CCR-TW01-7.0/9.0-20190124	KIF-CCR-TW01-11.5/13.5-20190124	KIF-CCR-TW01-16.5/18.5-20190125
Sample Depth		41.5 - 43.5 ft	46.5 - 48.5 ft	51.5 - 53.5 ft	36.5 - 38.5 ft	41.5 - 43.5 ft	2 - 4 ft	7 - 9 ft	11.5 - 13.5 ft	16.5 - 18.5 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Level of Review		Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified
	Units									
Radiological Parameters										
Radium-226	pCi/g	4.24 +/-(0.713)	4.61 +/-(0.673)	4.00 +/-(0.677)	2.77 +/-(0.466)	3.10 +/-(0.454)	2.16 +/-(0.348)	2.07 +/-(0.368)	2.21 +/-(0.334)	5.00 +/-(0.708)J
Radium-228	pCi/g	2.99 +/-(0.549)	2.84 +/-(0.530)	2.62 +/-(0.631)	2.00 +/-(0.472)	2.47 +/-(0.409)	1.75 +/-(0.342)	1.68 +/-(0.335)	1.70 +/-(0.311)	3.52 +/-(0.705)
Radium-226+228	pCi/g	7.23 +/-(0.900)	7.45 +/-(0.857)	6.62 +/-(0.925)	4.77 +/-(0.663)	5.57 +/-(0.611)	3.91 +/-(0.488)	3.75 +/-(0.498)	3.91 +/-(0.456)	8.52 +/-(0.999)J
Radiological Parameters - SPLP										
Radium-226	pCi/L	0.0619 +/-(0.0891)U	-0.0125 +/-(0.0440)U	0.148 +/-(0.0914)	0.0556 +/-(0.0677)U	0.0499 +/-(0.0634)U	0.0559 +/-(0.0545)U	0.0307 +/-(0.0477)U	0.0591 +/-(0.0533)U	0.0645 +/-(0.0493)
Radium-228	pCi/L	0.0541 +/-(0.264)U	0.325 +/-(0.264)U	0.248 +/-(0.264)U	0.207 +/-(0.284)U	0.0510 +/-(0.218)U	0.115 +/-(0.187)U	0.209 +/-(0.216)U	0.0230 +/-(0.180)U	-0.00362 +/-(0.167)U
Radium-226+228	pCi/L	0.116 +/-(0.279)U	0.325 +/-(0.268)U	0.396 +/-(0.279)J	0.263 +/-(0.292)U	0.101 +/-(0.227)U	0.171 +/-(0.195)U	0.240 +/-(0.221)U	0.0821 +/-(0.188)U	0.0645 +/-(0.174)J

See notes on last page.

TABLE B.3 – CCR Material Analytical Results for Radiological Parameters
Kingston Fossil Plant
November 2018 - December 2019

Sample Location		KIF-TW01					KIF-TW02		
Sample Date		25-Jan-19	25-Jan-19	28-Jan-19	28-Jan-19	28-Jan-19	5-Feb-19	5-Feb-19	5-Feb-19
Sample ID		KIF-CCR-DUP01-20190125	KIF-CCR-TW01-21.5/23.5-20190125	KIF-CCR-TW01-26.5/28.5-20190128	KIF-CCR-TW01-31.5/33.5-20190128	KIF-CCR-TW01-36.5/38.5-20190128	KIF-CCR-TW02-2.25/4.0-20190205	KIF-CCR-TW02-6.5/8.5-20190205	KIF-CCR-TW02-11.5/13.5-20190205
Sample Depth		16.5 - 18.5 ft	21.5 - 23.5 ft	26.5 - 28.5 ft	31.5 - 33.5 ft	36.5 - 38.5 ft	2.25 - 4 ft	6.5 - 8.5 ft	11.5 - 13.5 ft
Sample Type		Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Level of Review	Units	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified
Radiological Parameters									
Radium-226	pCi/g	4.04 +/-(0.630)J	4.71 +/-(0.657)	3.84 +/-(0.554)	3.59 +/-(0.533)	4.23 +/-(0.621)	3.70 +/-(0.599)	3.60 +/-(0.654)	4.20 +/-(0.668)
Radium-228	pCi/g	3.42 +/-(0.619)	2.89 +/-(0.561)	2.62 +/-(0.483)	2.24 +/-(0.522)	2.91 +/-(0.489)	2.17 +/-(0.499)	3.43 +/-(0.838)	2.46 +/-(0.597)
Radium-226+228	pCi/g	7.46 +/-(0.883)J	7.60 +/-(0.864)	6.46 +/-(0.735)	5.83 +/-(0.746)	7.14 +/-(0.790)	5.87 +/-(0.780)	7.03 +/-(1.06)	6.66 +/-(0.896)
Radiological Parameters - SPLP									
Radium-226	pCi/L	0.0199 +/-(0.0441)U	0.0996 +/-(0.0637)	0.0881 +/-(0.0598)	0.129 +/-(0.0679)	0.0833 +/-(0.0602)	0.0171 +/-(0.0488)U	0.0624 +/-(0.0579)UJ	0.0743 +/-(0.0551)
Radium-228	pCi/L	0.0415 +/-(0.201)U	0.171 +/-(0.185)U	0.00564 +/-(0.172)U	0.0970 +/-(0.162)U	0.203 +/-(0.232)U	0.00623 +/-(0.202)U	0.528 +/-(0.388)U	0.215 +/-(0.212)U
Radium-226+228	pCi/L	0.0614 +/-(0.206)U	0.270 +/-(0.196)J	0.0938 +/-(0.182)J	0.226 +/-(0.176)J	0.286 +/-(0.240)J	0.0233 +/-(0.208)U	0.590 +/-(0.392)UJ	0.289 +/-(0.219)J

See notes on last page.

TABLE B.3 – CCR Material Analytical Results for Radiological Parameters
Kingston Fossil Plant
November 2018 - December 2019

Sample Location		KIF-TW02				KIF-TW03			
Sample Date		5-Feb-19	5-Feb-19	5-Feb-19	5-Feb-19	25-Feb-19	25-Feb-19	25-Feb-19	25-Feb-19
Sample ID		KIF-CCR-TW02-16.5/18.5-20190205	KIF-CCR-TW02-26.5/28.5-20190205	KIF-CCR-TW02-31.5/33.5-20190205	KIF-CCR-TW02-36.5/38.5-20190205	KIF-CCR-TW03-1.5/3.5-20190225	KIF-CCR-TW03-6.5/8.5-20190225	KIF-CCR-TW03-11.5/13.5-20190225	KIF-CCR-TW03-16.5/18.5-20190225
Sample Depth		16.5 - 18.5 ft	26.5 - 28.5 ft	31.5 - 33.5 ft	36.5 - 38.5 ft	1.5 - 3.5 ft	6.5 - 8.5 ft	11.5 - 13.5 ft	16.5 - 18.5 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Level of Review		Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified
	Units								
Radiological Parameters									
Radium-226	pCi/g	4.06 +/-(0.593)	3.45 +/-(0.465)	3.51 +/-(0.562)	3.88 +/-(0.705)	1.57 +/-(0.321)	3.00 +/-(0.476)	2.96 +/-(0.451)	3.53 +/-(0.515)
Radium-228	pCi/g	3.19 +/-(0.650)	1.93 +/-(0.395)	2.60 +/-(0.483)	2.69 +/-(0.548)	1.38 +/-(0.335)	2.31 +/-(0.490)	1.89 +/-(0.564)	2.06 +/-(0.468)
Radium-226+228	pCi/g	7.25 +/-(0.880)	5.38 +/-(0.610)	6.11 +/-(0.741)	6.57 +/-(0.893)	2.95 +/-(0.464)	5.31 +/-(0.683)	4.85 +/-(0.722)	5.59 +/-(0.696)
Radiological Parameters - SPLP									
Radium-226	pCi/L	0.0629 +/-(0.0668)U	0.133 +/-(0.0749)	0.0381 +/-(0.0555)U	0.0849 +/-(0.0664)U	0.0580 +/-(0.0549)U	0.0369 +/-(0.0574)U	0.193 +/-(0.0954)	0.0781 +/-(0.0610)U
Radium-228	pCi/L	0.181 +/-(0.207)U	-0.0257 +/-(0.191)U	0.00394 +/-(0.184)U	-0.0812 +/-(0.220)U	0.185 +/-(0.191)U	0.251 +/-(0.291)U	0.401 +/-(0.264)	0.356 +/-(0.245)U
Radium-226+228	pCi/L	0.243 +/-(0.218)U	0.133 +/-(0.205)J	0.0420 +/-(0.192)U	0.0849 +/-(0.230)U	0.243 +/-(0.199)U	0.288 +/-(0.297)U	0.594 +/-(0.281)	0.434 +/-(0.252)U

See notes on last page.

TABLE B.3 – CCR Material Analytical Results for Radiological Parameters
Kingston Fossil Plant
November 2018 - December 2019

Sample Location		KIF-TW03					KIF-TW04		
Sample Date		26-Feb-19	26-Feb-19	26-Feb-19	26-Feb-19	26-Feb-19	8-Feb-19	8-Feb-19	11-Feb-19
Sample ID		KIF-CCR-TW03-23.0/26.0-20190226	KIF-CCR-DUP02-20190226	KIF-CCR-TW03-31.5/33.5-20190226	KIF-CCR-TW03-36.5/38.5-20190226	KIF-CCR-TW03-41.5/43.5-20190226	KIF-CCR-TW04-3.5/5.5-20190208	KIF-CCR-TW04-6.5/8.5-20190208	KIF-CCR-TW04-11.5/13.5-20190211
Sample Depth		23 - 26 ft	23 - 26 ft	31.5 - 33.5 ft	36.5 - 38.5 ft	41.5 - 43.5 ft	3.5 - 5.5 ft	6.5 - 8.5 ft	11.5 - 13.5 ft
Sample Type		Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Level of Review	Units	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Validated
Radiological Parameters									
Radium-226	pCi/g	4.47 +/-(0.721)	4.88 +/-(0.770)	3.14 +/-(0.422)	4.47 +/-(0.697)	4.71 +/-(0.700)	3.79 +/-(0.532)	3.49 +/-(0.544)	3.32 +/-(0.529)
Radium-228	pCi/g	3.14 +/-(0.563)	2.64 +/-(0.546)	2.14 +/-(0.346)	3.12 +/-(0.559)	3.64 +/-(0.797)	2.97 +/-(0.513)	3.97 +/-(0.649)	2.71 +/-(0.485)
Radium-226+228	pCi/g	7.61 +/-(0.915)	7.52 +/-(0.944)	5.28 +/-(0.546)	7.59 +/-(0.893)	8.35 +/-(1.06)	6.76 +/-(0.739)	7.46 +/-(0.847)	6.03 +/-(0.718)
Radiological Parameters - SPLP									
Radium-226	pCi/L	0.156 +/-(0.0814)	-0.00211 +/-(0.0363)U	0.0459 +/-(0.0510)U	-0.00142 +/-(0.0298)U	0.0376 +/-(0.0548)U	0.0515 +/-(0.0530)U	0.115 +/-(0.0757)	0.0274 +/-(0.0496)U
Radium-228	pCi/L	0.132 +/-(0.208)U	0.193 +/-(0.236)U	0.0319 +/-(0.203)U	0.170 +/-(0.247)U	0.458 +/-(0.268)	0.713 +/-(0.282)	0.947 +/-(0.289)	0.673 +/-(0.278)
Radium-226+228	pCi/L	0.288 +/-(0.223)J	0.193 +/-(0.239)U	0.0778 +/-(0.209)U	0.170 +/-(0.249)U	0.496 +/-(0.274)J	0.765 +/-(0.287)J	1.06 +/-(0.299)	0.700 +/-(0.282)J

See notes on last page.

TABLE B.3 – CCR Material Analytical Results for Radiological Parameters
Kingston Fossil Plant
November 2018 - December 2019

Sample Location		KIF-TW04					KIF-TW05		
Sample Date		11-Feb-19	11-Feb-19	11-Feb-19	13-Feb-19	13-Feb-19	13-Nov-18	13-Nov-18	13-Nov-18
Sample ID		KIF-CCR-TW04-16.5/18.5-20190211	KIF-CCR-TW04-21.5/23.5-20190211	KIF-CCR-TW04-26.5/28.5-20190211	KIF-CCR-TW04-31.5/33.5-20190213	KIF-CCR-TW04-36.5/38.5-20190213	KIF-CCR-TW05-1.5/3.5-20181113	KIF-CCR-TW05-6.5/8.5-20181113	KIF-CCR-TW05-11.5/13.5-20181113
Sample Depth		16.5 - 18.5 ft	21.5 - 23.5 ft	26.5 - 28.5 ft	31.5 - 33.5 ft	36.5 - 38.5 ft	1.5 - 3.5 ft	6.5 - 8.5 ft	11.5 - 13.5 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Level of Review	Units	Validated	Validated	Validated	Final-Verified	Final-Verified	Validated	Validated	Validated
Radiological Parameters									
Radium-226	pCi/g	3.89 +/-(0.626)	2.75 +/-(0.538)	3.10 +/-(0.452)	2.80 +/-(0.533)	3.68 +/-(0.683)	2.33 +/-(0.459)	3.03 +/-(0.545)	2.07 +/-(0.335)
Radium-228	pCi/g	3.46 +/-(0.627)	2.32 +/-(0.777)	2.17 +/-(0.465)	0.0729 +/-(0.104)U	2.70 +/-(0.554)	1.37 +/-(0.361)	2.01 +/-(0.505)	1.72 +/-(0.365)
Radium-226+228	pCi/g	7.35 +/-(0.886)	5.07 +/-(0.945)	5.27 +/-(0.648)	2.87 +/-(0.543)J	6.38 +/-(0.879)	3.70 +/-(0.584)	5.04 +/-(0.743)	3.79 +/-(0.495)
Radiological Parameters - SPLP									
Radium-226	pCi/L	0.0661 +/-(0.0639)U	0.125 +/-(0.0722)	0.0198 +/-(0.0512)U	0.0427 +/-(0.0701)U	0.0571 +/-(0.0624)U	0.0679 +/-(0.0591)U	-0.0127 +/-(0.0349)U	0.166 +/-(0.0753)
Radium-228	pCi/L	0.585 +/-(0.276)	0.617 +/-(0.260)	0.661 +/-(0.293)	0.403 +/-(0.240)	-0.0312 +/-(0.193)U	0.213 +/-(0.210)U	0.118 +/-(0.222)U	0.0785 +/-(0.211)U
Radium-226+228	pCi/L	0.651 +/-(0.283)J	0.742 +/-(0.270)	0.681 +/-(0.297)J	0.446 +/-(0.250)J	0.0571 +/-(0.203)U	0.281 +/-(0.218)U	0.118 +/-(0.225)U	0.244 +/-(0.224)J

See notes on last page.

TABLE B.3 – CCR Material Analytical Results for Radiological Parameters
Kingston Fossil Plant
November 2018 - December 2019

Sample Location		KIF-TW05				
Sample Date		13-Nov-18	13-Nov-18	13-Nov-18	13-Nov-18	13-Nov-18
Sample ID		KIF-CCR-TW05-16.5/19.5-20181113	KIF-CCR-TW05-22.5/24.5-20181113	KIF-CCR-DUP01-20181113	KIF-CCR-TW05-26.5/28.5-20181113	KIF-CCR-TW05-31.5/33.5-20181113
Sample Depth		16.5 - 19.5 ft	22.5 - 24.5 ft	22.5 - 24.5 ft	26.5 - 28.5 ft	31.5 - 33.5 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample
Level of Review		Validated	Validated	Validated	Validated	Validated
	Units					
Radiological Parameters						
Radium-226	pCi/g	2.41 +/-(0.385)	4.35 +/-(0.635)	2.55 +/-(0.450)	3.51 +/-(0.496)	4.07 +/-(0.606)
Radium-228	pCi/g	1.66 +/-(0.329)	3.26 +/-(0.558)	2.06 +/-(0.418)	2.42 +/-(0.419)	2.61 +/-(0.488)
Radium-226+228	pCi/g	4.07 +/-(0.506)	7.61 +/-(0.845)	4.60 +/-(0.614)	5.92 +/-(0.649)	6.68 +/-(0.778)
Radiological Parameters - SPLP						
Radium-226	pCi/L	0.0284 +/-(0.0404)U	0.208 +/-(0.0814)	0.0535 +/-(0.0499)U	0.0434 +/-(0.0457)U	-0.0122 +/-(0.0307)U
Radium-228	pCi/L	0.310 +/-(0.217)U	0.299 +/-(0.223)U	0.273 +/-(0.239)U	-0.119 +/-(0.189)U	-0.0803 +/-(0.262)U
Radium-226+228	pCi/L	0.338 +/-(0.221)U	0.507 +/-(0.237)J	0.327 +/-(0.244)U	0.0434 +/-(0.194)U	0.000 +/-(0.264)U

Notes:

ft	feet below ground surface
ID	identification
J	quantitation is approximate due to limitations identified during data validation
pCi/g	picoCurie per gram
pCi/L	picoCurie per Liter
SPLP	Synthetic Precipitation Leaching Procedure
U	not detected
UJ	this compound was not detected, but the reporting or detection limit should be considered estimated due to a bias identified during data validation

1. Level of review is defined in the Quality Assurance Project Plan.

TABLE B.4 - CCR Material pH Field Results
Kingston Fossil Plant
November 2018 - December 2019

Sample Location	Sample ID	Sample Date	Sample Depth	pH (field)
				SU
KIF-B01	KIF-CCR-B01-36.5/38.5-20191203	3-Dec-19	36.5 - 38.5 ft	8.25
	KIF-CCR-B01-41.5/43.5-20191203	3-Dec-19	41.5 - 43.5 ft	9.14
	KIF-CCR-B01-46.5/48.5-20191203	3-Dec-19	46.5 - 48.5 ft	8.53
KIF-B02	KIF-CCR-B02-36.0/39.0-20191204	4-Dec-19	36 - 39 ft	7.40
	KIF-CCR-B02-41.0/44.0-20191204	4-Dec-19	41 - 44 ft	7.44
	KIF-CCR-B02-46.5/48.5-20191204	4-Dec-19	46.5 - 48.5 ft	8.11
	KIF-CCR-B02-50.7/52.3-20191204	4-Dec-19	50.7 - 52.3 ft	7.43
KIF-B03	KIF-CCR-B03-41.5/43.5-20191205	5-Dec-19	41.5 - 43.5 ft	7.65
	KIF-CCR-B03-46.5/48.5-20191205	5-Dec-19	46.5 - 48.5 ft	7.71
	KIF-CCR-B03-51.5/53.5-20191205	5-Dec-19	51.5 - 53.5 ft	7.71
KIF-B04	KIF-CCR-B04-36.5/38.5-20191205	5-Dec-19	36.5 - 38.5 ft	8.28
	KIF-CCR-B04-41.5/43.5-20191205	5-Dec-19	41.5 - 43.5 ft	7.86
KIF-TW01	KIF-CCR-TW01-2.0/4.0-20190124	24-Jan-19	2 - 4 ft	7.47
	KIF-CCR-TW01-7.0/9.0-20190124	24-Jan-19	7 - 9 ft	5.76
	KIF-CCR-TW01-11.5/13.5-20190124	24-Jan-19	11.5 - 13.5 ft	5.41
	KIF-CCR-TW01-16.5/18.5-20190125	25-Jan-19	16.5 - 18.5 ft	7.79
	KIF-CCR-TW01-21.5/23.5-20190125	25-Jan-19	21.5 - 23.5 ft	6.48
	KIF-CCR-TW01-26.5/28.5-20190128	28-Jan-19	26.5 - 28.5 ft	6.91
	KIF-CCR-TW01-31.5/33.5-20190128	28-Jan-19	31.5 - 33.5 ft	6.64
	KIF-CCR-TW01-36.5/38.5-20190128	28-Jan-19	36.5 - 38.5 ft	5.97
KIF-TW02	KIF-CCR-TW02-2.25/4.0-20190205	5-Feb-19	2.25 - 4 ft	8.06
	KIF-CCR-TW02-6.5/8.5-20190205	5-Feb-19	6.5 - 8.5 ft	7.30
	KIF-CCR-TW02-11.5/13.5-20190205	5-Feb-19	11.5 - 13.5 ft	6.89
	KIF-CCR-TW02-16.5/18.5-20190205	5-Feb-19	16.5 - 18.5 ft	7.04
	KIF-CCR-TW02-26.5/28.5-20190205	5-Feb-19	26.5 - 28.5 ft	6.69
	KIF-CCR-TW02-31.5/33.5-20190205	5-Feb-19	31.5 - 33.5 ft	6.66
	KIF-CCR-TW02-36.5/38.5-20190205	5-Feb-19	36.5 - 38.5 ft	6.82
KIF-TW03	KIF-CCR-TW03-1.5/3.5-20190225	25-Feb-19	1.5 - 3.5 ft	9.48
	KIF-CCR-TW03-6.5/8.5-20190225	25-Feb-19	6.5 - 8.5 ft	9.08
	KIF-CCR-TW03-11.5/13.5-20190225	25-Feb-19	11.5 - 13.5 ft	5.59
	KIF-CCR-TW03-16.5/18.5-20190225	25-Feb-19	16.5 - 18.5 ft	5.52
	KIF-CCR-TW03-23.0/26.0-20190226	26-Feb-19	23 - 26 ft	5.87
	KIF-CCR-TW03-31.5/33.5-20190226	26-Feb-19	31.5 - 33.5 ft	6.67
	KIF-CCR-TW03-36.5/38.5-20190226	26-Feb-19	36.5 - 38.5 ft	7.38
	KIF-CCR-TW03-41.5/43.5-20190226	26-Feb-19	41.5 - 43.5 ft	7.85
KIF-TW04	KIF-CCR-TW04-3.5/5.5-20190208	8-Feb-19	3.5 - 5.5 ft	8.65
	KIF-CCR-TW04-6.5/8.5-20190208	8-Feb-19	6.5 - 8.5 ft	8.45
	KIF-CCR-TW04-11.5/13.5-20190211	11-Feb-19	11.5 - 13.5 ft	11.63
	KIF-CCR-TW04-16.5/18.5-20190211	11-Feb-19	16.5 - 18.5 ft	11.25
	KIF-CCR-TW04-21.5/23.5-20190211	11-Feb-19	21.5 - 23.5 ft	10.31
	KIF-CCR-TW04-26.5/28.5-20190211	11-Feb-19	26.5 - 28.5 ft	9.19
	KIF-CCR-TW04-31.5/33.5-20190213	13-Feb-19	31.5 - 33.5 ft	8.72
	KIF-CCR-TW04-36.5/38.5-20190213	13-Feb-19	36.5 - 38.5 ft	8.50
KIF-TW05	KIF-CCR-TW05-1.5/3.5-20181113	13-Nov-18	1.5 - 3.5 ft	8.36
	KIF-CCR-TW05-6.5/8.5-20181113	13-Nov-18	6.5 - 8.5 ft	7.81
	KIF-CCR-TW05-11.5/13.5-20181113	13-Nov-18	11.5 - 13.5 ft	4.48
	KIF-CCR-TW05-16.5/19.5-20181113	13-Nov-18	16.5 - 19.5 ft	4.60
	KIF-CCR-TW05-22.5/24.5-20181113	13-Nov-18	22.5 - 24.5 ft	5.17
	KIF-CCR-TW05-26.5/28.5-20181113	13-Nov-18	26.5 - 28.5 ft	6.38
	KIF-CCR-TW05-31.5/33.5-20181113	13-Nov-18	31.5 - 33.5 ft	6.72

Notes:

ft	feet below ground surface
ID	identification
SU	Standard Unit

Table B.5 - Pore Water Level Measurements
Kingston Fossil Plant
April 2019

Well ID	Date Measured	Depth to Pore Water	Top of Casing Elevation	Pore Water Elevation	Screen Interval
		ft btoc	ft msl	ft msl	ft btoc
KIF-TW01	04/09/2019	18.93	775.36	756.43	26.5 - 36.5
KIF-TW02	04/09/2019	18.59	774.73	756.14	30.0 - 40.0
KIF-TW03	04/09/2019	23.21	778.90	755.69	33.5 - 43.5
KIF-TW04	04/09/2019	14.37	769.60	755.23	26.0 - 36.0
KIF-TW05	04/09/2019	20.00	773.69	753.69	26.5 - 36.1

Notes:

btoc	below top of casing
ft	feet
ID	Identification
msl	mean sea level

1. Top of casing elevations and screen intervals were obtained from the TVA TDEC Order Well Installation Detail Logs included in the Exploratory Drilling SAR

TABLE B.6 – Summary of Pore Water Samples
Kingston Fossil Plant
April 2019

			Analysis Type										
Location ID	**Sample ID**	**Sample Type**	Field Parameters	Total Metals	Dissolved Metals	Total Mercury	Dissolved Mercury	Anions	Total Dissolved Solids	Total Organic Carbon	Radium-226	Radium-228	Radium-226+228
KIF-TW01	KIF-PW-TW01-35.5-20190412	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x
KIF-TW02	KIF-PW-TW02-38-20190409	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x
KIF-TW03	KIF-PW-TW03-42-20190409	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x
KIF-TW04	KIF-PW-TW04-35.9-20190411	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x
KIF-TW05	KIF-PW-TW05-36.5-20190410	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x
	KIF-PW-DUP01-20190410	Field Duplicate Sample		x	x	x	x	x	x	x	x	x	x

Notes

Total and Dissolved Metals	SW-846 6020A
Total and Dissolved Mercury	SW-846 7470A
Anions	SW-846 9056A
Total Dissolved Solids	SM2540C
Total Organic Carbon	SW-846 9060A
Radium-226	EPA 903.0
Radium-228	EPA 904.0
Radium-226+228	CALC
ID	identification

1. Field and laboratory quality control sample results except for field duplicates are not included in report tables but were used for data validation.
2. CEC collected a split sample from KIF-TW04.

TABLE B.7 – Summary of Pore Water Quality Parameters
Kingston Fossil Plant
April 2019

Sample Location		KIF-TW01	KIF-TW02	KIF-TW03	KIF-TW04	KIF-TW05
Sample Date		12-Apr-19	9-Apr-19	9-Apr-19	11-Apr-19	10-Apr-19
Sample ID		KIF-PW-TW01-35.5-20190412	KIF-PW-TW02-38-20190409	KIF-PW-TW03-42-20190409	KIF-PW-TW04-35.9-20190411	KIF-PW-TW05-36.5-20190410
Sample Depth		35.5 ft	38 ft	42 ft	35.9 ft	36.5 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Level of Review		Final QC Review	Final QC Review	Final QC Review	Final QC Review	Final QC Review
	Units					
Field Parameters						
Dissolved Oxygen	%	5.4	71.6	16.2	4.6	5.2
Dissolved Oxygen	mg/L	0.51	6.84	1.58	0.43	0.47
ORP	mV	-73.1	-33.0	-71.8	-38.9	-54.9
pH (field)	SU	6.85	6.84	6.93	8.86	6.53
Specific Cond. (Field)	uS/cm	2,832	1,119	1,964	892	1,979
Temperature, Water (C)	DEG C	17.5	18.8	17.4	19.6	19.9
Turbidity, field	NTU	9.89	36.1	3.24	3.31	16.7

Notes:

%	percent
Cond.	conductance
DEG C	degrees Celsius
ft	feet below top of casing
ID	identification
mg/L	milligrams per Liter
mV	milliVolts
NTU	Nephelometric Turbidity Unit
ORP	Oxidation Reduction Potential, measured using a silver reference electrode which has a standard potential of 200 mV
SU	Standard Units
uS/cm	microSiemens per centimeter

1. Level of review is defined in the Quality Assurance Project Plan.

TABLE B.8 - Pore Water Analytical Results for Metals, Anions, and General Chemistry
Kingston Fossil Plant
April 2019

Sample Location		KIF-TW01	KIF-TW02	KIF-TW03	KIF-TW04	KIF-TW05	
Sample Date		12-Apr-19	9-Apr-19	9-Apr-19	11-Apr-19	10-Apr-19	10-Apr-19
Sample ID		KIF-PW-TW01-35.5-20190412	KIF-PW-TW02-38-20190409	KIF-PW-TW03-42-20190409	KIF-PW-TW04-35.9-20190411	KIF-PW-TW05-36.5-20190410	KIF-PW-DUP01-20190410
Sample Depth		35.5 ft	38 ft	42 ft	35.9 ft	36.5 ft	36.5 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample
Level of Review	Units	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Validated	Validated
Total Metals							
Antimony	ug/L	<0.378	<0.378	<0.378	0.707 J	<0.378	<0.378
Arsenic	ug/L	301	229	382	79.4	365	371
Barium	ug/L	39.1	76.2	36.2	242	32.0	31.1
Beryllium	ug/L	<0.155	<0.155	<0.155	<0.155	<0.155	<0.155
Boron	ug/L	3,310	797	3,830	2,160	2,600	2,560
Cadmium	ug/L	0.127 J	<0.125	<0.125	<0.125	<0.125	<0.125
Calcium	ug/L	521,000	174,000	354,000	136,000	288,000	294,000
Chromium	ug/L	2.79 U*	4.74 U*	4.13 U*	1.96 U*	3.72 U*	3.14 U*
Cobalt	ug/L	3.10	0.673	0.393 J	0.257 J	0.350 J	0.349 J
Copper	ug/L	1.05 J	1.60 J	0.758 J	0.667 J	<0.627	0.660 J
Iron	ug/L	73,300	36,700	43,500	608	108,000	110,000
Lead	ug/L	<0.128	0.671 J	<0.128	<0.128	0.135 J	0.138 J
Lithium	ug/L	528	192	287	47.8	308	313
Manganese	ug/L	5,820	1,750	3,040	151	2,410	2,430
Mercury	ug/L	<0.101	<0.101	<0.101	<0.101	<0.101	<0.101
Molybdenum	ug/L	391	120	450	193	195	199
Nickel	ug/L	3.91	2.42	0.998 J	0.866 J	1.94	1.94
Selenium	ug/L	<2.62	<2.62	<2.62	<2.62	<2.62	<2.62
Silver	ug/L	<0.121	<0.121	<0.121	<0.121	<0.121	<0.121
Thallium	ug/L	0.491 J	0.149 J	<0.128	<0.128	<0.128	<0.128
Vanadium	ug/L	1.73 U*	3.90 U*	2.59 U*	13.4 U*	2.37 U*	1.88 U*
Zinc	ug/L	10.3	5.41	6.51	<3.22	45.3	46.3
Dissolved Metals							
Antimony	ug/L	<0.378	<0.378	<0.378	0.681 J	<0.378	<0.378
Arsenic	ug/L	288	180	372	78.4	349	347
Barium	ug/L	37.3	60.5	34.4	240	31.1	29.5
Beryllium	ug/L	<0.155	<0.155	<0.155	<0.155	<0.155	<0.155
Boron	ug/L	3,290	762	3,550	2,080	2,610	2,550
Cadmium	ug/L	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125
Calcium	ug/L	517,000	163,000	350,000	134,000	298,000	288,000
Chromium	ug/L	2.24 U*	3.13 U*	3.53 U*	<1.53	2.96 U*	3.42 U*
Cobalt	ug/L	2.88	0.436 J	0.369 J	0.243 J	0.313 J	0.318 J
Copper	ug/L	0.905 J	<0.627	<0.627	<0.627	<0.627	<0.627
Iron	ug/L	73,300	31,900	42,800	188	107,000	107,000
Lead	ug/L	<0.128	<0.128	<0.128	<0.128	<0.128	<0.128
Lithium	ug/L	555	181	280	48.6	317	314
Manganese	ug/L	5,770	1,680	2,970	155	2,430	2,340
Mercury	ug/L	<0.101	<0.101	<0.101	<0.101	<0.101	<0.101
Molybdenum	ug/L	385	115	443	195	196	197
Nickel	ug/L	3.96	1.68 U*	0.809 U*	0.912 U*	1.90	1.86
Selenium	ug/L	<2.62	<2.62	<2.62	<2.62	<2.62	<2.62
Silver	ug/L	<0.121	<0.121	<0.121	<0.121	<0.121	<0.121
Thallium	ug/L	0.442 J	<0.128	<0.128	<0.128	<0.128	<0.128
Vanadium	ug/L	1.40 U*	1.87 U*	2.12 U*	11.3	1.64 U*	1.75 U*
Zinc	ug/L	9.65	4.41 J	5.97	<3.22	44.7	50.2
Anions							
Chloride	mg/L	12.9	34.2	9.40	12.2	6.99	6.73
Fluoride	mg/L	0.463 J	0.268	0.322	0.192	0.325	0.324
Sulfate	mg/L	1,420	376	866	300	902	839
General Chemistry							
Total Dissolved Solids	mg/L	2,580	850	1,680	659	1,670	1,670
Total Organic Carbon	mg/L	0.996 J	2.12	0.916 J	4.29	1.19	1.23

Notes:

<0.03	analyte was not detected at a concentration greater than the Method Detection Limit
ft	feet below top of casing
ID	identification
J	quantitation is approximate due to limitations identified during data validation
mg/L	milligrams per Liter
U*	result should be considered “not detected” because it was detected in an associated field or laboratory blank at a similar level
ug/L	micrograms per Liter

1. Level of review is defined in the Quality Assurance Project Plan.

TABLE B.9 – Pore Water Analytical Results for Radiological Parameters
Kingston Fossil Plant
April 2019

Sample Location		KIF-TW01	KIF-TW02	KIF-TW03	KIF-TW04	KIF-TW05	
Sample Date		12-Apr-19	9-Apr-19	9-Apr-19	11-Apr-19	10-Apr-19	10-Apr-19
Sample ID		KIF-PW-TW01-35.5-20190412	KIF-PW-TW02-38-20190409	KIF-PW-TW03-42-20190409	KIF-PW-TW04-35.9-20190411	KIF-PW-TW05-36.5-20190410	KIF-PW-DUP01-20190410
Sample Depth		35.5 ft	38 ft	42 ft	35.9 ft	36.5 ft	36.5 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample
Level of Review		Final-Verified	Final-Verified	Final-Verified	Final-Verified	Validated	Validated
	Units						
Radiological Parameters							
Radium-226	pCi/L	0.127 +/-(0.0712)J	0.140 +/-(0.0726)	0.0112 +/-(0.0563)U	0.126 +/-(0.0735)J	0.0971 +/-(0.0577)	0.140 +/-(0.0713)
Radium-228	pCi/L	0.233 +/-(0.241)U	0.480 +/-(0.281)U*	0.223 +/-(0.297)U	0.131 +/-(0.241)U	0.447 +/-(0.236)U*	0.413 +/-(0.242)U*
Radium-226+228	pCi/L	0.359 +/-(0.251)J	0.620 +/-(0.290)J	0.234 +/-(0.302)U	0.257 +/-(0.252)J	0.544 +/-(0.243)J	0.554 +/-(0.252)J

Notes:

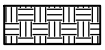
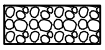
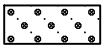
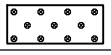
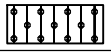
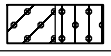
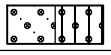
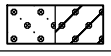
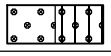
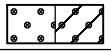
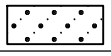
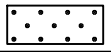
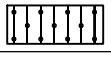
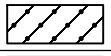
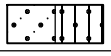
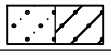
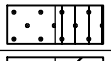
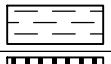
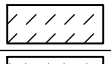
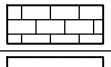
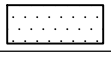
ft	feet below top of casing
ID	identification
J	quantitation is approximate due to limitations identified during data validation
pCi/L	picoCurie per Liter
U	not detected
U*	this result should be considered “not detected” because it was detected in an associated field or laboratory blank at a similar level.

1. Level of review is defined in the Quality Assurance Project Plan.

APPENDIX C - SUBSURFACE LOGS

Subsurface Boring Legend

Lithology Graphics

Symbol	Lithology
	Fill
	Top Soil
	Gravel
	Well Graded Gravel (GW)
	Poorly Graded Gravel (GP)
	Silty Gravel (GM)
	Silty, Clayey Gravel (GC-GM)
	Clayey Gravel (GC)
	Well Graded Gravel with Silt (GW-GM)
	Well Graded Gravel with Clay (GW-GC)
	Poorly Graded Gravel with Silt (GP-GM)
	Poorly Graded Gravel with Clay (GP-GC)
	Well Graded Sand (SW)
	Poorly Graded Sand (SP)
	Silty Sand (SM)
	Silty, Clayey Sand (SC-SM)
	Clayey Sand (SC)
	Well Graded Sand with Silt (SW-SM)
	Well Graded Sand with Clay (SW-SC)
	Poorly Graded Sand with Silt (SP-SM)
	Poorly Graded Sand with Clay (SP-SC)
	Silt (ML)
	Silty Clay (CL-ML)
	Lean Clay (CL)
	Organic Silt (OL)
	Elastic Silt (MH)
	Fat Clay (CH)
	Organic Clay (OH)
	Non-Durable Shale
	Durable Shale
	Coal
	Limestone
	Sandstone

Lithology Graphics are based on TVA drafting standards.

Other Graphics

Symbol	Description
	Denotes environmental analytical sample interval
	Denotes SS sample interval
	Denotes ST sample interval
	Denotes DP sample interval
	Denotes RS sample interval
	Denotes RC sample interval
	First water level reading
	Second water level reading

Common Abbreviations

Abbreviation	Definition
DP	Direct Push
HA	Hand Auger
HSA	Hollow Stem Auger
N/A	Not Applicable
NR	Not Recorded
RC	Rock Core
RQD	Rock Quality Designation
RS	Rotary Sonic
SS	Split Spoon
ST	Shelby Tube
WH	Weight of Hammer
WR	Weight of Rod

General Notes

The boring logs include sample numbering used during drilling. For assigned Environmental Analytical Sample ID numbers, see relevant Environmental Chain-of- Custody forms from the drilling date range listed on each log.

For pH readings and additional field data, see applicable field documentation (e.g., Soil pH Data Form) from the drilling date range listed on each log.

SUBSURFACE LOG

Client Borehole ID	N/A	Stantec Boring No.	**KIF-B01a**
Client	Tennessee Valley Authority	Boring Location	576,069.92 N; 2,407,677.68 E NAD83
Project Number	175668043	Surface Elevation	771.3 ft
Elevation Datum	NGVD29		
Project Name	KIF TDEC Order	Date Started	12/2/19
Completed	12/2/19		
Project Location	Harriman, Tennessee	Depth to Water	N/A
Date/Time	N/A		
Inspector	E. Smith	Logger	E. Smith
Depth to Water	N/A	Date/Time	N/A
Drilling Contractor	Hawkston	Drill Rig Type and ID	Geoprobe 3230DT
Overburden Drilling and Sampling Tools (Type and Size)	DT37 Dual Tube Soil Sampling System with 60" PVC Liners		
Rock Drilling and Sampling Tools (Type and Size)	No Coring		
Overdrill Tooling (Type and Size)	NA	Overdrill Depth	N/A
Sampler Hammer Type	No SPT	Weight	N/A
Drop	N/A	Efficiency	N/A
Borehole Azimuth	N/A	Borehole Inclination (from Vertical)	N/A
Reviewed By	J. Musselman	Approved By	M. Aplin

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]	Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft	Rec. Ft	Rec. %
0.0	771.3		Top of Hole					
			No sampling conducted from 0.0' to 35.0', boring advanced through this interval using DPT with closed tip. Refer to boring log for KIF-TW01 for 0.0' through 35.0'.					

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 3/18/20

SUBSURFACE LOG

Client Borehole ID N/A
Stantec Boring No. **KIF-B01a**
Client Tennessee Valley Authority
Boring Location 576,069.92 N; 2,407,677.68 E NAD83
Project Number 175668043
Surface Elevation 771.3 ft
Elevation Datum NGVD29

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]	Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft	Rec. Ft	Rec. %
			No sampling conducted from 0.0' to 35.0', boring advanced through this interval using DPT with closed tip. Refer to boring log for KIF-TW01 for 0.0' through 35.0'. *(Continued)*					
35.0	736.3		SILT, ML, 5Y 4/1 (dark gray) to 5Y 3/1 (very dark gray), non-plastic, soft to very soft, moist to wet, no odor, no staining, [CCR]		DP01aG	35.0 - 36.5		
					DP01bE	36.5 - 38.5	5.0	N/A
					DP01cG	38.5 - 40.0		
					DP02aG	40.0 - 41.5		

36.5/38.5-20191203

35.0 - 40.0

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 3/18/20

SUBSURFACE LOG

Client Borehole ID: N/A
Stantec Boring No.: **KIF-B01a**
Client: Tennessee Valley Authority
Boring Location: 576,069.92 N; 2,407,677.68 E NAD83
Project Number: 175668043
Surface Elevation: 771.3 ft
Elevation Datum: NGVD29

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]		Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft		Rec. Ft	Rec. %
43			SILT, ML, 5Y 4/1 (dark gray) to 5Y 3/1 (very dark gray), non-plastic, soft to very soft, moist to wet, no odor, no staining, [CCR] *(Continued)*	41.5/43.5-20191203	DP02bE	41.5 - 43.5	40.0 - 45.0	5.0	N/A
44					DP02cG	43.5 - 45.0			
45					DP03a	45.0 - 46.5			
46				46.5/48.5-20191203					
47					DP03bE	46.5 - 48.5	45.0 - 50.0	5.0	N/A
48									
49					DP03c	48.5 - 49.8			
	49.8	721.5			DP03dG	49.8 - 50.0			
50			LEAN CLAY, CL, 5Y 3/1 (very dark gray), medium plasticity, firm to soft, moist to wet, moderate organic odor, no staining		DP04aG	50.0 - 51.3			
51	51.3	720.0							
52			SANDY SILT, ML, 5Y 5/1 (gray), low plasticity, soft, moist to wet, moderate organic odor, sand increases with depth, clay decreases with depth		DP04bG	51.3 - 53.0	50.0 - 55.0	5.0	N/A
	53.0	718.3							
53	53.7	717.6	WELL GRADED SAND, SW, 5Y 3/1 (very dark gray), very fine to medium, loose, moist to wet, moderate organic odor		DP04cG	53.0 - 53.7			
54					DP04dG	53.7 - 55.0			
	55.0	716.3							
55			LEAN CLAY, CL, 7.5YR 6/4 (light brown) to 7.5YR 6/1 (gray), medium plasticity, firm, dry to moist, mottled gray						
			No Refusal / Bottom of Hole at 55.0 Ft.						

1: E = Environmental Sample Custody (two Split Spoons may be required to obtain sufficient sample)
G = Geotechnical Sample Custody
2: a,b,c denote Split Spoon divided between Environmental and Geotechnical Samples
3: Depths are reported in feet below ground surface

TVA EIP BORING LOG_175668043_TVA_KIF_TDEC.GPJ_TDEC SUBSURF DT 20190530.GDT 3/18/20

SUBSURFACE LOG

Client Borehole ID	N/A	Stantec Boring No.	**KIF-B01b**
Client	Tennessee Valley Authority	Boring Location	576,072.41 N; 2,407,677.12 E NAD83
Project Number	175668043	Surface Elevation	771.3 ft
Elevation Datum	NGVD29		
Project Name	KIF TDEC Order	Date Started	12/3/19
Completed	12/3/19		
Project Location	Harriman, Tennessee	Depth to Water	N/A
Date/Time	N/A		
Inspector	E. Smith	Logger	E. Smith
Depth to Water	N/A	Date/Time	N/A
Drilling Contractor	Hawkston	Drill Rig Type and ID	Geoprobe 3230DT
Overburden Drilling and Sampling Tools (Type and Size)	DT37 Dual Tube Soil Sampling System with 60" PVC Liners		
Rock Drilling and Sampling Tools (Type and Size)	No Coring		
Overdrill Tooling (Type and Size)	NA	Overdrill Depth	N/A
Sampler Hammer Type	No SPT	Weight	N/A
Drop	N/A	Efficiency	N/A
Borehole Azimuth	N/A	Borehole Inclination (from Vertical)	N/A
Reviewed By	J. Musselman	Approved By	M. Aplin

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]	Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft	Rec. Ft	Rec. %
0.0	771.3		Top of Hole					
			No sampling conducted from 0.0' to 35.0', boring advanced through this interval using DPT with closed tip. Refer to boring log for KIF-TW01 for 0.0' through 35.0'.					

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 3/18/20

SUBSURFACE LOG

Client Borehole ID N/A
Stantec Boring No. **KIF-B01b**
Client Tennessee Valley Authority
Boring Location 576,072.41 N; 2,407,677.12 E NAD83
Project Number 175668043
Surface Elevation 771.3 ft
Elevation Datum NGVD29

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]	Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft	Rec. Ft	Rec. %
			No sampling conducted from 0.0' to 35.0', boring advanced through this interval using DPT with closed tip. Refer to boring log for KIF-TW01 for 0.0' through 35.0'. *(Continued)*					
35.0	736.3		SILT, ML, 5Y 4/1 (dark gray) to 5Y 3/1 (very dark gray), non-plastic, soft to very soft, moist to wet, no odor, no staining, [CCR]		DP01a	35.0 - 36.5		
					DP01bE	36.5 - 38.5	5.0	N/A
					DP01c	38.5 - 40.0		
					DP02a	40.0 - 41.5		

36.5/38.5-20191203

35.0 - 40.0

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 3/18/20

SUBSURFACE LOG

Client Borehole ID: N/A
Stantec Boring No.: **KIF-B01b**
Client: Tennessee Valley Authority
Boring Location: 576,072.41 N; 2,407,677.12 E NAD83
Project Number: 175668043
Surface Elevation: 771.3 ft
Elevation Datum: NGVD29

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]		Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft		Rec. Ft	Rec. %
43			SILT, ML, 5Y 4/1 (dark gray) to 5Y 3/1 (very dark gray), non-plastic, soft to very soft, moist to wet, no odor, no staining, [CCR] *(Continued)*	41.5/43.5-20191203	DP02bE	41.5 - 43.5	40.0 - 45.0	5.0	N/A
44					DP02c	43.5 - 45.0			
45					DP03a	45.0 - 46.5			
46									
47				46.5/48.5-20191203	DP03bE	46.5 - 48.5	45.0 - 50.0	5.0	N/A
48									
49					DP03c	48.5 - 49.8			
50					DP03d	49.8 - 50.0			
51	51.4	719.9			DP04aG	50.0 - 51.4	50.0 - 52.5	2.5	N/A
52	52.3	719.0	LEAN CLAY, CL, 5Y 3/1 (very dark gray), medium plasticity, firm to soft, moist to wet, moderate organic odor, no staining, weak cementation		DP04b	51.4 - 52.5			
53	52.5	718.8	SANDY SILT, ML, 5Y 5/1 (gray), low plasticity, soft, moist to wet, moderate organic odor		DP05a	52.5 - 54.2	52.5 - 55.0	2.5	N/A
54	54.2	717.1	WELL GRADED SAND, SW, 5Y 3/1 (very dark gray), very fine to coarse, loose, moist to wet, moderate organic odor						
55	55.0	716.3	LEAN CLAY, CL, 7.5YR 6/4 (light brown) to 7.5YR 6/1 (gray), medium plasticity, firm, dry to moist, mottled gray, expanding clay		DP05b	54.2 - 55.0			
			No Refusal / Bottom of Hole at 55.0 Ft.						

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G = Geotechnical Sample Custody
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3: Depths are reported in feet below ground surface

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 3/18/20

SUBSURFACE LOG

Client Borehole ID	N/A	Stantec Boring No.	**KIF-B02a**
Client	Tennessee Valley Authority	Boring Location	575,556.85 N; 2,407,609.96 E NAD83
Project Number	175668043	Surface Elevation	772.3 ft
		Elevation Datum	NGVD29
Project Name	KIF TDEC Order	Date Started	12/3/19
		Completed	12/4/19
Project Location	Harriman, Tennessee	Depth to Water	N/A
		Date/Time	N/A
Inspector	E. Smith	Logger	E. Smith
Depth to Water	N/A	Date/Time	N/A
Drilling Contractor	Hawkston	Drill Rig Type and ID	Geoprobe 3230DT
Overburden Drilling and Sampling Tools (Type and Size)	DT37 Dual Tube Soil Sampling System with 60" PVC Liners		
Rock Drilling and Sampling Tools (Type and Size)	No Coring		
Overdrill Tooling (Type and Size)	NA	Overdrill Depth	N/A
Sampler Hammer Type	No SPT	Weight	N/A
Drop	N/A	Efficiency	N/A
Borehole Azimuth	N/A	Borehole Inclination (from Vertical)	N/A
Reviewed By	J. Musselman	Approved By	M. Aplin

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]	Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft	Rec. Ft	Rec. %
0.0	772.3		Top of Hole					
			No sampling conducted from 0.0 to 35.0', boring advanced through this interval using DPT with closed tip. Refer to boring log KIF-TW02 for 0.0 - 35.0' details.					

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 3/18/20

SUBSURFACE LOG

Client Borehole ID: N/A
Stantec Boring No.: **KIF-B02a**
Client: Tennessee Valley Authority
Boring Location: 575,556.85 N; 2,407,609.96 E NAD83
Project Number: 175668043
Surface Elevation: 772.3 ft
Elevation Datum: NGVD29

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]	Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft	Rec. Ft	Rec. %
			No sampling conducted from 0.0 to 35.0', boring advanced through this interval using DPT with closed tip. Refer to boring log KIF-TW02 for 0.0 - 35.0' details. *(Continued)*					
35.0	737.3							
			SILTY POORLY GRADED SAND WITH GRAVEL, SP, 5Y 2.5/1 (black), very fine, medium dense to dense, moist to wet, no odor, no staining, [CCR]		DP01G	35.0 - 40.0	5.0	N/A
40.0	732.3							
			GRAVELLY POORLY GRADED SAND, SP, 5Y 3/1 (very dark gray), very fine to fine, loose to medium dense, moist to wet, [CCR]		DP02aG	40.0 - 41.0		

35.0 - 40.0

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 3/18/20

SUBSURFACE LOG

Client Borehole ID: N/A
Stantec Boring No.: **KIF-B02a**
Client: Tennessee Valley Authority
Boring Location: 575,556.85 N; 2,407,609.96 E NAD83
Project Number: 175668043
Surface Elevation: 772.3 ft
Elevation Datum: NGVD29

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]		Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft		Rec. Ft	Rec. %
43.0	729.3				DP02bE	41.0 - 44.0	40.0 - 45.0	5.0	N/A
			SILT WITH SAND, ML, 5Y 3/1 (very dark gray), non-plastic, firm to hard, wet, [CCR]		DP02cG	44.0 - 45.0			
					DP03aG	45.0 - 46.5			
					DP03bE	46.5 - 48.5	45.0 - 50.0	5.0	N/A
					DP03cG	48.5 - 50.0			
					DP04a	50.0 - 50.7			
					DP04bE	50.7 - 52.3			
52.7	719.6				DP04c	52.3 - 52.7	50.0 - 55.0	5.0	N/A
			LEAN CLAY, CL, 10GY 5/1 (greenish gray) and 2.5Y 3/1 (very dark gray), low to medium plasticity, firm to hard, moist to dry, moderate organic odor		DP04dG	52.7 - 55.0			
			Color grades to 10Y 5/1 (greenish gray) mottled with 2.5Y 5/4 (light olive brown) by 55.0'		DP05G	55.0 - 57.5	55.0 - 57.5	2.5	N/A
57.5	714.8								
			No Refusal / Bottom of Hole at 57.5 Ft.						

41.0/44.0-20191204
46.5/48.5-20191204
50.7/52.3-20191204

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G = Geotechnical Sample Custody
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3: Depths are reported in feet below ground surface

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 3/18/20

SUBSURFACE LOG

Client Borehole ID	N/A	Stantec Boring No.	**KIF-B02b**
Client	Tennessee Valley Authority	Boring Location	575,555.09 N; 2,407,613.60 E NAD83
Project Number	175668043	Surface Elevation	772.5 ft
		Elevation Datum	NGVD29
Project Name	KIF TDEC Order	Date Started	12/4/19
		Completed	12/4/19
Project Location	Harriman, Tennessee	Depth to Water	N/A
		Date/Time	N/A
Inspector	E. Smith	Logger	E. Smith
Depth to Water	N/A	Date/Time	N/A
Drilling Contractor	Hawkston	Drill Rig Type and ID	Geoprobe 3230DT
Overburden Drilling and Sampling Tools (Type and Size)	DT37 Dual Tube Soil Sampling System with 60" PVC Liners		
Rock Drilling and Sampling Tools (Type and Size)	No Coring		
Overdrill Tooling (Type and Size)	NA	Overdrill Depth	N/A
Sampler Hammer Type	No SPT	Weight	N/A
Drop	N/A	Efficiency	N/A
Borehole Azimuth	N/A	Borehole Inclination (from Vertical)	N/A
Reviewed By	J. Musselman	Approved By	M. Aplin

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]	Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft	Rec. Ft	Rec. %
0.0	772.5		Top of Hole					
			No sampling conducted from 0.0 to 35.0', boring advanced through this interval using DPT with closed tip. Refer to boring log KIF-TW02 for 0.0 - 35.0' details.					

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 3/18/20

SUBSURFACE LOG

Client Borehole ID: N/A
Stantec Boring No.: **KIF-B02b**
Client: Tennessee Valley Authority
Boring Location: 575,555.09 N; 2,407,613.60 E NAD83
Project Number: 175668043
Surface Elevation: 772.5 ft
Elevation Datum: NGVD29

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]	Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft	Rec. Ft	Rec. %
			No sampling conducted from 0.0 to 35.0', boring advanced through this interval using DPT with closed tip. Refer to boring log KIF-TW02 for 0.0 - 35.0' details. *(Continued)*					
35.0	737.5							
			POORLY GRADED SAND WITH GRAVEL, SP, 5Y 2.5/1 (black), fine to medium, medium dense to dense, moist to wet, no odor, no staining, [CCR]		DP01aG	35.0 - 36.0	2.5	N/A
					DP01bE	36.0 - 37.5		
37.5	735.0							
			POORLY GRADED SAND, SP, 5Y 3/1 (very dark gray), very fine to fine, moist to wet, [CCR]		DP02aE	37.5 - 39.0	2.5	N/A
					DP02bG	39.0 - 40.0		
					DP03aG	40.0 - 41.0		

36.0/39.0-20191204

35.0 - 37.5

37.5 - 40.0

TVA EIP BORING LOG_175668043_TVA_KIF_TDEC.GPJ_TDEC SUBSURF DT 20190530.GDT 3/18/20

SUBSURFACE LOG

Client Borehole ID: N/A
Stantec Boring No.: **KIF-B02b**
Client: Tennessee Valley Authority
Boring Location: 575,555.09 N; 2,407,613.60 E NAD83
Project Number: 175668043
Surface Elevation: 772.5 ft
Elevation Datum: NGVD29

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]		Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft		Rec. Ft	Rec. %
43.0	729.5			41.0/44.0-20191204	DP03bE	41.0 - 44.0	40.0 - 45.0	5.0	N/A
			SILT WITH SAND, ML, 5Y 3/1 (very dark gray), non-plastic, firm to hard, wet, [CCR]		DP03cG	44.0 - 45.0			
					DP04aG	45.0 - 46.5			
				46.5/48.5-20191204	DP04bE	46.5 - 48.5	45.0 - 50.0	5.0	N/A
					DP04cG	48.5 - 50.0			
					DP05a	50.0 - 50.7			
				50.7/52.3-20191204	DP05bE	50.7 - 52.3	50.0 - 52.5	2.5	N/A
52.3	720.2				DP05cG	52.3 - 52.5			
			LEAN CLAY, CL, 10GY 5/1 (greenish gray) and 2.5Y 3/1 (very dark gray), low to medium plasticity, firm to hard, moist to dry, moderate organic odor		DP06G	52.5 - 55.0	52.5 - 55.0	2.5	N/A
			Color grades to 10Y 5/1 (greenish gray) mottled with 2.5Y 5/4 (light olive brown) by 55.0'		DP07G	55.0 - 57.5	55.0 - 57.5	2.5	N/A
57.5	715.0								
			No Refusal / Bottom of Hole at 57.5 Ft.						

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G = Geotechnical Sample Custody
2: a,b,c denote Split Spoon divided between Environmental and Geotechnical Samples
3: Depths are reported in feet below ground surface

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 3/18/20

SUBSURFACE LOG

Client Borehole ID	N/A	Stantec Boring No.	**KIF-B03a**
Client	Tennessee Valley Authority	Boring Location	575,720.46 N; 2,408,236.12 E NAD83
Project Number	175668043	Surface Elevation	776.3 ft
		Elevation Datum	NGVD29
Project Name	KIF TDEC Order	Date Started	12/5/19
		Completed	12/5/19
Project Location	Harriman, Tennessee	Depth to Water	N/A
		Date/Time	N/A
Inspector	E. Smith	Logger	E. Smith
Depth to Water	N/A	Date/Time	N/A
Drilling Contractor	Hawkston	Drill Rig Type and ID	Geoprobe 3230DT
Overburden Drilling and Sampling Tools (Type and Size)	DT37 Dual Tube Soil Sampling System with 60" PVC Liners		
Rock Drilling and Sampling Tools (Type and Size)	No Coring		
Overdrill Tooling (Type and Size)	NA	Overdrill Depth	N/A
Sampler Hammer Type	No SPT	Weight	N/A
Drop	N/A	Efficiency	N/A
Borehole Azimuth	N/A	Borehole Inclination (from Vertical)	N/A
Reviewed By	J. Musselman	Approved By	M. Aplin

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]	Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft	Rec. Ft	Rec. %
0.0	776.3		Top of Hole					
			No sampling conducted from 0.0 to 40.0', boring advanced through this interval using DPT with closed tip. Refer to boring log KIF-TW03 for 0.0 - 40.0' details.					

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 3/18/20

SUBSURFACE LOG

Client Borehole ID N/A
Stantec Boring No. **KIF-B03a**
Client Tennessee Valley Authority
Boring Location 575,720.46 N; 2,408,236.12 E NAD83
Project Number 175668043
Surface Elevation 776.3 ft
Elevation Datum NGVD29

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]	Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft	Rec. Ft	Rec. %
19			No sampling conducted from 0.0 to 40.0', boring advanced through this interval using DPT with closed tip. Refer to boring log KIF-TW03 for 0.0 - 40.0' details. *(Continued)*					
20								
21								
22								
23								
24								
25								
26								
27								
28								
29								
30								
31								
32								
33								
34								
35								
36								
37								
38								
39								
40	40.0	736.3						
41			SILT, ML, 5Y 2.5/1 (black), non-plastic, hard to very hard, moist to wet, [CCR]		DP01aG	40.0 - 41.5		
42				41.5/43.5-20191205			40.0 - 45.0	
43					DP01bE	41.5 - 43.5	5.0	N/A
44					DP01cG	43.5 - 45.0		

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 3/18/20

SUBSURFACE LOG

Client Borehole ID: N/A
Stantec Boring No.: **KIF-B03a**
Client: Tennessee Valley Authority
Boring Location: 575,720.46 N; 2,408,236.12 E NAD83
Project Number: 175668043
Surface Elevation: 776.3 ft
Elevation Datum: NGVD29

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]	Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft	Rec. Ft	Rec. %
45			SILT, ML, 5Y 2.5/1 (black), non-plastic, hard to very hard, moist to wet, [CCR] *(Continued)*		DP02aG	45.0 - 46.5		
46								
47				46.5/48.5-20191205	DP02bE	46.5 - 48.5	5.0	N/A
48								
49					DP02cG	48.5 - 50.0		
50					DP03aG	50.0 - 51.5		
51								
52				51.5/53.5-20191205	DP03bE	51.5 - 53.5	5.0	N/A
53								
54					DP03cG	53.5 - 54.5		
	54.5	721.8						
55			SANDY SILT, ML, 10Y 3/2 (very dark grayish olive) to N 7/ (light gray), low plasticity, hard to very hard, moist, slight organic odor		DP03dG	54.5 - 55.0		
56					DP04G	55.0 - 57.5	2.5	N/A
57								
58	58.2	718.1			DP05aG	57.5 - 58.2		
59	59.2	717.1	POORLY GRADED SAND, SP, 5Y 7/1 (light gray), very fine, very loose, wet		DP05bG	58.2 - 59.2	2.5	N/A
60	60.0	716.3	CLAYEY SAND, SC, 2.5Y 8/1 (white) with 2.5Y 5/4 (light olive brown), very fine to fine, very dense to medium dense, moist		DP05cG	59.2 - 60.0		
			No Refusal / Bottom of Hole at 60.0 Ft.					

45.0 - 50.0
50.0 - 55.0
55.0 - 57.5
57.5 - 60.0

1: E = Environmental Sample Custody (two Split Spoons may be required to obtain sufficient sample)
G = Geotechnical Sample Custody
2: a,b,c denote Split Spoon divided between Environmental and Geotechnical Samples
3: Depths are reported in feet below ground surface

TVA EIP BORING LOG_175668043_TVA_KIF_TDEC.GPJ_TDEC SUBSURF DT 20190530.GDT 3/18/20

SUBSURFACE LOG

Client Borehole ID	N/A	Stantec Boring No.	**KIF-B03b**
Client	Tennessee Valley Authority	Boring Location	575,718.86 N; 2,408,238.19 E NAD83
Project Number	175668043	Surface Elevation	776.5 ft
		Elevation Datum	NGVD29
Project Name	KIF TDEC Order	Date Started	12/5/19
		Completed	12/5/19
Project Location	Harriman, Tennessee	Depth to Water	N/A
		Date/Time	N/A
Inspector	E. Smith	Logger	E. Smith
Depth to Water	N/A	Date/Time	N/A
Drilling Contractor	Hawkston	Drill Rig Type and ID	Geoprobe 3230DT
Overburden Drilling and Sampling Tools (Type and Size)	DT37 Dual Tube Soil Sampling System with 60" PVC Liners		
Rock Drilling and Sampling Tools (Type and Size)	No Coring		
Overdrill Tooling (Type and Size)	NA	Overdrill Depth	N/A
Sampler Hammer Type	No SPT	Weight	N/A
Drop	N/A	Efficiency	N/A
Borehole Azimuth	N/A	Borehole Inclination (from Vertical)	N/A
Reviewed By	J. Musselman	Approved By	M. Aplin

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]	Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft	Rec. Ft	Rec. %
0.0	776.5		Top of Hole					
			No sampling conducted from 0.0 to 40.0', boring advanced through this interval using DPT with closed tip. Refer to boring log KIF-TW03 for 0.0 - 40.0' details.					

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19

TVA EIP BORING LOG_175668043_TVA_KIF_TDEC.GPJ_TDEC SUBSURF DT 20190530.GDT 3/18/20

SUBSURFACE LOG

Client Borehole ID: N/A
Stantec Boring No.: **KIF-B03b**
Client: Tennessee Valley Authority
Boring Location: 575,718.86 N; 2,408,238.19 E NAD83
Project Number: 175668043
Surface Elevation: 776.5 ft
Elevation Datum: NGVD29

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]	Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft	Rec. Ft	Rec. %
19–39			No sampling conducted from 0.0 to 40.0', boring advanced through this interval using DPT with closed tip. Refer to boring log KIF-TW03 for 0.0 - 40.0' details. *(Continued)*					
40.0	736.5		SILT, ML, 5Y 2.5/1 (black), non-plastic, hard to very hard, moist to wet, no odor, grain size decreases with depth, [CCR]		DP01aG	40.0 - 41.5		
41–43				41.5/43.5-20191205	DP01bE	41.5 - 43.5	5.0	N/A
44					DP01cG	43.5 - 45.0		

40.0 - 45.0

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 3/18/20

SUBSURFACE LOG

Client Borehole ID: N/A
Stantec Boring No.: **KIF-B03b**
Client: Tennessee Valley Authority
Boring Location: 575,718.86 N; 2,408,238.19 E NAD83
Project Number: 175668043
Surface Elevation: 776.5 ft
Elevation Datum: NGVD29

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]	Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft	Rec. Ft	Rec. %
45			SILT, ML, 5Y 2.5/1 (black), non-plastic, hard to very hard, moist to wet, no odor, grain size decreases with depth, [CCR] *(Continued)*		DP02aG	45.0 - 46.5		
46								
47				46.5/48.5-20191205	DP02bE	46.5 - 48.5	5.0	N/A
48								
49					DP02cG	48.5 - 50.0		
50								
51					DP03aG	50.0 - 51.5		
52				51.5/53.5-20191205				
53					DP03bE	51.5 - 53.5	5.0	N/A
54	54.5	722.0			DP03cG	53.5 - 54.5		
55			SANDY SILT, ML, 10Y 3/2 (very dark grayish olive) to N 7/ (light gray), low plasticity, hard to very hard, moist, slight organic odor		DP03dG	54.5 - 55.0		
56					DP04G	55.0 - 57.5	2.5	N/A
57								
58								
59					DP05G	57.5 - 60.0	2.5	N/A
60	60.0	716.5	Heavily iron stained 10YR 4/4 (dark yellowish brown) from 59.6' to 60.0'.					
			No Refusal / Bottom of Hole at 60.0 Ft.					

45.0 - 50.0
50.0 - 55.0
55.0 - 57.5
57.5 - 60.0

1: E = Environmental Sample Custody (two Split Spoons may be required to obtain sufficient sample)
G = Geotechnical Sample Custody
2: a,b,c denote Split Spoon divided between Environmental and Geotechnical Samples
3: Depths are reported in feet below ground surface

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 3/18/20

SUBSURFACE LOG

Client Borehole ID	N/A	Stantec Boring No.	**KIF-B04a**
Client	Tennessee Valley Authority	Boring Location	574,774.09 N; 2,407,874.27 E NAD83
Project Number	175668043	Surface Elevation	765.5 ft
Elevation Datum	NGVD29		
Project Name	KIF TDEC Order	Date Started	12/5/19
Completed	12/5/19		
Project Location	Harriman, Tennessee	Depth to Water	N/A
Date/Time	N/A		
Inspector	E. Smith	Logger	E. Smith
Depth to Water	N/A	Date/Time	N/A
Drilling Contractor	Hawkston	Drill Rig Type and ID	Geoprobe 3230DT
Overburden Drilling and Sampling Tools (Type and Size)	DT37 Dual Tube Soil Sampling System with 60" PVC Liners		
Rock Drilling and Sampling Tools (Type and Size)	No Coring		
Overdrill Tooling (Type and Size)	NA	Overdrill Depth	N/A
Sampler Hammer Type	No SPT	Weight	N/A
Drop	N/A	Efficiency	N/A
Borehole Azimuth	N/A	Borehole Inclination (from Vertical)	N/A
Reviewed By	J. Musselman	Approved By	M. Aplin

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]	Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft	Rec. Ft	Rec. %
0.0	765.5		Top of Hole					
			No sampling conducted from 0.0 to 35.0', boring advanced through this interval using DPT with closed tip. Refer to boring log KIF-TW04 for 0.0 - 35.0' details.					

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 3/18/20

SUBSURFACE LOG

Client Borehole ID: N/A
Stantec Boring No.: **KIF-B04a**
Client: Tennessee Valley Authority
Boring Location: 574,774.09 N; 2,407,874.27 E NAD83
Project Number: 175668043
Surface Elevation: 765.5 ft
Elevation Datum: NGVD29

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]	Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft	Rec. Ft	Rec. %
			No sampling conducted from 0.0 to 35.0', boring advanced through this interval using DPT with closed tip. Refer to boring log KIF-TW04 for 0.0 - 35.0' details. *(Continued)*					
35.0	730.5							
			POORLY GRADED SAND, SP, 10B 2.5/1 (bluish black), very fine, very loose, wet, poorly graded, [CCR]		DP01aG	35.0 - 36.5		
					DP01bE	36.5 - 38.5	5.0	N/A
					DP01cG	38.5 - 40.0		
40.0	725.5							
			SILT, ML, 10B 2.5/1 (bluish black), non-plastic, firm, wet, poorly graded, [CCR]		DP02aG	40.0 - 41.5		

36.5/38.5-20191205

35.0 - 40.0

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 3/18/20

SUBSURFACE LOG

Client Borehole ID N/A
Stantec Boring No. **KIF-B04a**
Client Tennessee Valley Authority
Boring Location 574,774.09 N; 2,407,874.27 E NAD83
Project Number 175668043
Surface Elevation 765.5 ft
Elevation Datum NGVD29

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]	Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft	Rec. Ft	Rec. %
43			Minimal coarse angular gravel at 42.0' SILT, ML, 10B 2.5/1 (bluish black), non-plastic, firm, wet, poorly graded, [CCR] *(Continued)*		DP02bE	41.5 - 43.5	5.0	N/A
44	44.0	721.5			DP02cG	43.5 - 44.0		
	45.0	720.5	LEAN CLAY, CL, 10B 2.5/1 (bluish black), very soft, wet, moderate organic odor		DP02dG	44.0 - 45.0		
45								
46			LEAN CLAY, CL, 5Y 6/2 (light olive gray) to 5Y 5/2 (olive gray), firm to hard, moist to wet, moderate organic odor, iron oxide staining, color and moisture content change with depth, mottled 7.5YR 4/4 (brown)		DP03G	45.0 - 47.5	2.5	N/A
47								
48								
49					DP04G	47.5 - 50.0	2.5	N/A
50	50.0	715.5						

41.5/43.5-20191205

40.0 - 45.0

45.0 - 47.5

47.5 - 50.0

No Refusal /
Bottom of Hole at 50.0 Ft.

1: E = Environmental Sample Custody (two Split Spoons may be required to obtain sufficient sample)
G = Geotechnical Sample Custody
2: a,b,c denote Split Spoon divided between Environmental and Geotechnical Samples
3: Depths are reported in feet below ground surface

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 3/18/20

SUBSURFACE LOG

Client Borehole ID	N/A	Stantec Boring No.	**KIF-TW01**
Client	Tennessee Valley Authority	Boring Location	576,050.03 N; 2,407,660.05 E NAD83
Project Number	175668043	Surface Elevation	771.8 ft
		Elevation Datum	NGVD29
Project Name	KIF TDEC Order	Date Started	1/24/19
		Completed	1/28/19
Project Location	Harriman, Tennessee	Depth to Water	15.5 ft
		Date/Time	1/25/19 09:05
Inspector	J. Andrew	Logger	D. Mihalek
Depth to Water	N/A	Date/Time	N/A
Drilling Contractor	Stantec Consulting Services Inc.	Drill Rig Type and ID	CME 55T#1, #709
Overburden Drilling and Sampling Tools (Type and Size)	4-1/4" HSA, 3" SS w/o liners, 3" Shelby Tubes		
Rock Drilling and Sampling Tools (Type and Size)	N/A		
Overdrill Tooling (Type and Size)	8-1/4" HSA overdrill of boring	Overdrill Depth	44.0 ft
Sampler Hammer Type	Automatic	Weight	140
Drop	30	Efficiency	N/A
Borehole Azimuth	N/A (Vertical)	Borehole Inclination (from Vertical)	N/A
Reviewed By	E. Smith	Approved By	L. Price

Lithology Depth Ft[3]	Elevation	Graphic	Description	Overburden: / Rock Core:	Sample[1,2]	RQD %	Depth Ft[3]	Run Ft	Rec. Ft	Rec. Ft	Blows/PSI Rec. %
0.0	771.8		Top of Hole								
0.3	771.5		Top Soil, [FILL]		SS01G		0.0 - 1.5	0.0 - 1.5	1.2		2-3-8
1.9	769.9		FAT CLAY, CH, 5YR 4/6 (yellowish red), high plasticity, firm, with sand and interbedded chert pebbles, [FILL]		SS02aG		1.5 - 1.9				
				2.0/4.0-20190124	SS02b		1.9 - 2.0	1.5 - 3.0	1.5		9-16-19
			SANDY SILT, ML, 5Y 4/1 (dark gray), non-plastic, firm, dry, [CCR]		SS02cE		2.0 - 3.0				
					SS03aE		3.0 - 4.0	3.0 - 4.5	1.5		11-15-18
					SS03bG		4.0 - 4.5				
					SS04aG		4.5 - 5.5	4.5 - 6.0	1.3		19-42-17
5.5	766.3				SS04bG		5.5 - 6.0				
6.0	765.8		WELL GRADED GRAVEL, GW, 10YR 6/1 (gray), dense, riprap, limestone, [FILL]		SS05aG		6.0 - 6.5				
6.5	765.3				SS05bG		6.5 - 7.0	6.0 - 7.5	1.5		5-6-31
7.0	764.8		SILT, ML, 5Y 4/1 (dark gray), low plasticity, firm, dry, [CCR]	7.0/9.0-20190124	SS05cE		7.0 - 7.5				
			FAT CLAY, CH, 7.5YR 4/4 (brown), high plasticity, firm, moist, [FILL]		SS06E		7.5 - 9.0	7.5 - 9.0	1.5		23-32-35
			SILT, ML, 5Y 4/1 (dark gray), low plasticity, hard, dry, [CCR]		SS07aG		9.0 - 9.5				
					SS07bG		9.5 - 10.0	9.0 - 10.5	1.5		7-25-48
					SS07cG		10.0 - 10.5				
					SS08aG		10.5 - 11.5	10.5 - 12.0	1.5		17-24-19
11.8	760.0			11.5/13.5-20190124	SS08bE		11.5 - 12.0				
12.0	759.8		FAT CLAY, CH, 7.5YR 4/4 (brown), high plasticity, firm, moist, [FILL]		SS09E		12.0 - 13.5	12.0 - 13.5	1.5		8-11-14
13.5	758.3		SILT, ML, 5Y 4/1 (dark gray), low plasticity, firm, dry, [CCR]		SS10G		13.5 - 15.0	13.5 - 15.0	1.5		12-11-11
			SILTY SAND, SM, 10YR 3/1 (very dark gray), medium dense, moist, [CCR]		SS11G		15.0 - 16.5	15.0 - 16.5	1.5		9-9-6
			Wet at 15.5'	16.5/18.5-20190125							
			Very loose at 16.5'		SS12E		16.5 - 18.0	16.5 - 18.0	1.5		3-2-3

TVA EIP BORING LOG_175668043_TVA_KIF_TDEC.GPJ_TDEC SUBSURF DT 20190530.GDT 4/9/20

SUBSURFACE LOG

Client Borehole ID: N/A
Stantec Boring No.: **KIF-TW01**
Client: Tennessee Valley Authority
Boring Location: 576,050.03 N; 2,407,660.05 E NAD83
Project Number: 175668043
Surface Elevation: 771.8 ft
Elevation Datum: NGVD29

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]		Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft		Rec. Ft	Rec. %
18			SILTY SAND, SM, 10YR 3/1 (very dark gray), medium dense, moist, [CCR] *(Continued)*		SS13aE	18.0 - 18.5	18.0 - 19.5	1.5	2-1-2
19					SS13bG	18.5 - 19.5			
20					ST01G	19.5 - 21.5	19.5 - 21.5	0.0	NR
21									
22				21.5/23.5-20190128	SS15E	21.5 - 22.5	21.5 - 22.5	1.0	3-3
23					SS16aE	22.5 - 23.5	22.5 - 24.0	1.5	2-2-3
24					SS16bG	23.5 - 24.0			
25					ST02G	24.0 - 26.0	24.0 - 26.0	0.0	NR
26	26.0	745.8			SS18a	26.0 - 26.5	26.0 - 27.0	0.7	WH-2-4
27			SILTY SAND WITH GRAVEL, SM, 5YR 2.5/1 (black), coarse, very loose, wet, [CCR]	26.5/28.5-20190128	SS18bE	26.5 - 27.0			
28					SS19E	27.0 - 28.5	27.0 - 28.5	1.5	2-5-7
29					SS20G	28.5 - 30.0	28.5 - 30.0	1.5	5-5-5
30					SS21aG	30.0 - 30.5			
31	31.0	740.8			SS21b	30.5 - 31.0	30.0 - 31.5	1.2	4-4-4
	32.0	739.8	SILTY SAND, SM, 5YR 2.5/1 (black), fine to medium, loose, wet, [CCR]		SS21cG	31.0 - 31.5			
32				31.5/33.5-20190128	SS22E	31.5 - 33.0	31.5 - 33.0	1.5	3-3-6
	33.0	738.8	WELL GRADED SAND, SW, 5YR 2.5/1 (black), coarse, very loose, wet, [CCR]		SS23aE	33.0 - 33.5	33.0 - 34.5	1.5	3-5-5
33			SILTY SAND, SM, 5YR 2.5/1 (black), fine to medium, very loose, wet, [CCR]		SS23bG	33.5 - 34.5			
34					SS24G	34.5 - 36.0	34.5 - 36.0	1.5	1-3-5
35					SS25aG	36.0 - 36.5	36.0 - 37.5	1.5	2-4-9
36				36.5/38.5-20190128	SS25bE	36.5 - 37.5			
37					SS26aE	37.5 - 38.5	37.5 - 39.0	1.5	10-7-8
38	38.8	733.0			SS26bG	38.5 - 39.0			
39			SILT, ML, 7.5YR 3/1 (very dark gray), non-plastic, very loose, wet, [CCR]		SS27G	39.0 - 40.5	39.0 - 40.5	1.5	1-1-1
40	40.5	731.3							
41	41.5	730.3	SILTY SAND, SM, 5YR 3/1 (very dark gray), very loose, wet, [CCR]		SS28G	40.5 - 42.0	40.5 - 42.0	1.5	1-2-1
42									

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 4/9/20

SUBSURFACE LOG

Client Borehole ID N/A
Stantec Boring No. **KIF-TW01**
Client Tennessee Valley Authority
Boring Location 576,050.03 N; 2,407,660.05 E NAD83
Project Number 175668043
Surface Elevation 771.8 ft
Elevation Datum NGVD29

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]		Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft		Rec. Ft	Rec. %
43			SILT, ML, 5YR 3/1 (very dark gray), non-plastic, very loose, wet, [CCR] *(Continued)*		ST03G	42.0 - 44.0	42.0 - 44.0	1.2	NR
44 44.0	727.8								
			No Refusal / Bottom of Hole at 44.0 Ft.						

Temporary well installed. See well installation log for backfill details

1: E = Environmental Sample Custody (two Split Spoons may be required to obtain sufficient sample)
G = Geotechnical Sample Custody
2: a,b,c denote Split Spoon divided between Environmental and Geotechnical Samples
3: Depths are reported in feet below ground surface

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 4/9/20

SUBSURFACE LOG

Client Borehole ID	N/A	Stantec Boring No.	**KIF-TW02**
Client	Tennessee Valley Authority	Boring Location	575,548.50 N; 2,407,585.76 E NAD83
Project Number	175668043	Surface Elevation	771.9 ft
		Elevation Datum	NGVD29
Project Name	KIF TDEC Order	Date Started	2/5/19
		Completed	2/5/19
Project Location	Harriman, Tennessee	Depth to Water	18.3 ft
		Date/Time	
Inspector	J. Andrew	Logger	D. Mihalek
Depth to Water	N/A	Date/Time	N/A
Drilling Contractor	Stantec Consulting Services Inc.	Drill Rig Type and ID	CME 55T#1, #709
Overburden Drilling and Sampling Tools (Type and Size)	4-1/4" HSA, 3" SS w/o liners, 3" Shelby Tubes		
Rock Drilling and Sampling Tools (Type and Size)	N/A		
Overdrill Tooling (Type and Size)	8-1/4" HSA overdrill of boring	Overdrill Depth	44.5 ft
Sampler Hammer Type	Automatic	Weight	140
		Drop	30
		Efficiency	N/A
Borehole Azimuth	N/A (Vertical)	Borehole Inclination (from Vertical)	N/A
Reviewed By	E. Smith	Approved By	L. Price

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]		Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft		Rec. Ft	Rec. %
0.0	771.9		Top of Hole						
0.8	771.1		ORGANIC SILT, OL, 7.5YR 4/3 (brown), low plasticity, stiff, moist, with organic matter, [FILL]		SS01G	0.0 - 1.5	0.0 - 1.5	1.3	1-4-5
2.3	769.6		FAT CLAY WITH SAND, CH, 7.5 4/3 (brown), high plasticity, soft, moist, some limestone cobbles interbedded, [FILL]		SS02aG	1.5 - 2.25	1.5 - 3.0	1.5	4-6-8
				2.25/4.0-20190205	SS02bE	2.25 - 3.0			
3.5	768.4		SILTY SAND, SM, 2.5Y 4/1 (dark gray), very loose, moist, [CCR]		SS03aE	3.0 - 4.0	3.0 - 4.5	1.3	1-16-23
			SILTY GRAVEL WITH SAND, GM, 2.5Y 4/1 (dark gray), medium dense, dry, [CCR]		SS03bG	4.0 - 4.5			
5.5	766.4				SS04aG	4.5 - 5.5	4.5 - 6.0	1.5	18-21-50
			SILTY SAND, SM, 2.5Y 4/2 (dark grayish brown), medium dense to dense, dry to moist, [CCR] Geofabric at 5.5'		SS04bG	5.5 - 6.0			
					SS05aG	6.0 - 6.5			
				6.5/8.5-20190205	SS05bE	6.5 - 7.5	6.0 - 7.5	1.5	23-44-46
					SS06aE	7.5 - 8.5	7.5 - 9.0	1.4	13-29-30
					SS06bG	8.5 - 9.0			
					SS07G	9.0 - 10.5	9.0 - 10.5	1.5	6-18-22
					SS08aG	10.5 - 11.5	10.5 - 12.0	1.5	12-28-32
				11.5/13.5-20190205	SS08bE	11.5 - 12.0			
					SS09E	12.0 - 13.5	12.0 - 13.5	1.5	21-20-20
			Loose at 13.5'		SS10G	13.5 - 15.0	13.5 - 15.0	1.5	8-12-13
15.5	756.4								
			SILTY SAND, SM, 2.5Y 4/2 (dark grayish brown), loose, wet, [CCR]		SS11G	15.0 - 16.5	15.0 - 16.5	1.5	6-9-9
			Organic material (twigs) at 16.5'	16.5/18.5-20190205					
					SS12E	16.5 - 18.0	16.5 - 18.0	1.5	2-6-3

TVA EIP BORING LOG_175668043_TVA_KIF_TDEC.GPJ_TDEC SUBSURF DT 20190530.GDT 3/23/20

SUBSURFACE LOG

Client Borehole ID: N/A
Stantec Boring No.: **KIF-TW02**
Client: Tennessee Valley Authority
Boring Location: 575,548.50 N; 2,407,585.76 E NAD83
Project Number: 175668043
Surface Elevation: 771.9 ft
Elevation Datum: NGVD29

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]		Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft		Rec. Ft	Rec. %
18			SILTY SAND, SM, 2.5Y 4/2 (dark grayish brown), loose, wet, [CCR] *(Continued)*		SS13aE	18.0 - 18.5	18.0 - 19.5	1.5	11-12-10
19					SS13bG	18.5 - 19.5			
20					SS14G	19.5 - 21.0	19.5 - 21.0	1.5	1-4-6
21									
22					ST01G	21.0 - 23.0	21.0 - 23.0	1.8	NR
23	23.5	748.4							
			SILTY SAND WITH GRAVEL, SM, 5Y 3/1 (very dark gray), very loose, wet, [CCR]		SS16G	23.0 - 24.0	23.0 - 24.0	1.0	6-10
24							24.0 - 25.5		
25					SS17G	24.0 - 25.5		1.5	2-3-11
26					SS18aG	25.5 - 26.5	25.5 - 27.0	1.5	6-6-7
27				26.5/28.5-20190205	SS18bE	26.5 - 27.0			
28					SS19E	27.0 - 28.5	27.0 - 28.5	1.5	4-6-6
29					SS20G	28.5 - 30.0	28.5 - 30.0	1.5	5-6-2
30									
31	31.0	740.9			SS21aG	30.0 - 31.0	30.0 - 31.5	1.5	1-1-1
	31.5	740.4	CLAYEY SILT, ML, 5Y 4/1 (dark gray), medium plasticity, very soft, wet, [CCR]		SS21bG	31.0 - 31.5			
32			SILTY SAND, SM, 5Y 2.5/1 (black), very loose, wet, [CCR]	31.5/33.5-20190205	SS22E	31.5 - 33.0	31.5 - 33.0	1.5	1-2-2
33					SS23aE	33.0 - 33.5	33.0 - 34.5	1.5	1-2-2
34					SS23bG	33.5 - 34.5			
35					SS24G	34.5 - 36.0	34.5 - 36.0	1.5	2-2-3
36					SS25aG	36.0 - 36.5	36.0 - 37.5	1.5	1-2-3
37				36.5/38.5-20190205	SS25bE	36.5 - 37.5			
38	38.5	733.4			SS26aE	37.5 - 38.5	37.5 - 39.0	1.5	2-2-3
			SILT WITH SAND, ML, 5Y 2.5/1 (black) to 5Y 4/1 (dark gray), non-plastic, soft, wet, [CCR]		SS26bG	38.5 - 39.0			
39							39.0 - 40.5		
40					SS27G	39.0 - 40.5		1.5	2-3-3
41					SS28aG	40.5 - 41.5	40.5 - 42.0	1.5	1-1-1
42					SS28b	41.5 - 42.0			

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 3/23/20

SUBSURFACE LOG

Client Borehole ID N/A
Stantec Boring No. **KIF-TW02**
Client Tennessee Valley Authority
Boring Location 575,548.50 N; 2,407,585.76 E NAD83
Project Number 175668043
Surface Elevation 771.9 ft
Elevation Datum NGVD29

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]		Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft		Rec. Ft	Rec. %
43			SILT WITH SAND, ML, 5Y 2.5/1 (black) to 5Y 4/1 (dark gray), non-plastic, soft, wet, [CCR] *(Continued)*		SS29aG	42.0 - 42.5	42.0 - 43.5	1.5	WH-WH-1
					SS29bG	42.5 - 43.5			
44							43.5 - 45.5		
					ST02G	43.5 - 45.5		1.9	1540
45	45.5	726.4							

No Refusal /
Bottom of Hole at 45.5 Ft.

Temporary well installed. See well installation log for backfill details

1: E = Environmental Sample Custody (two Split Spoons may be required to obtain sufficient sample)
G = Geotechnical Sample Custody
2: a,b,c denote Split Spoon divided between Environmental and Geotechnical Samples
3: Depths are reported in feet below ground surface

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 3/23/20

SUBSURFACE LOG

Client Borehole ID	N/A	Stantec Boring No.	**KIF-TW03**
Client	Tennessee Valley Authority	Boring Location	575,720.53 N; 2,408,211.78 E NAD83
Project Number	175668043	Surface Elevation	776.0 ft
		Elevation Datum	NGVD29
Project Name	KIF TDEC Order	Date Started	2/25/19
		Completed	2/26/19
Project Location	Harriman, Tennessee	Depth to Water	19.3 ft
		Date/Time	2/25/19
Inspector	J. Andrew	Logger	D. Mihalek
Depth to Water	N/A	Date/Time	N/A
Drilling Contractor	Stantec Consulting Services Inc.	Drill Rig Type and ID	CME 55T#1, #709
Overburden Drilling and Sampling Tools (Type and Size)	4-1/4" HSA, 3" SS w/o liners, 3" Shelby Tubes		
Rock Drilling and Sampling Tools (Type and Size)	N/A		
Overdrill Tooling (Type and Size)	8-1/4" HSA overdrill of boring	Overdrill Depth	44.5 ft
Sampler Hammer Type	Automatic	Weight	140
		Drop	30
		Efficiency	N/A
Borehole Azimuth	N/A (Vertical)	Borehole Inclination (from Vertical)	N/A
Reviewed By	E. Smith	Approved By	L. Price

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]		Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft		Rec. Ft	Rec. %
0.0	776.0		Top of Hole						
0.8	775.2		FAT CLAY, CH, 10YR 3/4 (dark yellowish brown), high plasticity, very soft, moist, with organic matter, [FILL]		SS01G	0.0 - 1.5	0.0 - 1.5	1.5	1-1-6
2.5	773.5		LEAN CLAY, CL, 5YR 5/6 (yellowish red), medium plasticity, firm, moist, [FILL]	1.5/3.5-20190225	SS02E	1.5 - 3.0	1.5 - 3.0	1.5	4-7-9
			SANDY SILT WITH GRAVEL, ML, 7.5YR 3/1 (very dark gray), fine, loose, moist, [CCR]		SS03aE	3.0 - 3.5	3.0 - 4.5	1.3	5-9-14
					SS03bG	3.5 - 4.5			
					SS04G	4.5 - 6.0	4.5 - 6.0	1.4	4-10-16
6.0	770.0								
			SILTY GRAVEL, GM, 7.5YR 3/1 (very dark gray), very fine to coarse, dense, dry, [CCR]		SS05aG	6.0 - 6.5	6.0 - 7.5	1.5	24-20-19
7.5	768.5			6.5/8.5-20190225	SS05bE	6.5 - 7.5			
			SILTY SAND, SM, 7.5YR 3/1 (very dark gray), fine, very dense, dry, [CCR]		SS06aE	7.5 - 8.5	7.5 - 9.0	1.5	15-32-50
9.3	766.7				SS06bG	8.5 - 9.0			
			WELL GRADED GRAVEL, GW, 10YR 5/1 (gray), medium to coarse, very dense, dry, [FILL]		SS07aG	9.0 - 10.0	9.0 - 10.5	1.5	41-44-23
10.3	765.7				SS07bG	10.0 - 10.5			
10.5	765.5		SILTY SAND, SM, 7.5YR 3/1 (very dark gray), medium dense, dry, [CCR]		SS08aG	10.5 - 11.5	10.5 - 12.0	1.5	8-19-49
11.5	764.5			11.5/13.5-20190225	SS08bE	11.5 - 12.0			
			SILT, ML, 5YR 5/6 (yellowish red), low plasticity, firm to hard, dry, [FILL]		SS09E	12.0 - 13.5	12.0 - 13.5	1.5	25-24-23
			SILTY SAND WITH GRAVEL, SM, 5YR 5/6 (yellowish red), fine to medium, very dense, dry, [CCR]		SS10G	13.5 - 15.0	13.5 - 15.0	1.5	10-15-19
15.0	761.0								
			POORLY GRADED SAND, SP, 5YR 5/6 (yellowish red), fine to medium, loose, dry, [CCR]		SS11G	15.0 - 16.5	15.0 - 16.5	1.5	7-9-10
16.5	759.5			16.5/18.5-20190225					
			SANDY SILT, ML, 5YR 5/6 (yellowish red), fine to medium, loose, moist, [CCR]		SS12E	16.5 - 18.0	16.5 - 18.0	1.5	4-5-6

TVA EIP BORING LOG_175668043_TVA_KIF_TDEC.GPJ_TDEC SUBSURF DT 20190530.GDT 1/28/20

SUBSURFACE LOG

Client Borehole ID: N/A
Stantec Boring No.: **KIF-TW03**
Client: Tennessee Valley Authority
Boring Location: 575,720.53 N; 2,408,211.78 E NAD83
Project Number: 175668043
Surface Elevation: 776.0 ft
Elevation Datum: NGVD29

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]		Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft		Rec. Ft	Rec. %
18			SANDY SILT, ML, 5YR 5/6 (yellowish red), fine to medium, loose, moist, [CCR] *(Continued)*		SS13aE	18.0 - 18.5	18.0 - 19.5	1.4	4-6-7
19 ▽			Wet at 19.3'		SS13bG	18.5 - 19.5			
20					SS14G	19.5 - 21.0	19.5 - 21.0	1.5	3-2-6
21									
22					ST01G	21.0 - 23.0	21.0 - 23.0	1.0	NR
23	23.0	753.0							
24			SILT, ML, 5YR 5/6 (yellowish red), very loose, wet, [CCR]	23.0/26.0-20190226	SS15E	23.0 - 24.5	23.0 - 24.5	1.5	3-5-6
25					SS16E	24.5 - 26.0	24.5 - 26.0	1.5	4-5-3
26									
27					SS17G	26.0 - 27.5	26.0 - 27.5	1.5	4-5-5
28					SS18G	27.5 - 29.0	27.5 - 29.0	1.5	2-2-3
29									
30	30.0	746.0			SS19G	29.0 - 30.5	29.0 - 30.5	1.5	3-7-6
31			SILTY SAND WITH GRAVEL, SM, 10YR 2/1 (black), very loose to loose, wet, [CCR]		SS20a	30.5 - 31.5	30.5 - 32.0	1.0	2-4-5
32				31.5/33.5-20190226	SS20bE	31.5 - 32.0			
33					SS21E	32.0 - 33.5	32.0 - 33.5	1.0	4-7-6
34					SS22G	33.5 - 35.0	33.5 - 35.0	1.5	4-4-4
35	35.5	740.5							
36			SILT WITH SAND, ML, 5YR 5/6 (yellowish red), very loose, wet, [CCR]		SS23G	35.0 - 36.5	35.0 - 36.5	1.5	3-4-4
37				36.5/38.5-20190226	SS24E	36.5 - 38.0	36.5 - 38.0	1.5	2-2-4
38					SS25aE	38.0 - 38.5	38.0 - 39.5	1.5	2-2-5
39					SS25bG	38.5 - 39.5			
40					SS26G	39.5 - 41.0	39.5 - 41.0	1.5	2-2-4
41					SS27aG	41.0 - 41.5	41.0 - 42.5		2-3-4
42					SS27bE	41.5 - 42.5			

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 1/28/20

SUBSURFACE LOG

Client Borehole ID N/A
Stantec Boring No. **KIF-TW03**
Client Tennessee Valley Authority
Boring Location 575,720.53 N; 2,408,211.78 E NAD83
Project Number 175668043
Surface Elevation 776.0 ft
Elevation Datum NGVD29

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]		Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft		Rec. Ft	Rec. %
43			SILT WITH SAND, ML, 5YR 5/6 (yellowish red), very loose, wet, [CCR] *(Continued)*		SS28aE	42.5 - 43.5	42.5 - 44.0	1.5	1-1-3
44					SS28bG	43.5 - 44.0			
	45.0	731.0			SS29aG	44.0 - 45.0	44.0 - 45.5	1.5	1-2-3
45					SS29bG	45.0 - 45.5			
46			SILT, ML, 10YR 3/1 (very dark gray), non-plastic, soft, wet, [CCR]						
					ST02G	45.5 - 47.5	45.5 - 47.5	2.0	NR
47	47.5	728.5							

41.5/43.5-20190226

No Refusal /
Bottom of Hole at 47.5 Ft.

Temporary well installed. See well installation log for backfill details

1: E = Environmental Sample Custody (two Split Spoons may be required to obtain sufficient sample)
G = Geotechnical Sample Custody
2: a,b,c denote Split Spoon divided between Environmental and Geotechnical Samples
3: Depths are reported in feet below ground surface

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 1/28/20

SUBSURFACE LOG

Client Borehole ID	N/A	Stantec Boring No.	**KIF-TW03a**
Client	Tennessee Valley Authority	Boring Location	575,741.10 N; 2,407,987.58 E NAD83
Project Number	175668043	Surface Elevation	771.4 ft
		Elevation Datum	NGVD29
Project Name	KIF TDEC Order	Date Started	1/31/19
		Completed	1/31/19
Project Location	Harriman, Tennessee	Depth to Water	15.0 ft
		Date/Time	1/31/19
Inspector	J. Andrew	Logger	D. Mihalek
Depth to Water	N/A	Date/Time	N/A
Drilling Contractor	Stantec Consulting Services Inc.	Drill Rig Type and ID	CME 55T#1, #709
Overburden Drilling and Sampling Tools (Type and Size)	4-1/4" HSA, 3" SS w/o liners		
Rock Drilling and Sampling Tools (Type and Size)	N/A		
Overdrill Tooling (Type and Size)	N/A	Overdrill Depth	N/A
Sampler Hammer Type	Automatic	Weight	140
Drop	30	Efficiency	N/A
Borehole Azimuth	N/A (Vertical)	Borehole Inclination (from Vertical)	N/A
Reviewed By	E. Smith	Approved By	L. Price

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]		Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft		Rec. Ft	Rec. %
0.0	771.4		Top of Hole						
0.5	770.9		ORGANIC SILT, OL, 7.5YR 6/4 (light brown), low plasticity, moist, top soil, [FILL]		SS01G	0.0 - 1.5	0.0 - 1.5	1.5	2-6-8
2.0	769.4		FAT CLAY, CH, 7.5YR 5/6 (strong brown), high plasticity, soft, moist, [FILL]		SS02aG	1.5 - 2.0	1.5 - 3.0	1.5	4-14-17
					SS02b	2.0 - 3.0			
4.0	767.4		SANDY SILT WITH GRAVEL, ML, 10YR 4/1 (dark gray), loose, dry, [CCR]		SS03a	3.0 - 4.0	3.0 - 4.5	1.4	18-22-18
					SS03bG	4.0 - 4.5			
6.0	765.4		WELL GRADED GRAVEL, GW, 10YR 7/1 (light gray), medium dense, [FILL]		SS04G	4.5 - 6.0	4.5 - 6.0	1.4	16-29-32
			Encountered geofabric at 6.0'						
			SILTY SAND, SM, 10YR 5/1 (gray), medium dense, dry, [CCR]		SS05	6.0 - 7.5	6.0 - 7.5	1.5	17-21-23
					SS06	7.5 - 9.0	7.5 - 9.0	1.5	5-5-4
9.5	761.9		Moist at 8.75'		SS07aG	9.0 - 9.5	9.0 - 10.5	1.5	5-14-46
			POORLY GRADED GRAVEL, GP, 10YR 5/1 (gray), dense, dry, [CCR]		SS07bG	9.5 - 10.5			
			Augured to 15.0'		SS08G	10.5 - 10.6	10.5 - 10.6	0.1	50+/1"

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 1/28/20

SUBSURFACE LOG

Client Borehole ID N/A
Stantec Boring No. **KIF-TW03a**
Client Tennessee Valley Authority
Boring Location 575,741.10 N; 2,407,987.58 E NAD83
Project Number 175668043
Surface Elevation 771.4 ft
Elevation Datum NGVD29

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]	Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft	Rec. Ft	Rec. %
13			POORLY GRADED GRAVEL, GP, 10YR 5/1 (gray), dense, dry, [CCR] *(Continued)*					
14								
15 ▽ 15.3	756.1		Wet at 15.0'		SS09	15.0 - 15.3	0.0	36/4"
			Refusal / Bottom of Hole at 15.3 Ft.					

15.0 - 15.3

Encountered obstruction at 15.3 feet, boring terminated and backfilled in accordance with Exploratory Drilling SAP

Since boring was terminated, all Environmental Samples were disposed of as investigative derived waste.

As-drilled boring location not surveyed. Horizontal coordinates based on proposed boring location. Vertical coordinates based on 2017 LIDAR surfaces.

1: E = Environmental Sample Custody (two Split Spoons may be required to obtain sufficient sample)
G = Geotechnical Sample Custody
2: a,b,c denote Split Spoon divided between Environmental and Geotechnical Samples
3: Depths are reported in feet below ground surface

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 1/28/20

SUBSURFACE LOG

Client Borehole ID	N/A	Stantec Boring No.	**KIF-TW03b**
Client	Tennessee Valley Authority	Boring Location	575,741.10 N; 2,407,967.58 E NAD83
Project Number	175668043	Surface Elevation	771.9 ft
Project Name	KIF TDEC Order	Date Started	1/31/19
Project Location	Harriman, Tennessee	Depth to Water	9.7 ft
Inspector	J. Andrew	Logger	D. Mihalek
Drilling Contractor	Stantec Consulting Services Inc.	Drill Rig Type and ID	CME 55T#1, #709
Overburden Drilling and Sampling Tools (Type and Size)	4-1/4" HSA, 3" SS w/o liners		
Rock Drilling and Sampling Tools (Type and Size)	N/A		
Overdrill Tooling (Type and Size)	N/A	Overdrill Depth	N/A
Sampler Hammer Type	Automatic	Weight	140
Drop	30	Efficiency	N/A
Borehole Azimuth	N/A (Vertical)	Borehole Inclination (from Vertical)	N/A
Reviewed By	E. Smith	Approved By	L. Price

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]		Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft		Rec. Ft	Rec. %
0.0	771.9		Top of Hole						
0.7	771.2		ORGANIC SILT, OL, 10YR 4/4 (dark yellowish brown), firm, moist, [FILL]		SS01G	0.0 - 1.5	0.0 - 1.5	1.2	4-7-9
2.0	769.9		FAT CLAY, CH, 7.5YR 4/6 (strong brown), high plasticity, firm, moist, [FILL]		SS02aG	1.5 - 2.5	1.5 - 3.0	1.5	9-12-19
3.0	768.9		SILTY SAND WITH GRAVEL, SM, 10YR 3/1 (very dark gray), fine to coarse, loose, [CCR]		SS02b	2.5 - 3.0			
4.5	767.4		SILTY SAND, SM, 10YR 3/1 (very dark gray), fine to medium, medium dense, dry, [CCR]		SS03a	3.0 - 3.5	3.0 - 4.5	1.5	17-21-22
					SS03bG	3.5 - 4.5			
6.0	765.9		SILTY SAND WITH GRAVEL, SM, 7.5Y 6/1 (very dark gray), fine to coarse, dense, dry, [CCR]		SS04G	4.5 - 6.0	4.5 - 6.0	1.4	10-21-42
7.5	764.4		SILTY SAND, SM, 10YR 3/1 (very dark gray), fine to medium, dense, dry, [CCR] Geofabric encountered at 6.5' and 7.5'		SS05	6.0 - 7.5	6.0 - 7.5	1.5	17-21-22
9.0	762.9		SILT WITH SAND, ML, 10YR 5/1 (gray), soft, moist, [CCR]		SS06	7.5 - 9.0	7.5 - 9.0	1.5	5-7-6
▽ 9.8	762.1		SILTY SAND, SM, 10YR 4/1 (dark gray), medium dense, moist to wet, [CCR] Wet at 9.7'		SS07aG	9.0 - 10.0	9.0 - 10.5	1.5	5-9-11
10.5	761.4		SILT WITH SAND AND GRAVEL, ML, 7.5Y 6/1 (dark gray), fine to coarse, medium dense, moist, [CCR] Geofabric encountered in sample		SS07bG	10.0 - 10.5			
11.5	760.4		SILT, ML, 10YR 5/1 (gray), soft, wet, with limestone cobbles, [CCR]		SS08aG	10.5 - 11.0	10.5 - 12.0	1.2	17-22-40
					SS08b	11.0 - 12.0			
			GRAVEL WITH SAND, GW, 5Y 6/2 (light olive gray), medium to coarse, dense, moist, [FILL]		SS09a	12.0 - 13.5	12.0 - 13.5	1.5	22-16-30

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 1/28/20

SUBSURFACE LOG

Client Borehole ID N/A
Stantec Boring No. **KIF-TW03b**
Client Tennessee Valley Authority
Boring Location 575,741.10 N; 2,407,967.58 E NAD83
Project Number 175668043
Surface Elevation 771.9 ft
Elevation Datum NGVD29

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]	Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft	Rec. Ft	Rec. %
13 13.5	758.4		Geofabric encountered in sample		SS09b	13.0 - 13.5		

Refusal /
Bottom of Hole at 13.5 Ft.

Encountered obstruction at 13.5 feet, boring terminated and backfilled in accordance with Exploratory Drilling SAP

Since boring was terminated, all Environmental Samples were disposed of as investigative derived waste.

As-drilled boring location not surveyed. Horizontal coordinates based on proposed boring location. Vertical coordinates based on 2017 LIDAR surfaces.

1: E = Environmental Sample Custody (two Split Spoons may be required to obtain sufficient sample)
G = Geotechnical Sample Custody
2: a,b,c denote Split Spoon divided between Environmental and Geotechnical Samples
3: Depths are reported in feet below ground surface

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 1/28/20

SUBSURFACE LOG

Client Borehole ID	N/A	Stantec Boring No.	**KIF-TW04**
Client	Tennessee Valley Authority	Boring Location	574,754.11 N; 2,407,855.14 E NAD83
Project Number	175668043	Surface Elevation	765.2 ft
Elevation Datum	NGVD29		
Project Name	KIF TDEC Order	Date Started	2/8/19
Completed	2/13/19		
Project Location	Harriman, Tennessee	Depth to Water	21.5 ft
Date/Time	2/11/19 14:25		
Inspector	J. Andrew	Logger	M. Edmunds, D. Mihalek
Depth to Water	N/A	Date/Time	N/A
Drilling Contractor	Stantec Consulting Services Inc.	Drill Rig Type and ID	CME 55T#1, #709
Overburden Drilling and Sampling Tools (Type and Size)	4-1/4" HSA, 3" SS w/o liners, 3" Shelby Tubes		
Rock Drilling and Sampling Tools (Type and Size)	N/A		
Overdrill Tooling (Type and Size)	8-1/4" HSA overdrill of boring	Overdrill Depth	37.0 ft
Sampler Hammer Type	Automatic	Weight	140
Drop	30	Efficiency	N/A
Borehole Azimuth	N/A (Vertical)	Borehole Inclination (from Vertical)	N/A
Reviewed By	E. Smith	Approved By	L. Price

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]		Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft		Rec. Ft	Rec. %
0.0	765.2		Top of Hole						
			SANDY LEAN CLAY, CL, 10YR 3/6 (dark yellowish brown), low plasticity, firm, moist, with silt, sand, and gravel, [FILL]		SS01G	0.0 - 1.5	0.0 - 1.5	0.9	1-5-4
2.0	763.2				SS02aG	1.5 - 2.0	1.5 - 3.0	1.5	5-3-5
			FAT CLAY, CH, 2.5YR 6/4 (light reddish brown), medium plasticity, firm, moist, [FILL]		SS02bG	2.0 - 3.0			
3.5	761.7				SS03aG	3.0 - 3.5	3.0 - 4.5	1.5	6-4-2
			SILT WITH SAND, ML, 5YR 3/1 (very dark gray), non-plastic to low plasticity, very soft to firm, moist, [CCR]	3.5/5.5-20190208	SS03bE	3.5 - 4.5			
					SS04aE	4.5 - 5.5	4.5 - 6.0	1.5	1-1-1
					SS04bG	5.5 - 6.0			
					SS05aG	6.0 - 6.5	6.0 - 7.5	1.5	WH-1-1
				6.5/8.5-20190208	SS05bE	6.5 - 7.5			
					SS06aE	7.5 - 8.5	7.5 - 9.0	1.5	1-0-1
					SS06bG	8.5 - 9.0			
10.0	755.2				SS07G	9.0 - 10.5	9.0 - 10.5	1.5	1-WR-WR
			SILTY SAND, SM, 10YR 4/1 (dark gray), fine, very loose, moist, [CCR]		SS08aG	10.5 - 11.5	10.5 - 12.0	1.5	1-1-2
12.0	753.2			11.5/13.5-20190211	SS08bE	11.5 - 12.0			
			SILT, ML, 10YR 4/1 (dark gray), very soft to firm, moist, [CCR]		SS09E	12.0 - 13.5	12.0 - 13.5	1.5	WH-WH-WH
					SS10G	13.5 - 15.0	13.5 - 15.0	1.5	1-3-5
					SS11G	15.0 - 16.5	15.0 - 16.5	1.5	1-1-3

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 8/26/20

SUBSURFACE LOG

Client Borehole ID: N/A
Stantec Boring No.: **KIF-TW04**
Client: Tennessee Valley Authority
Boring Location: 574,754.11 N; 2,407,855.14 E NAD83
Project Number: 175668043
Surface Elevation: 765.2 ft
Elevation Datum: NGVD29

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]		Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft		Rec. Ft	Rec. %
17			SILT, ML, 10YR 4/1 (dark gray), very soft to firm, moist, [CCR] *(Continued)*		SS12E	16.5 - 18.0	16.5 - 18.0	1.5	2-4-5
18				16.5/18.5-20190211	SS13aE	18.0 - 18.5	18.0 - 19.5	1.5	2-2-2
19	19.5	745.7			SS13bG	18.5 - 19.5			
20			SILTY SAND, SM, 10YR 4/1 (dark gray), very loose, wet, [CCR]		SS14G	19.5 - 21.0	19.5 - 21.0	1.5	1-1-1
21					SS15a	21.0 - 21.5	21.0 - 22.5	1.5	WH-1-1
22				21.5/23.5-20190211	SS15bE	21.5 - 22.5			
23					SS16aE	22.5 - 23.5	22.5 - 24.0	1.5	1-3-6
24					SS16b	23.5 - 24.0			
25					ST01G	24.0 - 26.0	24.0 - 26.0	1.9	NR
26	26.0	739.2			SS17aG	26.0 - 26.5	26.0 - 27.0	1.0	5-5
27			SILTY GRAVEL, GM, 5Y 2.5/1 (black), very loose, wet, [CCR]	26.5/28.5-20190211	SS17bE	26.5 - 27.0			
28					SS18E	27.0 - 28.5	27.0 - 28.5	1.2	1-2-2
29					SS19G	28.5 - 30.0	28.5 - 30.0	1.5	2-2-3
30	30.0	735.2							
31			SILTY SAND, SM, 5Y 2.5/1 (black), very loose, wet, [CCR]		SS20G	30.0 - 31.5	30.0 - 31.5	1.5	1-2-3
32				31.5/33.5-20190213	SS21E	31.5 - 33.0	31.5 - 33.0	1.5	3-2-3
33					SS22aE	33.0 - 33.5	33.0 - 34.5	1.3	1-3-2
34					SS22bG	33.5 - 34.5			
35					SS23G	34.5 - 36.0	34.5 - 36.0	1.5	1-2-3
36	36.0	729.2			SS24aG	36.0 - 36.5	36.0 - 37.5	1.5	1-1-2
37	37.5	727.7	CLAYEY SAND, SC, 5Y 2.5/1 (black), low plasticity, very loose, wet, [CCR]	36.5/38.5-20190213	SS24bE	36.5 - 37.5			
38			SILT, ML, 10Y 3/1 (very dark greenish gray), non-plastic, firm, wet, [CCR]		SS25aE	37.5 - 38.5	37.5 - 39.0	1.5	2-2-3
39					SS25bG	38.5 - 39.0			

TVA EIP BORING LOG_175668043_TVA_KIF_TDEC.GPJ_TDEC SUBSURF DT 20190530.GDT 8/26/20

SUBSURFACE LOG

Client Borehole ID N/A
Stantec Boring No. **KIF-TW04**
Client Tennessee Valley Authority
Boring Location 574,754.11 N; 2,407,855.14 E NAD83
Project Number 175668043
Surface Elevation 765.2 ft
Elevation Datum NGVD29

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]		Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft		Rec. Ft	Rec. %
40			SILT, ML, 10Y 3/1 (very dark greenish gray), non-plastic, firm, wet, [CCR] *(Continued)*		ST02G	39.0 - 41.0	39.0 - 41.0	1.7	NR
41 41.0	724.2		No Refusal / Bottom of Hole at 41.0 Ft.						

Temporary well installed. See well installation log for backfill details

1: E = Environmental Sample Custody (two Split Spoons may be required to obtain sufficient sample)
G = Geotechnical Sample Custody
2: a,b,c denote Split Spoon divided between Environmental and Geotechnical Samples
3: Depths are reported in feet below ground surface

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 8/26/20

SUBSURFACE LOG

Client Borehole ID	N/A	Stantec Boring No.	**KIF-TW05**
Client	Tennessee Valley Authority	Boring Location	575,382.75 N; 2,408,921.34 E NAD83
Project Number	175668043	Surface Elevation	770.5 ft
		Elevation Datum	NGVD29
Project Name	KIF TDEC Order	Date Started	11/13/18
		Completed	11/14/18
Project Location	Harriman, Tennessee	Depth to Water	16.5 ft
		Date/Time	11/13/18
Inspector	B. Lucente	Logger	G. Budd
Depth to Water	N/A	Date/Time	N/A
Drilling Contractor	Stantec Consulting Services Inc.	Drill Rig Type and ID	CME 850XR, #953
Overburden Drilling and Sampling Tools (Type and Size)	4-1/4" HSA, 3" SS w/o liners, 3" Shelby Tubes		
Rock Drilling and Sampling Tools (Type and Size)	N/A		
Overdrill Tooling (Type and Size)	8-1/4" HSA overdrill of boring	Overdrill Depth	39.0 ft
Sampler Hammer Type	Automatic	Weight	140
Drop	30	Efficiency	N/A
Borehole Azimuth	N/A (Vertical)	Borehole Inclination (from Vertical)	N/A
Reviewed By	E. Smith	Approved By	L. Price

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]		Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft		Rec. Ft	Rec. %
0.0	770.5		Top of Hole						
			SILTY SAND WITH GRAVEL, SM, 10YR 3/1 (very dark gray), loose to dense, dry to moist, placed fill material, [CCR]		SS01G	0.0 - 1.5	0.0 - 1.5	1.3	4-8-6
				1.5/3.5-20181113	SS02E	1.5 - 3.0	1.5 - 3.0	1.5	5-6-4
					SS03aE	3.0 - 3.5	3.0 - 4.5	1.5	4-2-2
					SS03b	3.5 - 4.5			
5.2	765.3				SS04G	4.5 - 6.0	4.5 - 6.0	1.2	5-3-6
			LEAN CLAY, CL, 5YR 4/4 (reddish brown), firm, dry to moist, with fragments of chert, [FILL]		SS05a	6.0 - 6.5	6.0 - 7.5	1.5	11-17-20
6.5	764.0			6.5/8.5-20181113	SS05bE	6.5 - 7.5			
7.5	763.0		POORLY GRADED GRAVEL, GP, 10YR 3/1 (very dark gray), fine to coarse, dense, dry, fill material, [CCR]		SS06aE	7.5 - 8.5	7.5 - 9.0	1.5	24-35-50+
			SILTY SAND WITH GRAVEL, SM, 10YR 3/1 (very dark gray) and 10YR 5/6 (yellowish brown), dense to very dense, dry, [CCR]		SS06b	8.5 - 9.0			
					SS07G	9.0 - 10.5	9.0 - 10.5	1.5	39-62-106
					SS08a	10.5 - 11.5	10.5 - 12.0	1.5	45-56-55
12.0	758.5			11.5/13.5-20181113	SS08bE	11.5 - 12.0			
			WELL GRADED SAND, SW, 10YR 3/1 (very dark gray), medium dense to dense, dry to moist, [CCR]		SS09E	12.0 - 13.5	12.0 - 13.5	1.5	27-30-34
					SS10G	13.5 - 15.0	13.5 - 15.0	1.5	25-30-25
15.0	755.5								
			WELL GRADED SAND WITH SILT AND GRAVEL, SW-SM, 10YR 2/1 (black), medium dense, moist to wet, [CCR]		SS11G	15.0 - 16.5	15.0 - 16.5	1.5	19-15-17

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 1/28/20

SUBSURFACE LOG

Client Borehole ID: N/A
Stantec Boring No.: **KIF-TW05**
Client: Tennessee Valley Authority
Boring Location: 575,382.75 N; 2,408,921.34 E NAD83
Project Number: 175668043
Surface Elevation: 770.5 ft
Elevation Datum: NGVD29

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]		Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft		Rec. Ft	Rec. %
17			WELL GRADED SAND WITH SILT AND GRAVEL, SW-SM, 10YR 2/1 (black), medium dense, moist to wet, [CCR] *(Continued)*		SS12E	16.5 - 18.0	16.5 - 18.0	1.5	13-11-10
18					SS13aE	18.0 - 18.5	18.0 - 19.5	1.5	17-22-19
19					SS13b	18.5 - 19.5			
20					SS14G	19.5 - 21.0	19.5 - 21.0	1.5	11-17-13
21					SS15G	21.0 - 22.5	21.0 - 22.5	1.5	11-11-11
22									
23	23.3	747.2			SS16E	22.5 - 24.0	22.5 - 24.0	1.5	14-26-30
24			SILTY SAND, SM, 10YR 4/1 (dark gray), very fine to fine, loose to medium dense, moist to wet, [CCR]		SS17aE	24.0 - 24.5	24.0 - 25.5	0.6	11-21-17
25					SS17b	24.5 - 25.5			
26	25.8	744.7	WELL GRADED SAND, SW, 10YR 2/1 (black), fine to coarse, loose, wet, [CCR]		SS18a	25.5 - 26.5	25.5 - 27.0	1.5	5-6-6
27	27.7	742.8			SS18bE	26.5 - 27.0			
28			SILT WITH SAND, ML, 10YR 4/1 (dark gray), very fine to fine, very loose to loose, wet, [CCR]		SS19E	27.0 - 28.5	27.0 - 28.5	1.5	9-9-10
29					SS20G	28.5 - 30.0	28.5 - 30.0	1.5	4-3-6
30					SS21G	30.0 - 31.5	30.0 - 31.5	1.5	2-3-4
31					SS22E	31.5 - 33.0	31.5 - 33.0	1.5	4-7-9
32					SS23aE	33.0 - 33.5	33.0 - 34.5	1.5	3-5-8
33					SS23bG	33.5 - 34.5			
34					SS24G	34.5 - 36.0	34.5 - 36.0	1.5	2-2-2
35									
36					SS25	36.0 - 37.5	36.0 - 37.5	1.5	WR-WR-WR
37									
38	38.0	732.5	LEAN CLAY WITH SAND, CL, 10YR 5/1 (gray) and 10YR 4/6 (dark yellowish brown), medium plasticity, moist to wet, with organics		SS26	37.5 - 39.0	37.5 - 39.0	1.5	1-2-2
39									

16.5/19.5-20181113
22.5/24.5-20181113
26.5/28.5-20181113
31.5/33.5-20181113

TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 1/28/20

SUBSURFACE LOG

Client Borehole ID N/A
Stantec Boring No. **KIF-TW05**
Client Tennessee Valley Authority
Boring Location 575,382.75 N; 2,408,921.34 E NAD83
Project Number 175668043
Surface Elevation 770.5 ft
Elevation Datum NGVD29

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]		Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft		Rec. Ft	Rec. %
40					ST01G	39.0 - 41.0	39.0 - 41.0	1.8	400
41	41.0	729.5							
			No Refusal / Bottom of Hole at 41.0 Ft.						

Temporary well installed. See well installation log for backfill details

1: E = Environmental Sample Custody (two Split Spoons may be required to obtain sufficient sample)
G = Geotechnical Sample Custody
2: a,b,c denote Split Spoon divided between Environmental and Geotechnical Samples
3: Depths are reported in feet below ground surface

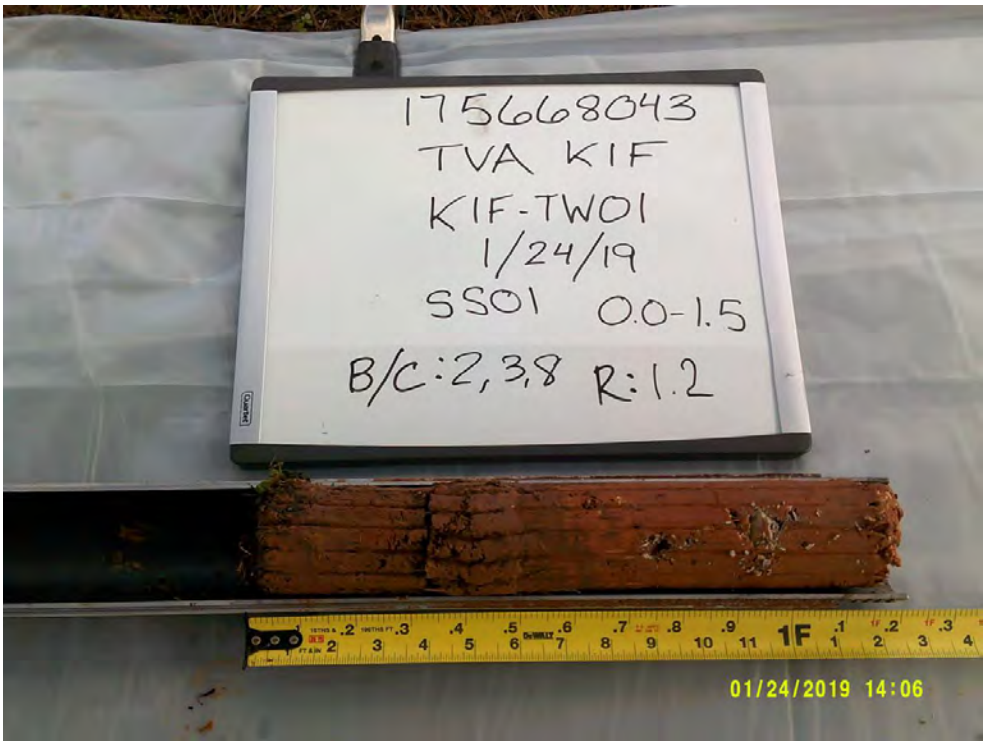
TVA EIP BORING LOG 175668043_TVA_KIF_TDEC.GPJ TDEC SUBSURF DT 20190530.GDT 1/28/20

APPENDIX D - PHOTOGRAPHIC LOGS

ATTACHMENT D.1

Photographic Logs of CCR Material Cores - Temporary Wells

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 1 **Photo Location:** KIF-TW01 **Photo Date:** 1/24/2019 **Comments:** Interval (0.0-1.5 feet).	
Photograph ID: 2 **Photo Location:** KIF-TW01 **Photo Date:** 1/24/2019 **Comments:** Interval (1.5-3.0 feet).	

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 3

Photo Location:
KIF-TW01

Photo Date:
1/24/2019

Comments:
Interval (3.0-4.5 feet).

Photograph ID: 4

Photo Location:
KIF-TW01

Photo Date:
1/24/2019

Comments:
Interval (4.5-6.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 5

Photo Location:
KIF-TW01

Photo Date:
1/24/2019

Comments:
Interval (6.0-7.5 feet).

Photograph ID: 6

Photo Location:
KIF-TW01

Photo Date:
1/24/2019

Comments:
Interval (7.5-9.0 feet).

Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Kingston Fossil Plant (KIF)	Site Location:	Harriman, Tennessee

Photograph ID: 7 **Photo Location:** KIF-TW01 **Photo Date:** 1/24/2019 **Comments:** Interval (9.0-10.5 feet).	
Photograph ID: 8 **Photo Location:** KIF-TW01 **Photo Date:** 1/24/2019 **Comments:** Interval (10.5-12.0 feet).	

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 9

Photo Location:
KIF-TW01

Photo Date:
1/24/2019

Comments:
Interval (12.0-13.5 feet).

Photograph ID: 10

Photo Location:
KIF-TW01

Photo Date:
1/25/2019

Comments:
Interval (13.5-15.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 11

Photo Location:
KIF-TW01

Photo Date:
1/25/2019

Comments:
Interval (15.0-16.5 feet). Missing part of white board should read 175668043: TVA KIF: TVA-TW01: 1/25/19.

Photograph ID: 12

Photo Location:
KIF-TW01

Photo Date:
1/25/2019

Comments:
Interval (16.5-18.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 13

Photo Location:
KIF-TW01

Photo Date:
1/25/2019

Comments:
Interval (18.0-19.5 feet). Missing part of white board, project number shown on white board should be 175668043

Photograph ID: 14

Photo Location:
KIF-TW01

Photo Date:
1/25/2019

Comments:
Photo of interval (19.5-21.5 feet) unavailable.

No Photo Applicable

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 15 **Photo Location:** KIF-TW01 **Photo Date:** 1/25/2019 **Comments:** Interval (21.5-22.5 feet).	
Photograph ID: 16 **Photo Location:** KIF-TW01 **Photo Date:** 1/25/2019 **Comments:** Interval (22.5-24.0 feet).	

Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Kingston Fossil Plant (KIF)	Site Location:	Harriman, Tennessee

Photograph ID: 17 **Photo Location:** KIF-TW01 **Photo Date:** 1/28/2019 **Comments:** Photo of interval (24.0-26.0) unavailable.	No Photo Applicable
Photograph ID: 18 **Photo Location:** KIF-TW01 **Photo Date:** 1/28/2019 **Comments:** Interval (26.0-27.0 feet).	

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 19

Photo Location:
KIF-TW01

Photo Date:
1/28/2019

Comments:
Interval (27.0-28.5 feet).

Photograph ID: 20

Photo Location:
KIF-TW01

Photo Date:
1/28/2019

Comments:
Interval (28.5-30.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 21

Photo Location:
KIF-TW01

Photo Date:
1/28/2019

Comments:
Interval (30.1-31.5 feet).

Photograph ID: 22

Photo Location:
KIF-TW01

Photo Date:
1/28/2019

Comments:
Interval (31.5-33.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 23

Photo Location:
KIF-TW01

Photo Date:
1/28/2019

Comments:
Interval (33.0-34.5 feet).

Photograph ID: 24

Photo Location:
KIF-TW01

Photo Date:
1/28/2019

Comments:
Interval (34.5-36.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 25 **Photo Location:** KIF-TW01 **Photo Date:** 1/28/2019 **Comments:** Interval (36.0-37.5 feet).	
Photograph ID: 26 **Photo Location:** KIF-TW01 **Photo Date:** 1/28/2019 **Comments:** Photo of interval (37.5-39.0 feet) unavailable.	No Photo Applicable

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 27 **Photo Location:** KIF-TW01 **Photo Date:** 1/28/2019 **Comments:** Photo of interval (39.0-40.5 feet) unavailable.	No Photo Applicable
Photograph ID: 28 **Photo Location:** KIF-TW01 **Photo Date:** 1/28/2019 **Comments:** Interval (40.5-42.0 feet).	

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 29 **Photo Location:** KIF-TW01 **Photo Date:** 1/28/2019 **Comments:** Photo of interval (42.0-44.0 feet) unavailable.	No Photo Applicable
Photograph ID: 30 **Photo Location:** KIF-TW02 **Photo Date:** 2/5/2019 **Comments:** Interval (0.0-1.5 feet).	

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 31 **Photo Location:** KIF-TW02 **Photo Date:** 2/5/2019 **Comments:** Photo of interval (1.5-3.0 feet) unavailable.	No Photo Applicable
Photograph ID: 32 **Photo Location:** KIF-TW02 **Photo Date:** 2/5/2019 **Comments:** Photo of interval (3.0-4.5 feet) unavailable.	No Photo Applicable

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 33

Photo Location:
KIF-TW02

Photo Date:
2/5/2019

Comments:
Interval (4.5-6.0 feet). White board blurred should read, 175668043: KIF TDEC ORDER; KIF-TW02: 2/5/19: SS-04; 4.5'-6.0'; B/C: 18,21,50: R:1.5

Photograph ID: 34

Photo Location:
KIF-TW02

Photo Date:
2/5/2019

Comments:
Interval (6.0-7.5 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 35

Photo Location:
KIF-TW02

Photo Date:
2/5/2019

Comments:
Interval (7.5-9.0 feet).

Photograph ID: 36

Photo Location:
KIF-TW02

Photo Date:
2/5/2019

Comments:
Interval (9.0-10.5 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 37

Photo Location:
KIF-TW02

Photo Date:
2/5/2019

Comments:
Interval (10.5-12.0 feet).

Photograph ID: 38

Photo Location:
KIF-TW02

Photo Date:
2/5/2019

Comments:
Interval (12.0-13.5 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 39

Photo Location:
KIF-TW02

Photo Date:
2/5/2019

Comments:
Interval (13.5-15.0 feet).

Photograph ID: 40

Photo Location:
KIF-TW02

Photo Date:
2/5/2019

Comments:
Interval (15.0-16.5 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 41 **Photo Location:** KIF-TW02 **Photo Date:** 2/5/2019 **Comments:** Interval (16.5-18.0 feet).	
Photograph ID: 42 **Photo Location:** KIF-TW02 **Photo Date:** 2/5/2019 **Comments:** Interval (18.0-19.5 feet).	

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 43

Photo Location:
KIF-TW02

Photo Date:
2/5/2019

Comments:
Interval (19.5-21.0 feet).

Photograph ID: 44

Photo Location:
KIF-TW02

Photo Date:
2/5/2019

Comments:
Photo of interval (21.0-23.0 feet) unavailable.

No Photo Applicable

Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Kingston Fossil Plant (KIF)	Site Location:	Harriman, Tennessee

Photograph ID: 45 **Photo Location:** KIF-TW02 **Photo Date:** 2/5/2019 **Comments:** Interval (23.0-24.0 feet).	
Photograph ID: 46 **Photo Location:** KIF-TW02 **Photo Date:** 2/5/2019 **Comments:** Interval (24.0-25.5 feet).	

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 47 **Photo Location:** KIF-TW02 **Photo Date:** 2/5/2019 **Comments:** Interval (25.5-27.0 feet).	
Photograph ID: 48 **Photo Location:** KIF-TW02 **Photo Date:** 2/5/2019 **Comments:** Interval (27.0-28.5 feet).	

Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Kingston Fossil Plant (KIF)	Site Location:	Harriman, Tennessee

Photograph ID: 49

Photo Location:
KIF-TW02

Photo Date:
2/5/2019

Comments:
Interval (28.5-30.0 feet).

Photograph ID: 50

Photo Location:
KIF-TW02

Photo Date:
2/5/2019

Comments:
Interval (30.0-31.5 feet).

Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Kingston Fossil Plant (KIF)	Site Location:	Harriman, Tennessee

Photograph ID: 51 **Photo Location:** KIF-TW02 **Photo Date:** 2/5/2019 **Comments:** Interval (31.5-33.0 feet).	
Photograph ID: 52 **Photo Location:** KIF-TW02 **Photo Date:** 2/5/2019 **Comments:** Interval (33.0-34.5 feet).	

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 53

Photo Location:
KIF-TW02

Photo Date:
2/5/2019

Comments:
Interval (34.5-36.0 feet).

Photograph ID: 54

Photo Location:
KIF-TW02

Photo Date:
2/5/2019

Comments:
Interval (36.0-37.5 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 55

Photo Location:
KIF-TW02

Photo Date:
2/5/2019

Comments:
Interval (37.5-39.0 feet).

Photograph ID: 56

Photo Location:
KIF-TW02

Photo Date:
2/5/2019

Comments:
Interval (39.0-40.5 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 57

Photo Location:
KIF-TW02

Photo Date:
2/5/2019

Comments:
Interval (40.5-42.0 feet).

Photograph ID: 58

Photo Location:
KIF-TW02

Photo Date:
2/5/2019

Comments:
Interval (42.0-43.5 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 59 **Photo Location:** KIF-TW02 **Photo Date:** 2/5/2019 **Comments:** Photo of interval (43.5-45.5 feet) unavailable.	No Photo Applicable
Photograph ID: 60 **Photo Location:** KIF-TW03 **Photo Date:** 2/25/2019 **Comments:** Third boring location interval (0.0-1.5 feet).	

Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Kingston Fossil Plant (KIF)	Site Location:	Harriman, Tennessee

Photograph ID: 61

Photo Location:
KIF-TW03

Photo Date:
2/25/2019

Comments:
Third boring location interval (1.5-3.0 feet). Offset approximately 235 feet to the east of the first boring.

Photograph ID: 62

Photo Location:
KIF-TW03

Photo Date:
2/25/2019

Comments:
Third boring location interval (3.0-4.5 feet). Offset approximately 235 feet to the east of the first boring.

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 63 **Photo Location:** KIF-TW03 **Photo Date:** 2/25/2019 **Comments:** Third boring location interval (4.5-6.0 feet). Offset approximately 235 feet to the east of the first boring.	
Photograph ID: 64 **Photo Location:** KIF-TW03 **Photo Date:** 2/25/2019 **Comments:** Third boring location interval (6.0-7.5 feet). Offset approximately 235 feet to the east of the first boring.	

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 65

Photo Location:
KIF-TW03

Photo Date:
2/25/2019

Comments:
Third boring location interval (7.5-9.0 feet). Offset approximately 235 feet to the east of the first boring.

Photograph ID: 66

Photo Location:
KIF-TW03

Photo Date:
2/25/2019

Comments:
Third boring location interval (9.0-10.5 feet). Offset approximately 235 feet to the east of the first boring.

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 67 **Photo Location:** KIF-TW03 **Photo Date:** 2/25/2019 **Comments:** Third boring location interval (10.5-12.0 feet). Offset approximately 235 feet to the east of the first boring.	
Photograph ID: 68 **Photo Location:** KIF-TW03 **Photo Date:** 2/25/2019 **Comments:** Third boring location interval (12.0-13.5 feet). Offset approximately 235 feet to the east of the first boring.	

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 69

Photo Location:
KIF-TW03

Photo Date:
2/25/2019

Comments:
Third boring location interval (13.5-15.0 feet). Offset approximately 235 feet to the east of the first boring.

Photograph ID: 70

Photo Location:
KIF-TW03

Photo Date:
2/25/2019

Comments:
Third boring location interval (15.0-16.5 feet). Offset approximately 235 feet to the east of the first boring.

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 71

Photo Location:
KIF-TW03

Photo Date:
2/25/2019

Comments:
Third boring location interval (16.5-18.0 feet). Offset approximately 235 feet to the east of the first boring.

Photograph ID: 72

Photo Location:
KIF-TW03

Photo Date:
2/25/2019

Comments:
Third boring location interval (18.0-19.5 feet). Offset approximately 235 feet to the east of the first boring.

Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Kingston Fossil Plant (KIF)	Site Location:	Harriman, Tennessee

Photograph ID: 73 **Photo Location:** KIF-TW03 **Photo Date:** 2/25/2019 **Comments:** Third boring location interval (19.5-21.0 feet). Offset approximately 235 feet to the east of the first boring.	
Photograph ID: 74 **Photo Location:** KIF-TW03 **Photo Date:** 2/25/2019 **Comments:** Photo of third boring location interval (21.0-23.0 feet) unavailable. Offset approximately 235 feet to the east of the first boring.	No Photo Applicable

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 75 **Photo Location:** KIF-TW03 **Photo Date:** 2/26/2019 **Comments:** Third boring location interval (23.0-24.5 feet). Offset approximately 235 feet to the east of the first boring.	
Photograph ID: 76 **Photo Location:** KIF-TW03 **Photo Date:** 2/26/2019 **Comments:** Third boring location interval (24.5-26.0 feet). Offset approximately 235 feet to the east of the first boring.	

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 77

Photo Location:
KIF-TW03

Photo Date:
2/26/2019

Comments:
Third boring location interval (26.0-27.5 feet). Offset approximately 235 feet to the east of the first boring.

Photograph ID: 78

Photo Location:
KIF-TW03

Photo Date:
2/26/2019

Comments:
Third boring location interval (27.5-29.0 feet). Offset approximately 235 feet to the east of the first boring.

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 79

Photo Location:
KIF-TW03

Photo Date:
2/26/2019

Comments:
Third boring location interval (29.0-30.5 feet). Offset approximately 235 feet to the east of the first boring.

Photograph ID: 80

Photo Location:
KIF-TW03

Photo Date:
2/26/2019

Comments:
Third boring location interval (30.5-32.0 feet). Offset approximately 235 feet to the east of the first boring.

Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Kingston Fossil Plant (KIF)	Site Location:	Harriman, Tennessee

Photograph ID: 81

Photo Location:
KIF-TW03

Photo Date:
2/26/2019

Comments:
Third boring location interval (32.0-33.5 feet). Offset approximately 235 feet to the east of the first boring.

Photograph ID: 82

Photo Location:
KIF-TW03

Photo Date:
2/26/2019

Comments:
Third boring location interval (33.5-35.0 feet). Offset approximately 235 feet to the east of the first boring.

Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Kingston Fossil Plant (KIF)	Site Location:	Harriman, Tennessee

Photograph ID: 83

Photo Location:
KIF-TW03

Photo Date:
2/26/2019

Comments:
Third boring location interval (35.0-36.5 feet). Offset approximately 235 feet to the east of the first boring.

Photograph ID: 84

Photo Location:
KIF-TW03

Photo Date:
2/26/2019

Comments:
Third boring location interval (36.5-38.0 feet). Offset approximately 235 feet to the east of the first boring.

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 85 **Photo Location:** KIF-TW03 **Photo Date:** 2/26/2019 **Comments:** Third boring location interval (38.0-39.5 feet). Offset approximately 235 feet to the east of the first boring.	
Photograph ID: 86 **Photo Location:** KIF-TW03 **Photo Date:** 2/26/2019 **Comments:** Third boring location interval (39.5-41.0 feet). Offset approximately 235 feet to the east of the first boring.	

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 87

Photo Location:
KIF-TW03

Photo Date:
2/26/2019

Comments:
Third boring location interval (41.0-42.5) feet. Offset approximately 235 feet to the east of the first boring.

Photograph ID: 88

Photo Location:
KIF-TW03

Photo Date:
2/26/2019

Comments:
Third boring location interval (42.5-44.0 feet). Offset approximately 235 feet to the east of the first boring.

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 89

Photo Location:
KIF-TW03

Photo Date:
2/26/2019

Comments:
Third boring location interval (44.0-45.5 feet). Offset approximately 235 feet to the east of the first boring.

Photograph ID: 90

Photo Location:
KIF-TW03

Photo Date:
2/26/2019

Comments:
Photo of third boring location interval (45.5-47.5 feet) unavailable. Offset approximately 235 feet to the east of the first boring.

No Photo Applicable

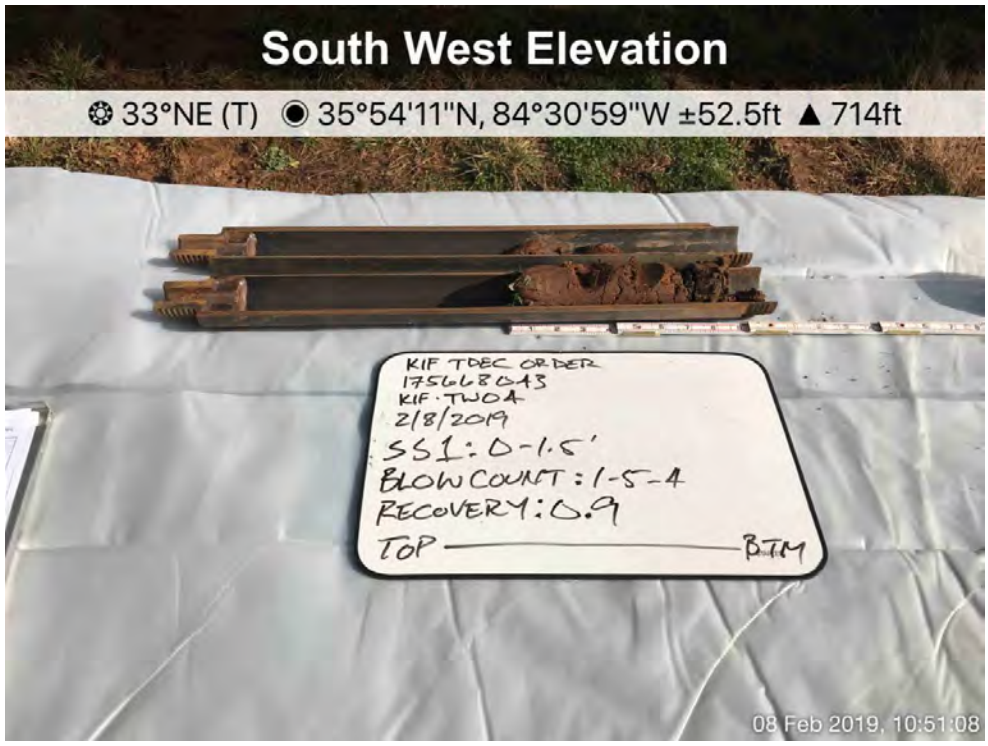
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 91

Photo Location:
KIF-TW04

Photo Date:
2/8/2019

Comments:
Interval (0.0-1.5 feet).

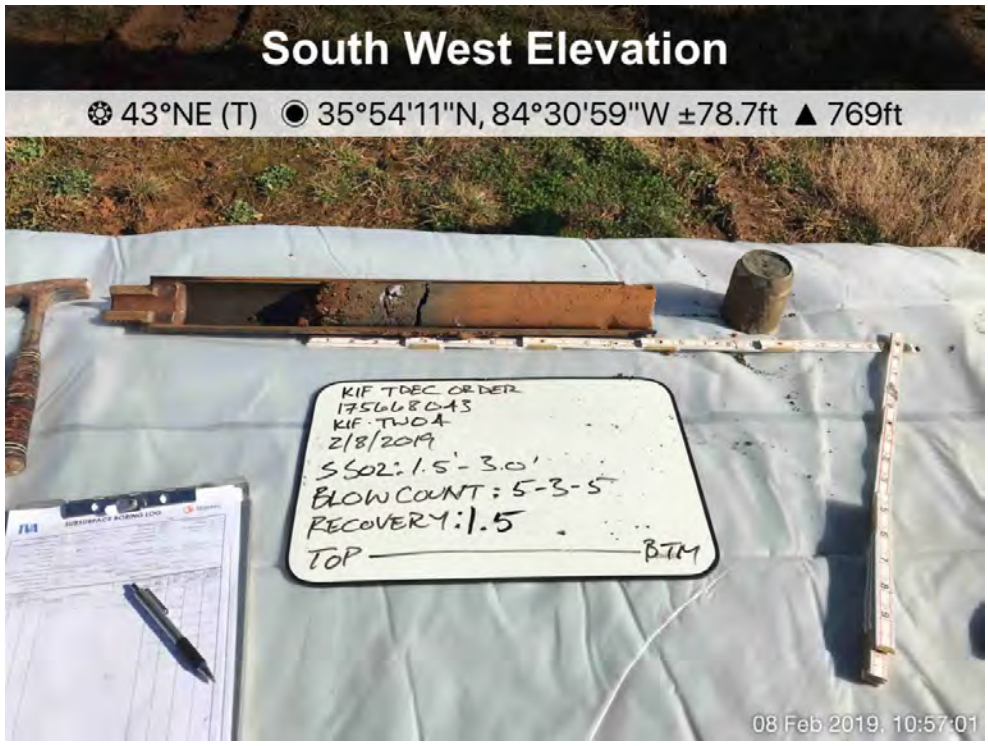


Photograph ID: 92

Photo Location:
KIF-TW04

Photo Date:
2/8/2019

Comments:
Interval (1.5-3.0 feet).



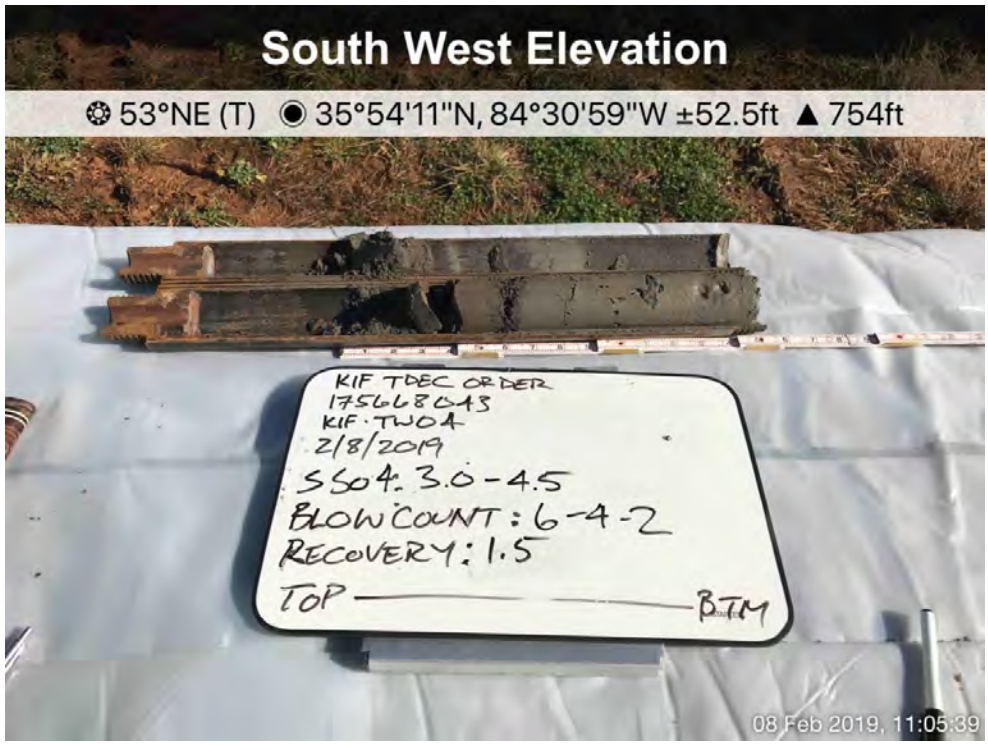
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 93

Photo Location:
KIF-TW04

Photo Date:
2/8/2019

Comments:
Interval (3.0-4.5 feet).



Photograph ID: 94

Photo Location:
KIF-TW04

Photo Date:
2/8/2019

Comments:
Interval (4.5-6.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 95

Photo Location:
KIF-TW04

Photo Date:
2/8/2019

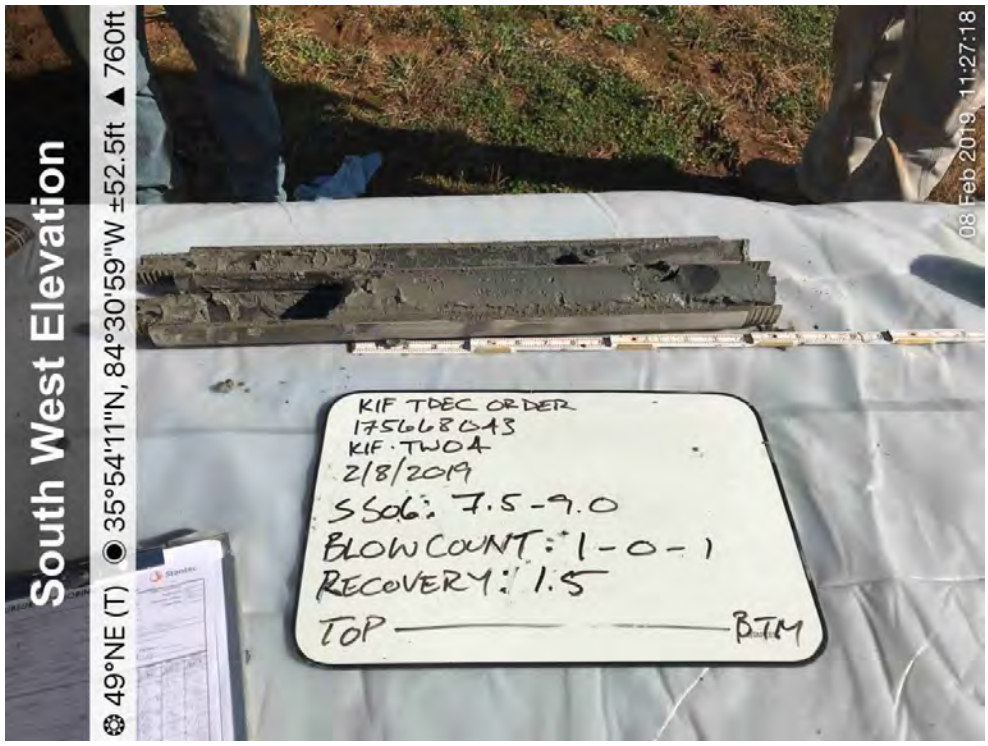
Comments:
Interval (6.0-7.5 feet).

Photograph ID: 96

Photo Location:
KIF-TW04

Photo Date:
2/8/2019

Comments:
Interval (7.5-9.0 feet).



Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 97

Photo Location:
KIF-TW04

Photo Date:
2/8/2019

Comments:
Interval (9.0-10.5 feet).

Photograph ID: 98

Photo Location:
KIF-TW04

Photo Date:
2/11/2019

Comments:
Interval (10.5-12.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 99

Photo Location:
KIF-TW04

Photo Date:
2/11/2019

Comments:
Interval (12.0-13.5 feet).

Photograph ID: 100

Photo Location:
KIF-TW04

Photo Date:
2/11/2019

Comments:
Interval (13.5-15.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 101

Photo Location:
KIF-TW04

Photo Date:
2/11/2019

Comments:
Interval (15.0-16.5 feet).

Photograph ID: 102

Photo Location:
KIF-TW04

Photo Date:
2/11/2019

Comments:
Interval (16.5-18.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 103 **Photo Location:** KIF-TW04 **Photo Date:** 2/11/2019 **Comments:** Interval (18.0-19.5 feet).	
Photograph ID: 104 **Photo Location:** KIF-TW04 **Photo Date:** 2/11/2019 **Comments:** Interval (19.5-21.0 feet).	

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 105 **Photo Location:** KIF-TW04 **Photo Date:** 2/11/2019 **Comments:** Interval (21.0-22.5 feet).	
Photograph ID: 106 **Photo Location:** KIF-TW04 **Photo Date:** 2/11/2019 **Comments:** Interval (22.5-24.0 feet).	

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 107 **Photo Location:** KIF-TW04 **Photo Date:** 2/11/2019 **Comments:** Photo of interval (24.0-26.0 feet) unavailable.	No Photo Applicable
Photograph ID: 108 **Photo Location:** KIF-TW04 **Photo Date:** 2/11/2019 **Comments:** Interval (26.0-27.0 feet).	

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 109

Photo Location:
KIF-TW04

Photo Date:
2/11/2019

Comments:
Interval (27.0-28.5 feet).

Photograph ID: 110

Photo Location:
KIF-TW04

Photo Date:
2/11/2019

Comments:
Interval (28.5-30.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 111 **Photo Location:** KIF-TW04 **Photo Date:** 2/13/2019 **Comments:** Interval (30.0 - 31.5 feet).	
Photograph ID: 112 **Photo Location:** KIF-TW04 **Photo Date:** 2/13/2019 **Comments:** Interval (31.5-33.0 feet).	

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 113

Photo Location:
KIF-TW04

Photo Date:
2/13/2019

Comments:
Interval (33.0-34.5 feet).

Photograph ID: 114

Photo Location:
KIF-TW04

Photo Date:
2/13/2019

Comments:
Interval (34.5-36.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 115 **Photo Location:** KIF-TW04 **Photo Date:** 2/13/2019 **Comments:** Interval (36.0-37.5 feet).	
Photograph ID: 116 **Photo Location:** KIF-TW04 **Photo Date:** 2/13/2019 **Comments:** Interval (37.5-39.0 feet).	

Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Kingston Fossil Plant (KIF)	Site Location:	Harriman, Tennessee

Photograph ID: 117 **Photo Location:** KIF-TW04 **Photo Date:** 2/13/2019 **Comments:** Photo of interval (39.0-41.0 feet) unavailable.	No Photo Applicable
Photograph ID: 118 **Photo Location:** KIF-TW05 **Photo Date:** 11/13/2018 **Comments:** Photo of interval (0.0-1.5 feet) unavailable.	No Photo Applicable

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 119

Photo Location:
KIF-TW05

Photo Date:
11/13/2018

Comments:
Interval (1.5-3.0 feet).

Photograph ID: 120

Photo Location:
KIF-TW05

Photo Date:
11/13/2018

Comments:
Interval (3.0-4.5 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 121

Photo Location:
KIF-TW05

Photo Date:
11/13/2018

Comments:
Interval (4.5-6.0 feet).

Photograph ID: 122

Photo Location:
KIF-TW05

Photo Date:
11/13/2018

Comments:
Interval (6.0-7.5 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 123

Photo Location:
KIF-TW05

Photo Date:
11/13/2018

Comments:
Interval (7.5-9.0 feet).

Photograph ID: 124

Photo Location:
KIF-TW05

Photo Date:
11/13/2018

Comments:
Interval (9.0-10.5 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 125

Photo Location:
KIF-TW05

Photo Date:
11/13/2018

Comments:
Interval (10.5-12.0 feet).

Photograph ID: 126

Photo Location:
KIF-TW05

Photo Date:
11/13/2018

Comments:
Interval (12.0-13.5 feet).

Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Kingston Fossil Plant (KIF)	Site Location:	Harriman, Tennessee

Photograph ID: 127

Photo Location:
KIF-TW05

Photo Date:
11/13/2018

Comments:
Interval (13.5-15.0 feet).

Photograph ID: 128

Photo Location:
KIF-TW05

Photo Date:
11/13/2018

Comments:
Interval (15.0-16.5 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 129

Photo Location:
KIF-TW05

Photo Date:
11/13/2018

Comments:
Interval (16.5-18.0 feet).

Photograph ID: 130

Photo Location:
KIF-TW05

Photo Date:
11/13/2018

Comments:
Interval (18.0-19.5 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 131

Photo Location:
KIF-TW05

Photo Date:
11/13/2018

Comments:
Interval (19.5-21.0 feet).

Photograph ID: 132

Photo Location:
KIF-TW05

Photo Date:
11/13/2018

Comments:
Interval (21.0-22.5 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 133

Photo Location:
KIF-TW05

Photo Date:
11/13/2018

Comments:
Interval (22.5-24.0 feet).

Photograph ID: 134

Photo Location:
KIF-TW05

Photo Date:
11/13/2018

Comments:
Interval (24.0-25.5 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 135

Photo Location:
KIF-TW05

Photo Date:
11/13/2018

Comments:
Interval (25.5-27.0 feet).

Photograph ID: 136

Photo Location:
KIF-TW05

Photo Date:
11/13/2018

Comments:
Interval (27.0-28.5 feet).

Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Kingston Fossil Plant (KIF)	Site Location:	Harriman, Tennessee

Photograph ID: 137

Photo Location:
KIF-TW05

Photo Date:
11/13/2018

Comments:
Interval (28.5-30.0 feet).

Photograph ID: 138

Photo Location:
KIF-TW05

Photo Date:
11/13/2018

Comments:
Interval (30.0-31.5 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 139

Photo Location:
KIF-TW05

Photo Date:
11/13/2018

Comments:
Interval (31.5-33.0 feet).

Photograph ID: 140

Photo Location:
KIF-TW05

Photo Date:
11/13/2018

Comments:
Interval (33.0-34.5 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 141

Photo Location:
KIF-TW05

Photo Date:
11/13/2018

Comments:
Interval (34.5-36.0 feet).

Photograph ID: 142

Photo Location:
KIF-TW05

Photo Date:
11/13/2018

Comments:
Interval (36.0-37.5 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 143 **Photo Location:** KIF-TW05 **Photo Date:** 11/13/2018 **Comments:** Photo of interval (37.5-39.0 feet) unavailable.	No Photo Applicable
Photograph ID: 144 **Photo Location:** KIF-TW05 **Photo Date:** 11/13/2018 **Comments:** Photo of interval (39.0-41.0 feet) unavailable.	No Photo Applicable

ATTACHMENT D.2

Photographic Logs of CCR Material Cores - Additional Borings

Stantec

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 1

Photo Location:
KIF-B01a

Photo Date:
12/2/2019

Comments:
Interval (35.0-40.0 feet).

Photograph ID: 2

Photo Location:
KIF-B01a

Photo Date:
12/2/2019

Comments:
Interval (40.0-45.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 3 **Photo Location:** KIF-B01a **Photo Date:** 12/2/2019 **Comments:** Interval (45.0-50.0 feet).	
Photograph ID: 4 **Photo Location:** KIF-B01a **Photo Date:** 12/2/2019 **Comments:** Photo of interval (50.0-55.0 feet) unavailable.	No Photo Applicable

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 5

Photo Location:
KIF-B01b

Photo Date:
12/3/2019

Comments:
Interval (35.0-40.0 feet).

Photograph ID: 6

Photo Location:
KIF-B01b

Photo Date:
12/3/2019

Comments:
Interval (40.0-45.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 7 **Photo Location:** KIF-B01b **Photo Date:** 12/3/2019 **Comments:** Interval (45.0-50.0 feet).	
Photograph ID: 8 **Photo Location:** KIF-B01b **Photo Date:** 12/3/2019 **Comments:** Interval (50.0-52.5 feet).	

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 9 **Photo Location:** KIF-B01b **Photo Date:** 12/3/2019 **Comments:** Interval (52.5-55.0 feet).	
Photograph ID: 10 **Photo Location:** KIF-B02a **Photo Date:** 12/4/2019 **Comments:** Photo of interval (35.0-40.0 feet) unavailable.	No Photo Applicable

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 11 **Photo Location:** KIF-B02a **Photo Date:** 12/4/2019 **Comments:** Interval (40.0-45.0 feet).	
Photograph ID: 12 **Photo Location:** KIF-B02a **Photo Date:** 12/4/2019 **Comments:** Interval (45.0-50.0 feet).	

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 13 **Photo Location:** KIF-B02a **Photo Date:** 12/4/2019 **Comments:** Interval (50.0-55.0 feet).	
Photograph ID: 14 **Photo Location:** KIF-B02a **Photo Date:** 12/4/2019 **Comments:** Interval (55.0-57.5 feet). Depth shown on white board should be 57.5'.	

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 15

Photo Location:
KIF-B02b

Photo Date:
12/4/2019

Comments:
Interval (35.0-37.5 feet).

Photograph ID: 16

Photo Location:
KIF-B02b

Photo Date:
12/4/2019

Comments:
Interval (37.5-40.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 17

Photo Location:
KIF-B02b

Photo Date:
12/4/2019

Comments:
Interval (40.0-45.0 feet).

Photograph ID: 18

Photo Location:
KIF-B02b

Photo Date:
12/4/2019

Comments:
Interval (45.0-50.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 19

Photo Location:
KIF-B02b

Photo Date:
12/4/2019

Comments:
Interval (50.0-52.5 feet).

Photograph ID: 20

Photo Location:
KIF-B02b

Photo Date:
12/4/2019

Comments:
Interval (52.5-55.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 21

Photo Location:
KIF-B02b

Photo Date:
12/4/2019

Comments:
Interval (55.0-57.5 feet).

Photograph ID: 22

Photo Location:
KIF-B03a

Photo Date:
12/5/2019

Comments:
Interval (40.0-45.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 23

Photo Location:
KIF-B03a

Photo Date:
12/5/2019

Comments:
Interval (45.0-50.0 feet).

Photograph ID: 24

Photo Location:
KIF-B03a

Photo Date:
12/5/2019

Comments:
Interval (50.0-55.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 25

Photo Location:
KIF-B03a

Photo Date:
12/5/2019

Comments:
Interval (55.0-57.5 feet).

Photograph ID: 26

Photo Location:
KIF-B03a

Photo Date:
12/5/2019

Comments:
Interval (57.5-60.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 27

Photo Location:
KIF-B03b

Photo Date:
12/5/2019

Comments:
Interval (40.0-45.0 feet).

Photograph ID: 28

Photo Location:
KIF-B03b

Photo Date:
12/5/2019

Comments:
Interval (45.0-50.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 29 **Photo Location:** KIF-B03b **Photo Date:** 12/5/2019 **Comments:** Interval (50.0-55.0 feet).	
Photograph ID: 30 **Photo Location:** KIF-B03b **Photo Date:** 12/5/2019 **Comments:** Interval (55.0-57.5 feet).	

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 31

Photo Location:
KIF-B03b

Photo Date:
12/5/2019

Comments:
Interval (57.5-60.0 feet).

Photograph ID: 32

Photo Location:
KIF-B04a

Photo Date:
12/5/2019

Comments:
Interval (35.0-40.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 33 **Photo Location:** KIF-B04a **Photo Date:** 12/5/2019 **Comments:** Interval (40.0-45.0 feet).	
Photograph ID: 34 **Photo Location:** KIF-B04a **Photo Date:** 12/5/2019 **Comments:** Interval (45.0-47.5 feet).	

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Kingston Fossil Plant (KIF)**	**Site Location:**	**Harriman, Tennessee**

Photograph ID: 35

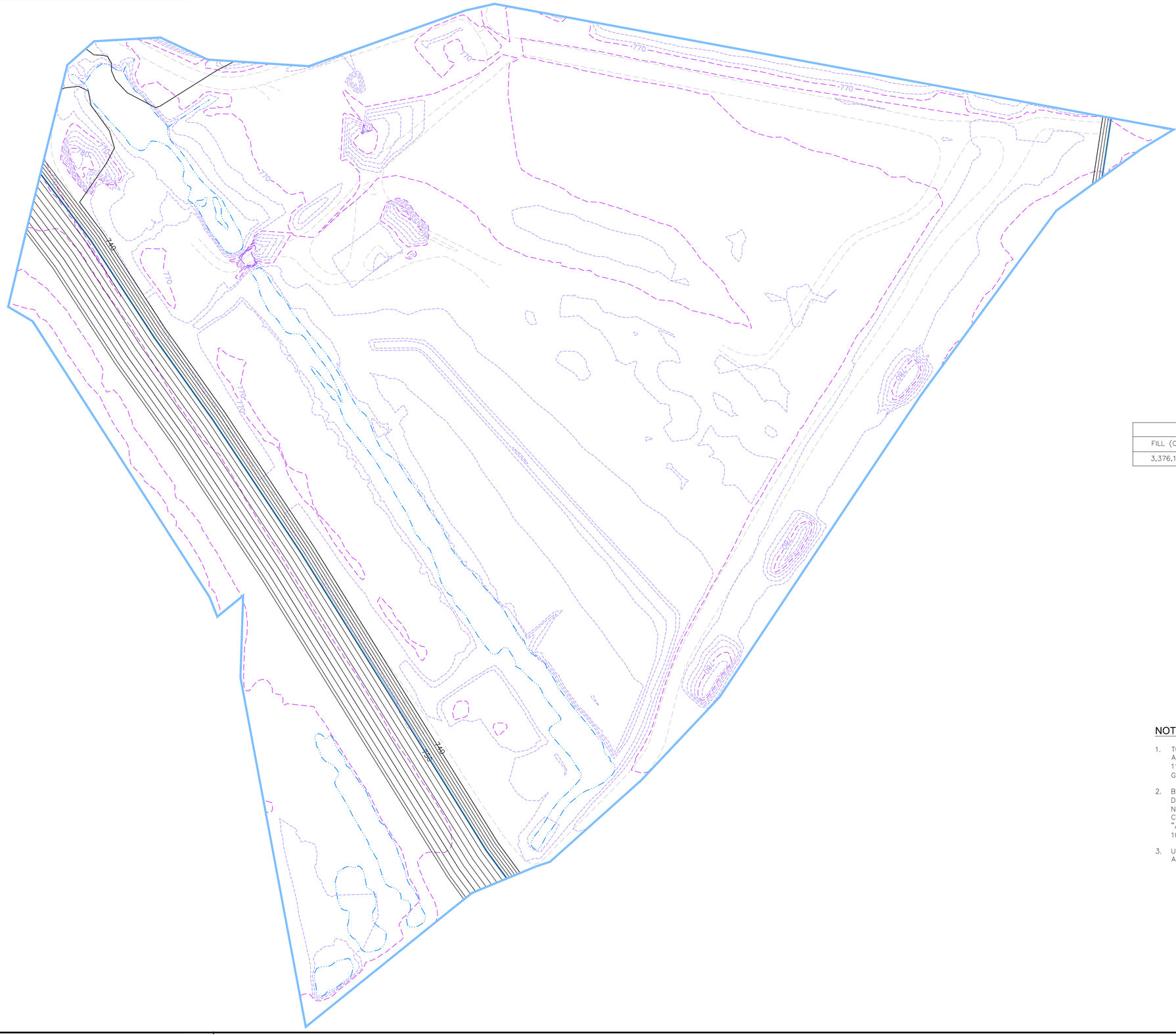
Photo Location:
KIF-B04a

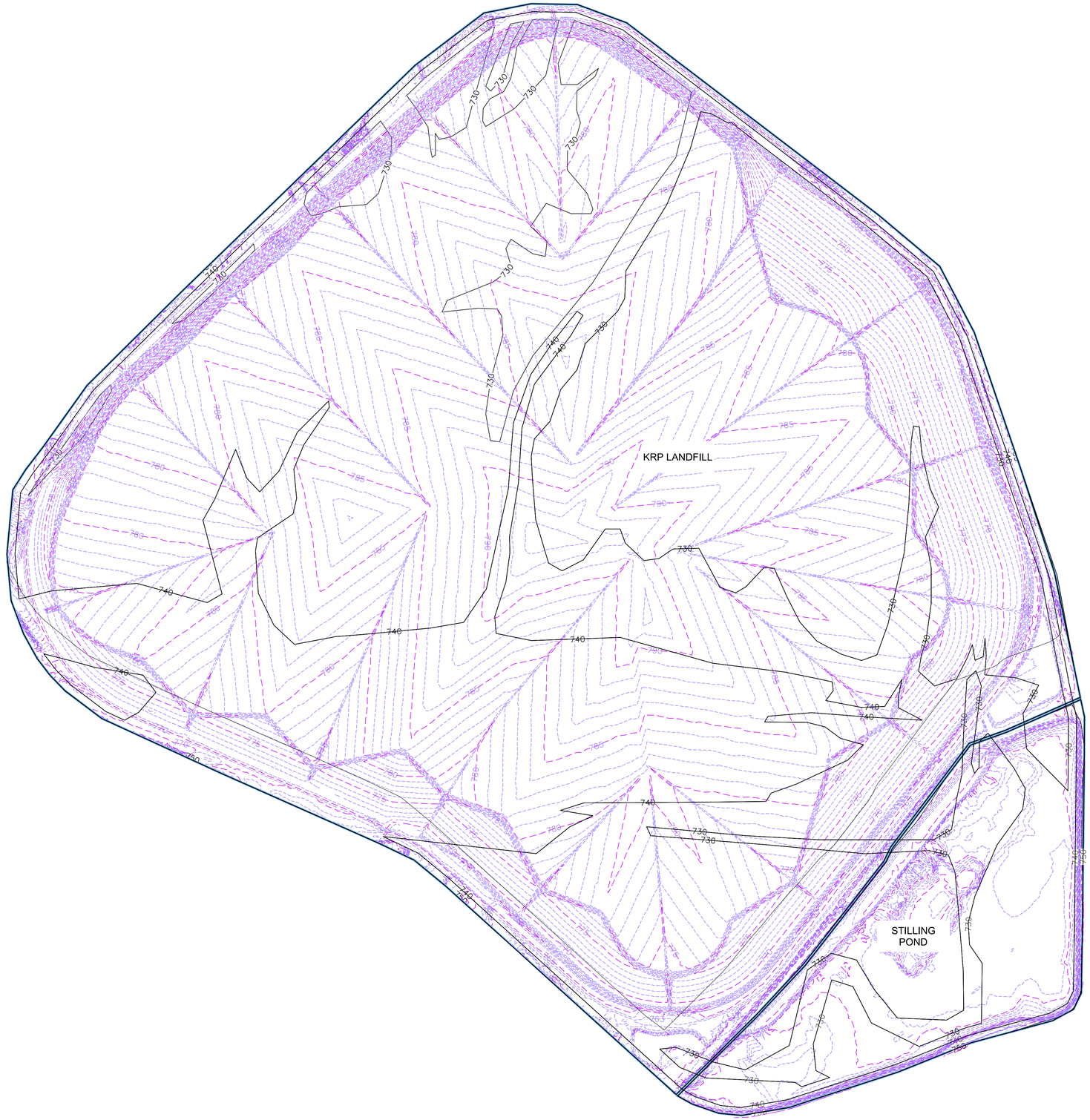
Photo Date:
12/5/2019

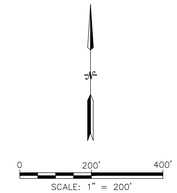
Comments:
Interval (47.5-50.0 feet).

APPENDIX G.6

MATERIAL QUANTITY ASSESSMENT HISTORIC INFORMATION AND SECONDARY VOLUME ESTIMATES


770
740
740
740





TOP OF ASH VS. BOTTOM OF ASH			
UNIT	FILL (CY)	AREA (FT^2)	AREA (ACRES)
KRP ASH LANDFILL	16,086,379	9,910,417	228
STILLING POND	734,162	1,136,271	26
TOTAL	16,518,968	11,046,688	254

LEGEND

- 760 — TOP OF ASH CONTOUR
- 750 — BOTTOM OF ASH CONTOUR
- UNIT BOUNDARY
- ROAD
- EDGE OF WATER

NOTES:

1. TOP OF ASH CONTOURS FOR KRP ASH LANDFILL PROVIDED BY STANTEC FROM "ASH LANDFILL CLOSURE", 10W501-03 LINER AND GEOCOMPOSITE LIMITS, DATED 3/13/15.
2. BOTTOM OF ASH CONTOURS DIGITIZED FROM TVA DRAWING ENTITLED "ASH DISPOSAL AREA", DRAWING NUMBER 10N400R4, DATED 5/6/1951.
3. CALCULATED QUANTITY OF FILL FOR KRP ASH LANDFILL REDUCED BY 36 C.Y. OF CUT.

TRIAD
ENVIRONMENTAL CONSULTANTS, INC.
Suite 200, 207 Donelson Pike, Nashville, Tn 37214
615-889-8888 fax 615-889-4004

NO	REVISION	BY	DATE

KRP ASH LANDFILL AND STILLING POND
HISTORICAL ASH VOLUME CALCULATION
KINGSTON FOSSIL PLANT
KINGSTON, TENNESSEE

TENNESSEE VALLEY AUTHORITY

DWN BY: ALW
CHK BY: NBS
DATE: 4/6/2017
SCALE: 1"=200'
PROJ. NUMBER: 13-TVA01-09

FIGURE
KRP

N:\data\TVA\13-TVA01 General Files\01-06 Historical CCR Volumes\KIF\DRAWINGS\HISTORICAL VOLUMES\KIF-HISTORICAL.dwg LAYOUT: KRP SAVED: 8/3/2017 5:40 PM PAGESETUP: M-J-4X36-PDF PLOTTED: 8/3/2017 BY: AWATTS

SURFACE TO SURFACE VOLUME REPORT

Trimble
5475 Kellenburger Road
Dayton, Ohio 45424-1099, USA
1-937-233-8921

Project: C:\Users\klindquist\OneDrive - Stantec\Desktop\terramodel_check.pro
Report Generated: Tuesday, February 28, 2023 12:42:44 PM

Where the second surface is above the first the volume is reported as fill. Where the second surface is below the first the volume is reported as excavation.

Shrinkage/swell factors: Excavation 1.0000 Fill 1.0000

First Surface Layer Name	Number of Points	Second Surface Layer Name	Number of Points
ASHDA_BA01	9,467	TOP_OF_CCR	56,754

Volume limited to that within the constraining boundary - Object 199053
Area within boundary: 2,938,485.95 Sq. Ft. (67.4584 Acres)
Total triangulated area: 2,745,894.90 Sq. Ft. (63.0371 Acres)

Excavation Volume (Cu. Yd.)	Fill Volume (Cu. Yd.)
0.0	3,890,787.2

Net Difference: 3,890,787.2 Cu. Yd. Borrow

SURFACE TO SURFACE VOLUME REPORT

Trimble
5475 Kellenburger Road
Dayton, Ohio 45424-1099, USA
1-937-233-8921

Project: C:\Users\klindquist\OneDrive - Stantec\Desktop\terramodel_check.pro
Report Generated: Tuesday, February 28, 2023 12:44:05 PM

Where the second surface is above the first the volume is reported as fill. Where the second surface is below the first the volume is reported as excavation.

Shrinkage/swell factors: Excavation 1.0000 Fill 1.0000

First Surface Layer Name	Number of Points	Second Surface Layer Name	Number of Points
ASHDA_BA01	9,467	TOP_OF_CCR	56,754

Volume limited to that within the constraining boundary - Object 197191
Area within boundary: 1,775,190.74 Sq. Ft. (40.7528 Acres)
Total triangulated area: 1,284,657.54 Sq. Ft. (29.4917 Acres)

Excavation Volume (Cu. Yd.)	Fill Volume (Cu. Yd.)
255.7	803,897.6

Net Difference: 803,641.9 Cu. Yd. Borrow

APPENDIX G.7

MATERIAL QUANTITY ASSESSMENT SAMPLING AND ANALYSIS REPORT

Kingston Fossil Plant
Material Quantity Assessment
Sampling and Analysis Report

TDEC Commissioner's Order:
Environmental Investigation Plan
Kingston Fossil Plant
Harriman, Tennessee

June 20, 2022

Prepared for:

Tennessee Valley Authority
Chattanooga, Tennessee

Prepared by:

Stantec Consulting Services Inc.
Lexington, Kentucky

Revision Record

Revision	Description	Date
0	Submittal to TDEC	July 20, 2021
1	Addresses August 6, 2021, TDEC Review Comments and Issued for TDEC	June 20, 2022

Sign-off Sheet

This document entitled Kingston Fossil Plant Material Quantity Sampling and Analysis Report was prepared by Stantec Consulting Services Inc. (“Stantec”) for the account of Tennessee Valley Authority (the “Client”). Any reliance on this document by any third party is strictly prohibited. The material in it reflects Stantec’s professional judgment in light of the scope, schedule, and other limitations stated in the document and in the contract between Stantec and the Client. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. In preparing the document, Stantec did not verify information supplied by others. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions taken based on this document.

Prepared by _____

Erin Mattmiller, Senior Project Engineer

Reviewed by _____

Hugo R. Aparicio, PE, Vice President

Approved by _____

Rebekah Brooks, Principal Hydrogeologist

Table of Contents

ABBREVIATIONS ..... **III**

1.0 INTRODUCTION **1**

2.0 OBJECTIVE AND SCOPE **2**

3.0 PHYSICAL SETTING AND SITE HISTORY **3**
3.1 CCR MATERIAL PLACEMENT SITE HISTORY 3
3.2 EXISTING CONDITIONS 5
3.3 PRIOR MATERIAL QUANTITY ASSESSMENTS 5

4.0 THREE-DIMENSIONAL MODEL METHODOLOGY **6**

5.0 CROSS SECTIONS **9**

6.0 LIMITATIONS **10**

7.0 SUMMARY **11**

8.0 REFERENCES **12**

LIST OF APPENDICES

APPENDIX A – EXHIBITS
Exhibit A.1 Location Plan and Topographic Map
Exhibit A.2 Historic Stream Alignments
Exhibit A.3 Dike Construction History
Exhibit A.4 Pre-Construction Topography
Exhibit A.5 Bottom of CCR Material Elevations
Exhibit A.6 Final Elevation of CCR Units
Exhibit A.7 Top of CCR Material Elevations
Exhibit A.8 Top of Bedrock Elevations
Exhibit A.9 Cross Section Locations
Exhibit A.10 KIF Material Quantity Cross Sections – A-A' and B-B'
Exhibit A.11 KIF Material Quantity Cross Sections – C-C', D-D', and E-E'

APPENDIX B – HISTORICAL DRAWINGS AND INFORMATION
Attachment B.1 TVA Drawing 10N200R10: Project Layout - General Plan
Attachment B.2 TVA Drawing 10N400R4: General - Ash Disposal Area
Attachment B.3 TVA Drawing 10N400R6: General - Ash Disposal Area
Attachment B.4 TVA Drawing 10N420R2: Plan – Raising Ash Disposal Area Dike
Attachment B.5 TVA Drawing 10N421R1: Ash Pond - Dike Section & Details
Attachment B.6 TVA Drawing 10W200-01R6: General Plan

Attachment B.7 Kingston Fossil Plant, Ball Field Interim Ash Staging Area Closure, TVA Project No. 604769, As-Built Record Drawings, TVA Drawing Series 10W387, Revision 1
Attachment B.8 TVA Record Drawing 10W393-03R1: Top of Protective Cover East Dike Area Closure
Attachment B.9 TVA Record Drawing 81W404-09R1: Stilling Pond Closure Final Grade Plan Baseline 'A'
Attachment B.10 TVA Record Drawing 81W404-03R1: Stilling Pond Closure Existing Conditions and Baseline 'A' Layout

APPENDIX C – TABLES

Table C.1 Model Input and Confirmation Data Used to Model the Material Quantity Assessment Study Area Pre-Construction and Bottom of CCR Surfaces
Table C.2 Model Input Data Used to Model the Material Quantity Assessment Study Area Final Elevation Surface
Table C.3 Model Input and Confirmation Data Used to Model the Material Quantity Assessment Study Area Top of CCR Surface
Table C.4 Model Input Data Used to Model the Material Quantity Assessment Study Area Top of Bedrock Surface

Abbreviations

Civil 3D	AutoDesk® Auto CAD® Civil 3D software
CCR	Coal Combustion Residuals
CCR Rule	EPA Final Rule on Disposal of Coal Combustion Residuals from Electric Utilities
EAR	Environmental Assessment Report
EIP	Environmental Investigation Plan
EXD	Exploratory Drilling
KIF Plant	Kingston Fossil Plant
KRP	Kingston Recovery Project
MQA	Material Quantity Assessment
MQA Study Area	Interim Ash Staging Area, Sluice Trench and Area East of Sluice Trench, and Stilling Pond
SAP	Sampling and Analysis Plan
SAR	Sampling and Analysis Report
Stantec	Stantec Consulting Services Inc.
TDEC	Tennessee Department of Environment and Conservation
TDEC Order	Commissioner's Order No. OGC15-0177
TriAD	TriAD Environmental Consultants, Inc.
TVA	Tennessee Valley Authority
USEPA	United States Environmental Protection Agency

1.0 INTRODUCTION

Stantec Consulting Services Inc. (Stantec) has prepared this Sampling and Analysis Report (SAR) on behalf of the Tennessee Valley Authority (TVA) to document activities related to a Material Quantity Assessment (MQA) at TVA's Kingston Fossil (KIF) Plant located in Harriman, Tennessee (see Exhibit A.1, Appendix A).

The purpose of the MQA is to use historical data supplemented with information collected for other TDEC Order SARs to perform three-dimensional modeling of certain coal combustion residuals (CCR) units at the KIF Plant and estimate CCR material quantities and other properties in support of fulfilling the requirements for the Tennessee Department of Environment and Conservation (TDEC) issued Commissioner's Order No. OGC15-0177 (TDEC Order) to TVA (TDEC 2015). The TDEC Order sets forth a "process for the investigation, assessment, and remediation of unacceptable risks" at TVA's coal ash disposal sites in Tennessee.

The purpose of this SAR is to document the three-dimensional modeling work completed during the MQA. This SAR is not intended to provide conclusions or evaluations of results. The scope of the MQA activities represented herein was conducted pursuant to the Material Quantity Sampling and Analysis Plan (SAP) (Stantec 2018b) and is part of a larger environmental investigation at the KIF Plant. The data provided in this SAR are not inclusive of other programmatic data that exist for this site. The evaluation of the results will consider other aspects of the environmental investigation, including data collected under other State and/or CCR programs and be presented in the Environmental Assessment Report (EAR).

The MQA activities discussed herein were performed in general accordance with the following documents developed by TVA to support fulfilling the requirements of the TDEC Order at the KIF Plant:

- *Material Quantity SAP* (Stantec 2018b)
- *Environmental Investigation Plan* (EIP) (TVA 2018)
- *Exploratory Drilling (EXD) SAP* (Stantec 2018c)
- *Quality Assurance Project Plan* (Environmental Standards, Inc. 2018).

2.0 OBJECTIVE AND SCOPE

The objectives of the MQA, conducted pursuant to the Material Quantity SAP, are to describe CCR unit geometry, CCR material quantity, phreatic elevations, and subsurface conditions for certain CCR units at the KIF Plant in response to the TDEC Order. The Material Quantity SAP included evaluation of the following CCR units: Interim Ash Staging Area, Sluice Trench and Area East of Sluice Trench, and Stilling Pond (MQA Study Area). This scope does not include the Kingston Recovery Project (KRP) Ash Landfill or the Peninsula Disposal Area.

The approach for the MQA SAR was to develop three-dimensional models of the MQA Study Area using data from existing borings installed under different environmental or geotechnical programs, as well as pre-construction topographic information for the MQA Study Area. The existing information was supplemented with data from borings drilled per the EXD SAP.

The scope of work consisted of the following tasks:

- Developing three-dimensional subsurface models from ground surface to bedrock using boring elevation data and pre-construction topographic information
- Developing a cross section location map and cross sections showing the modeled dikes and surfaces
- Identifying additional information needed to complete the objectives of the Material Quantity SAP.

Details of the completed MQA work are presented in the following sections. These activities were carried out following the completion of borings drilled per the EXD SAP. Details of the drilling activities are provided in the EXD SAR.

3.0 PHYSICAL SETTING AND SITE HISTORY

3.1 CCR MATERIAL PLACEMENT SITE HISTORY

The KIF Plant is located at the confluence of the Emory River and Clinch River (Exhibit A.1, Appendix A). Prior to the construction of Watts Bar Dam, Swan Pond Creek followed a meandering course through the KIF Plant footprint and discharged to the Emory River (Exhibit A.2, Appendix A); however, the construction of Watts Bar Dam circa 1942 created a backwater area that impounded Swan Pond Creek along with the Emory and Clinch Rivers.

The KIF Plant was initially constructed between 1951 and 1954, including starter dikes labeled North Dike and East Dike shown on Exhibit A.3 (Appendix A). CCR was initially sluiced to the Initial Ash Disposal Area which was initially bounded by the North Dike and East Dike (refer to Attachments B.1 and B.2, Appendix B; TVA 1981 and 1958; Exhibit A.3, Appendix A). By 1959, Dikes B (interior dike) and C (exterior dike) were constructed to form the Ash Disposal Area (refer to Attachments B.2 and B.3, Appendix B; TVA 1958 and 1977a; Exhibit A.3, Appendix A). The CCR sluiced into these ponds formed what would later be labeled the “Hydraulically Placed Ash” horizon. In 1965, the Initial Ash Disposal Area reached sluiced CCR placement capacity and CCR was subsequently directed to the Ash Disposal Area which was progressively filled from south to north (AECOM 2009). In 1968, Dike B, an interior dike, was constructed with CCR material along the toe of the railroad embankment on the west side of the Initial Ash Disposal Area (refer to Exhibit A.3, Appendix A). Between 1976 and 1978, TVA raised Dike C from elevation 748 feet to 765 feet to provide additional freeboard and constructed a divider dike to form the Stilling Pond to allow final particles to settle out before discharging to the Watts Bar Reservoir (refer to Attachments B.4 and B.5, Appendix B; TVA 1977b and TVA 1977c; Exhibit A.3, Appendix A). The Metal Cleaning Ponds were also constructed in the footprint of the closed Initial Ash Pond during this time period (refer to Attachments B.4 and B.5, Appendix B; TVA 1977b and 1977c; Exhibit A.3, Appendix A).

In 1983, TVA constructed Dike D (interior dike) in a southwest-to-northeast direction. The construction of Dike D roughly reduced the size of the Ash Disposal Area by half as part of a transition to dredge cell operations (refer to Attachment B.6, Appendix B; TVA 2001; Exhibit A.3, Appendix A). In 1984, TVA began sluicing fly ash, bottom ash, and other plant process waters into a sluice trench excavated into CCR that discharged to the Ash Disposal Area. Fly ash and bottom ash were then excavated from the sluice trench, dredged from the Ash Disposal Area, and transported to Dredge Cell Nos. 1, 2, and 3 for stacking (refer to Attachment B.6, Appendix B; TVA 2001; Exhibit A.3, Appendix A). The dredge cells were permitted by TDEC as a Class II Solid Waste Landfill (USEPA 2009).

Seeps were noted on the west slope of Dredge Cell Nos. 1, 2, and 3 from 2003 through 2008. Per the KIF Plant’s Routine Handling Operations and Maintenance Support Document (TVA 2011), quarterly seep inspections were conducted and documented and actions to address identified seeps were determined, prioritized, and executed. Instability was noted along the western limits of Dredge Cell Nos. 1, 2, and 3, which resulted in repairs. An Emergency Dredge Cell was constructed to stage CCR while the repairs were being made (TVA 2006).

In December 2007, the Peninsula Disposal Area was permitted by TDEC for the management of wet gypsum. A permit modification was later approved, allowing for the management of bottom ash and fly ash in the Peninsula Disposal Area along with gypsum

In December of 2008, a failure initiated in the northwestern corner of Dredge Cell No. 2, resulting in significant displacement of CCR to the Emory and Clinch Rivers. This resulted in TVA and the USEPA signing an Administrative Order and Agreement on Consent (USEPA 2009) that provided the regulatory framework for response and recovery actions under the Comprehensive Environmental Response, Compensation, and Liability Act. TDEC also issued a Commissioner's Order to TVA (TDEC 2009) requiring the comprehensive assessment, clean-up and restoration of areas impacted by the release. In accordance with these USEPA and TDEC Orders, TVA submitted plans and reports associated with the response and recovery projects to USEPA for review and approval and USEPA consulted TDEC during the review process (TVA 2015b).

TVA initiated emergency response actions and recovery operations the day of the failure on December 22, 2008 and continued through 2015. These included river dredging, environmental sampling, embayment restoration, and construction of the KRP Landfill. The KRP Landfill was constructed with a perimeter wall containment system to withstand design earthquake loads (TVA 2015b).

As a part of removal actions and per approvals from TDEC (TVA 2015a), the Metal Cleaning Ponds were closed so that the closed Initial Ash Pond could serve as a temporary staging area for CCR during river dredging operations and subsequent construction of the KRP Landfill. A delineation layer of stone and geotextile fabric was placed over the Initial Ash Pond subgrade prior to staging CCR (TVA 2009). This staging area corresponds to the Interim Ash Staging Area.

Staged CCR above the delineation layer was eventually removed from the Interim Ash Staging Area and placed in the Peninsula Disposal Area (AECOM 2016a). TVA completed capping and closure of the KRP Landfill in 2015 and the Interim Ash Staging Area in 2016 (Attachment B.7, Appendix B; AECOM 2018a).

In 2015, TVA initiated the transition from wet to dry CCR handling which included the following activities:

- Construction of temporary free-standing containers and the Bottom Ash Dewatering Plant to dewater bottom ash
- Capping and closure of the sluice trench area of the Sluice Trench and Area East of Sluice Trench as documented in AECOM (2018b and 2019a)
- Construction of a geomembrane-lined water quality channel and Polishing Pond to convey and treat process water prior to discharging to National Pollutant Discharge Elimination System (NPDES) Outfall 001.
- Construction of conveyance piping from the Polishing Pond outlet to NPDES Outfall 001
- Capping and closure of the Stilling Pond as documented in Stantec (2017 and 2018a).

Capping and closure of the Stilling Pond involved the removal of free water, partial excavation of Dike C for borrow material, and the construction of a cap with a geomembrane liner and vegetative soil layer as documented in Stantec (2017 and 2018a). TVA completed the construction of a seepage collection system and reverse graded filter at the East Dike in 2017. The closure of Sluice Trench and Area East of Sluice Trench CCR management unit was completed in 2018 with the construction of a cap with a geomembrane and vegetative soil layer along the East Dike in 2018 (AECOM 2018b and 2019a).

3.2 EXISTING CONDITIONS

CCR material is present at the KIF Plant in several individual areas including the three CCR management units in the MQA Study Area (Interim Ash Staging Area, Sluice Trench and Area East of Sluice Trench, and Stilling Pond), KRP Ash Landfill, and Peninsula Disposal Area. These CCR management units are shown on Exhibit A.1 (Appendix A). CCR generated at the KIF Plant is currently placed in the Peninsula Disposal Area which is the remaining active CCR unit at the KIF Plant.

3.3 PRIOR MATERIAL QUANTITY ASSESSMENTS

Previous material quantity assessments were completed by TriAD Environmental Consultants, Inc. (TriAD) of Nashville, Tennessee as part of their Historical Ash Volume Calculations (TriAD 2017a and 2017 b). The Historical Ash Volume Calculations by TriAD were completed for the MQA Study Area as well as the KRP Ash Landfill and Peninsula Disposal Area. The results of their calculations for the Interim Ash Staging Area and the Stilling Pond will be compared with Stantec's evaluation results in the EAR.

4.0 THREE-DIMENSIONAL MODEL METHODOLOGY

Three-dimensional models of the MQA Study Area were developed to depict subsurface conditions from the ground surface to bedrock using AutoDesk® AutoCAD® Civil 3D software (Civil 3D). Elevation data including contours and boring elevations were imported into Civil 3D to model the three-dimensional surface of specific layers that comprise the CCR management units within the MQA Study Area using a surface triangulation method. Refer to Autodesk (2021) for more information regarding Civil 3D surface triangulation. The approach used to model the CCR management units within the MQA Study Area is summarized below. The Interim Ash Staging Area and Sluice Trench and Area East of Sluice Trench were incorporated into one model since they are adjacent CCR management units not divided by a feature such as a dike or perimeter wall.

1. Pre-Construction Topography: The approach to modeling the ground surface prior to the construction of the dikes and placement of CCR was to identify and evaluate historic topographic drawings with pre-construction contours for use in the pre-construction surface. Topographic drawings that did not provide horizontal coordinates were deemed not usable since horizontal coordinates were required to georeference the drawing and spatially align it with other data sources. Boring elevation data was used to confirm the accuracy of the contours used in the pre-construction surface. If the elevation differences between the pre-construction contours from the drawing and the boring elevation data were considered negligible for the purposes of estimating CCR volumes, the borings were designated as confirmation borings and not imported into the surface to preserve the continuity of the pre-construction surface.

Topographic drawings with pre-construction contours evaluated for use in the pre-construction surface included the *1924 Aerial and Plane Table Survey by War Department* (AECOM 2009), the 1941 *United States Geologic Survey (USGS) Topographic Map of the Harriman Quadrangle* (USGS 1941) and TVA Drawing 10N400R4 (TVA 1958). With the exception of the 1*924 Aerial and Plane Table Survey by War Department* (AECOM 2009), the drawings provided horizontal coordinates that could be used to georeference the drawing and spatially align them with other data sources. Contour data from TVA Drawing 10N400R4 (Attachment B.2, Appendix B) was used to model the pre-construction surface since it provided 5-foot interval contours versus the 20-foot interval contours provided by USGS (1941), included coordinates for georeferencing, and included the starter dike alignments and other KIF Plant features.

The TVA Drawing was imported into Civil 3D as an image and georeferenced using the coordinates provided on the drawing. The contours shown on the drawing were digitized by tracing a three-dimensional polyline (3D polyline) over the contours and assigning an elevation coordinate to each 3D polyline which corresponded to the contour elevation shown on the drawing. The 3D polylines were used to model a three-dimensional surface of the pre-construction topography.

The pre-construction topographic information in low-lying areas below the water surface (represented by the 724-feet elevation contour) shown on TVA Drawing 10N400R4 (Attachment B.2, Appendix B) was supplemented with boring elevation data from the model input borings summarized in Table C.1 (Appendix C). Boring elevation data from confirmation borings summarized in Table C.1 (Appendix C)

were used to confirm the pre-construction topographic contours. Model input and confirmation data used to model and evaluate the pre-construction surface are summarized in Table C.1 (Appendix C). Model input and confirmation borings and the revised pre-construction topography used in the three-dimensional models are presented on Exhibit A.4 (Appendix A).

2. Starter Dike/Buttresses: In addition to topography information, TVA Drawings 10N400R4 (TVA 1958) and 10N400R6 (TVA 1977a) show cross sectional and design information for the North Dike, East Dike, and Dike C. The approximate locations of the starter dikes were digitized and modeled, using the design geometry presented on TVA Drawings 10N400R4 and 10N400R6, which are provided as Attachments B.2 and B.3 (Appendix B). The approximate locations of the starter dikes were also confirmed using boring information and topographic surveys.

The locations of the internal divider dikes and raised dike geometries were obtained from TVA Drawings 10N420R2 (TVA 1977b) and 10N421R1 (TVA 1977c) as presented on Attachments B.4 and B.5 (Appendix B).

3. Bottom of CCR Surface: For the purposes of the MQA, it was assumed that the bottom of CCR surface is equivalent to the pre-construction surface within the interior of the modeled dikes. Model input and confirmation data used to model and evaluate the bottom of CCR surface are summarized in Table C.1 (Appendix C). Exhibit A.5 (Appendix A) shows the bottom of CCR surface contours with the model input and confirmation borings.

4. Final Elevation Surface: Contours from the 2017 KIF Plant aerial survey (Tuck 2017) and supplemental 2018 as-built construction surveys for the East Dike (Attachment B.8, Appendix B; AECOM 2019b) and Stilling Pond (Attachment B.9, Appendix B; Stantec 2018e) capping projects, as shown on Exhibit A.6 (Appendix A) were used to model a composite final surface elevation of the MQA Study Area. Final grading for the East Dike and Stilling Pond closure projects was completed in 2018. The horizontal datum is Tennessee State Plane North American Datum of 1983, and the vertical datum is National Geodetic Vertical Datum of 1929. Model input data used to model the final elevation surface summarized in Table C.2 (Appendix C).

5. Top of CCR Surface: For the purposes of the MQA, the top of CCR surface for the Interim Ash Staging Area and Sluice Trench and Area East of Sluice Trench was developed by lowering the final elevation surface 24 inches which corresponds to the thickness of the Interim Ash Staging Area (refer to Attachment B.7) and Sluice Trench and Area East of Sluice Trench (refer to AECOM 2018b and 2019b) cap systems. The top of CCR surface in the Stilling Pond was modeled using hydrographic survey contours shown on TVA Drawing 81W404-03 (Attachment B.10, Appendix B, Stantec 2019d). The hydrographic survey contours were based on hydrographic surveys performed by TVA in 2012 and 2015 prior to the completion of the capping project.

The borings designated as confirmation borings summarized in Table C.3 (Appendix C) were used to evaluate the modeled top of CCR surfaces. Model input data and confirmation data used to model and evaluate the top of CCR surface are summarized in Table C.3 (Appendix C). Exhibit A.7 (Appendix A) shows contours from the modeled top of CCR surface with the confirmation borings.

6. Top of Bedrock Surface: Logs for borings installed as part of the EI discussed in the EXD SAR and other environmental and geotechnical programs were evaluated to identify which provided bedrock elevation boring data. Bedrock elevation boring data was imported into Civil 3D as point data to model a three-dimensional surface of the top of bedrock using a surface triangulation method. Imported bedrock elevation data is referenced herein as model input data. The Kriging interpolation method in Civil 3D was then applied to refine and smooth the bedrock surface. Model input data used to model the top of bedrock surface are summarized in Table C.4 (Appendix C). Exhibit A.8 (Appendix A) shows the top of bedrock surface contours and model input borings.

5.0 CROSS SECTIONS

A cross section location exhibit and five representative cross sections are provided as Exhibits A.9 through A.11 (Appendix A). The cross-section locations were intentionally selected to capture variations within each CCR management unit. The cross sections are on approximate 800-foot spacing. The modeled dikes and surfaces discussed in Section 4.0 are shown on the cross sections.

6.0 LIMITATIONS

The following items are limitations of the information presented herein:

- The topographic contours from TVA Drawing 10N400R4 (Attachment B.2, Appendix B) used to estimate the pre-construction and bottom of CCR material surface was generated by georeferencing historical data and digitizing the contours and should be considered approximate. In general, the topographic contours from TVA Drawing 10N400R4 correlated with historical and recent boring data.
- Documentation regarding the depth of cover placed over CCR material west and south of the capping limits within the Interim Ash Staging Area is limited.

7.0 SUMMARY

The information presented in this report is from the MQA at the KIF Plant. The scope of work for this MQA SAR included developing new three-dimensional models of the Study Area CCR management units using data from existing borings installed under different environmental or geotechnical programs and the EI, as well as pre-construction topographic information for the MQA Study Area. The existing information was supplemented with data from borings drilled per the EXD SAP. The scope of work included:

- Developing three-dimensional subsurface models from ground surface to bedrock based on existing and supplemental boring data and pre-construction topographic information
- Developing a cross section location exhibit and cross sections showing the modeled dikes and surfaces
- Identifying additional information needed to complete the objectives of the Material Quantity SAP.

Data and drawings used to develop the three-dimensional models are summarized in Section 4.0 and presented in the exhibits, attachments, and tables. A cross section location map and cross sections are presented in Section 5.0. Limitations of the three-dimensional models are presented in Section 6.0.

Stantec has completed development of three-dimensional models of the Study Area for the MQA at the KIF Plant in Harriman, Tennessee, in accordance with the Material Quantity SAP as documented herein. The three-dimensional models are usable for reporting and evaluation in the EAR and meet the objectives of the TDEC Order EIP. The three-dimensional models will be evaluated along with data collected under other TDEC Order SAPs, as well as data collected under other State and CCR programs and will be used to fulfill the requirements of the TDEC Order. This evaluation will be provided in the EAR.

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APPENDIX A - EXHIBITS

Exhibit No.

A.1

Title

Location Plan and Topographic Map

Client/Project

Tennessee Valley Authority
Kingston Fossil (KIF) Plant TDEC Order

Project Location

Roane County, Tennessee

175668043
Prepared by MB on 2022-05-10
Technical Review by EM on 2022-05-10

0 1,000 2,000 3,000 4,000 Feet

1:12,000 (At original document size of 22x34)

Legend

- CCR Management Unit Area (Approximate)
- Engineered Wetlands (Approximate)
- Polishing Pond (Approximate)

CCR = Coal Combustion Residuals

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Topographic mapping corresponds to the Harriman Quadrangle (Edition of 2019, Scale 1:24,000) and the Elverton Quadrangle (Edition of 2019, Scale 1:24,000)

Stantec TVA

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Exhibit No.

A.2

Title

Historic Stream Alignments

Client/Project

Tennessee Valley Authority
Kingston Fossil (KIF) Plant TDEC Order

Project Location

Roane County, Tennessee

175668043

Prepared by TKR on 2022-05-10
Technical Review by VS on 2022-05-10
Independent Review by EM & MB on 2022-05-10

0 500 1,000 1,500 2,000 Feet

1:6,000 (At original document size of 22x34)

Legend

- Historic Stream Alignment
- CCR Unit Area (Approximate)
- Engineered Wetlands (Approximate)
- Polishing Pond (Approximate)

CCR = Coal Combustion Residuals

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Imagery provided by Esri World Imagery
3. Historic stream locations obtained from Harriman Quadrangle Tennessee - Roane County 7.5 Minute Series Topographic Map (USGS 1935)

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Exhibit No.

A.3

Title

Dike Construction History

Client/Project

Tennessee Valley Authority
Kingston Fossil (KIF) Plant TDEC Order

Project Location

Roane County, Tennessee

175668043
Prepared by DMB on 2022-05-24
Technical Review by EM on 2022-05-24

0 300 600 900 1,200 Feet

1:3,600 (At original document size of 22x34)

Legend

- Cross Section Location
- Dike B (Approximate)
- North Dike (Approximate)
- East Dike (Approximate)
- Dike C (Approximate)
- Dike D (Approximate)
- Divider Dike (Approximate)
- Historic CCR Management Area (Approximate)
- Historic Metal Cleaning Pond (Approximate)
- CCR Management Unit Area (Approximate)
- Engineered Wetlands Area (Approximate)

CCR = Coal Combustion Residuals

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Imagery provided by Esri World Imagery

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Exhibit No.

A.4

Title

Pre-Construction Topography

Client/Project

Tennessee Valley Authority
Kingston Fossil (KIF) Plant TDEC Order

Project Location

Roane County, Tennessee

175668043

Prepared by DMB on 2022-05-10
Technical Review by VS on 2022-05-10

0 200 400 600 800 Feet

1:2,400 (At original document size of 22x34)

Legend

- EXD SAR Boring with Top of Foundation Soil Elevation in feet (ft)
- Existing Boring with Top of Foundation Soil Elevation in feet (ft)
- Original Ground Topography Contour (2 ft interval)
- Original Ground Topography Contour (10 ft interval)
- CCR Management Unit Area (Approximate)
- Engineered Wetlands Area (Approximate)
- Polishing Pond (Approximate)

CCR = Coal Combustion Residuals

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Vertical Datum: NGVD29
3. Imagery provided by Esri World Imagery
4. Model input data used to model the pre-construction surface shown herein are summarized in Table C.1 (Appendix C).

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Exhibit No.

A.5

Title

Bottom of CCR Material Elevations

Client/Project

Tennessee Valley Authority
Kingston Fossil (KIF) Plant TDEC Order

Project Location

Roane County, Tennessee

175668043

Prepared by DMB on 2022-05-11
Technical Review by VS on 2022-05-11

0 200 400 600 800 Feet

1:2,400 (At original document size of 22x34)

Legend

- EXD SAR Boring with Bottom of CCR Material Elevation in feet (ft)
- Existing Boring with Bottom of CCR Material Elevation in feet (ft)
- Bottom of CCR Material Elevation Contour (2 ft interval)
- Bottom of CCR Material Elevation Contour (10 ft interval)
- CCR Management Unit Area (Approximate)
- Engineered Wetlands Area (Approximate)
- Polishing Pond (Approximate)

CCR = Coal Combustion Residuals

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Vertical Datum: NGVD29
3. Imagery provided Esri World Imagery
4. Model input and confirmation data used to model the bottom of CCR surfaces shown herein are summarized in Table C.2 (Appendix C).

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Exhibit No.

A.6

Title

Final Elevation of CCR Units

Client/Project

Tennessee Valley Authority
Kingston Fossil (KIF) Plant TDEC Order

Project Location

Roane County, Tennessee

175668043
Prepared by DMB on 2022-05-11
Technical Review by VS on 2022-05-11

0 300 600 900 1,200 Feet

1:3,600 (At original document size of 22x34)

Legend

- CCR Unit Final Elevation Contour (10 foot (ft) interval)
- CCR Unit Final Elevation Contour (2 ft interval)
- Survey Extent
- CCR Management Unit Area (Approximate)
- Engineered Wetlands Area (Approximate)
- Polishing Pond (Approximate)

CCR = Coal Combustion Residuals

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Vertical Datum: NGVD29
3. Imagery provided by Esri World Imagery
4. Contours from the 2017 KIF Plant aerial survey (Tuck 2017) and supplemental 2018 as-built construction surveys for the East Dike (TVA drawing 10W393-03) and Stilling Pond (TVA drawing 81W404-09R1) closure projects were used to model the composite final surface shown herein. Model input data to model the composite final surface shown herein are also summarized in Table C.3 (Appendix C).

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Exhibit No.

A.7

Title

Top of CCR Material Elevations

Client/Project

Tennessee Valley Authority
Kingston Fossil (KIF) Plant TDEC Order

Project Location

Roane County, Tennessee

175668043

Prepared by DMB on 2022-05-11
Technical Review by VS on 2022-05-11

0 200 400 600 800 Feet

1:2,400 (At original document size of 22x34)

Legend

- EXD SAR Boring with Top of CCR Material Elevation in feet (ft)
- Top of CCR Material Elevation Contour (10 ft interval)
- Top of CCR Material Elevation Contour (2 ft interval)
- CCR Management Unit Area (Approximate)
- Engineered Wetlands Area (Approximate)
- Polishing Pond (Approximate)

CCR = Coal Combustion Residuals

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Vertical Datum: NGVD29
3. Imagery provided by Esri World Imagery
4. Model input and confirmation data used to model the top of CCR surfaces shown herein are summarized in Table C.4 (Appendix C).

Stantec TVA

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Exhibit No.

A.8

Title

Top of Bedrock Elevation

Client/Project

Tennessee Valley Authority
Kingston Fossil (KIF) Plant TDEC Order

Project Location

Roane County, Tennessee

175668043

Prepared by DMB on 2022-05-11
Technical Review by VS on 2022-05-11

0 200 400 600 800 Feet

1:2,400 (At original document size of 22x34)

Legend

- EXD SAR Boring with Top of Rock Elevation in feet (ft)
- Borings without Rock Core Data [ID & TOR Elevation in ft]
- Borings with Rock Core Data [ID, TOR Elevation in ft, RQD]
- Perimeter Containment Alignment (Approximate)
- Top of Bedrock Elevation Contour (10 ft interval)
- Top of Bedrock Elevation Contour (2 ft interval)
- CCR Management Unit Area (Approximate)
- Engineered Wetlands (Approximate)
- Polishing Pond (Approximate)
- Ordovician/Cambrian Knox Group
- Cambrian Maynardville Limestone
- Cambrian Conasauga Shale
- Cambrian Rome Formation

ID = identification
TOR = top of rock
RQD = Rock Quality Designation
CCR = Coal Combustion Residuals

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Vertical Datum: NGVD29
3. Imagery provided by Esri World Imagery
4. Model input data used to model the top of bedrock surfaces shown herein are summarized in Table C.5 (Appendix C).
5. During the construction of the Perimeter Containment Soil-Cement Stabilization, top of bedrock elevations were determined by a combination of predrilling (S&ME 2011) and trench excavations. This top of bedrock information is available for the entirety of the Stabilization alignment and the spacing between top of bedrock observations range from approximately 15 feet to 20 feet.
6. RQD value corresponds to upper 20 feet of rock core.
7. Geologic map corresponds to Moore, James L. et al (1993), "Geologic Map of The Harriman Quadrangle, Tennessee"

Stantec TVA

Disclaimer: Stantec assumes no responsibility for data supplied in electronic format. The recipient accepts full responsibility for verifying the accuracy and completeness of the data. The recipient releases Stantec, its officers, employees, consultants and agents, from any and all claims arising in any way from the content or provision of the data.

U:\TVA-EIP\175668043_KIF_Phase2\gis\mxd\MaterialsQuantities_SAR\KIF_MQTechMemo_ExhA08_TopofBedrock.mxd Revised: 2022-05-11 By: mbough

Exhibit No.

A.9

Title

Cross Section Locations

Client/Project

Tennessee Valley Authority
Kingston Fossil (KIF) Plant TDEC Order

Project Location

Roane County, Tennessee

175668043
Prepared by DMB on 2022-05-13
Technical Review by VS on 2022-05-13

0 300 600 900 1,200 Feet

1:3,600 (At original document size of 22x34)

Legend

- Cross Section Location
- CCR Management Unit Area (Approximate)
- Engineered Wetlands Area (Approximate)
- Polishing Pond (Approximate)

CCR = Coal Combustion Residuals

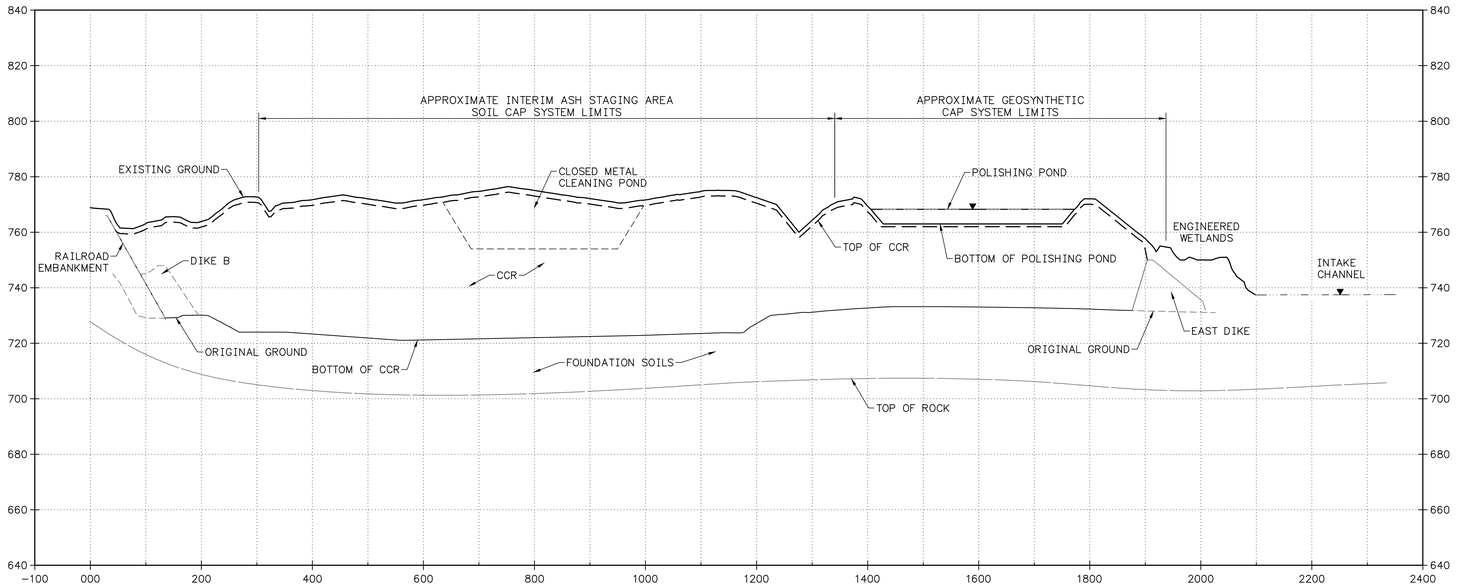
Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Imagery provided by Esri World Imagery

Stantec TVA

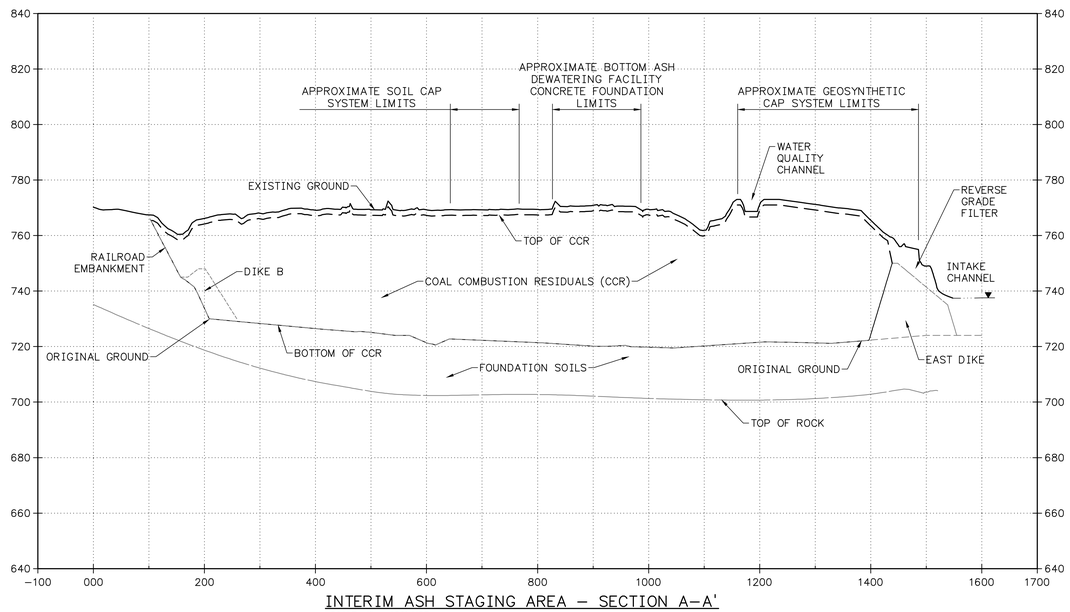
Disclaimer: Stantec assumes no responsibility for data supplied in electronic format. The recipient accepts full responsibility for verifying the accuracy and completeness of the data. The recipient releases Stantec, its officers, employees, consultants and agents, from any and all claims arising in any way from the content or provision of the data.

U:\TVA-EIP\175668043_KIF_Phase2\gis\mxd\Material\Quantities_SAR\KIF_MQTechMemo_ExhA09_XSLocations.mxd Revised: 2022-05-13 By: mbough



INTERIM ASH STAGING AREA – SECTION B–B'

SCALE: 1" = 100' HOR.
1" = 20' VER.



INTERIM ASH STAGING AREA – SECTION A–A'

SCALE: 1" = 100' HOR.
1" = 20' VER.

Exhibit No.
A.10

Title
KIF MATERIAL QUANTITY CROSS SECTIONS A-A' AND B-B'

Client/Project
Tennessee Valley Authority
Kingston Fossil (KIF) Plant TDEC Order

Project Location
Roane County, Tennessee

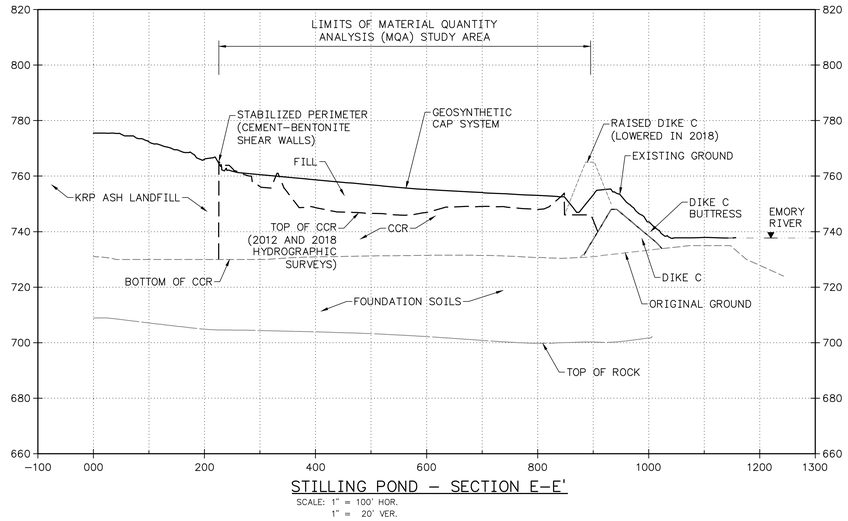
175668043

Prepared by EM on 2022-02-02
Technical Review by VS on 2022-02-02

NOTES:

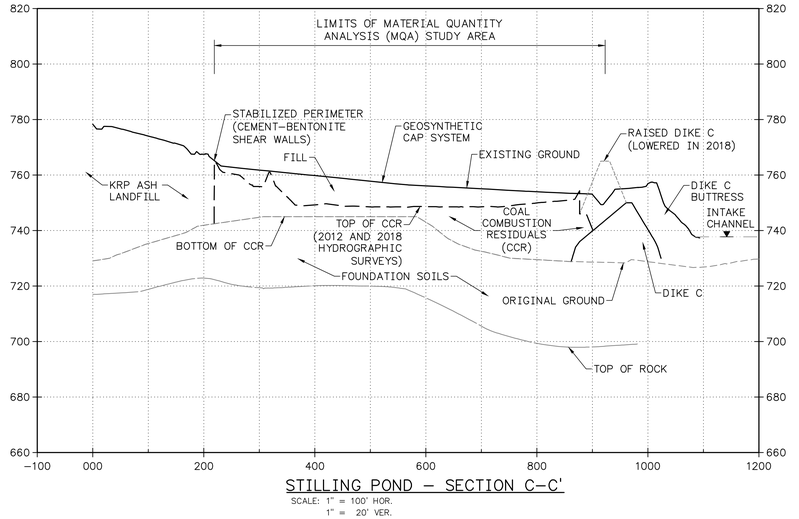
1. COORDINATE SYSTEM: HORIZONTAL DATUM: NAD83 STATE PLANE ZONE: TENNESSEE.
2. VERTICAL DATUM: NGVD29.
3. SEE SECTION 4.0 OF THE MATERIAL QUANTITY SAMPLING AND ANALYSIS REPORT FOR DETAILS REGARDING THE METHODOLOGY, ASSUMPTIONS, AND SOURCE DATA USED TO DEVELOP THE THREE–DIMENSIONAL MODELS FROM WHICH THESE CROSS SECTIONS WERE EXTRACTED.
4. THE INFORMATION AND DATA SHOWN HEREIN ARE FURNISHED ONLY FOR PURPOSES OF THE TDEC ORDER AND SHOULD NOT BE USED FOR ANY OTHER PURPOSE. THE ENGINEER OR OWNER WILL NOT BE RESPONSIBLE FOR ANY INTERPRETATION OR CONCLUSION DRAWN BY OTHERS FOR PURPOSES OTHER THAN THE TDEC ORDER.

Stantec TVA



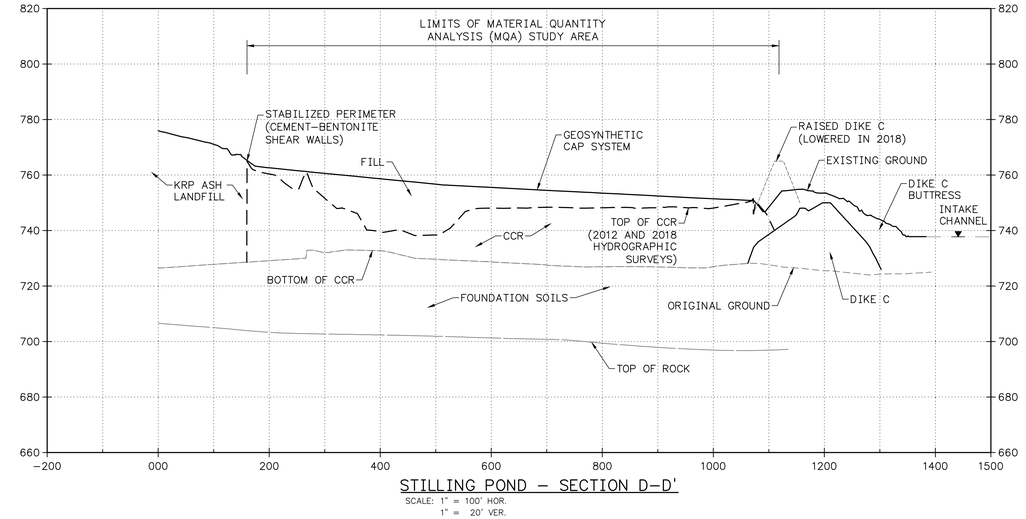
STILLING POND – SECTION E–E'

SCALE: 1" = 100' HOR.
1" = 20' VER.



STILLING POND – SECTION C–C'

SCALE: 1" = 100' HOR.
1" = 20' VER.



STILLING POND – SECTION D–D'

SCALE: 1" = 100' HOR.
1" = 20' VER.

Exhibit No.
A.11

Title
KIF MATERIAL QUANTITY CROSS SECTIONS C-C', D-D' AND E-E'

Client/Project
Tennessee Valley Authority
Kingston Fossil (KIF) Plant TDEC Order

Project Location
Roane County, Tennessee

175668043

Prepared by EM on 2022-02-02
Technical Review by VS on 2022-02-02

NOTES:

1. COORDINATE SYSTEM: HORIZONTAL DATUM: NAD83 STATE PLANE ZONE: TENNESSEE.
2. VERTICAL DATUM: NGVD29.
3. SEE SECTION 4.0 OF THE MATERIAL QUANTITY SAMPLING AND ANALYSIS REPORT FOR DETAILS REGARDING THE METHODOLOGY, ASSUMPTIONS, AND SOURCE DATA USED TO DEVELOP THE THREE–DIMENSIONAL MODELS FROM WHICH THESE CROSS SECTIONS WERE EXTRACTED.
4. THE INFORMATION AND DATA SHOWN HEREIN ARE FURNISHED ONLY FOR PURPOSES OF THE TDEC ORDER AND SHOULD NOT BE USED FOR ANY OTHER PURPOSE. THE ENGINEER OR OWNER WILL NOT BE RESPONSIBLE FOR ANY INTERPRETATION OR CONCLUSION DRAWN BY OTHERS FOR PURPOSES OTHER THAN THE TDEC ORDER.

Stantec TVA

APPENDIX B – HISTORICAL DRAWINGS AND INFORMATION

36 C 4 ION200

THIS DRAWING HAS BEEN REDRAWN; ORIGINAL DESTROYED
DATE / INITIAL
11-6-78 EL 4-19-79 HRT 1-22-79 HRT
APPROVED
REDRAWN

LOCALITY MAP
SCALE 6000 0 6000 12000

TENN. CENTRAL
SOU. RWY INTERCHANG YD
CANEY CR INTERCHANGE YD
SOUTHERN
HARRIMAN
TENN CENTRAL
TO CLINTON
TO CHATTANOOGA
ACCESS RAILROAD
LAKE
WATTS BAR
TO KNOXVILLE
KINGSTON

TO ROCKWOOD & HARRIMAN
U.S. HWY 70
TO KINGSTON
I-40
EMPTY STORAGE YARD
ACCESS RAILROAD
SWAN POND PIKE (PROJ 2002)
LOADED STORAGE YARD
NORTH ACCESS ROAD (PROJ 1002)
COAL STORAGE YARD
RETARDER CONTROL HOUSING
HOPPER BLDGS. EL. 766
UTILITY BLDG. CARPENTERS SHOP
℄ EAST-WEST BASE LINE & UNIT 1
N 33°00'-00"E
TRACK SCALES
ASH DISPOSAL AREA
CHEMICAL TREATMENT PONDS
NORTH DIKE
CRUSHER BLDG
NEW CHIMNEY
ASH SLUICE
CHLOR. BLDG.
INTAKE
CONDENSER WATER INTAKE EL. 711
CONDENSER WATER OUTLET EL. 725
OUTLETS
CLINCH RIVER
PRECIPITATORS UNITS 9 THRU 1
POWERHOUSE EL. 765
COL. LINE A
NORTH-SOUTH BASE LINE
HYD. STOR. PORT.
HYD. STOR. PORT.
CONTROL BLDG.
SWITCHYARD
WATER TREATMENT PLANT
EAST DIKE
WATTS BAR RESERVOIR
CONSTRUCTION PLANT AREA
STOR. BLDG.
STORAGE AREA
WATER TANK
FUTURE DOCK
CONSTRUCTION CAMP AREA
SCALE 200 0 200 400

2,434,000 2,435,000 2,436,000 2,437,000 2,438,000 2,439,000 2,440,000 2,441,000
535,000 548,000 549,000 550,000 551,000 552,000 553,000 554,000

OS 2-5-80 SBG | C PLATE | RM | EH | 2-5-80

Void dwg. Superseded by dwg IOE 200-01

REV	DESCRIPTION	DES	DRN	CHK	SUPV	INSP	ENGR	COMP	DATE
3	2/2/80 Add Treatment Pond & Haul Rd for Access Rd PA 3070 & PA 2940	CJ	HAC	WFE	HBH	WNC	AG		2-5-80
2	12-5-79 Units 5-8 added	CJ	HBH	WNC	AG				12-5-79
1	4-19-79 Units 5-8 added Storage area & Bldg. added	CJ	HBH	AG					4-19-79
0	11-6-78 General revision	CJ	HBH	AG					11-6-78

DESIGN WFE AG | SUPV. H.B.H.
DRWN HAC | INSP. W.N.C.
CHKD C.J. H.B. | WFE 2-5-80
TRCD | ENGINEER A. Quercia
COMP

VOID
REASON Redrawn
SUPERSEDED BY IOE 200-01
SUPERVISOR [illegible] DATE 7-8-82

PROJECT LAYOUT

GENERAL PLAN

KINGSTON STEAM PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

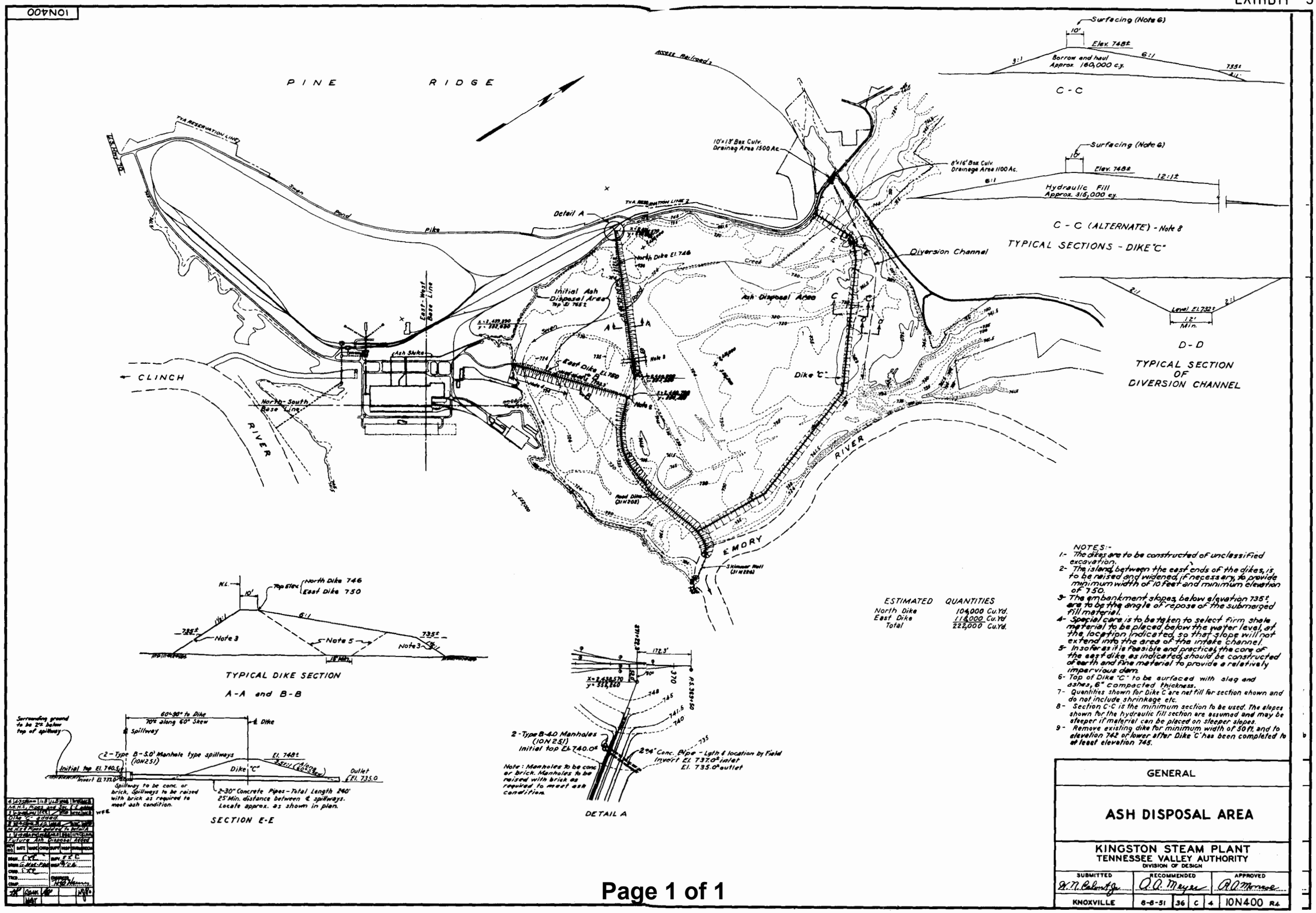
SUBMITTED	RECOMMENDED	APPROVED
A.A. Mayes	R.A. Morse	[illegible]

KNOXVILLE 5-8-51 | 36 C 4 | ION200 R10

RECORD DRAWING AS CONSTRUCTED

Attachment B.2

EXHIBIT 3



ESTIMATED	QUANTITIES
North Dike	104,000 Cu.Yd.
East Dike	118,000 Cu.Yd
Total	222,000 Cu.Yd.

NOTES:-

1- The dikes are to be constructed of unclassified excavation.
2- The island between the east ends of the dikes, is to be raised and widened, if necessary, to provide minimum width of 10 feet and minimum elevation of 750.
3- The embankment slopes below elevation 735±, are to be the angle of repose of the submerged fill material.
4- Special care is to be taken to select firm shale material to be placed below the water level, at the location indicated, so that slope will not extend into the area of the intake channel.
5- Insofar as it is feasible and practical, the core of the east dike as indicated, should be constructed of earth and fine material to provide a relatively impervious dam.
6- Top of Dike "C" to be surfaced with slag and ashes, 6" compacted thickness.
7- Quantities shown for Dike "C" are net fill for section shown and do not include shrinkage etc.
8- Section C-C is the minimum section to be used. The slopes shown for the hydraulic fill section are assumed and may be steeper if material can be placed on steeper slopes.
9- Remove existing dike for minimum width of 50 ft. and to elevation 742 or lower after Dike "C" has been completed to at least elevation 745.

GENERAL

ASH DISPOSAL AREA

KINGSTON STEAM PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF DESIGN

SUBMITTED	RECOMMENDED	APPROVED
W. N. Calvert Jr.	A. A. Meyer	R. A. Monroe

KNOXVILLE | 8-8-51 | 36 | C | 4 | 10N400 R4

36 | C | 4 | 10N400

PINE RIDGE

TVA RESERVATION LINE

75 Hwy 70

Swan Pond

Pike

NORTH ACCESS ROAD (PROJ. 1002)

Access Railroad

PROJ. 2101

PROJ. 2102

Channel through Dike 'C' after Dike B is constructed

10'x13' Box Culv. Drainage Area 1500 Ac.

8'x16' Box Culv. Drainage Area 1100 Ac.

Detail A

El. 749.1

TVA RESERVATION LINE 2

El. 743.0

Dike "B"

El. 741.3

North Dike El. 746

Diversion Channel

Creek

Initial Ash Disposal Area Top El. 765± Storage Capacity 3,600,000 C.Y.

Ash Disposal Area Top El. 765± Storage Capacity - 15,400,000 C.Y.

East-West Base Line

El. 751.5 x = 2,439,390 y = 352,990

Ash Sluice

Chemical Treatment Ponds

East Dike El. 750

Note 9

Note 4

Note 2

Dike "C" Possible Location - Future Spillway

CLINCH RIVER

North-South Base Line

Road Dike (3N202)

EMORY RIVER

Skimmer Wall (3N286)

x = 2,438,570 y = 356,260

El. 748.2

172.3'

90°

70'

R = 69.50'

748

745

741.5

740

735

2-Type B-4.0 Manholes (10N251) Initial top El. 740.0±

2-24" Conc. Pipe Lgth & location by Field Inv. El. 737.0± inlet El. 735.0± outlet

Note: Manholes to be conc. or brick. Manholes to be raised with brick as required to meet ash condition.

DETAIL A
Scale: 1"=100'

Surfacing (Note 6)

10'

Elev. 748±

3:1

6:1

Borrow and haul Approx. 160,000 c.y.

735±

3:1

C - C

Surfacing (Note 6)

10'

Elev. 748±

6:1

12:1±

Hydraulic Fill Approx. 315,000 c.y.

C - C (ALTERNATE) - Note 8

TYPICAL SECTIONS - DIKE "C"

2:1

2:1

Level El. 732±

12' Min.

D - D

TYPICAL SECTION OF DIVERSION CHANNEL

ESTIMATED QUANTITIES

North Dike	104,000 Cu.Yd.
East Dike	118,000 Cu.Yd.
Total	222,000 Cu.Yd.

12' Min El. 748

6:1

15 Min

Exist. Pipe

See stages for raising dikes

DIKE "B" Bottom Ash

2' Min.

SECTION F-F
N.T.S.

N.L.

10'

Top Elev. { North Dike 746 / East Dike 750

1½:1

6:1

735±

Note 3

Note 5

735±

1½:1

Note 3

18' Min.

TYPICAL DIKE SECTION

A-A and B-B

Surrounding ground to be 2± below top of spillway

60-90° to Dike

70± along 60° Skew

℄ Spillway

℄ Dike

2-Type B-5.0' Manhole type spillways (10N251)

El. 748±

3.5:1 (Along Skew)

Dike "C"

Outlet El. 735.0

Initial top El. 740.5±

Invert El. 737.0±

Spillway to be conc. or brick. Spillways to be raised with brick as required to meet ash condition.

2-30" Concrete Pipes - Total Length 240' 25' Min. distance between ℄ spillways. Locate approx. as shown in plan.

SECTION E-E
Scale: 1"=20'

Stages 5,6 etc. - Continue in similar manner to ultimate grade (El. 765)

Stage 3, Top of ash

Bottom Ash

Earth Dike

Stage 4 - Raise dike 4'± - 8'±

Berm 12' or wider Slopes 3:1 or flatter

Stage 3 - Ash 1'-3' below top of dike

Stage 1, Top of ash

Bottom Ash

Stage 2, Raise dike 4'± - 8'±

ASH

Earth Dike

Stage 1, - Ash 1'-3' below top of dike

STAGES FOR RAISING DIKES WITH ASHES

Scales { Vert. 1"=20' / Hor. 1"=30'

NOTES:-

1- The dikes are to be constructed of unclassified excavation.
2- The island, between the east ends of the dikes, is to be raised and widened, if necessary, to provide minimum width of 10 feet and minimum elevation of 750.
3- The embankment slopes, below elevation 735±, are to be the angle of repose of the submerged fill material.
4- Special care is to be taken to select firm shale material to be placed, below the water level, at the location indicated, so that slope will not extend into the area of the intake channel.
5- Insofar as it is feasible and practical, the core of the east dike, as indicated, should be constructed of earth and fine material to provide a relatively impervious dam.
6- Top of Dike "C" to be surfaced with slag and ashes, 6" compacted thickness.
7- Quantities shown for Dike C are net fill for section shown and do not include shrinkage etc.
8- Section C-C is the minimum section to be used. The slopes shown for the hydraulic fill section are assumed and may be steeper if material can be placed on steeper slopes.
9- Remove existing dike for minimum width of 50 ft. and to elevation 742 or lower after Dike C has been completed to at least elevation 745.

Scale: 1"=500' except as noted

GENERAL

ASH DISPOSAL AREA

KINGSTON STEAM PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF DESIGN

SUBMITTED	RECOMMENDED	APPROVED
W.N. Calvert Jr.	A.A. Meyer	A.A. Morrow

KNOXVILLE | 8-8-51 | 36 | C | 4 | 10N400 | 46

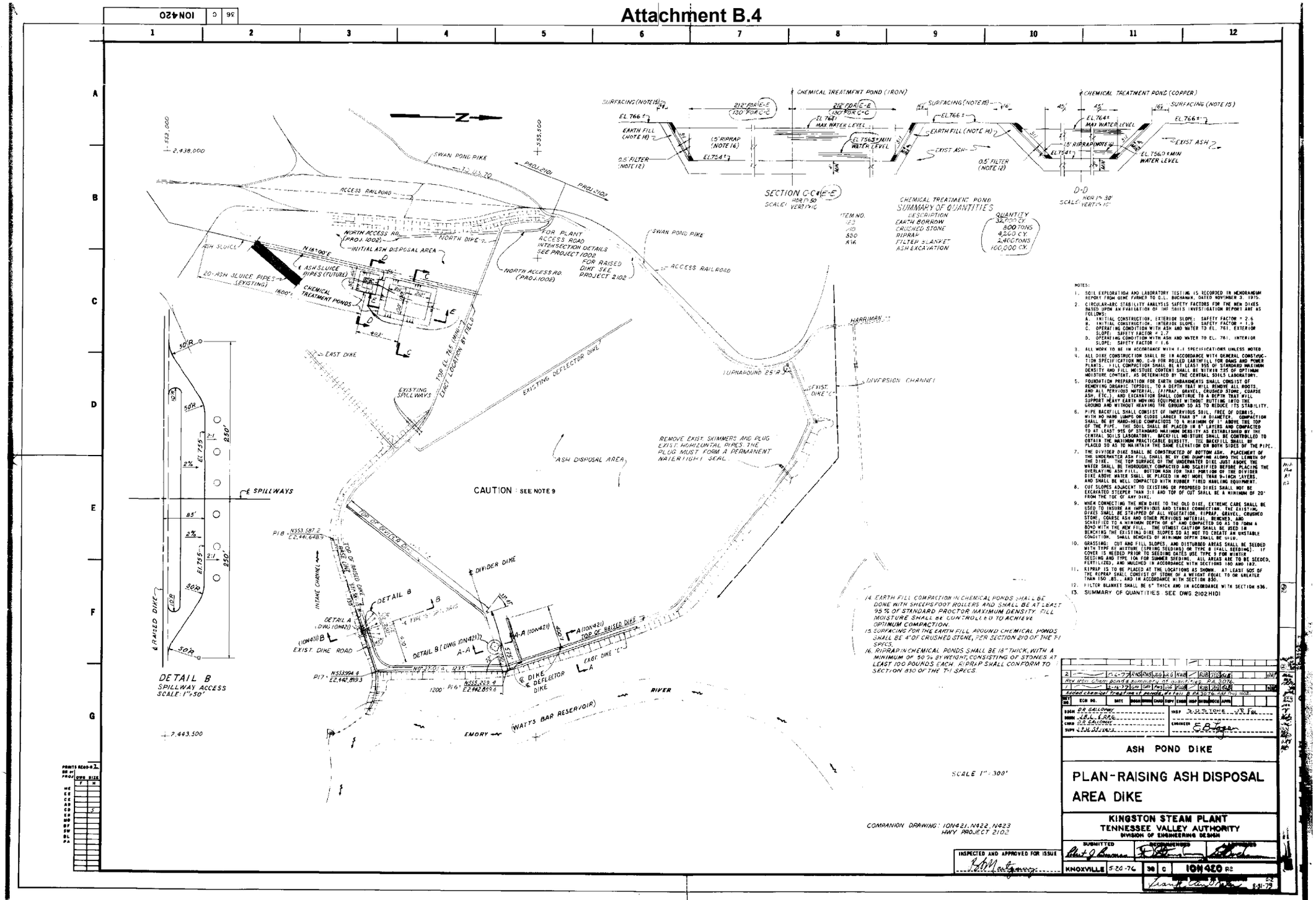
RECORD DRAWING AS CONSTRUCTED 7-5-56

PRINTS REQD-R & BR or PROJ

DWG	SIZE	F	H
ME			
EE			
CE			
AD			
CO			
ED			
MD			
BF			
SW			
BL			
PA			

REV NO.	DATE	MADE	CHKD	SUPV	INSP	SUBM	RECM
DSGN. E.K.L.				SUPV. E.E.C.			
DRWN. C.K.C.				INSP. W.H.H.			
CHKD. E.E.C.							
TRCD.				ENGINEER H.B. Hennig			
COMP.							

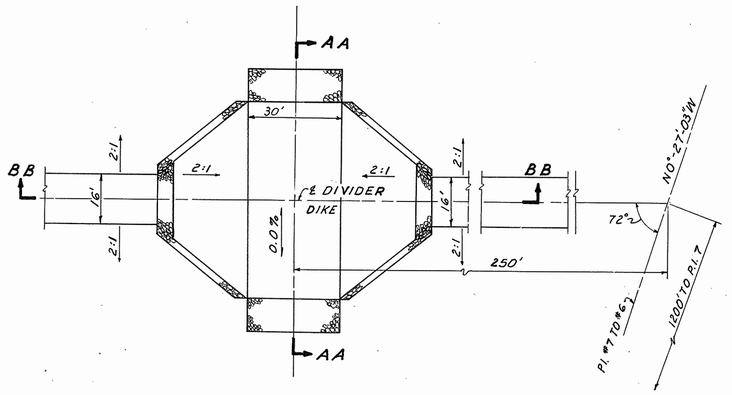
4 12-4-52 Mnl/Wks Dike W.Ck. Wtrd. Conn. Dike B-Slopes for raising dikes add.
3 12-7-56 Mnl LLB LWE Wtrd. Ck. Dike "C" added
2 10-4-56 Mnl LLB LWE Wtrd. Ck. M.H.'s, Pipes and Sta. F-F added
1 8-15-56 Mnl LLB LWE Wtrd. Ck. Future Ash Disposal Added
6 12-13-76 Mnl LWE Wtrd. Ck. Ash Treatment Ponds (X3076, Proj. 10003, Rel. 3940)



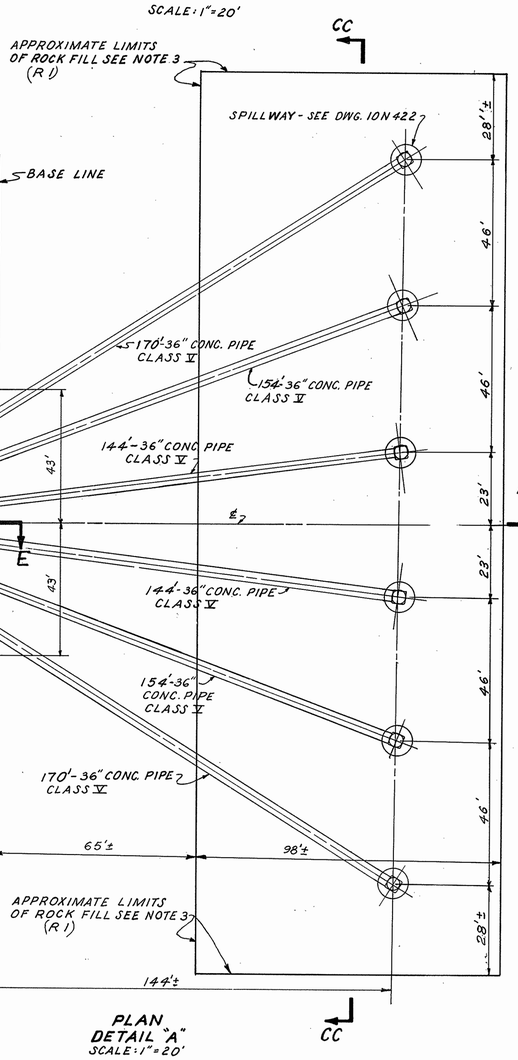
NOTES:

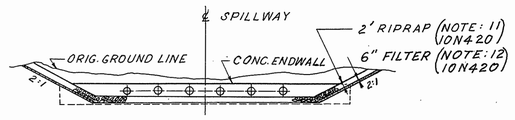
1. SOIL EXPLORATION AND LABORATORY TESTING IS RECORDED IN MEMORANDUM REPORT FROM GENE FARMER TO C.L. BUCHANAN, DATED NOVEMBER 3, 1975.
2. CIRCULAR-ARC STABILITY ANALYSIS SAFETY FACTORS FOR THE MEN DIKES BASED UPON AN EVALUATION OF THE SOILS INVESTIGATION REPORT ARE AS FOLLOWS:
   A. INITIAL CONSTRUCTION, EXTERIOR SLOPE: SAFETY FACTOR = 2.6
   B. INITIAL CONSTRUCTION, INTERIOR SLOPE: SAFETY FACTOR = 1.9
   C. OPERATING CONDITION WITH ASH AND WATER TO EL. 761, EXTERIOR SLOPE: SAFETY FACTOR = 2.7
   D. OPERATING CONDITION WITH ASH AND WATER TO EL. 761, INTERIOR SLOPE: SAFETY FACTOR = 1.6
3. ALL WORK TO BE IN ACCORDANCE WITH T.V.A SPECIFICATIONS UNLESS NOTED
4. ALL DIKE CONSTRUCTION SHALL BE IN ACCORDANCE WITH GENERAL CONSTRUCTION SPECIFICATION NO. G-9 FOR ROLLED EARTHFILL FOR DAMS AND POWER PLANTS. FILL COMPACTION SHALL BE AT LEAST 95% OF STANDARD MAXIMUM DENSITY AND FILL MOISTURE CONTENT SHALL BE WITHIN ±3% OF OPTIMUM MOISTURE CONTENT, AS DETERMINED BY THE CENTRAL SOILS LABORATORY.
5. FOUNDATION PREPARATION FOR EARTH EMBANKMENTS SHALL CONSIST OF REMOVING ORGANIC TOPSOIL, TO A DEPTH THAT WILL REMOVE ALL ROOTS, AND ALL PERVIOUS MATERIAL (RIPRAP, GRAVEL, CRUSHED STONE, COARSE ASH, ETC.), AND EXCAVATION SHALL CONTINUE TO A DEPTH THAT WILL SUPPORT HEAVY EARTH MOVING EQUIPMENT WITHOUT RUTTING INTO THE GROUND AND WITHOUT KNEADING THE GROUND SO AS TO REDUCE ITS STABILITY.
6. PIPE BACKFILL SHALL CONSIST OF IMPERVIOUS SOIL, FREE OF DEBRIS, WITH NO HARD LUMPS OR CLODS LARGER THAN 3" IN DIAMETER. COMPACTION SHALL BE BY HAND-HELD COMPACTORS TO A MINIMUM OF 1' ABOVE THE TOP OF THE PIPE. THE SOIL SHALL BE PLACED IN 6" LAYERS AND COMPACTED TO AT LEAST 95% OF STANDARD MAXIMUM DENSITY AS ESTABLISHED BY THE CENTRAL SOILS LABORATORY. BACKFILL MOISTURE SHALL BE CONTROLLED TO OBTAIN THE MAXIMUM PRACTICABLE DENSITY. THE BACKFILL SHALL BE PLACED SO AS TO MAINTAIN THE SAME ELEVATION ON BOTH SIDES OF THE PIPE.
7. THE DIVIDER DIKE SHALL BE CONSTRUCTED OF BOTTOM ASH. PLACEMENT OF THE UNDERWATER ASH FILL SHALL BE BY END DUMPING ALONG THE LENGTH OF THE DIKE. THE TOP SURFACE OF THE UNDERWATER DIKE JUST ABOVE THE WATER SHALL BE THOROUGHLY COMPACTED AND SCARIFIED BEFORE PLACING THE OVERLAYING ASH FILL. BOTTOM ASH FOR THAT PORTION OF THE DIVIDER DIKE ABOVE WATER SHALL BE PLACED IN NOT MORE THAN 9-INCH LAYERS, AND SHALL BE WELL COMPACTED WITH RUBBER TIRED HAULING EQUIPMENT.
8. CUT SLOPES ADJACENT TO EXISTING OR PROPOSED DIKES SHALL NOT BE EXCAVATED STEEPER THAN 3:1 AND TOP OF CUT SHALL BE A MINIMUM OF 20' FROM THE TOE OF ANY DIKE.
9. WHEN CONNECTING THE NEW DIKE TO THE OLD DIKE, EXTREME CARE SHALL BE USED TO INSURE AN IMPERVIOUS AND STABLE CONNECTION. THE EXISTING DIKES SHALL BE STRIPPED OF ALL VEGETATION, RIPRAP, GRAVEL, CRUSHED STONE, COARSE ASH AND OTHER PERVIOUS MATERIAL, BENCHED, AND SCARIFIED TO A MINIMUM DEPTH OF 6" AND COMPACTED SO AS TO FORM A BOND WITH THE NEW FILL. THE UTMOST CAUTION SHALL BE USED IN BENCHING THE EXISTING DIKE SLOPES SO AS NOT TO CREATE AN UNSTABLE CONDITION. SMALL BENCHES OF MINIMUM DEPTH SHALL BE USED.
10. GRASSING: CUT AND FILL SLOPES, AND DISTURBED AREAS SHALL BE SEEDED WITH TYPE RE MIXTURE (SPRING SEEDING) OR TYPE B (FALL SEEDING). IF COVER IS NEEDED PRIOR TO SEEDING DATES USE TYPE S FOR WINTER SEEDING AND TYPE 10N FOR SUMMER SEEDING. ALL AREAS ARE TO BE SEEDED, FERTILIZED, AND MULCHED IN ACCORDANCE WITH SECTIONS 180 AND 182.
11. RIPRAP IS TO BE PLACED AT THE LOCATIONS AS SHOWN. AT LEAST 50% OF THE RIPRAP SHALL CONSIST OF STONE OF A WEIGHT EQUAL TO OR GREATER THAN 150 LBS., AND IN ACCORDANCE WITH SECTION 830.
12. FILTER BLANKET SHALL BE 6" THICK AND IN ACCORDANCE WITH SECTION 831.
13. SUMMARY OF QUANTITIES: SEE DWG 2102H101
14. EARTH FILL COMPACTION IN CHEMICAL PONDS SHALL BE DONE WITH SHEEPSFOOT ROLLERS AND SHALL BE AT LEAST 95% OF STANDARD PROCTOR MAXIMUM DENSITY. FILL MOISTURE SHALL BE CONTROLLED TO ACHIEVE OPTIMUM COMPACTION.
15. SURFACING FOR THE EARTH FILL AROUND CHEMICAL PONDS SHALL BE 4" OF CRUSHED STONE, PER SECTION 210 OF THE T-I SPECS.
16. RIPRAP IN CHEMICAL PONDS SHALL BE 18" THICK, WITH A MINIMUM OF 50% BY WEIGHT, CONSISTING OF STONES AT LEAST 100 POUNDS EACH. RIPRAP SHALL CONFORM TO SECTION 830 OF THE T-I SPECS.

TVA-00000566

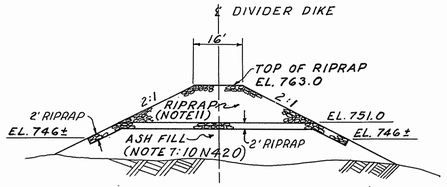


DETAIL B
SCALE: 1"=20'

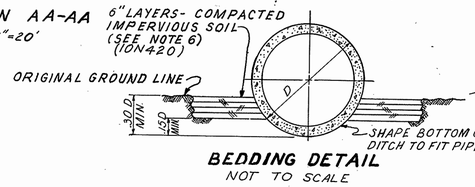




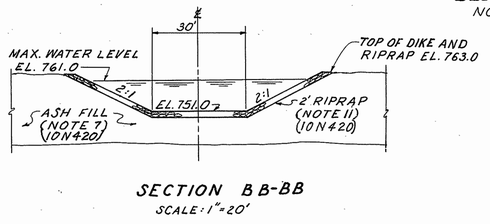
SECTION D-D
SCALE: 1"=20'



SECTION AA-AA
SCALE: 1"=20'

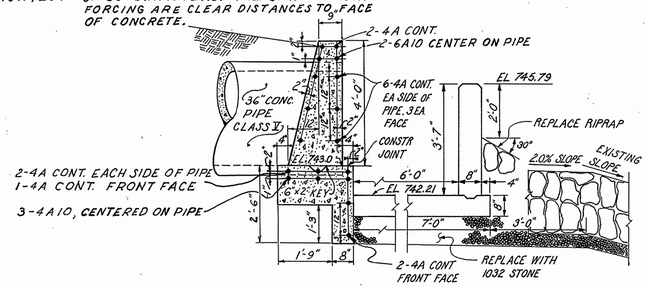


BEDDING DETAIL
NOT TO SCALE

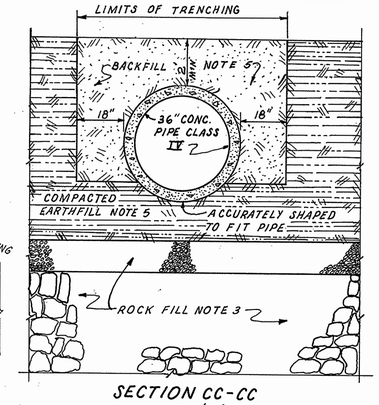


SECTION B B-BB
SCALE: 1"=20'

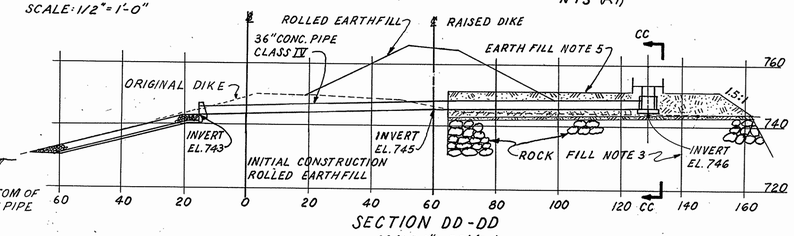
NOTE:
SPACER BARS BY FIELD
NOTE:
USE VERTICAL CONSTRUCTION JOINTS AT THIRD POINTS OF THE LENGTH WITH 6"x2" KEY. CHAMFER EXPOSED EDGES 3/4". LAP REINFORCING BARS A MINIMUM DISTANCE OF 36" DIAMETERS. DIMENSIONS TO REINFORCING ARE CLEAR DISTANCES TO FACE OF CONCRETE.



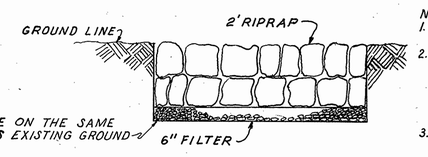
SECTION E-E
SCALE: 1/2"=1'-0"



SECTION CC-CC
NTS (R1)

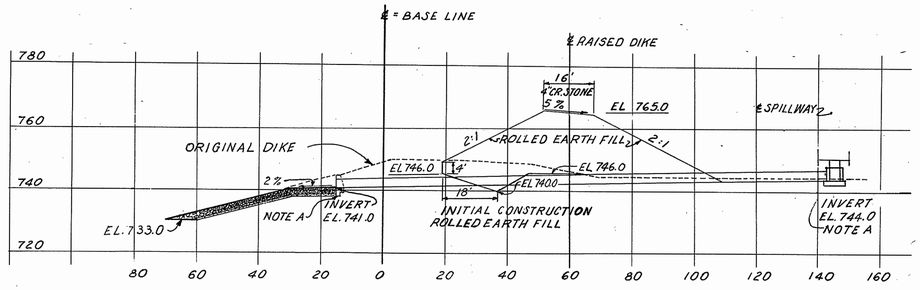


SECTION DD-DD
SCALE 1" = 20' (R1)



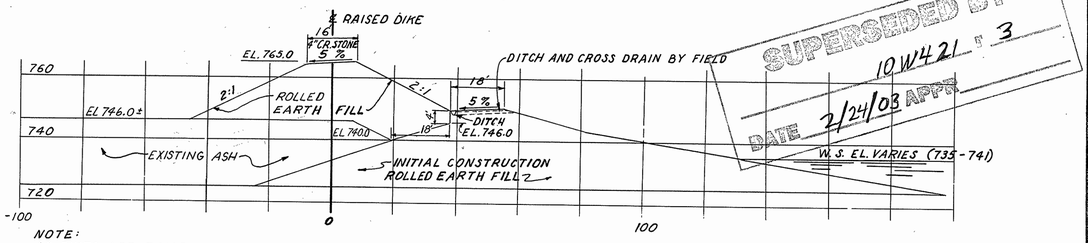
SECTION C-C
NOT TO SCALE

NOTES:
1. FOR ADDITIONAL NOTES SEE DWG 10N420. NOTES BELOW ARE FOR REVISION R1.
2. SPILLWAYS, OUTLET PIPES, AND HEADWALL WERE INSTALLED IN 1976. OUTLET PIPES ARE CRACKED AND JOINTS OPEN GENERALLY OVER HALF THE PIPE LENGTH TOWARD THE SPILLWAYS. ALL PIPES ARE TO BE REMOVED AND REPLACED. THE SPILLWAY BOXES AND HEADWALL ARE TO BE RAISED 2 FEET AND THE PIPES LAID TO NEW GRADE AS SHOWN ON SECTION DD-DD.
3. THE ROCKFILL SHOWN ON PLAN-DETAIL "A" AND SECTIONS DD-DD AND CC-CC IS THE ROCKFILL PLACED IN ACCORDANCE WITH THE REPORT FROM J. P. HILLIER STIVERS TO CIVIL ENGINEERING AND DESIGN BRANCH FILES, DATED AUGUST 27, 1976, COPIES TO DIVISION OF CONSTRUCTION (H.H. MULL AND GENE FARMER) AMONG OTHERS. THE SPILLWAY BOXES AND PART OF THE OUTLET PIPE LENGTHS WERE INSTALLED ON THE ROCKFILL.
4. COMPACTED EARTHFILL IS TO BE PLACED ON THE ROCKFILL TO PROVIDE NEW FOUNDATION FOR THE SPILLWAY BOXES AND OUTLET PIPES. BEFORE THE EARTHFILL IS PLACED, THE ROCKFILL SHALL BE TESTED FOR SOUNDNESS. SEVERAL PASSES OF HEAVY EARTH-MOVING EQUIPMENT SHALL BE MADE ON THE ROCKFILL TO ENSURE THAT THE ROCKFILL IS STABLE AND NON-SETTLING. IT MUST BE ASSURED THAT THERE IS A MINIMUM OF 6" OF COMPACTED CRUSHED STONE ON THE ROCKFILL TO PREVENT MIGRATION OF COMPACTED EARTHFILL INTO ROCKFILL.
5. COMPACTED EARTHFILL SHALL BE PLACED TO 2 FEET ABOVE TOP OF PIPE IN ACCORDANCE WITH NOTE 4 ON DWG 10N420, TRENCHED AS SHOWN ON SECTION CC-CC, THE OUTLET PIPES LAID, AND THE PIPES BACKFILLED IN ACCORDANCE WITH NOTE 6 ON DWG 10N420. THE SPILLWAY BOXES SHALL BE RESET ON THE COMPACTED EARTHFILL AND A NEW HEADWALL CONSTRUCTED. THE EARTHFILL AROUND THE SPILLWAY BOXES SHALL BE REMOVED TO EL 749 OR LOWER WHEN THE INSTALLATION OF THE SPILLWAYS, PIPES, AND HEADWALL IS COMPLETE. THE EARTHFILL SHALL BE REMOVED FROM A STRIP 10' EACH SIDE OF THE CENTERLINE OF THE SPILLWAY BOXES AND EXTENDING COMPLETELY BETWEEN ALL SPILLWAYS.



SECTION B-B (PIPE DETAILS SUPERSEDED SEE SECT. DD-DD (R1))
SCALE: 1"=20' (10N420)

NOTE A:
STRUCTURES TO BE ON FIRM FOUNDATION. IF NATURAL GROUND IS NOT FIRM, REMOVE TO DEPTH OF 4' AND REPLACE WITH COMPACTED FILL.



NOTE:
AS DIKES ARE RAISED, THE FIELD SHALL PROVIDE DRAINAGE FROM THE TOP AND OUTSIDE SLOPES OF THE DIKES THAT WILL CONTROL EROSION OF THE DIKES.

SECTION A-A
SCALE: 1"=20'
(10N420)

COMPANION DRAWING: 10N420, N422, N423
HWY. PROJECT 2102

SUPERSEDED BY 10W421 " 3
DATE 2/24/03 APPV

INSPECTED AND APPROVED FOR ISSUE
D.M. Montgomery

REV NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	AS CONST
R1	10-13-77	J.R.Lipps	J.R.Lipps	E.C.	CWP	R.B.	D.R.C.		DWG %
REVISED PLAN DETAIL "A" ADJ. SECT. CC-CC, DD-DD - NOTES 2,3,4,5.									

REV NO.	ECN NO.	DATE	DSGN	DRWN	CHKD	SUPV	ENGR	INSP	SUBM	RECM	APPR

DSGN D.R. GALLOWAY
DRWN J.R. LOTT
CHKD D.R. GALLOWAY
SUPV J.B.H. Stivers
INSP S.D. STONE
ENGINEER E.B. Logan

ASH POND DIKE

SECTION & DETAILS

KINGSTON STEAM PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

SUBMITTED	RECOMMENDED	APPROVED
Robert J. Bowman		

KNOXVILLE | 5-20-76 | 36 | C | 10N421 R1

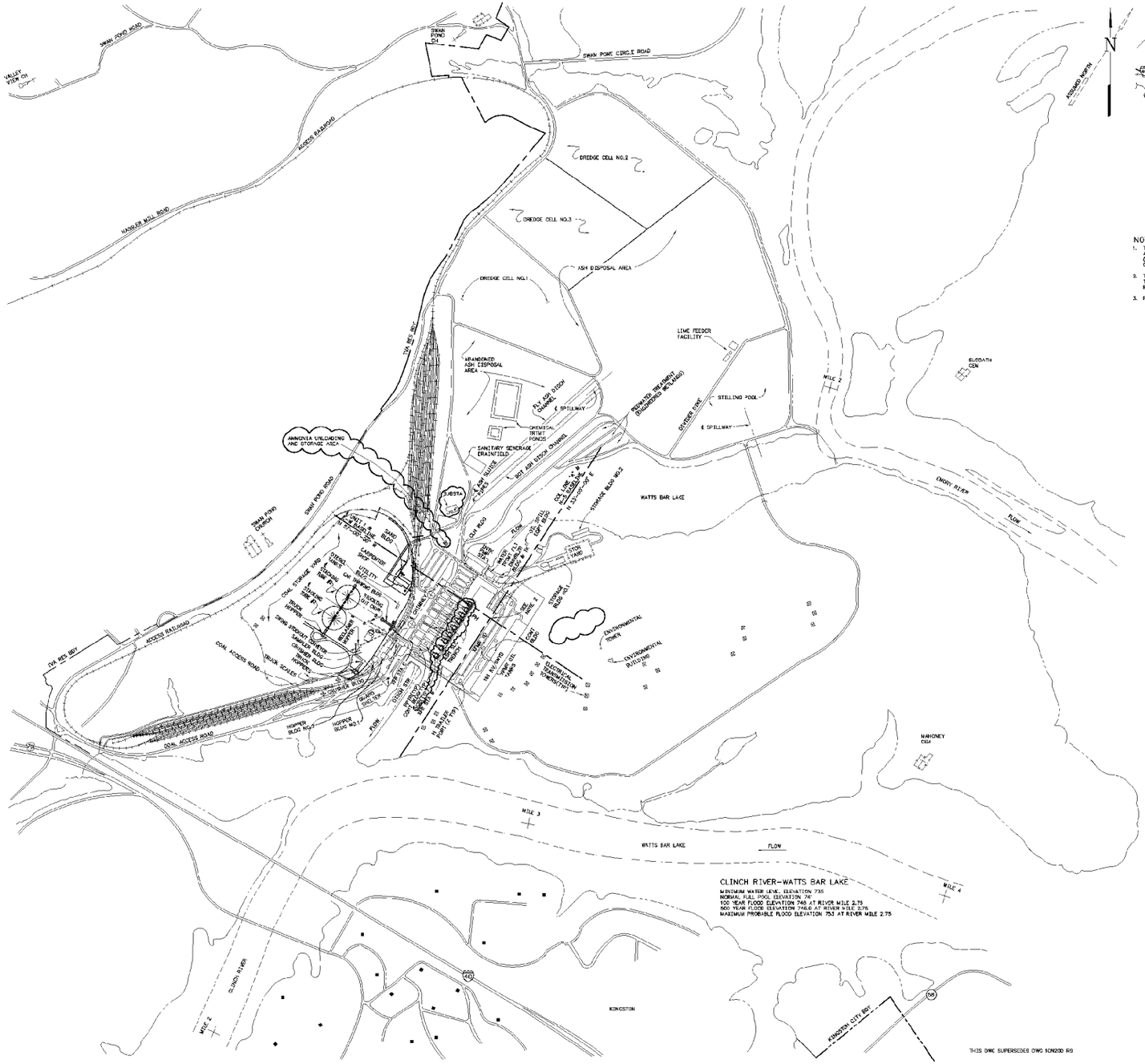
RECORD DRAWING AS CONSTRUCTED

PRINTS REQD-R	1
BR or PROJ	

	DWG F	DWG H
ME		
EE		
CE		
AD		
CD		4
ED		
MD		
RF		
SW		
BL		
PA		1

? Change the 10N921.. To 10N421-1 ?????

Attachment B.6



LOCALITY MAP

NOTES:
1. TOPOGRAPHY TRACED FROM KEIGH PLOTTED FROM APRIL 1974 AERIAL PHOTOGRAPHS AND FROM USGS 7.5 MINUTE QUADRANGLE (HARRIMAN, TN 123-NE AND LONDON CITY, TN 136-SE) ENLARGED. CONTOUR INTERVAL SHOWN IS 10 FEET.
2. THE TENNESSEE STATE COORDINATES AT THE INTERSECTION OF THE N-S AND E-W BASELINES ARE NORTH 551,654.16 AND EAST 3,439,536.03.
3. FOR PROPOSED AND TEMPORARY FEATURES SEE DWG 10E202-01.

PROJECT REVISION HISTORY

R –	–	–	–	–	–	–	–	–	–	–	–
R –	–	–	–	–	–	–	–	–	–	–	–
R5	8/11/2001	HLP	MGH	HLP	HLP	REP	JGA		KIF259		D
ADDED RAILROAD DISCHARGE DUMPER AND COAL BLENDING FACILITIES.											
R 5	07-15-05	KJT	KJT	BWD	PRP	REP/SB	DLL/DGB		KIF538		D
ISSUED FOR DCA KIF-04-1036 RQ, APPROVALS PER EJMS 865 020912 251											
R 4	2/14/1995	RWA	TM	RWA	VWD	VWD	RGJ	MDR			
ELECTRONICALLY RESTORED DRAWING											

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	PROJ MGR	APPD	SRD	PROJECT ID	AS CONST	DISCIPLINE INTERFACE

SCALE: NONE EXCEPT AS NOTED

MAIN PLANT

GENERAL PLAN

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
	MPT	CPJ	CPJ		ROD	

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

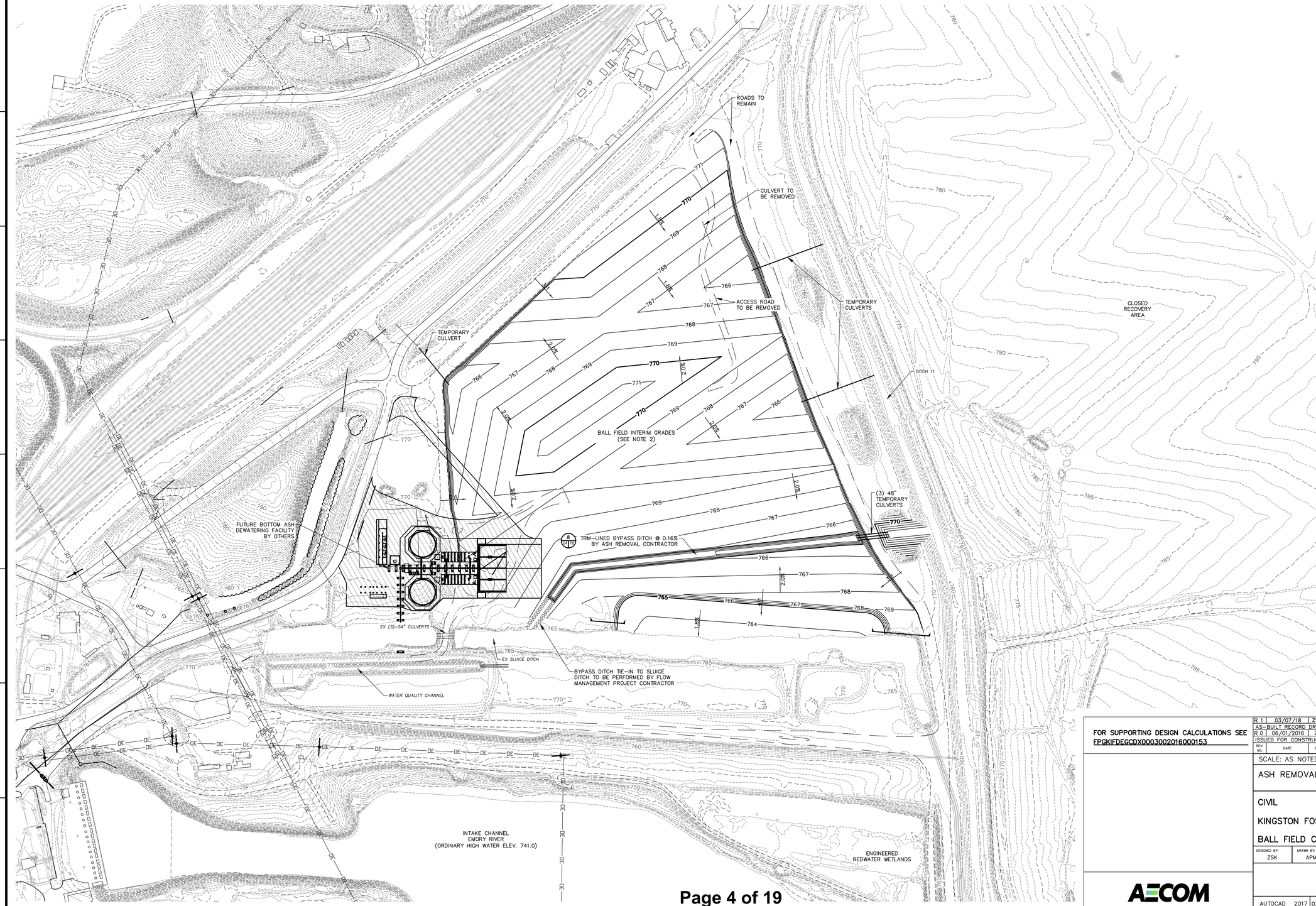
AUTOCAD R14	DATE			
	04/23/81	36	C	10W200-01 R 5

ALSTON POWER	6	ELECTRONICALLY RESTORED DRAWING THIS DRAWING HAS BEEN COMPLETELY REDRAWN AND SUPERSEDES :(10E200-01 R3)
TASK COMPLETED BY:	REV NO.	

PLOT FACTOR:4800
W-IVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

TVA-00000571



NOTE:

1. AERIAL TOPOGRAPHY DEVELOPED BY TUCK MAPPING SOLUTIONS, INC. VIA 11/10/2014 FLIGHT.
2. BALL FIELD STAGING AREA MATERIAL TO BE REMOVED BY OWNER. INTERIM GRADES AND SITE PLAN SHOWN ARE CONCEPTUAL.

FOR SUPPORTING DESIGN CALCULATIONS SEE EPGKIFDEGCDX0003002016000153

REV NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST
R 1	03/07/18	ZSK	TBS	CAB	TAK	RBC	MST	JCK	604769	J
AS-BUILT RECORD DRAWINGS										
R 0	06/01/2016	ZSK	APM	CAB	TAK	RBC	MST	JCK	604769	D
ISSUED FOR CONSTRUCTION DCN 117580315										

DISCIPLINE INTERFACE

SCALE: AS NOTED EXCEPT AS NOTED

ASH REMOVAL INTERIM GRADES

CIVIL

KINGSTON FOSSIL PLANT

BALL FIELD CLOSURE PROJECT

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
ZSK	APM	CAB	TAK	RBC	MST	JCK

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

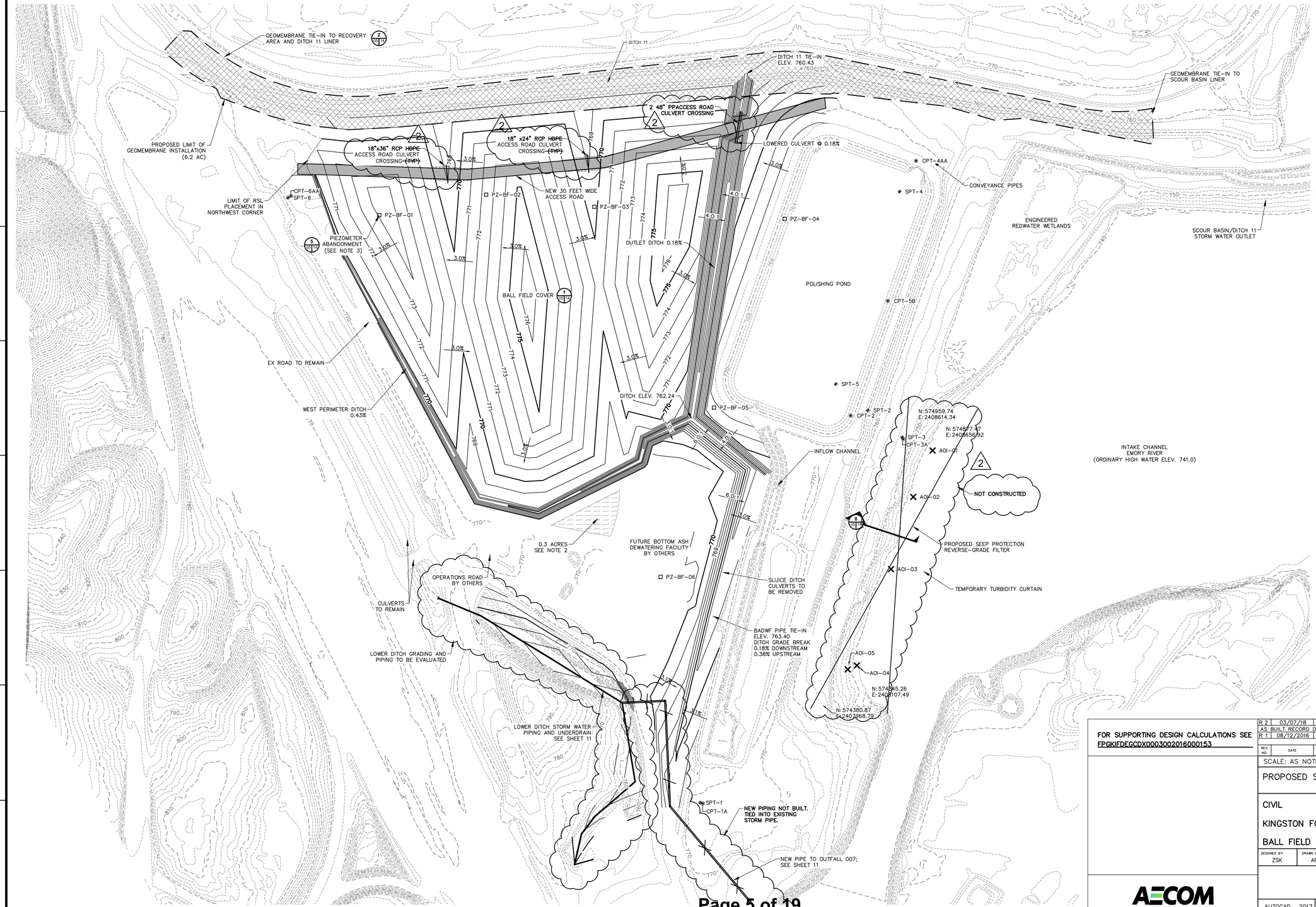
AUTOCAD 2017 | DATE 03/07/18 | 36 | C | 10W387-04 | R 1

AECOM | 1
TASK COMPLETED BY: | REV NO.

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

G:\Akron\DCS\Projects_Legacy\TVA-KIF\60429354_BALLFIELD\DWGs\Outbound\Final Drawings To TVA\As-Builts\10W387-04 Ash Removal Interim Grades_AsBuilt.dwg User:wesley.gabeti Mar 14, 2018 - 9:55am



NOTE:

1. AERIAL TOPOGRAPHY DEVELOPED BY TUCK MAPPING SOLUTIONS, INC. VIA 11/10/2014 FLIGHT.
2. 0.3-ACRE AREA BETWEEN PROPOSED OPERATIONS ROAD AND BOTTOM ASH DEWATERING FACILITY TO RECEIVE BALL FIELD COVER. COORDINATE GRADING WITH DEWATERING FACILITY CONTRACTOR.
3. PIEZOMETER(S) IN POLISHING POND FOOTPRINT TO BE ABANDONED BY CONTRACTOR PRIOR TO POLISHING POND CONSTRUCTION.

LEGEND

AOI-XX	SEEPAGE AREA OF INTEREST
PZ-BF-XX	EX PIEZOMETER
SPT-XX	BORING LOCATION
CPT-XX	CONE PENETRATION TEST
	GEOMEMBRANE LINER EXTENTS

FOR SUPPORTING DESIGN CALCULATIONS SEE FPGKIFDEGCDX0003002016000153

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT #	AS CONST
R 2	03/07/18	ZSK	TBS	CAB	TAK	RBC	MST	JCK	604769	
	AS BUILT RECORD DRAWINGS									
R 1	08/12/2016	ZSK	APM	CAB	TAK	RBC	MST	JCK	604769	

SCALE: AS NOTED — EXCEPT AS NOTED

PROPOSED SITE PLAN REV. 1

CIVIL

KINGSTON FOSSIL PLANT

BALL FIELD CLOSURE PROJECT

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
ZSK	APM	CAB	TAK	RBC	MST	JCK

AECOM

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD	DATE	36	C	10W387-05	R 2
2017	03/07/18				

AECOM	2
TASK COMPLETED BY:	REV NO.

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING DO NOT ALTER MANUALLY

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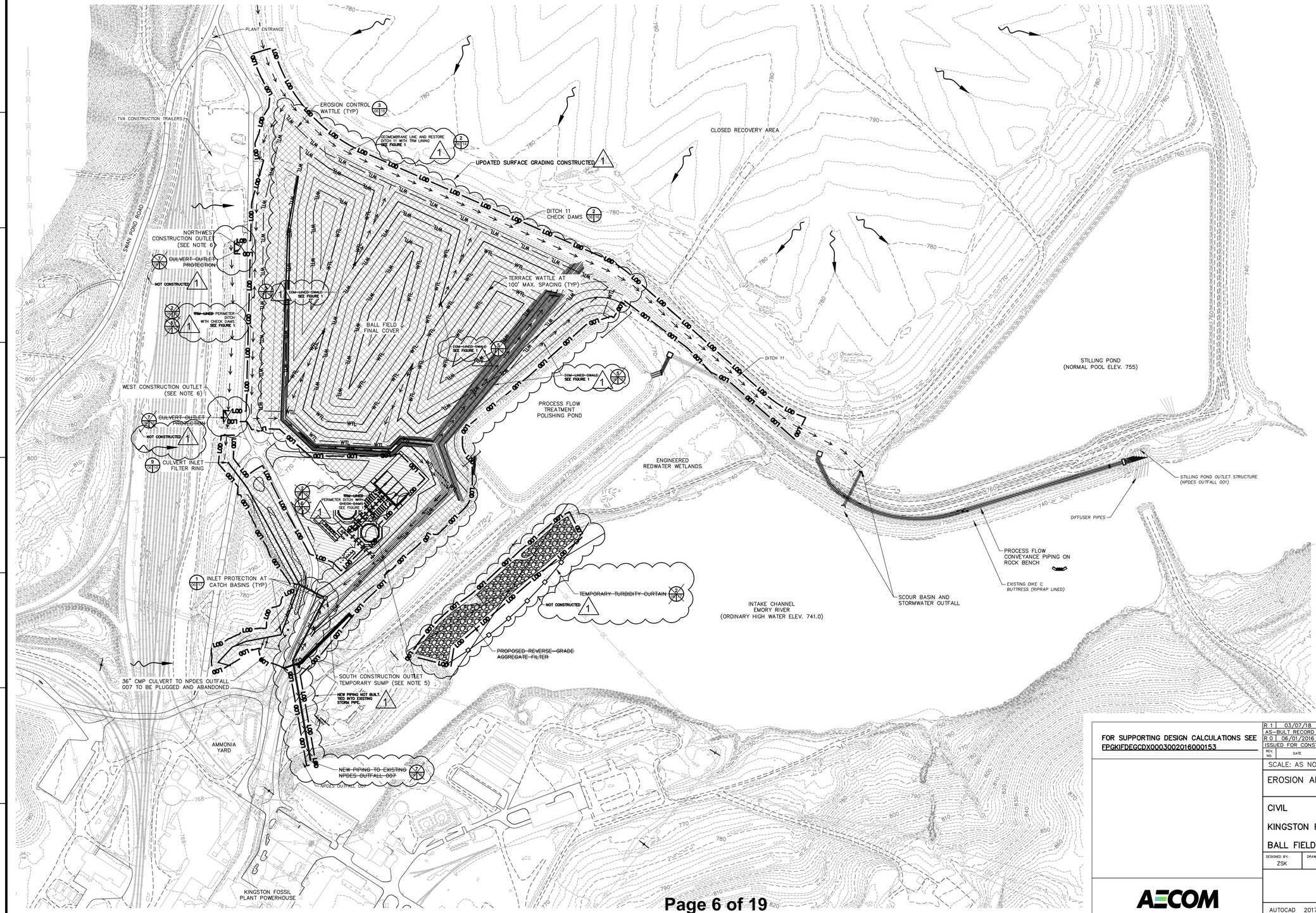

NOTE:

1. AERIAL TOPOGRAPHY DEVELOPED BY TUCK MAPPING SOLUTIONS, INC. VIA 11/10/2014 FLIGHT.
2. WATER QUALITY CHANNEL LIMITS OF LINER AND TOPOGRAPHY OBTAINED FROM ELECTRONIC COPIES OF "KINGSTON FOSSIL PLANT CHANNEL & PAD LINER FINAL AS-BUILTS" PROVIDED BY TVA OCTOBER 19, 2015.
3. CONSTRUCTION ENTRANCE (DETAIL 1 SHEET 16) SHALL BE CONSTRUCTED AT ALL LOCATIONS USED BY THE CONTRACTOR FOR VEHICULAR ACCESS TO THE SITE. THESE LOCATIONS SHALL BE SUBMITTED FOR APPROVAL WITH THE CONTRACTOR'S WORK PLAN.
4. CONCRETE WASHOUT (DETAIL 3 SHEET 17) SHALL BE CONSTRUCTED IN AN AREA DESIGNATED BY THE OWNER TO MANAGE CONCRETE WASTE GENERATED FROM THE FLOW MANAGEMENT AND BALL FIELD CLOSURE PROJECTS.
5. CONTRACTOR TO CONSTRUCT TEMPORARY SUMP AT SOUTH CONSTRUCTION OUTLET AND PUMP STORM WATER TO WATER QUALITY CHANNEL / POLISHING POND UNTIL DISTURBED AREA DRAINING TO THE SOUTH OUTLET IS STABILIZED.
6. CONTRACTOR TO CONSTRUCT TEMPORARY STORM WATER SUMPS AT NORTHWEST AND WEST CONSTRUCTION OUTLETS TO INTERCEPT STORM WATER. STORM WATER WILL BE PUMPED THROUGH SEDIMENT FILTER BAGS PRIOR TO DISCHARGE TO EXISTING CONVEYANCES DRAINING TO OUTFALL 007, OR PUMPED TO THE WATER QUALITY CHANNEL / POLISHING POND.

LEGEND

- EX CONTOUR MAJOR (10-FT)
- EX CONTOUR MINOR (2-FT)
- PHASE 2 GRADING CONTOUR MAJOR (10-FT)
- PHASE 2 GRADING CONTOUR MINOR (2-FT)
- OVERLAND FLOW PATH
- CHANNELIZED FLOW PATH
- PHASE 2 LIMIT OF DISTURBANCE (APPROX. 50.8 AC)
- PROPOSED WATTLE
- PROPOSED STORM DRAIN MANHOLE AND PIPING
- PERMANENT SEEDING AND MULCHING
- GRAVEL AREAS

FOR SUPPORTING DESIGN CALCULATIONS SEE FPGKIFDEGCDX0003002016000153

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST
R 1	03/07/18	ZSK	TBS	CAB	TAK	RBC	MST	JCK	604769	J
AS-BUILT RECORD DRAWINGS										
R 0	06/01/2016	ZSK	APM	CAB	TAK	RBC	MST	JCK	604769	D
ISSUED FOR CONSTRUCTION DCN 117580315										

DISCIPLINE INTERFACE

SCALE: AS NOTED EXCEPT AS NOTED

EROSION AND SEDIMENT CONTROL PLAN

CIVIL

KINGSTON FOSSIL PLANT

BALL FIELD CLOSURE PROJECT

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
ZSK	APM	CAB	TAK	RBC	MST	JCK

AECOM

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD	2017	DATE 03/07/18	36	C	10W387-06	R 1

AECOM	1
TASK COMPLETED BY:	REV NO.

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

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UPDATED SURFACE GRADING CONSTRUCTED 1

DITCH 11

3.0%

BALL FIELD COVER
35.2 AC

POLISHING POND

ENGINEERED
REDWATER WETLANDS

SCOUR BASIN/DITCH 11
STORM WATER OUTLET

(4) 15" ID MIN. CULVERT
INLET INVERT 762.60
OUTLET INVERT 762.00

NOT CONSTRUCTED 1

(2) 24" ID MIN. CULVERTS
INLET INVERT 762.00
OUTLET INVERT 761.00

NOT CONSTRUCTED 1

2 PERIMETER DITCH AT ROAD (TYP)

FUTURE BOTTOM ASH DEWATERING FACILITY BY OTHERS

5.1%

NEW PIPING NOT BUILT. TIED INTO EXISTING WATERLINE. 1

INTAKE CHANNEL
EMORY RIVER
(ORDINARY HIGH WATER ELEV. 741.0)

N

0 100 200
SCALE IN FEET

NOTE:

1. AERIAL TOPOGRAPHY DEVELOPED BY TUCK MAPPING SOLUTIONS, INC. VIA 11/10/2014 FLIGHT.

FOR SUPPORTING DESIGN CALCULATIONS SEE
EPGKIFDEGCDX0003002016000153

REV NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST
R 1	03/07/18	ZSK	TBS	CAB	TAK	RBC	MST	JCK	604769	
AS-BUILD RECORD DRAWINGS										
R 0	06/01/2016	ZSK	APM	CAB	TAK	RBC	MST	JCK	604769	
ISSUED FOR CONSTRUCTION DCN 117580315										

SCALE: AS NOTED EXCEPT AS NOTED

TOP OF PREPARED SUBGRADE

CIVIL

KINGSTON FOSSIL PLANT

BALL FIELD CLOSURE PROJECT

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
ZSK	APM	CAB	TAK	RBC	MST	JCK

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD 2017 | DATE 03/07/18 | 36 | C | 10W387-07 | R 1

AECOM	1
TASK COMPLETED BY:	REV NO.

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

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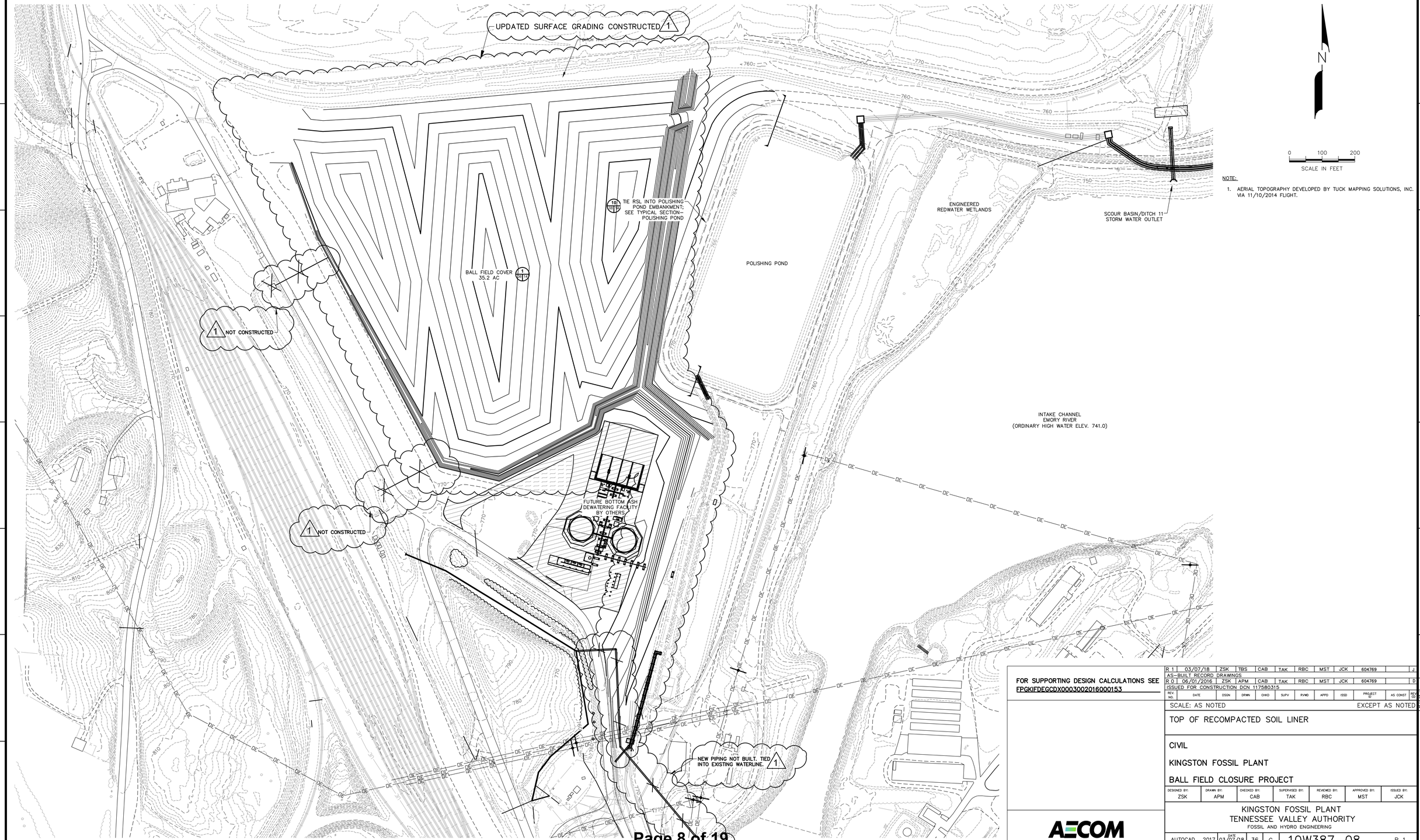

NOTE:

1. AERIAL TOPOGRAPHY DEVELOPED BY TUCK MAPPING SOLUTIONS, INC. VIA 11/10/2014 FLIGHT.

FOR SUPPORTING DESIGN CALCULATIONS SEE EPGKIFDEGCDX0003002016000153

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST
R 1	03/07/18	ZSK	TBS	CAB	TAK	RBC	MST	JCK	604769	
AS-BUILT RECORD DRAWINGS										
R 0	06/01/2016	ZSK	APM	CAB	TAK	RBC	MST	JCK	604769	
ISSUED FOR CONSTRUCTION DCN 117580315										

SCALE: AS NOTED — EXCEPT AS NOTED

TOP OF RECOMPACTED SOIL LINER

CIVIL

KINGSTON FOSSIL PLANT

BALL FIELD CLOSURE PROJECT

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
ZSK	APM	CAB	TAK	RBC	MST	JCK

AECOM

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD	2017	DATE 03/07/18	36	C	10W387-08	R 1

AECOM	1
TASK COMPLETED BY:	REV NO.

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

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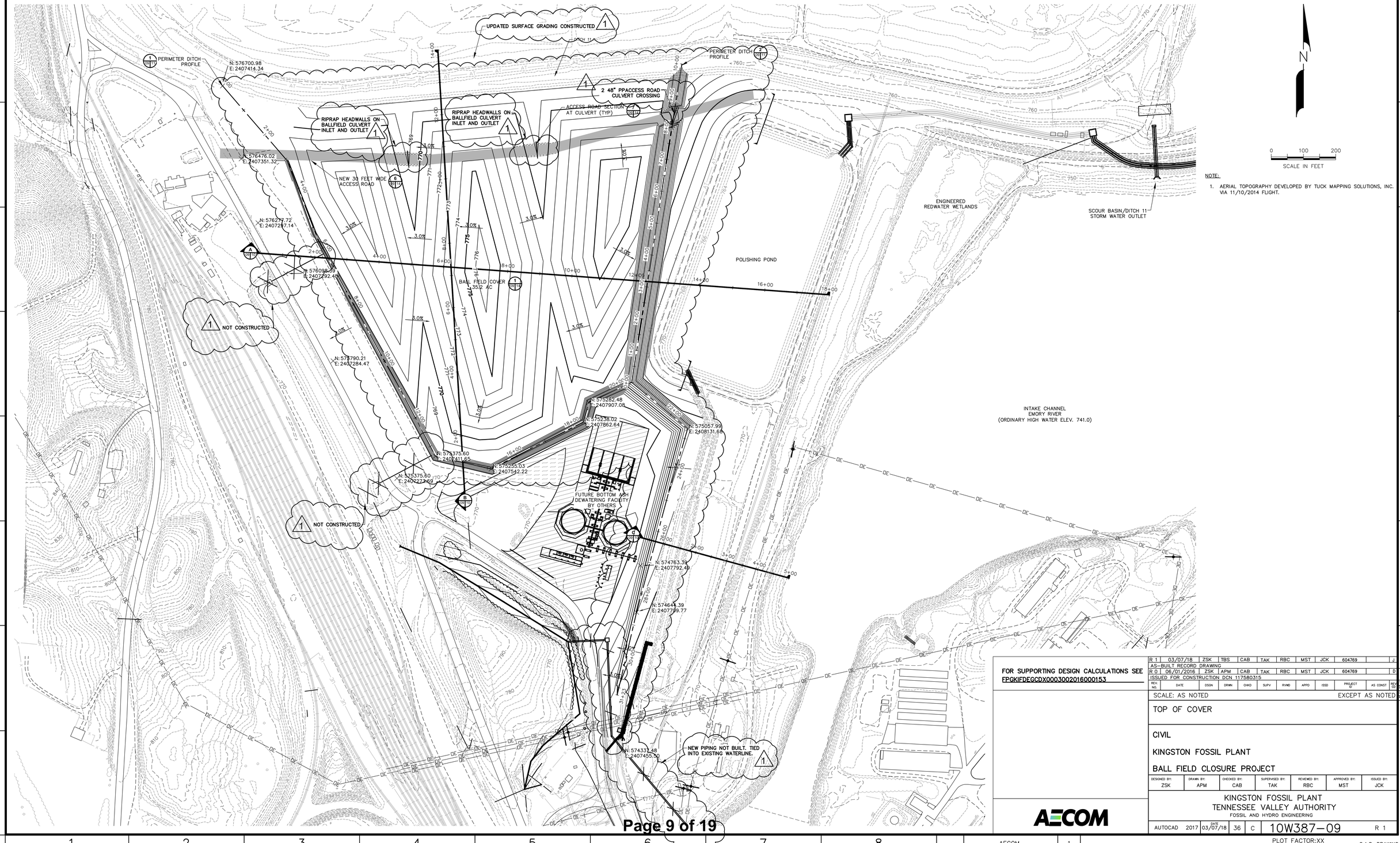

NOTE:

1. AERIAL TOPOGRAPHY DEVELOPED BY TUCK MAPPING SOLUTIONS, INC. VIA 11/10/2014 FLIGHT.

FOR SUPPORTING DESIGN CALCULATIONS SEE FPGKIFDEGCDX0003002016000153

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST
R 1	03/07/18	ZSK	TBS	CAB	TAK	RBC	MST	JCK	604769	J
AS-BUILT RECORD DRAWING										
R 0	06/01/2016	ZSK	APM	CAB	TAK	RBC	MST	JCK	604769	D
ISSUED FOR CONSTRUCTION DCN 117580315										

DISCIPLINE INTERFACE

SCALE: AS NOTED EXCEPT AS NOTED

TOP OF COVER

CIVIL

KINGSTON FOSSIL PLANT

BALL FIELD CLOSURE PROJECT

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
ZSK	APM	CAB	TAK	RBC	MST	JCK

AECOM

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD	2017	DATE 03/07/18	36	C	10W387-09	R 1

AECOM | 1
TASK COMPLETED BY: | REV NO.

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

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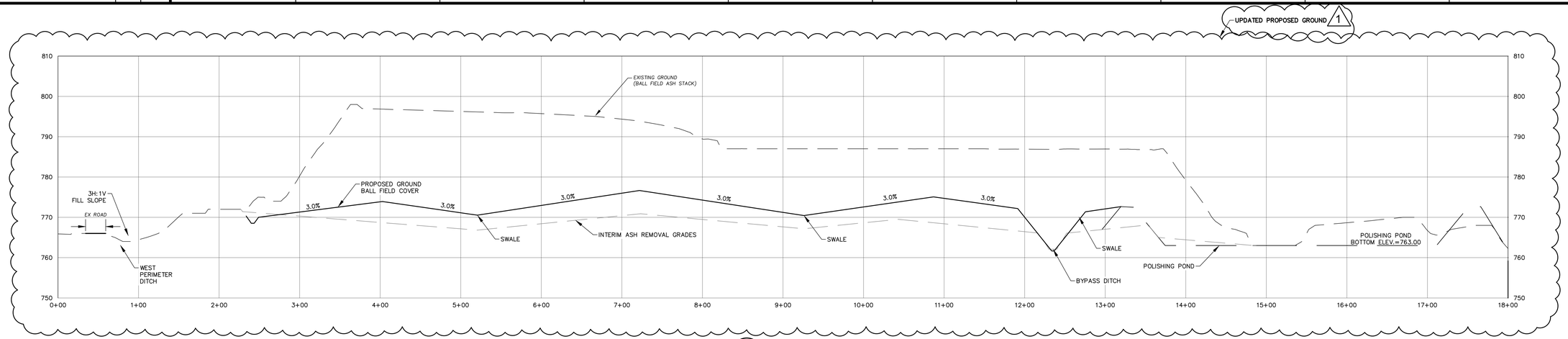

A (09 | 10) **SECTION A-A'**
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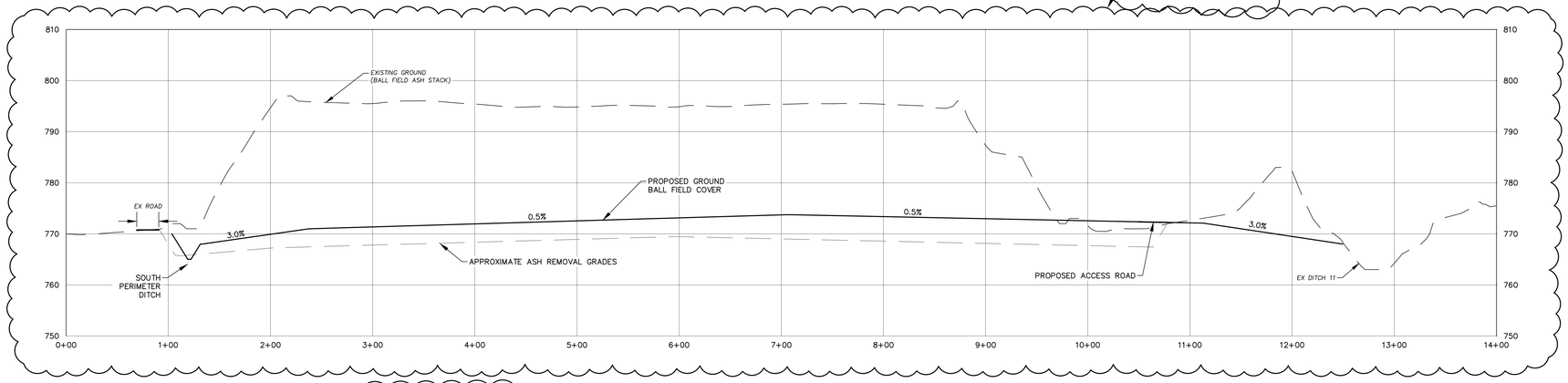
1"=10' (VERTICAL)



B (09 | 10) **SECTION B-B'**
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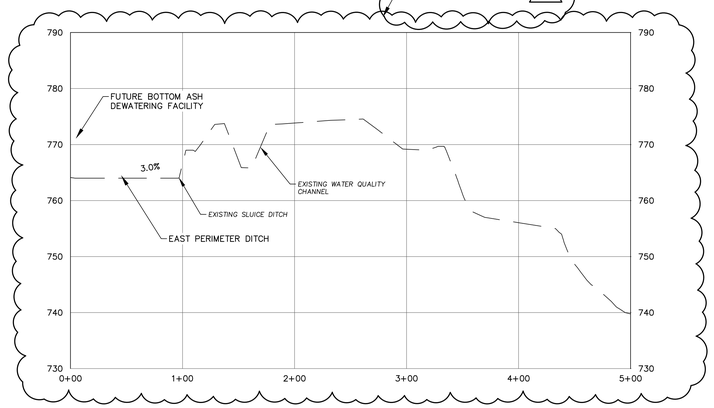
1"=10' (VERTICAL)



C (09 | 10) **SECTION C-C'**
SCALE: 1"=50' (HORIZONTAL)
1"=10' (VERTICAL)

FOR SUPPORTING DESIGN CALCULATIONS SEE FPGKIFDEGCDX0003002016000153

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST
R 1	03/07/18	ZSK	TBS	CAB	TAK	RBC	MST	JCK	604769	J
AS-BUILT RECORD DRAWINGS										
R 0	06/01/2016	ZSK	APM	CAB	TAK	RBC	MST	JCK	604769	D
ISSUED FOR CONSTRUCTION DCN 117580315										

DISCIPLINE INTERFACE

SCALE: AS NOTED EXCEPT AS NOTED

BALL FIELD CROSS-SECTIONS

CIVIL

KINGSTON FOSSIL PLANT

BALL FIELD CLOSURE PROJECT

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
ZSK	APM	CAB	TAK	RBC	MST	JCK

AECOM

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD 2017 | DATE 03/07/18 | 36 | C | 10W387-10 | R 1

AECOM | 1
TASK COMPLETED BY: | REV NO.

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

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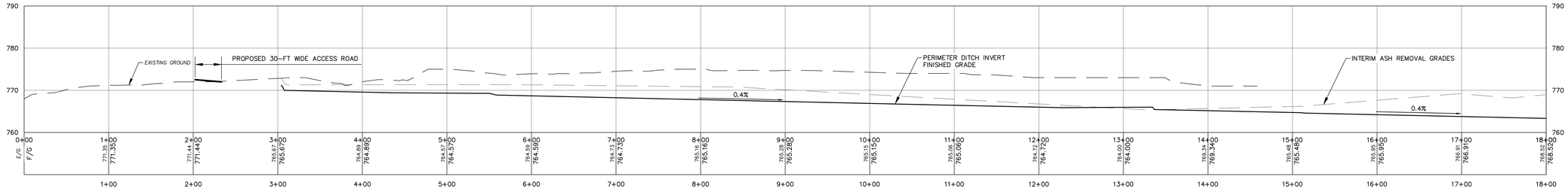
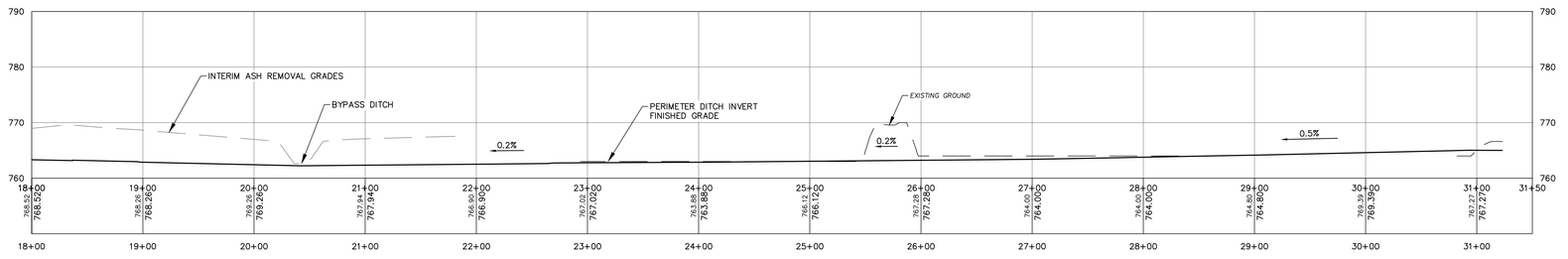
UPDATED PROPOSED GROUND AND DITCH 1





1 09 11 PERIMETER DITCH PROFILE
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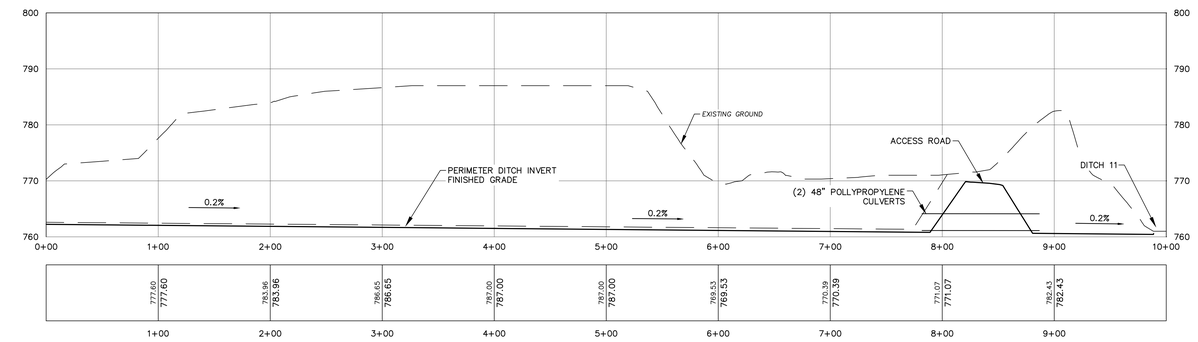

2 09 11 PERIMETER DITCH PROFILE
SCALE: 1"=50' (HORIZONTAL)
1"=5' (VERTICAL)

FOR SUPPORTING DESIGN CALCULATIONS SEE FPGKIFDEGCDX0003002016000153

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST	REV. CD
R 1	03/07/18	ZSK	TBS	CAB	TAK	RBC	MST	JCK	604769		J
AS-BUILT RECORD DRAWINGS											
R 0	06/01/2016	ZSK	APM	CAB	TAK	RBC	MST	JCK	604769		D
ISSUED FOR CONSTRUCTION DCN 117580315											

DISCIPLINE INTERFACE

SCALE: AS NOTED EXCEPT AS NOTED

BALL FIELD PERIMETER DITCH PROFILE

CIVIL

KINGSTON FOSSIL PLANT

BALL FIELD CLOSURE PROJECT

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
ZSK	APM	CAB	TAK	RBC	MST	JCK

AECOM

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD	2017	DATE 03/07/18	36	C	10W387-11	R 1

AECOM | 1
TASK COMPLETED BY: | REV NO.

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

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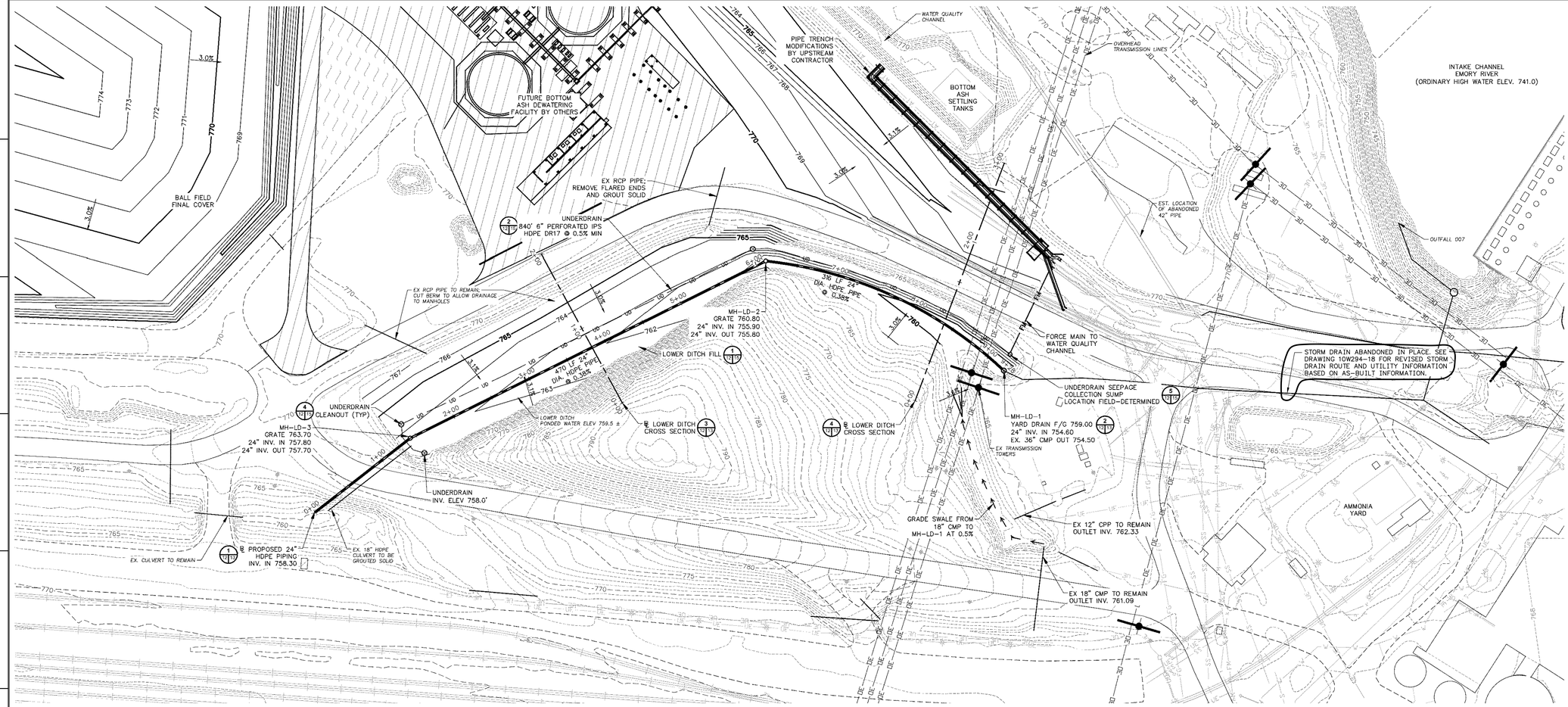


NOTE:

1. AERIAL TOPOGRAPHY DEVELOPED BY TUCK MAPPING SOLUTIONS, INC. VIA 11/10/2014 FLIGHT.

REV NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST	REV CO
R 3	11-19-21	JAW	JAW	WED	RGF	N/A	N/A	TVA	KIF-21-0001		
ISSUED FOR RECORD AS CONSTRUCTED UNDER DCN KIF-21-0001											
R 1	08/19/2016	ZSK	APM	CAB	TAK	RBC	MST	JCK	604769		D
ISSUED FOR CONSTRUCTION DCN 117580315											

DISCIPLINE INTERFACE

SCALE: AS NOTED — EXCEPT AS NOTED

LOWER DITCH IMPROVEMENTS PLAN REV. 1

Date: ***Invalid***
Comment: ***Invalid***
Invalid Signature

CIVIL
KINGSTON FOSSIL PLANT
BALL FIELD CLOSURE PROJECT

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

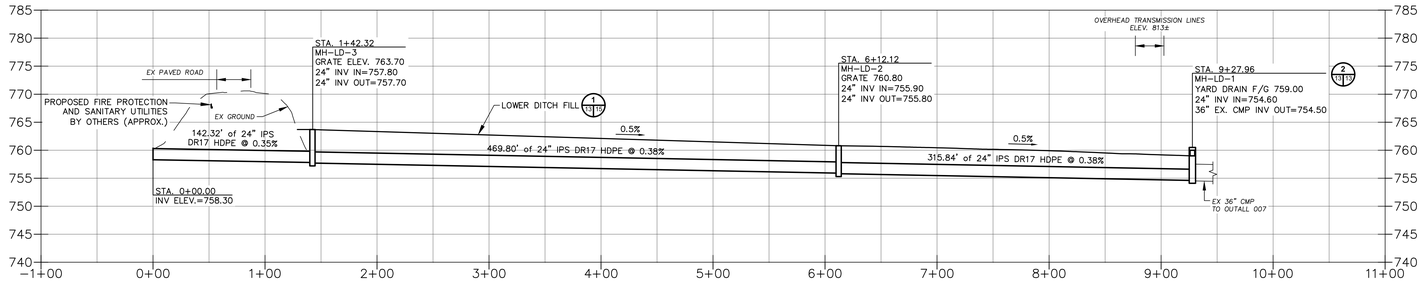
MESA ASSOCIATES, INC.
ENGINEERS AND CONSULTANTS
10804 MURDOCK DRIVE KNOXVILLE, TN 37932 (865) 671-6400

AUTOCAD 2017	DATE	36	C	10W387-12	R 3

PLOT FACTOR:1
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

MESA ASSOCIATES, INC.	3
TASK COMPLETED BY:	REV NO.



1 PROFILE - 24" PIPING
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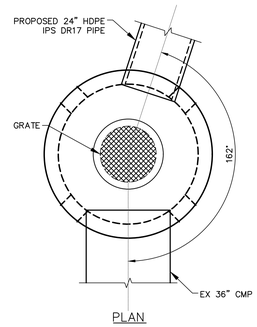
1"=10' (VERTICAL)



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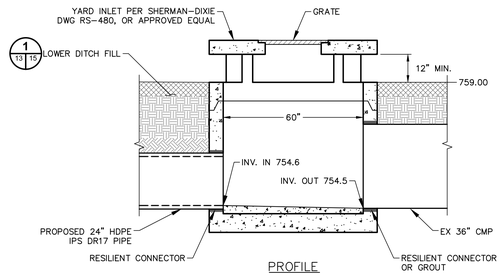

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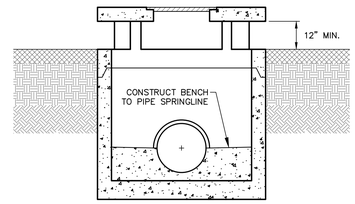
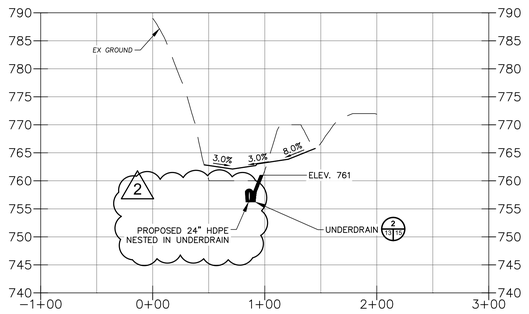
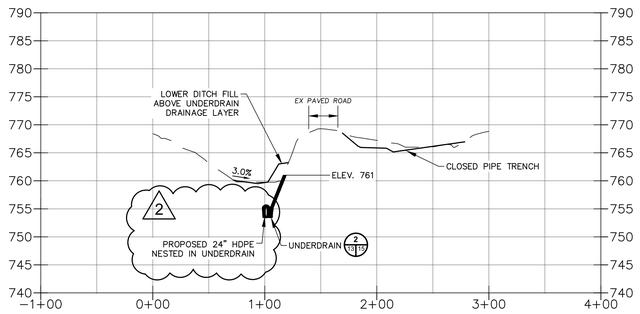


ELEVATION

2 MH-LD-1 YARD DRAIN
SCALE: 1"=2'



3 LOWER DITCH CROSS SECTION
SCALE: 1"=50' (HORIZONTAL)
1"=10' (VERTICAL)



4 LOWER DITCH CROSS SECTION
SCALE: 1"=50' (HORIZONTAL)
1"=10' (VERTICAL)

R 2	03/07/18	ZSK	TBS	CAB	TAK	RBC	MST	JCK	604769
AS-BUILT RECORD DRAWING									
R 1	08/26/2016	ZSK	APM	CAB	TAK	RBC	MST	JCK	604769
ISSUED FOR CONSTRUCTION DCN 117580315									

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST

SCALE: AS NOTED EXCEPT AS NOTED

LOWER DITCH IMPROVEMENTS PROFILES REV. 1

CIVIL

KINGSTON FOSSIL PLANT

BALL FIELD CLOSURE PROJECT

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
ZSK	APM	CAB	TAK	RBC	MST	JCK

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD 2017 | DATE 03/07/18 | 36 | C | 10W387-13 | R 2

AECOM | 2
TASK COMPLETED BY: | REV NO.

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

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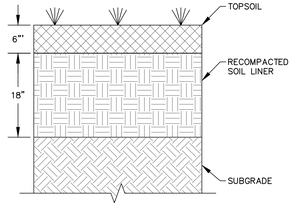
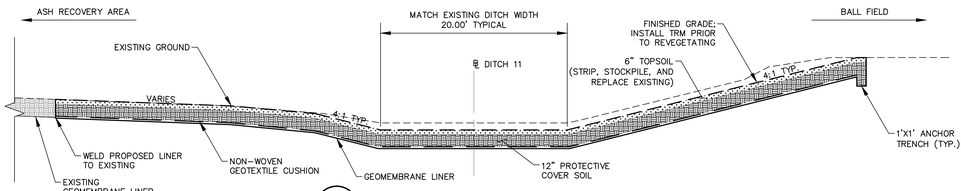


BALL FIELD SOIL COVER

1 05 14 BALL FIELD COVER DETAIL
NOT TO SCALE

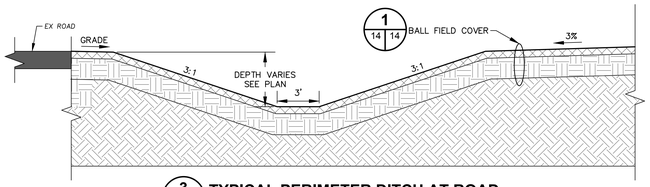
06, 07, 08, 09, 12, 14

NOTE: 10-7 CM/M PERMEABILITY REQUIREMENT USED IN PLACE OF 10-5 CM/S

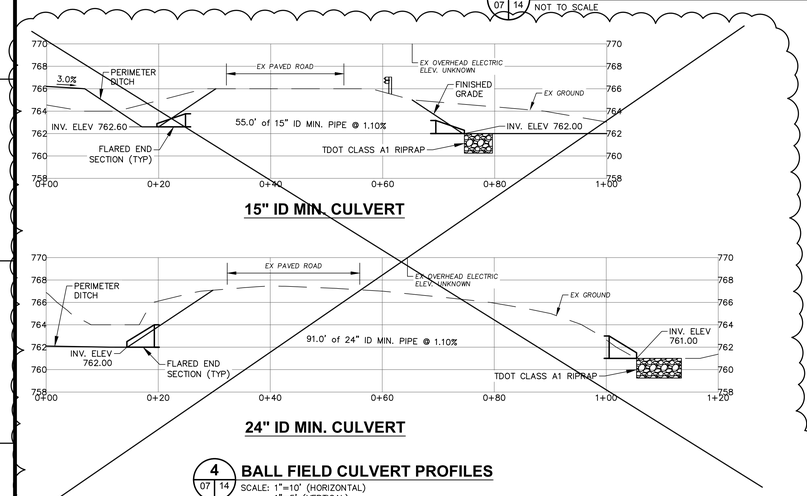


2 05 14 DITCH 11 GEOMEMBRANE LINER TYPICAL SECTION
NOT TO SCALE

06



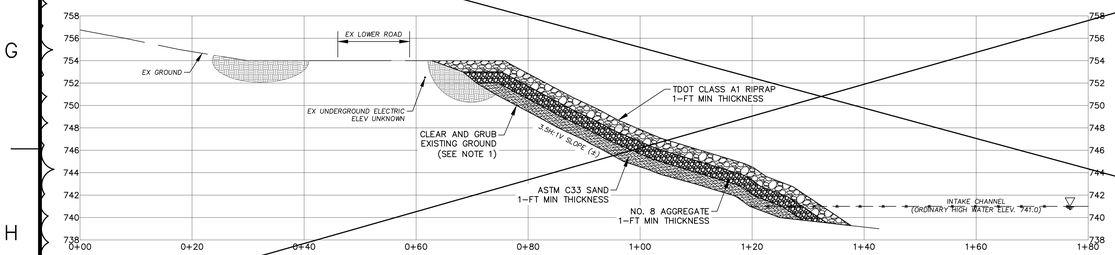
3 07 14 TYPICAL PERIMETER DITCH AT ROAD
NOT TO SCALE



15" ID MIN. CULVERT

24" ID MIN. CULVERT

4 07 14 BALL FIELD CULVERT PROFILES
SCALE: 1"=10' (HORIZONTAL)
1"=5' (VERTICAL)

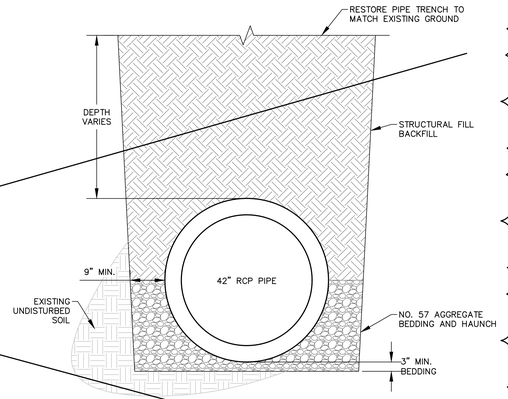


NOTES:

1. EXISTING GROUND TO BE CLEARED AND GRUBBED OF ALL TREES, STUMPS, VEGETATION, ROOTS, BRUSH, LOGS, STICKS, TRASH, AND OTHER MATERIALS TO ALLOW FOR A DIRECT INTERFACE BETWEEN EXISTING SOIL AND SAND FILTER LAYER.

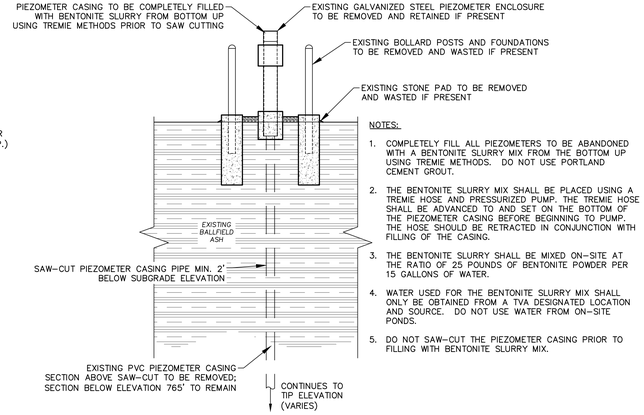
8 05 14 SEEP PROTECTION REVERSE-GRADE FILTER
SCALE: 1"=10' (HORIZONTAL)
1"=5' (VERTICAL)

NOT CONSTRUCTED 1



9 12 14 42" RCP PIPE TRENCH
NOT TO SCALE

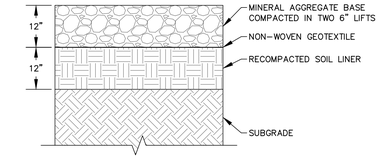
13



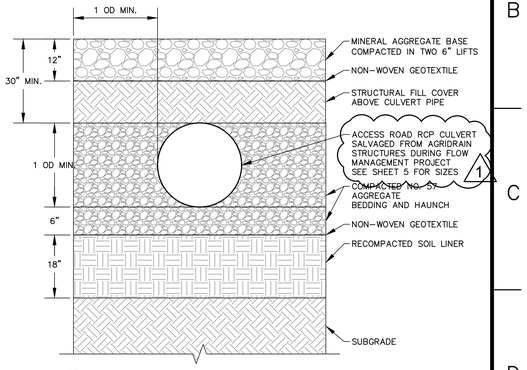
NOTES:

1. COMPLETELY FILL ALL PIEZOMETERS TO BE ABANDONED WITH A BENTONITE SLURRY MIX FROM THE BOTTOM UP USING TREMIE METHODS. DO NOT USE PORTLAND CEMENT GROUT.
2. THE BENTONITE SLURRY MIX SHALL BE PLACED USING A TREMIE HOSE AND PRESSURIZED PUMP. THE TREMIE HOSE SHALL BE ADVANCED TO AND SET ON THE BOTTOM OF THE PIEZOMETER CASING BEFORE BEGINNING TO PUMP. THE HOSE SHOULD BE RETRACTED IN CONJUNCTION WITH FILLING OF THE CASING.
3. THE BENTONITE SLURRY SHALL BE MIXED ON-SITE AT THE RATIO OF 25 POUNDS OF BENTONITE POWDER PER 15 GALLONS OF WATER.
4. WATER USED FOR THE BENTONITE SLURRY MIX SHALL ONLY BE OBTAINED FROM A TVA DESIGNATED LOCATION AND SOURCE. DO NOT USE WATER FROM ON-SITE PONDS.
5. DO NOT SAW-CUT THE PIEZOMETER CASING PRIOR TO FILLING WITH BENTONITE SLURRY MIX.

5 05 14 PIEZOMETER ABANDONMENT DETAIL
NOT TO SCALE

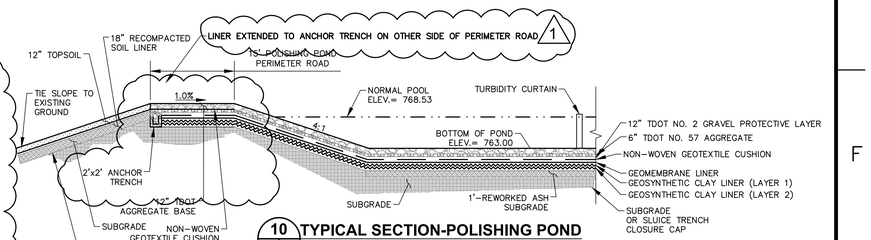


6 09 14 ACCESS ROAD SECTION
NOT TO SCALE



7 09 14 ACCESS ROAD SECTION AT CULVERT
NOT TO SCALE

NOTE: SEE SHEET 10W387-05 FOR PIPE TYPE AND SIZING AT EACH CULVERT 1



10 08 14 TYPICAL SECTION-POLISHING POND
NOT TO SCALE

FOR SUPPORTING DESIGN CALCULATIONS SEE FPGKIFDEGCDX0003002016000153

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST
R 1	03/07/18	ZSK	TBS	CAB	TAK	RBC	MST	JCK	604769	J
AS-BUILT RECORD DRAWINGS										
R 0	06/01/2016	ZSK	APM	CAB	TAK	RBC	MST	JCK	604769	D
ISSUED FOR CONSTRUCTION DCN 117580315										

DISCIPLINE INTERFACE
REV. NO. 1 2 3 4

SCALE: AS NOTED EXCEPT AS NOTED

MISCELLANEOUS DETAILS 1

CIVIL

KINGSTON FOSSIL PLANT

BALL FIELD CLOSURE PROJECT

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
ZSK	APM	CAB	TAK	RBC	MST	JCK

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD 2017 | DATE 03/07/18 | 36 | C | 10W387-14 | R 1

AECOM

AECOM	1
TASK COMPLETED BY:	REV NO.

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING DO NOT ALTER MANUALLY

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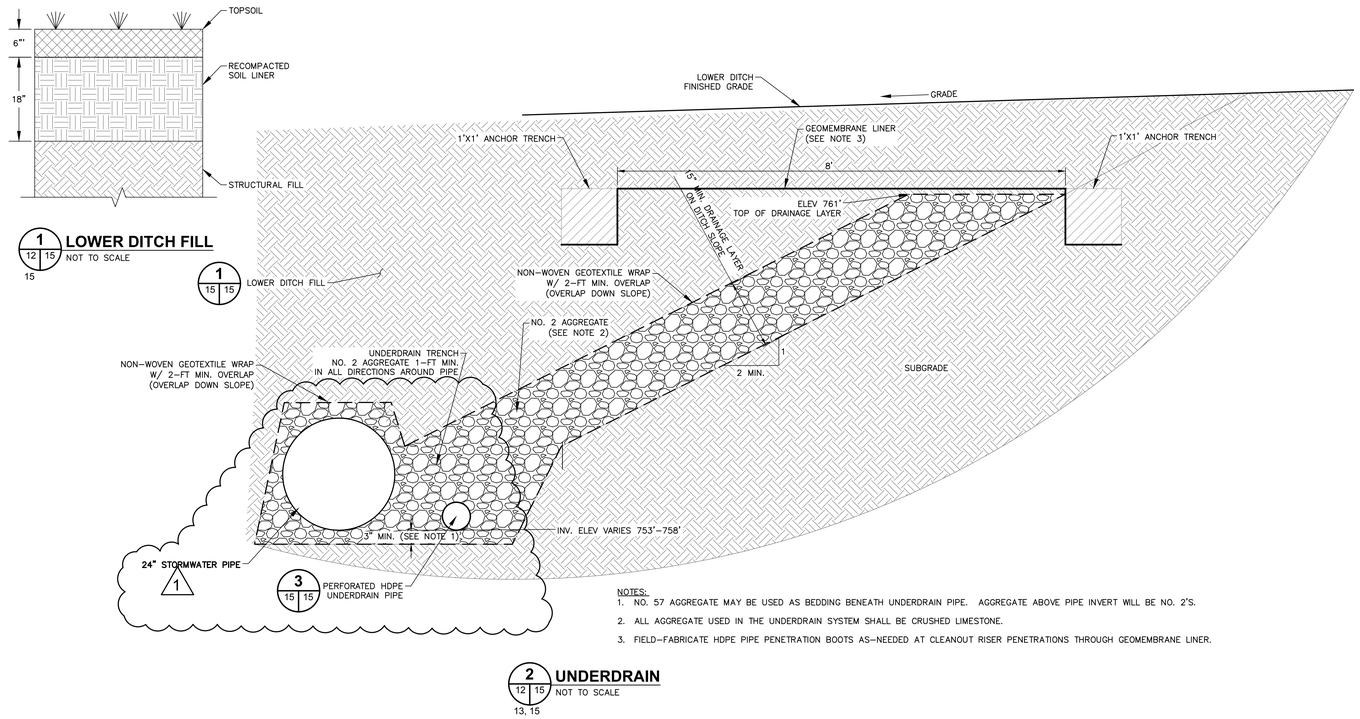
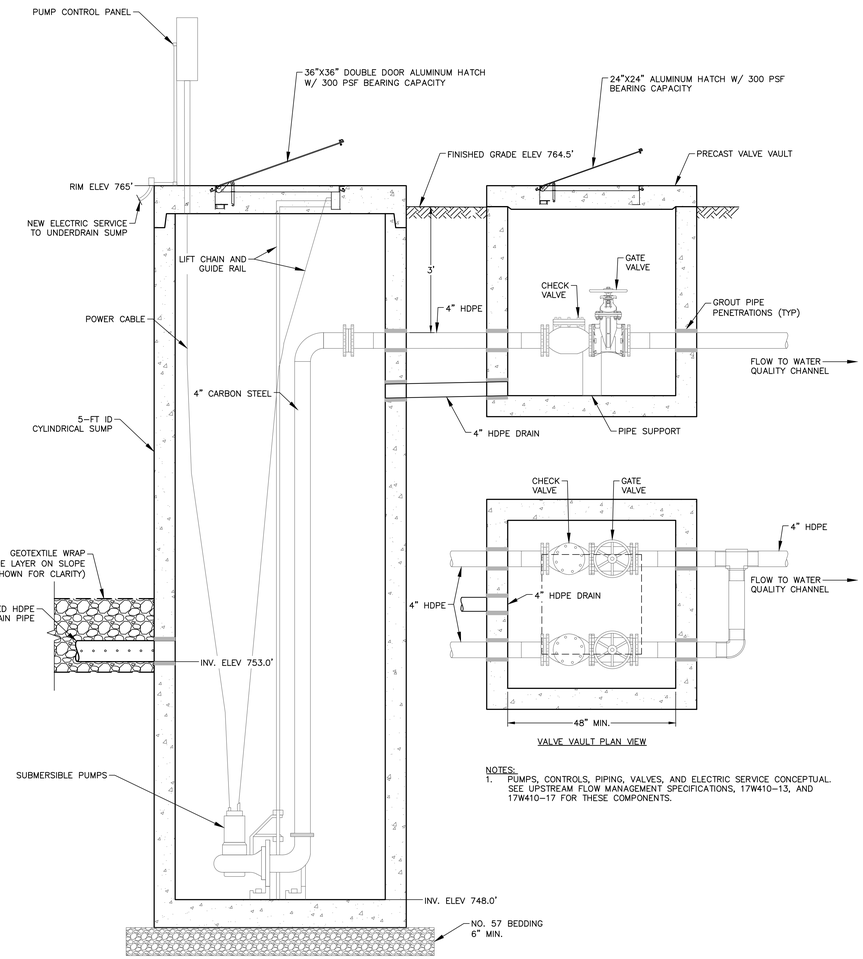


1 / 12 15 — LOWER DITCH FILL
NOT TO SCALE
15

1 / 15 15 LOWER DITCH FILL

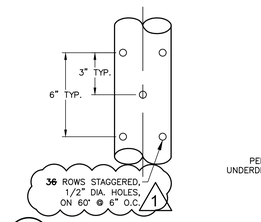
NOTES:
1. NO. 57 AGGREGATE MAY BE USED AS BEDDING BENEATH UNDERDRAIN PIPE. AGGREGATE ABOVE PIPE INVERT WILL BE NO. 2'S.
2. ALL AGGREGATE USED IN THE UNDERDRAIN SYSTEM SHALL BE CRUSHED LIMESTONE.
3. FIELD-FABRICATE HDPE PIPE PENETRATION BOOTS AS-NEEDED AT CLEANOUT RISER PENETRATIONS THROUGH GEOMEMBRANE LINER.

2 / 12 15 — UNDERDRAIN
NOT TO SCALE
13, 15

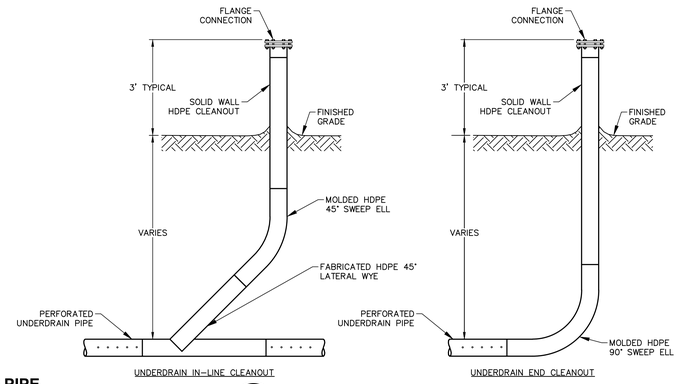


NOTES:
1. PUMPS, CONTROLS, PIPING, VALVES, AND ELECTRIC SERVICE CONCEPTUAL. SEE UPSTREAM FLOW MANAGEMENT SPECIFICATIONS, 17W410-13, AND 17W410-17 FOR THESE COMPONENTS.

5 / 12 15 — SEEPAGE COLLECTION SUMP
NOT TO SCALE



3 / 15 15 — PERFORATED HDPE PIPE
NOT TO SCALE



4 / 12 15 — UNDERDRAIN CLEANOUT
NOT TO SCALE

FOR SUPPORTING DESIGN CALCULATIONS SEE FPGKIFDEGCDX0003002016000153

REV NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST	REV QA
R 1	03/07/18	ZSK	TBS	CAD	TAK	RBC	MST	JCK	604769		J
AS-BUILT RECORD DRAWING											
R 0	06/01/2016	ZSK	APM	CAB	TAK	RBC	MST	JCK	604769		D
ISSUED FOR CONSTRUCTION DCN 117580315											

DISCIPLINE INTERFACE

SCALE: AS NOTED — EXCEPT AS NOTED

MISCELLANEOUS DETAILS 2

CIVIL

KINGSTON FOSSIL PLANT

BALL FIELD CLOSURE PROJECT

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
ZSK	APM	CAB	TAK	RBC	MST	JCK

AECOM

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

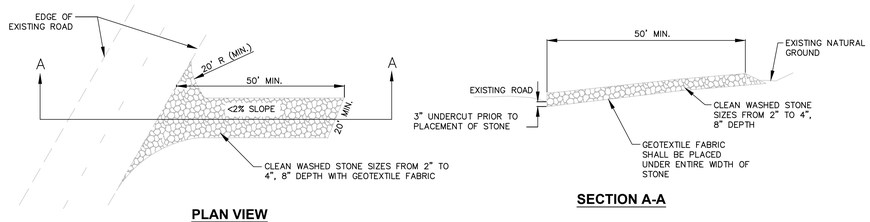
AUTOCAD	2017	DATE 03/07/18	36	C	10W387-15	R 1

AECOM	1
TASK COMPLETED BY:	REV NO.

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING DO NOT ALTER MANUALLY

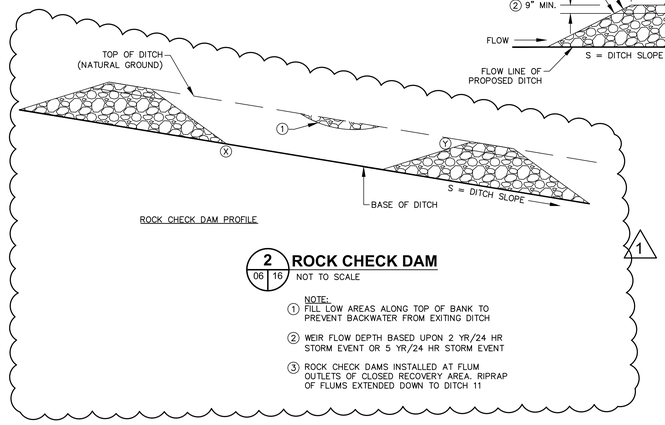
G:\Aecom\DCS\Projects_Legacy\TVA-KIF\60429354_BALLFIELD\DWGs\Outbound\Final Drawings To TVA\As-Builts\10W387-15 Miscellaneous Details 2_AsBuilt.dwg User:tom.selle Mar 13, 2018 - 10:55am



PLAN VIEW

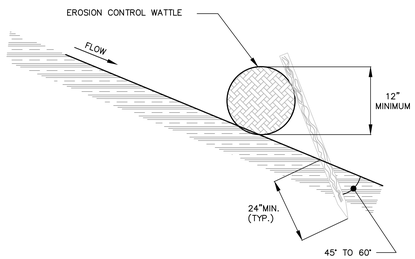
SECTION A-A

1 CONSTRUCTION EXIT
06 | 16 NOT TO SCALE



2 ROCK CHECK DAM
06 | 16 NOT TO SCALE

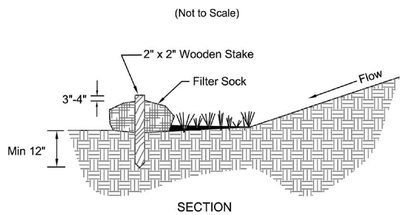
NOTE:
1. FILL LOW AREAS ALONG TOP OF BANK TO PREVENT BACKWATER FROM EXITING DITCH
2. WEIR FLOW DEPTH BASED UPON 2 YR/24 HR STORM EVENT OR 5 YR/24 HR STORM EVENT
3. ROCK CHECK DAMS INSTALLED AT FLUM OUTLETS OF CLOSED RECOVERY AREA. RIPRAP OF FLUMS EXTENDED DOWN TO DITCH 11



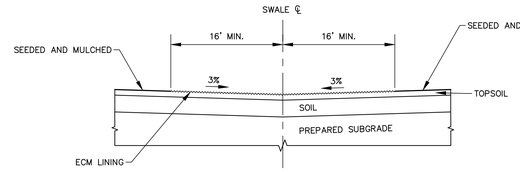
3 EROSION CONTROL WATTLE
06 | 16 NOT TO SCALE

NOTE:

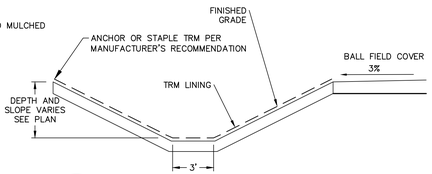
SILT SOCK, DETAIL 4 SHEET 15, MAY BE SUBSTITUTED FOR WATTLE.



4 SILT SOCK
16 | 16 NOT TO SCALE

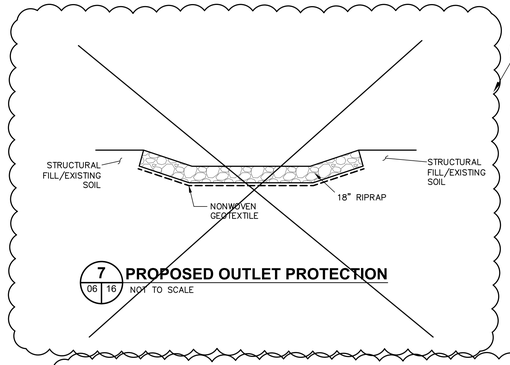


5 ECM-LINED STORMWATER SWALE
06 | 16 NOT TO SCALE



6 TRM-LINED PERIMETER DITCH
06 | 16 NOT TO SCALE

NOTE:
1. TRM-LINING USED ONLY AT DITCH 11. SEE FIGURE 1



7 PROPOSED OUTLET PROTECTION
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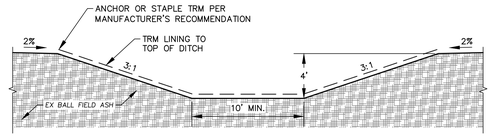
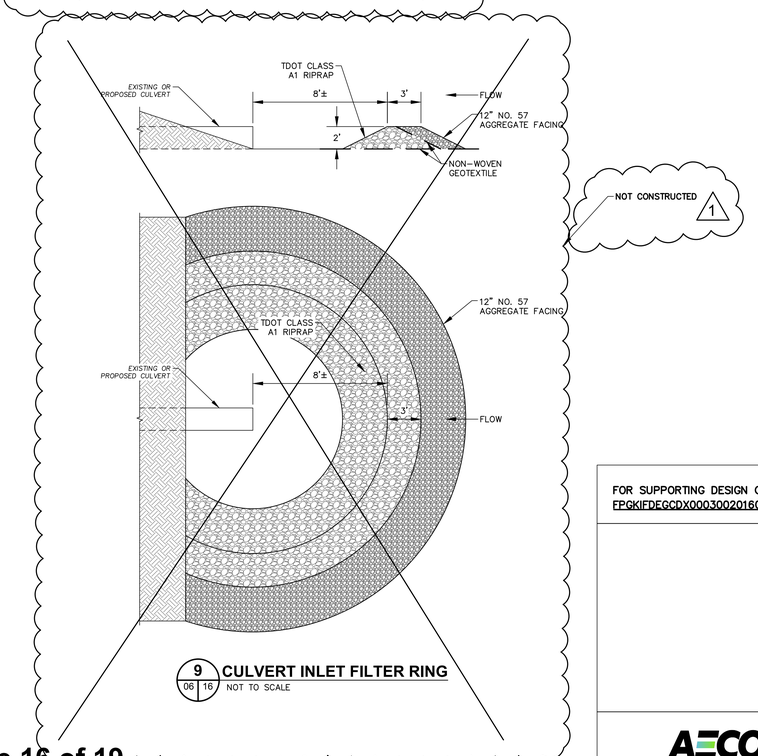


8 BYPASS DITCH
04 | 16 NOT TO SCALE



9 CULVERT INLET FILTER RING
06 | 16 NOT TO SCALE

FOR SUPPORTING DESIGN CALCULATIONS SEE FPGKIFDEGCDX0003002016000153

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST	REV. ID
R 1	03/07/18	ZSK	TBS	CAB	TAK	RBC	MST	JCK	604769		J
AS-BUILT RECORD DRAWING											
R 0	06/01/2016	ZSK	APM	CAB	TAK	RBC	MST	JCK	604769		D
ISSUED FOR CONSTRUCTION DCN 117580315											

DISCIPLINE INTERFACE

SCALE: AS NOTED EXCEPT AS NOTED

EROSION AND SEDIMENT CONTROL DETAILS I

CIVIL

KINGSTON FOSSIL PLANT

BALL FIELD CLOSURE PROJECT

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
ZSK	APM	CAB	TAK	RBC	MST	JCK

AECOM

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD 2017 | DATE 03/07/18 | 36 | C | 10W387-16 | R 1

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

AECOM	1
TASK COMPLETED BY:	REV NO.

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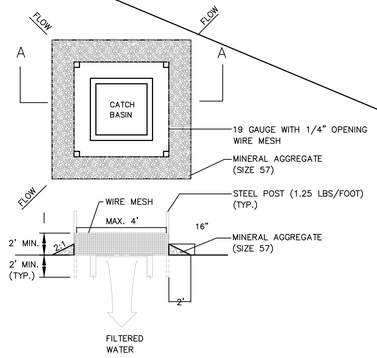
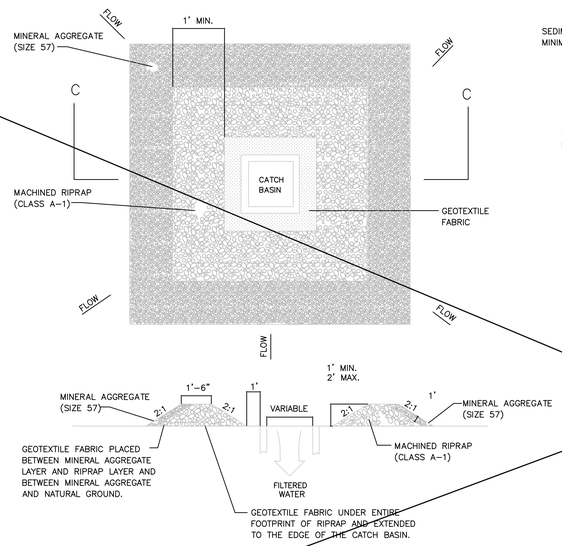
HARDWARE CLOTH AND GRAVEL INLET PROTECTION



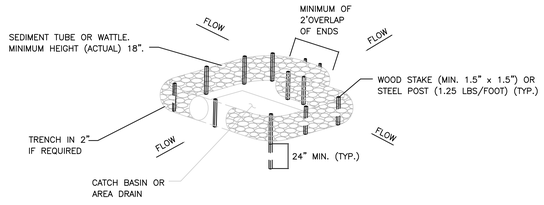
SECTION A–A

CATCH BASIN PROTECTION

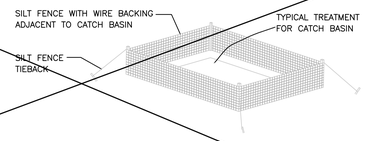


SECTION C–C

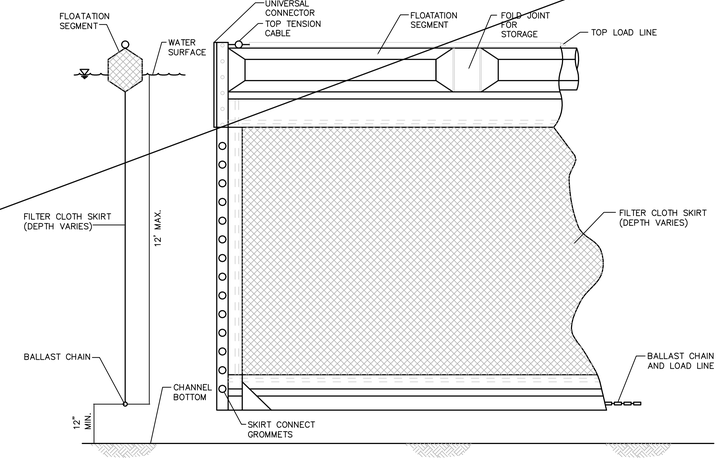
CATCH BASIN PROTECTION (TYPE D)



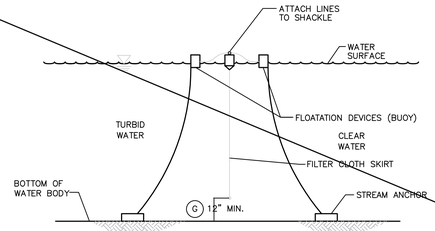
CATCH BASIN PROTECTION (TYPE E)



TURBIDITY CURTAIN

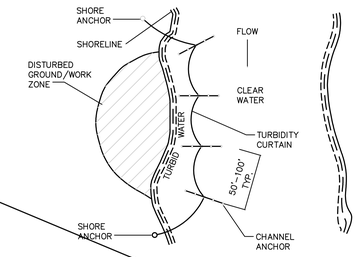


TYPICAL ANCHORING SECTION



SECTION A–A

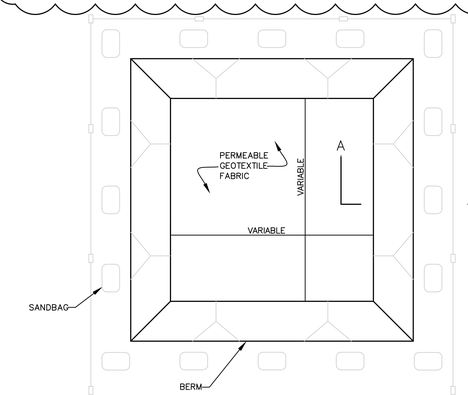
TYPICAL ANCHORING PLAN FOR SHORELINE/RIVER EDGE WORK



PLAN VIEW

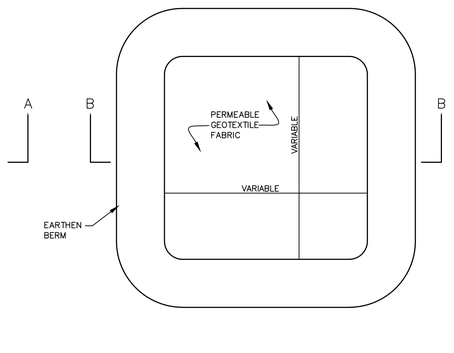
2 TEMPORARY TURBIDITY CURTAIN
06 17 NOT TO SCALE

1 NOT CONSTRUCTED



PLAN VIEW
NOT TO SCALE

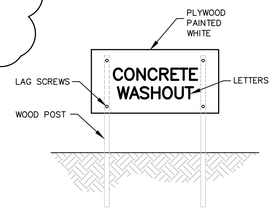
TYPE "BELOW GRADE"



PLAN VIEW
NOT TO SCALE

TYPE "ABOVE GRADE" WITH EARTHERN BERMS

3 CONCRETE WASHOUT
06 17 NOT TO SCALE



CONCRETE WASHOUT SIGN (OR EQUIVALENT)

NOTES:

1. ACTUAL LAYOUT DETERMINED IN THE FIELD.
2. SIGNAGE IDENTIFYING THE CONCRETE WASHOUT AREA SHALL BE INSTALLED WITHIN 5–FT OF THE WASHOUT FACILITY.

FOR SUPPORTING DESIGN CALCULATIONS SEE FPGKIFDEGCDX0003002016000153

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST
R 1	03/07/18	ZSK	TBS	CAB	TAK	RC	MST	JCK	604769	
AS–BUILT RECORD DRAWING										
R 0	06/01/2016	ZSK	APM	CAB	TAK	RBC	MST	JCK	604769	
ISSUED FOR CONSTRUCTION DCN 117580315										

SCALE: AS NOTED — EXCEPT AS NOTED

EROSION AND SEDIMENT CONTROL DETAILS II

CIVIL

KINGSTON FOSSIL PLANT

BALL FIELD CLOSURE PROJECT

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
ZSK	APM	CAB	TAK	RBC	MST	JCK

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD 2017 | DATE 03/07/18 | 36 | C | 10W387–17 | R 1

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING DO NOT ALTER MANUALLY

AECOM	1
TASK COMPLETED BY:	REV NO.

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GEOMEMBRANE TIE-IN TO RECOVERY AREA AND DITCH 11 LINER

DITCH 11

DITCH 11 TIE-IN ELEV. 760.43

RIPRAP AND #2 STONE IN USED IN PLACE OF CONCRETE DITCH LINING

GEOMEMBRANE TIE-IN TO SCOUR BASIN LINER

PROPOSED LIMIT OF GEOMEMBRANE INSTALLATION (6.2 AC)

RCP ACCESS ROAD CULVERT CROSSING (TYP)

LOWERED CULVERT @ 0.18%

CONVEYANCE PIPES

LIMIT OF RSL PLACEMENT IN NORTHWEST CORNER

NEW 30 FEET WIDE ACCESS ROAD

ENGINEERED REDWATER WETLANDS

SCOUR BASIN/DITCH 11 STORM WATER OUTLET

CONCRETE-LINED OUTLET DITCH 890 LF @ 0.18%

POLISHING POND

BALL FIELD COVER

EX ROAD TO REMAIN

WEST AND SOUTH CONCRETE-LINED PERIMETER DITCH 1,730 LF 0.43%

DITCH ELEV. 762.24

EXPANSION JOINTS AT CONFLUENCE (3 TOTAL)

INFLOW CHANNEL

INTAKE CHANNEL
EMORY RIVER
(ORDINARY HIGH WATER ELEV. 741.0)

FUTURE BOTTOM ASH DEWATERING FACILITY BY OTHERS

CONCRETE-LINED EAST PERIMETER DITCH 1,210 LF

OPERATIONS ROAD BY OTHERS

CULVERTS TO REMAIN

BADWF PIPE TIE-IN ELEV. 763.40
DITCH GRADE BREAK
0.18% DOWNSTREAM
0.38% UPSTREAM

CONCRETE-LINED SWALE 800 LF @ 0.5%

MH-LD-2 ISOLATION JOINT

EXPANSION JOINTS AT CONFLUENCE (1 TOTAL)

CONCRETE LINING NOT EXTENDED TO END OF PIPE RACK

MH-LD-1 ISOLATION JOINT

CONCRETE-LINED SWALE 290 LF @ 0.5%

SHOT ROCK PLACED AROUND 12" AND 18" PIPE OUTFALLS

SHOT ROCK PLACED AROUND 12" AND 18" PIPE OUTFALLS

N

0 100 200
SCALE IN FEET

NOTE:

1. AERIAL TOPOGRAPHY DEVELOPED BY TUCK MAPPING SOLUTIONS, INC. VIA 11/10/2014 FLIGHT.

LEGEND

GEOMEMBRANE LINER EXTENTS

PROPOSED CONCRETE-LINED DITCH

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST	REV NO
R 1	03/07/18	ZSK	TBS	CAB	TAK	RBC	MST	JCK	604769		J
AS-BUILT RECORD DRAWING											
R 1	09/02/2016	ZSK	APM	CAB	TAK	RBC	MST	JCK	604769		D
ISSUED AS BUILT											

DISCIPLINE INTERFACE

SCALE: AS NOTED EXCEPT AS NOTED

DITCH LINING PLAN

CIVIL

KINGSTON FOSSIL PLANT

BALL FIELD CLOSURE PROJECT

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
ZSK	APM	CAB	TAK	RBC	MST	JCK

AECOM

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

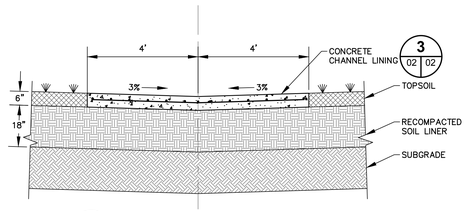
AUTOCAD	2017	DATE 03/07/18	36	C	10W387-18	R 1

AECOM	1
TASK COMPLETED BY:	REV NO.

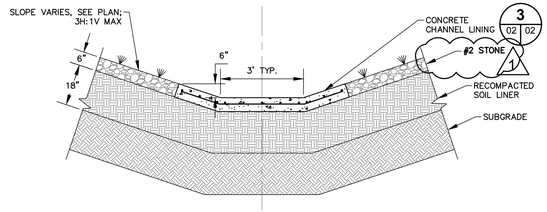
PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

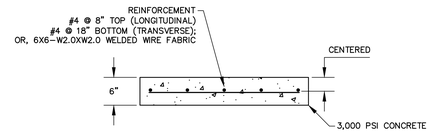
C:\Hold\Xrf\downstream flow man\10W387-SERIES\10W387-18 Ditch Lining Plan.dwg User:srcothey Apr 30, 2018 - 7:51am



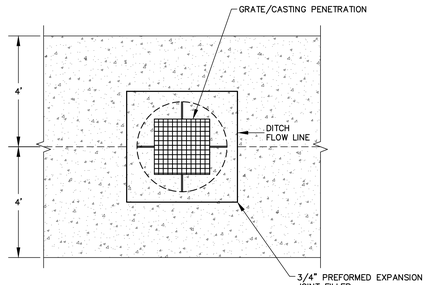
1 01 02 CONCRETE-LINED SWALE
SCALE: 1"=2'



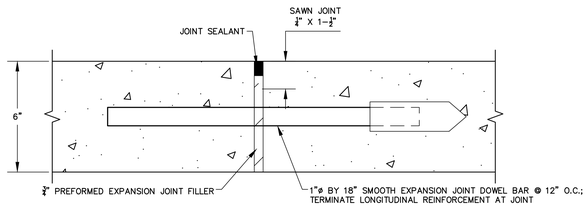
2 01 02 CONCRETE-LINED PERIMETER DITCH
SCALE: 1"=2'



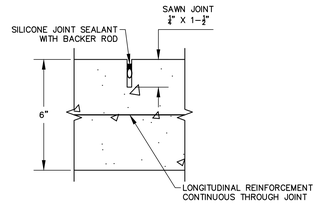
3 02 02 CONCRETE CHANNEL LINING
SCALE: 1"=2'



4 01 02 MANHOLE ISOLATION JOINT
SCALE: 1"=2'



5 01 02 SEALED CONTROL JOINT
SCALE: NONE



6 01 02 SEALED CONTROL JOINT
SCALE: NONE

R 1	03/07/18	ZSK	TBS	CAB	TAK	RBC	MST	JCK	604769	J
AS-BUILT RECORD DRAWING										
R A	09/02/2016	ZSK	APM	CAB	TAK	RBC	MST	JCK	604769	D
ISSUED FOR CONSTRUCTION DCN 117580315										

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST

DISCIPLINE INTERFACE

SCALE: AS NOTED — EXCEPT AS NOTED

DITCH LINING DETAILS

CIVIL

KINGSTON FOSSIL PLANT

BALL FIELD CLOSURE PROJECT

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
ZSK	APM	CAB	TAK	RBC	MST	JCK

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD	2015	DATE 03/07/18	36	C	10W387-19	R 1

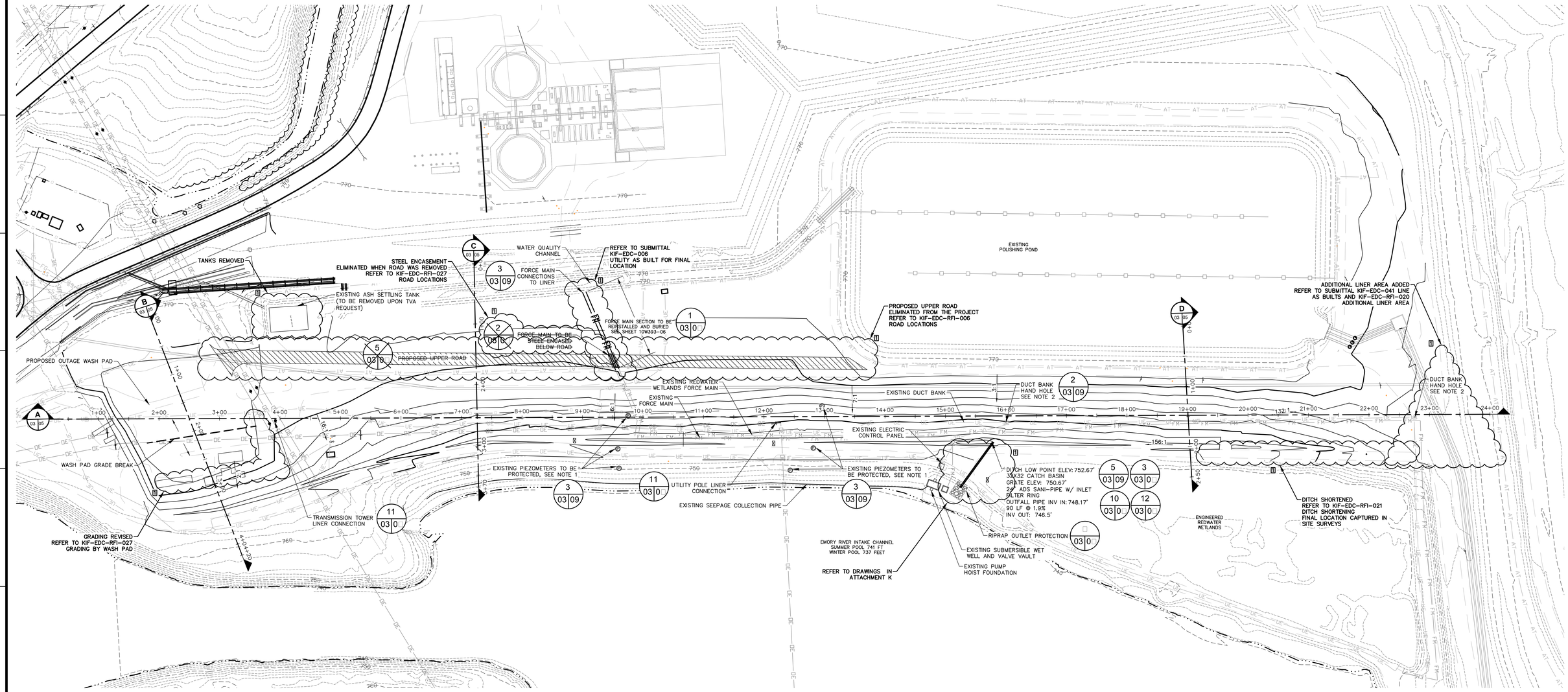
AECOM

AECOM	1
TASK COMPLETED BY:	REV NO.

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

C:\Hold\x\f\downstream flow man\10W387-SERIES\10W387-19 Concrete Ditch Details.dwg User:scathey Apr 30, 2018 - 7:54am



630 EXISTING MAJOR CONTOUR INTERVAL
EXISTING MINOR CONTOUR INTERVAL
630 PROPOSED MAJOR CONTOUR INTERVAL
PROPOSED MINOR CONTOUR INTERVAL
SITE VEGETATION BOUNDARY
EXISTING FENCE
EXISTING OVERHEAD ELECTRIC LINE
EXISTING UNDERGROUND ELECTRIC LINE
EXISTING UTILITY POLE
EDGE OF WATER

EXISTING ROADWAY EXTENTS (UNPAVED)
AT EXISTING ANCHOR TRENCH
FM EXISTING FORCE MAIN
FM PROPOSED FORCE MAIN
LOD LIMITS OF DISTURBANCE
EXISTING PIEZOMETER

0 60 120
SCALE IN FEET

REFER TO THE FOLLOWING RFIs AND SUBMITTALS FOR AS BUILT GRADE INFORMATION:

RFIs:
- KIF-EDC-RFI-001 – FIELD GRADE TO REDUCE EXCESS MATERIAL
- KIF-EDC-RFI-015 – FIELD GRADE AROUND EXISTING STRUCTURES
- KIF-EDC-RFI-016 – FORCE MAIN ELEVATION INTERFERENCE WITH GRADE
- KIF-EDC-RFI-027 – GRADING BY WASH PAD

SUBMITTALS:
- KIF-EDC-009 – TOP OF PROTECTIVE COVER SURVEY
- KIF-EDC-010 – FINAL SITE CONDITIONS

NOTES
1. EXISTING PIEZOMETERS ARE TO REMAIN AND SHALL BE PROTECTED FROM DAMAGE DURING CONSTRUCTION ACTIVITIES. CONTRACTOR TO RAISE PIEZOMETERS TO GRADE PER TVA INSTRUCTION.
2. CONTRACTOR TO RAISE HAND HOLES AS NEEDED, POUR CONCRETE SLAB AND CONNECT TO LINER WITH POLYLOK.

RECORD DRAWING

THIS DRAWING WAS REVISED BASED ON INFORMATION FURNISHED BY THE CONTRACTOR AND THE OWNER TO INCORPORATE CONSTRUCTION CHANGES. CARE SHALL BE TAKEN IN ANY FURTHER USE OF THIS DRAWING FOR THE EXTENSIONS OF THIS PROJECT OR FOR ANY OTHER PROJECT WITHOUT FIELD VERIFICATION

FOR SUPPORTING DESIGN CALCULATIONS SEE

THOMAS ANDREW MOSHOLDER REGISTERED ENGINEER 41448 STATE OF TENNESSEE June 11, 2019

AECOM

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST	REV. NO.
R 1	6/11/19										J
AS-BUILT DRAWINGS											
R 0	9/24/18	AMC	AMC	LEH	TAK	CBK	AFN	MST	613920		0
ISSUED FOR CONSTRUCTION											

DISCIPLINE INTERFACE

SCALE: AS SHOWN EXCEPT AS NOTED

TOP OF PROTECTIVE COVER

CIVIL

KINGSTON FOSSIL PLANT

EAST DIKE AREA CLOSURE

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
AMC	AMC	LEH	TAK	CBK	AFN	MST

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD	2017	DATE 6/11/19	36	C	10W393-03	R 1

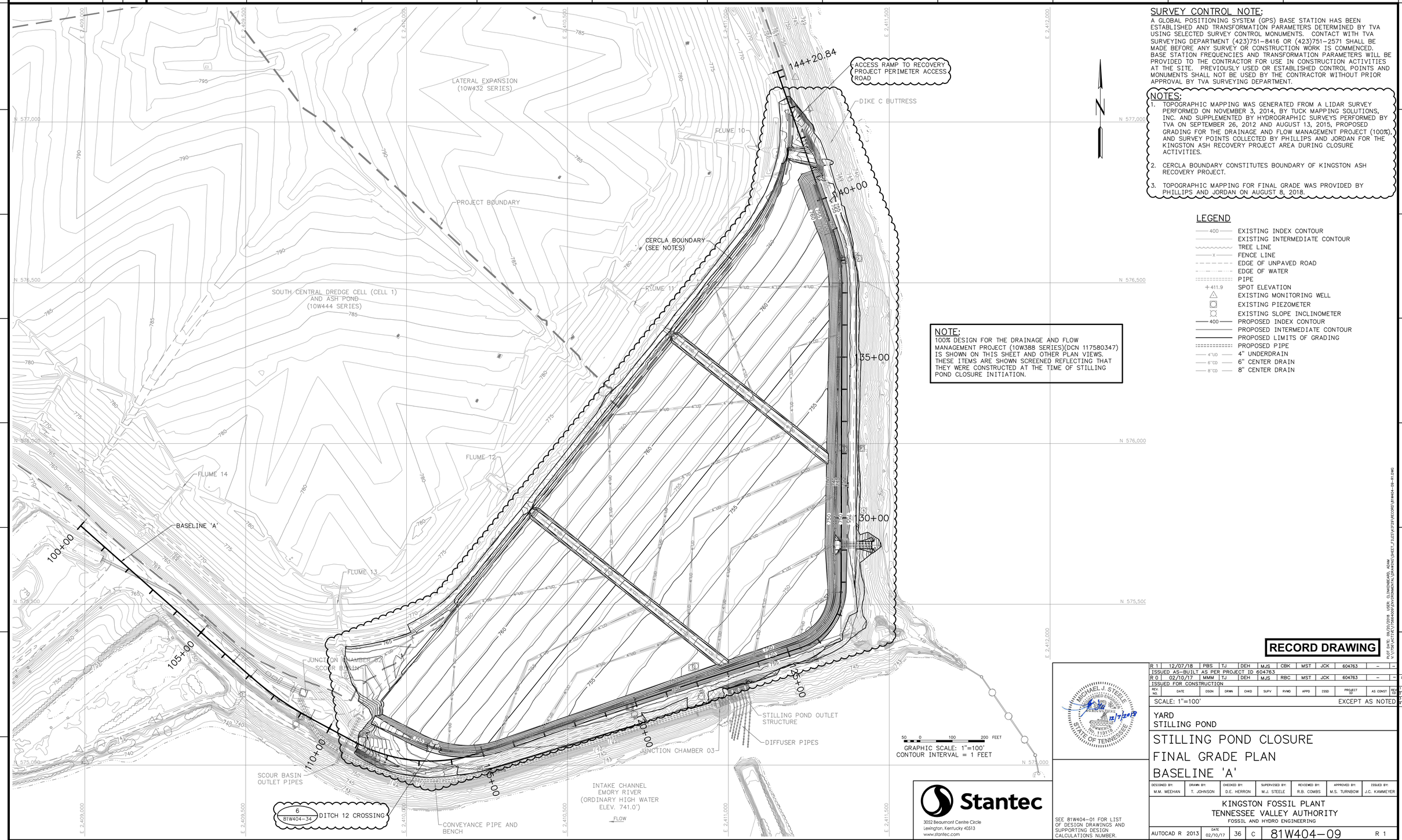
AECOM | 1
TASK COMPLETED BY: | REV NO.

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

G:\Aikron\DCS\Projects_Legacy\TVA-KIF\Area East of Sluice Trench Cap\900-CAD-GIS\910-CAD\20-SHEETS\03 TOP OF PROTECTIVE COVER.dwg User:Laura.Hatch Jun 11, 2019 - 3:26pm

36 | C | 81W404-09



SURVEY CONTROL NOTE:

A GLOBAL POSITIONING SYSTEM (GPS) BASE STATION HAS BEEN ESTABLISHED AND TRANSFORMATION PARAMETERS DETERMINED BY TVA USING SELECTED SURVEY CONTROL MONUMENTS. CONTACT WITH TVA SURVEYING DEPARTMENT (423)751-8416 OR (423)751-2571 SHALL BE MADE BEFORE ANY SURVEY OR CONSTRUCTION WORK IS COMMENCED. BASE STATION FREQUENCIES AND TRANSFORMATION PARAMETERS WILL BE PROVIDED TO THE CONTRACTOR FOR USE IN CONSTRUCTION ACTIVITIES AT THE SITE. PREVIOUSLY USED OR ESTABLISHED CONTROL POINTS AND MONUMENTS SHALL NOT BE USED BY THE CONTRACTOR WITHOUT PRIOR APPROVAL BY TVA SURVEYING DEPARTMENT.

NOTES:

1. TOPOGRAPHIC MAPPING WAS GENERATED FROM A LIDAR SURVEY PERFORMED ON NOVEMBER 3, 2014, BY TUCK MAPPING SOLUTIONS, INC. AND SUPPLEMENTED BY HYDROGRAPHIC SURVEYS PERFORMED BY TVA ON SEPTEMBER 26, 2012 AND AUGUST 13, 2015, PROPOSED GRADING FOR THE DRAINAGE AND FLOW MANAGEMENT PROJECT (100%), AND SURVEY POINTS COLLECTED BY PHILLIPS AND JORDAN FOR THE KINGSTON ASH RECOVERY PROJECT AREA DURING CLOSURE ACTIVITIES.
2. CERCLA BOUNDARY CONSTITUTES BOUNDARY OF KINGSTON ASH RECOVERY PROJECT.
3. TOPOGRAPHIC MAPPING FOR FINAL GRADE WAS PROVIDED BY PHILLIPS AND JORDAN ON AUGUST 8, 2018.

NOTE:

100% DESIGN FOR THE DRAINAGE AND FLOW MANAGEMENT PROJECT (10W388 SERIES)(DCN 117580347) IS SHOWN ON THIS SHEET AND OTHER PLAN VIEWS. THESE ITEMS ARE SHOWN SCREENED REFLECTING THAT THEY WERE CONSTRUCTED AT THE TIME OF STILLING POND CLOSURE INITIATION.

LEGEND

- 400 — EXISTING INDEX CONTOUR
- EXISTING INTERMEDIATE CONTOUR
- TREE LINE
- x — FENCE LINE
- EDGE OF UNPAVED ROAD
- EDGE OF WATER
- PIPE
- +411.9 SPOT ELEVATION
- EXISTING MONITORING WELL
- EXISTING PIEZOMETER
- EXISTING SLOPE INCLINOMETER
- 400 — PROPOSED INDEX CONTOUR
- PROPOSED INTERMEDIATE CONTOUR
- PROPOSED LIMITS OF GRADING
- PROPOSED PIPE
- 4"UD — 4" UNDERDRAIN
- 6"CD — 6" CENTER DRAIN
- 8"CD — 8" CENTER DRAIN

GRAPHIC SCALE: 1"=100'
CONTOUR INTERVAL = 1 FEET
50 0 100 200 FEET

RECORD DRAWING

REV NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST
R 1	12/07/18	PBS	TJ	DEH	MJS	CBK	MST	JCK	604763	–
	ISSUED AS-BUILT AS PER PROJECT ID 604763									
R 0	02/10/17	MMM	TJ	DEH	MJS	RBC	MST	JCK	604763	–
	ISSUED FOR CONSTRUCTION									

DISCIPLINE INTERFACE: 1 2 3 4

SCALE: 1"=100' EXCEPT AS NOTED

YARD
STILLING POND

STILLING POND CLOSURE
FINAL GRADE PLAN
BASELINE 'A'

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
M.M. MEEHAN	T. JOHNSON	D.E. HERRON	M.J. STEELE	R.B. COMBS	M.S. TURNBOW	J.C. KAMMEYER

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2013 | DATE 02/10/17 | 36 | C | 81W404-09 | R 1

PLOT FACTOR:1
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

Stantec
3052 Beaumont Centre Circle
Lexington, Kentucky 40513
www.stantec.com

SEE 81W404-01 FOR LIST OF DESIGN DRAWINGS AND SUPPORTING DESIGN CALCULATIONS NUMBER.

STANTEC	1
TASK COMPLETED BY:	REV NO.

PLOT DATE: 09/20/2018 USER: CLINKNEMS, ADAM
V:\1758\ACTIVE\125604609\DIV\FROMDEN\TAL\BASMTNS\SHEET_FILES\VLF29\VECORD\81W404-09-R1.DWG

TABLE OF BASELINE 'A' COORDINATES

NUMBER	BEGIN STATION	NORTHING	EASTING	LINE/CHORD LENGTH	LINE/CHORD BEARING	END STATION	NORTHING	EASTING	P.I. STATION	NORTHING	EASTING	DELTA	DEGREE OF CURVE	TANGENT	ARC LENGTH	RADIUS	EXTERNAL
L1	100+00.00	575,744.24	2,408,987.12	500.00'	S48°25'22"E	105+00.00	575,412.43	2,409,361.15									
L2	105+00.00	575,412.43	2,409,361.15	134.97'	S48°25'22"E	106+34.97	575,322.86	2,409,462.12									
L3	106+34.97	575,322.86	2,409,462.12	71.83'	S48°25'22"E	107+06.80	575,275.19	2,409,515.85									
C1	107+06.80	575,275.19	2,409,515.85	226.33'	S55°05'25"E	109+33.64	575,145.67	2,409,701.45	108+20.73	575,199.58	2,409,601.08	13°20'06"	5°52'42"	113.94'	226.85'	974.68'	6.64'
L4	109+33.64	575,145.67	2,409,701.45	66.36'	S61°45'28"E	110+00.00	575,114.27	2,409,759.91									
L5	110+00.00	575,114.27	2,409,759.91	94.67'	S61°45'28"E	110+94.67	575,069.47	2,409,843.31									
C2	110+94.67	575,069.47	2,409,843.31	377.44'	S84°55'03"E	114+82.59	575,036.03	2,410,219.27	112+99.93	574,972.34	2,410,024.14	46°19'10"	11°56'26"	205.26'	387.91'	479.84'	42.06'
L6	114+82.59	575,036.03	2,410,219.27	1056.93'	N71°55'22"E	125+39.52	575,363.99	2,411,224.03									
C3	125+39.52	575,363.99	2,411,224.03	214.45'	N36°02'28"E	127+68.65	575,537.39	2,411,350.20	126+71.85	575,405.06	2,411,349.83	71°45'50"	31°19'10"	132.34'	229.13'	182.94'	42.85'
L7	127+68.65	575,537.39	2,411,350.20	961.63'	N0°09'33"E	137+30.28	576,499.02	2,411,352.87									
C4	137+30.28	576,499.02	2,411,352.87	161.36'	N9°31'13"W	138+92.40	576,658.15	2,411,326.18	138+12.12	576,580.86	2,411,353.10	19°21'32"	11°56'26"	81.84'	162.13'	479.84'	6.93'
L8	138+92.40	576,658.15	2,411,326.18	528.44'	N19°11'59"W	144+20.84	577,157.20	2,411,152.40									

SURVEY CONTROL NOTE:

A GLOBAL POSITIONING SYSTEM (GPS) BASE STATION HAS BEEN ESTABLISHED AND TRANSFORMATION PARAMETERS DETERMINED BY TVA USING SELECTED SURVEY CONTROL MONUMENTS. CONTACT WITH TVA SURVEYING DEPARTMENT (423)751-8416 OR (423)751-2571 SHALL BE MADE BEFORE ANY SURVEY OR CONSTRUCTION WORK IS COMMENCED. BASE STATION FREQUENCIES AND TRANSFORMATION PARAMETERS WILL BE PROVIDED TO THE CONTRACTOR FOR USE IN CONSTRUCTION ACTIVITIES AT THE SITE. PREVIOUSLY USED OR ESTABLISHED CONTROL POINTS AND MONUMENTS SHALL NOT BE USED BY THE CONTRACTOR WITHOUT PRIOR APPROVAL BY TVA SURVEYING DEPARTMENT.

NOTES:

1. TOPOGRAPHIC MAPPING WAS GENERATED FROM A LIDAR SURVEY PERFORMED ON NOVEMBER 3, 2014, BY TUCK MAPPING SOLUTIONS, INC. AND SUPPLEMENTED BY HYDROGRAPHIC SURVEYS PERFORMED BY TVA ON SEPTEMBER 26, 2012 AND AUGUST 13, 2015, PROPOSED GRADING FOR THE DRAINAGE AND FLOW MANAGEMENT PROJECT (100%), AND SURVEY POINTS COLLECTED BY PHILLIPS AND JORDAN FOR THE KINGSTON ASH RECOVERY PROJECT AREA DURING CLOSURE ACTIVITIES.
2. CERCLA BOUNDARY CONSTITUTES BOUNDARY OF KINGSTON ASH RECOVERY PROJECT.

LEGEND

- 400 — EXISTING INDEX CONTOUR
- EXISTING INTERMEDIATE CONTOUR
- TREE LINE
- FENCE LINE
- EDGE OF UNPAVED ROAD
- EDGE OF WATER
- PIPE
- +411.9 SPOT ELEVATION
- EXISTING MONITORING WELL
- EXISTING PIEZOMETER
- EXISTING SLOPE INCLINOMETER
- (L1) BASELINE LINE LABEL
- (C1) BASELINE CURVE LABEL
- BASELINE

NOTE:

100% DESIGN FOR THE DRAINAGE AND FLOW MANAGEMENT PROJECT (10W388 SERIES)(DCN 117580347) IS SHOWN ON THIS SHEET AND OTHER PLAN VIEWS. THESE ITEMS ARE SHOWN SCREENED REFLECTING THAT THEY WERE CONSTRUCTED AT THE TIME OF STILLING POND CLOSURE INITIATION.

LATERAL EXPANSION (10W432 SERIES)

SOUTH CENTRAL DREDGE CELL (CELL 1) AND ASH POND (10W444 SERIES)

ASH POND OUTLET STRUCTURE REMOVED AND BACKFILLED WITH COMPACTED SOIL MATERIAL

CERCLA BOUNDARY (SEE NOTES)

PROJECT BOUNDARY

DIKE C BUTTRESS

FLUME 10

FLUME 12

FLUME 13

FLUME 14

BASELINE 'A'

100+00

105+00

110+00

115+00

120+00

125+00

130+00

135+00

140+00

144+20.84

DIVIDER DIKE DIVERSION DITCH

STILLING POND (NORMAL POOL ELEV. 755')

SIPHON STRUCTURE REMOVED AND BACKFILLED WITH COMPACTED SOIL MATERIAL

OUTLET RISER STRUCTURES REMOVED AND PIPES THROUGH THE EMBANKMENT ABANDONED BY GROUTING IN PLACE

JUNCTION CHAMBER 02 SCOUR BASIN

JUNCTION CHAMBER 03

SCOUR BASIN OUTLET PIPES

INTAKE CHANNEL EMORY RIVER (ORDINARY HIGH WATER ELEV. 741.0')

FLOW

CONVEYANCE PIPING

SIPHONS (NOT USED)

STILLING POND OUTLET STRUCTURE

DIFFUSER PIPES

LIMITS OF EXISTING CONDITIONS AS-BUILT SURVEY

SI-71 (DAMAGED)

SI-72

SI-73

SI-74

PZ-125D

PZ-126AC

PZ-126BC

PZ-124AC

PZ-124BC

PZ-109

PZ-110

PZ-120

PZ-121

PZ-122

PZ-123

PZ-16C

PZ-18C

PZ-20C

AD-3

B-1

B-2

C-1

C-2

D-1

D-2

GRAPHIC SCALE: 1"=100'
CONTOUR INTERVAL = 2 FEET

50 0 100 200 FEET

RECORD DRAWING

Stantec
3052 Beaumont Centre Circle
Lexington, Kentucky 40513
www.stantec.com

SEE 81W404-01 FOR LIST OF DESIGN DRAWINGS AND SUPPORTING DESIGN CALCULATIONS NUMBER.

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST	REV. NO.
R 1	12/07/18	PBS	TJ	DEH	MJS	CBK	MST	JCK	604763	–	–
ISSUED AS-BUILT AS PER PROJECT ID 604763											
R 0	02/10/17	MMM	TJ	DEH	MJS	RBC	MST	JCK	604763	–	–
ISSUED FOR CONSTRUCTION											

DISCIPLINE INTERFACE

SCALE: 1"=100' EXCEPT AS NOTED

YARD
STILLING POND

STILLING POND CLOSURE EXISTING CONDITIONS AND BASELINE 'A' LAYOUT

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
M.M. MEEHAN	T. JOHNSON	D.E. HERRON	M.J. STEELE	R.B. COMBS	M.S. TURNBOW	J.C. KAMMEYER

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2013	DATE: 02/10/17	36	C	81W404-03	R 1

STANTEC | 1
TASK COMPLETED BY: | REV NO.

PLOT FACTOR:1
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

PLOT DATE: 09/12/2018 USER: CJ.TAKEMEARD, JOAM
V:\1756\ACTIVE\175664009\ENVIRONMENTAL\DRAWINGS\SHEET_FILES\81F29\RECORD\81W404-03-R1.DWG

APPENDIX C – TABLES

Table C.1. Model Input and Confirmation Data Used to Model the Material Quantity Assessment Study Area Pre-Construction and Bottom of CCR Surfaces

Data Type	Data Use	Boring ID	Source
Pre-Construction Contours	Model Input	Not Applicable	Tennessee Valley Authority (TVA). 1958. TVA Drawing 10N400R4: General - Ash Disposal Area. April 7.
Boring Elevation	Confirmation	KIF-B01a	Stantec. 2022. Kingston Fossil Plant Exploratory Drilling Sampling and Analysis Report. Revision 3. Prepared for TVA. January 10, 2022.
Boring Elevation	Confirmation	KIF-B01b	Stantec. 2022. Kingston Fossil Plant Exploratory Drilling Sampling and Analysis Report. Revision 3. Prepared for TVA. January 10, 2022.
Boring Elevation	Confirmation	KIF-B02a	Stantec. 2022. Kingston Fossil Plant Exploratory Drilling Sampling and Analysis Report. Revision 3. Prepared for TVA. January 10, 2022.
Boring Elevation	Confirmation	KIF-B02b	Stantec. 2022. Kingston Fossil Plant Exploratory Drilling Sampling and Analysis Report. Revision 3. Prepared for TVA. January 10, 2022.
Boring Elevation	Confirmation	KIF-B03a	Stantec. 2022. Kingston Fossil Plant Exploratory Drilling Sampling and Analysis Report. Revision 3. Prepared for TVA. January 10, 2022.
Boring Elevation	Confirmation	KIF-B03b	Stantec. 2022. Kingston Fossil Plant Exploratory Drilling Sampling and Analysis Report. Revision 3. Prepared for TVA. January 10, 2022.
Boring Elevation	Confirmation	KIF-B04a	Stantec. 2022. Kingston Fossil Plant Exploratory Drilling Sampling and Analysis Report. Revision 3. Prepared for TVA. January 10, 2022.
Boring Elevation	Confirmation	KIF-TW05	Stantec. 2022. Kingston Fossil Plant Exploratory Drilling Sampling and Analysis Report. Revision 3. Prepared for TVA. January 10, 2022.
Boring Elevation	Model Input	B-1	Geosyntec Consultants. 2010a. Seepage and Stability Study for East Dike and Raised Dike. Prepared for Tennessee Valley Authority. June 30.

Table C.1. Model Input and Confirmation Data Used to Model the Material Quantity Assessment Study Area Pre-Construction and Bottom of CCR Surfaces

Data Type	Data Use	Boring ID	Source
Boring Elevation	Model Input	B-1A	Amec Foster Wheeler Environment and Infrastructure, Inc. (Amec Foster Wheeler). 2015. "Report of Geotechnical Exploration and Liquefaction Analysis, Bottom Ash Dewatering Facility, TVA Kingston Fossil Plant, Harriman, Tennessee." Prepared for Tennessee Valley Authority. March 6.
Boring Elevation	Model Input	B-2	Geosyntec Consultants. 2010a. "Seepage and Stability Study for East Dike and Raised Dike". Prepared for Tennessee Valley Authority. June 30.
Boring Elevation	Model Input	B-2A	Amec Foster Wheeler. 2015. "Report of Geotechnical Exploration and Liquefaction Analysis, Bottom Ash Dewatering Facility, TVA Kingston Fossil Plant, Harriman, Tennessee." Prepared for Tennessee Valley Authority. March 6.
Boring Elevation	Model Input	B-3	Geosyntec Consultants. 2010a. "Seepage and Stability Study for East Dike and Raised Dike". Prepared for Tennessee Valley Authority. June 30.
Boring Elevation	Model Input	B-3A	Amec Foster Wheeler. 2015. "Report of Geotechnical Exploration and Liquefaction Analysis, Bottom Ash Dewatering Facility, TVA Kingston Fossil Plant, Harriman, Tennessee." Prepared for Tennessee Valley Authority. March 6.
Boring Elevation	Model Input	B-5	Amec Environment & Infrastructure, Inc. (Amec). 2012. "Report of Geotechnical Exploration, Bottom Ash Dewatering Facility, TVA Kingston Fossil Plant, Harriman, Tennessee." Prepared for Tennessee Valley Authority. April 2.
Boring Elevation	Model Input	B-5A	Amec Foster Wheeler. 2015. "Report of Geotechnical Exploration and Liquefaction Analysis, Bottom Ash Dewatering Facility, TVA Kingston Fossil Plant, Harriman, Tennessee." Prepared for Tennessee Valley Authority. March 6.
Boring Elevation	Model Input	B-6	Amec. 2012. "Report of Geotechnical Exploration, Bottom Ash Dewatering Facility, TVA Kingston Fossil Plant, Harriman, Tennessee." Prepared for Tennessee Valley Authority. April 2.
Boring Elevation	Model Input	B-7A (2012)	Amec. 2012. "Report of Geotechnical Exploration, Bottom Ash Dewatering Facility, TVA Kingston Fossil Plant, Harriman, Tennessee." Prepared for Tennessee Valley Authority. April 2.
Boring Elevation	Model Input	MacB-13	MACTEC Engineering and Consulting, Inc. (MACTEC) 2009. "Report of Geotechnical Exploration – TVA Kingston Phase I Geotube Disposal Area." Prepared for Tennessee Valley Authority. March 9.
Boring Elevation	Model Input	MacB-14	MACTEC. 2009. "Report of Geotechnical Exploration – TVA Kingston Phase I Geotube Disposal Area." Prepared for Tennessee Valley Authority. March 9.
Boring Elevation	Model Input	MacB-17	MACTEC. 2009. "Report of Geotechnical Exploration – TVA Kingston Phase I Geotube Disposal Area." Prepared for Tennessee Valley Authority. March 9.
Boring Elevation	Model Input	MacB-18	MACTEC. 2009. "Report of Geotechnical Exploration – TVA Kingston Phase I Geotube Disposal Area." Prepared for Tennessee Valley Authority. March 9.
Boring Elevation	Model Input	MacB-21	MACTEC. 2009. "Report of Geotechnical Exploration – TVA Kingston Phase I Geotube Disposal Area." Prepared for Tennessee Valley Authority. March 9.
Boring Elevation	Model Input	MacB-26	MACTEC. 2009. "Report of Geotechnical Exploration – TVA Kingston Phase I Geotube Disposal Area." Prepared for Tennessee Valley Authority. March 9.
Boring Elevation	Model Input	MacB-27	MACTEC. 2009. "Report of Geotechnical Exploration – TVA Kingston Phase I Geotube Disposal Area." Prepared for Tennessee Valley Authority. March 9.
Boring Elevation	Model Input	MacB-3	MACTEC. 2009. "Report of Geotechnical Exploration – TVA Kingston Phase I Geotube Disposal Area." Prepared for Tennessee Valley Authority. March 9.

Table C.1. Model Input and Confirmation Data Used to Model the Material Quantity Assessment Study Area Pre-Construction and Bottom of CCR Surfaces

Data Type	Data Use	Boring ID	Source
Boring Elevation	Model Input	MacB-33	MACTEC. 2009. "Report of Geotechnical Exploration – TVA Kingston Phase I Geotube Disposal Area." Prepared for Tennessee Valley Authority. March 9.
Boring Elevation	Model Input	MacB-39	MACTEC. 2009. "Report of Geotechnical Exploration – TVA Kingston Phase I Geotube Disposal Area." Prepared for Tennessee Valley Authority. March 9.
Boring Elevation	Model Input	MacB-40	MACTEC. 2009. "Report of Geotechnical Exploration – TVA Kingston Phase I Geotube Disposal Area." Prepared for Tennessee Valley Authority. March 9.
Boring Elevation	Model Input	MacB-46	MACTEC. 2009. "Report of Geotechnical Exploration – TVA Kingston Phase I Geotube Disposal Area." Prepared for Tennessee Valley Authority. March 9.
Boring Elevation	Model Input	SME-221	Stantec Consulting Services, Inc. (Stantec) 2012. "Boring Logs Perimeter Containment Ash Pond Segments 3 and 4 Sta. B297+0.00 to Sta. B323+72.58 Kingston Fossil Plant Harriman, Roane County,Tennessee Document Control Number RDP-0114-E." Prepared for Tennessee Valley Authority. December 14.
Boring Elevation	Model Input	SME-222	Stantec. 2012. "Boring Logs Perimeter Containment Ash Pond Segments 3 and 4 Sta. B297+0.00 to Sta. B323+72.58 Kingston Fossil Plant Harriman, Roane County,Tennessee Document Control Number RDP-0114-E." Prepared for Tennessee Valley Authority. December 14.
Boring Elevation	Model Input	SME-223+90	Stantec. 2012. "Boring Logs Perimeter Containment Ash Pond Segments 3 and 4 Sta. B297+0.00 to Sta. B323+72.58 Kingston Fossil Plant Harriman, Roane County,Tennessee Document Control Number RDP-0114-E." Prepared for Tennessee Valley Authority. December 14.
Boring Elevation	Model Input	SUP-32	Stantec. 2012a. "Summary of Results for Engineering Evaluation, Segments 5 and 6 Perimeter Containment Alternative Alignments, Kingston Fossil Plant, Harriman, Roane County, Tennessee." Prepared for Tennessee Valley Authority. October 1.
Boring Elevation	Model Input	SUP-35	Stantec. 2012a. "Summary of Results for Engineering Evaluation, Segments 5 and 6 Perimeter Containment Alternative Alignments, Kingston Fossil Plant, Harriman, Roane County, Tennessee." Prepared for Tennessee Valley Authority. October 1.
Boring Elevation	Model Input	SUP-39	Stantec. 2012a. "Summary of Results for Engineering Evaluation, Segments 5 and 6 Perimeter Containment Alternative Alignments, Kingston Fossil Plant, Harriman, Roane County, Tennessee." Prepared for Tennessee Valley Authority. October 1.

Table C.2. Model Input Data Used to Model the Material Quantity Assessment Study Area Final Elevation Surface

Data Type	Data Use	Boring ID	Reference
Contours	Model Input	Not Applicable	Tuck Mapping Solutions (Tuck). 2017. Kingston Fossil Plant Aerial Survey.
Contours	Model Input	Not Applicable	AECOM. 2019b. Construction Record Document, East Dike Area Closure, Kingston Fossil Plant, TVA Drawing 10W393-03R1: Top of Protective Cover East Dike Area Closure. June 11.
Contours	Model Input	Not Applicable	Stantec. 2018e. Construction Certification Report Stilling Pond Closure, Kingston Fossil Plant, TVA Drawing 81W404-09R1: Stilling Pond Closure Final Grade Plan Baseline 'A'. December 7.

Table C.3. Model Input Data Used to Model the Material Quantity Assessment Study Area Top of CCR Surface

Data Type	Data Use	Boring ID	Reference
Contours	Model Input	Not Applicable	Tuck Mapping Solutions (Tuck). 2017. Kingston Fossil Plant Aerial Survey.
Contours	Model Input	Not Applicable	AECOM. 2019b. Construction Record Document, East Dike Area Closure, Kingston Fossil Plant, TVA Drawing 10W393-03R1: Top of Protective Cover East Dike Area Closure. June 11, 2019.
Contours	Model Input	Not Applicable	Stantec. 2018d. Construction Certification Report Stilling Pond Closure, Kingston Fossil Plant, TVA Drawing 81W404-03R1: Stilling Pond Closure Existing Conditions Baseline 'A' Layout. December 7., 2018.
Cap Details	Model Input	Not Applicable	AECOM. 2018a. Kingston Fossil Plant, Ball Field Interim Ash Staging Area Closure, TVA Project No. 604769, As-Built Record Drawings, TVA Drawing Series 10W387, Revision 1. March 7, 2018.
Cap Details	Model Input	Not Applicable	AECOM. 2018b. Closure and Post Closure Plan, Sluice Trench and Area East of Sluice Trench, EPA Final CCR Rule, TVA Kingston Fossil Plant, Harriman, Tennessee. Prepared for Tennessee Valley Authority. April 13, 2018.
Boring Elevation	Confirmation	KIF-TW01	Stantec. 2022. Kingston Fossil Plant Exploratory Drilling Sampling and Analysis Report. Revision 3. Prepared for TVA. January 10, 2022.
Boring Elevation	Confirmation	KIF-TW02	Stantec. 2022. Kingston Fossil Plant Exploratory Drilling Sampling and Analysis Report. Revision 3. Prepared for TVA. January 10, 2022.
Boring Elevation	Confirmation	KIF-TW03	Stantec. 2022. Kingston Fossil Plant Exploratory Drilling Sampling and Analysis Report. Revision 3. Prepared for TVA. January 10, 2022.
Boring Elevation	Confirmation	KIF-TW03a	Stantec. 2022. Kingston Fossil Plant Exploratory Drilling Sampling and Analysis Report. Revision 3. Prepared for TVA. January 10, 2022.
Boring Elevation	Confirmation	KIF-TW03b	Stantec. 2022. Kingston Fossil Plant Exploratory Drilling Sampling and Analysis Report. Revision 3. Prepared for TVA. January 10, 2022.
Boring Elevation	Confirmation	KIF-TW04	Stantec. 2022. Kingston Fossil Plant Exploratory Drilling Sampling and Analysis Report. Revision 3. Prepared for TVA. January 10, 2022.
Boring Elevation	Confirmation	KIF-TW05	Stantec. 2022. Kingston Fossil Plant Exploratory Drilling Sampling and Analysis Report. Revision 3. Prepared for TVA. January 10, 2022.

Table C.4. Model Input Data Used to Model the Material Quantity Assessment Study Area Top of Bedrock Surface

Data Type	Data Use	Boring ID	Source
Boring Elevation	Model Input	KIF-102	Stantec. 2022. Kingston Fossil Plant Exploratory Drilling Sampling and Analysis Report. Revision 3. Prepared for TVA. January 10, 2022.
Boring Elevation	Model Input	KIF-102a	Stantec. 2022. Kingston Fossil Plant Exploratory Drilling Sampling and Analysis Report. Revision 3. Prepared for TVA. January 10, 2022.
Boring Elevation	Model Input	KIF-TB01	Stantec. 2022. Kingston Fossil Plant Exploratory Drilling Sampling and Analysis Report. Revision 3. Prepared for TVA. January 10, 2022.
Boring Elevation	Model Input	KIF-TB02	Stantec. 2022. Kingston Fossil Plant Exploratory Drilling Sampling and Analysis Report. Revision 3. Prepared for TVA. January 10, 2022.
Boring Elevation	Model Input	KIF-TB03	Stantec. 2022. Kingston Fossil Plant Exploratory Drilling Sampling and Analysis Report. Revision 3. Prepared for TVA. January 10, 2022.
Boring Elevation	Model Input	KIF-TB04	Stantec. 2022. Kingston Fossil Plant Exploratory Drilling Sampling and Analysis Report. Revision 3. Prepared for TVA. January 10, 2022.
Boring Elevation	Model Input	KIF-TB05	Stantec. 2022. Kingston Fossil Plant Exploratory Drilling Sampling and Analysis Report. Revision 3. Prepared for TVA. January 10, 2022.
Boring Elevation	Model Input	KIF-TB05a	Stantec. 2022. Kingston Fossil Plant Exploratory Drilling Sampling and Analysis Report. Revision 3. Prepared for TVA. January 10, 2022.
Boring Elevation	Model Input	KIF-TB06	Stantec. 2022. Kingston Fossil Plant Exploratory Drilling Sampling and Analysis Report. Revision 3. Prepared for TVA. January 10, 2022.
Boring Elevation	Model Input	KIF-TB07	Stantec. 2022. Kingston Fossil Plant Exploratory Drilling Sampling and Analysis Report. Revision 3. Prepared for TVA. January 10, 2022.
Boring Elevation	Model Input	KIF-TB08	Stantec. 2022. Kingston Fossil Plant Exploratory Drilling Sampling and Analysis Report. Revision 3. Prepared for TVA. January 10, 2022.
Boring Elevation	Model Input	09-800	Stantec Consulting Services, Inc. (Stantec) 2012. Boring Logs Perimeter Containment Ash Pond Segments 3 and 4 Sta. B297+0.00 to Sta. B323+72.58 Kingston Fossil Plant Harriman, Roane County,Tennessee Document Control Number RDP-0114-E. Prepared for Tennessee Valley Authority. December 14.
Boring Elevation	Model Input	09-801	Stantec. 2012. Boring Logs Perimeter Containment Ash Pond Segments 3 and 4 Sta. B297+0.00 to Sta. B323+72.58 Kingston Fossil Plant Harriman, Roane County,Tennessee Document Control Number RDP-0114-E. Prepared for Tennessee Valley Authority. December 14.
Boring Elevation	Model Input	A-1	Geosyntec Consultants. 2010a. Seepage and Stability Study for East Dike and Raised Dike. Prepared for Tennessee Valley Authority. June 30.
Boring Elevation	Model Input	A-2	Geosyntec Consultants. 2010a. Seepage and Stability Study for East Dike and Raised Dike. Prepared for Tennessee Valley Authority. June 30.
Boring Elevation	Model Input	A-3	Geosyntec Consultants. 2010a. Seepage and Stability Study for East Dike and Raised Dike. Prepared for Tennessee Valley Authority. June 30.
Boring Elevation	Model Input	AD-1	Tennessee Valley Authority (TVA). 2014. Tennessee Valley Authority Kingston Fossil Plant Ash Landfill #IDL 73-0094, Groundwater Monitoring Plan. Prepared by Matthew D. Williams, PE. February 26.
Boring Elevation	Model Input	B-1	Geosyntec Consultants. 2010a. Seepage and Stability Study for East Dike and Raised Dike. Prepared for Tennessee Valley Authority. June 30.
Boring Elevation	Model Input	B-1	Geosyntec Consultants. 2010a. Seepage and Stability Study for East Dike and Raised Dike. Prepared for Tennessee Valley Authority. June 30.

Table C.4. Model Input Data Used to Model the Material Quantity Assessment Study Area Top of Bedrock Surface

Data Type	Data Use	Boring ID	Source
Boring Elevation	Model Input	B-10	Stantec. 2012. Boring Logs Perimeter Containment Ash Pond Segments 3 and 4 Sta. B297+0.00 to Sta. B323+72.58 Kingston Fossil Plant Harriman, Roane County,Tennessee Document Control Number RDP-0114-E. Prepared for Tennessee Valley Authority. December 14.
Boring Elevation	Model Input	B-1A	Amec Foster Wheeler Environment and Infrastructure, Inc. (Amec Foster Wheeler). 2015. Report of Geotechnical Exploration and Liquefaction Analysis, Bottom Ash Dewatering Facility, TVA Kingston Fossil Plant, Harriman, Tennessee. Prepared for Tennessee Valley Authority. March 6.
Boring Elevation	Model Input	B-2	Geosyntec Consultants. 2010a. Seepage and Stability Study for East Dike and Raised Dike. Prepared for Tennessee Valley Authority. June 30.
Boring Elevation	Model Input	B-2	Geosyntec Consultants. 2010a. Seepage and Stability Study for East Dike and Raised Dike. Prepared for Tennessee Valley Authority. June 30.
Boring Elevation	Model Input	B-2A	Amec Foster Wheeler. 2015. Report of Geotechnical Exploration and Liquefaction Analysis, Bottom Ash Dewatering Facility, TVA Kingston Fossil Plant, Harriman, Tennessee. Prepared for Tennessee Valley Authority. March 6.
Boring Elevation	Model Input	B-3	Geosyntec Consultants. 2010a. Seepage and Stability Study for East Dike and Raised Dike. Prepared for Tennessee Valley Authority. June 30.
Boring Elevation	Model Input	B-3	Geosyntec Consultants. 2010a. Seepage and Stability Study for East Dike and Raised Dike. Prepared for Tennessee Valley Authority. June 30.
Boring Elevation	Model Input	B-3A	Amec Foster Wheeler. 2015. Report of Geotechnical Exploration and Liquefaction Analysis, Bottom Ash Dewatering Facility, TVA Kingston Fossil Plant, Harriman, Tennessee. Prepared for Tennessee Valley Authority. March 6.
Boring Elevation	Model Input	B-4	Amec Environment & Infrastructure, Inc. (Amec). 2012. Report of Geotechnical Exploration, Bottom Ash Dewatering Facility, TVA Kingston Fossil Plant, Harriman, Tennessee. Prepared for Tennessee Valley Authority. April 2.
Boring Elevation	Model Input	B-4A	Amec Foster Wheeler. 2015. Report of Geotechnical Exploration and Liquefaction Analysis, Bottom Ash Dewatering Facility, TVA Kingston Fossil Plant, Harriman, Tennessee. Prepared for Tennessee Valley Authority. March 6.
Boring Elevation	Model Input	B-5	Amec. 2012. Report of Geotechnical Exploration, Bottom Ash Dewatering Facility, TVA Kingston Fossil Plant, Harriman, Tennessee. Prepared for Tennessee Valley Authority. April 2.
Boring Elevation	Model Input	B-5A	Amec Foster Wheeler. 2015. Report of Geotechnical Exploration and Liquefaction Analysis, Bottom Ash Dewatering Facility, TVA Kingston Fossil Plant, Harriman, Tennessee. Prepared for Tennessee Valley Authority. March 6.
Boring Elevation	Model Input	B-6	Amec. 2012. Report of Geotechnical Exploration, Bottom Ash Dewatering Facility, TVA Kingston Fossil Plant, Harriman, Tennessee. Prepared for Tennessee Valley Authority. April 2.
Boring Elevation	Model Input	B-6A	Amec Foster Wheeler. 2015. Report of Geotechnical Exploration and Liquefaction Analysis, Bottom Ash Dewatering Facility, TVA Kingston Fossil Plant, Harriman, Tennessee. Prepared for Tennessee Valley Authority. March 6.
Boring Elevation	Model Input	B-7A (2012)	Amec. 2012. Report of Geotechnical Exploration, Bottom Ash Dewatering Facility, TVA Kingston Fossil Plant, Harriman, Tennessee. Prepared for Tennessee Valley Authority. April 2.
Boring Elevation	Model Input	B-8	Stantec. 2012. Boring Logs Perimeter Containment Ash Pond Segments 3 and 4 Sta. B297+0.00 to Sta. B323+72.58 Kingston Fossil Plant Harriman, Roane County,Tennessee Document Control Number RDP-0114-E. Prepared for Tennessee Valley Authority. December 14.
Boring Elevation	Model Input	B-8A	Amec Foster Wheeler. 2015. Report of Geotechnical Exploration and Liquefaction Analysis, Bottom Ash Dewatering Facility, TVA Kingston Fossil Plant, Harriman, Tennessee. Prepared for Tennessee Valley Authority. March 6.
Boring Elevation	Model Input	B-9	Stantec. 2012. Boring Logs Perimeter Containment Ash Pond Segments 3 and 4 Sta. B297+0.00 to Sta. B323+72.58 Kingston Fossil Plant Harriman, Roane County,Tennessee Document Control Number RDP-0114-E. Prepared for Tennessee Valley Authority. December 14.
Boring Elevation	Model Input	C-1	Geosyntec Consultants. 2010B. Seepage and Stability Study for North End of East Dike. Prepared for Tennessee Valley Authority. October 29.

Table C.4. Model Input Data Used to Model the Material Quantity Assessment Study Area Top of Bedrock Surface

Data Type	Data Use	Boring ID	Source
Boring Elevation	Model Input	C-2	Geosyntec Consultants. 2010B. Seepage and Stability Study for North End of East Dike. Prepared for Tennessee Valley Authority. October 29.
Boring Elevation	Model Input	D-1	Geosyntec Consultants. 2010B. Seepage and Stability Study for North End of East Dike. Prepared for Tennessee Valley Authority. October 29.
Boring Elevation	Model Input	D-2	Geosyntec Consultants. 2010B. Seepage and Stability Study for North End of East Dike. Prepared for Tennessee Valley Authority. October 29.
Boring Elevation	Model Input	GW-1	TVA. 2014. Tennessee Valley Authority Kingston Fossil Plant Ash Landfill #IDL 73-0094, Groundwater Monitoring Plan. Prepared by Matthew D. Williams, PE. February 26.
Boring Elevation	Model Input	KIF-22B	TVA. 2015. TVA Project ID 609394-001, Tennessee Valley Authority Groundwater Monitoring Wells Site Inspection Summary Reports, Kingston Fossil Plant, Kingston Tennessee. Revision 2. Prepared by P&CC Engineering. May 5.
Boring Elevation	Model Input	KIF-BF-SPT-1	AECOM. 2016. TVA Kingston Fossil Plant, Polishing Pond Engineering Report, Drainage and Flow Management Project (Downstream), Revision 0. April 2016.
Boring Elevation	Model Input	KIF-BF-SPT-2	AECOM. 2016. TVA Kingston Fossil Plant, Polishing Pond Engineering Report, Drainage and Flow Management Project (Downstream), Revision 0. April 2016.
Boring Elevation	Model Input	KIF-BF-SPT-3	AECOM. 2016. TVA Kingston Fossil Plant, Polishing Pond Engineering Report, Drainage and Flow Management Project (Downstream), Revision 0. April 2016.
Boring Elevation	Model Input	KIF-BF-SPT-4	AECOM. 2016. TVA Kingston Fossil Plant, Polishing Pond Engineering Report, Drainage and Flow Management Project (Downstream), Revision 0. April 2016.
Boring Elevation	Model Input	KIF-BF-SPT-5	AECOM. 2016. TVA Kingston Fossil Plant, Polishing Pond Engineering Report, Drainage and Flow Management Project (Downstream), Revision 0. April 2016.
Boring Elevation	Model Input	KIF-BF-SPT-6	AECOM. 2016. TVA Kingston Fossil Plant, Polishing Pond Engineering Report, Drainage and Flow Management Project (Downstream), Revision 0. April 2016.
Boring Elevation	Model Input	MacB-1	MACTEC Engineering and Consulting, Inc. (MACTEC) 2009. Report of Geotechnical Exploration – TVA Kingston Phase I Geotube Disposal Area. Prepared for Tennessee Valley Authority. March 9.
Boring Elevation	Model Input	MacB-10	MACTEC. 2009. Report of Geotechnical Exploration – TVA Kingston Phase I Geotube Disposal Area. Prepared for Tennessee Valley Authority. March 9.
Boring Elevation	Model Input	MacB-12	MACTEC. 2009. Report of Geotechnical Exploration – TVA Kingston Phase I Geotube Disposal Area. Prepared for Tennessee Valley Authority. March 9.
Boring Elevation	Model Input	MacB-13	MACTEC. 2009. Report of Geotechnical Exploration – TVA Kingston Phase I Geotube Disposal Area. Prepared for Tennessee Valley Authority. March 9.
Boring Elevation	Model Input	MacB-14	MACTEC. 2009. Report of Geotechnical Exploration – TVA Kingston Phase I Geotube Disposal Area. Prepared for Tennessee Valley Authority. March 9.
Boring Elevation	Model Input	MacB-15	MACTEC. 2009. Report of Geotechnical Exploration – TVA Kingston Phase I Geotube Disposal Area. Prepared for Tennessee Valley Authority. March 9.
Boring Elevation	Model Input	MacB-17	MACTEC. 2009. Report of Geotechnical Exploration – TVA Kingston Phase I Geotube Disposal Area. Prepared for Tennessee Valley Authority. March 9.
Boring Elevation	Model Input	MacB-18	MACTEC. 2009. Report of Geotechnical Exploration – TVA Kingston Phase I Geotube Disposal Area. Prepared for Tennessee Valley Authority. March 9.
Boring Elevation	Model Input	MacB-21	MACTEC. 2009. Report of Geotechnical Exploration – TVA Kingston Phase I Geotube Disposal Area. Prepared for Tennessee Valley Authority. March 9.
Boring Elevation	Model Input	MacB-26	MACTEC. 2009. Report of Geotechnical Exploration – TVA Kingston Phase I Geotube Disposal Area. Prepared for Tennessee Valley Authority. March 9.

Table C.4. Model Input Data Used to Model the Material Quantity Assessment Study Area Top of Bedrock Surface

Data Type	Data Use	Boring ID	Source
Boring Elevation	Model Input	MacB-27	MACTEC. 2009. Report of Geotechnical Exploration – TVA Kingston Phase I Geotube Disposal Area. Prepared for Tennessee Valley Authority. March 9.
Boring Elevation	Model Input	MacB-28A	MACTEC. 2009. Report of Geotechnical Exploration – TVA Kingston Phase I Geotube Disposal Area. Prepared for Tennessee Valley Authority. March 9.
Boring Elevation	Model Input	MacB-3	MACTEC. 2009. Report of Geotechnical Exploration – TVA Kingston Phase I Geotube Disposal Area. Prepared for Tennessee Valley Authority. March 9.
Boring Elevation	Model Input	MacB-33	MACTEC. 2009. Report of Geotechnical Exploration – TVA Kingston Phase I Geotube Disposal Area. Prepared for Tennessee Valley Authority. March 9.
Boring Elevation	Model Input	MacB-35	MACTEC. 2009. Report of Geotechnical Exploration – TVA Kingston Phase I Geotube Disposal Area. Prepared for Tennessee Valley Authority. March 9.
Boring Elevation	Model Input	MacB-36	MACTEC. 2009. Report of Geotechnical Exploration – TVA Kingston Phase I Geotube Disposal Area. Prepared for Tennessee Valley Authority. March 9.
Boring Elevation	Model Input	MacB-39	MACTEC. 2009. Report of Geotechnical Exploration – TVA Kingston Phase I Geotube Disposal Area. Prepared for Tennessee Valley Authority. March 9.
Boring Elevation	Model Input	MacB-40	MACTEC. 2009. Report of Geotechnical Exploration – TVA Kingston Phase I Geotube Disposal Area. Prepared for Tennessee Valley Authority. March 9.
Boring Elevation	Model Input	MacB-43	MACTEC. 2009. Report of Geotechnical Exploration – TVA Kingston Phase I Geotube Disposal Area. Prepared for Tennessee Valley Authority. March 9.
Boring Elevation	Model Input	MacB-45	MACTEC. 2009. Report of Geotechnical Exploration – TVA Kingston Phase I Geotube Disposal Area. Prepared for Tennessee Valley Authority. March 9.
Boring Elevation	Model Input	MacB-46	MACTEC. 2009. Report of Geotechnical Exploration – TVA Kingston Phase I Geotube Disposal Area. Prepared for Tennessee Valley Authority. March 9.
Boring Elevation	Model Input	MacB-47	MACTEC. 2009. Report of Geotechnical Exploration – TVA Kingston Phase I Geotube Disposal Area. Prepared for Tennessee Valley Authority. March 9.
Boring Elevation	Model Input	MacB-5	MACTEC. 2009. Report of Geotechnical Exploration – TVA Kingston Phase I Geotube Disposal Area. Prepared for Tennessee Valley Authority. March 9.
Boring Elevation	Model Input	MacB-7	MACTEC. 2009. Report of Geotechnical Exploration – TVA Kingston Phase I Geotube Disposal Area. Prepared for Tennessee Valley Authority. March 9.
Boring Elevation	Model Input	MacB-8	MACTEC. 2009. Report of Geotechnical Exploration – TVA Kingston Phase I Geotube Disposal Area. Prepared for Tennessee Valley Authority. March 9.
Boring Elevation	Model Input	PZ3VW-10	Stantec. 2012. Boring Logs Perimeter Containment Ash Pond Segments 3 and 4 Sta. B297+0.00 to Sta. B323+72.58 Kingston Fossil Plant Harriman, Roane County,Tennessee Document Control Number RDP-0114-E. Prepared for Tennessee Valley Authority. December 14.
Boring Elevation	Model Input	PZ3VW-11	Stantec. 2012. Boring Logs Perimeter Containment Ash Pond Segments 3 and 4 Sta. B297+0.00 to Sta. B323+72.58 Kingston Fossil Plant Harriman, Roane County,Tennessee Document Control Number RDP-0114-E. Prepared for Tennessee Valley Authority. December 14.
Boring Elevation	Model Input	PZ3VW-7	Stantec. 2012. Boring Logs Perimeter Containment Ash Pond Segments 3 and 4 Sta. B297+0.00 to Sta. B323+72.58 Kingston Fossil Plant Harriman, Roane County,Tennessee Document Control Number RDP-0114-E. Prepared for Tennessee Valley Authority. December 14.
Boring Elevation	Model Input	PZ3VW-9	Stantec. 2012. Boring Logs Perimeter Containment Ash Pond Segments 3 and 4 Sta. B297+0.00 to Sta. B323+72.58 Kingston Fossil Plant Harriman, Roane County,Tennessee Document Control Number RDP-0114-E. Prepared for Tennessee Valley Authority. December 14.

Table C.4. Model Input Data Used to Model the Material Quantity Assessment Study Area Top of Bedrock Surface

Data Type	Data Use	Boring ID	Source
Boring Elevation	Model Input	SME-100	Stantec. 2012. Boring Logs Perimeter Containment Ash Pond Segments 3 and 4 Sta. B297+0.00 to Sta. B323+72.58 Kingston Fossil Plant Harriman, Roane County,Tennessee Document Control Number RDP-0114-E. Prepared for Tennessee Valley Authority. December 14.
Boring Elevation	Model Input	SME-101	Stantec. 2012. Boring Logs Perimeter Containment Ash Pond Segments 3 and 4 Sta. B297+0.00 to Sta. B323+72.58 Kingston Fossil Plant Harriman, Roane County,Tennessee Document Control Number RDP-0114-E. Prepared for Tennessee Valley Authority. December 14.
Boring Elevation	Model Input	SME-103	Stantec. 2012. Boring Logs Perimeter Containment Ash Pond Segments 3 and 4 Sta. B297+0.00 to Sta. B323+72.58 Kingston Fossil Plant Harriman, Roane County,Tennessee Document Control Number RDP-0114-E. Prepared for Tennessee Valley Authority. December 14.
Boring Elevation	Model Input	SME-104	Stantec. 2012. Boring Logs Perimeter Containment Ash Pond Segments 3 and 4 Sta. B297+0.00 to Sta. B323+72.58 Kingston Fossil Plant Harriman, Roane County,Tennessee Document Control Number RDP-0114-E. Prepared for Tennessee Valley Authority. December 14.
Boring Elevation	Model Input	SME-221	Stantec. 2012. Boring Logs Perimeter Containment Ash Pond Segments 3 and 4 Sta. B297+0.00 to Sta. B323+72.58 Kingston Fossil Plant Harriman, Roane County,Tennessee Document Control Number RDP-0114-E. Prepared for Tennessee Valley Authority. December 14.
Boring Elevation	Model Input	SME-222	Stantec. 2012. Boring Logs Perimeter Containment Ash Pond Segments 3 and 4 Sta. B297+0.00 to Sta. B323+72.58 Kingston Fossil Plant Harriman, Roane County,Tennessee Document Control Number RDP-0114-E. Prepared for Tennessee Valley Authority. December 14.
Boring Elevation	Model Input	SME-223	Stantec. 2012. Boring Logs Perimeter Containment Ash Pond Segments 3 and 4 Sta. B297+0.00 to Sta. B323+72.58 Kingston Fossil Plant Harriman, Roane County,Tennessee Document Control Number RDP-0114-E. Prepared for Tennessee Valley Authority. December 14.
Boring Elevation	Model Input	SME-223+80	Stantec. 2012. Boring Logs Perimeter Containment Ash Pond Segments 3 and 4 Sta. B297+0.00 to Sta. B323+72.58 Kingston Fossil Plant Harriman, Roane County,Tennessee Document Control Number RDP-0114-E. Prepared for Tennessee Valley Authority. December 14.
Boring Elevation	Model Input	SME-223+90	Stantec. 2012. Boring Logs Perimeter Containment Ash Pond Segments 3 and 4 Sta. B297+0.00 to Sta. B323+72.58 Kingston Fossil Plant Harriman, Roane County,Tennessee Document Control Number RDP-0114-E. Prepared for Tennessee Valley Authority. December 14.
Boring Elevation	Model Input	SME-300	Stantec. 2012. Boring Logs Perimeter Containment Ash Pond Segments 3 and 4 Sta. B297+0.00 to Sta. B323+72.58 Kingston Fossil Plant Harriman, Roane County,Tennessee Document Control Number RDP-0114-E. Prepared for Tennessee Valley Authority. December 14.
Boring Elevation	Model Input	SME-301	Stantec. 2012. Boring Logs Perimeter Containment Ash Pond Segments 3 and 4 Sta. B297+0.00 to Sta. B323+72.58 Kingston Fossil Plant Harriman, Roane County,Tennessee Document Control Number RDP-0114-E. Prepared for Tennessee Valley Authority. December 14.
Boring Elevation	Model Input	SME-302	Stantec. 2012. Boring Logs Perimeter Containment Ash Pond Segments 3 and 4 Sta. B297+0.00 to Sta. B323+72.58 Kingston Fossil Plant Harriman, Roane County,Tennessee Document Control Number RDP-0114-E. Prepared for Tennessee Valley Authority. December 14.
Boring Elevation	Model Input	SME-303	Stantec. 2012. Boring Logs Perimeter Containment Ash Pond Segments 3 and 4 Sta. B297+0.00 to Sta. B323+72.58 Kingston Fossil Plant Harriman, Roane County,Tennessee Document Control Number RDP-0114-E. Prepared for Tennessee Valley Authority. December 14.
Boring Elevation	Model Input	SME-306	Stantec. 2012. Boring Logs Perimeter Containment Ash Pond Segments 3 and 4 Sta. B297+0.00 to Sta. B323+72.58 Kingston Fossil Plant Harriman, Roane County,Tennessee Document Control Number RDP-0114-E. Prepared for Tennessee Valley Authority. December 14.

Table C.4. Model Input Data Used to Model the Material Quantity Assessment Study Area Top of Bedrock Surface

Data Type	Data Use	Boring ID	Source
Boring Elevation	Model Input	SME-307	Stantec. 2012. Boring Logs Perimeter Containment Ash Pond Segments 3 and 4 Sta. B297+0.00 to Sta. B323+72.58 Kingston Fossil Plant Harriman, Roane County,Tennessee Document Control Number RDP-0114-E. Prepared for Tennessee Valley Authority. December 14.
Boring Elevation	Model Input	SME-308	Stantec. 2012. Boring Logs Perimeter Containment Ash Pond Segments 3 and 4 Sta. B297+0.00 to Sta. B323+72.58 Kingston Fossil Plant Harriman, Roane County,Tennessee Document Control Number RDP-0114-E. Prepared for Tennessee Valley Authority. December 14.
Boring Elevation	Model Input	SME-309	Stantec. 2012. Boring Logs Perimeter Containment Ash Pond Segments 3 and 4 Sta. B297+0.00 to Sta. B323+72.58 Kingston Fossil Plant Harriman, Roane County,Tennessee Document Control Number RDP-0114-E. Prepared for Tennessee Valley Authority. December 14.
Boring Elevation	Model Input	SME-311	Stantec. 2012. Boring Logs Perimeter Containment Ash Pond Segments 3 and 4 Sta. B297+0.00 to Sta. B323+72.58 Kingston Fossil Plant Harriman, Roane County,Tennessee Document Control Number RDP-0114-E. Prepared for Tennessee Valley Authority. December 14.
Boring Elevation	Model Input	SME-312+20	Stantec. 2012. Boring Logs Perimeter Containment Ash Pond Segments 3 and 4 Sta. B297+0.00 to Sta. B323+72.58 Kingston Fossil Plant Harriman, Roane County,Tennessee Document Control Number RDP-0114-E. Prepared for Tennessee Valley Authority. December 14.
Boring Elevation	Model Input	SME-313	Stantec. 2012. Boring Logs Perimeter Containment Ash Pond Segments 3 and 4 Sta. B297+0.00 to Sta. B323+72.58 Kingston Fossil Plant Harriman, Roane County,Tennessee Document Control Number RDP-0114-E. Prepared for Tennessee Valley Authority. December 14.
Boring Elevation	Model Input	SME-314	Stantec. 2012. Boring Logs Perimeter Containment Ash Pond Segments 3 and 4 Sta. B297+0.00 to Sta. B323+72.58 Kingston Fossil Plant Harriman, Roane County,Tennessee Document Control Number RDP-0114-E. Prepared for Tennessee Valley Authority. December 14.
Boring Elevation	Model Input	SME-315	Stantec. 2012. Boring Logs Perimeter Containment Ash Pond Segments 3 and 4 Sta. B297+0.00 to Sta. B323+72.58 Kingston Fossil Plant Harriman, Roane County,Tennessee Document Control Number RDP-0114-E. Prepared for Tennessee Valley Authority. December 14.
Boring Elevation	Model Input	SME-316	Stantec. 2012. Boring Logs Perimeter Containment Ash Pond Segments 3 and 4 Sta. B297+0.00 to Sta. B323+72.58 Kingston Fossil Plant Harriman, Roane County,Tennessee Document Control Number RDP-0114-E. Prepared for Tennessee Valley Authority. December 14.
Boring Elevation	Model Input	SME-317	Stantec. 2012. Boring Logs Perimeter Containment Ash Pond Segments 3 and 4 Sta. B297+0.00 to Sta. B323+72.58 Kingston Fossil Plant Harriman, Roane County,Tennessee Document Control Number RDP-0114-E. Prepared for Tennessee Valley Authority. December 14.
Boring Elevation	Model Input	SME-318	Stantec. 2012. Boring Logs Perimeter Containment Ash Pond Segments 3 and 4 Sta. B297+0.00 to Sta. B323+72.58 Kingston Fossil Plant Harriman, Roane County,Tennessee Document Control Number RDP-0114-E. Prepared for Tennessee Valley Authority. December 14.
Boring Elevation	Model Input	SME-319	Stantec. 2012. Boring Logs Perimeter Containment Ash Pond Segments 3 and 4 Sta. B297+0.00 to Sta. B323+72.58 Kingston Fossil Plant Harriman, Roane County,Tennessee Document Control Number RDP-0114-E. Prepared for Tennessee Valley Authority. December 14.
Boring Elevation	Model Input	SME-320	Stantec. 2012. Boring Logs Perimeter Containment Ash Pond Segments 3 and 4 Sta. B297+0.00 to Sta. B323+72.58 Kingston Fossil Plant Harriman, Roane County,Tennessee Document Control Number RDP-0114-E. Prepared for Tennessee Valley Authority. December 14.
Boring Elevation	Model Input	SME-322	Stantec. 2012. Boring Logs Perimeter Containment Ash Pond Segments 3 and 4 Sta. B297+0.00 to Sta. B323+72.58 Kingston Fossil Plant Harriman, Roane County,Tennessee Document Control Number RDP-0114-E. Prepared for Tennessee Valley Authority. December 14.

Table C.4. Model Input Data Used to Model the Material Quantity Assessment Study Area Top of Bedrock Surface

Data Type	Data Use	Boring ID	Source
Boring Elevation	Model Input	STN-16	Stantec. 2009. Report of Geotechnical Exploration and Slope Stability for Dike C, Kingston Fossil Plant, Harriman, Tennessee. August 3.
Boring Elevation	Model Input	STN-18	Stantec. 2009. Report of Geotechnical Exploration and Slope Stability for Dike C, Kingston Fossil Plant, Harriman, Tennessee. August 3.
Boring Elevation	Model Input	STN-19	Stantec. 2009. Report of Geotechnical Exploration and Slope Stability for Dike C, Kingston Fossil Plant, Harriman, Tennessee. August 3.
Boring Elevation	Model Input	STN-20	Stantec. 2009. Report of Geotechnical Exploration and Slope Stability for Dike C, Kingston Fossil Plant, Harriman, Tennessee. August 3.
Boring Elevation	Model Input	STN-21	Stantec. 2009. Report of Geotechnical Exploration and Slope Stability for Dike C, Kingston Fossil Plant, Harriman, Tennessee. August 3.
Boring Elevation	Model Input	STN-23	Stantec. 2009. Report of Geotechnical Exploration and Slope Stability for Dike C, Kingston Fossil Plant, Harriman, Tennessee. August 3.
Boring Elevation	Model Input	STN-24	Stantec. 2009. Report of Geotechnical Exploration and Slope Stability for Dike C, Kingston Fossil Plant, Harriman, Tennessee. August 3.
Boring Elevation	Model Input	STN-26	Stantec. 2009. Report of Geotechnical Exploration and Slope Stability for Dike C, Kingston Fossil Plant, Harriman, Tennessee. August 3.
Boring Elevation	Model Input	STN-27	Stantec. 2009. Report of Geotechnical Exploration and Slope Stability for Dike C, Kingston Fossil Plant, Harriman, Tennessee. August 3.
Boring Elevation	Model Input	STN-28	Stantec. 2009. Report of Geotechnical Exploration and Slope Stability for Dike C, Kingston Fossil Plant, Harriman, Tennessee. August 3.
Boring Elevation	Model Input	STN-29	Stantec. 2009. Report of Geotechnical Exploration and Slope Stability for Dike C, Kingston Fossil Plant, Harriman, Tennessee. August 3.
Boring Elevation	Model Input	STN-31	Stantec. 2009. Report of Geotechnical Exploration and Slope Stability for Dike C, Kingston Fossil Plant, Harriman, Tennessee. August 3.
Boring Elevation	Model Input	STN-32	Stantec. 2009. Report of Geotechnical Exploration and Slope Stability for Dike C, Kingston Fossil Plant, Harriman, Tennessee. August 3.
Boring Elevation	Model Input	STN-34	Stantec. 2009. Report of Geotechnical Exploration and Slope Stability for Dike C, Kingston Fossil Plant, Harriman, Tennessee. August 3.
Boring Elevation	Model Input	STN-36	Stantec. 2009. Report of Geotechnical Exploration and Slope Stability for Dike C, Kingston Fossil Plant, Harriman, Tennessee. August 3.
Boring Elevation	Model Input	STN-37	Stantec. 2009. Report of Geotechnical Exploration and Slope Stability for Dike C, Kingston Fossil Plant, Harriman, Tennessee. August 3.
Boring Elevation	Model Input	STN-38	Stantec. 2009. Report of Geotechnical Exploration and Slope Stability for Dike C, Kingston Fossil Plant, Harriman, Tennessee. August 3.
Boring Elevation	Model Input	STN-41	Stantec. 2009. Report of Geotechnical Exploration and Slope Stability for Dike C, Kingston Fossil Plant, Harriman, Tennessee. August 3.
Boring Elevation	Model Input	STN-42	Stantec. 2009. Report of Geotechnical Exploration and Slope Stability for Dike C, Kingston Fossil Plant, Harriman, Tennessee. August 3.
Boring Elevation	Model Input	STN-43	Stantec. 2009. Report of Geotechnical Exploration and Slope Stability for Dike C, Kingston Fossil Plant, Harriman, Tennessee. August 3.
Boring Elevation	Model Input	STN-45	Stantec. 2009. Report of Geotechnical Exploration and Slope Stability for Dike C, Kingston Fossil Plant, Harriman, Tennessee. August 3.

Table C.4. Model Input Data Used to Model the Material Quantity Assessment Study Area Top of Bedrock Surface

Data Type	Data Use	Boring ID	Source
Boring Elevation	Model Input	STN-47	Stantec. 2009. Report of Geotechnical Exploration and Slope Stability for Dike C, Kingston Fossil Plant, Harriman, Tennessee. August 3.
Boring Elevation	Model Input	STN-48	Stantec. 2009. Report of Geotechnical Exploration and Slope Stability for Dike C, Kingston Fossil Plant, Harriman, Tennessee. August 3.
Boring Elevation	Model Input	STN-49	Stantec. 2009. Report of Geotechnical Exploration and Slope Stability for Dike C, Kingston Fossil Plant, Harriman, Tennessee. August 3.
Boring Elevation	Model Input	STN-50	Stantec. 2009. Report of Geotechnical Exploration and Slope Stability for Dike C, Kingston Fossil Plant, Harriman, Tennessee. August 3.
Boring Elevation	Model Input	STN-51	Stantec. 2009. Report of Geotechnical Exploration and Slope Stability for Dike C, Kingston Fossil Plant, Harriman, Tennessee. August 3.
Boring Elevation	Model Input	STN-52	Stantec. 2009. Report of Geotechnical Exploration and Slope Stability for Dike C, Kingston Fossil Plant, Harriman, Tennessee. August 3.
Boring Elevation	Model Input	STN-53	Stantec. 2009. Report of Geotechnical Exploration and Slope Stability for Dike C, Kingston Fossil Plant, Harriman, Tennessee. August 3.
Boring Elevation	Model Input	STN-55	Stantec. 2009. Report of Geotechnical Exploration and Slope Stability for Dike C, Kingston Fossil Plant, Harriman, Tennessee. August 3.
Boring Elevation	Model Input	STN-56	Stantec. 2009. Report of Geotechnical Exploration and Slope Stability for Dike C, Kingston Fossil Plant, Harriman, Tennessee. August 3.
Boring Elevation	Model Input	STN-61	Stantec. 2009. Report of Geotechnical Exploration and Slope Stability for Dike C, Kingston Fossil Plant, Harriman, Tennessee. August 3.
Boring Elevation	Model Input	STN-62	Stantec. 2009. Report of Geotechnical Exploration and Slope Stability for Dike C, Kingston Fossil Plant, Harriman, Tennessee. August 3.
Boring Elevation	Model Input	STN-63	Stantec. 2009. Report of Geotechnical Exploration and Slope Stability for Dike C, Kingston Fossil Plant, Harriman, Tennessee. August 3.
Boring Elevation	Model Input	STN-64	Stantec. 2009. Report of Geotechnical Exploration and Slope Stability for Dike C, Kingston Fossil Plant, Harriman, Tennessee. August 3.
Boring Elevation	Model Input	STN-65	Stantec. 2009. Report of Geotechnical Exploration and Slope Stability for Dike C, Kingston Fossil Plant, Harriman, Tennessee. August 3.
Boring Elevation	Model Input	STN-66	Stantec. 2009. Report of Geotechnical Exploration and Slope Stability for Dike C, Kingston Fossil Plant, Harriman, Tennessee. August 3.
Boring Elevation	Model Input	STN-69	Stantec. 2009. Report of Geotechnical Exploration and Slope Stability for Dike C, Kingston Fossil Plant, Harriman, Tennessee. August 3.
Boring Elevation	Model Input	STN-71	Stantec. 2009. Report of Geotechnical Exploration and Slope Stability for Dike C, Kingston Fossil Plant, Harriman, Tennessee. August 3.
Boring Elevation	Model Input	SUP 39	Stantec. 2012. Boring Logs Perimeter Containment Ash Pond Segments 3 and 4 Sta. B297+0.00 to Sta. B323+72.58 Kingston Fossil Plant Harriman, Roane County,Tennessee Document Control Number RDP-0114-E. Prepared for Tennessee Valley Authority. December 14.
Boring Elevation	Model Input	SUP-1	Stantec. 2012. Summary of Results for Engineering Evaluation, Segments 4 and 6 Perimeter Containment Alternative Alignments, Kingston Fossil Plant, Harriman, Roane County, Tennessee. Letter from Stantec to Tennessee Valley Authority. October 1.

Table C.4. Model Input Data Used to Model the Material Quantity Assessment Study Area Top of Bedrock Surface

Data Type	Data Use	Boring ID	Source
Boring Elevation	Model Input	SUP-10	Stantec. 2012. Summary of Results for Engineering Evaluation, Segments 4 and 6 Perimeter Containment Alternative Alignments, Kingston Fossil Plant, Harriman, Roane County, Tennessee. Letter from Stantec to Tennessee Valley Authority. October 1.
Boring Elevation	Model Input	SUP-12	Stantec. 2012. Summary of Results for Engineering Evaluation, Segments 4 and 6 Perimeter Containment Alternative Alignments, Kingston Fossil Plant, Harriman, Roane County, Tennessee. Letter from Stantec to Tennessee Valley Authority. October 1.
Boring Elevation	Model Input	SUP-14R	Stantec. 2012. Summary of Results for Engineering Evaluation, Segments 4 and 6 Perimeter Containment Alternative Alignments, Kingston Fossil Plant, Harriman, Roane County, Tennessee. Letter from Stantec to Tennessee Valley Authority. October 1.
Boring Elevation	Model Input	SUP-15	Stantec. 2012. Summary of Results for Engineering Evaluation, Segments 4 and 6 Perimeter Containment Alternative Alignments, Kingston Fossil Plant, Harriman, Roane County, Tennessee. Letter from Stantec to Tennessee Valley Authority. October 1.
Boring Elevation	Model Input	SUP-17R	Stantec. 2012. Summary of Results for Engineering Evaluation, Segments 4 and 6 Perimeter Containment Alternative Alignments, Kingston Fossil Plant, Harriman, Roane County, Tennessee. Letter from Stantec to Tennessee Valley Authority. October 1.
Boring Elevation	Model Input	SUP-18A	Stantec. 2012. Summary of Results for Engineering Evaluation, Segments 4 and 6 Perimeter Containment Alternative Alignments, Kingston Fossil Plant, Harriman, Roane County, Tennessee. Letter from Stantec to Tennessee Valley Authority. October 1.
Boring Elevation	Model Input	SUP-2	Stantec. 2012. Summary of Results for Engineering Evaluation, Segments 4 and 6 Perimeter Containment Alternative Alignments, Kingston Fossil Plant, Harriman, Roane County, Tennessee. Letter from Stantec to Tennessee Valley Authority. October 1.
Boring Elevation	Model Input	SUP-20	Stantec. 2012. Summary of Results for Engineering Evaluation, Segments 4 and 6 Perimeter Containment Alternative Alignments, Kingston Fossil Plant, Harriman, Roane County, Tennessee. Letter from Stantec to Tennessee Valley Authority. October 1.
Boring Elevation	Model Input	SUP-22R	Stantec. 2012. Summary of Results for Engineering Evaluation, Segments 4 and 6 Perimeter Containment Alternative Alignments, Kingston Fossil Plant, Harriman, Roane County, Tennessee. Letter from Stantec to Tennessee Valley Authority. October 1.
Boring Elevation	Model Input	SUP-24	Stantec. 2012. Summary of Results for Engineering Evaluation, Segments 4 and 6 Perimeter Containment Alternative Alignments, Kingston Fossil Plant, Harriman, Roane County, Tennessee. Letter from Stantec to Tennessee Valley Authority. October 1.
Boring Elevation	Model Input	SUP-26R	Stantec. 2012. Summary of Results for Engineering Evaluation, Segments 4 and 6 Perimeter Containment Alternative Alignments, Kingston Fossil Plant, Harriman, Roane County, Tennessee. Letter from Stantec to Tennessee Valley Authority. October 1.
Boring Elevation	Model Input	SUP-27	Stantec. 2012. Summary of Results for Engineering Evaluation, Segments 4 and 6 Perimeter Containment Alternative Alignments, Kingston Fossil Plant, Harriman, Roane County, Tennessee. Letter from Stantec to Tennessee Valley Authority. October 1.
Boring Elevation	Model Input	SUP-28R	Stantec. 2012. Summary of Results for Engineering Evaluation, Segments 4 and 6 Perimeter Containment Alternative Alignments, Kingston Fossil Plant, Harriman, Roane County, Tennessee. Letter from Stantec to Tennessee Valley Authority. October 1.
Boring Elevation	Model Input	SUP-29	Stantec. 2012a. Summary of Results for Engineering Evaluation, Segments 5 and 6 Perimeter Containment Alternative Alignments, Kingston Fossil Plant, Harriman, Roane County, Tennessee. Prepared for Tennessee Valley Authority. October 1.

Table C.4. Model Input Data Used to Model the Material Quantity Assessment Study Area Top of Bedrock Surface

Data Type	Data Use	Boring ID	Source
Boring Elevation	Model Input	SUP-3	Stantec. 2012. Summary of Results for Engineering Evaluation, Segments 4 and 6 Perimeter Containment Alternative Alignments, Kingston Fossil Plant, Harriman, Roane County, Tennessee. Letter from Stantec to Tennessee Valley Authority. October 1.
Boring Elevation	Model Input	SUP-32	Stantec. 2012a. Summary of Results for Engineering Evaluation, Segments 5 and 6 Perimeter Containment Alternative Alignments, Kingston Fossil Plant, Harriman, Roane County, Tennessee. Prepared for Tennessee Valley Authority. October 1.
Boring Elevation	Model Input	SUP-35	Stantec. 2012a. Summary of Results for Engineering Evaluation, Segments 5 and 6 Perimeter Containment Alternative Alignments, Kingston Fossil Plant, Harriman, Roane County, Tennessee. Prepared for Tennessee Valley Authority. October 1.
Boring Elevation	Model Input	SUP-39	Stantec. 2012a. Summary of Results for Engineering Evaluation, Segments 5 and 6 Perimeter Containment Alternative Alignments, Kingston Fossil Plant, Harriman, Roane County, Tennessee. Prepared for Tennessee Valley Authority. October 1.
Boring Elevation	Model Input	SUP-5R	Stantec. 2012. Summary of Results for Engineering Evaluation, Segments 4 and 6 Perimeter Containment Alternative Alignments, Kingston Fossil Plant, Harriman, Roane County, Tennessee. Letter from Stantec to Tennessee Valley Authority. October 1.
Boring Elevation	Model Input	SUP-7	Stantec. 2012. Summary of Results for Engineering Evaluation, Segments 4 and 6 Perimeter Containment Alternative Alignments, Kingston Fossil Plant, Harriman, Roane County, Tennessee. Letter from Stantec to Tennessee Valley Authority. October 1.
Boring Elevation	Model Input	SUP-9R	Stantec. 2012. Summary of Results for Engineering Evaluation, Segments 4 and 6 Perimeter Containment Alternative Alignments, Kingston Fossil Plant, Harriman, Roane County, Tennessee. Letter from Stantec to Tennessee Valley Authority. October 1.