APPENDIX H –
HYDROGEOLOGIC INVESTIGATIONS

APPENDIX H.1

TECHNICAL EVALUATION OF HYDROGEOLOGY

Appendix H.1 - Technical Evaluation of Hydrogeology

TDEC Commissioner's Order:
Environmental Assessment Report
Johnsonville Fossil Plant
New Johnsonville, Tennessee

February 12, 2024

Prepared for:

Tennessee Valley Authority
Chattanooga, Tennessee

Prepared by:

Stantec Consulting Services Inc.
Lexington, Kentucky

REVISION LOG

Revision	Description	Date
0	Submittal to TDEC	September 6, 2023
1	Addresses November 14, 2023 TDEC Review Comments and Issued for TDEC	February 12, 2024

Sign-off Sheet

This document entitled Appendix H.1 – Technical Evaluation of Hydrogeology was prepared by Stantec Consulting Services Inc. ("Stantec") for the account of Tennessee Valley Authority (the "Client"). Any reliance on this document by any third party is strictly prohibited. The material in it reflects Stantec's professional judgment in light of the scope, schedule and other limitations stated in the document and in the contract between Stantec and the Client. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. In preparing the document, Stantec did not verify information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions taken based on this document.

Prepared by ______________________________

Mark Densmore, Senior Geologist

Reviewed by ______________________________

Rebekah Brooks, PG, Senior Principal Hydrogeologist

Approved by ______________________________

John Griggs, PG, Senior Principal

Table of Contents

LIST OF TABLES

LIST OF EXHIBITS

LIST OF ATTACHMENTS

ABBREVIATIONS

CARA	Corrective Action/Risk Assessment
CCR	Coal Combustion Residuals
CCR Parameters	Constituents listed in Appendices III and IV of 40 CFR 257 and five inorganic constituents included in Appendix I of Tennessee Rule 0400-11-01-.04
CCR Rule	Title 40, Code of Federal Regulations, Part 257
CFR	Code of Federal Regulations
cm/sec	Centimeters Per Second
EAR	Environmental Assessment Report
EI	Environmental Investigation
EIP	Environmental Investigation Plan
GSL	Groundwater Screening Level
JOF Plant	Johnsonville Fossil Plant
NRS	Non-Registered Site
%	Percent
PVC	Polyvinyl Chloride
QAPP	Quality Assurance Project Plan
SAP	Sampling and Analysis Plan
SAR	Sampling and Analysis Report
Stantec	Stantec Consulting Services Inc.
TDEC	Tennessee Department of Environment and Conservation
TDEC Order	TDEC Commissioner’s Order OGC15-0177
TI	Technical Instruction
TVA	Tennessee Valley Authority
USGS	United States Geological Survey
USWAG	Utility Solid Waste Activities Group

1.0 INTRODUCTION

Stantec Consulting Services Inc (Stantec), on behalf of the Tennessee Valley Authority (TVA), has prepared this technical evaluation appendix to summarize historical and recent evaluations of hydrogeological and analytical results for groundwater and geochemical data at TVA's Johnsonville Fossil Plant (JOF Plant) in New Johnsonville, Tennessee. This technical appendix also provides a characterization of the extent of contamination and preliminary explanation for the observed occurrences of coal combustion residuals (CCR) constituents in groundwater to support information provided in the Environmental Assessment Report (EAR) and to fulfill the requirements for the Tennessee Department of Environment and Conservation (TDEC)-issued Commissioner's Order No. OGC15-0177 (TDEC Order) Program (TDEC 2015). Further evaluation of the need for corrective actions and the associated extent of groundwater contamination will be provided in the Corrective Action/Risk Assessment (CARA) Plan. For purposes of this document, the following hydrogeological terms as they are defined below are used throughout this document.

- Pore water - subsurface water that occurs in pore spaces in CCR material
- Groundwater - subsurface water that occurs in pore spaces in unconsolidated or geologic materials (e.g., soil, bedrock)
- Aquifer - a geologic formation capable of yielding useable quantities of groundwater
- Unconfined aquifer - an aquifer in which the water table forms the upper boundary
- Confined aquifer - an aquifer present between two aquitards when the water level in a well is observed to be above the top of the aquifer due to the confining pressure (see graphic below)
- Aquitard – a geologic formation comprised of less permeable geologic materials that transmit groundwater more slowly than the aquifer
- Saturated – unconsolidated or geologic materials (e.g., soil, bedrock) or CCR material where all of the pore space is filled with water. The use of the term "saturated" in reference to the moisture content of CCR material does not imply that the pore water is readily separable from the CCR material
- Moisture content - the measure of the amount of water contained within unconsolidated or geologic materials (e.g., soil, bedrock) or CCR material. Moisture content of saturated material can be variable because the characteristics of the material determine the amount of pore space available for water to fill
- Phreatic surface - the surface of pore water at which pressure is atmospheric and below which CCR material may be saturated with pore water. Pore water levels are measured at locations where temporary wells or piezometers were installed within CCR material. The measured pore water levels are used to infer pore water levels between the wells and piezometers to develop the phreatic surface

- Piezometric surface - the groundwater surface defined by the level to which groundwater will rise in a well completed in a confined aquifer

- Uppermost aquifer – the geologic formation nearest the natural ground surface that is an aquifer, as well as lower aquifers that are hydraulically interconnected with this aquifer within a facility's property boundary

- Water table – the surface of groundwater at which pressure is atmospheric and below which geologic materials (e.g., soil or bedrock) may be saturated with groundwater. The measured groundwater levels are used to infer groundwater levels between the wells and piezometers to develop the water table surface. Groundwater levels are measured at locations where wells or piezometers were installed at depths near the water table surface.

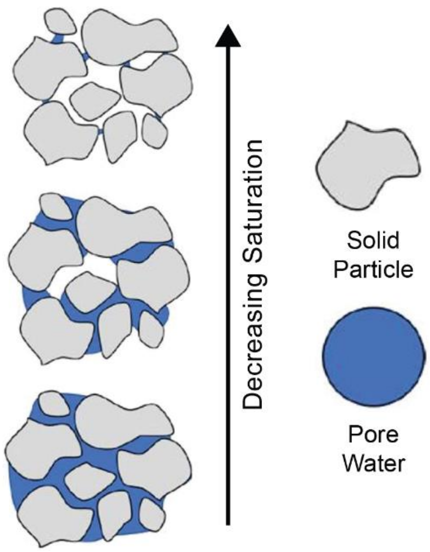
Groundwater level measurements from wells or piezometers installed around the CCR management units[1] and at multiple depths below the water table for unconfined aquifers or the upper aquitard for confined aquifers provide information about the direction of groundwater movement.

The figures below show examples of an unconfined and a confined aquifer. In an unconfined aquifer, groundwater levels measured in monitoring wells installed near the water table are used to infer the elevation of the water table surface.

In a confined aquifer, groundwater levels measured in monitoring wells installed between the upper and lower aquitards are used to infer the elevation of the piezometric surface. Measured groundwater levels rise above the top of the aquifer. The difference between the measured groundwater levels within the aquifer and the top of the aquifer is called the pressure head. The figure for the confined aquifer shows the pressure head for a confined aquifer and associated bounding aquitards. For confined aquifers, groundwater is not encountered in the interval shown as pressure head above the top of the aquifer because it is bounded by an upper aquitard, which also physically separates the groundwater from the geologic unit located above the upper aquitard.

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

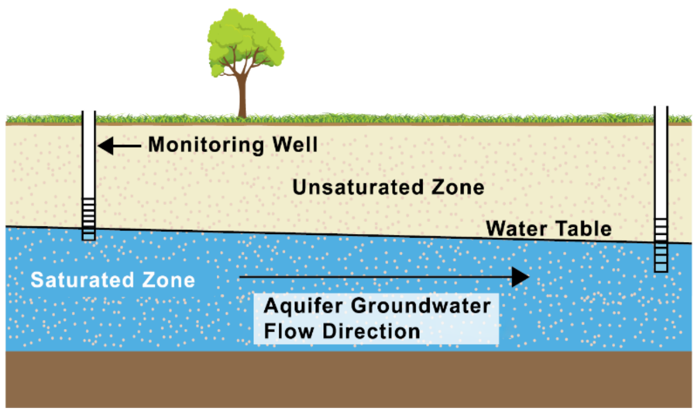
Pore Water



Benson, C., *Water Flow in Coal Combustion Products and Drainage of Free Water*, Report No. 3002021963, Electric Power Research Institute, Palo Alto, CA.

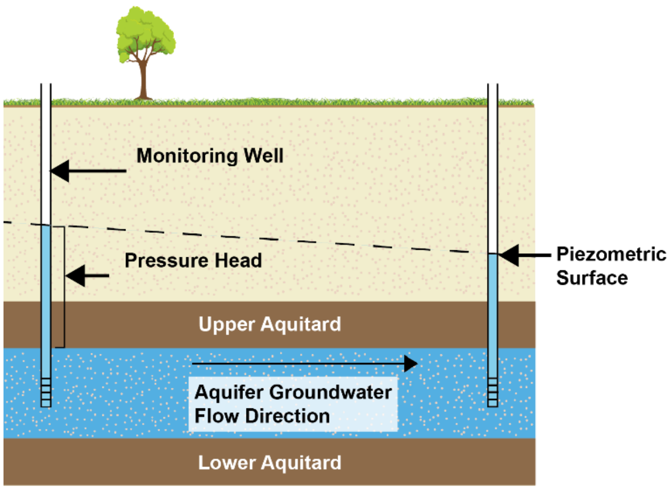
This figure depicts how subsurface water occurs in the pore spaces in CCR material (referred to as "pore water" in this EAR), and how saturation varies within the CCR material. The phreatic surface is the surface of pore water at which pressure is atmospheric and below which CCR material may be saturated with pore water.

Unconfined Aquifer



Groundwater is subsurface water that occurs in pore spaces in soil or bedrock. Groundwater level measurements taken in a well screened near the water table in an unconfined aquifer represent the water level in the aquifer. Groundwater level measurements are used to estimate directions of groundwater movement. Groundwater generally flows much more slowly than water in a surface stream or river.

Confined Aquifer



In a confined aquifer, measured groundwater levels rise above the top of the aquifer, but the actual level of groundwater is constrained by the upper aquitard. The difference between the measured groundwater level within the aquifer and the top of the aquifer is call the pressure head. Because the level of groundwater within a confined aquifer is constrained by the upper aquitard, groundwater in a confined aquifer is not in contact with the geologic unit located above the upper aquitard. The aquitard physically separates them.

2.0 GROUNDWATER AND HYDROGEOLOGICAL INVESTIGATIONS

The purpose of the groundwater and hydrogeological investigations was to further characterize and evaluate subsurface conditions in proximity to the CCR management units at the JOF Plant, including:

- Ash Disposal Area 1
- DuPont Road Dredge Cell
- South Rail Loop Area 4
- Active Ash Pond 2.

In addition, the former Coal Yard, which is not a CCR management unit, was investigated. For these investigations, TVA reviewed information from previous studies and assessments, completed field sampling programs, and conducted evaluations related to geology, hydrogeology, groundwater quality, and CCR material characteristics as part of the TDEC Order Environmental Investigation (EI).

The following sections summarize previous studies and present overall hydrogeological investigation and evaluation findings related to the JOF Plant CCR management units based on data obtained during previous studies and the EI.

2.1 PREVIOUS STUDIES AND ASSESSMENTS

This section provides a summary of prior studies that have been conducted at the JOF Plant and provide useable information related to geology, hydrogeology, groundwater quality, and CCR material characteristics. In addition to the studies summarized below, information from other hydrogeological and geotechnical studies that met the data quality objectives of the *Environmental Investigation Plan (EIP)* (TVA 2018) is incorporated into the evaluation presented in this appendix. Previously closed CCR management units were closed in accordance with applicable regulations in effect at the time of closure.

Exploratory drilling at the JOF Plant began in 1947 to evaluate the suitability for the foundation for a proposed power plant. The investigated site described in the *Geology of the New Johnsonville Steam Plant Site* (Kellberg 1948) encompassed the area presently occupied by the power plant and did not overlap CCR management units.

Beginning in the late 1980s, TVA began performing targeted hydrogeological studies to evaluate existing and future proposed ash management practices. These included:

- From 1989 to 1994, a study was conducted to assess ambient groundwater quality at the JOF Plant, investigate the potential for offsite groundwater contamination, estimate fluxes to the reservoir, and collect and organize hydrogeologic information from a number of studies to support future permitting and closure activities. A groundwater assessment report was completed in

1995.The report included a literature review, information about monitoring well installations, and evaluation of analytical data that characterized byproducts, soil, leachate, and groundwater quality. The report also provided characterization of the hydrogeology, including field hydraulic aquifer testing and groundwater rate and flow calculations (TVA 1995).

- In 1997, an investigation was conducted near South Rail Loop Area 4 to support plans to raise the elevation of CCR material in that area. A Hydraulic Evaluation of Landfill Performance (HELP2) model was utilized to predict the quantity of potential leachate generated (TVA 1997).
- In 2012, compliance monitoring for Dupont Road Dredge Cell was established (TVA 2012).
- Starting in 2011, TVA conducted semi-annual groundwater monitoring at Active Ash Pond 2 as part of the Utility Solid Waste Activities Group (USWAG) Voluntary Monitoring Program. The data reported for the USWAG program were submitted to TDEC for the DuPont Road Dredge Cell (IDL 43-102-0082) and the South Rail Loop Area 4 Non-Registered Site (NRS) No. 43-1232.

TVA compiled certain available historical hydrogeologic information from the investigations listed above and included it in Appendix P of the JOF Plant EIP. Appendix P includes:

- Identification of previously existing, abandoned, or closed piezometers and wells and historical surface water monitoring locations
- Historical groundwater quality data from previous studies were provided in Appendix P Table 1A. Physical parameter and general water quality parameter data were provided in Table 1B, and groundwater elevations were provided in Table 1C.

2.2 CURRENT AND ONGOING GROUNDWATER MONITORING

Current and ongoing compliance groundwater monitoring at the JOF Plant CCR management units consists of two programs:

- **CCR Rule Monitoring Program**: Monitoring at Active Ash Pond 2 is conducted per Title 40 of the Code of Federal Regulations (40 CFR) Part 257 (CCR Rule). In accordance with the CCR Rule, TVA established a certified groundwater monitoring system. Baseline sampling, detection monitoring, and assessment monitoring phases were implemented from 2017 to 2021. Groundwater elevation and analytical data have been and continue to be provided to TDEC and posted to TVA's CCR Rule Compliance Data and Information public website.

  TVA completed a statistical evaluation of the collected groundwater data from Active Ash Pond 2 and determined that constituents detected at downgradient monitoring wells had statistically significant levels above the groundwater protection standards established for the CCR Rule (TVA 2019a). Based on the statistical evaluation, TVA prepared an *Assessment of Corrective Measures Report* (TVA 2019b) in accordance with the CCR Rule. Subsequently, the remedy selection process began to select a remedy that meets the requirements of the CCR Rule. TVA will continue to produce semiannual remedy selection reports describing the progress made toward the selection and design of remedies and annual groundwater monitoring and corrective action reports describing groundwater analytical results from continued groundwater assessment monitoring.

- **TDEC Permitted Landfill Monitoring Program**. From 1990 to the present, TVA has conducted groundwater monitoring at the DuPont Road Dredge Cell under Solid Waste Disposal Permit No. IDL 43-102-0082. Groundwater analytical data reports have been and continue to be provided to TDEC as part of this program.

  From 1990 to the present, TVA has conducted groundwater monitoring at South Rail Loop Area 4. This CCR management unit was not permitted during operations and is designated by TDEC as NRS No. 43-1232. Groundwater analytical data reports have been and continue to be provided to TDEC as part of this program.

Exhibit H.1-1 shows the current groundwater monitoring well and piezometer networks. Appendix E-3 provides a list of the wells and their associated monitoring program.

2.3 HYDROGEOLOGY

The objectives of the TDEC Order hydrogeological and groundwater investigations were to characterize the hydrogeology and groundwater quality and evaluate groundwater flow conditions in the vicinity of the JOF Plant CCR management units.

TVA performed well and piezometer installation and groundwater sample collection activities in accordance with the *EIP, Groundwater Investigation and Hydrogeological Investigation Sampling and Analysis Plans (SAPs)* (Stantec 2018a and 2018b), *Quality Assurance Project Plan (QAPP)* (Environmental Standards, Inc 2018)., and TVA's Environmental Technical Instructions (TIs). Well installation and sample location selection, sample collection methodology, sample analyses, and quality assurance/quality control completed for the investigations are provided in the *Hydrogeological Investigation Sampling and Analysis Report (SAR)* (Appendix H.2) and the *Groundwater Investigation SARs* for the six sampling events (Appendices H.3 through H.8).

As reported in the *Groundwater and Hydrogeological Investigation SARs*, the data collected during these investigations were deemed usable for reporting and evaluation in this EAR because they met the objectives of the *EIP*. An analysis of results and discussion of the dataset from these investigations, along with data collected under other TDEC Order SAPs and data collected under other TDEC permitted landfill and CCR Rule compliance programs, is presented in the sections below.

2.3.1 Scope of Work

The scope of work for the EI hydrogeological and groundwater investigations included drilling soil borings and installing permanent wells at nine locations and a piezometer at a tenth location, collecting soil samples from the screened interval of three proposed background well locations, obtaining saturated zone hydraulic conductivity data, and conducting six groundwater sampling events. Encountered field conditions resulted in modifications to the original plan defined in the *SAP*. These changes are discussed in Section 2.3.2.

The groundwater sampling events included gauging groundwater and pore water levels in permanent and temporary monitoring wells and piezometers installed as part of the EI and other existing monitoring wells and piezometers near the CCR management units. The groundwater and soil samples were analyzed for the CCR-related constituents listed in Appendices III and IV of the CCR Rule, except soil samples were not analyzed for total dissolved solids. In addition, five inorganic constituents listed in Appendix I of Tennessee Rule 0400-11-01-.04 and not included in the CCR Rule Appendices III and IV were analyzed to maintain continuity with the TDEC compliance programs. These additional TDEC Appendix I constituents included copper, nickel, silver, vanadium, and zinc. The combined federal CCR Appendices III and IV constituents and TDEC Appendix I inorganic constituents are hereafter referred to as CCR Parameters. For geochemical evaluation, groundwater samples were analyzed for major cations/anions not included in the CCR Parameters. The additional geochemical parameters included bicarbonate, carbonate, magnesium, potassium, and sodium. Table H.1-1 provides a summary of the boring and well locations associated with the hydrogeological investigation and the rationale for each well location. The locations of the EI wells and other program well locations are shown on Exhibit H.1-1.

2.3.2 Well and Piezometer Installation

The hydrogeological investigation well and piezometer installation activities were conducted between May 21, 2019, and April 23, 2020. Field activities consisted of direct-push technology, hollow stem auger drilling in unconsolidated material, sonic drilling techniques in unconsolidated materials, well installation, vibrating wire piezometer installation, well development, slug testing, pump installation, and well surveys. Stantec performed field activities based on guidance and specifications listed in TVA’s TIs, the *SAPs*, and the *QAPP*.

Nine monitoring wells and one piezometer were installed as part of the EI. Table H.1-1 lists each of the EI borings advanced and whether a well or piezometer was installed. Details regarding the installation of the EI monitoring wells and piezometer are provided below.

For Ash Disposal Area 1, one piezometer (JOF-116-PZ) was installed in unconsolidated materials to monitor groundwater levels along the northern boundary of Ash Disposal Area 1. Monitoring wells JOF-110 and JOF-111 were installed in unconsolidated materials downgradient of Ash Disposal Area 1 to provide locations to monitor groundwater levels and quality. Monitoring well JOF-109 was installed in unconsolidated materials at an upgradient location to monitor groundwater levels and quality.

For the former Coal Yard, monitoring wells JOF-113, JOF-114, and JOF-117 were installed in unconsolidated materials downgradient of the former facility to provide locations to monitor groundwater levels and quality. Monitoring well JOF-112 was installed in unconsolidated materials at an upgradient location to monitor groundwater levels and quality.

For Active Ash Pond 2, monitoring well JOF-118 was installed in unconsolidated materials downgradient of the CCR management unit to monitor groundwater levels and quality. Monitoring well JOF-119 was installed in unconsolidated materials at a background location to monitor groundwater levels and quality.

Proposed monitoring well (JOF-108) was planned at a location downgradient of Ash Disposal Area 1 in unconsolidated materials to provide a location to monitor groundwater levels and quality; however, none of the five borings advanced in the vicinity of this location were completed as a well because CCR materials or shallow refusal was encountered at these locations.

2.3.3 Well and Piezometer Construction

Permanent monitoring wells and the piezometer were installed by qualified drill crews working under the direction of a Stantec Professional Geologist and a licensed Tennessee driller. Wells were constructed of four-inch diameter Schedule 40 polyvinyl chloride (PVC) pre-packed well screens (0.010-inch slots) and riser. The screen and riser consisted of flush-joint, threaded PVC pipe. The screen length was approximately 10 feet in length. Well construction details are included in the *Hydrogeological Investigation SAR.* Table H.1-2 shows the well construction summary for the EI wells and other previously existing wells as shown on Exhibits H.1-1.

The piezometer was completed with a vibrating wire type transducer. The piezometer was installed following drilling of the boring by first identifying the depth for the measurement tip of the transducer. The vibrating wire transducer and cabling were then attached to a sacrificial PVC riser at the selected monitoring depth. The riser was lowered into the boring, and the boring was backfilled with high solids bentonite grout. The vibrating wire data cable was secured within a protective cover at ground surface.

Individual well and piezometer construction details are included in Appendix C of the EAR.

2.3.4 Well Development

Each new permanent well was developed using a combination of bailing, surging, and pumping after a minimum of 24 hours following well installation. A summary of initial and final water quality measurements collected during well development is presented in Table B.2 in Appendix B of the *Hydrogeological Investigation SAR* (Appendix H.2).

2.3.5 Aquifer Testing

2.3.5.1 Slug Testing

After development of the wells installed as part of the hydrogeological investigation, Stantec performed slug testing in the nine permanent wells (JOF-109, JOF-110, JOF-111, JOF-112, JOF-113, JOF-114, JOF-117, JOF-118, and JOF-119) to estimate the hydraulic conductivity of the unconsolidated materials within the screened interval of each well. A pressure transducer with a data recorder was used to collect water level information from the wells.

The field data were analyzed using AQTESOLV™ Version 4.50 Professional software to estimate the hydraulic conductivity of the saturated unconsolidated materials in the screened interval of each tested monitoring well. Calculated hydraulic conductivities are summarized in Table B.3 in Appendix B of the *Hydrogeological Investigation SAR* (Appendix H.2), and the software output package is provided in Appendix E of the *Hydrogeological Investigation SAR*. The hydraulic conductivity in the nine EI permanent wells, listed above, ranged from 2.81×10^{-5} centimeters per second (cm/sec) to 7.68×10^{-2} cm/sec.

A summary of the EI slug test results combined with results of slug tests conducted in monitoring wells from other groundwater programs is provided in Table H.1-3. The hydraulic conductivity results are grouped by CCR management unit and the former Coal Yard. The geometric mean of the hydraulic conductivities follow:

- Ash Disposal Area 1: 3.19 x 10^{-4} cm/sec
- Former Coal Yard: 1.46 x 10^{-3} cm/sec
- DuPont Road Dredge Cell: 9.40 x 10^{-4} cm/sec
- South Rail Loop Area 4: 1.49 x 10^{-4} cm/sec
- Active Ash Pond 2: 4.16 x 10^{-2} cm/sec

2.3.6 Groundwater Sampling

Groundwater samples were collected during six events on the following dates:

- Event 1 - December 2-5, 2019
- Event 2 – February 11-12, 2020
- Event 3 – April 7-9, 2020
- Event 4 – June 9-11, 2020
- Event 5 – August 12-13, 2020
- Event 6 – October 13-15, 2020.

TVA performed investigation sample and data collection activities in accordance with the *Groundwater Investigation SAP*, TVA's TIs and the *QAPP*. Permanent wells were purged using dedicated bladder pumps equipped with dedicated tubing and low-flow purging and sampling techniques. Details of each sampling event are provided in the *Groundwater Investigation SARs,* Events #1 through #6 (Appendices H.3 through H.8).

2.3.7 Hydrogeologic Assessment Results

Several soil boring, well, and piezometer installation projects at and in the vicinity of the JOF Plant CCR management units yielded information about the geology, hydrogeologic properties of the geologic formations, groundwater elevations, groundwater flow direction, and groundwater quality. This section provides an evaluation of the hydrogeological setting of the JOF Plant CCR management units.

2.3.7.1 Geology and Lithology

Chapter 2.4 of the EAR provides a discussion of the regional geologic setting for the JOF Plant. This section provides a discussion of the geology and lithology of the JOF Plant CCR management units and former Coal Yard. Use of the terminology “fill material” in the following discussions excludes CCR material. A discussion of CCR material is provided in Appendix G.1. Exhibit H.1-2 shows a three-dimensional lithologic model, including representation of the extent of CCR material at the JOF Plant.

The JOF Plant is located in the Tennessee River Valley. The shallow stratigraphy in the vicinity of the JOF Plant CCR management units consists of fill material, residuum, and alluvium (collectively unconsolidated materials) overlying bedrock. Residuum is the material that remains after bedrock has weathered to a point that it is no longer considered rock. Alluvium refers to native materials (i.e., clay, silt, sand, or gravel) that are deposited by moving water. The unconsolidated materials range in thickness from a few feet to over 70 feet, with the thickest extent encountered in the Active Ash Pond 2.

The fill is composed of aggregate or reworked native deposits ranging in thickness from a few feet to over 45 feet at the former Coal Yard. The fill is underlain by alluvium. Alluvial deposits were observed to be poorly sorted and unconsolidated and consist of clay, silt, sand, and gravel. The finer-grained material is usually near the surface, and the coarser grained material is more common at depth. The alluvium ranges in thickness from six feet to over 35 feet. The residuum was encountered below the alluvium and ranges in thickness from a few feet to over 15 feet. Exhibits H.1-3 and H.1-4 show three-dimensional representations of the extent of the unconsolidated materials consisting primarily of silts and clays, and sands and gravels, respectively.

The unconsolidated materials overlie Mississippian and Devonian-aged sedimentary bedrock formations. These units are depicted on the geologic map of the JOF Plant area provided as Exhibit H.1-5. The Fort Payne Formation ranges from 200 to 300 feet in thickness and is comprised of a cherty limestone or calcareous siltstone that underlies the alluvial deposits in the eastern part of the JOF Plant and pinches out near the river (TDEC 2017). Ash Disposal Area 1 may be underlain by the Fort Payne Formation. The Chattanooga Shale consists of grayish-black, fissile, carbonaceous shale with a thickness of 7 to 75-feet at the site. Its variation in thickness originates in folding and repetition by faulting in the areas where it is over 30-feet thick and from partial removal by erosion in areas under 30-feet thick (TDEC 2017 and Kellberg 1948). The Chattanooga Shale is known to be a natural source of various constituents, including cobalt, molybdenum, nickel, and uranium (parent of radium-226). These four constituents have been shown to be correlated with one another in the Chattanooga Shale (United States Geological Survey 1969). South Rail Loop Area 4 is underlain by the Chattanooga Shale. The Chattanooga Shale is underlain by the Camden Formation. The Camden Formation is composed of hard, dense, brittle, light-gray, chert layers separated by softer gritty clay along bedding planes with a thickness of more than 100 feet. It is extremely fractured and fresh quarry faces break down rapidly. The weathered Camden Formation chert can appear as a clayey gravel while drilling (Kellberg 1948). Active Ash Pond 2 and the northern part of the former Coal Yard are underlain by the Camden Formation. The southern part of the former Coal Yard is underlain by the Chattanooga Shale. Borings installed in the vicinity of the DuPont Road Dredge Cell did not encounter bedrock. Exhibit H.1-6 shows a three-dimensional representation of the bedrock surface.

2.3.7.2 Hydrostratigraphic Units and the Uppermost Aquifer

Hydrostratigraphic units are geological formations that have been defined to characterize the hydrogeology of the JOF Plant to understand where and how groundwater is flowing. Groundwater flows from higher groundwater elevations to lower elevations. In saturated geological formations that have higher permeability than adjacent formations, groundwater flows in a mostly horizontal direction. In saturated geological formations that have lower permeability than adjacent formations, groundwater flows in a more vertical direction. Geological formations, groups of formations, or parts of a formation capable of yielding useable quantities of groundwater to wells or springs are called aquifers. Aquifers are targeted for development as water sources by property owners. The less permeable geological formations are called aquitards.

Hydraulic characteristics of hydrostratigraphic units are used to classify aquifers. If an aquifer's upper boundary forms the water table, then it is called an unconfined aquifer. An aquifer located between two aquitards is called a confined aquifer. Groundwater can flow through aquitards into underlying aquifers, but the rate of flow is commonly much slower than the rate of flow within the aquifer. Aquifers can be considered confined even if they are not completely covered by an aquitard. For example, the Memphis aquifer in western Tennessee is a confined aquifer, yet it is known that the aquitard above the Memphis aquifer is thin or absent in some areas (United States Geological Survey 1990).

As shown in the graphical representation in Section 1.0, in a confined aquifer measured groundwater levels rise above the top of the aquifer. The difference between the measured groundwater levels within the aquifer and the top of the aquifer is called the pressure head. For confined aquifers, groundwater is not encountered in the interval shown as pressure head above the top of the aquifer because it is bounded by an upper aquitard, which also physically separates the groundwater from the geologic unit located above the upper aquitard.

In state and federal regulations, the term uppermost aquifer is used. This is the aquifer nearest the natural ground surface, as well as lower aquifers that are hydraulically interconnected with this aquifer within a facility's property boundary that are capable of yielding usable quantities of groundwater. Regulations are designed to protect the groundwater in the uppermost aquifer because it could be used by property owners as a source of water. The term uppermost aquifer is used in this report.

Both confined and unconfined aquifers exist as the uppermost aquifer in the vicinity of the JOF Plant and are further described below.

Based on the geology and hydraulic conductivities measured in the vicinity of Ash Disposal Area 1, the DuPont Road Dredge Cell, and South Rail Loop Area 4 CCR management units, the primarily sand and gravel interval in the unconsolidated materials observed near the top of bedrock shown on JOF Sections A-A' through C-C' on Exhibits D-2 and D-3 in Appendix D of the EAR is considered to be the uppermost aquifer, which is under unconfined conditions. Section transect lines are shown on Exhibit D-1 (EAR Appendix D).

Based on the geology and hydraulic conductivities of geologic materials measured in the vicinity of the former Coal Yard, the primarily sand and gravel interval and the upper, highly fractured part of the Camden Chert shown on JOF Section E-E' on Exhibit D-4 are considered to be the uppermost aquifer, which is under unconfined conditions.

Based on the geology and hydraulic conductivities of geologic materials measured in the vicinity of the Active Ash Pond 2, the primarily sand and gravel interval near the top of bedrock shown on Exhibit D-4 in Appendix D of the EAR is considered to be the uppermost aquifer. The uppermost aquifer is overlain by primarily clay that is defined as an aquitard; therefore, the uppermost aquifer is a confined aquifer. Groundwater in a confined aquifer is not in contact with the CCR material inside the CCR management units where the aquitard is present because the aquitard physically separates them. Exhibit H.1-7 shows the distribution and thickness of the clay that comprises the aquitard above the uppermost aquifer. The clay layer appears to be continuous at Active Ash Pond 2 and ranges in thickness from approximately 10 to 40 feet.

The following discussions of groundwater elevations and flow for the JOF CCR management unit areas are focused on data from wells that monitor the uppermost aquifers, but also rely on data collected from wells or piezometers installed in the CCR management units or other hydrogeological units as part of other programs to support the evaluations.

2.3.7.3 Groundwater Flow

This section provides a discussion of how groundwater flows at the JOF Plant. Groundwater flow occurs because gravity moves groundwater from areas of higher groundwater elevations to areas of lower elevations along flow paths that are generally perpendicular to groundwater elevation contours. Physiographic and hydrogeological features affect how groundwater flows. Hydrogeological barriers (i.e., rivers and surface streams) and divides (i.e., ridges that form watershed boundaries) bound the extent of groundwater flow. Groundwater flows toward, but not across, hydrogeological barriers and away from hydrogeological divides.

Exhibit H.1-8 shows the physiographic setting of the JOF Plant within the floodplain of the Tennessee River. Within this document, Tennessee River and Kentucky Lake are used interchangeably to describe the same surface water body. A key characteristic of the setting is that the plant is situated in a low-lying area along the Tennessee River with a higher elevation ridge to the east of the plant. Physiographic features that affect groundwater flow in the vicinity of the JOF Plant include the steep topography of the ridge to the east and the Tennessee River to the west of the CCR management units and former Coal Yard. In addition, a hydrogeological divide was mapped approximately coincident with the southern boundary of the JOF Plant using the United States Geological Survey (USGS) StreamStats tool (https://www.usgs.gov/streamstats) as shown on Exhibit H.1-9. The historical stream network that existed where the JOF Plant was constructed based on a USGS topographic map from 1936 is also shown on Exhibit H.1-9. The mapped hydrogeological divide is consistent with higher ground surface elevations near the southern boundary of the JOF Plant and surface stream patterns shown on a USGS topographic map from 1950 (Exhibit H.1-10).

The discussions of groundwater elevations and flow are focused on data from wells that monitor the uppermost aquifers, but also rely on data collected from wells or piezometers installed in the CCR management units or other hydrogeological units as part of other programs to support the evaluations. Groundwater levels in the uppermost aquifer were measured in 29 wells and used for groundwater elevation contour map development. Groundwater level measurements were also obtained from 10 piezometers installed for the EI and other programs. Surface water elevation measurements for the

Tennessee River were continuously recorded as part of TVA's plant operations. The automated reading recorded closest to noon on the gauging date was used for comparison to groundwater levels. The groundwater level measurements were converted to elevations. Table H.1-4 provides elevation data for Event #5 in August 2020. Table H.1-5 provides elevation data from the groundwater investigation. Exhibit H.1-11 provides a representative groundwater elevation contour map for Event #5 in August 2020. Groundwater elevation contour maps for other sampling events can be found in Appendices H.3 through H.6 and H.8.

At the JOF Plant, groundwater levels were measured within the unconsolidated materials. Generally, the horizontal groundwater flow direction is to the west toward the Tennessee River. At Active Ash Pond 2, the groundwater elevation is approximately the same as the Tennessee River stage, but there typically is a small hydraulic gradient from the east-northeast to the west-southwest. Groundwater flow in the unconsolidated materials is bounded to the west by the Tennessee River. Exhibit H.1-11 from groundwater sampling Event #5 in August 2020 is a representative groundwater contour map for the unconsolidated materials.

Horizontal groundwater flow rates were calculated using groundwater elevation data acquired during the six EI groundwater sampling events and a mean hydraulic conductivity derived from the results of slug testing data (Table H.1-3) for the CCR management units and the former Coal Yard. Flow direction and hydraulic gradient were estimated using the triangulation method and groundwater elevations for each event. The flow rate was calculated using typical effective porosity percentages based on soil type, constant hydraulic conductivity values based on geometric mean calculations from slug testing, and the groundwater elevation inputs specific to each gauging event. Table H.1-6 provides a summary of the calculations used to estimate the average horizontal flow rate and the results of the calculations for each groundwater sampling event.

Ash Disposal Area 1

For the unconsolidated materials at the Ash Disposal Area 1, the values used to calculate groundwater flow rates follow:

- Geometric mean of hydraulic conductivity of 3.19 x 10-4 cm/sec
- Average horizontal hydraulic gradient ranged from 0.0090 feet/foot (Event # 6) to 0.0112 feet/foot (Event #2)
- Effective porosity 20 percent (%). The reference for the effective porosity of the unconsolidated materials uses specific yield as a proxy for effective porosity of unconsolidated material (Johnson, A.I. Revised 1966, page D18).

The average groundwater flow rate for the unconsolidated materials at Ash Disposal Area 1 ranged from 15 feet/year (Event #6) to 19 feet/year (Event #2).

Former Coal Yard

For the unconsolidated materials at the former Coal Yard, the values used to calculate groundwater flow rates follow:

- Geometric mean of hydraulic conductivity of 1.46 x 10-3 cm/sec
- Average horizontal hydraulic gradient ranged from 0.0142 feet/foot (Event # 2) to 0.0216 feet/foot (Event #6)
- Effective porosity 20% (Johnson, A.I. Revised 1966, page D18).

The average groundwater flow rate for the unconsolidated materials at the former Coal Yard ranged from 107 feet/year (Event #2) to 163 feet/year (Event #6).

DuPont Road Dredge Cell

For the unconsolidated materials at the DuPont Road Dredge Cell, the values used to calculate groundwater flow rates follow:

- Geometric mean of hydraulic conductivity of 9.40 x 10-4 cm/sec
- Average horizontal hydraulic gradient ranged from 0.0014 feet/foot (Event #1) to 0.0030 feet/foot (Event #4)
- Effective porosity 20% (Johnson, A.I. Revised 1966, page D18).

The average groundwater flow rate for the unconsolidated materials at the Dupont Road Dredge Cell ranged from 7 feet/year (Event #1) to 15 feet/year (Event #4).

South Rail Loop Area 4

For the unconsolidated materials at the South Rail Loop Area 4, the values used to calculate groundwater flow rates follow:

- Geometric mean of hydraulic conductivity of 1.49 x 10-4 cm/sec
- Average horizontal hydraulic gradient ranged from 0.0067 feet/foot (Event # 6) to 0.0082 feet/foot (Event #3)
- Effective porosity 20% (Johnson, A.I. Revised 1966, page D18).

The average groundwater flow rate for the unconsolidated materials at the South Rail Loop 4 ranged from 5 feet/year (Event #6) to 6 feet/year (Event #3).

Active Ash Pond 2

For the unconsolidated materials at Active Ash Pond 2, the values used to calculate groundwater flow rates follow:

- Geometric mean of hydraulic conductivity of 4.16 x 10-2 cm/sec
- Average horizontal hydraulic gradient ranged from 0.0001 feet/foot (Event #1) to 0.0005 feet/foot (Event #2)
- Effective porosity 20% (Johnson, A.I. Revised 1966, page D18).

The average groundwater flow rate for the unconsolidated materials at Active Ash Pond 2 ranged from 26 feet/year (Event #1) to 108 feet/year (Event #2).

2.3.7.4 Groundwater/Surface Water/Pore Water Relationship

This section provides a discussion of groundwater, surface stream, and pore water elevation relationships. The discussion consists of two parts. The first part of the discussion is focused on a general comparison of differences in pore water and inferred groundwater elevations in the vicinity of each of the CCR management units and the former Coal Yard. The second part of the discussion is focused on correlations between fluctuations in groundwater, surface stream, and pore water levels and includes an evaluation of the effect of precipitation events. Exhibit H.1-12 shows the locations of wells and piezometers used to manually gauge groundwater and pore water elevations. Exhibit H.1-13a shows locations of piezometers that are automated to record pore water and groundwater elevations at Active Ash Pond 2. Exhibit H.1-13b shows locations of wells and piezometers that are automated to record pore water and groundwater elevations at the DuPont Road Dredge Cell. Exhibit H.1-14 provides hydrographs of the Tennessee River, groundwater, and pore water elevations for manually gauged wells for Ash Disposal Area 1. Exhibit H.1-15 provides hydrographs of the Tennessee River, groundwater, and pore water elevations for manually gauged wells for the former Coal Yard. Exhibits H.1-16a and H.1-16b provide hydrographs of the Tennessee River, groundwater elevations of automated and manually gauged or read wells and piezometers, respectively, for the DuPont Road Dredge Cell. Exhibit H.1-17 provides hydrographs of the Tennessee River and pore water elevations for manually gauged wells for South Rail Loop Area 4. Exhibits H.1-18a and H.1-18b provide hydrographs of the Tennessee River, groundwater elevations of automated and manually gauged or read wells and piezometers, respectively, for Active Ash Pond 2. Table H.1-5 provides a comparison of the groundwater elevations at wells and piezometers and the Tennessee River for the six sampling events. A complete set of hydrographs for available instrumentation is provided in Attachment H.1-A.

<u>General Comparison of Pore Water and Groundwater Elevations</u>

Within Ash Disposal Area 1, pore water elevations were similar to groundwater elevations. The higher elevation of pore water within the CCR management unit compared to the Tennessee River stage suggests that the perimeter dikes and foundation soils are impeding lateral and vertical flow of pore water. Groundwater elevations on the upgradient side of this unit are higher than pore water elevations which indicates that pore water levels are not causing a reversal of the groundwater flow direction along the upgradient edge of this CCR management unit (sometimes referred to as mounding).

Within the former Coal Yard, pore water elevations were approximately 5 feet higher than groundwater elevations based on measurements made in monitoring wells along the perimeter of the former Coal

Yard. The higher elevation of pore water within the former Coal Yard compared to the Tennessee River stage suggests that the perimeter dikes are impeding lateral and vertical flow of pore water. As discussed below in this section, groundwater levels in upgradient well JOF-112 appear to be influenced by the water level of the Coal Yard Runoff Pond, which forms the eastern boundary of the former Coal Yard. This suggests that pore water levels within the former Coal Yard are not influencing well JOF-112 and are not causing a reversal of the groundwater flow direction along the upgradient edge of the former Coal Yard.

Historically, within the DuPont Road Dredge Cell prior to construction of the geosynthetic cap, pore water elevations ranged from approximately 428 to 433 feet above mean sea level. As of early 2023, pore water elevations ranged from approximately 401 to 402 feet above mean see level within the DuPont Road Dredge Cell. Exhibit H.1-19 shows the locations of certain abandoned piezometers that were previously gauged in relation to the locations of existing automated piezometers. Exhibit H.1-20 shows the elevations of pore water measured at the locations shown on Exhibit H.1-19. Since the temporary wells were installed as part of the EI, measured groundwater elevations in perimeter monitoring wells have ranged from approximately 18 to 27 feet below pore water elevations. The difference between pore water elevations and groundwater elevations suggests that the perimeter dikes and foundation soils are impeding lateral and vertical flow of pore water. Along the eastern boundary, available information is inconclusive regarding whether pore water levels are affecting the direction of groundwater flow; however, groundwater elevations were generally consistent with or possibly lower than what would be expected based on observed groundwater flow patterns across the JOF Plant, which suggests that they have not been affected by pore water levels.

Within Active Ash Pond 2, pore water elevations were more than 20 feet higher than groundwater elevations along the perimeter of the CCR management unit and the stage of the Tennessee River. The higher elevation of pore water within Active Ash Pond 2 compared to groundwater elevations and the Tennessee River stage suggests that the perimeter dikes and foundation soils are impeding lateral and vertical flow of pore water. Groundwater elevations along the perimeter of Active Ash Pond 2 were similar to the stage of the Tennessee River which indicates that pore water levels are not affecting groundwater elevations.

Within the South Rail Loop Area 4, pore water only exists withing two low areas (Exhibit D-3). The pore water elevations were approximately 5 to 6 feet higher in the eastern area than in the western area. The higher pore water elevations in the eastern area, as compared to the western area, suggest that the dikes and foundation soils in the eastern area are impeding lateral and vertical flow of pore water. The lower pore water elevations in the western area suggest that pore water elevations may be in equilibrium with the water table. The higher groundwater elevations on the upgradient side of the South Rail Loop Area 4 compared to the pore water elevations in the eastern area indicate that the pore water levels are not causing a reversal of groundwater flow direction along the upgradient side of this CCR management unit.

<u>Correlations Between Fluctuations in Groundwater, Surface Stream, and Pore Water Levels</u>

The following are observations regarding correlation of fluctuations in water levels between the Tennessee River, groundwater, pore water, and precipitation.

- **Tennessee River**: Exhibit H.1-14 shows a hydrograph for the Tennessee River and a timeline of precipitation events, including the amount of precipitation. The river stage fluctuations appear to correlate with winter and summer pool changes that are part of the management of water levels in the Tennessee River. The seasonal influence of the operating reservoir levels is apparent, with the lowest stages generally occurring during the late fall through early spring months and the highest stages generally occurring during the late spring through early fall months. Larger precipitation events correlate with higher elevations of the Tennessee River stage.

- **Ash Disposal Area 1**: Exhibit H.1-14 shows a comparison of river stage and groundwater level fluctuations at monitored locations near Ash Disposal Area 1. There were no automated piezometers or wells to measure groundwater levels. The groundwater hydrographs for the manually gauged piezometers and monitoring wells show a subdued fluctuation pattern compared to the river stage fluctuations but do not have the resolution to make comparisons to short-term river level fluctuations or individual precipitation events. In addition, monitoring wells JOF-110 and JOF-111 appear to have responded to the lowering of the water level in the Coal Yard Runoff Pond. Both wells show an overall decrease in groundwater elevations beginning in September 2021, which is when the Coal Yard Runoff Pond water level was reduced (Exhibit H.1-14).

  Exhibit H.1-14 shows a comparison of river stage and pore water level fluctuations at monitored locations within the Ash Disposal Area 1. There were no automated piezometers or wells to measure pore water levels. The pore water hydrographs for the manually gauged piezometers and temporary wells show a subdued fluctuation pattern compared to the river stage fluctuations but do not have the resolution to make comparisons to short-term river level fluctuations or individual precipitation events. In addition, temporary wells JOF-TW06 and JOF-TW07 appear to have responded to the lowering of the water level in the Coal Yard Runoff Pond. Both wells show an overall decrease in groundwater elevations beginning in September 2021, which is when the Coal Yard Runoff Pond water level was reduced (Exhibit H.1-14).

- **Former Coal Yard**: Exhibit H.1-15 shows a comparison of river stage and groundwater level fluctuations at monitored locations near the former Coal Yard. There were no automated piezometers or wells to measure groundwater levels. The groundwater hydrographs for the manually gauged monitoring wells JOF-113, JOF-114, and JOF-117 show a subdued fluctuation pattern compared to the river stage fluctuations but do not have the resolution to make comparisons to short-term river level fluctuations or individual precipitation events. The groundwater hydrograph for JOF-112 does not appear to have fluctuations that correlate with river stage or precipitation events; however, well JOF-112 appears to have responded to the lowering of the water level in the Coal Yard Runoff Pond. This well shows an overall decrease in groundwater elevations beginning in September 2021, which is when the Coal Yard Runoff Pond water level was reduced (Exhibit H.1-15).

  Exhibit H.1-15 shows a comparison of river stage and pore water level fluctuations at monitored locations within the former Coal Yard. There were no automated piezometers or wells to measure pore water levels. The pore water hydrographs for the manually gauged temporary wells show fluctuation patterns that could be correlated with the river stage fluctuations or precipitation related seasonal patterns. The pore water hydrographs do not have the resolution to make comparisons to short-term river level fluctuations or individual precipitation events. Temporary well JOF-TW09 shows an overall decrease in pore water elevations that generally correlates with the lowering of the water level in the Coal Yard Runoff Pond (Exhibit H.1-15).

- **DuPont Road Dredge Cell**: Exhibit H.1-16b shows a comparison of river stage and groundwater level fluctuations at monitored locations near the DuPont Road Dredge Cell. There were no automated piezometers or wells to measure groundwater levels. The groundwater hydrographs for the manually gauged monitoring wells show fluctuations that could be correlated with river stage or precipitation related to seasonal patterns. Because of the distance of these instruments from the Tennessee River, the observed fluctuations are interpreted to be associated with seasonal precipitation patterns. The groundwater hydrographs do not have the resolution to make comparisons to short-term river level fluctuations or individual precipitation events (Exhibit H.1-16b).

  Exhibit H.1-16a shows a comparison of river stage and pore water level fluctuations at monitored locations within the DuPont Road Dredge Cell. The pore water hydrographs for automated locations JOF-DC-PZ8, JOF-DC-PZ9, and JOF-DC-PZ10 had no apparent correlation between river stage or precipitation and the pore water fluctuations. The pore water elevations declined over time before dropping to near the piezometer tip elevation.

  The pore water hydrographs for the manually gauged temporary wells JOF-TW11, JOF-TW12, and JOF-TW13 show generally decreasing trends in pore water elevations, but do not have the resolution to make comparisons to short-term river level fluctuations or individual precipitation events (Exhibit H.1-16b).

- **South Rail Loop Area 4**: Exhibit H.1-17 shows a comparison of river stage and groundwater level fluctuations at monitored locations near the South Rail Loop Area 4. There were no automated piezometers or wells to measure groundwater levels. The groundwater hydrographs for manually gauged monitoring wells B-9 and JOF-101 show fluctuations that could be correlated with river stage or precipitation related to seasonal patterns. Because of the distance of these wells from the Tennessee River, the observed fluctuations are interpreted to be associated with seasonal precipitation patterns. The groundwater hydrographs for wells B-8R and JOF-102 and piezometers JOF-B05A, JOF-B06A, JOF-B07B, and JOF-B08B show similar, but subdued, patterns in comparison to wells B-9 and JOF-101. The fluctuations are interpreted to be due to seasonal precipitation patterns because of the distance from the Tennessee River. The groundwater hydrograph for well B-6R was generally stable over the gauging period. The hydrograph for piezometer JOF-B09A was variable. The groundwater hydrographs do not have the resolution to make comparisons to short-term river level fluctuations or individual precipitation events (Exhibit H.1-17).

  Exhibit H.1-17 shows a comparison of river stage and pore water level fluctuations at monitored locations within South Rail Loop Area 4. There were no automated piezometers or wells to measure pore water levels. The pore water hydrographs for manually gauged temporary wells

JOF-TW15 and JOF-TW16 show fluctuations that could be correlated with river stage or precipitation related to seasonal patterns. The hydrographs for piezometers JOF-B07A and JOF-B08A have a short period of coverage but appear similar to the hydrographs for the temporary wells. Because of the distance of these wells and piezometers from the Tennessee River, the observed fluctuations are interpreted to be associated with seasonal precipitation patterns. The manually gauged pore water hydrographs do not have the resolution to make comparisons to short-term river level fluctuations or individual precipitation events (Exhibit H.1-17).

- **Active Ash Pond 2**: Exhibit H.1-18a shows a comparison of river stage and groundwater level fluctuations at monitored locations beneath Active Ash Pond 2. The groundwater hydrographs for automated locations within the sand and gravel layer (e.g., JOF-PZ-AAP2-1-PZ3, JOF-PZ-AAP2-2-PZ3, JOF-PZ-AAP2-3-PZ3, JOF-PZ-AAP2-5-PZ3, JOF-PZ-AAP2-6-PZ3, JOF-PZ-AAP2-7-PZ3, JOF-PZ-AAP2-8-PZ3, and JOF-PZ-AAP2-10-PZ3) show fluctuations that are correlated with the fluctuations and stage elevation of the Tennessee River. Additional groundwater hydrographs from locations at or near the periphery of Active Ash Pond 2 and within the sand and gravel unit (e.g., JOF-PZET, JOF-PZFT, JOF-PZHT, JOF-B-2A-PZ3, JOF-B-2B-PZ4, JOF-C-2A-PZ2, JOF-C-2B-PZ2, JOF-E-2A-PZ2, JOF-E-2B-PZ3, JOF-K-2A-PZ1) also show fluctuations that are correlated with the fluctuations and stage elevation of the Tennessee River. The groundwater hydrographs for automated locations within the clay foundation soils (e.g., JOF-PZDT, JOF-PZGT, JOF-PZIT, JOF-B-2A-PZ4, JOF-B-2B-PZ3, JOF-C-2A-PZ4, JOF-C-2B-PZ3, JOF-E-2A-PZ3, JOF-K-2A-PZ2, JOF-PZ-AAP2-1-PZ2, JOF-PZ-AAP2-2-PZ2, JOF-PZ-AAP2-3-PZ2, JOF-PZ-AAP2-5-PZ2, JOF-PZ-AAP2-6-PZ2, JOF-PZ-AAP2-7-PZ2, JOF-PZ-AAP2-8-PZ2, and JOF-PZ-AAP2-10-PZ2) also show fluctuations that generally are correlated with the fluctuations of the Tennessee River. The groundwater elevations measured in piezometers located in the clay layer beneath Active Ash Pond 2 are typically higher than groundwater elevations in the sand and gravel and show subdued fluctuations as compared to the river stage fluctuations (Attachment H.1-A).

  The groundwater hydrographs for the manually gauged monitoring wells show fluctuations that generally are correlated with fluctuations and stage elevation of the Tennessee River. The groundwater hydrographs do not have the resolution to make comparisons to short-term river level fluctuations or individual precipitation events (Exhibit H.1-18b).

  Exhibit H.1-18a also shows a comparison between river stage and pore water level fluctuations at automated locations. The pore water hydrographs for automated locations within Active Ash Pond 2 (e.g., JOF-PZ-AAP2-1-PZ1, JOF-PZ-AAP2-2-PZ1, JOF-PZ-AAP2-3-PZ1, JOF-PZ-AAP2-5-PZ1, JOF-PZ-AAP2-6-PZ1, JOF-PZ-AAP2-7-PZ1, JOF-PZ-AAP2-8-PZ1, and JOF-PZ-AAP2-10-PZ1) show fluctuation patterns that do not appear to be correlated with river stage fluctuations and could be correlated with precipitation events. The pore water hydrographs for the manually gauged temporary wells show fluctuation patterns that could be correlated with the river stage fluctuations or precipitation related seasonal patterns. The pore water hydrographs show a range of fluctuations that appears to be greater than that of the Tennessee River (see JOF-TW02). This suggests that the pore water fluctuations are influenced by precipitation events and operation of the pool level within this CCR management unit. The pore water hydrographs do not have the resolution to make comparisons to short-term river level fluctuations or individual precipitation events (Exhibit H.1-18b).

In summary, for Ash Disposal Area 1, there is a subdued correlation of fluctuations in groundwater and pore water elevations with the Tennessee River stage. In addition, both groundwater and pore water elevations showed decreases that correlated with the lowering of the water level within the Coal Yard Runoff Pond. For the former Coal Yard, there is a subdued correlation of fluctuations in groundwater and pore water elevations with the Tennessee River stage, except for well JOF-112. Well JOF-112 showed a decrease in groundwater elevations that correlated with the lowering of the water level within the Coal Yard Runoff Pond.

For the DuPont Road Dredge Cell, the fluctuations in groundwater elevations correlated with seasonal precipitation patterns. There has been a downward trend in the pore water elevations surface since the geosynthetic caps were installed. Pore water elevations did not correlate with the Tennessee River stage or precipitation. For South Rail Loop Area 4, the fluctuations in groundwater, except for well B-6R which was stable, and pore water elevations correlated with seasonal precipitation patterns.

For Active Ash Pond 2, the fluctuations in groundwater elevations correlated with the Tennessee River stage. Pore water elevations did not correlate with the Tennessee River stage or seasonal precipitation patterns. The fluctuations in pore water elevations are interpreted to be affected by precipitation events and operation of the pool levels within the CCR management unit.

2.4 DYE TRACE STUDY

Dye trace study activities were conducted at Active Ash Pond 2 between April 8, 2019 and March 4, 2020. The dye trace study activities consisted of four phases: the bench study, the background study, dye injection, and post-injection sampling and analysis. Dye injection activities included injecting two different dyes (sodium fluorescein and sulphorhodamine B) from August 13-15, 2019, into five injection borings advanced along the north-south trending centerline of Active Ash Pond 2. The post-injection sampling was performed for the following six months on a weekly basis from August 19, 2019 through October 14, 2019, and biweekly from October 28, 2019 through March 4, 2020.

Exhibit H.1-21 depicts a summary of the dye trace study activities including the locations of the bench study borings, dye injection borings, and background study surface water and groundwater monitoring locations. The bench study results are presented in Table H.1-7, and the background study and post-injection sampling results are presented in Tables H.1-8 and H.1-9.

After the November 25, 2019, sampling event, sodium fluorescein (fluorescein) was detected in the bottom dye detector from monitoring well JOF-104, followed by four consecutive “positive” fluorescein signatures in the top and bottom dye detectors from the December 2019 and January 2020 sampling events. The fluorescein then decreased to a “trace” and “possible trace” in the February and March 2020 sampling events, respectively. The results of the dye trace study showed a connection between Active Ash Pond 2 and monitoring well JOF-104, but no other positive results were reported. Based on this information, no preferential transport pathways between Active Ash Pond 2 and the Tennessee River were observed during the dye trace study. The dye trace study data were reported by Ewers Water

Consultants, Inc. and validated by Karst Works, Inc. A detailed description of the JOF dye trace activities is presented in *JOF Plant Sampling and Analysis Report for Active Ash Pond 2 Dye Trace Study* (Appendix H.9).

2.5 GROUNDWATER QUALITY

This section provides a discussion of the analytical results for groundwater samples collected from monitoring wells installed as part of the EI and previously installed wells monitored as part of the TDEC permitted landfill and CCR Rule groundwater monitoring programs. The purpose of the statistical evaluation is to provide an objective method to inform decisions about the need for corrective action as of the date of the latest sampling event. The statistical evaluation is not intended to predict future groundwater quality. The purpose of ongoing groundwater monitoring is to identify changes in groundwater quality. Future analytical results reported for the ongoing groundwater monitoring programs, and the need for continued groundwater monitoring, will be further evaluated as part of the CARA Plan. If further statistical evaluation conducted as part of the CARA Plan process concludes that a corrective action is or is not required, then the supporting information will be included in the CARA Plan.

The groundwater quality evaluation is based on a statistical evaluation of constituents listed in Appendix I of TDEC Rule 0400-11-01-.04 (TDEC Appendix I) and Appendices III and IV of the CCR Rule. The analytical results were compared to groundwater screening levels (GSLs) approved by TDEC (see Appendix A.2). The results of the statistical evaluation are shown in a color-coded format where green indicates no statistically significant concentration greater than or equal to the GSL for constituents other than pH and no statistically significant difference outside the GSL range for pH, and red indicates a statistically significant concentration greater than or equal to the GSL for constituents other than pH or a statistically significant difference outside the GSL range for pH. The statistical methods applied to determine the green and red categories are discussed in the statistical evaluation of groundwater analytical data provided in Appendix E.3, and the results are summarized below. Table H.1-10 provides the analytical results of groundwater samples used in the statistical evaluation. Table H.1-11 provides a summary of groundwater quality parameters used for the statistical analyses. Table H.1-12 lists the approved GSLs. Table H.1-13 shows the results of the statistical evaluation with the color-coded format described above.

The dataset compiled for statistical analysis included available analytical data for groundwater samples collected between March 2015 and February 2023, although the specific start date and frequency of sampling may vary between wells based on date of well installation and the applicable monitoring program.

The results of the statistical evaluations are dependent on the dataset and method used for the evaluation. The dataset used for the evaluation conducted for the EAR is different than the one used for reporting required by the CCR Rule or the TDEC permitted landfill programs. Also, the statistical method is different than the method used for TDEC permitted landfill reporting. Because of these differences, the results of the statistical evaluations conducted for the CCR Rule and TDEC permitted landfill monitoring programs may differ from the results discussed below.

The statistical evaluation included screening for outliers, which are abnormally high or low values that may represent anomalous data or data errors. There were no outliers removed from further statistical analysis based on this evaluation. Appendix E.3 provides additional information regarding the outlier evaluation and methods used to compare results to the GSLs.

The nine groundwater monitoring wells installed for the EI (JOF-109, JOF-110, JOF-111, JOF-112, JOF-113, JOF-114, JOF-117, JOF-118, and JOF-119) were sampled during 10 events between December 2019 and September 2022 to complete the scope in the approved *Groundwater Investigation SAP* and additional sampling conducted in conjunction with sampling events for the CCR Rule and TDEC permitted landfill monitoring programs. Wells included in the CCR Rule (10-AP1, 10-AP3, JOF-103, and JOF-104) and TDEC permitted landfill (89-B10, 99-B20A, B-6R, B-8R, B-11, B-12, B-13, JOF-102, JOF-105, JOF-106, and JOF-107and) or both CCR Rule and TDEC permitted landfill (B-9 and JOF-101) groundwater monitoring systems were sampled between March 2015 and February 2023 per the required frequencies of those programs (see Table E.3.2 in Appendix E.3).

The statistical evaluation identified 46 CCR Rule Appendix III well-constituent pairs with statistically significantly concentrations above a GSL or outside the GSL range for pH. These included boron, chloride, pH, sulfate, and total dissolved solids. Eleven well-constituent pairs for the CCR Rule Appendix IV constituents (some of which are also TDEC Appendix I constituents) had a statistically significant concentration above a GSL. Arsenic (JOF-111 and JOF-117), cobalt (10-AP3, JOF-103, JOF-112, JOF-114, JOF-117, and JOF-118), lithium (JOF-113 and JOF-114), and molybdenum (JOF-113) were the Appendix IV constituents with a statistically significant concentration above an approved level. In addition, one TDEC Appendix I constituent that is not included in Appendix IV of the CCR Rule, nickel (JOF-103), had a statistically significant concentration above an approved level. Table H.1-13 provides a summary of the statistical evaluation. Exhibits H.1-22 through H.1-25 provide the results of the statistical evaluations for CCR Rule Appendix IV and TDEC Appendix I constituents with at least one detection above the GSL. A detailed explanation of the interpretation of the graphs inset on this exhibit is provided in Appendix E.3.

For the well-constituent pairs identified with statistically significant concentrations greater than or equal to a GSL or outside the GSL range for pH, linear regression analysis identified 26 statistically significant decreasing trends and 15 statistically significant increasing trends. Table H.1-14 provides a summary of the trend evaluation.

2.5.1 Piper Diagrams

Another approach to characterize the groundwater analytical results included the use of Piper diagrams, which are graphical representations of the major ion chemistry of groundwater. Available groundwater data were used to develop the diagrams, which were used to visually evaluate similarities and differences in the general chemistry characteristics of the groundwater samples and assess whether the results potentially indicated influences from various sources of groundwater. A Piper diagram from the August 2020 groundwater sampling event is depicted in Exhibit H.1-26, which is considered to be representative of the major ion distribution of the groundwater near the JOF Plant CCR management units over the sampling time period. Piper diagrams for the remaining five EI events conducted between December 2019 and October 2020 are provided in Attachment H.1-B.

The groundwater-type of the most upgradient groundwater well was observed to be a calcium-chloride type. Groundwater near Ash Disposal Area 1 varied from a calcium-sodium chloride (JOF-110) to a calcium sulfate-chloride (JOF-111). Groundwater near the former Coal Yard was a calcium-sulfate type and near Active Ash Pond 2 varied from a calcium-sulfate (JOF-118) to a calcium-bicarbonate (JOF-119). Additional information regarding groundwater geochemistry is provided in Section 2.5.2.

2.5.2 Geochemistry of Soils-Groundwater Interaction

Groundwater quality is affected by numerous geochemical processes during groundwater flow through geological materials. The distinct difference between the chemical characteristics of pore water within the CCR material, presented in Appendix G.1, and the characteristics of groundwater quality downgradient of the TDEC Order CCR management units at the JOF Plant is difficult to explain without the aid of geochemistry. It is well documented in the literature that certain CCR constituents that are detected in pore water (typically at higher concentrations than in groundwater) can be affected by geochemical processes that occur between constituents dissolved in groundwater and geological materials through which it flows. The effects of these geochemical processes, which often result in the attenuation of CCR constituents (i.e., reduced concentrations) can explain observed differences between the characteristics of pore water and groundwater. The extent of the interactions between dissolved constituents in groundwater and geological materials ranges from limited interaction for constituents such as boron, chloride and sulfate, to strong interactions for constituents such as arsenic and cobalt.

Descriptions of the geochemical interactions between geological materials and constituents dissolved in groundwater are provided in many textbooks (e.g., Appelo and Postma 1996). Geochemical reactions or processes that can affect CCR constituents include:

- Adsorption/desorption on the surfaces of metal hydroxides – an interaction whereby constituents adsorb to metal hydroxide soil minerals; the process is reversible and controlled by the pH and oxidation/reduction potential (redox) of groundwater.
- Cation exchange with clay minerals – a process where positively charged constituents (cations) absorb to negatively charged clay minerals, subject to competition and concentrations relative to other constituents. The strength of the electrostatic bond formed varies with the constituents involved, but in general cation exchange reactions are reversible.
- Mineral precipitation or dissolution – a process where dissolved constituents in groundwater combine to form a soil mineral; minerals are also subject to dissolution (i.e., reaction is reversible) under certain conditions of groundwater pH and redox.

Observations of groundwater and pore water chemistry can indicate the extent to which geochemical processes chemically change groundwater and influence groundwater quality at the JOF Plant. Boron, chloride, and sulfate commonly occur in high concentrations in pore water and are minimally attenuated by geochemical processes. Thus, they can be used to infer locations in the groundwater monitoring program where there is an influence from pore water. This is because boron and chloride are considered non-reactive because neither constituent is subject to geochemical reactions that would materially change concentrations in groundwater during flow through geological materials. Sulfate is considered a lowreactive constituent because there are geochemical conditions in some CCR influenced groundwater where the concentration of sulfate can be reduced by mineral precipitation.

In contrast, those CCR constituents most likely to be influenced by interactions between geological materials and groundwater (e.g., arsenic, lithium, and molybdenum) typically show concentrations in groundwater monitoring wells that are much different than those observed in pore water, indicating that groundwater is being chemically changed relative to pore water by some physical or geochemical process (or a combination of both) occurring as it flows through geological materials. Groundwater quality measured at a given groundwater monitoring location is a result not only of the interactions between its constituents and the geological materials through which it flows, but also of flow from upgradient sources (including background). Thus, the area upgradient of a groundwater monitoring well can be thought of as an interacting geochemical and hydrogeologic system, including:

- Materials that contribute chemical mass to groundwater
- The physical properties of the geological materials that govern direction and rate of groundwater flow
- Minerals in the geologic materials that can interact with constituents being transported by groundwater
- The pH and redox conditions of groundwater.

This geochemical and hydrogeological system, which includes natural and anthropogenic sources and interactions with natural geologic materials, is referred to as the upgradient system.

Understanding the geochemistry of geological materials is important in interpreting the processes influencing current conditions of groundwater chemistry at the JOF Plant and evaluating effects of activities, such as capping or groundwater remediation, on the evolution of groundwater quality. Further evaluation of the geochemical processes acting in the upgradient system at the JOF Plant to influence groundwater quality will be included in the CARA Plan during assessments of remedies, where needed.

2.5.3 Summary

Downgradient of the CCR management units and the former Coal Yard, four CCR Rule Appendix IV CCR constituents had statistically significant concentrations in onsite groundwater above a GSL in seven wells, including arsenic (JOF-111 and JOF-117), cobalt (10-AP3, JOF-103, JOF-114, JOF-117, and JOF-118), lithium (JOF-113 and JOF-114), and molybdenum (JOF-113). One CCR Rule Appendix IV constituent (cobalt) had a statistically significant concentration in onsite groundwater above a GSL in one upgradient well (JOF-112) associated with the former Coal Yard. One additional TDEC Appendix I constituent (nickel) had a statistically significant concentration in onsite groundwater above a GSL in one well (JOF-103). Four wells had only one constituent with a statistically significant concentration greater than a GSL, and four wells had two constituents with statistically significant concentrations above a GSL. The groundwater impacts described above are limited to onsite areas along the perimeter of the CCR management units. These constituents and onsite groundwater in the vicinity of these wells will be further evaluated in the CARA Plan to determine the need for corrective actions.

3.0 SUMMARY

The objectives of the TDEC Order hydrogeological and groundwater investigations were to characterize the hydrogeology and groundwater quality and evaluate groundwater flow conditions in the vicinity of the JOF Plant CCR management units. The key findings of the JOF Plant hydrogeological and groundwater investigations are summarized below:

- TVA evaluated analytical results for groundwater in support of the EAR based on data collected under three groundwater monitoring programs (some of which overlap), including the EI, CCR Rule, and TDEC permitted landfill monitoring programs. Monitoring well locations and CCR constituents that will require further evaluation in the CARA Plan are provided below.

Summary of Findings Requiring Further Evaluation in the CARA Plan	
CCR Management Unit	**Groundwater**
Ash Disposal Area 1	Arsenic (Well JOF-111)
Active Ash Pond 2	Cobalt (Wells 10-AP3, JOF-103 and JOF-118) Nickel (Well JOF-103)
Former Coal Yard*	Arsenic (Well JOF-117) Cobalt (Wells JOF-112, JOF-114 and JOF-117) Lithium (Wells JOF-113 and JOF-114) Molybdenum (Well JOF-113)
South Rail Loop Area 4	None
DuPont Road Dredge Cell	None

*Not a CCR management unit

- Drainage improvements or potential corrective actions are expected to reduce concentrations of CCR constituents to below GSLs in groundwater at downgradient monitoring locations for Active Ash Pond 2, Ash Disposal Area 1, and the Former Coal Yard

- Pore water within the CCR material has specific chemical characteristics that are different from the characteristics of groundwater downgradient of the CCR management units and the former Coal Yard. Certain CCR constituents that have been detected in pore water are affected by geochemical processes during groundwater flow through geological materials. The effect of these geochemical processes, which can result in the attenuation of CCR constituents and reduced dissolved groundwater concentrations, can explain the observed differences between the characteristics of pore water and groundwater quality

- The pore water levels reported herein may not represent steady-state conditions. The low permeability of the geosynthetic caps is expected to result in the continued decrease in pore water levels in the DuPont Road Dredge Cell and South Rail Loop Area 4. The pore water levels within Ash Disposal Area 1, the former Coal Yard, and Active Ash Pond 2 would be expected to decrease in elevation if stormwater drainage or cap modifications were to be implemented. The low permeability of the perimeter dikes limits lateral flow into or out of the CCR management units. The results of the dye trace study support this conclusion because it indicated that there are no preferential transport pathways between Active Ash Pond 2 and the Tennessee River. The use of the term “saturated” or references to the moisture content of CCR material does not imply that the pore water is readily separable from the CCR material

- The coarse-grained unconsolidated materials are considered to be the uppermost aquifer and are under unconfined conditions, except in the vicinity of Active Ash Pond 2. The uppermost aquifer in the vicinity of Active Ash Pond 2 is the coarse-grained unconsolidated materials and is considered confined because it is overlain by fine-grained unconsolidated materials that act as an aquitard
- The groundwater flow direction within the uppermost aquifer beneath the CCR management units and former Coal Yard is generally to the west-southwest toward the Tennessee River. Groundwater flow in the vicinity of the CCR management units is bounded to the west by the Tennessee River. A higher elevation ridge to the east of the plant and a watershed boundary along the southern border are topographic divides for groundwater flow.

TVA will continue to monitor the trends of arsenic, cobalt, lithium, molybdenum, and nickel and conduct further evaluation in the CARA Plan to determine if corrective actions are needed. The influence of geochemical processes on groundwater quality will be further evaluated in the CARA Plan as part of the assessment of remedies, where needed.

4.0 REFERENCES

Appelo, C.A.J and D. Postma. (1996). *Geochemistry, Groundwater and Pollution*. A.A. Balkema.

Johnson, A.I. Revised 1966. Specific Yield – Compilation of Specific Yields for Various Materials. U.S. Geological Survey, Water Supply Paper 1662-D.

Environmental Standards, Inc. (2018). Quality Assurance Project Plan for the Tennessee Valley Authority Johnsonville Fossil Plant Environmental Investigation. Revision 3. December 2018.

Kellberg, John M. (1948). Geology of the Now Johnsonville Steam Plant Site. Tennessee Valley Authority, Water Control Planning Department, Geologic Division.

Stantec. (2018a). *Groundwater Investigation Sampling and Analysis Plan, Johnsonville Fossil Plant.* Revision 4. Prepared for Tennessee Valley Authority. December 10, 2018.

Stantec. (2018b). *Hydrogeological Investigation Sampling and Analysis Plan, Johnsonville Fossil Plant.* Revision 4. Prepared for Tennessee Valley Authority. December 10, 2018.

TDEC. (2015). *Commissioner's Order No. OGC15-0177*. August 6, 2015.

TDEC. (2017). *Geologic Map of the Johnsonville Quadrangle, Tennessee*.

TVA. (1995). Johnsonville Groundwater Assessment. Prepared for Tennessee Valley Authority. March 1995.

TVA. (1997). Hydrogeology of Rail Loop Dredged Ash Stacking Area, New Johnsonville Fossil Plant, September 1997

TVA. (2012). Groundwater Detection Monitoring Program Plan. May 29, 2012.

TVA. (2018). Environmental Investigation Plan, Johnsonville Fossil Plant, Revision 4 Final. December 10, 2018.

TVA. (2019a). 2018 Annual Groundwater Monitoring and Corrective Action Report. Tennessee Valley Authority Johnsonville Fossil Plant Active Ash Pond 2 CCR Unit. January 31, 2019.

TVA. (2019b). Assessment of Corrective Measures. Tennessee Valley Authority Johnsonville Fossil Plant. July 15, 2019.

United States Geological Survey. (1969). Element Distribution in Some Paleozoic Black Shales and Associated Rocks, J. D. Vine. Geological Survey Bulletin 1214-G. (1969).

United States Geological Survey. (1990). Geology and Ground-Water Resources of the Memphis Sand in Western Tennessee by W.S. Parks and J.K. Carmichael. 1990.

TABLES

Table H.1-1 - Summary of Environmental Investigation Boring and Monitoring Well Locations
Johnsonville Fossil Plant

Boring ID	Well ID	Location	Rationale
JOF-108	NC	Proposed at south central boundary of Ash Disposal Area 1	Proposed to collect groundwater data from a downgradient location between Ash Disposal Area 1 and the Tennessee River. Well not installed because adjacent pre-screen borings encountered CCR material and/or hit shallow refusal.
JOF-109	JOF-109	Eastern boundary of Ash Disposal Area 1; in alluvial deposits	To collect groundwater data from a background location
JOF-110	JOF-110	Northwest corner of Ash Disposal Area 1; in alluvial deposits	To collect groundwater data from a downgradient location between Ash Disposal Area 1 and the Tennessee River.
JOF-111A	NC	Attempted at southwest corner of Ash Disposal Area 1; in alluvial deposits	Monitoring well JOF-111 was initially installed in boring JOF-111A, but the well was subsequently abandoned and installed in boring JOF-111B; see additional details in Appendix H.2, Section 3.3.1.3.
JOF-111B	JOF-111	Southwest corner of Ash Disposal Area 1; in alluvial deposits	To collect groundwater data from a downgradient location between Ash Disposal Area 1 and the Tennessee River.
JOF-112	JOF-112	Northeast of the former Coal Yard; in alluvial deposits	To collect groundwater data from a background locatiion
JOF-113	JOF-113	Northwest area of the former Coal Yard; in alluvial deposits	To collect groundwater data from a downgradient location between the former Coal Yard and the Tennessee River
JOF-114	JOF-114	Central west area of the former Coal Yard; in alluvial deposits	To collect groundwater data from a downgradient location between the former Coal Yard and the Tennessee River
JOF-116-PZ	JOF-116-PZ	Northern boundary of Ash Disposal Area 1, between wells JOF-109 and JOF-110; in alluvial deposits	To allow for water level (i.e. pore water pressure) readings in the unconsolidated materials to improve subsurface characterization in the vicinity of the northern boundary of Ash Disposal Area 1
JOF-117	JOF-117	Southwest area of the former Coal Yard; in alluvial deposits	To collect groundwater data from a downgradient location between the former Coal Yard and the Tennessee River
JOF-118	JOF-118	North of Active Ash Pond 2; in alluvial deposits	To collect groundwater data from a downgradient location between Active Ash Pond 2 and the Tennessee River
JOF-119	JOF-119	Southeastern point of the Active Ash Pond 2; in alluvial deposits	To collect groundwater data from a background location

Notes:

CCR	Coal Combustion Residual
JOF	Johnsonville Fossil Plant
ID	Identification
NC	Not completed as a monitoring well

Table H.1-2 - Summary of Monitoring Well Construction Specifications
Johnsonville Fossil Plant

Well ID	Top of Casing		Bottom of Well			Screened Interval					
	Stickup	Elevation	Depth	Depth	Elevation	Depth Top	Depth Bottom	Depth Top	Depth Bottom	Elevation Top	Elevation Bottom
	ft ags	ft NGVD29	ft bgs	ft btoc	ft NGVD29	ft bgs	ft bgs	ft btoc	ft btoc	ft NGVD29	ft NGVD29
10-AP1	2.6	370.51	46.9	49.5	321.0	36.4	46.5	39.0	49.1	331.5	321.4
10-AP3	3.1	367.27	44.5	47.6	319.7	34.3	44.4	37.4	47.5	329.9	319.8
89-B10	0.8	401.19	39.6	40.4	360.8	31.2	39.5	32.0	40.3	369.2	360.9
94-B16	3.4	390.53	22.8	26.2	364.3	12.8	22.8	16.2	26.2	374.3	364.3
99-B19	2.8	394.50	24.9	27.7	366.8	9.8	24.9	12.6	27.7	381.9	366.8
99-B20A	3.3	408.88	33.3	36.6	372.3	18.3	33.2	21.6	36.5	387.3	372.4
B-6R	3.4	395.57	17.9	21.3	374.3	14.8	17.8	18.2	21.2	377.4	374.4
B-8R	3.0	391.04	14.1	17.1	373.9	10.8	13.8	13.8	16.8	377.2	374.2
B-9	3.2	423.88	47.4	50.6	373.3	37.3	46.8	40.5	50.0	383.4	373.9
B-11	2.6	400.67	34.2	36.7	364.0	24.2	34.2	26.7	36.7	374.0	364.0
B-12	2.4	393.03	34.5	36.9	356.1	24.4	34.5	26.8	36.9	366.2	356.1
B-13	2.0	409.87	41.9	43.9	366.0	31.8	41.9	33.8	43.9	376.1	366.0
JOF-101	3.9	424.59	50.2	54.1	370.5	39.7	49.3	43.6	53.2	381.0	371.4
JOF-102	3.9	407.64	30.0	33.9	373.7	19.7	30.0	23.6	33.9	384.0	373.7
JOF-103	3.5	374.24	48.8	52.3	321.9	38.4	48.6	41.9	52.1	332.3	322.1
JOF-104	4.1	379.44	54.7	58.8	320.6	44.3	54.5	48.4	58.6	331.0	320.8
JOF-105	3.8	406.15	29.9	33.7	372.5	19.6	29.9	23.4	33.7	382.8	372.5
A-3	1.0	403.73	85.1	86.1	317.6	65.1	85.1	66.1	86.1	337.6	317.6
JOF-106	3.8	403.16	29.6	33.4	369.8	19.5	29.0	23.3	32.8	379.9	370.4
JOF-107	3.8	409.95	38.3	42.0	368.0	28.2	37.7	31.9	41.4	378.1	368.6
JOF-109	3.4	386.11	41.7	45.1	341.0	30.7	40.5	34.1	43.9	352.0	342.2
JOF-110	4.7	388.76	57.8	62.5	326.3	47.6	57.4	52.3	62.1	336.5	326.7
JOF-111	4.8	390.08	46.7	51.5	338.6	36.5	46.3	41.3	51.1	348.8	339.0
JOF-112	4.7	394.48	30.4	35.1	359.4	20.2	30.0	24.9	34.7	369.6	359.8
JOF-113	4.7	388.13	45.1	49.8	338.3	34.9	44.7	39.6	49.4	348.5	338.7
JOF-114	4.7	388.36	40.2	44.9	343.5	30.0	39.8	34.7	44.5	353.7	343.9
JOF-117	4.6	388.63	40.6	45.2	343.4	30.4	40.2	35.0	44.8	353.6	343.8
JOF-118	3.4	372.69	50.7	54.1	318.6 #	40.5	50.3	43.9	53.7	328.8	319.0
JOF-119	3.5	366.89	44.7	48.2	318.7	34.5	44.3	38.0	47.8	328.9	319.1

Notes:

ags	above ground surface
bgs	below ground surface
btoc	below top of casing
ft	feet
ID	identification
NGVD29	National Geodetic Vertical Datum of 1929

1. Well information based on data provided by TVA and Stantec (e.g., well logs, well inspection report); however, there may be discrepancies between sources of information.
2. Stick-up height based on difference between surveyed values for Top of Casing Elevation and Ground Surface Elevation.

Table H.1-3 - Summary of Hydraulic Conductivity Results from Slug Test Data
Johnsonville Fossil Plant

Monitoring Well ID	Monitoring Well Designation	Slug Test Hydraulic Conductivity (cm/sec)
Ash Disposal Area 1		
JOF-109[1]	Background	9.87E-04
JOF-110[1]	Downgradient	2.81E-05
JOF-111[1]	Downgradient	1.17E-03
Geometric Mean of Hydraulic Conductivity Unconsolidated Materials (cm/sec)		**3.19E-04**
Former Coal Yard		
JOF-112[1]	Background	9.38E-03
JOF-113[1]	Downgradient	5.40E-04
JOF-114[1]	Downgradient	3.59E-03
JOF-117[1]	Downgradient	2.49E-04
Geometric Mean of Hydraulic Conductivity Unconsolidated Materials (cm/sec)		**1.46E-03**
DuPont Road Dredge Cell		
B13[3]	Background	9.40E-04*
Geometric Mean of Hydraulic Conductivity Unconsolidated Materials (cm/sec)		**9.40E-04**
South Rail Loop Area 4		
B9[3]	Background	9.20E-05
B6[3]	Downgradient	2.40E-04
Geometric Mean of Hydraulic Conductivity Unconsolidated Materials (cm/sec)		**1.49E-04**
Active Ash Pond 2		
JOF-10-AP1[2,4]	Downgradient	1.36E-02
JOF-10-AP3[2,4]	Downgradient	3.82E-02
JOF-103[2,4]	Downgradient	1.29E-02
JOF-104[2,4]	Downgradient	1.88E-01
JOF-118[1]	Downgradient	7.68E-02
JOF-119[1]	Downgradient	5.39E-02
Geometric Mean of Hydraulic Conductivity Unconsolidated Materials (cm/sec)		**4.16E-02**

Notes

ID - identification

cm/sec - centimeters per second

*from pump/injection test

[1]Stantec (2021).Johnsonville Fossil Plant Hydrogeologic Investigation Sampling and Analysis Report, August 20, 2021

[2]Terracon (2018). Aquifer Testing and Equipment Blank Results TVA CCR Rule – Johnsonville Fossil Plant (JOF). Terracon Consultants, Inc. December 12, 2018.

[3]TVA (1995). Johnsonville Groundwater Assessment. WR28-1-30-111 K.F. Lindquist et al. March 1995.

[4]Stantec (2021). Johnsonville Fossil Plant Exploratory Drilling Sampling and Analysis Report, August 20, 2021

Table H.1-4 – Groundwater Level Measurements, Groundwater Sampling Event #5 (August 10-11, 2020)
Johnsonville Fossil Plant

UNID	Well / Piezometer ID	Date Measured	Depth to Groundwater	Top of Casing Elevation	Groundwater Elevation	Piezometer Ground Surface Elevation	Piezometer Sensor Elevation	Piezometer Sensor Depth	Screened Interval	Screened / Piezometer Sensor Formation
			ft btoc	ft msl	ft msl	ft msl	ft msl	ft bgs	ft btoc	
Monitoring Wells										
JOF-00-GW-43-001	10-AP1	10-Aug-20	13.99	370.51	356.52	n/a	n/a	n/a	39.0 - 49.1	Alluvium: Sands and Gravels
JOF-00-GW-43-002	10-AP3	10-Aug-20	10.55	367.27	356.72	n/a	n/a	n/a	37.4 - 47.5	Alluvium: Sands and Gravels
JOF-00-GW-43-003	89-B10	10-Aug-20	25.65	401.19	375.54	n/a	n/a	n/a	32.0 - 40.3	Alluvium: Sands and Gravels
JOF-00-GW-43-004	94-B16	10-Aug-20	13.61	390.53	376.92	n/a	n/a	n/a	16.2 - 26.2	Alluvium: Sands and Gravels
JOF-00-GW-43-005	99-B19	10-Aug-20	16.34	394.50	378.16	n/a	n/a	n/a	12.6 - 27.7	Alluvium: Sands and Gravels/Shale Bedrock
JOF-00-GW-43-006	99-B20A	10-Aug-20	29.90	408.88	378.98	n/a	n/a	n/a	21.6 - 36.5	Alluvium: Sands and Gravels
JOF-00-GW-43-007	B-6R	10-Aug-20	17.92	395.57	377.65	n/a	n/a	n/a	18.2 - 21.2	Alluvium: Sands and Gravels
JOF-00-GW-43-008	B-8R	10-Aug-20	12.03	391.04	379.01	n/a	n/a	n/a	13.8 - 16.8	Alluvium: Sands and Gravels
JOF-00-GW-43-009	B-9	10-Aug-20	26.85	423.88	397.03	n/a	n/a	n/a	40.5 - 50.0	Alluvium: Silts and Clays
JOF-00-GW-43-010	B-11	10-Aug-20	20.55	400.67	380.12	n/a	n/a	n/a	26.7 - 36.7	Alluvium: Sands and Gravels
JOF-00-GW-43-011	B-12	10-Aug-20	12.28	393.03	380.75	n/a	n/a	n/a	26.8 - 36.9	Alluvium: Sands and Gravels
JOF-00-GW-43-012	B-13	11-Aug-20	29.25	409.87	380.62	n/a	n/a	n/a	33.8 - 43.9	Alluvium: Sands and Gravels
JOF-00-GW-43-013	JOF-101	10-Aug-20	25.75	424.59	398.84	n/a	n/a	n/a	43.6 - 53.2	Alluvium: Sands and Gravels
JOF-00-GW-43-014	JOF-102	10-Aug-20	19.58	407.64	388.06	n/a	n/a	n/a	23.6 - 33.9	Alluvium: Sands and Gravels
JOF-00-GW-43-015	JOF-103	10-Aug-20	17.20	374.24	357.04	n/a	n/a	n/a	41.9 - 52.1	Alluvium: Sands and Gravels
JOF-00-GW-43-016	JOF-104	10-Aug-20	22.60	379.44	356.84	n/a	n/a	n/a	48.4 - 58.6	Alluvium: Sands and Gravels
JOF-00-GW-43-017	JOF-105	10-Aug-20	27.33	406.15	378.82	n/a	n/a	n/a	23.4 - 33.7	Alluvium: Sands and Gravels
JOF-00-GW-43-018	A-3	10-Aug-20	23.70	403.73	380.03	n/a	n/a	n/a	66.1 - 86.1	Chattanooga Shale/Camden Formation
JOF-00-GW-43-019	JOF-106	10-Aug-20	22.70	403.16	380.46	n/a	n/a	n/a	23.3 - 32.8	Alluvium: Sands and Gravels
JOF-00-GW-43-020	JOF-107	10-Aug-20	28.90	409.95	381.05	n/a	n/a	n/a	31.9 - 41.4	Alluvium: Sands and Gravels
JOF-00-GW-43-021	JOF-109	10-Aug-20	5.70	386.11	380.41	n/a	n/a	n/a	34.1 - 43.9	Alluvium
JOF-00-GW-43-022	JOF-110	10-Aug-20	18.05	388.76	370.71	n/a	n/a	n/a	52.3 - 62.1	Alluvium
JOF-00-GW-43-023	JOF-111	10-Aug-20	19.65	390.08	370.43	n/a	n/a	n/a	41.3 - 51.1	Clay
JOF-00-GW-43-024	JOF-112	10-Aug-20	17.30	394.48	377.18	n/a	n/a	n/a	24.9 - 34.7	Alluvium
JOF-00-GW-43-025	JOF-113	10-Aug-20	28.55	388.13	359.58	n/a	n/a	n/a	39.6 - 49.4	Alluvium
JOF-00-GW-43-026	JOF-114	10-Aug-20	28.88	388.36	359.48	n/a	n/a	n/a	34.7 - 44.5	Alluvium
JOF-00-GW-43-027	JOF-117	10-Aug-20	26.60	388.63	362.03	n/a	n/a	n/a	35.0 - 44.8	Alluvium
JOF-00-GW-43-028	JOF-118	10-Aug-20	15.84	372.69	356.85	n/a	n/a	n/a	43.9 - 53.7	Alluvium
JOF-00-GW-43-029	JOF-119	10-Aug-20	10.09	366.89	356.80	n/a	n/a	n/a	38.0 - 47.8	Alluvium
Piezometers										
n/a	JOF-B-2A-PZ3	10-Aug-20	n/a	n/a	356.3	392.7	322.7	70.0	n/a	Alluvial Sand and Gravel
n/a	JOF-C-2A-PZ3	10-Aug-20	n/a	n/a	357.8	392.8	326.8	66.0	n/a	Alluvial Sand and Gravel
n/a	JOF-C-2B-PZ2	10-Aug-20	n/a	n/a	356.1	370.6	321.6	49.0	n/a	Alluvial Sand and Gravel
n/a	JOF-E-2A-PZ2	10-Aug-20	n/a	n/a	356.2	390.9	327.9	63.0	n/a	Alluvial Sand and Gravel
n/a	JOF-E-2B-PZ2	10-Aug-20	n/a	n/a	355.5	365.4	310.4	55.0	n/a	Alluvial Sand and Gravel
n/a	JOF-K-2A-PZ1	10-Aug-20	n/a	n/a	358.9	377.5	327.5	50.0	n/a	Alluvial Sand and Gravel
n/a	JOF_PZET	10-Aug-20	n/a	n/a	352.9	363.8	329.8	34.0	n/a	Alluvial Clay and Silt and Alluvial Sand and Gravel
n/a	JOF_PZFT	10-Aug-20	n/a	n/a	352.5	362.9	327.6	35.3	n/a	Alluvial Clay and Silt and Alluvial Sand and Gravel
n/a	JOF_PZHT	10-Aug-20	n/a	n/a	357.3	363.1	316.1	47.0	n/a	Alluvial Sand and Gravel
n/a	JOF-116-PZ	10-Aug-20	n/a	n/a	372.4	388.0	342.0	46.0	n/a	Alluvium

See notes on last page.

Table H.1-4 – Groundwater Level Measurements, Groundwater Sampling Event #5 (August 10-11, 2020)
Johnsonville Fossil Plant

UNID	Well / Piezometer ID	Date Measured	Depth to Groundwater	Top of Casing Elevation	Groundwater Elevation	Piezometer Ground Surface Elevation	Piezometer Sensor Elevation	Piezometer Sensor Depth	Screened Interval	Screened / Piezometer Sensor Formation
			ft btoc	ft msl	ft msl	ft msl	ft msl	ft bgs	ft btoc	
Surface Water Gauge										
Tennessee River/Kentucky Lake gauge (GS-1)	n/a	10-Aug-20	n/a	n/a	356.83	n/a	n/a	n/a	n/a	n/a

Notes:

bgs below ground surface
btoc below top of casing
ft feet
ID identification
msl mean sea level
n/a not applicable
UNID Unique Numerical Identification

1. Top of casing elevations, screen intervals, and screened formations for monitoring wells were obtained from the TVA Well Inventory Log provided by TVA.
2. Tennessee River/Kentucky Lake data point is the reading closest to noon recorded by the automated staff gauge provided by TVA.
3. For piezometers, ground surface elevation, groundwater elevations and piezometer data were obtained from the geotechnical instrumentation database. Vibrating wire sensor formation information was obtained from boring logs. Data from automated piezometers are averaged for the measurement date.
4. Groundwater elevations in piezometers are calculated values. Accuracy of piezometer data is to 0.1 ft.

Table H.1-5 - Kentucky Lake / Tennessee River and Groundwater Elevation Comparison
Johnsonville Fossil Plant
December 2019-October 2020

Well ID	Groundwater Elevation by Date (ft asml)					
	12/2/2019	2/10/2020	4/6/2020	6/8/2020	8/10/2020	10/12/2020
10-AP1	356.11	359.14	359.64	358.84	356.52	354.25
10-AP3	356.09	359.14	359.84	359.06	356.72	354.41
89-B10	376.58	377.30	377.29	375.85	375.54	375.12
94-B16	378.70	378.98	378.68	377.52	376.92	376.82
99-B19	379.04	379.64	379.49	378.32	378.16	377.68
99-B20A	379.08	379.99	380.43	379.45	378.98	378.51
B-6R	378.11	378.06	377.89	377.76	377.65	377.58
B-8R	380.29	380.66	379.98	379.60	379.01	378.71
B-9	397.41	399.30	400.27	397.78	397.03	395.33
B-11	380.19	381.27	381.73	380.52	380.12	379.42
B-12	380.32	382.03	382.27	372.06	380.75	379.91
B-13	380.26	381.67	382.28	381.38	380.62	380.24
JOF-101	398.77	400.78	402.18	400.23	398.84	397.33
JOF-102	387.82	389.19	389.54	389.02	388.06	387.40
JOF-103	356.42	359.42	360.08	359.36	357.04	354.71
JOF-104	356.28	359.36	359.92	359.19	356.84	354.53
JOF-105	NM	379.93	379.26	379.15	378.82	378.31
A-3	380.22	381.21	381.55	NM	380.03	379.55
JOF-106	380.45	381.57	382.03	380.87	380.46	379.76
JOF-107	381.14	382.37	382.69	381.35	381.05	380.21
JOF-109	380.66	380.85	381.42	380.43	380.41	379.50
JOF-110	370.46	370.37	371.67	371.05	370.71	370.25
JOF-111	370.59	368.73	371.38	370.76	370.43	369.84
JOF-112	378.19	373.80	377.78	377.22	377.18	376.81
JOF-113	359.05	361.12	362.21	359.56	359.58	357.41
JOF-114	361.67	360.97	360.91	359.58	359.48	357.27
JOF-117	359.90	361.61	362.96	363.67	362.03	347.23
JOF-118	356.24	359.30	359.93	359.23	356.85	354.56
JOF-119	356.27	358.43	359.92	359.15	356.80	354.51
Tennessee River/ Kentucky Lake gauge (GS-1)	356.36	359.07	359.60	359.12	356.83	354.37

Notes:

ft asml	feet above mean sea level
ID	identification
NM	not measured

Stantec

Table H.1-6 - Rate and Direction of Groundwater Flow Summary
Johnsonville Fossil Plant

Ash Disposal Area 1

Sampling Event	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6
Groundwater Elevation Collection Date	12/2/2019	2/10/2020	4/6/2020	6/8/2020	8/10/2020	10/12/2020
Horizontal Gradient (ft/ft)	0.0096	0.0112	0.0094	0.0091	0.0093	0.0090
Hydraulic Conductivity (cm/sec)	3.19E-04	3.19E-04	3.19E-04	3.19E-04	3.19E-04	3.19E-04
Effective Porosity	20%	20%	20%	20%	20%	20%
Flow Direction	274	260	270	270	270	269
Linear Velocity (ft/yr)	15.84	18.48	15.51	15.02	15.35	14.85

Former Coal Yard

Sampling Event	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6
Groundwater Elevation Collection Date	12/2/2019	2/10/2020	4/6/2020	6/8/2020	8/10/2020	10/12/2020
Horizontal Gradient (ft/ft)	0.0215	0.0142	0.0175	0.0205	0.0200	0.0216
Hydraulic Conductivity (cm/sec)	1.46E-03	1.46E-03	1.46E-03	1.46E-03	1.46E-03	1.46E-03
Effective Porosity	20%	20%	20%	20%	20%	20%
Flow Direction	267	267	267	274	271	244
Linear Velocity (ft/yr)	162.39	107.25	132.18	154.83	151.06	163.14

DuPont Dredge Cell

Sampling Event	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6
Groundwater Elevation Collection Date	12/2/2019	2/10/2020	4/6/2020	6/8/2020	8/10/2020	10/12/2020
Horizontal Gradient (ft/ft)	0.0014	0.0022	0.0026	0.0030	0.0023	0.0027
Hydraulic Conductivity (cm/sec)	9.40E-04	9.40E-04	9.40E-04	9.40E-04	9.40E-04	9.40E-04
Effective Porosity	20%	20%	20%	20%	20%	20%
Flow Direction	219	234	241	248	240	248
Linear Velocity (ft/yr)	6.81	10.70	12.64	14.59	11.18	13.13

Active Ash Pond 2

Sampling Event	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6
Groundwater Elevation Collection Date	12/2/2019	2/10/2020	4/6/2020	6/8/2020	8/10/2020	10/12/2020
Horizontal Gradient (ft/ft)	0.0001	0.0005	0.0002	0.0002	0.0002	0.0002
Hydraulic Conductivity (cm/sec)	4.16E-02	4.16E-02	4.16E-02	4.16E-02	4.16E-02	4.16E-02
Effective Porosity	20%	20%	20%	20%	20%	20%
Flow Direction	162	180	261	253	256	250
Linear Velocity (ft/yr)	25.69	107.65	43.06	43.06	43.06	43.06

South Rail Loop Area 4

Sampling Event	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6
Groundwater Elevation Collection Date	12/2/2019	2/10/2020	4/6/2020	6/8/2020	8/10/2020	10/12/2020
Horizontal Gradient (ft/ft)	0.0070	0.0077	0.0082	0.0076	0.0072	0.0067
Hydraulic Conductivity (cm/sec)	1.49E-04	1.49E-04	1.49E-04	1.49E-04	1.49E-04	1.49E-04
Effective Porosity	20%	20%	20%	20%	20%	20%
Flow Direction	279	280	276	275	273	272
Linear Velocity (ft/yr)	5.40	5.94	6.32	5.86	5.55	5.16

Notes:
cm/sec - centimeter per second
ft/ft - feet per foot
ft/yr - feet per year
% - percent

Table H.1-7 - Bench Study Results

EWC *Ewers Water Consultants Inc.*

160 Redwood Drive, Richmond, Kentucky 40475
Phone & Fax (859) 623-8464 E-mail: ewc@mis.net

StanTec, TVA Dye Survivability Study

		Sampling Time After Inoculation With Dyes			
Vessel	Sample/Dye	1 Hour	3 Hours	9 Hours	21 Hours
Vessel 1	Control Fluor	3091	3064	2930	2774
	Control RWT	2668	2723	2746	2613
Vessel 2	Control Eos	4912	4784	4692	4250
	Control SRB	3698	3753	3786	3634
Vessel- 3	IP-1 Fluor	25.6	23.6	22.6	21.2
	IP-1 RWT	Trace	Trace	Trace	Trace
Vessel -4	IP-1 Eos	*24.9,10	*22.7	*22.3	*21.2
	IP-1 SRB	9.2	1.7	Trace	1.5
Vessel -5	IP-2 Fluor	131.4	64.5	36.9	35.3
	IP-2 RWT	11.1	4.9	3.2	3.7
Vessel- 6	IP-2 Eos	*30, 84	*23.8, 15.8	*22.6, 4.1	*21.3, 5
	IP-2 SRB	32.7	9.6	4.1	4.2
Vessel- 7	IP-3 Fluor	1748	1306	863	824
	IP-3 RWT	276	87.4	32.6	35.8
Vessel -8	IP-3 Eos	1624	519.8	*40, 124.9	*25, 114.5
	IP-3 SRB	860	266.1	90.6	89.7
Vessel -9	IP-4 Fluor	24.5	23.1	22.8	21.6
	IP-4 RWT	Trace	1.9	Trace	Trace
Vessel- 10	IP-4 Eos	*24.5	*22.8	*22.7	21.3
	IP-4 SRB	2.2	1.6	Trace	Trace
Vessel- 11	IP-5 Fluor	24.3	22.9	22.5	21.7
	IP-5 RWT	Trace	1.5	Trace	2
Vessel -12	IP-5 Eos	*24.3	*22.7	*22.5	21.1
	IP-5 SRB	2.3	Trace	1.8	2

* indicates Eosine has shifted from a peak of 535nm to +/-510nm.
An additional number indicates that a peak at 535nm is also present.

"Control" is obtained from analysis of the dye inoculation solution in a separate reaction vessel.

Fluor = Fluorescein, RWT = Rhodamine-WT, Eos = Eosine , SRB = Sulphorhodamine-B

(1) - Results are for the Dye Trace Study performed at the Johnsonville Fossil Plant

Trace - dye detected in trace amount based on analysis of scans and peak amplitude.

Results are reported in Fluorescence units.

Table H.1-8 Background Study Results

ID	Location of Dye Detectors	5/13/2019			8/5/2019			8/12/2019		
		Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature
Surface Water										
TSW01	SW01	-	-	-	-	-	-			
TSW02	SW02	-	-	-	-	-	-			
TSW03	SW03	-	-	-	-	-	-			
TSW04	SW04	-	-	-	-	-	-			
TSW05	SW05	-	-	-	-	-	-			
TSW06	SW06	-	-	-						
TSW07	SW07	-	-	-						
TSW08	SW08	-	-	-						
TSW09	SW09	-	-	-						
TSW10	SW10	-	-	-						
TSW11	SW11	-	-	-						
TSW12	SW12	-	-	-						
TSW13	SW13	-	-	-						
TSW14	SW14	-	-	-						
TSPILL	Spillway	-	-	-						
Well Samples										
T103T	JOF-103	-	-	+						
T103B	JOF-103	-	-	+						
T104T	JOF-104	-	-	+						
T104B	JOF-104	-	-	+						
T118T	JOF-118	NS	NS	NS	-	-	-			
T118B	JOF-118	NS	NS	NS	-	-	-			
T119T	JOF-119	NS	NS	NS	-	-	-			
T119B	JOF-119	NS	NS	NS	-	-	-			
TAP1T	10-AP1	-	-	+						
TAP1B	10-AP1	-	-	+						
TAP3T	10-AP3	-	-	+						
TAP3B	10-AP3	-	-	+						
TPAZT	JOF-PZAT	NS	NS	NS				-	-	+
TPAZB	JOF-PZAT	NS	NS	NS				+	-	-

Notes:

SRB	Sulphorhodamine-B Dye
T	"T" at end of sample ID indicates upper dye detector set at location shown.
B	"B" at end of sample ID indicates lower dye detector set at bottom location shown.
NS	No sample collected
-	Dye not detected
Low Flow Signature	A '+' result in the low flow signature column indicated background flourescence was detected in the dye detector carbon due to low water flow. This condition was found in dye detectors placed in wells and piezometers where unwashed carbon was used and does not indicate a positive dye detection.
+	Positive dye detection

Table H.1-9 Post Injection Dye Detector Results
Johnsonville Fossil Plant
Johnsonville, Tennessee

Location of Dye Detectors		SW01			DUP 01			DUP03			SW02			DUP01		
ID/Duplicate Parent		TSW01			TSW01			TSW01			TSW02			TSW02		
Surface Water		Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature
Round 1	8/19-20/2019	-	-	-	-	-	-				-	-	-			
Round 2	8/26-27/2019	-	-	-							-	-	-			
Round 3	9/03-04/2019	-	-	-							-	-	-			
Round 4	9/9/219	-	-	-							-	-	-			
Round 5	9/16/2019	-	-	-							-	-	-			
Round 6	9/23/2019	-	-	-							-	-	-			
Round 7	9/30/2019	-	-	-							-	-	-			
Round 8	10/7/2019	-	-	-							-	-	-			
Round 9	10/14/2019	-	-	-							-	-	-			
Round 10	10/28/2019	-	-	-							-	-	-			
Round 11	11/12/2019[a]	NS	NS	NS							NS	NS	NS			
Round 12	11/25/2019	-	-	-							NS	NS	NS			
Round 13	12/9/2019	-	-	-							-	-	-			
Round 14	12/19-20/2019	-	-	-							-	-	-	-	-	-
Round 15	1/6/2020	-	-	-				-	-	-	-	-	-			
Round 16	1/21-22/2020	-	-	-							-	-	-			
Round 17	2/3/2020	-	-	-							-	-	-			
Round 18	2/18-19/2020	-	-	-							-	-	-			
Round 19	3/03-04/2020	-	-	-							-	-	-			

Table H.1-9 Post Injection Dye Detector Results
Johnsonville Fossil Plant
Johnsonville, Tennessee

Location of Dye Detectors		DUP02			DUP03			SW03			DUP02			DUP03		
ID/Duplicate Parent		TSW02			TSW02			TSW03			TSW03			TSW03		
Surface Water		Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature
Round 1	8/19-20/2019							-	-	-						
Round 2	8/26-27/2019							NS	NS	NS						
Round 3	9/03-04/2019							-	-	-						
Round 4	9/9/219							-	-	-						
Round 5	9/16/2019							-	-	-						
Round 6	9/23/2019							-	-	-	-	-	-			
Round 7	9/30/2019	-	-	-				-	-	-						
Round 8	10/7/2019							-	-	-						
Round 9	10/14/2019							-	-	-						
Round 10	10/28/2019							-	-	-	-	-	-			
Round 11	11/12/2019[a]							-	-	-				-	-	-
Round 12	11/25/2019							-	-	-						
Round 13	12/9/2019	-	-	-				-	-	-						
Round 14	12/19-20/2019							-	-	-						
Round 15	1/6/2020	-	-	-				-	-	-						
Round 16	1/21-22/2020							NS	NS	NS						
Round 17	2/3/2020				-	-	-	-	-	-						
Round 18	2/18-19/2020							-	-	-						
Round 19	3/03-04/2020							-	-	-						

Table H.1-9 Post Injection Dye Detector Results
Johnsonville Fossil Plant
Johnsonville, Tennessee

Location of Dye Detectors		SW04			SW05			DUP01			SW06			DUP03		
ID/Duplicate Parent		TSW04			TSW05			TSW05			TSW06			TSW06		
Surface Water		Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature
Round 1	8/19-20/2019	-	-	-	-	-	-				-	-	-			
Round 2	8/26-27/2019	NS	NS	NS	-	-	-				-	-	-			
Round 3	9/03-04/2019	-	-	-	-	-	-	-	-	-	-	-	-			
Round 4	9/9/219	NS	NS	NS	-	-	-				-	-	-			
Round 5	9/16/2019	-	-	-	-	-	-				-	-	-			
Round 6	9/23/2019	-	-	-	-	-	-				-	-	-			
Round 7	9/30/2019	-	-	-	-	-	-				-	-	-			
Round 8	10/7/2019	-	-	-	-	-	-				-	-	-	-	-	-
Round 9	10/14/2019	-	-	-	-	-	-				-	-	-	-	-	-
Round 10	10/28/2019	-	-	-	-	-	-				-	-	-			
Round 11	11/12/2019[a]	-	-	-	-	-	-				-	-	-			
Round 12	11/25/2019	-	-	-	-	-	-				-	-	-			
Round 13	12/9/2019	NS	NS	NS	-	-	-				-	-	-			
Round 14	12/19-20/2019	-	-	-	-	-	-				-	-	-			
Round 15	1/6/2020	NS	NS	NS	-	-	-	-	-	-	-	-	-			
Round 16	1/21-22/2020	-	-	-	NS	NS	NS				-	-	-			
Round 17	2/3/2020	-	-	-	-	-	-				-	-	-			
Round 18	2/18-19/2020	-	-	-	-	-	-				NS	NS	NS			
Round 19	3/03-04/2020	-	-	-	-	-	-				-	-	-			

Table H.1-9 Post Injection Dye Detector Results
Johnsonville Fossil Plant
Johnsonville, Tennessee

Location of Dye Detectors		SW07			SW08			DUP01			SW09			DUP01		
ID/Duplicate Parent		TSW07			TSW08			TSW08			TSW09			TSW09		
Surface Water		Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature
Round 1	8/19-20/2019	NS	NS	NS	NS	NS	NS				-	-	-			
Round 2	8/26-27/2019	NS	NS	NS	-	-	-				-	-	-			
Round 3	9/03-04/2019	-	-	-	-	-	-				-	-	-			
Round 4	9/9/219	-	-	-	-	-	-				-	-	-			
Round 5	9/16/2019	-	-	-	-	-	-				-	-	-			
Round 6	9/23/2019	-	-	-	-	-	-				-	-	-			
Round 7	9/30/2019	-	-	-	-	-	-				-	-	-	-	-	-
Round 8	10/7/2019	-	-	-	-	-	-				-	-	-			
Round 9	10/14/2019	-	-	-	-	-	-				-	-	-			
Round 10	10/28/2019	-	-	-	-	-	-				-	-	-			
Round 11	11/12/2019[a]	-	-	-	-	-	-				-	-	-			
Round 12	11/25/2019	-	-	-	-	-	-				-	-	-			
Round 13	12/9/2019	-	-	-	-	-	-				NS	NS	NS			
Round 14	12/19-20/2019	-	-	-	-	-	-				-	-	-			
Round 15	1/6/2020	-	-	-	NS	NS	NS				-	-	-			
Round 16	1/21-22/2020	-	-	-	-	-	-	-	-	-	-	-	-			
Round 17	2/3/2020	-	-	-	-	-	-				-	-	-			
Round 18	2/18-19/2020	-	-	-	-	-	-				-	-	-			
Round 19	3/03-04/2020	-	-	-	-	-	-				-	-	-			

Table H.1-9 Post Injection Dye Detector Results
Johnsonville Fossil Plant
Johnsonville, Tennessee

Location of Dye Detectors		DUP02			SW10			DUP01			DUP02			SW11		
ID/Duplicate Parent		TSW09			TSW10			TSW10			TSW10			TSW11		
Surface Water		Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature
Round 1	8/19-20/2019				-	-	-							-	-	-
Round 2	8/26-27/2019				-	-	-							-	-	-
Round 3	9/03-04/2019				-	-	-							-	-	-
Round 4	9/9/219				-	-	-							-	-	-
Round 5	9/16/2019				-	-	-	-	-	+				-	-	-
Round 6	9/23/2019				-	-	-	-	-	-				-	-	-
Round 7	9/30/2019				-	-	-							-	-	-
Round 8	10/7/2019				-	-	-				-	-	-	-	-	-
Round 9	10/14/2019				-	-	-				-	-	-	-	-	-
Round 10	10/28/2019				-	-	-							-	-	-
Round 11	11/12/2019[a]	-	-	-	-	-	-							-	-	-
Round 12	11/25/2019				-	-	-							-	-	-
Round 13	12/9/2019				-	-	-	-	-	-				-	-	-
Round 14	12/19-20/2019				-	-	-							-	-	-
Round 15	1/6/2020				-	-	-							-	-	-
Round 16	1/21-22/2020				-	-	-							-	-	-
Round 17	2/3/2020				-	-	-							-	-	-
Round 18	2/18-19/2020				-	-	-							-	-	-
Round 19	3/03-04/2020	-	-	-	-	-	-							-	-	-

Table H.1-9 Post Injection Dye Detector Results
Johnsonville Fossil Plant
Johnsonville, Tennessee

	Location of Dye Detectors	DUP01			SW12			DUP01			SW13			SW14		
	ID/Duplicate Parent	TSW11			TSW12			TSW12			TSW13			TSW14		
Surface Water		Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature
Round 1	8/19-20/2019				-	-	-				-	-	-	-	-	-
Round 2	8/26-27/2019				-	-	-				-	-	-	-	-	-
Round 3	9/03-04/2019				-	-	-				-	-	-	NS	NS	NS
Round 4	9/9/219				-	-	-				-	-	-	-	-	-
Round 5	9/16/2019				-	-	-				-	-	-	-	-	-
Round 6	9/23/2019				-	-	-				-	-	-	-	-	-
Round 7	9/30/2019				-	-	-				-	-	-	-	-	-
Round 8	10/7/2019				-	-	-				-	-	-	-	-	-
Round 9	10/14/2019				-	-	-				-	-	-	-	-	-
Round 10	10/28/2019				-	-	-	-	-	+	-	-	-	-	-	-
Round 11	11/12/2019[a]	-	-	-	-	-	-				NS	NS	NS	-	-	-
Round 12	11/25/2019				NS	NS	NS				-	-	-	-	-	-
Round 13	12/9/2019				-	-	-				-	-	-	-	-	-
Round 14	12/19-20/2019				-	-	-				-	-	-	-	-	-
Round 15	1/6/2020				-	-	-				NS	NS	NS	-	-	-
Round 16	1/21-22/2020				-	-	-				-	-	-	-	-	-
Round 17	2/3/2020				-	-	-				-	-	-	-	-	-
Round 18	2/18-19/2020				-	-	-				NS	NS	NS	-	-	-
Round 19	3/03-04/2020				-	-	-				NS	NS	NS	-	-	-

Table H.1-9 Post Injection Dye Detector Results
Johnsonville Fossil Plant
Johnsonville, Tennessee

Location of Dye Detectors		Spillway			DUP02			DUP04			DUP05		
ID/Duplicate Parent		TSPILL			TSPILL			TSPILL			TSPILL		
Surface Water		Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature
Round 1	8/19-20/2019	-	-	-									
Round 2	8/26-27/2019	-	-	-									
Round 3	9/03-04/2019	-	-	-									
Round 4	9/9/219	-	-	-									
Round 5	9/16/2019	-	-	-									
Round 6	9/23/2019	-	-	-									
Round 7	9/30/2019	-	-	-									
Round 8	10/7/2019	-	-	-									
Round 9	10/14/2019	-	-	-									
Round 10	10/28/2019	-	-	-				-	-	-			
Round 11	11/12/2019[a]	-	-	-									
Round 12	11/25/2019	-	-	-									
Round 13	12/9/2019	-	-	-									
Round 14	12/19-20/2019	-	-	-									
Round 15	1/6/2020	-	-	-							-	-	-
Round 16	1/21-22/2020	-	-	-									
Round 17	2/3/2020	-	-	-	-	-	-						
Round 18	2/18-19/2020	-	-	-									
Round 19	3/03-04/2020	-	-	-									

Table H.1-9 Post Injection Dye Detector Results
Johnsonville Fossil Plant
Johnsonville, Tennessee

Location of Dye Detectors		JOF103			DUP03			DUP01			JOF103			DUP04		
	ID	T103T			T103T			T103T			T103B			T103B		
Well Samples		Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature
Round 1	8/19-20/2019	-	-	+							-	-	+			
Round 2	8/26-27/2019	-	-	+							-	-	+			
Round 3	9/03-04/2019	-	-	+							-	-	+			
Round 4	9/9/2019	-	-	+							-	-	+			
Round 5	9/16/2019	-	-	+							-	-	+	-	-	+
Round 6	9/23/2019	-	-	+							-	-	+			
Round 7	9/30/2019	-	-	+							-	-	+			
Round 8	10/7/2019	-	-	+							-	-	+			
Round 9	10/14/2019	-	-	+							-	-	+			
Round 10	10/28/2019	-	-	+	-	-	-				-	-	+			
Round 11	11/12/2019[a]	-	-	-							-	-	-			
Round 12	11/25/2019	-	-	-							-	-	-			
Round 13	12/9/2019	-	-	-							-	-	-			
Round 14	12/19-20/2019	-	-	-							-	-	-			
Round 15	1/6/2020	-	-	-							-	-	-			
Round 16	1/21-22/2020	-	-	-							-	-	-			
Round 17	2/3/2020	-	-	-							-	-	-			
Round 18	2/18-19/2020	-	-	-				Possible trace	-	-	-	-	-			
Round 19	2/11/2020[b] 3/03-04/2020	-	-	-							-	-	-			

Table H.1-9 Post Injection Dye Detector Results
Johnsonville Fossil Plant
Johnsonville, Tennessee

Location of Dye Detectors		DUP01			JOF104			DUP02			DUP04			JOF104		
	ID	T103B			T104T			T104T			T104T			T104B		
Well Samples		Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	Sulphorhodamine-B	Low-Flow Signature
Round 1	8/19-20/2019				-	-	+							-	-	+
Round 2	8/26-27/2019				-	-	+							-	-	+
Round 3	9/03-04/2019				-	-	+							-	-	+
Round 4	9/9/2019				-	-	+							-	-	+
Round 5	9/16/2019				-	-	+							-	-	+
Round 6	9/23/2019				-	-	+							-	-	+
Round 7	9/30/2019				-	-	+							-	-	+
Round 8	10/7/2019				-	-	+							-	-	+
Round 9	10/14/2019				-	-	+							-	-	+
Round 10	10/28/2019				-	-	+							-	-	+
Round 11	11/12/2019[a]				-	-	-							-	-	-
Round 12	11/25/2019	-	-	-	-	-	-							+	-	-
Round 13	12/9/2019				+	-	-							+	-	-
Round 14	12/19-20/2019				+	-	-	-	-	-				+	-	-
Round 15	1/6/2020				+	-	-				+	-	-	+	-	-
Round 16	1/21-22/2020				+	-	-							+	-	-
Round 17	2/3/2020				DRY	DRY	DRY							Trace	-	-
Round 18	2/18-19/2020				Trace	-	-	+	-	-				Trace	-	-
Round 19	2/11/2020[b] 3/03-04/2020				DRY	DRY	DRY							Possible Trace	-	-

Table H.1-9 Post Injection Dye Detector Results
Johnsonville Fossil Plant
Johnsonville, Tennessee

Location of Dye Detectors		DUP02			DUP03			DUP01			JOF118			DUP02		
	ID	T104B			T104B			T104B			T118T			T118T		
Well Samples		Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature
Round 1	8/19-20/2019										-	-	+			
Round 2	8/26-27/2019										-	-	+			
Round 3	9/03-04/2019	-	-	+							-	-	+			
Round 4	9/9/2019										-	-	+			
Round 5	9/16/2019										-	-	+			
Round 6	9/23/2019										-	-	+			
Round 7	9/30/2019										-	-	+			
Round 8	10/7/2019										-	-	+			
Round 9	10/14/2019										-	-	+			
Round 10	10/28/2019										-	-	+			
Round 11	11/12/2019[a]										-	-	-			
Round 12	11/25/2019				-	-	-				-	-	-	-	-	-
Round 13	12/9/2019										-	-	-			
Round 14	12/19-20/2019										-	-	-			
Round 15	1/6/2020										-	-	-			
Round 16	1/21-22/2020	-	-	-							-	-	-			
Round 17	2/3/2020										-	-	-			
Round 18	2/18-19/2020										UC	UC	UC			
Round 19	2/11/2020[b]										-	-	-			
	3/03-04/2020							Possible Trace	-	-	Possible trace	-	-			

Table H.1-9 Post Injection Dye Detector Results
Johnsonville Fossil Plant
Johnsonville, Tennessee

Location of Dye Detectors		DUP03			JOF118			DUP01			JOF119			DUP01		
	ID	T118T			T118B			T118B			T119T			T119T		
Well Samples		Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature
Round 1	8/19-20/2019				-	-	+				-	-	+			
Round 2	8/26-27/2019				-	-	+				-	-	+			
Round 3	9/03-04/2019				-	-	+				-	-	+			
Round 4	9/9/2019				-	-	+				-	-	+			
Round 5	9/16/2019	-	-	+	-	-	+				-	-	+			
Round 6	9/23/2019				-	-	+				-	-	+			
Round 7	9/30/2019				-	-	+				-	-	+			
Round 8	10/7/2019				-	-	+				-	-	+	-	-	+
Round 9	10/14/2019				-	-	+				-	-	+			
Round 10	10/28/2019				-	-	+				-	-	+			
Round 11	11/12/2019[a]				-	-	-				-	-	-			
Round 12	11/25/2019				-	-	-				-	-	-			
Round 13	12/9/2019				-	-	-				-	-	-			
Round 14	12/19-20/2019				-	-	-	-	-	-	-	-	-			
Round 15	1/6/2020				-	-	-				-	-	-			
Round 16	1/21-22/2020				-	-	-				-	-	-	-	-	-
Round 17	2/3/2020				DRY	DRY	+	DRY	DRY	+	-	-	-			
Round 18	2/18-19/2020				UC	UC	UC				UC	UC	UC			
Round 19	2/11/2020[b]				-	-	-				?	-	-			
	3/03-04/2020				Possible trace	-	-				Possible trace	-	-			

Table H.1-9 Post Injection Dye Detector Results
Johnsonville Fossil Plant
Johnsonville, Tennessee

Location of Dye Detectors		JOF119			DUP02			DUP03			10AP1			10AP1		
	ID	T119B			T119B			T119B			TAP1T			TAP1B		
Well Samples		Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature
Round 1	8/19-20/2019	-	-	+	-	-	-				-	-	+	-	-	+
Round 2	8/26-27/2019	-	-	+							-	-	+	-	-	+
Round 3	9/03-04/2019	-	-	+							-	-	+	-	-	+
Round 4	9/9/2019	-	-	+							-	-	+	-	-	+
Round 5	9/16/2019	-	-	+							-	-	+	-	-	+
Round 6	9/23/2019	-	-	+							-	-	+	-	-	+
Round 7	9/30/2019	-	-	+				-	-	+	-	-	+	-	-	+
Round 8	10/7/2019	-	-	+							-	-	+	-	-	+
Round 9	10/14/2019	-	-	+							-	-	+	-	-	+
Round 10	10/28/2019	-	-	+							-	-	+	-	-	+
Round 11	11/12/2019[a]	-	-	-							-	-	-	-	-	-
Round 12	11/25/2019	-	-	-							-	-	-	-	-	-
Round 13	12/9/2019	-	-	-				-	-	-	-	-	-	-	-	-
Round 14	12/19-20/2019	-	-	-							-	-	-	-	-	-
Round 15	1/6/2020	-	-	-							-	-	-	-	-	-
Round 16	1/21-22/2020	-	-	-							-	-	-	-	-	-
Round 17	2/3/2020	-	-	-							DRY	DRY	+	-	-	-
Round 18	2/18-19/2020	UC	UC	UC							?	-	+	-	-	-
Round 19	2/11/2020[b]	Possible trace	-	-												
	3/03-04/2020	-	-	-							Possible Trace	-	-	-	-	-

Table H.1-9 Post Injection Dye Detector Results
Johnsonville Fossil Plant
Johnsonville, Tennessee

Location of Dye Detectors		DUP01			10AP3			10AP3			DUP03			JOFPZAT		
	ID	TAP1B			TAP3T			TAP3B			TAP3B			TPAZT		
Well Samples		Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature
Round 1	8/19-20/2019				-	-	+	-	-	+				NS	NS	NS
Round 2	8/26-27/2019				-	-	+	-	-	+				NS	NS	NS
Round 3	9/03-04/2019				-	-	+	-	-	+				NS	NS	NS
Round 4	9/9/2019				-	-	+	-	-	+				NS	NS	NS
Round 5	9/16/2019				-	-	+	-	-	+				NS	NS	NS
Round 6	9/23/2019				-	-	+	-	-	+	-	-	+	-	-	+
Round 7	9/30/2019				-	-	+	-	-	+				-	-	+
Round 8	10/7/2019				-	-	+	-	-	+				-	-	+
Round 9	10/14/2019	-	-	+	-	-	+	-	-	+						
Round 10	10/28/2019				-	-	+	-	-	+						
Round 11	11/12/2019[a]				-	-	-	-	-	-				DRY	DRY	DRY
Round 12	11/25/2019				-	-	-	-	-	-				DRY	DRY	DRY
Round 13	12/9/2019				-	-	-	-	-	-				DRY	DRY	DRY
Round 14	12/19-20/2019				-	-	-	-	-	-				DRY	DRY	DRY
Round 15	1/6/2020				-	-	-	-	-	-				DRY	DRY	DRY
Round 16	1/21-22/2020				-	-	-	-	-	-				DRY	DRY	DRY
Round 17	2/3/2020				-	-	-	-	-	-				DRY	DRY	DRY
Round 18	2/18-19/2020				-	-	-	-	-	-				DRY	DRY	DRY
Round 19	2/11/2020[b] 3/03-04/2020				-	-	-	-	-	-				DRY	DRY	+

Table H.1-9 Post Injection Dye Detector Results
Johnsonville Fossil Plant
Johnsonville, Tennessee

Location of Dye Detectors		JOFPZAT			DUP01			DUP02			DUP03		
	ID	TPAZB			UNKNOWN			UNKNOWN			UNKNOWN		
Well Samples		Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature
Round 1	8/19-20/2019	+*	-	+									
Round 2	8/26-27/2019	+*	-	+	-	-	-						
Round 3	9/03-04/2019	-	-	+									
Round 4	9/9/2019	-	-	+	-	-	-	-	-	-	-	-	+
Round 5	9/16/2019	-	-	+				-	-	+			
Round 6	9/23/2019	-	-	+									
Round 7	9/30/2019	-	-	+									
Round 8	10/7/2019	-	-	+									
Round 9	10/14/2019												
Round 10	10/28/2019												
Round 11	11/12/2019[a]	DRY	DRY	DRY									
Round 12	11/25/2019	DRY	DRY	DRY									
Round 13	12/9/2019	DRY	DRY	DRY									
Round 14	12/19-20/2019	DRY	DRY	DRY									
Round 15	1/6/2020	-	-	-									
Round 16	1/21-22/2020	-	-										
Round 17	2/3/2020	-	-	-									
Round 18	2/18-19/2020	-	-	-									
Round 19	2/11/2020[b] 3/03-04/2020	-	-	-									

Notes:

SRB	Sulphorhodamine-B Dye
NS	No sample collected
-	Dye not detected
Low Flow Signature	A '+' result in the low flow signature column indicated background flourescence is present in the dye detector carbon due to low water flow. This condition was found in dye detectors placed in wells and piezometers where unwashed carbon was used and does not indicate a positive dye detection.
Possible trace	Possible detection of dye in trace amount, but not repeated in a series.
Trace	Dye detected in trace amount based on analysis of scans and peak amplitude.
+	Positive dye detection
+*	Results for JOFPZAT for Fluorescein in Rounds 1 and 2 were determined not to be positive detections since Fluorescein was also reported during the Background Study.
UC	Dye detector contained unwashed carbon, sample not analyzed
?	Questionable dye detection, criteria not met for positive result
DRY	The dye detector packet was not submerged in water after placement.
NA	Sample not analyzed
T	"T" at end of sample ID indicates upper dye detector set at top of location shown.
B	"B" at end of sample ID indicates lower dye detector set at bottom location shown.
a	Prior to November 12, 2019, unwashed carbon was used in the dye detectors. Beginning with this event, acid washed carbon was used in the dye detectors.
b	Dye detectors collected on February 11, 2020 were removed from wells that were included in groundwater sampling. The dye detectors were analyzed with the same batch as the dye detectors collected on March 3-4, 2020.

Table H.1-10- Groundwater Analytical Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		10-AP1											
Sample Date		23-Sep-15	22-Mar-16	21-Sep-16	21-Sep-16	2-Nov-16	5-Jan-17	18-Jan-17	16-Feb-17	15-Mar-17	11-Apr-17	11-Apr-17	17-May-17
Sample ID		10-AP1_0923151200_L790475-01	JOF-10-AP1-0316	10-AP1_0921161200_20160929-01	10-AP1_0921161201_L861578-01	JOF-GW-001-11022016	JOF-GW-001-01052017	JOF-GW-001-01182017	JOF-GW-001-02162017	JOF-GW-001-03152017	JOF-GW-001-04112017	JOF-GW-903-04112017	JOF-GW-001-05172017
Parent Sample ID												JOF-GW-001-04112017	
Sample Depth		47 ft	47 ft	47 ft	47 ft	47 ft	47 ft	47 ft	47 ft	47 ft	47 ft	47 ft	47 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample
Program	Units	State Compliance	State Compliance	State Compliance	State Compliance	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program
Total Metals													
Antimony	ug/L	<2	<2.00	-	<2	<0.0213	0.493 U*	<0.443	<0.443	<0.443	0.719 U*	0.466 U*	<0.443
Arsenic	ug/L	2.17	<2.00	-	<2	1.13	1.1	0.657 J	1.53 J	0.903 J	0.776 J	0.789 J	0.709 J
Barium	ug/L	28.6	29.9	-	29.5	32.3	0.27 U*	31.4	34.8	28.5	25.5	26.2	26.6
Beryllium	ug/L	<2	<2.00	-	<2	0.214 J	<0.102	<0.131	0.161 J	<0.131	<0.131	<0.131	<0.131
Boron	ug/L	-	-	-	7,620	8,910	8,480	8,810	10,700	9,440	7,870	8,070	8,780
Cadmium	ug/L	<1	<1.00	-	<1	0.497 J	0.619 J	0.501 J	0.58 J	0.223 J	1.08	1.16	2.37
Calcium	ug/L	-	-	-	107,000	101,000 J	107,000 J	104,000	99,600	95,900	96,100	98,100	94,100
Chromium	ug/L	<2	<2.00	-	<2	<0.339	0.667 J	0.539 J	0.79 J	<0.378	<0.378	<0.378	0.378 UJ
Cobalt	ug/L	5	4.51	-	3.73	4.04	5.02	4.61	4.6	4.35	4.16	4.2	3.57
Copper	ug/L	<5	<5.00	-	<5	<0.454	1.14 U*	<1.04	1.09 U*	<1.04	1.23 U*	1.71 U*	<1.04
Lead	ug/L	<2	<2.00	-	<2	0.293 U*	0.28 U*	<0.318	0.412 J	<0.318	<0.318	<0.318	<0.318
Lithium	ug/L	-	-	-	<15	6	11.8 U*	7.16 U*	8.78 U*	5.47	5.69 U*	6.22 U*	6.38
Magnesium	ug/L	-	-	-	-	17,300 J	17,600	17,500	15,400	14,600	15,700	15,800	16,600
Mercury	ug/L	<0.2	<0.200	-	<0.2	<0.0521	<0.0521	<0.0521	<0.0521	<0.0653	<0.0653	<0.0653	<0.0653
Molybdenum	ug/L	-	-	-	<5	<0.873	<0.873	<0.593	<0.593	<0.593	<0.593	<0.593	<0.593
Nickel	ug/L	31.8	32.4	-	32.1	31.7	42 J	38	40	38.3	36.6	36.9	32.7 J
Potassium	ug/L	-	-	-	-	1,150	1,190	1,130	1,230	1,020	982	1,020	1,100
Selenium	ug/L	<2	<2.00	-	<2	<0.348	0.741 U*	<1.27	<1.27	<1.27	<1.27	<1.27	<1.27
Silver	ug/L	<2	<2.00	-	<2	-	-	-	-	-	-	-	-
Sodium	ug/L	-	-	-	-	16,100 J	15,800	16,400	13,000	14,500	14,100	14,100	15,000
Thallium	ug/L	<2	<1.00	-	<1	<0.036	<0.036	<0.0531	<0.0531	<0.0531	<0.0531	<0.0531	<0.0531
Vanadium	ug/L	<5	<5.00	-	<5	-	-	-	-	-	-	-	-
Zinc	ug/L	<25	<25.0	-	<25	-	-	-	-	-	-	-	-
Radiological Parameters													
Radium-226	pCi/L	-	-	-0.191 +/-()	-	0.468 +/-(0.41)U	0.345 +/-(0.55)U	-0.1380 +/-(0.33)UJ	0.173 +/-(0.26)U	0.0733 +/-(0.33)U	0.149 +/-(0.31)U	0.233 +/-(0.39)U	0.187 +/-(0.25)U
Radium-228	pCi/L	-	-	0.239 +/-()	-	0.109 +/-(1.3)UJ	0.248 +/-(0.31)U	-0.1360 +/-(0.28)U	-0.0931 +/-(0.20)UJ	0.457 +/-(0.31)U	0.240 +/-(0.19)UJ	0.0912 +/-(0.23)UJ	0.151 +/-(0.41)U
Radium-226+228	pCi/L	-	-	-	-	0.577 +/-(1.4)UJ	0.593 +/-(0.63)U	0.00000 +/-(0.43)UJ	0.173 +/-(0.33)UJ	0.531 +/-(0.46)U	0.389 +/-(0.36)UJ	0.324 +/-(0.46)UJ	0.338 +/-(0.48)U
Anions													
Chloride	mg/L	-	-	-	22.3	18.5	24.6	25.0	16.6	16.9	24.2	23.1	19.9
Fluoride	mg/L	0.125	0.177	-	0.108	0.148	0.166	0.170	0.125	0.192	0.175	0.174	0.118 U*
Sulfate	mg/L	-	-	-	345	264	275	275	306	277	295	281	280
General Chemistry													
Alkalinity, Bicarbonate	mg/L	-	-	-	-	15.4	26.4 J	24.2	36.4	13.0	10.9	13.0	14.5
Alkalinity, Carbonate	mg/L	-	-	-	-	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00
pH (lab)	SU	-	-	-	5.78	-	-	-	-	-	-	-	-
Total Dissolved Solids	mg/L	-	-	-	549	534	540	535	571	551	546	547	546

See notes on last page.

Table H.1-10- Groundwater Analytical Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		10-AP1											
Sample Date		6-Jun-17	11-Jul-17	2-Aug-17	20-Sep-17	20-Sep-17	6-Oct-17	15-Mar-18	24-May-18	24-May-18	13-Jun-18	27-Jun-18	27-Jun-18
Sample ID		JOF-GW-001-06062017	JOF-GW-001-07112017	JOF-GW-001-08022017	JOF-AP1	JOF-GW-001-09202017	JOF-GW-001-10062017	JOF-AP1-0318	JOF-GW-001-05242018	JOF-GW-903-05242018	JOF-GW-001-06132018	JOF-GW-001-06272018	JOF-GW-903-06272018
Parent Sample ID										JOF-GW-001-05242018			JOF-GW-001-06272018
Sample Depth		47 ft	47 ft	47 ft	47 ft	47 ft	47 ft	47 ft	47 ft	47 ft	47 ft	47 ft	47 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample
Program	Units	CCR Program	CCR Program	CCR Program	State Compliance	CCR Program	CCR Program	State Compliance	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program
Total Metals													
Antimony	ug/L	<0.443	1.09 U*	<0.443	<2	0.566 U*	-	<2	<1.12	<1.12	<1.12	<1.12	<1.12
Arsenic	ug/L	1.02 U*	0.764 J	0.838 U*	<1	0.751 J	-	<1	0.867 J	0.83 J	0.83 J	0.772 J	0.736 J
Barium	ug/L	29	27.2	31	29.8	29.3	-	31.3	27.6	26.9	29.2	31.3	31.5
Beryllium	ug/L	<0.131	<0.131	<0.131	<1	<0.131	-	<1	0.088 J	0.083 J	0.079 J	0.057 J	<0.057
Boron	ug/L	8,420	6,240	7,030	7,660	9,900	7,600	9,470	9,000	8,700	8,310	6,820	6,850
Cadmium	ug/L	1.11	0.776 J	0.843 J	<1	0.698 J	-	5.14	2.05	1.99	1.44	1.14	1.14
Calcium	ug/L	97,100	90,300	100,000	98,200	94,000	94,800	103,000	94,300	93,100	96,200	101,000	102,000
Chromium	ug/L	<0.378	<0.378	<0.378	<2	0.646 U*	-	<2	1.43 U*	1.52 U*	2.02 U*	2.03 U*	1.86 U*
Cobalt	ug/L	3.98	3.25	4.46	3.68	3.35	-	3.78	3.71	3.56	3.95	3.6	3.58
Copper	ug/L	<1.04	<1.04	1.63 U*	<2	<1.04	-	<2	<1.3	<1.3	<1.3	<1.3	<1.3
Lead	ug/L	<0.318	<0.318	<0.318	<1	<0.318	-	<1	<0.094	<0.094	0.101 J	0.106 J	0.118 J
Lithium	ug/L	5.31	5.4 U*	7.8 U*	5	4.98 J	-	7.67	7.35	6.83	6.42 U*	4.53 J	4.27 J
Magnesium	ug/L	16,000	14,500	16,400	-	15,200	15,800	-	15,700	15,500	15,200	15,500	15,800
Mercury	ug/L	<0.0653	<0.0653	<0.0653	<0.2	<0.0653	-	<0.2	<0.0653	<0.0653	<0.0653	<0.0653	<0.0653
Molybdenum	ug/L	<0.593	<0.593	<0.593	<5	<0.593	-	<5	<0.474	<0.474	<0.474	<0.474	<0.474
Nickel	ug/L	33.5	32.1	35.5	32.4	31.7	-	35	33.4	32.6	34.8	36.5	36.1
Potassium	ug/L	1,090	971	1,080	1,010	1,020	1,030	-	933	917	1,020	972	980
Selenium	ug/L	<1.27	<1.27	<1.27	<5	<1.27	-	<5	<0.813	<0.813	<0.813	<0.813	<0.813
Silver	ug/L	-	-	-	<1	-	-	<1	-	-	-	-	-
Sodium	ug/L	15,600	14,400	15,600	15,500	14,900	13,400	-	14,200	14,200	14,700	14,600	14,800
Thallium	ug/L	<0.0531	<0.0531	<0.0531	<1	<0.0531	-	<1	<0.063	<0.063	<0.063	<0.063	<0.063
Vanadium	ug/L	-	-	-	<1	-	-	2.94	-	-	-	-	-
Zinc	ug/L	-	-	-	20.8	-	-	20.3	-	-	-	-	-
Radiological Parameters													
Radium-226	pCi/L	0.0792 +/-(0.17)U	0.00617 +/-(0.21)U	-0.1150 +/-(0.26)U	0.0967 +/-(0.0637)	-0.0839 +/-(0.36)U	-	0.0746 +/-(0.0538)	0.0979 +/-(0.0720)U	0.174 +/-(0.0956)	0.0670 +/-(0.0539)U	0.0728 +/-(0.0727)UJ	0.0246 +/-(0.0588)UJ
Radium-228	pCi/L	0.255 +/-(0.39)U	0.581 +/-(0.55)U	0.404 +/-(0.23)J	0.503 +/-(0.223)	0.544 +/-(0.32)J	-	0.0773 +/-(0.231)U	0.252 +/-(0.215)U	0.102 +/-(0.199)U	0.182 +/-(0.204)U	0.249 +/-(0.266)U	0.286 +/-(0.232)U
Radium-226+228	pCi/L	0.335 +/-(0.42)U	0.587 +/-(0.59)U	0.404 +/-(0.35)J	-	0.544 +/-(0.49)J	-	-	0.350 +/-(0.227)U	0.276 +/-(0.221)J	0.249 +/-(0.211)U	0.322 +/-(0.276)UJ	0.310 +/-(0.239)UJ
Anions													
Chloride	mg/L	23.2	23.2	23.4	25.3	24.9	19.9	23.2	22.2	22.0	20.9	21.7	22.7
Fluoride	mg/L	0.135	0.211	0.152	0.118	0.119	0.120	0.114	0.127	0.125	0.146	0.172	0.202
Sulfate	mg/L	305	289	297	265	285	269	279	279	291	261	264	279
General Chemistry													
Alkalinity, Bicarbonate	mg/L	14.9	15.7	14.7	-	17.2	14.4	-	11.5	12.0	<5.00	37.6 J	23.8 J
Alkalinity, Carbonate	mg/L	<5.00	<5.00	<5.00	-	<5.00	<5.00	-	<5.00	<5.00	<5.00	<5.00	<5.00
pH (lab)	SU	-	-	-	5.8	-	-	6.0	-	-	-	-	-
Total Dissolved Solids	mg/L	559	522	529	520	531	522	523	552	549	546	498	493

See notes on last page.

Table H.1-10- Groundwater Analytical Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		10-AP1											
Sample Date		25-Jul-18	15-Aug-18	12-Sep-18	3-Apr-19	3-Apr-19	10-Jul-19	18-Sep-19	9-Oct-19	22-Jan-20	6-Mar-20	22-Jul-20	10-Sep-20
Sample ID		JOF-GW-001-07252018	JOF-GW-001-08152018	JOF-AP1-09122018	JOF-GW-001-04032019	JOF-GW-903-04032019	JOF-GW-001-07102019	JOF-GW-001-09182019	JOF-GW-001-10092019	JOF-GW-001-01222020	JOF-GW-001-03062020	JOF-GW-001-07222020	JOF-GW-001-09102020
Parent Sample ID						JOF-GW-001-04032019							
Sample Depth		47 ft	47 ft	47 ft	47 ft	47 ft	47 ft	47 ft	47 ft	47 ft	47 ft	47 ft	47 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	CCR Program	CCR Program	State Compliance	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	State Compliance	State Compliance
Total Metals													
Antimony	ug/L	<1.12	<1.12	<2	<0.378	<0.378	<0.378	<0.378	<0.378	<1.00	<1.00	<1.00	<1.00
Arsenic	ug/L	0.43 J	0.451 U*	<1	0.708 J	0.556 J	0.773 U*	0.686 J	0.613 J	<2.00	2.95 U*	<2.00	<2.00
Barium	ug/L	27.8	23.5	28.4	31.3	31.4	28.3	25.0	32.8	30.0	29.2	27.6	27.4
Beryllium	ug/L	0.078 U*	<0.057	<1	<0.155	<0.155	0.384 U*	<0.182	<0.182	<0.200	<0.200	<0.200	<0.200
Boron	ug/L	6,850	5,170	7,930	8,490	8,350	6,710	7,640	6,840	9,510	8,730	8,460 J	9,590
Cadmium	ug/L	0.856 J	0.57 U*	<1	2.18	2.12	1.07 U*	0.868 J	1.06	0.924 J	2.91	0.694 J	0.936 J
Calcium	ug/L	88,700	77,100	87,300	98,500	99,600	92,400	82,600	94,400	98,000	90,200	102,000	94,300
Chromium	ug/L	<0.631	<0.631	<2	1.65 U*	<1.53	<1.53	<1.53	1.69 U*	<3.00	<3.00	<3.00	<3.00
Cobalt	ug/L	3.01	2.46	2.78	4.02	4	4.78	3.68	3.89	3.94	3.52	3.88	4.00
Copper	ug/L	<1.3	<1.3	<2	0.895 J	0.659 J	0.928 U*	1.82 U*	<0.627	0.354 J	0.604 J	<0.300	<0.300
Lead	ug/L	0.122 J	0.187 U*	<1	<0.128	<0.128	0.168 U*	<0.128	<0.128	<0.500	<0.500	<0.500	<0.500
Lithium	ug/L	4.9 J	5.84 U*	6.7	5.58	5.25	7.92 U*	3.58 J	5.58	5.37 J	4.60 J	4.89 J	5.05 J
Magnesium	ug/L	13,900	11,700	-	16,900	16,800	14,700	13,800	15,100	15,500	14,000	15,000	16,000
Mercury	ug/L	0.0662 U*	<0.0653	<0.2	<0.101	<0.101	<0.101	<0.101	<0.101	<0.0670	<0.0670	<0.0670	<0.0670
Molybdenum	ug/L	<0.474	<0.474	<5	<0.61	<0.61	<0.61	<0.610	<0.610	<0.200	<0.200	<0.200	<0.200
Nickel	ug/L	30.2	26.5	30.6	39.2	38.7	43	34.7	38.0	41.9	34.8	38.6	40.1
Potassium	ug/L	926	827	-	1,160	1,140	1,000	1,180	1,110	1,030	854	958	967
Selenium	ug/L	<0.813	<0.813	<5	<2.62	<2.62	<2.62	<1.51	<1.51	<2.00	<2.00	<2.00	<2.00
Silver	ug/L	-	-	<1	<0.121	<0.121	<0.121	<0.177	<0.177	<0.300	<0.300	<0.300	<0.300
Sodium	ug/L	12,900	11,000	-	16,300	16,200	14,000	13,300	15,100	15,100	13,700	14,400	15,300
Thallium	ug/L	<0.063	<0.063	<1	<0.128	<0.128	<0.128	<0.148	<0.148	<0.600	<0.600	<0.600	<0.600
Vanadium	ug/L	-	-	1.94 U*	2.34 U*	1.61 U*	1.56	1.34 U*	1.08	<3.30	<3.30	<3.30	<3.30
Zinc	ug/L	-	-	19.3 U*	19.4	20.3	25.5	23.3	45.8	23.3	22.3	24.3	22.7
Radiological Parameters													
Radium-226	pCi/L	0.176 +/-(0.0827)U*	0.225 +/-(0.0965)U*	0.210 +/-(0.0844)U*	0.0261 +/-(0.0561)UJ	0.142 +/-(0.0800)J	0.0168 +/-(0.0629)U	0.219 +/-(0.336)U	0.273 +/-(0.360)U	1.17 +/-(0.702)U*	1.05 +/-(0.719)	-0.0937 +/-(0.376)U	0.684 +/-(0.651)U
Radium-228	pCi/L	0.121 +/-(0.199)U	0.106 +/-(0.214)U	-0.00372 +/-(0.216)U	0.195 +/-(0.197)U	0.0349 +/-(0.233)U	0.0973 +/-(0.262)U	0.00675 +/-(0.280)U	0.503 +/-(0.539)U	-0.208 +/-(0.233)U	0.324 +/-(0.301)U	-0.115 +/-(0.417)U	-0.321 +/-(0.434)U
Radium-226+228	pCi/L	0.297 +/-(0.216)U*	0.332 +/-(0.235)U*	-	0.221 +/-(0.205)UJ	0.177 +/-(0.246)J	0.114 +/-(0.269)U	0.226 +/-(0.437)U	0.776 +/-(0.649)U	1.17 +/-(0.740)U*	1.38 +/-(0.779)J	0.000 +/-(0.562)U	0.684 +/-(0.783)U
Anions													
Chloride	mg/L	22.4	23.4	19.5	22.5	22.7	22.6	22.8	21.6	21.9	23.9	24.7	23.9
Fluoride	mg/L	0.151	0.138	0.129	0.131	0.130	0.138	0.0969 J	0.0921 U*	0.231	0.218	0.180	0.153
Sulfate	mg/L	294	302	306	247 J	249 J	254	283	273	256	273	281	277
General Chemistry													
Alkalinity, Bicarbonate	mg/L	15.3	16.3	-	13.5	12.5	40.0	35.3	37.4	20.0	15.9	14.9	15.3
Alkalinity, Carbonate	mg/L	<5.00	<5.00	-	<5.00	<5.00	<5.00	<5.00	<5.00	<1.45	<1.45	<1.45	<1.45
pH (lab)	SU	-	-	5.6 J	-	-	-	-	5.8 J	-	5.72 J	-	-
Total Dissolved Solids	mg/L	531	522	491	490	497	490	525	509	521	504	490	489

See notes on last page.

Table H.1-10- Groundwater Analytical Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		10-AP1								
Sample Date		10-Feb-21	18-Mar-21	28-Jul-21	15-Sep-21	2-Feb-22	16-Mar-22	3-Aug-22	14-Sep-22	8-Feb-23
Sample ID		JOF-GW-10-AP1-02102021	JOF-GW-10-AP1-03182021	JOF-GW-10-AP1-07282021	JOF-GW-10-AP1-09152021	JOF-GW-10-AP1-02022022	JOF-GW-10-AP1-03162022	JOF-GW-10-AP1-08032022	JOF-GW-10-AP1-09142022	JOF-GW-10-AP1-02082023
Parent Sample ID										
Sample Depth		47 ft	47 ft	47 ft	47 ft	47 ft	47 ft	47 ft	47 ft	47 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	
Total Metals										
Antimony	ug/L	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
Arsenic	ug/L	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
Barium	ug/L	29.4	31.2	27.7	26.2	26.8	27.3	29.2	29.2	26.1
Beryllium	ug/L	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200
Boron	ug/L	8,820	9,120	8,470	7,680	9,670	8,180	7,790	8,260	8,710
Cadmium	ug/L	0.839 J	1.20	0.851 J	0.724 J	0.724 J	1.22	1.16	0.774 J	0.950 J
Calcium	ug/L	96,500	108,000	88,500	87,500	96,700	101,000	87,800	95,300	95,500
Chromium	ug/L	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00
Cobalt	ug/L	4.48	5.39	4.20	3.88	4.17	4.25	3.85	3.46	3.47
Copper	ug/L	0.459 J	0.499 U*	0.301 J	0.382 J	<0.300	<0.300	0.510 J	0.425 J	0.628 J
Lead	ug/L	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	0.576 J	<0.500	<0.500
Lithium	ug/L	5.56 J	5.15 J	3.49 J	4.84 J	5.06 J	5.35 J	5.58 J	4.99 J	5.05 J
Magnesium	ug/L	16,500 J	18,100 J	14,700	14,800	16,100	16,700	15,000	14,800	15,800
Mercury	ug/L	<0.0670	<0.0670	0.0940 U*	<0.0670	<0.0670	<0.0670	<0.0670	<0.0670	<0.0670
Molybdenum	ug/L	0.255 U*	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200
Nickel	ug/L	42.1	48.3	36.7	35.8	41.2	39.2	39.4	39.6	40.0
Potassium	ug/L	1,210	1,220	1,020	952	1,040	1,030	1,150	1,100	1,070
Selenium	ug/L	<2.00	<2.00	<2.00	<2.00	<1.50	<1.50	<1.50	<1.50	<1.50
Silver	ug/L	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300
Sodium	ug/L	16,000	18,300	14,200	14,000	15,400	15,700	15,100	14,500	15,500
Thallium	ug/L	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600
Vanadium	ug/L	<3.30	<3.30	<3.30	<3.30	<3.30	<3.30	<3.30	<3.30	<3.30
Zinc	ug/L	25.7	25.0	24.8 U*	25.8	22.7	22.8	27.6	23.0	21.2
Radiological Parameters										
Radium-226	pCi/L	0.181 +/-(0.303)U	-0.0641 +/-(0.160)U	0.213 +/-(0.346)U	0.0395 +/-(0.428)U	-0.0595 +/-(0.282)U	0.177 +/-(0.498)U	0.403 +/-(0.335)U	0.626 +/-(0.683)U	0.261 +/-(0.347)U
Radium-228	pCi/L	0.147 +/-(0.303)U	-0.143 +/-(0.257)U	0.561 +/-(0.480)U	0.211 +/-(0.253)U	0.839 +/-(0.466)	1.04 +/-(0.555)U*	0.345 +/-(0.497)U	0.324 +/-(0.426)U	0.301 +/-(0.399)U
Radium-226+228	pCi/L	0.328 +/-(0.429)U	0.000 +/-(0.303)U	0.774 +/-(0.592)U	0.251 +/-(0.497)U	0.839 +/-(0.545)J	1.22 +/-(0.745)U*	0.748 +/-(0.600)U	0.950 +/-(0.805)U	0.562 +/-(0.529)U
Anions										
Chloride	mg/L	25.8	25.8	27.3	23.9	24.1	25.7	25.2	24.4	26.5
Fluoride	mg/L	0.196	0.169	0.202	0.234	0.139	0.134	0.257	0.152	0.200 J
Sulfate	mg/L	286	285	289	265	270	272	267	257	267
General Chemistry										
Alkalinity, Bicarbonate	mg/L	11.2 J	12.0 J	13.7	14.1	14.0	13.2 J	40.6 J	16.6	13.6 J
Alkalinity, Carbonate	mg/L	0.725 UJ	0.725 UJ	<1.45	<1.45	<1.45	<1.45	<1.45	<1.45	0.725 UR
pH (lab)	SU	-	-	-	-	-	-	-	-	-
Total Dissolved Solids	mg/L	536	559	524	509	499	501	502	479	505

See notes on last page.

Stantec

Table H.1-10- Groundwater Analytical Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		10-AP3											
Sample Date		23-Sep-15	22-Mar-16	22-Sep-16	22-Sep-16	2-Nov-16	5-Jan-17	17-Jan-17	17-Jan-17	15-Feb-17	15-Feb-17	14-Mar-17	14-Mar-17
Sample ID		10-AP3_0923151200_L790475-03	JOF-10-AP3-0316	10-AP3_0922161200_20160929-02	10-AP3_0922161200_L861578-02	JOF-GW-002-11022016	JOF-GW-002-01052017	JOF-GW-002-01172017	JOF-GW-903-01172017	JOF-GW-002-02152017	JOF-GW-903-02152017	JOF-GW-002-03142017	JOF-GW-903-03142017
Parent Sample ID									JOF-GW-002-01172017		JOF-GW-002-02152017		JOF-GW-002-03142017
Sample Depth		45.5 ft	45.5 ft	45.5 ft	45.5 ft	45.5 ft	45.5 ft	45.5 ft	45.5 ft	45.5 ft	45.5 ft	45.5 ft	45.5 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Field Duplicate Sample
Program	Units	State Compliance	State Compliance	State Compliance	State Compliance	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program
Total Metals													
Antimony	ug/L	<2	<2.00	-	<2	<0.0213	0.473 U*	<0.443	0.446 J	<0.443	<0.443	<0.443	<0.443
Arsenic	ug/L	<2	<2.00	-	<2	0.511 J	0.643 J	0.637 J	0.694 J	1.25 J	1.06 J	0.551 J	0.516 J
Barium	ug/L	16.8	17.5	-	15.8	15.8	15.5	18.5 J	19.1 J	19.5	18.6	14.6	13.8
Beryllium	ug/L	<2	<2.00	-	<2	0.178 J	0.117 J	0.169 J	0.173 J	<0.131	0.143 J	<0.131	<0.131
Boron	ug/L	-	-	-	6,130	6,820	5,850	6,590 J	6,720 J	7,360	7,500	6,420	6,430
Cadmium	ug/L	5.1	5.87	-	5.02	4.96	4.15	4.17	4.22	5.23 J	5.52 J	10.6	9.93
Calcium	ug/L	-	-	-	218,000	198,000 J	207,000 J	187,000	195,000	188,000	188,000	186,000	182,000
Chromium	ug/L	<2	<2.00	-	<2	<0.339	<0.339	<0.378	<0.378	0.462 J	0.379 J	<0.378	<0.378
Cobalt	ug/L	40.1	38.9	-	36.8	35.1	45.3	40.7	42.4	40.9	39.2	39.9	39
Copper	ug/L	<5	<5.00	-	<5	<0.454	0.868 U*	<1.04	<1.04	2.65 U*	1.61 U*	1.24 J	1.33 J
Lead	ug/L	<2	<2.00	-	<2	0.132 U*	0.116 U*	<0.318	<0.318	<0.318	<0.318	<0.318	<0.318
Lithium	ug/L	-	-	-	<15	4.08 U*	9.84 U*	5.2 U*	5.49 U*	6.57 U*	6.5 U*	3.46 J	3.4 J
Magnesium	ug/L	-	-	-	-	21,800 J	24,200	20,500	21,500	18,900	19,000	21,400	21,000
Mercury	ug/L	<0.2	<0.200	-	<0.2	<0.0521	<0.0521	<0.0521	<0.0521	<0.0521	<0.0521	<0.0653	<0.0653
Molybdenum	ug/L	-	-	-	<5	<0.873	<0.873	<0.593	<0.593	<0.593	0.714 J	<0.593	<0.593
Nickel	ug/L	101	101	-	94.4	90.3	114 J	104	109	105	98.5	102	100
Potassium	ug/L	-	-	-	-	5,490	5,200	4,890	5,090	5,510	5,580	4,550	4,450
Selenium	ug/L	<2	<2.00	-	<2	0.454 J	1.09 U*	<1.27	<1.27	<1.27	<1.27	2.42 J	2.02 J
Silver	ug/L	<2	<2.00	-	<2	-	-	-	-	-	-	-	-
Sodium	ug/L	-	-	-	-	33,200 J	34,100	31,600	33,200	27,100	27,800	31,400	30,400
Thallium	ug/L	<2	<1.00	-	<1	0.099 U*	0.051 J	0.057 J	0.109 J	0.104 U*	0.221 U*	<0.0531	<0.0531
Vanadium	ug/L	<5	<5.00	-	<5	-	-	-	-	-	-	-	-
Zinc	ug/L	77	74.9	-	66.8	-	-	-	-	-	-	-	-
Radiological Parameters													
Radium-226	pCi/L	-	-	-0.112 +/-()	-	0.283 +/-(0.32)U	0.155 +/-(0.40)U	0.307 +/-(0.34)U	0.116 +/-(0.81)UJ	0.511 +/-(0.34)J	0.296 +/-(0.29)U	-0.2010 +/-(0.23)U	0.460 +/-(0.46)U
Radium-228	pCi/L	-	-	0.303 +/-()	-	0.839 +/-(0.61)U	0.221 +/-(0.35)U	0.275 +/-(0.26)U	0.437 +/-(0.25)J	0.377 +/-(0.24)U	0.509 +/-(0.27)J	0.448 +/-(0.35)U	0.274 +/-(0.25)U
Radium-226+228	pCi/L	-	-	-	-	1.12 +/-(0.69)U	0.376 +/-(0.53)U	0.582 +/-(0.43)U	0.553 +/-(0.85)J	0.888 +/-(0.41)J	0.804 +/-(0.39)J	0.448 +/-(0.42)U	0.734 +/-(0.52)U
Anions													
Chloride	mg/L	-	-	-	30.4	26.5	28.3	31.7 J	23.8 J	21.9	23.0	21.5 J	29.1 J
Fluoride	mg/L	<0.1	<0.100	-	<0.1	0.0557 J	0.0699 J	0.0649 J	0.0630 J	0.0388 J	0.0467 J	0.0790 J	0.0914 J
Sulfate	mg/L	-	-	-	752	611	656	583	577	640	662	589	673
General Chemistry													
Alkalinity, Bicarbonate	mg/L	-	-	-	-	<5.00	24.4 J	24.2	22.2	24.2	26.3	6.50	<5.00
Alkalinity, Carbonate	mg/L	-	-	-	-	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00
pH (lab)	SU	-	-	-	5.24	-	-	-	-	-	-	-	-
Total Dissolved Solids	mg/L	-	-	-	1,030	1,000	951	982	991	1,020	1,000	1,000	992

See notes on last page.

Stantec

Table H.1-10- Groundwater Analytical Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location								10-AP3						
Sample Date		12-Apr-17	16-May-17	6-Jun-17	6-Jun-17	11-Jul-17	11-Jul-17	2-Aug-17	2-Aug-17	20-Sep-17	20-Sep-17	20-Sep-17	6-Oct-17	14-Mar-18
Sample ID		JOF-GW-002-04122017	JOF-GW-002-05162017	JOF-GW-002-06062017	JOF-GW-903-06062017	JOF-GW-002-07112017	JOF-GW-903-07112017	JOF-GW-002-08022017	JOF-GW-903-08022017	JOF-AP3	JOF-GW-002-09202017	JOF-GW-903-09202017	JOF-GW-002-10062017	JOF-AP3-0318
Parent Sample ID					JOF-GW-002-06062017		JOF-GW-002-07112017		JOF-GW-002-08022017			JOF-GW-002-09202017		
Sample Depth		45.5 ft	45.5 ft	45.5 ft	45.5 ft	45.5 ft	45.5 ft	45.5 ft	45.5 ft	45.5 ft	45.5 ft	45.5 ft	45.5 ft	45.5 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	State Compliance	CCR Program	CCR Program	CCR Program	State Compliance
Total Metals														
Antimony	ug/L	1.09 U*	<0.443	<0.443	<0.443	1.27 U*	1.23 U*	<0.443	<0.443	<2	0.803 U*	0.679 U*	-	<2
Arsenic	ug/L	0.623 J	0.254 J	0.822 U*	0.678 U*	0.622 J	0.583 J	0.708 U*	0.625 U*	<1	0.567 J	0.584 J	-	<1
Barium	ug/L	14.1	14	15.4	15.6	15.3	14.4	14.6	15	14.9	14.2	14.6	-	16.8
Beryllium	ug/L	<0.131	<0.131	<0.131	<0.131	<0.131	<0.131	<0.131	<0.131	<1	<0.131	<0.131	-	<1
Boron	ug/L	5,610	6,140	6,010	6,020	4,820	4,800	5,230	5,050	5,700	7,480	7,710	5,620	6,160
Cadmium	ug/L	5.48	4.57	4.22	4.75	4.74	4.76	4.82	4.82	5.06	4.86	5.14	-	6.04
Calcium	ug/L	174,000	175,000	185,000	187,000	188,000	183,000	183,000	186,000	192,000	182,000	189,000	178,000	174,000
Chromium	ug/L	<0.378	0.378 UJ	<0.378	<0.378	<0.378	<0.378	<0.378	<0.378	<2	0.451 U*	<0.378	-	<2
Cobalt	ug/L	41.7	32	34.3	32.8	35	34.9	42.5	43.1	37.7	36.6	38.2	-	34.7
Copper	ug/L	1.75 U*	<1.04	<1.04	<1.04	<1.04	<1.04	2.37 U*	2.08 U*	<2	<1.04	<1.04	-	<2
Lead	ug/L	<0.318	<0.318	<0.318	0.489 J	<0.318	<0.318	<0.318	<0.318	<1	<0.318	<0.318	-	<1
Lithium	ug/L	4.06 J	4.76 J	3.68 J	3.81 J	4.24 U*	3.96 U*	7.13 U*	6.54 U*	<5	3.32 J	3.31 J	-	5.29
Magnesium	ug/L	19,500	20,300	19,700	19,900	20,000	19,900	20,800	21,200	-	20,000	20,700	20,700	-
Mercury	ug/L	<0.0653	<0.0653	<0.0653	<0.0653	<0.0653	<0.0653	<0.0653	<0.0653	<0.2	0.0669 J	<0.0653	-	<0.2
Molybdenum	ug/L	<0.593	<0.593	<0.593	<0.593	<0.593	<0.593	<0.593	<0.593	<5	<0.593	<0.593	-	<5
Nickel	ug/L	104	79.6 J	86.1	83.4	91.5	90.7	91.1	92.3	88.7	85.9	89.7	-	86
Potassium	ug/L	4,970	5,020	5,360	5,440	5,160	5,070	5,240	5,280	5,300	5,170	5,290	5,230	-
Selenium	ug/L	<1.27	<1.27	<1.27	<1.27	<1.27	<1.27	<1.27	<1.27	<5	<1.27	<1.27	-	<5
Silver	ug/L	-	-	-	-	-	-	-	-	<1	-	-	-	<1
Sodium	ug/L	30,300	31,300	33,100	33,400	31,700	31,500	31,900	32,600	33,600	32,100	32,900	28,300	-
Thallium	ug/L	<0.0531	0.069 U*	0.085 J	0.099 J	0.099 J	0.092 J	0.123 J	0.11 J	<1	0.095 J	0.098 J	-	<1
Vanadium	ug/L	-	-	-	-	-	-	-	-	<1	-	-	-	1.9
Zinc	ug/L	-	-	-	-	-	-	-	-	65.6	-	-	-	62.6
Radiological Parameters														
Radium-226	pCi/L	0.257 +/-(0.38)U	-0.0365 +/-(0.14)U	0.338 +/-(0.61)U	0.0809 +/-(0.17)U	0.353 +/-(0.32)U	0.248 +/-(0.30)U	-0.0753 +/-(0.42)U	0.392 +/-(0.47)U	0.145 +/-(0.0777)	0.158 +/-(0.48)U	0.465 +/-(0.54)U	-	0.113 +/-(0.0595)
Radium-228	pCi/L	0.621 +/-(0.24)U*	0.208 +/-(0.41)U	0.331 +/-(0.33)U	0.359 +/-(0.37)U	1.63 +/-(0.92)U*	0.608 +/-(0.73)U	0.516 +/-(0.64)UJ	0.584 +/-(0.30)J	0.585 +/-(0.274)	0.481 +/-(0.29)J	0.275 +/-(0.40)U	-	0.407 +/-(0.236)
Radium-226+228	pCi/L	0.878 +/-(0.45)U*	0.208 +/-(0.43)U	0.669 +/-(0.69)U	0.440 +/-(0.41)U	1.98 +/-(0.98)U*	0.856 +/-(0.79)U	0.516 +/-(0.77)UJ	0.976 +/-(0.55)J	-	0.639 +/-(0.56)J	0.740 +/-(0.67)U	-	-
Anions														
Chloride	mg/L	29.7	25.3 J	28.9	28.7	30.9	30.9	29.1	29.7	32.9	32.8	32.7	26.3	28.5
Fluoride	mg/L	0.0778 J	0.0497 U*	0.0523 J	0.0817 J	0.0726 J	0.0708 J	0.0468 J	0.0470 J	<0.100	0.0377 J	0.0361 J	0.0358 J	<0.100
Sulfate	mg/L	617	592	598	618	613	614	576	573	614	635	629	573	540
General Chemistry														
Alkalinity, Bicarbonate	mg/L	7.80	11.2	7.46	5.97	7.35	6.86	5.39	5.88	-	8.87	7.88	<5.00	-
Alkalinity, Carbonate	mg/L	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	-	<5.00	<5.00	<5.00	-
pH (lab)	SU	-	-	-	-	-	-	-	-	5.3	-	-	-	6.0
Total Dissolved Solids	mg/L	971	986	1,000	1,000	974	995	957	937	932	972	974	951	898

See notes on last page.

Table H.1-10- Groundwater Analytical Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		10-AP3											
Sample Date		23-May-18	13-Jun-18	13-Jun-18	26-Jun-18	24-Jul-18	14-Aug-18	12-Sep-18	3-Apr-19	10-Jul-19	18-Sep-19	9-Oct-19	23-Jan-20
Sample ID		JOF-GW-002-05232018	JOF-GW-002-06132018	JOF-GW-903-06132018	JOF-GW-002-06262018	JOF-GW-002-07242018	JOF-GW-002-08142018	JOF-AP3-09122018	JOF-GW-002-04032019	JOF-GW-002-07102019	JOF-GW-002-09182019	JOF-GW-002-10092019	JOF-GW-002-01232020
Parent Sample ID				JOF-GW-002-06132018									
Sample Depth		45.5 ft	45.5 ft	45.5 ft	45.5 ft	45.5 ft	45.5 ft	45.5 ft	45.5 ft	45.5 ft	45.5 ft	45.5 ft	45.5 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	State Compliance	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program
Total Metals													
Antimony	ug/L	<1.12	<1.12	<1.12	<1.12	<1.12	<1.12	<2	<0.378	<0.378	<0.378	<0.378	<1.00
Arsenic	ug/L	0.876 J	0.772 J	0.784 J	0.668 U*	0.487 J	0.696 U*	<1	0.686 J	0.563 U*	0.388 J	0.513 J	2.46 J
Barium	ug/L	14.9	15.6	15.8	17.9	15.8	15.6	14.7	17.7	14.6	14.2	18.0 U*	16.0
Beryllium	ug/L	0.1 J	0.122 J	0.125 J	0.06 J	0.104 U*	0.057 J	<1	<0.155	0.246 U*	0.192 J	<0.182	<0.200
Boron	ug/L	5,650	5,790	5,480	4,980	5,110	5,700	5,570	5,890	4,990	5,300	4,740	6,620
Cadmium	ug/L	4.5	4.87	4.81	5.22	5.35	4.59	4.46	4.74	4.23	3.92	4.22	4.20
Calcium	ug/L	166,000	178,000	177,000	192,000	205,000	167,000	161,000	168,000	173,000	151,000	166,000	174,000
Chromium	ug/L	1.54 U*	2.01 U*	2.12 U*	1.82 U*	<0.631	1.82 U*	<2	<1.53	<1.53	<1.53	1.65 U*	<3.00
Cobalt	ug/L	33.1	37.1	37.8	36.8	34.2	36.4	31.2	36.4	34.5	28.8	32.3	32.6
Copper	ug/L	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<2	0.835 J	1.01 J	2.23 U*	<0.627	0.370 J
Lead	ug/L	0.098 J	<0.094	<0.094	<0.094	0.111 J	<0.094	<1	0.19 J	0.188 U*	0.146 J	0.249 J	<0.500
Lithium	ug/L	4.83 J	4.6 U*	4.47 U*	<2.56	3.16 J	4.11 J	<5	3.34 J	3.98 J	<3.39	4.14 J	3.33 J
Magnesium	ug/L	17,900	18,700	18,800	20,800	19,500	18,800	-	19,200	18,400	16,600	17,600	17,500
Mercury	ug/L	<0.0653	<0.0653	<0.0653	<0.0653	<0.0653	<0.0653	<0.2	<0.101	<0.101	<0.101	<0.101	<0.0670
Molybdenum	ug/L	<0.474	<0.474	<0.474	<0.474	<0.474	<0.474	<5	<0.61	<0.61	<0.610	<0.610	<0.200
Nickel	ug/L	85	87.8	90.5	94.8	87.6	95.3	81.4	91.8	89.9	73.3	83.0	82.9
Potassium	ug/L	4,880	5,240	5,310	5,540	5,320	5,180	-	5,850	5,750	4,770	5,230	4,810
Selenium	ug/L	<0.813	<0.813	<0.813	<0.813	<0.813	<0.813	<5	<2.62	<2.62	<1.51	<1.51	<2.00
Silver	ug/L	-	-	-	-	-	-	<1	<0.121	<0.121	<0.177	<0.177	<0.300
Sodium	ug/L	29,500	30,000	30,700	32,900	31,100	30,000	-	33,600	32,300	28,700	31,600	31,000
Thallium	ug/L	0.091 J	0.106 J	0.112 J	0.11 J	<0.063	0.103 J	<1	<0.128	0.176 U*	<0.148	<0.148	<0.600
Vanadium	ug/L	-	-	-	-	-	-	1.45 U*	1.08 U*	<0.899	1.45 U*	1.02	<3.30
Zinc	ug/L	-	-	-	-	-	-	62.3 U*	68.2	70.7	58.2	75.9	62.0
Radiological Parameters													
Radium-226	pCi/L	0.0610 +/-(0.0632)U	0.0932 +/-(0.0610)	0.116 +/-(0.0717)	0.115 +/-(0.0896)UJ	0.272 +/-(0.103)U*	0.325 +/-(0.115)U*	0.308 +/-(0.0966)U*	0.0930 +/-(0.0682)J	0.0897 +/-(0.0859)U	0.448 +/-(0.499)U	0.500 +/-(0.456)U	0.499 +/-(0.545)U
Radium-228	pCi/L	0.317 +/-(0.215)U	0.0510 +/-(0.208)UJ	0.551 +/-(0.253)J	0.269 +/-(0.258)U	0.422 +/-(0.207)J	0.164 +/-(0.230)U	-0.0225 +/-(0.191)U	0.330 +/-(0.237)U	-0.172 +/-(0.275)U	0.291 +/-(0.286)U	0.553 +/-(0.432)U	0.421 +/-(0.345)U
Radium-226+228	pCi/L	0.378 +/-(0.224)U	0.144 +/-(0.217)J	0.667 +/-(0.263)J	0.384 +/-(0.273)UJ	0.693 +/-(0.231)U*	0.489 +/-(0.257)U*	-	0.422 +/-(0.247)J	0.0897 +/-(0.288)U	0.739 +/-(0.575)U	1.05 +/-(0.628)U	0.920 +/-(0.644)U
Anions													
Chloride	mg/L	26.1	26.3	26.1	27.5	29.7	28.8	24.5	25.4	27.9	27.0	26.7	27.8
Fluoride	mg/L	0.0548 J	0.0484 J	0.0539 J	0.0865 J	<0.0263	0.0621 J	<0.100	0.0424 J	0.0449 J	0.0527 J	0.0592 U*	0.128
Sulfate	mg/L	514	540	563	548	610	614	478	489 J	512	518	485	479
General Chemistry													
Alkalinity, Bicarbonate	mg/L	9.00	8.00	<5.00	7.43	<5.00	6.40	-	7.50	9.78	9.95	9.36	11.0
Alkalinity, Carbonate	mg/L	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	-	<5.00	<5.00	<5.00	<5.00	<1.45
pH (lab)	SU	-	-	-	-	-	-	5.2 J	-	-	-	5.4 J	-
Total Dissolved Solids	mg/L	954	948	958	869	908	941	880	855	852	894	820	821

See notes on last page.

Table H.1-10- Groundwater Analytical Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		10-AP3											
Sample Date		6-Mar-20	22-Jul-20	9-Sep-20	10-Feb-21	18-Mar-21	28-Jul-21	15-Sep-21	2-Feb-22	2-Feb-22	16-Mar-22	3-Aug-22	14-Sep-22
Sample ID		JOF-GW-002-03062020	JOF-GW-002-07222020	JOF-GW-002-09092020	JOF-GW-10-AP3-02102021	JOF-GW-10-AP3-03182021	JOF-GW-10-AP3-07282021	JOF-GW-10-AP3-09152021	JOF-GW-10-AP3-02022022	JOF-GW-FD02-02022022	JOF-GW-10-AP3-03162022	JOF-GW-10-AP3-08032022	JOF-GW-10-AP3-09142022
Parent Sample ID										JOF-GW-10-AP3-02022022			
Sample Depth		45.5 ft	45.5 ft	45.5 ft	45.5 ft	45.5 ft	45.5 ft	45.5 ft	45.5 ft	45.5 ft	45.5 ft	45.5 ft	45.5 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	CCR Program	State Compliance	State Compliance	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program
Total Metals													
Antimony	ug/L	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
Arsenic	ug/L	3.65 U*	<2.00	<2.00	<2.00	<2.00	<2.00	2.24 J	<2.00	<2.00	2.10 J	<2.00	<2.00
Barium	ug/L	16.3	16.3	14.9	14.9	16.8	15.0	15.1	15.1	15.4	14.4	16.3	15.9
Beryllium	ug/L	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200
Boron	ug/L	5,900	5,510	5,940	4,980	5,400	5,460	4,880	5,900	5,860	5,260	5,290	5,830
Cadmium	ug/L	8.17	4.15	4.10	2.67	4.30	4.00	3.80	3.88	3.74	7.65	4.46	3.88
Calcium	ug/L	165,000	183,000	161,000	142,000	167,000	144,000	142,000	155,000	155,000	152,000	140,000	148,000
Chromium	ug/L	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00
Cobalt	ug/L	30.8	36.1	32.8	26.1	37.4	31.1	30.1	31.4	31.5	31.5	31.5	31.7
Copper	ug/L	0.886 J	0.327 J	0.331 J	<0.300	0.419 U*	<0.300	0.319 J	<0.300	<0.300	0.852 J	0.315 J	<0.300
Lead	ug/L	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500
Lithium	ug/L	<3.00	3.34 J	3.18 J	3.00 J	3.21 J	<3.00	<3.00	3.07 J	<3.00	<3.00	3.35 J	3.09 J
Magnesium	ug/L	17,100	18,800	18,100	19,500 J	19,700 J	15,300	16,000	16,300	16,600	16,500	15,600	15,600
Mercury	ug/L	<0.0670	<0.0670	<0.0670	<0.0670	<0.0670	0.0910 U*	<0.0670	<0.0670	<0.0670	<0.0670	<0.0670	<0.0670
Molybdenum	ug/L	<0.200	<0.200	<0.200	0.999 U*	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200
Nickel	ug/L	75.9	88.1	81.5	72.4	90.7	76.0	71.8	75.3	76.3	74.0	78.1	76.5
Potassium	ug/L	4,490	5,650	5,180	4,440	5,910	5,090	4,870	5,100	5,240	4,720	5,350	5,020
Selenium	ug/L	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<1.50	<1.50	<1.50	<1.50	<1.50
Silver	ug/L	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300
Sodium	ug/L	30,800	32,200	31,700	32,600	36,100	28,800	30,100	30,400	30,800	30,300	30,300	29,100
Thallium	ug/L	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600
Vanadium	ug/L	<3.30	<3.30	<3.30	<3.30	<3.30	<3.30	<3.30	<3.30	<3.30	<3.30	<3.30	<3.30
Zinc	ug/L	65.6	66.2	58.5	51.6	55.6	60.7 U*	65.1	57.0	58.5	57.1	67.1	61.4
Radiological Parameters													
Radium-226	pCi/L	1.13 +/-(0.763)	0.342 +/-(0.525)U	0.829 +/-(0.699)U	0.362 +/-(0.371)U	0.125 +/-(0.396)U	0.191 +/-(0.439)U	0.390 +/-(0.529)U	0.659 +/-(0.402)	0.342 +/-(0.315)U	0.134 +/-(0.318)U	0.236 +/-(0.359)U	0.331 +/-(0.550)U
Radium-228	pCi/L	0.110 +/-(0.231)U	0.225 +/-(0.354)U	0.151 +/-(0.234)U	0.0538 +/-(0.254)U	-0.137 +/-(0.263)U	-0.499 +/-(0.379)U	0.255 +/-(0.354)U	0.134 +/-(0.312)U	0.513 +/-(0.510)U	0.466 +/-(0.448)U	-0.0482 +/-(0.446)U	0.0970 +/-(0.548)U
Radium-226+228	pCi/L	1.24 +/-(0.797)J	0.567 +/-(0.633)U	0.980 +/-(0.737)U	0.416 +/-(0.450)U	0.125 +/-(0.476)U	0.191 +/-(0.580)U	0.646 +/-(0.636)U	0.793 +/-(0.509)J	0.855 +/-(0.599)U	0.600 +/-(0.550)U	0.236 +/-(0.572)U	0.428 +/-(0.776)U
Anions													
Chloride	mg/L	29.4	29.7	29.1	31.7	28.8	30.7	27.4	27.0	33.1	29.9	32.3	37.2
Fluoride	mg/L	0.120	0.0703 J	0.0432 J	0.127	0.0688 J	0.0834 J	0.108	<0.0330	<0.0330	0.0415 J	0.101	0.0571 J
Sulfate	mg/L	518	525	505	577	459	503	466	458 J	574 J	457	475	579
General Chemistry													
Alkalinity, Bicarbonate	mg/L	10.4	9.20	9.98	10.2 J	8.46	10.3	11.1	10.4	10.6	10.8 J	14.4 J	10.8 J
Alkalinity, Carbonate	mg/L	<1.45	<1.45	<1.45	0.725 UJ	<0.725	<1.45	<1.45	<1.45	<1.45	<1.45	<1.45	<1.45
pH (lab)	SU	5.44 J	-	-	-	-	-	-	-	-	-	-	-
Total Dissolved Solids	mg/L	814	814	847	804	826	816	794	771	781	759	750	736

See notes on last page.

Table H.1-10- Groundwater Analytical Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		10-AP3	B-6R							
Sample Date		8-Feb-23	17-Mar-15	23-Sep-15	22-Mar-16	21-Sep-16	21-Sep-16	21-Sep-16	21-Sep-16	14-Mar-17
Sample ID		JOF-GW-10-AP3-02082023	JOF-B6R-0315	JOF-B6R-0915	JOF-B6R-0316	B-6R_0921161200_20160930-01	B-6R_0921161200D_20160930-03	JOF-B6R-0916	JOF-B6R-DUP-0916	JOF-B6R
Parent Sample ID							B-6R_0921161200_20160930-01		JOF-B6R-0916	
Sample Depth		45.5 ft	20.5 ft	20.5 ft	20.5 ft	20.5 ft	20.5 ft	20.5 ft	20.5 ft	20.5 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample
Program	Units		State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance
Total Metals										
Antimony	ug/L	<1.00	<2.00	<2.00	<2.00	-	-	<2.00	<2.00	<2
Arsenic	ug/L	<2.00	<2.00	<2.00	<2.00	-	-	<2.00	<2.00	<1
Barium	ug/L	16.8	16.6	17.4	17.3	-	-	15.7	17.1	15.8
Beryllium	ug/L	<0.200	<2.00	<2.00	<2.00	-	-	<2.00	<2.00	<1
Boron	ug/L	5,680	-	-	-	-	-	7,680	7,650	7,260
Cadmium	ug/L	3.68	<1.00	<1.00	<1.00	-	-	<1.00	<1.00	<1
Calcium	ug/L	146,000	-	-	-	-	-	104,000	104,000	84,500
Chromium	ug/L	<3.00	<2.00	<2.00	<2.00	-	-	<2.00	<2.00	<2
Cobalt	ug/L	28.4	<2.00	<2.00	<2.00	-	-	<2.00	<2.00	<0.5
Copper	ug/L	0.319 J	<5.00	<5.00	<5.00	-	-	<5.00	<5.00	<2
Lead	ug/L	<0.500	<2.00	<2.00	<2.00	-	-	<2.00	<2.00	<1
Lithium	ug/L	3.04 J	-	-	-	-	-	<15.0	<15.0	<5
Magnesium	ug/L	17,700	-	-	-	-	-	-	-	-
Mercury	ug/L	<0.0670	<0.200	<0.200	<0.200	-	-	0.200 UJ	0.200 UJ	<0.2
Molybdenum	ug/L	<0.200	-	-	-	-	-	<5.00	<5.00	<5
Nickel	ug/L	74.3	10.4	9.40	9.17	-	-	7.99	7.92	5.8
Potassium	ug/L	4,990	-	-	-	-	-	-	-	3,790
Selenium	ug/L	<1.50	<2.00	<2.00	<2.00	-	-	<2.00	<2.00	<5
Silver	ug/L	<0.300	<2.00	<2.00	<2.00	-	-	<2.00	<2.00	<1
Sodium	ug/L	32,100	-	-	-	-	-	-	-	13,700
Thallium	ug/L	<0.600	2.00 UJ	<2.00	<1.00	-	-	<1.00	<1.00	<1
Vanadium	ug/L	<3.30	<5.00	<5.00	<5.00	-	-	<5.00	<5.00	<1
Zinc	ug/L	54.0	<25.0	<25.0	<25.0	-	-	<25.0	<25.0	14.7
Radiological Parameters										
Radium-226	pCi/L	0.294 +/-(0.397)U	-	-	-	-0.096 +/-()	-0.176 +/-()	-	-	0.122 +/-(0.0818)
Radium-228	pCi/L	0.312 +/-(0.387)U	-	-	-	0.132 +/-()	0.115 +/-()	-	-	0.181 +/-(0.244)U
Radium-226+228	pCi/L	0.606 +/-(0.554)U	-	-	-	-	-	-	-	-
Anions										
Chloride	mg/L	32.6	-	-	-	-	-	19.7	19.3	16.3
Fluoride	mg/L	0.116 J	<0.100	<0.100	<0.100	-	-	<0.100	<0.100	<0.100
Sulfate	mg/L	406	-	-	-	-	-	333	334	272
General Chemistry										
Alkalinity, Bicarbonate	mg/L	9.10 J	-	-	-	-	-	-	-	-
Alkalinity, Carbonate	mg/L	0.725 UR	-	-	-	-	-	-	-	-
pH (lab)	SU	-	-	-	-	-	-	5.29	5.47	5.6
Total Dissolved Solids	mg/L	696	-	-	-	-	-	475	475	430

See notes on last page.

Table H.1-10- Groundwater Analytical Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		B-6R												
Sample Date		12-Jun-17	12-Jun-17	18-Sep-17	12-Dec-17	12-Dec-17	13-Mar-18	11-Jun-18	11-Jun-18	11-Sep-18	12-Dec-18	12-Dec-18	12-Mar-19	12-Sep-19
Sample ID		JOF-B6R	JOF-B6R-DUP	JOF-B6R	JOF-B6R-1217	JOF-B6R-DUP-1217	JOF-B6R-0318	JOF-B6R-0618	JOF-B6R-DUP-0618	JOF-B6R-09112018	JOF-B6R-	JOF-B6R-DUP-	B-6R	JOF-B6R-0919
Parent Sample ID			JOF-B6R-0617			JOF-B6R-1217			JOF-B6R-0618			JOF-B6R-12122018		
Sample Depth		20.5 ft	20.5 ft	20.5 ft	20.5 ft	20.5 ft	20.5 ft	20.5 ft	20.5 ft	20.5 ft	20.5 ft	20.5 ft	20.5 ft	20.5 ft
Sample Type		Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance
Total Metals														
Antimony	ug/L	-	-	<2	-	-	<2	-	-	<2	-	-	<0.378	<0.378
Arsenic	ug/L	-	-	<1	-	-	<1	-	-	<1	-	-	<0.323	0.517 J
Barium	ug/L	-	-	17.2	-	-	21.5	-	-	16.4	-	-	20	20.1
Beryllium	ug/L	-	-	<1	-	-	<1	-	-	<1	-	-	<0.155	0.190 J
Boron	ug/L	7,350	7,410	7,180	7,410	7,050	5,260	6,840	6,990	7,240	6,110	6,020	4,710	7,160
Cadmium	ug/L	-	-	<1	-	-	<1	-	-	<1	-	-	0.444 J	0.414 J
Calcium	ug/L	89,100	91,100	91,900	91,500	91,000	86,300	89,300	87,700	85,300	88,400	85,300	90,600	93,900
Chromium	ug/L	-	-	<2	-	-	<2	-	-	<2	-	-	<1.53	3.04 U*
Cobalt	ug/L	-	-	<0.5	-	-	<0.5	-	-	<0.5	-	-	<0.075	0.209 J
Copper	ug/L	-	-	2.1	-	-	<2	-	-	<2	-	-	<0.627	0.733 J
Lead	ug/L	-	-	<1	-	-	<1	-	-	<1	-	-	<0.128	0.165 J
Lithium	ug/L	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<3.14	31.5
Magnesium	ug/L	-	-	-	-	-	-	-	-	-	-	-	-	-
Mercury	ug/L	-	-	<0.2	-	-	<0.2	-	-	<0.2	-	-	<0.101	0.248
Molybdenum	ug/L	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<0.61	0.786 J
Nickel	ug/L	-	-	8.4	-	-	7.47	-	-	6.06	-	-	8.64	6.03
Potassium	ug/L	-	-	4,420	-	-	-	-	-	-	-	-	-	-
Selenium	ug/L	-	-	<5	-	-	<5	-	-	<5	-	-	<2.62	<1.51
Silver	ug/L	-	-	<1	-	-	<1	-	-	<1	-	-	<0.121	<0.177
Sodium	ug/L	-	-	15,400	-	-	-	-	-	-	-	-	-	-
Thallium	ug/L	-	-	<1	-	-	<1	-	-	<1	-	-	<0.128	0.222 J
Vanadium	ug/L	-	-	<1	-	-	2.22	-	-	1.93 U*	-	-	1.04	1.55 U*
Zinc	ug/L	-	-	20.4	-	-	19	-	-	22.9 U*	-	-	24.8	21.7
Radiological Parameters														
Radium-226	pCi/L	0.0248 +/-(0.0480)U	0.0644 +/-(0.0458)	0.102 +/-(0.0598)	0.0856 +/-(0.0530)	0.0664 +/-(0.0469)	0.0554 +/-(0.0500)U	0.155 +/-(0.128)U	0.112 +/-(0.126)U	0.254 +/-(0.0900)U*	0.0170 +/-(0.0433)U	0.0136 +/-(0.0443)U	0.0394 +/-(0.0516)U	0.725 +/-(0.632)U
Radium-228	pCi/L	0.00729 +/-(0.172)U	0.215 +/-(0.204)U	0.242 +/-(0.229)U	0.0495 +/-(0.220)U	0.343 +/-(0.231)U	0.239 +/-(0.229)U	0.0872 +/-(0.227)U	0.0639 +/-(0.205)U	0.0965 +/-(0.200)U	0.0682 +/-(0.187)U	0.264 +/-(0.244)U	0.173 +/-(0.267)U	-0.245 +/-(0.255)U
Radium-226+228	pCi/L	-	-	-	-	-	-	-	-	-	-	-	-	0.725 +/-(0.682)U
Anions														
Chloride	mg/L	18.6	18.8	18.4	19.1	19.3	13.6	19.3	19.2	16.7	16.8	17.1	11.4	18.7
Fluoride	mg/L	-	-	<0.100	-	-	<0.100	-	-	<0.100	-	-	0.0311 J	0.0270 J
Sulfate	mg/L	286	280	277	279	279	236	306	302	249	266	252	251 J	280
General Chemistry														
Alkalinity, Bicarbonate	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-
Alkalinity, Carbonate	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-
pH (lab)	SU	-	-	5.4	-	-	5.4	-	-	5.7 J	-	-	5.3 J	5.9 J
Total Dissolved Solids	mg/L	462	463	470	439	441	401	455	449	473	415	425	383	504

See notes on last page.

Table H.1-10- Groundwater Analytical Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		B-6R								
Sample Date		4-Mar-20	16-Sep-20	17-Mar-21	15-Sep-21	8-Feb-22	8-Feb-22	2-Aug-22	2-Aug-22	7-Feb-23
Sample ID		JOF-B6R-0320	JOF-B6R-0920	JOF-GW-B-6R-03172021	JOF-GW-B6R-09152021	JOF-GW-B-6R-02082022	JOF-GW-FD-02082022	JOF-GW-B-6R-08022022	JOF-GW-FD-08022022	JOF-GW-B-6R-02072023
Parent Sample ID							JOF-GW-B-6R-02082022		JOF-GW-B-6R-08022022	
Sample Depth		20.5 ft	20.5 ft	20.5 ft	20.5 ft	20.5 ft	20.5 ft	20.5 ft	20.5 ft	20.5 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample
Program	Units	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	
Total Metals										
Antimony	ug/L	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
Arsenic	ug/L	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
Barium	ug/L	20.5	18.3	18.5	17.7	16.7	16.4	17.7	17.5	16.6
Beryllium	ug/L	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200
Boron	ug/L	4,100	7,080	6,740	6,680	6,210	6,310	7,280	7,210	10,200
Cadmium	ug/L	<0.300	0.331 J	0.378 J	0.396 J	<0.300	<0.300	0.300 J	<0.300	<0.300
Calcium	ug/L	87,900	96,100	102,000	84,200	82,700	79,600	92,900	93,100	84,700
Chromium	ug/L	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00
Cobalt	ug/L	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300
Copper	ug/L	<0.300	0.473 J	1.94 J	<0.300	0.333 J	0.324 J	<0.300	<0.300	<0.300
Lead	ug/L	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500
Lithium	ug/L	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00
Magnesium	ug/L	-	-	-	-	-	-	-	-	-
Mercury	ug/L	0.128 J	0.0980 J	0.0720 J	0.0720 J	<0.0670	<0.0670	<0.0670	<0.0670	<0.0670
Molybdenum	ug/L	0.675 J	0.948 U*	0.968 U*	0.760 U*	0.747 J	0.714 J	0.758 J	0.760 J	0.747 U*
Nickel	ug/L	6.16	8.02	9.32	7.46	5.91	5.95	6.29	6.21	3.81
Potassium	ug/L	-	-	-	-	-	-	-	-	-
Selenium	ug/L	<2.00	<2.00	<2.00	<2.00	<1.50	<1.50	<1.50	<1.50	<1.50
Silver	ug/L	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300
Sodium	ug/L	-	-	-	-	-	-	-	-	-
Thallium	ug/L	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600
Vanadium	ug/L	<3.30	<3.30	<3.30	<3.30	<3.30	<3.30	<3.30	<3.30	<3.30
Zinc	ug/L	18.3 J	22.1	27.7	20.0 U*	17.8 J	17.7 J	18.8 J	18.5 J	11.8 J
Radiological Parameters										
Radium-226	pCi/L	0.192 +/-(0.402)U	0.206 +/-(0.391)U	-0.0524 +/-(0.0842)U	0.469 +/-(0.448)U	-0.0610 +/-(0.253)U	-0.322 +/-(0.300)U	-0.0713 +/-(0.227)U	0.0102 +/-(0.222)U	0.0230 +/-(0.350)U
Radium-228	pCi/L	-0.0783 +/-(0.191)U	0.0297 +/-(0.214)U	0.541 +/-(0.579)U	-0.0381 +/-(0.321)U	-0.173 +/-(0.318)U	0.368 +/-(0.299)U	0.169 +/-(0.462)U	0.692 +/-(0.552)U	0.0570 +/-(0.401)U
Radium-226+228	pCi/L	0.192 +/-(0.445)U	0.236 +/-(0.446)U	0.541 +/-(0.585)U	0.469 +/-(0.551)U	0.000 +/-(0.406)U	0.368 +/-(0.424)U	0.169 +/-(0.515)U	0.702 +/-(0.595)U	0.0800 +/-(0.532)U
Anions										
Chloride	mg/L	11.2	17.8	16.9	19.0	14.3	14.3	18.7	18.7	15.0
Fluoride	mg/L	0.0856 J	<0.0330	0.0426 J	0.0398 J	<0.0330	<0.0330	0.0425 J	0.0826 J	0.0480 J
Sulfate	mg/L	243	266	288	288	260	256	258	260	262
General Chemistry										
Alkalinity, Bicarbonate	mg/L	-	-	-	-	-	-	-	-	-
Alkalinity, Carbonate	mg/L	-	-	-	-	-	-	-	-	-
pH (lab)	SU	5.36 J	5.21 J	5.28 J	5.30 J	5.40 J	5.37 J	5.50 J	5.55 J	5.45 J
Total Dissolved Solids	mg/L	434	463	461	499	453	464	458	451	398

See notes on last page.

Table H.1-10- Groundwater Analytical Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		B-8R											
Sample Date		17-Mar-15	17-Mar-15	22-Sep-15	22-Mar-16	22-Mar-16	21-Sep-16	21-Sep-16	14-Mar-17	14-Mar-17	12-Jun-17	18-Sep-17	18-Sep-17
Sample ID		JOF-B8R-0315	JOF-B8R-0315 DUP	JOF-B8R-0915	JOF-B8R-0316	JOF-B8R-0316-DUP	B-8R_0921161200_20160930-02	JOF-B8R-0916	JOF-B-8R	JOF-B8R-DUP	JOF-B8R	JOF-B-8R	JOF-B8R-DUP
Parent Sample ID			JOF-B8R-0315			JOF-B8R-0316				JOF-B-8R-0317			JOF-B8R-0917
Sample Depth		16 ft	16 ft	16 ft	16 ft	16 ft	16 ft	16 ft	16 ft	16 ft	16 ft	16 ft	16 ft
Sample Type		Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample
Program	Units	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance
Total Metals													
Antimony	ug/L	<2.00	<2.00	<2.00	<2.00	<2.00	-	<2.00	<2	<2	-	<2	<2
Arsenic	ug/L	<2.00	<2.00	<2.00	<2.00	<2.00	-	<2.00	<1	<1	-	<1	<1
Barium	ug/L	20.7	20.3	30.1	28.2	27.6	-	26.9	29.5	29.8	-	28.3	28.2
Beryllium	ug/L	<2.00	<2.00	<2.00	<2.00	<2.00	-	<2.00	<1	<1	-	<1	<1
Boron	ug/L	-	-	-	-	-	-	1,460	979	994	1,330	1,270	1,280
Cadmium	ug/L	<1.00	<1.00	<1.00	<1.00	<1.00	-	<1.00	<1	<1	-	<1	<1
Calcium	ug/L	-	-	-	-	-	-	28,800	38,700	39,200	25,400	29,500	29,300
Chromium	ug/L	<2.00	<2.00	<2.00	<2.00	<2.00	-	<2.00	<2	<2	-	<2	<2
Cobalt	ug/L	<2.00	<2.00	<2.00	<2.00	<2.00	-	<2.00	<0.5	<0.5	-	<0.5	<0.5
Copper	ug/L	<5.00	<5.00	<5.00	<5.00	<5.00	-	<5.00	<2	<2	-	<2	2.05
Lead	ug/L	<2.00	<2.00	<2.00	<2.00	<2.00	-	<2.00	<1	<1	-	<1	<1
Lithium	ug/L	-	-	-	-	-	-	<15.0	<5	<5	<5	<5	<5
Magnesium	ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Mercury	ug/L	<0.200	<0.200	<0.200	<0.200	<0.200	-	0.200 UJ	<0.2	<0.2	-	<0.2	<0.2
Molybdenum	ug/L	-	-	-	-	-	-	<5.00	<5	<5	<5	<5	<5
Nickel	ug/L	5.31	5.15	9.99	2.87 U*	2.94 U*	-	7.82	3.02	3.33	-	3.42	3.52
Potassium	ug/L	-	-	-	-	-	-	-	1,320	1,390	-	1,620	1,620
Selenium	ug/L	<2.00	<2.00	<2.00	<2.00	<2.00	-	<2.00	<5	<5	-	<5	<5
Silver	ug/L	<2.00	<2.00	<2.00	<2.00	<2.00	-	<2.00	<1	<1	-	<1	<1
Sodium	ug/L	-	-	-	-	-	-	-	12,000	12,100	-	14,300	14,500
Thallium	ug/L	2.00 UJ	2.00 UJ	<2.00	<1.00	<1.00	-	<1.00	<1	<1	-	<1	<1
Vanadium	ug/L	<5.00	<5.00	<5.00	<5.00	<5.00	-	<5.00	<1	<1	-	<1	<1
Zinc	ug/L	<25.0	<25.0	<25.0	<25.0	<25.0	-	<25.0	9.53	7.48	-	10.3	10
Radiological Parameters													
Radium-226	pCi/L	-	-	-	-	-	0.161 +/-()	-	0.321 +/-(0.114)	0.220 +/-(0.0955)	0.308 +/-(0.0989)	0.298 +/-(0.0950)	0.312 +/-(0.0994)
Radium-228	pCi/L	-	-	-	-	-	-0.161 +/-()	-	0.0427 +/-(0.198)U	0.418 +/-(0.250)	0.0781 +/-(0.197)U	0.227 +/-(0.225)U	0.155 +/-(0.201)U
Radium-226+228	pCi/L	-	-	-	-	-	-	-	-	-	-	-	-
Anions													
Chloride	mg/L	-	-	-	-	-	-	13.4	8.69	9.30	12.2	10.7	10.8
Fluoride	mg/L	<0.100	<0.100	<0.100	<0.100	<0.100	-	<0.100	<0.500	<0.100	-	<0.100	<0.100
Sulfate	mg/L	-	-	-	-	-	-	135	119	117	103	94.2	94.7
General Chemistry													
Alkalinity, Bicarbonate	mg/L	-	-	-	-	-	-	-	-	-	-	-	-
Alkalinity, Carbonate	mg/L	-	-	-	-	-	-	-	-	-	-	-	-
pH (lab)	SU	-	-	-	-	-	-	5.61	6.0	6.0	-	5.6	5.7
Total Dissolved Solids	mg/L	-	-	-	-	-	-	184	208	209	191	191	187

See notes on last page.

Table H.1-10- Groundwater Analytical Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		B-8R											
Sample Date		12-Dec-17	13-Mar-18	13-Mar-18	11-Jun-18	11-Sep-18	11-Sep-18	12-Dec-18	13-Mar-19	13-Mar-19	12-Sep-19	4-Mar-20	16-Sep-20
Sample ID		JOF-B-8R-1217	JOF-B-8R-0318	JOF-B8R-DUP-0318	JOF-B-8R-0618	JOF-B-8R-09112018	JOF-B8R-DUP	JOF-B-8R	B-8R	JOF-B8R-DUP	JOF-B8R-0919	JOF-B8R-0320	JOF-B8R-0920
Parent Sample ID				JOF-B8R-0318			JOF-B-8R-09112018			B-8R-031319			
Sample Depth		16 ft	16 ft	16 ft	16 ft	16 ft	16 ft	16 ft	16 ft	16 ft	16 ft	16 ft	16 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance
Total Metals													
Antimony	ug/L	-	<2	<2	-	<2	<2	-	<0.378	<0.378	<0.378	<1.00	<1.00
Arsenic	ug/L	-	<1	<1	-	<1	<1	-	<0.323	<0.323	<0.323	<2.00	<2.00
Barium	ug/L	-	31.6	31.4	-	32	31.8	-	26.7	26.8	45.9	34.7	32.7
Beryllium	ug/L	-	<1	<1	-	<1	<1	-	<0.155	<0.155	<0.182	<0.200	<0.200
Boron	ug/L	1,330	618	614	1,290	1,490	1,430	1,130	510	484	1,720	655	1,740
Cadmium	ug/L	-	<1	<1	-	<1	<1	-	<0.125	<0.125	0.172 J	<0.300	<0.300
Calcium	ug/L	29,900	48,200	48,000	32,400	27,700	27,700	38,700	40,700	37,400	28,800	45,100	32,600
Chromium	ug/L	-	<2	<2	-	<2	<2	-	<1.53	<1.53	2.09 U*	<3.00	<3.00
Cobalt	ug/L	-	<0.5	<0.5	-	<0.5	<0.5	-	0.156 U*	0.119 U*	0.344 J	<0.300	0.798 J
Copper	ug/L	-	<2	<2	-	<2	<2	-	<0.627	<0.627	<0.627	0.376 J	0.559 J
Lead	ug/L	-	<1	<1	-	<1	<1	-	<0.128	0.167 J	<0.128	<0.500	<0.500
Lithium	ug/L	<5	<5	<5	<5	<5	<5	<5	<3.14	<3.14	9.15	<3.00	<3.00
Magnesium	ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Mercury	ug/L	-	<0.2	<0.2	-	<0.2	<0.2	-	<0.101	<0.101	<0.101	<0.0670	<0.0670
Molybdenum	ug/L	<5	<5	<5	<5	<5	<5	<5	<0.61	<0.61	<0.610	<0.200	<0.200
Nickel	ug/L	-	1.2	1.17	-	4.6	4.76	-	1.89 U*	1.65 U*	6.23	1.41 J	3.45
Potassium	ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Selenium	ug/L	-	<5	<5	-	<5	<5	-	<2.62	<2.62	<1.51	<2.00	<2.00
Silver	ug/L	-	<1	<1	-	<1	<1	-	<0.121	<0.121	<0.177	<0.300	<0.300
Sodium	ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Thallium	ug/L	-	<1	<1	-	<1	<1	-	<0.128	<0.128	<0.148	<0.600	<0.600
Vanadium	ug/L	-	2.28	2.32	-	1.68 U*	1.77 U*	-	0.966 J	<0.899	1.14 U*	<3.30	<3.30
Zinc	ug/L	-	<5	<5	-	12.6 U*	14.9 U*	-	4.18 J	3.81 J	18.6 U*	5.62 J	13.7 J
Radiological Parameters													
Radium-226	pCi/L	0.259 +/-(0.0926)	0.123 +/-(0.0630)	0.169 +/-(0.0783)	0.135 +/-(0.129)U	0.480 +/-(0.123)	0.366 +/-(0.108)	0.223 +/-(0.0952)U*	0.217 +/-(0.0849)	0.159 +/-(0.0801)	0.651 +/-(0.551)U	1.07 +/-(0.611)	0.403 +/-(0.550)U
Radium-228	pCi/L	0.276 +/-(0.264)U	0.232 +/-(0.211)U	0.132 +/-(0.192)U	0.113 +/-(0.209)U	0.322 +/-(0.205)	0.255 +/-(0.201)U	-0.316 +/-(0.169)U	0.0426 +/-(0.213)U	-0.0277 +/-(0.205)U	-0.0508 +/-(0.305)U	0.741 +/-(0.433)	0.496 +/-(0.345)
Radium-226+228	pCi/L	-	-	-	-	-	-	-	-	-	0.651 +/-(0.629)U	1.81 +/-(0.749)	0.899 +/-(0.649)J
Anions													
Chloride	mg/L	12.3	9.21	9.22	12.5	11.8	12.1	9.41	6.34	5.77	12.0	7.92	10.3
Fluoride	mg/L	-	<0.100	<0.100	-	<0.100	<0.100	-	0.0515 J	0.0500 J	0.0386 J	0.0995 J	0.0416 J
Sulfate	mg/L	103	93.7	93.3	101	75.7	78.2	105	86.9 J	81.9	90.9	104	97.7
General Chemistry													
Alkalinity, Bicarbonate	mg/L	-	-	-	-	-	-	-	-	-	-	-	-
Alkalinity, Carbonate	mg/L	-	-	-	-	-	-	-	-	-	-	-	-
pH (lab)	SU	-	6.1	6.1	-	5.7 J	5.7 J	-	6.2 J	6.2 J	6.7 J	6.05 J	5.56 J
Total Dissolved Solids	mg/L	187	199	196	181	193	191	191	170	173	244	270	189

See notes on last page.

Stantec

Table H.1-10- Groundwater Analytical Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		B-8R					B-9					
Sample Date		17-Mar-21	16-Sep-21	8-Feb-22	2-Aug-22	7-Feb-23	17-Mar-15	22-Sep-15	22-Sep-15	21-Mar-16	20-Sep-16	20-Sep-16
Sample ID		JOF-GW-B-8R-03172021	JOF-GW-B8R-09162021	JOF-GW-B-8R-02082022	JOF-GW-B-8R-08022022	JOF-GW-B-8R-02072023	JOF-B9-0315	JOF-B9-0915	JOF-B9-0915 DUP	JOF-B9-0316	B-9_0920161200_20160927-01	JOF-B9-0916
Parent Sample ID									JOF-B9-0915			
Sample Depth		16 ft	16 ft	16 ft	16 ft	16 ft	48 ft	48 ft	48 ft	48 ft	48 ft	48 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	State Compliance	State Compliance	State Compliance	State Compliance		State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance
Total Metals												
Antimony	ug/L	<1.00	<1.00	<1.00	1.01 U*	<1.00	<2.00	<2.00	<2.00	<2.00	-	<2.00
Arsenic	ug/L	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	-	<2.00
Barium	ug/L	30.6	31.1	24.0	32.1	26.5	6.92	6.50	5.74	6.84	-	9.59
Beryllium	ug/L	<0.200	<0.200	<0.200	<0.200	<0.200	<2.00	<2.00	<2.00	<2.00	-	<2.00
Boron	ug/L	1,280	2,000	998	1,810	1,110	-	-	-	-	-	<200
Cadmium	ug/L	<0.300	<0.300	<0.300	<0.300	<0.300	<1.00	<1.00	<1.00	<1.00	-	<1.00
Calcium	ug/L	49,000	31,500	42,600	36,600	47,800	-	-	-	-	-	5,830
Chromium	ug/L	<3.00	<3.00	<3.00	<3.00	<3.00	<2.00	<2.00	<2.00	<2.00	-	<2.00
Cobalt	ug/L	<0.300	<0.300	<0.300	<0.300	<0.300	<2.00	<2.00	<2.00	<2.00	-	<2.00
Copper	ug/L	1.42 J	0.391 J	0.471 J	0.441 J	0.547 J	<5.00	<5.00	<5.00	<5.00	-	<5.00
Lead	ug/L	<0.500	<0.500	<0.500	<0.500	<0.500	<2.00	<2.00	<2.00	<2.00	-	<2.00
Lithium	ug/L	<3.00	<3.00	<3.00	<3.00	<3.00	-	-	-	-	-	<15.0
Magnesium	ug/L	-	-	-	-	-	-	-	-	-	-	-
Mercury	ug/L	<0.0670	<0.0670	<0.0670	<0.0670	<0.0670	<0.200	<0.200	<0.200	<0.200	-	<0.200
Molybdenum	ug/L	0.219 U*	<0.200	<0.200	<0.200	<0.200	-	-	-	-	-	<5.00
Nickel	ug/L	1.19 J	2.31	1.11 J	1.87 J	0.959 J	<2.00	<2.00	<2.00	<2.00	-	<2.00
Potassium	ug/L	-	-	-	-	-	-	-	-	-	-	-
Selenium	ug/L	<2.00	<2.00	<1.50	<1.50	<1.50	<2.00	<2.00	<2.00	<2.00	-	<2.00
Silver	ug/L	<0.300	<0.300	<0.300	<0.300	<0.300	<2.00	<2.00	<2.00	<2.00	-	<2.00
Sodium	ug/L	-	-	-	-	-	-	-	-	-	-	-
Thallium	ug/L	<0.600	<0.600	<0.600	<0.600	<0.600	2.00 UJ	<2.00	<2.00	<1.00	-	<1.00
Vanadium	ug/L	<3.30	<3.30	<3.30	<3.30	4.76 U*	<5.00	<5.00	<5.00	<5.00	-	<5.00
Zinc	ug/L	12.3 J	9.45 U*	4.48 J	7.61 J	16.4 J	<25.0	<25.0	<25.0	<25.0	-	<25.0
Radiological Parameters												
Radium-226	pCi/L	0.0582 +/-(0.277)U	0.114 +/-(0.297)U	0.572 +/-(0.574)U	0.262 +/-(0.480)U	-0.0578 +/-(0.237)U	-	-	-	-	-0.192 +/-()	-
Radium-228	pCi/L	0.174 +/-(0.506)U	0.414 +/-(0.266)	0.695 +/-(0.456)	0.0473 +/-(0.428)U	-0.328 +/-(0.278)U	-	-	-	-	0 +/-()	-
Radium-226+228	pCi/L	0.233 +/-(0.577)U	0.529 +/-(0.398)J	1.27 +/-(0.733)J	0.310 +/-(0.643)U	0.000 +/-(0.365)U	-	-	-	-	-	-
Anions												
Chloride	mg/L	8.63	10.3	5.36	11.5	8.28	-	-	-	-	-	4.59
Fluoride	mg/L	0.0663 J	0.0714 J	0.0592 J	0.0845 J	0.0642 J	<0.100	<0.100	<0.100	<0.100	-	<0.100
Sulfate	mg/L	110	111	88.0	102	104	-	-	-	-	-	<5.00
General Chemistry												
Alkalinity, Bicarbonate	mg/L	-	-	-	-	-	-	-	-	-	-	-
Alkalinity, Carbonate	mg/L	-	-	-	-	-	-	-	-	-	-	-
pH (lab)	SU	5.98 J	5.57 J	6.19 J	5.70 J	6.57 J	-	-	-	-	-	6.27
Total Dissolved Solids	mg/L	247	219	200	189	200	-	-	-	-	-	53.0

See notes on last page.

Stantec

Table H.1-10- Groundwater Analytical Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		B-9											
Sample Date		1-Nov-16	4-Jan-17	16-Jan-17	15-Feb-17	14-Mar-17	11-Apr-17	16-May-17	6-Jun-17	10-Jul-17	1-Aug-17	19-Sep-17	19-Sep-17
Sample ID		JOF-GW-009-11012016	JOF-GW-009-01042017	JOF-GW-009-01162017	JOF-GW-009-02152017	JOF-GW-009-03142017	JOF-GW-009-04112017	JOF-GW-009-05162017	JOF-GW-009-06062017	JOF-GW-009-07102017	JOF-GW-009-08012017	JOF-B-9	JOF-GW-009-09192017
Parent Sample ID													
Sample Depth		48 ft	48 ft	48 ft	48 ft	48 ft	48 ft	48 ft	48 ft	48 ft	48 ft	48 ft	48 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	State Compliance	CCR Program
Total Metals													
Antimony	ug/L	0.615 U*	0.449 U*	<0.443	<0.443	<0.443	0.782 U*	<0.443	<0.443	1.4 U*	<0.443	<2	0.916 U*
Arsenic	ug/L	<0.118	0.188 U*	0.329 J	0.225 J	<0.22	0.308 J	0.22 UJ	<0.22	0.3 J	0.268 J	<1	<0.22
Barium	ug/L	7.85 J	9.71 U*	18.4 J	10.4	8.55 J	11.5	7.39 J	7.84 J	9.69 J	7.87 J	<10	6.58 J
Beryllium	ug/L	<0.102	<0.102	0.131 UJ	<0.131	<0.131	<0.131	<0.131	<0.131	<0.131	<0.131	<1	<0.131
Boron	ug/L	15.8 J	12.7 J	7.81 UJ	<7.81	10.8 U*	<7.81	<7.81	<7.81	8.68 U*	<7.81	<80	<7.81
Cadmium	ug/L	<0.152	<0.152	<0.0781	<0.0781	<0.0781	<0.0781	<0.0781	<0.0781	<0.0781	<0.0781	<1	<0.0781
Calcium	ug/L	5,570 J	6,540 U*	5,850	5,660	5,720	5,660	5,070	5,800	5,430	5,960	6,070	5,380
Chromium	ug/L	<0.339	0.687 U*	1.21 J	0.476 J	0.454 U*	0.89 J	0.378 UJ	<0.378	0.881 J	0.501 J	<2	0.67 U*
Cobalt	ug/L	0.079 U*	0.123 U*	0.369 J	0.16 J	<0.0947	0.23 J	<0.0947	0.108 J	0.123 J	<0.0947	<0.5	<0.0947
Copper	ug/L	<0.454	0.933 U*	<1.04	2.68 U*	<1.04	1.67 U*	<1.04	<1.04	<1.04	1.48 U*	3.01	<1.04
Lead	ug/L	<0.0675	0.178 U*	0.622 J	<0.318	<0.318	0.443 J	<0.318	<0.318	<0.318	<0.318	<1	<0.318
Lithium	ug/L	1.29 U*	6.42 U*	2.82 U*	4.28 U*	<2.12	<2.12	<2.12	<2.12	2.43 U*	4.62 U*	<5	<2.12
Magnesium	ug/L	3,130 J	3,480	3,120	2,970	2,840	3,020	3,100	3,160	2,860	3,240	-	2,870
Mercury	ug/L	<0.0521	<0.0521	<0.0521	<0.0521	<0.0653	<0.0653	<0.0653	<0.0653	<0.0653	<0.0653	<0.2	<0.0653
Molybdenum	ug/L	0.93 J	<0.873	<0.593	<0.593	<0.593	<0.593	<0.593	<0.593	<0.593	<0.593	<5	<0.593
Nickel	ug/L	<0.416	0.461 U*	0.834 J	2.23	0.94 J	0.53 J	0.271 UJ	0.891 U*	0.373 J	<0.271	<1	0.277 J
Potassium	ug/L	208 J	276 J	348 J	290 J	243 J	285 J	254 J	265 J	294 J	210 J	<500	236 J
Selenium	ug/L	<0.348	<0.348	<1.27	<1.27	1.28 J	<1.27	<1.27	<1.27	<1.27	<1.27	<5	<1.27
Silver	ug/L	-	-	-	-	-	-	-	-	-	-	<1	-
Sodium	ug/L	3,010 J	3,260	2,920	2,540	2,830	2,870	3,160	2,970	3,030	3,120	3,170	3,080
Thallium	ug/L	0.095 U*	<0.036	<0.0531	0.074 U*	<0.0531	<0.0531	<0.0531	<0.0531	<0.0531	<0.0531	<1	<0.0531
Vanadium	ug/L	-	-	-	-	-	-	-	-	-	-	<1	-
Zinc	ug/L	-	-	-	-	-	-	-	-	-	-	<5	-
Radiological Parameters													
Radium-226	pCi/L	0.0223 +/-(0.12)U	-0.2830 +/-(0.22)U	0.253 +/-(0.32)U	0.434 +/-(0.33)J	0.382 +/-(0.40)U	-0.0766 +/-(0.28)U	0.164 +/-(0.23)U	0.262 +/-(0.26)U	0.208 +/-(0.23)U	0.00000 +/-(0.25)U	0.0319 +/-(0.0403)U	0.0188 +/-(0.38)U
Radium-228	pCi/L	-0.0357 +/-(0.25)U	-0.1220 +/-(0.36)U	0.222 +/-(0.31)U	-0.2080 +/-(0.35)U	-0.1720 +/-(0.31)U	0.310 +/-(0.33)UJ	0.112 +/-(0.47)U	0.387 +/-(0.44)U	0.240 +/-(0.53)U	0.0136 +/-(0.20)U	0.264 +/-(0.214)U	-0.0714 +/-(0.25)U
Radium-226+228	pCi/L	0.0223 +/-(0.27)U	0.00000 +/-(0.42)U	0.475 +/-(0.44)U	0.434 +/-(0.48)J	0.382 +/-(0.51)U	0.310 +/-(0.43)UJ	0.276 +/-(0.52)U	0.649 +/-(0.52)U	0.448 +/-(0.57)U	0.0136 +/-(0.32)U	-	0.0188 +/-(0.46)U
Anions													
Chloride	mg/L	4.40	4.46	3.40	3.68	3.62	4.75	3.25 J	4.56	4.55	4.45	4.75	4.06
Fluoride	mg/L	0.0448 J	0.0439 J	0.0405 J	0.0300 J	0.0532 J	0.0397 J	0.0352 U*	0.0466 J	0.0551 J	0.0371 J	<0.100	0.0334 J
Sulfate	mg/L	0.565 J	<0.503	<0.503	<0.503	0.810 J	<0.503	<0.503	<0.503	0.711 J	0.822 J	<1.00	0.539 J
General Chemistry													
Alkalinity, Bicarbonate	mg/L	25.9	52.8 J	34.3	46.5	20.5	27.0	19.9	33.8	20.1	19.6	-	19.7
Alkalinity, Carbonate	mg/L	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	-	<5.00
pH (lab)	SU	-	-	-	-	-	-	-	-	-	-	6.2	-
Total Dissolved Solids	mg/L	66.0	46.0	23.0	60.0	52.0	58.0	71.0	36.0	33.0	51.0	49.0	48.0

See notes on last page.

Table H.1-10- Groundwater Analytical Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		B-9											
Sample Date		5-Oct-17	5-Oct-17	13-Mar-18	23-May-18	12-Jun-18	26-Jun-18	24-Jul-18	14-Aug-18	11-Sep-18	2-Apr-19	8-Jul-19	17-Sep-19
Sample ID		JOF-GW-009-10052017	JOF-GW-903-10052017	JOF-B9-0318	JOF-GW-009-05232018	JOF-GW-009-06122018	JOF-GW-009-06262018	JOF-GW-009-07242018	JOF-GW-009-08142018	JOF-B-9-09112018	JOF-GW-009-04022019	JOF-GW-009-07082019	JOF-GW-009-09172019
Parent Sample ID			JOF-GW-009-10052017										
Sample Depth		48 ft	48 ft	48 ft	48 ft	48 ft	48 ft	48 ft	48 ft	48 ft	48 ft	48 ft	48 ft
Sample Type		Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	CCR Program	CCR Program	State Compliance	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	State Compliance	CCR Program	CCR Program	CCR Program
Total Metals													
Antimony	ug/L	-	-	<2	<1.12	<1.12	<1.12	<1.12	<1.12	<2	<0.378	<0.378	<0.378
Arsenic	ug/L	-	-	<1	0.329 J	0.337 J	0.371 U*	<0.323	0.377 U*	<1	<0.323	<0.323	<0.323
Barium	ug/L	-	-	<10	7.79 J	7.5 J	8.15 J	8.13 J	7.99 J	<10	8.05 J	7.39 J	7.90 J
Beryllium	ug/L	-	-	<1	<0.057	<0.057	<0.057	0.098 U*	<0.057	<1	<0.155	<0.155	<0.182
Boron	ug/L	<7.81	<7.81	<80	<30.3	<30.3	<30.3	<30.3	<30.3	<80	<30.3	<30.3	<38.6
Cadmium	ug/L	-	-	<1	<0.125	<0.125	<0.125	<0.125	<0.125	<1	<0.125	<0.125	<0.125
Calcium	ug/L	5,800	5,900	6,520	5,380	5,440	5,900	5,940	5,590	5,670	5,810	6,100	5,170
Chromium	ug/L	-	-	2.02	1.68 U*	1.97 U*	2.08 U*	<0.631	2.16 U*	<2	<1.53	<1.53	<1.53
Cobalt	ug/L	-	-	<0.5	<0.075	0.094 J	<0.075	<0.075	<0.075	<0.5	<0.075	<0.075	<0.0750
Copper	ug/L	-	-	<2	<1.3	<1.3	<1.3	<1.3	<1.3	<2	1.36 J	<0.627	1.69 U*
Lead	ug/L	-	-	<1	<0.094	<0.094	<0.094	0.112 J	0.099 U*	<1	<0.128	<0.128	<0.128
Lithium	ug/L	-	-	<5	<2.56	<2.56	<2.56	<2.56	<2.56	<5	<3.14	<3.14	<3.39
Magnesium	ug/L	3,160	3,230	-	2,890	2,870	3,020	2,950	2,950	-	3,270	3,250	2,880
Mercury	ug/L	-	-	<0.2	<0.0653	<0.0653	<0.0653	<0.0653	<0.0653	<0.2	<0.101	<0.101	<0.101
Molybdenum	ug/L	-	-	<5	<0.474	<0.474	<0.474	<0.474	<0.474	<5	<0.61	<0.61	<0.610
Nickel	ug/L	-	-	<1	<0.312	<0.312	<0.312	0.325 J	0.386 U*	<1	<0.312	0.345 U*	0.358 J
Potassium	ug/L	238 J	235 J	-	156 J	189 J	151 J	255 J	253 J	-	252 J	252 J	237 J
Selenium	ug/L	-	-	<5	<0.813	<0.813	<0.813	<0.813	<0.813	<5	<2.62	<2.62	<1.51
Silver	ug/L	-	-	<1	-	-	-	-	-	<1	<0.121	<0.121	<0.177
Sodium	ug/L	2,710	2,760	-	2,960	3,050	3,100	2,750	3,190	-	3,310	3,580	2,960
Thallium	ug/L	-	-	<1	<0.063	<0.063	<0.063	<0.063	<0.063	<1	<0.128	<0.128	<0.148
Vanadium	ug/L	-	-	2.69	-	-	-	-	-	1.76 U*	1.07 U*	<0.899	1.76 U*
Zinc	ug/L	-	-	<5	-	-	-	-	-	<5	<3.22	3.92 J	3.37 J
Radiological Parameters													
Radium-226	pCi/L	-	-	0.0826 +/-(0.0539)	0.0127 +/-(0.0538)U	0.0187 +/-(0.0414)U	0.105 +/-(0.0810)UJ	0.170 +/-(0.0878)U*	0.279 +/-(0.103)U*	0.149 +/-(0.0700)U*	0.0981 +/-(0.0716)J	-0.0873 +/-(0.0400)U	0.236 +/-(0.466)U
Radium-228	pCi/L	-	-	0.384 +/-(0.227)	0.222 +/-(0.242)U	0.0681 +/-(0.223)U	0.541 +/-(0.271)	0.295 +/-(0.207)U	0.226 +/-(0.235)U	-0.0619 +/-(0.177)U	0.0365 +/-(0.186)U	-0.0572 +/-(0.243)U	-0.0736 +/-(0.495)U
Radium-226+228	pCi/L	-	-	-	0.235 +/-(0.248)U	0.0868 +/-(0.227)U	0.646 +/-(0.283)J	0.465 +/-(0.225)U*	0.505 +/-(0.257)U*	-	0.135 +/-(0.199)J	0.000 +/-(0.246)U	0.236 +/-(0.680)U
Anions													
Chloride	mg/L	3.53	3.55	4.85	3.35	3.42	4.23	4.77	4.45	4.89	3.70	4.16	4.48
Fluoride	mg/L	0.0361 J	0.0356 J	<0.100	0.0399 J	0.0487 J	0.0596 J	0.0308 J	0.0282 J	<0.100	0.0458 J	0.0514 J	0.0398 J
Sulfate	mg/L	<0.380	<0.380	<1.00	0.498 J	0.528 J	0.699 J	<0.380	0.646 U*	2.31	0.589 U*	0.674 J	0.980 U*
General Chemistry													
Alkalinity, Bicarbonate	mg/L	13.4 J	30.9 J	-	18.0	28.0	18.8	41.4	18.2	-	10.0	27.5	26.0
Alkalinity, Carbonate	mg/L	<5.00	<5.00	-	<5.00	<5.00	<5.00	<5.00	<5.00	-	<5.00	<5.00	<5.00
pH (lab)	SU	-	-	6.1	-	-	-	-	-	6.1 J	-	-	-
Total Dissolved Solids	mg/L	41.0	42.0	36.0	57.0	39.0	36.0	40.0	43.0	46.0	43.0 J	<10.0	36.0 J

See notes on last page.

Table H.1-10- Groundwater Analytical Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		B-9											
Sample Date		9-Oct-19	22-Jan-20	4-Mar-20	21-Jul-20	9-Sep-20	9-Feb-21	16-Mar-21	16-Mar-21	27-Jul-21	14-Sep-21	1-Feb-22	15-Mar-22
Sample ID		JOF-GW-009-10092019	JOF-GW-009-01222020	JOF-GW-009-03042020	JOF-GW-009-07212020	JOF-GW-009-09092020	JOF-GW-B-9-02092021	JOF-GW-B-9-03162021	JOF-GW-FD02-03162021	JOF-GW-B-9-07272021	JOF-GW-B-9-09142021	JOF-GW-B-9-02012022	JOF-GW-B-9-03152022
Parent Sample ID									JOF-GW-B-9-03162021				
Sample Depth		48 ft	48 ft	48 ft	48 ft	48 ft	48 ft	48 ft	48 ft	48 ft	48 ft	48 ft	48 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	CCR Program	CCR Program	CCR Program	State Compliance	State Compliance	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program
Total Metals													
Antimony	ug/L	<0.378	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
Arsenic	ug/L	<0.323	<2.00	2.20 U*	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
Barium	ug/L	8.72 J	8.96	8.68	7.34	8.58	8.44	8.18	7.95	7.53	8.92	8.61	8.18
Beryllium	ug/L	<0.182	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200
Boron	ug/L	<38.6	5.57 J	<5.20	<5.20	<5.20	<5.20	<5.20	5.39 J	<5.20	<5.20	<5.20	<5.20
Cadmium	ug/L	<0.125	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300
Calcium	ug/L	6,000	6,060	5,640	5,890	6,060	5,900	6,210	6,230	5,650	5,830	6,020	6,480
Chromium	ug/L	1.53 U*	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00
Cobalt	ug/L	<0.0750	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300
Copper	ug/L	<0.627	0.454 J	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300
Lead	ug/L	<0.128	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	0.811 J	<0.500	<0.500	<0.500
Lithium	ug/L	6.84	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00
Magnesium	ug/L	3,180	3,040	3,050	2,840	3,360	3,580 J	3,360	3,440	3,090	3,460	3,380	3,580
Mercury	ug/L	<0.101	<0.0670	<0.0670	<0.0670	<0.0670	<0.0670	<0.0670	<0.0670	0.103 U*	<0.0670	<0.0670	<0.0670
Molybdenum	ug/L	<0.610	<0.200	<0.200	<0.200	<0.200	0.284 U*	<0.200	<0.200	0.486 U*	<0.200	0.342 U*	<0.200
Nickel	ug/L	<0.336	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	3.06 U*
Potassium	ug/L	215 J	265 J	110 J	204 J	227 J	275 J	245 J	247 J	250 J	233 J	249 J	233 J
Selenium	ug/L	<1.51	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<1.50	<1.50
Silver	ug/L	<0.177	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300
Sodium	ug/L	3,860	3,280	3,080	3,050	3,110	3,390	3,290	3,300	2,970	3,190	3,030	3,260
Thallium	ug/L	<0.148	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600
Vanadium	ug/L	<0.991	10.7 U*	<3.30	<3.30	<3.30	<3.30	5.32 U*	4.43 U*	<3.30	<3.30	<3.30	<3.30
Zinc	ug/L	<3.22	11.9	4.61 J	11.0 U*	10.5 J	<3.30	<3.30	<3.30	3.85 J	<3.30	<3.30	<3.30
Radiological Parameters													
Radium-226	pCi/L	0.141 +/-(0.351)U	-0.0822 +/-(0.454)U	0.475 +/-(0.593)U	0.111 +/-(0.490)U	0.358 +/-(0.582)U	0.241 +/-(0.281)U	0.294 +/-(0.293)U	0.0349 +/-(0.225)U	0.422 +/-(0.409)U	0.372 +/-(0.500)U	0.0142 +/-(0.306)U	0.432 +/-(0.442)U
Radium-228	pCi/L	0.228 +/-(0.399)U	-0.0619 +/-(0.310)U	-0.00145 +/-(0.194)U	-0.158 +/-(0.397)U	0.209 +/-(0.243)U	-0.0165 +/-(0.364)U	-0.290 +/-(0.495)U	-0.0710 +/-(0.203)U	-0.0332 +/-(0.542)U	-0.0703 +/-(0.424)U	0.668 +/-(0.422)	1.14 +/-(0.540)U*
Radium-226+228	pCi/L	0.369 +/-(0.531)U	0.000 +/-(0.550)U	0.475 +/-(0.624)U	0.111 +/-(0.631)U	0.567 +/-(0.631)U	0.241 +/-(0.460)U	0.294 +/-(0.576)U	0.0349 +/-(0.303)U	0.422 +/-(0.679)U	0.372 +/-(0.656)U	0.682 +/-(0.521)J	1.57 +/-(0.698)U*
Anions													
Chloride	mg/L	4.49	4.82	4.87	4.74	5.45	5.62	5.65	5.72	6.15	5.52	5.77	5.96
Fluoride	mg/L	0.0459 U*	<0.0330	0.0663 J	<0.0330	0.0666 J	0.0835 J	0.0946 J	0.0900 J	0.0778 J	0.0999 J	0.0561 J	0.0356 J
Sulfate	mg/L	0.668 J	0.512	0.545	0.504	0.827	0.539	0.562	0.565	0.747	0.590	0.555	0.548
General Chemistry													
Alkalinity, Bicarbonate	mg/L	30.2	26.2	26.4	23.3	26.0	25.4 J	26.7	26.7	26.9	26.1	27.0	26.0
Alkalinity, Carbonate	mg/L	<5.00	<1.45	<1.45	<1.45	<1.45	0.725 UJ	<0.725	<0.725	<1.45	<1.45	<1.45	<1.45
pH (lab)	SU	6.2 J	-	6.05 J	-	-	-	6.26 J	6.23 J	-	6.83 J	6.21 J	-
Total Dissolved Solids	mg/L	30.0	57.1 J	42.9	30.0	44.3	31.4 J	50.0 J	42.9 J	40.0	22.9	45.7 J	22.9

See notes on last page.

Table H.1-10- Groundwater Analytical Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		B-9			89-B10							
Sample Date		2-Aug-22	13-Sep-22	7-Feb-23	17-Mar-15	22-Sep-15	21-Mar-16	21-Mar-16	20-Sep-16	21-Sep-16	15-Mar-17	15-Mar-17
Sample ID		JOF-GW-B-9-08022022	JOF-GW-B-9-09132022	JOF-GW-B-9-02072023	JOF-B10-0315	JOF-B10-0915	JOF-B10-0316	JOF-B10-0316 DUP	89-B10_0920161200_L861582-01	89-B10_0921161200_20160928-01	JOF- B10	JOF-B10-DUP
Parent Sample ID								JOF-B10-0316				JOF- B10-0317
Sample Depth		48 ft	48 ft	48 ft	40 ft	40 ft	40 ft	40 ft	40 ft	40 ft	40 ft	40 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample
Program	Units	CCR Program	CCR Program		State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance
Total Metals												
Antimony	ug/L	<1.00	<1.00	<1.00	<2.00	<2.00	<2.00	<2.00	<2	-	<2	<2
Arsenic	ug/L	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2	-	<1	<1
Barium	ug/L	9.22	7.75	8.26	10.6	20.6	14.9	14.0	19.2	-	11.5	11.8
Beryllium	ug/L	<0.200	<0.200	<0.200	<2.00	<2.00	<2.00	<2.00	<2	-	<1	<1
Boron	ug/L	<5.20	<5.20	<5.20	-	-	-	-	<200	-	<80	<80
Cadmium	ug/L	<0.300	<0.300	<0.300	<1.00	<1.00	<1.00	<1.00	<1	-	<1	<1
Calcium	ug/L	6,150	5,790	6,010	-	-	-	-	7,570	-	5,710	6,170
Chromium	ug/L	<3.00	<3.00	<3.00	9.11	2.47	3.86	3.46	<2	-	<2	<2
Cobalt	ug/L	<0.300	<0.300	<0.300	<2.00	<2.00	<2.00	<2.00	<2	-	<0.5	<0.5
Copper	ug/L	<0.300	<0.300	<0.300	<5.00	<5.00	<5.00	<5.00	<5	-	<2	<2
Lead	ug/L	<0.500	<0.500	<0.500	<2.00	<2.00	<2.00	<2.00	<2	-	<1	<1
Lithium	ug/L	<3.00	<3.00	<3.00	-	-	-	-	<15	-	<5	<5
Magnesium	ug/L	3,330	3,250	3,440	-	-	-	-	-	-	-	-
Mercury	ug/L	<0.0670	<0.0670	<0.0670	<0.200	<0.200	<0.200	<0.200	<0.2	-	<0.2	<0.2
Molybdenum	ug/L	<0.200	<0.200	0.205 U*	-	-	-	-	<5	-	<5	<5
Nickel	ug/L	<0.600	<0.600	<0.600	5.35	4.93	6.52	6.30	3.68	-	3.5	3.65
Potassium	ug/L	254 J	225 J	227 J	-	-	-	-	-	-	915	948
Selenium	ug/L	<1.50	<1.50	<1.50	<2.00	<2.00	<2.00	<2.00	<2	-	<5	<5
Silver	ug/L	<0.300	<0.300	<0.300	<2.00	<2.00	<2.00	<2.00	<2	-	<1	<1
Sodium	ug/L	3,130	2,770	3,080	-	-	-	-	-	-	7,170	7,850
Thallium	ug/L	<0.600	<0.600	<0.600	2.00 UJ	<2.00	<1.00	<1.00	<1	-	<1	<1
Vanadium	ug/L	<3.30	<3.30	<3.30	<5.00	<5.00	<5.00	<5.00	<5	-	1.26	1.73
Zinc	ug/L	<3.30	<3.30	<3.30	<25.0	<25.0	<25.0	<25.0	<25	-	10.4	10.8
Radiological Parameters												
Radium-226	pCi/L	-0.246 +/-(0.309)U	0.143 +/-(0.468)U	0.515 +/-(0.547)U	-	-	-	-	-	-0.118 +/-()	0.134 +/-(0.0815)	0.130 +/-(0.0961)U
Radium-228	pCi/L	0.413 +/-(0.505)U	0.101 +/-(0.773)U	0.629 +/-(0.484)U	-	-	-	-	-	1.27 +/-()	+/-(0.204)U	0.0691 +/-(0.288)U
Radium-226+228	pCi/L	0.413 +/-(0.592)U	0.243 +/-(0.904)U	1.14 +/-(0.730)U	-	-	-	-	-	-	-	-
Anions												
Chloride	mg/L	6.34	6.12	6.17	-	-	-	-	24.3	-	14.2	14.6
Fluoride	mg/L	<0.0330	0.0454 J	0.0735 J	<0.100	<0.100	<0.100	<0.100	<0.1	-	<0.100	<0.100
Sulfate	mg/L	0.651	0.545	0.563	-	-	-	-	6.85	-	3.60	3.84
General Chemistry												
Alkalinity, Bicarbonate	mg/L	27.2 J	26.2	25.2	-	-	-	-	-	-	-	-
Alkalinity, Carbonate	mg/L	<0.725	<1.45	<1.45	-	-	-	-	-	-	-	-
pH (lab)	SU	6.10 J	-	6.78 J	-	-	-	-	5.52	-	6.2	6.2
Total Dissolved Solids	mg/L	28.0 J	36.0	36.0	-	-	-	-	92	-	82.0	68.0

See notes on last page.

Table H.1-10- Groundwater Analytical Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		89-B10											
Sample Date		13-Jun-17	13-Jun-17	19-Sep-17	11-Dec-17	14-Mar-18	12-Jun-18	12-Sep-18	12-Dec-18	12-Dec-18	12-Mar-19	10-Sep-19	3-Mar-20
Sample ID		JOF-B10	JOF-B10-DUP	JOF-B10	JOF-B10-1217	JOF-B10-0318	JOF-B10-0618	JOF-B10-09122018	JOF-B10	JOF-B10-DUP	JOF-B10	JOF-B10-0919	JOF-B10-0320
Parent Sample ID			JOF-B10-0617							JOF-B10-12122018			
Sample Depth		40 ft	40 ft	40 ft	40 ft	40 ft	40 ft	40 ft	40 ft	40 ft	40 ft	40 ft	40 ft
Sample Type		Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance
Total Metals													
Antimony	ug/L	-	-	<2	-	<2	-	<2	-	-	<0.378	<0.378	<1.00
Arsenic	ug/L	-	-	<1	-	<1	-	<1	-	-	<0.323	0.777 J	<2.00
Barium	ug/L	-	-	<10	-	<10	-	<10	-	-	10.3	25.8	13.9
Beryllium	ug/L	-	-	<1	-	<1	-	<1	-	-	<0.155	<0.182	<0.200
Boron	ug/L	<80	<80	<80	<80	<80	<80	<80	<80	<80	<30.3	95.1	10.0 U*
Cadmium	ug/L	-	-	<1	-	<1	-	<1	-	-	0.135 J	0.163 J	<0.300
Calcium	ug/L	6,080	6,190	6,250	5,430	5,710	5,210	4,890	6,720	6,490	6,270	6,210	6,170
Chromium	ug/L	-	-	<2	-	2.16	-	2.18	-	-	<1.53	4.01 U*	<3.00
Cobalt	ug/L	-	-	<0.5	-	<0.5	-	<0.5	-	-	0.131 U*	0.334 J	<0.300
Copper	ug/L	-	-	<2	-	<2	-	<2	-	-	<0.627	<0.627	0.619 J
Lead	ug/L	-	-	<1	-	<1	-	1 UJ	-	-	0.2 J	0.691 J	0.650 J
Lithium	ug/L	<5	<5	5.05	<5	<5	5.26	5.93	<5	<5	4.97 J	9.77	4.25 J
Magnesium	ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Mercury	ug/L	-	-	<0.2	-	<0.2	-	<0.2	-	-	<0.101	<0.101	<0.0670
Molybdenum	ug/L	<5	<5	<5	<5	<5	<5	<5	<5	<5	<0.61	<0.610	<0.200
Nickel	ug/L	-	-	2.85	-	2.87	-	2.11	-	-	3.42	3.87	4.20
Potassium	ug/L	-	-	931	-	-	-	-	-	-	-	-	-
Selenium	ug/L	-	-	<5	-	<5	-	<5	-	-	<2.62	<1.51	<2.00
Silver	ug/L	-	-	<1	-	<1	-	<1	-	-	<0.121	<0.177	<0.300
Sodium	ug/L	-	-	7,360	-	-	-	-	-	-	-	-	-
Thallium	ug/L	-	-	<1	-	<1	-	<1	-	-	<0.128	<0.148	<0.600
Vanadium	ug/L	-	-	<1	-	1.45	-	2.48 U*	-	-	1.09 J	3.62 U*	<3.30
Zinc	ug/L	-	-	7.34	-	7.44	-	7.53 U*	-	-	9.46	14.7 U*	14.9 J
Radiological Parameters													
Radium-226	pCi/L	0.178 +/-(0.0867)	0.164 +/-(0.0740)	0.258 +/-(0.0988)	0.0903 +/-(0.0586)	0.0644 +/-(0.0468)	0.116 +/-(0.118)U	0.310 +/-(0.100)U*	0.0590 +/-(0.0494)U	0.104 +/-(0.0646)U*	0.173 +/-(0.0812)	0.159 +/-(0.350)U	0.428 +/-(0.577)U
Radium-228	pCi/L	0.000549 +/-(0.159)U	0.0620 +/-(0.180)U	0.277 +/-(0.228)U	0.549 +/-(0.221)	0.162 +/-(0.227)U	0.142 +/-(0.214)U	0.122 +/-(0.173)U	0.287 +/-(0.221)U	0.400 +/-(0.227)	0.245 +/-(0.197)U	0.322 +/-(0.414)U	0.156 +/-(0.500)U
Radium-226+228	pCi/L	-	-	-	-	-	-	-	-	-	-	0.482 +/-(0.542)U	0.584 +/-(0.764)U
Anions													
Chloride	mg/L	18.9	19.1	15.9	11.7	10.6	11.7	9.34	18.7	18.3	17.2	15.7	15.7
Fluoride	mg/L	-	-	<0.100	-	<0.100	-	<0.100	-	-	0.0503 J	0.0498 J	<0.0330
Sulfate	mg/L	4.86	4.76	3.21	1.15	<1.00	1.05	<1.00	3.30	3.12	3.19 J	3.12	3.18
General Chemistry													
Alkalinity, Bicarbonate	mg/L	-	-	-	-	-	-	-	-	-	-	-	-
Alkalinity, Carbonate	mg/L	-	-	-	-	-	-	-	-	-	-	-	-
pH (lab)	SU	-	-	5.7	-	5.9	-	5.8 J	-	-	5.7 J	6.2 J	5.68 J
Total Dissolved Solids	mg/L	66.0	76.0	74.0	40.0	44.0	66.0	55.0 J	39.0 J	55.0 J	59.0	79.0	77.1

See notes on last page.

Table H.1-10- Groundwater Analytical Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		89-B10						B-11					
Sample Date		15-Sep-20	15-Mar-21	14-Sep-21	9-Feb-22	4-Aug-22	8-Feb-23	17-Mar-15	22-Sep-15	22-Mar-16	21-Sep-16	21-Sep-16	16-Mar-17
Sample ID		JOF-B10-0920	JOF-GW-89-B10-03152021	JOF-GW-89-B10-09142021	JOF-GW-89-B10-02092022	JOF-GW-89-B10-08042022	JOF-GW-89-B10-02082023	JOF-B11-0315	JOF-B11-0915	JOF-B11-0316	B-11_0921161200_20160928-02	B-11_0921161201_L861582-02	JOF-B11
Parent Sample ID													
Sample Depth		40 ft	40 ft	40 ft	40 ft	40 ft	40 ft	35 ft	35 ft	35 ft	35 ft	35 ft	35 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance		State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance
Total Metals													
Antimony	ug/L	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<2.00	<2.00	<2.00	-	<2	<2
Arsenic	ug/L	<2.00	<2.00	<2.00	<2.00	<2.00	2.02 U*	<2.00	<2.00	<2.00	-	<2	<1
Barium	ug/L	9.49	7.97	10.4	8.53	10.4	10.0	184	244	176	-	363	258
Beryllium	ug/L	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<2.00	<2.00	<2.00	-	<2	<1
Boron	ug/L	10.5 J	11.6 J	13.2 J	7.29 J	14.4 J	16.7 U*	-	-	-	-	200	183
Cadmium	ug/L	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<1.00	<1.00	<1.00	-	<1	<1
Calcium	ug/L	5,690	5,960	6,200	5,710	6,280	6,280	-	-	-	-	41,100	26,700
Chromium	ug/L	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<2.00	<2.00	<2.00	-	<2	<2
Cobalt	ug/L	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<2.00	<2.00	<2.00	-	<2	0.726
Copper	ug/L	0.386 J	<0.300	<0.300	<0.300	<0.300	<0.300	<5.00	<5.00	<5.00	-	<5	<2
Lead	ug/L	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<2.00	<2.00	<2.00	-	<2	<1
Lithium	ug/L	4.07 J	4.61 J	<3.00	3.13 J	<3.00	3.36 J	-	-	-	-	<15	<5
Magnesium	ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Mercury	ug/L	<0.0670	<0.0670	<0.0670	<0.0670	<0.0670	<0.0670	<0.200	<0.200	<0.200	-	<0.2	<0.2
Molybdenum	ug/L	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	-	-	-	-	<5	<5
Nickel	ug/L	3.18	2.78	2.60	2.43	2.83	2.94	5.51	6.22	4.78	-	7.18	6.47
Potassium	ug/L	-	-	-	-	-	-	-	-	-	-	-	1,970
Selenium	ug/L	<2.00	<2.00	<2.00	<1.50	<1.50	<1.50	<2.00	<2.00	<2.00	-	<2	<5
Silver	ug/L	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<2.00	<2.00	<2.00	-	<2	<1
Sodium	ug/L	-	-	-	-	-	-	-	-	-	-	-	161,000
Thallium	ug/L	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	2.00 UJ	<2.00	<1.00	-	<1	<1
Vanadium	ug/L	3.44 J	<3.30	<3.30	<3.30	<3.30	5.89 U*	<5.00	<5.00	<5.00	-	<5	1.18
Zinc	ug/L	9.43 J	6.65 J	7.49 U*	6.94 J	7.34 J	7.10 J	<25.0	<25.0	<25.0	-	<25	12.6
Radiological Parameters													
Radium-226	pCi/L	0.0724 +/-(0.295)U	-0.129 +/-(0.0896)U	0.212 +/-(0.330)U	0.331 +/-(0.472)U	0.255 +/-(0.518)U	0.358 +/-(0.390)U	-	-	-	0.87 +/-()	-	1.28 +/-(0.228)
Radium-228	pCi/L	0.227 +/-(0.373)U	0.692 +/-(0.394)U*	0.161 +/-(0.244)U	0.245 +/-(0.348)U	-0.0733 +/-(0.378)U	0.344 +/-(0.446)U	-	-	-	1.33 +/-()	-	0.218 +/-(0.259)U
Radium-226+228	pCi/L	0.299 +/-(0.475)U	0.692 +/-(0.404)U*	0.373 +/-(0.410)U	0.576 +/-(0.586)U	0.255 +/-(0.641)U	0.702 +/-(0.592)U	-	-	-	-	-	-
Anions													
Chloride	mg/L	13.4	13.7	18.5	15.0	18.0	15.0	-	-	-	-	392	355
Fluoride	mg/L	0.0546 J	0.0736 J	0.0586 J	0.0581 J	0.0767 J	0.0695 J	<0.100	<0.100	<0.100	-	<0.1	<0.100
Sulfate	mg/L	2.27	2.54	4.29	2.19	4.71	3.58	-	-	-	-	24	26.4
General Chemistry													
Alkalinity, Bicarbonate	mg/L	-	-	-	-	-	-	-	-	-	-	-	-
Alkalinity, Carbonate	mg/L	-	-	-	-	-	-	-	-	-	-	-	-
pH (lab)	SU	5.61 J	5.53 J	5.80 J	5.76 J	12.4 J	5.84 J	-	-	-	-	5.19	5.7
Total Dissolved Solids	mg/L	67.1	35.7 U*	68.6	85.7 J	58.0	45.0	-	-	-	-	870	612

See notes on last page.

Table H.1-10- Groundwater Analytical Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		B-11												
Sample Date		13-Jun-17	19-Sep-17	19-Sep-17	11-Dec-17	14-Mar-18	11-Jun-18	12-Jun-18	13-Sep-18	11-Dec-18	13-Mar-19	13-Mar-19	11-Sep-19	5-Mar-20
Sample ID		JOF-B11	JOF-B11	JOF-B11-DUP	JOF-B11-1217	JOF-B11-0318	JOF-B11-DUP-0618	JOF-B11-0618	JOF-B11-09132018	JOF-B11	JOF-B11	JOF-B11-DUP	JOF-B11-0919	JOF-B11-0320
Parent Sample ID				JOF-B11-0917			JOF-B11-0618					JOF-B11-031319		
Sample Depth		35 ft	35 ft	35 ft	35 ft	35 ft	35 ft	35 ft	35 ft	35 ft	35 ft	35 ft	35 ft	35 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance
Total Metals														
Antimony	ug/L	-	<2	<2	-	<2	-	-	<2	-	<0.378	<0.378	<0.378	<1.00
Arsenic	ug/L	-	<1	<1	-	<1	-	-	<1	-	<0.323	<0.323	0.475 J	<2.00
Barium	ug/L	-	384	379	-	240	-	-	259	-	174	174	399	157
Beryllium	ug/L	-	<1	<1	-	<1	-	-	<1	-	<0.155	<0.155	<0.182	<0.200
Boron	ug/L	167	161	164	145	187	134	138	133	148	129	137	152	104
Cadmium	ug/L	-	<1	<1	-	<1	-	-	<1	-	0.15 J	0.233 J	0.381 J	<0.300
Calcium	ug/L	25,000	40,100	39,800	36,200	33,300	17,400	18,500	27,400	27,300	22,400	22,500	39,200	16,800
Chromium	ug/L	-	<2	<2	-	<2	-	-	2.11	-	<1.53	<1.53	3.58 U*	<3.00
Cobalt	ug/L	-	0.935	0.96	-	0.734	-	-	0.749	-	0.556	0.562 U*	1.30	0.565 J
Copper	ug/L	-	<2	<2	-	<2	-	-	<2	-	1.07 J	<0.627	<0.627	0.449 J
Lead	ug/L	-	<1	<1	-	<1	-	-	1 UJ	-	<0.128	<0.128	0.304 J	<0.500
Lithium	ug/L	<5	<5	<5	<5	<5	<5	<5	<5	<5	<3.14	<3.14	6.82	<3.00
Magnesium	ug/L	-	-	-	-	-	-	-	-	-	-	-	-	-
Mercury	ug/L	-	<0.2	<0.2	-	<0.2	-	-	<0.2	-	<0.101	<0.101	<0.101	<0.0670
Molybdenum	ug/L	<5	<5	<5	<5	<5	<5	<5	<5	<5	<0.61	<0.61	<0.610	<0.200
Nickel	ug/L	-	7.79	8.05	-	5.59	-	-	5.53	-	5.29	5.28	8.82	4.09
Potassium	ug/L	-	2,520	2,480	-	-	-	-	-	-	-	-	-	-
Selenium	ug/L	-	<5	<5	-	<5	-	-	<5	-	<2.62	<2.62	<1.51	<2.00
Silver	ug/L	-	<1	<1	-	<1	-	-	<1	-	<0.121	<0.121	<0.177	<0.300
Sodium	ug/L	-	242,000	237,000	-	-	-	-	-	-	-	-	-	-
Thallium	ug/L	-	<1	<1	-	<1	-	-	<1	-	<0.128	<0.128	<0.148	<0.600
Vanadium	ug/L	-	<1	<1	-	<1	-	-	2.11 U*	-	<0.899	<0.899	2.49	<3.30
Zinc	ug/L	-	15.4	17.4	-	11.7	-	-	13.3 U*	-	10.7	10	22.5	9.57 J
Radiological Parameters														
Radium-226	pCi/L	0.968 +/-(0.180)	1.86 +/-(0.285)	2.01 +/-(0.304)	1.56 +/-(0.238)	1.02 +/-(0.182)	0.495 +/-(0.197)	0.702 +/-(0.234)	1.28 +/-(0.215)	0.845 +/-(0.174)	0.773 +/-(0.169)	0.831 +/-(0.175)	1.87 +/-(0.630)	1.26 +/-(0.481)
Radium-228	pCi/L	0.610 +/-(0.217)	0.887 +/-(0.287)	0.824 +/-(0.295)	0.871 +/-(0.250)	0.759 +/-(0.240)	0.0726 +/-(0.193)U	0.379 +/-(0.236)	0.769 +/-(0.249)	1.18 +/-(0.312)	0.398 +/-(0.229)	0.447 +/-(0.278)	0.926 +/-(0.567)U*	0.194 +/-(0.392)U
Radium-226+228	pCi/L	-	-	-	-	-	-	-	-	-	-	-	2.79 +/-(0.847)J	1.45 +/-(0.620)J
Anions														
Chloride	mg/L	285	472	471	453	302	228	227	279	333	220	219	463	181
Fluoride	mg/L	-	<0.100	<0.100	-	<0.100	-	-	<0.100	-	<0.0263	<0.0263	<0.0263	<0.0330
Sulfate	mg/L	32.2	29.4	30.3	31.0	34.0	35.5	36.1	25.9	29.1	33.9 J	30.4 J	26.7	36.4
General Chemistry														
Alkalinity, Bicarbonate	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-
Alkalinity, Carbonate	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-
pH (lab)	SU	-	5.3	5.2	-	5.9	-	-	5.5 J	-	5.7 J	5.8 J	5.7 J	5.46 J
Total Dissolved Solids	mg/L	619	911	915	770	613	426	470	654	550	432	430	912	384

See notes on last page.

Table H.1-10- Groundwater Analytical Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		B-11						B-12				
Sample Date		17-Sep-20	16-Mar-21	15-Sep-21	9-Feb-22	3-Aug-22	3-Aug-22	17-Mar-15	22-Sep-15	22-Sep-15	21-Mar-16	21-Sep-16
Sample ID		JOF-B11-0920	JOF-GW-B11-03162021	JOF-GW-B11-09152021	JOF-GW-B-11-02092022	JOF-GW-B-11-08032022	JOF-GW-FD01-08032022	JOF-B12-0315	JOF-B12-0915	JOF-B12-0915 DUP	JOF-B12-0316	B-12_0921161200_20160928-03
Parent Sample ID							JOF-GW-B-11-08032022			JOF-B12-0915		
Sample Depth		35 ft	35 ft	35 ft	35 ft	35 ft	35 ft	35 ft	35 ft	35 ft	35 ft	35 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	State Compliance	State Compliance	CCR Program	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance
Total Metals												
Antimony	ug/L	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<2.00	<2.00	<2.00	<2.00	-
Arsenic	ug/L	<2.00	<2.00	2.15 J	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	-
Barium	ug/L	247	169	218	177	183	191	272	502	492	286	-
Beryllium	ug/L	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<2.00	<2.00	<2.00	<2.00	-
Boron	ug/L	142	120	121	105	109	112	-	-	-	-	-
Cadmium	ug/L	0.356 J	<0.300	<0.300	<0.300	<0.300	<0.300	<1.00	<1.00	<1.00	<1.00	-
Calcium	ug/L	31,400	23,600	28,100	22,800	26,300	26,600	-	-	-	-	-
Chromium	ug/L	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<2.00	<2.00	<2.00	<2.00	-
Cobalt	ug/L	0.866 J	0.517 J	0.736 J	0.373 J	0.393 J	0.408 J	<2.00	<2.00	-	<2.00	-
Copper	ug/L	0.791 J	<0.300	0.582 J	<0.300	1.34 J	0.300 J	<5.00	<5.00	-	<5.00	-
Lead	ug/L	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<2.00	<2.00	<2.00	<2.00	-
Lithium	ug/L	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	-	-	-	-	-
Magnesium	ug/L	-	-	-	-	-	-	-	-	-	-	-
Mercury	ug/L	<0.0670	<0.0670	<0.0670	<0.0670	<0.0670	<0.0670	<0.200	<0.200	<0.200	<0.200	-
Molybdenum	ug/L	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	-	-	-	-	-
Nickel	ug/L	6.62	3.83	4.83	3.51	4.16	4.22	12.7	17.5	17.1	16.5	-
Potassium	ug/L	-	-	-	-	-	-	-	-	-	-	-
Selenium	ug/L	<2.00	<2.00	<2.00	<1.50	<1.50	<1.50	<2.00	<2.00	<2.00	<2.00	-
Silver	ug/L	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<2.00	<2.00	<2.00	<2.00	-
Sodium	ug/L	-	-	-	-	-	-	-	-	-	-	-
Thallium	ug/L	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	2.00 UJ	<2.00	<2.00	<1.00	-
Vanadium	ug/L	<3.30	<3.30	3.32 J	<3.30	<3.30	<3.30	<5.00	<5.00	-	<5.00	-
Zinc	ug/L	14.0 J	7.28 J	14.5 U*	8.45 J	9.32 J	9.14 J	<25.0	25.9	-	26.5	-
Radiological Parameters												
Radium-226	pCi/L	1.71 +/-(0.829)	0.704 +/-(0.399)	0.688 +/-(0.447)	1.59 +/-(0.824)	0.512 +/-(0.491)U	0.329 +/-(0.623)U	-	-	-	-	1.86 +/-()
Radium-228	pCi/L	0.477 +/-(0.402)U	0.357 +/-(0.415)U	0.269 +/-(0.357)U	0.432 +/-(0.369)U	0.573 +/-(0.482)U	0.855 +/-(0.568)	-	-	-	-	0.735 +/-()
Radium-226+228	pCi/L	2.18 +/-(0.921)J	1.06 +/-(0.576)J	0.957 +/-(0.572)J	2.03 +/-(0.903)J	1.09 +/-(0.688)U	1.18 +/-(0.843)J	-	-	-	-	-
Anions												
Chloride	mg/L	298	220	268	202	216 J	238 J	-	-	-	-	-
Fluoride	mg/L	<0.0330	<0.0330	<0.0330	<0.0330	0.0330 UJ	0.0330 UJ	<0.100	<0.100	<0.100	<0.100	-
Sulfate	mg/L	27.5	33.8	31.2	31.9	39.2 J	41.0 J	-	-	-	-	-
General Chemistry												
Alkalinity, Bicarbonate	mg/L	-	-	-	-	-	-	-	-	-	-	-
Alkalinity, Carbonate	mg/L	-	-	-	-	-	-	-	-	-	-	-
pH (lab)	SU	5.28 J	5.33 J	5.48 J	5.72 J	5.63 J	5.67 J	-	-	-	-	-
Total Dissolved Solids	mg/L	580	433	567	510	413	416	-	-	-	-	-

See notes on last page.

Table H.1-10- Groundwater Analytical Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		B-12											
Sample Date		21-Sep-16	21-Sep-16	21-Sep-16	16-Mar-17	13-Jun-17	19-Sep-17	11-Dec-17	11-Dec-17	14-Mar-18	12-Jun-18	13-Sep-18	11-Dec-18
Sample ID		B-12_0921161200_L861582-03	B-12_0921161200D_20160928-05	B-12_0921161200D_L861582-05	JOF-B12	JOF-B12	JOF-B12	JOF-B12-1217	JOF-B12-1217-DUP	JOF-B12-0318	JOF-B12-0618	JOF-B12-09132018	JOF-B12
Parent Sample ID			B-12_0921161200_20160928-03	B-12_0921161200D_L861582-05					JOF-B12-1217				
Sample Depth		35 ft	35 ft	35 ft	35 ft	35 ft	35 ft	35 ft	35 ft	35 ft	35 ft	35 ft	35 ft
Sample Type		Normal Environmental Sample	Field Duplicate Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance
Total Metals													
Antimony	ug/L	<2	-	<2	<2	-	<2	-	-	<2	-	<2	-
Arsenic	ug/L	<2	-	<2	<1	-	<1	-	-	<1	-	<1	-
Barium	ug/L	601	-	603	463	-	500	-	-	281	-	544	-
Beryllium	ug/L	<2	-	<2	<1	-	<1	-	-	<1	-	<1	-
Boron	ug/L	<200	-	<200	<80	<80	<80	<80	<80	<80	<80	<80	<80
Cadmium	ug/L	<1	-	<1	<1	-	<1	-	-	<1	-	1.1	-
Calcium	ug/L	56,600	-	56,600	45,700	45,500	51,500	51,500	52,100	47,400	44,600	55,100	43,400
Chromium	ug/L	8.48	-	2.98	<2	-	<2	-	-	<2	-	2.21	-
Cobalt	ug/L	4.43	-	4.47	5.93	-	5.63	-	-	3.08	-	7.7	-
Copper	ug/L	<5	-	<5	<2	-	<2	-	-	<2	-	<2	-
Lead	ug/L	<2	-	<2	<1	-	<1	-	-	<1	-	1 UJ	-
Lithium	ug/L	<15	-	<15	<5	<5	<5	<5	<5	<5	<5	<5	<5
Magnesium	ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Mercury	ug/L	<0.2	-	<0.2	<0.2	-	<0.2	-	-	<0.2	-	<0.2	-
Molybdenum	ug/L	<5	-	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Nickel	ug/L	26.8	-	26.3	23.5	-	26	-	-	28.5	-	28.2	-
Potassium	ug/L	-	-	-	3,580	-	4,440	-	-	-	-	-	-
Selenium	ug/L	<2	-	<2	<5	-	<5	-	-	<5	-	<5	-
Silver	ug/L	<2	-	<2	<1	-	<1	-	-	<1	-	<1	-
Sodium	ug/L	-	-	-	576,000	-	763,000	-	-	-	-	-	-
Thallium	ug/L	<1	-	<1	<1	-	<1	-	-	<1	-	<1	-
Vanadium	ug/L	<5	-	<5	2.23	-	1.26	-	-	<1	-	2.44 U*	-
Zinc	ug/L	58.6	-	57.2	41.1	-	47.6	-	-	55.8	-	109	-
Radiological Parameters													
Radium-226	pCi/L	-	2.22 +/-()	-	2.33 +/-(0.344)	2.49 +/-(0.338)	3.02 +/-(0.396)	2.63 +/-(0.348)	2.97 +/-(0.379)	2.49 +/-(0.322)	2.11 +/-(0.425)	3.39 +/-(0.421)	2.17 +/-(0.312)
Radium-228	pCi/L	-	1.73 +/-()	-	1.33 +/-(0.338)	1.39 +/-(0.307)	1.58 +/-(0.349)	2.12 +/-(0.332)	2.72 +/-(0.452)	1.20 +/-(0.306)	0.514 +/-(0.284)	1.82 +/-(0.357)	1.44 +/-(0.332)
Radium-226+228	pCi/L	-	-	-	-	-	-	-	-	-	-	-	-
Anions													
Chloride	mg/L	1,270	-	1,240	970	1,150	1,300	1,260	1,270	888	915	1,160	886
Fluoride	mg/L	<0.1	-	<0.1	<0.500	-	<0.250	-	-	<0.250	-	<0.250	-
Sulfate	mg/L	25.1	-	25	18.7	29.8	35.4	36.7	36.7	30.4	31.8	31.0	32.0
General Chemistry													
Alkalinity, Bicarbonate	mg/L	-	-	-	-	-	-	-	-	-	-	-	-
Alkalinity, Carbonate	mg/L	-	-	-	-	-	-	-	-	-	-	-	-
pH (lab)	SU	-	-	5.32	5.7	-	5.4	-	-	5.7	-	5.5 J	-
Total Dissolved Solids	mg/L	2,080	-	2,410	1,910	2,160	2,430	2,090	2,040	1,600	1,660	2,300	1,420

See notes on last page.

Stantec

Table H.1-10- Groundwater Analytical Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		B-12						B-13					
Sample Date		13-Mar-19	12-Sep-19	5-Mar-20	16-Sep-20	16-Mar-21	16-Sep-21	17-Mar-15	17-Mar-15	22-Sep-15	21-Mar-16	20-Sep-16	21-Sep-16
Sample ID		JOF-B12	JOF-B12-0919	JOF-B12-0320	JOF-B12-0920	JOF-GW-B12-03162021	JOF-GW-B12-09162021	JOF-B13-0315	JOF-B13-0315-DUP	JOF-B13-0915	JOF-B13-0316	B-13_0920161200_L861582-04	B-13_0921161200_20160928-04
Parent Sample ID									JOF-B13-0315				
Sample Depth		35 ft	35 ft	35 ft	35 ft	35 ft	35 ft	42 ft	42 ft	42 ft	42 ft	42 ft	42 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance
Total Metals													
Antimony	ug/L	<0.378	<0.378	<1.00	<1.00	<1.00	<1.00	<2.00	<2.00	<2.00	<2.00	<2	-
Arsenic	ug/L	<0.323	3.21	11.3	5.84	6.79	3.54 J	<2.00	<2.00	<2.00	<2.00	<2	-
Barium	ug/L	254	690	261	370	254	282	1,050	1,060	826	838	754	-
Beryllium	ug/L	<0.155	0.438 J	1.54	0.939	0.646	0.348 J	<2.00	<2.00	<2.00	<2.00	<2	-
Boron	ug/L	43.4 J	70.5 J	<5.20	67.2	45.4	49.6	-	-	-	-	<200	-
Cadmium	ug/L	0.71 J	1.22	0.456 J	0.769 J	0.506 J	0.580 J	2.18	2.42	2.05	2.01	2.17	-
Calcium	ug/L	39,400	65,000	26,100	44,100	36,100	38,200	-	-	-	-	362,000	-
Chromium	ug/L	<1.53	10.8 U*	18.7	10.3	8.54 J	5.36 J	3.66	3.90	5.58	3.23	<2	-
Cobalt	ug/L	4.16	12.4	7.38	8.34	6.87	6.58	5.16	5.26	3.11	3.47	3.21	-
Copper	ug/L	0.675 J	3.39	8.94	5.11	4.21	3.18	<5.00	<5.00	<5.00	<5.00	<5	-
Lead	ug/L	0.143 J	2.01	6.13	3.16	2.63	0.983 J	<2.00	<2.00	<2.00	<2.00	<2	-
Lithium	ug/L	<3.14	7.74	5.11 J	4.16 J	3.86 J	<3.00	-	-	-	-	16	-
Magnesium	ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Mercury	ug/L	<0.101	0.175 J	0.129 J	0.0690 J	0.108 J	0.137 J	<0.200	<0.200	0.301	<0.200	<0.2	-
Molybdenum	ug/L	<0.61	<0.610	1.40	0.706 J	0.687 U*	0.277 J	-	-	-	-	<5	-
Nickel	ug/L	23.8	40.1	45.3	38.3	30.2	22.7	22.2	22.4	19.2	19.9	17.6	-
Potassium	ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Selenium	ug/L	<2.62	<1.51	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2	-
Silver	ug/L	0.158 J	0.355 J	<0.300	<0.300	<0.300	<0.300	<2.00	<2.00	<2.00	<2.00	<2	-
Sodium	ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Thallium	ug/L	<0.128	0.225 J	<0.600	<0.600	<0.600	<0.600	2.00 UJ	2.00 UJ	<2.00	<1.00	<1	-
Vanadium	ug/L	0.99 J	9.36	20.5	12.3 J	10.0 U*	4.44 J	<5.00	<5.00	<5.00	<5.00	<5	-
Zinc	ug/L	48.1	89.1	99.5	82.4	61.0	49.4 U*	42.1	41.5	30.6	35.5	34.6	-
Radiological Parameters													
Radium-226	pCi/L	1.75 +/-(0.274)	3.32 +/-(0.870)	2.89 +/-(0.780)	2.74 +/-(0.792)	1.75 +/-(0.616)	1.70 +/-(0.541)	-	-	-	-	-	3.81 +/-()
Radium-228	pCi/L	0.930 +/-(0.283)	1.47 +/-(0.652)U*	0.736 +/-(0.389)	1.36 +/-(0.500)	0.635 +/-(0.433)U*	0.657 +/-(0.382)	-	-	-	-	-	3.41 +/-()
Radium-226+228	pCi/L	-	4.80 +/-(1.09)J	3.63 +/-(0.871)	4.10 +/-(0.937)	2.38 +/-(0.753)J	2.36 +/-(0.662)	-	-	-	-	-	-
Anions													
Chloride	mg/L	715	1,560	566	971	725	803	-	-	-	-	987	-
Fluoride	mg/L	0.0301 J	<0.132	<0.0330	<0.0330	<0.0330	<0.0330	<0.100	<0.100	<0.100	<0.100	<0.1	-
Sulfate	mg/L	29.4 J	29.9	32.2	32.0	34.6	35.5	-	-	-	-	38.2	-
General Chemistry													
Alkalinity, Bicarbonate	mg/L	-	-	-	-	-	-	-	-	-	-	-	-
Alkalinity, Carbonate	mg/L	-	-	-	-	-	-	-	-	-	-	-	-
pH (lab)	SU	5.7 J	5.8 J	5.59 J	5.37 J	5.44 J	5.37 J	-	-	-	-	5.14	-
Total Dissolved Solids	mg/L	1,370	2,580	1,200	1,830	1,500	1,560	-	-	-	-	2,550	-

See notes on last page.

Table H.1-10- Groundwater Analytical Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		B-13											
Sample Date		16-Mar-17	12-Jun-17	19-Sep-17	11-Dec-17	14-Mar-18	14-Mar-18	11-Jun-18	12-Sep-18	11-Dec-18	12-Mar-19	10-Sep-19	4-Mar-20
Sample ID		JOF-B13	JOF-B13	JOF-B13	JOF-B13-1217	JOF-B13-0318	JOF-B13-0318-DUP-0318	JOF-B13-0618	JOF-B13-09122018	JOF-B13	JOF-B13	JOF-B13-0919	JOF-B13-0320
Parent Sample ID							JOF-B13-0318						
Sample Depth		42 ft	42 ft	42 ft	42 ft	42 ft	42 ft	42 ft	42 ft	42 ft	42 ft	42 ft	42 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance
Total Metals													
Antimony	ug/L	<2	-	<2	-	<2	<2	-	<2	-	<0.378	<0.378	<1.00
Arsenic	ug/L	<1	-	<1	-	<1	<1	-	<1	-	<0.323	0.542 J	<2.00
Barium	ug/L	712	-	668	-	521	524	-	633	-	469	671	570
Beryllium	ug/L	<1	-	<1	-	<1	<1	-	<1	-	0.187 J	<0.182	0.229 J
Boron	ug/L	<80	<80	<80	<80	<80	<80	<80	<80	<80	<30.3	48.2 J	102
Cadmium	ug/L	2.36	-	2.6	-	1.77	1.84	-	2.21	-	1.72	2.41	1.78
Calcium	ug/L	339,000	315,000	356,000	337,000	311,000	309,000	315,000	286,000	309,000	287,000	283,000	301,000
Chromium	ug/L	<2	-	<2	-	<2	<2	-	<2	-	<1.53	3.13 U*	<3.00
Cobalt	ug/L	3.76	-	3.5	-	2.52	2.5	-	2.43	-	1.76	3.08	2.49
Copper	ug/L	<2	-	2.39	-	<2	<2	-	29.6	-	<0.627	0.966 J	0.398 J
Lead	ug/L	<1	-	<1	-	<1	<1	-	12.1 J	-	<0.128	0.435 J	<0.500
Lithium	ug/L	9.59	8.31	9.99	8.52	<5	<5	8.75	10.2	9.87	5.57	12.7	7.12 J
Magnesium	ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Mercury	ug/L	<0.2	-	<0.2	-	<0.2	<0.2	-	<0.2	-	<0.101	0.260	0.120 J
Molybdenum	ug/L	<5	<5	<5	<5	<5	<5	<5	<5	<5	<0.61	<0.610	<0.200
Nickel	ug/L	18.9	-	17.3	-	12	12.1	-	14.1	-	9.34	16.5	12.5
Potassium	ug/L	4,810	-	5,120	-	-	-	-	-	-	-	-	-
Selenium	ug/L	<5	-	<5	-	<5	<5	-	<5	-	<2.62	<1.51	<2.00
Silver	ug/L	<1	-	<1	-	<1	<1	-	<1	-	<0.121	<0.177	<0.300
Sodium	ug/L	185,000	-	207,000	-	-	-	-	-	-	-	-	-
Thallium	ug/L	<1	-	<1	-	<1	<1	-	<1	-	<0.128	0.236 J	<0.600
Vanadium	ug/L	<1	-	1.09	-	<1	<1	-	2.09 U*	-	<0.899	2.37 U*	<3.30
Zinc	ug/L	36	-	35.8	-	25.8	26.3	-	55.5 U*	-	22.3	37.4	24.7
Radiological Parameters													
Radium-226	pCi/L	4.77 +/-(0.577)	4.44 +/-(0.526)	5.05 +/-(0.588)	4.79 +/-(0.548)	3.99 +/-(0.480)	3.81 +/-(0.463)	3.51 +/-(0.589)	4.83 +/-(0.553)	4.38 +/-(0.523)	2.89 +/-(0.390)	4.24 +/-(1.03)	4.81 +/-(1.14)
Radium-228	pCi/L	2.15 +/-(0.416)	2.55 +/-(0.450)	2.11 +/-(0.420)	2.48 +/-(0.410)	1.29 +/-(0.337)	1.48 +/-(0.335)	1.54 +/-(0.343)	1.90 +/-(0.351)	2.12 +/-(0.416)	1.29 +/-(0.323)	1.65 +/-(0.666)U*	1.73 +/-(0.603)
Radium-226+228	pCi/L	-	-	-	-	-	-	-	-	-	-	5.89 +/-(1.22)J	6.54 +/-(1.29)
Anions													
Chloride	mg/L	971	907	1,070	1,030	904	847	982	782	994	871	986	934
Fluoride	mg/L	<0.500	-	<0.500	-	<0.250	<0.100	-	<0.100	-	0.0369 J	<0.132	<0.0330
Sulfate	mg/L	43.2	42.4	43.8	48.0	43.4	44.4	45.4	41.8	44.8	41.7 J	38.1	48.1
General Chemistry													
Alkalinity, Bicarbonate	mg/L	-	-	-	-	-	-	-	-	-	-	-	-
Alkalinity, Carbonate	mg/L	-	-	-	-	-	-	-	-	-	-	-	-
pH (lab)	SU	5.4	-	5.0	-	5.4	5.4	-	5.2 J	-	5.2 J	5.6 J	5.08 J
Total Dissolved Solids	mg/L	2,020	2,020	2,290	1,670	1,610	1,550	1,740	2,110	1,620	1,450	2,170	1,580

See notes on last page.

Stantec

Table H.1-10- Groundwater Analytical Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		B-13						99-B20A					
Sample Date		16-Sep-20	15-Mar-21	14-Sep-21	9-Feb-22	3-Aug-22	7-Feb-23	15-Mar-17	12-Jun-17	18-Sep-17	11-Dec-17	13-Mar-18	11-Jun-18
Sample ID		JOF-B13-0920	JOF-GW-B13-03152021	JOF-GW-B13-09142021	JOF-GW-B-13-02092022	JOF-GW-B-13-08032022	JOF-GW-B-13-02072023	JOF-B20A	JOF-B20A	JOF-B20A	JOF-B20A-1217	JOF-B20A-0318	JOF-B20A-0618
Parent Sample ID													
Sample Depth		42 ft	42 ft	42 ft	42 ft	42 ft	42 ft	35 ft	35 ft	35 ft	35 ft	35 ft	35 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	State Compliance	State Compliance	CCR Program	State Compliance	State Compliance		State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance
Total Metals													
Antimony	ug/L	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<2	-	<2	-	<2	-
Arsenic	ug/L	<2.00	2.28 J	2.38 J	<2.00	<2.00	3.62 J	<1	-	<1	-	<1	-
Barium	ug/L	530	541	525	564	532	494	36.7	-	34.8	-	55	-
Beryllium	ug/L	<0.200	<0.200	0.207 J	<0.200	<0.200	<0.200	<1	-	<1	-	<1	-
Boron	ug/L	45.1	41.8	35.3	26.4	28.3	51.4	317	335	287	258	459	356
Cadmium	ug/L	2.27	2.04	1.70	1.77	1.70	1.57	<1	-	<1	-	<1	-
Calcium	ug/L	318,000	317,000	247,000	236,000	214,000	225,000	14,900	13,900	15,500	15,400	23,600	21,100
Chromium	ug/L	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<2	-	<2	-	<2	-
Cobalt	ug/L	2.83	2.93	2.33	1.67	1.53	1.90	0.505	-	<0.5	-	<0.5	-
Copper	ug/L	0.554 J	0.380 J	0.522 J	0.610 J	0.515 J	<0.300	<2	-	2.47	-	<2	-
Lead	ug/L	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<1	-	<1	-	<1	-
Lithium	ug/L	8.13 J	9.51 J	8.39 J	9.18 J	9.72 J	8.15 J	<5	<5	<5	<5	<5	<5
Magnesium	ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Mercury	ug/L	0.202	0.331	0.343	0.226	0.458	0.407	<0.2	-	<0.2	-	<0.2	-
Molybdenum	ug/L	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<5	<5	<5	<5	<5	<5
Nickel	ug/L	14.8	14.5	12.7	12.2	11.3	11.6	1.67	-	<1	-	1.36	-
Potassium	ug/L	-	-	-	-	-	-	834	-	673	-	-	-
Selenium	ug/L	<2.00	2.07 J	<2.00	<1.50	2.23 J	<1.50	<5	-	<5	-	<5	-
Silver	ug/L	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<1	-	<1	-	<1	-
Sodium	ug/L	-	-	-	-	-	-	10,300	-	11,200	-	-	-
Thallium	ug/L	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	<1	-	<1	-	<1	-
Vanadium	ug/L	<3.30	<3.30	<3.30	<3.30	<3.30	4.47 U*	1.6	-	<1	-	3.17	-
Zinc	ug/L	31.3	26.6	24.5 U*	24.0	24.7	21.0	5.41	-	<5	-	<5	-
Radiological Parameters													
Radium-226	pCi/L	4.46 +/-(1.12)	4.35 +/-(1.10)	4.16 +/-(1.05)	3.64 +/-(0.913)	0.937 +/-(0.420)	5.32 +/-(1.23)	0.156 +/-(0.0833)	0.104 +/-(0.0672)	0.174 +/-(0.0757)	0.163 +/-(0.0683)	0.247 +/-(0.0910)	0.298 +/-(0.171)
Radium-228	pCi/L	1.70 +/-(0.605)	1.65 +/-(0.712)U*	0.712 +/-(0.343)	1.48 +/-(0.616)	2.10 +/-(0.910)	2.04 +/-(0.801)U*	-0.125 +/-(0.187)U	0.0826 +/-(0.241)U	0.106 +/-(0.217)U	0.111 +/-(0.230)U	0.0647 +/-(0.212)U	-0.0457 +/-(0.217)
Radium-226+228	pCi/L	6.16 +/-(1.27)	6.01 +/-(1.31)J	4.87 +/-(1.11)	5.12 +/-(1.10)	3.04 +/-(1.00)	7.36 +/-(1.46)J	-	-	-	-	-	-
Anions													
Chloride	mg/L	904	894	867	771	752	619	54.5	49.5	50.8	53.0	71.8	70.4
Fluoride	mg/L	<0.0330	0.0452 J	<0.0330	0.0422 J	0.0551 J	<0.0330	<0.100	-	<0.100	-	<0.100	-
Sulfate	mg/L	50.8	52.1	40.7	48.6	59.0	42.4	7.17	7.66	7.30	7.14	6.94	7.22
General Chemistry													
Alkalinity, Bicarbonate	mg/L	-	-	-	-	-	-	-	-	-	-	-	-
Alkalinity, Carbonate	mg/L	-	-	-	-	-	-	-	-	-	-	-	-
pH (lab)	SU	4.96 J	4.86 J	5.07 J	5.01 J	5.05 J	5.26 J	5.7	-	4.1	-	5.6	-
Total Dissolved Solids	mg/L	1,780	1,600	1,700	1,670	1,240	1,150	123	146	165	123	183	193

See notes on last page.

Table H.1-10- Groundwater Analytical Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		99-B20A									
Sample Date		13-Sep-18	13-Sep-18	11-Dec-18	12-Mar-19	11-Sep-19	3-Mar-20	16-Sep-20	15-Mar-21	15-Mar-21	15-Sep-21
Sample ID		JOF-B20A-09132018	JOF-B20A-DUP-09132018	JOF-B20A	JOF-B20A	JOF-B20A-0919	JOF-B20A-0320	JOF-B20A-0920	JOF-GW-99-B20A-03152021	JOF-GW-FD-03152021	JOF-GW-99-B20A-09152021
Parent Sample ID			JOF-B20A-09132018							JOF-GW-99-B20A-03152021	
Sample Depth		35 ft	35 ft	35 ft	35 ft	35 ft	35 ft	35 ft	35 ft	35 ft	35 ft
Sample Type		Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample
Program	Units	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance
Total Metals											
Antimony	ug/L	<2	<2	-	<0.378	<0.378	<1.00	<1.00	<1.00	<1.00	<1.00
Arsenic	ug/L	<1	<1	-	<0.323	0.535 J	<2.00	<2.00	<2.00	<2.00	<2.00
Barium	ug/L	48.3	48.2	-	54	64.3	51.1	51.4	46.5	50.2	43.1
Beryllium	ug/L	<1	<1	-	<0.155	<0.182	<0.200	<0.200	<0.200	<0.200	<0.200
Boron	ug/L	388	377	475	379	363	261 U*	316	287	341	263
Cadmium	ug/L	<1	<1	-	<0.125	<0.125	<0.300	<0.300	<0.300	<0.300	<0.300
Calcium	ug/L	19,800	20,100	19,800	22,300	21,600	20,200	19,900	18,900	20,400	16,000
Chromium	ug/L	<2	<2	-	<1.53	4.19 U*	<3.00	<3.00	<3.00	<3.00	<3.00
Cobalt	ug/L	<0.5	<0.5	-	0.213 U*	0.474 J	0.399 J	<0.300	<0.300	<0.300	<0.300
Copper	ug/L	<2	<2	-	<0.627	<0.627	0.356 J	0.310 J	<0.300	<0.300	0.376 J
Lead	ug/L	<1	<1	-	<0.128	0.389 J	<0.500	<0.500	<0.500	<0.500	<0.500
Lithium	ug/L	<5	<5	<5	<3.14	6.83	<3.00	<3.00	<3.00	<3.00	<3.00
Magnesium	ug/L	-	-	-	-	-	-	-	-	-	-
Mercury	ug/L	<0.2	<0.2	-	<0.101	<0.101	<0.0670	<0.0670	<0.0670	<0.0670	<0.0670
Molybdenum	ug/L	<5	<5	<5	<0.61	<0.610	<0.200	<0.200	<0.200	<0.200	<0.200
Nickel	ug/L	1.28	1.34	-	1.74 U*	1.73	1.53 J	1.33 J	1.21 J	0.982 J	1.14 J
Potassium	ug/L	-	-	-	-	-	-	-	-	-	-
Selenium	ug/L	<5	<5	-	<2.62	<1.51	<2.00	<2.00	<2.00	<2.00	<2.00
Silver	ug/L	<1	<1	-	<0.121	<0.177	<0.300	<0.300	<0.300	<0.300	<0.300
Sodium	ug/L	-	-	-	-	-	-	-	-	-	-
Thallium	ug/L	<1	<1	-	<0.128	<0.148	<0.600	<0.600	<0.600	<0.600	<0.600
Vanadium	ug/L	2.21 U*	1.91 U*	-	<0.899	3.15	<3.30	<3.30	<3.30	<3.30	<3.30
Zinc	ug/L	7.31 U*	9.39 U*	-	3.23 J	7.18 U*	5.53 J	4.90 J	<3.30	<3.30	6.90 U*
Radiological Parameters											
Radium-226	pCi/L	0.413 +/-(0.116)	0.313 +/-(0.0969)U*	0.172 +/-(0.0885)U*	0.358 +/-(0.116)	0.714 +/-(0.360)	0.933 +/-(0.590)	0.0534 +/-(0.388)U	0.107 +/-(0.221)U	0.372 +/-(0.291)	0.729 +/-(0.471)
Radium-228	pCi/L	0.320 +/-(0.221)U	0.483 +/-(0.209)	0.439 +/-(0.227)	0.441 +/-(0.228)	0.0683 +/-(0.229)U	-0.0940 +/-(0.226)U	0.161 +/-(0.424)U	-0.0231 +/-(0.271)U	1.24 +/-(0.654)U*	0.375 +/-(0.383)U
Radium-226+228	pCi/L	-	-	-	-	0.783 +/-(0.427)J	0.933 +/-(0.632)J	0.214 +/-(0.575)U	0.107 +/-(0.350)U	1.62 +/-(0.716)J	1.10 +/-(0.607)J
Anions											
Chloride	mg/L	66.8	63.0	71.1	80.8	71.2	68.0	69.3	65.3	64.3	61.9
Fluoride	mg/L	<0.100	<0.100	-	<0.0263	0.0291 J	<0.0330	<0.0330	<0.0330	0.0809 J	<0.0330
Sulfate	mg/L	5.72	5.31	7.02	7.83 J	6.69	8.23	8.29	9.81	9.42	9.54
General Chemistry											
Alkalinity, Bicarbonate	mg/L	-	-	-	-	-	-	-	-	-	-
Alkalinity, Carbonate	mg/L	-	-	-	-	-	-	-	-	-	-
pH (lab)	SU	5.6 J	6.0 J	-	5.6 J	6.0 J	5.52 J	5.46 J	5.47 J	5.39 J	5.57 J
Total Dissolved Solids	mg/L	218	249	81.0	176	167	47.1	169	184	193	181

See notes on last page.

Stantec

Table H.1-10- Groundwater Analytical Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		99-B20A			JOF-101								
Sample Date		9-Feb-22	2-Aug-22	8-Feb-23	1-Nov-16	1-Nov-16	4-Jan-17	16-Jan-17	15-Feb-17	14-Mar-17	11-Apr-17	16-May-17	6-Jun-17
Sample ID		JOF-GW-99-B20A-02092022	JOF-GW-99-B20A-08022022	JOF-GW-99-B20A-02082023	JOF-GW-013-11012016	JOF-GW-903-11012016	JOF-GW-013-01042017	JOF-GW-013-01162017	JOF-GW-013-02152017	JOF-GW-013-03142017	JOF-GW-013-04112017	JOF-GW-013-05162017	JOF-GW-013-06062017
Parent Sample ID						JOF-GW-013-11012016							
Sample Depth		35 ft	35 ft	35 ft	52 ft	52 ft	52 ft	52 ft	52 ft	52 ft	52 ft	52 ft	52 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	State Compliance	State Compliance		CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program
Total Metals													
Antimony	ug/L	<1.00	<1.00	<1.00	0.052 U*	<0.0213	0.439 U*	<0.443	<0.443	<0.443	0.642 U*	<0.443	<0.443
Arsenic	ug/L	<2.00	<2.00	2.31 U*	<0.118	<0.118	0.125 U*	<0.22	<0.22	<0.22	<0.22	0.22 UJ	<0.22
Barium	ug/L	39.6	39.1	37.2	7.6 J	7.06 J	6.86 U*	7.84 J	6.99 J	6.46 J	5.52 J	5.87 J	6.6 J
Beryllium	ug/L	<0.200	<0.200	<0.200	<0.102	<0.102	<0.102	0.131 UJ	<0.131	<0.131	<0.131	<0.131	<0.131
Boron	ug/L	281	235	257	11.2 J	5.72 J	5.49 J	7.81 UJ	<7.81	<7.81	<7.81	<7.81	<7.81
Cadmium	ug/L	<0.300	<0.300	<0.300	<0.152	<0.152	<0.152	<0.0781	<0.0781	<0.0781	<0.0781	<0.0781	<0.0781
Calcium	ug/L	15,300	15,200	14,900	2,850 J	2,930	3,210 U*	2,960	2,880	2,860	2,950	2,720	3,130
Chromium	ug/L	<3.00	<3.00	<3.00	<0.339	<0.339	<0.339	<0.378	<0.378	<0.378	<0.378	0.378 UJ	<0.378
Cobalt	ug/L	<0.300	<0.300	<0.300	2.27	2.21	1.6 U*	1.1	2.3	1.72	1.49	1.54	2.07
Copper	ug/L	<0.300	<0.300	<0.300	<0.454	<0.454	0.696 U*	<1.04	1.69 U*	<1.04	1.23 U*	<1.04	<1.04
Lead	ug/L	<0.500	<0.500	<0.500	<0.0675	<0.0675	<0.0675	<0.318	<0.318	<0.318	<0.318	<0.318	<0.318
Lithium	ug/L	<3.00	<3.00	<3.00	1.19 U*	1.62 U*	5.78 U*	3.07 U*	3.74 U*	<2.12	<2.12	<2.12	<2.12
Magnesium	ug/L	-	-	-	1,480 J	1,470 J	1,580 U*	1,450	1,340	1,320	1,430	1,460	1,540
Mercury	ug/L	<0.0670	<0.0670	<0.0670	<0.0521	<0.0521	<0.0521	<0.0521	<0.0521	<0.0653	<0.0653	<0.0653	<0.0653
Molybdenum	ug/L	<0.200	<0.200	<0.200	<0.873	<0.873	<0.873	<0.593	<0.593	<0.593	<0.593	<0.593	<0.593
Nickel	ug/L	0.818 J	1.03 J	1.06 J	1.33	1.37	1.32 U*	1.29	1.39	1.15	1.14	0.989 J	1.64 U*
Potassium	ug/L	-	-	-	245 J	265 J	241 J	216 J	230 J	196 J	180 J	210 J	211 J
Selenium	ug/L	<1.50	<1.50	<1.50	<0.348	<0.348	<0.348	<1.27	<1.27	<1.27	<1.27	<1.27	<1.27
Silver	ug/L	<0.300	<0.300	<0.300	-	-	-	-	-	-	-	-	-
Sodium	ug/L	-	-	-	4,290 J	4,230 J	4,020	4,100	3,010	3,210	3,280	3,150	3,470
Thallium	ug/L	<0.600	<0.600	<0.600	0.041 U*	0.053 U*	<0.036	<0.0531	<0.0531	<0.0531	<0.0531	<0.0531	<0.0531
Vanadium	ug/L	<3.30	<3.30	6.37 U*	-	-	-	-	-	-	-	-	-
Zinc	ug/L	3.35 J	<3.30	<3.30	-	-	-	-	-	-	-	-	-
Radiological Parameters													
Radium-226	pCi/L	-0.0179 +/-(0.353)U	0.333 +/-(0.367)U	0.147 +/-(0.439)U	0.172 +/-(0.35)U	-0.0301 +/-(0.22)U	0.416 +/-(0.54)U	-0.1170 +/-(0.21)U	0.473 +/-(0.35)J	0.569 +/-(0.55)U	0.644 +/-(0.51)U	-0.1260 +/-(0.092)U	0.0156 +/-(0.19)U
Radium-228	pCi/L	0.314 +/-(0.506)U	0.295 +/-(0.491)U	0.524 +/-(0.401)U	0.238 +/-(0.30)U	0.208 +/-(0.27)U	0.126 +/-(0.25)U	0.153 +/-(0.19)U	0.0791 +/-(0.25)U	0.337 +/-(0.25)U	0.132 +/-(0.25)UJ	0.509 +/-(0.44)U	0.360 +/-(0.35)U
Radium-226+228	pCi/L	0.314 +/-(0.617)U	0.628 +/-(0.613)U	0.671 +/-(0.595)U	0.410 +/-(0.46)U	0.208 +/-(0.35)U	0.542 +/-(0.60)U	0.153 +/-(0.28)U	0.552 +/-(0.43)J	0.905 +/-(0.60)U	0.775 +/-(0.57)UJ	0.509 +/-(0.45)U	0.375 +/-(0.39)U
Anions													
Chloride	mg/L	52.7	47.5	47.7	6.75	6.48	4.61	3.78	3.64	3.00	4.64	3.34 J	4.27
Fluoride	mg/L	0.0431 J	0.0476 J	0.0460 J	0.0303 J	0.0242 J	<0.0293	<0.0293	<0.0293	0.0431 J	<0.0293	<0.0293	0.0334 J
Sulfate	mg/L	9.35	9.29	8.93	4.28	4.22	1.28	1.72	1.19	1.10	0.767 J	0.892 J	0.937 J
General Chemistry													
Alkalinity, Bicarbonate	mg/L	-	-	-	11.9	11.9	24.4 J	32.3	34.3	11.0	10.4	13.3	10.9
Alkalinity, Carbonate	mg/L	-	-	-	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00
pH (lab)	SU	5.82 J	5.63 J	5.90 J	-	-	-	-	-	-	-	-	-
Total Dissolved Solids	mg/L	210	144	79.0	50.0	56.0	37.0	26.0	47.0	37.0	32.0	73.0	30.0

See notes on last page.

Stantec

Table H.1-10- Groundwater Analytical Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		JOF-101											
Sample Date		10-Jul-17	1-Aug-17	18-Sep-17	19-Sep-17	5-Oct-17	13-Mar-18	23-May-18	12-Jun-18	26-Jun-18	24-Jul-18	14-Aug-18	11-Sep-18
Sample ID		JOF-GW-013-07102017	JOF-GW-013-08012017	JOF-101	JOF-GW-013-09192017	JOF-GW-013-10052017	JOF-101-0318	JOF-GW-013-05232018	JOF-GW-013-06122018	JOF-GW-013-06262018	JOF-GW-013-07242018	JOF-GW-013-08142018	JOF-101-09112018
Parent Sample ID													
Sample Depth		52 ft	52 ft	52 ft	52 ft	52 ft	52 ft	52 ft	52 ft	52 ft	52 ft	52 ft	52 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	CCR Program	CCR Program	State Compliance	CCR Program	CCR Program	State Compliance	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	State Compliance
Total Metals													
Antimony	ug/L	1.54 U*	<0.443	<2	0.753 U*	-	<2	<1.12	<1.12	<1.12	<1.12	<1.12	<2
Arsenic	ug/L	0.233 J	<0.22	<1	<0.22	-	<1	0.371 J	0.387 J	0.36 U*	<0.323	0.37 U*	<1
Barium	ug/L	5.96 J	5.49 J	<10	5.34 J	-	<10	5.38 J	5.63 J	5.83 J	5.63 J	5.28 J	<10
Beryllium	ug/L	<0.131	<0.131	<1	<0.131	-	<1	<0.057	<0.057	<0.057	<0.057	<0.057	<1
Boron	ug/L	27.9 U*	<7.81	<80	<7.81	<7.81	<80	<30.3	<30.3	<30.3	<30.3	<30.3	<80
Cadmium	ug/L	<0.0781	<0.0781	<1	<0.0781	-	<1	<0.125	<0.125	<0.125	<0.125	<0.125	<1
Calcium	ug/L	3,010	3,120	3,240	3,240	3,140	3,590	3,130	3,320	3,490	3,240	3,240	3,110
Chromium	ug/L	<0.378	<0.378	<2	0.399 U*	-	<2	1.48 U*	1.96 U*	1.81 U*	<0.631	2.01 U*	<2
Cobalt	ug/L	2.18	1.06	0.805	0.739	-	0.667	0.659	0.368 J	0.435 J	0.273 J	0.366 U*	<0.5
Copper	ug/L	<1.04	1.39 U*	<2	<1.04	-	<2	<1.3	<1.3	<1.3	<1.3	<1.3	<2
Lead	ug/L	<0.318	<0.318	<1	<0.318	-	<1	<0.094	<0.094	<0.094	<0.094	<0.094	<1
Lithium	ug/L	2.6 U*	4.84 U*	<5	<2.12	-	<5	<2.56	<2.56	<2.56	<2.56	<2.56	<5
Magnesium	ug/L	1,460	1,540	-	1,560	1,550	-	1,510	1,520	1,620	1,390	1,540	-
Mercury	ug/L	<0.0653	<0.0653	<0.2	<0.0653	-	<0.2	<0.0653	<0.0653	<0.0653	<0.0653	<0.0653	<0.2
Molybdenum	ug/L	<0.593	<0.593	<5	<0.593	-	<5	<0.474	<0.474	<0.474	<0.474	<0.474	<5
Nickel	ug/L	1.03	0.81 J	<1	0.881 J	-	<1	0.723 J	0.66 J	0.695 J	0.815 J	0.873 U*	<1
Potassium	ug/L	193 J	161 J	<500	177 J	181 J	-	<136	161 J	<136	166 J	171 J	-
Selenium	ug/L	<1.27	<1.27	<5	<1.27	-	<5	<0.813	<0.813	<0.813	<0.813	<0.813	<5
Silver	ug/L	-	-	<1	-	-	<1	-	-	-	-	-	<1
Sodium	ug/L	3,500	3,500	3,790	3,950	3,120	-	3,510	4,470	3,660	3,070	3,490	-
Thallium	ug/L	<0.0531	<0.0531	<1	<0.0531	-	<1	<0.063	<0.063	<0.063	<0.063	<0.063	<1
Vanadium	ug/L	-	-	<1	-	-	3.22	-	-	-	-	-	1.89 U*
Zinc	ug/L	-	-	<5	-	-	<5	-	-	-	-	-	<5
Radiological Parameters													
Radium-226	pCi/L	-0.0971 +/-(0.17)U	0.293 +/-(0.48)U	0.0414 +/-(0.0458)U	0.442 +/-(0.55)U	-	0.126 +/-(0.0661)	0.112 +/-(0.0694)	0.0360 +/-(0.0478)U	0.109 +/-(0.0818)J	0.248 +/-(0.107)U*	0.383 +/-(0.128)	0.132 +/-(0.0692)U*
Radium-228	pCi/L	0.798 +/-(0.63)U	0.124 +/-(0.33)U	0.227 +/-(0.217)U	1.02 +/-(0.40)J	-	0.0519 +/-(0.190)U	0.270 +/-(0.235)U	0.273 +/-(0.215)U	0.196 +/-(0.232)U	0.162 +/-(0.233)U	0.229 +/-(0.226)U	0.316 +/-(0.242)U
Radium-226+228	pCi/L	0.798 +/-(0.65)U	0.417 +/-(0.58)U	-	1.46 +/-(0.68)J	-	-	0.382 +/-(0.245)J	0.309 +/-(0.220)U	0.305 +/-(0.246)J	0.410 +/-(0.256)U*	0.612 +/-(0.260)U*	-
Anions													
Chloride	mg/L	4.61	4.37	4.41	4.31	3.36	4.46	3.52	4.19	3.90	4.45	4.81	3.94
Fluoride	mg/L	0.0539 J	0.0301 J	<0.100	<0.0263	<0.0263	<0.100	0.0263 J	0.0284 J	0.0531 J	<0.0263	<0.0263	<0.100
Sulfate	mg/L	1.27	1.28	1.01	1.15	0.736 J	<1.00	0.863 J	1.95	1.22	0.829 J	1.10 U*	<1.00
General Chemistry													
Alkalinity, Bicarbonate	mg/L	12.3	12.7	-	7.88	12.4	-	10.5	24.0	9.90	45.3	15.3	-
Alkalinity, Carbonate	mg/L	<5.00	<5.00	-	<5.00	<5.00	-	<5.00	<5.00	<5.00	<5.00	<5.00	-
pH (lab)	SU	-	-	6.1	-	-	5.9	-	-	-	-	-	6.0 J
Total Dissolved Solids	mg/L	22.0	32.0	28.0	28.0	26.0	26.0	44.0 J	40.0	30.0	33.0	32.0	35.0

See notes on last page.

Table H.1-10- Groundwater Analytical Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		JOF-101										
Sample Date		2-Apr-19	8-Jul-19	17-Sep-19	9-Oct-19	21-Jan-20	4-Mar-20	21-Jul-20	9-Sep-20	9-Feb-21	16-Mar-21	27-Jul-21
Sample ID		JOF-GW-013-04022019	JOF-GW-013-07082019	JOF-GW-013-09172019	JOF-GW-013-10092019	JOF-GW-013-01212020	JOF-GW-013-03042020	JOF-GW-013-07212020	JOF-GW-013-09092020	JOF-GW-JOF-101-02092021	JOF-GW-JOF-101-03162021	JOF-GW-FD03-07272021
Parent Sample ID												JOF-GW-JOF-101-07272021
Sample Depth		52 ft	52 ft	52 ft	52 ft	52 ft	52 ft	52 ft	52 ft	52 ft	52 ft	52 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample
Program	Units	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	State Compliance	State Compliance	CCR Program	CCR Program	CCR Program
Total Metals												
Antimony	ug/L	<0.378	<0.378	<0.378	<0.378	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
Arsenic	ug/L	<0.323	<0.323	<0.323	<0.323	<2.00	2.30 U*	<2.00	<2.00	<2.00	2.24 J	<2.00
Barium	ug/L	7.05 J	4.4 J	4.57 J	5.24 U*	5.67	6.33	4.92	4.80	5.55	4.94	4.79
Beryllium	ug/L	<0.155	<0.155	<0.182	<0.182	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200
Boron	ug/L	<30.3	<30.3	<38.6	<38.6	<5.20	7.02 J	<5.20	<5.20	<5.20	<5.20	<5.20
Cadmium	ug/L	<0.125	<0.125	<0.125	<0.125	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300
Calcium	ug/L	3,500	3,590	3,110	3,730	3,680	3,540	3,650	3,430	3,660	3,560	3,330
Chromium	ug/L	<1.53	<1.53	<1.53	1.72 U*	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00
Cobalt	ug/L	0.612	0.609 U*	0.560	0.236 J	0.324 J	1.29	<0.300	<0.300	0.979 J	<0.300	<0.300
Copper	ug/L	<0.627	<0.627	1.84 U*	<0.627	<0.300	0.674 J	0.347 J	<0.300	<0.300	<0.300	<0.300
Lead	ug/L	0.171 J	<0.128	<0.128	<0.128	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500
Lithium	ug/L	<3.14	<3.14	<3.39	6.52	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00
Magnesium	ug/L	1,690	1,680	1,500	1,650	1,540	1,650	1,590	1,620	1,920 J	1,750	1,570
Mercury	ug/L	<0.101	<0.101	<0.101	<0.101	<0.0670	<0.0670	<0.0670	<0.0670	<0.0670	<0.0670	0.0990 U*
Molybdenum	ug/L	<0.61	<0.61	<0.610	<0.610	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200
Nickel	ug/L	0.413 J	0.582 U*	0.518 J	<0.336	0.630 J	0.789 J	<0.600	<0.600	<0.600	<0.600	<0.600
Potassium	ug/L	169 J	153 J	<156	<156	155 J	<80.0	125 J	123 J	165 J	160 J	127 J
Selenium	ug/L	<2.62	<2.62	<1.51	<1.51	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
Silver	ug/L	<0.121	<0.121	<0.177	<0.177	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300
Sodium	ug/L	3,720	4,190	3,210	4,300	3,630	3,540	3,370	3,590	3,970	3,830	3,430
Thallium	ug/L	<0.128	<0.128	<0.148	<0.148	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600
Vanadium	ug/L	1.40 U*	<0.899	1.10 U*	<0.991	8.10 U*	<3.30	<3.30	<3.30	<3.30	11.3 U*	<3.30
Zinc	ug/L	5.69	3.33 J	<3.22	<3.22	3.49 U*	32.0	5.31 U*	<3.30	<3.30	<3.30	4.96 J
Radiological Parameters												
Radium-226	pCi/L	0.109 +/-(0.0732)J	0.0310 +/-(0.0622)U	0.351 +/-(0.426)U	-0.0556 +/-(0.309)U	0.999 +/-(0.691)	0.457 +/-(0.557)U	0.0693 +/-(0.425)U	0.0605 +/-(0.500)U	-0.0354 +/-(0.165)U	0.215 +/-(0.259)U	0.279 +/-(0.340)U
Radium-228	pCi/L	0.0716 +/-(0.167)U	0.280 +/-(0.233)U	-0.13 +/-(0.245)U	0.121 +/-(0.372)U	0.156 +/-(0.283)U	0.208 +/-(0.252)U	0.211 +/-(0.333)U	0.238 +/-(0.356)U	0.161 +/-(0.404)U	-0.0939 +/-(0.204)U	-0.165 +/-(0.438)U
Radium-226+228	pCi/L	0.180 +/-(0.182)J	0.311 +/-(0.241)U	0.351 +/-(0.491)U	0.121 +/-(0.484)U	1.16 +/-(0.747)J	0.665 +/-(0.611)U	0.280 +/-(0.540)U	0.298 +/-(0.614)U	0.161 +/-(0.437)U	0.215 +/-(0.330)U	0.279 +/-(0.554)U
Anions												
Chloride	mg/L	3.60	3.98	4.29	4.46	4.42	4.53	4.71	4.41	4.58	4.62	4.79
Fluoride	mg/L	0.0317 J	0.0319 J	0.0348 J	0.0451 U*	<0.0330	<0.0330	<0.0330	<0.0330	0.0436 J	0.0803 J	<0.0330
Sulfate	mg/L	0.790 U*	0.879 J	1.44 U*	0.826 J	0.721	0.710	0.704	0.715	0.677	0.691	0.766
General Chemistry												
Alkalinity, Bicarbonate	mg/L	10.0	32.5	32.4	35.6	16.0	15.7	14.7	16.0	13.9 J	14.4	16.3
Alkalinity, Carbonate	mg/L	<5.00	<5.00	<5.00	<5.00	<1.45	<1.45	<1.45	<1.45	0.725 UJ	<0.725	<1.45
pH (lab)	SU	-	-	-	6.1 J	-	6.17 J	-	-	-	6.11 J	-
Total Dissolved Solids	mg/L	27.0 J	33.0 J	37.0 J	29.0	50.0 J	42.9	17.1	48.6	41.4 J	40.0 J	25.7

See notes on last page.

Stantec

Table H.1-10- Groundwater Analytical Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		JOF-101							
Sample Date		27-Jul-21	14-Sep-21	14-Sep-21	1-Feb-22	15-Mar-22	2-Aug-22	13-Sep-22	7-Feb-23
Sample ID		JOF-GW-JOF-101-07272021	JOF-GW-FD02-09142021	JOF-GW-JOF-101-09142021	JOF-GW-JOF-101-02012022	JOF-GW-JOF-101-03152022	JOF-GW-JOF-101-08022022	JOF-GW-JOF-101-09132022	JOF-GW-JOF-101-02072023
Parent Sample ID			JOF-GW-JOF-101-09142021						
Sample Depth		52 ft	52 ft	52 ft	52 ft	52 ft	52 ft	52 ft	52 ft
Sample Type		Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	
Total Metals									
Antimony	ug/L	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
Arsenic	ug/L	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
Barium	ug/L	4.82	4.71	4.86	4.87	4.60	4.93	4.58	4.65
Beryllium	ug/L	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200
Boron	ug/L	<5.20	<5.20	<5.20	<5.20	<5.20	<5.20	<5.20	<5.20
Cadmium	ug/L	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300
Calcium	ug/L	3,260	3,340	3,460	3,560	3,640	3,370	3,430	3,500
Chromium	ug/L	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00
Cobalt	ug/L	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300
Copper	ug/L	0.422 J	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300
Lead	ug/L	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500
Lithium	ug/L	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00
Magnesium	ug/L	1,520	1,620	1,730	1,670	1,670	1,600	1,590	1,670
Mercury	ug/L	0.107 U*	<0.0670	<0.0670	<0.0670	<0.0670	<0.0670	<0.0670	<0.0670
Molybdenum	ug/L	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200
Nickel	ug/L	<0.600	<0.600	<0.600	<0.600	1.02 U*	<0.600	<0.600	<0.600
Potassium	ug/L	134 J	124 J	132 J	129 J	120 J	130 J	123 J	109 J
Selenium	ug/L	<2.00	<2.00	<2.00	<1.50	<1.50	<1.50	<1.50	<1.50
Silver	ug/L	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300
Sodium	ug/L	3,360	3,380	3,610	3,570	3,480	3,360	3,100	3,470
Thallium	ug/L	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600
Vanadium	ug/L	<3.30	<3.30	<3.30	<3.30	<3.30	<3.30	<3.30	<3.30
Zinc	ug/L	5.87 J	5.94 J	6.08 J	<3.30	<3.30	5.40 U*	3.92 J	3.95 J
Radiological Parameters									
Radium-226	pCi/L	0.109 +/-(0.266)U	-0.251 +/-(0.306)U	0.0495 +/-(0.416)U	0.147 +/-(0.289)U	0.817 +/-(0.643)	0.192 +/-(0.490)U	0.452 +/-(0.647)U	0.115 +/-(0.280)U
Radium-228	pCi/L	0.235 +/-(0.319)U	0.235 +/-(0.337)U	0.134 +/-(0.292)U	0.212 +/-(0.415)U	0.882 +/-(0.504)U*	0.719 +/-(0.478)	0.472 +/-(0.735)U	1.08 +/-(0.587)U*
Radium-226+228	pCi/L	0.345 +/-(0.415)U	0.235 +/-(0.455)U	0.184 +/-(0.508)U	0.359 +/-(0.506)U	1.70 +/-(0.817)J	0.910 +/-(0.685)J	0.924 +/-(0.979)U	1.20 +/-(0.650)U*
Anions									
Chloride	mg/L	4.79	4.32	4.32	4.51	4.71	4.72	4.60	4.73
Fluoride	mg/L	<0.0330	0.0973 J	0.0970 J	<0.0330	<0.0330	0.0538 J	0.0344 J	<0.0330
Sulfate	mg/L	0.777	0.698	0.707	0.683	0.685	0.746	0.636	0.680
General Chemistry									
Alkalinity, Bicarbonate	mg/L	16.5	16.5	16.1	16.6	16.0 J	32.2	15.6	14.2 J
Alkalinity, Carbonate	mg/L	<1.45	<1.45	<1.45	<1.45	<1.45	<0.725	<1.45	0.725 UR
pH (lab)	SU	-	6.32 J	5.88 J	6.00 J	-	5.96 J	-	6.27 J
Total Dissolved Solids	mg/L	34.3	17.1	17.1	40.0	37.1 J	20.0 J	18.0	20.0

See notes on last page.

Table H.1-10- Groundwater Analytical Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		JOF-102											
Sample Date		14-Mar-17	12-Jun-17	18-Sep-17	11-Dec-17	13-Mar-18	11-Jun-18	11-Sep-18	11-Dec-18	12-Mar-19	10-Sep-19	3-Mar-20	15-Sep-20
Sample ID		JOF-102	JOF-102	JOF-102	JOF-102-1217	JOF-102-0318	JOF-102-0618	JOF-102-09112018	JOF-102	JOF-102	JOF-102-0919	JOF-102-0320	JOF-102-0920
Parent Sample ID													
Sample Depth		32 ft	32 ft	32 ft	32 ft	32 ft	32 ft	32 ft	32 ft	32 ft	32 ft	32 ft	32 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance
Total Metals													
Antimony	ug/L	<2	-	<2	-	<2	-	<2	-	<0.378	<0.378	<1.00	<1.00
Arsenic	ug/L	<1	-	<1	-	<1	-	<1	-	1.04	<0.323	2.24 J	<2.00
Barium	ug/L	24.4	-	26.3	-	29.1	-	25.6	-	23.2	33.5	28.2	26.7
Beryllium	ug/L	<1	-	<1	-	<1	-	<1	-	<0.155	<0.182	<0.200	<0.200
Boron	ug/L	1,090	1,040	1,110	1,030	1,010	870	979	993	712	920	601 U*	806
Cadmium	ug/L	<1	-	<1	-	<1	-	<1	-	0.133 J	0.192 J	<0.300	<0.300
Calcium	ug/L	20,900	18,700	21,100	20,900	22,800	19,800	18,400	19,000	18,000	19,900	21,600	17,600
Chromium	ug/L	<2	-	<2	-	<2	-	2.14	-	<1.53	2.43 U*	<3.00	<3.00
Cobalt	ug/L	<0.5	-	<0.5	-	<0.5	-	<0.5	-	0.219 U*	0.142 J	<0.300	<0.300
Copper	ug/L	<2	-	2.86	-	<2	-	<2	-	<0.627	<0.627	0.468 J	0.421 J
Lead	ug/L	<1	-	<1	-	<1	-	<1	-	<0.128	0.194 J	<0.500	<0.500
Lithium	ug/L	<5	<5	<5	<5	<5	<5	<5	<5	3.37 J	4.52 J	<3.00	<3.00
Magnesium	ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Mercury	ug/L	<0.2	-	<0.2	-	<0.2	-	<0.2	-	<0.101	<0.101	<0.0670	<0.0670
Molybdenum	ug/L	<5	<5	<5	<5	<5	<5	<5	<5	1.2 J	<0.610	0.775 J	<0.200
Nickel	ug/L	7.87	-	6.8	-	6.72	-	5.79	-	6.58	6.70	5.73	6.64
Potassium	ug/L	958	-	1,080	-	-	-	-	-	-	-	-	-
Selenium	ug/L	<5	-	<5	-	<5	-	<5	-	<2.62	<1.51	<2.00	<2.00
Silver	ug/L	<1	-	<1	-	<1	-	<1	-	<0.121	<0.177	<0.300	<0.300
Sodium	ug/L	20,600	-	21,200	-	-	-	-	-	-	-	-	-
Thallium	ug/L	<1	-	<1	-	<1	-	<1	-	<0.128	<0.148	<0.600	<0.600
Vanadium	ug/L	<1	-	<1	-	3.32	-	2.45 U*	-	<0.899	1.78 U*	<3.30	<3.30
Zinc	ug/L	49.2	-	32.4	-	29.9	-	28.2 U*	-	27.8	39.1	28.6	30.6
Radiological Parameters													
Radium-226	pCi/L	0.240 +/-(0.0992)	0.207 +/-(0.0829)	0.165 +/-(0.0741)	0.199 +/-(0.0833)	0.190 +/-(0.0835)	0.182 +/-(0.141)	0.238 +/-(0.0855)U*	0.171 +/-(0.0850)U*	0.144 +/-(0.0705)	0.749 +/-(0.598)	0.415 +/-(0.492)U	0.589 +/-(0.612)U
Radium-228	pCi/L	0.277 +/-(0.248)U	0.217 +/-(0.193)U	0.335 +/-(0.226)U	0.310 +/-(0.228)U	0.0867 +/-(0.200)U	0.0138 +/-(0.227)	0.176 +/-(0.212)U	0.318 +/-(0.229)U	0.265 +/-(0.248)U	-0.445 +/-(0.360)U	0.216 +/-(0.263)U	0.0192 +/-(0.241)U
Radium-226+228	pCi/L	-	-	-	-	-	-	-	-	-	0.749 +/-(0.698)J	0.631 +/-(0.558)U	0.608 +/-(0.657)U
Anions													
Chloride	mg/L	15.0	13.6	13.0	14.5	13.4	15.1	13.2	14.1	12.4	14.1	12.4	13.7
Fluoride	mg/L	<0.100	-	<0.100	-	<0.100	-	<0.100	-	0.0703 J	0.0422 J	0.111	0.0493 J
Sulfate	mg/L	95.9	96.4	95.8	95.2	96.4	99.6	73.5	81.9	92.9 J	76.2	85.8	78.6
General Chemistry													
Alkalinity, Bicarbonate	mg/L	-	-	-	-	-	-	-	-	-	-	-	-
Alkalinity, Carbonate	mg/L	-	-	-	-	-	-	-	-	-	-	-	-
pH (lab)	SU	5.2	-	5.7	-	5.5	-	5.2 J	-	5.9 J	6.1 J	5.78 J	5.18 J
Total Dissolved Solids	mg/L	176	182	184	171	181	177	180	103	194	156	181	167

See notes on last page.

Table H.1-10- Groundwater Analytical Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		JOF-102						JOF-103					
Sample Date		15-Mar-21	14-Sep-21	8-Feb-22	2-Aug-22	7-Feb-23	7-Feb-23	3-Nov-16	4-Jan-17	4-Jan-17	17-Jan-17	15-Feb-17	15-Mar-17
Sample ID		JOF-GW-JOF-102-03152021	JOF-GW-JOF-102-09142021	JOF-GW-JOF-102-02082022	JOF-GW-JOF-102-08022022	JOF-GW-FD01-02072023	JOF-GW-JOF-102-02072023	JOF-GW-015-11032016	JOF-GW-015-01042017	JOF-GW-903-01042017	JOF-GW-015-01172017	JOF-GW-015-02152017	JOF-GW-015-03152017
Parent Sample ID						JOF-GW-JOF-102-02072023				JOF-GW-015-01042017			
Sample Depth		32 ft	32 ft	32 ft	32 ft	32 ft	32 ft	50.5 ft	50.5 ft	50.5 ft	50.5 ft	50.5 ft	50.5 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	State Compliance	State Compliance	State Compliance	State Compliance			CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program
Total Metals													
Antimony	ug/L	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	0.041 U*	0.653 U*	0.648 U*	<0.443	<0.443	0.845 J
Arsenic	ug/L	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	0.686 J	0.813 U*	0.781 U*	0.63 J	0.756 J	0.656 J
Barium	ug/L	29.8	27.0	25.7	28.8	29.3	28.6	33	34.7 U*	34.9 U*	42 J	35.5	31.4
Beryllium	ug/L	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	0.353 J	0.227 J	0.216 J	0.283 U*	0.311 J	<0.131
Boron	ug/L	881	764	808	819	915	922	8,510	7,370	7,610	8,600 J	9,380	8,540
Cadmium	ug/L	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	5.62	11.1	11.7	5.85	4.34 J	3.94
Calcium	ug/L	20,900	15,900	24,100	18,000	21,600	21,700	64,200 J	68,400 J	71,000 J	63,700	62,100	60,900
Chromium	ug/L	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<0.339	<0.339	<0.339	<0.378	<0.378	<0.378
Cobalt	ug/L	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	52.6	67.7	69.5	65.4	61.2	58.2
Copper	ug/L	0.453 J	0.378 J	0.669 J	0.319 J	0.379 J	<0.300	1.16 J	1.55 U*	1.78 U*	<1.04	1.53 U*	<1.04
Lead	ug/L	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	0.121 U*	0.146 U*	0.138 U*	<0.318	<0.318	<0.318
Lithium	ug/L	<3.00	<3.00	3.58 J	<3.00	3.04 J	<3.00	10.7 J	15 U*	17.6 U*	12.6 U*	12.6 U*	10.3
Magnesium	ug/L	-	-	-	-	-	-	14,900 J	15,700	16,200	14,500	13,400	13,300
Mercury	ug/L	<0.0670	<0.0670	<0.0670	<0.0670	<0.0670	<0.0670	<0.0521	<0.0521	<0.0521	<0.0521	<0.0521	<0.0653
Molybdenum	ug/L	0.273 U*	<0.200	0.302 U*	<0.200	0.457 U*	0.224 U*	<0.873	<0.873	<0.873	<0.593	<0.593	0.749 J
Nickel	ug/L	6.35	5.51	5.27	6.36	5.92	5.61	117	143 J	147 J	136	125	130
Potassium	ug/L	-	-	-	-	-	-	1,190	1,300	1,320	1,180	1,260	1,180
Selenium	ug/L	<2.00	<2.00	<1.50	<1.50	<1.50	<1.50	<0.348	0.399 U*	0.734 U*	<1.27	<1.27	<1.27
Silver	ug/L	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	-	-	-	-	-	-
Sodium	ug/L	-	-	-	-	-	-	20,200 J	20,600	21,300	20,100	16,800	19,300
Thallium	ug/L	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	0.045 U*	<0.036	<0.036	<0.0531	0.078 U*	<0.0531
Vanadium	ug/L	<3.30	<3.30	<3.30	<3.30	3.63 U*	6.06 U*	-	-	-	-	-	-
Zinc	ug/L	31.0	34.5 U*	27.1	33.0	30.5	29.4	-	-	-	-	-	-
Radiological Parameters													
Radium-226	pCi/L	0.389 +/-(0.357)U	0.256 +/-(0.379)U	0.119 +/-(0.360)U	0.275 +/-(0.387)U	0.931 +/-(0.605)	0.311 +/-(0.351)U	0.240 +/-(0.36)U	-0.3160 +/-(0.27)U	0.196 +/-(0.44)U	0.123 +/-(0.31)U	-0.0163 +/-(0.20)U	0.179 +/-(0.42)U
Radium-228	pCi/L	1.35 +/-(0.696)U*	0.403 +/-(0.328)U	0.230 +/-(0.289)U	0.0649 +/-(0.474)U	0.141 +/-(0.369)U	0.484 +/-(0.416)U	-0.0281 +/-(0.23)U	0.500 +/-(0.38)U	0.891 +/-(0.57)U	0.383 +/-(0.28)U	0.156 +/-(0.21)U	0.189 +/-(0.48)U
Radium-226+228	pCi/L	1.74 +/-(0.782)U*	0.659 +/-(0.501)U	0.349 +/-(0.462)U	0.340 +/-(0.612)U	1.07 +/-(0.709)J	0.794 +/-(0.544)U	0.240 +/-(0.43)U	0.500 +/-(0.47)U	1.09 +/-(0.72)U	0.507 +/-(0.42)U	0.156 +/-(0.29)U	0.367 +/-(0.64)U
Anions													
Chloride	mg/L	14.1	13.6	12.2	14.8	16.0	15.9	23.2	24.6	26.9	19.6	21.6	21.0
Fluoride	mg/L	0.0638 J	0.0373 J	0.0634 J	0.0493 J	0.0720 J	0.0701 J	0.578	0.559	0.573	0.571	0.571	0.654
Sulfate	mg/L	82.8	79.8	86.6	71.7	79.1	78.8	199	224	199	206	228	196
General Chemistry													
Alkalinity, Bicarbonate	mg/L	-	-	-	-	-	-	15.4	26.4 J	24.4 J	28.3	28.3	11.5
Alkalinity, Carbonate	mg/L	-	-	-	-	-	-	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00
pH (lab)	SU	5.21 J	5.28 J	5.67 J	5.27 J	5.77 J	5.75 J	-	-	-	-	-	-
Total Dissolved Solids	mg/L	163	139	210	133	147	146	447	359	356	412	460	426

See notes on last page.

Stantec

Table H.1-10- Groundwater Analytical Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		JOF-103											
Sample Date		12-Apr-17	17-May-17	7-Jun-17	11-Jul-17	2-Aug-17	20-Sep-17	20-Sep-17	6-Oct-17	15-Mar-18	24-May-18	13-Jun-18	26-Jun-18
Sample ID		JOF-GW-015-04122017	JOF-GW-015-05172017	JOF-GW-015-06072017	JOF-GW-015-07112017	JOF-GW-015-08022017	JOF-103	JOF-GW-015-09202017	JOF-GW-015-10062017	JOF-103-0318	JOF-GW-015-05242018	JOF-GW-015-06132018	JOF-GW-015-06262018
Parent Sample ID													
Sample Depth		50.5 ft	50.5 ft	50.5 ft	50.5 ft	50.5 ft	50.5 ft	50.5 ft	50.5 ft	50.5 ft	50.5 ft	50.5 ft	50.5 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	State Compliance	CCR Program	CCR Program	State Compliance	CCR Program	CCR Program	CCR Program
Total Metals													
Antimony	ug/L	1.76 U*	<0.443	1.85 J	2.1 U*	0.548 J	<2	0.82 U*	-	<2	<1.12	<1.12	<1.12
Arsenic	ug/L	0.729 J	0.489 J	0.657 J	0.726 J	0.676 U*	<1	0.679 J	-	<1	0.655 J	0.675 J	0.656 U*
Barium	ug/L	28.5	30.7	28.6	28.7	30.8	28.4	28	-	36.6	28.7	29.9	30.4
Beryllium	ug/L	0.197 J	0.19 J	0.147 J	0.319 J	0.258 J	<1	0.188 J	-	<1	0.259 J	0.257 J	0.162 J
Boron	ug/L	6,870	7,720	7,480	5,930	6,670	7,110	9,660	6,810	7,620	7,070	7,340	6,120
Cadmium	ug/L	3.71	5.46	3.99	3.48	3.06	3.14	2.9	-	3.16	3.37	2.92	3.13
Calcium	ug/L	60,400	59,300	60,100	59,000	64,400	62,200	60,500	58,400	65,800	57,800	60,400	64,500
Chromium	ug/L	<0.378	0.378 UJ	<0.378	0.523 J	<0.378	<2	<0.378	-	<2	1.52 U*	1.84 U*	1.84 U*
Cobalt	ug/L	57.8	47.5	51.2	51.3	67.9	56.3	50.5	-	58.1	52.5	58	53.6
Copper	ug/L	1.46 U*	<1.04	<1.04	<1.04	1.74 U*	<2	<1.04	-	<2	<1.3	<1.3	<1.3
Lead	ug/L	<0.318	<0.318	0.457 J	<0.318	<0.318	<1	<0.318	-	<1	0.098 J	<0.094	<0.094
Lithium	ug/L	106	11.9	10.1	13.6 U*	12.6 U*	10.2	10.1	-	12.4	11.3	11.4 U*	8.88
Magnesium	ug/L	13,600	15,200	14,300	13,600	15,200	-	13,800	14,000	-	13,600	13,900	14,500
Mercury	ug/L	<0.0653	<0.0653	<0.0653	<0.0653	<0.0653	<0.2	0.0693 J	-	<0.2	<0.0653	<0.0653	<0.0653
Molybdenum	ug/L	0.805 J	<0.593	0.791 J	<0.593	<0.593	<5	<0.593	-	<5	<0.474	<0.474	<0.474
Nickel	ug/L	127	106 J	108	109	119	108	108	-	114	109	111	116
Potassium	ug/L	1,080	1,170	1,120	992	1,100	1,110	1,130	1,070	-	955	1,060	985
Selenium	ug/L	<1.27	<1.27	<1.27	<1.27	<1.27	<5	<1.27	-	<5	<0.813	<0.813	<0.813
Silver	ug/L	-	-	-	-	-	<1	-	-	<1	-	-	-
Sodium	ug/L	18,100	20,900	20,600	19,600	21,200	20,300	19,300	16,900	-	19,000	19,100	19,400
Thallium	ug/L	<0.0531	<0.0531	0.101 J	<0.0531	<0.0531	<1	<0.0531	-	<1	<0.063	<0.063	<0.063
Vanadium	ug/L	-	-	-	-	-	<1	-	-	1.98	-	-	-
Zinc	ug/L	-	-	-	-	-	94.4	-	-	96.5	-	-	-
Radiological Parameters													
Radium-226	pCi/L	0.310 +/-(0.44)U	0.0864 +/-(0.19)U	0.0574 +/-(0.19)U	0.0618 +/-(0.26)U	-0.0924 +/-(0.27)U	0.113 +/-(0.0671)	-0.0676 +/-(0.33)U	-	0.104 +/-(0.0583)	0.0611 +/-(0.0599)U	0.101 +/-(0.0629)	0.0692 +/-(0.0820)UJ
Radium-228	pCi/L	0.355 +/-(0.24)UJ	0.274 +/-(0.33)U	0.198 +/-(0.39)U	0.304 +/-(0.69)U	0.796 +/-(0.53)U	0.253 +/-(0.209)U	0.437 +/-(0.61)U	-	0.0393 +/-(0.180)U	0.247 +/-(0.220)U	0.225 +/-(0.214)U	0.146 +/-(0.184)U
Radium-226+228	pCi/L	0.665 +/-(0.50)UJ	0.360 +/-(0.38)U	0.255 +/-(0.43)U	0.365 +/-(0.74)U	0.796 +/-(0.60)U	-	0.437 +/-(0.69)U	-	-	0.308 +/-(0.228)U	0.325 +/-(0.223)J	0.215 +/-(0.201)UJ
Anions													
Chloride	mg/L	29.9	26.4	30.3	31.9	30.3	35.3	35.1	27.5	29.6	28.1	29.7	30.9
Fluoride	mg/L	0.614	0.563	0.543	0.718	0.663	0.507	0.530	0.564	0.613	0.589	0.843	0.551
Sulfate	mg/L	224	201	198	219	199	196	207	195	199	202	196	195
General Chemistry													
Alkalinity, Bicarbonate	mg/L	15.1	10.5	21.9	11.8	14.7	-	8.87	10.8	-	5.50	9.00	9.90
Alkalinity, Carbonate	mg/L	<5.00	<5.00	<5.00	<5.00	<5.00	-	<5.00	<5.00	-	<5.00	<5.00	<5.00
pH (lab)	SU	-	-	-	-	-	5.4	-	-	5.7	-	-	-
Total Dissolved Solids	mg/L	426	441	443	430	411	433	428	431	421	437	460	427

See notes on last page.

Stantec

Sample Location		JOF-103												
Sample Date		25-Jul-18	14-Aug-18	12-Sep-18	3-Apr-19	9-Jul-19	18-Sep-19	18-Sep-19	10-Oct-19	23-Jan-20	23-Jan-20	5-Mar-20	23-Jul-20	23-Jul-20
Sample ID		JOF-GW-015-07252018	JOF-GW-015-08142018	JOF-103-09122018	JOF-GW-015-04032019	JOF-GW-015-07092019	JOF-GW-015-09182019	JOF-GW-903-09182019	JOF-GW-015-10102019	JOF-GW-015-01232020	JOF-GW-903-01232020	JOF-GW-015-03052020	JOF-GW-015-07232020	JOF-GW-903-07232020
Parent Sample ID								JOF-GW-015-09182019			JOF-GW-015-01232020			JOF-GW-015-07232020
Sample Depth		50.5 ft	50.5 ft	50.5 ft	50.5 ft	50.5 ft	50.5 ft	50.5 ft	50.5 ft	50.5 ft	50.5 ft	50.5 ft	50.5 ft	50.5 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample
Program	Units	CCR Program	CCR Program	State Compliance	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	State Compliance	State Compliance
Total Metals														
Antimony	ug/L	<1.12	<1.12	<2	<0.378	0.58 J	0.435 J	<0.378	<0.378	<1.00	<1.00	<1.00	<1.00	<1.00
Arsenic	ug/L	<0.323	0.541 U*	<1	0.573 J	2.78	0.606 J	0.541 J	0.526 J	<2.00	2.02 J	2.80 U*	<2.00	<2.00
Barium	ug/L	27.8	30.3	28.5	32.4	30.4 U*	28.3	27.4	33.9	28.6	29.8	32.0	29.8	29.8
Beryllium	ug/L	0.247 U*	0.184 J	<1	0.16 J	1.36 U*	0.627 J	0.327 J	0.220 J	0.281 J	0.269 J	<1.00	0.211 J	0.259 J
Boron	ug/L	6,640	7,410	7,210	7,000	6,370	6,860	6,980	6,650	8,760	8,250	8,200	8,090	8,210
Cadmium	ug/L	2.5	2.82	2.69	2.8	3.71	2.30	2.18	2.76	3.07	3.28	2.76	2.56	2.37
Calcium	ug/L	57,400	59,100	58,600	61,600	65,600	56,400	56,200	63,100	63,800	67,700	59,900	66,300	64,200
Chromium	ug/L	<0.631	1.3 U*	<2	1.95 U*	<1.53	<1.53	<1.53	<1.53	<3.00	<3.00	<15.0	<3.00	<3.00
Cobalt	ug/L	45.7	57.5	49.8	61.9	59.8	51.5	50.3	52.7	55.9	58.4	59.6	52.4	52.0
Copper	ug/L	<1.3	<1.3	<2	0.952 J	1.77 U*	1.51 U*	1.80 U*	<0.627	1.28 J	1.20 J	<1.50	0.621 J	0.607 J
Lead	ug/L	<0.094	<0.094	<1	<0.128	1.2 U*	<0.128	<0.128	<0.128	<0.500	<0.500	<0.500	<0.500	<0.500
Lithium	ug/L	9.61	10.4	11.7	10.6	11.5	12.4	9.22	10.7	10.2	11.0	<15.0	10.6	10.5
Magnesium	ug/L	12,600	13,700	-	15,400	15,200	13,700	13,600	14,800	14,000	14,700	14,500	16,500	16,500
Mercury	ug/L	0.0969 U*	<0.0653	<0.2	<0.101	<0.101	<0.101	<0.101	<0.101	<0.0670	<0.0670	<0.0670	<0.0670	<0.0670
Molybdenum	ug/L	<0.474	<0.474	<5	<0.61	1.33 U*	<0.610	<0.610	<0.610	<0.200	<0.200	<0.200	<0.200	<0.200
Nickel	ug/L	99.8	123	105	120	122	111	110	119	118	123	129	118	119
Potassium	ug/L	968	1,090	-	1,230	1,280	1,150	1,100	1,260	1,060	1,120	966 J	1,170	1,180
Selenium	ug/L	<0.813	<0.813	<5	<2.62	<2.62	<1.51	<1.51	<1.51	<2.00	<2.00	<2.00	<2.00	<2.00
Silver	ug/L	-	-	<1	<0.121	<0.121	<0.177	<0.177	<0.177	<0.300	<0.300	<0.300	<0.300	<0.300
Sodium	ug/L	16,700	18,900	-	21,600	22,000	18,500	18,400	20,700	20,100	21,000	20,200	19,000	19,500
Thallium	ug/L	<0.063	<0.063	<1	<0.128	2.29 U*	1.08	<0.148	<0.148	<0.600	<0.600	<0.600	<0.600	<0.600
Vanadium	ug/L	-	-	1.69 U*	1.71 U*	1.48	1.63 U*	1.12 U*	<0.991	<3.30	<3.30	<16.5	<3.30	<3.30
Zinc	ug/L	-	-	101	102	110 U*	96.0	95.9	96.3	98.9	104	96.5	92.0	93.4
Radiological Parameters														
Radium-226	pCi/L	0.296 +/-(0.105)U*	0.220 +/-(0.0946)U*	0.296 +/-(0.0996)U*	0.115 +/-(0.0837)	-0.0295 +/-(0.0698)U	0.543 +/-(0.580)U	0.518 +/-(0.526)U	0.511 +/-(0.450)U	0.794 +/-(0.637)U	0.552 +/-(0.609)U	1.14 +/-(0.753)	0.244 +/-(0.447)U	0.174 +/-(0.373)U
Radium-228	pCi/L	0.236 +/-(0.220)U	0.197 +/-(0.201)U	-0.0182 +/-(0.197)U	-0.0528 +/-(0.208)U	0.130 +/-(0.281)U	0.504 +/-(0.455)U	0.223 +/-(0.364)U	-0.189 +/-(0.463)U	0.421 +/-(0.329)U	0.396 +/-(0.349)U	0.356 +/-(0.351)U	0.101 +/-(0.245)U	-0.0338 +/-(0.274)U
Radium-226+228	pCi/L	0.532 +/-(0.244)U*	0.416 +/-(0.222)U*	-	0.115 +/-(0.224)J	0.130 +/-(0.290)U	1.05 +/-(0.737)U	0.740 +/-(0.640)U	0.511 +/-(0.646)U	1.22 +/-(0.717)U	0.948 +/-(0.702)U	1.49 +/-(0.831)J	0.345 +/-(0.510)U	0.174 +/-(0.462)U
Anions														
Chloride	mg/L	31.7	31.3	26.1	30.1	32.1	31.5	32.3	29.1	29.2	28.8	29.6	31.5	30.6
Fluoride	mg/L	0.510	0.497	0.514	0.529	0.607	0.569	0.616	0.508	0.679	0.682	0.745	0.793	0.793
Sulfate	mg/L	210	228	165	195 J	198	219	220	192	203	202	211	231	220
General Chemistry														
Alkalinity, Bicarbonate	mg/L	9.85	<5.00	-	7.00	11.8	11.3	11.5	11.7	11.8	12.6	10.8	11.0	11.2
Alkalinity, Carbonate	mg/L	<5.00	<5.00	-	<5.00	<5.00	<5.00	<5.00	<5.00	<1.45	<1.45	<1.45	<1.45	<1.45
pH (lab)	SU	-	-	5.3 J	-	-	-	-	5.4 J	-	-	5.26 J	-	-
Total Dissolved Solids	mg/L	444	432	405	397	392	455	471	436	419	371	443	426	430

See notes on last page.

Table H.1-10- Groundwater Analytical Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		JOF-103										
Sample Date		9-Sep-20	9-Sep-20	10-Feb-21	18-Mar-21	29-Jul-21	16-Sep-21	2-Feb-22	15-Mar-22	15-Mar-22	4-Aug-22	14-Sep-22
Sample ID		JOF-GW-015-09092020	JOF-GW-903-09092020	JOF-GW-JOF-103-02102021	JOF-GW-JOF-103-03182021	JOF-GW-JOF-103-07292021	JOF-GW-JOF-103-09162021	JOF-GW-JOF-103-02022022	JOF-GW-FD02-03152022	JOF-GW-JOF-103-03152022	JOF-GW-JOF-103-08042022	JOF-GW-FD02-09142022
Parent Sample ID			JOF-GW-015-09092020						JOF-GW-JOF-103-03152022			JOF-GW-JOF-103-09142022
Sample Depth		50.5 ft	50.5 ft	50.5 ft	50.5 ft	50.5 ft	50.5 ft	50.5 ft	50.5 ft	50.5 ft	50.5 ft	50.5 ft
Sample Type		Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample
Program	Units	State Compliance	State Compliance	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program
Total Metals												
Antimony	ug/L	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
Arsenic	ug/L	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
Barium	ug/L	28.8	29.4	31.1	32.1	31.0	29.9	31.0	30.6	30.7	34.2	34.9
Beryllium	ug/L	0.309 J	0.300 J	0.268 J	0.304 U*	0.256 J	0.315 J	0.294 J	0.359 J	0.327 J	0.367 J	0.395 J
Boron	ug/L	8,060	8,090	7,410	7,670	7,530	7,030	7,930	7,040	7,080	7,430	7,730
Cadmium	ug/L	2.51	2.76	4.66	2.89	2.36	11.6	2.70	4.96	5.01	3.13	10.8
Calcium	ug/L	61,300	61,600	63,200	65,700	61,000	62,200	66,300	66,900	66,800	63,200	66,400
Chromium	ug/L	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00
Cobalt	ug/L	53.5	55.1	56.8	58.4	48.7	49.9	50.9	53.2	53.5	43.5	43.9
Copper	ug/L	0.615 J	0.571 J	1.49 J	0.656 U*	0.676 J	2.49	0.553 J	1.24 J	1.15 J	0.650 J	1.59 J
Lead	ug/L	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500
Lithium	ug/L	10.7	11.1	11.0	11.0	10.0	10.8	10.6	11.1	11.2	11.9	10.5
Magnesium	ug/L	15,500	15,700	15,300 J	16,800 J	14,200	14,600	15,700	15,500	15,700	15,400	14,700
Mercury	ug/L	<0.0670	<0.0670	<0.0670	<0.0670	0.0950 U*	<0.0670	<0.0670	<0.0670	<0.0670	<0.0670	<0.0670
Molybdenum	ug/L	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200
Nickel	ug/L	120	123	127	137	110	114	124	118	120	117	116
Potassium	ug/L	1,130	1,160	1,440	1,460	1,160	1,190	1,390	1,210	1,220	1,480	1,320
Selenium	ug/L	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<1.50	<1.50	<1.50	<1.50	<1.50
Silver	ug/L	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300
Sodium	ug/L	20,500	20,900	21,600	23,800	20,300	21,600	21,300	21,600	21,800	23,000	21,000
Thallium	ug/L	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600
Vanadium	ug/L	<3.30	<3.30	<3.30	<3.30	<3.30	<3.30	<3.30	<3.30	<3.30	<3.30	<3.30
Zinc	ug/L	94.8	97.3	100	97.0	85.5	90.7	90.1	92.3	92.2	92.2	84.5
Radiological Parameters												
Radium-226	pCi/L	0.748 +/-(0.637)U	0.596 +/-(0.605)U	0.659 +/-(0.506)	0.328 +/-(0.289)U	-0.00384 +/-(0.392)U	0.00114 +/-(0.263)U	0.110 +/-(0.399)U	0.626 +/-(0.535)U	0.270 +/-(0.433)U	-0.0420 +/-(0.233)U	0.706 +/-(0.666)U
Radium-228	pCi/L	-0.0318 +/-(0.186)U	0.0834 +/-(0.216)U	0.126 +/-(0.282)U	0.170 +/-(0.269)U	0.144 +/-(0.414)U	0.466 +/-(0.348)U	0.173 +/-(0.341)U	1.12 +/-(0.575)U*	0.348 +/-(0.411)UJ	-0.576 +/-(0.351)U	0.279 +/-(0.346)U
Radium-226+228	pCi/L	0.748 +/-(0.663)U	0.679 +/-(0.643)U	0.785 +/-(0.579)J	0.498 +/-(0.395)U	0.144 +/-(0.571)U	0.467 +/-(0.437)U	0.283 +/-(0.525)U	1.75 +/-(0.786)U*	0.618 +/-(0.597)UJ	0.000 +/-(0.421)U	0.985 +/-(0.751)U
Anions												
Chloride	mg/L	30.2	30.3	31.8	29.8	30.6	31.9	29.3	30.3	30.3	31.4	31.1
Fluoride	mg/L	0.700	0.730	0.678	0.619	0.861	0.739	0.602	0.662	0.650	0.778	0.649
Sulfate	mg/L	216	218	226	218	220	219	220	218	218	228	222
General Chemistry												
Alkalinity, Bicarbonate	mg/L	10.6	10.2	6.97 J	6.17 J	18.3	14.1	11.8	13.0 J	12.0 J	17.8 J	17.4
Alkalinity, Carbonate	mg/L	<1.45	<1.45	0.725 UJ	0.725 UJ	<1.45	<1.45	<1.45	<1.45	<1.45	<1.45	<1.45
pH (lab)	SU	-	-	-	-	-	-	-	-	-	-	-
Total Dissolved Solids	mg/L	410	416	460	471	423	433	457	416	426	439	443

See notes on last page.

Stantec

Table H.1-10- Groundwater Analytical Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		JOF-103		JOF-104							
Sample Date		14-Sep-22	7-Feb-23	3-Nov-16	5-Jan-17	18-Jan-17	16-Feb-17	15-Mar-17	12-Apr-17	17-May-17	17-May-17
Sample ID		JOF-GW-JOF-103-09142022	JOF-GW-JOF-103-02072023	JOF-GW-016-11032016	JOF-GW-016-01052017	JOF-GW-016-01182017	JOF-GW-016-02162017	JOF-GW-016-03152017	JOF-GW-016-04122017	JOF-GW-016-05172017	JOF-GW-903-05172017
Parent Sample ID											JOF-GW-016-05172017
Sample Depth		50.5 ft	50.5 ft	57 ft	57 ft	57 ft	57 ft	57 ft	57 ft	57 ft	57 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample
Program	Units	CCR Program		CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program
Total Metals											
Antimony	ug/L	<1.00	<1.00	0.025 U*	0.524 U*	<0.443	<0.443	<0.443	0.571 U*	<0.443	<0.443
Arsenic	ug/L	<2.00	<2.00	0.982 J	0.982 U*	0.643 J	0.964 J	0.657 J	0.784 J	0.756 J	0.856 J
Barium	ug/L	34.7	36.0	38.1	34.7	33.3	33.7	28.8	31.7	34.2	34
Beryllium	ug/L	0.331 J	0.330 J	<0.102	<0.102	<0.131	<0.131	<0.131	<0.131	<0.131	<0.131
Boron	ug/L	7,710	7,800	4,110	3,630	3,820	4,470	4,070	3,090	3,670	3,650
Cadmium	ug/L	12.7	6.54	<0.152	0.241 J	0.158 J	0.157 J	0.116 J	0.149 J	0.236 J	0.174 J
Calcium	ug/L	67,700	69,500	72,500 J	79,100 J	73,600	70,100	69,500	65,200	64,400	64,200
Chromium	ug/L	<3.00	<3.00	<0.339	<0.339	<0.378	<0.378	<0.378	<0.378	0.378 UJ	0.378 UJ
Cobalt	ug/L	45.6	48.0	1.56	2.09	1.6	1.48	1.51	2.01	1.52	1.47
Copper	ug/L	1.94 J	0.615 J	<0.454	0.725 U*	<1.04	1.45 U*	<1.04	<1.04	<1.04	<1.04
Lead	ug/L	<0.500	<0.500	<0.0675	<0.0675	<0.318	<0.318	<0.318	<0.318	<0.318	<0.318
Lithium	ug/L	10.7	11.0	4.48 U*	9.84 U*	5.72 U*	6.07 U*	4.72 J	4.45 J	4.73 J	4.96 J
Magnesium	ug/L	14,900	16,400	17,400 J	17,700	16,800	14,700	14,400	14,300	16,100	16,200
Mercury	ug/L	<0.0670	<0.0670	<0.0521	<0.0521	<0.0521	<0.0521	<0.0653	<0.0653	<0.0653	<0.0653
Molybdenum	ug/L	<0.200	<0.200	<0.873	<0.873	<0.593	<0.593	<0.593	<0.593	<0.593	<0.593
Nickel	ug/L	117	124	7.82	10.9 J	8.33	9.06	9.27	7.6	5.97 J	6.75 J
Potassium	ug/L	1,330	1,450	1,880	1,910	1,810	1,860	1,670	1,560	1,710	1,710
Selenium	ug/L	<1.50	<1.50	<0.348	0.443 U*	<1.27	<1.27	1.77 J	<1.27	<1.27	<1.27
Silver	ug/L	<0.300	<0.300	-	-	-	-	-	-	-	-
Sodium	ug/L	21,500	22,800	50,300 J	47,500	46,200	37,600	42,900	40,500	47,400	47,500
Thallium	ug/L	<0.600	<0.600	<0.036	<0.036	<0.0531	<0.0531	<0.0531	<0.0531	<0.0531	<0.0531
Vanadium	ug/L	<3.30	<3.30	-	-	-	-	-	-	-	-
Zinc	ug/L	87.0	90.1	-	-	-	-	-	-	-	-
Radiological Parameters											
Radium-226	pCi/L	-0.184 +/-(0.355)U	-0.0201 +/-(0.425)U	-0.0719 +/-(0.21)U	0.399 +/-(0.55)U	0.549 +/-(0.38)J	0.218 +/-(0.29)U	0.0118 +/-(0.37)U	0.315 +/-(0.39)U	-0.1050 +/-(0.13)U	-0.0260 +/-(0.15)U
Radium-228	pCi/L	0.755 +/-(0.555)U	0.600 +/-(0.447)U	0.383 +/-(0.27)U	0.0374 +/-(0.33)U	0.0330 +/-(0.21)U	0.109 +/-(0.24)U	0.179 +/-(0.22)U	0.267 +/-(0.22)UJ	0.321 +/-(0.31)U	0.216 +/-(0.34)U
Radium-226+228	pCi/L	0.755 +/-(0.659)U	0.600 +/-(0.617)U	0.383 +/-(0.34)U	0.436 +/-(0.64)U	0.582 +/-(0.44)J	0.327 +/-(0.38)U	0.191 +/-(0.44)U	0.582 +/-(0.45)UJ	0.321 +/-(0.33)U	0.216 +/-(0.37)U
Anions											
Chloride	mg/L	31.8	30.8	14.8	17.3	23.0	14.5	13.9	17.6	14.4	14.4
Fluoride	mg/L	0.567	0.646	0.257	0.249	0.289	0.239	0.247	0.290	0.245	0.247
Sulfate	mg/L	230	222	268	273	280	306	257	291	276	278
General Chemistry											
Alkalinity, Bicarbonate	mg/L	17.4	11.0 J	21.4	24.4 J	24.2	44.4	11.5	13.5	15.5	14.0
Alkalinity, Carbonate	mg/L	<1.45	0.725 UR	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00
pH (lab)	SU	-	-	-	-	-	-	-	-	-	-
Total Dissolved Solids	mg/L	437	431	505	495	516	506	499	489	488	491

See notes on last page.

Stantec

Table H.1-10- Groundwater Analytical Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		JOF-104											
Sample Date		6-Jun-17	11-Jul-17	2-Aug-17	20-Sep-17	20-Sep-17	6-Oct-17	15-Mar-18	24-May-18	13-Jun-18	27-Jun-18	25-Jul-18	25-Jul-18
Sample ID		JOF-GW-016-06062017	JOF-GW-016-07112017	JOF-GW-016-08022017	JOF-104	JOF-GW-016-09202017	JOF-GW-016-10062017	JOF-104-0318	JOF-GW-016-05242018	JOF-GW-016-06132018	JOF-GW-016-06272018	JOF-GW-016-07252018	JOF-GW-903-07252018
Parent Sample ID													JOF-GW-016-07252018
Sample Depth		57 ft	57 ft	57 ft	57 ft	57 ft	57 ft	57 ft	57 ft	57 ft	57 ft	57 ft	57 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample
Program	Units	CCR Program	CCR Program	CCR Program	State Compliance	CCR Program	CCR Program	State Compliance	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program
Total Metals													
Antimony	ug/L	<0.443	1.04 U*	<0.443	<2	1.51 U*	-	<2	<1.12	<1.12	<1.12	<1.12	<1.12
Arsenic	ug/L	1.07 U*	0.791 J	0.887 U*	<1	0.772 J	-	1.22	0.959 J	0.77 J	0.685 J	0.506 J	0.496 J
Barium	ug/L	31.2	32.1	31.4	28.8	29.3	-	34.8	36.3	35.7	35.9	31.2	30.8
Beryllium	ug/L	<0.131	<0.131	<0.131	<1	<0.131	-	<1	0.071 J	0.067 J	<0.057	0.067 U*	<0.057
Boron	ug/L	3,510	2,730	3,090	3,660	4,650	3,360	3,710	3,370	3,650	3,090	3,330	3,390
Cadmium	ug/L	0.144 J	0.143 J	0.194 J	<1	0.232 J	-	<1	0.199 J	0.266 J	0.263 J	0.251 J	0.306 J
Calcium	ug/L	66,100	63,800	68,000	70,000	66,200	67,200	70,800	62,600	68,600	73,000	66,100	66,200
Chromium	ug/L	<0.378	<0.378	<0.378	<2	0.455 U*	-	<2	1.41 U*	1.99 U*	1.95 U*	<0.631	<0.631
Cobalt	ug/L	1.52	1.47	1.33	0.929	1.05	-	1.9	2.55	1.71	1.5	1.09	0.985
Copper	ug/L	<1.04	<1.04	1.9 U*	<2	<1.04	-	<2	<1.3	<1.3	<1.3	<1.3	<1.3
Lead	ug/L	<0.318	<0.318	<0.318	<1	<0.318	-	<1	<0.094	<0.094	<0.094	<0.094	<0.094
Lithium	ug/L	3.41 J	4.24 U*	6.48 U*	<5	4.04 J	-	5.03	5.39	4.59 U*	2.57 J	3.88 J	3.27 J
Magnesium	ug/L	15,400	14,400	15,800	-	15,000	15,700	-	14,100	15,300	15,800	14,300	14,200
Mercury	ug/L	<0.0653	<0.0653	<0.0653	<0.2	<0.0653	-	<0.2	<0.0653	<0.0653	<0.0653	<0.0653	<0.0653
Molybdenum	ug/L	<0.593	<0.593	<0.593	<5	<0.593	-	<5	<0.474	<0.474	<0.474	<0.474	<0.474
Nickel	ug/L	8.06	5.7	5.58	5.22	5.27	-	6.34	6.22	5.71	5.66	4.57	5.25
Potassium	ug/L	1,730	1,550	1,680	1,680	1,630	1,660	-	1,500	1,670	1,600	1,510	1,510
Selenium	ug/L	<1.27	<1.27	<1.27	<5	<1.27	-	<5	<0.813	<0.813	<0.813	<0.813	<0.813
Silver	ug/L	-	-	-	<1	-	-	<1	-	-	-	-	-
Sodium	ug/L	47,100	44,400	46,300	46,900	44,000	39,700	-	41,300	44,200	44,100	40,100	39,500
Thallium	ug/L	<0.0531	<0.0531	<0.0531	<1	<0.0531	-	<1	<0.063	<0.063	<0.063	<0.063	<0.063
Vanadium	ug/L	-	-	-	<1	-	-	1.91	-	-	-	-	-
Zinc	ug/L	-	-	-	5.36	-	-	7.39	-	-	-	-	-
Radiological Parameters													
Radium-226	pCi/L	-0.0920 +/-(0.11)U	-0.1040 +/-(0.23)U	0.314 +/-(0.45)U	0.0990 +/-(0.0742)U	-0.1260 +/-(0.34)U	-	0.0825 +/-(0.0551)	0.194 +/-(0.0992)	0.0469 +/-(0.0488)U	0.0463 +/-(0.0659)UJ	0.317 +/-(0.107)U*	0.315 +/-(0.106)U*
Radium-228	pCi/L	0.133 +/-(0.39)U	0.459 +/-(0.36)U	0.364 +/-(0.23)J	0.462 +/-(0.235)	0.526 +/-(0.36)U	-	0.127 +/-(0.191)U	0.169 +/-(0.201)U	0.226 +/-(0.213)U	0.136 +/-(0.192)U	0.0272 +/-(0.170)UJ	0.408 +/-(0.214)J
Radium-226+228	pCi/L	0.133 +/-(0.40)U	0.459 +/-(0.43)U	0.678 +/-(0.51)J	-	0.526 +/-(0.49)U	-	-	0.363 +/-(0.224)J	0.272 +/-(0.219)U	0.183 +/-(0.203)UJ	0.345 +/-(0.201)U*	0.723 +/-(0.239)U*
Anions													
Chloride	mg/L	14.7	18.6	17.3	19.2	19.0	15.2	18.2	15.0	15.5	18.1	19.1	19.0
Fluoride	mg/L	0.245	0.304	0.255	0.223	0.223	0.241	0.290	0.246	0.267	0.316	0.244	0.299
Sulfate	mg/L	262	283	284	276	293	277	288	271	272	275	306	308
General Chemistry													
Alkalinity, Bicarbonate	mg/L	13.9	12.7	13.7	-	<5.00	5.67	-	<5.00	12.0	23.8	11.3	12.8
Alkalinity, Carbonate	mg/L	<5.00	<5.00	<5.00	-	<5.00	<5.00	-	<5.00	<5.00	<5.00	<5.00	<5.00
pH (lab)	SU	-	-	-	5.7	-	-	6.1	-	-	-	-	-
Total Dissolved Solids	mg/L	517	497	473	493	486	490	481	473	521	485	493	506

See notes on last page.

Stantec

Table H.1-10- Groundwater Analytical Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location								JOF-104						
Sample Date		15-Aug-18	15-Aug-18	12-Sep-18	12-Sep-18	3-Apr-19	9-Jul-19	9-Jul-19	18-Sep-19	10-Oct-19	10-Oct-19	23-Jan-20	5-Mar-20	5-Mar-20
Sample ID		JOF-GW-016-08152018	JOF-GW-903-08152018	JOF-104-09122018	JOF-104-DUP	JOF-GW-016-04032019	JOF-GW-016-07092019	JOF-GW-903-07092019	JOF-GW-016-09182019	JOF-GW-016-10102019	JOF-GW-903-10102019	JOF-GW-016-01232020	JOF-GW-016-03052020	JOF-GW-903-03052020
Parent Sample ID			JOF-GW-016-08152018		JOF-104-09122018			JOF-GW-016-07092019			JOF-GW-016-10102019			JOF-GW-016-03052020
Sample Depth		57 ft	57 ft	57 ft	57 ft	57 ft	57 ft	57 ft	57 ft	57 ft	57 ft	57 ft	57 ft	57 ft
Sample Type		Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample
Program	Units	CCR Program	CCR Program	State Compliance	State Compliance	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program
Total Metals														
Antimony	ug/L	7.96 J	1.12 UJ	<2	<2	<0.378	<0.378	<0.378	0.893 J	<0.378	<0.378	<1.00	<1.00	<1.00
Arsenic	ug/L	0.627 U*	0.481 U*	<1	<1	0.746 J	0.631 U*	0.734 U*	0.602 J	0.617 J	0.676 J	<2.00	2.83 U*	2.91 U*
Barium	ug/L	27.3	27.5	29.1	30.7	34.6	28.6 U*	29.2 U*	26.9	30.1	30.0	27.4	26.2	26.4
Beryllium	ug/L	<0.057	<0.057	<1	<1	<0.155	<0.155	<0.155	<0.182	<0.182	<0.182	<0.200	<0.200	<0.200
Boron	ug/L	2,510	2,510	3,690	3,820	3,730	3,330	3,540	3,160	3,230	3,180	4,090	3,890	3,930
Cadmium	ug/L	0.351 U*	0.345 U*	<1	<1	0.802 J	0.357 U*	0.43 U*	0.321 J	0.361 J	0.339 J	<0.300	<0.300	0.300 J
Calcium	ug/L	60,500	61,500	65,400	69,700	71,700	78,300	80,300	60,200	71,800	72,400	74,500	63,900	68,200
Chromium	ug/L	<0.631	<0.631	<2	<2	<1.53	<1.53	<1.53	<1.53	<1.53	1.57 U*	<3.00	<3.00	<3.00
Cobalt	ug/L	0.782	0.786	0.712	0.761	1.73	1.46	1.56	1.19	0.620	0.675	1.31	0.914 J	0.960 J
Copper	ug/L	<1.3	<1.3	<2	<2	0.719 J	<0.627	<0.627	1.47 U*	<0.627	<0.627	<0.300	<0.300	<0.300
Lead	ug/L	0.282 U*	0.154 U*	<1	<1	<0.128	<0.128	<0.128	<0.128	<0.128	<0.128	<0.500	<0.500	<0.500
Lithium	ug/L	4.31 U*	3.94 U*	5.36	5.23	3.54 J	3.52 J	3.7 J	3.42 J	4.08 J	3.74 J	3.42 J	<3.00	3.13 J
Magnesium	ug/L	12,800	12,800	-	-	16,200	16,900	17,600	13,900	15,900	16,200	16,100	14,100	14,800
Mercury	ug/L	<0.0653	<0.0653	<0.2	<0.2	<0.101	<0.101	<0.101	<0.101	<0.101	<0.101	<0.0670	<0.0670	<0.0670
Molybdenum	ug/L	<0.474	<0.474	<5	<5	<0.61	<0.61	<0.61	<0.610	<0.610	<0.610	<0.200	<0.200	<0.200
Nickel	ug/L	4.84	4.6	4.42	4.7	6.88	7.02	7.14	5.58	5.48	5.57	6.08	5.49	5.79
Potassium	ug/L	1,440	1,420	-	-	1,790	2,110	2,180	4,970	2,050	2,080	1,740	1,510	1,610
Selenium	ug/L	<0.813	<0.813	<5	<5	<2.62	<2.62	<2.62	<1.51	<1.51	<1.51	<2.00	<2.00	<2.00
Silver	ug/L	-	-	<1	<1	<0.121	<0.121	<0.121	<0.177	<0.177	<0.177	<0.300	<0.300	<0.300
Sodium	ug/L	36,300	36,000	-	-	45,800	48,100	50,700	41,100	46,800	47,200	45,600	43,000	44,900
Thallium	ug/L	<0.063	<0.063	<1	<1	<0.128	<0.128	<0.128	<0.148	<0.148	<0.148	<0.600	<0.600	<0.600
Vanadium	ug/L	-	-	1.91 U*	1.97 U*	1.32 U*	<0.899	<0.899	1.37 U*	1.11	<0.991	<3.30	<3.30	<3.30
Zinc	ug/L	-	-	7.35 U*	14 U*	16.4	15.6 U*	15.1 U*	10.2 U*	9.65	6.26	9.97 J	6.52 J	6.81 J
Radiological Parameters														
Radium-226	pCi/L	0.355 +/-(0.121)U*	0.329 +/-(0.115)U*	0.280 +/-(0.0922)U*	0.252 +/-(0.0881)U*	0.116 +/-(0.0818)	-0.0220 +/-(0.0800)U	0.0345 +/-(0.0704)U	0.579 +/-(0.562)U	0.400 +/-(0.463)U	-0.139 +/-(0.325)U	0.673 +/-(0.627)U	0.466 +/-(0.559)U	0.327 +/-(0.548)U
Radium-228	pCi/L	0.249 +/-(0.217)U	0.163 +/-(0.210)U	-0.0210 +/-(0.191)U	-0.00185 +/-(0.179)U	0.134 +/-(0.234)U	0.198 +/-(0.260)U	0.0471 +/-(0.265)U	0.276 +/-(0.328)U	-0.204 +/-(0.453)U	0.765 +/-(0.537)U	0.746 +/-(0.482)	-0.0408 +/-(0.212)U	0.0753 +/-(0.325)U
Radium-226+228	pCi/L	0.605 +/-(0.248)U*	0.491 +/-(0.239)U*	-	-	0.250 +/-(0.248)J	0.198 +/-(0.272)U	0.0816 +/-(0.274)U	0.856 +/-(0.651)U	0.400 +/-(0.648)U	0.765 +/-(0.628)U	1.42 +/-(0.791)J	0.466 +/-(0.598)U	0.403 +/-(0.638)U
Anions														
Chloride	mg/L	19.0	18.9	16.5	16.1	18.0	18.9	18.5	19.4	18.2	18.0	17.4	17.3	17.4
Fluoride	mg/L	0.221	0.227	0.276	0.261	0.256	0.246	0.244	0.283	0.200	0.186	0.339	0.331	0.284
Sulfate	mg/L	297	310	289	291	271 J	284	283	283	294	287	262	266	273
General Chemistry														
Alkalinity, Bicarbonate	mg/L	10.8	11.3	-	-	11.5	30.2	30.8	20.1	35.4	36.9	16.0	14.5	14.7
Alkalinity, Carbonate	mg/L	<5.00	<5.00	-	-	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<1.45	<1.45	<1.45
pH (lab)	SU	-	-	5.8 J	5.7 J	-	-	-	-	5.7 J	5.7 J	-	5.79 J	5.77 J
Total Dissolved Solids	mg/L	499	495	480	482	466	462	450	500	490	487	466	547	469

See notes on last page.

Table H.1-10- Groundwater Analytical Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		JOF-104										
Sample Date		22-Jul-20	10-Sep-20	10-Feb-21	10-Feb-21	18-Mar-21	29-Jul-21	16-Sep-21	1-Feb-22	16-Mar-22	4-Aug-22	4-Aug-22
Sample ID		JOF-GW-016-07222020	JOF-GW-016-09102020	JOF-GW-FD-02102021	JOF-GW-JOF-104-02102021	JOF-GW-JOF-104-03182021	JOF-GW-JOF-104-07292021	JOF-GW-JOF-104-09162021	JOF-GW-JOF-104-02012022	JOF-GW-JOF-104-03162022	JOF-GW-FD02-08042022	JOF-GW-JOF-104-08042022
Parent Sample ID				JOF-GW-JOF-104-02102021							JOF-GW-JOF-104-08042022	
Sample Depth		57 ft	57 ft	57 ft	57 ft	57 ft	57 ft	57 ft	57 ft	57 ft	57 ft	57 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample
Program	Units	State Compliance	State Compliance	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program
Total Metals												
Antimony	ug/L	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
Arsenic	ug/L	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
Barium	ug/L	28.0	25.1	24.6	25.4	25.6	24.1	24.5	24.0	22.3	38.3	38.0
Beryllium	ug/L	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200
Boron	ug/L	3,520	3,750	3,540	3,430	3,290	3,510	3,120	3,490	3,160	3,080	3,070
Cadmium	ug/L	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	0.464 J	0.462 J
Calcium	ug/L	67,900	65,700	66,000	66,300	66,600	61,700	61,100	69,200	68,000	58,000	57,400
Chromium	ug/L	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00
Cobalt	ug/L	1.14	0.709 J	0.649 J	0.643 J	0.765 J	0.706 J	0.570 J	0.643 J	0.529 J	0.545 J	0.562 J
Copper	ug/L	<0.300	<0.300	<0.300	<0.300	0.311 U*	<0.300	<0.300	<0.300	<0.300	0.533 J	1.08 J
Lead	ug/L	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500
Lithium	ug/L	<3.00	3.27 J	3.28 J	3.38 J	3.28 J	3.31 J	3.37 J	<3.00	3.08 J	3.24 J	3.19 J
Magnesium	ug/L	14,700	15,500	15,100 J	15,200 J	15,700 J	14,400	14,900	14,600	14,700	14,100	14,100
Mercury	ug/L	<0.0670	<0.0670	<0.0670	<0.0670	<0.0670	0.107 U*	<0.0670	<0.0670	<0.0670	<0.0670	<0.0670
Molybdenum	ug/L	<0.200	0.290 U*	<0.200	<0.200	<0.200	0.832 U*	<0.200	<0.200	<0.200	<0.200	<0.200
Nickel	ug/L	5.65	4.99	5.39	5.29	5.95	4.45	4.40	4.88	5.76	6.89	7.29
Potassium	ug/L	1,690	1,570	1,810	1,830	1,750	1,550	1,570	1,590	1,540	1,620	1,640
Selenium	ug/L	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<1.50	<1.50	<1.50	<1.50
Silver	ug/L	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300
Sodium	ug/L	41,900	44,600	44,000	43,900	46,200	41,800	44,400	41,700	41,800	42,800	43,300
Thallium	ug/L	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600
Vanadium	ug/L	<3.30	<3.30	<3.30	<3.30	<3.30	<3.30	<3.30	<3.30	<3.30	<3.30	<3.30
Zinc	ug/L	10.5 U*	5.94 J	4.54 J	4.02 J	5.57 J	5.94 J	4.56 J	4.85 J	3.86 J	8.71 J	9.58 J
Radiological Parameters												
Radium-226	pCi/L	0.0831 +/-(0.472)U	0.480 +/-(0.590)U	0.282 +/-(0.379)U	0.0881 +/-(0.308)U	0.158 +/-(0.249)U	0.692 +/-(0.581)U	0.301 +/-(0.340)U	0.134 +/-(0.264)U	0.212 +/-(0.319)U	0.0973 +/-(0.214)U	0.0570 +/-(0.321)U
Radium-228	pCi/L	0.221 +/-(0.519)U	-0.0550 +/-(0.296)U	0.302 +/-(0.283)U	0.134 +/-(0.274)U	0.0750 +/-(0.373)U	0.600 +/-(0.486)U	0.0723 +/-(0.406)U	0.550 +/-(0.405)U	0.707 +/-(0.503)U	0.747 +/-(0.550)U	0.114 +/-(0.449)U
Radium-226+228	pCi/L	0.304 +/-(0.701)U	0.480 +/-(0.660)U	0.585 +/-(0.473)U	0.222 +/-(0.412)U	0.233 +/-(0.448)U	1.29 +/-(0.757)U	0.374 +/-(0.529)U	0.684 +/-(0.483)U	0.919 +/-(0.595)U	0.845 +/-(0.590)U	0.171 +/-(0.552)U
Anions												
Chloride	mg/L	17.1	17.1	17.7	17.3	16.1	16.3	17.6	15.4	17.1	17.4	17.5
Fluoride	mg/L	0.313	0.284	0.313	0.314	0.289	0.347	0.335	0.268	0.248	0.405	0.432
Sulfate	mg/L	260	265	280	271	248	273	277	246	256	256	263
General Chemistry												
Alkalinity, Bicarbonate	mg/L	14.9	15.1	9.95 J	9.45 J	9.45 J	13.1	12.5	14.0	13.0 J	25.2 J	15.0 J
Alkalinity, Carbonate	mg/L	<1.45	<1.45	0.725 UJ	0.725 UJ	0.725 UJ	<1.45	<1.45	<1.45	<1.45	<1.45	<1.45
pH (lab)	SU	-	-	-	-	-	-	-	-	-	-	-
Total Dissolved Solids	mg/L	436	460	494	501	463	484	480	449	430	430	421

See notes on last page.

Table H.1-10- Groundwater Analytical Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		JOF-104			JOF-105								
Sample Date		13-Sep-22	7-Feb-23	7-Feb-23	14-Mar-17	12-Jun-17	18-Sep-17	11-Dec-17	13-Mar-18	12-Jun-18	11-Sep-18	11-Dec-18
Sample ID		JOF-GW-JOF-104-09132022	JOF-GW-JOF-104-02072023	JOF-GW-FD02-02072023	JOF-105	JOF-105	JOF-105	JOF-105-1217	JOF-105-0318	JOF-105-0618	JOF-105-09112018	JOF-105
Parent Sample ID				JOF-GW-JOF-104-02072023								
Sample Depth		57 ft	57 ft	57 ft	32.5 ft	32.5 ft	32.5 ft	32.5 ft	32.5 ft	32.5 ft	32.5 ft	32.5 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	CCR Program			State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance
Total Metals												
Antimony	ug/L	<1.00	<1.00	<1.00	<2	-	<2	-	<2	-	<2	-
Arsenic	ug/L	<2.00	<2.00	<2.00	<1	-	<1	-	1.04	-	<1	-
Barium	ug/L	35.5	31.4	31.8	155	-	123	-	109	-	124	-
Beryllium	ug/L	<0.200	<0.200	<0.200	<1	-	<1	-	<1	-	<1	-
Boron	ug/L	3,290	3,290	3,250	2,250	1,950	2,200	2,030	1,980	1,860	1,850	1,870
Cadmium	ug/L	0.316 J	0.330 J	0.320 J	<1	-	<1	-	<1	-	<1	-
Calcium	ug/L	64,000	66,800	65,900	166,000	153,000	146,000	138,000	118,000	130,000	133,000	145,000
Chromium	ug/L	<3.00	<3.00	<3.00	<2	-	<2	-	<2	-	<2	-
Cobalt	ug/L	0.697 J	0.742 J	0.783 J	12	-	7.96	-	5.77	-	6.28	-
Copper	ug/L	<0.300	<0.300	<0.300	<2	-	3.75	-	<2	-	<2	-
Lead	ug/L	<0.500	<0.500	<0.500	<1	-	<1	-	<1	-	<1	-
Lithium	ug/L	3.17 J	3.27 J	3.27 J	<5	<5	<5	<5	<5	<5	<5	<5
Magnesium	ug/L	14,000	14,900	15,500	-	-	-	-	-	-	-	-
Mercury	ug/L	<0.0670	<0.0670	<0.0670	<0.2	-	0.201	-	<0.2	-	0.407	-
Molybdenum	ug/L	<0.200	<0.200	<0.200	<5	<5	<5	<5	<5	<5	<5	<5
Nickel	ug/L	5.96	5.57	5.79	15.4	-	10.7	-	9.43	-	10.6	-
Potassium	ug/L	1,520	1,610	1,620	2,450	-	2,290	-	-	-	-	-
Selenium	ug/L	<1.50	<1.50	<1.50	<5	-	<5	-	<5	-	<5	-
Silver	ug/L	<0.300	<0.300	<0.300	<1	-	<1	-	<1	-	<1	-
Sodium	ug/L	42,200	44,500	45,100	74,400	-	71,600	-	-	-	-	-
Thallium	ug/L	<0.600	<0.600	<0.600	<1	-	<1	-	<1	-	<1	-
Vanadium	ug/L	<3.30	<3.30	<3.30	<1	-	<1	-	2.72	-	2.27 U*	-
Zinc	ug/L	6.62 J	4.66 J	4.83 J	39.3	-	28	-	25.9	-	77.4	-
Radiological Parameters												
Radium-226	pCi/L	0.0805 +/-(0.469)U	0.193 +/-(0.344)U	-0.0644 +/-(0.274)U	1.42 +/-(0.249)	1.45 +/-(0.231)	0.883 +/-(0.171)	0.959 +/-(0.178)	0.863 +/-(0.176)	1.18 +/-(0.317)	1.14 +/-(0.198)	1.24 +/-(0.224)
Radium-228	pCi/L	0.487 +/-(0.588)U	0.536 +/-(0.450)U	0.498 +/-(0.476)U	0.382 +/-(0.265)U	0.376 +/-(0.213)	0.554 +/-(0.263)	0.257 +/-(0.220)U	0.242 +/-(0.218)U	0.477 +/-(0.258)	0.629 +/-(0.234)	0.417 +/-(0.232)
Radium-226+228	pCi/L	0.568 +/-(0.752)U	0.728 +/-(0.566)U	0.498 +/-(0.549)U	-	-	-	-	-	-	-	-
Anions												
Chloride	mg/L	16.4	17.2	17.8	461	415	387	362	264	381	331	405
Fluoride	mg/L	0.338	0.334	0.336	<0.100	-	<0.100	-	<0.100	-	<0.100	-
Sulfate	mg/L	250	257	259	100	99.4	102	107	93.5	98.9	71.3	88.3
General Chemistry												
Alkalinity, Bicarbonate	mg/L	16.0	12.2 J	12.6 J	-	-	-	-	-	-	-	-
Alkalinity, Carbonate	mg/L	<1.45	0.725 UR	0.725 UR	-	-	-	-	-	-	-	-
pH (lab)	SU	-	-	-	5.1	-	5.2	-	5.6	-	5.0 J	-
Total Dissolved Solids	mg/L	424	436	438	964	1,060	959	744	686	906	1,170	816

See notes on last page.

Table H.1-10- Groundwater Analytical Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		JOF-105									
Sample Date		13-Mar-19	11-Sep-19	4-Mar-20	17-Sep-20	17-Mar-21	14-Sep-21	14-Sep-21	8-Feb-22	3-Aug-22	7-Feb-23
Sample ID		JOF-105	JOF-105-0919	JOF-105-0320	JOF-105-0920	JOF-GW-JOF-105-03172021	JOF-GW-FD-09142021	JOF-GW-JOF-105-09142021	JOF-GW-JOF-105-02082022	JOF-GW-JOF-105-08032022	JOF-GW-JOF-105-02072023
Parent Sample ID							JOF-GW-JOF-105-09142021				
Sample Depth		32.5 ft	32.5 ft	32.5 ft	32.5 ft	32.5 ft	32.5 ft	32.5 ft	32.5 ft	32.5 ft	32.5 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	
Total Metals											
Antimony	ug/L	<0.378	0.575 J	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
Arsenic	ug/L	0.48 J	0.763 J	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	3.13 J
Barium	ug/L	94	130	104	92.5	105	114	120	138	169	117
Beryllium	ug/L	0.277 J	0.777 J	0.219 J	0.202 J	<0.200	0.211 J	0.222 J	0.221 J	<0.200	<0.200
Boron	ug/L	1,540	1,690	1,210	1,360	766	984	999	1,110	1,020	1,630
Cadmium	ug/L	0.475 J	0.889 J	0.545 J	0.650 J	0.533 J	0.528 J	0.560 J	0.597 J	0.665 J	0.505 J
Calcium	ug/L	117,000	139,000	111,000	110,000	88,700	116,000	118,000	160,000	187,000	150,000
Chromium	ug/L	<1.53	3.23 U*	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00
Cobalt	ug/L	5.05	6.94	5.92	6.24	5.49	5.00	5.06	5.87	5.52	3.89
Copper	ug/L	<0.627	1.00 U*	0.496 J	0.751 J	0.727 J	0.828 J	0.493 J	0.518 J	0.373 J	<0.300
Lead	ug/L	<0.128	0.260 J	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500
Lithium	ug/L	<3.14	6.49	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00
Magnesium	ug/L	-	-	-	-	-	-	-	-	-	-
Mercury	ug/L	0.267	0.493	0.342	0.270	0.348	0.505	0.498	0.314	0.307	0.238
Molybdenum	ug/L	<0.61	<0.610	0.242 J	<0.200	0.246 U*	<0.200	<0.200	<0.200	<0.200	<0.200
Nickel	ug/L	8.85	11.2	9.24	8.66	8.30	7.18	7.47	8.78	9.97	7.60
Potassium	ug/L	-	-	-	-	-	-	-	-	-	-
Selenium	ug/L	<2.62	2.11 J	<2.00	<2.00	<2.00	<2.00	<2.00	<1.50	<1.50	<1.50
Silver	ug/L	<0.121	<0.177	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300
Sodium	ug/L	-	-	-	-	-	-	-	-	-	-
Thallium	ug/L	<0.128	0.514 U*	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600
Vanadium	ug/L	0.936 J	2.14	<3.30	<3.30	<3.30	<3.30	<3.30	<3.30	<3.30	5.06 U*
Zinc	ug/L	22.8	35.9	26.4	24.8	21.7	25.0 U*	27.0 U*	26.3	26.2	18.3 J
Radiological Parameters											
Radium-226	pCi/L	0.834 +/-(0.170)	1.02 +/-(0.415)	1.59 +/-(0.805)	1.76 +/-(0.827)	1.52 +/-(0.687)	1.06 +/-(0.557)	1.47 +/-(0.674)	1.50 +/-(0.520)	1.10 +/-(0.694)	1.06 +/-(0.630)
Radium-228	pCi/L	0.200 +/-(0.275)U	0.250 +/-(0.408)U	0.673 +/-(0.414)	0.509 +/-(0.324)	0.903 +/-(0.545)U*	0.280 +/-(0.304)UJ	0.899 +/-(0.443)J	0.434 +/-(0.393)U	0.741 +/-(0.533)U	0.767 +/-(0.446)U*
Radium-226+228	pCi/L	-	1.27 +/-(0.582)J	2.27 +/-(0.905)	2.27 +/-(0.888)	2.42 +/-(0.877)J	1.34 +/-(0.634)J	2.37 +/-(0.807)J	1.93 +/-(0.652)J	1.84 +/-(0.875)J	1.83 +/-(0.772)J
Anions											
Chloride	mg/L	295	391	290	296	343	418	417	490	628	405
Fluoride	mg/L	0.0450 J	0.0310 J	0.0537 J	0.0661 J	0.0435 J	0.0434 J	0.0538 J	<0.0330	0.0379 J	<0.0330
Sulfate	mg/L	89.2 J	77.3	88.8	88.0	71.1	78.9	79.8	75.5	107	96.3
General Chemistry											
Alkalinity, Bicarbonate	mg/L	-	-	-	-	-	-	-	-	-	-
Alkalinity, Carbonate	mg/L	-	-	-	-	-	-	-	-	-	-
pH (lab)	SU	5.5 J	5.6 J	5.19 J	5.12 J	4.86 J	5.10 J	5.64 J	5.27 J	5.14 J	5.45 J
Total Dissolved Solids	mg/L	751	890	696	720	689	1,020 J	1,300 J	1,140	1,130	824

See notes on last page.

Table H.1-10- Groundwater Analytical Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		JOF-106										
Sample Date		15-May-18	13-Jun-18	13-Sep-18	11-Dec-18	13-Mar-19	11-Sep-19	3-Mar-20	3-Mar-20	16-Sep-20	16-Mar-21	15-Sep-21
Sample ID		JOF-106-0518	JOF-106-0618	JOF-106-09132018	JOF-106	JOF-106	JOF-106-0919	JOF-106-0320	JOF-106-DUP-0320	JOF-106-0920	JOF-GW-JOF-106-03162021	JOF-GW-JOF-106-09152021
Parent Sample ID									JOF-106-0320			
Sample Depth		31 ft	31 ft	31 ft	31 ft	31 ft	31 ft	31 ft	31 ft	31 ft	31 ft	31 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance
Total Metals												
Antimony	ug/L	<2	-	<2	<2	<0.378	0.422 J	<1.00	<1.00	<1.00	<1.00	<1.00
Arsenic	ug/L	<1	-	<1	<1	<0.323	0.564 J	<2.00	<2.00	<2.00	<2.00	<2.00
Barium	ug/L	190	-	179	178	203	221	213	212	208	202	181
Beryllium	ug/L	<1	-	<1	<1	0.173 J	0.339 J	<0.200	<0.200	<0.200	<0.200	<0.200
Boron	ug/L	424	374	293	358	342	321	293 U*	277 U*	378	355	233
Cadmium	ug/L	<1	-	<1	<1	0.292 J	0.352 J	<0.300	<0.300	<0.300	<0.300	<0.300
Calcium	ug/L	29,300	30,600	28,900	31,900	30,900	33,200	31,400	31,400	33,000	34,300	29,000
Chromium	ug/L	<2	-	<2	<2	<1.53	3.68 U*	<3.00	<3.00	<3.00	<3.00	<3.00
Cobalt	ug/L	5.21	-	1.77	1.5	1.51	1.38	1.17	1.15	1.28	1.15	0.974 J
Copper	ug/L	<2	-	<2	<2	<0.627	0.637 U*	<0.300	<0.300	0.659 J	<0.300	0.402 J
Lead	ug/L	<1	-	<1	<1	<0.128	0.166 J	<0.500	<0.500	<0.500	<0.500	<0.500
Lithium	ug/L	<5	<5	<5	<5	<3.14	5.20	<3.00	<3.00	<3.00	<3.00	<3.00
Magnesium	ug/L	-	-	-	-	-	-	-	-	-	-	-
Mercury	ug/L	<0.2	-	<0.2	<0.2	<0.101	<0.101	<0.0670	<0.0670	<0.0670	<0.0670	<0.0670
Molybdenum	ug/L	<5	<5	<5	<5	<0.61	<0.610	<0.200	<0.200	<0.200	<0.200	<0.200
Nickel	ug/L	5.8	-	4.61	4.6	5.62	4.88	4.92	4.94	4.99	4.59	5.96
Potassium	ug/L	-	-	-	-	-	-	-	-	-	-	-
Selenium	ug/L	<5	-	<5	<5	<2.62	<1.51	<2.00	<2.00	<2.00	<2.00	<2.00
Silver	ug/L	<1	-	<1	<1	<0.121	<0.177	<0.300	<0.300	<0.300	<0.300	<0.300
Sodium	ug/L	-	-	-	-	-	-	-	-	-	-	-
Thallium	ug/L	<1	-	<1	<1	<0.128	0.241 U*	<0.600	<0.600	<0.600	<0.600	<0.600
Vanadium	ug/L	1.25	-	1.85 U*	1.91	<0.899	2.66	<3.30	<3.30	<3.30	<3.30	<3.30
Zinc	ug/L	17.3	-	20.5 U*	14.5	17.9	18.5	15.2 J	16.2 J	15.5 J	13.0 J	15.5 U*
Radiological Parameters												
Radium-226	pCi/L	0.723 +/-(0.150)	0.833 +/-(0.261)	0.988 +/-(0.181)	0.638 +/-(0.146)	0.740 +/-(0.158)	0.877 +/-(0.402)	1.90 +/-(0.876)	1.66 +/-(0.910)	1.68 +/-(0.576)	1.11 +/-(0.497)	1.27 +/-(0.604)
Radium-228	pCi/L	0.464 +/-(0.230)	0.317 +/-(0.250)	0.392 +/-(0.226)	0.485 +/-(0.252)	0.571 +/-(0.245)	-0.002 +/-(0.388)U	0.590 +/-(0.337)	0.504 +/-(0.326)	0.428 +/-(0.330)U	1.32 +/-(0.690)U*	0.426 +/-(0.308)U
Radium-226+228	pCi/L	-	-	-	-	-	0.877 +/-(0.559)J	2.49 +/-(0.939)	2.16 +/-(0.967)	2.11 +/-(0.663)J	2.43 +/-(0.850)J	1.70 +/-(0.678)J
Anions												
Chloride	mg/L	121	119	93.1	121	138	124	126	128	124	120	112
Fluoride	mg/L	<0.100	-	<0.100	<0.100	<0.0263	<0.0263	<0.0330	<0.0330	<0.0330	<0.0330	<0.0330
Sulfate	mg/L	24.2	26.0	17.5	22.2	25.9 J	21.4	25.3	25.6	27.2	25.6	24.8
General Chemistry												
Alkalinity, Bicarbonate	mg/L	-	-	-	-	-	-	-	-	-	-	-
Alkalinity, Carbonate	mg/L	-	-	-	-	-	-	-	-	-	-	-
pH (lab)	SU	5.4	-	5.5 J	3.7 J	5.2 J	5.6 J	5.10 J	5.08 J	5.05 J	5.03 J	5.23 J
Total Dissolved Solids	mg/L	283	328	320	199	300	290	231 J	321 J	337	316	317

See notes on last page.

Table H.1-10- Groundwater Analytical Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		JOF-106			JOF-107							
Sample Date		10-Feb-22	3-Aug-22	8-Feb-23	15-May-18	15-May-18	13-Jun-18	13-Sep-18	12-Dec-18	12-Mar-19	11-Sep-19	11-Sep-19
Sample ID		JOF-GW-JOF-106-02102022	JOF-GW-JOF-106-08032022	JOF-GW-JOF-106-02082023	JOF-107-0518	JOF-107-DUP-0518	JOF-107-0618	JOF-107-09132018	JOF-107	JOF-107	JOF-107-0919	JOF-107-DUP-0919
Parent Sample ID						JOF-107-0518						JOF-107-0919
Sample Depth		31 ft	31 ft	31 ft	40 ft	40 ft	40 ft	40 ft	40 ft	40 ft	40 ft	40 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample
Program	Units	State Compliance	State Compliance		State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance
Total Metals												
Antimony	ug/L	<1.00	<1.00	<1.00	<2	<2	-	<2	<2	<0.378	<0.378	<0.378
Arsenic	ug/L	2.03 J	<2.00	3.00 U*	<1	<1	-	<1	<1	<0.323	0.613 J	0.623 J
Barium	ug/L	203	204	428	125	121	-	176	135	107	217	210
Beryllium	ug/L	<0.200	<0.200	<0.200	<1	<1	-	<1	<1	<0.155	<0.182	<0.182
Boron	ug/L	184	152	231	<80	<80	<80	<80	124	47.7 J	93.3	78.9 J
Cadmium	ug/L	<0.300	<0.300	0.383 J	<1	<1	-	<1	<1	<0.125	<0.125	0.131 J
Calcium	ug/L	32,000	34,400	54,400	18,000	18,000	19,600	26,600	22,100	17,300	32,400	31,800
Chromium	ug/L	<3.00	<3.00	<3.00	<2	<2	-	<2	2.16	<1.53	3.16 U*	3.51 U*
Cobalt	ug/L	0.944 J	0.907 J	1.74	8.44	8.22	-	2.13	0.891	0.551	0.813	0.860
Copper	ug/L	<0.300	0.327 J	<0.300	<2	<2	-	<2	<2	<0.627	<0.627	0.648 U*
Lead	ug/L	<0.500	<0.500	<0.500	<1	<1	-	<1	<1	0.174 J	0.351 J	0.388 J
Lithium	ug/L	<3.00	<3.00	<3.00	<5	<5	<5	<5	<5	<3.14	3.76 J	4.09 J
Magnesium	ug/L	-	-	-	-	-	-	-	-	-	-	-
Mercury	ug/L	<0.0670	<0.0670	<0.0670	<0.2	<0.2	-	<0.2	<0.2	<0.101	<0.101	<0.101
Molybdenum	ug/L	<0.200	<0.200	<0.200	<5	<5	<5	<5	<5	<0.61	<0.610	<0.610
Nickel	ug/L	4.28	5.09	7.53	4.57	4.93	-	2.7	1.63	1.84 U*	1.66	1.55
Potassium	ug/L	-	-	-	-	-	-	-	-	-	-	-
Selenium	ug/L	<1.50	<1.50	<1.50	<5	<5	-	<5	<5	<2.62	<1.51	<1.51
Silver	ug/L	<0.300	<0.300	<0.300	<1	<1	-	<1	<1	<0.121	<0.177	<0.177
Sodium	ug/L	-	-	-	-	-	-	-	-	-	-	-
Thallium	ug/L	<0.600	<0.600	<0.600	<1	<1	-	<1	<1	<0.128	0.176 U*	<0.148
Vanadium	ug/L	<3.30	<3.30	6.51 U*	1.21	1.11	-	2.32 U*	2.95	<0.899	2.52	2.84
Zinc	ug/L	13.1 J	16.9 J	20.1	5.73	5.94	-	13.4 U*	5.01	<3.22	9.76 U*	10.7 U*
Radiological Parameters												
Radium-226	pCi/L	0.512 +/-(0.346)	0.954 +/-(0.752)U	1.39 +/-(0.759)	0.304 +/-(0.0993)	0.483 +/-(0.156)	0.383 +/-(0.176)	0.560 +/-(0.137)	0.478 +/-(0.126)	0.345 +/-(0.110)	0.699 +/-(0.393)	0.285 +/-(0.288)U
Radium-228	pCi/L	0.224 +/-(0.216)U	0.457 +/-(0.487)U	1.48 +/-(0.581)U*	0.00618 +/-(0.212)U	1.04 +/-(0.309)	0.125 +/-(0.232)	0.386 +/-(0.228)	0.241 +/-(0.214)U	0.325 +/-(0.217)U	0.0656 +/-(0.253)U	0.251 +/-(0.295)U
Radium-226+228	pCi/L	0.736 +/-(0.408)J	1.41 +/-(0.896)U	2.86 +/-(0.956)J	-	-	-	-	-	-	0.765 +/-(0.468)J	0.536 +/-(0.412)U
Anions												
Chloride	mg/L	137	129	328	68.2	76.1	85.7	103	102	74.7	146	144
Fluoride	mg/L	<0.0330	<0.0330	0.0518 J	<0.100	<0.100	-	<0.100	<0.100	<0.0263	<0.0263	<0.0263
Sulfate	mg/L	21.8	17.9	28.9	20.1	22.6	29.7	15.2	23.1	23.2 J	17.8	18.3
General Chemistry												
Alkalinity, Bicarbonate	mg/L	-	-	-	-	-	-	-	-	-	-	-
Alkalinity, Carbonate	mg/L	-	-	-	-	-	-	-	-	-	-	-
pH (lab)	SU	5.31 J	5.12 J	5.26 J	5.7	5.8	-	5.6 J	2.6 J	5.8 J	6.0 J	6.1 J
Total Dissolved Solids	mg/L	347	234	611	224	231	264	347	224	188	313	330

See notes on last page.

Stantec

Table H.1-10- Groundwater Analytical Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		JOF-107									JOF-109		
Sample Date		4-Mar-20	15-Sep-20	15-Sep-20	16-Mar-21	15-Sep-21	10-Feb-22	4-Aug-22	8-Feb-23	8-Feb-23	3-Dec-19	11-Feb-20	7-Apr-20
Sample ID		JOF-107-0320	JOF-107-0920	JOF-107-DUP-0920	JOF-GW-JOF-107-03162021	JOF-GW-JOF-107-09152021	JOF-GW-JOF-107-02102022	JOF-GW-JOF-107-08042022	JOF-GW-FD01-02082023	JOF-GW-JOF-107-02082023	JOF-GW-021-20191203	JOF-GW-021-20200211	JOF-GW-021-20200407
Parent Sample ID				JOF-107-0920					JOF-GW-JOF-107-02082023				
Sample Depth		40 ft	40 ft	40 ft	40 ft	40 ft	40 ft	40 ft	40 ft	40 ft	39 ft	39 ft	39 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance			EIP	EIP	EIP
Total Metals													
Antimony	ug/L	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<0.378	<1.00	<1.00
Arsenic	ug/L	<2.00	<2.00	<2.00	<2.00	<2.00	2.28 J	<2.00	2.57 U*	2.38 U*	0.328 J	<2.00	<2.00
Barium	ug/L	135	188	179	170	269	245	285	193	193	17.1	14.9	14.7
Beryllium	ug/L	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	0.331 J	0.300 J	0.391 J
Boron	ug/L	75.7	59.3	59.5	58.6	52.0	55.4	57.9	49.3	47.2	84.5	80.0	71.7
Cadmium	ug/L	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	0.316 J	<0.300	<0.300
Calcium	ug/L	19,800	28,900	29,100	28,900	38,200	32,100	40,800	30,100	29,800	18,400	17,000	16,500
Chromium	ug/L	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	1.63 J	<3.00	<3.00
Cobalt	ug/L	0.542 J	1.04	1.15	0.440 J	0.678 J	0.322 J	<0.300	0.639 J	0.624 J	2.56	0.570 J	0.467 J
Copper	ug/L	<0.300	0.403 J	0.585 J	<0.300	0.416 J	<0.300	0.527 J	<0.300	<0.300	1.09 J	0.939 U*	0.941 J
Lead	ug/L	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	0.172 J	<0.500	<0.500
Lithium	ug/L	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.39	<3.00	<3.00
Magnesium	ug/L	-	-	-	-	-	-	-	-	-	4,250	5,010	5,140
Mercury	ug/L	<0.0670	<0.0670	<0.0670	<0.0670	<0.0670	<0.0670	<0.0670	<0.0670	<0.0670	<0.101	<0.0670	<0.0670
Molybdenum	ug/L	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	0.371 U*	<0.200	<0.200	<0.610	0.235 U*	<0.200
Nickel	ug/L	1.28 J	1.48 J	1.72 J	0.985 J	1.58 J	1.31 J	3.62	1.50 J	1.50 J	36.2	27.2	22.4
Potassium	ug/L	-	-	-	-	-	-	-	-	-	1,110	1,260	1,290
Selenium	ug/L	<2.00	<2.00	<2.00	<2.00	<2.00	<1.50	<1.50	<1.50	<1.50	<1.51	<2.00	<2.00
Silver	ug/L	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.177	<0.300	<0.300
Sodium	ug/L	-	-	-	-	-	-	-	-	-	7,360	7,420	6,980
Thallium	ug/L	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	0.170 J	<0.600	<0.600
Vanadium	ug/L	<3.30	<3.30	<3.30	<3.30	<3.30	<3.30	<3.30	6.29 U*	5.50 U*	1.30	<3.30	<3.30
Zinc	ug/L	5.98 J	4.18 J	4.59 J	<3.30	9.76 U*	<3.30	4.15 J	<3.30	<3.30	51.5	45.8	47.3
Radiological Parameters													
Radium-226	pCi/L	1.41 +/-(0.760)	0.780 +/-(0.605)U	0.658 +/-(0.578)U	0.414 +/-(0.314)	0.152 +/-(0.328)U	1.35 +/-(0.824)	1.47 +/-(0.894)	0.760 +/-(0.645)U	0.472 +/-(0.480)U	0.765 +/-(0.398)	0.828 +/-(0.645)U	0.680 +/-(0.500)U
Radium-228	pCi/L	0.112 +/-(0.235)U	0.503 +/-(0.380)U	0.279 +/-(0.479)U	0.516 +/-(0.590)U	0.362 +/-(0.324)U	0.598 +/-(0.319)	0.496 +/-(0.487)U	1.00 +/-(0.518)U*	0.644 +/-(0.434)U*	-0.0935 +/-(0.274)U	0.273 +/-(0.378)U	0.0308 +/-(0.254)U
Radium-226+228	pCi/L	1.52 +/-(0.795)J	1.28 +/-(0.715)U	0.937 +/-(0.751)U	0.930 +/-(0.668)J	0.515 +/-(0.461)U	1.95 +/-(0.884)	1.96 +/-(1.02)J	1.76 +/-(0.827)U*	1.12 +/-(0.647)U*	0.765 +/-(0.484)J	1.10 +/-(0.748)U	0.711 +/-(0.561)U
Anions													
Chloride	mg/L	84.2	142	141	126	234	229	265	219	229	38.6	39.3	39.2
Fluoride	mg/L	<0.0330	<0.0330	<0.0330	0.0414 J	<0.0330	<0.0330	0.0522 J	<0.0330	<0.0330	0.0408 J	0.122	0.105
Sulfate	mg/L	22.2	24.9	25.1	26.8	33.3	39.4	49.7	56.6	57.5	5.17	4.63	4.09
General Chemistry													
Alkalinity, Bicarbonate	mg/L	-	-	-	-	-	-	-	-	-	27.2	14.8 J	12.5
Alkalinity, Carbonate	mg/L	-	-	-	-	-	-	-	-	-	<5.00	<1.45	<1.45
pH (lab)	SU	5.62 J	5.57 J	5.57 J	5.67 J	5.58 J	5.71 J	5.80 J	5.84 J	6.10 J	-	-	-
Total Dissolved Solids	mg/L	211	344	361	353	553	486	509	432	425	112	92.9	281 J

See notes on last page.

Table H.1-10- Groundwater Analytical Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		JOF-109							JOF-110		
Sample Date		9-Jun-20	12-Aug-20	13-Oct-20	19-Mar-21	27-Jul-21	17-Mar-22	15-Sep-22	4-Dec-19	12-Feb-20	7-Apr-20
Sample ID		JOF-GW-021-20200609	JOF-GW-021-20200812	JOF-GW-021-20201013	JOF-GW-JOF-109-03192021	JOF-GW-JOF-109-07272021	JOF-GW-JOF-109-03172022	JOF-GW-JOF-109-09152022	JOF-GW-022-20191204	JOF-GW-022-20200212	JOF-GW-022-20200407
Parent Sample ID											
Sample Depth		39 ft	39 ft	39 ft	39 ft	39 ft	39 ft	39 ft	57 ft	57 ft	57 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	EIP	EIP	EIP	EIP	EIP	CCR Program	CCR Program	EIP	EIP	EIP
Total Metals											
Antimony	ug/L	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<0.378	<1.00	<1.00
Arsenic	ug/L	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	3.75	3.59 J	2.07 J
Barium	ug/L	14.2	13.9	14.7	16.7	15.9	18.9	26.4	76.0	66.3	65.4
Beryllium	ug/L	0.362 J	0.348 J	0.374 J	0.306 J	0.406 J	0.323 J	0.534	<0.182	<0.200	<0.200
Boron	ug/L	81.5	67.2	64.1	71.3	64.4	131	111	1,290	1,410	1,460
Cadmium	ug/L	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	0.322 U*	<0.125	<0.300	<0.300
Calcium	ug/L	17,900	16,000	16,100	19,100	17,800	22,200	30,200	19,300	19,300	18,600
Chromium	ug/L	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	2.98	<3.00	<3.00
Cobalt	ug/L	0.415 J	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	5.47	4.44 J	3.69
Copper	ug/L	0.910 J	1.05 J	0.873 U*	1.05 J	1.48 J	1.01 J	1.25 J	<0.627	<0.300	<0.300
Lead	ug/L	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	0.284 J	<0.500	<0.500
Lithium	ug/L	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	12.9 U*	3.05 J	<3.00
Magnesium	ug/L	5,080	5,000	5,040	6,360	5,970	7,640	10,300	4,860	5,090	4,990
Mercury	ug/L	<0.0670	<0.0670	<0.0670	0.125 U*	0.110 U*	0.0780 J	0.142 J	<0.101	<0.0670	<0.0670
Molybdenum	ug/L	<0.200	<0.200	<0.200	<0.200	0.262 U*	<0.200	<0.200	<0.610	0.343 U*	0.244 J
Nickel	ug/L	22.3	19.7	19.5	22.5	19.5	24.6	27.6	8.85	9.63	8.34
Potassium	ug/L	1,360	1,150	1,250	1,410	1,330	1,510	1,730	350 J	340	331
Selenium	ug/L	<2.00	<2.00	<2.00	<2.00	<2.00	<1.50	<1.50	<1.51	<2.00	<2.00
Silver	ug/L	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.177	<0.300	<0.300
Sodium	ug/L	7,820	6,990	6,790	8,540	7,610	8,690	11,000	39,500	40,600	36,800
Thallium	ug/L	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	<0.148	<0.600	<0.600
Vanadium	ug/L	<3.30	<3.30	5.49 U*	<3.30	<3.30	<3.30	<3.30	2.42	<3.30	<3.30
Zinc	ug/L	47.7	45.7	48.8	52.3	48.6	57.9 J	71.4	13.2 U*	5.29 J	6.21 U*
Radiological Parameters											
Radium-226	pCi/L	0.846 +/-(0.454)	1.36 +/-(0.818)	0.741 +/-(0.516)U*	1.24 +/-(0.706)	1.14 +/-(0.641)	0.828 +/-(0.489)	1.23 +/-(0.772)	0.332 +/-(0.556)U	0.599 +/-(0.602)U	0.588 +/-(0.537)U
Radium-228	pCi/L	-0.00890 +/-(0.355)U	0.522 +/-(0.344)	-0.0120 +/-(0.232)U	0.326 +/-(0.478)U	0.142 +/-(0.260)U	2.36 +/-(0.959)U*	0.900 +/-(0.682)U	-0.21 +/-(0.261)U	0.304 +/-(0.333)U	0.599 +/-(0.382)U*
Radium-226+228	pCi/L	0.846 +/-(0.577)J	1.89 +/-(0.888)	0.741 +/-(0.565)U*	1.56 +/-(0.853)J	1.29 +/-(0.692)J	3.19 +/-(1.08)J	2.13 +/-(1.03)J	0.332 +/-(0.614)U	0.902 +/-(0.688)U	1.19 +/-(0.659)U*
Anions											
Chloride	mg/L	41.6	41.5	42.6	48.5	54.4	60.0	86.2	52.4	50.8	49.3
Fluoride	mg/L	0.0969 J	0.158	<0.0330	0.0995 J	0.121	0.110	0.102	0.376	0.405 J	0.402
Sulfate	mg/L	4.25	3.91	3.57	3.50	3.57	7.56	6.20	27.5	26.0	23.8
General Chemistry											
Alkalinity, Bicarbonate	mg/L	12.1	11.0 J	11.0	7.76 J	8.84 J	10.0 J	7.80 J	52.5	43.0	42.3
Alkalinity, Carbonate	mg/L	<1.45	<1.45	<1.45	0.725 UJ	<1.45	<1.45	<1.45	<5.00	<1.45	<1.45
pH (lab)	SU	-	-	-	-	-	-	-	-	-	-
Total Dissolved Solids	mg/L	87.1	117	106	199	147	201	147	242	189	181 J

See notes on last page.

Stantec

Table H.1-10- Groundwater Analytical Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		JOF-110						
Sample Date		11-Jun-20	12-Aug-20	14-Oct-20	16-Mar-21	27-Jul-21	15-Mar-22	13-Sep-22
Sample ID		JOF-GW-022-20200611	JOF-GW-022-20200812	JOF-GW-022-20201014	JOF-GW-JOF-110-03162021	JOF-GW-JOF-110-07272021	JOF-GW-JOF-110-03152022	JOF-GW-JOF-110-09132022
Parent Sample ID								
Sample Depth		57 ft	57 ft	57 ft	57 ft	57 ft	57 ft	57 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	EIP	EIP	EIP	EIP	EIP	CCR Program	CCR Program
Total Metals								
Antimony	ug/L	<1.00	<1.00	1.40 J	<1.00	1.21 J	<1.00	<1.00
Arsenic	ug/L	<2.00	2.14 J	<2.00	3.40 J	<2.00	<2.00	<2.00
Barium	ug/L	75.1	63.8	70.3	67.9	66.7	70.6	70.7
Beryllium	ug/L	<0.200	<0.200	<0.200	<0.200	0.725	<0.200	<0.200
Boron	ug/L	1,670	1,500	1,430	1,460	1,530	1,310	1,480
Cadmium	ug/L	<0.300	<0.300	<0.300	<0.300	0.481 J	<0.300	<0.300
Calcium	ug/L	18,900	17,200	17,000	18,800	17,800	19,000	19,300
Chromium	ug/L	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00
Cobalt	ug/L	3.30	2.75	2.53	2.58	2.98	2.26	2.16
Copper	ug/L	0.419 U*	<0.300	0.349 U*	0.347 U*	0.745 J	<0.300	<0.300
Lead	ug/L	<0.500	<0.500	<0.500	<0.500	2.41	<0.500	<0.500
Lithium	ug/L	<3.00	<3.00	<3.00	3.97 J	3.00 J	<3.00	<3.00
Magnesium	ug/L	4,790	4,380	4,380	5,190	4,660	5,150	5,010
Mercury	ug/L	<0.0670	<0.0670	0.0740 U*	<0.0670	<0.0670	<0.0670	<0.0670
Molybdenum	ug/L	0.200 U*	0.261 J	0.205 J	0.343 U*	1.37 U*	0.221 J	<0.200
Nickel	ug/L	8.92	7.90	8.57	9.17	9.31	8.79	8.55
Potassium	ug/L	380	254 J	338	333	374	313	324
Selenium	ug/L	<2.00	<2.00	<2.00	<2.00	<2.00	<1.50	<1.50
Silver	ug/L	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300
Sodium	ug/L	35,600	34,800	33,500	38,500	33,700	37,200	34,700
Thallium	ug/L	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600
Vanadium	ug/L	<3.30	<3.30	<3.30	9.63 J	<3.30	<3.30	10.1 U*
Zinc	ug/L	8.23 U*	7.44 J	13.8 U*	7.63 J	7.43 J	5.64 J	5.86 J
Radiological Parameters								
Radium-226	pCi/L	0.328 +/-(0.424)U	-0.0168 +/-(0.463)U	0.808 +/-(0.631)U	0.112 +/-(0.234)U	0.0807 +/-(0.407)U	0.301 +/-(0.543)U	0.868 +/-(0.713)U
Radium-228	pCi/L	0.0457 +/-(0.403)U	0.0258 +/-(0.336)U	0.166 +/-(0.375)U	-0.433 +/-(0.324)U	0.292 +/-(0.421)U	0.406 +/-(0.473)U	0.410 +/-(0.497)U
Radium-226+228	pCi/L	0.374 +/-(0.585)U	0.0258 +/-(0.572)U	0.974 +/-(0.734)U	0.112 +/-(0.400)U	0.373 +/-(0.586)U	0.706 +/-(0.721)U	1.28 +/-(0.869)U
Anions								
Chloride	mg/L	48.8 J	49.6	48.4	53.8	56.2	61.4	59.2
Fluoride	mg/L	0.518	0.565	0.432	0.430	0.426	0.397	0.452
Sulfate	mg/L	27.3 J	25.1	24.8	25.2	25.8	25.7	24.9
General Chemistry								
Alkalinity, Bicarbonate	mg/L	38.0	37.4	36.0	35.1	35.2	33.4	32.8
Alkalinity, Carbonate	mg/L	<1.45	<1.45	<1.45	<0.725	<1.45	<1.45	<1.45
pH (lab)	SU	-	-	-	-	-	-	-
Total Dissolved Solids	mg/L	180	193	207	201	220	204	201

Sample Location		JOF-111			
Sample Date		4-Dec-19	12-Feb-20	7-Apr-20	11-Jun-20
Sample ID		JOF-GW-023-20191204	JOF-GW-023-20200212	JOF-GW-023-20200407	JOF-GW-023-20200611
Parent Sample ID					
Sample Depth		46 ft	46 ft	46 ft	46 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	EIP	EIP	EIP	EIP
Total Metals					
Antimony	ug/L	<0.378	<1.00	<1.00	<1.00
Arsenic	ug/L	6.61	7.91	3.02 J	5.19
Barium	ug/L	49.0	31.9	24.5	30.9
Beryllium	ug/L	<0.182	<0.200	0.310 J	<0.200
Boron	ug/L	4,450	5,540	4,550	5,000
Cadmium	ug/L	0.179 J	<0.300	0.418 J	<0.300
Calcium	ug/L	426,000	449,000	419,000	464,000
Chromium	ug/L	2.84	<3.00	<3.00	<3.00
Cobalt	ug/L	98.8	195 J	218	203
Copper	ug/L	0.787 J	<0.300	<0.300	0.369 U*
Lead	ug/L	<0.128	<0.500	<0.500	<0.500
Lithium	ug/L	40.4	9.95 J	3.15 J	3.10 J
Magnesium	ug/L	30,000	22,100	19,300	23,000
Mercury	ug/L	<0.101	<0.0670	<0.0670	<0.0670
Molybdenum	ug/L	48.5	16.1	9.66	29.8
Nickel	ug/L	26.8	46.7	57.3	53.5
Potassium	ug/L	46,000	53,500	47,000	56,900
Selenium	ug/L	<1.51	<2.00	<2.00	<2.00
Silver	ug/L	<0.177	<0.300	<0.300	<0.300
Sodium	ug/L	177,000	191,000	247,000	272,000
Thallium	ug/L	0.163 J	<0.600	<0.600	<0.600
Vanadium	ug/L	1.36	<3.30	<3.30	<3.30
Zinc	ug/L	49.1	57.8	111	101
Radiological Parameters					
Radium-226	pCi/L	0.481 +/-(0.292)	0.595 +/-(0.323)	0.799 +/-(0.406)	1.87 +/-(0.930)
Radium-228	pCi/L	1.02 +/-(0.484)U*	0.726 +/-(0.443)	0.759 +/-(0.519)U*	0.740 +/-(0.403)
Radium-226+228	pCi/L	1.50 +/-(0.565)J	1.32 +/-(0.549)	1.56 +/-(0.659)J	2.61 +/-(1.01)
Anions					
Chloride	mg/L	456	452	643	736 J
Fluoride	mg/L	0.150 J	0.143 J	0.271	0.241 J
Sulfate	mg/L	930	938	783	930 J
General Chemistry					
Alkalinity, Bicarbonate	mg/L	81.9	40.6	19.0	34.6
Alkalinity, Carbonate	mg/L	<5.00	<1.45	<1.45	<1.45
pH (lab)	SU	-	-	-	-
Total Dissolved Solids	mg/L	2,160	2,090	2,280	2,500

See notes on last page.

Stantec

Table H.1-10- Groundwater Analytical Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		JOF-111						JOF-112				
Sample Date		12-Aug-20	14-Oct-20	16-Mar-21	28-Jul-21	15-Mar-22	13-Sep-22	2-Dec-19	11-Feb-20	7-Apr-20	9-Jun-20	9-Jun-20
Sample ID		JOF-GW-023-20200812	JOF-GW-023-20201014	JOF-GW-JOF-111-03162021	JOF-GW-JOF-111-07282021	JOF-GW-JOF-111-03152022	JOF-GW-JOF-111-09132022	JOF-GW-024-20191202	JOF-GW-024-20200211	JOF-GW-024-20200407	JOF-GW-024-20200609	JOF-GW-DUP01-20200609
Parent Sample ID												JOF-GW-024-20200609
Sample Depth		46 ft	46 ft	46 ft	46 ft	46 ft	46 ft	29.5 ft	29.5 ft	29.5 ft	29.5 ft	29.5 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample
Program	Units	EIP	EIP	EIP	EIP	CCR Program	CCR Program	EIP	EIP	EIP	EIP	EIP
Total Metals												
Antimony	ug/L	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<0.378	<1.00	<1.00	<1.00	<1.00
Arsenic	ug/L	11.5	19.2	26.0	12.5	51.6	35.2	0.579 J	<2.00	<2.00	<2.00	<2.00
Barium	ug/L	48.3	43.8	44.2	40.5	40.6	33.2	58.8	51.5	55.4	60.7	57.1
Beryllium	ug/L	<0.200	<0.200	<0.200	0.352 J	<0.200	<0.200	0.223 U*	<0.200	<0.200	<0.200	<0.200
Boron	ug/L	5,260	5,190	5,560	5,290	5,140	7,280	56.6 J	31.0	36.2	40.2	41.2
Cadmium	ug/L	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	0.357 J	1.23	0.523 J	0.523 J	0.531 J
Calcium	ug/L	476,000	482,000	502,000	461,000	551,000	457,000	31,600	28,700	34,600	37,000	37,000
Chromium	ug/L	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	2.15	<3.00	<3.00	<3.00	<3.00
Cobalt	ug/L	132	109	77.8	113	13.7	19.4	112	112	105	108	105
Copper	ug/L	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	0.637 J	<0.300	<0.300	<0.300	<0.300
Lead	ug/L	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.128	<0.500	<0.500	<0.500	<0.500
Lithium	ug/L	17.5	35.9	46.2	25.1	106	55.7	3.80 J	<3.00	<3.00	<3.00	<3.00
Magnesium	ug/L	31,300	29,200	33,400	30,100	31,500	26,500	13,100	13,900	14,000	13,900	13,800
Mercury	ug/L	<0.0670	<0.0670	<0.0670	<0.0670	<0.0670	<0.0670	<0.101	<0.0670	<0.0670	<0.0670	<0.0670
Molybdenum	ug/L	48.8	40.4	47.4	38.6	77.2	96.1	0.746 J	0.595 U*	0.923 J	0.965 J	0.870 J
Nickel	ug/L	35.4	29.8	19.7	30.1	3.05	4.13	10.3	10.4	8.93	9.22	8.67
Potassium	ug/L	50,600	46,700	46,400	45,700	48,600	50,800	861	844	1,030	1,070	1,070
Selenium	ug/L	<2.00	<2.00	<2.00	<2.00	<1.50	<1.50	<1.51	<2.00	<2.00	<2.00	<2.00
Silver	ug/L	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.177	<0.300	<0.300	<0.300	<0.300
Sodium	ug/L	226,000	194,000	163,000	192,000	130,000	91,100	25,600	24,400	26,000	29,500	29,300
Thallium	ug/L	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	0.493 U*	<0.600	<0.600	<0.600	<0.600
Vanadium	ug/L	<3.30	<3.30	<3.30	<3.30	<3.30	<3.30	1.31	<3.30	<3.30	<3.30	<3.30
Zinc	ug/L	63.8	57.6	22.2	45.0	<3.30	3.93 J	17.2 U*	16.3 J	12.4 U*	12.5 J	11.7 J
Radiological Parameters												
Radium-226	pCi/L	0.711 +/-(0.363)	1.56 +/-(0.747)U*	0.767 +/-(0.427)	1.60 +/-(0.805)	1.49 +/-(0.789)	0.333 +/-(0.544)U	2.81 +/-(0.812)	2.86 +/-(0.781)	2.50 +/-(0.714)	2.46 +/-(0.753)	3.31 +/-(0.897)
Radium-228	pCi/L	0.801 +/-(0.386)	0.754 +/-(0.452)	1.24 +/-(0.607)	1.18 +/-(0.561)	0.395 +/-(0.427)U	0.905 +/-(0.612)U*	-0.03 +/-(0.330)U	0.484 +/-(0.418)U	0.635 +/-(0.497)U	0.0551 +/-(0.328)U	0.127 +/-(0.350)U
Radium-226+228	pCi/L	1.51 +/-(0.530)	2.31 +/-(0.873)J	2.00 +/-(0.742)	2.78 +/-(0.982)	1.89 +/-(0.897)J	1.24 +/-(0.819)U*	2.81 +/-(0.876)J	3.35 +/-(0.886)J	3.13 +/-(0.870)J	2.52 +/-(0.822)J	3.44 +/-(0.963)J
Anions												
Chloride	mg/L	603	493	426	490	244	146	47.3	41.7	34.8	35.2	34.0
Fluoride	mg/L	0.187	0.179	0.180	0.188	0.386	0.198	0.379	0.441	0.390	0.429	0.420
Sulfate	mg/L	1,010	1,070	1,210	1,110	1,580	1,390	61.0	49.4	58.2	62.7	61.7
General Chemistry												
Alkalinity, Bicarbonate	mg/L	65.2	64.4	60.6	65.3	41.0	71.2	106	79.4	94.3	96.9	94.5
Alkalinity, Carbonate	mg/L	<1.45	<1.45	<0.725	<1.45	<1.45	<1.45	<5.00	<1.45	<1.45	<1.45	<1.45
pH (lab)	SU	-	-	-	-	-	-	-	-	-	-	-
Total Dissolved Solids	mg/L	2,590	2,610	2,570	2,640	2,770	2,340	268	201	279 J	240	220

See notes on last page.

Stantec

Table H.1-10- Groundwater Analytical Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		JOF-112							JOF-113			
Sample Date		13-Aug-20	13-Oct-20	16-Mar-21	16-Mar-21	28-Jul-21	16-Mar-22	15-Sep-22	4-Dec-19	12-Feb-20	8-Apr-20	10-Jun-20
Sample ID		JOF-GW-024-20200813	JOF-GW-024-20201013	JOF-GW-FD03-03162021	JOF-GW-JOF-112-03162021	JOF-GW-JOF-112-07282021	JOF-GW-JOF-112-03162022	JOF-GW-JOF-112-09152022	JOF-GW-025-20191204	JOF-GW-025-20200212	JOF-GW-025-20200408	JOF-GW-025-20200610
Parent Sample ID				JOF-GW-JOF-112-03162021								
Sample Depth		29.5 ft	29.5 ft	29.5 ft	29.5 ft	29.5 ft	29.5 ft	29.5 ft	43.5 ft	43.5 ft	43.5 ft	43.5 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	EIP	EIP	EIP	EIP	EIP	CCR Program	CCR Program	EIP	EIP	EIP	EIP
Total Metals												
Antimony	ug/L	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<0.378	<1.00	<1.00	<1.00
Arsenic	ug/L	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	1.62	4.16 J	<2.00	3.21 J
Barium	ug/L	57.0	64.8	61.1	59.0	61.5	86.0	88.3	29.4	24.4	23.5	23.4
Beryllium	ug/L	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.182	<0.200	<0.200	<0.200
Boron	ug/L	36.3	36.1	43.1	36.8	39.4	33.2	38.3	15,500	16,100	16,100	18,600
Cadmium	ug/L	0.551 J	0.576 J	0.528 J	0.537 J	0.708 J	1.40	1.38 U*	0.535 J	3.31	1.64	2.01
Calcium	ug/L	29,900	29,900	34,300	33,600	26,900	31,800	30,400	538,000	606,000	590,000	658,000
Chromium	ug/L	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	2.15	<3.00	<3.00	<3.00
Cobalt	ug/L	102	105	101	97.2	98.4	116	84.5	7.83	3.90 J	3.34	3.09
Copper	ug/L	0.532 J	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	0.655 J	<0.300	0.325 J	0.343 U*
Lead	ug/L	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.128	<0.500	<0.500	<0.500
Lithium	ug/L	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	156	133	118	128
Magnesium	ug/L	15,000	13,400	14,500	14,200	12,300	14,800	15,600	6,860	7,000	6,520	6,480
Mercury	ug/L	<0.0670	<0.0670	<0.0670	<0.0670	<0.0670	<0.0670	<0.0670	<0.101	<0.0670	<0.0670	<0.0670
Molybdenum	ug/L	0.760 J	0.824 J	0.874 U*	0.763 U*	0.717 U*	0.541 J	0.441 J	204	235	229	251
Nickel	ug/L	8.81	8.54	9.35	9.04	7.93	8.72	6.92	123	123	113	115
Potassium	ug/L	809	915	1,060	1,040	864	923	991	59,200	66,100	64,700	79,600
Selenium	ug/L	<2.00	<2.00	<2.00	<2.00	<2.00	<1.50	<1.50	<1.51	<2.00	<2.00	<2.00
Silver	ug/L	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.177	<0.300	<0.300	<0.300
Sodium	ug/L	27,100	25,400	33,300	32,500	28,200	23,000	23,800	62,700	54,200	46,200	58,500
Thallium	ug/L	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	0.676 J	0.758 J	0.811 J	0.823 J	0.874 J
Vanadium	ug/L	<3.30	<3.30	<3.30	<3.30	<3.30	<3.30	<3.30	1.22	<3.30	<3.30	<3.30
Zinc	ug/L	13.8 J	14.8 U*	11.9 J	12.0 J	10.7 J	14.7 J	12.2 J	173	236	234	247
Radiological Parameters												
Radium-226	pCi/L	3.31 +/-(0.894)	3.05 +/-(0.857)	3.67 +/-(0.967)	3.57 +/-(0.951)	3.66 +/-(0.938)	4.32 +/-(1.05)	4.05 +/-(1.05)	3.49 +/-(0.906)	2.44 +/-(0.689)	3.07 +/-(0.801)	3.13 +/-(0.848)
Radium-228	pCi/L	-0.325 +/-(0.351)U	0.785 +/-(0.616)U	-0.00587 +/-(0.326)U	-0.243 +/-(0.286)U	0.145 +/-(0.458)U	1.29 +/-(0.609)U*	-0.0967 +/-(0.526)U	0.853 +/-(0.574)U*	0.275 +/-(0.335)U	1.13 +/-(0.733)	0.399 +/-(0.323)U
Radium-226+228	pCi/L	3.31 +/-(0.960)J	3.83 +/-(1.06)J	3.67 +/-(1.02)J	3.57 +/-(0.993)J	3.81 +/-(1.04)J	5.61 +/-(1.22)J	4.05 +/-(1.17)J	4.34 +/-(1.07)J	2.72 +/-(0.766)J	4.21 +/-(1.09)	3.53 +/-(0.907)J
Anions												
Chloride	mg/L	31.6	32.0	39.0	38.7	31.9	59.6	73.2	38.8	43.1	64.8	53.3
Fluoride	mg/L	0.452	0.434	0.444	0.445	0.496	0.380	0.375	0.164	0.642 J	<0.330	<0.0330
Sulfate	mg/L	56.6	52.9	65.4	65.3	57.0	47.7	33.4	1,390	1,530	1,530	1,510
General Chemistry												
Alkalinity, Bicarbonate	mg/L	92.6	103	97.8	98.4	102	74.2	70.4	22.9	16.6	15.7	15.5
Alkalinity, Carbonate	mg/L	<1.45	<1.45	<0.725	<0.725	<1.45	<1.45	<1.45	<5.00	<1.45	<1.45	<1.45
pH (lab)	SU	-	-	-	-	-	-	-	-	-	-	-
Total Dissolved Solids	mg/L	213	267	234	246	234	233	219	2,330	2,330	2,390	2,290

See notes on last page.

Stantec

Table H.1-10- Groundwater Analytical Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		JOF-113							JOF-114			
Sample Date		13-Aug-20	13-Aug-20	15-Oct-20	18-Mar-21	29-Jul-21	17-Mar-22	15-Sep-22	4-Dec-19	12-Feb-20	8-Apr-20	10-Jun-20
Sample ID		JOF-GW-025-20200813	JOF-GW-DUP01-20200813	JOF-GW-025-20201015	JOF-GW-JOF-113-03182021	JOF-GW-JOF-113-07292021	JOF-GW-JOF-113-03172022	JOF-GW-JOF-113-09152022	JOF-GW-026-20191204	JOF-GW-026-20200212	JOF-GW-026-20200408	JOF-GW-026-20200610
Parent Sample ID			JOF-GW-025-20200813									
Sample Depth		43.5 ft	43.5 ft	43.5 ft	43.5 ft	43.5 ft	43.5 ft	43.5 ft	39.5 ft	39.5 ft	39.5 ft	39.5 ft
Sample Type		Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	EIP	EIP	EIP	EIP	EIP	CCR Program	CCR Program	EIP	EIP	EIP	EIP
Total Metals												
Antimony	ug/L	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<0.378	<1.00	<1.00	<1.00
Arsenic	ug/L	3.24 J	3.11 J	2.82 J	3.02 J	<2.00	3.68 J	<2.00	1.11	4.03 J	2.15 J	3.40 J
Barium	ug/L	23.3	23.5	24.4	23.3	21.4	22.8	21.1	24.0	20.4	21.5	20.5
Beryllium	ug/L	0.203 J	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	0.619 J	1.00	0.767	0.784
Boron	ug/L	15,700	15,700	15,600	15,300	13,500	13,900	16,100	10,700	11,200	12,500	15,900
Cadmium	ug/L	3.31	3.42	7.10	2.65	5.98	2.06	1.67 U*	0.335 J	0.346 J	<0.300	<0.300
Calcium	ug/L	553,000	531,000	580,000	583,000	500,000	550,000	548,000	469,000	548,000	543,000	629,000
Chromium	ug/L	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	2.84	<3.00	<3.00	<3.00
Cobalt	ug/L	2.65	2.74	2.48	2.34 J	1.74	1.85	1.79	76.9	77.3 J	68.2	68.7
Copper	ug/L	1.36 J	1.49 J	1.17 U*	0.415 J	0.634 J	0.400 J	0.483 J	1.79 J	1.24 U*	1.32 J	1.24 U*
Lead	ug/L	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.128	<0.500	<0.500	<0.500
Lithium	ug/L	121	121	123	134	115	117	114	101	81.1	83.4	87.6
Magnesium	ug/L	6,710	6,760	6,540	7,160	6,690	6,720	6,790	48,500	48,300	58,300	60,500
Mercury	ug/L	<0.0670	<0.0670	<0.0670	<0.0670	0.104 U*	<0.0670	<0.0670	<0.101	<0.0670	<0.0670	<0.0670
Molybdenum	ug/L	262	258	236	238	232	256	205	<0.610	<0.200	<0.200	0.277 J
Nickel	ug/L	115	115	117	114	98.9	109	112	24.0	22.1	17.9	17.7 U*
Potassium	ug/L	59,500	59,000	61,700	60,300	55,100	58,400	55,800	95,900	113,000	113,000	122,000
Selenium	ug/L	<2.00	<2.00	<2.00	<2.00	<2.00	<1.50	<1.50	<1.51	<2.00	<2.00	<2.00
Silver	ug/L	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.177	<0.300	<0.300	<0.300
Sodium	ug/L	42,500	41,800	42,700	43,800	37,600	39,700	36,600	328,000	345,000	333,000	390,000
Thallium	ug/L	0.883 J	0.857 J	0.919 J	0.954 J	0.913 J	0.935 J	0.909 J	0.636 J	0.637 J	<0.600	<0.600
Vanadium	ug/L	<3.30	<3.30	<3.30	<3.30	<3.30	<3.30	<3.30	1.46	<3.30	<3.30	<3.30
Zinc	ug/L	246	240	292 J	236	273	267 J	247	70.6	64.4	51.9	50.6
Radiological Parameters												
Radium-226	pCi/L	3.25 +/-(0.906)	3.63 +/-(0.954)	3.77 +/-(1.00)	3.26 +/-(0.876)	3.07 +/-(0.834)	2.79 +/-(0.825)	2.61 +/-(0.790)	2.56 +/-(0.730)	2.71 +/-(0.763)	1.92 +/-(0.603)	2.01 +/-(0.670)
Radium-228	pCi/L	0.207 +/-(0.340)U	0.524 +/-(0.442)U	0.293 +/-(0.341)U	0.239 +/-(0.421)U	0.918 +/-(0.549)	1.98 +/-(0.881)U*	1.20 +/-(0.730)	2.26 +/-(0.828)	2.18 +/-(0.828)	2.04 +/-(0.702)	2.12 +/-(0.738)
Radium-226+228	pCi/L	3.46 +/-(0.968)J	4.16 +/-(1.05)J	4.07 +/-(1.06)J	3.49 +/-(0.972)J	3.99 +/-(0.999)	4.77 +/-(1.21)J	3.81 +/-(1.08)	4.82 +/-(1.10)	4.89 +/-(1.13)	3.96 +/-(0.925)	4.13 +/-(0.997)
Anions												
Chloride	mg/L	70.0	69.9	65.8	68.0	70.5	70.9	67.7	258	252	257	252
Fluoride	mg/L	0.178	0.175	0.168	0.239	0.0824 J	0.177	0.157	<0.0658	0.106 J	<0.330	<0.0330
Sulfate	mg/L	1,480	1,500	1,440	1,540	1,550	1,530	1,460	1,800	2,090	2,100	2,050
General Chemistry												
Alkalinity, Bicarbonate	mg/L	13.9	13.9	13.1	9.55 J	13.3	13.8	14.4	<5.00	6.00 J	<1.45	2.35 J
Alkalinity, Carbonate	mg/L	<1.45	<1.45	<1.45	0.725 UJ	<1.45	<1.45	<1.45	<5.00	<1.45	<1.45	<1.45
pH (lab)	SU	-	-	-	-	-	-	-	-	-	-	-
Total Dissolved Solids	mg/L	2,320	2,370	2,340	2,380	2,400	2,440	2,280	3,240	3,220	3,350	3,310

See notes on last page.

Table H.1-10- Groundwater Analytical Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		JOF-114							JOF-117			
Sample Date		13-Aug-20	14-Oct-20	18-Mar-21	28-Jul-21	28-Jul-21	16-Mar-22	13-Sep-22	5-Dec-19	12-Feb-20	8-Apr-20	11-Jun-20
Sample ID		JOF-GW-026-20200813	JOF-GW-026-20201014	JOF-GW-JOF-114-03182021	JOF-GW-FD02-07282021	JOF-GW-JOF-114-07282021	JOF-GW-JOF-114-03162022	JOF-GW-JOF-114-09132022	JOF-GW-027-20191205	JOF-GW-027-20200212	JOF-GW-027-20200408	JOF-GW-027-20200611
Parent Sample ID					JOF-GW-JOF-114-07282021							
Sample Depth		39.5 ft	39.5 ft	39.5 ft	39.5 ft	39.5 ft	39.5 ft	39.5 ft	40.5 ft	40.5 ft	40.5 ft	40.5 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	EIP	EIP	EIP	EIP	EIP	CCR Program	CCR Program	EIP	EIP	EIP	EIP
Total Metals												
Antimony	ug/L	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<0.378	<1.00	<1.00	<1.00
Arsenic	ug/L	2.78 J	<2.00	3.28 J	<2.00	<2.00	2.80 J	<2.00	28.5	33.9	32.1	28.4
Barium	ug/L	20.1	20.3	20.8	18.6	18.2	19.1	18.3	95.4	89.7	88.8	88.9
Beryllium	ug/L	0.858	1.10	0.909	0.870	0.827	0.845	0.892	<0.182	<0.200	<0.200	<0.200
Boron	ug/L	11,500	11,600	11,800	11,600	11,600	11,400	11,100	<386	12.7 J	15.6	17.8 U*
Cadmium	ug/L	0.307 J	<0.300	<0.300	0.337 J	<0.300	<0.300	0.417 J	<0.125	<0.300	<0.300	<0.300
Calcium	ug/L	505,000	518,000	523,000	484,000	479,000	504,000	501,000	89,500	96,700	96,700	92,200
Chromium	ug/L	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	3.10 U*	<3.00	<3.00	<3.00
Cobalt	ug/L	68.9	71.1	65.5 J	60.6	58.8	55.7	55.5	25.7	24.2 J	21.5	20.1
Copper	ug/L	1.80 J	2.82 U*	2.22	1.79 J	1.63 J	2.92	1.40 J	0.697 J	<0.300	<0.300	<0.300
Lead	ug/L	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.128	<0.500	<0.500	<0.500
Lithium	ug/L	79.5	77.5	92.8	77.8	74.8	78.6	73.0	12.9 U*	<3.00	<3.00	<3.00
Magnesium	ug/L	53,300	47,900	55,400	54,100	54,100	51,800	50,900	30,400	31,100	30,300	28,900
Mercury	ug/L	<0.0670	<0.0670	<0.0670	0.0990 U*	0.0950 U*	<0.0670	<0.0670	<0.101	<0.670	<0.0670	<0.0670
Molybdenum	ug/L	<0.200	<0.200	0.443 U*	0.212 U*	<0.200	<0.200	<0.200	26.8	29.3	29.6	30.4
Nickel	ug/L	18.8	20.4	16.4	16.3	15.9	15.0	16.3	10.1	6.96	5.94	5.26 U*
Potassium	ug/L	106,000	104,000	103,000	94,000	94,500	95,300	94,400	2,760	2,890	3,000	2,790
Selenium	ug/L	<2.00	<2.00	<2.00	<2.00	<2.00	<1.50	<1.50	<1.51	<2.00	<2.00	<2.00
Silver	ug/L	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.177	<0.300	<0.300	<0.300
Sodium	ug/L	313,000	307,000	315,000	281,000	282,000	259,000	229,000	35,900	39,300	34,900	34,200
Thallium	ug/L	0.609 J	0.741 J	<0.600	0.606 J	<0.600	<0.600	<0.600	<0.148	<0.600	<0.600	<0.600
Vanadium	ug/L	<3.30	<3.30	<3.30	<3.30	<3.30	<3.30	<3.30	1.18	<3.30	<3.30	<3.30
Zinc	ug/L	53.7	68.0	45.9	50.2	49.1	40.4	43.5	4.62 U*	<3.30	3.61 U*	<3.30
Radiological Parameters												
Radium-226	pCi/L	2.38 +/-(0.712)	2.18 +/-(0.735)	2.19 +/-(0.692)	1.72 +/-(0.578)	2.39 +/-(0.749)	1.84 +/-(0.583)	1.87 +/-(0.677)	1.80 +/-(0.579)	1.73 +/-(0.576)	1.72 +/-(0.570)	2.61 +/-(0.748)
Radium-228	pCi/L	1.42 +/-(0.689)	2.26 +/-(0.755)	1.86 +/-(0.710)	2.49 +/-(0.840)	2.85 +/-(0.953)	2.54 +/-(0.858)U*	2.20 +/-(0.985)U*	0.897 +/-(0.496)	0.499 +/-(0.342)	0.589 +/-(0.364)	0.538 +/-(0.346)
Radium-226+228	pCi/L	3.81 +/-(0.991)	4.44 +/-(1.05)	4.05 +/-(0.992)	4.22 +/-(1.02)	5.24 +/-(1.21)	4.38 +/-(1.04)J	4.07 +/-(1.19)J	2.69 +/-(0.763)	2.23 +/-(0.670)	2.31 +/-(0.677)	3.15 +/-(0.824)
Anions												
Chloride	mg/L	233	224	213	224	223	194	192	82.3	79.3	77.8	81.6 J
Fluoride	mg/L	0.0814 J	0.0623 J	0.0496 J	0.0541 J	0.0537 J	0.410	0.0641 J	0.793	0.972 J	0.864	0.957
Sulfate	mg/L	1,980	1,890	2,090	2,120	2,130	2,130	2,060	6.80	8.68	7.30	7.27 J
General Chemistry												
Alkalinity, Bicarbonate	mg/L	1.96 J	1.76 J	0.725 UJ	<1.45	<1.45	1.80 J	<1.45	322	348	332	303
Alkalinity, Carbonate	mg/L	<1.45	<1.45	0.725 UJ	<1.45	<1.45	<1.45	<1.45	<5.00	<1.45	<1.45	<1.45
pH (lab)	SU	-	-	-	-	-	-	-	-	-	-	-
Total Dissolved Solids	mg/L	3,270	3,250	3,380	3,410	3,370	3,300	3,150	470	464	454	403

See notes on last page.

Table H.1-10- Groundwater Analytical Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		JOF-117						JOF-118			
Sample Date		13-Aug-20	15-Oct-20	19-Mar-21	29-Jul-21	16-Mar-22	14-Sep-22	3-Dec-19	11-Feb-20	9-Apr-20	9-Apr-20
Sample ID		JOF-GW-027-20200813	JOF-GW-027-20201015	JOF-GW-JOF-117-03192021	JOF-GW-JOF-117-07292021	JOF-GW-JOF-117-03162022	JOF-GW-JOF-117-09142022	JOF-GW-028-20191203	JOF-GW-028-20200211	JOF-GW-028-20200409	JOF-GW-DUP01-20200409
Parent Sample ID											JOF-GW-028-20200409
Sample Depth		40.5 ft	40.5 ft	40.5 ft	40.5 ft	40.5 ft	40.5 ft	48.5 ft	48.5 ft	48.5 ft	48.5 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample
Program	Units	EIP	EIP	EIP	EIP	CCR Program	CCR Program	EIP	EIP	EIP	EIP
Total Metals											
Antimony	ug/L	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<0.378	<1.00	<1.00	<1.00
Arsenic	ug/L	32.8	31.9	32.8	27.8	28.8	27.6	1.30	3.11 U*	2.18 J	2.25 J
Barium	ug/L	81.8	92.0	90.3	79.3	89.6	84.0	22.3	22.2	30.6	31.4
Beryllium	ug/L	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.182	<0.200	<0.200	<0.200
Boron	ug/L	14.6 J	13.9 J	15.0	11.2 J	11.9 J	10.6 J	57.3 J	59.4	65.5	63.9
Cadmium	ug/L	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.125	<0.300	0.382 J	0.353 J
Calcium	ug/L	84,600	91,800	93,700	81,900	92,900	83,400	31,200	29,900	40,600	42,100
Chromium	ug/L	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	1.58 J	<3.00	<3.00	<3.00
Cobalt	ug/L	20.6	20.4	18.5 J	15.1	14.4	14.7	2.41	1.86	3.02	3.08
Copper	ug/L	<0.300	<0.300	<0.300	0.500 J	<0.300	<0.300	<0.627	<0.300	<0.300	<0.300
Lead	ug/L	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.128	<0.500	<0.500	<0.500
Lithium	ug/L	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.39	<3.00	<3.00	<3.00
Magnesium	ug/L	28,600	28,500	31,700	27,800	32,900	30,400	5,730	5,970	7,140	7,330
Mercury	ug/L	<0.0670	<0.0670	<0.0670	<0.0670	<0.0670	<0.0670	<0.101	<0.0670	<0.0670	<0.0670
Molybdenum	ug/L	30.8	26.7	24.6	24.5	20.8	22.5	<0.610	<0.200	0.344 J	0.341 J
Nickel	ug/L	5.52	6.00	5.96	5.18	5.81	5.72	8.56	7.12	9.16	9.68
Potassium	ug/L	2,510	2,780	2,820	2,370	2,870	2,490	932	1,020	1,300	1,290
Selenium	ug/L	<2.00	<2.00	<2.00	<2.00	<1.50	<1.50	<1.51	<2.00	<2.00	<2.00
Silver	ug/L	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.177	<0.300	<0.300	<0.300
Sodium	ug/L	32,800	34,100	37,100	30,500	39,600	33,500	26,800	24,400	44,500	46,000
Thallium	ug/L	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	<0.148	<0.600	<0.600	<0.600
Vanadium	ug/L	<3.30	<3.30	<3.30	<3.30	<3.30	<3.30	1.33	<3.30	<3.30	<3.30
Zinc	ug/L	<3.30	<3.30	<3.30	4.04 J	<3.30	<3.30	5.51 U*	4.56 J	10.1 U*	10.6 U*
Radiological Parameters											
Radium-226	pCi/L	2.57 +/-(0.762)	3.72 +/-(0.981)	3.01 +/-(0.822)	2.40 +/-(0.736)U*	2.69 +/-(0.797)	1.88 +/-(1.03)	0.273 +/-(0.412)U	-0.436 +/-(0.380)U	0.751 +/-(0.648)U	1.21 +/-(0.707)
Radium-228	pCi/L	0.580 +/-(0.494)U	0.534 +/-(0.394)U	0.230 +/-(0.447)U	0.509 +/-(0.480)U	0.708 +/-(0.495)U*	0.946 +/-(0.894)U	-0.264 +/-(0.347)U	0.303 +/-(0.484)U	0.757 +/-(0.647)U	-0.514 +/-(0.374)U
Radium-226+228	pCi/L	3.15 +/-(0.908)J	4.25 +/-(1.06)J	3.24 +/-(0.936)J	2.91 +/-(0.879)U*	3.40 +/-(0.938)J	2.82 +/-(1.36)J	0.273 +/-(0.539)U	0.303 +/-(0.616)U	1.51 +/-(0.916)U	1.21 +/-(0.800)J
Anions											
Chloride	mg/L	79.3	78.5	81.6	86.1	94.1	87.9	11.6	10.3	14.2	13.8
Fluoride	mg/L	0.984	0.851	0.826	0.829	0.836	0.854	0.0818 J	0.344	0.498	0.523
Sulfate	mg/L	5.42	3.86	2.63	1.49	0.507 U*	0.611	99.7	81.0	127	125
General Chemistry											
Alkalinity, Bicarbonate	mg/L	327	334	323 J	324	308	303	50.5	41.0	64.8	64.0
Alkalinity, Carbonate	mg/L	<1.45	<1.45	0.725 UJ	<1.45	<1.45	<1.45	<5.00	<1.45	<1.45	<1.45
pH (lab)	SU	-	-	-	-	-	-	-	-	-	-
Total Dissolved Solids	mg/L	431	476	473 J	479	496	479	214	190	259	254

See notes on last page.

Table H.1-10- Groundwater Analytical Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		JOF-118							
Sample Date		10-Jun-20	13-Aug-20	14-Oct-20	18-Mar-21	29-Jul-21	17-Mar-22	14-Sep-22	14-Sep-22
Sample ID		JOF-GW-028-20200610	JOF-GW-028-20200813	JOF-GW-028-20201014	JOF-GW-JOF-118-03182021	JOF-GW-JOF-118-07292021	JOF-GW-JOF-118-03172022	JOF-GW-FD03-09142022	JOF-GW-JOF-118-09142022
Parent Sample ID								JOF-GW-JOF-118-09142022	
Sample Depth		48.5 ft	48.5 ft	48.5 ft	48.5 ft	48.5 ft	48.5 ft	48.5 ft	48.5 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample
Program	Units	EIP	EIP	EIP	EIP	EIP	CCR Program	CCR Program	CCR Program
Total Metals									
Antimony	ug/L	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
Arsenic	ug/L	2.81 J	2.66 J	<2.00	2.79 J	<2.00	4.23 J	<2.00	<2.00
Barium	ug/L	25.6	24.4	24.1	31.9	22.4	37.3	20.1	20.0
Beryllium	ug/L	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200
Boron	ug/L	76.9	61.2	62.0	132	99.4	924	510	517
Cadmium	ug/L	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300
Calcium	ug/L	39,700	35,400	34,600	74,700	48,500	169,000	75,300	72,400
Chromium	ug/L	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00
Cobalt	ug/L	3.05	3.07	2.93	9.29 J	6.58	43.5	22.0	22.3
Copper	ug/L	<0.300	0.490 J	<0.300	<0.300	0.353 J	<0.300	0.314 J	<0.300
Lead	ug/L	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500
Lithium	ug/L	<3.00	<3.00	<3.00	3.46 J	<3.00	8.12 J	5.76 J	5.68 J
Magnesium	ug/L	6,300	6,750	6,980	17,600	11,200	27,300	12,100	12,300
Mercury	ug/L	<0.0670	<0.0670	0.0670 U*	0.0760 U*	<0.0670	<0.0670	<0.0670	<0.0670
Molybdenum	ug/L	0.234 J	0.210 J	<0.200	0.292 U*	0.285 U*	0.302 U*	<0.200	<0.200
Nickel	ug/L	8.03 U*	11.2	13.0	43.4	26.2	38.0	16.6	16.8
Potassium	ug/L	1,270	936	976	1,250	977	2,540	1,820	1,820
Selenium	ug/L	<2.00	<2.00	<2.00	<2.00	<2.00	<1.50	<1.50	<1.50
Silver	ug/L	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300
Sodium	ug/L	41,800	32,800	34,400	71,700	44,100	48,900	20,800	21,000
Thallium	ug/L	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600
Vanadium	ug/L	<3.30	<3.30	<3.30	<3.30	<3.30	<3.30	<3.30	<3.30
Zinc	ug/L	5.50 U*	9.71 J	10.8 U*	20.6	18.5 J	18.9 J	6.26 J	5.96 J
Radiological Parameters									
Radium-226	pCi/L	0.345 +/-(0.372)U	0.513 +/-(0.534)U	0.563 +/-(0.511)U	0.110 +/-(0.225)U	0.462 +/-(0.489)U	0.414 +/-(0.455)U	0.333 +/-(0.563)U	0.445 +/-(0.596)U
Radium-228	pCi/L	-0.173 +/-(0.326)U	0.293 +/-(0.447)U	0.136 +/-(0.240)U	0.120 +/-(0.327)U	0.142 +/-(0.443)U	1.13 +/-(0.702)U*	0.0624 +/-(0.393)U	-0.134 +/-(0.617)U
Radium-226+228	pCi/L	0.345 +/-(0.494)U	0.806 +/-(0.696)U	0.699 +/-(0.565)U	0.230 +/-(0.397)U	0.604 +/-(0.660)U	1.54 +/-(0.837)U*	0.395 +/-(0.687)U	0.445 +/-(0.858)U
Anions									
Chloride	mg/L	11.6	12.9	12.5	18.8	13.5	14.1	9.57	9.76
Fluoride	mg/L	0.480	0.449	0.356	0.405	0.387	0.522	0.386	0.392
Sulfate	mg/L	100	116	120	297	204	786	321	326
General Chemistry									
Alkalinity, Bicarbonate	mg/L	51.5	50.3	42.9	42.3 J	42.4	45.6	44.0 J	35.6 J
Alkalinity, Carbonate	mg/L	<1.45	<1.45	<1.45	0.725 UJ	<1.45	<1.45	<1.45	<1.45
pH (lab)	SU	-	-	-	-	-	-	-	-
Total Dissolved Solids	mg/L	250	246	286	527	364	1,270	548	517

See notes on last page.

Sample Location		JOF-119									
Sample Date		3-Dec-19	3-Dec-19	11-Feb-20	11-Feb-20	9-Apr-20	9-Jun-20	13-Aug-20	13-Oct-20	13-Oct-20	18-Mar-21
Sample ID		JOF-GW-029-20191203	JOF-GW-DUP01-20191203	JOF-GW-029-20200211	JOF-GW-DUP01-20200211	JOF-GW-029-20200409	JOF-GW-029-20200609	JOF-GW-029-20200813	JOF-GW-029-20201013	JOF-GW-DUP01-20201013	JOF-GW-JOF-119-03182021
Parent Sample ID			JOF-GW-029-20191203		JOF-GW-029-20200211					JOF-GW-029-20201013	
Sample Depth		42.5 ft	42.5 ft	42.5 ft	42.5 ft	42.5 ft	42.5 ft	42.5 ft	42.5 ft	42.5 ft	42.5 ft
Sample Type		Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample
Program	Units	EIP	EIP	EIP	EIP	EIP	EIP	EIP	EIP	EIP	EIP
Total Metals											
Antimony	ug/L	<0.378	<0.378	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1.56 J
Arsenic	ug/L	1.36	1.29	3.77 U*	3.59 U*	<2.00	3.11 J	2.50 J	<2.00	<2.00	3.22 J
Barium	ug/L	38.9	38.9	41.0	41.7	29.1	40.4	39.4	35.5	36.5	35.3
Beryllium	ug/L	<0.182	<0.182	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200
Boron	ug/L	<38.6	<38.6	37.0	36.2	28.5	40.2	29.6	22.2	19.8	30.4
Cadmium	ug/L	<0.125	<0.125	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300
Calcium	ug/L	22,200	21,700	25,800	25,600	21,200	27,500	24,700	20,700	20,600	28,200
Chromium	ug/L	<1.53	2.12	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00
Cobalt	ug/L	2.22	2.49	3.04	3.06	0.723 J	3.00	2.21	1.91	1.94	1.70 J
Copper	ug/L	<0.627	<0.627	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	0.410 J
Lead	ug/L	<0.128	<0.128	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500
Lithium	ug/L	<3.39	<3.39	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00
Magnesium	ug/L	4,240	4,170	5,070	5,140	4,210	4,640	4,560	3,960	3,920	5,180
Mercury	ug/L	<0.101	<0.101	<0.0670	<0.0670	<0.0670	<0.0670	<0.0670	<0.0670	<0.0670	0.0820 U*
Molybdenum	ug/L	<0.610	<0.610	0.789 U*	0.795 U*	0.354 J	0.721 J	0.455 J	0.386 J	0.334 J	0.724 U*
Nickel	ug/L	2.47	2.60	2.79	2.63	1.58 J	2.41	2.05	1.66 J	1.69 J	1.54 J
Potassium	ug/L	1,480	1,480	1,600	1,640	1,930	1,720	1,350	1,310	1,300	1,530
Selenium	ug/L	<1.51	<1.51	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
Silver	ug/L	<0.177	<0.177	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300
Sodium	ug/L	52,100	52,800	62,300	60,800	45,600	59,200	41,900	33,800	33,700	52,000
Thallium	ug/L	<0.148	<0.148	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600
Vanadium	ug/L	0.999 J	1.65	<3.30	<3.30	<3.30	<3.30	<3.30	3.83 U*	3.89 U*	<3.30
Zinc	ug/L	5.09 U*	3.79 U*	<3.30	<3.30	6.82 U*	3.63 J	4.52 J	3.71 U*	6.32 U*	<3.30
Radiological Parameters											
Radium-226	pCi/L	0.752 +/-(0.696)U	0.453 +/-(0.531)U	0.804 +/-(0.682)U	0.275 +/-(0.550)U	0.241 +/-(0.541)U	0.0436 +/-(0.211)U	0.456 +/-(0.465)U	0.0515 +/-(0.274)U	0.284 +/-(0.326)U	0.00997 +/-(0.187)U
Radium-228	pCi/L	-0.211 +/-(0.267)U	-0.358 +/-(0.364)U	-0.397 +/-(0.318)U	0.108 +/-(0.507)U	0.287 +/-(0.407)U	0.238 +/-(0.280)U	0.130 +/-(0.341)U	-0.0856 +/-(0.329)U	0.0159 +/-(0.268)U	0.489 +/-(0.564)U
Radium-226+228	pCi/L	0.752 +/-(0.746)U	0.453 +/-(0.644)U	0.804 +/-(0.752)U	0.383 +/-(0.748)U	0.527 +/-(0.677)U	0.282 +/-(0.351)U	0.586 +/-(0.577)U	0.0515 +/-(0.428)U	0.300 +/-(0.422)U	0.499 +/-(0.595)U
Anions											
Chloride	mg/L	24.8	24.9	21.5	21.4	22.3	22.9	21.6	21.1	21.0	20.6
Fluoride	mg/L	0.0719 J	0.203 J	0.411	0.408	0.420	0.407	0.413	0.350	0.378	0.414
Sulfate	mg/L	65.6	66.3	53.8	53.7	53.1	44.9	36.9	27.9	28.0	39.0
General Chemistry											
Alkalinity, Bicarbonate	mg/L	99.3	101	113	111	118	111	99.6	83.4	84.5	114 J
Alkalinity, Carbonate	mg/L	<5.00	<5.00	<1.45	<1.45	<1.45	<1.45	<1.45	<1.45	<1.45	0.725 UJ
pH (lab)	SU	-	-	-	-	-	-	-	-	-	-
Total Dissolved Solids	mg/L	235	234	246 J	249	199	240	171	176	171	247

See notes on last page.

Table H.1-10- Groundwater Analytical Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		JOF-119			
Sample Date		28-Jul-21	17-Mar-22	17-Mar-22	14-Sep-22
Sample ID		JOF-GW-JOF-119-07282021	JOF-GW-FD03-03172022	JOF-GW-JOF-119-03172022	JOF-GW-JOF-119-09142022
Parent Sample ID			JOF-GW-JOF-119-03172022		
Sample Depth		42.5 ft	42.5 ft	42.5 ft	42.5 ft
Sample Type		Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	EIP	CCR Program	CCR Program	CCR Program
Total Metals					
Antimony	ug/L	<1.00	<1.00	<1.00	<1.00
Arsenic	ug/L	2.33 J	3.40 J	3.27 J	<2.00
Barium	ug/L	39.7	33.7	34.1	31.5
Beryllium	ug/L	<0.200	<0.200	<0.200	<0.200
Boron	ug/L	34.6	28.1	29.2	20.9
Cadmium	ug/L	<0.300	<0.300	<0.300	<0.300
Calcium	ug/L	25,100	27,700	27,400	21,300
Chromium	ug/L	<3.00	<3.00	<3.00	<3.00
Cobalt	ug/L	2.16	1.58	1.54	1.57
Copper	ug/L	<0.300	<0.300	<0.300	<0.300
Lead	ug/L	<0.500	<0.500	<0.500	<0.500
Lithium	ug/L	<3.00	<3.00	<3.00	<3.00
Magnesium	ug/L	4,560	4,890	4,810	3,790
Mercury	ug/L	0.101 U*	<0.0670	<0.0670	<0.0670
Molybdenum	ug/L	0.543 U*	0.677 U*	0.646 U*	0.296 J
Nickel	ug/L	1.80 J	1.29 J	1.29 J	2.05
Potassium	ug/L	1,320	1,430	1,400	1,240
Selenium	ug/L	<2.00	<1.50	<1.50	<1.50
Silver	ug/L	<0.300	<0.300	<0.300	<0.300
Sodium	ug/L	40,800	42,700	41,400	31,100
Thallium	ug/L	<0.600	<0.600	<0.600	<0.600
Vanadium	ug/L	<3.30	<3.30	<3.30	<3.30
Zinc	ug/L	<3.30	<3.30	<3.30	<3.30
Radiological Parameters					
Radium-226	pCi/L	0.124 +/-(0.324)U	0.0943 +/-(0.349)U	0.220 +/-(0.279)U	0.130 +/-(0.429)U
Radium-228	pCi/L	0.425 +/-(0.371)U	0.941 +/-(0.614)U*	0.726 +/-(0.408)U*	0.714 +/-(0.463)U*
Radium-226+228	pCi/L	0.549 +/-(0.493)U	1.04 +/-(0.706)U*	0.946 +/-(0.494)U*	0.843 +/-(0.631)U*
Anions					
Chloride	mg/L	22.1	20.4	20.4	21.1
Fluoride	mg/L	0.421	0.399	0.397	0.386
Sulfate	mg/L	32.3	28.8	28.8	19.7
General Chemistry					
Alkalinity, Bicarbonate	mg/L	112	109	113	85.0
Alkalinity, Carbonate	mg/L	<1.45	<1.45	<1.45	<1.45
pH (lab)	SU	-	-	-	-
Total Dissolved Solids	mg/L	213	237	220	154

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

15.2	measured concentration did not exceed the indicated standard
<0.03	analyte was not detected at a concentration greater than the Method Detection Limit
-	Parameter not analyzed / not available.
ft	feet
ID	Identification
J	quantitation is approximate due to limitations identified during data validation
U*	result should be considered "not detected" because it was detected in an associated field or laboratory blank at a similar level
UJ	This compound was not detected, but the reporting or detection limit should be considered estimated due to a bias identified during data validation.
UR	Unreliable reporting or detection limit; compound may or may not be present in sample.
mg/L	milligrams per Liter
pCi/L	picocuries per Liter
SU	standard unit
ug/L	micrograms per Liter

Stantec

Table H.1-11- Groundwater Quality Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		10-AP1								
Sample Date		23-Sep-15	22-Mar-16	22-Mar-16	21-Sep-16	2-Nov-16	5-Jan-17	18-Jan-17	16-Feb-17	15-Mar-17
Sample ID		10-AP1_0923151200_L790475-01	10-AP1_0322161200_L825030-01	JOF-10-AP1-0316	10-AP1_0921161200_L861578-01	JOF-GW-001-11022016	JOF-GW-001-01052017	JOF-GW-001-01182017	JOF-GW-001-02162017	JOF-GW-001-03152017
Parent Sample ID										
Sample Depth		47 ft	47 ft	47 ft	47 ft	47 ft	47 ft	47 ft	47 ft	47 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	State Compliance	State Compliance	State Compliance	State Compliance	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program
Field Parameters										
Dissolved Oxygen	%	-	-	-	-	41.1	2.0	2.8	3.6	2.5
Dissolved Oxygen	mg/L	-			1.3	3.67	0.20	0.26	0.36	0.24
ORP	mV	-	345	345	348	66.7	114.0	129.6	134.6	124.9
pH (field)	SU	-	5.5	5.5	-	5.45	5.54	5.43	5.50	5.37
Specific Cond. (Field)	uS/cm	-	693	693	675	700	700	700	700	700
Temperature, Water (C)	DEG C	21.1	21.1	21.1	24.5	20.8	16.9	17.9	17.5	16.6
Turbidity, field	NTU	3.4	3.8	3.8	10.6	8.78	4.81	3.57	9.39	4.93

See notes on last page.

Table H.1-11- Groundwater Quality Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		10-AP1									
Sample Date		11-Apr-17	17-May-17	6-Jun-17	11-Jul-17	2-Aug-17	20-Sep-17	20-Sep-17	6-Oct-17	15-Mar-18	24-May-18
Sample ID		JOF-GW-001-04112017	JOF-GW-001-05172017	JOF-GW-001-06062017	JOF-GW-001-07112017	JOF-GW-001-08022017	JOF-AP1	JOF-GW-001-09202017	JOF-GW-001-10062017	JOF-AP1-0318	JOF-GW-001-05242018
Parent Sample ID											
Sample Depth		47 ft	47 ft	47 ft	47 ft	47 ft	47 ft	47 ft	47 ft	47 ft	47 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	State Compliance	CCR Program	CCR Program	State Compliance	CCR Program
Field Parameters											
Dissolved Oxygen	%	4.4	3.9	8.7	2.4	1.8	-	2.1	2.9	-	4.8
Dissolved Oxygen	mg/L	0.43	0.36	0.89	0.23	0.16	0.55	0.19	0.27	0.5	0.45
ORP	mV	133.8	135.7	190.4	119.3	124.1	367	142.6	157.6	413	129.4
pH (field)	SU	5.40	5.34	5.30	5.39	5.32	-	5.35	5.37	5.5	5.27
Specific Cond. (Field)	uS/cm	710	700	700	640	650	673	640	590	682	700
Temperature, Water (C)	DEG C	19.1	19.4	19.9	20.1	20.3	-	20.7	20.1	-	19.4
Turbidity, field	NTU	4.63	4.85	4.95	4.47	3.22	-	2.60	4.29	-	4.66

See notes on last page.

Table H.1-11- Groundwater Quality Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		10-AP1									
Sample Date		13-Jun-18	27-Jun-18	25-Jul-18	15-Aug-18	12-Sep-18	3-Apr-19	10-Jul-19	18-Sep-19	9-Oct-19	22-Jan-20
Sample ID		JOF-GW-001-06132018	JOF-GW-001-06272018	JOF-GW-001-07252018	JOF-GW-001-08152018	JOF-AP1-09122018	JOF-GW-001-04032019	JOF-GW-001-07102019	JOF-GW-001-09182019	JOF-GW-001-10092019	JOF-GW-001-01222020
Parent Sample ID											
Sample Depth		47 ft	47 ft	47 ft	47 ft	47 ft	47 ft	47 ft	47 ft	47 ft	47 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	CCR Program	CCR Program	CCR Program	CCR Program	State Compliance	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program
Field Parameters											
Dissolved Oxygen	%	2.7	2.5	3.4	2.2	-	2.7	1.3	1.7	5.4	4.8
Dissolved Oxygen	mg/L	0.25	0.23	0.29	0.21	0.5	0.25	0.12	0.15	0.47	0.48
ORP	mV	162.3	193.3	121.7	175.3	391	208.9	-101.4	150.2	150.4	138.5
pH (field)	SU	5.29	5.24	5.39	5.25	5.4	5.29	5.30	5.27	5.27	5.41
Specific Cond. (Field)	uS/cm	610	600	600	610	662	620	610	610	570	540
Temperature, Water (C)	DEG C	19.5	19.8	19.7	19.9	21.3	19.1	22.3	21.8	22.2	15.4
Turbidity, field	NTU	4.82	4.44	3.67	4.12	9.1	4.38	4.10	4.21	4.67	7.81

See notes on last page.

Stantec

Table H.1-11- Groundwater Quality Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		10-AP1								
Sample Date		6-Mar-20	22-Jul-20	10-Sep-20	10-Feb-21	18-Mar-21	28-Jul-21	15-Sep-21	2-Feb-22	16-Mar-22
Sample ID		JOF-GW-001-03062020	JOF-GW-001-07222020	JOF-GW-001-09102020	JOF-GW-10-AP1-02102021	JOF-GW-10-AP1-03182021	JOF-GW-10-AP1-07282021	JOF-GW-10-AP1-09152021	JOF-GW-10-AP1-02022022	JOF-GW-10-AP1-03162022
Parent Sample ID										
Sample Depth		47 ft	47 ft	47 ft	47 ft	47 ft	47 ft	47 ft	47 ft	47 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	CCR Program	State Compliance	State Compliance	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program
Field Parameters										
Dissolved Oxygen	%	2.6	4.0	4.0	2.2	4.1	4.3	3.5	3.7	3.9
Dissolved Oxygen	mg/L	0.25	0.35	0.35	0.22	0.40	0.36	0.31	0.36	0.39
ORP	mV	122.6	159.8	129.3	102.3	156.0	46.7	293.2	168.8	50.2
pH (field)	SU	5.25	5.32	5.13	5.38	5.29	5.60	5.36	5.40	5.42
Specific Cond. (Field)	uS/cm	610	670	700	670	680	710	660	630	620
Temperature, Water (C)	DEG C	17.8	21.4	21.3	15.3	15.9	23.1	20.6	16.8	16.3
Turbidity, field	NTU	8.38	6.11	4.98	4.47	1.51	7.75	5.62	2.67	3.82

See notes on last page.

Table H.1-11- Groundwater Quality Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		10-AP1			10-AP3				
Sample Date		3-Aug-22	14-Sep-22	8-Feb-23	23-Sep-15	22-Mar-16	22-Mar-16	22-Sep-16	2-Nov-16
Sample ID		JOF-GW-10-AP1-08032022	JOF-GW-10-AP1-09142022	JOF-GW-10-AP1-02082023	10-AP3_0923151200_L790475-03	10-AP3_0322161200_L825030-02	JOF-10-AP3-0316	10-AP3_0922161200_L861581-02	JOF-GW-002-11022016
Parent Sample ID									
Sample Depth		47 ft	47 ft	47 ft	45.5 ft	45.5 ft	45.5 ft	45.5 ft	45.5 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	CCR Program	CCR Program		State Compliance	State Compliance	State Compliance	State Compliance	CCR Program
Field Parameters									
Dissolved Oxygen	%	0.1	2.3	3.2	-	-	-	-	-
Dissolved Oxygen	mg/L	0.01	0.21	0.31	-	1	1	1.4	0.45
ORP	mV	148.9	138.6	153.3	-	446	446	421	92.4
pH (field)	SU	5.44	5.41	5.36	-	5.1	5.1	4.9	4.98
Specific Cond. (Field)	uS/cm	580	567	663	-	1,235	1,235	1,219	1,260
Temperature, Water (C)	DEG C	22.8	20.5	17.1	23.6	21.9	21.9	19.3	18.4
Turbidity, field	NTU	27.1	14.7	3.65	4.9	8.2	8.2	1.1	3.99

See notes on last page.

Table H.1-11- Groundwater Quality Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		10-AP3									
Sample Date		5-Jan-17	17-Jan-17	15-Feb-17	14-Mar-17	12-Apr-17	16-May-17	6-Jun-17	11-Jul-17	2-Aug-17	20-Sep-17
Sample ID		JOF-GW-002-01052017	JOF-GW-002-01172017	JOF-GW-002-02152017	JOF-GW-002-03142017	JOF-GW-002-04122017	JOF-GW-002-05162017	JOF-GW-002-06062017	JOF-GW-002-07112017	JOF-GW-002-08022017	JOF-AP3
Parent Sample ID											
Sample Depth		45.5 ft	45.5 ft	45.5 ft	45.5 ft	45.5 ft	45.5 ft	45.5 ft	45.5 ft	45.5 ft	45.5 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	State Compliance
Field Parameters											
Dissolved Oxygen	%	1.5	3.0	2.5	3.3	9.0	10.2	45.5	8.8	2.8	-
Dissolved Oxygen	mg/L	0.15	0.29	0.25	0.33	0.88	0.96	4.29	0.85	0.24	0.37
ORP	mV	144.1	196.5	181.4	198.5	204.2	169.0	236.8	164.1	229.9	437
pH (field)	SU	5.14	5.00	5.10	5.09	4.94	4.92	4.77	4.93	4.89	-
Specific Cond. (Field)	uS/cm	1,220	1,200	1,220	1,240	1,200	1,210	1,200	1,140	1,140	1,165
Temperature, Water (C)	DEG C	16.0	17.3	16.8	15.8	17.6	18.1	18.5	19.2	19.4	-
Turbidity, field	NTU	1.81	2.74	4.24	3.23	3.28	2.24	3.17	1.38	0.46	-

See notes on last page.

Table H.1-11- Groundwater Quality Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		10-AP3									
Sample Date		20-Sep-17	6-Oct-17	14-Mar-18	23-May-18	13-Jun-18	26-Jun-18	24-Jul-18	14-Aug-18	12-Sep-18	3-Apr-19
Sample ID		JOF-GW-002-09202017	JOF-GW-002-10062017	JOF-AP3-0318	JOF-GW-002-05232018	JOF-GW-002-06132018	JOF-GW-002-06262018	JOF-GW-002-07242018	JOF-GW-002-08142018	JOF-AP3-09122018	JOF-GW-002-04032019
Parent Sample ID											
Sample Depth		45.5 ft	45.5 ft	45.5 ft	45.5 ft	45.5 ft	45.5 ft	45.5 ft	45.5 ft	45.5 ft	45.5 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	CCR Program	CCR Program	State Compliance	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	State Compliance	CCR Program
Field Parameters											
Dissolved Oxygen	%	1.7	3.8	-	3.0	4.1	2.5	5.4	2.4	-	2.2
Dissolved Oxygen	mg/L	0.16	0.37	0.6	0.30	0.40	0.23	0.46	0.26	0.4	0.22
ORP	mV	190.6	222.0	523	138.4	137.5	272.6	204.7	250.2	443	255.1
pH (field)	SU	4.92	4.96	5.1	4.83	4.91	4.85	5.02	4.86	5	4.92
Specific Cond. (Field)	uS/cm	1,140	1,030	1,111	1,170	1,050	1,060	1,050	1,070	1,135	1,000
Temperature, Water (C)	DEG C	19.2	18.6	-	18.2	18.1	18.8	18.8	18.6	19.1	17.4
Turbidity, field	NTU	1.15	0.29	-	4.92	2.09	1.96	1.85	1.41	0.4	4.35

See notes on last page.

Stantec

Table H.1-11- Groundwater Quality Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		10-AP3									
Sample Date		10-Jul-19	18-Sep-19	9-Oct-19	23-Jan-20	6-Mar-20	22-Jul-20	9-Sep-20	10-Feb-21	18-Mar-21	28-Jul-21
Sample ID		JOF-GW-002-07102019	JOF-GW-002-09182019	JOF-GW-002-10092019	JOF-GW-002-01232020	JOF-GW-002-03062020	JOF-GW-002-07222020	JOF-GW-002-09092020	JOF-GW-10-AP3-02102021	JOF-GW-10-AP3-03182021	JOF-GW-10-AP3-07282021
Parent Sample ID											
Sample Depth		45.5 ft	45.5 ft	45.5 ft	45.5 ft	45.5 ft	45.5 ft	45.5 ft	45.5 ft	45.5 ft	45.5 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	State Compliance	State Compliance	CCR Program	CCR Program	CCR Program
Field Parameters											
Dissolved Oxygen	%	0.8	2.4	6.0	7.1	3.5	4.0	2.4	3.1	2.5	1.9
Dissolved Oxygen	mg/L	0.07	0.22	0.58	0.72	0.36	0.36	0.22	0.31	0.26	0.18
ORP	mV	-74.8	222.1	184.3	218.4	151.8	257.9	182.3	132.1	186.3	82.8
pH (field)	SU	4.97	4.88	4.94	5.04	4.96	4.95	4.97	5.13	4.99	5.27
Specific Cond. (Field)	uS/cm	1,010	990	930	860	950	1,080	1,100	980	1,010	1,070
Temperature, Water (C)	DEG C	18.4	19.0	18.6	14.6	15.2	19.3	18.9	15.3	16.5	17.8
Turbidity, field	NTU	4.72	4.07	3.25	4.10	4.48	4.02	2.39	2.01	1.81	3.16

See notes on last page.

Table H.1-11- Groundwater Quality Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		10-AP3						B-6R		
Sample Date		15-Sep-21	2-Feb-22	16-Mar-22	3-Aug-22	14-Sep-22	8-Feb-23	17-Mar-15	22-Mar-16	21-Sep-16
Sample ID		JOF-GW-10-AP3-09152021	JOF-GW-10-AP3-02022022	JOF-GW-10-AP3-03162022	JOF-GW-10-AP3-08032022	JOF-GW-10-AP3-09142022	JOF-GW-10-AP3-02082023	JOF-B6R-0315	JOF-B6R-0316	JOF-B6R-0916
Parent Sample ID										
Sample Depth		45.5 ft	45.5 ft	45.5 ft	45.5 ft	45.5 ft	45.5 ft	20.5 ft	20.5 ft	20.5 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program		State Compliance	State Compliance	State Compliance
Field Parameters										
Dissolved Oxygen	%	2.1	2.4	2.0	0.1	0.5	2.0	-	-	-
Dissolved Oxygen	mg/L	0.20	0.23	0.20	0.01	0.05	0.19	2.9	1.1	2.5
ORP	mV	316.8	237.8	13.0	258.5	175.6	197.9	510	520	540
pH (field)	SU	5.04	5.06	5.05	5.02	5.02	5.00	5	5.2	4.9
Specific Cond. (Field)	uS/cm	1,010	920	920	880	860	950	547	616	650
Temperature, Water (C)	DEG C	18.2	16.9	17.0	18.7	18.5	17.0	18.7	15.3	24.1
Turbidity, field	NTU	2.09	0.79	1.94	4.84	4.95	3.52	4.4	4.6	4.3

See notes on last page.

Stantec

Table H.1-11- Groundwater Quality Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		B-6R									
Sample Date		21-Sep-16	14-Mar-17	12-Jun-17	18-Sep-17	12-Dec-17	13-Mar-18	11-Jun-18	11-Sep-18	12-Mar-19	12-Sep-19
Sample ID		JOF-B8R-DUP-0916	JOF-B6R	JOF-B6R	JOF-B6R	JOF-B6R-1217	JOF-B6R-0318	JOF-B6R-0618	JOF-B6R-09112018	B-6R	JOF-B6R-0919
Parent Sample ID											
Sample Depth		20.5 ft	20.5 ft	20.5 ft	20.5 ft	20.5 ft	20.5 ft	20.5 ft	20.5 ft	20.5 ft	20.5 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance
Field Parameters											
Dissolved Oxygen	%	-	-	-	-	-	-	-	-	-	-
Dissolved Oxygen	mg/L	-	2.3	1.7	1.3	1.9	1.7	1.3	1.5	2.2	1.56
ORP	mV	-	604	588	576	598	628	587	634	630	565
pH (field)	SU	5.47	5	4.9	5	5	5.1	4.9	5	4.9	5.05
Specific Cond. (Field)	uS/cm	-	600	640	629	615	576	624	632	571	647
Temperature, Water (C)	DEG C	-	-	-	-	-	-	-	22.5	16.7	26.75
Turbidity, field	NTU	-	-	-	-	-	-	-	1.7	0.4	0.1

See notes on last page.

Stantec

Table H.1-11- Groundwater Quality Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		B-6R							B-8R		
Sample Date		4-Mar-20	16-Sep-20	17-Mar-21	15-Sep-21	8-Feb-22	2-Aug-22	7-Feb-23	17-Mar-15	22-Sep-15	22-Mar-16
Sample ID		JOF-B6R-0320	JOF-B6R-0920	JOF-GW-B-6R-03172021	JOF-GW-B6R-09152021	JOF-GW-B-6R-02082022	JOF-GW-B-6R-08022022	JOF-GW-B-6R-02072023	JOF-B8R-0315	JOF-B8R-0915	JOF-B8R-0316
Parent Sample ID											
Sample Depth		20.5 ft	20.5 ft	20.5 ft	20.5 ft	20.5 ft	20.5 ft	20.5 ft	16 ft	16 ft	16 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance		State Compliance	State Compliance	State Compliance
Field Parameters											
Dissolved Oxygen	%	-	-	16	15.8	18.5	22.9	18.5	-	-	-
Dissolved Oxygen	mg/L	2.2	1.24	1.54	1.34	1.75	1.87	1.69	3.9	1.8	4.1
ORP	mV	554	623	718	596	553	499	471	494	430	452
pH (field)	SU	5.0	4.95	4.83	4.82	5.09	4.97	4.94	5.3	4.7	5.9
Specific Cond. (Field)	uS/cm	564	641	628	644	607	644	581	255	286	297
Temperature, Water (C)	DEG C	15.5	22.4	15.4	22.37	16.62	24.63	18.82	15.6	23.5	10.4
Turbidity, field	NTU	0.0	0.0	0.8	1.4	0.4	0.00	1.5	5	3.7	4.4

See notes on last page.

See notes on last page.

Stantec

Table H.1-11- Groundwater Quality Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		B-8R									
Sample Date		21-Sep-16	14-Mar-17	12-Jun-17	18-Sep-17	12-Dec-17	13-Mar-18	11-Jun-18	11-Sep-18	13-Mar-19	12-Sep-19
Sample ID		JOF-B8R-0916	JOF-B-8R	JOF-B8R	JOF-B-8R	JOF-B-8R-1217	JOF-B-8R-0318	JOF-B-8R-0618	JOF-B-8R-09112018	B-8R	JOF-B8R-0919
Parent Sample ID											
Sample Depth		16 ft	16 ft	16 ft	16 ft	16 ft	16 ft	16 ft	16 ft	16 ft	16 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance
Field Parameters											
Dissolved Oxygen	%	-	-	-	-	-	-	-	-	-	-
Dissolved Oxygen	mg/L	2.3	4.1	1.4	1.2	1.2	3.8	2	2.6	4.9	1.01
ORP	mV	478	400	555	520	528	514	457	564	569	488
pH (field)	SU	5.61	5.6	5	5.2	5.2	5.9	5.6	5.2	5.8	5.13
Specific Cond. (Field)	uS/cm	285	344	297	281	288	331	301	291	280	292
Temperature, Water (C)	DEG C	24.4	-	-	-	-	-	-	22.5	13	25.23
Turbidity, field	NTU	1.4	-	-	-	-	-	-	1.8	0	0

See notes on last page.

See notes on last page.

Stantec

Table H.1-11- Groundwater Quality Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		B-8R	B-8R	B-8R	B-8R	B-8R	B-8R	B-8R	B-9	B-9	B-9
Sample Date		4-Mar-20	16-Sep-20	17-Mar-21	16-Sep-21	8-Feb-22	2-Aug-22	7-Feb-23	17-Mar-15	22-Sep-15	21-Mar-16
Sample ID		JOF-B8R-0320	JOF-B8R-0920	JOF-GW-B-8R-03172021	JOF-GW-B8R-09162021	JOF-GW-B-8R-02082022	JOF-GW-B-8R-08022022	JOF-GW-B-8R-02072023	JOF-B9-0315	JOF-B9-0915	JOF-B9-0316
Parent Sample ID											
Sample Depth		16 ft	16 ft	16 ft	16 ft	16 ft	16 ft	16 ft	48 ft	48 ft	48 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance		State Compliance	State Compliance	State Compliance
Field Parameters											
Dissolved Oxygen	%	-	-	31	12.2	32.5	26.3	52.2	-	-	-
Dissolved Oxygen	mg/L	3.7	1.1	3.12	1.06	3.36	2.12	4.78	7.8	6.7	6.7
ORP	mV	522	240	777	257	457	492	433	459	347	364
pH (field)	SU	5.8	5.3	5.58	5.08	5.85	5.24	5.76	5.7	5.8	5.8
Specific Cond. (Field)	uS/cm	346	611	349	314	304	327	357	60	61	61
Temperature, Water (C)	DEG C	14.6	22.5	14.4	20.37	13.31	25.52	19.05	17.2	15.6	14.4
Turbidity, field	NTU	0.0	0.0	0.4	0.0	0.4	0.90	1.3	4.5	4.4	4.1

See notes on last page.

Table H.1-11- Groundwater Quality Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		B-9									
Sample Date		20-Sep-16	1-Nov-16	4-Jan-17	16-Jan-17	15-Feb-17	14-Mar-17	11-Apr-17	16-May-17	6-Jun-17	10-Jul-17
Sample ID		JOF-B9-0916	JOF-GW-009-11012016	JOF-GW-009-01042017	JOF-GW-009-01162017	JOF-GW-009-02152017	JOF-GW-009-03142017	JOF-GW-009-04112017	JOF-GW-009-05162017	JOF-GW-009-06062017	JOF-GW-009-07102017
Parent Sample ID											
Sample Depth		48 ft	48 ft	48 ft	48 ft	48 ft	48 ft	48 ft	48 ft	48 ft	48 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	State Compliance	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program
Field Parameters											
Dissolved Oxygen	%	-	-	56.5	56.6	55.3	53.0	54.2	68.5	73.9	54.0
Dissolved Oxygen	mg/L	7.4	8.01	5.85	5.56	5.66	5.59	5.48	6.65	6.85	5.11
ORP	mV	500	189.2	186.1	177.3	179.1	168.8	156.7	164.7	220.6	218.4
pH (field)	SU	5.5	5.87	5.65	5.56	5.69	5.66	5.45	5.28	5.47	5.32
Specific Cond. (Field)	uS/cm	66	65	70	70	70	69	69	68	70	67
Temperature, Water (C)	DEG C	20.5	18.0	13.9	16.6	14.5	12.8	16.4	16.8	17.2	18.0
Turbidity, field	NTU	8.5	32.8	4.33	21.1	4.26	6.78	12.4	4.21	4.18	4.96

See notes on last page.

Table H.1-11- Groundwater Quality Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		B-9									
Sample Date		1-Aug-17	19-Sep-17	19-Sep-17	5-Oct-17	13-Mar-18	23-May-18	12-Jun-18	26-Jun-18	24-Jul-18	14-Aug-18
Sample ID		JOF-GW-009-08012017	JOF-B-9	JOF-GW-009-09192017	JOF-GW-009-10052017	JOF-B9-0318	JOF-GW-009-05232018	JOF-GW-009-06122018	JOF-GW-009-06262018	JOF-GW-009-07242018	JOF-GW-009-08142018
Parent Sample ID											
Sample Depth		48 ft	48 ft	48 ft	48 ft	48 ft	48 ft	48 ft	48 ft	48 ft	48 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	CCR Program	State Compliance	CCR Program	CCR Program	State Compliance	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program
Field Parameters											
Dissolved Oxygen	%	63.5	-	62.1	58.5	-	62.9	59.6	58.1	55.4	56.0
Dissolved Oxygen	mg/L	5.96	7	6.00	5.57	6.87	6.01	5.82	5.57	5.28	5.40
ORP	mV	169.1	481	171.0	171.7	513	149.9	156.2	254.3	165.3	217.7
pH (field)	SU	5.76	5.6	5.60	5.91	5.67	5.33	5.14	5.61	5.78	5.41
Specific Cond. (Field)	uS/cm	66	68	63	61	67	70	69	59	62	60
Temperature, Water (C)	DEG C	17.9	-	17.9	17.0	-	17.0	17.0	17.4	18.2	17.0
Turbidity, field	NTU	11.28	-	4.36	2.71	-	3.67	4.21	4.18	4.40	3.95

See notes on last page.

Table H.1-11- Groundwater Quality Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		B-9									
Sample Date		11-Sep-18	2-Apr-19	8-Jul-19	17-Sep-19	9-Oct-19	22-Jan-20	4-Mar-20	21-Jul-20	9-Sep-20	9-Feb-21
Sample ID		JOF-B-9-09112018	JOF-GW-009-04022019	JOF-GW-009-07082019	JOF-GW-009-09172019	JOF-GW-009-10092019	JOF-GW-009-01222020	JOF-GW-009-03042020	JOF-GW-009-07212020	JOF-GW-009-09092020	JOF-GW-B-9-02092021
Parent Sample ID											
Sample Depth		48 ft	48 ft	48 ft	48 ft	48 ft	48 ft	48 ft	48 ft	48 ft	48 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	State Compliance	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	State Compliance	State Compliance	CCR Program
Field Parameters											
Dissolved Oxygen	%	-	65.2	63.2	61.8	57.8	67.9	69.1	77.2	64.1	58.3
Dissolved Oxygen	mg/L	6.8	5.76	6.05	5.90	5.64	6.67	6.65	7.43	6.06	5.85
ORP	mV	551	227.6	22.0	230.8	159.1	226.4	155.9	229.1	176.3	176.4
pH (field)	SU	5.6	5.21	5.46	5.02	5.80	5.48	5.48	5.46	5.25	5.89
Specific Cond. (Field)	uS/cm	68	62	64	60	60	55	63	64	76.4	70
Temperature, Water (C)	DEG C	17.9	16.5	17.3	17.5	16.3	15.5	16.1	17.2	18.2	15.4
Turbidity, field	NTU	1.5	3.93	4.63	3.85	2.81	4.41	4.92	3.37	4.71	4.54

See notes on last page.

Table H.1-11- Groundwater Quality Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		B-9							
Sample Date		16-Mar-21	27-Jul-21	14-Sep-21	1-Feb-22	15-Mar-22	2-Aug-22	13-Sep-22	7-Feb-23
Sample ID		JOF-GW-B-9-03162021	JOF-GW-B-9-07272021	JOF-GW-B-9-09142021	JOF-GW-B-9-02012022	JOF-GW-B-9-03152022	JOF-GW-B-9-08022022	JOF-GW-B-9-09132022	JOF-GW-B-9-02072023
Parent Sample ID									
Sample Depth		48 ft	48 ft	48 ft	48 ft	48 ft	48 ft	48 ft	48 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	
Field Parameters									
Dissolved Oxygen	%	61.3	52.6	70.8	51.7	53.7	61.7	60.7	60.2
Dissolved Oxygen	mg/L	6.03	4.85	6.61	5.14	5.39	5.56	5.73	6.02
ORP	mV	206	106.8	358.4	177.0	76.5	237.9	146.4	194.0
pH (field)	SU	5.8	5.94	5.80	5.90	6.07	5.50	5.87	5.78
Specific Cond. (Field)	uS/cm	72	116	72	68	68	65	62	73.4
Temperature, Water (C)	DEG C	17.2	18.8	18.6	15.0	15.7	18.9	17.9	15.4
Turbidity, field	NTU	3.85	4.26	4.84	4.12	4.10	4.29	3.10	3.59

See notes on last page.

Table H.1-11- Groundwater Quality Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		89-B10								
Sample Date		17-Mar-15	22-Sep-15	21-Mar-16	20-Sep-16	13-Jun-17	19-Sep-17	11-Dec-17	12-Sep-18	12-Mar-19
Sample ID		JOF-B10-0315	JOF-B10-0915	JOF-B10-0316	89-B10_0920161201_L861582-01	JOF-B10	JOF-B10	JOF-B10-1217	JOF-B10-09122018	JOF-B10
Parent Sample ID										
Sample Depth		40 ft	40 ft	40 ft	40 ft	40 ft	40 ft	40 ft	40 ft	40 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance
Field Parameters										
Dissolved Oxygen	%	-	-	-	-	-	-	-	-	-
Dissolved Oxygen	mg/L	6.7	5.9	5.8	6.4	5.9	6.1	6.4	6	5.96
ORP	mV	455	393	431	528	490	519	524	572	605
pH (field)	SU	5.2	5.3	5.3	-	5	5.2	5.2	5.2	5.18
Specific Cond. (Field)	uS/cm	83	131	107	128	104	88	66	7.2	90
Temperature, Water (C)	DEG C	21.3	20.2	18.1	19.1	-	-	-	28.4	18.3
Turbidity, field	NTU	5.2	5.1	10.6	16.1	-	-	-	6.3	15.2

See notes on last page.

Stantec

Table H.1-11- Groundwater Quality Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		89-B10							
Sample Date		10-Sep-19	3-Mar-20	15-Sep-20	15-Mar-21	14-Sep-21	9-Feb-22	4-Aug-22	8-Feb-23
Sample ID		JOF-B10-0919	JOF-B10-0320	JOF-B10-0920	JOF-GW-89-B10-03152021	JOF-GW-89-B10-09142021	JOF-GW-89-B10-02092022	JOF-GW-89-B10-08042022	JOF-GW-89-B10-02082023
Parent Sample ID									
Sample Depth		40 ft	40 ft	40 ft	40 ft	40 ft	40 ft	40 ft	40 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	
Field Parameters									
Dissolved Oxygen	%	-	-	-	60.7	69.9	59.9	65.0	61.2
Dissolved Oxygen	mg/L	6	5.9	5.97	5.84	5.83	5.25	6.11	5.78
ORP	mV	567	512	428	571	435	524	517	467
pH (field)	SU	5.2	5.3	5.2	5.13	5.27	5.25	4.95	5.02
Specific Cond. (Field)	uS/cm	95	86	83	73	107	85	108	90
Temperature, Water (C)	DEG C	25.9	18.9	22.0	16.47	24.94	16.52	23.90	19.99
Turbidity, field	NTU	40.9	50.1	18.8	15.4	4.7	4.5	3.7	4.0

See notes on last page.

Table H.1-11- Groundwater Quality Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		B-11									
Sample Date		17-Mar-15	22-Sep-15	22-Mar-16	21-Sep-16	13-Jun-17	19-Sep-17	11-Dec-17	13-Sep-18	13-Mar-19	11-Sep-19
Sample ID		JOF-B11-0315	JOF-B11-0915	JOF-B11-0316	B-11_0921161200_L861582-02	JOF-B11	JOF-B11	JOF-B11-1217	JOF-B11-09132018	JOF-B11	JOF-B11-0919
Parent Sample ID											
Sample Depth		35 ft	35 ft	35 ft	35 ft	35 ft	35 ft	35 ft	35 ft	35 ft	35 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance
Field Parameters											
Dissolved Oxygen	%	-	-	-	-	-	-	-	-	-	-
Dissolved Oxygen	mg/L	1.8	1.1	1	1.6	1.1	0.9	1.27	1.3	1.7	0.4
ORP	mV	458	416	485	509	508	539	546	557	598	578
pH (field)	SU	5.2	5.1	5.2	-	4.9	5	5.22	5.1	5.5	5
Specific Cond. (Field)	uS/cm	791	966	809	1,421	1,115	1,634	1,535	1,150	852	1,576
Temperature, Water (C)	DEG C	18.8	23	18.7	20.9	-	-	-	24.1	19.7	25
Turbidity, field	NTU		2.7	5.2	5.4	-	-	-	6.7	6.6	15.5

See notes on last page.

Table H.1-11- Groundwater Quality Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		B-11						B-12			
Sample Date		5-Mar-20	17-Sep-20	16-Mar-21	15-Sep-21	9-Feb-22	3-Aug-22	17-Mar-15	22-Sep-15	21-Mar-16	21-Sep-16
Sample ID		JOF-B11-0320	JOF-B11-0920	JOF-GW-B11-03162021	JOF-GW-B11-09152021	JOF-GW-B-11-02092022	JOF-GW-B-11-08032022	JOF-B12-0315	JOF-B12-0915	JOF-B12-0316	B-12_0921161201_L861582-03
Parent Sample ID											
Sample Depth		35 ft	35 ft	35 ft	35 ft	35 ft	35 ft	35 ft	35 ft	35 ft	35 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	State Compliance	State Compliance	State Compliance	CCR Program	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance
Field Parameters											
Dissolved Oxygen	%	-	-	6.9	59.4	58.3	60.00	-	-	-	-
Dissolved Oxygen	mg/L	1.2	0.4	0.69	5.26	5.35	5.15	2.5	0.8	2.1	1.7
ORP	mV	532	451	502	458	507	486	461	409	452	470
pH (field)	SU	5.3	5.0	5.16	5.04	5.35	5.07	5.5	5.3	5.3	5.1
Specific Cond. (Field)	uS/cm	740	1,118	820	978	860	854	2,506	3,374	2,458	4,120
Temperature, Water (C)	DEG C	18.2	21.8	17.07	20.07	18.12	21.80	19.6	21.1	18.9	20.3
Turbidity, field	NTU	54.0	24.9	23.3	15.7	4.7	4.7	0.9	4.7	3.9	62.1

See notes on last page.

Table H.1-11- Groundwater Quality Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		B-12									
Sample Date		13-Jun-17	19-Sep-17	11-Dec-17	13-Sep-18	13-Mar-19	12-Sep-19	5-Mar-20	16-Sep-20	16-Mar-21	16-Sep-21
Sample ID		JOF-B12	JOF-B12	JOF-B12-1217	JOF-B12-09132018	JOF-B12	JOF-B12-0919	JOF-B12-0320	JOF-B12-0920	JOF-GW-B12-03162021	JOF-GW-B12-09162021
Parent Sample ID											
Sample Depth		35 ft	35 ft	35 ft	35 ft	35 ft	35 ft	35 ft	35 ft	35 ft	35 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance
Field Parameters											
Dissolved Oxygen	%	-	-	-	-	-	-	-	-	3.7	30.7
Dissolved Oxygen	mg/L	1.2	0.9	0.88	0.8	3.5	0.4	2.6	0.9	0.43	2.50
ORP	mV	520	540	568	567	610	518	538	444	541	449
pH (field)	SU	5	5.1	5.05	5	5.1	5.1	5.3	5.1	5.19	5.07
Specific Cond. (Field)	uS/cm	3,878	4,185	3,540	4,041	2,525	4,547	2,009	3,378	2,449	2,774
Temperature, Water (C)	DEG C	-	-	-	28	23.8	22.2	14.3	22.8	19	24.09
Turbidity, field	NTU	-	-	-	9.6	8.2	229	668	384	267.8	63.7

See notes on last page.

Stantec

Table H.1-11- Groundwater Quality Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		B-13									
Sample Date		17-Mar-15	22-Sep-15	21-Mar-16	20-Sep-16	12-Jun-17	19-Sep-17	11-Dec-17	12-Sep-18	12-Mar-19	10-Sep-19
Sample ID		JOF-B13-0315	JOF-B13-0915	JOF-B13-0316	B-13_0920161200_L861582-04	JOF-B13	JOF-B13	JOF-B13-1217	JOF-B13-09122018	JOF-B13	JOF-B13-0919
Parent Sample ID											
Sample Depth		42 ft	42 ft	42 ft	42 ft	42 ft	42 ft	42 ft	42 ft	42 ft	42 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance
Field Parameters											
Dissolved Oxygen	%	-	-	-	-	-	-	-	-	-	-
Dissolved Oxygen	mg/L	5.4	5.4	5.1	6.1	5.4	5.2	5.77	5.43	4.8	5.3
ORP	mV	415	429	493	529	551	542	579	567	584	564
pH (field)	SU	4.7	4.9	4.8	-	4.7	4.8	4.79	4.74	5	4.8
Specific Cond. (Field)	uS/cm	3,763	3,146	3,476	3,222	3,110	3,367	3,115	2,901	2,420	3,122
Temperature, Water (C)	DEG C	21.5	22.7	19.9	19.9	-	-	-	21.42	15.3	24.5
Turbidity, field	NTU	5.1	5.2	9.4	13.1	-	-	-	7.3	4.8	9.3

See notes on last page.

Table H.1-11- Groundwater Quality Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		B-13							99-B20A		
Sample Date		4-Mar-20	16-Sep-20	15-Mar-21	14-Sep-21	9-Feb-22	3-Aug-22	7-Feb-23	15-Mar-17	12-Jun-17	18-Sep-17
Sample ID		JOF-B13-0320	JOF-B13-0920	JOF-GW-B13-03152021	JOF-GW-B13-09142021	JOF-GW-B-13-02092022	JOF-GW-B-13-08032022	JOF-GW-B-13-02072023	JOF-B20A	JOF-B20A	JOF-B20A
Parent Sample ID											
Sample Depth		42 ft	42 ft	42 ft	42 ft	42 ft	42 ft	42 ft	35 ft	35 ft	35 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	State Compliance	State Compliance	State Compliance	CCR Program	State Compliance	State Compliance		State Compliance	State Compliance	State Compliance
Field Parameters											
Dissolved Oxygen	%	-	-	54	66.2	50.0	60.5	50.6	-	-	-
Dissolved Oxygen	mg/L	4.9	4.9	4.99	5.38	5.17	5.01	4.80	5.9	6.2	5.9
ORP	mV	565	453	599	454	513	552	473	553	475	482
pH (field)	SU	4.9	4.7	4.65	4.73	4.74	4.49	4.68	5.1	5.3	5.3
Specific Cond. (Field)	uS/cm	3,056	3,100	2,996	2,746	2,599	2,496	2,384	222	220	214
Temperature, Water (C)	DEG C	16.9	19.3	17.8	24.15	12.84	23.44	17.03	-	-	-
Turbidity, field	NTU	5.0	4.9	4.9	4.6	0.9	2.3	4.9	-	-	-

See notes on last page.

Table H.1-11- Groundwater Quality Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		99-B20A									
Sample Date		11-Dec-17	13-Mar-18	11-Jun-18	13-Sep-18	12-Mar-19	11-Sep-19	3-Mar-20	16-Sep-20	15-Mar-21	15-Sep-21
Sample ID		JOF-B20A-1217	JOF-B20A-0318	JOF-B20A-0618	JOF-B20A-09132018	JOF-B20A	JOF-B20A-0919	JOF-B20A-0320	JOF-B20A-0920	JOF-GW-99-B20A-03152021	JOF-GW-99-B20A-09152021
Parent Sample ID											
Sample Depth		35 ft	35 ft	35 ft	35 ft	35 ft	35 ft	35 ft	35 ft	35 ft	35 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance
Field Parameters											
Dissolved Oxygen	%	-	-	-	-	-	-	-	-	56.1	57.2
Dissolved Oxygen	mg/L	5.69	5.5	5.3	5.43	5.3	5.3	5.14	5.00	5.11	5.07
ORP	mV	535	476	560	531	618	530	521	436	568	446
pH (field)	SU	5.27	5.3	5.2	5.2	5.1	5.2	5.31	5.2	5.22	5.03
Specific Cond. (Field)	uS/cm	219	301	291	300	328	300	278	293	266	256
Temperature, Water (C)	DEG C	-	-	-	20.01	17.9	22.8	19.6	22.7	19.13	20.19
Turbidity, field	NTU	-	-	-	6.3	6.5	12.8	24.2	4.8	8	4.2

See notes on last page.

Table H.1-11- Groundwater Quality Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		99-B20A			JOF-101				
Sample Date		9-Feb-22	2-Aug-22	8-Feb-23	1-Nov-16	4-Jan-17	16-Jan-17	15-Feb-17	14-Mar-17
Sample ID		JOF-GW-99-B20A-02092022	JOF-GW-99-B20A-08022022	JOF-GW-99-B20A-02082023	JOF-GW-013-11012016	JOF-GW-013-01042017	JOF-GW-013-01162017	JOF-GW-013-02152017	JOF-GW-013-03142017
Parent Sample ID									
Sample Depth		35 ft	35 ft	35 ft	52 ft	52 ft	52 ft	52 ft	52 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	State Compliance	State Compliance		CCR Program	CCR Program	CCR Program	CCR Program	CCR Program
Field Parameters									
Dissolved Oxygen	%	54.0	68.2	54.4	-	49.7	52.4	58.4	51.7
Dissolved Oxygen	mg/L	5.16	5.44	5.11	6.63	5.21	5.18	5.80	5.53
ORP	mV	530	503	459	200.1	177.4	185.8	181.2	180.5
pH (field)	SU	5.27	5.13	5.10	5.62	5.39	5.18	5.33	5.51
Specific Cond. (Field)	uS/cm	241	226	213	47	46	49	46	46
Temperature, Water (C)	DEG C	16.84	25.87	17.96	18.6	13.3	16.9	15.4	12.4
Turbidity, field	NTU	4.6	3.9	4.1	0.37	0.44	1.47	0.77	0.98

See notes on last page.

Table H.1-11- Groundwater Quality Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		JOF-101									
Sample Date		11-Apr-17	16-May-17	6-Jun-17	10-Jul-17	1-Aug-17	18-Sep-17	19-Sep-17	5-Oct-17	13-Mar-18	23-May-18
Sample ID		JOF-GW-013-04112017	JOF-GW-013-05162017	JOF-GW-013-06062017	JOF-GW-013-07102017	JOF-GW-013-08012017	JOF-101	JOF-GW-013-09192017	JOF-GW-013-10052017	JOF-101-0318	JOF-GW-013-05232018
Parent Sample ID											
Sample Depth		52 ft	52 ft	52 ft	52 ft	52 ft	52 ft	52 ft	52 ft	52 ft	52 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	State Compliance	CCR Program	CCR Program	State Compliance	CCR Program
Field Parameters											
Dissolved Oxygen	%	57.5	59.4	78.4	65.1	65.7	-	67.2	57.0	-	63.9
Dissolved Oxygen	mg/L	5.68	5.64	7.36	5.38	5.97	7.01	5.68	5.68	6.9	6.00
ORP	mV	175.6	209.4	238.0	258.1	199.4	465	174.9	190.6	500	144.0
pH (field)	SU	5.07	4.60	5.09	4.79	5.64	5.39	5.49	5.75	5.5	5.07
Specific Cond. (Field)	uS/cm	47	48	48	48	45	45	47	50	45	49
Temperature, Water (C)	DEG C	16.8	18.2	18.6	21.8	19.8	-	22.3	19.5	-	18.6
Turbidity, field	NTU	1.29	0.57	1.03	0.44	0.01	-	0.01	0.01	-	1.00

See notes on last page.

Table H.1-11- Groundwater Quality Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		JOF-101									
Sample Date		12-Jun-18	26-Jun-18	24-Jul-18	14-Aug-18	11-Sep-18	2-Apr-19	8-Jul-19	17-Sep-19	9-Oct-19	21-Jan-20
Sample ID		JOF-GW-013-06122018	JOF-GW-013-06262018	JOF-GW-013-07242018	JOF-GW-013-08142018	JOF-101-09112018	JOF-GW-013-04022019	JOF-GW-013-07082019	JOF-GW-013-09172019	JOF-GW-013-10092019	JOF-GW-013-01212020
Parent Sample ID											
Sample Depth		52 ft	52 ft	52 ft	52 ft	52 ft	52 ft	52 ft	52 ft	52 ft	52 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	CCR Program	CCR Program	CCR Program	CCR Program	State Compliance	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program
Field Parameters											
Dissolved Oxygen	%	62.0	62.7	64.9	62.1	-	65.7	72.8	73.7	65.2	70.2
Dissolved Oxygen	mg/L	5.84	5.76	6.15	5.82	7	6.39	6.76	6.63	6.29	7.18
ORP	mV	173.6	256.7	176.0	205.1	581	221.5	74.8	225.4	147.1	237.7
pH (field)	SU	5.19	5.41	5.46	5.08	5.4	5.13	5.20	4.69	5.60	5.80
Specific Cond. (Field)	uS/cm	56	44	43	43	46	46	45	44	42	39
Temperature, Water (C)	DEG C	18.5	19.4	18.00	18.6	18.6	16.5	18.8	20.2	16.9	14.2
Turbidity, field	NTU	0.56	0.44	0.43	0.47	1.2	4.67	3.66	1.66	1.70	5.25

See notes on last page.

Table H.1-11- Groundwater Quality Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		JOF-101									
Sample Date		4-Mar-20	21-Jul-20	9-Sep-20	9-Feb-21	16-Mar-21	27-Jul-21	14-Sep-21	1-Feb-22	15-Mar-22	2-Aug-22
Sample ID		JOF-GW-013-03042020	JOF-GW-013-07212020	JOF-GW-013-09092020	JOF-GW-JOF-101-02092021	JOF-GW-JOF-101-03162021	JOF-GW-JOF-101-07272021	JOF-GW-JOF-101-09142021	JOF-GW-JOF-101-02012022	JOF-GW-JOF-101-03152022	JOF-GW-JOF-101-08022022
Parent Sample ID											
Sample Depth		52 ft	52 ft	52 ft	52 ft	52 ft	52 ft	52 ft	52 ft	52 ft	52 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	CCR Program	State Compliance	State Compliance	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program
Field Parameters											
Dissolved Oxygen	%	69.5	76.4	70.3	78.6	63.9	68.1	77.4	57.6	63.5	71.1
Dissolved Oxygen	mg/L	6.82	7.08	6.63	7.92	6.42	6.48	7.42	5.71	6.20	6.67
ORP	mV	149.9	192.0	188.0	129.1	196	93.4	326.4	167.1	81.9	256.0
pH (field)	SU	5.19	5.10	4.64	5.87	5.73	5.97	5.55	5.79	5.97	5.09
Specific Cond. (Field)	uS/cm	47	48	52.5	49	50	88	48	46	46	44
Temperature, Water (C)	DEG C	16.5	19.0	18.2	15	15.2	17.8	17.4	16.3	15.5	17.9
Turbidity, field	NTU	4.97	3.65	1.74	2.08	0.62	1.52	1.77	1.25	1.61	1.94

See notes on last page.

Table H.1-11- Groundwater Quality Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		JOF-101		JOF-102						
Sample Date		13-Sep-22	7-Feb-23	14-Mar-17	12-Jun-17	18-Sep-17	11-Dec-17	13-Mar-18	11-Jun-18	11-Sep-18
Sample ID		JOF-GW-JOF-101-09132022	JOF-GW-JOF-101-02072023	JOF-102	JOF-102	JOF-102	JOF-102-1217	JOF-102-0318	JOF-102-0618	JOF-102-09112018
Parent Sample ID										
Sample Depth		52 ft	52 ft	32 ft	32 ft	32 ft	32 ft	32 ft	32 ft	32 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	CCR Program		State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance
Field Parameters										
Dissolved Oxygen	%	72.4	70.6	-	-	-	-	-	-	-
Dissolved Oxygen	mg/L	6.97	6.88	3	2.6	2.8	2.5	2.9	2.8	2.5
ORP	mV	172.3	209.2	613	466	423	557	427	568	519
pH (field)	SU	5.69	5.60	4.7	4.8	4.9	4.8	5.31	5	4.9
Specific Cond. (Field)	uS/cm	42.4	49.9	277	280	283	273	285	281	270
Temperature, Water (C)	DEG C	17.1	16.5	-	-	-	-	-	-	17
Turbidity, field	NTU	1.02	0.65	-	-	-	-	-	-	1.6

See notes on last page.

Table H.1-11- Groundwater Quality Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		JOF-102								
Sample Date		12-Mar-19	10-Sep-19	3-Mar-20	15-Sep-20	15-Mar-21	14-Sep-21	8-Feb-22	2-Aug-22	7-Feb-23
Sample ID		JOF-102	JOF-102-0919	JOF-102-0320	JOF-102-0920	JOF-GW-JOF-102-03152021	JOF-GW-JOF-102-09142021	JOF-GW-JOF-102-02082022	JOF-GW-JOF-102-08022022	JOF-GW-JOF-102-02072023
Parent Sample ID										
Sample Depth		32 ft	32 ft	32 ft	32 ft	32 ft	32 ft	32 ft	32 ft	32 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	
Field Parameters										
Dissolved Oxygen	%	-	-	-	-	26.5	28.0	25.3	29.5	29.5
Dissolved Oxygen	mg/L	2.7	2.4	2.6	2.53	2.71	2.45	2.69	2.41	3.00
ORP	mV	521	496	420	366	460	435	479	527	436
pH (field)	SU	5.5	5	5.5	5.13	4.96	4.90	5.26	4.69	5.11
Specific Cond. (Field)	uS/cm	297	270	278	261	255	255	281	256	271
Temperature, Water (C)	DEG C	12.6	19	15.3	18.1	13.57	21.27	11.87	24.83	15.26
Turbidity, field	NTU	0.7	0	4.9	0.0	0.6	1.0	2.1	0.48	4.9

See notes on last page.

Table H.1-11- Groundwater Quality Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		JOF-103									
Sample Date		3-Nov-16	4-Jan-17	17-Jan-17	15-Feb-17	15-Mar-17	12-Apr-17	17-May-17	7-Jun-17	11-Jul-17	2-Aug-17
Sample ID		JOF-GW-015-11032016	JOF-GW-015-01042017	JOF-GW-015-01172017	JOF-GW-015-02152017	JOF-GW-015-03152017	JOF-GW-015-04122017	JOF-GW-015-05172017	JOF-GW-015-06072017	JOF-GW-015-07112017	JOF-GW-015-08022017
Parent Sample ID											
Sample Depth		50.5 ft	50.5 ft	50.5 ft	50.5 ft	50.5 ft	50.5 ft	50.5 ft	50.5 ft	50.5 ft	50.5 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program
Field Parameters											
Dissolved Oxygen	%	11.9	1.8	3.0	4.0	3.6	2.8	39.7	7.7	1.7	2.8
Dissolved Oxygen	mg/L	1.07	0.17	0.31	0.41	0.37	0.27	3.61	0.75	0.15	0.25
ORP	mV	101.3	144.0	177.7	158.1	123.3	199.2	142.4	159.1	151.1	144.6
pH (field)	SU	5.16	5.31	5.21	5.26	5.15	5.13	5.03	5.09	5.14	5.07
Specific Cond. (Field)	uS/cm	580	580	575	581	581	580	590	580	542	550
Temperature, Water (C)	DEG C	19.6	17.4	17.9	17.4	17.4	18.6	19.6	19.2	20.0	20.9
Turbidity, field	NTU	2.60	0.99	0.26	0.36	0.52	1.02	0.26	4.02	4.43	0.67

See notes on last page.

Table H.1-11- Groundwater Quality Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		JOF-103									
Sample Date		20-Sep-17	20-Sep-17	6-Oct-17	15-Mar-18	24-May-18	13-Jun-18	26-Jun-18	25-Jul-18	14-Aug-18	12-Sep-18
Sample ID		JOF-103	JOF-GW-015-09202017	JOF-GW-015-10062017	JOF-103-0318	JOF-GW-015-05242018	JOF-GW-015-06132018	JOF-GW-015-06262018	JOF-GW-015-07252018	JOF-GW-015-08142018	JOF-103-09122018
Parent Sample ID											
Sample Depth		50.5 ft	50.5 ft	50.5 ft	50.5 ft	50.5 ft	50.5 ft	50.5 ft	50.5 ft	50.5 ft	50.5 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	State Compliance	CCR Program	CCR Program	State Compliance	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	State Compliance
Field Parameters											
Dissolved Oxygen	%	-	1.9	3.5	-	1.7	4.9	2.6	5.0	2.8	-
Dissolved Oxygen	mg/L	0.21	0.17	0.33	0.4	0.16	0.44	0.24	0.61	0.23	0.3
ORP	mV	415	152.7	177.3		143.8	168.3	231.1	143.8	227.7	438
pH (field)	SU	5.04	5.06	5.10	5.2	4.94	4.99	4.93	5.06	4.81	5
Specific Cond. (Field)	uS/cm	568	550	497	565	590	521	520	509	522	568
Temperature, Water (C)	DEG C	-	20.7	20.0	-	18.7	19.3	19.7	19.4	19.6	22.4
Turbidity, field	NTU	-	0.53	0.01	-	4.24	1.41	1.91	0.76	0.67	1.2

See notes on last page.

Table H.1-11- Groundwater Quality Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		JOF-103									
Sample Date		3-Apr-19	9-Jul-19	18-Sep-19	10-Oct-19	23-Jan-20	5-Mar-20	23-Jul-20	9-Sep-20	10-Feb-21	18-Mar-21
Sample ID		JOF-GW-015-04032019	JOF-GW-015-07092019	JOF-GW-015-09182019	JOF-GW-015-10102019	JOF-GW-015-01232020	JOF-GW-015-03052020	JOF-GW-015-07232020	JOF-GW-015-09092020	JOF-GW-JOF-103-02102021	JOF-GW-JOF-103-03182021
Parent Sample ID											
Sample Depth		50.5 ft	50.5 ft	50.5 ft	50.5 ft	50.5 ft	50.5 ft	50.5 ft	50.5 ft	50.5 ft	50.5 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	State Compliance	State Compliance	CCR Program	CCR Program
Field Parameters											
Dissolved Oxygen	%	4.3	1.5	0.4	2.0	3.2	2.4	2.1	2.8	1.7	2.3
Dissolved Oxygen	mg/L	0.39	0.15	0.04	0.18	0.31	0.23	0.19	0.26	0.16	0.22
ORP	mV	235.2	-113.7	210.6	144.6	189.3	125.1	199.5	189.6	107	186
pH (field)	SU	4.84	4.93	4.68	5.00	5.06	5.08	4.93	4.79	5.03	4.94
Specific Cond. (Field)	uS/cm	530	533	527	499	470	520	590	610	590	590
Temperature, Water (C)	DEG C	18.8	19.5	19.9	19.1	17.6	17.9	18.9	19.5	17.5	17.4
Turbidity, field	NTU	3.11	4.60	2.87	0.85	2.59	1.35	4.80	2.31	0.96	0.39

See notes on last page.

Table H.1-11- Groundwater Quality Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		JOF-103						
Sample Date		29-Jul-21	16-Sep-21	2-Feb-22	15-Mar-22	4-Aug-22	14-Sep-22	7-Feb-23
Sample ID		JOF-GW-JOF-103-07292021	JOF-GW-JOF-103-09162021	JOF-GW-JOF-103-02022022	JOF-GW-JOF-103-03152022	JOF-GW-JOF-103-08042022	JOF-GW-JOF-103-09142022	JOF-GW-JOF-103-02072023
Parent Sample ID								
Sample Depth		50.5 ft	50.5 ft	50.5 ft	50.5 ft	50.5 ft	50.5 ft	50.5 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	
Field Parameters								
Dissolved Oxygen	%	1.7	1.9	2.5	1.8	0.0	1.3	1.6
Dissolved Oxygen	mg/L	0.16	0.17	0.22	0.16	0.00	0.12	0.15
ORP	mV	-1.5	256.4	178.4	10.8	122.1	83.1	127.8
pH (field)	SU	5.63	5.17	5.12	5.41	5.26	5.28	5.06
Specific Cond. (Field)	uS/cm	640	590	562	547	525	521	605
Temperature, Water (C)	DEG C	18.6	19.0	17.8	18.2	19.3	19.0	18.3
Turbidity, field	NTU	4.69	3.81	0.54	2.77	4.60	3.41	0.61

See notes on last page.

Table H.1-11- Groundwater Quality Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		JOF-104				
Sample Date		3-Nov-16	5-Jan-17	18-Jan-17	16-Feb-17	15-Mar-17
Sample ID		JOF-GW-016-11032016	JOF-GW-016-01052017	JOF-GW-016-01182017	JOF-GW-016-02162017	JOF-GW-016-03152017
Parent Sample ID						
Sample Depth		57 ft	57 ft	57 ft	57 ft	57 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program
Field Parameters						
Dissolved Oxygen	%	21.6	2.9	3.2	4.2	2.4
Dissolved Oxygen	mg/L	1.97	0.28	0.31	0.42	0.22
ORP	mV	3.6	102.5	126.0	111.9	113.3
pH (field)	SU	5.41	5.51	5.36	5.41	5.29
Specific Cond. (Field)	uS/cm	670	700	700	700	690
Temperature, Water (C)	DEG C	18.1	16.3	17.0	17.5	16.6
Turbidity, field	NTU	0.42	0.00	0.17	0.68	0.34

Sample Location		JOF-104				
Sample Date		12-Apr-17	17-May-17	6-Jun-17	11-Jul-17	2-Aug-17
Sample ID		JOF-GW-016-04122017	JOF-GW-016-05172017	JOF-GW-016-06062017	JOF-GW-016-07112017	JOF-GW-016-08022017
Parent Sample ID						
Sample Depth		57 ft	57 ft	57 ft	57 ft	57 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program
Field Parameters						
Dissolved Oxygen	%	2.5	32.9	38.7	2.5	2.6
Dissolved Oxygen	mg/L	0.24	3.04	3.65	0.23	0.23
ORP	mV	193.6	134.6	199.4	28.3	119.0
pH (field)	SU	5.44	5.28	5.22	5.48	5.36
Specific Cond. (Field)	uS/cm	680	690	690	630	650
Temperature, Water (C)	DEG C	17.8	19.0	18.8	19.8	19.6
Turbidity, field	NTU	0.92	1.43	1.19	0.25	2.98

See notes on last page.

Table H.1-11- Groundwater Quality Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		JOF-104									
Sample Date		20-Sep-17	20-Sep-17	6-Oct-17	15-Mar-18	24-May-18	13-Jun-18	27-Jun-18	25-Jul-18	15-Aug-18	12-Sep-18
Sample ID		JOF-104	JOF-GW-016-09202017	JOF-GW-016-10062017	JOF-104-0318	JOF-GW-016-05242018	JOF-GW-016-06132018	JOF-GW-016-06272018	JOF-GW-016-07252018	JOF-GW-016-08152018	JOF-104-09122018
Parent Sample ID											
Sample Depth		57 ft	57 ft	57 ft	57 ft	57 ft	57 ft	57 ft	57 ft	57 ft	57 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	State Compliance	CCR Program	CCR Program	State Compliance	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	State Compliance
Field Parameters											
Dissolved Oxygen	%	-	2.1	3.6	-	3.2	3.6	2.4	4.2	2.7	-
Dissolved Oxygen	mg/L	0.55	0.18	0.31		0.30	0.33	0.23	0.40	0.27	0.25
ORP	mV	317	132.4	154.8	310	95.7	163.5	186.5	139.1	195.6	424
pH (field)	SU	5.39	5.38	5.40	5.7	5.32	5.32	5.23	5.36	5.21	5.29
Specific Cond. (Field)	uS/cm	683	650	600	653	690	620	620	610	630	694
Temperature, Water (C)	DEG C	-	19.9	19.1	-	18.6	19.0	18.8	18.8	18.7	21.44
Turbidity, field	NTU	-	0.51	0.18	-	0.76	2.27	1.23	1.85	3.95	2.1

See notes on last page.

Table H.1-11- Groundwater Quality Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		JOF-104									
Sample Date		3-Apr-19	9-Jul-19	18-Sep-19	10-Oct-19	23-Jan-20	5-Mar-20	22-Jul-20	10-Sep-20	10-Feb-21	18-Mar-21
Sample ID		JOF-GW-016-04032019	JOF-GW-016-07092019	JOF-GW-016-09182019	JOF-GW-016-10102019	JOF-GW-016-01232020	JOF-GW-016-03052020	JOF-GW-016-07222020	JOF-GW-016-09102020	JOF-GW-JOF-104-02102021	JOF-GW-JOF-104-03182021
Parent Sample ID											
Sample Depth		57 ft	57 ft	57 ft	57 ft	57 ft	57 ft	57 ft	57 ft	57 ft	57 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	State Compliance	State Compliance	CCR Program	CCR Program
Field Parameters											
Dissolved Oxygen	%	3.1	2.7	-0.6	2.2	3.0	2.5	3.2	5.0	1.8	2.1
Dissolved Oxygen	mg/L	0.29	0.25	-	0.21	0.30	0.24	0.30	0.48	0.16	0.2
ORP	mV	215.3	-100.4	176.2	148.7	165.2	131.7	200.1	144.6	85.9	141.6
pH (field)	SU	5.29	5.43	5.28	5.33	5.43	5.37	5.39	5.19	5.36	5.31
Specific Cond. (Field)	uS/cm	620	660	620	600	558	610	650	700	640	640
Temperature, Water (C)	DEG C	18.1	19.0	19.0	18.2	17.2	17.5	19.8	18.4	17.3	16.9
Turbidity, field	NTU	2.01	2.58	0.42	3.26	0.72	1.13	3.18	3.30	0.8	1.38

See notes on last page.

Table H.1-11- Groundwater Quality Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		JOF-104						
Sample Date		29-Jul-21	16-Sep-21	1-Feb-22	16-Mar-22	4-Aug-22	13-Sep-22	7-Feb-23
Sample ID		JOF-GW-JOF-104-07292021	JOF-GW-JOF-104-09162021	JOF-GW-JOF-104-02012022	JOF-GW-JOF-104-03162022	JOF-GW-JOF-104-08042022	JOF-GW-JOF-104-09132022	JOF-GW-JOF-104-02072023
Parent Sample ID								
Sample Depth		57 ft	57 ft	57 ft	57 ft	57 ft	57 ft	57 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	CCR Program	
Field Parameters								
Dissolved Oxygen	%	2.8	2.3	0.9	2.0	4.0	3.1	1.4
Dissolved Oxygen	mg/L	0.26	0.22	0.08	0.20	0.37	0.29	0.13
ORP	mV	78.2	351.1	101.3	16.9	243.0	134.1	154.4
pH (field)	SU	5.47	5.44	5.43	5.39	5.30	5.51	5.27
Specific Cond. (Field)	uS/cm	690	650	590	581	546	547	637
Temperature, Water (C)	DEG C	18.0	18.5	17.6	17.3	18.6	18.5	18.0
Turbidity, field	NTU	1.83	0.67	0.52	0.41	2.74	2.91	2.11

See notes on last page.

Stantec

Table H.1-11- Groundwater Quality Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		JOF-105									
Sample Date		14-Mar-17	12-Jun-17	18-Sep-17	11-Dec-17	13-Mar-18	12-Jun-18	11-Sep-18	13-Mar-19	11-Sep-19	4-Mar-20
Sample ID		JOF-105	JOF-105	JOF-105	JOF-105-1217	JOF-105-0318	JOF-105-0618	JOF-105-09112018	JOF-105	JOF-105-0919	JOF-105-0320
Parent Sample ID											
Sample Depth		32.5 ft	32.5 ft	32.5 ft	32.5 ft	32.5 ft	32.5 ft	32.5 ft	32.5 ft	32.5 ft	32.5 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance
Field Parameters											
Dissolved Oxygen	%	-	-	-	-	-	-	-	-	-	-
Dissolved Oxygen	mg/L	2.4	2	1.9	1.9	2.4	1.8	1.9	2.5	2	2.4
ORP	mV	601	5.16	509	592	492	539	589	614	580	542
pH (field)	SU	4.7	4.8	4.8	4.8	5.5	4.6	4.7	5.3	4.8	5.1
Specific Cond. (Field)	uS/cm	1,672	1,592	1,445	1,337	1,106	1,366	1,499	1,085	1,401	1,196
Temperature, Water (C)	DEG C	-	-	-	-	-	-	19.9	17	25.9	17.2
Turbidity, field	NTU	-	-	-	-	-	-	1.9	0.6	0.4	0.0

See notes on last page.

Table H.1-11- Groundwater Quality Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		JOF-105					JOF-106				
Sample Date		17-Sep-20	17-Mar-21	14-Sep-21	8-Feb-22	7-Feb-23	15-May-18	13-Jun-18	13-Sep-18	13-Mar-19	11-Sep-19
Sample ID		JOF-105-0920	JOF-GW-JOF-105-03172021	JOF-GW-JOF-105-09142021	JOF-GW-JOF-105-02082022	JOF-GW-JOF-105-02072023	JOF-106-0518	JOF-106-0618	JOF-106-09132018	JOF-106	JOF-106-0919
Parent Sample ID											
Sample Depth		32.5 ft	32.5 ft	32.5 ft	32.5 ft	32.5 ft	31 ft	31 ft	31 ft	31 ft	31 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	State Compliance	State Compliance	State Compliance	State Compliance		State Compliance	State Compliance	State Compliance	State Compliance	State Compliance
Field Parameters											
Dissolved Oxygen	%	-	29	25.3	26.2	24.8	-	-	-	-	-
Dissolved Oxygen	mg/L	2.3	2.83	2.17	2.45	2.24	3	2.9	3.4	2.5	3.4
ORP	mV	447	782	467	564	461	562	474	578	620	556
pH (field)	SU	4.7	4.61	4.66	4.83	4.84	4.95	4.6	4.9	4.9	4.9
Specific Cond. (Field)	uS/cm	1,150	1,226	1,567	1,870	1,618	481	468	459	554	495
Temperature, Water (C)	DEG C	19.9	15.84	22.17	17.73	19.5	-	-	23.9	17	26
Turbidity, field	NTU	0.0	0	0.6	0.1	0.5	-	-	5.3	4.5	2.7

See notes on last page.

Table H.1-11- Groundwater Quality Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		JOF-106							JOF-107		
Sample Date		3-Mar-20	16-Sep-20	16-Mar-21	15-Sep-21	10-Feb-22	3-Aug-22	8-Feb-23	15-May-18	13-Jun-18	13-Sep-18
Sample ID		JOF-106-0320	JOF-106-0920	JOF-GW-JOF-106-03162021	JOF-GW-JOF-106-09152021	JOF-GW-JOF-106-02102022	JOF-GW-JOF-106-08032022	JOF-GW-JOF-106-02082023	JOF-107-0518	JOF-107-0618	JOF-107-09132018
Parent Sample ID											
Sample Depth		31 ft	31 ft	31 ft	31 ft	31 ft	31 ft	31 ft	40 ft	40 ft	40 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance		State Compliance	State Compliance	State Compliance
Field Parameters											
Dissolved Oxygen	%	-	-	32.6	36.5	38.2	38.3	14.0	-	-	-
Dissolved Oxygen	mg/L	2.79	2.5	3.02	3.21	3.76	3.17	1.35	1.15	1.07	0.8
ORP	mV	546	442	554	461	505	532	477	497	412	534
pH (field)	SU	4.98	4.8	4.79	4.65	4.70	4.59	4.66	5.54	5.08	5.2
Specific Cond. (Field)	uS/cm	523	521	480	461	505	512	1,278	341	378	498
Temperature, Water (C)	DEG C	18.28	21.1	17.98	20.45	14.90	23.79	16.48	-	-	21.4
Turbidity, field	NTU	1.5	1.9	1.5	1.2	0.00	4.00	0.20	-	-	5.5

See notes on last page.

Table H.1-11- Groundwater Quality Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		JOF-107								
Sample Date		12-Mar-19	11-Sep-19	4-Mar-20	15-Sep-20	16-Mar-21	15-Sep-21	10-Feb-22	4-Aug-22	8-Feb-23
Sample ID		JOF-107	JOF-107-0919	JOF-107-0320	JOF-107-0920	JOF-GW-JOF-107-03162021	JOF-GW-JOF-107-09152021	JOF-GW-JOF-107-02102022	JOF-GW-JOF-107-08042022	JOF-GW-JOF-107-02082023
Parent Sample ID										
Sample Depth		40 ft	40 ft	40 ft	40 ft	40 ft	40 ft	40 ft	40 ft	40 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	State Compliance	
Field Parameters										
Dissolved Oxygen	%	-	-	-	-	11.3	9.8	9.0	23.5	7.4
Dissolved Oxygen	mg/L	1.2	1.2	0.7	0.12	1.01	0.88	0.93	2.18	0.73
ORP	mV	592	505	509	417	517	439	436	494	449
pH (field)	SU	5.3	5.3	5.5	5.3	5.23	5.10	5.18	5.09	5.27
Specific Cond. (Field)	uS/cm	350	590	388	601	526	918	857	1,053	874
Temperature, Water (C)	DEG C	17.3	23.3	17.5	20.8	19.78	19.38	12.47	26.46	14.94
Turbidity, field	NTU	5.5	7	6.1	6.2	5	3.6	3.7	4.3	4.2

See notes on last page.

Table H.1-11- Groundwater Quality Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		JOF-109							
Sample Date		3-Dec-19	11-Feb-20	7-Apr-20	9-Jun-20	12-Aug-20	13-Oct-20	19-Mar-21	27-Jul-21
Sample ID		JOF-GW-021-20191203	JOF-GW-021-20200211	JOF-GW-021-20200407	JOF-GW-021-20200609	JOF-GW-021-20200812	JOF-GW-021-20201013	JOF-GW-JOF-109-03192021	JOF-GW-JOF-109-07272021
Parent Sample ID									
Sample Depth		39 ft	39 ft	39 ft	39 ft	39 ft	39 ft	39 ft	39 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	EIP	EIP	EIP	EIP	EIP	EIP	EIP	EIP
Field Parameters									
Dissolved Oxygen	%	24.6	40.7	33.1	10.3	32.8	34.6	31.1	34.4
Dissolved Oxygen	mg/L	2.45	4.12	3.18	0.93	2.99	3.24	3.12	3.15
ORP	mV	162.4	223.8	113.4	122.6	136.4	153.3	234.9	139.6
pH (field)	SU	5.67	5.63 J	5.17	5.17	4.84	5.05	5.91	5.08
Specific Cond. (Field)	uS/cm	189.3	169.5	164.1	188.1	273.8	193.7	207	218
Temperature, Water (C)	DEG C	15.5	14.7	17.2	20.0	19.7	19.1	15.2	18.9
Turbidity, field	NTU	7.91	13.3	4.36	4.72	4.66	4.71	4.92	4.70

See notes on last page.

Table H.1-11- Groundwater Quality Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		JOF-109		JOF-110						
Sample Date		17-Mar-22	15-Sep-22	4-Dec-19	12-Feb-20	7-Apr-20	11-Jun-20	12-Aug-20	14-Oct-20	16-Mar-21
Sample ID		JOF-GW-JOF-109-03172022	JOF-GW-JOF-109-09152022	JOF-GW-022-20191204	JOF-GW-022-20200212	JOF-GW-022-20200407	JOF-GW-022-20200611	JOF-GW-022-20200812	JOF-GW-022-20201014	JOF-GW-JOF-110-03162021
Parent Sample ID										
Sample Depth		39 ft	39 ft	57 ft	57 ft	57 ft	57 ft	57 ft	57 ft	57 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	CCR Program	CCR Program	EIP	EIP	EIP	EIP	EIP	EIP	EIP
Field Parameters										
Dissolved Oxygen	%	33.0	35.9	4.5	5.9	4.2	14.1	8.1	4.2	5.0
Dissolved Oxygen	mg/L	3.25	3.36	0.44	0.59	0.39	1.21	0.70	0.48	0.49
ORP	mV	166.3	193.4	24.7	31.4	52.0	74.0	-8.0	109.6	112.0
pH (field)	SU	4.79	5.13	5.85	5.75	5.46	5.43	5.25	5.29	4.92
Specific Cond. (Field)	uS/cm	242	350	337.9	326.9	289.4	303.4	410.9	306.3	322
Temperature, Water (C)	DEG C	16.5	18.7	16.2	16.1	19.2	21.1	22.6	22.2	16.2
Turbidity, field	NTU	4.37	4.17	8.34	4.96	3.14	3.94	1.99	2.85	2.34

See notes on last page.

Table H.1-11- Groundwater Quality Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		JOF-110			JOF-111					
Sample Date		27-Jul-21	15-Mar-22	13-Sep-22	4-Dec-19	12-Feb-20	7-Apr-20	11-Jun-20	12-Aug-20	14-Oct-20
Sample ID		JOF-GW-JOF-110-07272021	JOF-GW-JOF-110-03152022	JOF-GW-JOF-110-09132022	JOF-GW-023-20191204	JOF-GW-023-20200212	JOF-GW-023-20200407	JOF-GW-023-20200611	JOF-GW-023-20200812	JOF-GW-023-20201014
Parent Sample ID										
Sample Depth		57 ft	57 ft	57 ft	46 ft	46 ft	46 ft	46 ft	46 ft	46 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	EIP	CCR Program	CCR Program	EIP	EIP	EIP	EIP	EIP	EIP
Field Parameters										
Dissolved Oxygen	%	6.7	5.0	5.2	1.8	5.1	6.1	4.2	5.7	4.1
Dissolved Oxygen	mg/L	0.69	0.50	0.46	0.18	0.50	0.59	0.38	0.50	0.36
ORP	mV	97.7	102.3	98.9	-62.7	26.5	108.7	34.3	-27.7	-21.4
pH (field)	SU	5.45	5.05	5.45	6.40	5.85	5.42	5.80	6.12	6.13
Specific Cond. (Field)	uS/cm	318	319	333.2	3,027	3,054	2,978	3,420	3,709	3,328
Temperature, Water (C)	DEG C	22.9	15.7	20.6	17.6	15.9	19.1	19.4	20.7	19.3
Turbidity, field	NTU	2.65	0.59	0.62	4.77	3.63	2.47	2.62	3.49	2.87

See notes on last page.

Table H.1-11- Groundwater Quality Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		JOF-111				JOF-112				
Sample Date		16-Mar-21	28-Jul-21	15-Mar-22	13-Sep-22	2-Dec-19	11-Feb-20	7-Apr-20	9-Jun-20	13-Aug-20
Sample ID		JOF-GW-JOF-111-03162021	JOF-GW-JOF-111-07282021	JOF-GW-JOF-111-03152022	JOF-GW-JOF-111-09132022	JOF-GW-024-20191202	JOF-GW-024-20200211	JOF-GW-024-20200407	JOF-GW-024-20200609	JOF-GW-024-20200813
Parent Sample ID										
Sample Depth		46 ft	46 ft	46 ft	46 ft	29.5 ft	29.5 ft	29.5 ft	29.5 ft	29.5 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	EIP	EIP	CCR Program	CCR Program	EIP	EIP	EIP	EIP	EIP
Field Parameters										
Dissolved Oxygen	%	3.4	4.4	3.2	3.2	3.2	44.7	3.5	3.0	3.8
Dissolved Oxygen	mg/L	0.33	0.41	0.31	0.29	0.31	4.39	0.33	0.29	0.35
ORP	mV	-82.7	21.6	-88.2	-116.9	48.1	51.5	19.9	52.2	74.0
pH (field)	SU	5.93	6.31	6.42	6.71	6.27	6.29 J	6.10	6.10	6.22
Specific Cond. (Field)	uS/cm	3,340	3,220	3,060	2,730	436.6	374.2	392.3	418.4	546.3
Temperature, Water (C)	DEG C	18.3	20.1	17.4	19.5	19.7	-	17.4	17.4	19.3
Turbidity, field	NTU	3.36	3.06	1.95	1.25	1.51	2.10	3.23	2.80	1.00

See notes on last page.

Table H.1-11- Groundwater Quality Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		JOF-112					JOF-113			
Sample Date		13-Oct-20	16-Mar-21	28-Jul-21	16-Mar-22	15-Sep-22	4-Dec-19	12-Feb-20	8-Apr-20	10-Jun-20
Sample ID		JOF-GW-024-20201013	JOF-GW-JOF-112-03162021	JOF-GW-JOF-112-07282021	JOF-GW-JOF-112-03162022	JOF-GW-JOF-112-09152022	JOF-GW-025-20191204	JOF-GW-025-20200212	JOF-GW-025-20200408	JOF-GW-025-20200610
Parent Sample ID										
Sample Depth		29.5 ft	29.5 ft	29.5 ft	29.5 ft	29.5 ft	43.5 ft	43.5 ft	43.5 ft	43.5 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	EIP	EIP	EIP	CCR Program	CCR Program	EIP	EIP	EIP	EIP
Field Parameters										
Dissolved Oxygen	%	3.4	1.7	2.9	2.3	15.9	4.8	12.7	4.1	11.5
Dissolved Oxygen	mg/L	0.30	0.16	0.28	0.21	1.42	0.48	1.24	0.39	1.01
ORP	mV	81.2	47.4	126.9	54.8	24.4	81.2	91.0	87.9	143.3
pH (field)	SU	5.84	5.60	6.11	5.88	6.17	6.02	5.91	5.81	5.84
Specific Cond. (Field)	uS/cm	424.3	467	413	420	450	2,400	2,515	2,219	2,377
Temperature, Water (C)	DEG C	20.3	18.2	18.8	17.3	20.9	18.1	16.6	18.6	21.5
Turbidity, field	NTU	0.48	3.26	2.38	2.42	0.96	1.59	4.51	0.79	3.82

See notes on last page.

Table H.1-11- Groundwater Quality Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		JOF-113						JOF-114		
Sample Date		13-Aug-20	15-Oct-20	18-Mar-21	29-Jul-21	17-Mar-22	15-Sep-22	4-Dec-19	12-Feb-20	8-Apr-20
Sample ID		JOF-GW-025-20200813	JOF-GW-025-20201015	JOF-GW-JOF-113-03182021	JOF-GW-JOF-113-07292021	JOF-GW-JOF-113-03172022	JOF-GW-JOF-113-09152022	JOF-GW-026-20191204	JOF-GW-026-20200212	JOF-GW-026-20200408
Parent Sample ID										
Sample Depth		43.5 ft	43.5 ft	43.5 ft	43.5 ft	43.5 ft	43.5 ft	39.5 ft	39.5 ft	39.5 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	EIP	EIP	EIP	EIP	CCR Program	CCR Program	EIP	EIP	EIP
Field Parameters										
Dissolved Oxygen	%	4.9	2.4	3.4	3.3	3.9	3.6	2.7	5.3	2.9
Dissolved Oxygen	mg/L	0.48	0.23	0.32	0.31	0.34	0.33	0.27	0.46	0.27
ORP	mV	115.5	163.6	155.0	98.9	146.0	126.5	119.3	159.1	145.5
pH (field)	SU	5.92	5.70	5.75	5.73	5.59	5.79	4.98	4.64	4.45
Specific Cond. (Field)	uS/cm	2,780	2,465	2,440	2,370	2,390	2,450	3,697	3,921	3,511
Temperature, Water (C)	DEG C	19.9	18.6	17.5	19.9	17.5	19.4	19.0	18.7	19.7
Turbidity, field	NTU	2.01	3.25	1.46	4.64	0.26	0.73	2.39	2.55	1.04

See notes on last page.

Table H.1-11- Groundwater Quality Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		JOF-114						
Sample Date		10-Jun-20	13-Aug-20	14-Oct-20	18-Mar-21	28-Jul-21	16-Mar-22	13-Sep-22
Sample ID		JOF-GW-026-20200610	JOF-GW-026-20200813	JOF-GW-026-20201014	JOF-GW-JOF-114-03182021	JOF-GW-JOF-114-07282021	JOF-GW-JOF-114-03162022	JOF-GW-JOF-114-09132022
Parent Sample ID								
Sample Depth		39.5 ft	39.5 ft	39.5 ft	39.5 ft	39.5 ft	39.5 ft	39.5 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	EIP	EIP	EIP	EIP	EIP	CCR Program	CCR Program
Field Parameters								
Dissolved Oxygen	%	3.8	4.2	3.5	61.9	2.6	3.1	1.8
Dissolved Oxygen	mg/L	0.35	0.38	0.31	5.73	0.24	0.28	0.17
ORP	mV	101.7	170.5	189.6	141.9	165.6	146.6	186.6
pH (field)	SU	4.70	4.61	4.45	4.58	4.53	4.23	5.14
Specific Cond. (Field)	uS/cm	3,727	4,108	3,748	3,720	3,600	3,550	3,567
Temperature, Water (C)	DEG C	19.7	20.2	19.5	18.5	19.6	18.9	19.8
Turbidity, field	NTU	4.62	3.45	1.81	1.88	2.13	1.26	0.46

See notes on last page.

Table H.1-11- Groundwater Quality Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		JOF-117							
Sample Date		5-Dec-19	12-Feb-20	8-Apr-20	11-Jun-20	13-Aug-20	15-Oct-20	19-Mar-21	29-Jul-21
Sample ID		JOF-GW-027-20191205	JOF-GW-027-20200212	JOF-GW-027-20200408	JOF-GW-027-20200611	JOF-GW-027-20200813	JOF-GW-027-20201015	JOF-GW-JOF-117-03192021	JOF-GW-JOF-117-07292021
Parent Sample ID									
Sample Depth		40.5 ft	40.5 ft	40.5 ft	40.5 ft	40.5 ft	40.5 ft	40.5 ft	40.5 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	EIP	EIP	EIP	EIP	EIP	EIP	EIP	EIP
Field Parameters									
Dissolved Oxygen	%	3.0	10.9	1.1	3.2	1.6	1.3	1.4	5.8
Dissolved Oxygen	mg/L	0.30	1.07	0.09	0.29	0.14	0.12	0.14	0.51
ORP	mV	-104.8	-111.8	-121.3	-97.9	119.5	-106.8	-124.1	-64.2
pH (field)	SU	6.64	6.60	6.49	6.41	6.34	6.46	7.18	6.97
Specific Cond. (Field)	uS/cm	1,004	1,075	951	1,032	1,616	1,067	1,080	1,070
Temperature, Water (C)	DEG C	16.8	15.9	19.4	19.8	21.6	19.2	16.3	22.3
Turbidity, field	NTU	4.59	15.3	4.64	4.10	4.83	6.62	4.51	4.33

See notes on last page.

Table H.1-11- Groundwater Quality Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		JOF-117		JOF-118					
Sample Date		16-Mar-22	14-Sep-22	3-Dec-19	11-Feb-20	9-Apr-20	10-Jun-20	13-Aug-20	14-Oct-20
Sample ID		JOF-GW-JOF-117-03162022	JOF-GW-JOF-117-09142022	JOF-GW-028-20191203	JOF-GW-028-20200211	JOF-GW-028-20200409	JOF-GW-028-20200610	JOF-GW-028-20200813	JOF-GW-028-20201014
Parent Sample ID									
Sample Depth		40.5 ft	40.5 ft	48.5 ft	48.5 ft	48.5 ft	48.5 ft	48.5 ft	48.5 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	CCR Program	CCR Program	EIP	EIP	EIP	EIP	EIP	EIP
Field Parameters									
Dissolved Oxygen	%	3.2	2.5	2.5	3.6	11.6	2.2	3.1	2.0
Dissolved Oxygen	mg/L	0.31	0.23	0.23	0.34	1.08	0.21	0.28	0.18
ORP	mV	-82.7	-125.5	79.6	-42.0	69.5	95.1	83.3	96.6
pH (field)	SU	6.24	6.50	5.79	5.87 J	5.92	5.68	5.62	5.49
Specific Cond. (Field)	uS/cm	1,060	1,094	338.1	283.0	418.0	368.4	589	416.9
Temperature, Water (C)	DEG C	16.8	21.5	18.6	17.4	17.8	18.9	20.4	18.8
Turbidity, field	NTU	1.73	5.78	1.40	2.45	4.72	4.51	4.38	1.13

See notes on last page.

Table H.1-11- Groundwater Quality Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		JOF-118				JOF-119				
Sample Date		18-Mar-21	29-Jul-21	17-Mar-22	14-Sep-22	3-Dec-19	11-Feb-20	9-Apr-20	9-Jun-20	13-Aug-20
Sample ID		JOF-GW-JOF-118-03182021	JOF-GW-JOF-118-07292021	JOF-GW-JOF-118-03172022	JOF-GW-JOF-118-09142022	JOF-GW-029-20191203	JOF-GW-029-20200211	JOF-GW-029-20200409	JOF-GW-029-20200609	JOF-GW-029-20200813
Parent Sample ID										
Sample Depth		48.5 ft	48.5 ft	48.5 ft	48.5 ft	42.5 ft	42.5 ft	42.5 ft	42.5 ft	42.5 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	EIP	EIP	CCR Program	CCR Program	EIP	EIP	EIP	EIP	EIP
Field Parameters										
Dissolved Oxygen	%	1.6	2.5	2.3	0.9	2.8	3.5	22.1	3.7	2.3
Dissolved Oxygen	mg/L	0.16	0.22	0.21	0.09	0.28	0.36	2.27	0.35	0.21
ORP	mV	99.5	113.1	15.5	6.6	87.0	0.4	48.0	60.8	41.2
pH (field)	SU	5.69	5.47	5.61	5.66	6.22	6.51 J	6.32	6.06	6.04
Specific Cond. (Field)	uS/cm	770	580	1,450	780	377.2	374.4	297.9	384.0	574
Temperature, Water (C)	DEG C	17.4	18.9	18.3	19.3	16.9	15.9	16.3	17.5	19.2
Turbidity, field	NTU	3.36	1.88	1.01	1.11	2.09	4.14	1.34	3.97	3.49

See notes on last page.

Table H.1-11- Groundwater Quality Results (March 2015 - February 2023)
Johnsonville Fossil Plant

Sample Location		JOF-119				
Sample Date		13-Oct-20	18-Mar-21	28-Jul-21	17-Mar-22	14-Sep-22
Sample ID		JOF-GW-029-20201013	JOF-GW-JOF-119-03182021	JOF-GW-JOF-119-07282021	JOF-GW-JOF-119-03172022	JOF-GW-JOF-119-09142022
Parent Sample ID						
Sample Depth		42.5 ft	42.5 ft	42.5 ft	42.5 ft	42.5 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Program	Units	EIP	EIP	EIP	CCR Program	CCR Program
Field Parameters						
Dissolved Oxygen	%	2.2	14.1	0.8	11.2	1.3
Dissolved Oxygen	mg/L	0.21	1.40	0.08	1.05	0.12
ORP	mV	87.2	74.1	95.2	118.7	49.3
pH (field)	SU	5.83	6.50	6.23	6.06	6.20
Specific Cond. (Field)	uS/cm	301.2	343	351	352	290
Temperature, Water (C)	DEG C	17.7	16.1	18.0	16.8	17.9
Turbidity, field	NTU	0.42	4.69	0.95	2.24	3.43

Notes:

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

-	Parameter not analyzed / not available.
%	percent
Cond.	conductance
DEG C	degrees Celsius
ft	feet below top of casing
ID	identification
J	quantitation is approximate due to limitations identified during data validation
mg/L	milligrams per Liter
mV	milliVolts
NTU	Nephelometric Turbidity Unit
ORP	Oxidation Reduction Potential, measured using a silver reference electrode which has a standard potential of 200 mV
SU	Standard Units
uS/cm	microSiemens per centimeter

Table H.1-12 - Screening Levels for Groundwater
Johnsonville Fossil Plant

CCR Parameters	Groundwater Screening Levels	
	(µg/L)	Source
CCR Rule Appendix III Constituents :		
Boron	4,000	RSL
Calcium		
Chloride	250,000	SMCL
Fluoride	4,000	MCL
pH	6.5 8.5 S.U.	SMCL
Sulfate	250,000	SMCL
Total Dissolved Solids	500,000	SMCL
CCR Rule Appendix IV Constituents :		
Antimony	6	MCL
Arsenic	10	MCL
Barium	2,000	MCL
Beryllium	4	MCL
Cadmium	5	MCL
Chromium (total)	100	MCL
Cobalt	6	CCR Rule GWPS
Fluoride	4,000	MCL
Lead	15	CCR Rule GWPS
Lithium	40	CCR Rule GWPS
Mercury	2	MCL
Molybdenum	100	CCR Rule GWPS
Radium-226 & 228	5 pCi/L	MCL
Selenium	50	MCL
Thallium	2	MCL
TDEC Appendix I Constituents :		
Copper	1,300	MCLG
Nickel	100	TN MCL
Silver	100	TN SMCL
Vanadium	86	RSL
Zinc	5,000	SMCL

Notes:

CCR - coal combustion residuals

CCR Rule - Coal Combustion Residuals rule, USEPA Title 40, Code of Federal Regulations, Part 257

GWPS - groundwater protection standards

MCL - USEPA maximum contaminant level

MCLG - Maximum contaminant level goal

pCi/L - picocuries per liter

RSL - USEPA regional screening level

SMCL - USEPA secondary maximum contaminant level

S.U. - standard units

TN MCL - maximum contaminant level promulgated by State of Tennessee

TN SMCL - secondary maximum contaminant level promulgated by State of Tennessee

TDEC - Tennessee Department of Environmental and Conservation

µg/L - micrograms per liter

USEPA - United States Environmental Protection Agency

Table H.1-13 - Summary of Statistically Significant Concentrations/Values
Johnsonville Fossil Plant

Parameter	Background		Upgradient				Active Ash Pond 2					Ash Disposal Area 1	
	B-9	JOF-101	B-13	JOF-109	JOF-112	JOF-119	10-AP1	10-AP3	JOF-103	JOF-104	JOF-118	JOF-110	JOF-111
CCR Rule Appendix III Parameters													
Boron	Green*	Green*	Green	Green	Green	Green	Red	Red	Red	Green	Green	Green	Red
Chloride	Green	Green	Red	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
Fluoride[1] (also Appendix IV)	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
pH	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Green
Sulfate	Green	Green	Green	Green	Green	Green	Green	Red	Green	Green	Green	Green	Red
Total Dissolved Solids	Green	Green	Red	Green	Green	Green	Green	Red	Green	Green	Green	Green	Red
CCR Rule Appendix IV Parameters													
Antimony	Green*	Green*	Green*	Green*	Green*	Green*	Green*	Green*	Green	Green	Green*	Green*	Green*
Arsenic	Green	Green	Green	Green*	Green*	Green	Green	Green	Green	Green	Green	Green	Red
Barium	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
Beryllium	Green*	Green*	Green*	Green	Green*	Green*	Green	Green	Green	Green*	Green*	Green*	Green*
Cadmium	Green*	Green*	Green	Green*	Green	Green*	Green	Green	Green	Green	Green*	Green*	Green*
Chromium	Green	Green*	Green*	Green*	Green*	Green*	Green*	Green*	Green*	Green*	Green*	Green*	Green*
Cobalt	Green	Green	Green	Green	Red	Green	Green	Red	Red	Green	Red	Green	Green
Lead	Green	Green*	Green*	Green*	Green*	Green*	Green	Green	Green*	Green*	Green*	Green*	Green*
Lithium	Green*	Green*	Green	Green*	Green*	Green*	Green	Green	Green	Green	Green*	Green*	Green
Mercury	Green*	Green*	Green	Green*	Green*	Green*	Green*	Green*	Green*	Green*	Green*	Green*	Green*
Molybdenum	Green*	Green*	Green*	Green*	Green	Green	Green*	Green*	Green*	Green*	Green*	Green	Green
Radium-226+228	Green	Green	Green	Green	Green	Green*	Green	Green	Green	Green	Green*	Green*	Green
Selenium	Green*	Green*	Green*	Green*	Green*	Green*	Green*	Green*	Green*	Green*	Green*	Green*	Green*
Thallium	Green*	Green*	Green*	Green*	Green*	Green*	Green*	Green	Green*	Green*	Green*	Green*	Green*
TDEC Appendix I Parameters													
Copper	Green*	Green*	Green	Green	Green*	Green*	Green	Green	Green	Green*	Green*	Green*	Green*
Nickel	Green	Green	Green	Green	Green	Green	Green	Green	Red	Green	Green	Green	Green
Silver	Green*	Green*	Green*	Green*	Green*	Green*	Green*	Green*	Green*	Green*	Green*	Green*	Green*
Vanadium	Green*	Green*	Green*	Green*	Green*	Green*	Green*	Green*	Green*	Green*	Green*	Green*	Green*
Zinc	Green	Green	Green	Green	Green	Green*	Green	Green	Green	Green	Green	Green	Green

See notes on last page

Table H.1-13 - Summary of Statistically Significant Concentrations/Values
Johnsonville Fossil Plant

Parameter	Former Coal Yard			DuPont Road Dredge Cell							South Rail Loop Area 4		
	JOF-113	JOF-114	JOF-117	89-B10	99-B20A	B-11	B-12	JOF-105	JOF-106	JOF-107	B-6R	B-8R	JOF-102
CCR Rule Appendix III Parameters													
Boron	Red	Red	Green	Green	Green	Green	Green	Green	Green	Green	Red	Green	Green
Chloride	Green	Green	Green	Green	Green	Green	Red	Red	Green	Green	Green	Green	Green
Fluoride[1] (also Appendix IV)	Green	Green	Green	Green	Green	Green*	Green*	Green	Green*	Green*	Green	Green	Green
pH	Red	Red	Green	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red
Sulfate	Red	Red	Green	Green	Green	Green	Green	Green	Green	Green	Red	Green	Green
Total Dissolved Solids	Red	Red	Green	Green	Green	Green	Red	Red	Green	Green	Green	Green	Green
CCR Rule Appendix IV Parameters													
Antimony	Green*	Green*	Green*	Green*	Green*	Green*	Green*	Green*	Green*	Green*	Green*	Green*	Green*
Arsenic	Green	Green	Red	Green*	Green*	Green*	Green	Green	Green*	Green*	Green*	Green*	Green*
Barium	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
Beryllium	Green*	Green	Green*	Green*	Green*	Green*	Green	Green	Green*	Green*	Green*	Green*	Green*
Cadmium	Green	Green	Green*	Green*	Green*	Green*	Green	Green	Green*	Green*	Green	Green*	Green*
Chromium	Green*	Green*	Green*	Green	Green*	Green*	Green	Green*	Green*	Green*	Green*	Green*	Green*
Cobalt	Green	Red	Red	Green*	Green*	Green	Green	Green	Green	Green	Green*	Green*	Green*
Lead	Green*	Green*	Green*	Green*	Green*	Green*	Green	Green*	Green*	Green*	Green*	Green*	Green*
Lithium	Red	Red	Green*	Green	Green*	Green*	Green	Green*	Green*	Green*	Green*	Green*	Green*
Mercury	Green*	Green*	Green*	Green*	Green*	Green*	Green	Green	Green*	Green*	Green	Green*	Green*
Molybdenum	Red	Green*	Green	Green*	Green*	Green*	Green*	Green*	Green*	Green*	Green	Green*	Green*
Radium-226+228	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
Selenium	Green*	Green*	Green*	Green*	Green*	Green*	Green*	Green*	Green*	Green*	Green*	Green*	Green*
Thallium	Green	Green	Green*	Green*	Green*	Green*	Green*	Green*	Green*	Green*	Green*	Green*	Green*
TDEC Appendix I Parameters													
Copper	Green	Green	Green*	Green*	Green	Green	Green	Green	Green*	Green*	Green	Green	Green
Nickel	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
Silver	Green*	Green*	Green*	Green*	Green*	Green*	Green*	Green*	Green*	Green*	Green*	Green*	Green*
Vanadium	Green*	Green*	Green*	Green	Green*	Green*	Green	Green*	Green*	Green*	Green*	Green*	Green*
Zinc	Green	Green	Green*	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green

Green	No statistically significant concentration greater than or equal to the GSL for constituents other than pH and no statistically significant difference outside the GSL range for pH.
Green*	Limited dataset (sample size <5 or <4 detected values), but none of the available results are greater than or equal to the GSL or outside the GSL range for pH.
Red	Statistically significant concentration greater than or equal to the GSL for constituents other than pH or a statistically significant difference outside the GSL range for pH.

Notes:

CCR Rule - Title 40, Code of Federal Regulations, Part 257

GSL - Groundwater Screening Level established for the TDEC Order EI (see Appendix A.2)

TDEC - Tennessee Department of Environment and Conservation

Bold colors are used to represent CCR Rule Appendix IV Parameter and TDEC Appendix I Parameter results; subdued colors represent CCR Rule Appendix III Parameter results.

See Appendix E.3 for full description of statistical methods applied.

[1]Fluoride is both a CCR Rule Appendix III and CCR Rule Appendix IV constituent. In this table, fluoride has been grouped with the Appendix III constituents to avoid duplication of results.

Table H.1-14 - Linear Regression Results
Groundwater Investigation - Johnsonville Fossil Plant - New Johnsonville, Tennessee

Well	Constituent Type	Constituent	p-value	Trend summary[1]
B-9	CCR Rule Appendix III Parameters	pH (field)	0.253	No trend
JOF-101	CCR Rule Appendix III Parameters	pH (field)	0.0433	Increasing
B-13	CCR Rule Appendix III Parameters	Chloride	0.0004	Decreasing
		pH (field)	0.1005	No trend
		Total Dissolved Solids	0.001	Decreasing
	CCR Rule Appendix IV Parameters	Radium-226+228	0.0027	Decreasing
JOF-109	CCR Rule Appendix III Parameters	pH (field)	0.266	No trend
JOF-112	CCR Rule Appendix III Parameters	pH (field)	0.3615	No trend
	CCR Rule Appendix IV Parameters	Cobalt	0.103	No trend
		Radium-226+228	0.0107	Increasing
JOF-119	CCR Rule Appendix III Parameters	pH (field)	0.6925	No trend
10-AP1	CCR Rule Appendix III Parameters	Boron	0.7411	No trend
		pH (field)	0.8037	No trend
		Sulfate	0.012	Decreasing
		Total Dissolved Solids	0.0001	Decreasing
	CCR Rule Appendix IV Parameters	Cadmium	0.9244	No trend
10-AP3	CCR Rule Appendix III Parameters	Boron	0.0147	Decreasing
		pH (field)	0.0454	Increasing
		Sulfate	<0.0001	Decreasing
		Total Dissolved Solids	<0.0001	Decreasing
	CCR Rule Appendix IV Parameters	Cadmium	0.0983	No trend
		Cobalt	<0.0001	Decreasing
	TDEC Appendix I Parameters	Nickel	<0.0001	Decreasing
JOF-103	CCR Rule Appendix III Parameters	Boron	0.7657	No trend
		pH (field)	0.5267	No trend
	CCR Rule Appendix IV Parameters	Cadmium	0.4028	No trend
		Cobalt	0.0046	Decreasing
		Lithium	0.2356	No trend
	TDEC Appendix I Parameters	Nickel	0.7934	No trend
JOF-104	CCR Rule Appendix III Parameters	Boron	0.0844	No trend
		pH (field)	0.9308	No trend
		Sulfate	0.0005	Decreasing
		Total Dissolved Solids	<0.0001	Decreasing
	CCR Rule Appendix IV Parameters	Antimony	0.8513	No trend
JOF-118	CCR Rule Appendix III Parameters	pH (field)	0.1249	No trend
		Sulfate	0.0148	Increasing
		Total Dissolved Solids	0.0216	Increasing
	CCR Rule Appendix IV Parameters	Cobalt	0.0067	Increasing
JOF-110	CCR Rule Appendix III Parameters	pH (field)	0.1396	No trend
JOF-111	CCR Rule Appendix III Parameters	Boron	0.018	Increasing
		Chloride	0.0097	Decreasing
		pH (field)	0.0365	Increasing
		Sulfate	0.0004	Increasing
		Total Dissolved Solids	0.124	No trend
	CCR Rule Appendix IV Parameters	Arsenic	0.002	Increasing
		Cobalt	0.0055	Decreasing
		Lithium	0.0239	Increasing
JOF-113	CCR Rule Appendix III Parameters	Boron	0.2219	No trend
		pH (field)	0.028	Decreasing
		Sulfate	0.5691	No trend
		Total Dissolved Solids	0.5959	No trend
	CCR Rule Appendix IV Parameters	Cadmium	0.8489	No trend
		Cobalt	0.028	Decreasing
		Lithium	0.0496	Decreasing
		Molybdenum	0.882	No trend
	TDEC Appendix I Parameters	Nickel	0.0486	Decreasing

Table H.1-14 - Linear Regression Results
Groundwater Investigation - Johnsonville Fossil Plant - New Johnsonville, Tennessee

Well	Constituent Type	Constituent	p-value	Trend summary[1]
JOF-114	CCR Rule Appendix III Parameters	Boron	0.5414	No trend
		Chloride	<0.0001	Decreasing
		pH (field)	0.9294	No trend
		Sulfate	0.1776	No trend
		Total Dissolved Solids	0.6965	No trend
	CCR Rule Appendix IV Parameters	Cobalt	0.0001	Decreasing
		Lithium	0.0685	No trend
		Radium-226+228	0.7926	No trend
JOF-117	CCR Rule Appendix III Parameters	pH (field)	0.9978	No trend
	CCR Rule Appendix IV Parameters	Arsenic	0.1441	No trend
		Cobalt	0.0001	Decreasing
89-B10	CCR Rule Appendix III Parameters	pH (field)	0.1437	No trend
99-B20A	CCR Rule Appendix III Parameters	pH (field)	0.1223	No trend
B-11	CCR Rule Appendix III Parameters	Chloride	0.0164	Decreasing
		pH (field)	0.8329	No trend
		Total Dissolved Solids	0.0205	Decreasing
B-12	CCR Rule Appendix III Parameters	Chloride	0.0697	No trend
		pH (field)	0.1152	No trend
		Total Dissolved Solids	0.0998	No trend
	CCR Rule Appendix IV Parameters	Arsenic	0.0414	Increasing
		Cobalt	0.0056	Increasing
		Radium-226+228	0.3418	No trend
JOF-105	CCR Rule Appendix III Parameters	Chloride	0.1649	No trend
		pH (field)	0.6217	No trend
		Total Dissolved Solids	0.5108	No trend
	CCR Rule Appendix IV Parameters	Cobalt	0.0079	Decreasing
JOF-106	CCR Rule Appendix III Parameters	Chloride	0.0545	No trend
		pH (field)	0.044	Decreasing
		Total Dissolved Solids	0.0953	No trend
JOF-107	CCR Rule Appendix III Parameters	Chloride	<0.0001	Increasing
		pH (field)	0.261	No trend
		Total Dissolved Solids	0.001	Increasing
	CCR Rule Appendix IV Parameters	Cobalt	0.075	No trend
B-6R	CCR Rule Appendix III Parameters	Boron	0.5366	No trend
		pH (field)	0.1358	No trend
		Sulfate	0.1931	No trend
		Total Dissolved Solids	0.9939	No trend
B-8R	CCR Rule Appendix III Parameters	pH (field)	0.3931	No trend
JOF-102	CCR Rule Appendix III Parameters	pH (field)	0.5119	No trend

Notes
CCR Rule - Title 40, Code of Federal Regulations, Part 257
p-value - probability value
1. Trend evaluated using linear regression. Slope considered significant when $p<0.05$.

EXHIBITS

Exhibit No.
H.1-1

Title
Monitoring Well and Piezometer Network

Client/Project
Tennessee Valley Authority
Johnsonville Fossil (JOF) Plant TDEC Order

Project Location
New Johnsonville, Tennessee

175568286
Prepared by DMB on 2023-08-17
Technical Review by MD on 2023-08-17

0 450 900 1,350 1,800 Feet

1:5,400 (At original document size of 22x34)

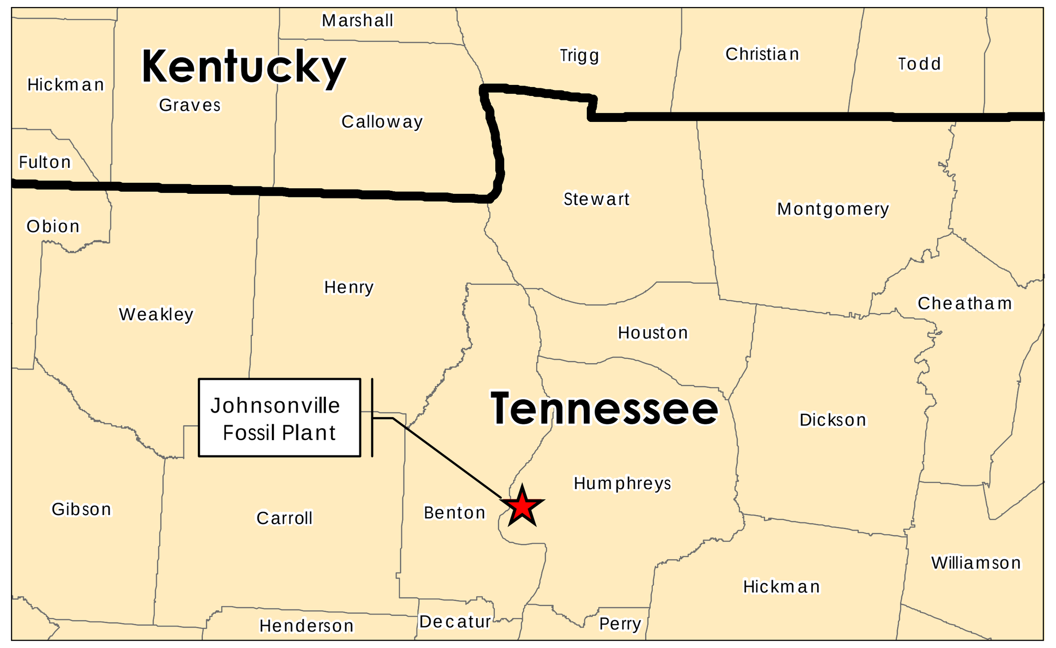
Legend

- Groundwater Investigation Monitoring Well
- Other Monitoring Well
- Piezometer
- Pore Water Piezometer in CCR Material
- Tennessee River/Kentucky Lake Gauging Station
- 2017 Imagery Boundary
- 2018 Imagery Boundary
- CCR Management Unit Area (Approximate)
- Former Coal Yard (Approximate)
- Former Stilling Pond (Approximate)

CCR: Coal combustion residuals

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Imagery Provided by TVA (2017 & 2018) and Esri World Imagery



Stantec TVA

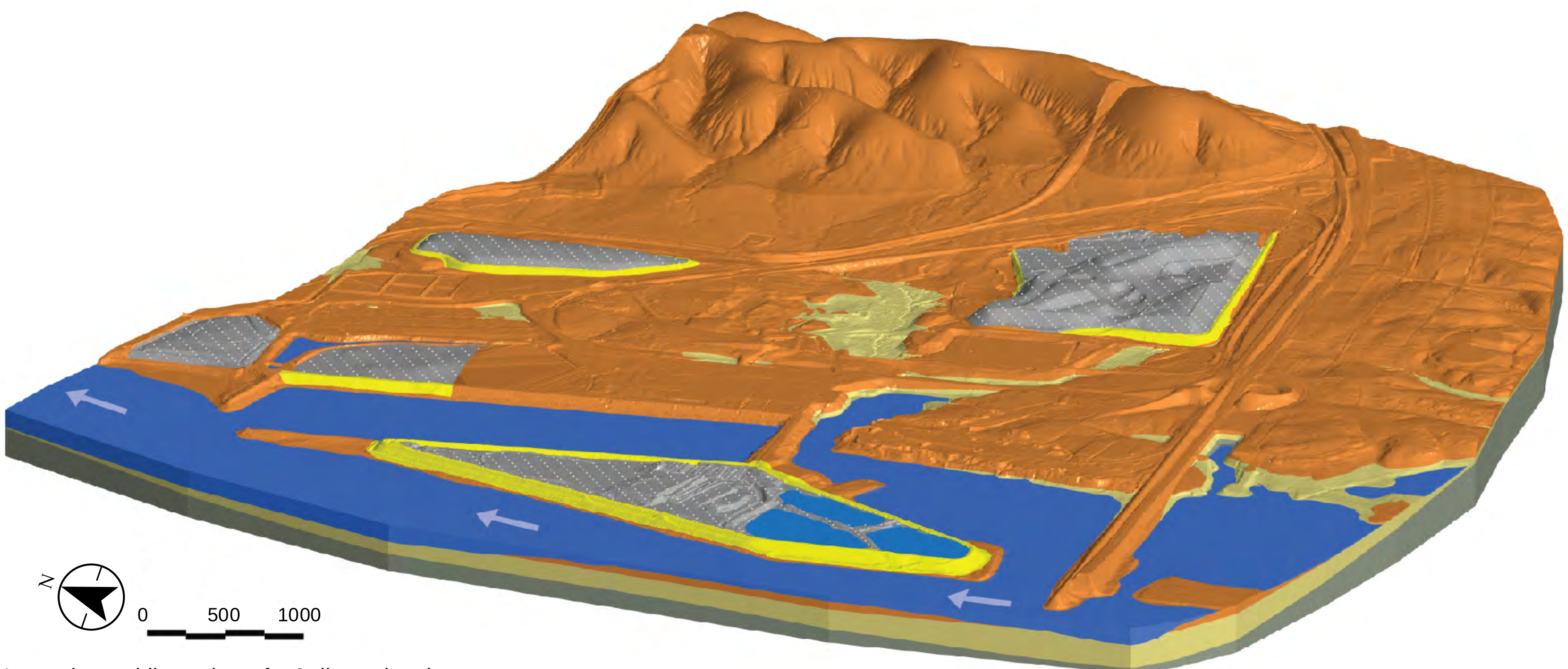


Image is an oblique view of a 3-dimensional model at 2.5X vertical exaggeration. The scale above is valid only in the horizontal direction.

Exhibit No.

H.1-2

Title

Lithologic Model (Oblique View Looking East)

Client/Project 175568286

Tennessee Valley Authority
Johnsonville Fossil (JOF) Plant TDEC Order

Clinton, Tennessee
New Johnsonville, Tennessee

Prepared by DMB on 2023-08-28
TR by BL on 2023-08-28

Legend

- CCR Material
- Clay Dike
- Unconsolidated Materials (Primarily Silt and Clay)
- Unconsolidated Materials (Primarily Sand and Gravel)
- Waterbody
- Bedrock
- Typical Surface Stream Flow Direction

CCR: Coal combustion residuals

Stantec

TVA

U:\TVA-EIP\175568286_JOF_Phase2\gis\mxd\EAR\H.1-2_LithologicalModel_ObliqueLookingEast.mxd Revised: 2023-08-28 By: mbough

Exhibit No.

H.1-3

Title

Lithologic Model - Primarily Silts and Clays (Oblique View Looking East)

Client/Project 175568286

Tennessee Valley Authority
Johnsonville Fossil (JOF) Plant TDEC Order

Clinton, Tennessee
New Johnsonville, Tennessee

Prepared by DMB on 2023-08-28
TR by BL on 2023-08-28

Legend

- Clay Dike
- Unconsolidated Materials (Primarily Silt and Clay)
- Unconsolidated Materials (Primarily Sand and Gravel)
- Waterbody
- Bedrock
- Typical Surface Stream Flow Direction

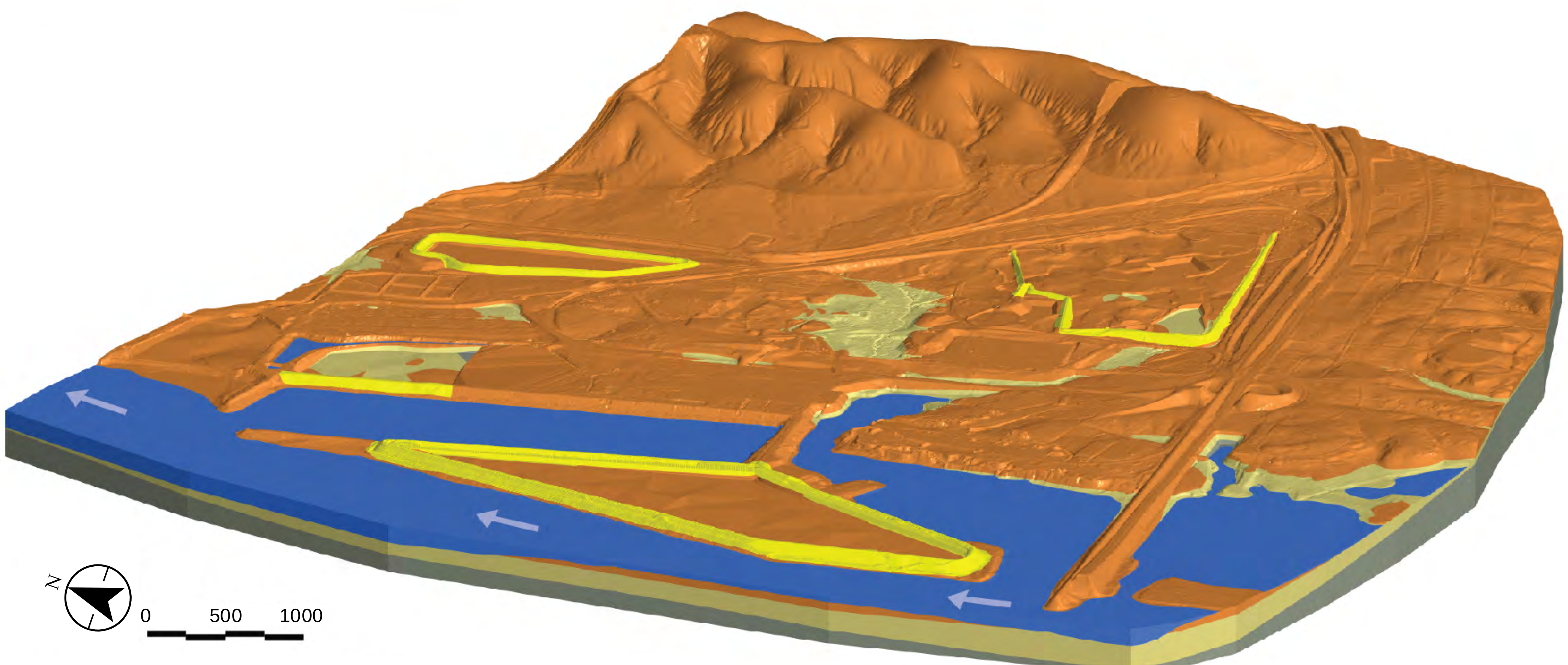


Image is an oblique view of a 3-dimensional model at 2.5X vertical exaggeration. The scale above is valid only in the horizontal direction.

Stantec

TVA

U:\TVA-EIP\175568286_JOF_Phase2\gis\mxd\EAR\H.1-3_LithologicalModel_SiltsClays_ObliqueLookingEast.mxd Revised: 2023-08-28 By: mbough

Exhibit No.

H.1-4

Title

Lithologic Model - Primarily Sand and Gravel (Oblique View Looking East)

Client/Project 175568286

Tennessee Valley Authority
Johnsonville Fossil (JOF) Plant TDEC Order

Clinton, Tennessee
New Johnsonville, Tennessee

Prepared by DMB on 2023-08-28
TR by BL on 2023-08-28

Legend

- Clay Dike
- Unconsolidated Materials (Primarily Sand and Gravel)
- Waterbody
- Bedrock
- Typical Surface Stream Flow Direction

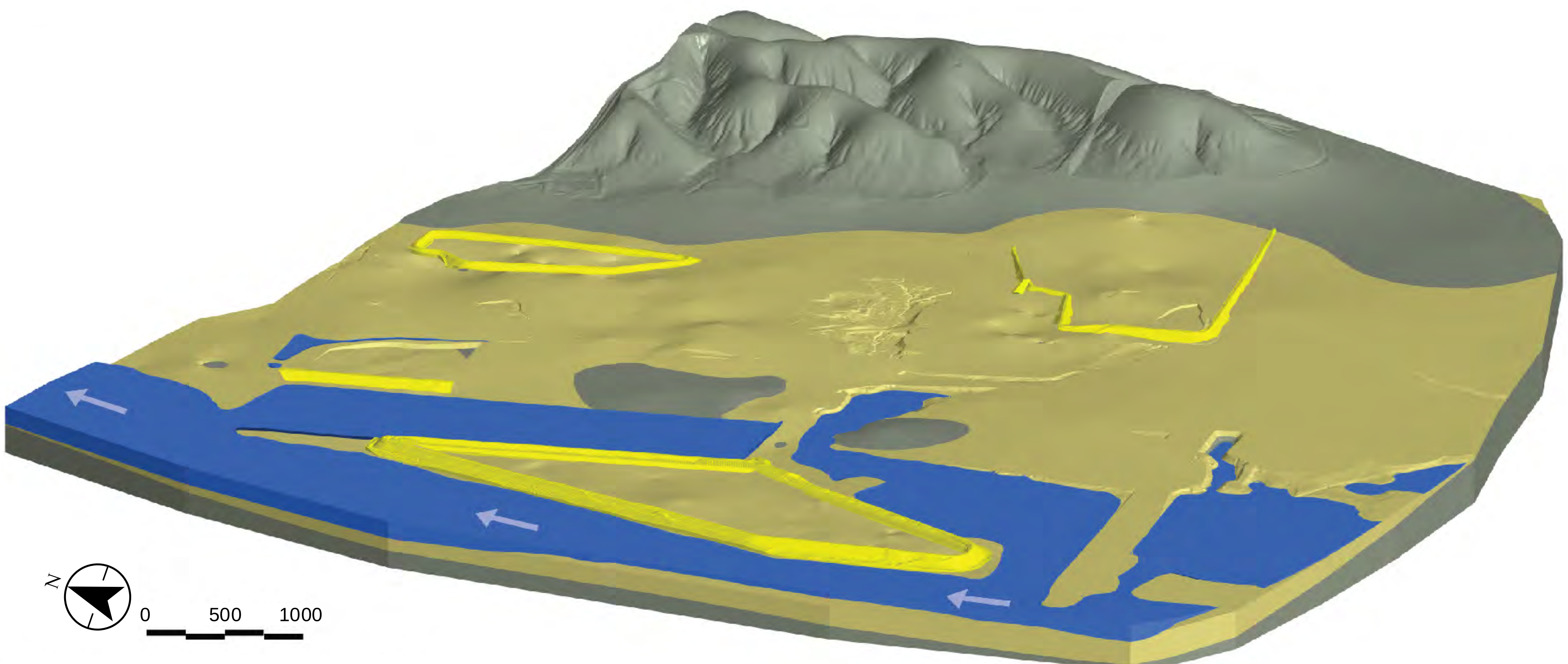


Image is an oblique view of a 3-dimensional model at 2.5X vertical exaggeration. The scale above is valid only in the horizontal direction.

U:\TVA-EIP\175568286_JOF_Phase2\gis\mxd\EAR\H.1-4_LithologicalModel_SandGravel_ObliqueLookingEast.mxd Revised: 2023-08-28 By: mbough

Exhibit No.
H.1-5

Title
Geologic Map

Client/Project
Tennessee Valley Authority
Johnsonville Fossil (JOF) Plant TDEC Order

Project Location
New Johnsonville, Tennessee

175568286
Prepared by DMB on 2023-08-21
Technical Review by MD on 2023-08-21

0 400 800 1,200 1,600 Feet
1:4,800 (At original document size of 22x34)

Legend

- Approximate Location of Inferred Thrust Fault (1948)
- 2017 Imagery Boundary
- 2018 Imagery Boundary
- CCR Management Unit Area (Approximate)
- Former Coal Yard (Approximate)
- Former Stilling Pond (Approximate)
- TVA Property Boundary

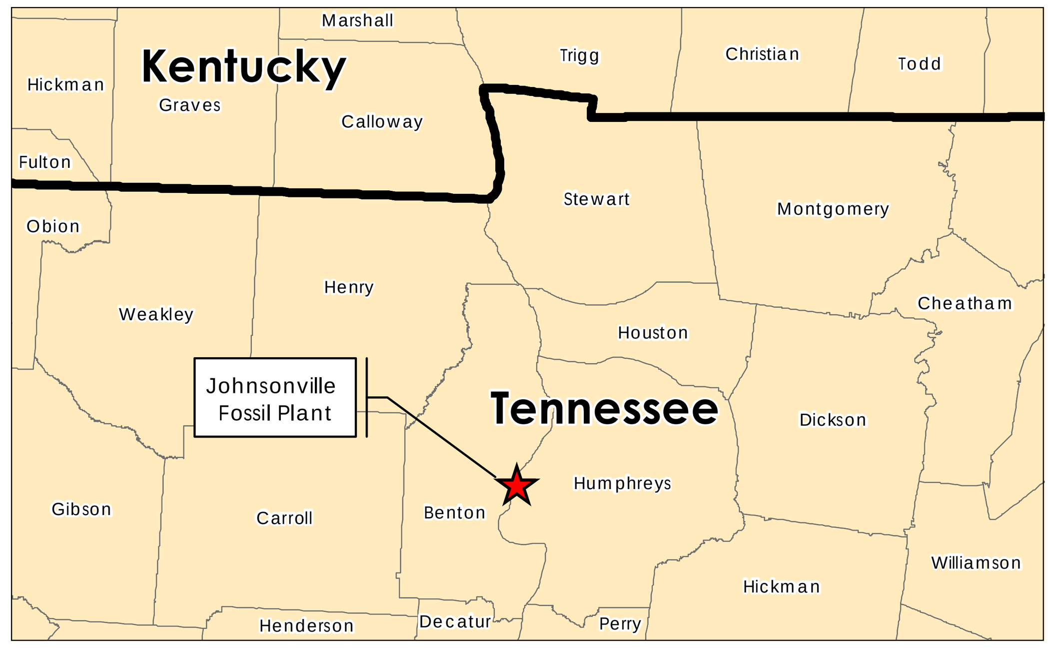
Geologic Formations

- D - Devonian Formations, includes Pegram Formation, Camden Formation, Harriman Formation, Flat Gap Limestone, and Ross Formation
- Mfp - Fort Payne Formation or Fort Payne Formation and Chattanooga Shale
- Msw - St. Louis Limestone and Warsaw Limestone
- Qal - Alluvial deposits

CCR = Coal Combustion Residuals

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Imagery Provided by TVA (2017 and 2018-09-18) and Esri World Imagery
3. Geologic Data downloaded from https://mrdata.usgs.gov/geology/state/state.php?state=TN
4. Location of fault obtained from Kellberg, 1948



Stantec TVA

Exhibit No.

H.1-6

Title

Lithologic Model - Top of Bedrock (Oblique View Looking East)

Client/Project 175568286

Tennessee Valley Authority
Johnsonville Fossil (JOF) Plant TDEC Order

Clinton, Tennessee
New Johnsonville, Tennessee

Prepared by DMB on 2023-08-28
TR by BL on 2023-08-28

Legend

- Clay Dike
- Waterbody
- Bedrock
- Typical Surface Stream Flow Direction

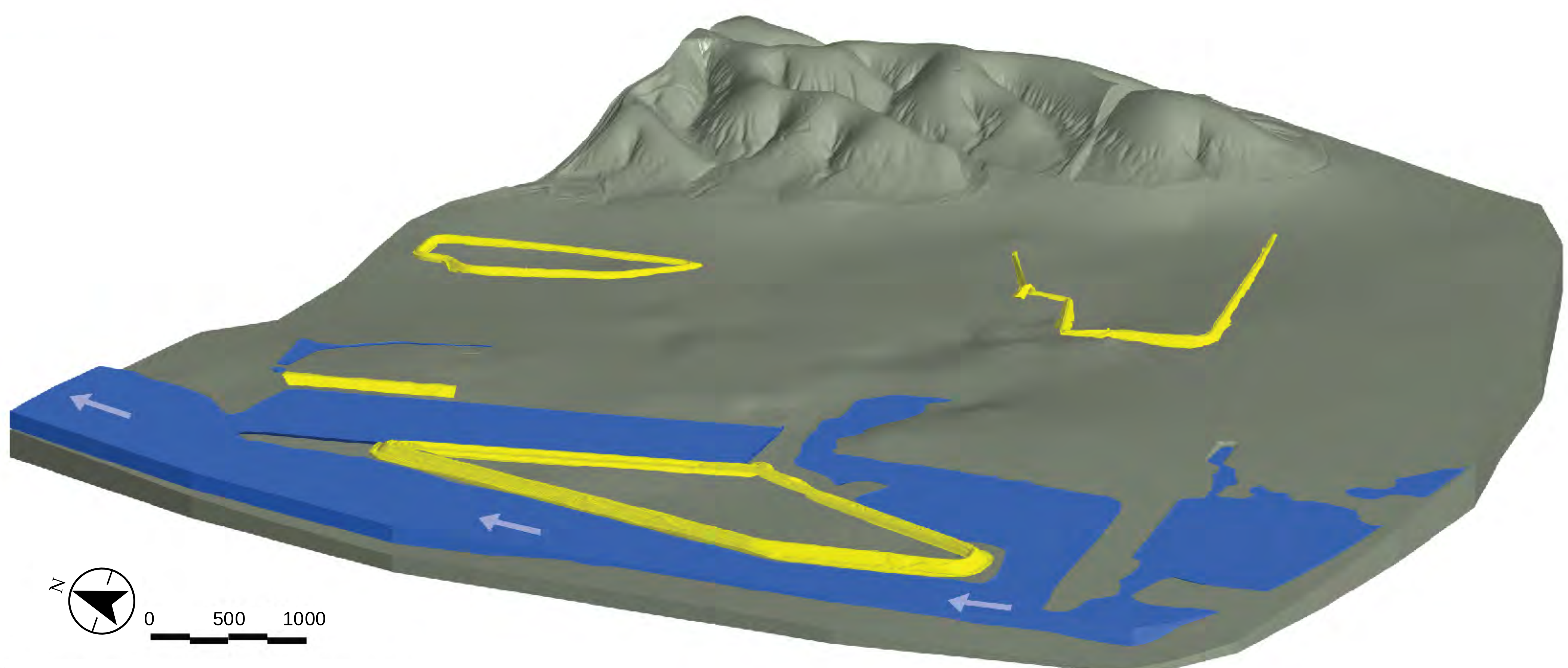
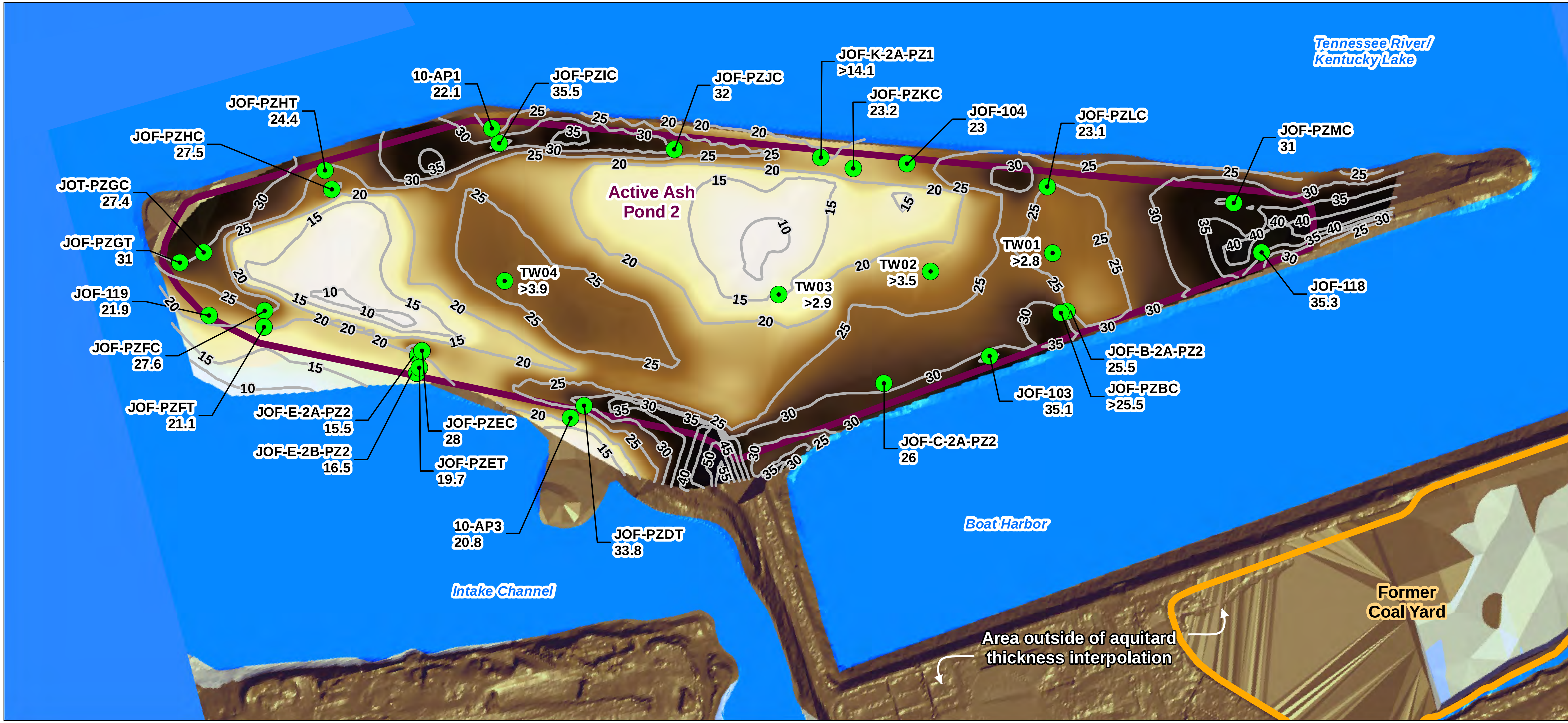


Image is an oblique view of a 3-dimensional model at 2.5X vertical exaggeration. The scale above is valid only in the horizontal direction.

U:\TVA-EIP\175568286_JOF_Phase2\gis\mxd\EAR\H.1-6_LithologicalModel_TopofBedrock_ObliqueLookingEast.mxd Revised: 2023-08-28 By: mbough



Legend

- Boring Location with Logged Clays/Silts
- Isopach Contour (5 ft interval)
- CCR Management Unit Area (Approximate)
- Former Coal Yard (Approximate)

Approximate Clay/Silt Thickness Range (feet)

- 10
- 20
- 30
- 40
- 50

0 450 900 Feet

(At original document size of 11x17)
1:5,400

N

CCR: Coal combustion residuals

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet

2. The isopach map was developed using the Leapfrog lithologic model and is based on the differential elevation of two surfaces: pre-construction ground surface and the top of the uppermost aquifer (either coarse alluvium or top of bedrock where coarse alluvium is absent). The boring locations with logged clay thinkness are posted as confirmatory data points.

3. Thickness values showing a ">" symbol refers to a location where the boring was stopped before penetrating the full thickness of the fine grained layer. At these locations the contouring is based solely on the differential elevation of the bottom of the CCR to the top of the alluvial aquifer model surface.

Project Location
New Johnsonville, Tennessee

Prepared by DMB on 2023-08-17
TR by MD on 2023-08-17
IR Review by JG on 2023-08-17

Client/Project 175568286
Tennessee Valley Authority
Johnsonville Fossil (JOF) Plant TDEC Order

Exhibit No.
H.1-7

Title
Thickness of Clays Above Uppermost Aquifer (Active Ash Pond 2)

U:\TVA-EIP\175568286_JOF_Phase2\gis\mxd\EAR\H.1-7_isopach.mxd Revised: 2023-08-17 By: mbough

Exhibit No.

H.1-8

Title

Lithologic Model - Physiographic Setting (Oblique View Looking East)

Client/Project 175568286

Tennessee Valley Authority
Johnsonville Fossil (JOF) Plant TDEC Order

Clinton, Tennessee
New Johnsonville, Tennessee

Prepared by DMB on 2023-08-28
TR by BL on 2023-08-28

Legend

Typical Surface Stream Flow Direction

Property Boundary

Stantec

TVA

U:\TVA-EIP\175568286_JOF_Phase2\gis\mxd\EAR\H.1-8_LithologicalModel_PhysiographicSetting_ObliqueLookingEast.mxd Revised: 2023-08-28 By: mbough

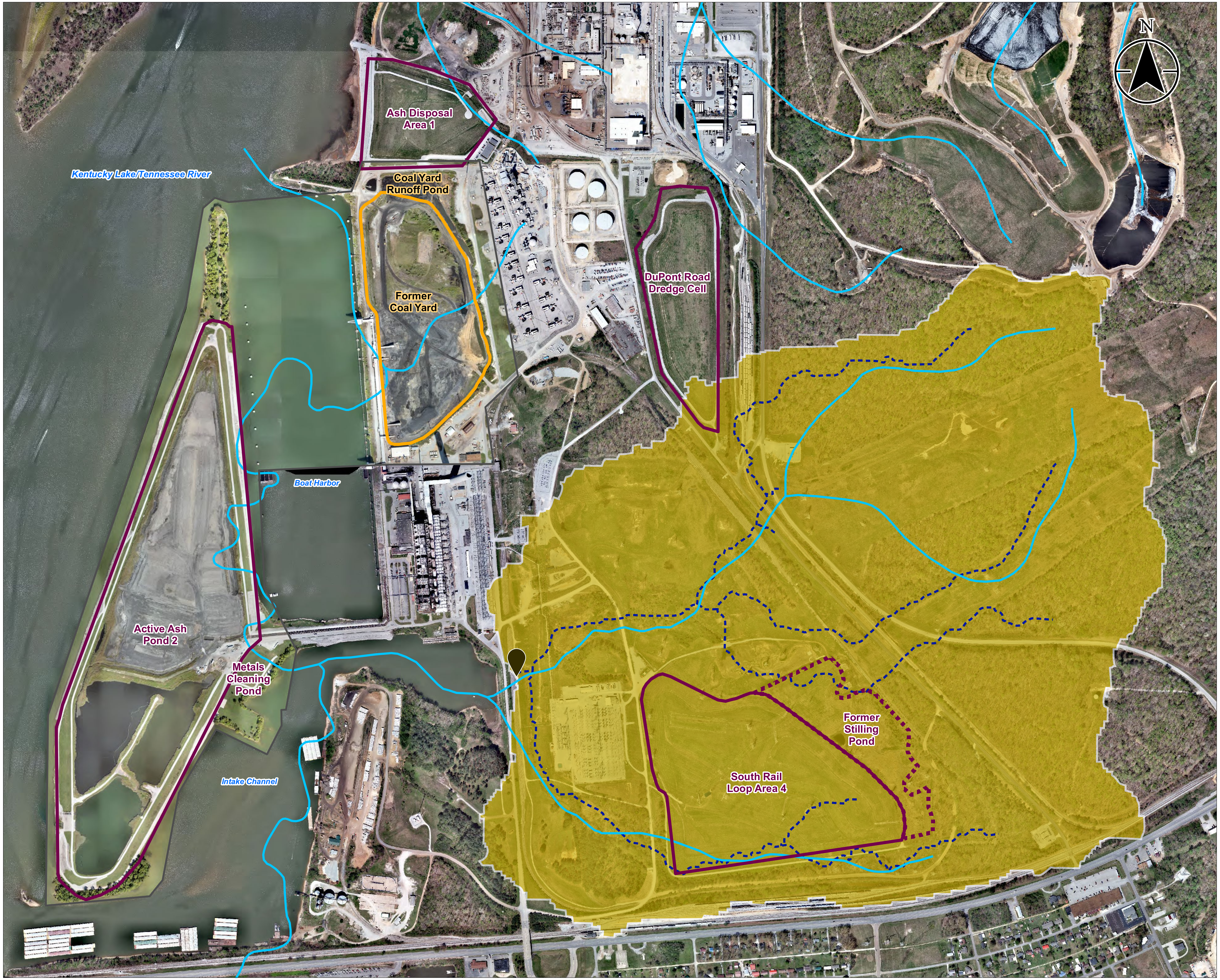


Exhibit No.

H.1-9

Title

Historical Stream Alignments and USGS StreamStats Map

Client/Project

Tennessee Valley Authority
Johnsonville Fossil (JOF) Plant TDEC Order

Project Location

New Johnsonville, Tennessee

175568286
Prepared by KB on 2024-01-10
Technical Review by JG on 2024-01-10

0 400 800 1,200 1,600 Feet

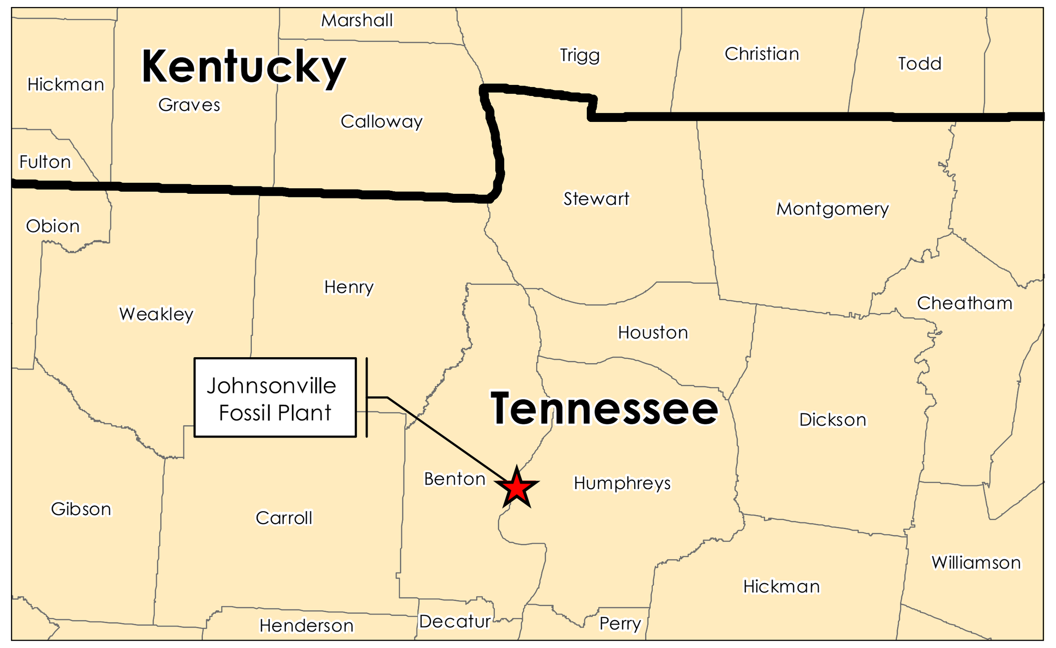
1:4,800 (At original document size of 22x34)

Legend

- Historic Stream (Approximate)
- 2018 Imagery Boundary
- CCR Management Unit Area (Approximate)
- Former Coal Yard (Approximate)
- Former Stilling Pond (Approximate)
- JOF Plant Watershed (Approximate)
- JOF Plan Watershed Stream Network (Approximate)
- Watershed Reference Point

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Imagery Provided by TVA (2017 & 2018) and Esri World Imagery
3. Historic Streams obtained from topographic map USGS, Johnsonville Quadrangle, 1936
4. Watershed and Stream Network obtained from USGS StreamStats Tool



Stantec TVA

U:\TVA-EIP\175568286_JOF_Phase2\gis\mxd\EAR\zzz_2-4_HistoricStreamsExtentShiftforKB.mxd Revised: 2024-01-09 By: mbough

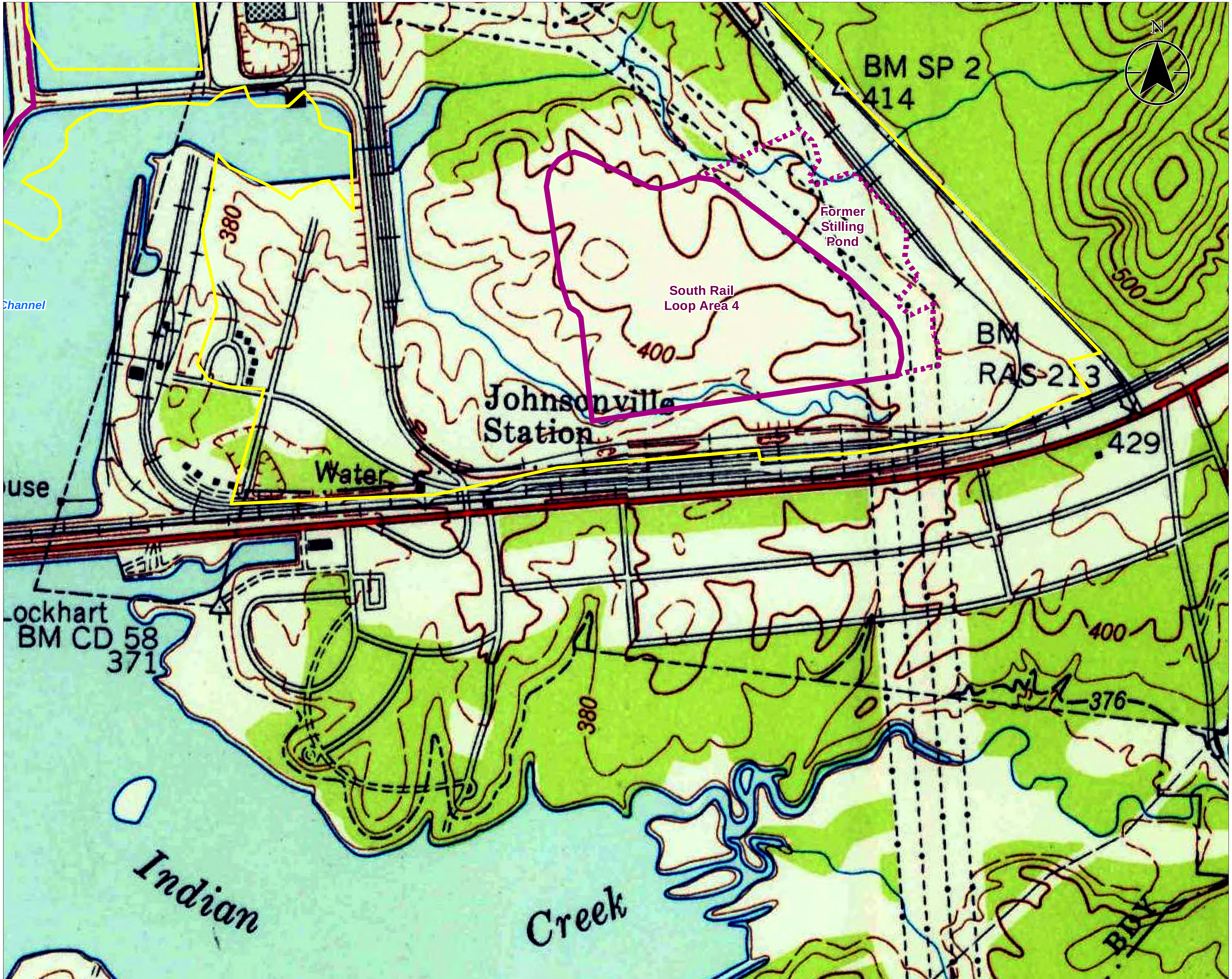


Exhibit No.
H.1-10

Title
Topographic Map - USGS (1950)

Client/Project
Tennessee Valley Authority
Johnsonville Fossil (JOF) Plant TDEC Order

Project Location
New Johnsonville, Tennessee

175568286
Prepared by DMB on 2024-01-18
Technical Review by MD on 2024-01-18

0 300 600 900 1,200 Feet
1:3,600 (At original document size of 22x34)

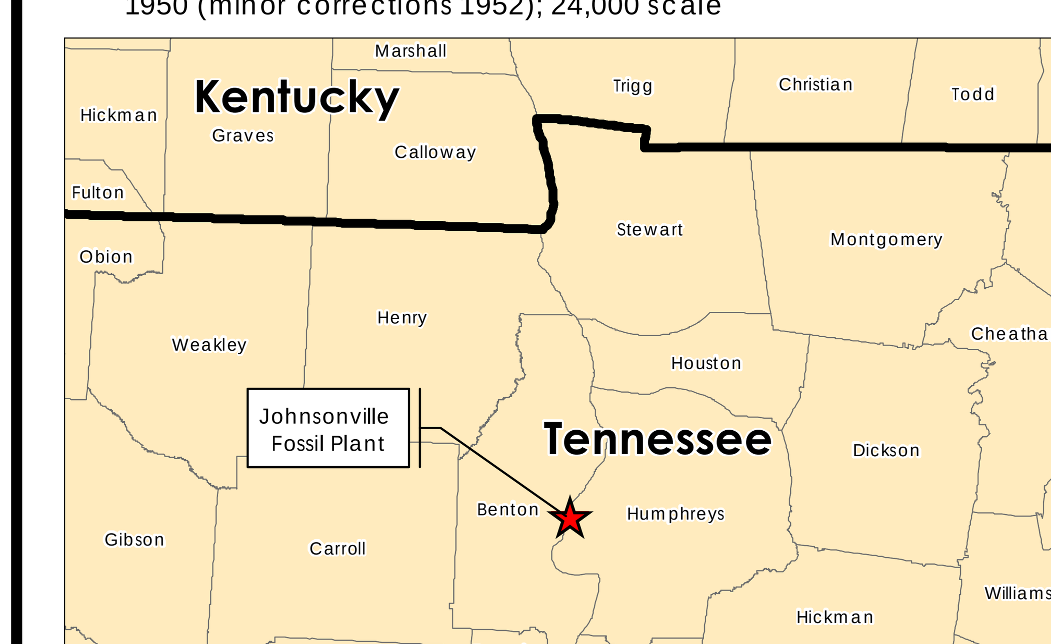
Legend

- CCR Management Unit Area (Approximate)
- Former Stilling Pond (Approximate)
- TVA Property Boundary

CCR = Coal Combustion Residuals

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Topographic Map: Tennessee Valley Authority and the Department of the Interior Geological Survey; Johnsonville Tennessee Quadrangle, 1950 (minor corrections 1952); 24,000 scale



U:\TVA-EP\175568286_JOF_Phase2\gis\mxd\EAR\H.1-10_USGSTopo1950.mxd Revised: 2024-01-18 By: mbough

Exhibit No.

H.1-11

Title

Groundwater Elevation Contour Map, Event #5 (August 10-11, 2020)

Client/Project

Tennessee Valley Authority
Johnsonville Fossil (JOF) Plant TDEC Order

Project Location: New Johnsonville, Tennessee

175568286
Prepared by DMB on 2024-01-29
Technical Review by MD on 2024-01-29

0 450 900 1,350 1,800 Feet

1:5,400 (At original document size of 22x34)

Legend

- Groundwater Investigation Monitoring Well — groundwater elevation in feet above mean sea level (ft amsl)
- Other Monitoring Well — groundwater elevation in ft amsl
- Piezometer, groundwater label in blue text, pore water label in yellow highlighted black text; elevation in ft amsl (e.g., JOF-E-2A-PZ2) (e.g., JOF-E-2A-PZ5)
- Piezometer in CCR — pore water elevation in ft amsl; value not used for contouring
- Temporary well in CCR — pore water elevation in ft amsl; value not used for contouring
- Tennessee River/Kentucky Lake Gauging Station — surface water elevation in ft amsl
- Surface Stream Flow
- Interpolated Groundwater Contour (5 ft interval; elevations are in ft amsl)
- Groundwater Contour (5 ft interval; elevations are in ft amsl)
- 2017 Imagery Boundary
- 2018 Imagery Boundary
- CCR Management Unit Area (Approximate)
- Former Coal Yard (Approximate)
- Former Stilling Pond (Approximate)

CCR: Coal combustion residuals

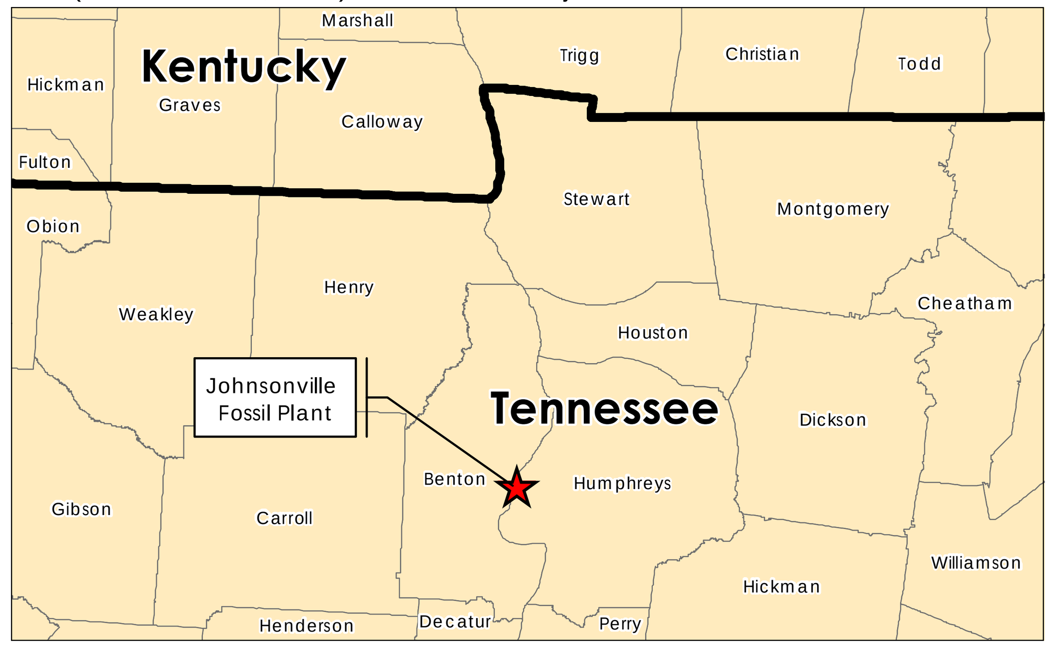
*Groundwater and pore water elevation displayed but not used as input for contouring due to factors such as well construction or being screened in a different hydrogeologic unit.

**Nested VWPZ sensors monitoring pore water and groundwater elevations in the same borehole, and the location is shown by a single symbol.

***The JOF_PZET and JOF_PZFT groundwater elevations are approximately 3-4 feet below the trend established in other piezometers within the Active Ash Pond 2. The groundwater elevation is displayed but not used for contouring.

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Imagery Provided by TVA (2017 & 2018) and Esri World Imagery
3. Groundwater contours were created using Surfer Version 16.1.350 (December 13, 2018) and manual adjustment



Stantec TVA

U:\TVA-EP\175568286_JOF_Phase2\gis\mxd\EAR\H.1-11_GroundwaterElevationContour_Event5.mxd Revised: 2024-01-29 By: mbough

Exhibit No.

H.1-12

Title

Manual Groundwater and Pore Water Gauging Locations

Client/Project

Tennessee Valley Authority
Johnsonville Fossil (JOF) Plant TDEC Order

Project Location: New Johnsonville, Tennessee

175568286
Prepared by DMB on 2024-01-29
Technical Review by MD on 2024-01-29

0 | 450 | 900 | 1,350 | 1,800 Feet

1:5,400 (At original document size of 22x34)

Legend

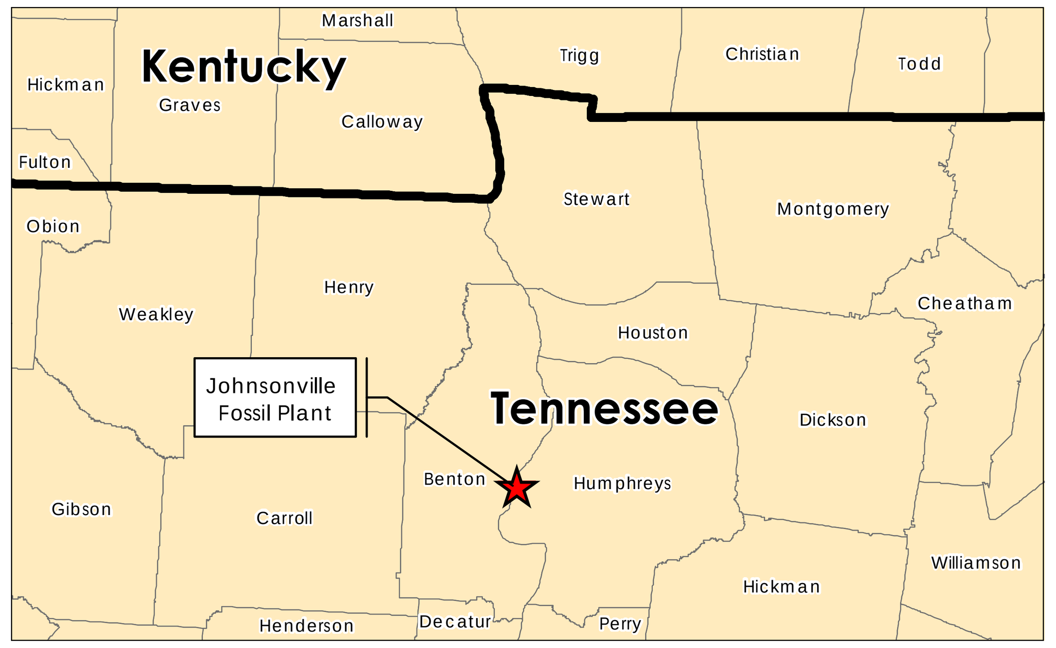
- Groundwater Investigation Monitoring Well
- Other Monitoring Well
- Piezometer, groundwater label in blue text, pore water label in yellow highlighted black text (e.g., JOF-B01B) (e.g., JOF-B01A)
- Pore Water Piezometer in CCR Material
- Temporary Well within CCR Material
- Tennessee River/Kentucky Lake Gauging Station
- 2017 Imagery Boundary
- 2018 Imagery Boundary
- CCR Management Unit Area (Approximate)
- Former Coal Yard (Approximate)
- Former Stilling Pond (Approximate)

CCR: Coal combustion residuals

*Nested VWPZ sensors monitoring pore water and groundwater in the same borehole, and the location is shown by a single symbol.

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Imagery Provided by TVA (2017 & 2018) and Esri World Imagery



Stantec TVA

U:\TVA-EIP\175568286_JOF_Phase2\gis\mxd\EAR\H.1-12_Manual_GW_PW_GaugingLocations_w8048.mxd Revised: 2024-01-29 By: mbough

Exhibit No.

H.1-13a

Title

JOF Instrumentation Used for Surface Water / Pore Water / Groundwater Hydrograph Comparison (Active Ash Pond 2)

Client/Project

Tennessee Valley Authority
Johnsonville Fossil (JOF) Plant TDEC Order

Project Location

New Johnsonville, Tennessee

175568286

Prepared by DMB on 2024-01-29
Technical Review by MD on 2024-01-29

0 300 600 900 1,200 Feet

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

Piezometer Name	Northing (TN STP NAD83)	Easting (TN STP NAD83)
JOF-B-2A	623,697.72	1,379,502.95
JOF-B-2B	623,696.29	1,379,573.90
JOF-C-2A	622,832.82	1,379,600.69
JOF-C-2B	622,824.28	1,379,662.62
JOF-E-2A	620,872.68	1,378,948.54
JOF-E-2B	620,845.70	1,379,021.93
JOF-K-2A	622,811.20	1,378,562.35
JOF_PZ_AAP2-1	620,842.26	1,378,346.71
JOF_PZ_AAP2-2	620,925.47	1,378,631.73
JOF_PZ_AAP2-3	621,360.30	1,378,746.72
JOF_PZ_AAP2-4	621,847.22	1,378,530.70
JOF_PZ_AAP2-5	621,777.73	1,378,782.72
JOF_PZ_AAP2-6	621,991.55	1,379,321.75
JOF_PZ_AAP2-7	622,609.79	1,379,371.74
JOF_PZ_AAP2-8	622,690.48	1,378,823.70
JOF_PZ_AAP2-9	623,010.71	1,379,136.72
JOF_PZ_AAP2-10	623,893.16	1,379,243.71
JOF_PZBC	623,692.13	1,379,494.75

Piezometer Name	Northing (TN STP NAD83)	Easting (TN STP NAD83)
JOF_PZDC2	621,518.10	1,379,284.05
JOF_PZDT	621,525.45	1,379,353.36
JOF_PZEC	620,895.51	1,378,934.21
JOF_PZET	620,863.95	1,379,002.11
JOF_PZFC	620,270.17	1,378,582.09
JOF_PZFT	620,246.24	1,378,651.34
JOF_PZGC	620,074.50	1,378,264.85
JOF_PZGT	619,960.47	1,378,278.26
JOF_PZHC	620,692.84	1,378,141.65
JOF_PZHT	620,686.30	1,378,051.12
JOF_PZIC	621,464.47	1,378,135.73
JOF_PZIT	621,480.98	1,378,066.18
JOF_PZJC	622,203.04	1,378,362.27
JOF_PZKC	622,861.56	1,378,605.56
JOF_PZKT	622,866.01	1,378,562.82
JOF_PZLC	623,752.53	1,378,935.87
JOF_PZMC	624,534.83	1,379,225.40

Legend

Piezometer

2017 Imagery Boundary

2018 Imagery Boundary

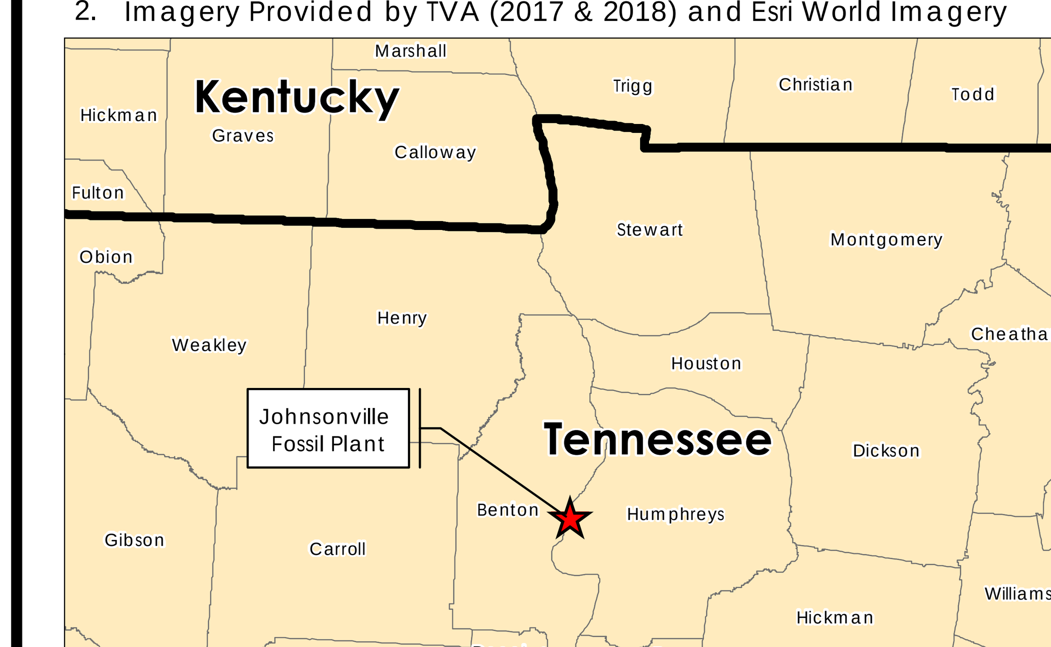
CCR Management Unit Area (Approximate)

Former Coal Yard (Approximate)

CCR: Coal combustion residuals

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Imagery Provided by TVA (2017 & 2018) and Esri World Imagery



Stantec TVA

U:\TVA-EIP\175568286_JOF_Phase2\gis\mxd\EAR\H.1-13a_Instrumentation_AAP2.mxd Revised: 2024-01-29 By: mbough

Exhibit No.

H.1-13b

Title

JOF Instrumentation Used for Surface Water / Pore Water / Groundwater Hydrograph Comparison (DuPont Dredge Cell)

Client/Project

Tennessee Valley Authority
Johnsonville Fossil (JOF) Plant TDEC Order

Project Location

New Johnsonville, Tennessee

175568286
Prepared by DMB on 2024-01-29
Technical Review by MD on 2024-01-29

0 100 200 300 400 Feet

1:1,200 (At original document size of 22x34)

Legend

Piezometer

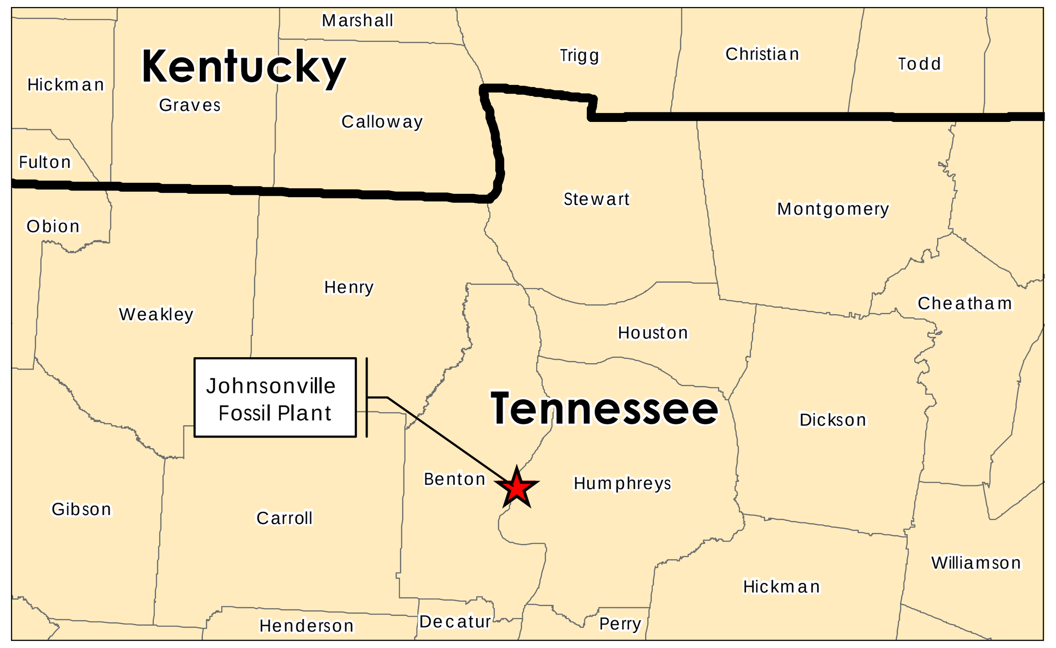
CCR Management Unit Area (Approximate)

CCR: Coal combustion residuals

Piezometer Name	Northing (TN STP NAD83)	Easting (TN STP NAD83)
JOF_DDC_PZ8	625,452.01	1,383,168.03
JOF_DDC_PZ9	625,211.63	1,383,569.34
JOF_DDC_PZ10	624,538.21	1,383,283.95

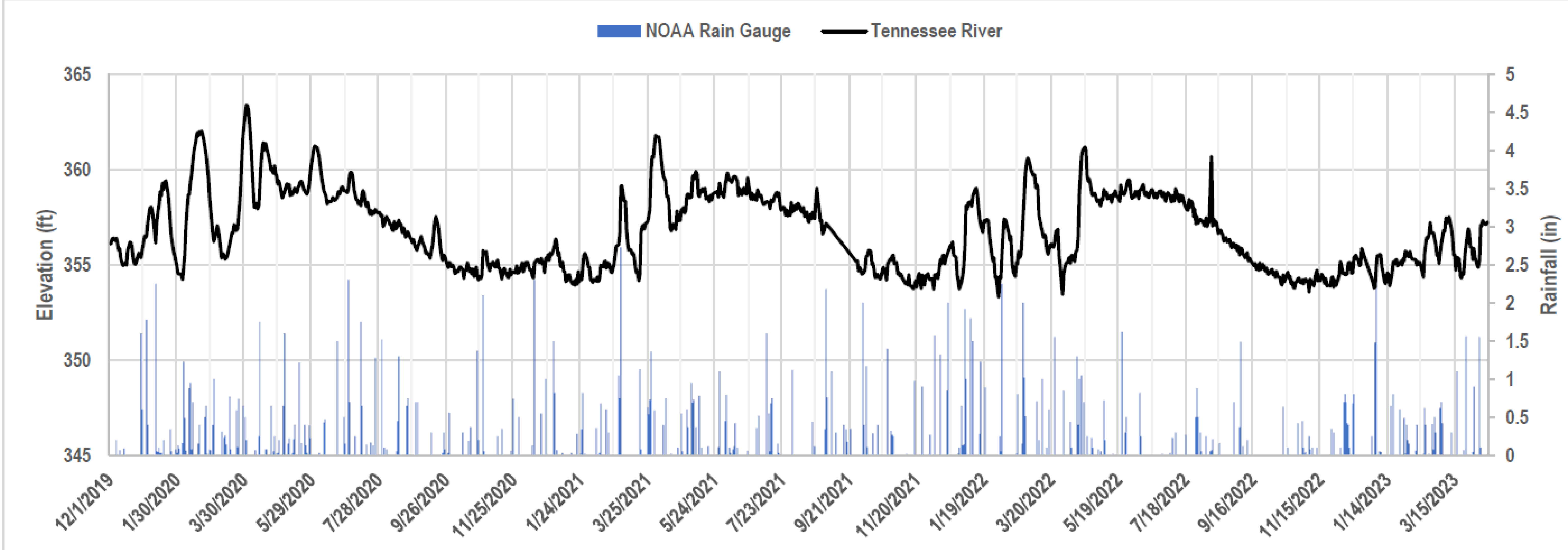
Notes

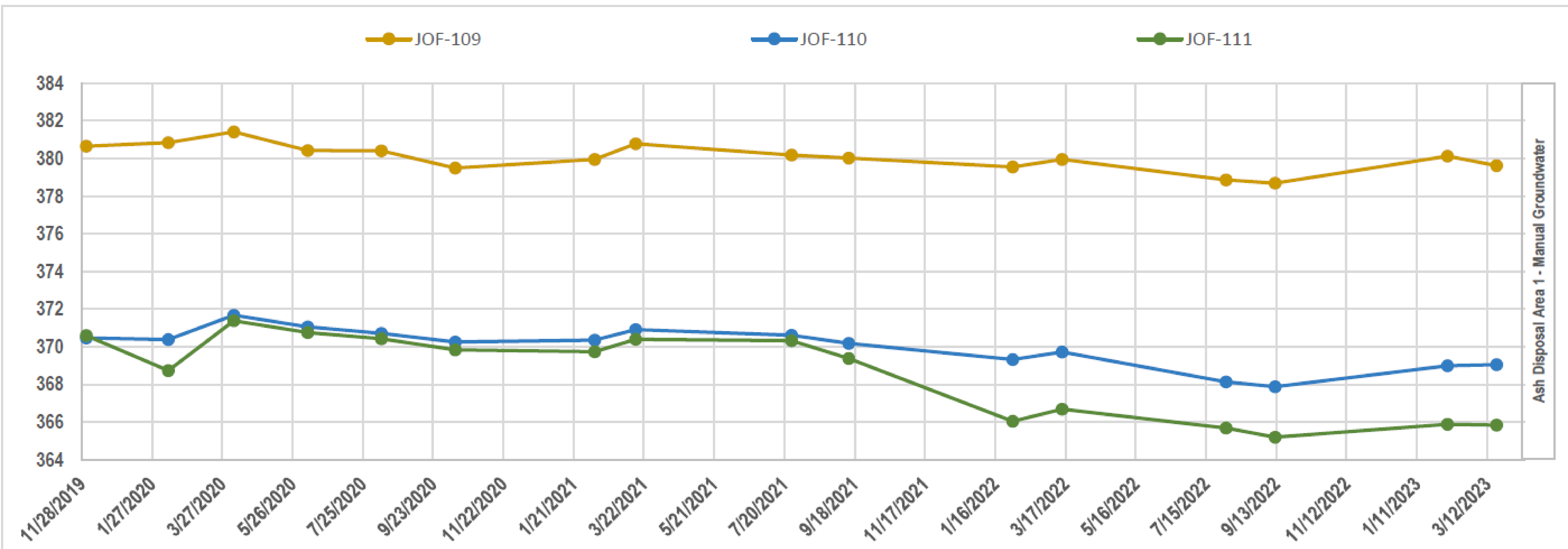
1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Imagery Provided by TVA (2017)



Stantec TVA

Disclaimer: Stantec assumes no responsibility for data supplied in electronic format. The recipient accepts full responsibility for verifying the accuracy and completeness of the data. The recipient releases Stantec, its officers, employees, consultants and agents, from any and all claims arising in any way from the content or provision of the data.





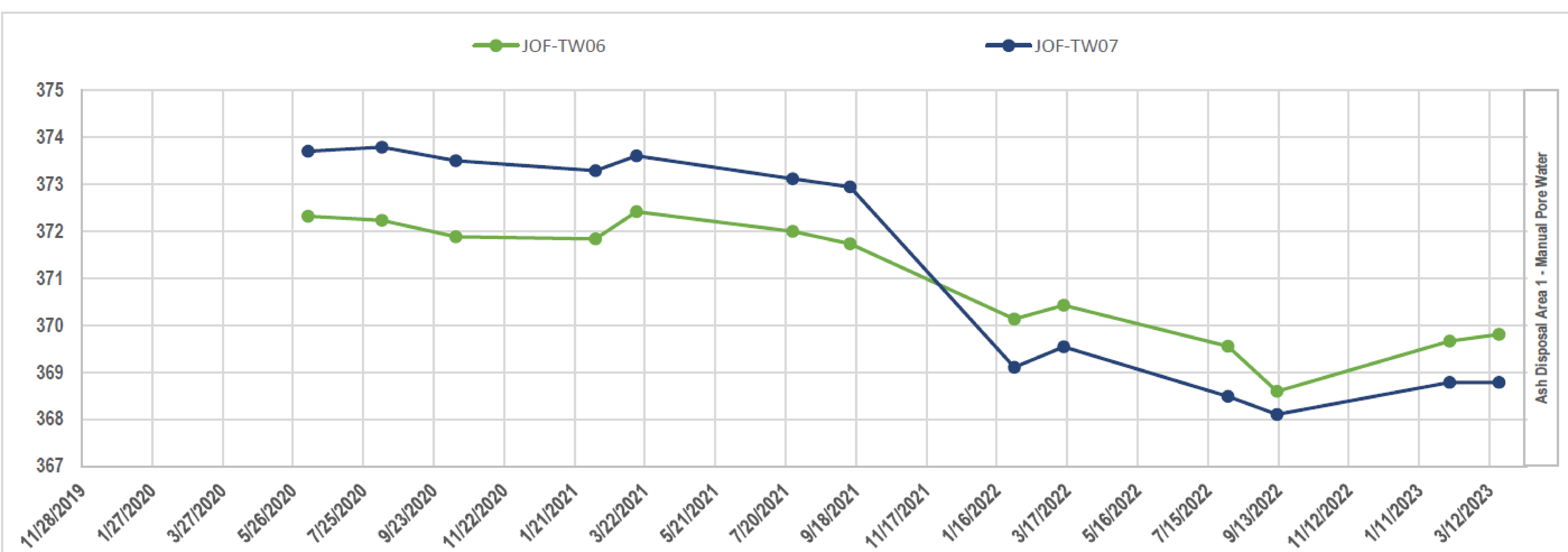


Figure No.
H.1-14

Title
Manually Gauged Instrument Hydrographs - Ash Disposal Area 1

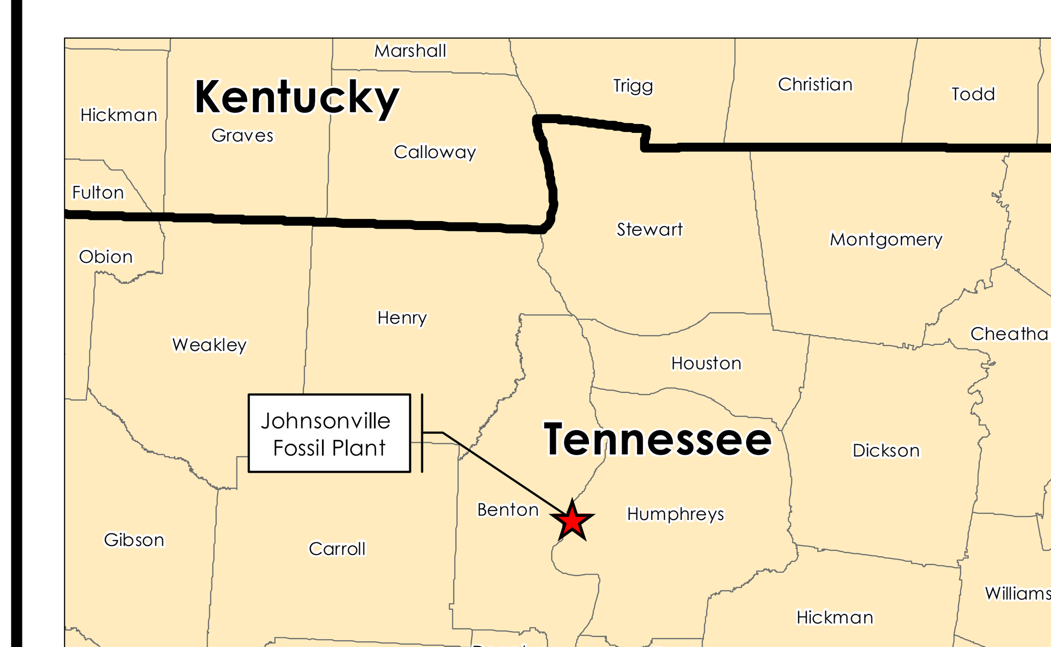
Client/Project
Tennessee Valley Authority
Johnsonville Fossil (JOF) Plant TDEC Order

Project Location
New Johnsonville, Tennessee

175568286
Prepared by MP on 2022-07-27
Technical Review by MD on 2022-07-27

Legend

ft - feet
in - inches



Stantec TVA

Figure No.
H.1-15

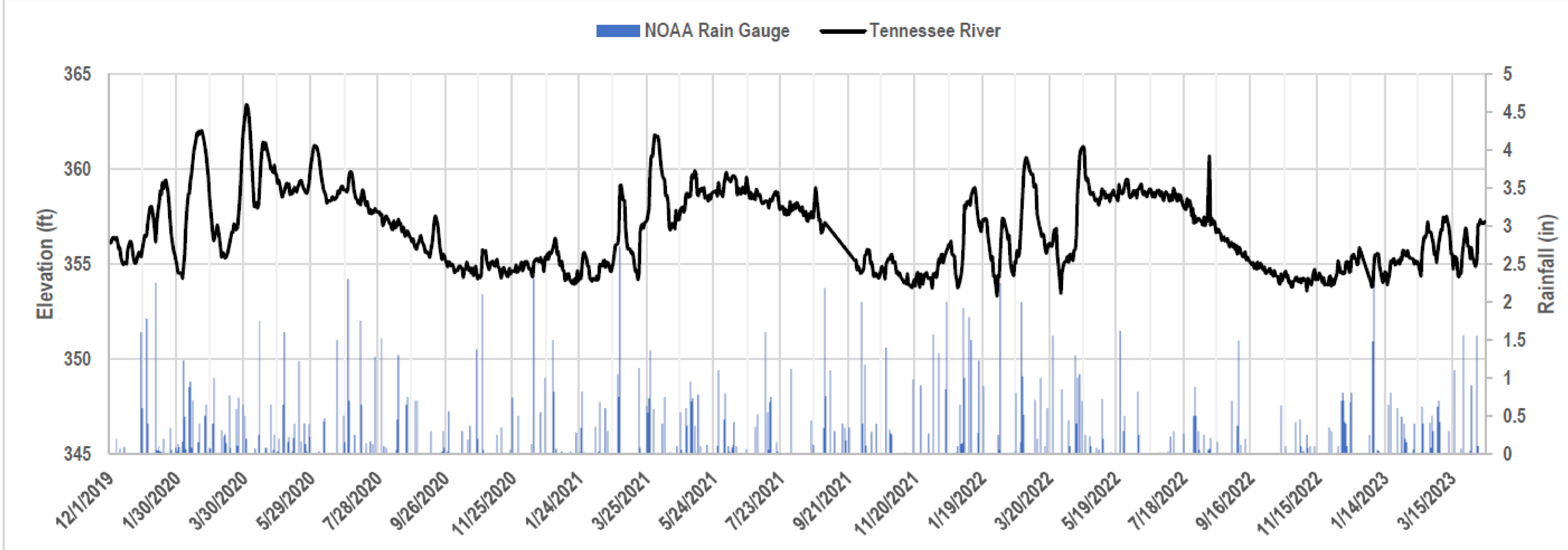
Title
Manually Gauged Instrument Hydrographs - Former Coal Yard

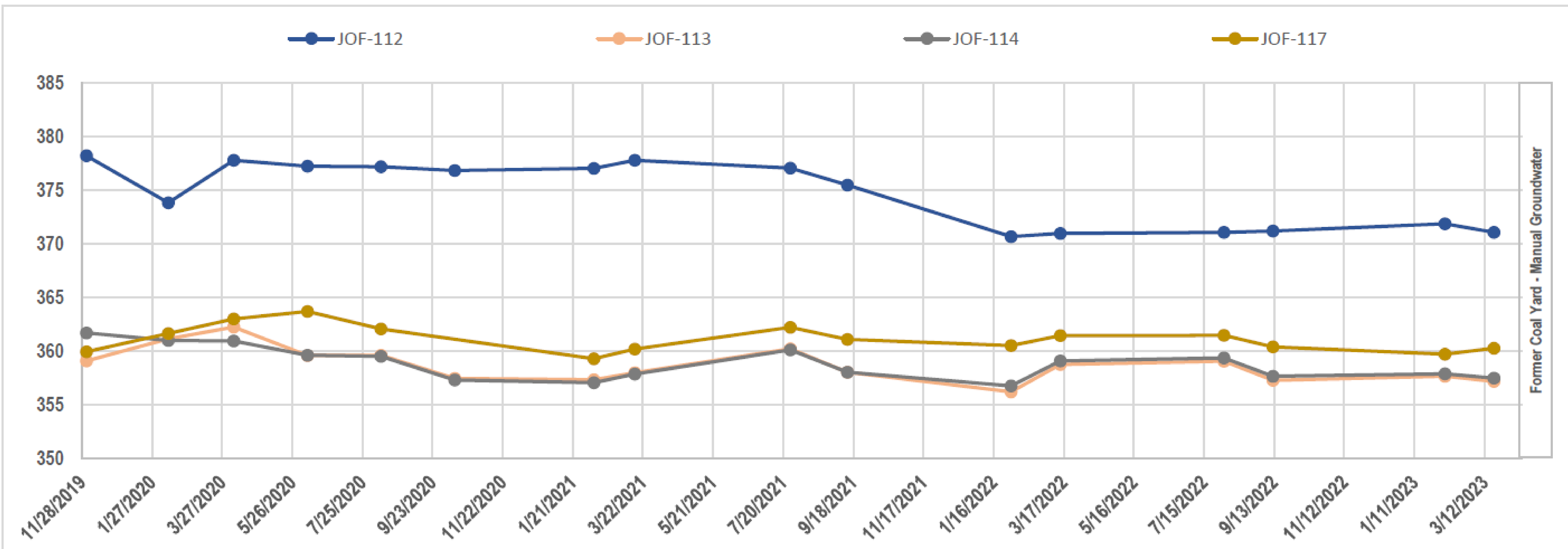
Client/Project
Tennessee Valley Authority
Johnsonville Fossil (JOF) Plant TDEC Order

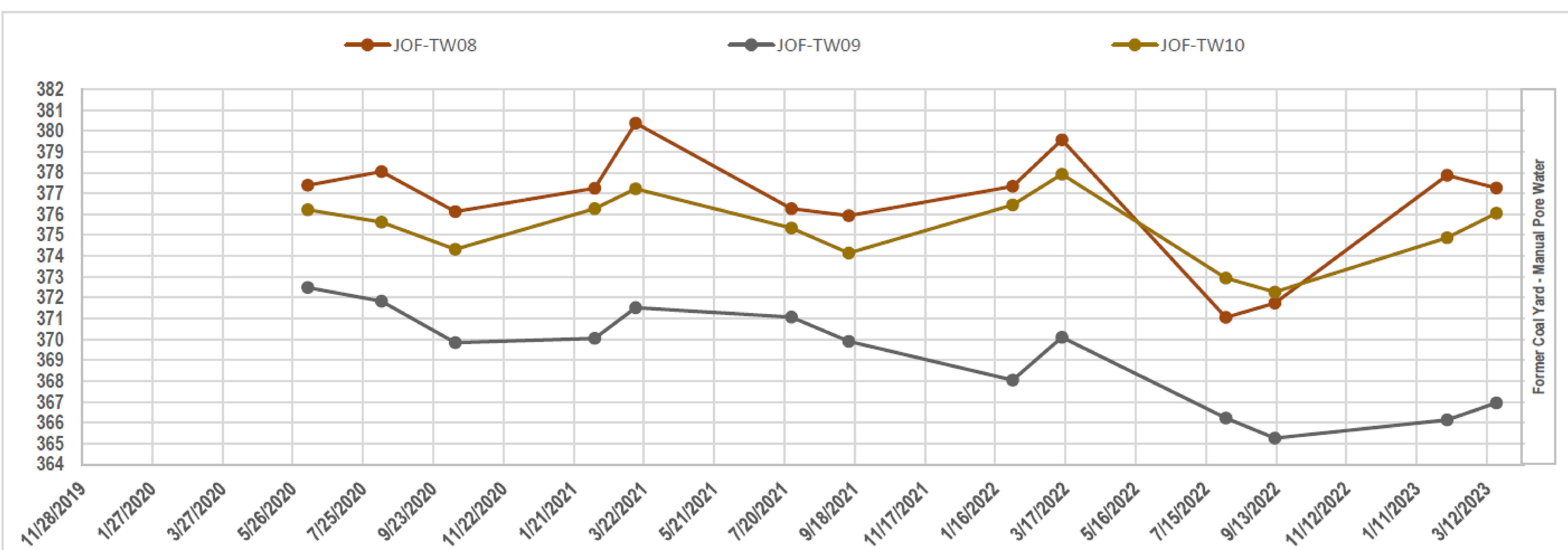
Project Location 175568286
New Johnsonville, Tennessee
Prepared by MP on 2022-07-27
Technical Review by MD on 2022-07-27

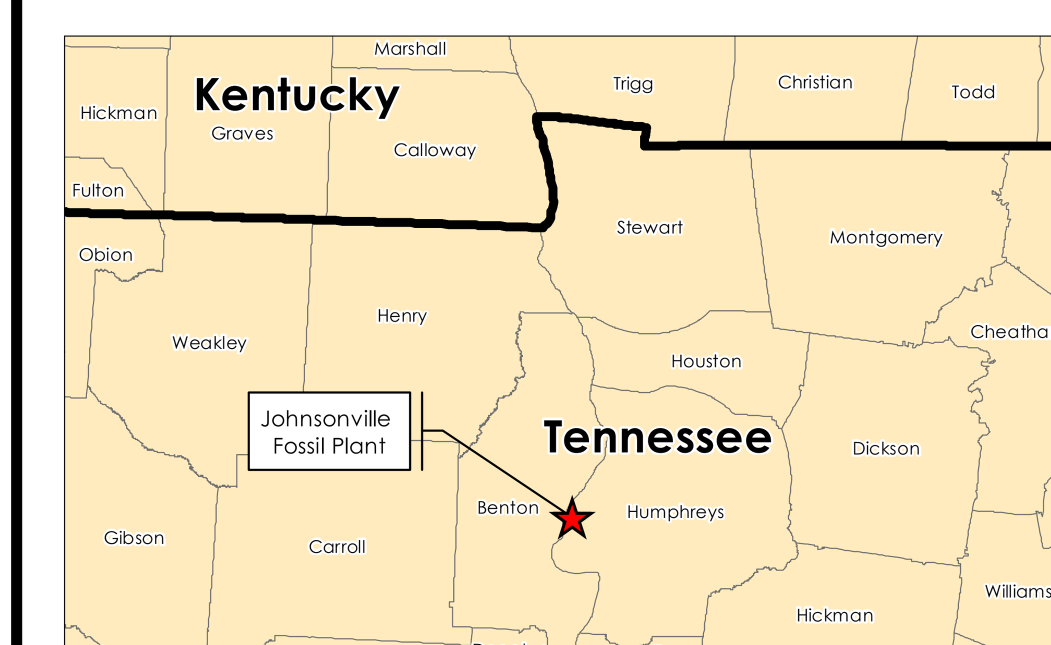
Legend

ft - feet
in - inches









Stantec TVA

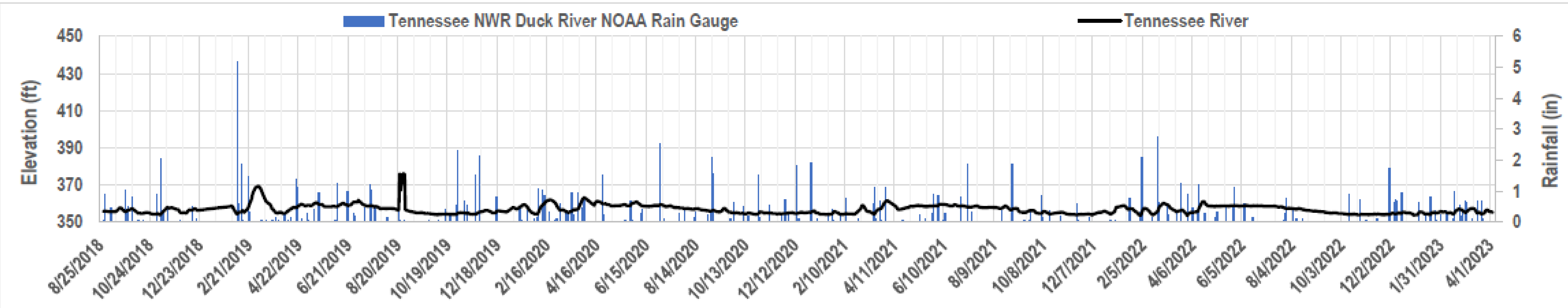
Figure No.
H.1-16a

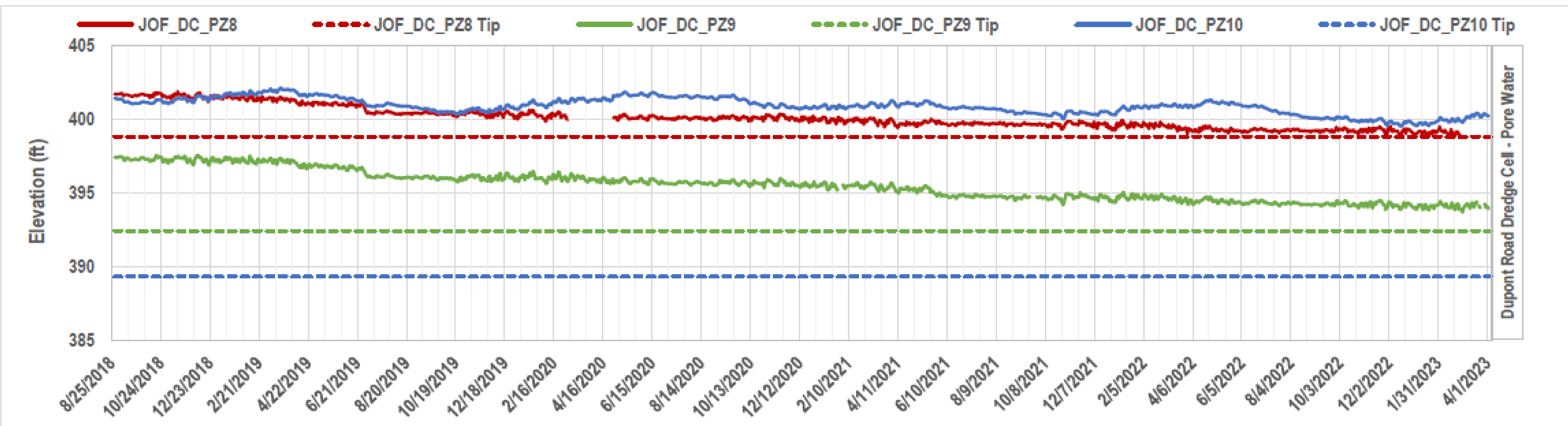
Title
Automated Instrument Hydrographs - DuPont Road Dredge Cell

Client/Project
Tennessee Valley Authority
Johnsonville Fossil (JOF) Plant TDEC Order

Project Location
New Johnsonville, Tennessee

175568286
Prepared by MP on 2022-07-27
Technical Review by MD on 2022-07-27

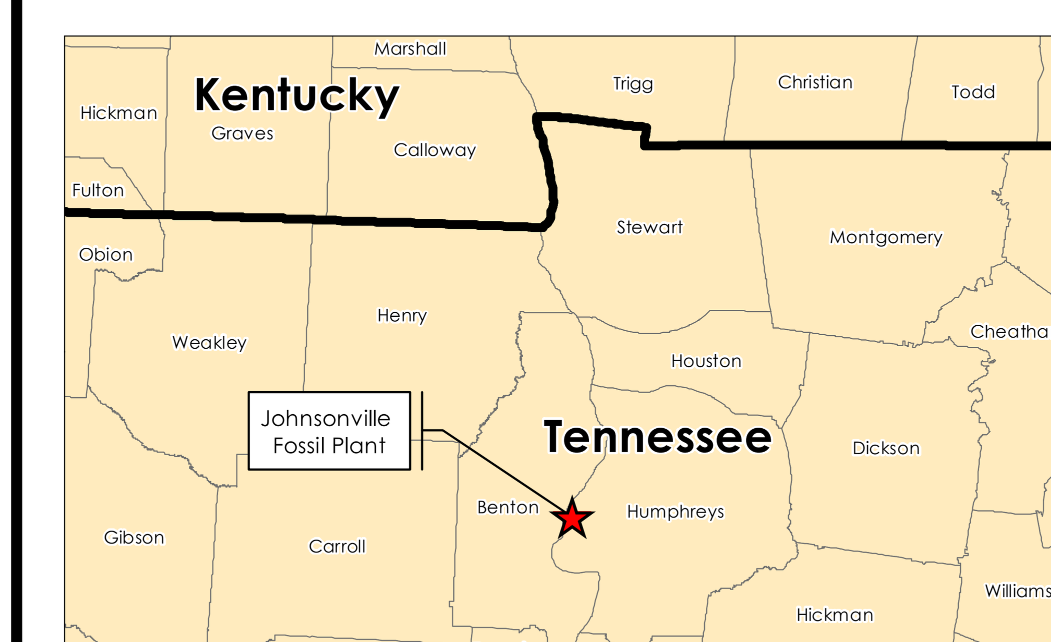


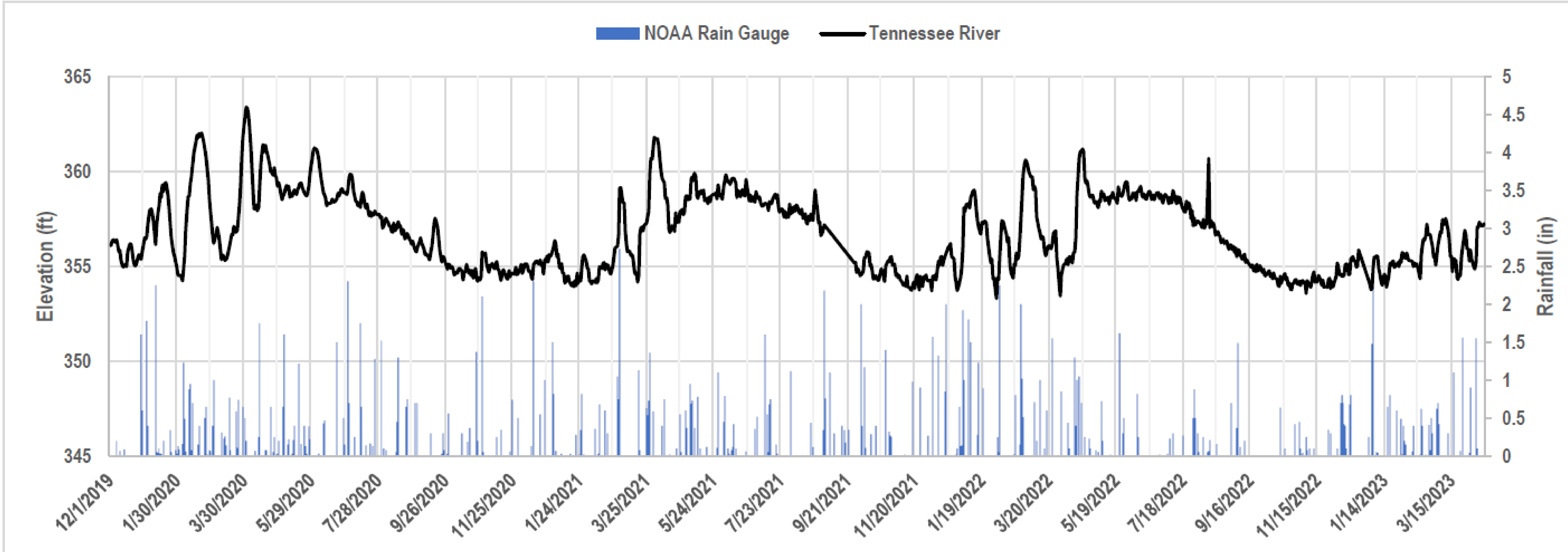


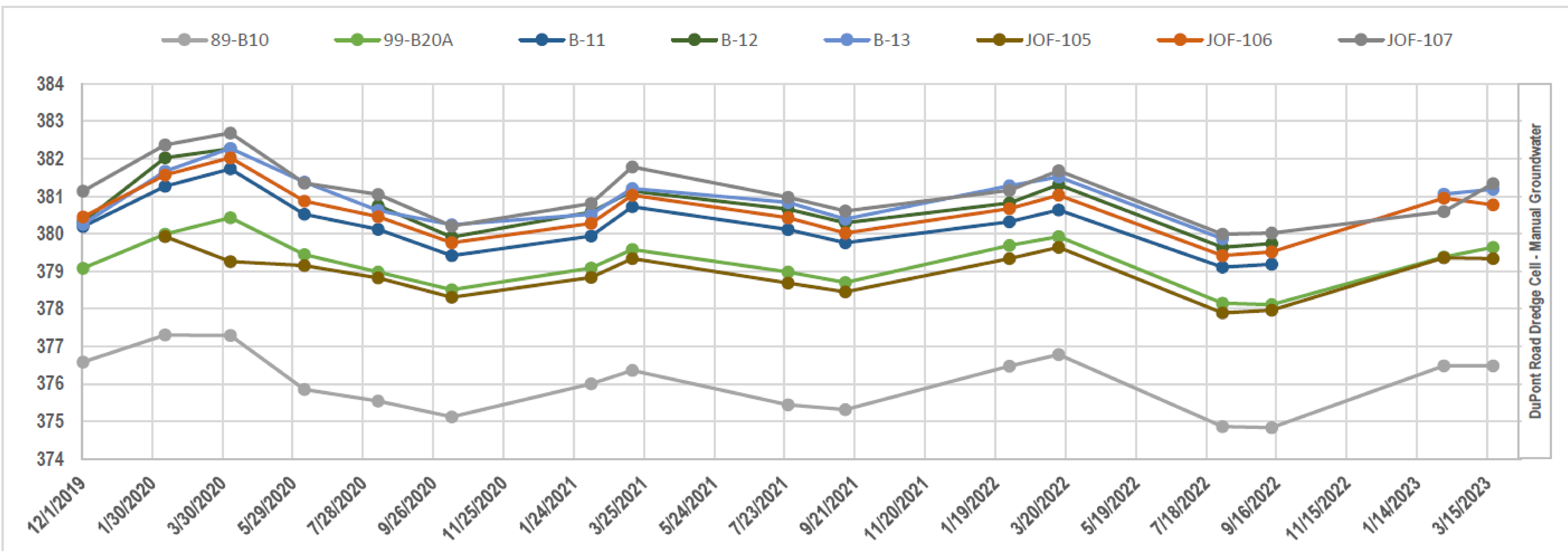
Legend

ft - feet

in - inches







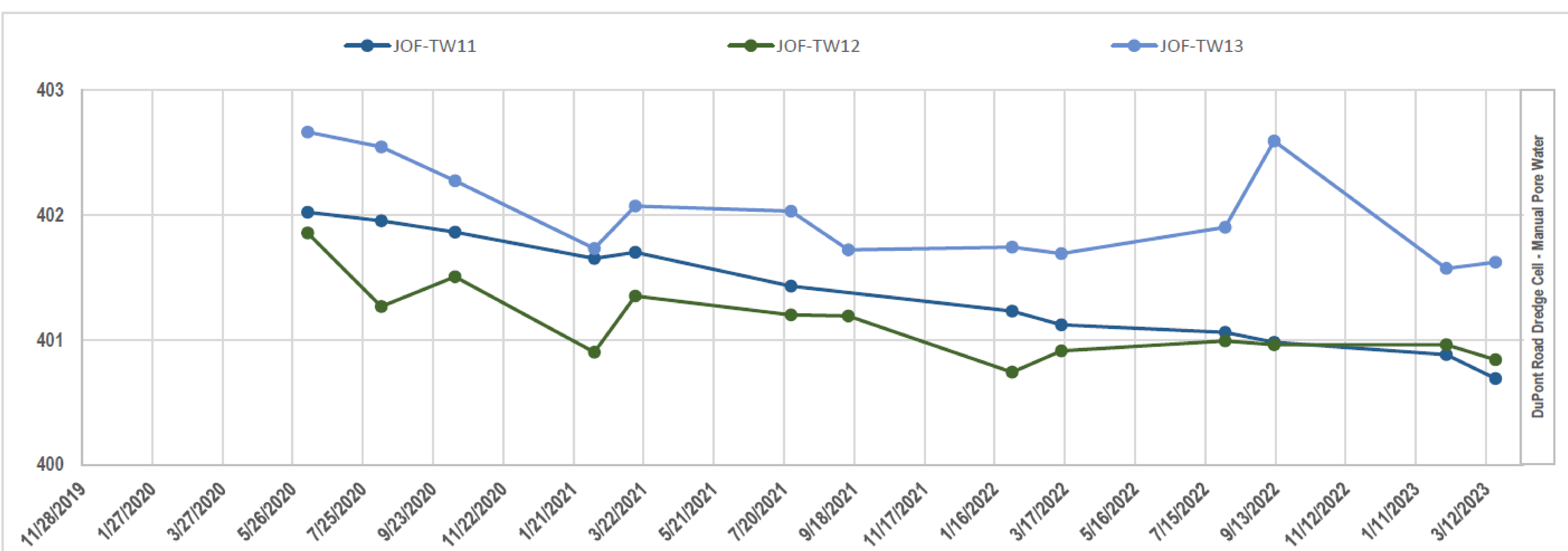


Figure No.

H.1-16b

Title

Manually Gauged Instrument Hydrographs - DuPont Road Dredge Cell

Client/Project

Tennessee Valley Authority
Johnsonville Fossil (JOF) Plant TDEC Order

Project Location

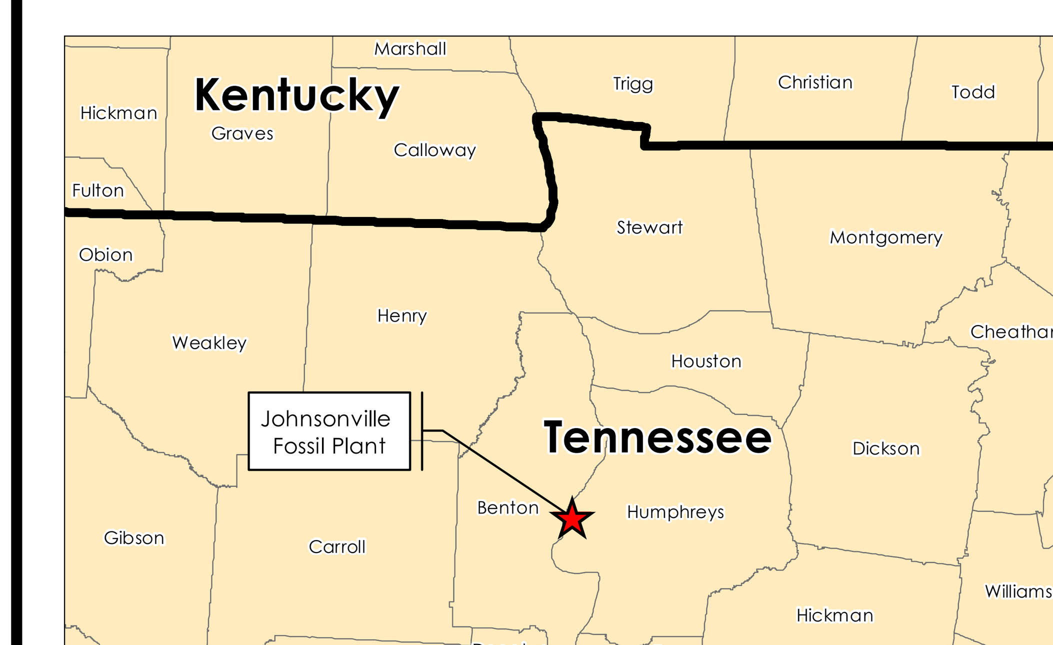
New Johnsonville, Tennessee

175568286
Prepared by MP on 2022-07-27
Technical Review by MD on 2022-07-27

Legend

ft - feet

in - inches



Stantec TVA

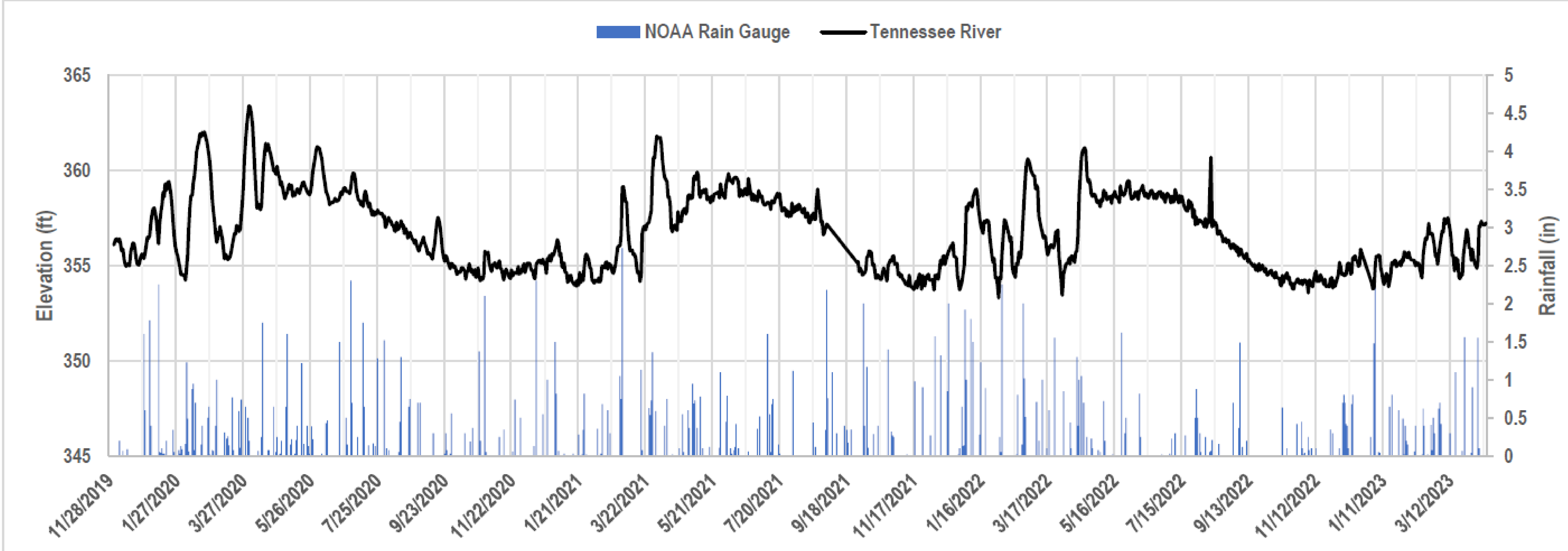
Figure No.
H.1-17

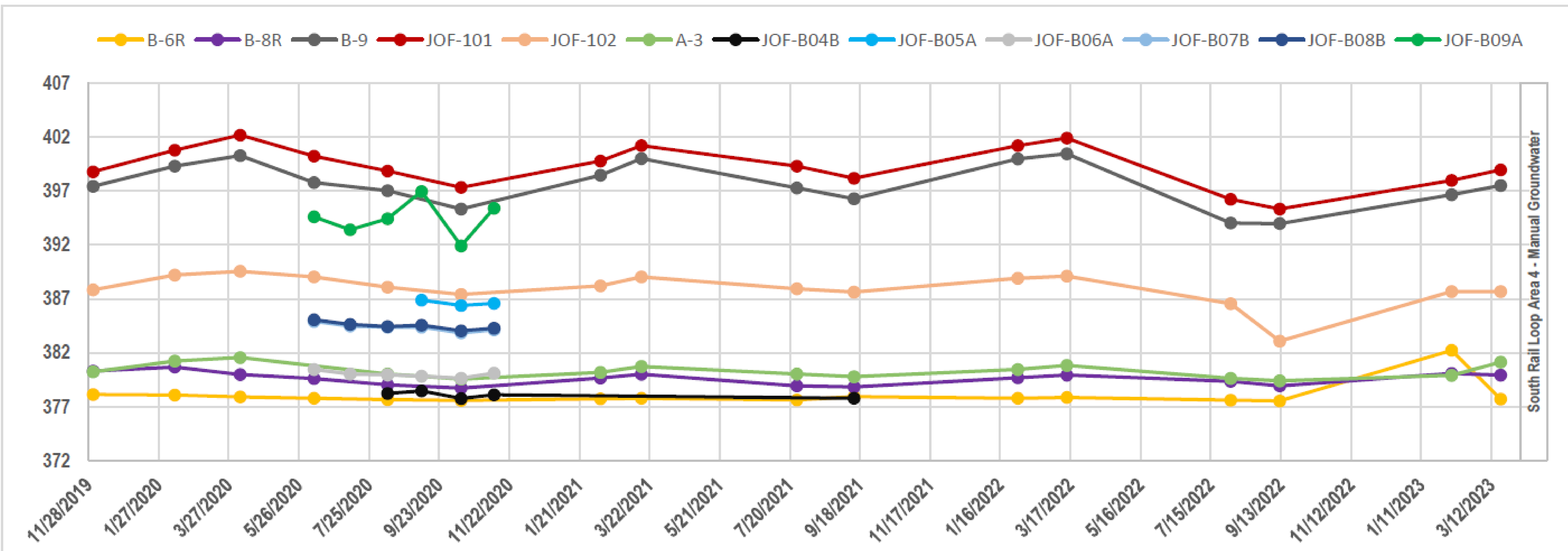
Title
Manually Gauged Instrument Hydrographs - South Rail Loop Area 4

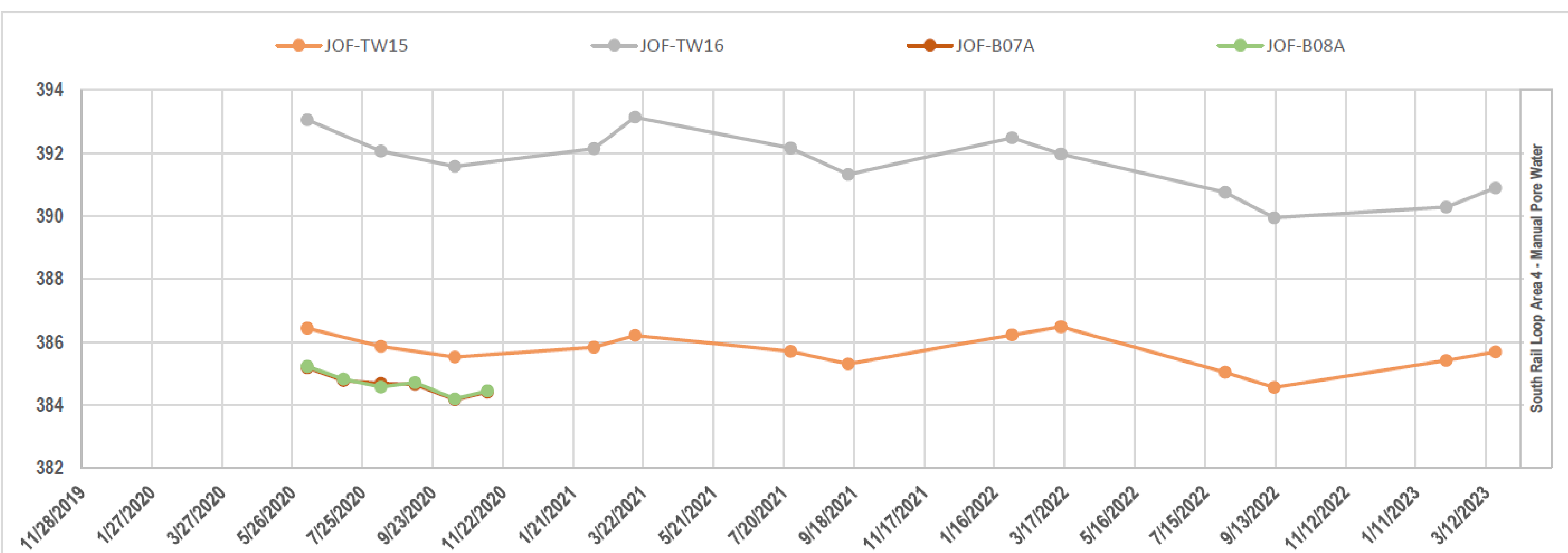
Client/Project
Tennessee Valley Authority
Johnsonville Fossil (JOF) Plant TDEC Order

Project Location
New Johnsonville, Tennessee

175568286
Prepared by MP on 2022-07-27
Technical Review by MD on 2022-07-27



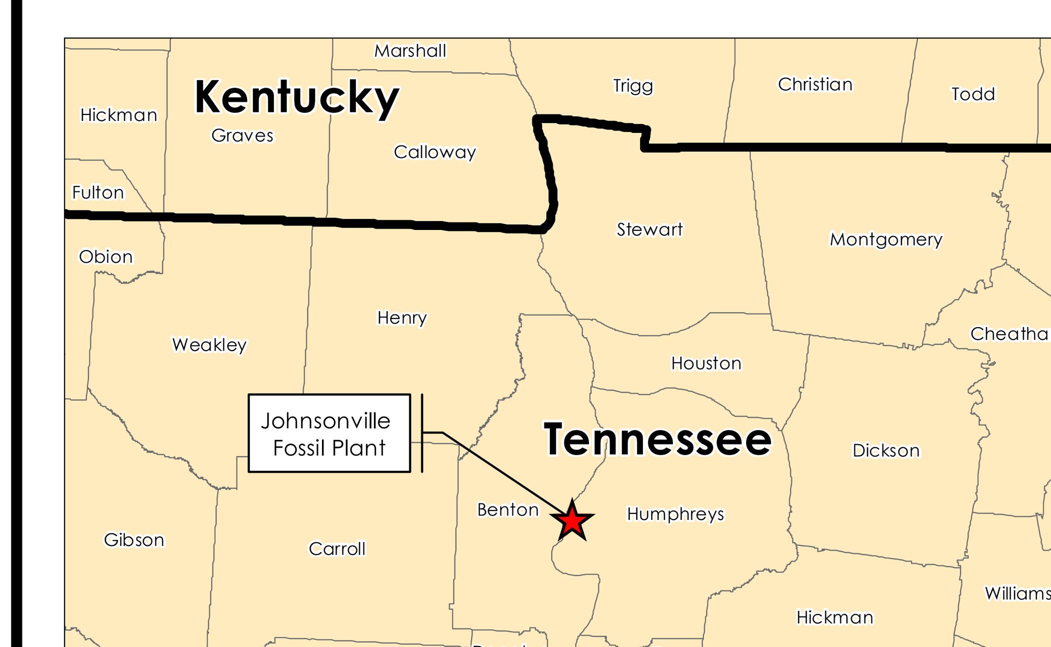


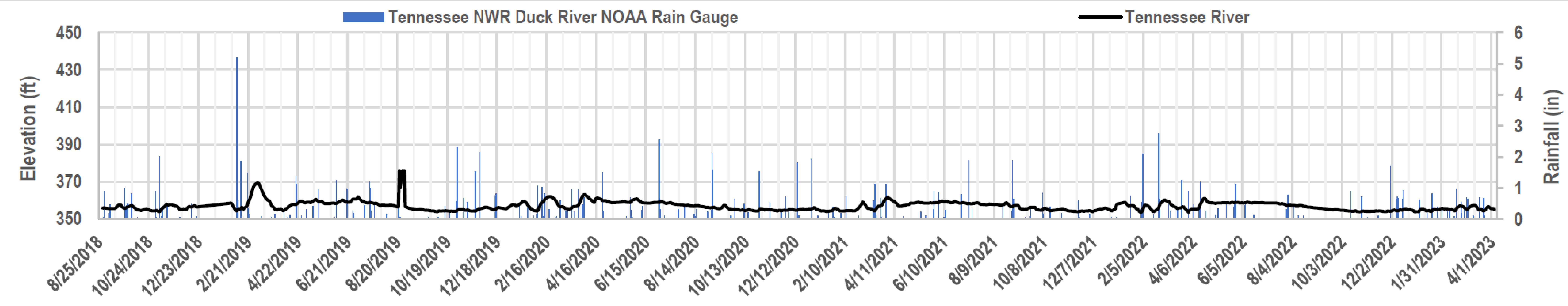


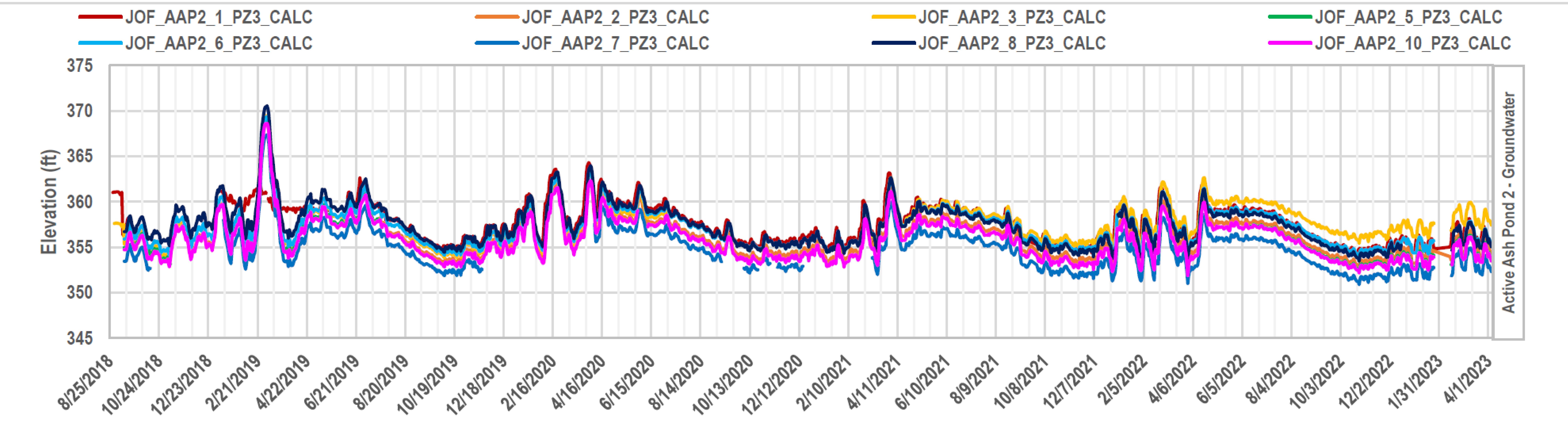
Legend

ft - feet

in - inches







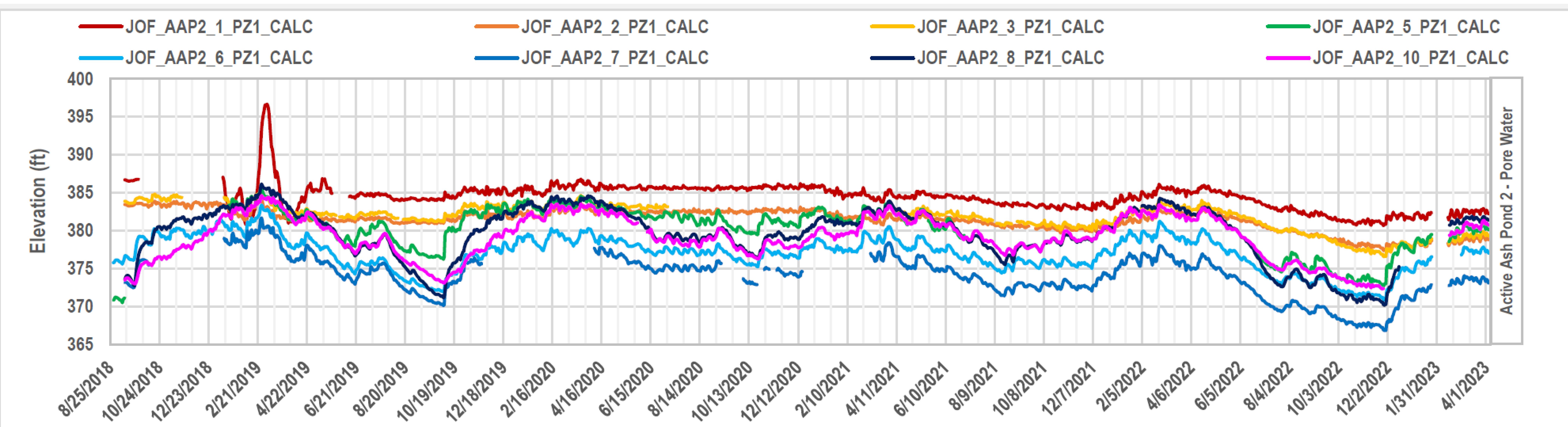


Figure No.
H.1-18a

Title
Automated Instrument Hydrographs - Active Ash Pond 2

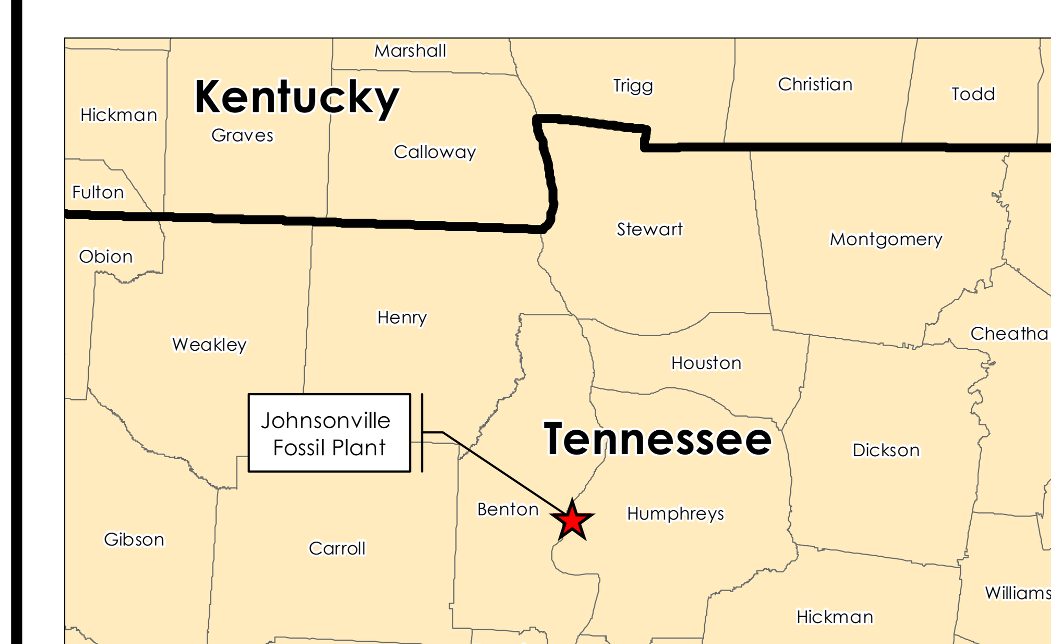
Client/Project
Tennessee Valley Authority
Johnsonville Fossil (JOF) Plant TDEC Order

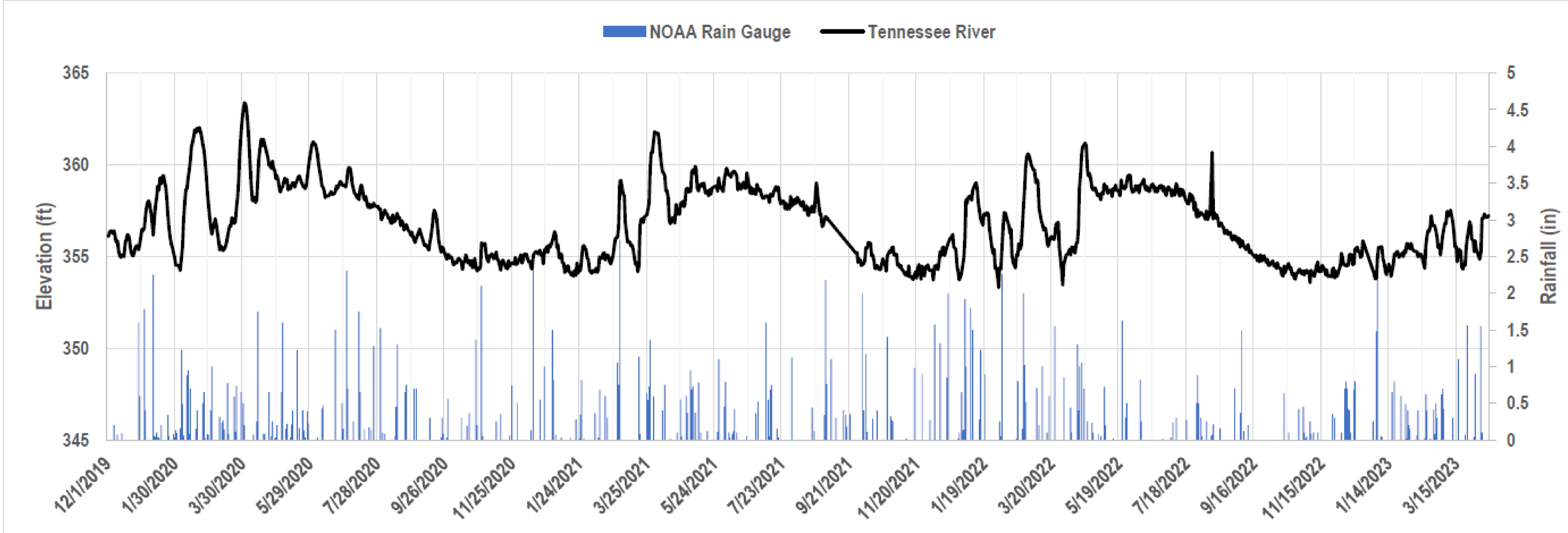
Project Location
New Johnsonville, Tennessee

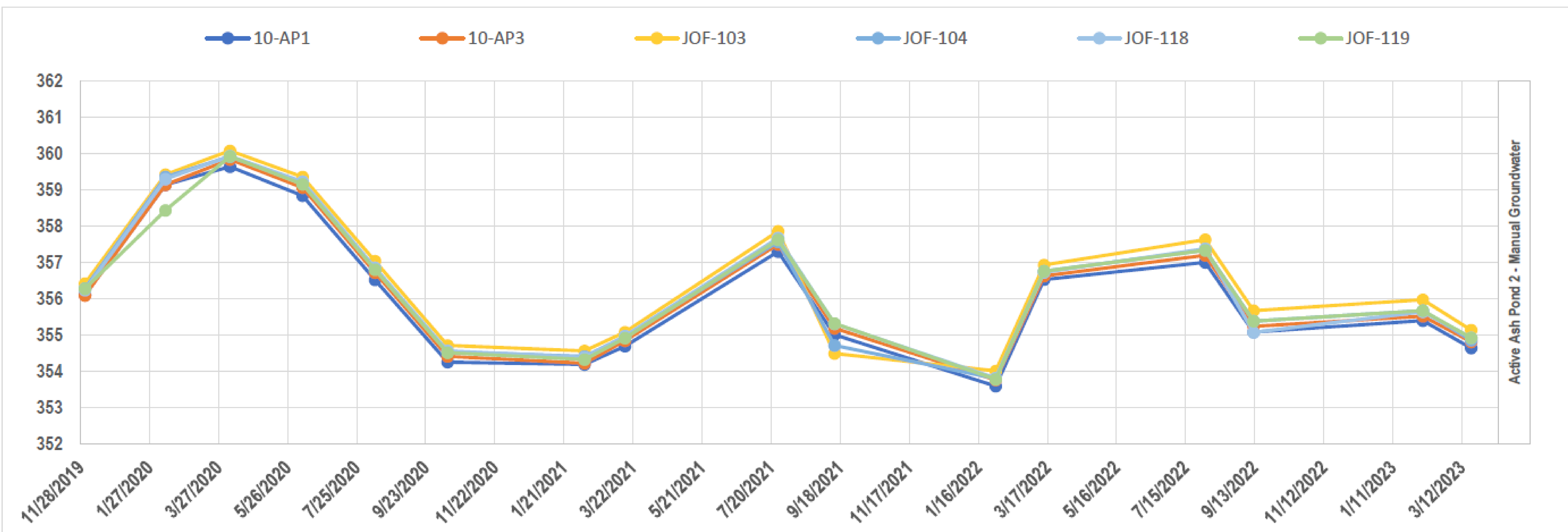
175568286
Prepared by MP on 2022-07-27
Technical Review by MD on 2022-07-27

Legend

ft - feet
in - inches







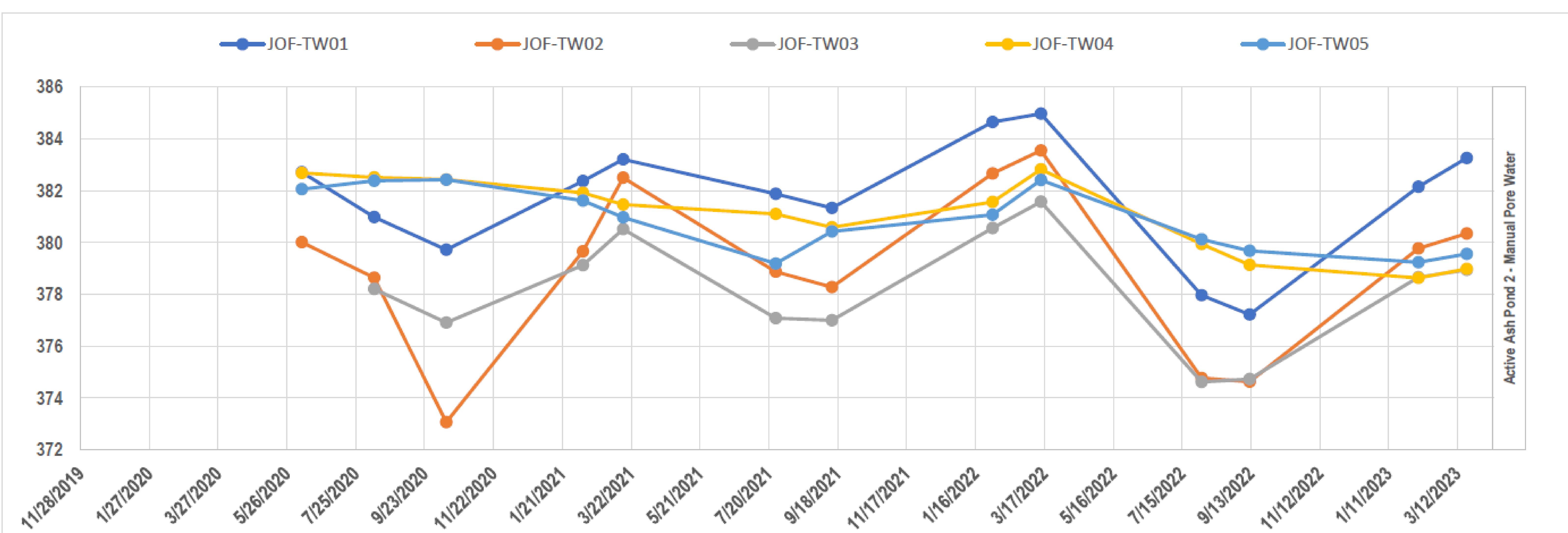


Figure No.
H.1-18b

Title
Manually Gauged Instrument Hydrographs - Active Ash Pond 2

Client/Project
Tennessee Valley Authority
Johnsonville Fossil (JOF) Plant TDEC Order

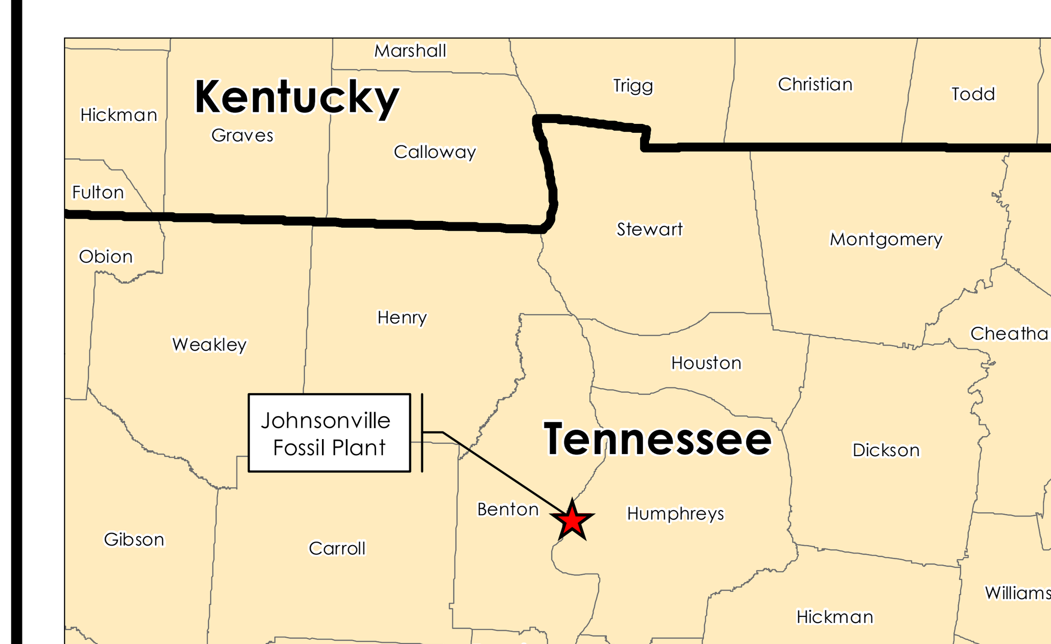
Project Location
New Johnsonville, Tennessee

175568286
Prepared by MP on 2022-07-27
Technical Review by MD on 2022-07-27

Legend

ft - feet

in - inches



Disclaimer: Stantec assumes no responsibility for data supplied in electronic format. The recipient accepts full responsibility for verifying the accuracy and completeness of the data. The recipient releases Stantec, its officers, employees, consultants and agents, from any and all claims arising in any way from the content or provision of the data.

Exhibit No.
H.1-19

Title
DuPont Road Dredge Cell Select Piezometer Locations

Client/Project
Tennessee Valley Authority
Johnsonville Fossil (JOF) Plant TDEC Order

Project Location
New Johnsonville, Tennessee

175568286
Prepared by DMB on 2024-01-29
Technical Review by MD on 2024-01-29

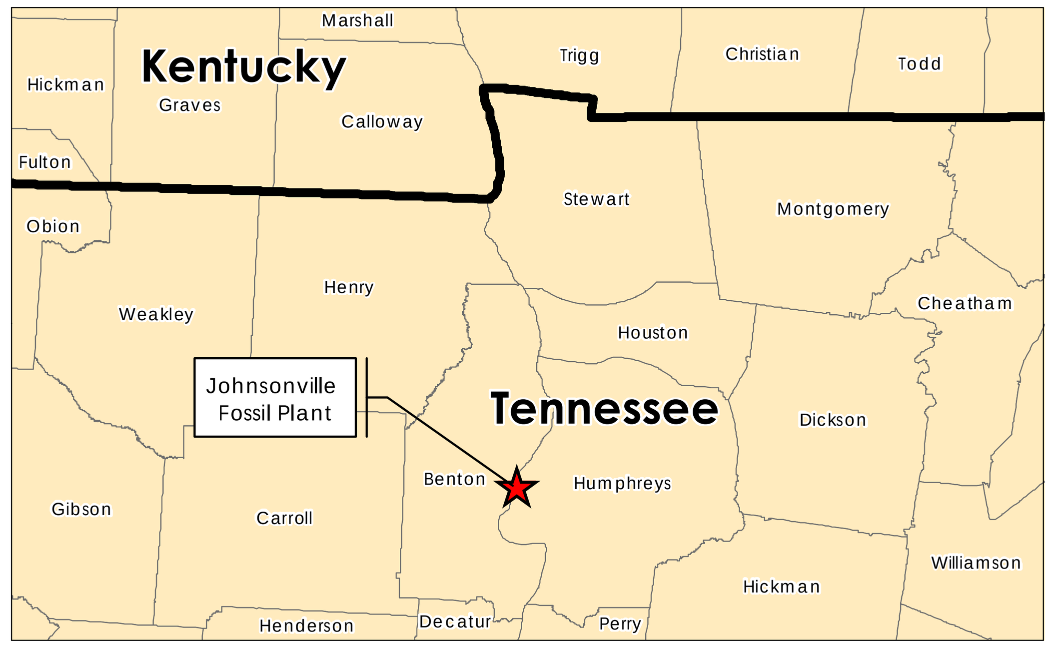
0 100 200 300 400 Feet
1:1,200 (At original document size of 22x34)

Legend

Piezometer JOF_DDC_PZ8
Abandoned Piezometer PZ-3
CCR Management Unit Area (Approximate)

CCR: Coal combustion residuals

Notes
1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Imagery Provided by TVA (2017)
3. Piezometers PZ-3, PZ-6, and PZ-7 were abandoned in December 2012.



U:\TVA-EIP\175568286_JOF_Phase2\gis\mxd\EAR\H.1-19_SelectPiezometerLocations_DRDC.mxd Revised: 2024-01-29 By: mbough

Figure No.
H.1-20

Title
Phreatic Surface Graph DuPont Road Dredge Cell Before and After Capping

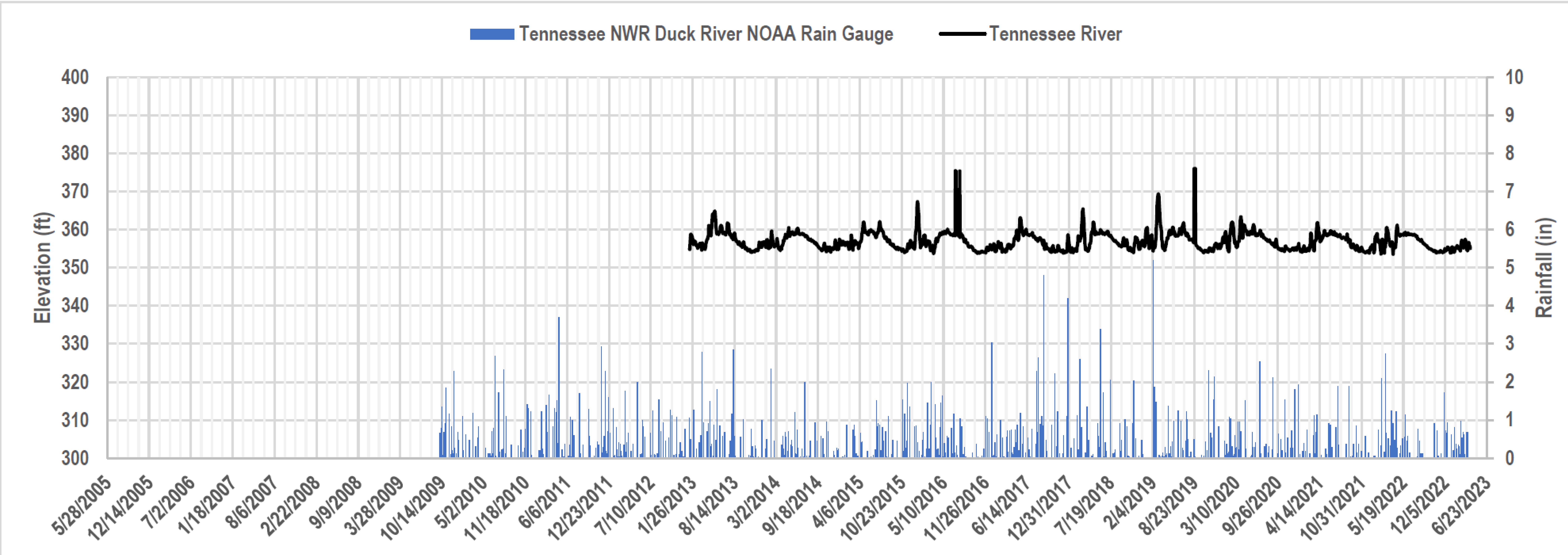
Client/Project
Tennessee Valley Authority
Johnsonville Fossil (JOF) Plant TDEC Order

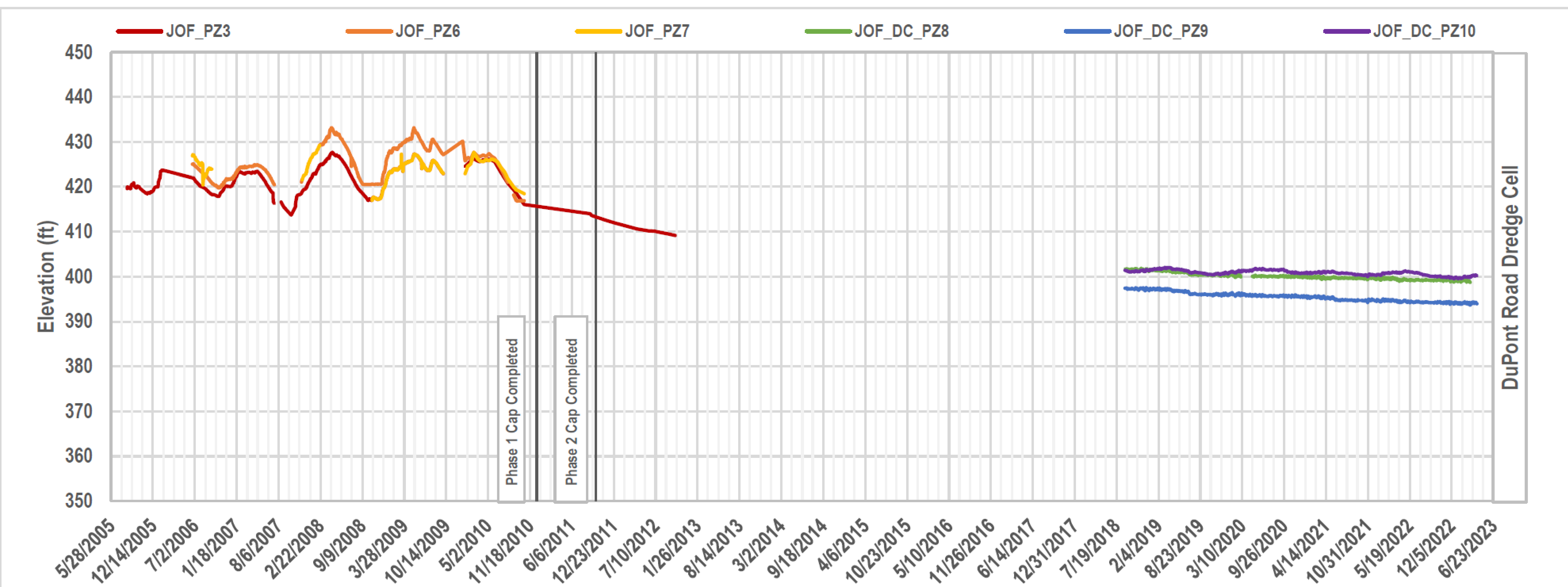
Project Location
New Johnsonville, Tennessee

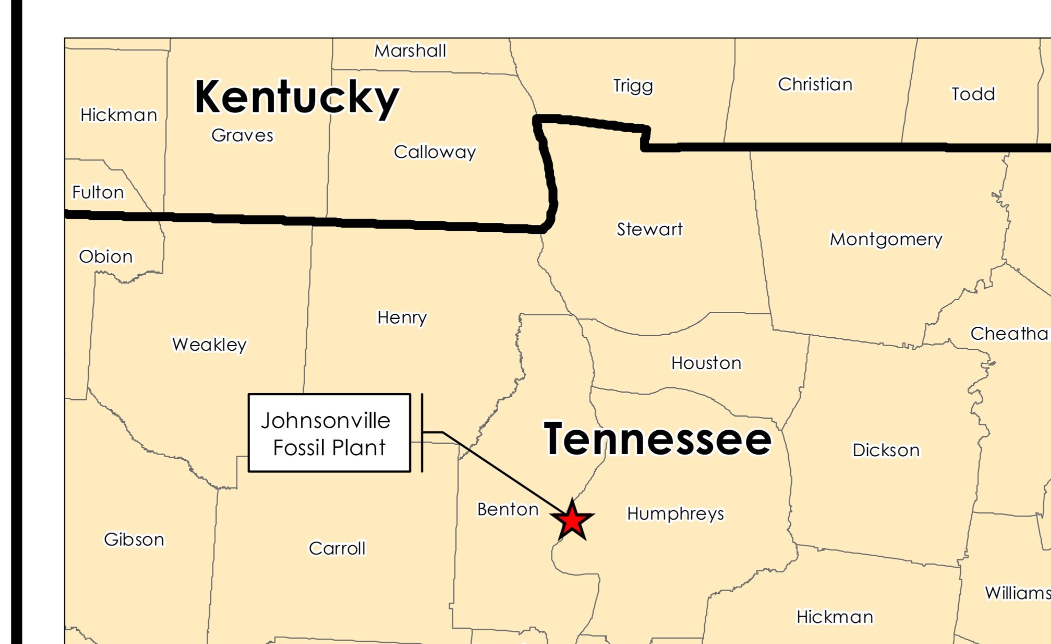
175568286
Prepared by MP on 2022-07-27
Technical Review by MD on 2022-07-27

Legend

ft - feet
in - inches







Stantec TVA

Exhibit No.

H.1-21

Title

Dye Trace Study Borings and Sampling Locations

Client/Project

Tennessee Valley Authority
Johnsonville Fossil (JOF) Plant TDEC Order

Project Location

New Johnsonville, Tennessee

175568286
Prepared by DMB on 2024-01-29
Technical Review by KC on 2024-01-29

0 400 800 1,200 1,600 Feet

1:4,800 (At original document size of 22x34)

Legend

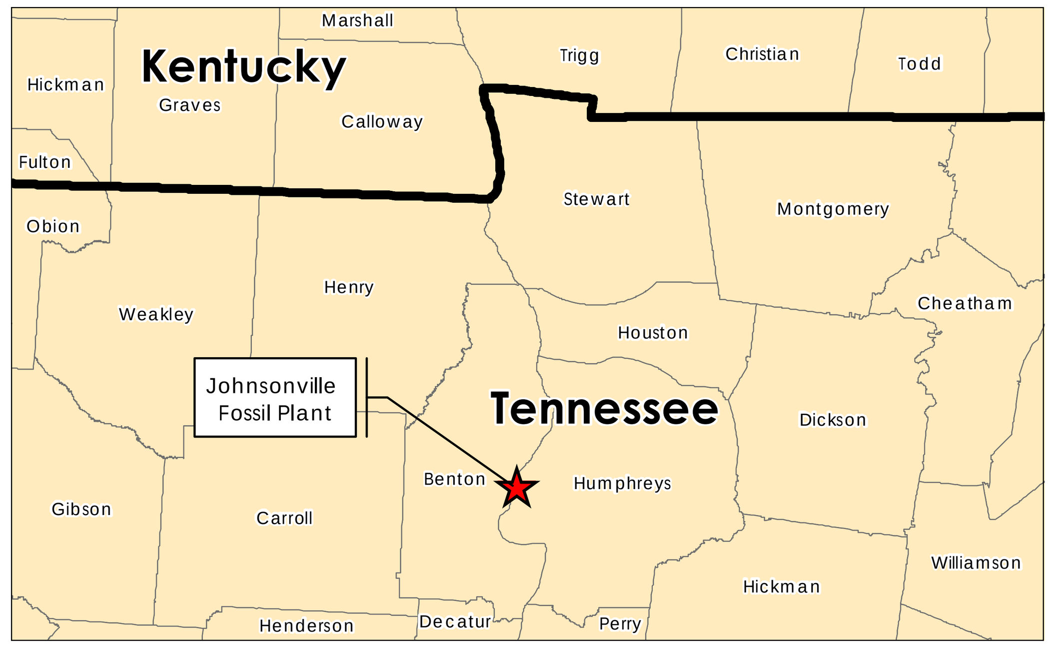
- CCR Well Monitoring Location
- Boring Location to Collect Samples for Bench Study
- Surface Water Upgradient Monitoring Location
- Dye Injection Boring Location
- Surface Water Monitoring Location
- Monitoring Well
- Existing Piezometer Open Standpipe
- 2017 Imagery Boundary
- 2018 Imagery Boundary
- CCR Management Unit Area (Approximate)
- Former Coal Yard (Approximate)
- Former Stilling Pond (Approximate)
- TVA Property Boundary

CCR = Coal Combustion Residuals

Injected Dyes:
IP-1 and IP-2 Sulpho Rhodamine-B
IP-3, IP-4, and IP-5 fluorescein

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Imagery Provided by TVA (2017 & 2018) and Esri World Imagery



Stantec TVA

U:\TVA-EP\175568286_JOF_Phase2\gis\mxd\EAR\H.1-21_DyeTraceStudyBorings_and_SamplingLocations.mxd Revised: 2024-01-29 By: mbough

Exhibit No.

H.1-22

Title

Summary of Statistical Evaluation of Groundwater Analytical Results for CCR Rule Appendix IV and TDEC Appendix I Constituents - Ash Disposal Area 1

Client/Project

Tennessee Valley Authority
Johnsonville Fossil (JOF) Plant TDEC Order

Project Location

New Johnsonville, Tennessee

175568286

Prepared by DMB on 2024-01-29
Technical Review by MD on 2024-01-29

0 100 200 300 400 Feet

1:1,200 (At original document size of 22x34)

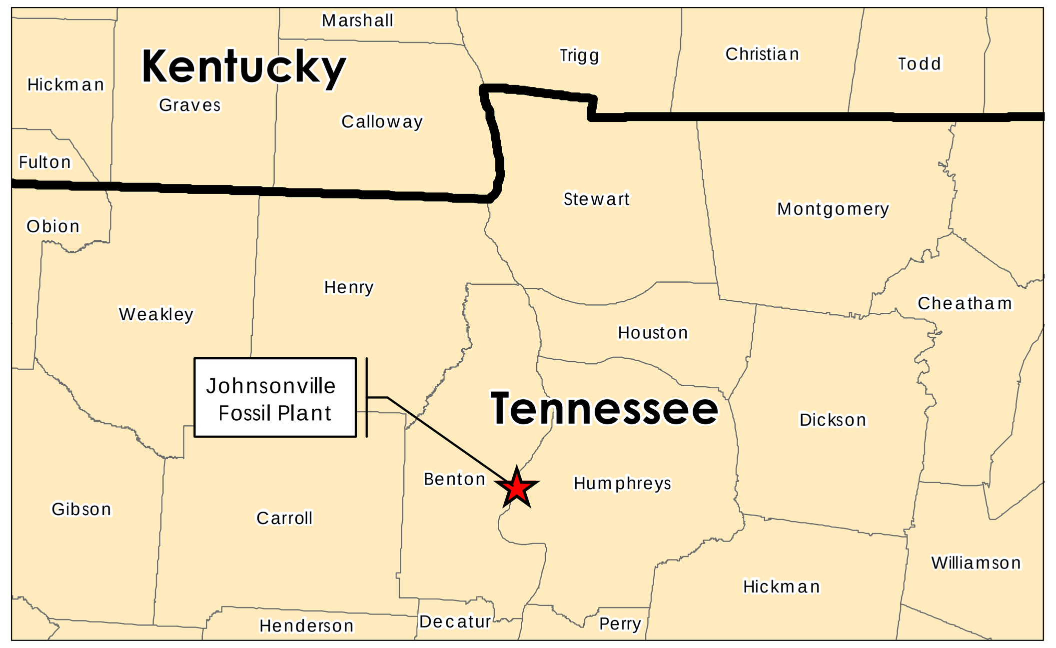
Legend

- Groundwater Investigation Monitoring Well
- Piezometer
- Tennessee River/Kentucky Lake Gauging Station
- 2017 Imagery Boundary
- 2018 Imagery Boundary
- CCR Management Unit Area (Approximate)
- Former Coal Yard (Approximate)

CCR: Coal combustion residuals

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Imagery Provided by TVA (2017 & 2018)



Stantec TVA

U:\TVA-EIP\175568286_JOF_Phase2\gis\mxd\EAR\H.1-22_SummaryStats_ADA1.mxd Revised: 2024-01-29 By: mbough

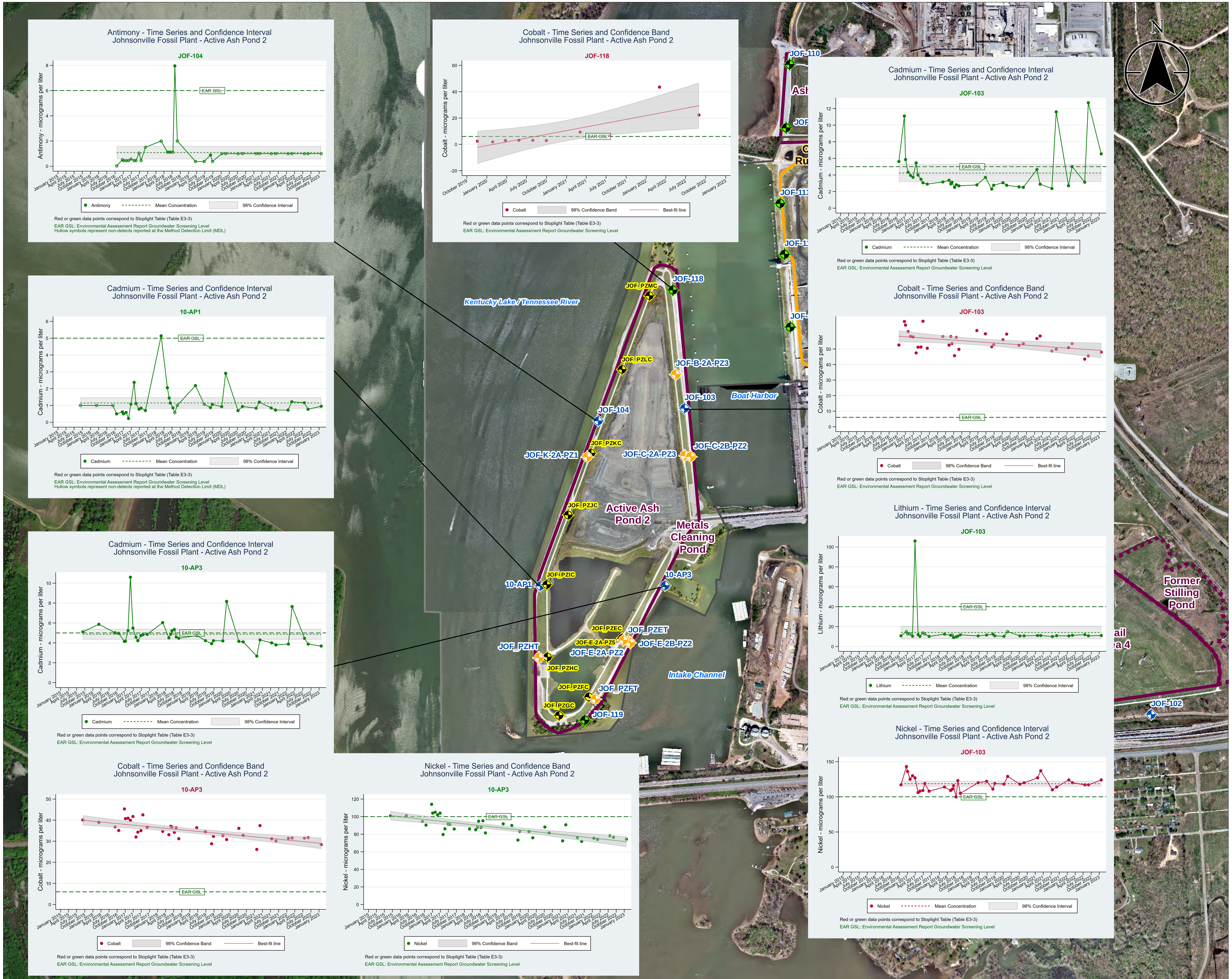


Exhibit No.

H.1-23

Title

Summary of Statistical Evaluation of Groundwater Analytical Results for CCR Rule Appendix IV and TDEC Appendix I Constituents - Active Ash Pond 2

Client/Project

Tennessee Valley Authority
Johnsonville Fossil (JOF) Plant TDEC Order

Project Location

New Johnsonville, Tennessee

175568286

Prepared by DMB on 2024-01-29
Technical Review by MD on 2024-01-29

0 500 1,000 1,500 2,000 Feet

1:6,000 (At original document size of 22x34)

Legend

- Groundwater Investigation Monitoring Well
- Other Monitoring Well
- Piezometer
- Pore Water Piezometer in CCR Material
- Tennessee River/Kentucky Lake Gauging Station
- 2017 Imagery Boundary
- 2018 Imagery Boundary
- CCR Management Unit Area (Approximate)
- Former Coal Yard (Approximate)
- Former Stilling Pond (Approximate)

CCR: Coal combustion residuals

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Imagery Provided by TVA (2017 & 2018) and Esri World Imagery

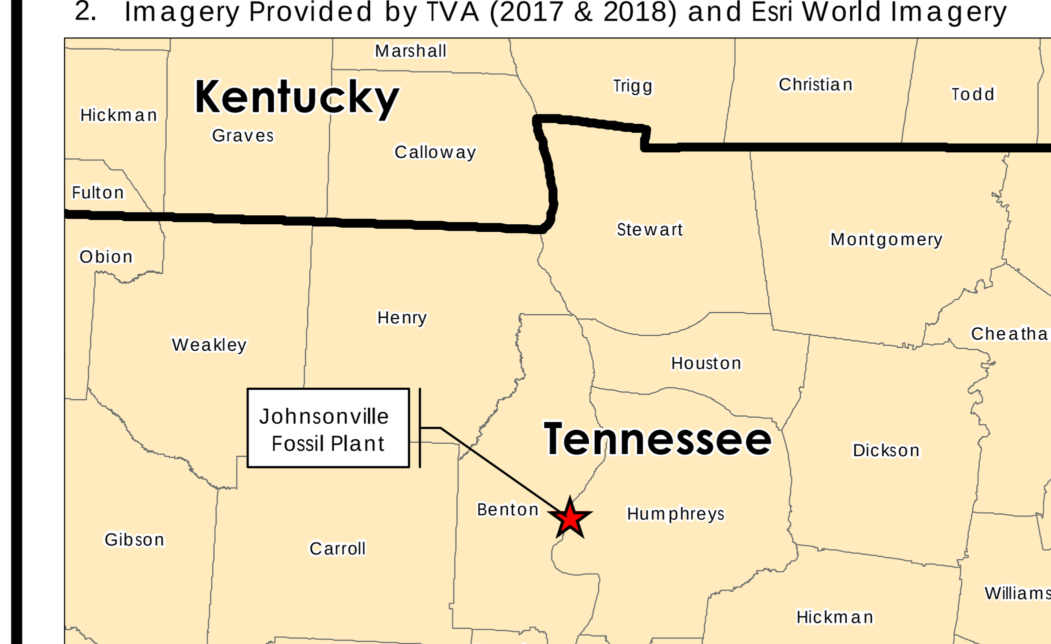


Exhibit No.

H.1-24

Title

Summary of Statistical Evaluation of Groundwater Analytical Results for CCR Rule Appendix IV and TDEC Appendix I Constituents - Former Coal Yard

Client/Project

Tennessee Valley Authority
Johnsonville Fossil (JOF) Plant TDEC Order

Project Location 175568286

New Johnsonville, Tennessee

Prepared by DMB on 2024-01-29
Technical Review by MD on 2024-01-29

0 500 1,000 1,500 2,000 Feet

1:6,000 (At original document size of 22x34)

Legend

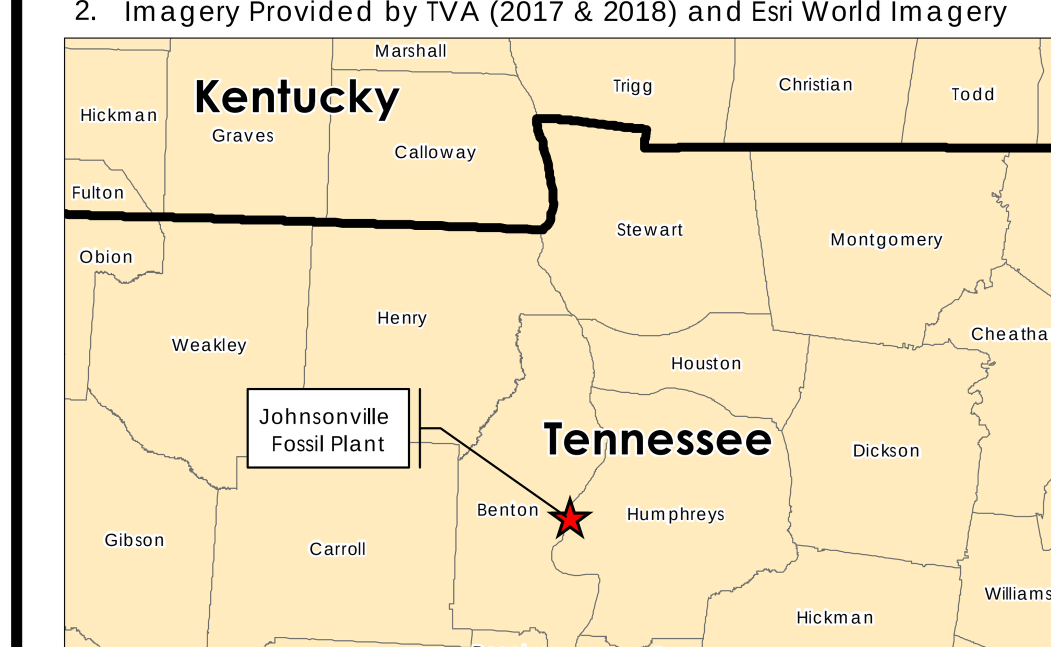
- Groundwater Investigation Monitoring Well
- Other Monitoring Well
- Piezometer
- Pore Water Piezometer in CCR Material
- Tennessee River/Kentucky Lake Gauging Station
- 2017 Imagery Boundary
- 2018 Imagery Boundary
- CCR Management Unit Area (Approximate)
- Former Coal Yard (Approximate)
- Former Stilling Pond (Approximate)

CCR: Coal combustion residuals

N

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Imagery Provided by TVA (2017 & 2018) and Esri World Imagery



Stantec TVA

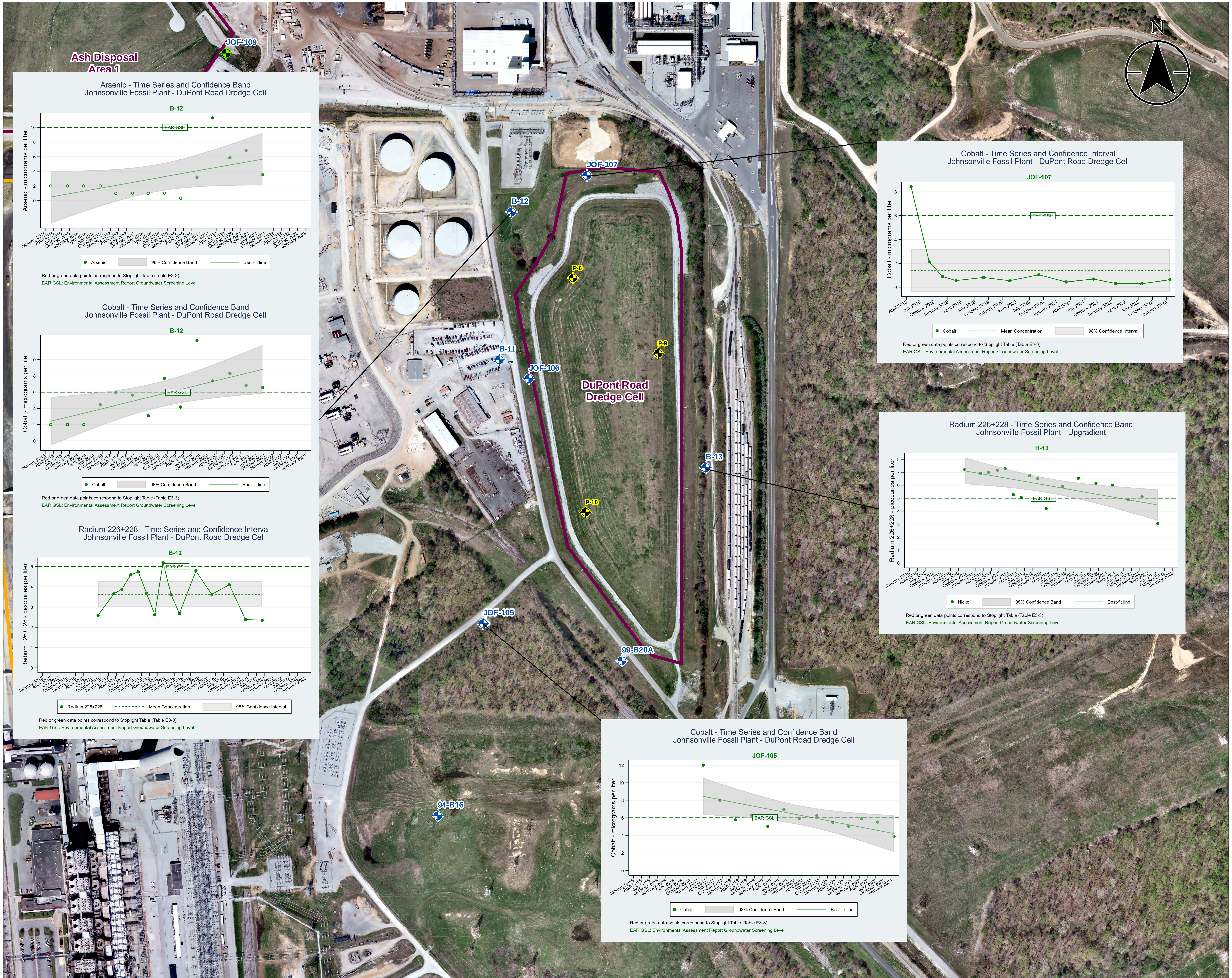


Exhibit No.

H.1-25

Title

Summary of Statistical Evaluation of Groundwater Analytical Results for CCR Rule Appendix IV and TDEC Appendix I Constituents - DuPont Road Dredge Cell

Client/Project

Tennessee Valley Authority
Johnsonville Fossil (JOF) Plant TDEC Order

Project Location

175568286

New Johnsonville, Tennessee

Prepared by DMB on 2024-01-29
Technical Review by MD on 2024-01-29

0 200 400 600 800 Feet

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

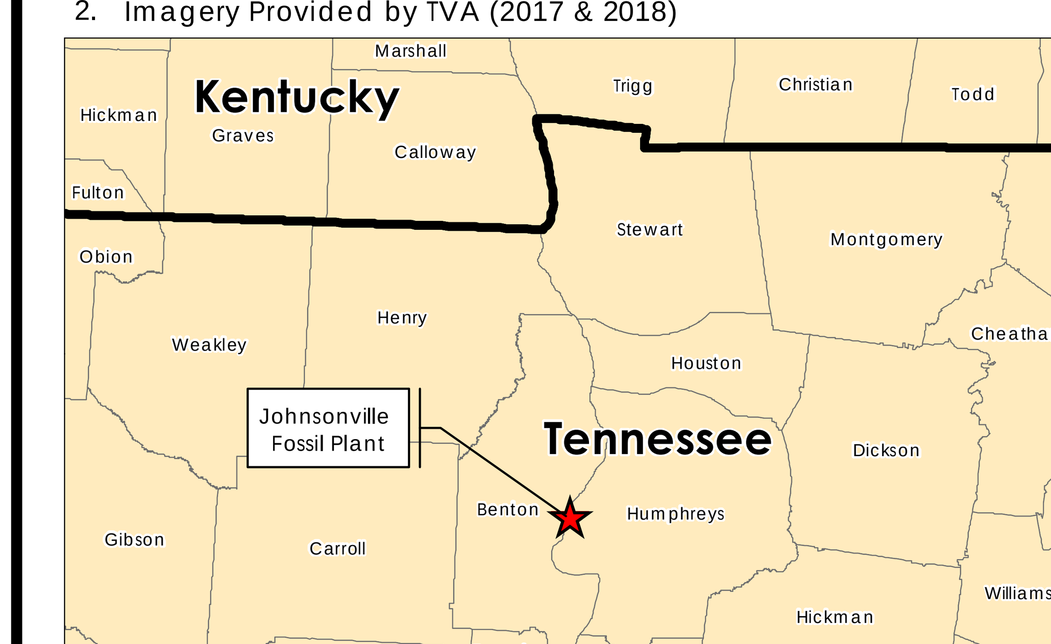
Legend

- Groundwater Investigation Monitoring Well
- Other Monitoring Well
- Pore Water Piezometer in CCR Material
- 2017 Imagery Boundary
- 2018 Imagery Boundary
- CCR Management Unit Area (Approximate)
- Former Coal Yard (Approximate)

CCR: Coal combustion residuals

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Imagery Provided by TVA (2017 & 2018)



Stantec

TVA

V:\TVA-EIP\175568286_JOF_Phase2\gis\mxd\EAR\H.1-25_SummaryStats_DuPont.mxd Revised: 2024-01-29 By: mbough

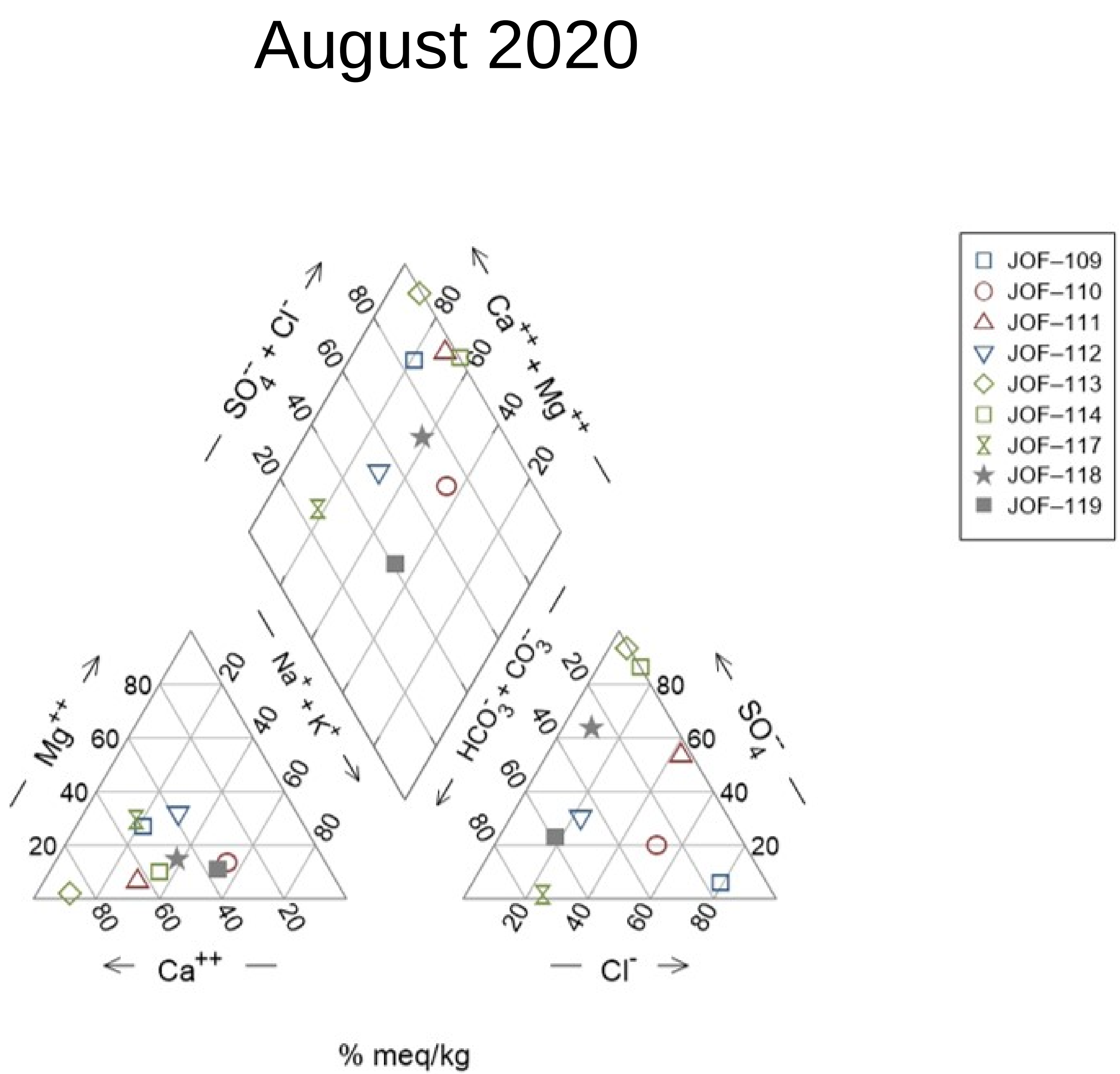


Exhibit No.
H.1-26

Title
Piper Diagram - August 2020

Client/Project 175568286
Tennessee Valley Authority
Johnsonville Fossil (JOF) Plant TDEC Order

Clinton, Tennessee
New Johnsonville, Tennessee

Prepared by DMB on 2024-01-29
TR by BL on 2024-01-29

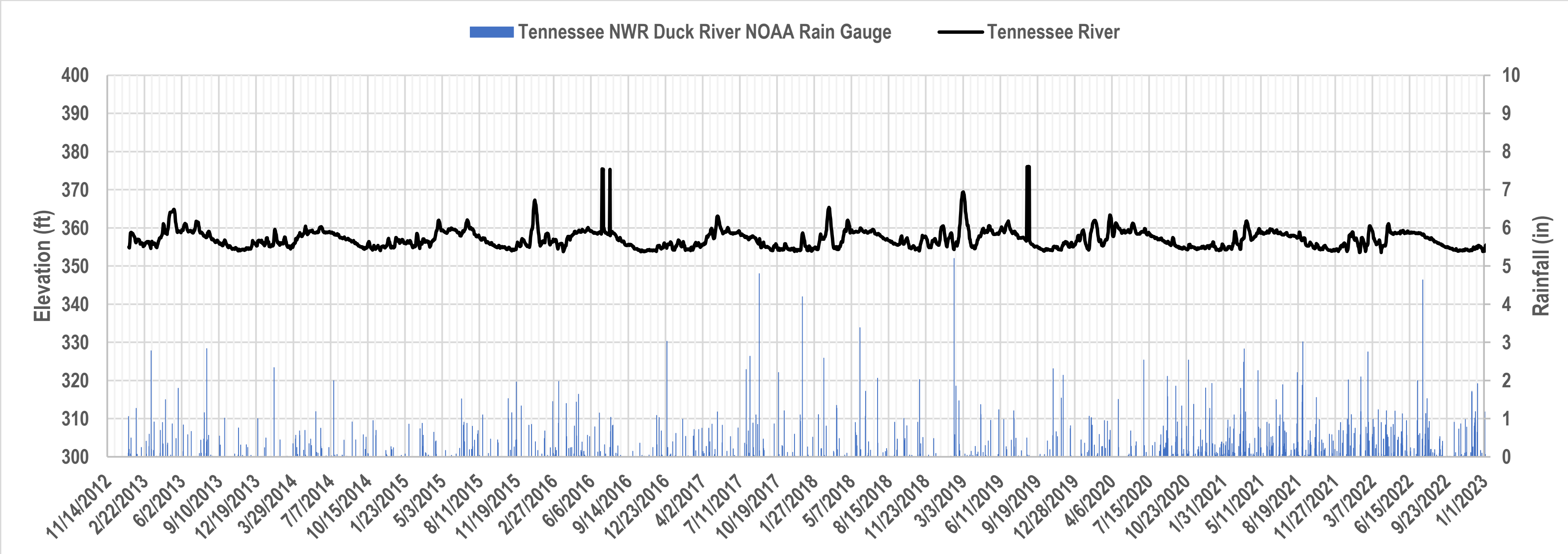
Legend

Notes
1. % meq/kg - Percent milliequivalent per kilogram
2. Ca^{++} - Calcium
3. Cl^- - Chloride
4. CO_3 - Carbonate
5. HCO_3 - Bicarbonate
6. K^+ - Potassium
7. Mg^{++} - Magnesium
8. Na^+ - Sodium
9. SO_4 - Sulfate

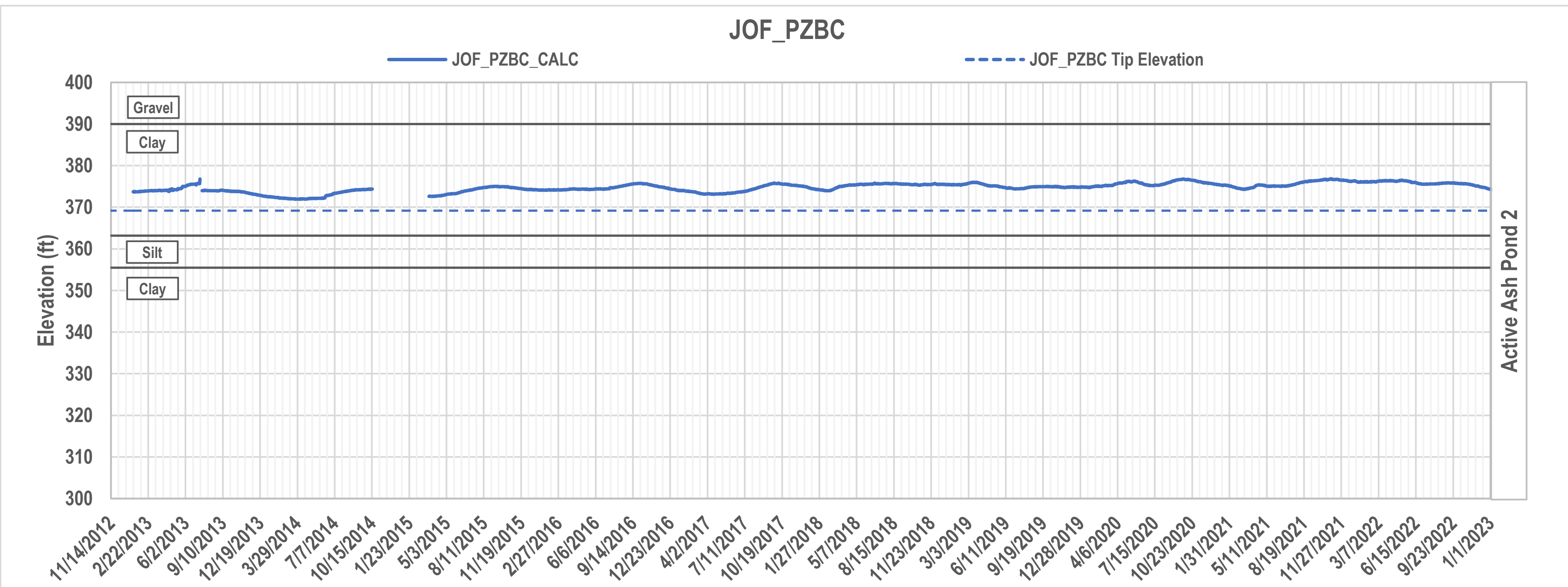
Stantec TVA

U:\TVA-EIP\175568286_JOF_Phase2\gis\mxd\EAR\H.1-26_PiperDiagramAug2020.mxd Revised: 2024-01-29 By: mbough

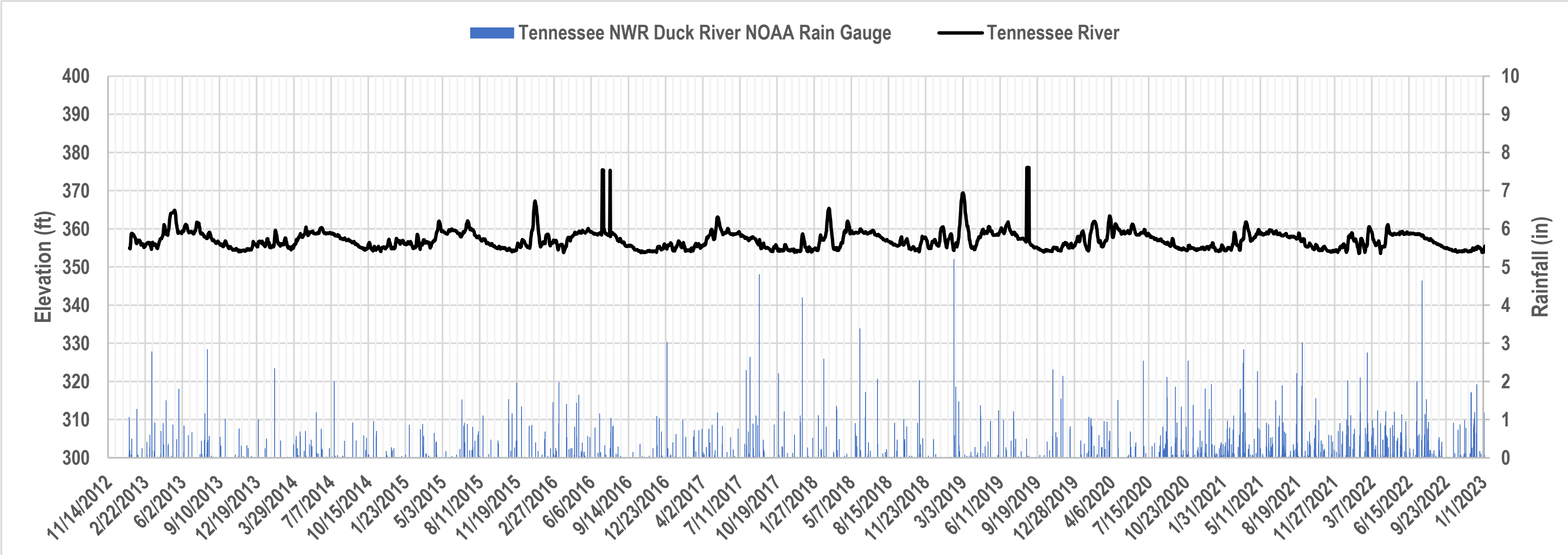
ATTACHMENT H.1-A HYDROGRAPHS



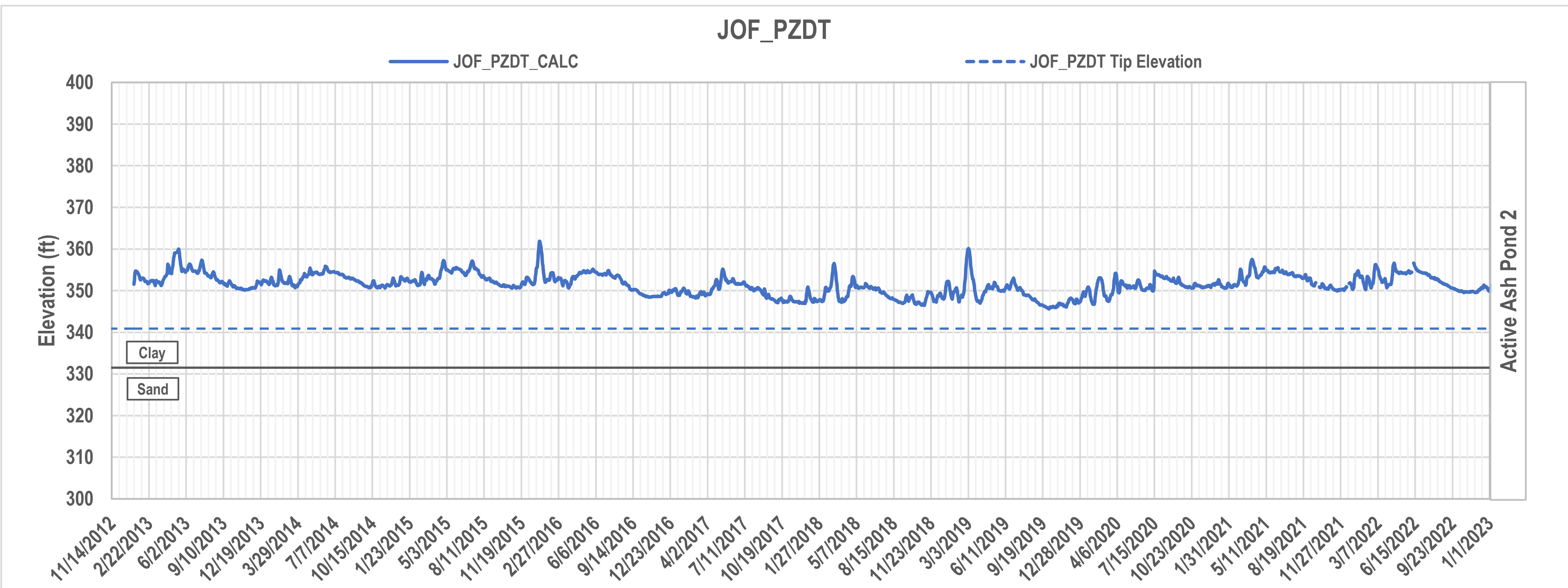
Tennessee NWR Duck River NOAA Rain Gauge
Tennessee River
Elevation (ft)
Rainfall (in)



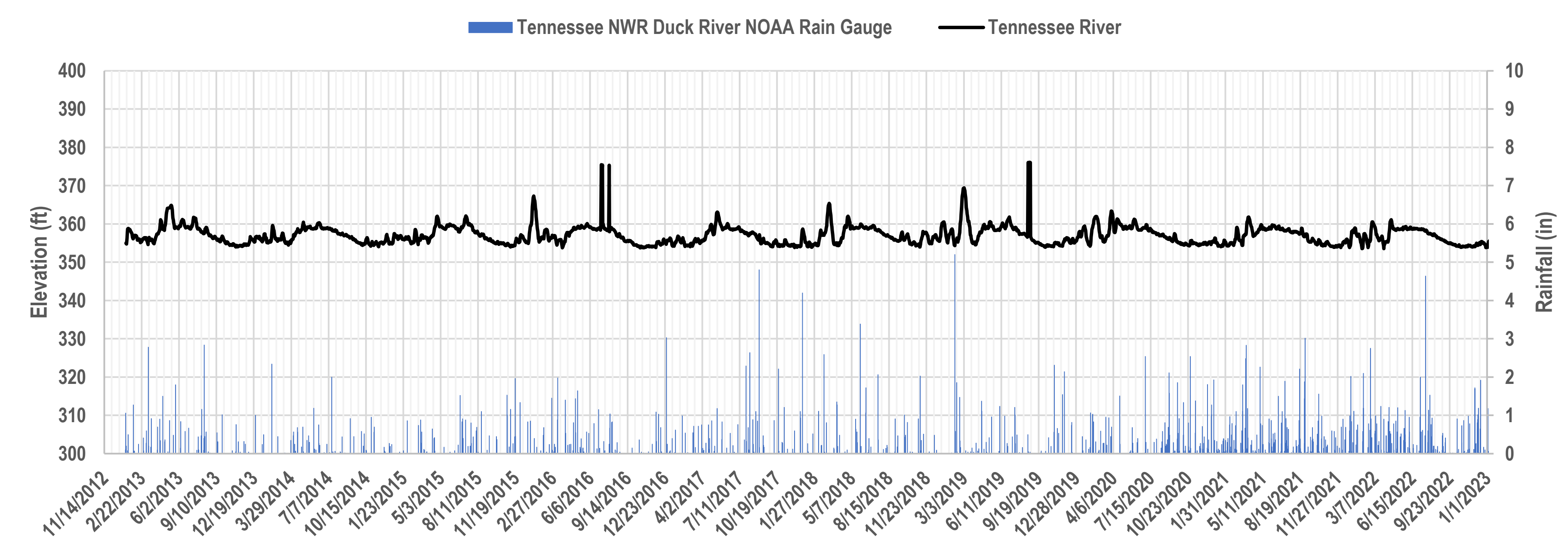
JOF_PZBC
JOF_PZBC_CALC
JOF_PZBC Tip Elevation
Gravel
Clay
Silt
Clay
Elevation (ft)
Active Ash Pond 2



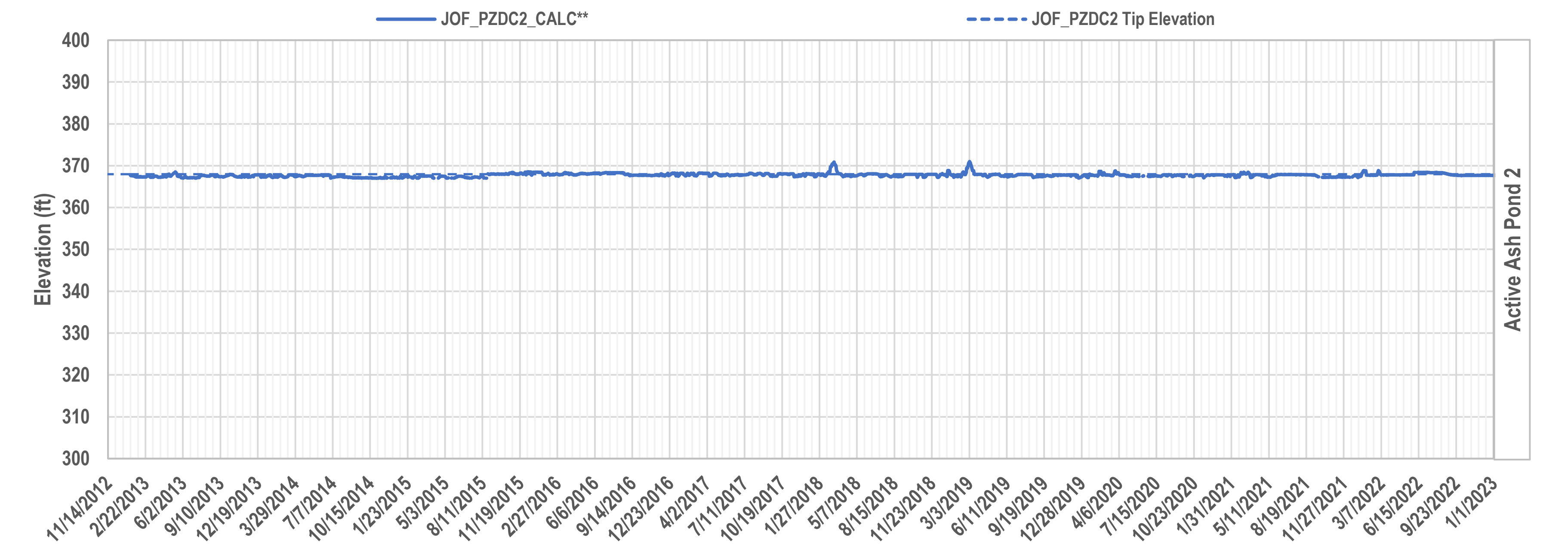
Tennessee NWR Duck River NOAA Rain Gauge
Tennessee River
Elevation (ft)
Rainfall (in)
400
390
380
370
360
350
340
330
320
310
300
10
9
8
7
6
5
4
3
2
1
0
11/14/2012
2/22/2013
6/2/2013
9/10/2013
12/19/2013
3/29/2014
7/7/2014
10/15/2014
1/23/2015
5/3/2015
8/11/2015
11/19/2015
2/27/2016
6/6/2016
9/14/2016
12/23/2016
4/2/2017
7/11/2017
10/19/2017
1/27/2018
5/7/2018
8/15/2018
11/23/2018
3/3/2019
6/11/2019
9/19/2019
12/28/2019
4/6/2020
7/15/2020
10/23/2020
1/31/2021
5/11/2021
8/19/2021
11/27/2021
3/7/2022
6/15/2022
9/23/2022
1/1/2023



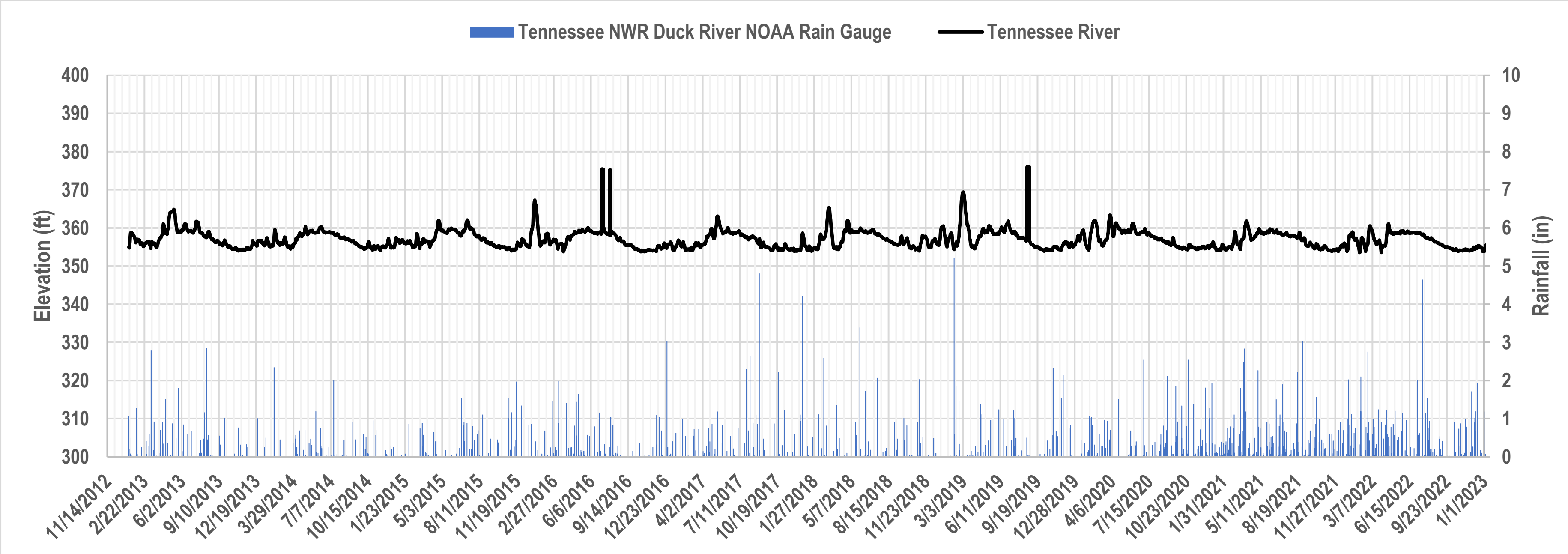
JOF_PZDT
JOF_PZDT_CALC
JOF_PZDT Tip Elevation
Elevation (ft)
400
390
380
370
360
350
340
330
320
310
300
Clay
Sand
Active Ash Pond 2
11/14/2012
2/22/2013
6/2/2013
9/10/2013
12/19/2013
3/29/2014
7/7/2014
10/15/2014
1/23/2015
5/3/2015
8/11/2015
11/19/2015
2/27/2016
6/6/2016
9/14/2016
12/23/2016
4/2/2017
7/11/2017
10/19/2017
1/27/2018
5/7/2018
8/15/2018
11/23/2018
3/3/2019
6/11/2019
9/19/2019
12/28/2019
4/6/2020
7/15/2020
10/23/2020
1/31/2021
5/11/2021
8/19/2021
11/27/2021
3/7/2022
6/15/2022
9/23/2022
1/1/2023

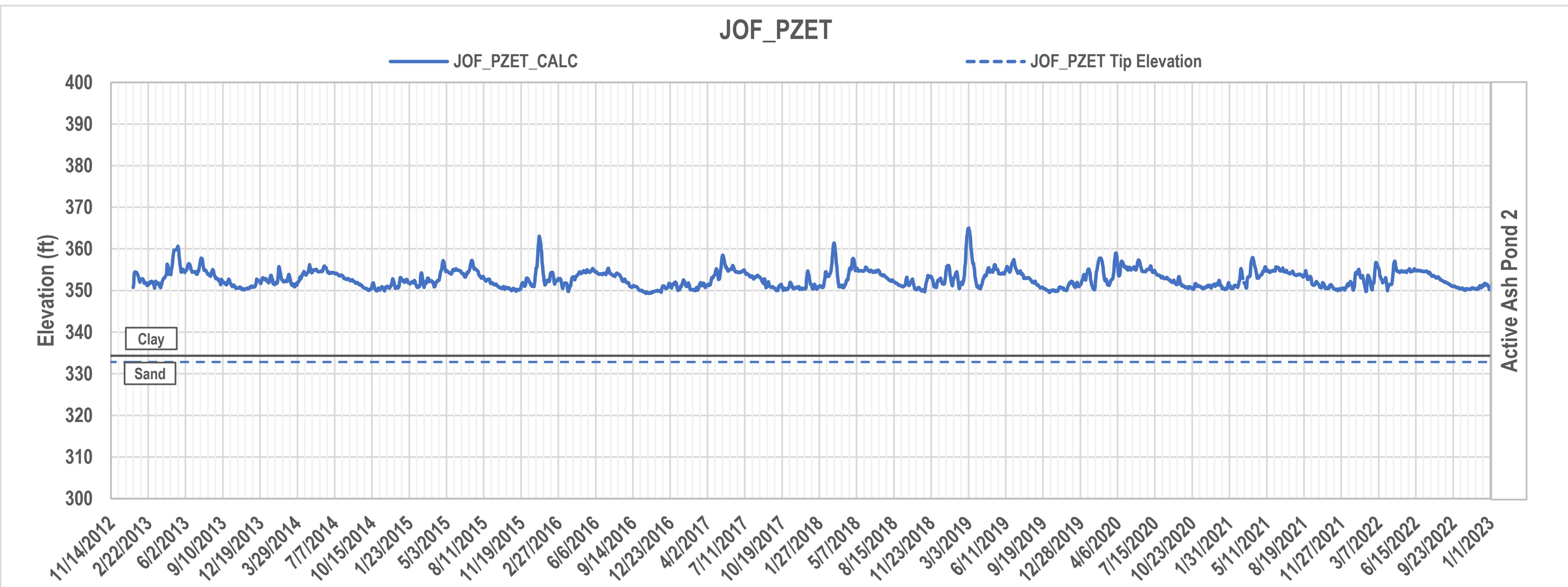


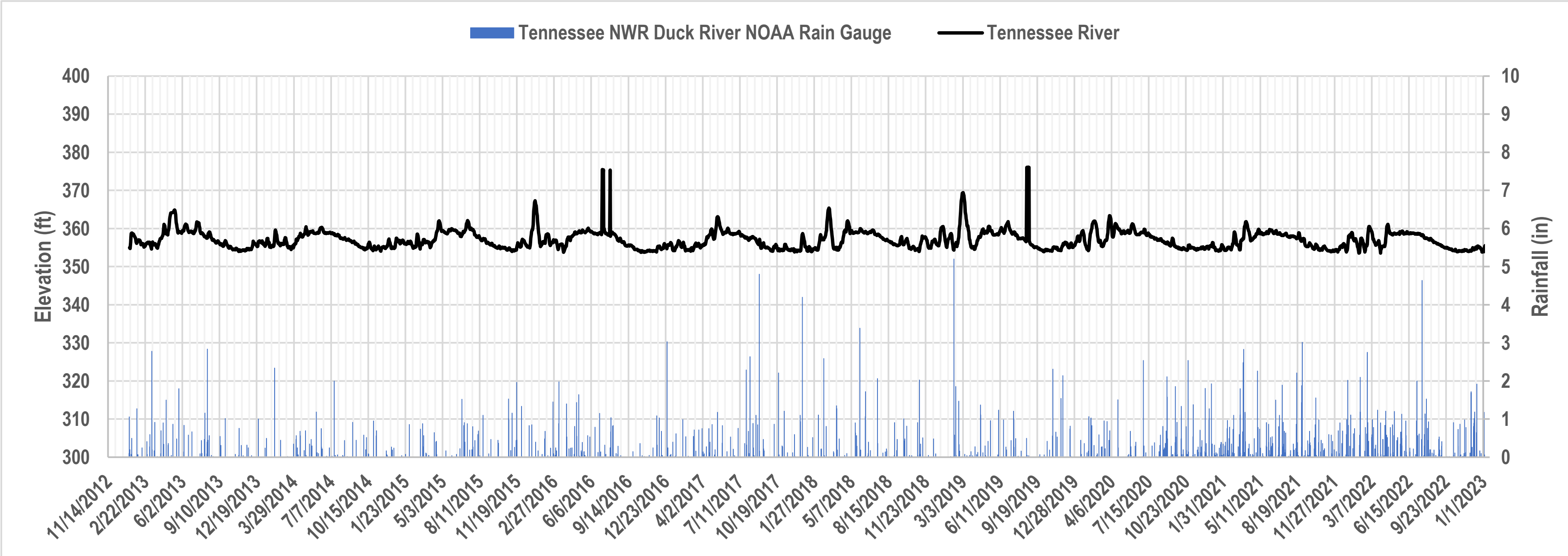
JOF_PZDC2**



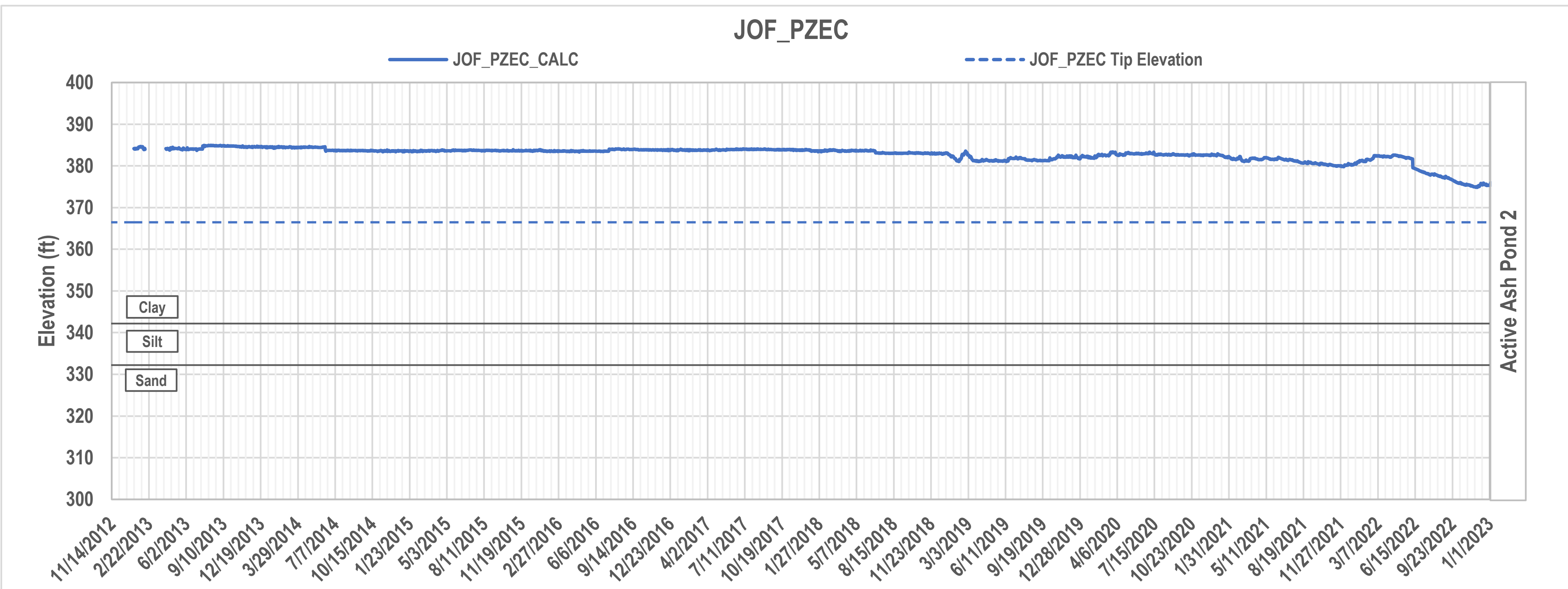
** Soil horizon is unavailable for this instrument. Where possible, a nearby boring log has been substituted.


Tennessee NWR Duck River NOAA Rain Gauge
Tennessee River
Elevation (ft)
Rainfall (in)
400
390
380
370
360
350
340
330
320
310
300
10
9
8
7
6
5
4
3
2
1
0
11/14/2012
2/22/2013
6/2/2013
9/10/2013
12/19/2013
3/29/2014
7/7/2014
10/15/2014
1/23/2015
5/3/2015
8/11/2015
11/19/2015
2/27/2016
6/6/2016
9/14/2016
12/23/2016
4/2/2017
7/11/2017
10/19/2017
1/27/2018
5/7/2018
8/15/2018
11/23/2018
3/3/2019
6/11/2019
9/19/2019
12/28/2019
4/6/2020
7/15/2020
10/23/2020
1/31/2021
5/11/2021
8/19/2021
11/27/2021
3/7/2022
6/15/2022
9/23/2022
1/1/2023

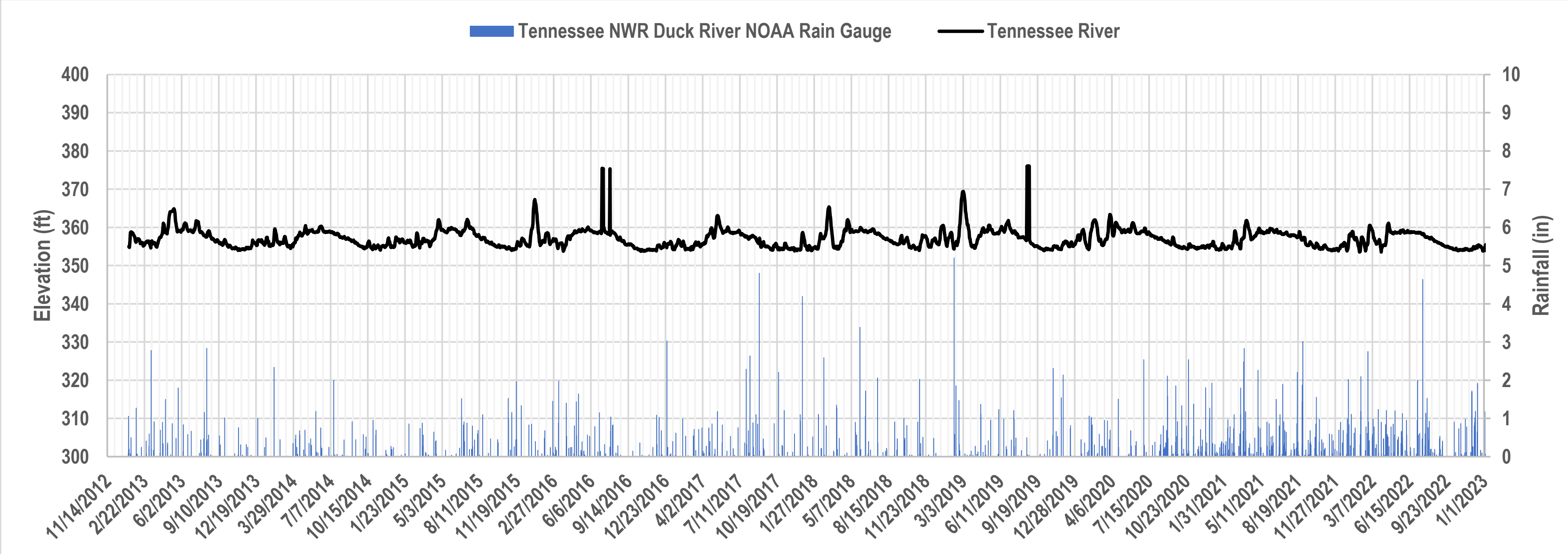

JOF_PZET
JOF_PZET_CALC
JOF_PZET Tip Elevation
Elevation (ft)
400
390
380
370
360
350
340
330
320
310
300
Clay
Sand
Active Ash Pond 2
11/14/2012
2/22/2013
6/2/2013
9/10/2013
12/19/2013
3/29/2014
7/7/2014
10/15/2014
1/23/2015
5/3/2015
8/11/2015
11/19/2015
2/27/2016
6/6/2016
9/14/2016
12/23/2016
4/2/2017
7/11/2017
10/19/2017
1/27/2018
5/7/2018
8/15/2018
11/23/2018
3/3/2019
6/11/2019
9/19/2019
12/28/2019
4/6/2020
7/15/2020
10/23/2020
1/31/2021
5/11/2021
8/19/2021
11/27/2021
3/7/2022
6/15/2022
9/23/2022
1/1/2023

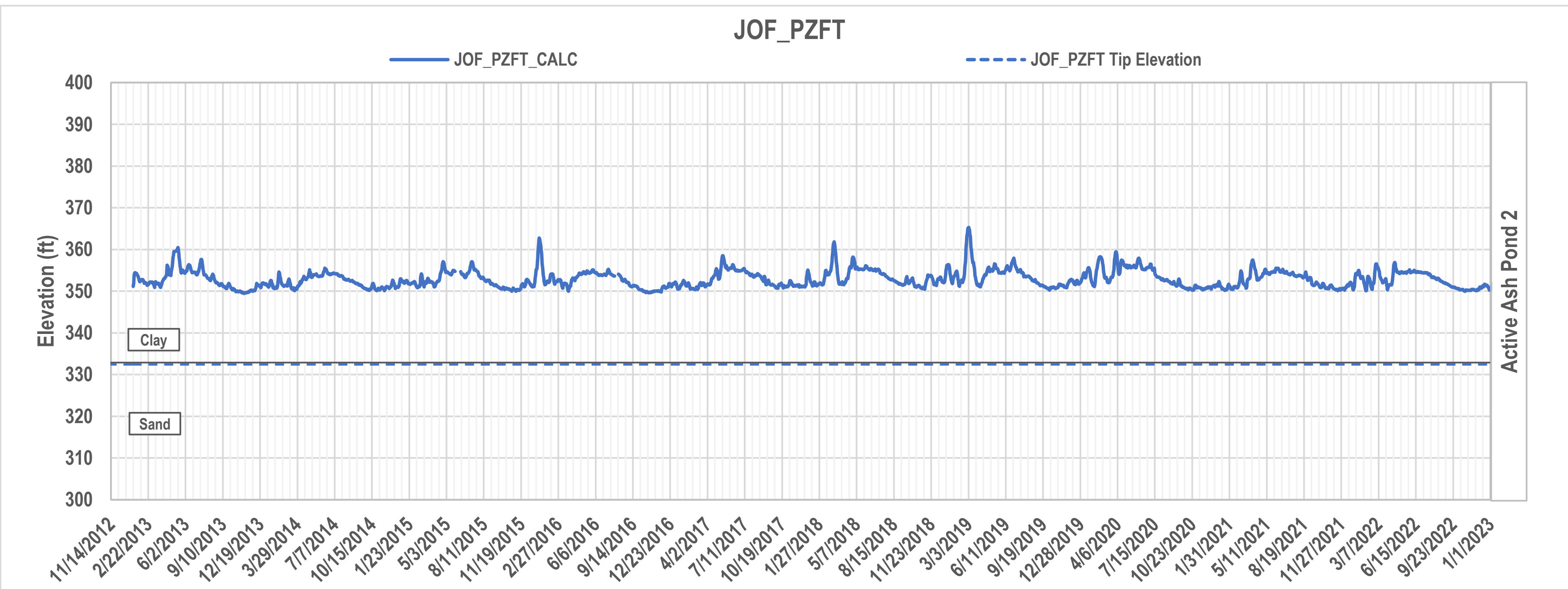


Tennessee NWR Duck River NOAA Rain Gauge
Tennessee River
Elevation (ft)
Rainfall (in)

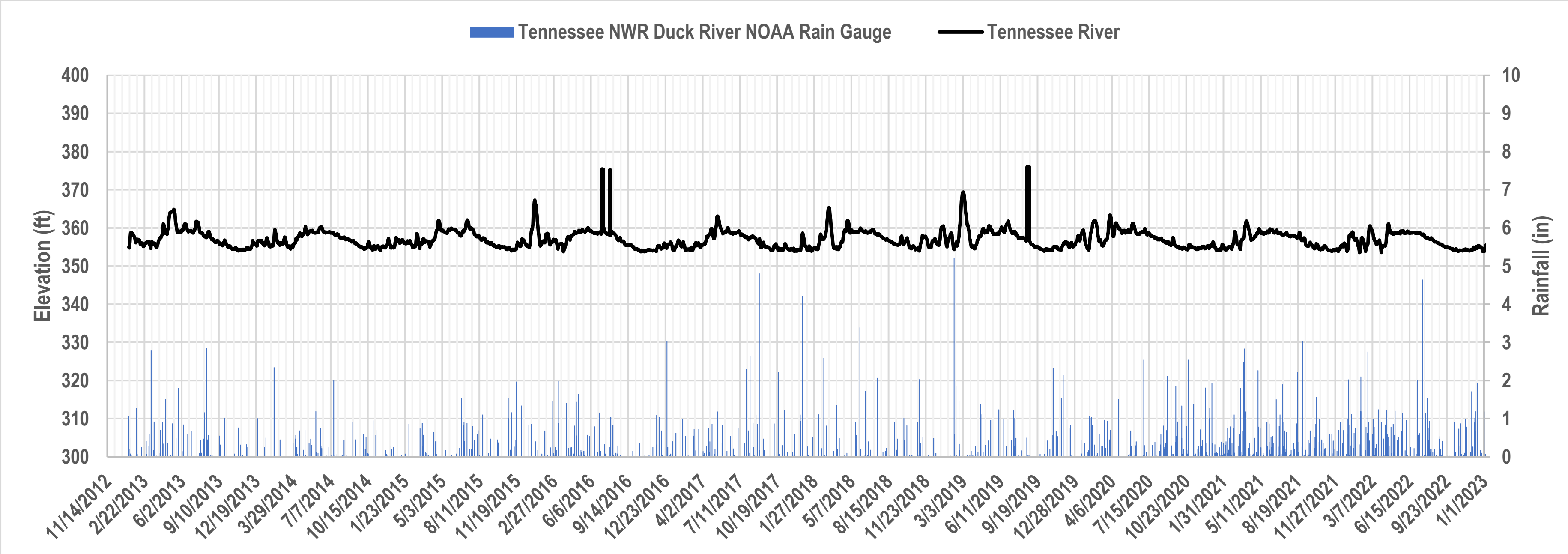


JOF_PZEC
JOF_PZEC_CALC
JOF_PZEC Tip Elevation
Elevation (ft)
Clay
Silt
Sand
Active Ash Pond 2

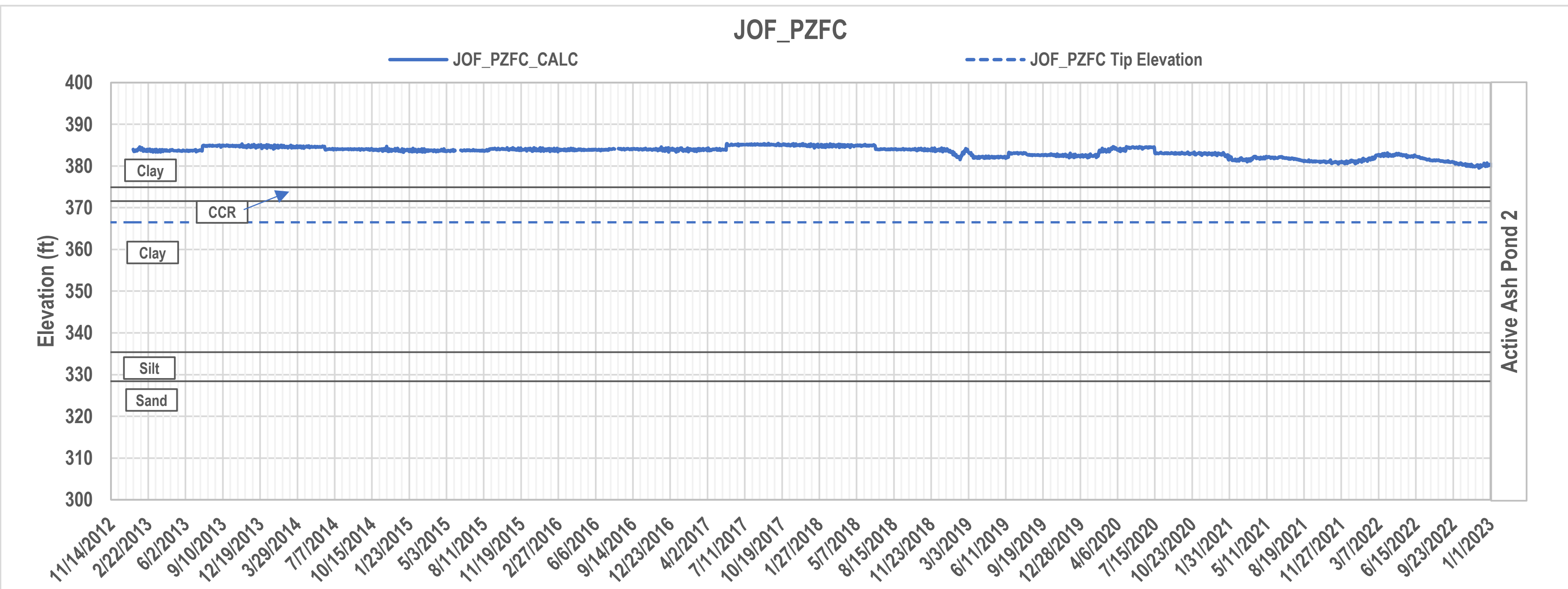




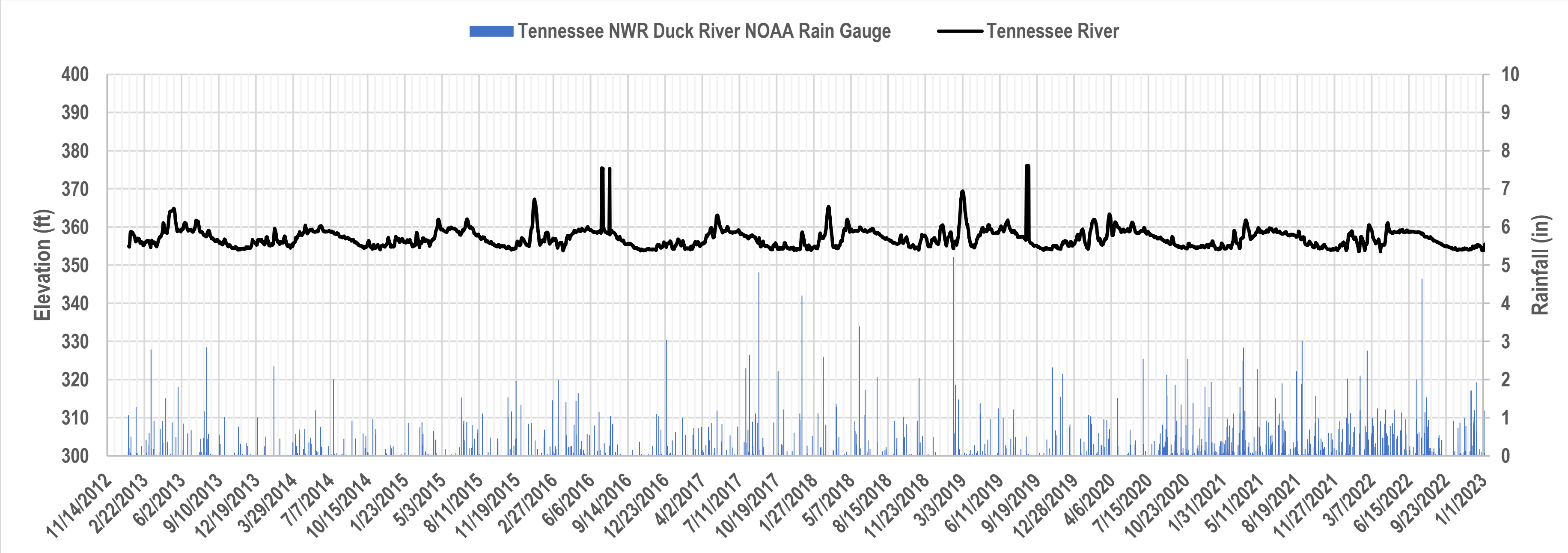
** Soil horizon is unavailable for this instrument. Where possible, a nearby boring log has been substituted.

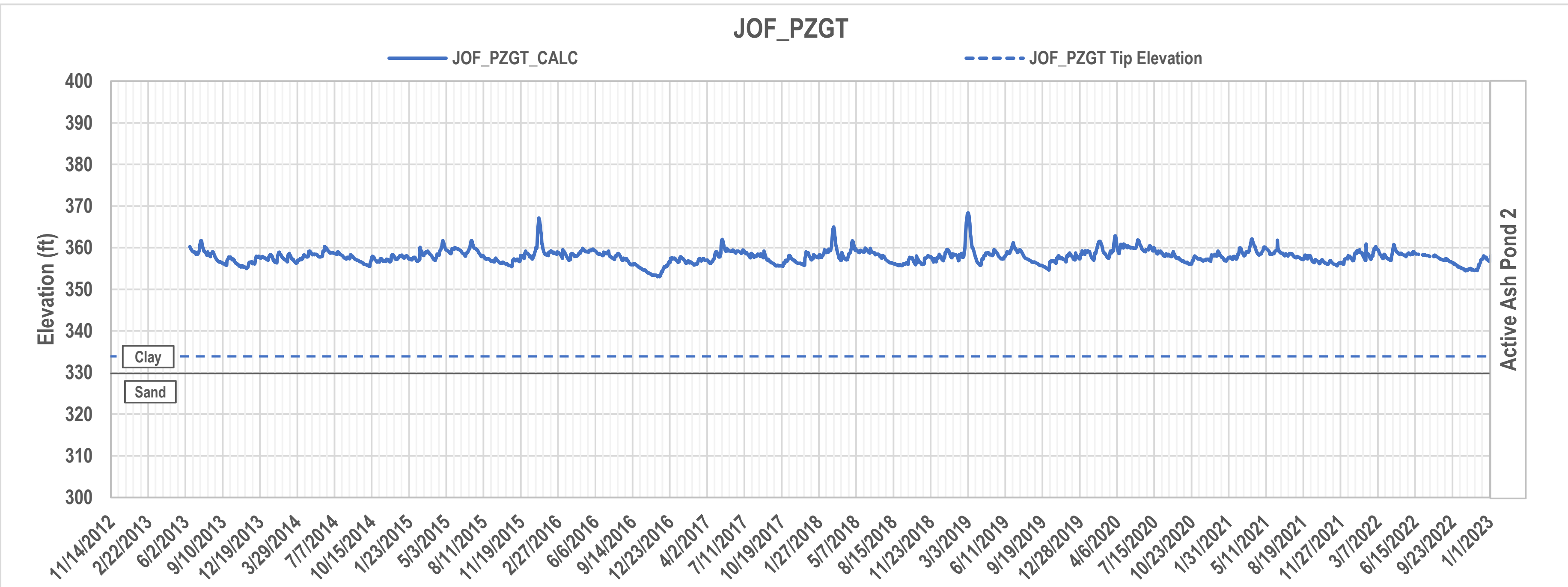


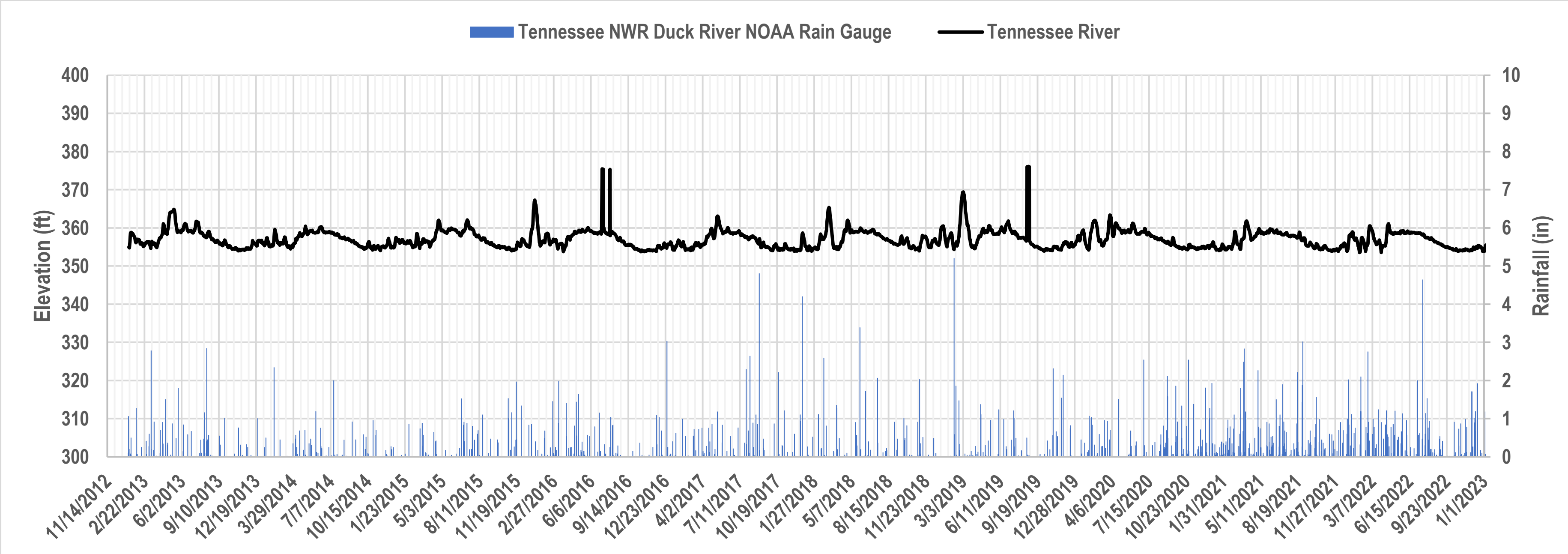
Tennessee NWR Duck River NOAA Rain Gauge
Tennessee River
Elevation (ft)
Rainfall (in)
400
390
380
370
360
350
340
330
320
310
300
10
9
8
7
6
5
4
3
2
1
0
11/14/2012
2/22/2013
6/2/2013
9/10/2013
12/19/2013
3/29/2014
7/7/2014
10/15/2014
1/23/2015
5/3/2015
8/11/2015
11/19/2015
2/27/2016
6/6/2016
9/14/2016
12/23/2016
4/2/2017
7/11/2017
10/19/2017
1/27/2018
5/7/2018
8/15/2018
11/23/2018
3/3/2019
6/11/2019
9/19/2019
12/28/2019
4/6/2020
7/15/2020
10/23/2020
1/31/2021
5/11/2021
8/19/2021
11/27/2021
3/7/2022
6/15/2022
9/23/2022
1/1/2023



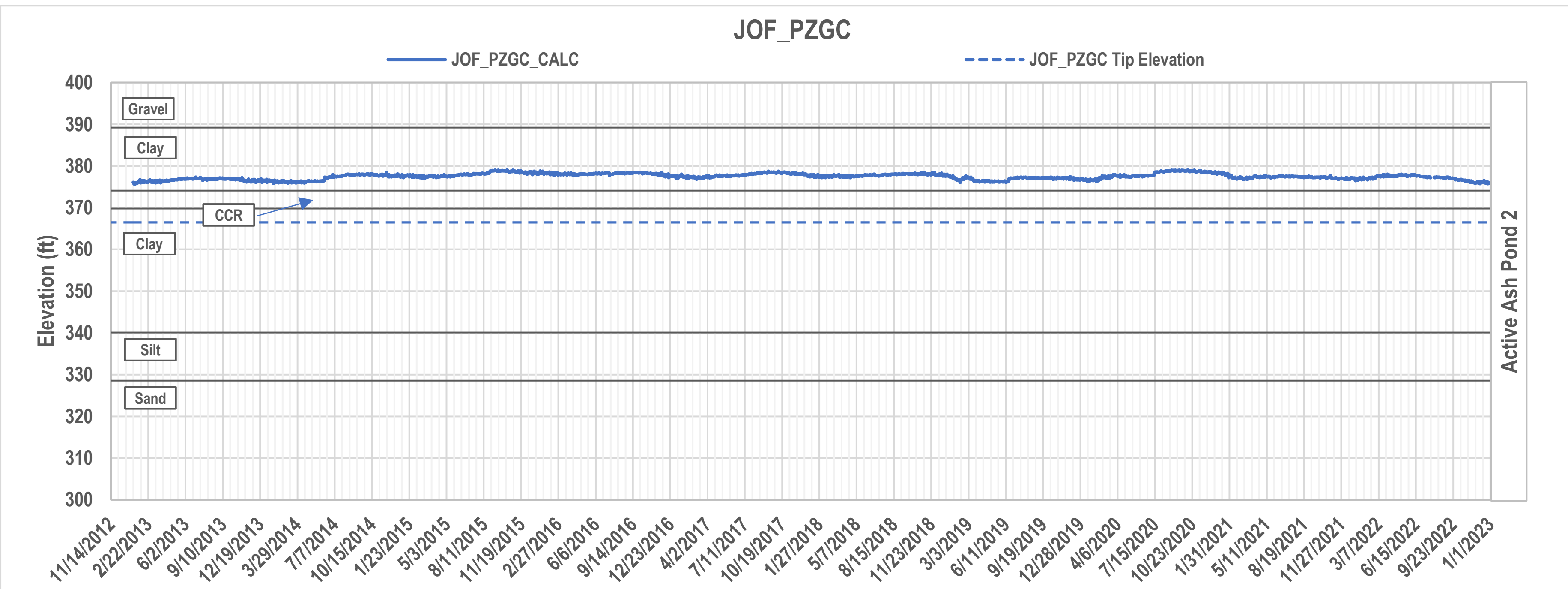
JOF_PZFC
JOF_PZFC_CALC
JOF_PZFC Tip Elevation
Elevation (ft)
400
390
380
370
360
350
340
330
320
310
300
Clay
CCR
Clay
Silt
Sand
Active Ash Pond 2
11/14/2012
2/22/2013
6/2/2013
9/10/2013
12/19/2013
3/29/2014
7/7/2014
10/15/2014
1/23/2015
5/3/2015
8/11/2015
11/19/2015
2/27/2016
6/6/2016
9/14/2016
12/23/2016
4/2/2017
7/11/2017
10/19/2017
1/27/2018
5/7/2018
8/15/2018
11/23/2018
3/3/2019
6/11/2019
9/19/2019
12/28/2019
4/6/2020
7/15/2020
10/23/2020
1/31/2021
5/11/2021
8/19/2021
11/27/2021
3/7/2022
6/15/2022
9/23/2022
1/1/2023


Tennessee NWR Duck River NOAA Rain Gauge
Tennessee River
Elevation (ft)
Rainfall (in)
400
390
380
370
360
350
340
330
320
310
300
10
9
8
7
6
5
4
3
2
1
0
11/14/2012
2/22/2013
6/2/2013
9/10/2013
12/19/2013
3/29/2014
7/7/2014
10/15/2014
1/23/2015
5/3/2015
8/11/2015
11/19/2015
2/27/2016
6/6/2016
9/14/2016
12/23/2016
4/2/2017
7/11/2017
10/19/2017
1/27/2018
5/7/2018
8/15/2018
11/23/2018
3/3/2019
6/11/2019
9/19/2019
12/28/2019
4/6/2020
7/15/2020
10/23/2020
1/31/2021
5/11/2021
8/19/2021
11/27/2021
3/7/2022
6/15/2022
9/23/2022
1/1/2023

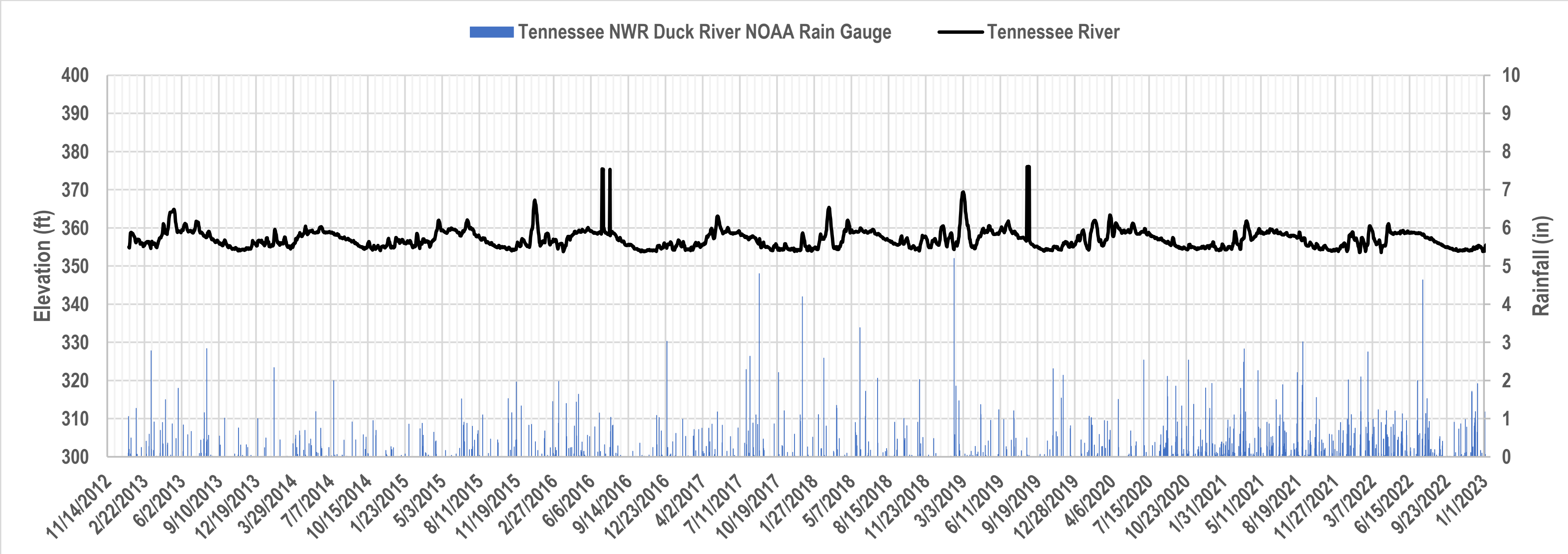

JOF_PZGT
JOF_PZGT_CALC
JOF_PZGT Tip Elevation
Elevation (ft)
400
390
380
370
360
350
340
330
320
310
300
Clay
Sand
Active Ash Pond 2
11/14/2012
2/22/2013
6/2/2013
9/10/2013
12/19/2013
3/29/2014
7/7/2014
10/15/2014
1/23/2015
5/3/2015
8/11/2015
11/19/2015
2/27/2016
6/6/2016
9/14/2016
12/23/2016
4/2/2017
7/11/2017
10/19/2017
1/27/2018
5/7/2018
8/15/2018
11/23/2018
3/3/2019
6/11/2019
9/19/2019
12/28/2019
4/6/2020
7/15/2020
10/23/2020
1/31/2021
5/11/2021
8/19/2021
11/27/2021
3/7/2022
6/15/2022
9/23/2022
1/1/2023



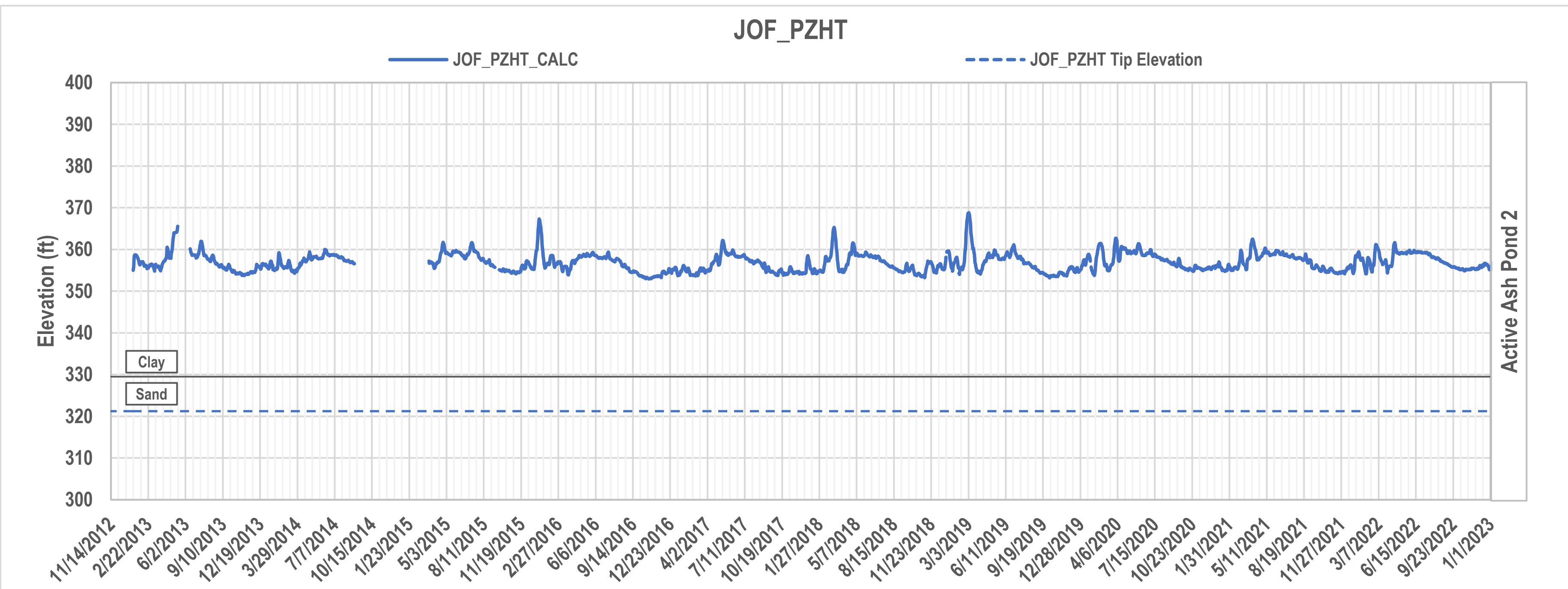
Tennessee NWR Duck River NOAA Rain Gauge
Tennessee River
Elevation (ft)
Rainfall (in)
400
390
380
370
360
350
340
330
320
310
300
10
9
8
7
6
5
4
3
2
1
0
11/14/2012
2/22/2013
6/2/2013
9/10/2013
12/19/2013
3/29/2014
7/7/2014
10/15/2014
1/23/2015
5/3/2015
8/11/2015
11/19/2015
2/27/2016
6/6/2016
9/14/2016
12/23/2016
4/2/2017
7/11/2017
10/19/2017
1/27/2018
5/7/2018
8/15/2018
11/23/2018
3/3/2019
6/11/2019
9/19/2019
12/28/2019
4/6/2020
7/15/2020
10/23/2020
1/31/2021
5/11/2021
8/19/2021
11/27/2021
3/7/2022
6/15/2022
9/23/2022
1/1/2023



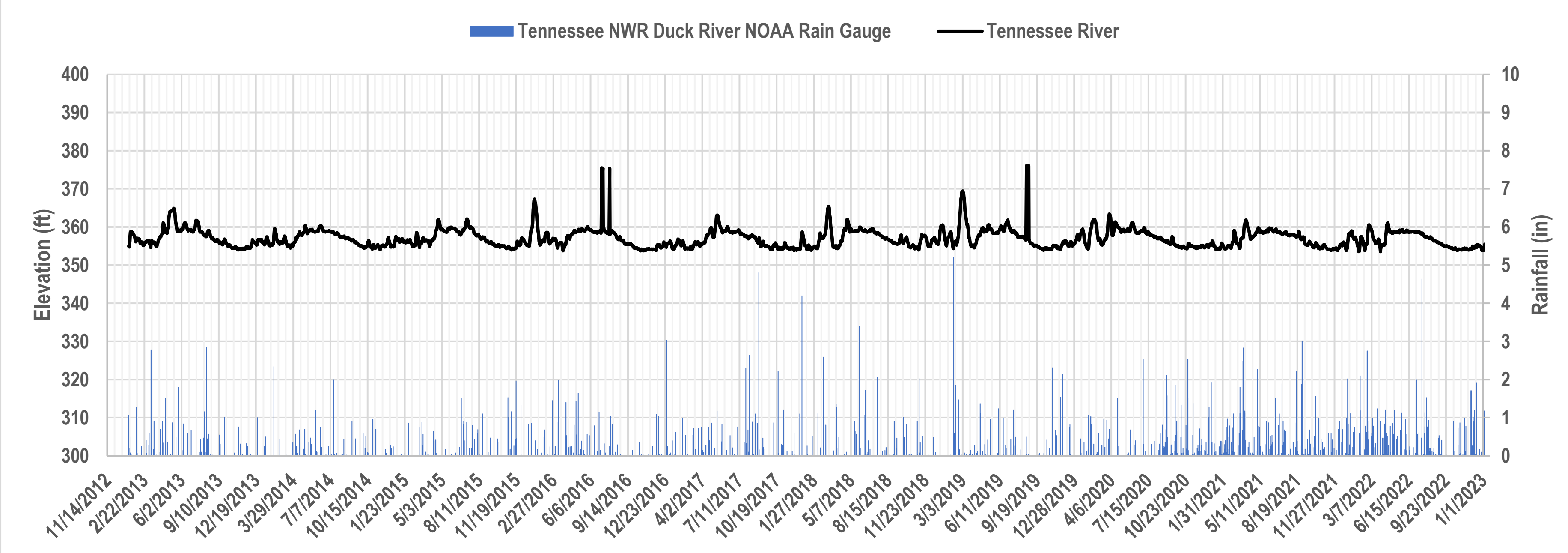
JOF_PZGC
JOF_PZGC_CALC
JOF_PZGC Tip Elevation
Elevation (ft)
400
390
380
370
360
350
340
330
320
310
300
Gravel
Clay
CCR
Clay
Silt
Sand
Active Ash Pond 2
11/14/2012
2/22/2013
6/2/2013
9/10/2013
12/19/2013
3/29/2014
7/7/2014
10/15/2014
1/23/2015
5/3/2015
8/11/2015
11/19/2015
2/27/2016
6/6/2016
9/14/2016
12/23/2016
4/2/2017
7/11/2017
10/19/2017
1/27/2018
5/7/2018
8/15/2018
11/23/2018
3/3/2019
6/11/2019
9/19/2019
12/28/2019
4/6/2020
7/15/2020
10/23/2020
1/31/2021
5/11/2021
8/19/2021
11/27/2021
3/7/2022
6/15/2022
9/23/2022
1/1/2023



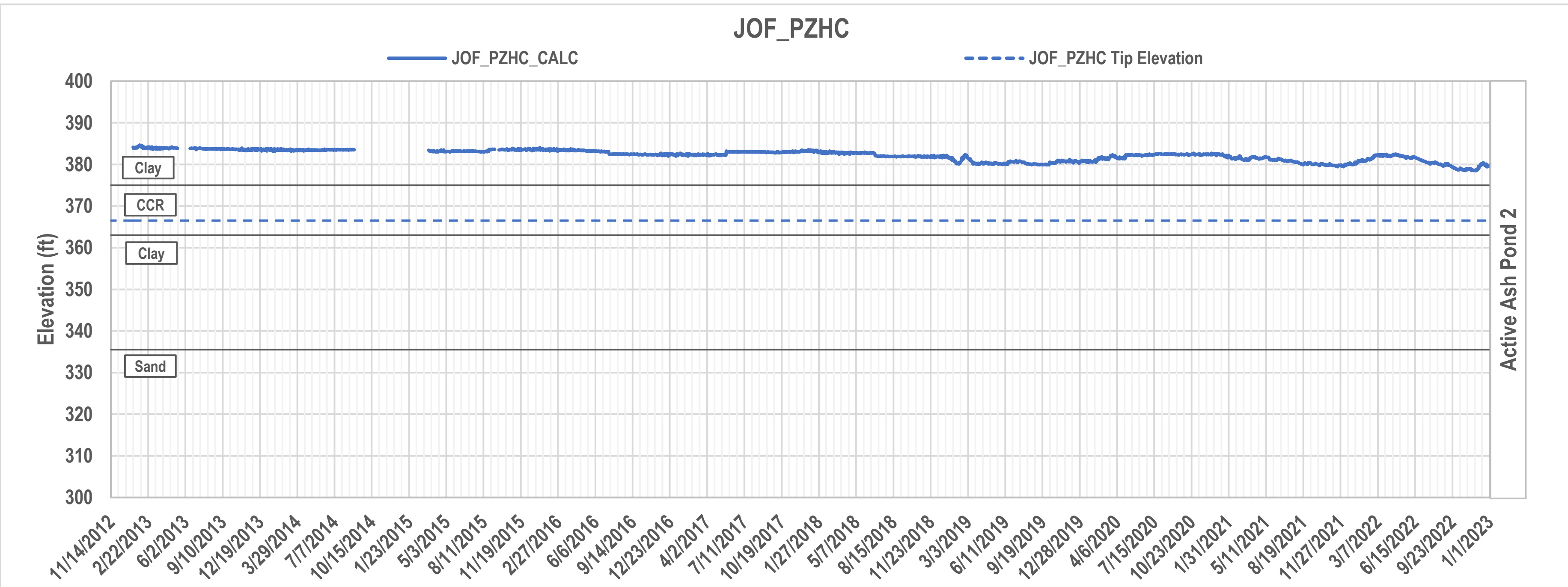
Tennessee NWR Duck River NOAA Rain Gauge
Tennessee River
Elevation (ft)
Rainfall (in)
400
390
380
370
360
350
340
330
320
310
300
10
9
8
7
6
5
4
3
2
1
0
11/14/2012
2/22/2013
6/2/2013
9/10/2013
12/19/2013
3/29/2014
7/7/2014
10/15/2014
1/23/2015
5/3/2015
8/11/2015
11/19/2015
2/27/2016
6/6/2016
9/14/2016
12/23/2016
4/2/2017
7/11/2017
10/19/2017
1/27/2018
5/7/2018
8/15/2018
11/23/2018
3/3/2019
6/11/2019
9/19/2019
12/28/2019
4/6/2020
7/15/2020
10/23/2020
1/31/2021
5/11/2021
8/19/2021
11/27/2021
3/7/2022
6/15/2022
9/23/2022
1/1/2023



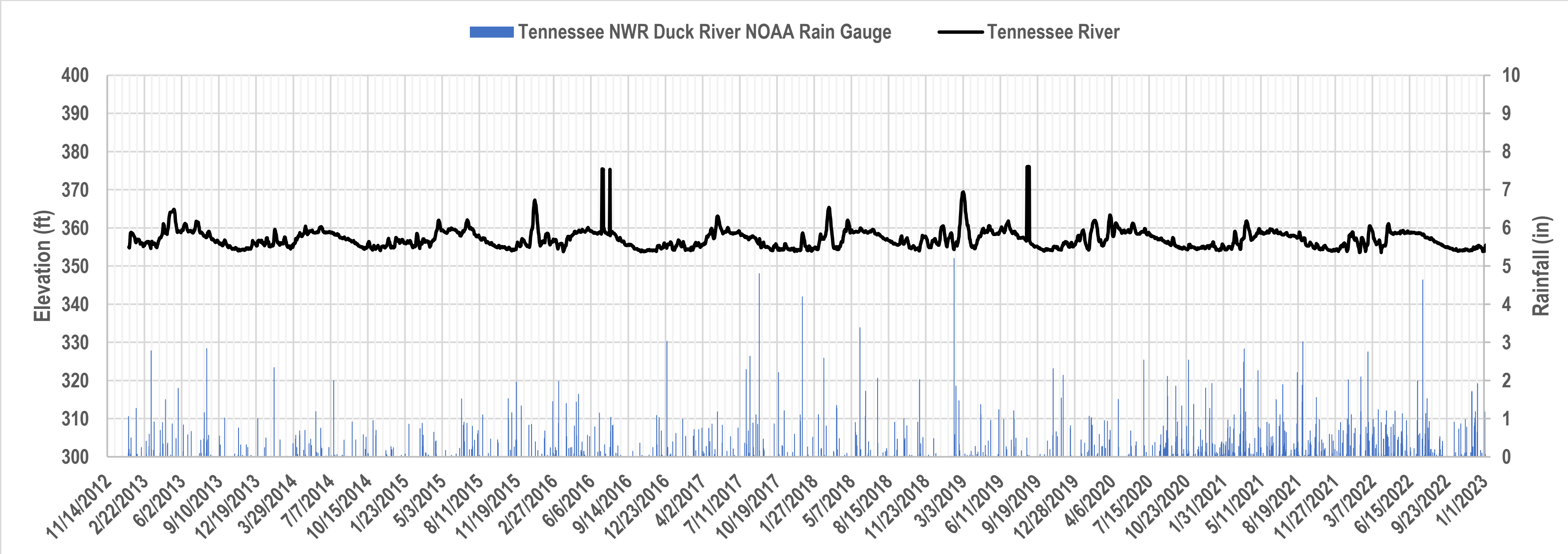
JOF_PZHT
JOF_PZHT_CALC
JOF_PZHT Tip Elevation
Elevation (ft)
400
390
380
370
360
350
340
330
320
310
300
Clay
Sand
Active Ash Pond 2
11/14/2012
2/22/2013
6/2/2013
9/10/2013
12/19/2013
3/29/2014
7/7/2014
10/15/2014
1/23/2015
5/3/2015
8/11/2015
11/19/2015
2/27/2016
6/6/2016
9/14/2016
12/23/2016
4/2/2017
7/11/2017
10/19/2017
1/27/2018
5/7/2018
8/15/2018
11/23/2018
3/3/2019
6/11/2019
9/19/2019
12/28/2019
4/6/2020
7/15/2020
10/23/2020
1/31/2021
5/11/2021
8/19/2021
11/27/2021
3/7/2022
6/15/2022
9/23/2022
1/1/2023



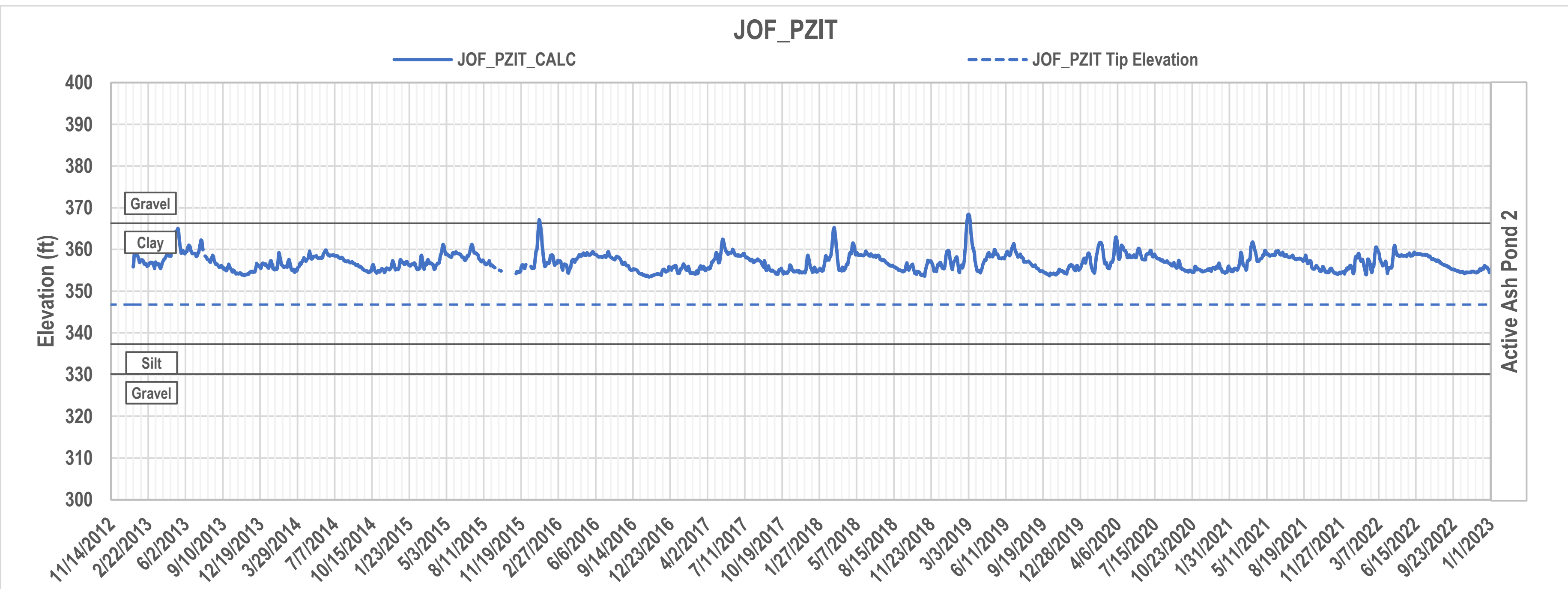
Tennessee NWR Duck River NOAA Rain Gauge
Tennessee River
Elevation (ft)
Rainfall (in)
400
390
380
370
360
350
340
330
320
310
300
10
9
8
7
6
5
4
3
2
1
0
11/14/2012
2/22/2013
6/2/2013
9/10/2013
12/19/2013
3/29/2014
7/7/2014
10/15/2014
1/23/2015
5/3/2015
8/11/2015
11/19/2015
2/27/2016
6/6/2016
9/14/2016
12/23/2016
4/2/2017
7/11/2017
10/19/2017
1/27/2018
5/7/2018
8/15/2018
11/23/2018
3/3/2019
6/11/2019
9/19/2019
12/28/2019
4/6/2020
7/15/2020
10/23/2020
1/31/2021
5/11/2021
8/19/2021
11/27/2021
3/7/2022
6/15/2022
9/23/2022
1/1/2023



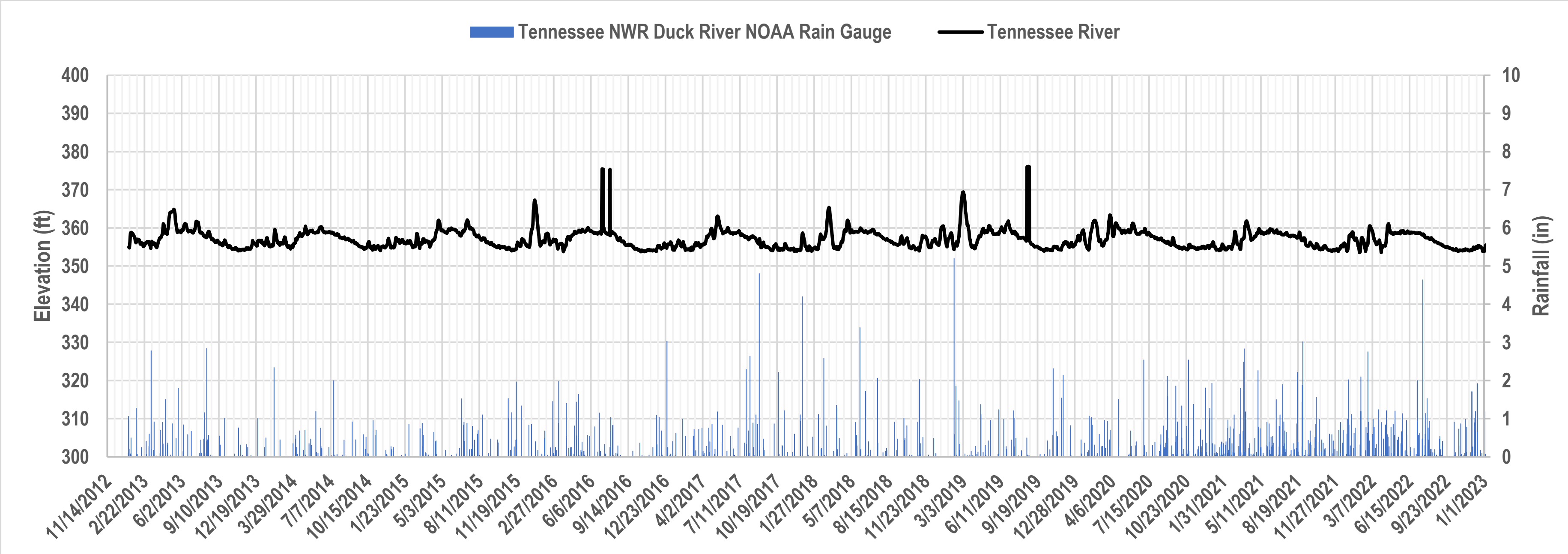
JOF_PZHC
JOF_PZHC_CALC
JOF_PZHC Tip Elevation
Elevation (ft)
400
390
380
370
360
350
340
330
320
310
300
Clay
CCR
Clay
Sand
Active Ash Pond 2
11/14/2012
2/22/2013
6/2/2013
9/10/2013
12/19/2013
3/29/2014
7/7/2014
10/15/2014
1/23/2015
5/3/2015
8/11/2015
11/19/2015
2/27/2016
6/6/2016
9/14/2016
12/23/2016
4/2/2017
7/11/2017
10/19/2017
1/27/2018
5/7/2018
8/15/2018
11/23/2018
3/3/2019
6/11/2019
9/19/2019
12/28/2019
4/6/2020
7/15/2020
10/23/2020
1/31/2021
5/11/2021
8/19/2021
11/27/2021
3/7/2022
6/15/2022
9/23/2022
1/1/2023

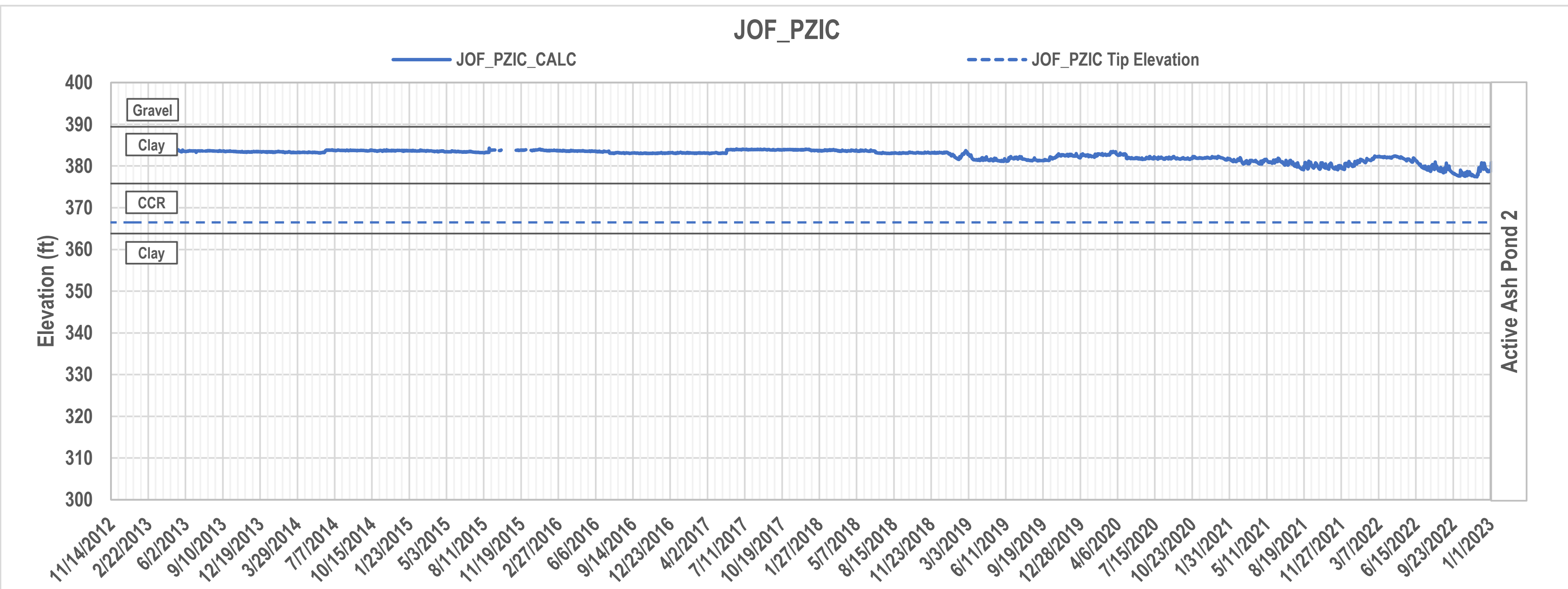


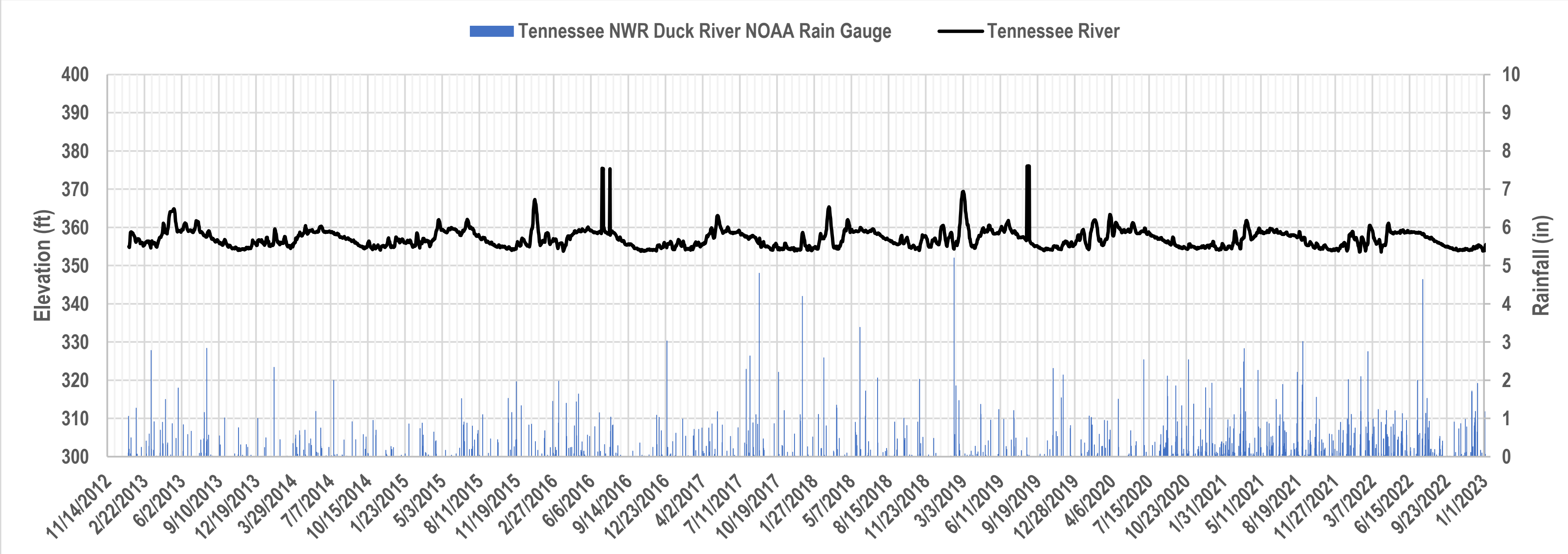
Tennessee NWR Duck River NOAA Rain Gauge
Tennessee River
Elevation (ft)
Rainfall (in)
400
390
380
370
360
350
340
330
320
310
300
10
9
8
7
6
5
4
3
2
1
0
11/14/2012
2/22/2013
6/2/2013
9/10/2013
12/19/2013
3/29/2014
7/7/2014
10/15/2014
1/23/2015
5/3/2015
8/11/2015
11/19/2015
2/27/2016
6/6/2016
9/14/2016
12/23/2016
4/2/2017
7/11/2017
10/19/2017
1/27/2018
5/7/2018
8/15/2018
11/23/2018
3/3/2019
6/11/2019
9/19/2019
12/28/2019
4/6/2020
7/15/2020
10/23/2020
1/31/2021
5/11/2021
8/19/2021
11/27/2021
3/7/2022
6/15/2022
9/23/2022
1/1/2023



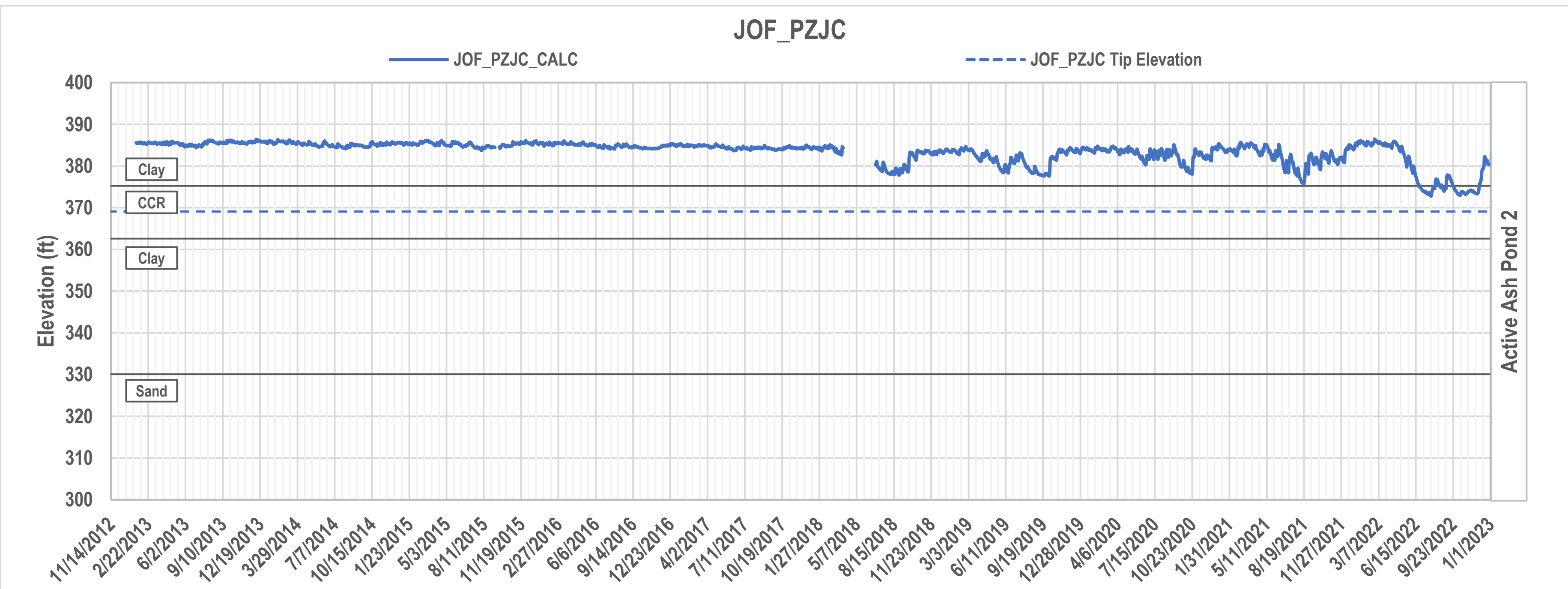
JOF_PZIT
JOF_PZIT_CALC
JOF_PZIT Tip Elevation
Elevation (ft)
400
390
380
370
360
350
340
330
320
310
300
Gravel
Clay
Silt
Gravel
Active Ash Pond 2
11/14/2012
2/22/2013
6/2/2013
9/10/2013
12/19/2013
3/29/2014
7/7/2014
10/15/2014
1/23/2015
5/3/2015
8/11/2015
11/19/2015
2/27/2016
6/6/2016
9/14/2016
12/23/2016
4/2/2017
7/11/2017
10/19/2017
1/27/2018
5/7/2018
8/15/2018
11/23/2018
3/3/2019
6/11/2019
9/19/2019
12/28/2019
4/6/2020
7/15/2020
10/23/2020
1/31/2021
5/11/2021
8/19/2021
11/27/2021
3/7/2022
6/15/2022
9/23/2022
1/1/2023


Tennessee NWR Duck River NOAA Rain Gauge
Tennessee River
Elevation (ft)
Rainfall (in)
400
390
380
370
360
350
340
330
320
310
300
10
9
8
7
6
5
4
3
2
1
0
11/14/2012
2/22/2013
6/2/2013
9/10/2013
12/19/2013
3/29/2014
7/7/2014
10/15/2014
1/23/2015
5/3/2015
8/11/2015
11/19/2015
2/27/2016
6/6/2016
9/14/2016
12/23/2016
4/2/2017
7/11/2017
10/19/2017
1/27/2018
5/7/2018
8/15/2018
11/23/2018
3/3/2019
6/11/2019
9/19/2019
12/28/2019
4/6/2020
7/15/2020
10/23/2020
1/31/2021
5/11/2021
8/19/2021
11/27/2021
3/7/2022
6/15/2022
9/23/2022
1/1/2023

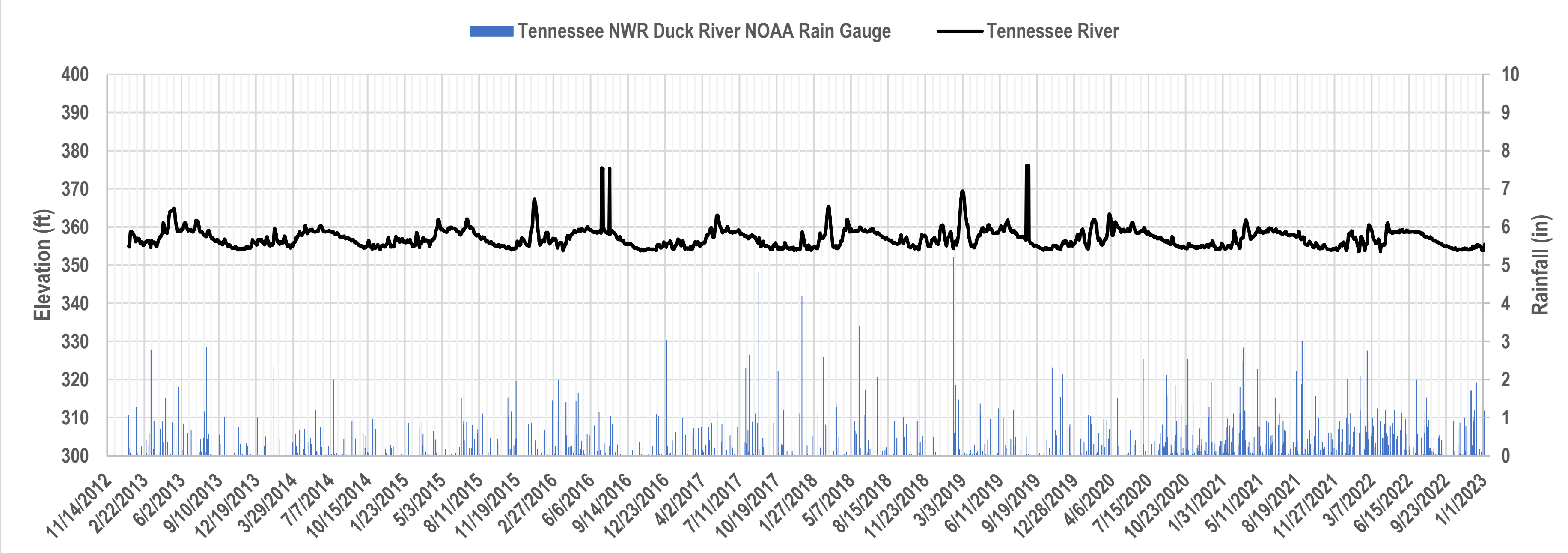

JOF_PZIC
JOF_PZIC_CALC
JOF_PZIC Tip Elevation
Elevation (ft)
Gravel
Clay
CCR
Clay
Active Ash Pond 2
400
390
380
370
360
350
340
330
320
310
300
11/14/2012
2/22/2013
6/2/2013
9/10/2013
12/19/2013
3/29/2014
7/7/2014
10/15/2014
1/23/2015
5/3/2015
8/11/2015
11/19/2015
2/27/2016
6/6/2016
9/14/2016
12/23/2016
4/2/2017
7/11/2017
10/19/2017
1/27/2018
5/7/2018
8/15/2018
11/23/2018
3/3/2019
6/11/2019
9/19/2019
12/28/2019
4/6/2020
7/15/2020
10/23/2020
1/31/2021
5/11/2021
8/19/2021
11/27/2021
3/7/2022
6/15/2022
9/23/2022
1/1/2023



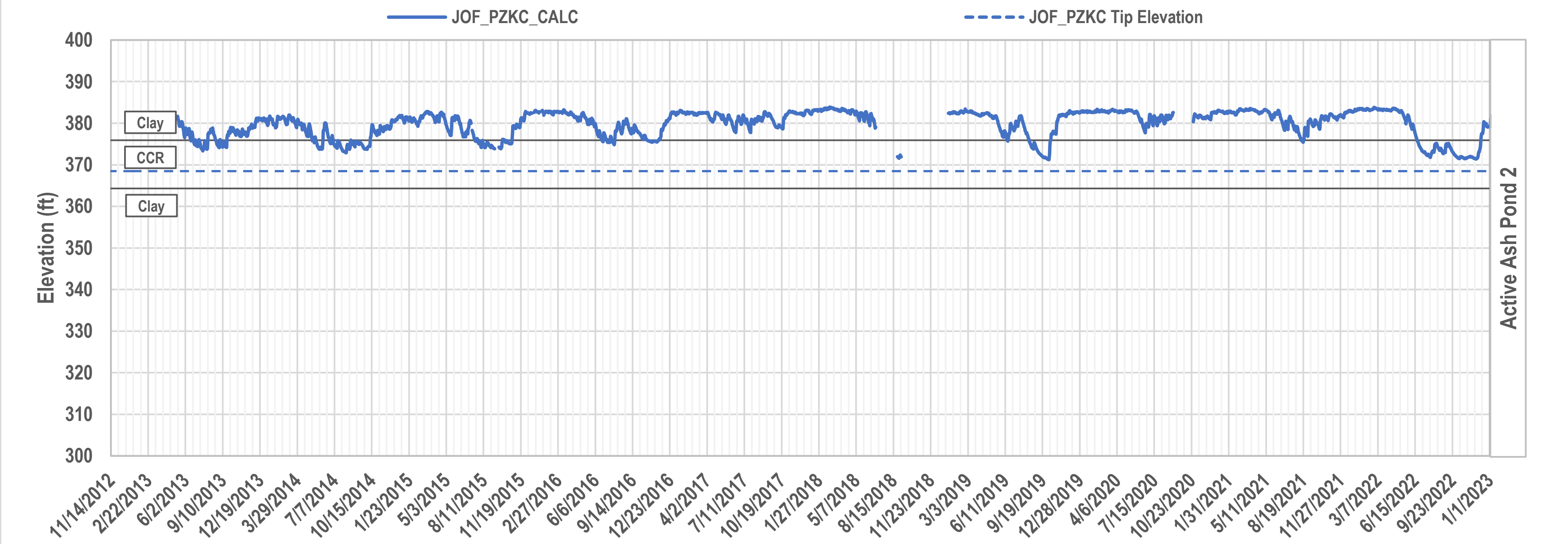
Tennessee NWR Duck River NOAA Rain Gauge
Tennessee River
Elevation (ft)
Rainfall (in)
400
390
380
370
360
350
340
330
320
310
300
10
9
8
7
6
5
4
3
2
1
0
11/14/2012
2/22/2013
6/2/2013
9/10/2013
12/19/2013
3/29/2014
7/7/2014
10/15/2014
1/23/2015
5/3/2015
8/11/2015
11/19/2015
2/27/2016
6/6/2016
9/14/2016
12/23/2016
4/2/2017
7/11/2017
10/19/2017
1/27/2018
5/7/2018
8/15/2018
11/23/2018
3/3/2019
6/11/2019
9/19/2019
12/28/2019
4/6/2020
7/15/2020
10/23/2020
1/31/2021
5/11/2021
8/19/2021
11/27/2021
3/7/2022
6/15/2022
9/23/2022
1/1/2023

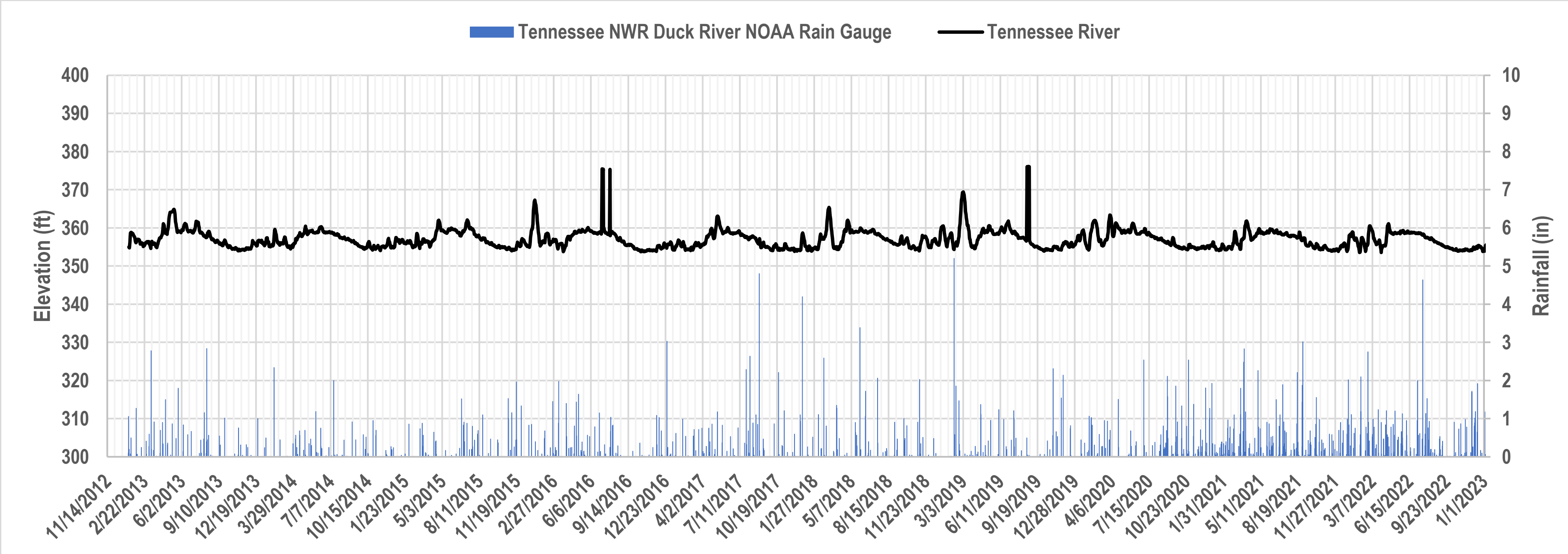


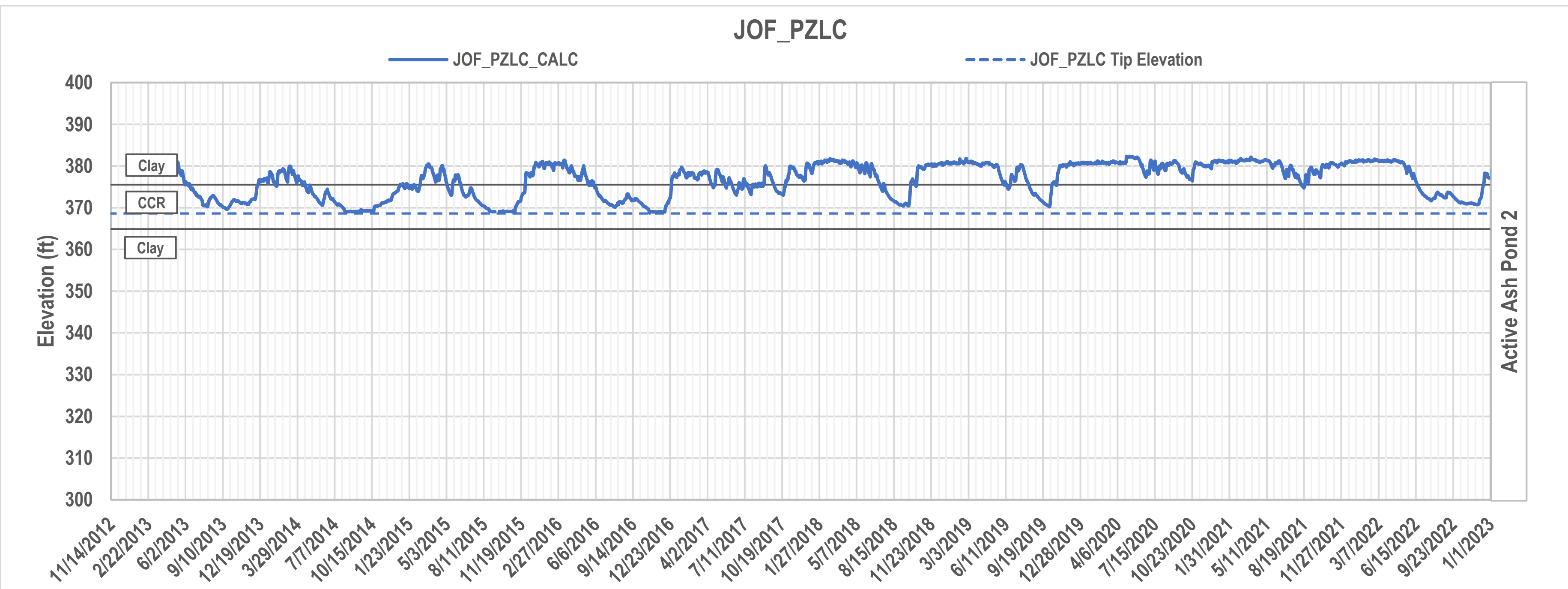
JOF_PZJC
JOF_PZJC_CALC
JOF_PZJC Tip Elevation
Elevation (ft)
400
390
380
370
360
350
340
330
320
310
300
Clay
CCR
Clay
Sand
Active Ash Pond 2
11/14/2012
2/22/2013
6/2/2013
9/10/2013
12/19/2013
3/29/2014
7/7/2014
10/15/2014
1/23/2015
5/3/2015
8/11/2015
11/19/2015
2/27/2016
6/6/2016
9/14/2016
12/23/2016
4/2/2017
7/11/2017
10/19/2017
1/27/2018
5/7/2018
8/15/2018
11/23/2018
3/3/2019
6/11/2019
9/19/2019
12/28/2019
4/6/2020
7/15/2020
10/23/2020
1/31/2021
5/11/2021
8/19/2021
11/27/2021
3/7/2022
6/15/2022
9/23/2022
1/1/2023

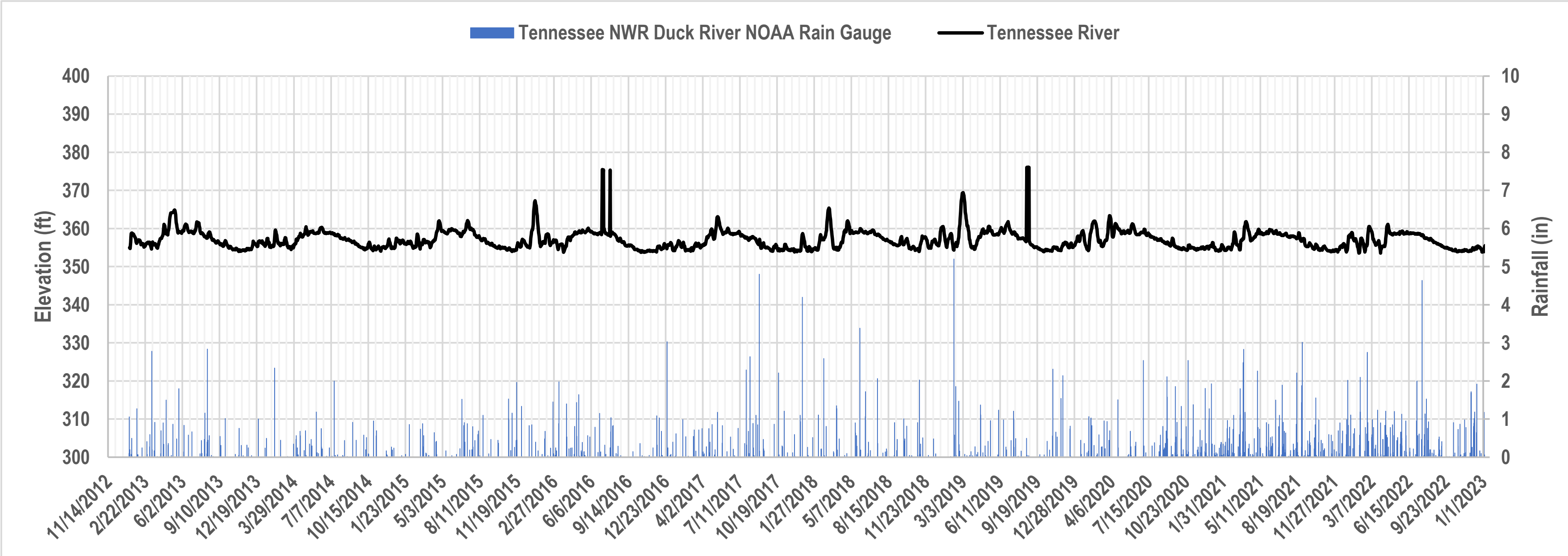

Tennessee NWR Duck River NOAA Rain Gauge
Tennessee River
Elevation (ft)
Rainfall (in)

JOF_PZKC

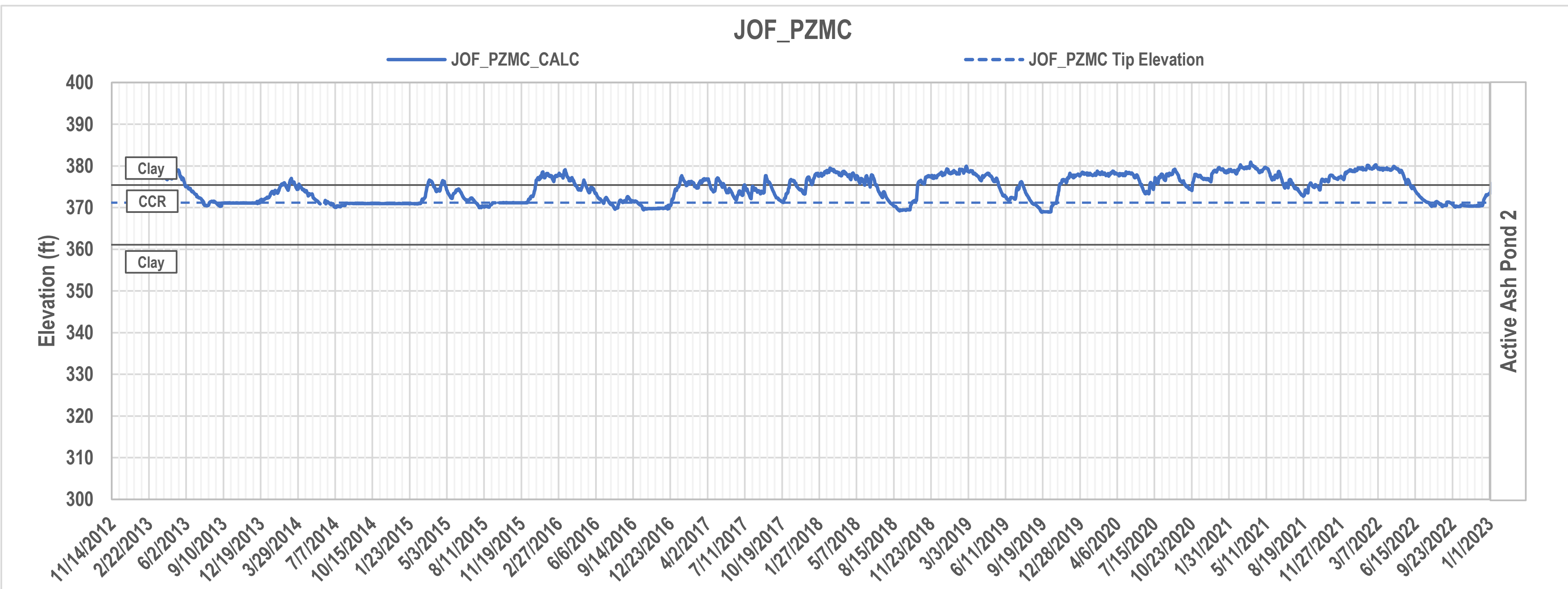

JOF_PZKC_CALC
JOF_PZKC Tip Elevation
Clay
CCR
Clay
Elevation (ft)
Active Ash Pond 2


Tennessee NWR Duck River NOAA Rain Gauge
Tennessee River
Elevation (ft)
Rainfall (in)
400
390
380
370
360
350
340
330
320
310
300
10
9
8
7
6
5
4
3
2
1
0
11/14/2012
2/22/2013
6/2/2013
9/10/2013
12/19/2013
3/29/2014
7/7/2014
10/15/2014
1/23/2015
5/3/2015
8/11/2015
11/19/2015
2/27/2016
6/6/2016
9/14/2016
12/23/2016
4/2/2017
7/11/2017
10/19/2017
1/27/2018
5/7/2018
8/15/2018
11/23/2018
3/3/2019
6/11/2019
9/19/2019
12/28/2019
4/6/2020
7/15/2020
10/23/2020
1/31/2021
5/11/2021
8/19/2021
11/27/2021
3/7/2022
6/15/2022
9/23/2022
1/1/2023

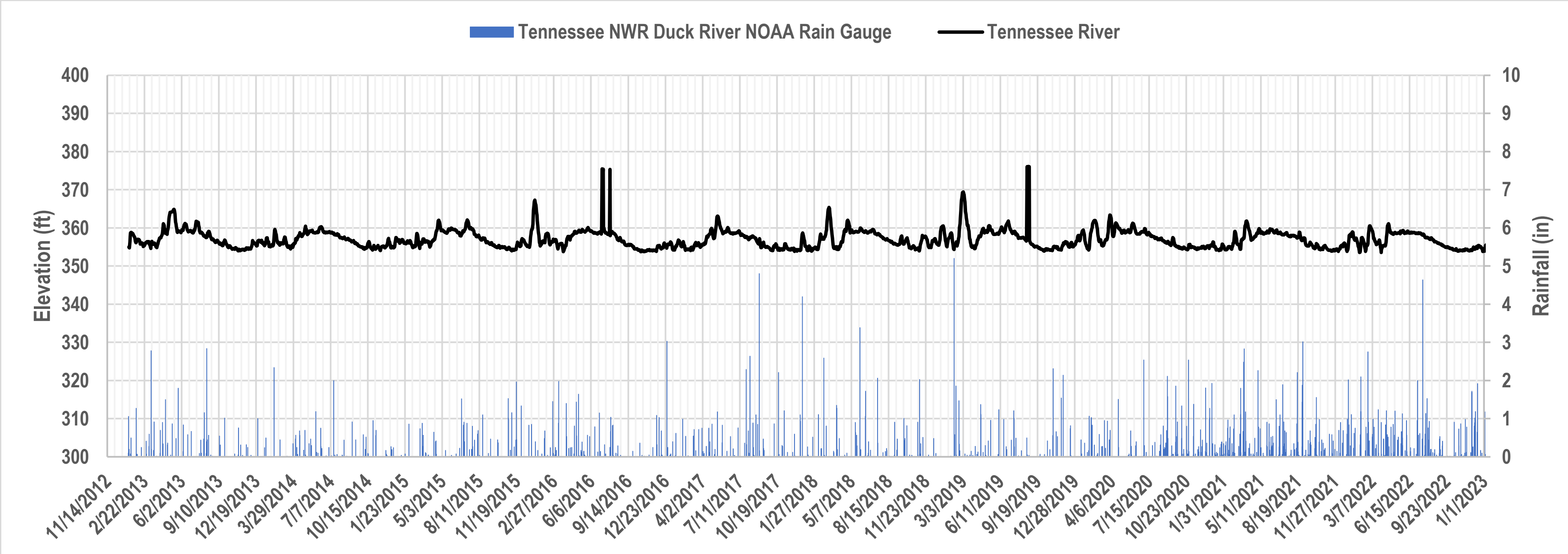

JOF_PZLC
JOF_PZLC_CALC
JOF_PZLC Tip Elevation
Elevation (ft)
Active Ash Pond 2
Clay
CCR
Clay
400
390
380
370
360
350
340
330
320
310
300
11/14/2012
2/22/2013
6/2/2013
9/10/2013
12/19/2013
3/29/2014
7/7/2014
10/15/2014
1/23/2015
5/3/2015
8/11/2015
11/19/2015
2/27/2016
6/6/2016
9/14/2016
12/23/2016
4/2/2017
7/11/2017
10/19/2017
1/27/2018
5/7/2018
8/15/2018
11/23/2018
3/3/2019
6/11/2019
9/19/2019
12/28/2019
4/6/2020
7/15/2020
10/23/2020
1/31/2021
5/11/2021
8/19/2021
11/27/2021
3/7/2022
6/15/2022
9/23/2022
1/1/2023

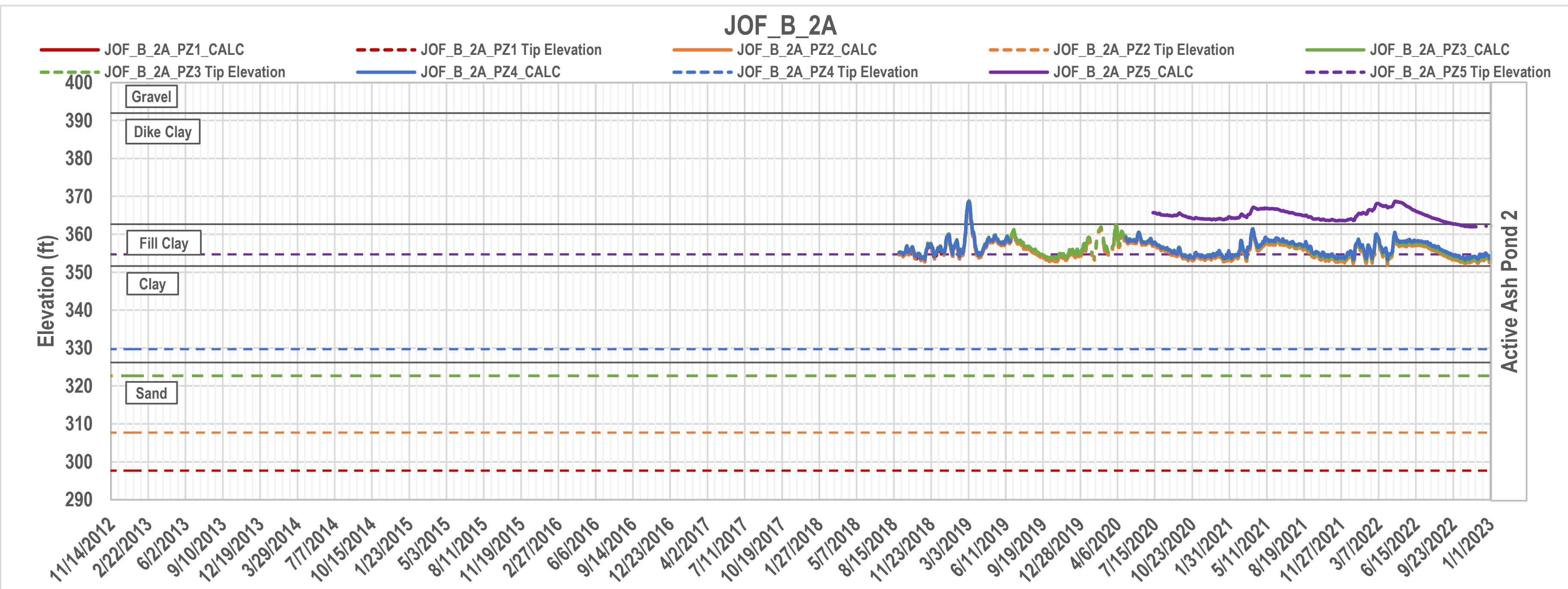


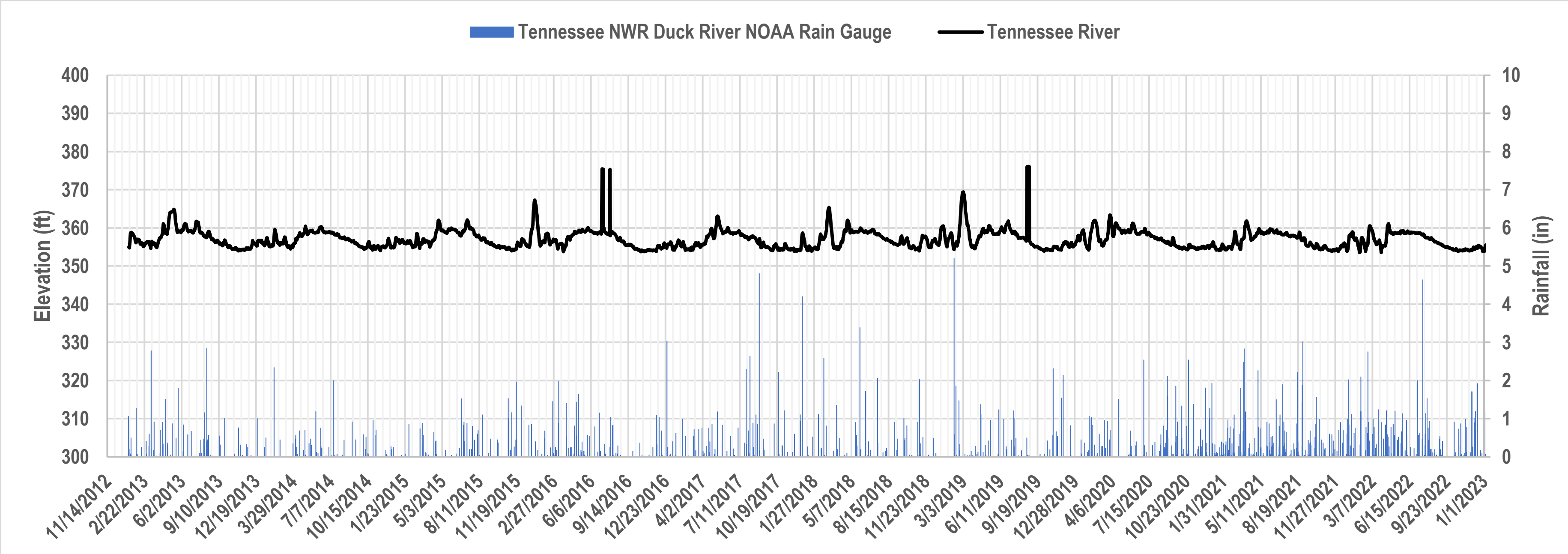
Tennessee NWR Duck River NOAA Rain Gauge
Tennessee River
Elevation (ft)
Rainfall (in)



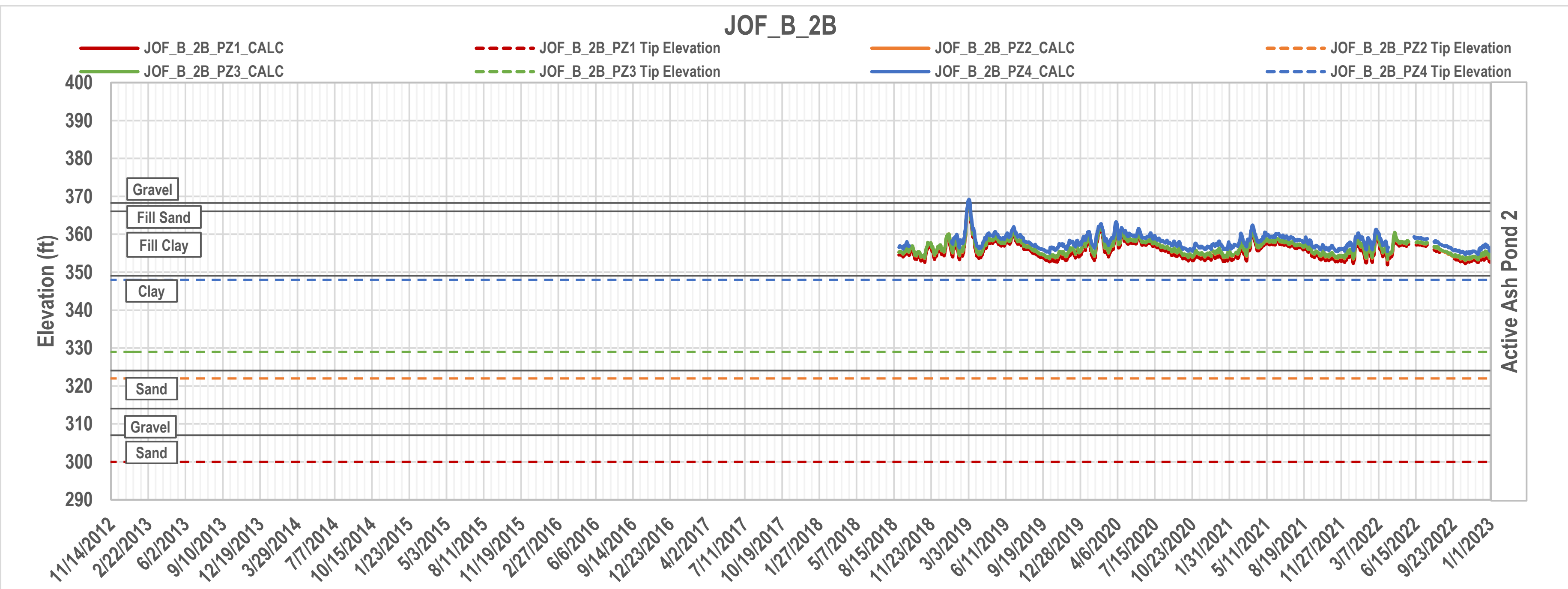
JOF_PZMC
JOF_PZMC_CALC
JOF_PZMC Tip Elevation
Clay
CCR
Clay
Elevation (ft)
Active Ash Pond 2


Tennessee NWR Duck River NOAA Rain Gauge
Tennessee River
Elevation (ft)
Rainfall (in)
400
390
380
370
360
350
340
330
320
310
300
10
9
8
7
6
5
4
3
2
1
0
11/14/2012
2/22/2013
6/2/2013
9/10/2013
12/19/2013
3/29/2014
7/7/2014
10/15/2014
1/23/2015
5/3/2015
8/11/2015
11/19/2015
2/27/2016
6/6/2016
9/14/2016
12/23/2016
4/2/2017
7/11/2017
10/19/2017
1/27/2018
5/7/2018
8/15/2018
11/23/2018
3/3/2019
6/11/2019
9/19/2019
12/28/2019
4/6/2020
7/15/2020
10/23/2020
1/31/2021
5/11/2021
8/19/2021
11/27/2021
3/7/2022
6/15/2022
9/23/2022
1/1/2023

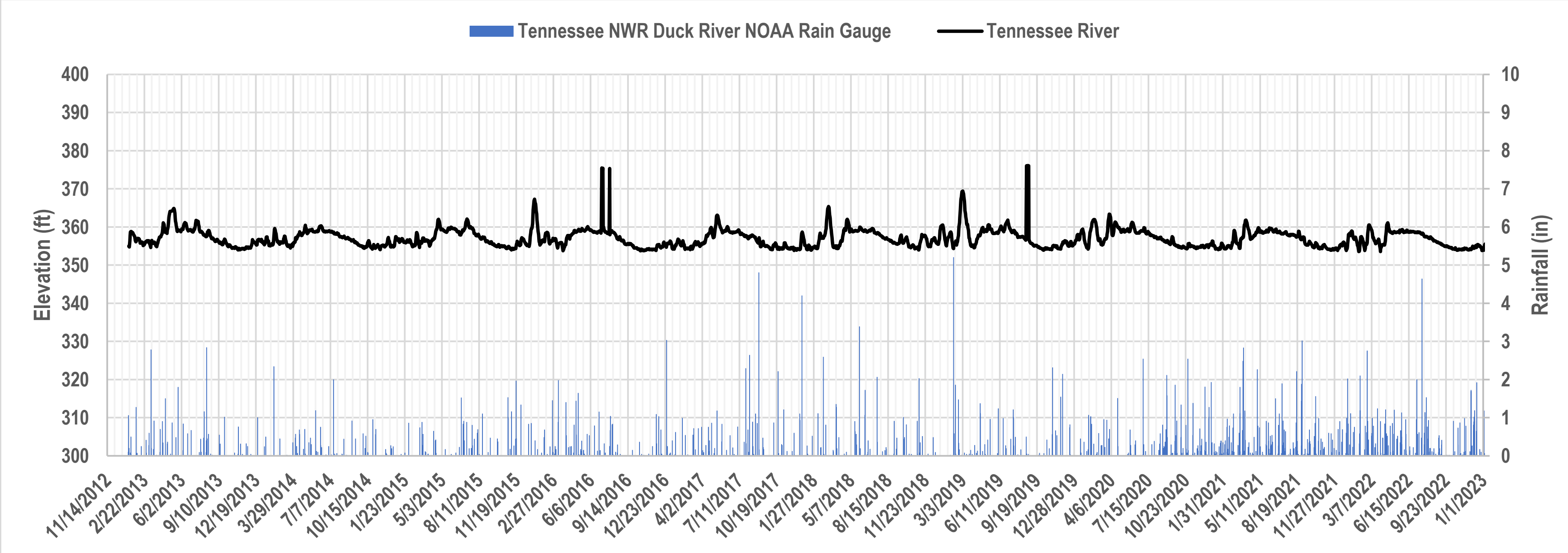

JOF_B_2A
JOF_B_2A_PZ1_CALC
JOF_B_2A_PZ1 Tip Elevation
JOF_B_2A_PZ2_CALC
JOF_B_2A_PZ2 Tip Elevation
JOF_B_2A_PZ3_CALC
JOF_B_2A_PZ3 Tip Elevation
JOF_B_2A_PZ4_CALC
JOF_B_2A_PZ4 Tip Elevation
JOF_B_2A_PZ5_CALC
JOF_B_2A_PZ5 Tip Elevation
Gravel
Dike Clay
Fill Clay
Clay
Sand
Elevation (ft)
Active Ash Pond 2
400
390
380
370
360
350
340
330
320
310
300
290
11/14/2012
2/22/2013
6/2/2013
9/10/2013
12/19/2013
3/29/2014
7/7/2014
10/15/2014
1/23/2015
5/3/2015
8/11/2015
11/19/2015
2/27/2016
6/6/2016
9/14/2016
12/23/2016
4/2/2017
7/11/2017
10/19/2017
1/27/2018
5/7/2018
8/15/2018
11/23/2018
3/3/2019
6/11/2019
9/19/2019
12/28/2019
4/6/2020
7/15/2020
10/23/2020
1/31/2021
5/11/2021
8/19/2021
11/27/2021
3/7/2022
6/15/2022
9/23/2022
1/1/2023

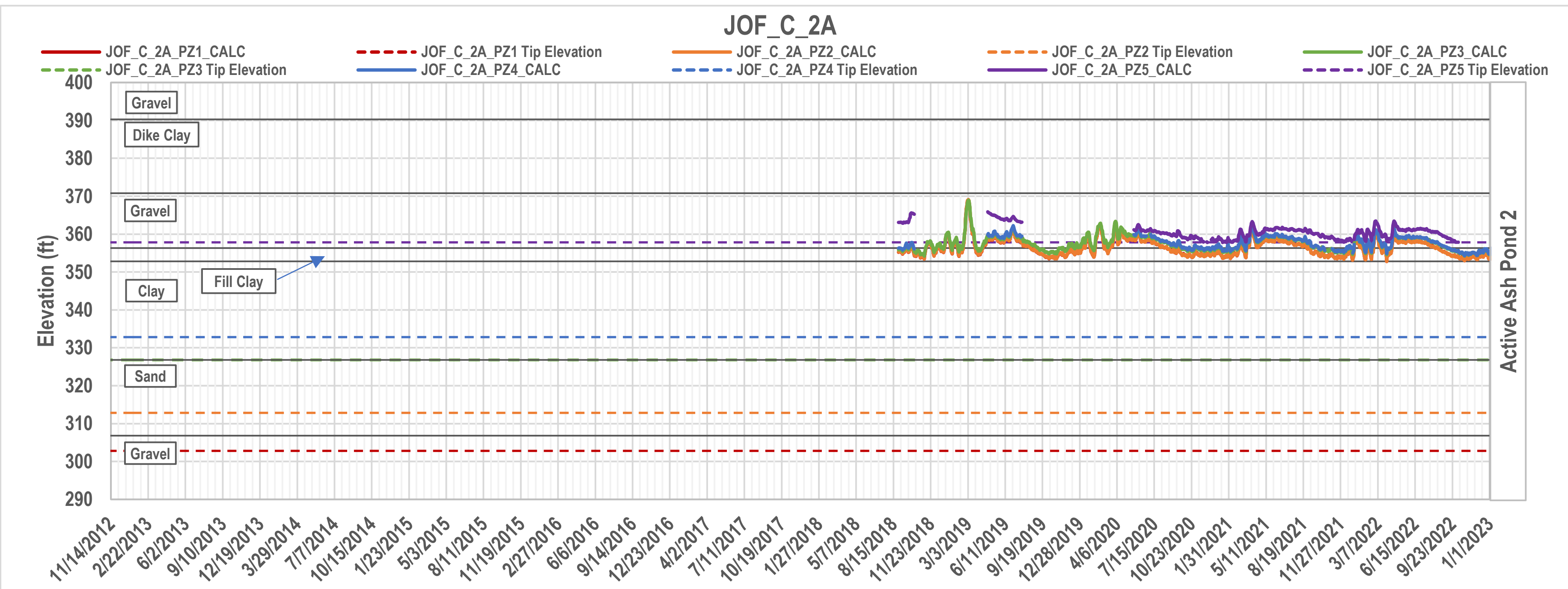


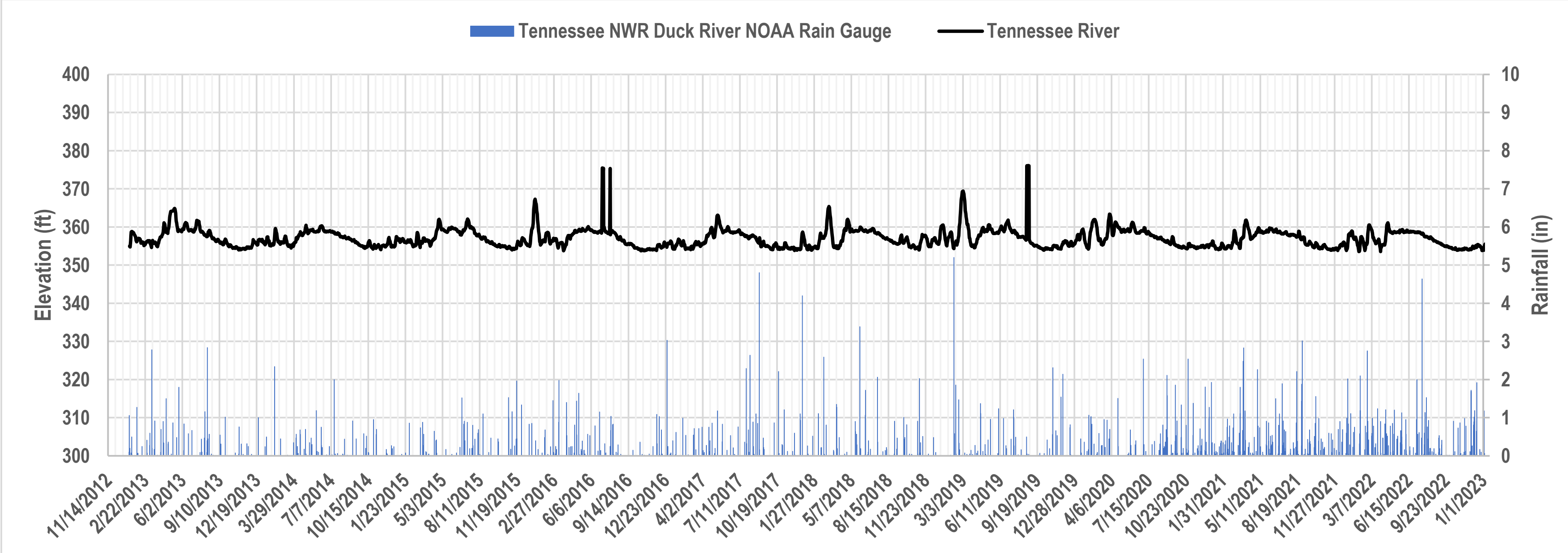
Tennessee NWR Duck River NOAA Rain Gauge
Tennessee River
Elevation (ft)
Rainfall (in)
400
390
380
370
360
350
340
330
320
310
300
10
9
8
7
6
5
4
3
2
1
0
11/14/2012
2/22/2013
6/2/2013
9/10/2013
12/19/2013
3/29/2014
7/7/2014
10/15/2014
1/23/2015
5/3/2015
8/11/2015
11/19/2015
2/27/2016
6/6/2016
9/14/2016
12/23/2016
4/2/2017
7/11/2017
10/19/2017
1/27/2018
5/7/2018
8/15/2018
11/23/2018
3/3/2019
6/11/2019
9/19/2019
12/28/2019
4/6/2020
7/15/2020
10/23/2020
1/31/2021
5/11/2021
8/19/2021
11/27/2021
3/7/2022
6/15/2022
9/23/2022
1/1/2023



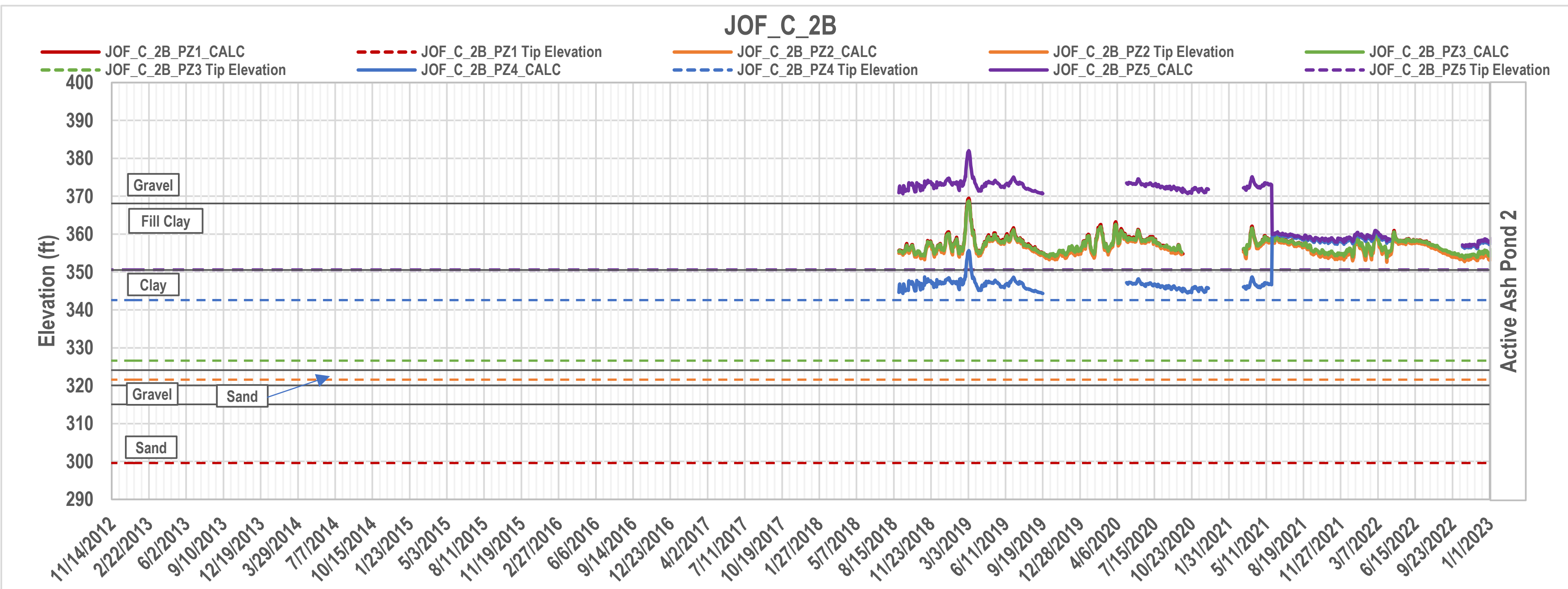
JOF_B_2B
JOF_B_2B_PZ1_CALC
JOF_B_2B_PZ1 Tip Elevation
JOF_B_2B_PZ2_CALC
JOF_B_2B_PZ2 Tip Elevation
JOF_B_2B_PZ3_CALC
JOF_B_2B_PZ3 Tip Elevation
JOF_B_2B_PZ4_CALC
JOF_B_2B_PZ4 Tip Elevation
Elevation (ft)
400
390
380
370
360
350
340
330
320
310
300
290
Gravel
Fill Sand
Fill Clay
Clay
Sand
Gravel
Sand
Active Ash Pond 2
11/14/2012
2/22/2013
6/2/2013
9/10/2013
12/19/2013
3/29/2014
7/7/2014
10/15/2014
1/23/2015
5/3/2015
8/11/2015
11/19/2015
2/27/2016
6/6/2016
9/14/2016
12/23/2016
4/2/2017
7/11/2017
10/19/2017
1/27/2018
5/7/2018
8/15/2018
11/23/2018
3/3/2019
6/11/2019
9/19/2019
12/28/2019
4/6/2020
7/15/2020
10/23/2020
1/31/2021
5/11/2021
8/19/2021
11/27/2021
3/7/2022
6/15/2022
9/23/2022
1/1/2023


Tennessee NWR Duck River NOAA Rain Gauge
Tennessee River
Elevation (ft)
Rainfall (in)

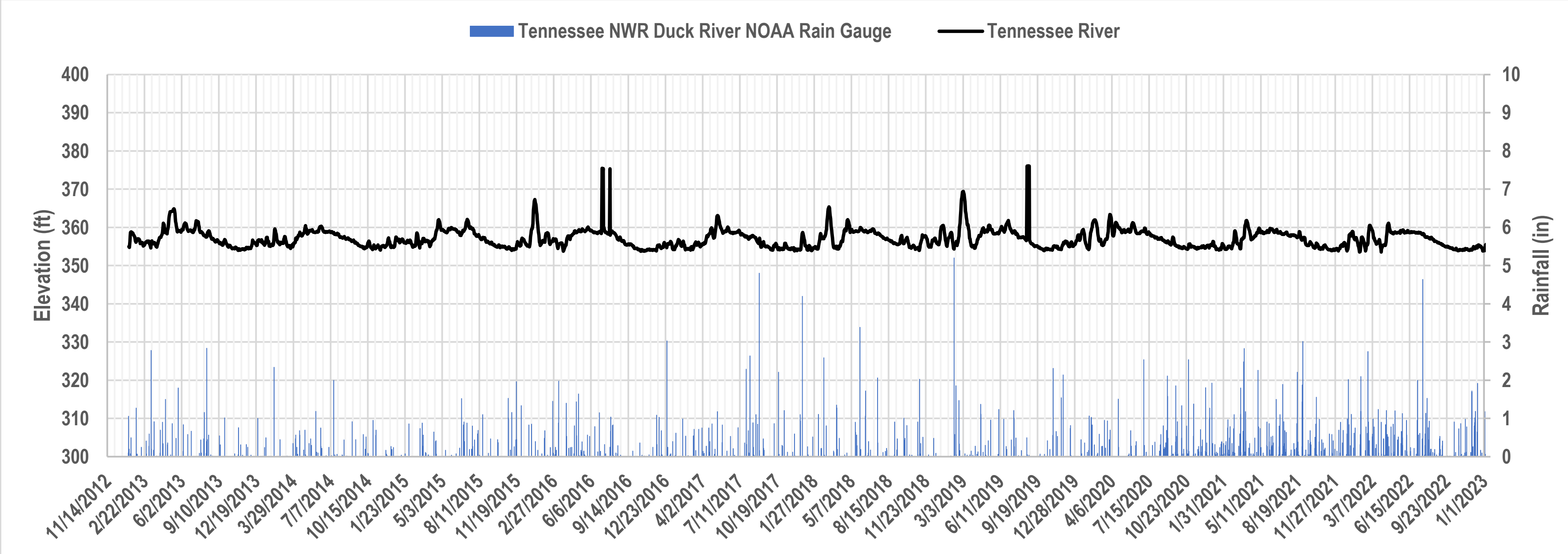

JOF_C_2A
JOF_C_2A_PZ1_CALC
JOF_C_2A_PZ1 Tip Elevation
JOF_C_2A_PZ2_CALC
JOF_C_2A_PZ2 Tip Elevation
JOF_C_2A_PZ3_CALC
JOF_C_2A_PZ3 Tip Elevation
JOF_C_2A_PZ4_CALC
JOF_C_2A_PZ4 Tip Elevation
JOF_C_2A_PZ5_CALC
JOF_C_2A_PZ5 Tip Elevation
Gravel
Dike Clay
Gravel
Fill Clay
Clay
Sand
Gravel
Elevation (ft)
Active Ash Pond 2



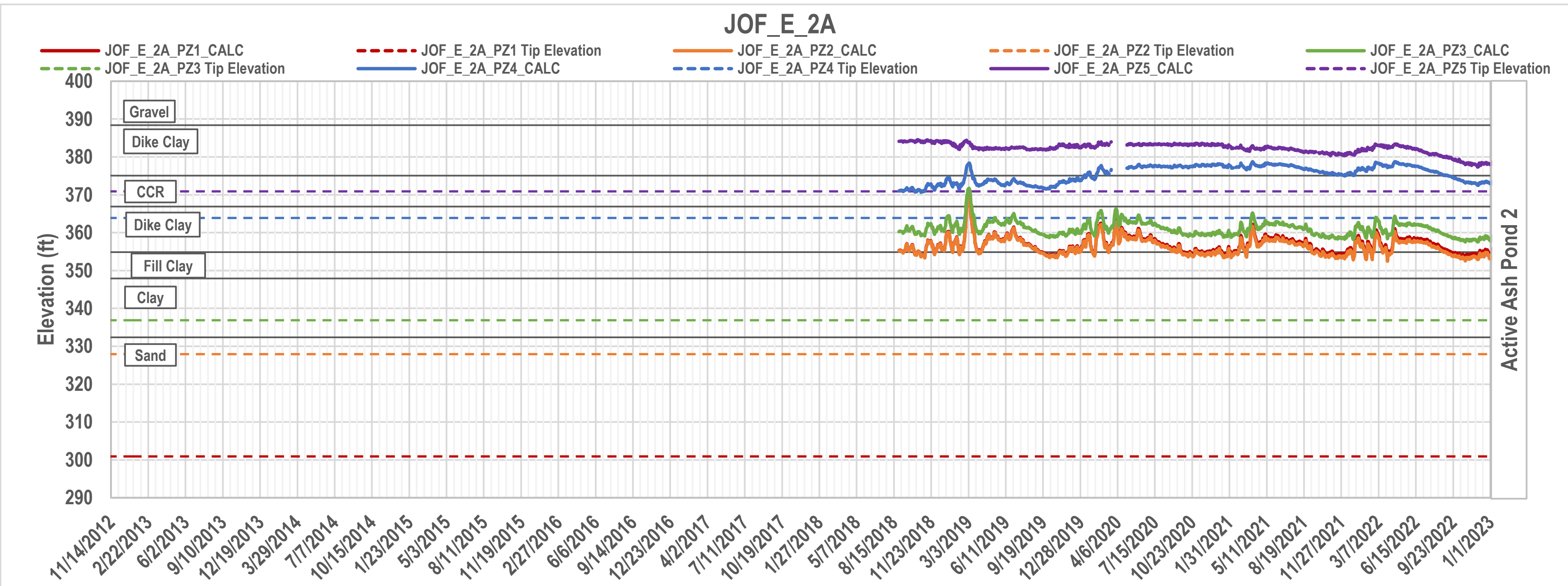
Tennessee NWR Duck River NOAA Rain Gauge
Tennessee River
Elevation (ft)
Rainfall (in)



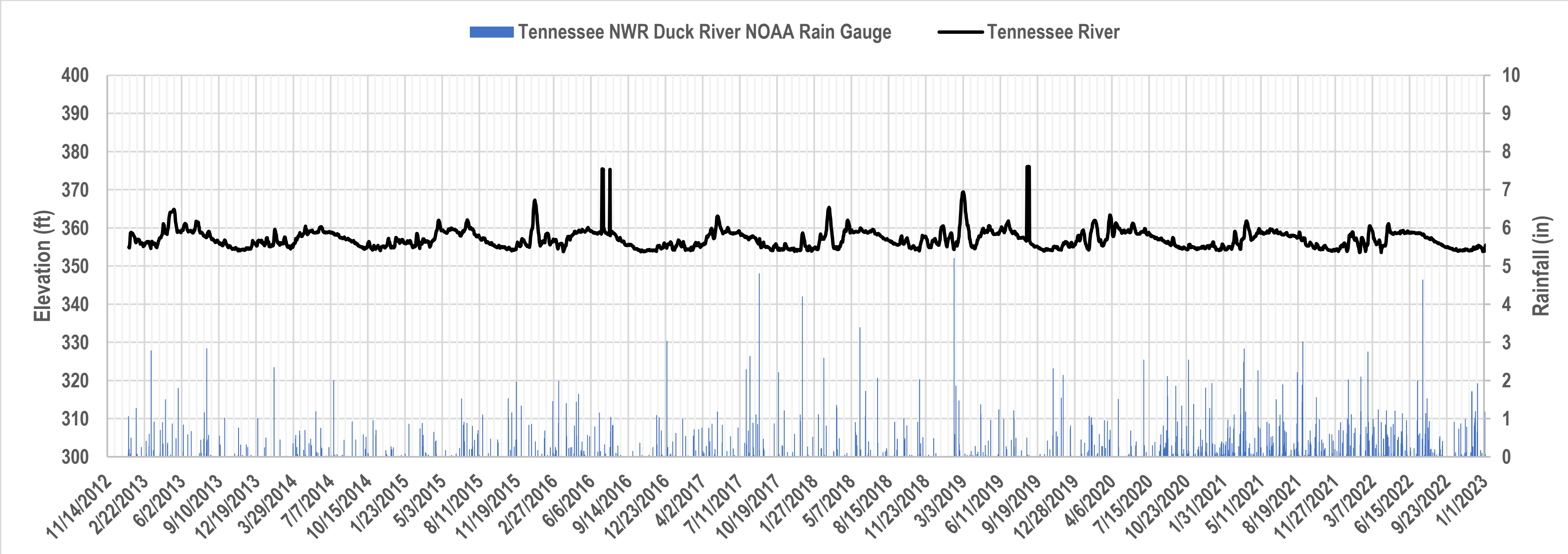
JOF_C_2B
JOF_C_2B_PZ1_CALC
JOF_C_2B_PZ1 Tip Elevation
JOF_C_2B_PZ2_CALC
JOF_C_2B_PZ2 Tip Elevation
JOF_C_2B_PZ3_CALC
JOF_C_2B_PZ3 Tip Elevation
JOF_C_2B_PZ4_CALC
JOF_C_2B_PZ4 Tip Elevation
JOF_C_2B_PZ5_CALC
JOF_C_2B_PZ5 Tip Elevation
Elevation (ft)
Gravel
Fill Clay
Clay
Gravel
Sand
Sand
Active Ash Pond 2



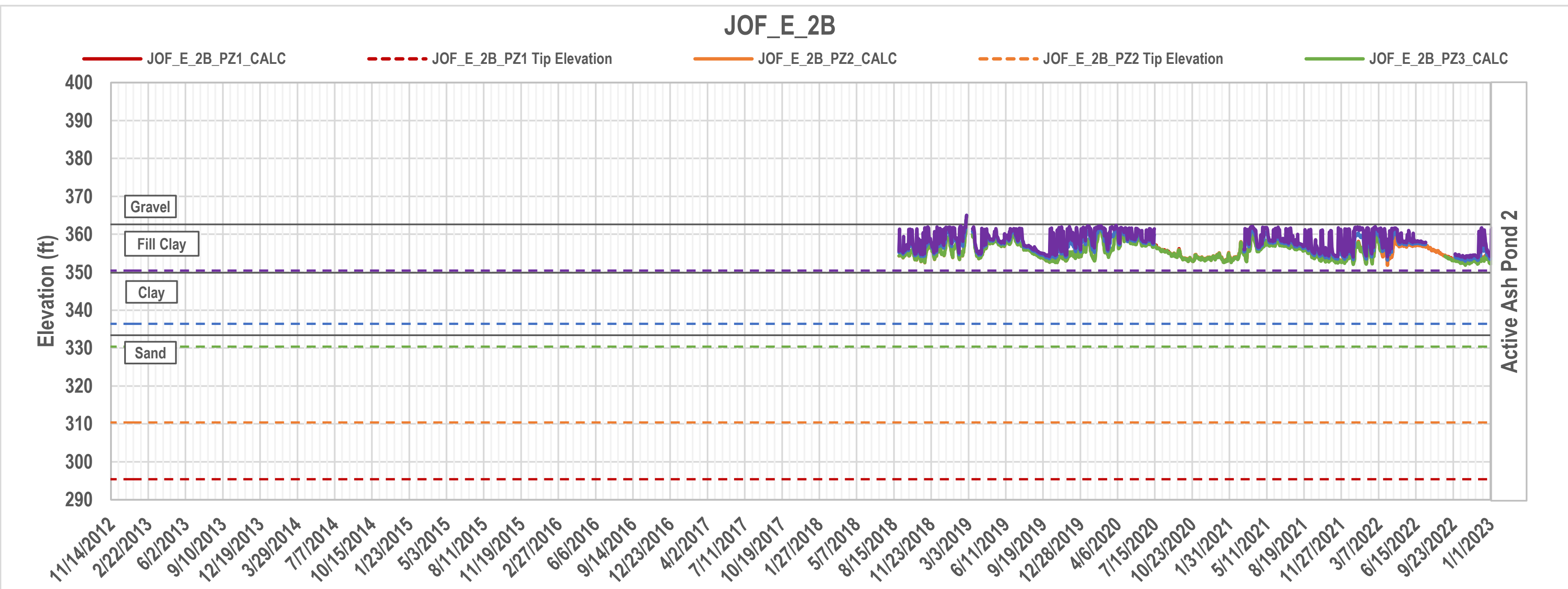
Tennessee NWR Duck River NOAA Rain Gauge
Tennessee River
Elevation (ft)
Rainfall (in)
400
390
380
370
360
350
340
330
320
310
300
10
9
8
7
6
5
4
3
2
1
0
11/14/2012
2/22/2013
6/2/2013
9/10/2013
12/19/2013
3/29/2014
7/7/2014
10/15/2014
1/23/2015
5/3/2015
8/11/2015
11/19/2015
2/27/2016
6/6/2016
9/14/2016
12/23/2016
4/2/2017
7/11/2017
10/19/2017
1/27/2018
5/7/2018
8/15/2018
11/23/2018
3/3/2019
6/11/2019
9/19/2019
12/28/2019
4/6/2020
7/15/2020
10/23/2020
1/31/2021
5/11/2021
8/19/2021
11/27/2021
3/7/2022
6/15/2022
9/23/2022
1/1/2023



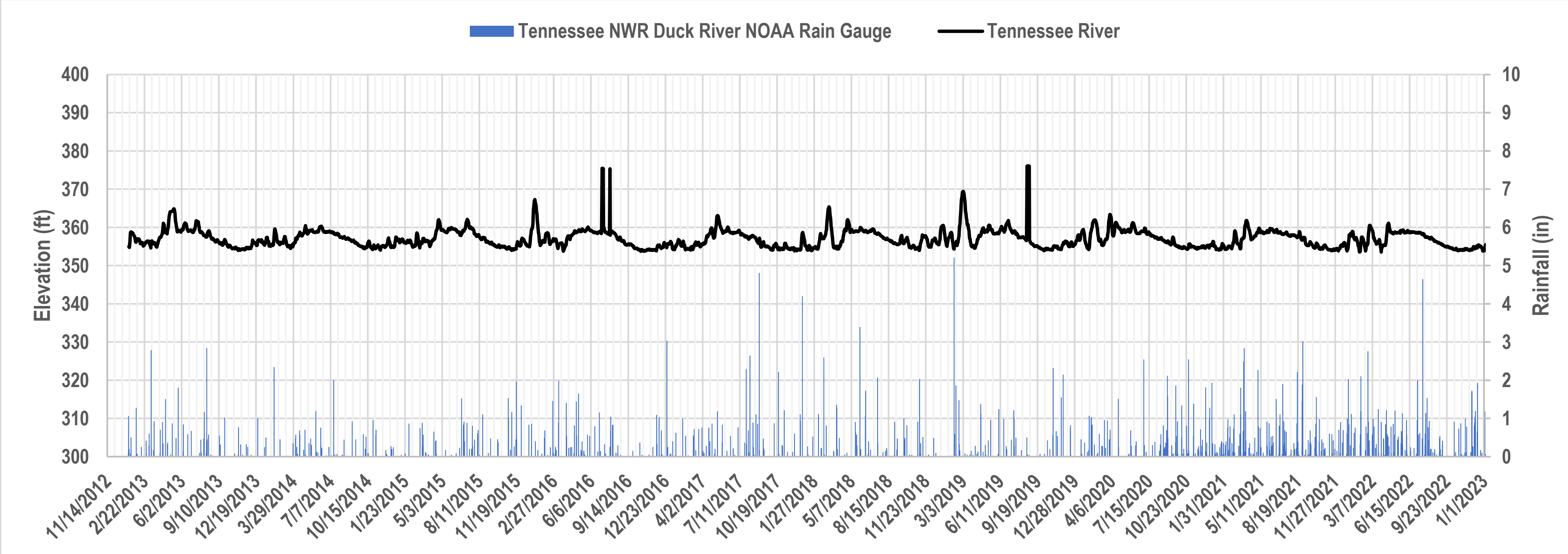
JOF_E_2A
JOF_E_2A_PZ1_CALC
JOF_E_2A_PZ1 Tip Elevation
JOF_E_2A_PZ2_CALC
JOF_E_2A_PZ2 Tip Elevation
JOF_E_2A_PZ3_CALC
JOF_E_2A_PZ3 Tip Elevation
JOF_E_2A_PZ4_CALC
JOF_E_2A_PZ4 Tip Elevation
JOF_E_2A_PZ5_CALC
JOF_E_2A_PZ5 Tip Elevation
Elevation (ft)
Gravel
Dike Clay
CCR
Dike Clay
Fill Clay
Clay
Sand
Active Ash Pond 2
400
390
380
370
360
350
340
330
320
310
300
290
11/14/2012
2/22/2013
6/2/2013
9/10/2013
12/19/2013
3/29/2014
7/7/2014
10/15/2014
1/23/2015
5/3/2015
8/11/2015
11/19/2015
2/27/2016
6/6/2016
9/14/2016
12/23/2016
4/2/2017
7/11/2017
10/19/2017
1/27/2018
5/7/2018
8/15/2018
11/23/2018
3/3/2019
6/11/2019
9/19/2019
12/28/2019
4/6/2020
7/15/2020
10/23/2020
1/31/2021
5/11/2021
8/19/2021
11/27/2021
3/7/2022
6/15/2022
9/23/2022
1/1/2023

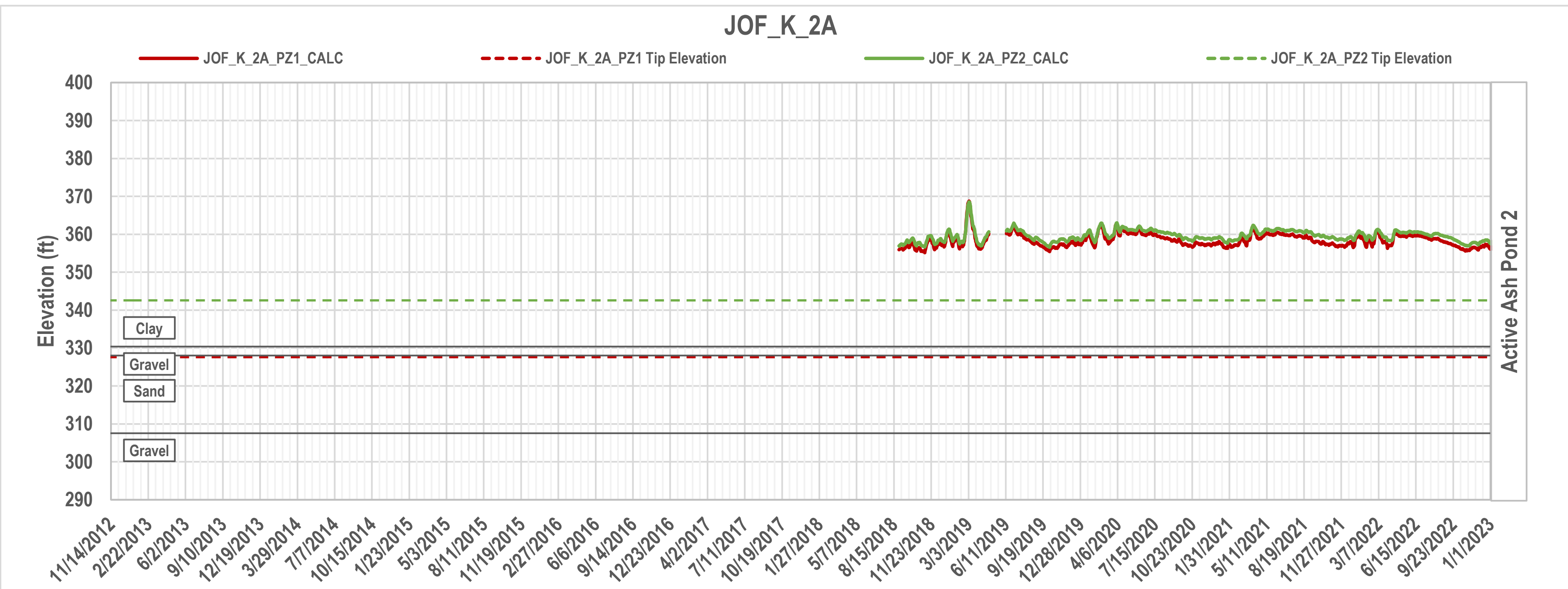


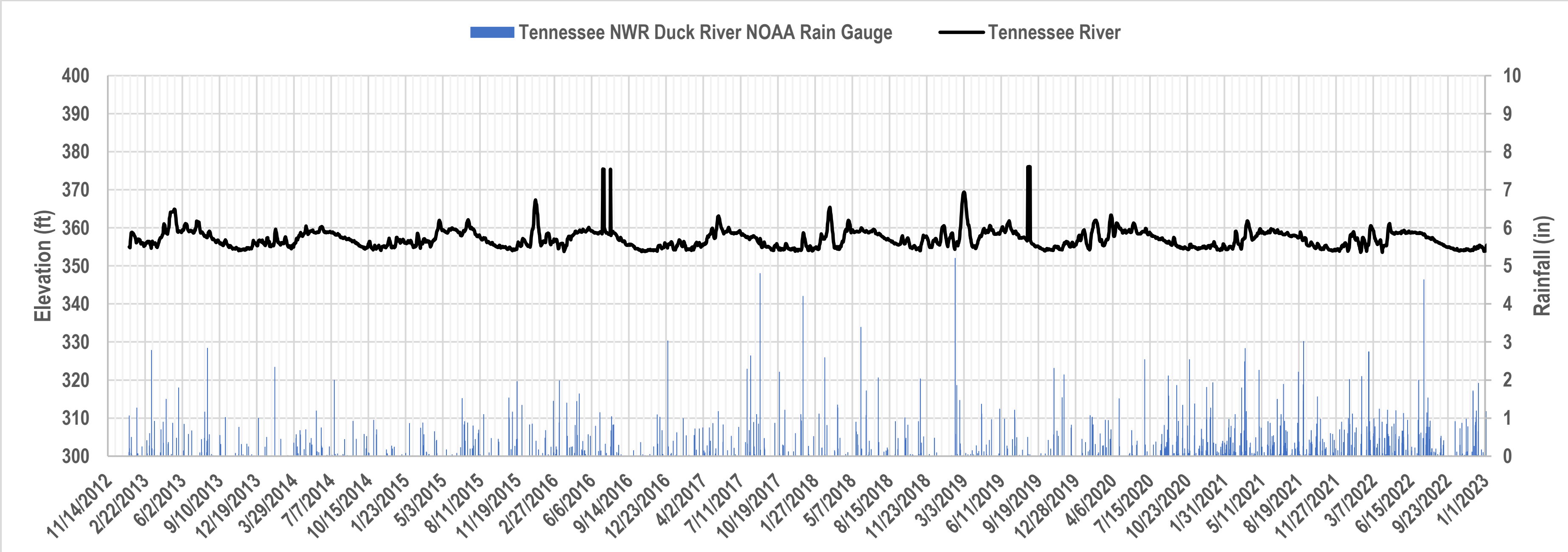
Tennessee NWR Duck River NOAA Rain Gauge
Tennessee River
Elevation (ft)
Rainfall (in)

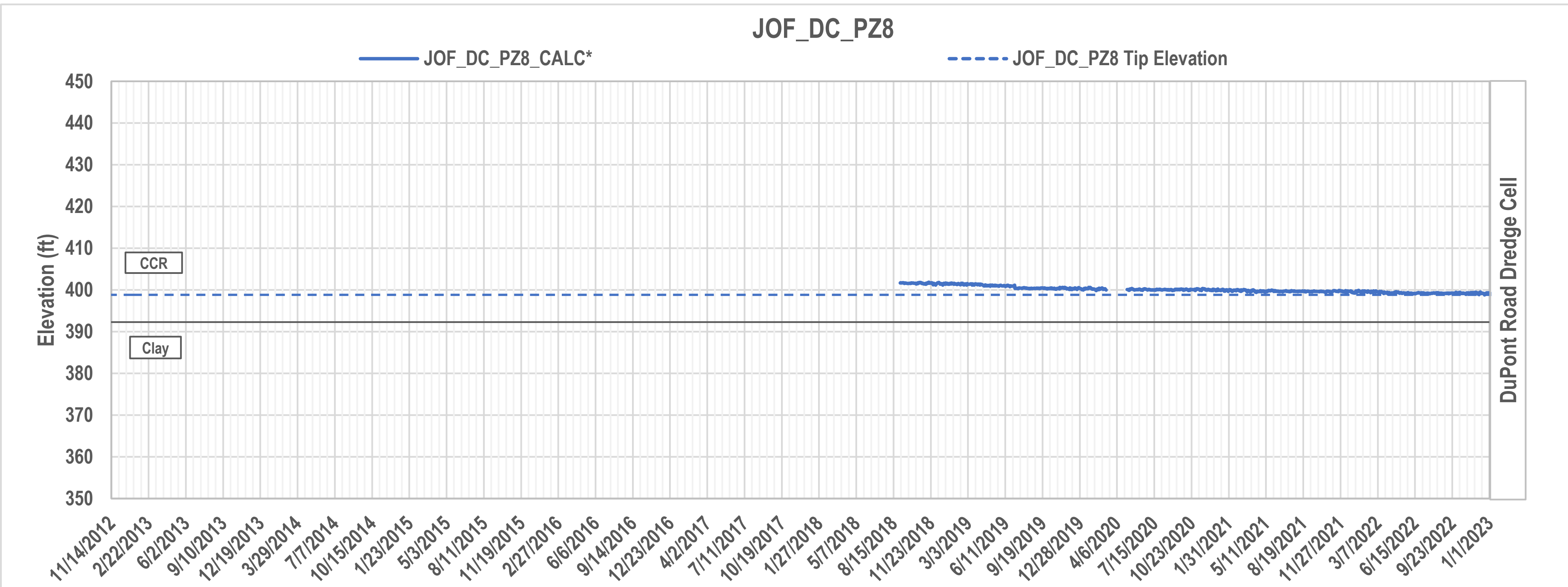


JOF_E_2B
JOF_E_2B_PZ1_CALC
JOF_E_2B_PZ1 Tip Elevation
JOF_E_2B_PZ2_CALC
JOF_E_2B_PZ2 Tip Elevation
JOF_E_2B_PZ3_CALC
Gravel
Fill Clay
Clay
Sand
Elevation (ft)
Active Ash Pond 2

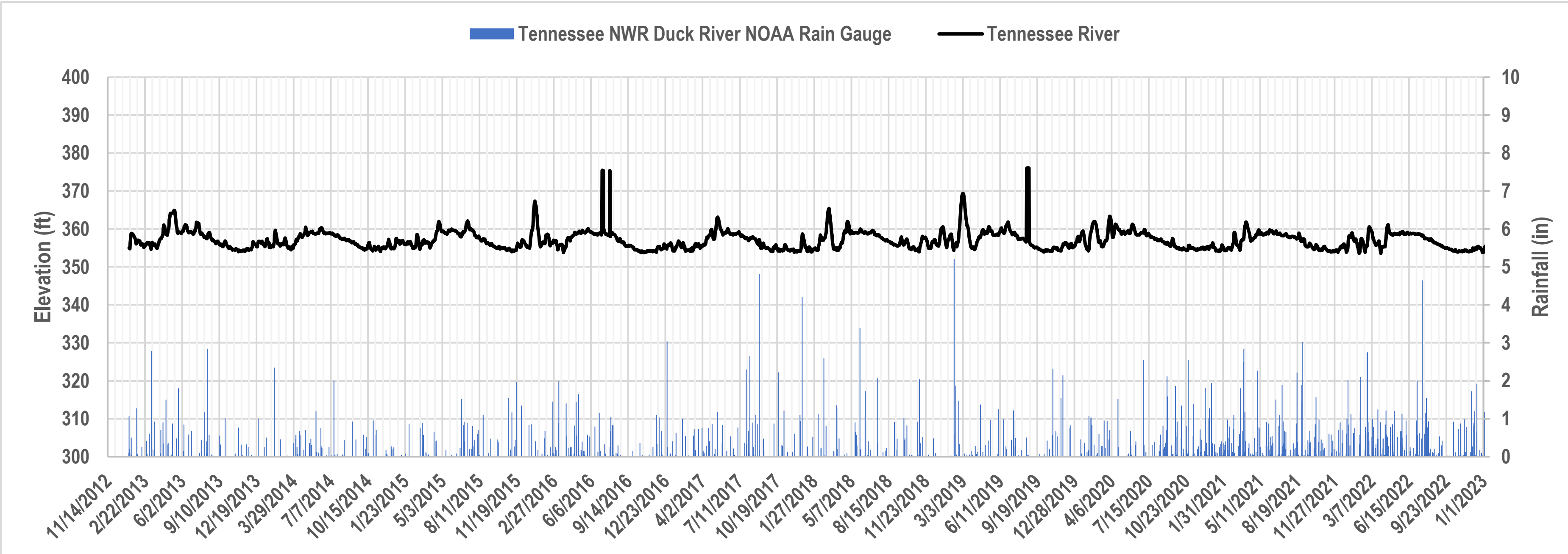

Tennessee NWR Duck River NOAA Rain Gauge
Tennessee River
Elevation (ft)
Rainfall (in)

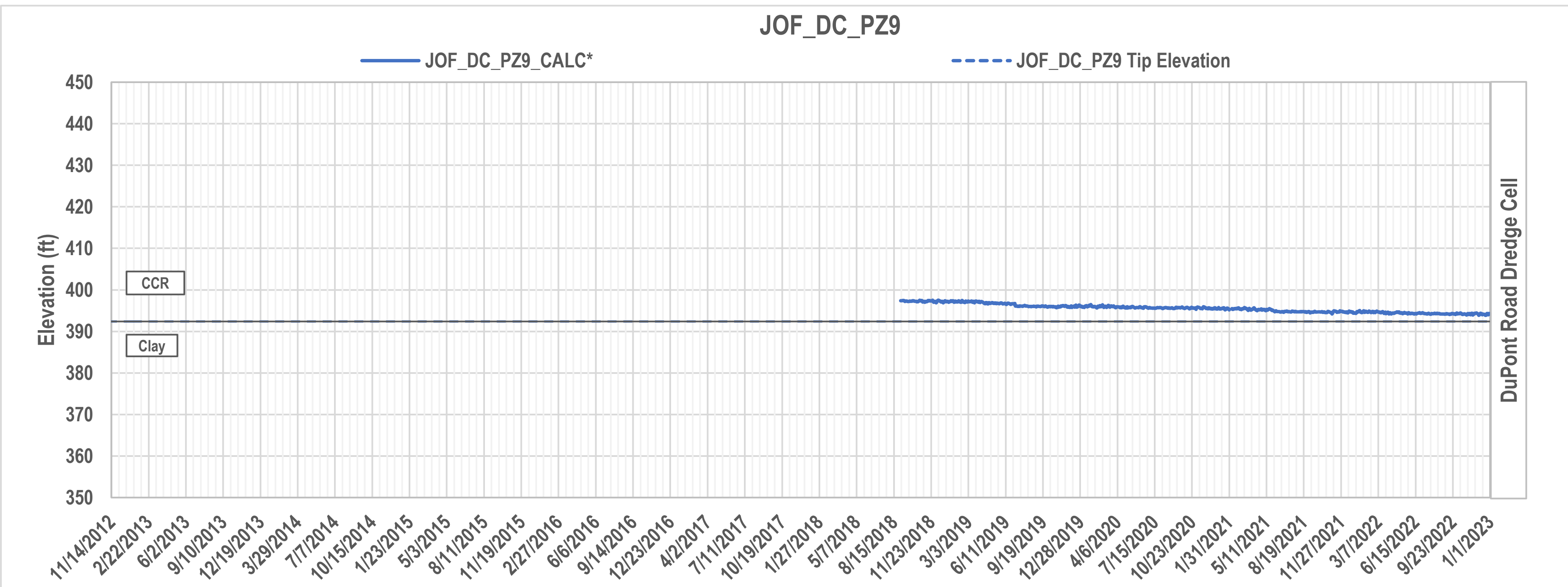

JOF_K_2A
JOF_K_2A_PZ1_CALC
JOF_K_2A_PZ1 Tip Elevation
JOF_K_2A_PZ2_CALC
JOF_K_2A_PZ2 Tip Elevation
Elevation (ft)
Clay
Gravel
Sand
Gravel
Active Ash Pond 2



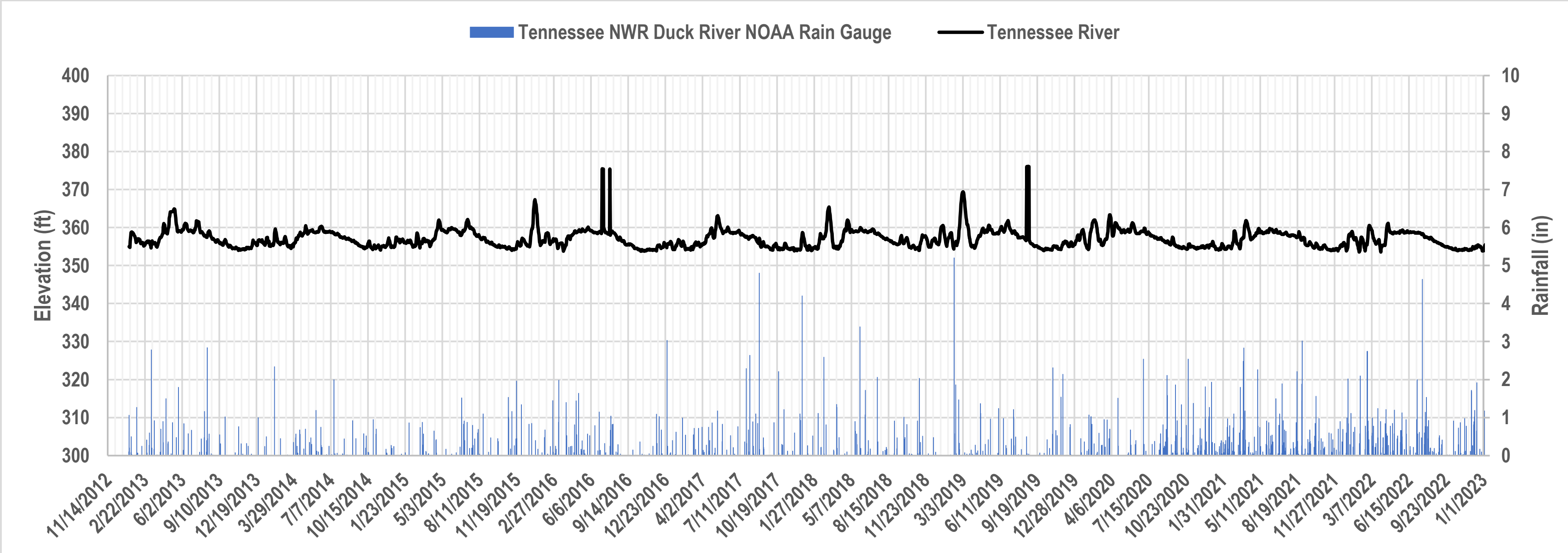


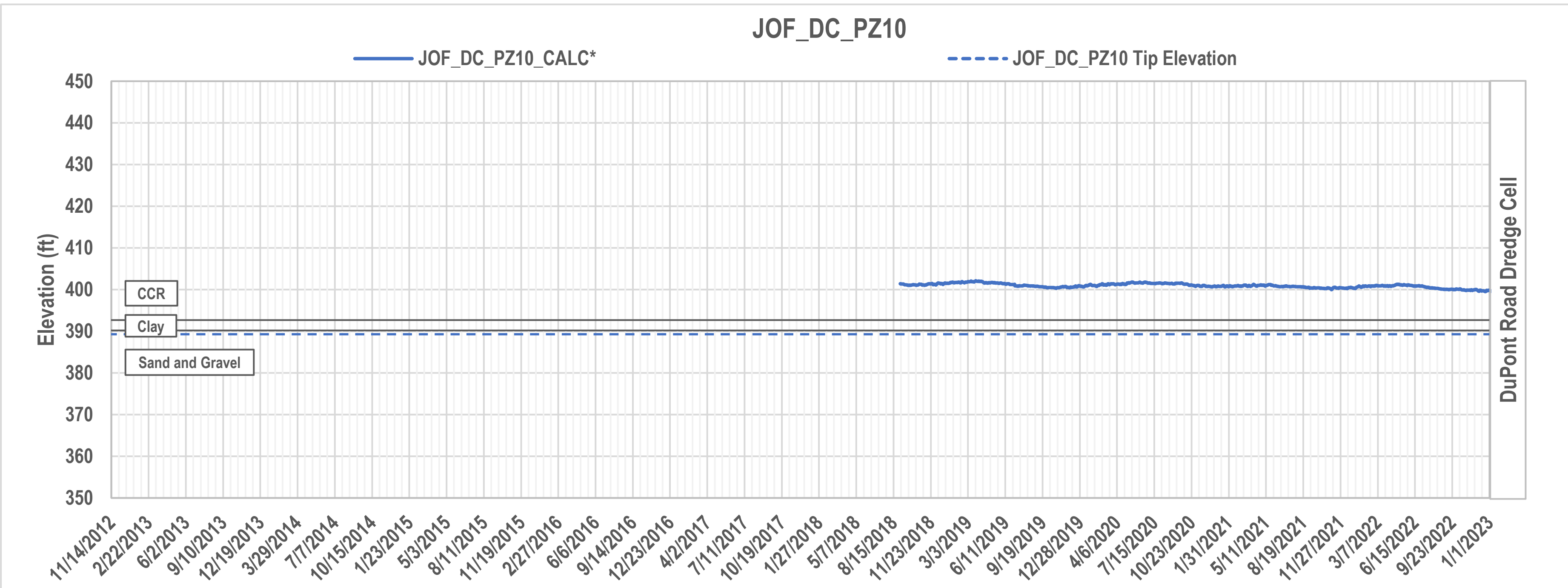
* Tip elevation is unavailable for this instrument.





* Tip elevation is unavailable for this instrument.





* Tip elevation is unavailable for this instrument.

ATTACHMENT H.1-B PIPER DIAGRAMS

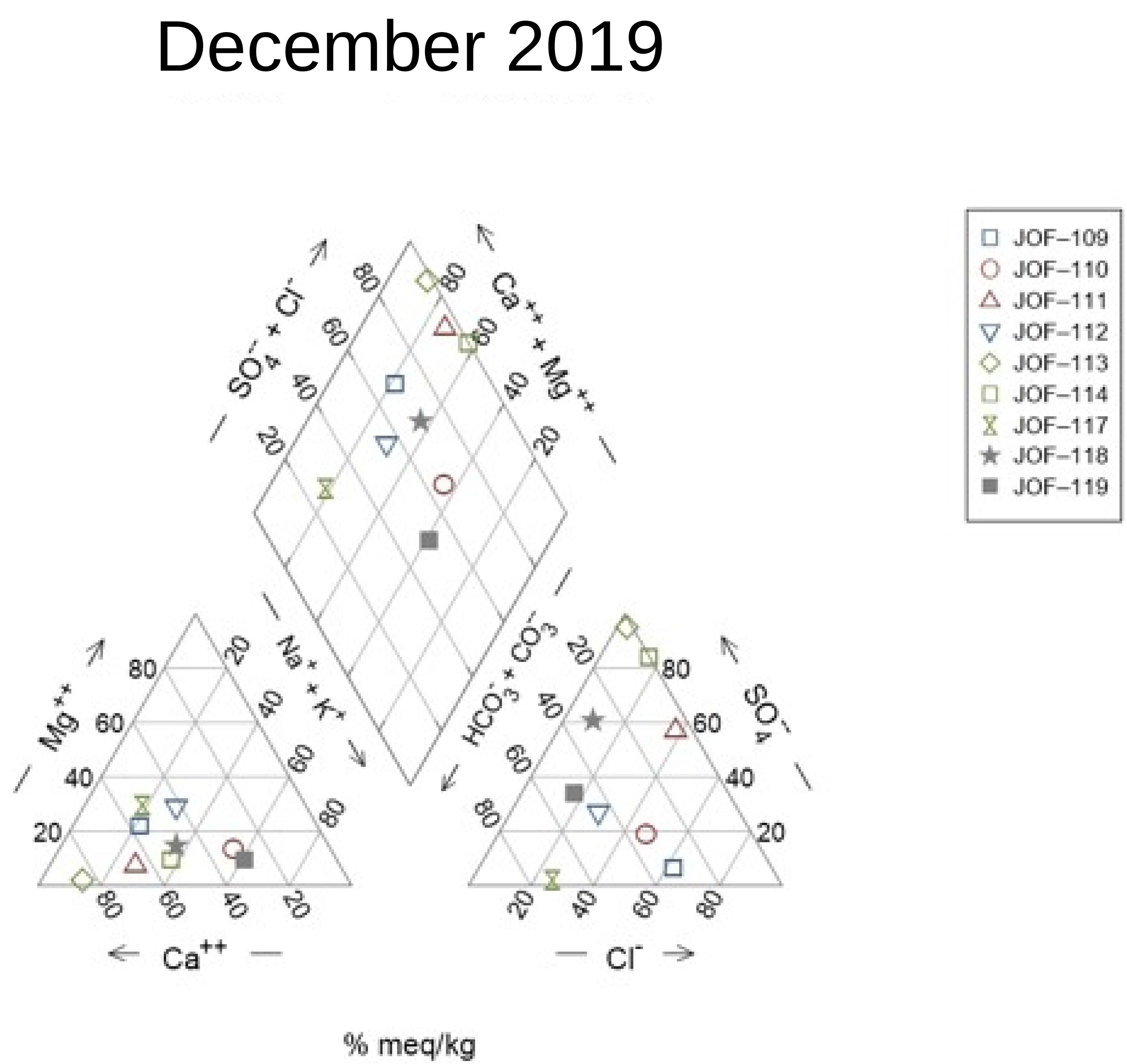


Exhibit No.

H.1-Aa

Title

Piper Diagram - December 2019

Client/Project 175568286

Tennessee Valley Authority
Johnsonville Fossil (JOF) Plant TDEC Order

Clinton, Tennessee
New Johnsonville, Tennessee

Prepared by DMB on 2022-10-18
TR by BL on 2022-10-18

Legend

Notes

1. % meq/kg - Percent milliequivalent per kilogram
2. Ca^{++} - Calcium
3. Cl^- - Chloride
4. CO_3 - Carbonate
5. HCO_3 - Bicarbonate
6. K^+ - Potassium
7. Mg^{++} - Magnesium
8. Na^+ - Sodium
9. SO_4 - Sulfate

U:\TVA-EIP\175568286_JOF_Phase2\gis\mxd\EAR\H.1-Aa_PiperDiagramDec2019.mxd Revised: 2022-10-18 By: mbough

February 2020

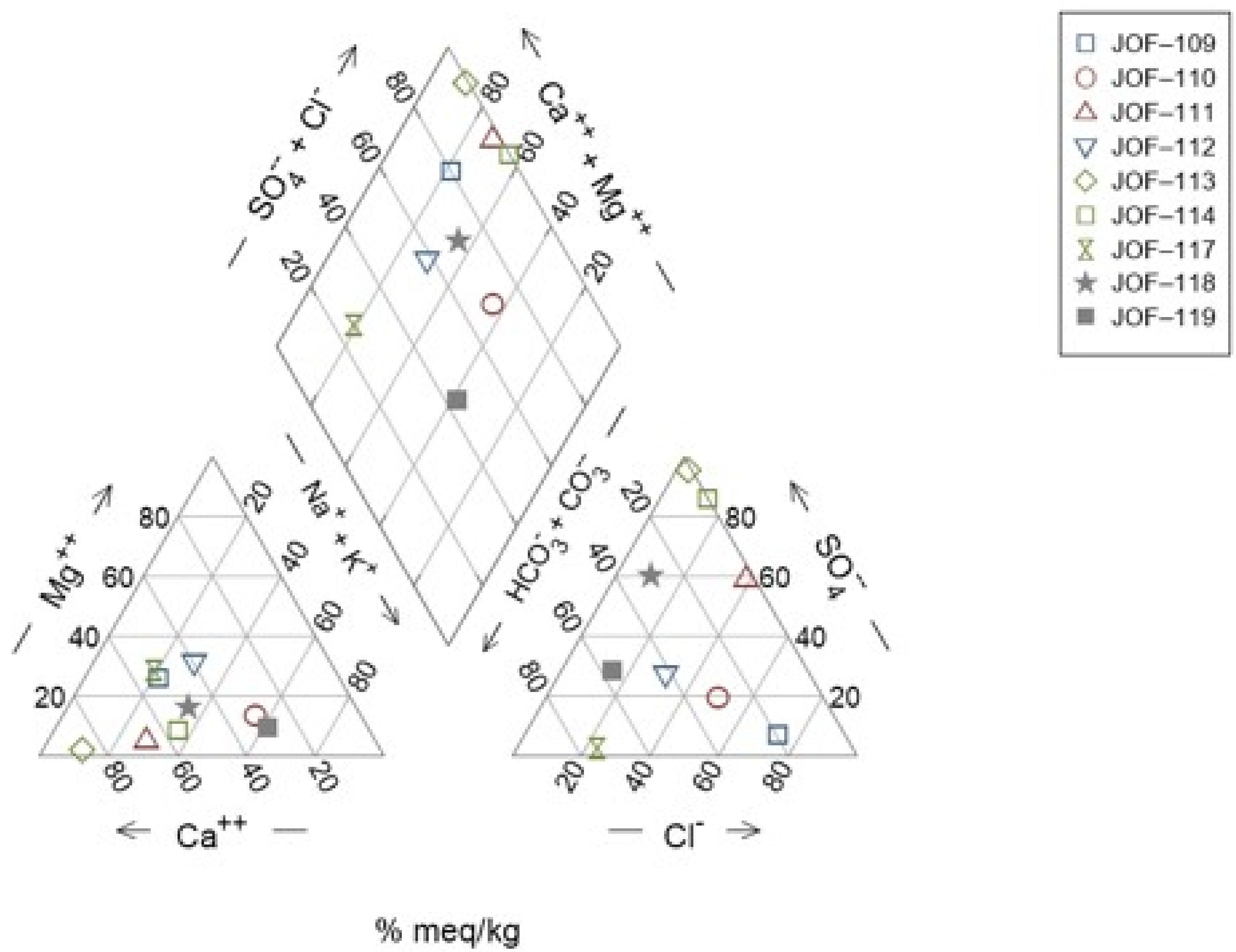


Exhibit No.
H.1-Ab

Title
Piper Diagram - February 2020

Client/Project 175568286
Tennessee Valley Authority
Johnsonville Fossil (JOF) Plant TDEC Order

Clinton, Tennessee
New Johnsonville, Tennessee

Prepared by DMB on 2022-10-18
TR by BL on 2022-10-18

Legend

Notes
1. % meq/kg - Percent milliequivalent per kilogram
2. Ca^{++} - Calcium
3. Cl^{-} - Chloride
4. CO_3 - Carbonate
5. HCO_3 - Bicarbonate
6. K^{+} - Potassium
7. Mg^{++} - Magnesium
8. Na^{+} - Sodium
9. SO_4 - Sulfate

U:\TVA-EIP\175568286_JOF_Phase2\gis\mxd\EAR\H.1-Ab_PiperDiagramFeb2020.mxd Revised: 2022-10-18 By: mbough

June 2020

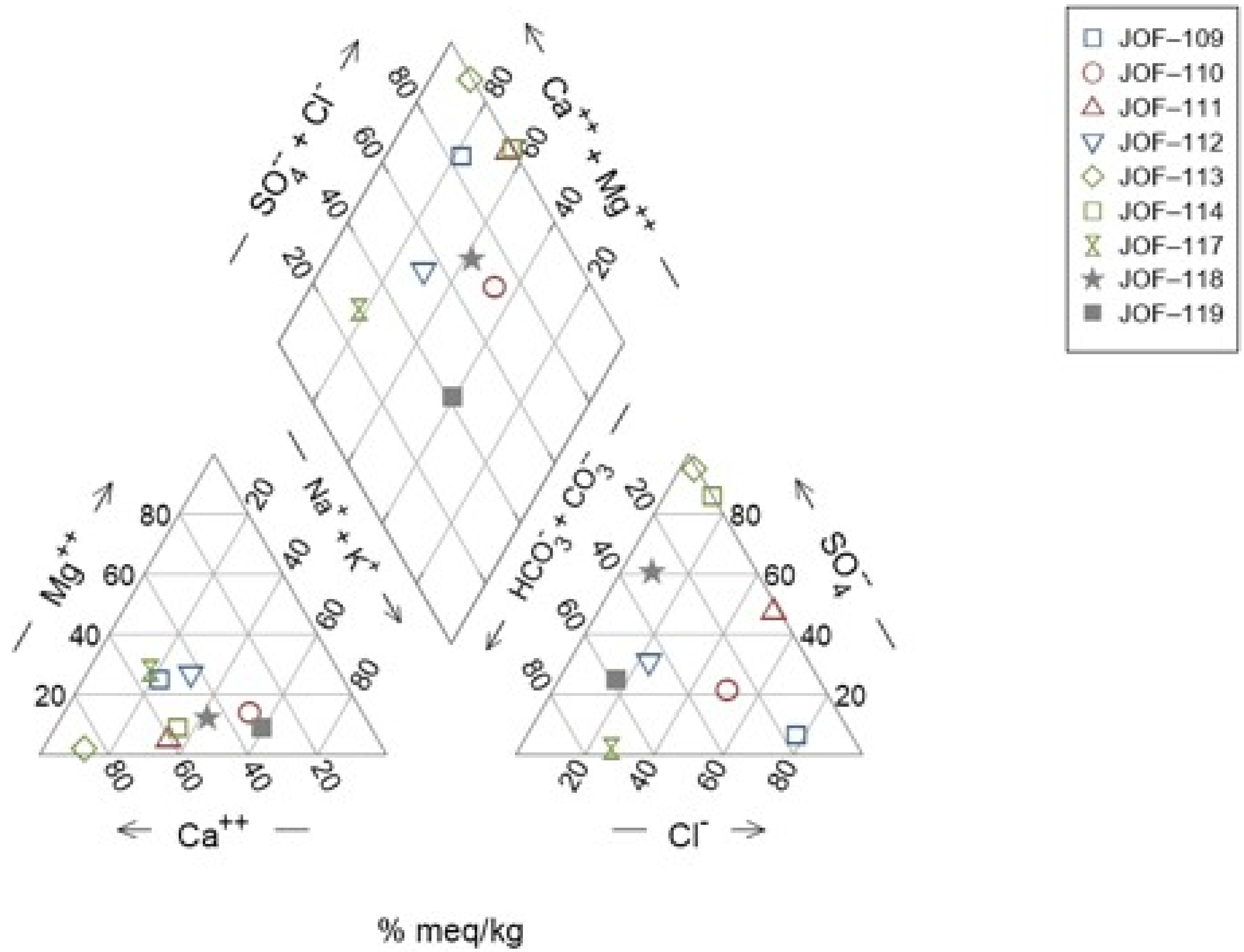


Exhibit No.

H.1-Ac

Title

Piper Diagram - June 2020

Client/Project 175568286

Tennessee Valley Authority
Johnsonville Fossil (JOF) Plant TDEC Order

Clinton, Tennessee
New Johnsonville, Tennessee

Prepared by DMB on 2022-10-18
TR by BL on 2022-10-18

Legend

Notes

1. % meq/kg - Percent milliequivalent per kilogram
2. Ca^{++} - Calcium
3. Cl^{-} - Chloride
4. CO_3 - Carbonate
5. HCO_3 - Bicarbonate
6. K^{+} - Potassium
7. Mg^{++} - Magnesium
8. Na^{+} - Sodium
9. SO_4 - Sulfate

Stantec

TVA

U:\TVA-EIP\175568286_JOF_Phase2\gis\mxd\EAR\H.1-Ac_PiperDiagramJune2020.mxd Revised: 2022-10-18 By: mbough

October 2020

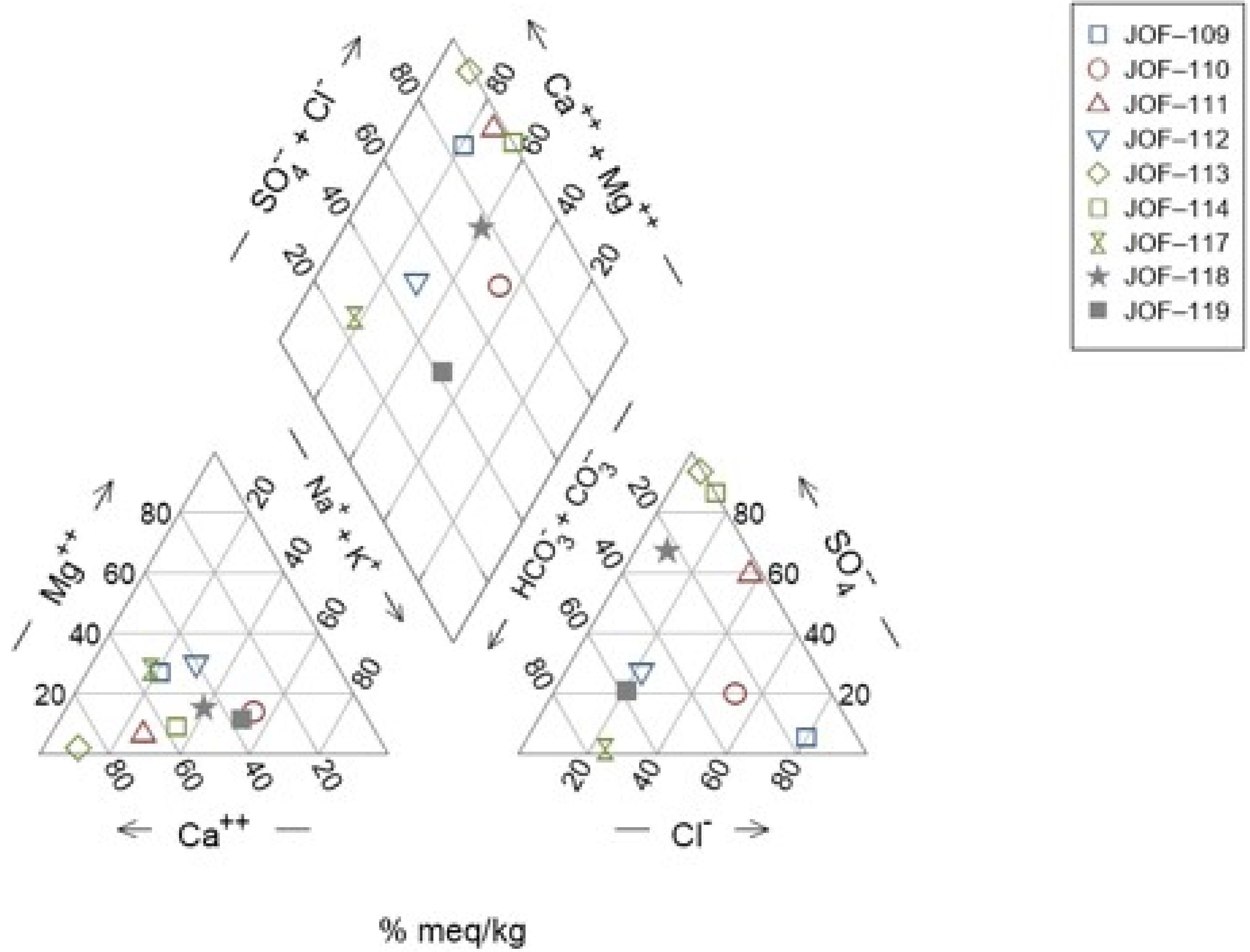


Exhibit No.

H.1-Ad

Title

Piper Diagram - October 2020

Client/Project 175568286

Tennessee Valley Authority
Johnsonville Fossil (JOF) Plant TDEC Order

Clinton, Tennessee
New Johnsonville, Tennessee

Prepared by DMB on 2022-10-18
TR by BL on 2022-10-18

Legend

Notes

1. % meq/kg - Percent milliequivalent per kilogram
2. Ca^{++} - Calcium
3. Cl^- - Chloride
4. CO_3 - Carbonate
5. HCO_3 - Bicarbonate
6. K^+ - Potassium
7. Mg^{++} - Magnesium
8. Na^+ - Sodium
9. SO_4 - Sulfate

Stantec

TVA

APPENDIX H.2

HYDROGEOLOGY INVESTIGATION SAMPLING AND ANALYSIS REPORT

Johnsonville Fossil Plant Hydrogeological Investigation Sampling and Analysis Report

TDEC Commissioner's Order
Environmental Investigation Plan
Johnsonville Fossil Plant
New Johnsonville, Tennessee

August 20, 2021

Prepared for:

Tennessee Valley Authority
Chattanooga, Tennessee

Prepared by:

Stantec Consulting Services Inc.
Lexington, Kentucky

Revision Record

Revision	Description	Date
0	Submittal to TDEC	March 19, 2021
1	Addresses May 17, 2021 TDEC Review Comments and Issued for TDEC	May 21, 2021

Sign-off Sheet

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

Prepared by Jamie Snider

Jamie Snider, Geologic Staff

Reviewed by J. M. Kerr, Jr.

James M. Kerr, Jr., Senior Principal Geologist

Approved by Rebekah Brooks

Rebekah Brooks, Principal Hydrogeologist

Table of Contents

LIST OF TABLES

LIST OF APPENDICES

Abbreviations

ASTM	American Society for Testing and Materials
CCR	Coal Combustion Residuals
CCR Parameters	Constituents listed in Appendices III and IV of 40 CFR 257 and five inorganic constituents included in Appendix I of Tennessee Rule 0400-11-01-.04
CFR	Code of Federal Regulations
COC	Chain-of-Custody
DPT	Direct-Push Technology
EAR	Environmental Assessment Report
EIP	Environmental Investigation Plan
ENV	Environmental
EnvStds	Environmental Standards, Inc.
FSP	Field Sampling Personnel
ft bgs	Feet Below Ground Surface
GPS	Global Positioning System
HGI	Hydrogeological Investigation
HSA	Hollow-Stem Auger
IDW	Investigation Derived Waste
JOF Plant	Johnsonville Fossil Plant
PG	Professional Geologist
PPE	Personal Protective Equipment
PVC	Polyvinyl Chloride
QAPP	Quality Assurance Project Plan
SAP	Sampling and Analysis Plan
SAR	Sampling and Analysis Report
Stantec	Stantec Consulting Services Inc.
TDEC	Tennessee Department of Environment and Conservation
TDEC Order	Commissioner’s Order No. OGC15-0177
TI	Technical Instruction
TVA	Tennessee Valley Authority
VWP	Vibrating Wire Piezometer

1.0 INTRODUCTION

Stantec Consulting Services Inc. (Stantec) has prepared this sampling and analysis report (SAR), on behalf of the Tennessee Valley Authority (TVA), to document activities related to a hydrogeological investigation (HGI) at TVA's Johnsonville Fossil (JOF) Plant located in New Johnsonville, Tennessee.

The purpose of the HGI was to install permanent monitoring wells and one piezometer to evaluate hydrogeological conditions at the JOF Plant in support of fulfilling the requirements for the Tennessee Department of Environment and Conservation (TDEC) issued Commissioner's Order No. OGC15-0177 (TDEC Order) to TVA (TDEC 2015). The TDEC Order sets forth a "process for the investigation, assessment, and remediation of unacceptable risks" at TVA's coal ash disposal sites in Tennessee.

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

The HGI activities were performed in conjunction with the background soil investigation at the JOF Plant and in general accordance with the following documents developed by TVA to support fulfilling the requirements of the TDEC Order:

- *Hydrogeological Investigation SAP* (Stantec 2018a)
- *Environmental Investigation Plan (EIP)* (Stantec 2018b)
- *Background Soil SAP* (Stantec 2018c)
- *Quality Assurance Project Plan* (QAPP) (Environmental Standards, Inc. 2018).

The hydrogeological and background soil investigations were implemented in accordance with TVA- and TDEC-approved Programmatic- and Project-specific changes. Minor variations in scope and procedures from those outlined in the JOF Plant HGI SAP and Background Soil SAP occurred during field activities due to field conditions and programmatic updates and are referenced in Section 3.6.

HGI field work consisted of two primary activities – drilling and sampling, and permanent monitoring well and piezometer installation. Quality Assurance oversight of field data acquisition protocols, sampling practices, and data review were performed by Environmental Standards, Inc. (EnvStds) under direct contract to TVA.

2.0 OBJECTIVE AND SCOPE

The primary objective of the HGI conducted pursuant to the HGI SAP was to install permanent monitoring wells and one piezometer to evaluate hydrogeological conditions at the JOF Plant in response to the TDEC Order. The activities conducted during the HGI support data collection for the groundwater and background soil investigations at the JOF Plant, including groundwater level measurements, and groundwater and background soil sample collection for analysis of CCR-related constituents.

The approach for the HGI was to:

- Identify permanent downgradient monitoring well, background well, and piezometer locations targeting unconsolidated alluvial deposits at the JOF Plant
- Use direct-push technology (DPT), hollow-stem auger (HSA), and roto-sonic drilling techniques to collect soil samples at staked monitoring locations approved by TDEC and considered suitable for the rigs to safely drill
- Complete monitoring well and piezometer installation, well development, hydraulic conductivity (slug) testing, pump installation, and survey activities.

The scope of work of the HGI consisted of the following tasks:

- Confirming drilling locations for planned permanent downgradient monitoring well, background monitoring well, and piezometer locations using global positioning system (GPS) survey
- Drilling and logging soil borings for geotechnical and lithologic information
- Collecting soil samples for potential analysis of geotechnical parameters (if deemed warranted), and CCR-related constituents from the background monitoring well boring locations (as part of the Background Soil SAP)
- Installing permanent monitoring wells in the borings and constructing surface completions
- Installing a vibrating wire piezometer (VWP) in one of the borings
- Developing each permanent monitoring well and conducting slug tests to estimate hydraulic conductivity for evaluation of hydrogeologic conditions for the EAR
- Surveying each permanent monitoring well and piezometer.

Details on each activity are presented in the sections below. Groundwater level measurements and sampling are being conducted as part of six groundwater monitoring events being performed pursuant to the Groundwater Investigation SAP and reported in a series of Groundwater Investigation SARs for the JOF Plant. Soil sampling for CCR-related constituents was performed in accordance with the Background Soil SAP and reported in the JOF Plant Background Soil Investigation SAR.

3.0 FIELD ACTIVITIES

HGI field activities were conducted between May 21, 2019 and April 23, 2020, and consisted of DPT, HSA, and roto-sonic drilling, monitoring well and piezometer installation, well development, slug tests, pump installation, and well/piezometer surveys. Prior to initiating field activities, TVA conducted environmental reviews, obtained permits, and performed utility clearances as necessary to complete the field work.

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

During the HGI, Stantec conducted the following field activities:

- Confirmed drilling locations for planned monitoring well, background monitoring well, and piezometer locations
- Drilled 16 soil borings in the vicinity of proposed well locations to pre-screen the soil characteristics in these areas prior to advancement of well borings
- Drilled 12 soil borings for installation of six permanent monitoring wells, three background monitoring wells, and one piezometer under the direction of a Stantec Professional Geologist (PG) licensed in the State of Tennessee
- Collected soil samples using a DPT dual tube, HSA split-spoon sampler, or roto-sonic core barrel to develop a continuous boring log/soil profile for each well boring, and for potential analysis of geotechnical parameters (if deemed warranted)
- Collected six soil samples and one field duplicate for analysis of CCR-related constituents from the screened interval depth range of three background monitoring well borings
- Installed permanent monitoring wells in nine of the borings
- Installed a VWP in one of the borings
- Developed each well and conducted slug tests in nine wells to estimate hydraulic conductivity.

Following monitoring well and piezometer installation, TVA constructed surface completions and surveyed each new permanent well and piezometer.

3.1 WORK LOCATIONS

The HGI field activities were conducted at 28 soil boring locations for installation of nine monitoring wells and one piezometer at the JOF Plant under the HGI scope of work. As approved by TVA and TDEC, up to five DPT pre-screen soil borings were advanced within expanded zones in the vicinity of each proposed well location to evaluate soil characteristics in these areas prior to well drilling and installation. This approach was used to increase accessibility due to limited historical information in the areas of the proposed monitoring well and background well locations. A total of 16 pre-screen borings were completed as follows:

- Borings JOF-108 Offset A, JOF-108 Offset B, JOF-108 Offset C, and JOF-108 Offset D near proposed well JOF-108
- Boring JOF-109-Pre near proposed well JOF-109
- Borings JOF-110-Pre and JOF-110Alt1 near proposed well JOF-110
- Borings JOF-111-Pre, JOF-111 Offset A, JOF-111 Offset B, and JOF-111 Offset C near proposed well JOF-111
- Boring JOF-112-Pre near proposed well JOF-112
- Boring JOF-113 Offset A near proposed well JOF-113
- Borings JOF-114-Pre and JOF-114 Offset A near proposed well JOF-114
- Boring JOF-117 Offset A near proposed well JOF-117.

Due to the presence of CCR material encountered in the five borings for well JOF-108 and shallow refusal at three of these borings (JOF-108 Offset B, JOF-108 Offset C, and JOF-108 Offset D), well JOF-108 was not installed following approval by TDEC.

Due to the presence of CCR material encountered in the first pre-screen boring JOF-110-Pre for well JOF-110, the second pre-screen boring JOF-110Alt1 was drilled 119 feet northeast of the original proposed location within the expanded accessibility zone, as approved by TDEC. Due to CCR materials encountered in boring JOF-110Alt1, the final location of well JOF-110 was within 5 feet of the original proposed location.

Due to the presence of CCR material encountered in the four pre-screen borings for well JOF-111, the well was relocated to the southwest from the original proposed location following approval by TDEC.

Due to shallow refusal at pre-screen boring JOF-114 Offset A for well JOF-114, a second pre-screen boring (JOF-114-Pre) and subsequent well boring were relocated to the north of the original proposed well location following approval by TDEC.

Based on the information collected from the pre-screen borings, the borings of the proposed monitoring well and background well locations were advanced using HSA or roto-sonic methods, as described in Section 3.3.1.

The HGI boring, monitoring well, and piezometer locations are shown on Exhibit A.1 in Appendix A and are described in Table 1 following Section 3.1.2. Tables B.1 through B.5 in Appendix B provide data and information obtained at the HGI boring, monitoring well, and piezometer locations as described in Section 3.4. The pre-screen boring locations are shown on Exhibit A.1 in Appendix A, and subsurface logs for these locations are provided in Attachment C.1 in Appendix C.

3.1.1 Background Locations

Soil samples were collected from within the anticipated depth range for the well screened interval at three soil boring/background monitoring well locations as described in Section 3.3.2.2 and the Background Soil SAP. Three background monitoring wells (JOF-109, JOF-112, and JOF-119) were installed in unconsolidated alluvial deposits to provide groundwater samples that have not been affected by the CCR units and to be representative of background conditions. A fourth proposed background monitoring well (JOF-120) was included as an 'alternate' location further south of JOF-119; however, well JOF-119 was deemed suitable as a background well and therefore, consistent with the JOF Plant HGI SAP, alternate well JOF-120 was not installed.

3.1.2 Coal Combustion Residuals Unit Locations

Six of seven proposed permanent monitoring wells, and one VWP, were installed near the CCR units to provide locations to evaluate groundwater flow and/or quality in these areas, as summarized in Table 1 below. Proposed monitoring well location JOF-108 could not be installed as part of the planned field activities as described in Sections 3.1 and 3.6.

Table 1. Summary of Boring and Monitoring Well/Piezometer Locations

Boring ID	Well/ Piezometer ID	Location	Rationale
JOF-108	NC	Proposed at south central boundary of the Ash Disposal Area 1	Proposed to collect groundwater data from a downgradient location between the Ash Disposal Area 1 and the Tennessee River. Well not installed because adjacent pre-screen borings encountered CCR and/or hit shallow refusal.
JOF-109	JOF-109	Eastern boundary of the Ash Disposal Area 1; in alluvial deposits	To collect groundwater data from a background location
JOF-110	JOF-110	Northwest corner of the Ash Disposal Area 1; in alluvial deposits	To collect groundwater data from a downgradient location between the Ash Disposal Area 1 and the Tennessee River.
JOF-111A	NC	Attempted at southwest corner of the Ash Disposal Area 1; in alluvial deposits	Monitoring well JOF-111 was initially installed in boring JOF-111A, but the well was subsequently abandoned and installed in boring JOF-111B; see additional details in Section 3.3.1.3.
JOF-111B	JOF-111	Southwest corner of the Ash Disposal Area 1; in alluvial deposits	To collect groundwater data from a downgradient location between the Ash Disposal Area 1 and the Tennessee River.

Boring ID	Well/ Piezometer ID	Location	Rationale
JOF-112	JOF-112	Northeast of the Coal Yard; in alluvial deposits	To collect groundwater data from a background location
JOF-113	JOF-113	Northwest area of the Coal Yard; in alluvial deposits	To collect groundwater data from a downgradient location between the Coal Yard and the Tennessee River
JOF-114	JOF-114	Central west area of the Coal Yard; in alluvial deposits	To collect groundwater data from a downgradient location between the Coal Yard and the Tennessee River
JOF-116-PZ	JOF-116-PZ	Northern boundary of the Ash Disposal Area 1, between wells JOF-109 and JOF-110; in alluvial deposits	To allow for water level (i.e. pore water pressure) readings in the soils to improve subsurface characterization in the vicinity of the northern boundary of Ash Disposal Area 1
JOF-117	JOF-117	Southwest area of the Coal Yard; in alluvial deposits	To collect groundwater data from a downgradient location between the Coal Yard and the Tennessee River
JOF-118	JOF-118	North of the Active Ash Pond 2; in alluvial deposits	To collect groundwater data from a downgradient location between the Active Ash Pond 2 and the Tennessee River
JOF-119	JOF-119	Southeastern point of the Active Ash Pond 2; in alluvial deposits	To collect groundwater data from a background location

Notes:

ID Identification

NC Not completed as a monitoring well

3.2 DOCUMENTATION

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

3.2.1 Field Forms

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

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

- *Groundwater Monitoring Well Abandonment Checklist*
- *Monitoring Well Abandonment Form*
- *Well Development Form*
- *Slug Test Data Form*
- *QED Well Wizard Dedicated Sampling Pump Installation Checklist*
- *Well Pump Calibration Form.*

3.2.1.1 Daily Field Activity Log

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

3.2.1.2 Subsurface Boring Log

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

3.2.1.3 Chain of Custody

Stantec FSP completed *COC* documentation for each geotechnical soil sample collected during the HGI. As described above, documentation of soil sample collection and analysis of CCR-related constituents for the background soil samples collected during the HGI are reported in the JOF Plant Background Soil Investigation SAR.

Information on the geotechnical sample *COC* included the sample ID, sample location, sample depth, type of sample, sampling date, and sample custody record. *COCs* were completed in general accordance with *ENV-TI-05.80.02: Sample Labeling and Custody* and reviewed by the laboratory manager.

3.2.1.4 Monitoring Well Installation Field Log

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

3.2.1.5 Vibrating Wire Piezometer Installation Notes and Details

Stantec FSP prepared a *Vibrating Wire Piezometer Installation Notes and Details* form for the piezometer. The log documented the VWP location, VWP installation date, VWP installation materials, calibration data, borehole depth, sensor depth, grout details, field zero measurements, and an office and field check of proper operation. Information from these logs was used to construct the piezometer installation details provided in Attachment C.2 in Appendix C.

3.2.1.6 Equipment Calibration Form

Stantec FSP performed daily calibration of the water quality meters and turbidity meters and documented the results on an Equipment Calibration Form for well development activities. The form documented the calibration results for temperature, turbidity, specific conductance, pH, dissolved oxygen (DO), and oxidation-reduction potential (ORP), and verified that the field instruments' sensors were operating within acceptance criteria.

3.2.1.7 Groundwater Monitoring Well Abandonment Checklist

Stantec completed a *Groundwater Monitoring Well Abandonment Checklist* for the monitoring well being abandoned. The checklist documented the monitoring well location, well depth, depth to water, and general construction details.

3.2.1.8 Monitoring Well Abandonment Form

Stantec completed a *Monitoring Well Abandonment Form* for the monitoring well being abandoned. The form documented the well details, abandonment method, and materials and quantity used.

3.2.1.9 Well Development Form

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

3.2.1.10 Slug Test Data Form

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

3.2.1.11 QED Well Wizard Dedicated Sampling Pump Installation Checklist

Stantec FSP installed a dedicated bladder pump system in each monitoring well to facilitate subsequent groundwater sampling events. A *QED Well Wizard Dedicated Sampling Pump Installation Checklist* was prepared for each monitoring well to document the well information, pump information, initial testing results, and any relevant comments.

3.2.1.12 Well Pump Calibration Form

Stantec FSP performed a calibration procedure on the dedicated pump in each monitoring well and recorded the results on a *Well Pump Calibration Form* as described herein (see Section 3.6.2). Each form documented the well location, date, time, depth to water, flow rate, flow volume, and water quality stabilization measurements during and at completion of the calibration.

3.2.2 Photographs

In addition to documentation of field activities described above, photographs were taken to document the field investigation. A photographic log of soil cores recovered from the borings and the surface completions of installed monitoring wells and piezometer are provided in Attachments D.1 and D.2, respectively, in Appendix D.

3.3 DRILLING AND SAMPLING

The following sections present drilling and soil sampling procedures used in the HGI. Additional information for drilling and sampling procedures at the background monitoring well locations are provided in the Background Soil Investigation SAR. Drilling and sampling activities were performed under the direction of a Stantec PG licensed in the State of Tennessee.

3.3.1 Drilling

The HGI borings were advanced using three drilling methods: DPT, HSA, and roto-sonic.

3.3.1.1 Direct Push Technology

Sixteen pre-screen soil borings were advanced in the vicinity of the proposed well locations. The borings were advanced by Geo Logic, Inc., a drilling company licensed in Tennessee, under Stantec oversight using DPT drilling techniques. The DPT rig was equipped with a dual tube soil sampling system and 60-inch-long polyvinyl chloride (PVC) liners. Soil samples were recovered in five-foot runs for lithologic description and photographic documentation. Completed boreholes were tremie-backfilled with a 30 percent (%) solids bentonite grout.

3.3.1.2 Hollow-Stem Auger

Seven monitoring well and one piezometer installation borings were advanced by Stantec drillers licensed in Tennessee using HSA drilling techniques following procedures provided in American Society for

Testing and Materials (ASTM) D6151: *Standard Practice for Using Hollow-Stem Augers for Geotechnical Exploration and Soil Sampling*. HSA borings were generally advanced in five-foot runs using a 4.25-inch inside diameter auger to advance the pilot boring (resulting in approximately an eight-inch borehole diameter). Standard penetration test sampling was conducted continuously in accordance with ASTM D1586 *Standard Test Method for Standard Penetration Test and Split-Barrel Sampling of Soils* and consisted of dropping a 140-pound hammer from a height of 30 inches, to drive a standard size 2-inch diameter split-spoon sampler to a depth of 18-inches. Blow-counts were recorded for each six inches of penetration. Soil samples were recovered for lithologic description, photographic documentation, and sample collection.

Seven HSA borings (JOF-109, JOF-112, JOF-113, JOF-114, JOF-117, JOF-118, and JOF-119) were completed as planned and finished with the installation of a permanent monitoring well. After reaching the targeted depth, the augers were withdrawn, and the borehole was overdrilled using an 8.25-inch inside diameter auger (resulting in approximately a 13-inch borehole diameter). The HSA boring for the piezometer (JOF-116PZ) was finished with the installation of a VWP. After reaching the targeted depth, the augers were withdrawn, the VWP was installed, and the borehole was tremie-backfilled using a 30% solids bentonite grout.

Following removal, the augers were decontaminated using a high-pressure steam cleaner and potable water after use at each boring. Well installation procedures for the HSA boreholes completed as permanent wells are described in Section 3.4 below.

3.3.1.3 Roto-Sonic

Six pre-screen DPT borings for wells JOF-110 and JOF-111 encountered CCR material in the shallow soil layers. Three well borings (JOF-110, JOF-111A, and JOF-111B) were subsequently completed using roto-sonic techniques. With TVA and TDEC approval, the drilling methodology was changed at these boring locations to minimize the possible migration of CCR material downward in the boreholes. Stantec utilized the subcontractor M&W Drilling, who provided a driller licensed in Tennessee to operate a truck-mounted roto-sonic drilling rig.

Borings were advanced in five and 10-foot runs using a four-inch diameter steel casing to recover soil for lithologic description, photographic documentation, and sample collection. Each run was then overdrilled using 6-inch and 10-inch diameter casings used in succession. Borings JOF-110, JOF-111A, and JOF-111B were advanced to a total depth of 30.0, 29.0 and 28.0 feet below ground surface (ft bgs), respectively. The casing was then withdrawn except for the 10-inch diameter casing, which was tremie-backfilled with 30% solids bentonite grout to surface grade, and then withdrawn. An 8.5-inch diameter flush-joint threaded PVC casing was inserted down through the grout column to the targeted depth, thereby isolating the CCR material from the interior of the PVC casing. The remainder of each borehole was completed by using 4-inch, 6-inch, and 8-inch diameter casings in succession inserted down the interior of the PVC casing to reach the targeted depth for bottom of borehole. The 4-inch and 6-inch diameter casings were withdrawn to facilitate subsequent installation of the monitoring well. The 8.5-inch diameter PVC casings were left in place and cut off just below surface grade. Steel casings were decontaminated using a high-pressure steam cleaner and potable water after use at each boring. Well installation procedures for the boreholes completed as permanent wells are described in Section 3.4 below.

During the completion of boring JOF-111A as a monitoring well, the 8.5-inch diameter outer PVC casing dropped to approximately 4.5 ft bgs. As a result, the well was abandoned as approved by TVA, and boring JOF-111B was advanced for installation of monitoring well JOF-111. To abandon the well, the four-inch diameter PVC well casing and 8.5-inch diameter outer PVC casing installed in boring JOF-111A were left in place and the boring was backfilled with a 30% solids bentonite grout. Prior to grouting, the bottom of the 4-inch PVC casing sump was broken through to allow for grout to fill-in any potential void beneath the casing. Well abandonment documentation was recorded on the *Groundwater Monitoring Well Abandonment Checklist* and *Monitoring Well Abandonment Form*.

3.3.2 Soil Sampling

During advancement of each boring, the Stantec PG prepared field subsurface logs using a mobile data collection platform. Inputs included a description of subsurface lithology, sample recovery, color using the Munsell Soil Color Chart, and other relevant parameters as required by the SAPs and TIs. Subsurface logs for the JOF Plant HGI are presented in Attachment C.1 in Appendix C.

Soil samples were collected from each boring to provide geotechnical and lithologic information for a continuous boring log/soil profile and for analysis, as described below.

3.3.2.1 Geotechnical Sampling

At HSA borings, following preparation of the subsurface logs, geotechnical soil samples were placed in laboratory-provided glass jars and labeled in general accordance with the SAP. FSP secured the caps on each bottle, and confirmed it was labeled legibly and externally clean before placing the sample container in a box for storage prior to transport to the laboratory. Geotechnical sample information was recorded on a *COC* as described above in Section 3.2.1.3. The samples were temporarily placed in a secure storage unit onsite under custody protocols until transport and submittal to the geotechnical laboratory.

Stantec personnel transported and submitted the geotechnical samples to the Stantec Geotechnical Laboratory in Lexington, Kentucky. No geotechnical samples were tested since they were not needed for additional lithologic and geotechnical information and they remain stored at the Stantec laboratory.

3.3.2.2 CCR Parameter Sampling

Soil samples were collected from background monitoring well boring locations for analysis of CCR-related constituents following procedures in the Background Soil SAP. Six soil samples and one field duplicate were collected from the screened interval depth range of the three background monitoring well borings and submitted for laboratory analysis:

- Boring JOF-109 - two samples were collected (31.5 to 34.5 ft bgs and 36.0 to 39.0 ft bgs)

- Boring JOF-112 - two samples and one field duplicate sample were collected (19.5 to 24.0 ft bgs and 24.0 to 28.9 ft bgs)
- Boring JOF-119 - two samples were collected (34.5 to 37.5 ft bgs and 39.0 to 42.0 ft bgs).

As specified in the JOF Plant Background Soil SAP, the soil samples collected from the background monitoring well borings were analyzed for CCR-related constituents listed in Appendices III and IV of Title 40 of the Code of Federal Regulations (CFR) Part 257 (40 CFR 257). In addition, five inorganic constituents listed in Appendix I of Tennessee Rule 0400-11-01-.04 and not included in the 40 CFR 257 Appendices III and IV were analyzed to maintain continuity with the TDEC environmental programs. These additional TDEC Appendix I constituents included copper, nickel, silver, vanadium, and zinc. The combined federal CCR Appendices III and IV constituents and TDEC Appendix I inorganic constituents are referred to as "CCR Parameters."

Background soil sampling investigation activities, including sampling procedures, laboratory information, and analytical results are presented in the JOF Plant Background Soil Investigation SAR.

3.4 MONITORING WELL AND PIEZOMETER INSTALLATION

3.4.1 Well and Piezometer Installation

The monitoring wells and piezometer were installed in the borings by qualified drill crews working under the direction of a Stantec PG or PE and a licensed Tennessee driller. Well and piezometer installation was carried out in general accordance with ENV-TI-05.80.25, *Monitoring Well and Piezometer Installation and Development*. Well and piezometer construction details are documented on the Well/Piezometer Installation Details provided in Attachment C.2 in Appendix C.

The lowest portions of the borings were generally backfilled with 0.375-inch bentonite pellets, then topped with a layer of sand filter pack (20/40 mesh). The monitoring well was installed above the backfilled portion. Monitoring wells consisted of a four-inch diameter Schedule 40 PVC pre-packed well screen (0.010-inch slots) and riser. The screen and riser consisted of flush-joint, threaded PVC pipe. A screen length of 9.8 feet was selected based on the results of the boring log and the target stratum. A four-inch diameter Schedule 40 PVC bottom well plug measuring approximately 0.4 feet in length was threaded onto the bottom of the screen (for well JOF-109, the bottom well plug was approximately 1.2 feet in length). The PVC riser extended a minimum of 2.5 feet above the ground surface and was capped with a temporary plug or slip cap. The annular space was backfilled with a sand filter pack extending approximately two feet above and six inches below the screen. A bentonite pellet seal approximately two feet thick was placed on top of the sand filter pack. The sand filter pack and bentonite pellets were either placed by tremie method or poured slowly into the annular space of the drill tooling to prevent bridging.

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

For the piezometer, one VWP was installed in the boring and grouted in-place. The piezometer was attached to a sacrificial one-inch diameter PVC pipe. The boring was then backfilled by tremie method described above using a 30% solids bentonite grout.

Subsequent monitoring well and piezometer surface completions consisted of an above-grade steel locking protective cover anchored to a concrete surface pad. The protective cover extended above the concrete pad and the annular space was filled with sand or pea gravel to about six inches below the top of PVC casing. Steel protective bollards were installed near each corner of the concrete pad and filled with concrete.

A summary of monitoring well and piezometer construction specifications is presented in Table B.1 in Appendix B. Full construction details are presented in the Well and Piezometer Installation Details provided in Attachment C.2 in Appendix C.

3.4.2 Well Development

Each new monitoring well was developed in accordance with ENV-TI-05.80.25, *Monitoring Well and Piezometer Installation and Development* by a combination of bailing, surging, and pumping after a minimum of 24 hours following well installation. First, a three-inch diameter PVC bailer was lowered and raised within the screened intervals to create a slight surging action to dislodge particles within the wells and sand filter packs. Then the bailer was used to remove turbid water from the well. Baseline readings of turbidity, pH, temperature, and specific conductance were measured using a calibrated YSI Pro Plus water quality meter and a calibrated Hach 2100Q turbidity meter. This process of alternately surging and bailing was repeated several times to decrease the water turbidity within the wells. Lastly, a submersible pump was employed to further develop the wells until stabilization criteria for turbidity (≤10 Nephelometric Turbidity Units (NTUs) prior to September 16, 2019 and ≤5 NTUs thereafter), pH (±0.1 Standard Unit), temperature (±10%), and specific conductance (±10%) were achieved. The target turbidity value was based on well development criteria specified in ENV-TI-05.80.25, *Monitoring Well and Piezometer Installation and Development* at the time of development. As approved by TDEC, the turbidity stabilization limits were revised to ≤5 NTUs, as specified above, to meet overall programmatic objectives for the hydrogeologic investigation at the JOF Plant. Well development details were recorded on the *Well Development Form*. A summary of initial and final water quality measurements is presented in Table B.2 in Appendix B.

3.4.3 Hydraulic Conductivity (Slug) Testing

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

Three rising-head and three falling-head slug tests were performed at each well, as shown on Table B.3 in Appendix B. Each well was tested by taking an initial measurement of the static water level followed by the insertion of the pressure transducer into the well. After the transducer had been installed, a falling-head slug test was conducted by introducing a solid slug (e.g., PVC pipe filled with sand) into the well to cause a nearly instantaneous rise in the water level. The water levels were then recorded at regular intervals until reaching near initial static levels. After the first test concluded, a rising-head slug test was conducted by removing the slug to cause a nearly instantaneous drop in the water level. Water levels were recorded until initial static water levels were reached again. The procedure of alternating a falling-head and a rising-head slug test was conducted three times at each well. The data were recorded electronically by the transducer and downloaded into a data collector. Raw data were checked in the field for discrepancies prior to demobilizing from the JOF Plant.

The field data were analyzed using AQTESOLV™ Version 4.50 Professional software to estimate the hydraulic conductivity of the saturated soils in the screened interval. Calculated hydraulic conductivities are summarized in Table B.3 in Appendix B, and the full software output package is provided in Appendix E. The following assumptions and methods were utilized for the calculations:

- The analysis was completed using the Bouwer-Rice method. The straight line solution was matched to the normalized plotted recovery data between 70 to 80% recovery (0.2 to 0.3 feet of the normalized head) plotted on a log-linear scale.

- Data collected during the tests conducted at wells JOF-118 and JOF-119 suggest that while the data exhibited an oscillatory (underdamped) response during the latter part of the test, the early time data (>80% recovered) was sufficient for the determination of hydraulic conductivity using the Bouwer-Rice method. An oscillatory response is commonly seen in slug test data of higher hydraulic conductivity formations.

- Wells JOF-109, JOF-113, JOF-114, JOF-118, and JOF-119 were assumed to be under confined aquifer conditions based on stratigraphic data noted on the boring logs and groundwater level measurements. The static water levels measured at these locations at the time of the slug testing were within clay intervals overlying the water-bearing units targeted for well installation; therefore, the clay intervals were considered to represent local confining characteristics for the purpose of the slug test analyses.

3.4.4 Pump Installation

A new, decontaminated, dedicated QED Environmental Systems, Inc. brand dedicated bladder pump was installed in each new monitoring well after well development was completed. The pump model installed in each well was either model P1101M (polypropylene construction) or model P1101HM (stainless steel construction) because the water column height was more than 10 feet. Each pump intake was placed at approximately the mid-point of the well screened interval or the mid-point of the saturated portion of the well screened interval for future groundwater sampling. Following pump installation, the pumps were calibrated in general accordance with ENV-TI-05.80.42, *Groundwater Sampling*. Well pump placement depths, installation calculations, and calibration details were recorded on the *QED Well Wizard Dedicated*

Sampling Pump Installation Checklist and the *Well Pump Calibration Form*. Pump installation information is provided in Table B.4 in Appendix B.

3.4.5 Well and Piezometer Surveys

After the surface completions for each monitoring well were installed, the top of the well casing and ground surface elevation were professionally surveyed using a survey-grade GPS for horizontal and vertical control. The surface completion for the piezometer was surveyed for ground surface elevation only. Measurements were calculated relative to the coordinate systems used by the JOF Plant. Well and piezometer survey information is provided in Table B.5 in Appendix B.

3.5 INVESTIGATION DERIVED WASTE

Investigation derived waste (IDW) generated during the HGI included:

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

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

3.6 VARIATIONS

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

3.6.1 Variations in Scope

Variations in scope are provided below.

- The location of boring JOF-108 was relocated four times within the expanded zone due to encountering CCR materials and/or shallow refusal at five borings. As a result, monitoring well JOF-108 was not installed. This change in scope was approved by TDEC.
- Due to the presence of CCR material encountered in pre-screen borings for wells JOF-110 and JOF-111, and shallow refusal at a pre-screen boring for well JOF-114, the wells were relocated near the original proposed well locations following approval by TDEC.
- Geotechnical samples were not collected at borings JOF-110, JOF-111A, and JOF-111B during drilling because a roto-sonic drill rig was used, and undisturbed geotechnical samples cannot be collected using this drilling method. This change in drilling method was approved by TDEC and information obtained using this drilling technique was adequate to meet the objectives of the HGI.
- As approved by TDEC, the turbidity stabilization limits were revised to meet overall programmatic objectives of the hydrogeologic investigation.

3.6.2 Variations in Procedures

Variations in procedures occurring in the field are provided below.

- Borings JOF-110, JOF-111A, and JOF-111B encountered CCR material in the shallow soils. As described in Section 3.3.1.3, the drilling method was modified, as approved by TVA and TDEC, to minimize CCR material migration deeper into the borehole. Borings JOF-110 and JOF-111B were completed with the installation of monitoring wells JOF-110 and JOF-111, respectively.
- The well installed at JOF-111A was abandoned because the outer PVC casing dropped during well installation, as described in Section 3.3.1.3. Well JOF-111 was installed at boring JOF-111B as a replacement.
- A *Well Pump Calibration Form* was not completed for wells JOF-118 and JOF-119. The wells were sampled the same day as installation of the dedicated pump (December 3, 2019); therefore, stabilization parameters were recorded on a *Groundwater Sampling Form*.
- During well development of well JOF-119, the July 18, 2019 afternoon calibration verification of the YSI and Hach 2100Q was completed the following morning due to a lightning stand-down. The calibration verifications were within acceptance criteria.
- During the installation of JOF-109, the pre-pack well screen available at the time of installation had threaded male connections at both ends, and the only available endcaps also had male connections. To accommodate well completion, a union was added to the male connections at

the bottom of the well screen and the male end cap to complete the well string. This increased the end cap length at the bottom of the well from approximately 0.4 feet to approximately 1.2 feet.

4.0 SUMMARY

The data presented in this report are from the HGI at the JOF Plant. Nine permanent monitoring wells and one VWP were installed during the HGI to support data collection for the groundwater and background soil investigations at the JOF Plant, including groundwater level measurements, and groundwater and background soil sample collection for analysis of CCR Parameters. The scope of work for the HGI included:

- Drilled 16 pre-screen soil borings in the vicinities of proposed monitoring well locations
- Drilled 12 soil borings for installation of six permanent monitoring wells, three background monitoring wells, and one piezometer
- Collected soil samples to develop a continuous boring log/soil profile for each well boring
- Collected six soil samples and one field duplicate for analysis of CCR Parameters from the screened interval depth range of three background monitoring well borings
- Installed permanent monitoring wells in nine of the borings and constructed surface completions
- Installed a VWP in the piezometer boring
- Developed each new monitoring well
- Conducted slug testing in the nine new monitoring wells to estimate hydraulic conductivity
- Surveyed each new permanent well and piezometer.

A summary of boring, monitoring well, and piezometer locations is presented in Table 1. Monitoring well and piezometer construction specifications, well development, hydraulic testing results, pump installation details, and survey information are presented in Tables B.1 through B.5, respectively. Background soil sampling information and analytical results are reported in the Background Soil Investigation SAR, and groundwater level measurements and sampling analytical results are reported in a series of Groundwater Investigation SARs for the JOF Plant.

Stantec has completed an HGI at the JOF Plant in New Johnsonville, Tennessee, in accordance with the HGI SAP as documented herein. The data collected during the HGI are usable for reporting and evaluation in the EAR and meet the objectives of the TDEC Order EIP. HGI drilling and well/piezometer installation data will be evaluated along with data collected under other TDEC Order SAPs, including but not limited to, the background soil investigation and the six sampling events of the groundwater investigation, as well as data collected under other State and CCR programs. This evaluation will be provided in the EAR.

5.0 REFERENCES

American Society for Testing and Materials (ASTM). D6151: *Standard Practice for Using Hollow-Stem Augers for Geotechnical Exploration and Soil Sampling.*

ASTM. D1586: *Standard Test Method for Standard Penetration Test and Split-Barrel Sampling for Soils*.

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

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

Munsell Color. 2009*. Munsell Soil Color Book*.

Stantec Consulting Services Inc. (Stantec). 2018a. *Hydrogeological Investigation Sampling and Analysis Plan*, Johnsonville Fossil Plant. Revision 4. Prepared for Tennessee Valley Authority. December 10, 2018.

Stantec. 2018b. *Environmental Investigation Plan*, Johnsonville Fossil Plant. Revision 4. Prepared for Tennessee Valley Authority. December 10, 2018.

Stantec. 2018c. *Background Soil Sampling and Analysis Plan*, Johnsonville Fossil Plant. Revision 4. Prepared for Tennessee Valley Authority. December 10, 2018.

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

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

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

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

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

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

APPENDIX A - EXHIBITS

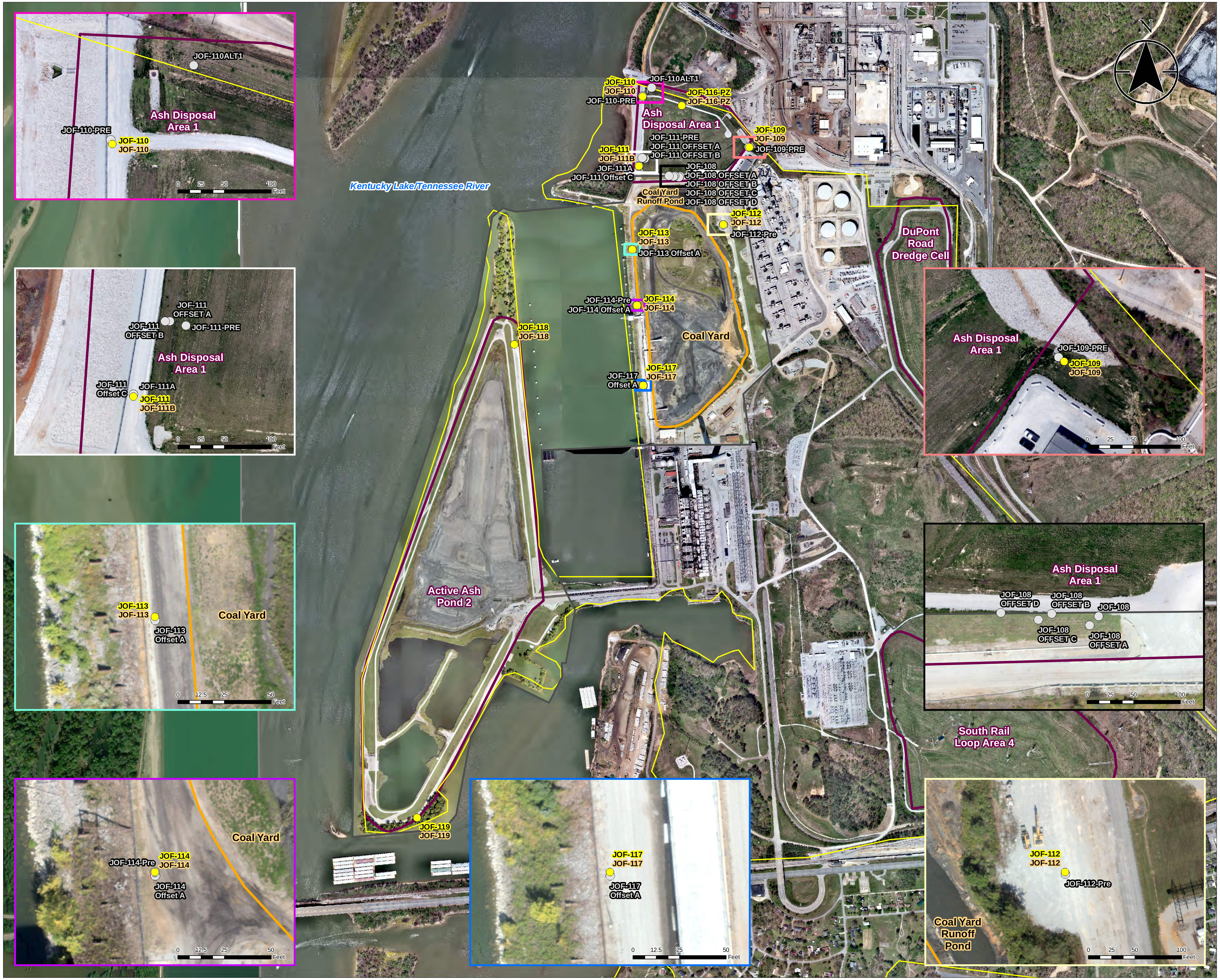


Exhibit No.

A.1

Title

Site Map and Monitoring Well/ Piezometer Locations

Client/Project

Tennessee Valley Authority
Johnsonville Fossil Plant (JOF) TDEC Order

Project Location

New Johnsonville, Tennessee

175568286
Prepared by MB on 2021-05-19
Technical Review by JS on 2021-05-19

0 450 900 1,350 1,800 Feet

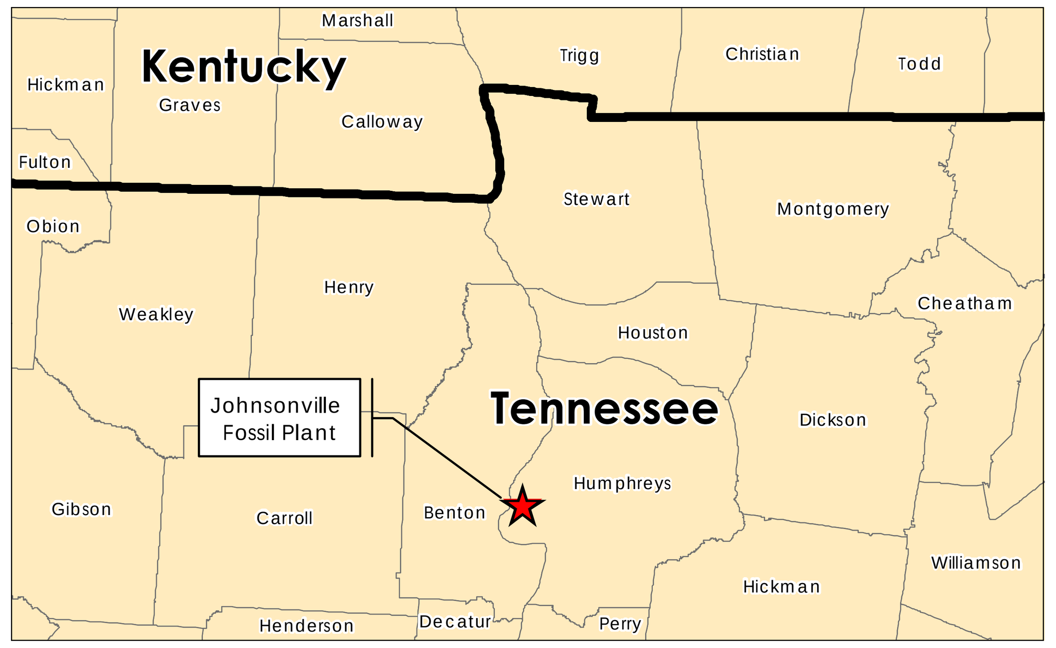
1:5,400 (At original document size of 22x34)

Legend

- Monitoring Well/Piezometer Location — Well/Piezometer Name, Boring Name
- Drilled and Abandoned Borehole — Boring Name
- 2017 Imagery Boundary
- 2018 Imagery Boundary
- TVA Property Boundary
- CCR Unit Area (Approximate)
- Coal Yard (Approximate)

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Imagery Provided by TVA (2017 & 2018) & ESRI World Imagery



Stantec TVA

U:\TVA-EP\175568286_JOF_Phase2\gis\mxd\HG_TM\JOF_ExhibitA1_SiteMap_and_MonitoringWellLocations.mxd Revised: 2021-05-19 By: mbough

APPENDIX B - TABLES

Table B.1 - Summary of Monitoring Well and Piezometer Construction Specifications
Johnsonville Fossil Plant
May-September 2019

Well/ Piezometer ID	Top of Casing		Piezometer			Bottom of Well			Screened Interval					
	Stickup	Elevation	GS Elevation	Sensor Depth	Sensor Elevation	Depth	Depth	Elevation	Depth Top	Depth Bottom	Depth Top	Depth Bottom	Elevation Top	Elevation Bottom
	ft ags	ft NGVD29	ft NGVD29	ft bgs	ft NGVD29	ft bgs	ft btoc	ft NGVD29	ft bgs	ft bgs	ft btoc	ft btoc	ft NGVD29	ft NGVD29
JOF-109	3.4	386.11	n/a	n/a	n/a	41.7	45.1	341.0	30.7	40.5	34.1	43.9	352.0	342.2
JOF-110	4.7	388.76	n/a	n/a	n/a	57.8	62.5	326.3	47.6	57.4	52.3	62.1	336.5	326.7
JOF-111	4.8	390.08	n/a	n/a	n/a	46.7	51.5	338.6	36.5	46.3	41.3	51.1	348.8	339.0
JOF-112	4.7	394.48	n/a	n/a	n/a	30.4	35.1	359.4	20.2	30.0	24.9	34.7	369.6	359.8
JOF-113	4.7	388.13	n/a	n/a	n/a	45.1	49.8	338.3	34.9	44.7	39.6	49.4	348.5	338.7
JOF-114	4.7	388.36	n/a	n/a	n/a	40.2	44.9	343.5	30.0	39.8	34.7	44.5	353.7	343.9
JOF-116-PZ	n/a	n/a	388.0	46.0	342.0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
JOF-117	4.6	388.63	n/a	n/a	n/a	40.6	45.2	343.4	30.4	40.2	35.0	44.8	353.6	343.8
JOF-118	3.4	372.69	n/a	n/a	n/a	50.7	54.1	318.6	40.5	50.3	43.9	53.7	328.8	319.0
JOF-119	3.5	366.89	n/a	n/a	n/a	44.7	48.2	318.7	34.5	44.3	38.0	47.8	328.9	319.1

Notes:

ags	above ground surface
bgs	below ground surface
btoc	below top of casing
ft	feet
GS	ground surface
ID	identification
n/a	not applicable
NGVD29	National Geodetic Vertical Datum of 1929

1. Measurement data are from Well Installation and Piezometer Details (Appendix C.2).
2. Wells/piezometer were surveyed on November 12-14, 2019.

Stantec

Table B.2 - Summary of Well Development Data
Johnsonville Fossil Plant
July-November 2019

Well ID	pH		Turbidity		Specific Conductance		Temperature	
	Initial	Final	Initial	Final	Initial	Final	Initial	Final
			NTU	NTU	uS/cm	uS/cm	DEG C	DEG C
JOF-109	6.14	5.62	>1,000	3.84	262	189	21.3	18.2
JOF-110	6.84	5.91	>1,000	4.44	311	292	16.8	15.5
JOF-111	6.31	5.99	>1,000	2.98	1529	3500	16.6	18.2
JOF-112	7.01	5.97	>1,000	1.66	592	491	18.3	20.2
JOF-113	6.59	6.34	>1,000	4.72	2878	2561	16.5	16.3
JOF-114	6.11	5.21	>1,000	0.75	2097	3658	17.4	19.9
JOF-117	6.17	6.34	>1,000	4.16	1009	1012	17.1	19.1
JOF-118	5.52	5.43	>1,000	6.86	335	205	20.6	23.7
JOF-119	5.76	5.56	>1,000	6.52	154	191	18.8	20.0

Notes:

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

Stantec

Table B.3 - Summary of Hydraulic Conductivity Testing Results
Johnsonville Fossil Plant
April 2020

Well ID	Saturated Thickness	Number of Tests		Average Hydraulic Conductivity	Average Hydraulic Conductivity
		Falling Head	Rising Head		
	ft			ft/day	cm/s
JOF-109	32.7	3	3	2.799	9.87E-04
JOF-110	44.8	3	3	0.07960	2.81E-05
JOF-111	32.8	3	3	3.309	1.17E-03
JOF-112	18.3	3	3	26.59	9.38E-03
JOF-113	21.1	3	3	1.530	5.40E-04
JOF-114	14.7	3	3	10.19	3.59E-03
JOF-117	20.6	3	3	0.7067	2.49E-04
JOF-118	10.9	3	3	217.7	7.68E-02
JOF-119	13.4	3	3	152.9	5.39E-02

Notes:

cm/s	centimeters per second
ft	feet
ID	identification

Stantec

Table B.4 - Summary of Pump Installation Details
Johnsonville Fossil Plant
November-December 2019

Well ID	Top of Casing Elevation	Bottom of Well Depth	Bottom of Well Elevation	Groundwater Level Depth	Groundwater Level Elevation	Pump Intake Depth	Pump Intake Elevation	Water Column Above Intake
	ft NGVD29	ft btoc	ft NGVD29	ft btoc	ft NGVD29	ft btoc	ft NGVD29	ft
JOF-109	386.11	45.1	341.0	6.48	379.63	39.0	347.1	32.5
JOF-110	388.76	62.5	326.3	18.45	370.31	57.0	331.8	38.6
JOF-111	390.08	51.5	338.6	22.72	367.36	46.0	344.1	23.3
JOF-112	394.48	35.1	359.4	23.14	371.34	29.5	365.0	6.4
JOF-113	388.13	49.8	338.3	31.32	356.81	43.5	344.6	12.2
JOF-114	388.36	44.9	343.5	31.46	356.90	39.5	348.9	8.0
JOF-117	388.63	45.2	343.4	29.21	359.42	40.5	348.1	11.3
JOF-118	372.69	54.1	318.6	16.18	356.51	48.5	324.2	32.3
JOF-119	366.89	48.2	318.7	10.62	356.27	42.5	324.4	31.9

Notes:

btoc	below top of casing
ft	feet
ID	identification
NGVD29	National Geodetic Vertical Datum of 1929

1. Wells were surveyed on November 12-14, 2019.

2. Depth data are from *QED Well Wizard Dedicated Sampling Pump Installation Checklists* dated November 18-December 3, 2019. Depth to groundwater level was measured prior to pump insertion. Pump intake and water column above intake rounded to nearest 0.1 foot.

Table B.5 - Summary of Monitoring Well and Piezometer Survey Data
Johnsonville Fossil Plant
November 2019

Well/Piezometer ID	JOF Plant Local Northing	JOF Plant Local Easting	Latitude	Longitude	Ground Surface Elevation
	ft NAD27	ft NAD27	DMS NAD27	DMS NAD27	ft NGVD29
JOF-109	605,123.62	1,413,243.55	N36°02'17.00"	W87°59'04.84"	382.8
JOF-110	605,614.27	1,412,210.58	N36°02'21.64"	W87°59'17.54"	384.0
JOF-111	604,940.99	1,412,174.09	N36°02'14.98"	W87°59'17.81"	385.3
JOF-112	604,376.52	1,412,991.02	N36°02'09.56"	W87°59'07.73"	389.8
JOF-113	604,136.76	1,412,110.10	N36°02'07.01"	W87°59'18.39"	383.4
JOF-114	603,597.10	1,412,156.67	N36°02'01.69"	W87°59'17.69"	383.7
JOF-116-PZ	605,526.64	1,412,589.35	N36°02'20.85"	W87°59'12.90"	388.0
JOF-117	602,823.15	1,412,216.73	N36°01'54.04"	W87°59'16.77"	384.1
JOF-118	603,219.11	1,410,969.82	N36°01'57.71"	W87°59'32.05"	369.3
JOF-119	598,645.87	1,410,031.49	N36°01'12.30"	W87°59'42.33"	363.4

Notes:

DMS	Degrees, Minutes, Seconds
ft	feet
ID	identification
NAD27	North American Datum of 1927
NGVD29	National Geodetic Vertical Datum of 1929
PZ	piezometer

1. Wells were surveyed on November 12-14, 2019. Coordinates are for the top of well casing, except ground surface elevation which is adjacent to the concrete well pad. Plant Local coordinates rounded to the nearest 0.01 feet. Latitude and Longitude rounded to the nearest 0.01 degree. Ground surface elevations rounded to the nearest 0.1 feet.

Stantec

APPENDIX C – SUBSURFACE LOGS AND WELL/PIEZOMETER INSTALLATION DETAILS

ATTACHMENT C.1

Subsurface Logs

Subsurface Boring Legend

Lithology Graphics

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

Lithology Graphics are based on TVA drafting standards.

Other Graphics

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

Common Abbreviations

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

General Notes

The boring logs include sample numbering used during drilling. For assigned Environmental Analytical Sample ID numbers, see relevant Environmental Chain-of- Custody forms from the drilling date range listed on each log.
For pH readings and additional field data, see applicable field documentation (e.g., Soil pH Data Form) from the drilling date range listed on each log.

SUBSURFACE LOG

Client Borehole ID	N/A	Stantec Boring No.	**JOF-108**
Client	Tennessee Valley Authority	Boring Location	604,844.93 N; 1,412,570.95 E NAD27 Plant Local
Project Number	175568286	Surface Elevation	390.6 ft; Elevation Datum NGVD29
Project Name	JOF TDEC Order	Date Started	8/6/19; Completed 8/6/19
Project Location	New Johnsonville, Humphreys Co., TN	Depth to Water	N/A; Date/Time N/A
Inspector	C. Burton; Logger C. Burton	Depth to Water	N/A; Date/Time N/A
Drilling Contractor	Geo Logic (Subcontractor)	Drill Rig Type and ID	Geoprobe 6610DT

Overburden Drilling and Sampling Tools (Type and Size) Macro Core 2.0" OD with 60" PVC sample liners

Rock Drilling and Sampling Tools (Type and Size) N/A

Overdrill Tooling (Type and Size) N/A — Overdrill Depth N/A

Sampler Hammer Type N/A — Weight N/A — Drop N/A — Efficiency N/A

Borehole Azimuth N/A — Borehole Inclination (from Vertical) N/A

Reviewed By K. Carey — Approved By C. Millhollin

Depth Ft[3]	Elevation	Graphic	Description	Overburden: Sample[1,2] / Rock Core: RQD %	Depth Ft[3] / Run Ft	Rec. Ft / Rec. Ft	Blows/PSI / Rec. %
0.0	390.6		Top of Hole				
0.7	389.9		Topsoil				
5.3	385.3		LEAN CLAY, ML, 7.5YR 5/6 (strong brown) to 7.5YR 5/1 (gray), medium to high plasticity, moist, mixed with CCR, [FILL]	DP01	0.0 - 5.0	4.1	N/A
7.8	382.8		SILTY LEAN CLAY WITH SAND, CL-ML, 2.5Y 5/2 (grayish brown) to 10YR 4/1 (dark gray), low plasticity, moist, with organics and coal fragments, mixed with CCR, [FILL]	DP02	5.0 - 10.0	5.0	N/A
10.0	380.6		SILTY SAND WITH GRAVEL, SM, 10YR 3/1 (very dark gray), non-plastic, with organics and coal fragments, [CCR]				

No Refusal /
Bottom of Hole at 10.0 Ft.

Boring JOF-108 was backfilled with grout on 8/6/2019.

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

SUBSURFACE LOG

Stantec TVA

Client Borehole ID	N/A	Stantec Boring No.	**JOF-108 Offset A**
Client	Tennessee Valley Authority	Boring Location	604,835.25 N; 1,412,561.34 E NAD27 Plant Local
Project Number	175568286	Surface Elevation	389.0 ft
		Elevation Datum	NGVD29
Project Name	JOF TDEC Order	Date Started	8/6/19
		Completed	8/6/19
Project Location	New Johnsonville, Humphreys Co., TN	Depth to Water	N/A
		Date/Time	N/A
Inspector	C. Burton	Depth to Water	N/A
Logger	C. Burton	Date/Time	N/A
Drilling Contractor	Geo Logic (Subcontractor)	Drill Rig Type and ID	Geoprobe 6610DT
Overburden Drilling and Sampling Tools (Type and Size)	Macro Core 2.0" OD		
Rock Drilling and Sampling Tools (Type and Size)	N/A		
Overdrill Tooling (Type and Size)	N/A	Overdrill Depth	N/A
Sampler Hammer Type	N/A	Weight	N/A
Drop	N/A	Efficiency	N/A
Borehole Azimuth	N/A	Borehole Inclination (from Vertical)	N/A
Reviewed By	K. Carey	Approved By	P. Dunne

Lithology Depth Ft[3]	Elevation	Graphic	Description	Overburden: Sample[1,2] / Rock Core: RQD %	Depth Ft[3] / Run Ft	Rec. Ft / Rec. Ft	Blows/PSI / Rec. %
0.0	389.0		Top of Hole				
0.9	388.1		Overburden				
2.1	386.9		SANDY LEAN CLAY WITH GRAVEL, CL, 5YR 5/6 (yellowish red) to 5YR 4/1 (dark gray), low plasticity				
3.9	385.1		FAT CLAY WITH GRAVEL, CH, 7.5YR 4/6 (strong brown) to 2.5Y 5/1 (gray), moist, with coal fragments	DP01	0.0 - 5.0	4.3	N/A
5.2	383.8		SANDY FAT CLAY WITH GRAVEL, CH, 2.5Y 2.5/1 (black) to 10YR 5/8 (yellowish brown), non to low plasticity, moist				
10.0	379.0		POORLY GRADED SAND WITH SILT, SP-SM, 10YR 3/1 (very dark gray) to 7.5YR 2.5/1 (black), medium to coarse, non-plastic, [CCR]	DP02	5.0 - 10.0	3.3	N/A

No Refusal /
Bottom of Hole at 10.0 Ft.

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

TVA EIP BORING LOG 175568286_JOF_TDEC_ORDER.GPJ TDEC SUBSURF DT 20190530.GDT 8/7/20

SUBSURFACE LOG

Client Borehole ID: N/A
Stantec Boring No.: **JOF-108 Offset B**
Client: Tennessee Valley Authority
Boring Location: 604,847.67 N; 1,412,520.66 E NAD27 Plant Local
Project Number: 175568286
Surface Elevation: 391.0 ft
Elevation Datum: NGVD29
Project Name: JOF TDEC Order
Date Started: 8/7/19
Completed: 8/7/19
Project Location: New Johnsonville, Humphreys Co., TN
Depth to Water: N/A
Date/Time: N/A
Inspector: C. Burton
Logger: C. Burton
Depth to Water: N/A
Date/Time: N/A
Drilling Contractor: Geo Logic (Subcontractor)
Drill Rig Type and ID: Geoprobe 6610DT
Overburden Drilling and Sampling Tools (Type and Size): Macro Core 2.0" OD
Rock Drilling and Sampling Tools (Type and Size): N/A
Overdrill Tooling (Type and Size): N/A
Overdrill Depth: N/A
Sampler Hammer Type: N/A
Weight: N/A
Drop: N/A
Efficiency: N/A
Borehole Azimuth: N/A
Borehole Inclination (from Vertical): N/A
Reviewed By: K. Carey
Approved By: P. Dunne

Depth Ft[3]	Elevation	Graphic	Description	Overburden: Sample[1,2] / Rock Core: RQD %	Depth Ft[3] / Run Ft	Rec. Ft / Rec. Ft	Blows/PSI / Rec. %
0.0	391.0		Top of Hole				
0.0 – 1.1	391.0 – 389.9		Topsoil	DP01	0.0 - 5.0	4.8	N/A
1.1	389.9		GRAVELLY LEAN CLAY, CL, 7.5YR 4/6 (strong brown), low to medium plasticity, moist, [FILL]				
– 3.8	387.2		FAT CLAY SOME GRAVEL, CH, 7.5YR 4/6 (strong brown), medium to high plasticity				
3.8 – 12.4	387.2 – 378.6		POORLY GRADED GRAVEL WITH CLAY, GP-GC, 2.5Y 4/1 (dark gray), moist to wet, [FILL], [CCR]	DP02	5.0 - 10.0	4.3	N/A
12.4 – 15.3	378.6 – 375.7		FAT CLAY, CH, 2.5Y 5/3 (light olive brown) to 2.5Y 4/2 (dark grayish brown), moist, [FILL]	DP03	10.0 - 15.0	3.2	N/A
15.3 – 16.1	375.7 – 374.9		SANDY POORLY GRADED GRAVEL WITH CLAY, GP, 5Y 2.5/1 (black), wet, [CCR]				
16.1	374.9		SANDY SILT WITH CLAY, ML, 5Y 2.5/1 (black), non to low plasticity, moist to wet, [FILL], [CCR]	DP04	15.0 - 20.0	5.0	N/A

SUBSURFACE LOG

Client Borehole ID	N/A	Stantec Boring No.	**JOF-108 Offset B**
Client	Tennessee Valley Authority	Boring Location	604,847.67 N; 1,412,520.66 E NAD27 Plant Local
Project Number	175568286	Surface Elevation	391.0 ft
		Elevation Datum	NGVD29

Lithology: Depth Ft[3]	Elevation	Graphic	Description	Overburden: Sample[1,2] / Rock Core: RQD %	Depth Ft[3] / Run Ft	Rec. Ft / Rec. Ft	Blows/PSI / Rec. %
22.6	368.4		SANDY SILT WITH CLAY, ML, 5Y 2.5/1 (black), non to low plasticity, moist to wet, [FILL], [CCR] *(Continued)*	DP05	20.0 - 25.0	5.0	N/A
27.3	363.7		SANDY POORLY GRADED GRAVEL WITH SILT, GP-GM, 5Y 2.5/1 (black), moist to wet, [FILL], [CCR]				
29.9	361.1		FAT CLAY WITH GRAVEL, CH, 7.5YR 4/4 (brown), moist, Macro core liner crushed in macro core tube	DP06	25.0 - 29.9	2.3	N/A

Bedrock Refusal /
Bottom of Hole at 29.9 Ft.

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

TVA EIP BORING LOG 175568286_JOF_TDEC_ORDER.GPJ TDEC SUBSURF DT 20190530.GDT 7/6/20

SUBSURFACE LOG

Client Borehole ID	N/A	Stantec Boring No.	**JOF-108 Offset C**
Client	Tennessee Valley Authority	Boring Location	604,841.52 N; 1,412,506.20 E NAD27 Plant Local
Project Number	175568286	Surface Elevation	389.5 ft
		Elevation Datum	NGVD29
Project Name	JOF TDEC Order	Date Started	8/22/19
		Completed	8/22/19
Project Location	New Johnsonville, Humphreys Co., TN	Depth to Water	14.0 ft
		Date/Time	8/22/19 16:00
Inspector	C. Burton	Depth to Water	N/A
Logger	C. Burton	Date/Time	N/A
Drilling Contractor	Geo Logic (Subcontractor)	Drill Rig Type and ID	Geoprobe 6610DT
Overburden Drilling and Sampling Tools (Type and Size)	Macro Core 2.0" OD with 60" PVC sample liners		
Rock Drilling and Sampling Tools (Type and Size)	N/A		
Overdrill Tooling (Type and Size)	N/A	Overdrill Depth	N/A
Sampler Hammer Type	N/A	Weight	N/A
Drop	N/A	Efficiency	N/A
Borehole Azimuth	N/A	Borehole Inclination (from Vertical)	N/A
Reviewed By	K. Carey	Approved By	C. Millhollin

Depth Ft[3]	Elevation	Graphic	Description
0.0	389.5		Top of Hole
0.4	389.1		Topsoil
3.3	386.2		SILTY LEAN CLAY, CL, 10YR 7/4 (very pale brown) to 10YR 8/8 (yellow), low plasticity, hard, moist, [FILL]
10.0	379.5		LEAN CLAY WITH SILT, CL, 7.5YR 5/6 (strong brown), medium to high plasticity, very hard, moist, [FILL]
16.1	373.4		SILTY SAND WITH GRAVEL, SP, 10YR 2/1 (black) with 10YR 6/6 (brownish yellow), fine to coarse, loose, moist, [CCR]
			SILTY SAND LITTLE GRAVEL, SP, 10YR 3/1 (very dark gray), [CCR]

Overburden: Sample[1,2] / Rock Core: RQD %	Depth Ft[3] / Run Ft	Rec. Ft / Rec. Ft	Blows/PSI / Rec. %
DP01	0.0 - 5.0	4.5	N/A
DP02	5.0 - 10.0	4.2	N/A
DP03	10.0 - 15.0	4.2	N/A
DP04	15.0 - 20.0	1.9	N/A

TVA EIP BORING LOG 175568286_JOF_TDEC_ORDER.GPJ TDEC SUBSURF DT 20190530.GDT 6/15/20

SUBSURFACE LOG

Client Borehole ID	N/A	Stantec Boring No.	**JOF-108 Offset C**
Client	Tennessee Valley Authority	Boring Location	604,841.52 N; 1,412,506.20 E NAD27 Plant Local
Project Number	175568286	Surface Elevation	389.5 ft
		Elevation Datum	NGVD29

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]	Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft	Rec. Ft	Rec. %
20.1	369.4		SILTY SAND LITTLE GRAVEL, SP, 10YR 3/1 (very dark gray), [CCR] *(Continued)*					
24.5	365.0		SANDY SILT LITTLE GRAVEL, ML, 10YR 3/1 (very dark gray) to 2.5Y 3/1 (very dark gray), non to low plasticity, very soft, wet, [CCR]		DP05	20.0 - 24.5	4.5	N/A

Depth scale: 18, 19, 20, 21, 22, 23, 24

20.0 - 24.5

Bedrock Refusal /
Bottom of Hole at 24.5 Ft.

Boring JOF-108 Offset C backfilled with grout on 8/22/2019

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

SUBSURFACE LOG

Client Borehole ID	N/A	Stantec Boring No.	**JOF-108 Offset D**
Client	Tennessee Valley Authority	Boring Location	604,848.71 N; 1,412,465.99 E NAD27 Plant Local
Project Number	175568286	Surface Elevation	390.8 ft — Elevation Datum NGVD29
Project Name	JOF TDEC Order	Date Started	8/22/19 — Completed 8/22/19
Project Location	New Johnsonville, Humphreys Co., TN	Depth to Water	N/A — Date/Time N/A
Inspector	C. Burton — Logger C. Burton	Depth to Water	N/A — Date/Time N/A
Drilling Contractor	Geo Logic (Subcontractor)	Drill Rig Type and ID	Geoprobe 6610DT

Overburden Drilling and Sampling Tools (Type and Size) Macro Core 2.0" OD with 60" PVC sample liners

Rock Drilling and Sampling Tools (Type and Size) N/A

Overdrill Tooling (Type and Size) N/A — Overdrill Depth N/A

Sampler Hammer Type N/A — Weight N/A — Drop N/A — Efficiency N/A

Borehole Azimuth N/A — Borehole Inclination (from Vertical) N/A

Reviewed By K. Carey — Approved By C. Millhollin

Lithology Depth Ft[3]	Elevation	Graphic	Description	Overburden: Sample[1,2] / Rock Core: RQD %	Depth Ft[3] / Run Ft	Rec. Ft	Blows/PSI / Rec. %
0.0	390.8		Top of Hole				
0.6	390.2		Topsoil	DP01	0.0 - 5.0	3.4	N/A
2.6	388.2		LEAN CLAY WITH SILT, CL, 7.5YR 6/6 (reddish yellow) to 10YR 6/4 (light yellowish brown), high plasticity, very hard, moist, [FILL]				
6.2	384.6		CLAYEY GRAVEL WITH SAND, GP-GC, 7.5YR 4/4 (brown) to 7.5YR 5/6 (strong brown), non to low plasticity, moist, sand is very fine to medium, [FILL]	DP02	5.0 - 10.0	2.7	N/A
7.3	383.5		FAT CLAY WITH GRAVEL, CH, 7.5YR 4/6 (strong brown) to 7.5YR 4/3 (brown), high plasticity, hard, moist, [FILL]				
13.5	377.3		POORLY GRADED GRAVEL WITH SAND, GP, 10YR 4/4 (dark yellowish brown) to 10YR 3/1 (very dark gray), fine, loose, moist, [CCR]	DP03	10.0 - 13.5	3.5	N/A

Bedrock Refusal /
Bottom of Hole at 13.5 Ft.

Boring JOF-108 Offset D was backfilled with grout on 8/22/2019

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

SUBSURFACE LOG

Client Borehole ID: N/A
Stantec Boring No. **JOF-109**
Client: Tennessee Valley Authority
Boring Location: 605,123.62 N; 1,413,243.55 E NAD27 Plant Local
Project Number: 175568286
Surface Elevation: 382.8 ft
Elevation Datum: NGVD29
Project Name: JOF TDEC Order
Date Started: 6/19/19
Completed: 6/20/19
Project Location: New Johnsonville, Humphreys Co., TN
Depth to Water: N/A
Date/Time: N/A
Inspector: C. Burton
Logger: C. Burton
Depth to Water: N/A
Date/Time: N/A
Drilling Contractor: Stantec Consulting Services Inc.
Drill Rig Type and ID: CME 55T#1, #709
Overburden Drilling and Sampling Tools (Type and Size): 4-1/4" HSA, 2" SS w/o liners
Rock Drilling and Sampling Tools (Type and Size): N/A
Overdrill Tooling (Type and Size): 8-1/4" HSA overdrill of boring
Overdrill Depth: 41.0 ft
Sampler Hammer Type: Automatic
Weight: 140 lb
Drop: 30"
Efficiency: N/A
Borehole Azimuth: N/A
Borehole Inclination (from Vertical): N/A
Reviewed By: K. Carey
Approved By: L. Tucker

Lithology Depth Ft[3]	Elevation	Description
0.0	382.8	Top of Hole
0.1	382.7	Topsoil
1.5	381.3	SILTY LEAN CLAY WITH SAND, CL, 2.5Y 8/3 (pale brown) to 2.5Y 8/2 (pale brown), non to low plasticity, medium firm, moist, [FILL]
4.5	378.3	SILTY LEAN CLAY WITH GRAVEL, CL, 10YR 4/2 (dark grayish brown) to 10YR 5/2 (grayish brown), low plasticity, firm, [FILL]
7.7	375.1	CLAYEY SILT, CL-ML, 7.5YR 4/2 (brown), low plasticity, very soft to very hard, moist, [FILL]
9.0	373.8	SILTY LEAN CLAY WITH GRAVEL, CL, 7.5YR 5/6 (strong brown) to 10YR 5/1 (gray), non-plastic, hard, moist
		POORLY GRADED GRAVEL WITH CLAY, GC, 10YR 5/8 (yellowish brown) to 10YR 7/1 (light gray), non-plastic, very dense

Overburden: Sample[1,2] / Rock Core: RQD %	Depth Ft[3] / Run Ft	Rec. Ft	Blows/PSI / Rec. %
SS01G	0.0 - 1.5	0.9	5-7-7
SS02G	1.5 - 3.0	0.1	6-7-7
SS03G	3.0 - 4.5	0.5	3-2-2
SS04G	4.5 - 6.0	0.3	1-WH-WH
SS05G	6.0 - 7.5	0.3	WH-WH-1
SS06aG	7.5 - 7.7		
SS06bG	7.7 - 9.0	0.9	1-4-12
SS07G	9.0 - 10.2	1.0	21-40-50/2"
SS08G	10.5 - 11.2	0.7	46-50/2"
SS09G	12.0 - 13.1	0.7	29-21-50/1"
SS10G	13.5 - 14.4	0.9	40-50/5"
SS11G	15.0 - 15.4	0.4	50/5"
SS12G	16.5 - 16.9	0.4	50/5"

Client Borehole ID	N/A	Stantec Boring No.	**JOF-109**
Client	Tennessee Valley Authority	Boring Location	605,123.62 N; 1,413,243.55 E NAD27 Plant Local
Project Number	175568286	Surface Elevation	382.8 ft
		Elevation Datum	NGVD29

Depth Ft[3]	Elevation	Description	Sample[1,2] (Overburden) / RQD % (Rock Core)	Depth Ft[3] / Run Ft	Rec. Ft	Blows/PSI / Rec. %
18 – 27.0		POORLY GRADED GRAVEL WITH CLAY, GC, 10YR 5/8 (yellowish brown) to 10YR 7/1 (light gray), non-plastic, very dense *(Continued)*	SS13G	18.0 - 19.5	1.3	40-47-48
			SS14G	19.5 - 21.0	1.3	41-31-30
			SS15G	21.0 - 22.5	0.6	42-32-34
			SS16G	22.5 - 24.0	0.6	14-29-49
			SS17G	24.0 - 25.2	0.8	48-42-50/2"
			SS18G	25.5 - 27.0	1.5	47-43-25
27.0	355.8	POORLY GRADED GRAVEL WITH CLAY WITH SAND, GP-GC, 10YR 5/6 (yellowish brown) to 10YR 8/1 (white), very dense, moist	SS19G	27.0 - 28.5	1.4	18-17-19
			SS20G	28.5 - 30.0	0.7	17-17-13
			SS21G	30.0 - 31.5	1.1	14-23-35
			SS22E (31.5/34.5-20190620)	31.5 - 33.0	0.8	12-12-20
			SS23E	33.0 - 34.5	0.9	16-44-38
			SS24G	34.5 - 36.0	1.1	14-16-30
			SS25E (36.0/39.0-20190620)	36.0 - 37.5	1.0	25-16-10
			SS26E	37.5 - 39.0	0.4	30-24-16
			SS27G	39.0 - 40.5	1.3	14-17-20
			SS28aG	40.5 - 41.1	1.1	15-14-7
41.1	341.7		SS28bG	41.1 - 42.0		

TVA EIP BORING LOG 175568286_JOF_TDEC_ORDER.GPJ TDEC SUBSURF DT 20190530.GDT 8/27/20

Client Borehole ID	N/A	Stantec Boring No.	JOF-109
Client	Tennessee Valley Authority	Boring Location	605,123.62 N; 1,413,243.55 E NAD27 Plant Local
Project Number	175568286	Surface Elevation	382.8 ft
		Elevation Datum	NGVD29

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]		Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft		Rec. Ft	Rec. %
43 44.0	338.8		SANDY LEAN CLAY WITH GRAVEL, CL, 10YR 4/6 (dark yellowish brown) to 10YR 6/3 (pale brown), low to medium plasticity, very soft to very hard, moist *(Continued)*		SS29G	42.0 - 43.5	42.0 - 43.5	0.9	22-13-17
44					SS30aG	43.5 - 44.0	43.5 - 45.0	1.0	13-9-11
45 46 46.5	336.3		FAT CLAY, CH, 10R 5/3 (weak red), medium to high plasticity, very hard, moist, iron oxide staining, Color 5G 5/2 metallic appearance on 10R 5/3		SS30bG	44.0 - 45.0			
					SS31G	45.0 - 46.5	45.0 - 46.5	1.3	9-11-15

No Refusal /
Bottom of Hole at 46.5 Ft.

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

TVA EIP BORING LOG 175568286_JOF_TDEC_ORDER.GPJ TDEC SUBSURF DT 20190530.GDT 8/27/20

Client Borehole ID	N/A	Stantec Boring No.	**JOF-109-Pre**
Client	Tennessee Valley Authority	Boring Location	605,128.24 N; 1,413,237.64 E NAD27 Plant Local
Project Number	175568286	Surface Elevation	381.5 ft
		Elevation Datum	NGVD29
Project Name	JOF TDEC Order	Date Started	5/21/19
		Completed	5/21/19
Project Location	New Johnsonville, Humphreys Co., TN	Depth to Water	16.0 ft
		Date/Time	5/21/19
Inspector	D. Mihalek	Depth to Water	N/A
Logger	D. Mihalek	Date/Time	N/A
Drilling Contractor	Geo Logic (Subcontractor)	Drill Rig Type and ID	GEOPROBE 6610
Overburden Drilling and Sampling Tools (Type and Size)	DT37 Dual Tube Soil Sampling System with 60" PVC Liners		
Rock Drilling and Sampling Tools (Type and Size)	N/A		
Overdrill Tooling (Type and Size)	N/A	Overdrill Depth	N/A
Sampler Hammer Type	GH70 Direct Push	Weight	N/A
Drop	N/A	Efficiency	N/A
Borehole Azimuth	N/A	Borehole Inclination (from Vertical)	N/A
Reviewed By	K. Carey	Approved By	C. Millhollin

Lithology Depth Ft[3]	Lithology Elevation	Lithology Graphic	Description	Overburden: Sample[1,2] / Rock Core: RQD %	Depth Ft[3] / Run Ft	Rec. Ft / Rec. Ft	Blows/PSI / Rec. %
0.0	381.5		Top of Hole				
0.0 – 5.0	381.5 – 376.5		CLAYEY SILT, ML, 10YR 4/4 (dark yellowish brown), medium plasticity, soft, moist, [FILL]	DP01	0.0 - 5.0	2.1	N/A
5.0 – 10.0	376.5 – 371.5		FAT CLAY, CH, 5Y 3/1 (very dark gray), high plasticity, very soft, moist, [FILL]	DP02	5.0 - 10.0	NR	N/A
10.0 – 12.5	371.5 – 369.0		FAT CLAY, CH, 5Y 3/1 (very dark gray), high plasticity, very soft, wet	DP03	10.0 - 15.0	3.5	N/A
12.5 – 15.0	369.0 – 366.5		SANDY CLAY, CL, 10YR 5/6 (yellowish brown), low to medium plasticity, firm, moist, chert fragments (coarse) embedded throughout				
15.0 –	366.5 –		SANDY CLAY, CL, 10YR 5/6 (yellowish brown), low plasticity, stiff, wet	DP04	15.0 - 20.0	NR	N/A

Depth scale: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16 (water level), 17, 18

Stantec TVA

SUBSURFACE LOG

Client Borehole ID	N/A	Stantec Boring No.	**JOF-109-Pre**
Client	Tennessee Valley Authority	Boring Location	605,128.24 N; 1,413,237.64 E NAD27 Plant Local
Project Number	175568286	Surface Elevation	381.5 ft — Elevation Datum NGVD29

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]	Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft	Rec. Ft	Rec. %
18 / 19 / 20 — 20.0	361.5		SANDY CLAY, CL, 10YR 5/6 (yellowish brown), low plasticity, stiff, wet *(Continued)*					

Bedrock Refusal /
Bottom of Hole at 20.0 Ft.

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

TVA EIP BORING LOG 175568286_JOF_TDEC_ORDER.GPJ TDEC SUBSURF DT 20190530.GDT 6/15/20

SUBSURFACE LOG

Client Borehole ID	N/A	Stantec Boring No.	**JOF-110**
Client	Tennessee Valley Authority	Boring Location	605,614.27 N; 1,412,210.58 E NAD27 Plant Local
Project Number	175568286	Surface Elevation	384.0 ft — Elevation Datum NGVD29
Project Name	JOF TDEC Order	Date Started	9/10/19 — Completed 9/13/19
Project Location	New Johnsonville, Humphreys Co., TN	Depth to Water	N/A — Date/Time N/A
Inspector	S. Stanley — Logger S. Stanley	Depth to Water	N/A — Date/Time N/A
Drilling Contractor	M&W Drilling (Subcontractor)	Drill Rig Type and ID	Geoprobe 8150LS

Overburden Drilling and Sampling Tools (Type and Size) 4" X 6" Rotosonic

Rock Drilling and Sampling Tools (Type and Size) N/A

Overdrill Tooling (Type and Size) 4" x 10" Sonic — Overdrill Depth 57.5 ft

Sampler Hammer Type N/A — Weight N/A — Drop N/A — Efficiency N/A

Borehole Azimuth N/A — Borehole Inclination (from Vertical) N/A

Reviewed By K. Carey — Approved By P. Dunne

Depth Ft[3]	Elevation	Graphic	Description	Overburden: Sample[1,2] / Rock Core: RQD %	Depth Ft[3] / Run Ft	Rec. Ft / Rec. Ft	Blows/PSI / Rec. %
0.0	384.0		Top of Hole				
1.0	383.0		Crushed stone, [FILL]				
2.8	381.2		FAT CLAY SOME SILT, CH, 7.5YR 5/6 (strong brown), low to medium plasticity, firm, moist, [FILL]				
4.4	379.6		CLAYEY SILTY SAND LITTLE GRAVEL, CL, 7.5YR 4/3 (brown), non-plastic, dry, [FILL]				
10.0	374.0		CLAYEY SILT, ML, 7.5YR 2.5/1 (black), non-plastic, dry, [CCR]	RS01	0.0 - 10.0	8.5	N/A
13.0	371.0		CLAYEY SILTY SAND LITTLE GRAVEL, CL, 7.5YR 5/6 (strong brown), non-plastic, dry, [CCR]				
16.4	367.6		SANDY POORLY GRADED SAND WITH SILT LITTLE SILT, SP, 7.5YR 4/2 (brown), moist, [CCR]	RS02	10.0 - 20.0	9.3	N/A
			SANDY POORLY GRADED SAND WITH SILT LITTLE SILT, SP, 7.5YR 2.5/1 (black), moist, [CCR]				

TVA EIP BORING LOG 175568286_JOF_TDEC_ORDER.GPJ TDEC SUBSURF DT 20190530.GDT 8/7/20

Client Borehole ID	N/A	Stantec Boring No.	**JOF-110**
Client	Tennessee Valley Authority	Boring Location	605,614.27 N; 1,412,210.58 E NAD27 Plant Local
Project Number	175568286	Surface Elevation	384.0 ft
		Elevation Datum	NGVD29

Depth Ft[3]	Elevation	Graphic	Description	Sample[1,2] / RQD %	Depth Ft[3] / Run Ft		Rec. Ft / Rec. Ft	Blows/PSI / Rec. %
20.0	364.0							
27.6	356.4		SILTY SILT, ML, 7.5YR 2.5/1 (black), wet, [CCR]	RS03	20.0 - 30.0	20.0 - 30.0	7.5	N/A
30.0	354.0		FAT CLAY TRACE SILT, CH, 2.5Y 4/3 (olive brown), medium plasticity, firm to hard, moist					
40.0	344.0		No Recovery	RS04	30.0 - 40.0	30.0 - 40.0	0.0	N/A
			No Recovery					

Depth scale: 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44

Stantec TVA

SUBSURFACE LOG

Client Borehole ID N/A
Stantec Boring No. **JOF-110**
Client Tennessee Valley Authority
Boring Location 605,614.27 N; 1,412,210.58 E NAD27 Plant Local
Project Number 175568286
Surface Elevation 384.0 ft
Elevation Datum NGVD29

Depth Ft[3]	Elevation	Graphic	Description	Sample[1,2] / RQD %	Depth Ft[3] / Run Ft	Rec. Ft	Blows/PSI / Rec. %
50.0	334.0		No Recovery *(Continued)*	RS05	40.0 - 50.0	0.0	N/A
52.5	331.5		LEAN CLAY LITTLE GRAVEL, CL, 7.5YR 5/6 (strong brown), low to medium plasticity, soft to firm, wet	RS06	50.0 - 55.0	5.0	N/A
53.8	330.2		LEAN CLAY LITTLE GRAVEL, CL, 7.5YR 4/1 (dark gray), low to medium plasticity, soft to firm, wet				
55.0	329.0		LEAN CLAY TRACE SAND, CL, 7.5YR 5/6 (strong brown), non to low plasticity, firm to hard, moist				
56.5	327.5		CLAYEY POORLY GRADED SAND WITH CLAY LITTLE GRAVEL, SP-SC, 7.5YR 4/1 (dark gray), non-plastic, very soft to soft, wet	RS07	55.0 - 60.0	5.0	N/A
60.0	324.0		LEAN CLAY TRACE SAND, CL, 7.5YR 5/4 (brown), non-plastic, firm, moist				

No Refusal /
Bottom of Hole at 60.0 Ft.

Monitoring well installed in boring. Refer to JOF-110 Well Installation Detail for well construction information.

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

TVA EIP BORING LOG 175568286_JOF_TDEC_ORDER.GPJ TDEC SUBSURF DT 20190530.GDT 8/7/20

SUBSURFACE LOG

Client Borehole ID: N/A	Stantec Boring No.: **JOF-110Alt1**
Client: Tennessee Valley Authority	Boring Location: 605,698.83 N; 1,412,298.19 E NAD27 Plant Local
Project Number: 175568286	Surface Elevation: 378.3 ft; Elevation Datum: NGVD29
Project Name: JOF TDEC Order	Date Started: 8/22/19; Completed: 8/22/19
Project Location: New Johnsonville, Humphreys Co., TN	Depth to Water: 13.2 ft; Date/Time: 8/22/19 09:44
Inspector: C. Burton; Logger: C. Burton	Depth to Water: N/A; Date/Time: N/A
Drilling Contractor: Geo Logic (Subcontractor)	Drill Rig Type and ID: Geoprobe 6610DT

Overburden Drilling and Sampling Tools (Type and Size): Macro Core 2.0" OD with 60" PVC sample liners

Rock Drilling and Sampling Tools (Type and Size): N/A

Overdrill Tooling (Type and Size): N/A — Overdrill Depth: N/A

Sampler Hammer Type: N/A — Weight: N/A — Drop: N/A — Efficiency: N/A

Borehole Azimuth: N/A — Borehole Inclination (from Vertical): N/A

Reviewed By: K. Carey — Approved By: C. Millhollin

Depth Ft[3]	Elevation	Description	Sample[1,2] / RQD %	Depth Ft[3] / Run Ft	Rec. Ft	Blows/PSI / Rec. %
0.0	378.3	Top of Hole				
0.0–2.2	378.3–376.1	Crushed stone, [FILL]				
2.2–11.7	376.1–366.6	SILTY POORLY GRADED SAND WITH GRAVEL, SP, 10YR 3/2 (very dark grayish brown) to 7.5YR 2.5/1 (black), coarse, loose, moist, [CCR]	DP01	0.0 - 5.0	3.3	N/A
			DP02	5.0 - 10.0	3.3	N/A
11.7–15.8	366.6–362.5	GRAVELLY POORLY GRADED SAND WITH SILT WITH CLAY, SP, 2.5Y 5/4 (light olive brown) to 2.5Y 2.5/1 (black), medium to coarse, wet, [CCR]	DP03	10.0 - 15.0	3.3	N/A
15.8–20.7	362.5–357.6	SILTY POORLY GRADED SAND WITH GRAVEL, SP, fine to coarse, loose, wet, [CCR]	DP04	15.0 - 20.0	4.2	N/A
20.7	357.6					

TVA EIP BORING LOG 175568286_JOF_TDEC_ORDER.GPJ TDEC SUBSURF DT 20190530.GDT 9/28/20

Client Borehole ID	N/A	Stantec Boring No.	**JOF-110Alt1**
Client	Tennessee Valley Authority	Boring Location	605,698.83 N; 1,412,298.19 E NAD27 Plant Local
Project Number	175568286	Surface Elevation	378.3 ft
		Elevation Datum	NGVD29

Lithology: Depth Ft[3]	Elevation	Graphic	Description	Overburden: Sample[1,2] / Rock Core: RQD %	Depth Ft[3] / Run Ft	Rec. Ft / Rec. Ft	Blows/PSI / Rec. %
			CLAYEY SILT WITH SAND, ML, 5Y 4/1 (dark gray) and 10YR 3/1 (very dark gray), low plasticity, soft to very soft, wet, [CCR] *(Continued)*	DP05	20.0 - 25.0	4.8	N/A
26.0	352.3						
26.7	351.6		CLAYEY SILT WITH SAND, ML, 2.5Y 4/1 (dark gray), low plasticity, wet, [CCR]	DP06	25.0 - 30.0	4.5	N/A
34.6	343.7		SILTY LEAN CLAY WITH SAND, CL, 2.5Y 4/3 (olive brown) to 2.5Y 5/3 (light olive brown), low to medium plasticity, hard to firm, moist to wet, sand lenses	DP07	30.0 - 35.0	4.0	N/A
38.3	340.0		SILTY LEAN CLAY WITH SAND, CL, 2.5Y 4/2 (dark grayish brown) to 10YR 3/3 (dark brown), non-plastic to low plasticity, moist to wet, with lenses of sand and gravel, [FILL]	DP08	35.0 - 40.0	3.4	N/A
40.0	338.3		POORLY GRADED GRAVEL WITH SILT WITH SAND, GP-GM, 5Y 2.5/1 (black), non-plastic, medium dense, wet, [FILL]				

No Refusal /
Bottom of Hole at 40.0 Ft.

Boring JOF-110Alt1 was backfilled with grout on 8/22/2019

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

SUBSURFACE LOG

Client Borehole ID	N/A	Stantec Boring No.	**JOF-110-Pre**
Client	Tennessee Valley Authority	Boring Location	605,619.11 N; 1,412,209.20 E NAD27 Plant Local
Project Number	175568286	Surface Elevation	383.9 ft; Elevation Datum NGVD29
Project Name	JOF TDEC Order	Date Started	5/21/19; Completed 5/21/19
Project Location	New Johnsonville, Humphreys Co., TN	Depth to Water	11.0 ft; Date/Time 5/21/19 11:57
Inspector	D. Mihalek; Logger D. Mihalek	Depth to Water	N/A; Date/Time N/A
Drilling Contractor	Geo Logic (Subcontractor)	Drill Rig Type and ID	GEOPROBE 6610

Overburden Drilling and Sampling Tools (Type and Size) DT37 Dual Tube Soil Sampling System with 60" PVC Liners

Rock Drilling and Sampling Tools (Type and Size) N/A

Overdrill Tooling (Type and Size) N/A Overdrill Depth N/A

Sampler Hammer Type GH70 Direct Push Weight N/A Drop N/A Efficiency N/A

Borehole Azimuth N/A Borehole Inclination (from Vertical) N/A

Reviewed By K. Carey Approved By C. Millhollin

Depth Ft[3]	Elevation	Description	Sample[1,2] / RQD %	Depth Ft[3] / Run Ft	Rec. Ft	Blows/PSI / Rec. %
0.0	383.9	Top of Hole				
0.5	383.4	SILTY SAND, SM, 5Y 2.5/1 (black), very fine, loose, moist, [CCR] Geofabric penetrated at 0.5' SILT, ML, 7.5YR 4/3 (brown), low plasticity, dry No recovery from 2.0' to 5.0'	DP01	0.0 - 5.0	2.0	N/A
5.0	378.9	POORLY GRADED SAND, SP, 5Y 2.5/1 (black), fine, loose, moist, [CCR] 1-in lens of CCR at 6.0' No recovery from 8.3' to 10'	DP02	5.0 - 10.0	3.5	N/A
10.0	373.9	POORLY GRADED SAND, SP, 5Y 2.5/1 (black), fine, loose, wet, [CCR]	DP03	10.0 - 15.0	5.0	N/A
			DP04	15.0 - 20.0	5.0	N/A

SUBSURFACE LOG

Client Borehole ID N/A

Client Tennessee Valley Authority

Project Number 175568286

Stantec Boring No. **JOF-110-Pre**

Boring Location 605,619.11 N; 1,412,209.20 E NAD27 Plant Local

Surface Elevation 383.9 ft

Elevation Datum NGVD29

Depth Ft[3]	Elevation	Graphic	Description	Sample[1,2]	Depth Ft[3]	Rec. Ft	Blows/PSI
			Overburden: / Rock Core:	RQD %	Run Ft	Rec. Ft	Rec. %
18–31			POORLY GRADED SAND, SP, 5Y 2.5/1 (black), fine, loose, wet, [CCR] *(Continued)*	DP05	20.0 - 25.0	NR	N/A
				DP06	25.0 - 30.0	NR	N/A
31.0	352.9		FAT CLAY, CH, 10YR 4/4 (dark yellowish brown), high plasticity, stiff, moist, [FILL]	DP07	30.0 - 35.0	5.0	N/A
35.0	348.9		No Refusal / Bottom of Hole at 35.0 Ft.				

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

TVA EIP BORING LOG 175568286_JOF_TDEC_ORDER.GPJ TDEC SUBSURF DT 20190530.GDT 6/15/20

SUBSURFACE LOG

Client Borehole ID	N/A	Stantec Boring No.	**JOF-111 Offset A**
Client	Tennessee Valley Authority	Boring Location	605,022.08 N; 1,412,212.88 E NAD27 Plant Local
Project Number	175568286	Surface Elevation	381.1 ft — Elevation Datum NGVD29
Project Name	JOF TDEC Order	Date Started	8/8/19 — Completed 8/8/19
Project Location	New Johnsonville, Humphreys Co., TN	Depth to Water	N/A — Date/Time N/A
Inspector	C. Burton — Logger C. Burton	Depth to Water	N/A — Date/Time N/A
Drilling Contractor	Geo Logic (Subcontractor)	Drill Rig Type and ID	Geoprobe 6610DT

Overburden Drilling and Sampling Tools (Type and Size) Macro Core 2.0" OD with 60" PVC sample liners
Rock Drilling and Sampling Tools (Type and Size) N/A
Overdrill Tooling (Type and Size) N/A — Overdrill Depth N/A
Sampler Hammer Type N/A — Weight N/A — Drop N/A — Efficiency N/A
Borehole Azimuth N/A — Borehole Inclination (from Vertical) N/A
Reviewed By K. Carey — Approved By C. Millhollin

Lithology: Depth Ft[3]	Elevation	Graphic	Description	Overburden: Sample[1,2] / Rock Core: RQD %	Depth Ft[3] / Run Ft	Rec. Ft / Rec. Ft	Blows/PSI / Rec. %
0.0	381.1		Top of Hole				
0.3	380.8		Topsoil	DP01	0.0 - 5.0	3.2	N/A
1.2	379.9		FAT CLAY WITH GRAVEL, CH, 10YR 6/4 (light yellowish brown), medium to high plasticity, moist, [FILL]				
2.2	378.9		FAT CLAY, CH, 10YR 6/8 (brownish yellow) to 10YR 8/1 (white), high plasticity, moist, [FILL]				
			POORLY GRADED SAND WITH GRAVEL, SP, 10YR 3/4 (dark yellowish brown) to 2.5Y 2.5/1 (black), moist, [CCR]				
6.1	375.0		GRAVELLY POORLY GRADED SAND WITH SILT, SP, 5Y 2.5/1 (black), moist, [CCR]	DP02	5.0 - 10.0	3.2	N/A
10.0	371.1		No Refusal / Bottom of Hole at 10.0 Ft.				

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

SUBSURFACE LOG

Client Borehole ID	N/A	Stantec Boring No.	**JOF-111 Offset B**
Client	Tennessee Valley Authority	Boring Location	605,021.86 N; 1,412,207.96 E NAD27 Plant Local
Project Number	175568286	Surface Elevation	382.4 ft
		Elevation Datum	NGVD29
Project Name	JOF TDEC Order	Date Started	8/8/19
		Completed	8/8/19
Project Location	New Johnsonville, Humphreys Co., TN	Depth to Water	11.4 ft
		Date/Time	8/8/19 11:56
Inspector	C. Burton	Depth to Water	N/A
Logger	C. Burton	Date/Time	N/A
Drilling Contractor	Geo Logic (Subcontractor)	Drill Rig Type and ID	Geoprobe 6610DT
Overburden Drilling and Sampling Tools (Type and Size)	Macro Core 2.0" OD with 60" PVC sample liners		
Rock Drilling and Sampling Tools (Type and Size)	N/A		
Overdrill Tooling (Type and Size)	N/A	Overdrill Depth	N/A
Sampler Hammer Type	GH70 Direct Push	Weight	N/A
Drop	N/A	Efficiency	N/A
Borehole Azimuth	N/A	Borehole Inclination (from Vertical)	N/A
Reviewed By	K. Carey	Approved By	C. Millhollin

Lithology Depth Ft[3]	Elevation	Graphic	Description	Overburden: Sample[1,2] / Rock Core: RQD %	Depth Ft[3] / Run Ft	Rec. Ft / Rec. Ft	Blows/PSI / Rec. %
0.0	382.4		Top of Hole				
0.5	381.9		Topsoil				
1.3	381.1		LEAN CLAY WITH SILT, CL, 2.5Y 8/1 (white) to 10YR 6/4 (light yellowish brown), low to medium plasticity, moist, [FILL]	DP01	0.0 - 5.0	4.1	N/A
2.9	379.5		LEAN CLAY, CL, 10YR 6/6 (brownish yellow) to 2.5Y 7/1 (light gray), medium plasticity, moist, [FILL]				
6.8	375.6		GRAVELLY POORLY GRADED SAND WITH SILT, SP, 10YR 4/4 (dark yellowish brown) to 2.5YR 3/2 (dusky red), moist, with coal, [CCR]				
			SILTY POORLY GRADED GRAVEL WITH SAND, GP-GM, 2.5Y 3/1 (very dark gray) to 5Y 3/1 (very dark gray), moist to wet, with coal fragments, [CCR]	DP02	5.0 - 10.0	3.7	N/A
				DP03	10.0 - 15.0	2.5	N/A
15.6	366.8						
17.3	365.1		SILT WITH SAND, ML, 7.5YR 4/1 (dark gray), non-plastic, moist to wet, [CCR]				
20.2	362.2		SILTY POORLY GRADED GRAVEL WITH SAND, GP-GM, 10YR 2/1 (black), [CCR]	DP04	15.0 - 20.0	4.9	N/A

Depth scale: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21

Sample intervals: 0.0 - 5.0, 5.0 - 10.0, 10.0 - 15.0, 15.0 - 20.0

TVA EIP BORING LOG 175568286_JOF_TDEC_ORDER.GPJ TDEC SUBSURF DT 20190530.GDT 6/15/20

SUBSURFACE LOG

Client Borehole ID N/A
Client Tennessee Valley Authority
Project Number 175568286
Stantec Boring No. **JOF-111 Offset B**
Boring Location 605,021.86 N; 1,412,207.96 E NAD27 Plant Local
Surface Elevation 382.4 ft
Elevation Datum NGVD29

Depth Ft[3]	Elevation	Description	Sample[1,2]	Depth Ft[3] / Run Ft	Rec. Ft	Blows/PSI / Rec. %
23.5	358.9	SILT WITH SAND, ML, 2.5Y 3/1 (very dark gray), non to low plasticity, moist to wet, [CCR] *(Continued)*	DP05	20.0 - 25.0	5.0	N/A
26.4	356.0	SILTY LEAN CLAY WITH GRAVEL, CL, 10YR 5/3 (brown) to 2.5Y 2.5/1 (black), low to medium plasticity, moist	DP06	25.0 - 30.0	5.0	N/A
28.4	354.0	SANDY POORLY GRADED GRAVEL WITH SILT WITH CLAY, GP-GM, 2.5Y 4/3 (olive brown), wet				
30.1	352.3	POORLY GRADED GRAVEL WITH SAND, GP, 10YR 4/2 (dark grayish brown) to 10YR 3/1 (very dark gray), non-plastic, moist to wet				
37.3	345.1	SILTY FAT CLAY WITH SAND, CH, 10YR 5/4 (yellowish brown) to 5Y 7/1 (light gray), medium to high plasticity, moist	DP07	30.0 - 35.0	3.7	N/A
39.2	343.2	CLAYEY POORLY GRADED GRAVEL WITH SAND, GP-GC, 10YR 4/4 (dark yellowish brown), moist to wet	DP08	35.0 - 40.0	5.0	N/A
40.0	342.4	SILTY LEAN CLAY WITH SAND, CL, 10YR 6/6 (brownish yellow) to 10YR 7/1 (light gray), moist to wet				

No Refusal /
Bottom of Hole at 40.0 Ft.

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

Client Borehole ID: N/A
Stantec Boring No.: **JOF-111 Offset C**
Client: Tennessee Valley Authority
Boring Location: 604,942.32 N; 1,412,173.07 E NAD27 Plant Local
Project Number: 175568286
Surface Elevation: 385.3 ft
Elevation Datum: NGVD29
Project Name: JOF TDEC Order
Date Started: 8/22/19
Completed: 8/22/19
Project Location: New Johnsonville, Humphreys Co., TN
Depth to Water: 13.7 ft
Date/Time: 8/22/19 13:25
Inspector: C. Burton
Logger: C. Burton
Depth to Water: N/A
Date/Time: N/A
Drilling Contractor: Geo Logic (Subcontractor)
Drill Rig Type and ID: Geoprobe 6610DT
Overburden Drilling and Sampling Tools (Type and Size): Macro Core 2.0" OD with 60" PVC sample liners
Rock Drilling and Sampling Tools (Type and Size): N/A
Overdrill Tooling (Type and Size): N/A
Overdrill Depth: N/A
Sampler Hammer Type: GH70 Direct Push
Weight: N/A
Drop: N/A
Efficiency: N/A
Borehole Azimuth: N/A
Borehole Inclination (from Vertical): N/A
Reviewed By: K. Carey
Approved By: C. Millhollin

Lithology Depth Ft[3]	Lithology Elevation	Description	Overburden: Sample[1,2] / Rock Core: RQD %	Depth Ft[3] / Run Ft	Rec. Ft / Rec. Ft	Blows/PSI / Rec. %
0.0	385.3	Top of Hole				
0.5	384.8	Crushed stone				
3.1	382.2	SILTY FAT CLAY, CH, 10YR 6/3 (pale brown) and 10YR 7/1 (light gray), medium to high plasticity, very hard, moist, [FILL]	DP01	0.0 - 5.0	3.7	N/A
11.4	373.9	POORLY GRADED SAND WITH SILT WITH GRAVEL, SP, 10YR 3/2 (very dark grayish brown) to 10YR 2/1 (black), non-plastic, loose, moist, poorly graded, [CCR]	DP02	5.0 - 10.0	4.0	N/A
		GRAVELLY POORLY GRADED SAND WITH SILT, GP-GC, 2.5Y 4/2 (dark grayish brown) to 10YR 5/3 (brown), medium to coarse, loose, wet, [CCR]	DP03	10.0 - 15.0	2.6	N/A
			DP04	15.0 - 20.0	4.5	N/A

Client Borehole ID	N/A	Stantec Boring No.	**JOF-111 Offset C**
Client	Tennessee Valley Authority	Boring Location	604,942.32 N; 1,412,173.07 E NAD27 Plant Local
Project Number	175568286	Surface Elevation	385.3 ft
		Elevation Datum	NGVD29

Lithology: Depth Ft[3]	Elevation	Graphic	Description	Overburden: Sample[1,2] / Rock Core: RQD %	Depth Ft[3] / Run Ft	Rec. Ft / Rec. Ft	Blows/PSI / Rec. %
24.5	360.8		GRAVELLY POORLY GRADED SAND WITH SILT, GP-GC, 2.5Y 4/2 (dark grayish brown) to 10YR 5/3 (brown), medium to coarse, loose, wet, [CCR] *(Continued)*	DP05	20.0 - 25.0	4.7	N/A
34.5	350.8		SILTY LEAN CLAY, CL, 2.5Y 3/1 (very dark gray), medium plasticity, firm, moist to wet	DP06	25.0 - 30.0	3.5	N/A
				DP07	30.0 - 34.5	0.3	N/A

Bedrock Refusal /
Bottom of Hole at 34.5 Ft.

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

TVA EIP BORING LOG 175568286_JOF_TDEC_ORDER.GPJ TDEC SUBSURF DT 20190530.GDT 6/15/20

SUBSURFACE LOG

Client Borehole ID	N/A	Stantec Boring No.	**JOF-111A**
Client	Tennessee Valley Authority	Boring Location	604,942.32 N; 1,412,173.07 E NAD27 Plant Local
Project Number	175568286	Surface Elevation	385.3 ft; Elevation Datum NGVD29
Project Name	JOF TDEC Order	Date Started	9/11/19; Completed 9/17/19
Project Location	New Johnsonville, Humphreys Co., TN	Depth to Water	N/A; Date/Time N/A
Inspector	S. Stanley; Logger S. Stanley	Depth to Water	N/A; Date/Time N/A
Drilling Contractor	M&W Drilling (Subcontractor)	Drill Rig Type and ID	Geoprobe 8150LS

Overburden Drilling and Sampling Tools (Type and Size) 4" X 6" Rotosonic

Rock Drilling and Sampling Tools (Type and Size) N/A

Overdrill Tooling (Type and Size) 8" Rotosonic — Overdrill Depth N/A

Sampler Hammer Type N/A — Weight N/A — Drop N/A — Efficiency N/A

Borehole Azimuth N/A — Borehole Inclination (from Vertical) N/A

Reviewed By K. Carey — Approved By P. Dunne

Depth Ft[3]	Elevation	Graphic	Description	Overburden: Sample[1,2] / Rock Core: RQD %	Depth Ft[3] / Run Ft	Rec. Ft / Rec. Ft	Blows/PSI / Rec. %
0.0	385.3		Top of Hole				
0.8	384.5		Crushed stone				
4.8	380.5		LEAN CLAY LITTLE SILT, CL, 7.5YR 5/6 (strong brown), low to medium plasticity, very hard, moist, [FILL]	RS01	0.0 - 10.0	9.6	N/A
8.2	377.1		LEAN CLAY LITTLE SILT, CL, 7.5YR 2.5/1 (black), non to low plasticity, firm, moist, [FILL]				
12.4	372.9		LEAN CLAY LITTLE SILT, CL, 7.5YR 4/4 (brown), non to low plasticity, firm, moist, [FILL]				
13.5	371.8		SILT, ML, 7.5YR 2.5/1 (black), wet, [CCR]				
			POORLY GRADED SAND LITTLE SILT, SP, 7.5YR 2.5/1 (black), loose, moist, [CCR]	RS02	10.0 - 20.0	8.6	N/A

TVA EIP BORING LOG 175568286_JOF_TDEC_ORDER.GPJ TDEC SUBSURF DT 20190530.GDT 7/6/20

Client Borehole ID	N/A	Stantec Boring No.	**JOF-111A**
Client	Tennessee Valley Authority	Boring Location	604,942.32 N; 1,412,173.07 E NAD27 Plant Local
Project Number	175568286	Surface Elevation	385.3 ft — Elevation Datum NGVD29

Depth Ft[3]	Elevation	Description	Sample[1,2] / RQD %	Depth Ft[3] / Run Ft	Rec. Ft / Rec. Ft	Blows/PSI / Rec. %
22.0	363.3	POORLY GRADED SAND LITTLE SILT, SP, 7.5YR 2.5/1 (black), loose, moist, [CCR] *(Continued)*				
24.7	360.6	POORLY GRADED SAND LITTLE SILT, SP, 7.5YR 2.5/1 (black), wet, [CCR]	RS03	20.0 - 29.0	9.0	N/A
29.0	356.3	FAT CLAY TRACE SILT, CL, 7.5YR 5/4 (brown), medium plasticity, firm to hard, moist				
30.0	355.3	Able to push outer 8.5" PVC casing to 30' during installation				
35.0	350.3	No recovery	RS04	30.0 - 35.0	0.0	N/A
37.6	347.7	POORLY GRADED SAND WITH SILT SOME GRAVEL, SP-SM, 7.5YR 5/6 (strong brown), fine to coarse, low to medium plasticity, loose, moist	RS05	35.0 - 40.0	5.0	N/A
40.0	345.3	LEAN CLAY LITTLE SILT, CL, 7.5YR 5/6 (strong brown), low to medium plasticity, soft, moist				
		POORLY GRADED GRAVEL WITH CLAY, GP-GC, 7.5YR 4/1 (dark gray), fine to coarse, low to medium plasticity, very loose, wet				

SUBSURFACE LOG

Client Borehole ID	N/A	Stantec Boring No.	**JOF-111A**
Client	Tennessee Valley Authority	Boring Location	604,942.32 N; 1,412,173.07 E NAD27 Plant Local
Project Number	175568286	Surface Elevation	385.3 ft
		Elevation Datum	NGVD29

Depth Ft[3]	Elevation	Graphic	Description	Overburden: Sample[1,2] / Rock Core: RQD %	Depth Ft[3] / Run Ft	Rec. Ft / Rec. Ft	Blows/PSI / Rec. %
				RS06	40.0 - 50.0	5.0	N/A
46.0	339.3		LEAN CLAY LITTLE GRAVEL, CL, 7.5YR 5/6 (strong brown), low to medium plasticity, firm, moist				
50.0	335.3		LEAN CLAY, CL, 7.5YR 6/6 (reddish yellow), low to medium plasticity, firm, moist	RS07	50.0 - 60.0	10.0	N/A
60.0	325.3		No Refusal / Bottom of Hole at 60.0 Ft.				

Boring abandoned after surface casing dropped 4' during well completion. Monitoring Well JOF-111 installed adjacent boring JOF-111B.

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

TVA EIP BORING LOG 175568286_JOF_TDEC_ORDER.GPJ TDEC SUBSURF DT 20190530.GDT 7/6/20

SUBSURFACE LOG

Client Borehole ID	N/A	Stantec Boring No.	**JOF-111B**
Client	Tennessee Valley Authority	Boring Location	604,940.99 N; 1,412,174.09 E NAD27 Plant Local
Project Number	175568286	Surface Elevation	385.3 ft — Elevation Datum: NGVD29
Project Name	JOF TDEC Order	Date Started	9/18/19 — Completed: 9/19/19
Project Location	New Johnsonville, Humphreys Co., TN	Depth to Water	N/A — Date/Time: N/A
Inspector	S. Stanley — Logger: S. Stanley	Depth to Water	N/A — Date/Time: N/A
Drilling Contractor	M&W Drilling (Subcontractor)	Drill Rig Type and ID	Geoprobe 8150LS

Overburden Drilling and Sampling Tools (Type and Size): 4" X 6" Rotosonic Casing

Rock Drilling and Sampling Tools (Type and Size): N/A

Overdrill Tooling (Type and Size): 8" Rotosonic Casing — Overdrill Depth: 46.5 ft

Sampler Hammer Type: N/A — Weight: N/A — Drop: N/A — Efficiency: N/A

Borehole Azimuth: N/A — Borehole Inclination (from Vertical): N/A

Reviewed By: K. Carey — Approved By: P. Dunne

Depth Ft[3]	Elevation	Graphic	Description	Overburden: Sample[1,2] / Rock Core: RQD %	Depth Ft[3] / Run Ft	Rec. Ft / Rec. Ft	Blows/PSI / Rec. %
0.0	385.3		Top of Hole				
0.0 – 1.5	385.3 – 383.8		Crushed stone				
2.0	383.3		LEAN CLAY LITTLE SAND, CL, 7.5YR 4/3 (brown), non-plastic, dry, crumbly				
			LEAN CLAY LITTLE SAND, CL, 7.5YR 4/1 (dark gray), non-plastic, soft, dry, crumbly				
3.5	381.8		LEAN CLAY LITTLE SAND, CL, 7.5YR 4/3 (brown), non-plastic, soft, dry, crumbly	RS01	0.0 - 10.0	5.0	N/A
10.0	375.3		POORLY GRADED SAND WITH SILT, SM, 7.5YR 2.5/1 (black), loose, wet, [CCR]	RS02	10.0 - 20.0	8.0	N/A

Depth scale: 0 – 18 ft

TVA EIP BORING LOG 175568286_JOF_TDEC_ORDER.GPJ TDEC SUBSURF DT 20190530.GDT 6/15/20

SUBSURFACE LOG

Client Borehole ID	N/A	Stantec Boring No.	**JOF-111B**
Client	Tennessee Valley Authority	Boring Location	604,940.99 N; 1,412,174.09 E NAD27 Plant Local
Project Number	175568286	Surface Elevation	385.3 ft
		Elevation Datum	NGVD29

Depth Ft[3]	Elevation	Description	Sample[1,2] / RQD %	Depth Ft[3] / Run Ft	Rec. Ft	Blows/PSI / Rec. %
		POORLY GRADED SAND WITH SILT, SM, 7.5YR 2.5/1 (black), loose, wet, [CCR] *(Continued)*				
25.5	359.8		RS03	20.0 - 30.0	8.0	N/A
27.0	358.3	SILT LITTLE SAND, MH, 7.5YR 2.5/1 (black), wet, [CCR]				
29.3	356.0	LEAN CLAY TRACE SILT, CL, 7.5YR 5/4 (brown), low to medium plasticity, firm to hard, moist				
30.0	355.3	POORLY GRADED GRAVEL WITH CLAY TRACE SILT, GP-GC, 7.5YR 5/1 (gray), low to medium plasticity, soft, moist				
32.4	352.9	CLAYEY ORGANIC SILT SOME GRAVEL, OL, 7.5YR 3/1 (very dark gray), low to medium plasticity, wet, moderate organic odor	RS04	30.0 - 35.0	5.0	N/A
35.0	350.3	CLAYEY ORGANIC SILT, OL, 7.5YR 5/4 (brown), low to medium plasticity, wet, moderate organic odor				
39.5	345.8	CLAYEY ORGANIC SILT LITTLE SAND, OL, 7.5YR 5/4 (brown) and 7.5YR 7/1 (light gray), low to medium plasticity, soft, wet	RS05	35.0 - 40.0	3.8	N/A
40.0	345.3					
		POORLY GRADED GRAVEL WITH CLAY LITTLE SAND, GP-GC, 7.5YR 4/4 (brown), low to medium plasticity, soft, wet				

SUBSURFACE LOG

Client Borehole ID	N/A	Stantec Boring No.	**JOF-111B**
Client	Tennessee Valley Authority	Boring Location	604,940.99 N; 1,412,174.09 E NAD27 Plant Local
Project Number	175568286	Surface Elevation	385.3 ft
		Elevation Datum	NGVD29

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]	Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft	Rec. Ft	Rec. %
43–50.0	335.3		POORLY GRADED GRAVEL WITH CLAY LITTLE SAND, GP-GC, 7.5YR 4/4 (brown) and 7.5YR 7/1 (light gray), low to medium plasticity, soft, wet *(Continued)*		RS06	40.0 - 50.0	5.0	N/A

No Refusal /
Bottom of Hole at 50.0 Ft.

Monitoring well JOF-111 installed in boring on 9/18/19. Refer to JOF-111 well installation detail for well construction details.

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

TVA EIP BORING LOG 175568286_JOF_TDEC_ORDER.GPJ TDEC SUBSURF DT 20190530.GDT 6/15/20

SUBSURFACE LOG

Client Borehole ID	N/A	Stantec Boring No.	**JOF-111-Pre**
Client	Tennessee Valley Authority	Boring Location	605,017.14 N; 1,412,230.40 E NAD27 Plant Local
Project Number	175568286	Surface Elevation	382.3 ft; Elevation Datum NGVD29
Project Name	JOF TDEC Order	Date Started	8/7/19; Completed 8/7/19
Project Location	New Johnsonville, Humphreys Co., TN	Depth to Water	11.1 ft; Date/Time 8/7/19 13:40
Inspector	C. Burton; Logger C. Burton	Depth to Water	N/A; Date/Time N/A
Drilling Contractor	Geo Logic (Subcontractor)	Drill Rig Type and ID	Geoprobe 6610DT

Overburden Drilling and Sampling Tools (Type and Size) Macro Core 2.0" OD with 60" PVC sample liners

Rock Drilling and Sampling Tools (Type and Size) N/A

Overdrill Tooling (Type and Size) N/A; Overdrill Depth N/A

Sampler Hammer Type GH70 Direct Push; Weight N/A; Drop N/A; Efficiency N/A

Borehole Azimuth N/A; Borehole Inclination (from Vertical) N/A

Reviewed By K. Carey; Approved By P. Dunne

Depth Ft[3]	Elevation	Description	Overburden: Sample[1,2] / Rock Core: RQD %	Depth Ft[3] / Run Ft	Rec. Ft / Rec. Ft	Blows/PSI / Rec. %
0.0	382.3	Top of Hole				
0.8	381.5	Topsoil	DP01	0.0 - 5.0	3.9	N/A
2.7	379.6	LEAN CLAY SOME GRAVEL, CL, 10YR 5/8 (yellowish brown), medium to high plasticity, moist, [FILL]				
6.0	376.3	FAT CLAY WITH GRAVEL, CH, 2.5Y 3/2 (very dark grayish brown) to 10YR 5/6 (yellowish brown), medium to high plasticity, moist, with coal fragments and organics, [CCR]	DP02	5.0 - 10.0	3.3	N/A
13.3	369.0	SANDY POORLY GRADED GRAVEL, GP, 2.5Y 3/3 (dark olive brown) to N 4/ (dark gray), non-plastic, moist, stratified, coal fragments, [FILL]	DP03	10.0 - 15.0	3.5	N/A
15.3	367.0	FAT CLAY SOME GRAVEL, CH, 5Y 2.5/1 (black), medium to high plasticity, moist, [CCR]				
		SANDY SILT SOME GRAVEL, ML, 5Y 2.5/1 (black), wet, [CCR]	DP04	15.0 - 20.0	2.5	N/A

Water level symbol at 11 ft.

TVA EIP BORING LOG 175568286_JOF_TDEC_ORDER.GPJ TDEC SUBSURF DT 20190530.GDT 8/7/20

SUBSURFACE LOG

Client Borehole ID	N/A	Stantec Boring No.	**JOF-111-Pre**
Client	Tennessee Valley Authority	Boring Location	605,017.14 N; 1,412,230.40 E NAD27 Plant Local
Project Number	175568286	Surface Elevation	382.3 ft
		Elevation Datum	NGVD29

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]	Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft	Rec. Ft	Rec. %
18 / 19 / 20 — 20.0	362.3		SANDY SILT SOME GRAVEL, ML, 5Y 2.5/1 (black), wet, [CCR] *(Continued)*					
			No Refusal / Bottom of Hole at 20.0 Ft.					

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

TVA EIP BORING LOG 175568286_JOF_TDEC_ORDER.GPJ TDEC SUBSURF DT 20190530.GDT 8/7/20

SUBSURFACE LOG

Client Borehole ID	N/A	Stantec Boring No.	**JOF-112**
Client	Tennessee Valley Authority	Boring Location	604,376.52 N; 1,412,991.02 E NAD27 Plant Local
Project Number	175568286	Surface Elevation	389.8 ft — Elevation Datum: NGVD29
Project Name	JOF TDEC Order	Date Started	8/27/19 — Completed: 8/27/19
Project Location	New Johnsonville, Humphreys Co., TN	Depth to Water	N/A — Date/Time: N/A
Inspector	S. Stanley — Logger: S. Stanley	Depth to Water	N/A — Date/Time: N/A
Drilling Contractor	Stantec Consulting Services Inc.	Drill Rig Type and ID	CME 1050, #952

Overburden Drilling and Sampling Tools (Type and Size): 4-1/4" HSA, 2" SS w/o liners, 3" Shelby Tubes

Rock Drilling and Sampling Tools (Type and Size): N/A

Overdrill Tooling (Type and Size): 8-1/4" HSA overdrill of boring — Overdrill Depth: 30.9 ft

Sampler Hammer Type: Automatic — Weight: 140 lb — Drop: 30" — Efficiency: N/A

Borehole Azimuth: N/A — Borehole Inclination (from Vertical): N/A

Reviewed By: J. Snider — Approved By: L. Tucker

Lithology Depth Ft[3]	Elevation	Description	Overburden: Sample[1,2] / Rock Core: RQD %	Depth Ft[3] / Run Ft	Rec. Ft	Blows/PSI / Rec. %
0.0	389.8	Top of Hole				
0.5	389.3	Crushed stone	SS01G	0.0 - 1.5	1.2	28-14-9
		SANDY LEAN CLAY LITTLE GRAVEL, CL, 7.5YR 5/8 (strong brown), low to medium plasticity, very hard, dry, [FILL] Rock in SS02 from 1.5' to 3.0'	SS02G	1.5 - 3.0	0.4	8-7-6
4.0	385.8		SS03G	3.0 - 4.5	1.0	7-3-4
4.5	385.3	SANDY LEAN CLAY LITTLE GRAVEL, CL, 7.5YR 5/2 (brown), low to medium plasticity, firm, moist	SS04G	4.5 - 6.0	1.2	4-2-3
		SANDY LEAN CLAY LITTLE GRAVEL, CL, 7.5YR 5/8 (strong brown), low to medium plasticity, firm, moist	SS05G	6.0 - 7.5	1.2	3-3-2
7.2	382.6					
7.5	382.3	CLAYEY SILT TRACE SAND, CL-ML, 7.5YR 4/6 (strong brown), low to medium plasticity, firm, moist	SS06G	7.5 - 9.0	1.4	WH-1-WH
		SANDY LEAN CLAY LITTLE GRAVEL, CL, 2.5YR 4/6 (red), low to medium plasticity, very soft, moist				
9.2	380.6	SANDY LEAN CLAY LITTLE GRAVEL, CL, 2.5YR 4/6 (red), low plasticity, very soft, wet	SS07G	9.0 - 10.5	1.0	WH-WH-WH
			SS08G	10.5 - 12.0	1.2	WH-WH-2
12.5	377.3	POORLY GRADED GRAVEL WITH SILT, GP, 7.5YR 4/6 (strong brown), non-plastic, very hard, wet, limestone rock fragments	SS09aG / SS09bG	12.0 - 12.5 / 12.5 - 13.5	1.5	10-19-35
			SS10G	13.5 - 15.0	1.5	18-26-42
			SS11G	15.0 - 16.5	1.5	11-20-20
			SS12G	16.5 - 18.0	1.3	12-14-14

SUBSURFACE LOG

Stantec TVA

Client Borehole ID	N/A	Stantec Boring No.	**JOF-112**
Client	Tennessee Valley Authority	Boring Location	604,376.52 N; 1,412,991.02 E NAD27 Plant Local
Project Number	175568286	Surface Elevation	389.8 ft
		Elevation Datum	NGVD29

Depth Ft[3]	Elevation	Description	Sample[1,2]	Depth Ft[3]	Rec. Ft	Blows/PSI
		POORLY GRADED GRAVEL WITH SILT, GP, 7.5YR 4/6 (strong brown), non-plastic, very hard, wet, limestone rock fragments *(Continued)*	SS13G	18.0 - 19.5	1.0	9-5-8
			SS14E	19.5 - 21.0	1.3	10-10-15
			SS15E	21.0 - 22.5	1.1	16-14-11
			SS16E	22.5 - 24.0	1.5	9-7-5
			SS17E	24.0 - 25.5	0.9	12-16-43
26.9	362.9		SS18E	25.5 - 26.9	1.4	27-37-50/5"
27.0	362.8	Auger without sampling	SS19E	27.0 - 27.3	0.3	50/4"
27.3	362.5	POORLY GRADED GRAVEL WITH SILT, GP, 7.5YR 4/6 (strong brown), non-plastic, very hard, wet, limestone rock fragments				
28.5	361.3	Auger without sampling				
28.9	360.9	POORLY GRADED GRAVEL WITH SILT, GP, 7.5YR 4/3 (brown), non-plastic, very hard, wet, limestone rock fragments	SS20E	28.5 - 28.9	0.4	50/5"
30.0	359.8	Auger without sampling				
30.9	358.9	POORLY GRADED GRAVEL WITH SILT, GP, 7.5YR 4/3 (brown), non-plastic, very hard, wet, limestone rock fragments	SS21G	30.0 - 30.9	0.9	40-50/5"

19.5/24.0-20190828

24.0/28.9-20190828

Refusal /
Bottom of Hole at 30.9 Ft.

Permanent monitoring well JOF-112 installed in this boring following over-drilling. See JOF-112 monitoring well installation log for details.

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

TVA EIP BORING LOG 175568286_JOF_TDEC_ORDER.GPJ TDEC SUBSURF DT 20190530.GDT 2/20/20

SUBSURFACE LOG

Client Borehole ID: N/A
Stantec Boring No.: **JOF-112-Pre**
Client: Tennessee Valley Authority
Boring Location: 604,373.46 N; 1,412,990.25 E NAD27 Plant Local
Project Number: 175568286
Surface Elevation: 389.2 ft
Elevation Datum: NGVD29
Project Name: JOF TDEC Order
Date Started: 8/6/19
Completed: 8/6/19
Project Location: New Johnsonville, Humphreys Co., TN
Depth to Water: 9.0 ft
Date/Time: 8/6/19 13:05
Inspector: C. Burton
Logger: C. Burton
Depth to Water: N/A
Date/Time: N/A
Drilling Contractor: Geo Logic (Subcontractor)
Drill Rig Type and ID: Geoprobe 6610DT
Overburden Drilling and Sampling Tools (Type and Size): Macro Core 2.0" OD
Rock Drilling and Sampling Tools (Type and Size): N/A
Overdrill Tooling (Type and Size): N/A
Overdrill Depth: N/A
Sampler Hammer Type: GH70 Direct Push
Weight: N/A
Drop: N/A
Efficiency: N/A
Borehole Azimuth: N/A
Borehole Inclination (from Vertical): N/A
Reviewed By: K. Carey
Approved By: P. Dunne

Depth Ft[3]	Elevation	Graphic	Description	Overburden: Sample[1,2] / Rock Core: RQD %	Depth Ft[3] / Run Ft	Rec. Ft / Rec. Ft	Blows/PSI / Rec. %
0.0	389.2		Top of Hole				
0.6	388.6		Crushed stone				
5.9	383.3		GRAVELLY LEAN CLAY, CL, 7.5YR 5/6 (strong brown) to 10YR 6/1 (gray), [FILL]	DP01	0.0 - 5.0	2.8	N/A
10.0	379.2		LEAN CLAY WITH GRAVEL, CL, 2.5YR 4/8 (red) to 7.5YR 5/6 (strong brown), low to medium plasticity, moist, [FILL]	DP02	5.0 - 10.0	1.6	N/A
13.8	375.4		GRAVELLY LEAN CLAY, CL, 7.5YR 5/6 (strong brown)	DP03	10.0 - 14.0	3.0	N/A
15.8	373.4		GRAVELLY POORLY GRADED SAND, SP-SC, 7.5YR 5/4 (brown) to 5YR 4/6 (yellowish red), medium to coarse	DP04	14.0 - 19.0	2.8	N/A
			CLAYEY SAND WITH GRAVEL, SP-SC, 7.5YR 6/6 (reddish yellow)				

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

Run intervals: 0.0 - 5.0; 5.0 - 10.0; 10.0 - 14.0; 14.0 - 19.0

TVA EIP BORING LOG 175568286_JOF_TDEC_ORDER.GPJ TDEC SUBSURF DT 20190530.GDT 9/15/20

Client Borehole ID	N/A	Stantec Boring No.	**JOF-112-Pre**
Client	Tennessee Valley Authority	Boring Location	604,373.46 N; 1,412,990.25 E NAD27 Plant Local
Project Number	175568286	Surface Elevation	389.2 ft
		Elevation Datum	NGVD29

Lithology Depth Ft[3]	Elevation	Graphic	Description	Overburden: Sample[1,2] / Rock Core: RQD %	Depth Ft[3] / Run Ft	Rec. Ft / Rec. Ft	Blows/PSI / Rec. %
			CLAYEY SAND WITH GRAVEL, SP-SC, 7.5YR 6/6 (reddish yellow) *(Continued)*				
21.4	367.8		FAT CLAY WITH GRAVEL, CH, 5Y 7/3 (pale yellow), moist	DP05	19.0 - 24.0	3.2	N/A
25.2	364.0			DP06	24.0 - 25.2	0.4	N/A

Bedrock Refusal /
Bottom of Hole at 25.2 Ft.

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

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

TVA EIP BORING LOG 175568286_JOF_TDEC_ORDER.GPJ TDEC SUBSURF DT 20190530.GDT 9/15/20

Client Borehole ID	N/A	Stantec Boring No.	**JOF-113**
Client	Tennessee Valley Authority	Boring Location	604,136.76 N; 1,412,110.10 E NAD27 Plant Local
Project Number	175568286	Surface Elevation	383.4 ft; Elevation Datum NGVD29
Project Name	JOF TDEC Order	Date Started	8/30/19; Completed 9/3/19
Project Location	New Johnsonville, Humphreys Co., TN	Depth to Water	30.2 ft; Date/Time 9/3/19 10:09
Inspector	S. Stanley; Logger S. Stanley	Depth to Water	13.0 ft; Date/Time 9/3/19 10:09
Drilling Contractor	Stantec Consulting Services Inc.	Drill Rig Type and ID	CME 1050, #952

Overburden Drilling and Sampling Tools (Type and Size) 4-1/4" HSA, 2" SS w/o liners, 3" Shelby Tubes

Rock Drilling and Sampling Tools (Type and Size) N/A

Overdrill Tooling (Type and Size) 8-1/4" HSA overdrill of boring; Overdrill Depth 49.7 ft

Sampler Hammer Type Automatic; Weight 140 lb; Drop 30"; Efficiency N/A

Borehole Azimuth N/A; Borehole Inclination (from Vertical) N/A

Reviewed By K. Carey; Approved By P. Dunne

Lithology Depth Ft[3]	Elevation	Graphic	Description	Overburden: Sample[1,2] / Rock Core: RQD %	Depth Ft[3] / Run Ft	Rec. Ft / Rec. Ft	Blows/PSI / Rec. %
0.0	383.4		Top of Hole				
1.0	382.4		Overburden - general description of previously air-excavated material: Gravel mixed with clay, [FILL]				
6.0	377.4		Fat Clay mixed with gravel, moist, [FILL] Hole backfilled with coarse sand to 6.0' bgs after completion of air-excavation.				
9.5	373.9		SILTY FAT CLAY, CH, 7.5YR 5/6 (strong brown), medium plasticity, very soft, moist	SS01G	6.0 - 7.5	0.4	3-2-3
				SS02G	7.5 - 9.0	0.2	5-2-2
15.0	368.4		SILTY LEAN CLAY, CL, 7.5YR 5/6 (strong brown), low to medium plasticity, firm, moist	SS03G	9.0 - 10.5	1.2	2-2-3
				SS04G	10.5 - 12.0	1.5	2-2-4
				SS05G	12.0 - 13.5	1.5	1-2-3
				SS06G	13.5 - 15.0	1.5	2-3-3
			SILTY LEAN CLAY, CL, 7.5YR 5/6 (strong brown), low to medium plasticity, firm, wet	SS07G	15.0 - 16.5	0.9	3-2-2
				SS08G	16.5 - 18.0	1.2	3-2-3

TVA EIP BORING LOG 175568286_JOF_TDEC_ORDER.GPJ TDEC SUBSURF DT 20190530.GDT 6/15/20

Client Borehole ID	N/A	Stantec Boring No.	**JOF-113**
Client	Tennessee Valley Authority	Boring Location	604,136.76 N; 1,412,110.10 E NAD27 Plant Local
Project Number	175568286	Surface Elevation	383.4 ft
		Elevation Datum	NGVD29

Lithology: Depth Ft[3]	Elevation	Graphic	Description	Overburden: Sample[1,2] / Rock Core: RQD %	Depth Ft[3] / Run Ft	Rec. Ft / Rec. Ft	Blows/PSI / Rec. %
			SILTY LEAN CLAY, CL, 7.5YR 5/6 (strong brown), low to medium plasticity, firm, wet *(Continued)*	SS09G	18.0 - 19.5	1.2	3-2-3
20.0	363.4						
			SILTY LEAN CLAY LITTLE GRAVEL, CL, 2.5YR 4/6 (red), low plasticity, firm, wet	SS10G	19.5 - 21.0	1.5	3-3-4
				SS11G	21.0 - 22.5	1.5	3-3-2
22.5	360.9						
			SILTY LEAN CLAY LITTLE GRAVEL, CL, 7.5YR 5/4 (brown), low plasticity, firm, wet	SS12G	22.5 - 24.0	1.5	1-2-3
24.0	359.4						
			CLAYEY SILT LITTLE GRAVEL, ML, 7.5YR 5/4 (brown), non-plastic, very soft, wet, water on SS	SS13G	24.0 - 25.5	1.5	3-3-3
				SS14G	25.5 - 27.0	1.5	WH-WH-1
27.5	355.9						
			CLAYEY SILT LITTLE SAND, ML, 7.5YR 3/3 (dark brown), non-plastic, very soft, wet, water on SS	SS15G	27.0 - 28.5	1.5	7-18-23
28.2	355.2						
			SANDY SILTY GRAVEL, GC, 7.5YR 4/4 (brown), fine to coarse, loose, wet, with chert	SS16G	28.5 - 30.0	1.5	24-30-30
30.0	353.4						
			SANDY SILTY GRAVEL, GC, 7.5YR 5/6 (strong brown), fine to coarse, loose, wet, with chert	SS17G	30.0 - 31.5	1.4	20-13-25
				SS18G	31.5 - 33.0	1.2	19-14-23
				SS19G	33.0 - 34.5	1.5	20-15-25
				SS20G	34.5 - 36.0	1.3	23-14-17
				SS21G	36.0 - 37.5	1.2	30-30-30
				SS22G	37.5 - 39.0	1.3	18-22-35
				SS23G	39.0 - 40.1	1.0	50-35-50/1"
40.2	343.2						
			CLAYEY GRAVEL WITH SILT, GP-GC, 7.5YR 5/4 (brown) to 2.5YR 8/1 (white), fine to medium, dense, moist, poorly graded	SS24G	40.5 - 40.9	0.4	50/5"
41.5	341.9						

Depth scale: 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42

TVA EIP BORING LOG 175568286_JOF_TDEC_ORDER.GPJ TDEC SUBSURF DT 20190530.GDT 6/15/20

Client Borehole ID	N/A	Stantec Boring No.	**JOF-113**
Client	Tennessee Valley Authority	Boring Location	604,136.76 N; 1,412,110.10 E NAD27 Plant Local
Project Number	175568286	Surface Elevation	383.4 ft
		Elevation Datum	NGVD29

Lithology: Depth Ft[3]	Elevation	Graphic	Description	Overburden: Sample[1,2] / Rock Core: RQD %	Depth Ft[3] / Run Ft	Rec. Ft / Rec. Ft	Blows/PSI / Rec. %
43 44 44.7	338.7		CLAYEY GRAVEL WITH SILT, GP-GC, 2.5Y 8/1 (white) to 2.5Y 7/4 (pale brown), fine to medium, moist *(Continued)*	SS25G	42.0 - 43.5	1.3	15-30-37
				SS26G	43.5 - 44.7	1.1	23-22-50/2"

No Refusal /
Bottom of Hole at 44.7 Ft.

Permanent monitoring well JOF-113 installed in this boring following over-drilling. See JOF-113 monitoring well installation log for details.

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

Stantec TVA

SUBSURFACE LOG

Client Borehole ID	N/A	Stantec Boring No.	**JOF-113 Offset A**
Client	Tennessee Valley Authority	Boring Location	604,133.73 N; 1,412,109.26 E NAD27 Plant Local
Project Number	175568286	Surface Elevation	382.8 ft — Elevation Datum NGVD29
Project Name	JOF TDEC Order	Date Started	8/21/19 — Completed 8/21/19
Project Location	New Johnsonville, Humphreys Co., TN	Depth to Water	13.1 ft — Date/Time 8/22/19 06:50
Inspector	C. Burton — Logger C. Burton	Depth to Water	N/A — Date/Time N/A
Drilling Contractor	Geo Logic (Subcontractor)	Drill Rig Type and ID	Geoprobe 6610DT

Overburden Drilling and Sampling Tools (Type and Size) Macro Core 2.0" OD with 60" PVC liners

Rock Drilling and Sampling Tools (Type and Size) N/A

Overdrill Tooling (Type and Size) N/A — Overdrill Depth N/A

Sampler Hammer Type GH70 Direct Push — Weight N/A — Drop N/A — Efficiency N/A

Borehole Azimuth N/A — Borehole Inclination (from Vertical) N/A

Reviewed By K. Carey — Approved By C. Millhollin

Depth Ft[3]	Elevation	Description	Overburden: Sample[1,2] / Rock Core: RQD %	Depth Ft[3] / Run Ft	Rec. Ft / Rec. Ft	Blows/PSI / Rec. %
0.0	382.8	Top of Hole				
1.0	381.8	Overburden - general description of previously air-excavated material to 6.0' bgs: Gravel mixed with clay, moist, [FILL]				
6.0	376.8	FAT CLAY WITH GRAVEL, moist, [FILL] Hole backfilled with coarse sand to 6.0' bgs after completion of air excavation.				
15.0	367.8	FAT CLAY WITH GRAVEL, CH, 7.5YR 5/4 (brown) to 10YR 5/4 (yellowish brown), high plasticity, moist, [FILL]	DP01	5.0 - 10.0	1.9	N/A
			DP02	10.0 - 15.0	3.2	N/A
16.6	366.2	FAT CLAY, CH, 10YR 5/6 (yellowish brown) to 7.5YR 4/4 (brown), high plasticity, moist, [FILL]				
17.2	365.6	FAT CLAY, CH, 10YR 5/8 (yellowish brown) to 7.5YR 7/1 (light gray), high plasticity, hard to firm, [FILL]	DP03	15.0 - 20.0	1.9	N/A

TVA EIP BORING LOG 175568286_JOF_TDEC_ORDER.GPJ TDEC SUBSURF DT 20190530.GDT 6/17/20

SUBSURFACE LOG

Client Borehole ID	N/A	Stantec Boring No.	**JOF-113 Offset A**
Client	Tennessee Valley Authority	Boring Location	604,133.73 N; 1,412,109.26 E NAD27 Plant Local
Project Number	175568286	Surface Elevation	382.8 ft
		Elevation Datum	NGVD29

Depth Ft[3]	Elevation	Description	Sample[1,2]	Depth Ft[3]	Rec. Ft	Blows/PSI / Rec. %
18.5	364.3	GRAVELLY FAT CLAY WITH SAND, CH, 7.5YR 5/6 (strong brown), firm, wet, [FILL] *(Continued)*				
21.7	361.1	GRAVELLY CLAYEY SAND, GP-GC, 7.5YR 5/6 (strong brown), high plasticity, medium dense, wet				
28.4	354.4	SILTY LEAN CLAY, CL, 7.5YR 5/6 (strong brown) to 10YR 6/6 (brownish yellow), medium plasticity, firm, moist	DP04	20.0 - 25.0	3.7	N/A
			DP05	25.0 - 28.4	2.9	N/A

Bedrock Refusal /
Bottom of Hole at 28.4 Ft.

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

TVA EIP BORING LOG 175568286_JOF_TDEC_ORDER.GPJ TDEC SUBSURF DT 20190530.GDT 6/17/20

SUBSURFACE LOG

Stantec TVA

Client Borehole ID	N/A	Stantec Boring No.	**JOF-114**
Client	Tennessee Valley Authority	Boring Location	603,597.10 N; 1,412,156.67 E NAD27 Plant Local
Project Number	175568286	Surface Elevation	383.7 ft — Elevation Datum NGVD29
Project Name	JOF TDEC Order	Date Started	9/10/19 — Completed 9/10/19
Project Location	New Johnsonville, Humphreys Co., TN	Depth to Water	18.5 ft — Date/Time 9/10/19 15:28
Inspector	C. .Burton — Logger C. Burton	Depth to Water	23.1 ft — Date/Time 9/12/19 07:12
Drilling Contractor	Stantec Consulting Services Inc.	Drill Rig Type and ID	CME 85#2, #951

Overburden Drilling and Sampling Tools (Type and Size) 4-1/4" HSA, 2" SS w/o liners, 3" Shelby Tubes

Rock Drilling and Sampling Tools (Type and Size) N/A

Overdrill Tooling (Type and Size) 8-1/4" HSA overdrill of boring — Overdrill Depth 40.5 ft

Sampler Hammer Type Automatic — Weight 140 lb — Drop 30" — Efficiency N/A

Borehole Azimuth N/A — Borehole Inclination (from Vertical) N/A

Reviewed By K. Carey — Approved By P. Dunne

Lithology Depth Ft[3]	Elevation	Graphic	Description	Overburden: Sample[1,2] / Rock Core: RQD %	Depth Ft[3] / Run Ft	Rec. Ft / Rec. Ft	Blows/PSI / Rec. %
0.0	383.7		Top of Hole				
1.0	382.7		Overburden - description of previously air-excavated material: Gravel mixed with clay, moist, [FILL]				
6.0	377.7		Fat Clay, with gravel, moist, [FILL] Hole backfilled with coarse sand to 6.0' bgs after completion of air-excavation. Lithology determined from air knifing cuttings.				
7.5	376.2		FAT CLAY WITH SAND, CH, 10YR 5/4 (yellowish brown), [FILL]	SS01G	6.0 - 7.5	0.3	WH-WH-1
10.3	373.4		FAT CLAY, CH, 7.5YR 6/4 (light brown) with 7.5YR 7/1 (light gray), medium to high plasticity, very soft to firm, moist, [FILL]	SS02G	7.5 - 9.0	1.5	2-2-5
				SS03aG	9.0 - 10.3	1.2	3-2-5
11.2	372.5		LEAN CLAY, CL, medium to high plasticity, firm, moist, [FILL]	SS03bG SS04aG	10.3 - 10.5 10.5 - 11.2	1.3	3-3-3
13.5	370.2		FAT CLAY WITH GRAVEL, CH, 7.5YR 5/2 (brown) to 10YR 4/4 (dark yellowish brown), medium to high plasticity, firm, moist, with coal fragments, [FILL]	SS04bG	11.2 - 12.0		
				SS05G	12.0 - 13.5	0.9	1-2-2
15.0	368.7		FAT CLAY WITH GRAVEL, CH, 7.5YR 5/3 (brown) with 7.5YR 7/1 (light gray), medium to high plasticity, very soft, moist, [FILL]	SS06G	13.5 - 15.0	1.0	1-1-1
			FAT CLAY, CH, 10YR 5/6 (yellowish brown) with 7.5YR 7/1 (light gray), medium to high plasticity, very soft to firm, moist to wet, [FILL]	SS07	15.0 - 16.5	1.3	1-3-4
				SS08	16.5 - 18.0	1.1	WH-1-1
				SS09	18.0 - 19.5	1.3	WH-WH-WH
				SS10G	19.5 - 21.0	1.3	WH-WH-WH

SUBSURFACE LOG

Client Borehole ID	N/A	Stantec Boring No.	**JOF-114**
Client	Tennessee Valley Authority	Boring Location	603,597.10 N; 1,412,156.67 E NAD27 Plant Local
Project Number	175568286	Surface Elevation	383.7 ft — Elevation Datum NGVD29

Depth Ft[3]	Elevation	Description	Sample[1,2]	Depth Ft[3]	Rec. Ft	Blows/PSI
21.4	362.3	FAT CLAY WITH GRAVEL, CH, 10YR 5/3 (brown) to 10YR 6/6 (brownish yellow), medium to high plasticity, very soft to firm, moist, [FILL]	SS11aG	21.0 - 21.4	0.9	WH-1-2
			SS11bG	21.4 - 22.5		
			SS12G	22.5 - 24.0	0.4	1-1-1
25.5	358.2		SS13G	24.0 - 25.5	0.3	1-WH-1
		SANDY CLAYEY GRAVEL, GP-GC, 7.5YR 4/6 (strong brown) to 10YR 7/1 (light gray), very fine to medium, very dense, moist to wet	SS14G	25.5 - 27.0	1.5	2-4-4
28.5	355.2		SS15G	27.0 - 28.5	1.2	18-34-32
		SANDY CLAYEY GRAVEL, GP-GC, 10YR 5/8 (yellowish brown) to 10YR 7/6 (yellow), fine to medium, very dense, wet	SS16G	28.5 - 30.0	1.0	10-18-18
			SS17G	30.0 - 31.5	1.3	22-24-21
			SS18G	31.5 - 33.0	1.1	2-20-25
			SS19G	33.0 - 34.5	1.1	18-28-25
			SS20G	34.5 - 36.0	1.2	19-20-20
			SS21G	36.0 - 37.5	1.2	20-23-18
			SS22G	37.5 - 39.0	1.2	15-16-23
40.5	343.2		SS23G	39.0 - 40.5	1.2	28-25-25

No Refusal /
Bottom of Hole at 40.5 Ft.

Permanent monitoring well JOF-114 installed in this boring following over-drilling. See JOF-114 monitoring well installation log for details.

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

TVA EIP BORING LOG 175568286_JOF_TDEC_ORDER.GPJ TDEC SUBSURF DT 20190530.GDT 10/27/20

SUBSURFACE LOG

Client Borehole ID	N/A	Stantec Boring No.	**JOF-114 Offset A**
Client	Tennessee Valley Authority	Boring Location	603,594.03 N; 1,412,155.80 E NAD27 Plant Local
Project Number	175568286	Surface Elevation	383.1 ft — Elevation Datum: NGVD29
Project Name	JOF TDEC Order	Date Started	8/21/19 — Completed: 8/21/19
Project Location	New Johnsonville, Humphreys Co., TN	Depth to Water	N/A — Date/Time: N/A
Inspector	C. Burton — Logger: C. Burton	Depth to Water	N/A — Date/Time: N/A
Drilling Contractor	Geo Logic (Subcontractor)	Drill Rig Type and ID	Geoprobe 6610DT

Overburden Drilling and Sampling Tools (Type and Size) Macro Core 2.0" OD

Rock Drilling and Sampling Tools (Type and Size) N/A

Overdrill Tooling (Type and Size) N/A — Overdrill Depth N/A

Sampler Hammer Type GH70 Direct Push — Weight N/A — Drop N/A — Efficiency N/A

Borehole Azimuth N/A — Borehole Inclination (from Vertical) N/A

Reviewed By K. Carey — Approved By P. Dunne

Depth Ft[3]	Elevation	Graphic	Description	Overburden: Sample[1,2] / Rock Core: RQD %	Depth Ft[3] / Run Ft	Rec. Ft / Rec. Ft	Blows/PSI / Rec. %
0.0	383.1		Top of Hole				
1.0	382.1	Gravel	Overburden, previously air-knifed to 6.0'. Gravel mixed with clay				
6.0	377.1	Fat clay	FAT CLAY WITH GRAVEL, CH, high plasticity, moist, (as interpreted from spoils generated during air knifing) Air-knife boring backfill (coarse sand) from 5.0' to 6.0'				
10.6	372.5	Fat clay	FAT CLAY WITH GRAVEL, CH, 7.5YR 5/6 (strong brown) to 5YR 7/1 (light gray), high plasticity, moist, [FILL]	DP01	5.0 - 10.0	3.9	N/A
12.0	371.1	Fat clay	FAT CLAY WITH GRAVEL, CH, 10YR 4/3 (brown) with 10YR 5/1 (gray), medium to high plasticity, moist, with coal fragments, [FILL]	DP02	10.0 - 12.0	1.2	N/A

Bedrock Refusal /
Bottom of Hole at 12.0 Ft.

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

TVA EIP BORING LOG 175568286_JOF_TDEC_ORDER.GPJ TDEC SUBSURF DT 20190530.GDT 7/6/20

SUBSURFACE LOG

Client Borehole ID: N/A
Stantec Boring No.: **JOF-114-Pre**
Client: Tennessee Valley Authority
Boring Location: 603,597.10 N; 1,412,156.67 E NAD27 Plant Local
Project Number: 175568286
Surface Elevation: 383.7 ft
Elevation Datum: NGVD29
Project Name: JOF TDEC Order
Date Started: 8/21/19
Completed: 8/21/19
Project Location: New Johnsonville, Humphreys Co., TN
Depth to Water: N/A
Date/Time: N/A
Inspector: C. Burton
Logger: C. Burton
Depth to Water: N/A
Date/Time: N/A
Drilling Contractor: Geo Logic (Subcontractor)
Drill Rig Type and ID: Geoprobe 6610DT
Overburden Drilling and Sampling Tools (Type and Size): Macro Core 2.0" OD with 60" PVC sample liners
Rock Drilling and Sampling Tools (Type and Size): N/A
Overdrill Tooling (Type and Size): N/A
Overdrill Depth: N/A
Sampler Hammer Type: GH70 Direct Push
Weight: N/A
Drop: N/A
Efficiency: N/A
Borehole Azimuth: N/A
Borehole Inclination (from Vertical): N/A
Reviewed By: K. Carey
Approved By: C. Millhollin

Lithology Depth Ft[3]	Elevation	Graphic	Description	Overburden: Sample[1,2] / Rock Core: RQD %	Depth Ft[3] / Run Ft	Rec. Ft / Rec. Ft	Blows/PSI / Rec. %
0.0	383.7		Top of Hole				
1.0	382.7		Overburden, previously air-knifed material. Gravel mixed with clay				
6.0	377.7		FAT CLAY WITH GRAVEL, CH, high plasticity, [FILL] Hole backfilled with coarse sand to 6.0' bgs after completion of air-excavation.				
9.1	374.6		FAT CLAY SOME GRAVEL, CH, 10YR 5/8 (yellowish brown) to 2.5Y 8/1 (white), high plasticity, [FILL]	DP01	5.0 - 10.0	4.1	N/A
18.0	365.7		FAT CLAY WITH GRAVEL, CH, 10YR 5/4 (yellowish brown) to 10YR 5/6 (yellowish brown), high plasticity, moist, with coal fragments, [FILL]	DP02	10.0 - 15.0	2.4	N/A
				DP03	15.0 - 20.0	4.0	N/A

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

Sample interval labels: 5.0 - 10.0; 10.0 - 15.0; 15.0 - 20.0

TVA EIP BORING LOG 175568286_JOF_TDEC_ORDER.GPJ TDEC SUBSURF DT 20190530.GDT 7/13/20

Client Borehole ID	N/A	Stantec Boring No.	**JOF-114-Pre**
Client	Tennessee Valley Authority	Boring Location	603,597.10 N; 1,412,156.67 E NAD27 Plant Local
Project Number	175568286	Surface Elevation	383.7 ft
		Elevation Datum	NGVD29

Lithology: Depth Ft[3]	Elevation	Graphic	Description	Overburden: / Rock Core:	Sample[1,2] / RQD %	Depth Ft[3] / Run Ft	Rec. Ft / Rec. Ft	Blows/PSI / Rec. %
27.5	356.2		FAT CLAY WITH GRAVEL, CH, 2.5Y 6/3 (light yellowish brown) to 10YR 5/4 (yellowish brown), high plasticity, hard, moist, [FILL]		DP04	20.0 - 25.0	2.1	N/A
					DP05	25.0 - 27.5	2.5	N/A

Depth scale: 18, 19, 20, 21, 22, 23, 24, 25, 26, 27

Bedrock Refusal /
Bottom of Hole at 27.5 Ft.

Boring JOF-114-Pre was backfilled with grout on 8/21/2019.

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

SUBSURFACE LOG

Client Borehole ID	N/A	Stantec Boring No.	**JOF-116-PZ**
Client	Tennessee Valley Authority	Boring Location	605,526.64 N; 1,412,589.35 E NAD27 Plant Local
Project Number	175568286	Surface Elevation	388.0 ft
		Elevation Datum	NGVD29
Project Name	JOF TDEC Order	Date Started	7/30/19
		Completed	7/31/19
Project Location	New Johnsonville, Humphreys Co., TN	Depth to Water	N/A
		Date/Time	N/A
Inspector	C. Burton	Depth to Water	N/A
Logger	C. Burton	Date/Time	N/A
Drilling Contractor	Stantec Consulting Services Inc.	Drill Rig Type and ID	CME 55T#1, #709

Overburden Drilling and Sampling Tools (Type and Size): 4-1/4" HSA, 2" SS w/o liners, 3" Shelby Tubes

Rock Drilling and Sampling Tools (Type and Size): NQ-3 Wireline, Split Barrel, Impregnated Bit

Overdrill Tooling (Type and Size): N/A — Overdrill Depth: N/A

Sampler Hammer Type: Automatic — Weight: 140 lb — Drop: 30" — Efficiency: N/A

Borehole Azimuth: N/A — Borehole Inclination (from Vertical): N/A

Reviewed By: K. Carey — Approved By: P. Dunne

Lithology Depth Ft[3]	Elevation	Graphic	Description
0.0	388.0		Top of Hole
0.8	387.2		Topsoil
3.3	384.7		LEAN CLAY, CL, 7.5YR 7/1 (light gray) to 7.5YR 6/8 (reddish yellow), medium to high plasticity, firm to very hard, [FILL]
5.4	382.6		GRAVELLY FAT CLAY, CH, 7.5YR 4/1 (dark gray) to 7.5YR 5/6 (strong brown), medium to high plasticity, firm to very hard, [FILL], [CCR]
7.5	380.5		GRAVELLY , CH, 7.5YR 4/6 (strong brown) to 10YR 4/2 (dark grayish brown), medium to high plasticity, firm, [FILL], [CCR]
9.0	379.0		GRAVELLY SILTY SAND, SP-SM, 5Y 4/1 (dark gray), very dense, [FILL], [CCR]
15.0	373.0		SANDY SILT SOME CLAY, SP-SM, 10YR 3/1 (very dark gray), very dense, moist, [FILL], [CCR]
18.0	370.0		SANDY SILT SOME CLAY, SP-SM, 10YR 3/3 (dark brown), non-plastic, wet, [FILL], [CCR]

Overburden: Sample[1,2] / Rock Core: RQD %	Depth Ft[3] / Run Ft	Interval	Rec. Ft	Blows/PSI / Rec. %
SS01G	0.0 - 1.5	0.0 - 1.5	1.3	5-4-4
SS02G	1.5 - 3.0	1.5 - 3.0	1.4	5-3-5
SS03aG	3.0 - 3.3	3.0 - 4.5	1.5	7-7-12
SS03bG	3.3 - 4.1			
SS03cG	4.1 - 4.5			
SS04aG	4.5 - 5.4	4.5 - 6.0	1.4	8-5-6
SS04bG	5.4 - 6.0			
SS05G	6.0 - 7.5	6.0 - 7.5	0.9	3-2-6
SS06G	7.5 - 9.0	7.5 - 9.0	1.3	8-8-7
SS07G	9.0 - 10.5	9.0 - 10.5	1.3	5-5-4
SS08G	10.5 - 12.0	10.5 - 12.0	1.5	5-5-8
SS09G	12.0 - 13.5	12.0 - 13.5	1.0	9-3-3
SS10G	13.5 - 15.0	13.5 - 15.0	1.4	3-4-5
SS11G	15.0 - 16.5	15.0 - 16.5	1.5	4-2-3
SS12G	16.5 - 18.0	16.5 - 18.0	1.5	1-1-2

SUBSURFACE LOG

Client Borehole ID	N/A	Stantec Boring No.	**JOF-116-PZ**
Client	Tennessee Valley Authority	Boring Location	605,526.64 N; 1,412,589.35 E NAD27 Plant Local
Project Number	175568286	Surface Elevation	388.0 ft
		Elevation Datum	NGVD29

Depth Ft[3]	Elevation	Description	Sample[1,2] / RQD %	Depth Ft[3] / Run Ft	Rec. Ft	Blows/PSI / Rec. %
		CLAYEY SILT WITH SAND, SP-SM, 10YR 3/4 (dark yellowish brown), very dense, wet, no staining, [FILL], [CCR]	SS13G	18.0 - 19.5	1.5	1-1-2
			SS14	19.5 - 21.0	1.5	1-1-10
			SS15	21.0 - 22.5	1.4	1-4-4
			SS16	22.5 - 24.0	1.5	1-1-2
			SS17G	24.0 - 25.5	1.3	1-WH-WH
27.0	361.0		SS18G	25.5 - 27.0	0.8	WR-WR-WR
28.3	359.7	GRAVELLY FAT CLAY WITH SILT, GP-GC, 10YR 5/6 (yellowish brown) to 10YR 5/1 (gray), very dense	SS19aG	27.0 - 28.3	1.5	WR-WR-WR
			SS19bG	28.3 - 28.5		
30.0	358.0	GRAVELLY LEAN CLAY, GP-GC, 5Y 6/4 (pale olive), very dense	SS20G	28.5 - 30.0	1.5	5-8-4
		LEAN CLAY WITH SILT, CL, 10YR 4/6 (dark yellowish brown) with 10YR 5/6 (yellowish brown), high plasticity, firm	SS21G	30.0 - 31.5	1.5	3-6-9
			SS22G	31.5 - 33.0	1.5	4-5-7
34.5	353.5		SS23G	33.0 - 34.5	1.5	4-5-6
		FAT CLAY, CH, 10YR 5/6 (yellowish brown) to 10YR 6/1 (gray), medium to high plasticity, firm to very hard	SS24G	34.5 - 36.0	1.5	2-3-4
			SS25G	36.0 - 37.5	1.5	4-5-11
			SS26G	37.5 - 39.0	1.5	3-4-8
			SS27G	39.0 - 40.5	1.5	6-8-8
			SS28G	40.5 - 42.0	1.1	6-5-8

TVA EIP BORING LOG 175568286_JOF_TDEC_ORDER.GPJ TDEC SUBSURF DT 20190530.GDT 7/6/20

Client Borehole ID	N/A	Stantec Boring No.	**JOF-116-PZ**
Client	Tennessee Valley Authority	Boring Location	605,526.64 N; 1,412,589.35 E NAD27 Plant Local
Project Number	175568286	Surface Elevation	388.0 ft
		Elevation Datum	NGVD29

Lithology Depth Ft[3]	Elevation	Graphic	Description	Overburden: Sample[1,2] / Rock Core: RQD %	Depth Ft[3] / Run Ft	Rec. Ft / Rec. Ft	Blows/PSI / Rec. %
43.8	344.2		FAT CLAY, CH, 10YR 5/6 (yellowish brown) to 10YR 6/1 (gray), medium to high plasticity, firm to very hard *(Continued)*	SS29G	42.0 - 43.5	1.5	5-8-14
				SS30aG	43.5 - 43.8	1.5	17-17-15
45.6	342.4		GRAVELLY , GP-GC, 7.5YR 5/6 (strong brown) to 10YR 5/4 (yellowish brown), very dense, moist	SS30bG	43.8 - 45.0		
				SS31aG	45.0 - 45.6	1.5	10-12-13
55.6	332.4		CLAYEY GRAVEL WITH SAND, GP-GC, 10YR 4/6 (dark yellowish brown) to 7.5YR 4/6 (strong brown), very dense, moist	SS31bG	45.6 - 46.5		
				SS32G	46.5 - 48.0	1.5	6-8-10
				SS33G	48.0 - 49.5	1.2	6-10-11
				SS34G	49.5 - 51.0	1.4	6-11-9
				SS35G	51.0 - 52.5	1.3	5-10-12
				SS36G	52.5 - 54.0	1.1	5-11-14
				SS37G	54.0 - 54.9	0.9	6-50/5"
				SS38G	55.5 - 55.6	0.1	50/1"

Refusal /
Bottom of Hole at 55.6 Ft.

Top of Rock = 55.6 Ft.
Top of Rock Elevation = 332.4 Ft.

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

TVA EIP BORING LOG 175568286_JOF_TDEC_ORDER.GPJ TDEC SUBSURF DT 20190530.GDT 7/6/20

SUBSURFACE LOG

Client Borehole ID	N/A	Stantec Boring No.	**JOF-117**
Client	Tennessee Valley Authority	Boring Location	602,823.15 N; 1,412,216.73 E NAD27 Plant Local
Project Number	175568286	Surface Elevation	384.1 ft
		Elevation Datum	NGVD29
Project Name	JOF TDEC Order	Date Started	9/12/19
		Completed	9/12/19
Project Location	New Johnsonville, Humphreys Co., TN	Depth to Water	30.2 ft
		Date/Time	9/13/19 07:18
Inspector	C. Burton	Depth to Water	N/A
Logger	C. Burton	Date/Time	N/A
Drilling Contractor	Stantec Consulting Services Inc.	Drill Rig Type and ID	CME 85#2, #951
Overburden Drilling and Sampling Tools (Type and Size)	4-1/4" HSA, 2" SS w/o liners, 3" Shelby Tubes		
Rock Drilling and Sampling Tools (Type and Size)	N/A		
Overdrill Tooling (Type and Size)	8-1/4" HSA overdrill of boring	Overdrill Depth	40.7 ft
Sampler Hammer Type	Automatic	Weight	140 lb
Drop	30"	Efficiency	N/A
Borehole Azimuth	N/A	Borehole Inclination (from Vertical)	N/A
Reviewed By	K. Carey	Approved By	P. Dunne

Lithology Depth Ft[3]	Lithology Elevation	Graphic	Description	Overburden: Sample[1,2] / Rock Core: RQD %	Depth Ft[3] / Run Ft	Rec. Ft / Rec. Ft	Blows/PSI / Rec. %
0.0	384.1		Top of Hole				
1.0	383.1		Overburden - general description of previously air-excavated material: GRAVEL mixed with clay, moist, [FILL]				
6.0	378.1		FAT CLAY WITH GRAVEL, CH, moist, [FILL] Hole backfilled with coarse sand to 6.0' bgs after completion of air-excavation.				
12.0	372.1		SANDY FAT CLAY WITH GRAVEL, CH, 7.5YR 5/6 (strong brown) to 10YR 8/1 (white), medium to high plasticity, very soft to firm, moist, [FILL]	SS01G	6.0 - 7.5	0.9	1-2-3
				SS02G	7.5 - 9.0	0.3	2-1-1
				SS03G	9.0 - 10.5	0.2	WH-1-1
				SS04G	10.5 - 12.0	0.5	3-4-4
			FAT CLAY SOME GRAVEL, CH, 10YR 5/8 (yellowish brown) and 10YR 8/1 (white), medium to high plasticity, very soft to firm, moist, with roots and pieces of wood, [FILL]	SS05G	12.0 - 13.5	1.0	4-3-3
				SS06G	13.5 - 15.0	1.0	2-2-4
				SS07G	15.0 - 16.5	1.3	2-1-2

TVA EIP BORING LOG 175568286_JOF_TDEC_ORDER.GPJ TDEC SUBSURF DT 20190530.GDT 3/10/21

SUBSURFACE LOG

Client Borehole ID	N/A	Stantec Boring No.	**JOF-117**
Client	Tennessee Valley Authority	Boring Location	602,823.15 N; 1,412,216.73 E NAD27 Plant Local
Project Number	175568286	Surface Elevation	384.1 ft — Elevation Datum NGVD29

Depth Ft[3]	Elevation	Graphic	Description	Sample[1,2] (Overburden) / RQD % (Rock Core)	Depth Ft[3] / Run Ft	Rec. Ft	Blows/PSI / Rec. %
			FAT CLAY SOME GRAVEL, CH, 10YR 5/8 (yellowish brown) and 10YR 8/1 (white), medium to high plasticity, very soft to firm, moist, with roots and pieces of wood, [FILL] *(Continued)*	SS08G	16.5 - 18.0	1.2	WH-WH-3
				SS09G	18.0 - 19.5	1.0	1-4-3
				SS10G	19.5 - 21.0	0.5	4-3-3
				SS11G	21.0 - 22.5	1.0	1-1-1
				SS12	22.5 - 24.0	0.0	WH-WH-1
				SS13G	24.0 - 25.5	0.5	3-1-2
27.0	357.1			SS14G	25.5 - 27.0	0.5	WH-WH-2
			FAT CLAY SOME SAND, CH, 10YR 5/4 (yellowish brown), medium to high plasticity, very soft to very hard, moist to wet, [FILL]	SS15G	27.0 - 28.5	1.5	WH-WH-1
				SS16G	28.5 - 30.0	0.5	WH-WH-1
30 ▽				SS17G	30.0 - 31.5	0.4	1-5-6
				SS18G	31.5 - 33.0	1.0	1-1-2
				SS19	33.0 - 34.5	0.0	WH-1-1
36.0	348.1			SS20G	34.5 - 36.0	1.2	WH-1-1
			GRAVELLY LEAN CLAY WITH SILT, CL, 10YR 5/4 (yellowish brown) to 2.5Y 4/3 (olive brown), medium plasticity, very soft to firm, moist to wet, with roots and shale fragments, [FILL]	SS21G	36.0 - 37.5	0.6	WH-1-1
39.0	345.1			SS22G	37.5 - 39.0	0.4	WH-1-1

Depth scale: 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39

Client Borehole ID	N/A	Stantec Boring No.	**JOF-117**
Client	Tennessee Valley Authority	Boring Location	602,823.15 N; 1,412,216.73 E NAD27 Plant Local
Project Number	175568286	Surface Elevation	384.1 ft — Elevation Datum NGVD29

Lithology			Description	Overburden: Sample[1,2]	Depth Ft[3]	Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic		Rock Core: RQD %	Run Ft	Rec. Ft	Rec. %
40.5	343.6		GRAVELLY FAT CLAY, CH, 2.5Y 4/3 (olive brown), medium to high plasticity, firm, moist, [FILL] *(Continued)*	SS23G	39.0 - 40.5	0.9	WH-1-2

No Refusal /
Bottom of Hole at 40.5 Ft.

Permanent monitoring well JOF-117 installed in this boring following overdilling. See JOF-117 monitoring well installation log for details.

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

TVA EIP BORING LOG 175568286_JOF_TDEC_ORDER.GPJ TDEC SUBSURF DT 20190530.GDT 3/10/21

SUBSURFACE LOG

Client Borehole ID: N/A
Stantec Boring No. **JOF-117 Offset A**
Client: Tennessee Valley Authority
Boring Location: 602,820.03 N; 1,412,215.82 E NAD27 Plant Local
Project Number: 175568286
Surface Elevation: 383.2 ft
Elevation Datum: NGVD29
Project Name: JOF TDEC Order
Date Started: 8/21/19
Completed: 8/21/19
Project Location: New Johnsonville, Humphreys Co., TN
Depth to Water: 22.5 ft
Date/Time: 8/21/19 09:13
Inspector: C. Burton
Logger: C. Burton
Depth to Water: N/A
Date/Time: N/A
Drilling Contractor: Geo Logic (Subcontractor)
Drill Rig Type and ID: Geoprobe 6610DT
Overburden Drilling and Sampling Tools (Type and Size): Macro Core 2.0" OD with 60" PVC sample liners
Rock Drilling and Sampling Tools (Type and Size): N/A
Overdrill Tooling (Type and Size): N/A
Overdrill Depth: N/A
Sampler Hammer Type: GH70 Direct Push
Weight: N/A
Drop: N/A
Efficiency: N/A
Borehole Azimuth: N/A
Borehole Inclination (from Vertical): N/A
Reviewed By: K. Carey
Approved By: C. Millhollin

Lithology Depth Ft[3]	Lithology Elevation	Lithology Graphic	Description	Overburden: Sample[1,2] / Rock Core: RQD %	Depth Ft[3] / Run Ft	Rec. Ft / Rec. Ft	Blows/PSI / Rec. %
0.0	383.2		Top of Hole				
			Waste, air-knife excavation to 6.0'. No loggable recovery. Overburden - general description of previously air-excavated material: GRAVEL mixed with clay, moist, [FILL] Hole backfilled with coarse sand to 6.0' bgs after completion of air-excavation.				
6.0	377.2		GRAVELLY FAT CLAY WITH GRAVEL, CH, 7.5YR 4/6 (strong brown) to 10YR 5/2 (grayish brown), fine, medium to high plasticity, moist, with coal and wood fragments, [FILL] Operator used smaller diameter sampler to 15.0', reducing recovery Switched to standard diameter sampler at 15.0'	DP01	5.0 - 10.0	2.3	N/A
				DP02	10.0 - 15.0	0.8	N/A
16.8	366.4			DP03	15.0 - 20.0	3.9	N/A

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

TVA EIP BORING LOG 175568286_JOF_TDEC_ORDER.GPJ TDEC SUBSURF DT 20190530.GDT 6/15/20

Client Borehole ID	N/A	Stantec Boring No.	**JOF-117 Offset A**
Client	Tennessee Valley Authority	Boring Location	602,820.03 N; 1,412,215.82 E NAD27 Plant Local
Project Number	175568286	Surface Elevation	383.2 ft
		Elevation Datum	NGVD29

Lithology: Depth Ft[3]	Elevation	Graphic	Description	Overburden: Sample[1,2] / Rock Core: RQD %	Depth Ft[3] / Run Ft	Rec. Ft / Rec. Ft	Blows/PSI / Rec. %
(18) – 21.4	361.8		FAT CLAY WITH GRAVEL, CH, 7.5YR 5/8 (strong brown) to 10YR 5/1 (gray), high plasticity, firm, moist, iron oxide staining, [FILL] *(Continued)*				
21.4 – 22.5 (water level symbol at 22.5)	360.7		FAT CLAY WITH GRAVEL, CH, 10YR 5/8 (yellowish brown) to 10YR 5/1 (gray), [FILL]	DP04	20.0 - 25.0	4.3	N/A
22.5 – 26.9	356.3		GRAVELLY FAT CLAY, CH, 10YR 5/4 (yellowish brown), high plasticity, moist, [FILL]				
26.9 – 35.7	347.5		FAT CLAY WITH GRAVEL, CH, 10YR 5/4 (yellowish brown) to 2.5Y 7/1 (light gray), high plasticity, soft, moist, with organics - wood fragments, [FILL]	DP05	25.0 - 30.0	3.1	N/A
				DP06	30.0 - 35.0	2.3	N/A
35.7 – 40.2	343.0		CLAYEY POORLY GRADED GRAVEL, GP-GC, 10YR 6/4 (light yellowish brown) to 7.5YR 5/6 (strong brown), moist, [FILL]	DP07	35.0 - 40.0	1.4	N/A
40.2 – (42)			FAT CLAY, CH, 2.5Y 5/3 (light olive brown) to 10YR 5/4 (yellowish brown), high plasticity, moist, [FILL]				

Depth scale: 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42

Sample interval labels: 20.0 - 25.0; 25.0 - 30.0; 30.0 - 35.0; 35.0 - 40.0

TVA EIP BORING LOG 175568286_JOF_TDEC_ORDER.GPJ TDEC SUBSURF DT 20190530.GDT 6/15/20

SUBSURFACE LOG

Client Borehole ID N/A
Stantec Boring No. **JOF-117 Offset A**
Client Tennessee Valley Authority
Boring Location 602,820.03 N; 1,412,215.82 E NAD27 Plant Local
Project Number 175568286
Surface Elevation 383.2 ft
Elevation Datum NGVD29

Lithology Depth Ft[3]	Elevation	Graphic	Description	Overburden: Sample[1,2] / Rock Core: RQD %	Depth Ft[3] / Run Ft	Rec. Ft / Rec. Ft	Blows/PSI / Rec. %
44.6	338.6		FAT CLAY, CH, 2.5Y 5/3 (light olive brown) to 10YR 5/4 (yellowish brown), high plasticity, moist, [FILL] *(Continued)*	DP08	40.0 - 45.0	3.0	N/A
45.0	338.2		FAT CLAY, CH, 5YR 5/6 (yellowish red) and 10YR 7/1 (light gray), high plasticity, firm, moist, [FILL]				

No Refusal /
Bottom of Hole at 45.0 Ft.

Boring JOF-117 Offset A was backfilled with grout on 8/21/2019.

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

TVA EIP BORING LOG 175568286_JOF_TDEC_ORDER.GPJ TDEC SUBSURF DT 20190530.GDT 6/15/20

Client Borehole ID: N/A
Stantec Boring No.: **JOF-118**
Client: Tennessee Valley Authority
Boring Location: 603,219.11 N; 1,410,969.82 E NAD27 Plant Local
Project Number: 175568286
Surface Elevation: 369.3 ft
Elevation Datum: NGVD29
Project Name: JOF TDEC Order
Date Started: 6/27/19
Completed: 6/28/19
Project Location: New Johnsonville, Humphreys Co., TN
Depth to Water: 7.8 ft
Date/Time: 7/8/19 09:10
Inspector: C. Burton
Logger: C. Burton
Depth to Water: N/A
Date/Time: N/A
Drilling Contractor: Stantec Consulting Services Inc.
Drill Rig Type and ID: CME 55T#1, #709
Overburden Drilling and Sampling Tools (Type and Size): 4-1/4" HSA, 2" SS w/o liners, 3" Shelby Tubes
Rock Drilling and Sampling Tools (Type and Size): N/A
Overdrill Tooling (Type and Size): 8-1/4" HSA overdrill of boring
Overdrill Depth: 51.0 ft
Sampler Hammer Type: Automatic
Weight: 140 lb
Drop: 30"
Efficiency: N/A
Borehole Azimuth: N/A
Borehole Inclination (from Vertical): N/A
Reviewed By: K. Carey
Approved By: P. Dunne

Depth Ft[3]	Elevation	Graphic	Description	Overburden: Sample[1,2] / Rock Core: RQD %	Depth Ft[3] / Run Ft	Rec. Ft / Rec. Ft	Blows/PSI / Rec. %
0.0	369.3		Top of Hole				
2.8	366.5		Blind-drilled through gravel to 2.8', [FILL]				
4.5	364.8		POORLY GRADED GRAVEL WITH CLAY, GP, 10YR 4/4 (dark yellowish brown), very dense, [FILL]	SS01G	3.0 - 4.5	0.2	4-2-4
15.8	353.5		SILTY LEAN CLAY, CL, 10YR 5/4 (yellowish brown) to 2.5Y 5/1 (gray), low plasticity, firm	SS02G	4.5 - 6.0	0.7	2-2-2
				SS03G	6.0 - 7.5	1.5	3-7-5
				SS04G	7.5 - 9.0	1.1	2-2-2
				SS05G	9.0 - 10.5	1.5	2-1-2
				SS06G	10.5 - 12.0	1.5	1-1-2
				SS07G	12.0 - 13.5	1.5	1-2-2
				SS08G	13.5 - 15.0	1.3	1-1-2
				SS09G	15.0 - 16.5	1.4	1-1-2
			SILTY LEAN CLAY, CL, 2.5Y 5/1 (gray), very soft to very hard	SS10G	16.5 - 18.0	1.5	3-6-4

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

TVA EIP BORING LOG 175568286_JOF_TDEC_ORDER.GPJ TDEC SUBSURF DT 20190530.GDT 7/6/20

SUBSURFACE LOG

Client Borehole ID N/A
Stantec Boring No. **JOF-118**
Client Tennessee Valley Authority
Boring Location 603,219.11 N; 1,410,969.82 E NAD27 Plant Local
Project Number 175568286
Surface Elevation 369.3 ft
Elevation Datum NGVD29

Lithology: Depth Ft[3]	Elevation	Graphic	Description	Overburden: Sample[1,2] / Rock Core: RQD %	Depth Ft[3] / Run Ft	Rec. Ft / Rec. Ft	Blows/PSI / Rec. %
18–39.8			SILTY LEAN CLAY, CL, 2.5Y 5/1 (gray), very soft to very hard *(Continued)*	SS11G	18.0 - 19.5	1.5	3-5-6
				SS12G	19.5 - 21.0	1.4	5-8-8
				SS13G	21.0 - 22.5	1.5	7-12-13
				SS14G	22.5 - 24.0	1.5	6-9-13
				SS15G	24.0 - 25.5	1.5	6-7-8
				SS16G	25.5 - 27.0	0.9	2-3-6
				SS17G	27.0 - 28.5	1.5	3-4-6
				SS18G	28.5 - 30.0	1.5	3-3-4
				SS19G	30.0 - 31.5	1.5	2-2-3
				SS20G	31.5 - 33.0	1.5	1-3-3
				SS21G	33.0 - 34.5	1.5	3-2-3
				SS22G	34.5 - 36.0	1.5	3-3-3
				SS23G	36.0 - 37.5	1.5	WH-WH-3
				SS24G	37.5 - 39.0	1.5	5-3-5
39.8	329.5			SS25aG	39.0 - 39.8	1.5	3-22-17
			GRAVELLY POORLY GRADED SAND WITH SILT, GP-GM, 7.5YR 4/4 (brown), fine to medium, very dense	SS25bG	39.8 - 40.5		
				SS26G	40.5 - 42.0	1.3	6-11-12

TVA EIP BORING LOG 175568286_JOF_TDEC_ORDER.GPJ TDEC SUBSURF DT 20190530.GDT 7/6/20

SUBSURFACE LOG

Client Borehole ID	N/A	Stantec Boring No.	**JOF-118**
Client	Tennessee Valley Authority	Boring Location	603,219.11 N; 1,410,969.82 E NAD27 Plant Local
Project Number	175568286	Surface Elevation	369.3 ft
		Elevation Datum	NGVD29

Lithology: Depth Ft[3]	Elevation	Graphic	Description	Overburden: Sample[1,2] / Rock Core: RQD %	Depth Ft[3] / Run Ft	Rec. Ft / Rec. Ft	Blows/PSI / Rec. %
			GRAVELLY POORLY GRADED SAND WITH SILT, GP-GM, 7.5YR 4/4 (brown), fine to medium, very dense *(Continued)*	SS27G	42.0 - 43.5	1.2	10-26-22
				SS28G	43.5 - 45.0	1.5	5-13-14
				SS29G	45.0 - 46.5	1.4	7-7-22
				SS30G	46.5 - 48.0	0.7	18-12-14
				SS31G	48.0 - 49.5	1.1	7-8-16
51.0	318.3			SS32G	49.5 - 51.0	0.9	10-10-11

No Refusal /
Bottom of Hole at 51.0 Ft.

Permanent monitoring well JOF-118 installed in this boring after overdrilling. Refer to JOF-118 Well Installation Detail for further details.

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

TVA EIP BORING LOG 175568286_JOF_TDEC_ORDER.GPJ TDEC SUBSURF DT 20190530.GDT 7/6/20

SUBSURFACE LOG

Client Borehole ID: N/A
Stantec Boring No.: **JOF-119**
Client: Tennessee Valley Authority
Boring Location: 598,645.87 N; 1,410,031.49 E NAD27 Plant Local
Project Number: 175568286
Surface Elevation: 363.4 ft
Elevation Datum: NGVD29
Project Name: JOF TDEC Order
Date Started: 7/9/19
Completed: 7/10/19
Project Location: New Johnsonville, Humphreys Co., TN
Depth to Water: 3.7 ft
Date/Time: 7/10/19 15:38
Inspector: C. Burton
Logger: C. Burton
Depth to Water: N/A
Date/Time: N/A
Drilling Contractor: Stantec Consulting Services Inc.
Drill Rig Type and ID: CME 55T#1, #709
Overburden Drilling and Sampling Tools (Type and Size): 4-1/4" HSA, 2" SS w/o liners, 3" Shelby Tubes
Rock Drilling and Sampling Tools (Type and Size): N/A
Overdrill Tooling (Type and Size): 8-1/4" HSA overdrill of boring
Overdrill Depth: 45.0 ft
Sampler Hammer Type: Automatic
Weight: 140 lb
Drop: 30"
Efficiency: N/A
Borehole Azimuth: N/A
Borehole Inclination (from Vertical): N/A
Reviewed By: J. Snider
Approved By: L. Tucker

Lithology Depth Ft[3]	Elevation	Graphic	Description	Overburden: Sample[1,2] / Rock Core: RQD %	Depth Ft[3] / Run Ft	Rec. Ft / Rec. Ft	Blows/PSI / Rec. %
0.0	363.4		Top of Hole				
			Crushed stone mixed with clay, [FILL]	SS01G	0.0 - 1.5	0.3	2-1-2
3.0	360.4			SS02G	1.5 - 3.0	0.5	3-3-3
			FAT CLAY, CH, 10YR 4/3 (brown) with 10YR 6/1 (gray), high plasticity, firm, iron oxide staining	SS03G	3.0 - 4.5	1.3	2-2-5
				SS04G	4.5 - 6.0	0.8	4-6-6
7.5	355.9			SS05G	6.0 - 7.5	1.1	3-2-4
9.0	354.4		SILTY FAT CLAY, CH, 10YR 5/4 (yellowish brown), medium to high plasticity, very soft to very hard	SS06G	7.5 - 9.0	1.4	2-2-2
			SILTY FAT CLAY, CH, 10YR 5/3 (brown) to 2.5Y 6/3 (light yellowish brown), high plasticity, very soft	SS07G	9.0 - 10.5	1.3	1-1-1
				SS08G	10.5 - 12.0	1.5	3-5-7
				SS09G	12.0 - 13.5	1.5	3-3-5
				SS10G	13.5 - 15.0	1.5	3-4-7
				SS11G	15.0 - 16.5	1.5	4-4-5
				SS12G	16.5 - 18.0	1.3	2-3-6

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

TVA EIP BORING LOG 175568286_JOF_TDEC_ORDER.GPJ TDEC SUBSURF DT 20190530.GDT 10/27/20

SUBSURFACE LOG

Client Borehole ID: N/A
Stantec Boring No. **JOF-119**
Client: Tennessee Valley Authority
Boring Location: 598,645.87 N; 1,410,031.49 E NAD27 Plant Local
Project Number: 175568286
Surface Elevation: 363.4 ft
Elevation Datum: NGVD29

Lithology Depth Ft[3]	Elevation	Graphic	Description	Overburden: Sample[1,2] / Rock Core: RQD %	Depth Ft[3] / Run Ft	Rec. Ft	Blows/PSI / Rec. %
19.5	343.9		SILTY FAT CLAY, CH, 10YR 5/3 (brown) to 2.5Y 6/3 (light yellowish brown), high plasticity, very soft *(Continued)*	SS13G	18.0 - 19.5	1.5	5-6-10
25.5	337.9		FAT CLAY, CH, 7.5YR 4/6 (strong brown) with 10YR 6/1 (gray), high plasticity	SS14G	19.5 - 21.0	1.3	7-8-10
				SS15G	21.0 - 22.5	1.5	7-7-9
				SS16G	22.5 - 24.0	1.5	4-5-4
				SS17G	24.0 - 25.5	1.3	5-4-6
31.3	332.1		SILTY FAT CLAY, CH, 10YR 4/1 (dark gray) with 7.5YR 5/6 (strong brown), high plasticity	SS18G	25.5 - 27.0	1.5	4-2-3
				SS19G	27.0 - 28.5	1.5	2-2-2
				SS20G	28.5 - 30.0	1.5	WH-WH-2
				SS21aG	30.0 - 31.3	1.5	1-1-8
				SS21bG	31.3 - 31.5		
			POORLY GRADED GRAVEL, GP, 7.5YR 4/6 (strong brown) to 7.5YR 5/4 (brown), fine to coarse, very dense, poorly graded	SS22G	31.5 - 33.0	1.5	9-15-31
				SS23G	33.0 - 34.5	1.0	10-14-21
				SS24E	34.5 - 36.0	1.4	18-23-26
				SS25E	36.0 - 37.5	1.3	13-19-31
				SS26G	37.5 - 39.0	1.5	15-12-15
				SS27E	39.0 - 40.5	1.5	9-10-12
				SS28E	40.5 - 42.0	1.3	11-18-19

34.5/37.5-20190710

39.0/42.0-20190710

Client Borehole ID	N/A	Stantec Boring No.	**JOF-119**
Client	Tennessee Valley Authority	Boring Location	598,645.87 N; 1,410,031.49 E NAD27 Plant Local
Project Number	175568286	Surface Elevation	363.4 ft
		Elevation Datum	NGVD29

Lithology: Depth Ft[3]	Elevation	Graphic	Description	Overburden: Sample[1,2] / Rock Core: RQD %	Depth Ft[3] / Run Ft	Rec. Ft / Rec. Ft	Blows/PSI / Rec. %
43			POORLY GRADED GRAVEL, GP, 7.5YR 4/6 (strong brown) to 7.5YR 5/4 (brown), fine to coarse, very dense, poorly graded *(Continued)*	SS29G	42.0 - 43.5	1.5	14-11-15
44				SS30G	43.5 - 45.0	1.5	9-13-18
45 / 45.0	318.4						

No Refusal /
Bottom of Hole at 45.0 Ft.

Permanent monitoring well JOF-119 installed in this boring following over-drilling. See JOF-119 monitoring well installation log for details.

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

ATTACHMENT C.2

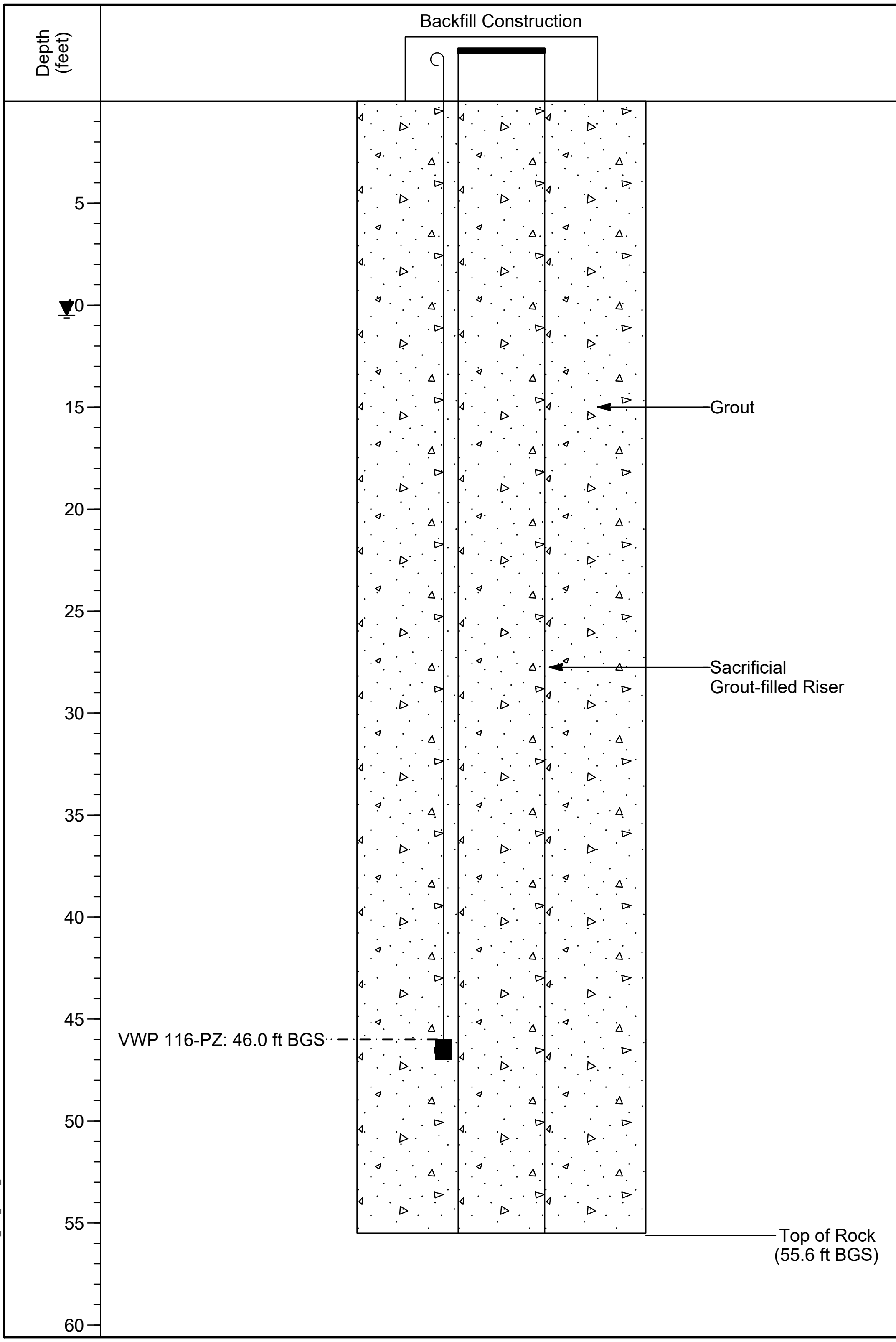
Well and Piezometer Installation Details

PIEZOMETER INSTALLATION DETAIL

WELL / PROBEHOLE / BOREHOLE NO: **JOF-116-PZ** (Boring JOF-116-PZ)

PROJECT: **JOF TDEC Order**
PROJECT NUMBER: **175568286**
DRILLING COMPANY: **Stantec Consulting Services Inc.**
DRILLING EQUIPMENT: **CME 55T#1, #709**
DRILLING METHOD: **4-1/4" HSA, 2" SS w/o liners, 3" Shelby Tubes**
SAMPLING METHOD: **4-1/4" HSA, 2" SS w/o liners, 3" Shelby Tubes**
OBSERVED BY: **M. Pritt**
REVIEWED BY: **B. Halada**
APPROVED BY: **P. Dunne**

INSTALLATION: STARTED: **8/20/19** COMPLETED: **8/21/19**
LOCATION: **605,526.64 N; 1,412,589.35 E** DATUM: **NAD27 Plant Local**
LOC. DESCRIPTION: **Ash Disposal Area 1**
LATITUDE: **36° 2' 20.85"** LONGITUDE: **-87° 59' 12.90"**
GROUND ELEV (ft): **388.0** TOC ELEV (ft): **N/A**
ELEVATION DATUM: **NGVD29**
BOREHOLE DEPTH (ft): **55.6** RISER DEPTH (ft): **55.5**
DTW AT COMPLETION (ft, bgs): **10.5**
BOREHOLE DIA. (in): **9.0** RISER DIA. (in): **1.0**



Materials Inventory

RISER TYPE:
1" Sch 40 PVC Riser (Sacrificial)

SCREEN TYPE:
N/A

SCREEN SLOT SIZE (in):
N/A

GROUT QUANTITY (gal):
153

GROUT TYPE:
30% Solids Bentonite Grout

GROUT INITIAL DENSITY (lbs/gal):
10.1

GROUT RETURN DENSITY (lbs/gal)
10.1

GROUT TOP (ft BGS):
0.0

GROUT BOTTOM (ft BGS):
55.5

FILTER PACK TYPE:
N/A

NOTES:
TOC elevation is not applicable for grouted VWPs; instrument reference datum is ground surface elevation.

Refer to the boring log for additional details.

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

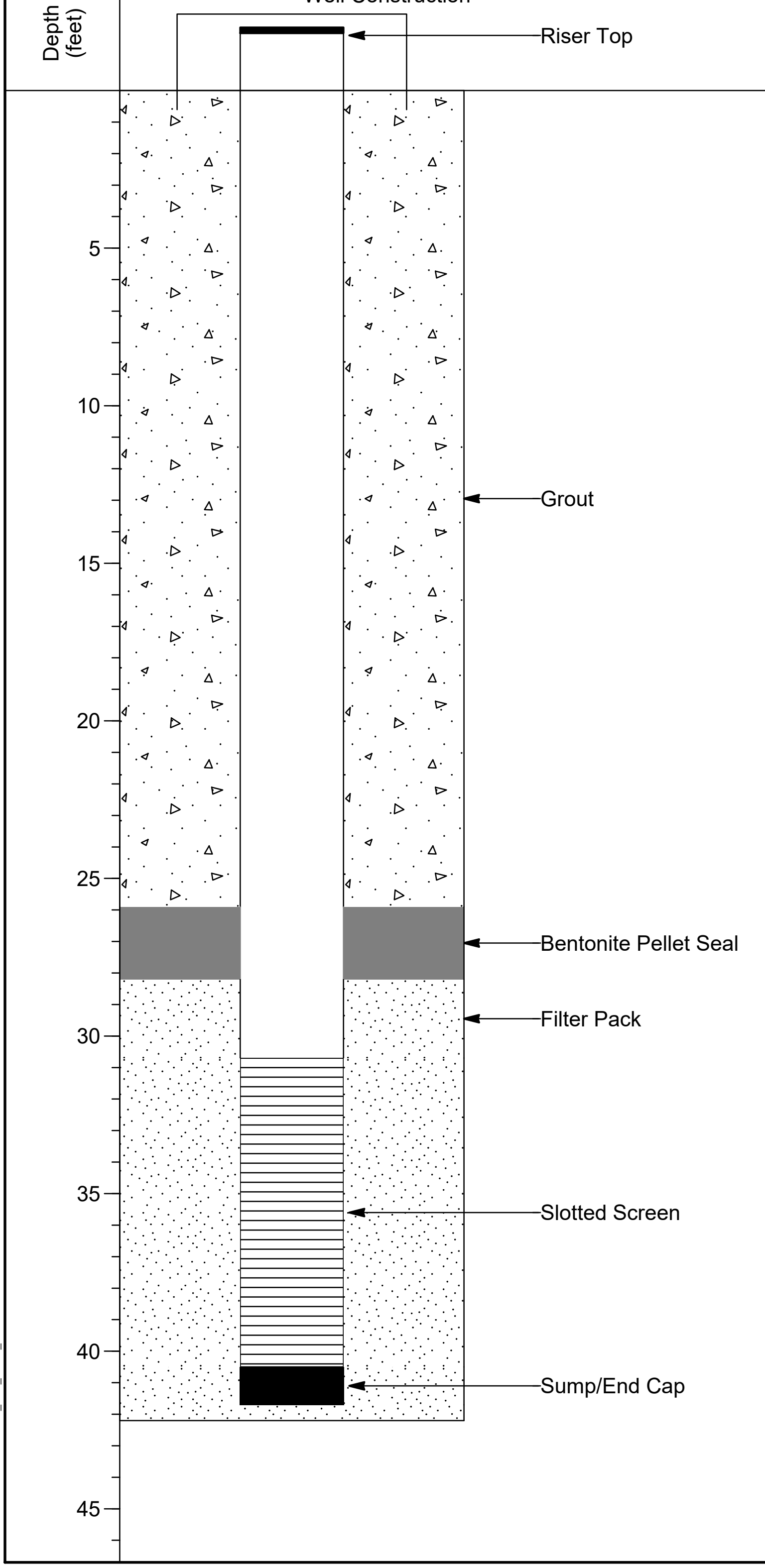
PZ DETAILS 175568286_JOF_TDEC_ORDER.GPJ TDEC SUBSURF DT 20190530.GDT 12/4/20

WELL INSTALLATION DETAIL

WELL / PROBEHOLE / BOREHOLE NO: **JOF-109** (Boring JOF-109)

PROJECT: **JOF TDEC Order**	INSTALLATION: STARTED: **6/24/19** COMPLETED: **6/26/19**
PROJECT NUMBER: **175568286**	LOCATION: **605,123.62 N; 1,413,243.55 E** DATUM: **NAD27 Plant Local**
DRILLING COMPANY: **Stantec Consulting Services Inc.**	LOC. DESCRIP: **Ash Disposal Area 1**
DRILLING EQUIPMENT: **CME 55T#1, #709**	LATITUDE: **36° 2' 17.00"** LONGITUDE: **-87° 59' 4.84"**
DRILLING METHOD: **8-1/4" HSA overdrill of boring**	GROUND ELEV (ft): **382.8** TOC ELEV (ft): **386.11**
SAMPLING METHOD: **4-1/4" HSA, 2" SS w/o liners**	ELEVATION DATUM: **NGVD29**
OBSERVED BY: **C. Burton**	WELL DEPTH (ft, bgs): **41.7**
REVIEWED BY: **D. Norman**	DTW AT COMPLETION (ft, bgs): **N/A**
APPROVED BY: **P. Dunne**	BOREHOLE DIA. (in): **13.0** WELL DIA. (in): **4.0**

Depth (feet) | Well Construction



Materials Inventory

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

RISER: TOP (AGS): **3.4 ft** BOTTOM (BGS): **30.7 ft**

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

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

SCREEN: TOP (BGS): **30.7 ft** BOTTOM (BGS): **40.5 ft**

END CAP: TOP (BGS): **40.5 ft** BOTTOM (BGS): **41.7 ft**

GROUT QUANTITY: **147 gal**

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

GROUT: TOP (BGS): **1.0 ft** BOTTOM (BGS): **25.9 ft**

GROUT DENSITY:
INITIAL (lbs/gal): **10.1** RETURN (lbs/gal): **10.3**

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

BENTONITE SEAL:
TOP (BGS): **25.9 ft** BOTTOM (BGS): **28.2 ft**

FILTER PACK - PRE-PACK AND ANNULAR SPACE:
TYPE: **20/40 Mesh (Unimin #00N)**

FILTER PACK: TOP (BGS): **28.2 ft** BOTTOM (BGS): **42.2 ft**

NOTES:
1) 4-1/4" HSA exploratory boring advanced to 46.5' (47.7' corrected). Boring overdrilled with 8 1/4" HSA to 41' (42.2' corrected) for well installation. Interval from 46.5' to 41' (47.7' to 42.2' corrected) backfilled w/ 3/8" Pel-Plug bentonite pellets. Corrected values represent the boring depth from the surveyed ground surface elevation adjacent to the pad and consider grade modifications made during pad installation.

2) Monitoring well constructed with 1.2' sump/end cap.

3) Final as-built well depths are listed. These corrected depths use the surveyed ground surface (GS) elevation as the reference datum following pad placement and may differ from the unknown elevation of the GS reference point used during well installation. For JOF-109 the finished grade surveyed elevation was approximately 1.2' higher than the original grade reference used when the well was installed. The position of each well component, however, has not changed relative to original elevation of the bottom of the well.

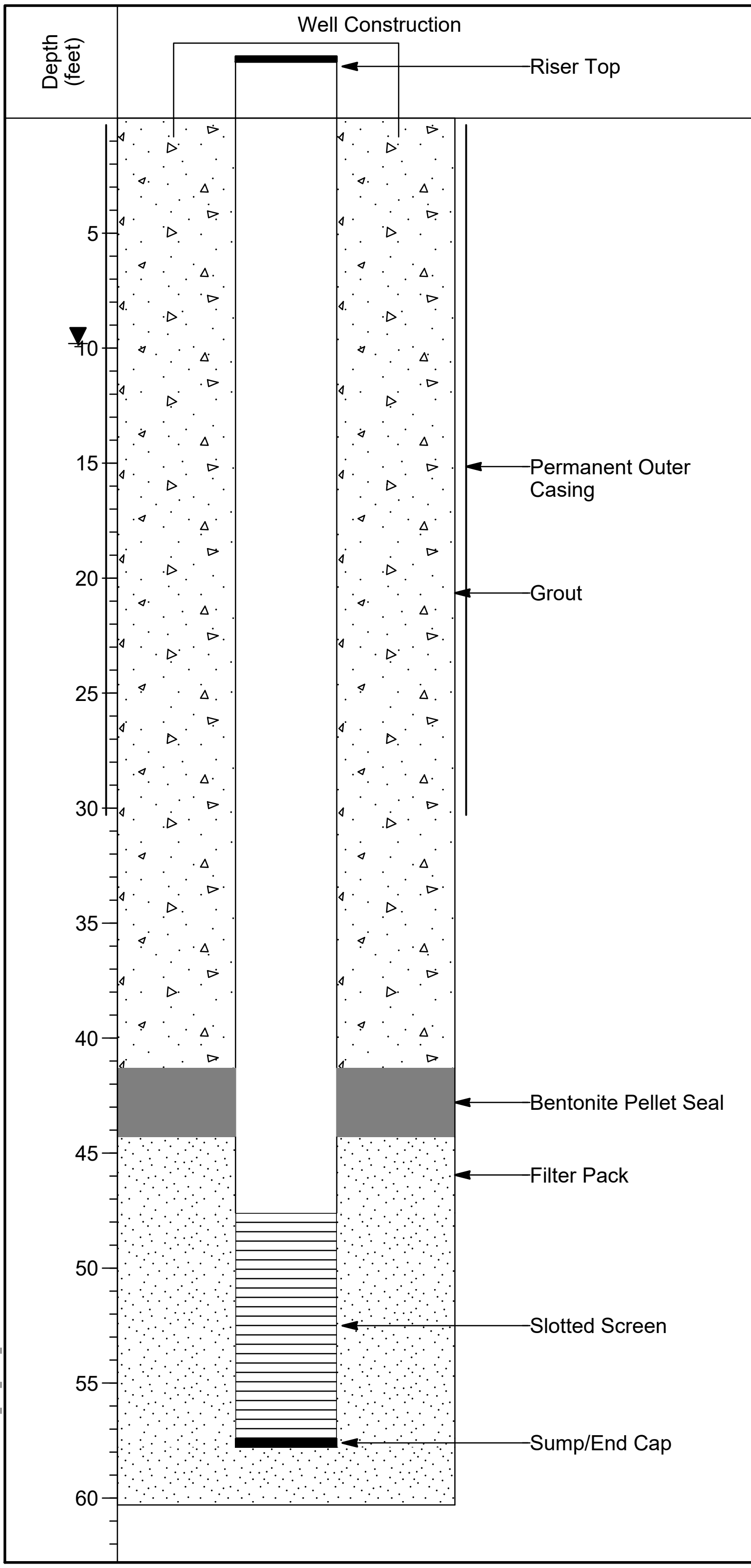
VERTICAL SCALE: AS SHOWN. HORIZONTAL SCALE: NOT TO SCALE (EXAGGERATED TO SHOW DETAIL)

WELL INSTALLATION DETAIL

WELL / PROBEHOLE / BOREHOLE NO: **JOF-110** (Boring JOF-110)

PROJECT: **JOF TDEC Order**	INSTALLATION: STARTED: **9/10/19** COMPLETED: **9/16/19**
PROJECT NUMBER: **175568286**	LOCATION: **605,614.27 N; 1,412,210.58 E** DATUM: **NAD27 Plant Local**
DRILLING COMPANY: **M&W Drilling (Subcontractor)**	LOC. DESCRIP: **Ash Disposal Area 1**
DRILLING EQUIPMENT: **Geoprobe 8150LS**	LATITUDE: **36° 2' 21.64"** LONGITUDE: **-87° 59' 17.54"**
DRILLING METHOD: **4" x 10" Sonic**	GROUND ELEV (ft): **384.0** TOC ELEV (ft): **388.76**
SAMPLING METHOD: **4" X 6" Rotosonic**	ELEVATION DATUM: **NGVD29**
OBSERVED BY: **S. Stanley**	WELL DEPTH (ft, bgs): **57.8**
REVIEWED BY: **J. Snider**	DTW AT COMPLETION (ft, bgs): **9.8**
APPROVED BY: **P. Dunne**	BOREHOLE DIA. (in): **8.0** WELL DIA. (in): **4.0**

Well Construction



Materials Inventory

RISER TYPE: **4" Sch 40 PVC Riser**	
RISER: TOP (AGS): **4.7 ft**	BOTTOM (BGS): **47.6 ft**
SCREEN TYPE: **5"ID x 4"ID U-Pack**	
SCREEN SLOT SIZE (in): **0.010**	
SCREEN: TOP (BGS): **47.6 ft**	BOTTOM (BGS): **57.4 ft**
END CAP: TOP (BGS): **57.4 ft**	BOTTOM (BGS): **57.8 ft**
GROUT QUANTITY: **96 gal**	
GROUT TYPE: **30% Solids Bentonite Grout**	
GROUT: TOP (BGS): **0.0 ft**	BOTTOM (BGS): **41.3 ft**
GROUT DENSITY: INITIAL (lbs/gal): **10.2**	RETURN (lbs/gal): **10.3**
BENTONITE TYPE: **3/8" PDS TR30 pellets**	
BENTONITE SEAL: TOP (BGS): **41.3 ft**	BOTTOM (BGS): **44.3 ft**
FILTER PACK - PRE-PACK AND ANNULAR SPACE: TYPE: **20/40 Mesh (Unimin #00N)**	
FILTER PACK: TOP (BGS): **44.3 ft**	BOTTOM (BGS): **60.3 ft**

NOTES:

1) Well boring advanced with 10" sonic to set a 8.5" permanent PVC surface casing to 30.0' (30.3' corrected). Boring then advanced through surface casing with 8" sonic to 60.0' (60.3' corrected). Borehole backfilled with filter pack sand from bottom of borehole to 57.5' (57.8' corrected). Corrected values represent the boring depth from the surveyed ground surface elevation adjacent to the pad and consider grade modifications made during pad installation.

2) Final as-built depths are listed. These corrected depths use the surveyed ground surface (GS) elevation following pad placement as the reference datum and may differ from the unknown elevation of the GS reference point used during well installation. For JOF-110, the finished grade surveyed elevation was approximately 0.3' higher than the original grade reference used when the well was installed. The position of each well component, however, has not changed relative to original elevation of the bottom of the well.

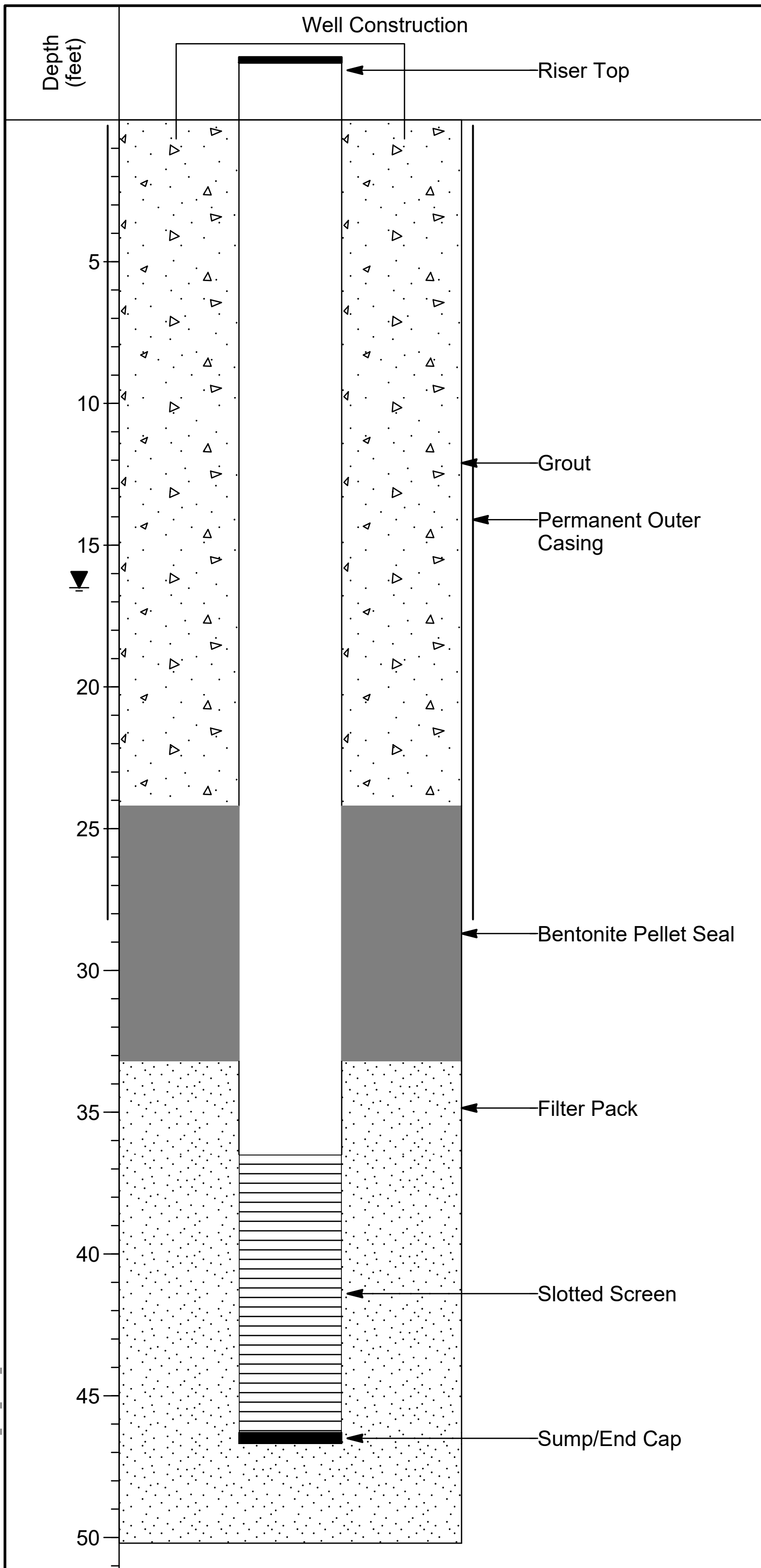
VERTICAL SCALE: AS SHOWN. HORIZONTAL SCALE: NOT TO SCALE (EXAGGERATED TO SHOW DETAIL)

WELL INSTALLATION DETAIL

WELL / PROBEHOLE / BOREHOLE NO:

JOF-111 (Boring JOF-111B)

PROJECT: **JOF TDEC Order**	INSTALLATION: STARTED: **9/18/19** COMPLETED: **9/23/19**
PROJECT NUMBER: **175568286**	LOCATION: **604,940.99 N; 1,412,174.09 E** DATUM: **NAD27 Plant Local**
DRILLING COMPANY: **M&W Drilling (Subcontractor)**	LOC. DESCRIP: **Southwest of Ash Disposal Area 1**
DRILLING EQUIPMENT: **Geoprobe 8150LS**	LATITUDE: **36° 2' 14.98"** LONGITUDE: **-87° 59' 17.81"**
DRILLING METHOD: **4" x 10" Sonic**	GROUND ELEV (ft): **385.3** TOC ELEV (ft): **390.08**
SAMPLING METHOD: **4" X 6" Rotosonic Casing**	ELEVATION DATUM: **NGVD29**
OBSERVED BY: **D. Norman**	WELL DEPTH (ft, bgs): **46.7**
REVIEWED BY: **J. Snider**	DTW AT COMPLETION (ft, bgs): **16.5**
APPROVED BY: **P. Dunne**	BOREHOLE DIA. (in): **8.0** WELL DIA. (in): **4.0**



Materials Inventory

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

RISER: TOP (AGS): **4.8 ft** BOTTOM (BGS): **36.5 ft**

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

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

SCREEN: TOP (BGS): **36.5 ft** BOTTOM (BGS): **46.3 ft**

END CAP: TOP (BGS): **46.3 ft** BOTTOM (BGS): **46.7 ft**

GROUT QUANTITY: **54 gal**

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

GROUT: TOP (BGS): **0.0 ft** BOTTOM (BGS): **24.2 ft**

GROUT DENSITY:
INITIAL (lbs/gal): **10.1** RETURN (lbs/gal): **10.0**

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

BENTONITE SEAL:
TOP (BGS): **24.2 ft** BOTTOM (BGS): **33.2 ft**

FILTER PACK - PRE-PACK AND ANNULAR SPACE:
TYPE: **20/40 Mesh (Unimin #00N)**

FILTER PACK: TOP (BGS): **33.2 ft** BOTTOM (BGS): **50.2 ft**

NOTES:

1) Well boring advanced with 10" sonic to set a 8.5" permanent PVC surface casing to 28.0' (28.2' corrected). Exploratory boring then advanced through surface casing with 6" sonic to 50.0' (50.2' corrected), and overdrilled with 8" sonic to 46.5' (46.7' corrected). Borehole backfilled with filter pack sand from bottom of borehole to 46.5' (46.7' corrected). Corrected values represent the boring depth from the surveyed ground surface elevation adjacent to the pad and consider grade modifications made during pad installation.

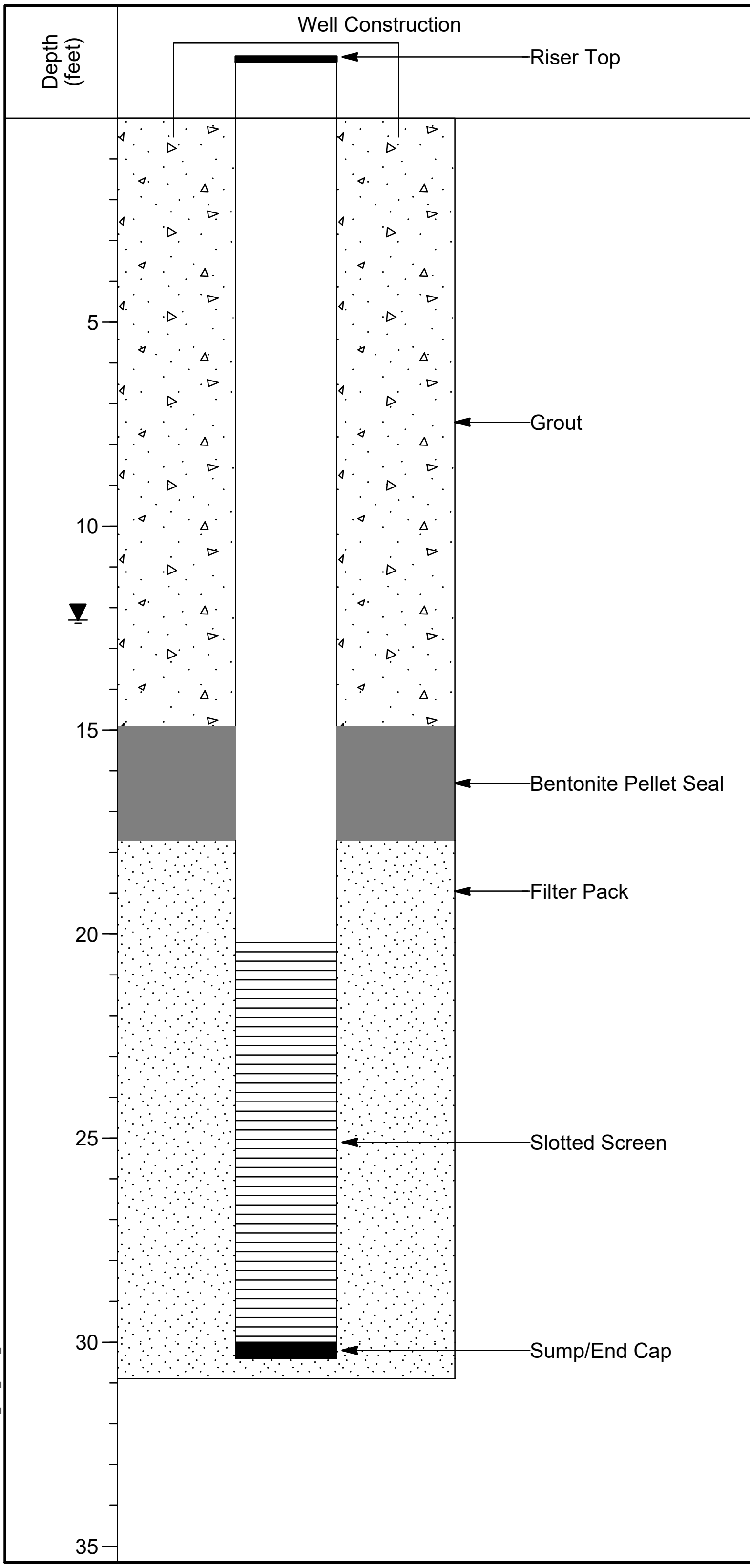
2) Final as-built depths are listed. These corrected depths use the surveyed ground surface (GS) elevation following pad placement as the reference datum and may differ from the unknown elevation of the GS reference point used during well installation. For JOF-111, the finished grade surveyed elevation was approximately 0.2' higher than the original grade reference used when the well was installed. The position of each well component, however, has not changed relative to original elevation of the bottom of the well.

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

MW FINAL DETAIL 175568286_JOF_TDEC_ORDER.GPJ TDEC SUBSURF DT 20191120.GDT 2/12/21

WELL INSTALLATION DETAIL	WELL / PROBEHOLE / BOREHOLE NO: **JOF-112** (Boring JOF-112)

PROJECT: **JOF TDEC Order**	INSTALLATION: STARTED: **8/27/19** COMPLETED: **8/28/19**
PROJECT NUMBER: **175568286**	LOCATION: **604,376.52 N; 1,412,991.02 E** DATUM: **NAD27 Plant Local**
DRILLING COMPANY: **Stantec Consulting Services Inc.**	LOC. DESCRIP: **Coal Yard**
DRILLING EQUIPMENT: **CME 1050, #952**	LATITUDE: **36° 2' 9.56"** LONGITUDE: **-87° 59' 7.73"**
DRILLING METHOD: **8-1/4" HSA overdrill of boring**	GROUND ELEV (ft): **389.8** TOC ELEV (ft): **394.48**
SAMPLING METHOD: **4-1/4" HSA, 2" SS w/o liners, 3" Shelby Tubes**	ELEVATION DATUM: **NGVD29**
OBSERVED BY: **S. Stanley**	WELL DEPTH (ft, bgs): **30.4**
REVIEWED BY: **D. Norman**	DTW AT COMPLETION (ft, bgs): **12.3**
APPROVED BY: **P. Dunne**	BOREHOLE DIA. (in): **13.0** WELL DIA. (in): **4.0**



Materials Inventory

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

RISER: TOP (AGS): **4.7 ft** BOTTOM (BGS): **20.2 ft**

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

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

SCREEN: TOP (BGS): **20.2 ft** BOTTOM (BGS): **30.0 ft**

END CAP: TOP (BGS): **30.0 ft** BOTTOM (BGS): **30.4 ft**

GROUT QUANTITY: **119 gal**

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

GROUT: TOP (BGS): **0.0 ft** BOTTOM (BGS): **14.9 ft**

GROUT DENSITY:
INITIAL (lbs/gal): **10.1** RETURN (lbs/gal): **10.3**

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

BENTONITE SEAL:
TOP (BGS): **14.9 ft** BOTTOM (BGS): **17.7 ft**

FILTER PACK - PRE-PACK AND ANNULAR SPACE:
TYPE: **20/40 Mesh (Unimin #00N)**

FILTER PACK: TOP (BGS): **17.7 ft** BOTTOM (BGS): **30.9 ft**

NOTES:
1) 4-1/4" HSA exploratory boring advanced to 30.9 ft bgs (corrected). Boring subsequently overdrilled with 8-1/4" HSA to same depth. Exploratory boring backfilled from bottom of boring to bottom of well with filter pack sand. Corrected values represent the boring depth from the surveyed ground surface elevation adjacent to the pad and consider grade modifications made during pad installation.

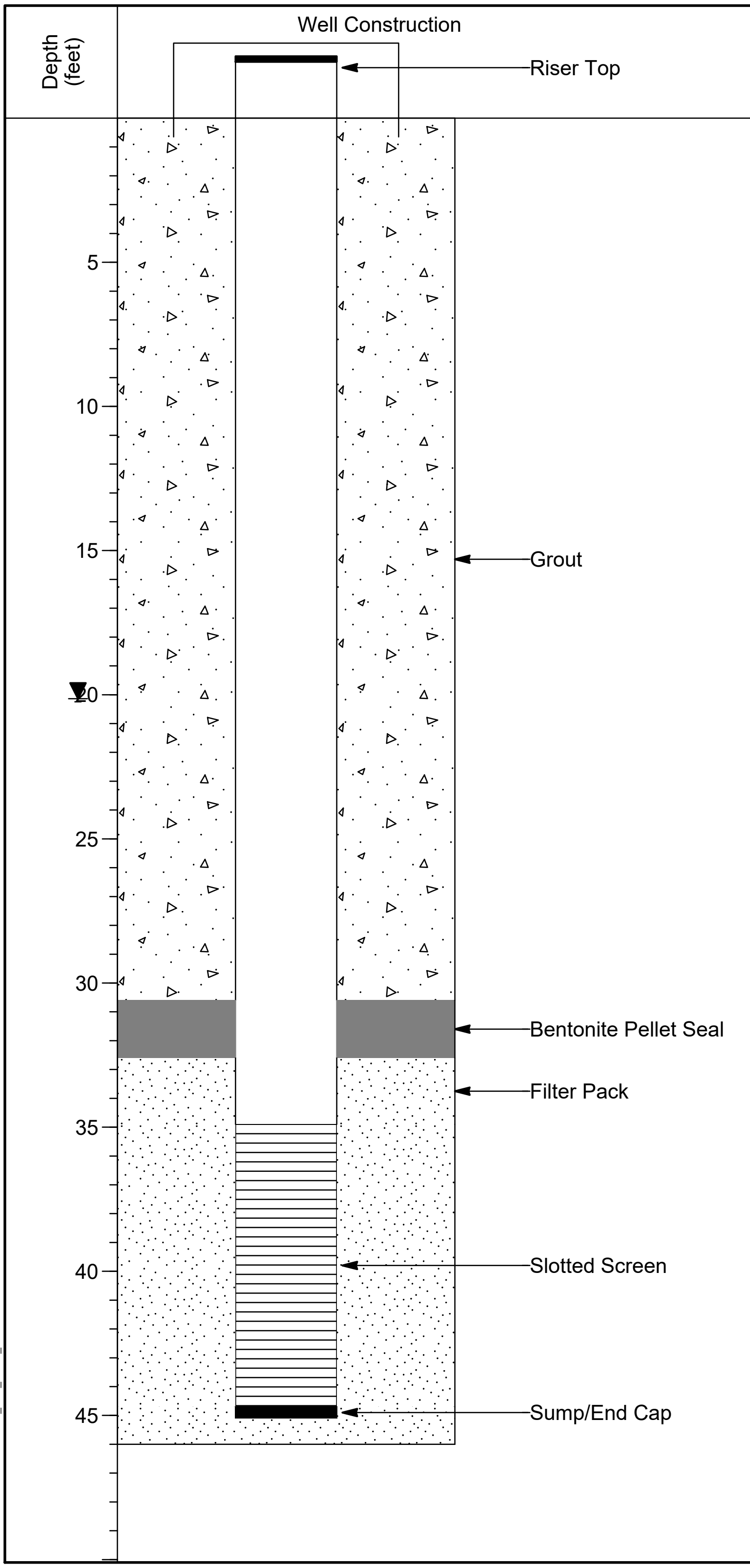
2) Final as-built depths are listed. These corrected depths use the surveyed ground surface (GS) elevation following pad placement as the reference datum and may differ from the unknown elevation of the GS reference point used during well installation. For JOF-112 the finished grade surveyed elevation was approximately even with the original grade reference used when the well was installed. The position of each well component, however, has not changed relative to original elevation of the bottom of the well.

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

WELL INSTALLATION DETAIL

WELL / PROBEHOLE / BOREHOLE NO: **JOF-113** (Boring JOF-113)

PROJECT: **JOF TDEC Order**	INSTALLATION: STARTED: **9/4/19** COMPLETED: **9/5/19**
PROJECT NUMBER: **175568286**	LOCATION: **604,136.76 N; 1,412,110.10 E** DATUM: **NAD27 Plant Local**
DRILLING COMPANY: **Stantec Consulting Services Inc.**	LOC. DESCRIP: **Coal Yard**
DRILLING EQUIPMENT: **CME 1050, #952**	LATITUDE: **36° 2' 7.01"** LONGITUDE: **-87° 59' 18.39"**
DRILLING METHOD: **8-1/4" HSA overdrill of boring**	GROUND ELEV (ft): **383.4** TOC ELEV (ft): **388.13**
SAMPLING METHOD: **4-1/4" HSA, 2" SS w/o liners, 3" Shelby Tubes**	ELEVATION DATUM: **NGVD29**
OBSERVED BY: **C. Burton**	WELL DEPTH (ft, bgs): **45.1**
REVIEWED BY: **D. Norman**	DTW AT COMPLETION (ft, bgs): **20.1**
APPROVED BY: **P. Dunne**	BOREHOLE DIA. (in): **13.0** WELL DIA. (in): **4.0**



Materials Inventory

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

RISER: TOP (AGS): **4.7 ft** BOTTOM (BGS): **34.9 ft**

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

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

SCREEN: TOP (BGS): **34.9 ft** BOTTOM (BGS): **44.7 ft**

END CAP: TOP (BGS): **44.7 ft** BOTTOM (BGS): **45.1 ft**

GROUT QUANTITY: **153 gal**

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

GROUT: TOP (BGS): **0.0 ft** BOTTOM (BGS): **30.6 ft**

GROUT DENSITY:
INITIAL (lbs/gal): **10.1** RETURN (lbs/gal): **10.0**

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

BENTONITE SEAL:
TOP (BGS): **30.6 ft** BOTTOM (BGS): **32.6 ft**

FILTER PACK - PRE-PACK AND ANNULAR SPACE:
TYPE: **20/40 Mesh (Unimin #00N)**

FILTER PACK: TOP (BGS): **32.6 ft** BOTTOM (BGS): **46.0 ft**

NOTES:
1) 4-1/4" HSA exploratory boring advanced to 49.7' (50.8' corrected). Boring subsequently overdrilled with 8-1/4" HSA to same depth. Boring backfilled with 3/8" bentonite pellets from bottom of boring to 44.9' (46.0' corrected) Corrected values represent the boring depth from the surveyed ground surface elevation adjacent to the pad and consider grade modifications made during pad installation.

2) Final as-built depths are listed. These corrected depths use the surveyed ground surface (GS) elevation following pad placement as the reference datum and may differ from the unknown elevation of the GS reference point used during well installation. For JOF-113 the finished grade surveyed elevation was approximately 1.1' higher than the original grade reference used when the well was installed. The position of each well component, however, has not changed relative to original elevation of the bottom of the well.

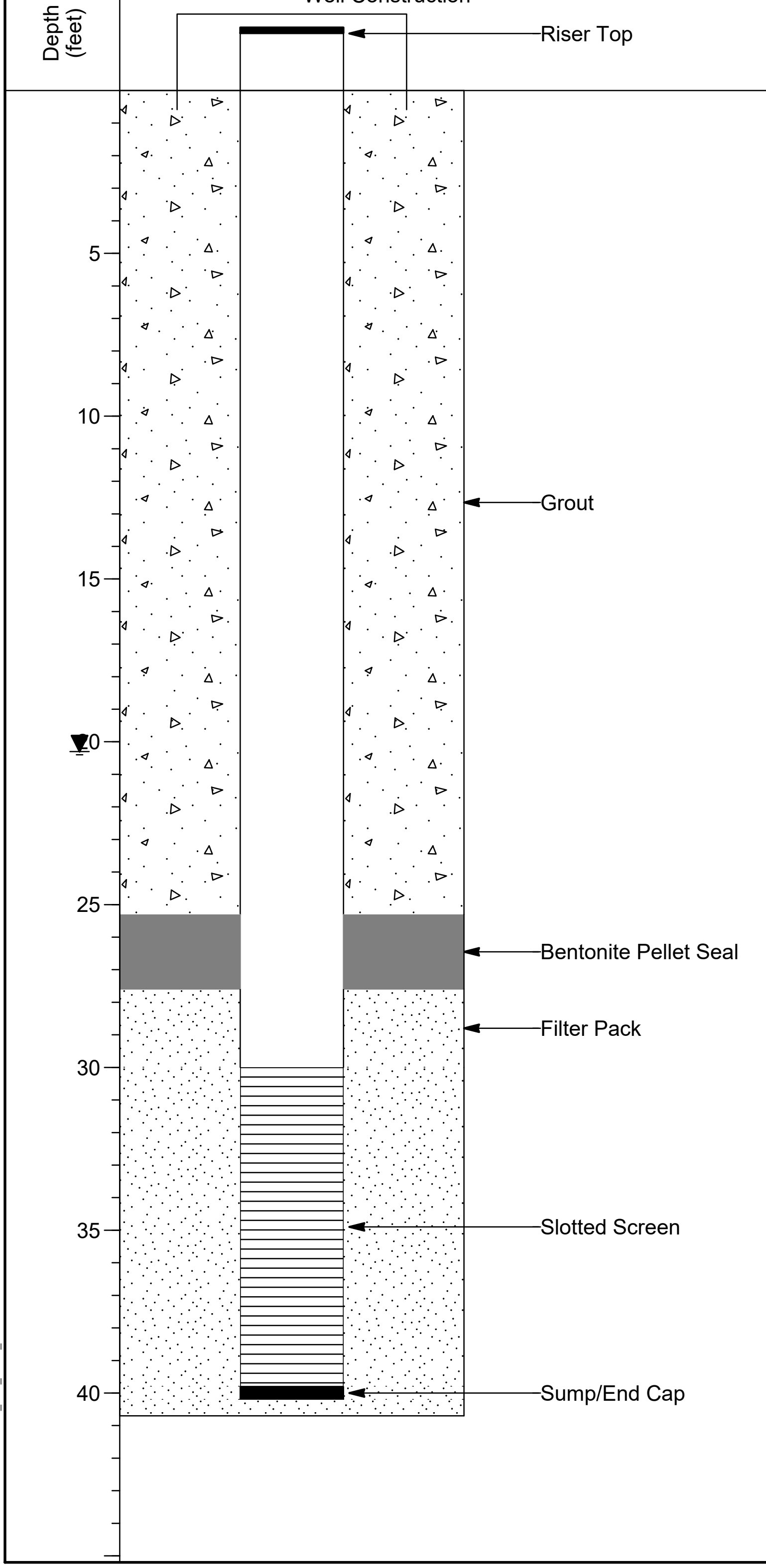
VERTICAL SCALE: AS SHOWN. HORIZONTAL SCALE: NOT TO SCALE (EXAGGERATED TO SHOW DETAIL)

WELL INSTALLATION DETAIL

WELL / PROBEHOLE / BOREHOLE NO: **JOF-114** (Boring JOF-114)	PAGE 1 OF 1

PROJECT: **JOF TDEC Order**	INSTALLATION: STARTED: **9/11/19**	COMPLETED: **9/12/19**
PROJECT NUMBER: **175568286**	LOCATION: **603,597.10 N; 1,412,156.67 E**	DATUM: **NAD27 Plant Local**
DRILLING COMPANY: **Stantec Consulting Services Inc.**	LOC. DESCRIP: **Coal Yard**	
DRILLING EQUIPMENT: **CME 85#2, #951**	LATITUDE: **36° 2' 1.69"**	LONGITUDE: **-87° 59' 17.69"**
DRILLING METHOD: **8-1/4" HSA overdrill of boring**	GROUND ELEV (ft): **383.7**	TOC ELEV (ft): **388.36**
SAMPLING METHOD: **4-1/4" HSA, 2" SS w/o liners, 3" Shelby Tubes**	ELEVATION DATUM: **NGVD29**	
OBSERVED BY: **C. Burton**	WELL DEPTH (ft, bgs): **40.2**	
REVIEWED BY: **J. Snider**	DTW AT COMPLETION (ft, bgs): **20.3**	
APPROVED BY: **P. Dunne**	BOREHOLE DIA. (in): **13.0**	WELL DIA. (in): **4.0**

Depth (feet) | Well Construction



Materials Inventory

RISER TYPE: **4" Sch 40 PVC Riser**	
RISER: TOP (AGS): **4.7 ft**	BOTTOM (BGS): **30.0 ft**
SCREEN TYPE: **5"ID x 4"ID U-Pack**	
SCREEN SLOT SIZE (in): **0.010**	
SCREEN: TOP (BGS): **30.0 ft**	BOTTOM (BGS): **39.8 ft**
END CAP: TOP (BGS): **39.8 ft**	BOTTOM (BGS): **40.2 ft**
GROUT QUANTITY: **144 gal**	
GROUT TYPE: **30% Solids Bentonite Grout**	
GROUT: TOP (BGS): **0.0 ft**	BOTTOM (BGS): **25.3 ft**
GROUT DENSITY: INITIAL (lbs/gal): **10.1**	RETURN (lbs/gal): **10.0**
BENTONITE TYPE: **3/8" PDS TR30 pellets**	
BENTONITE SEAL: TOP (BGS): **25.3 ft**	BOTTOM (BGS): **27.6 ft**
FILTER PACK - PRE-PACK AND ANNULAR SPACE: TYPE: **20/40 Mesh (Unimin #00N)**	
FILTER PACK: TOP (BGS): **27.6 ft**	BOTTOM (BGS): **40.7 ft**

NOTES:

1) 4-1/4" HSA exploratory boring advanced to 40.5' (40.7' corrected). Boring subsequently overdrilled with 8-1/4" HSA to same depth. Exploratory boring backfilled from bottom of boring to 40.0' (40.2' corrected) with filter pack sand. Corrected values represent the boring depth from the surveyed ground surface elevation adjacent to the pad and consider grade modifications made during pad installation.

2) Final as-built depths are listed. These corrected depths use the surveyed ground surface (GS) elevation following pad placement as the reference datum and may differ from the unknown elevation of the GS reference point used during well installation. For JOF-114, the finished grade surveyed elevation was approximately 0.2' higher than the original grade reference used when the well was installed. The position of each well component, however, has not changed relative to original elevation of the bottom of the well.

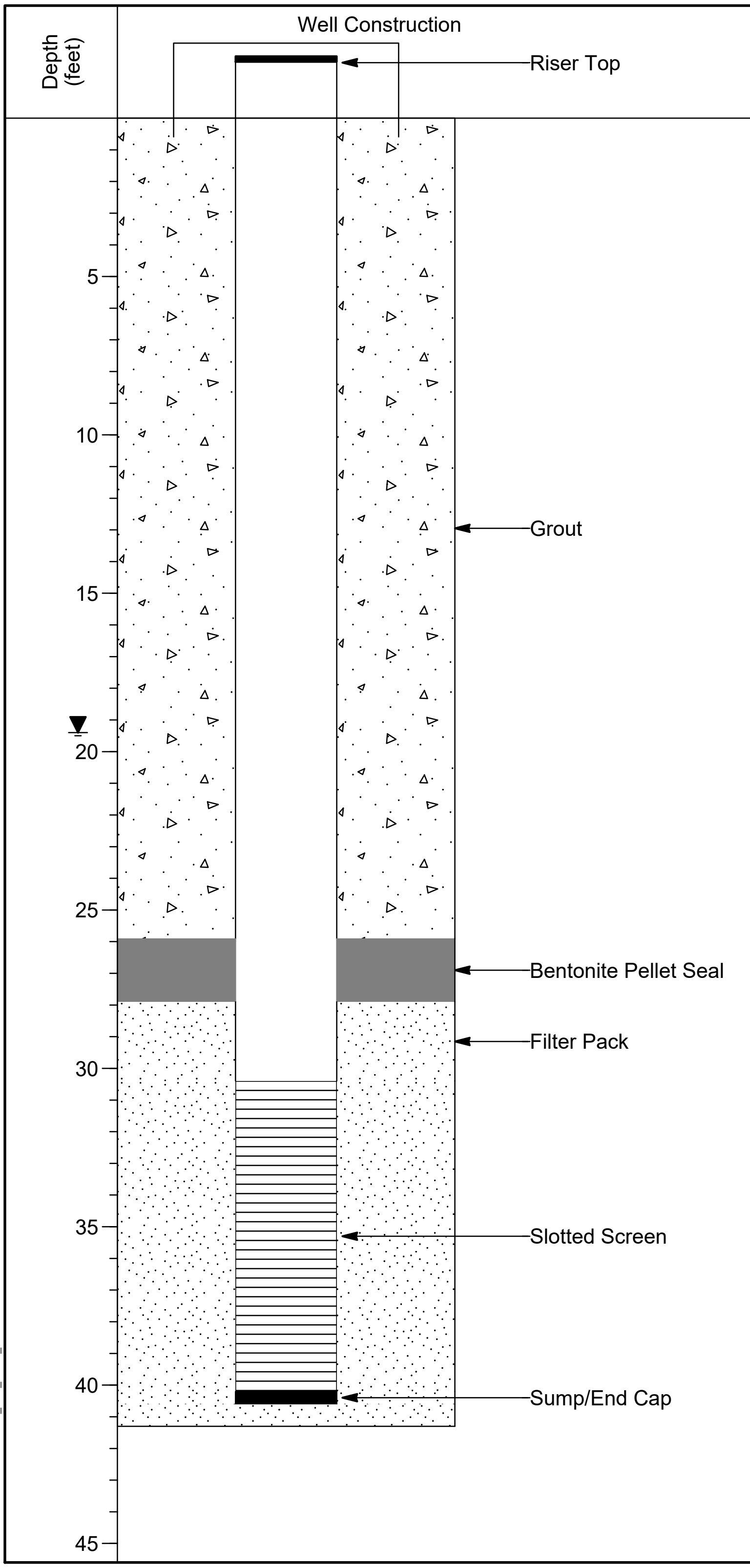
VERTICAL SCALE: AS SHOWN. HORIZONTAL SCALE: NOT TO SCALE (EXAGGERATED TO SHOW DETAIL)

WELL INSTALLATION DETAIL

WELL / PROBEHOLE / BOREHOLE NO: PAGE 1 OF 1

JOF-117 (Boring JOF-117)

PROJECT: **JOF TDEC Order**	INSTALLATION: STARTED: **9/16/19** COMPLETED: **9/17/19**
PROJECT NUMBER: **175568286**	LOCATION: **602,823.15 N; 1,412,216.73 E** DATUM: **NAD27 Plant Local**
DRILLING COMPANY: **Stantec Consulting Services Inc.**	LOC. DESCRIP: **Coal Yard**
DRILLING EQUIPMENT: **CME 85#2, #951**	LATITUDE: **36° 1' 54.04"** LONGITUDE: **-87° 59' 16.77"**
DRILLING METHOD: **8-1/4" HSA overdrill of boring**	GROUND ELEV (ft): **384.1** TOC ELEV (ft): **388.63**
SAMPLING METHOD: **4-1/4" HSA, 2" SS w/o liners, 3" Shelby Tubes**	ELEVATION DATUM: **NGVD29**
OBSERVED BY: **C. Burton**	WELL DEPTH (ft, bgs): **40.6**
REVIEWED BY: **J. Snider**	DTW AT COMPLETION (ft, bgs): **19.4**
APPROVED BY: **P. Dunne**	BOREHOLE DIA. (in): **13.0** WELL DIA. (in): **4.0**



Materials Inventory

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

RISER: TOP (AGS): **4.6 ft** BOTTOM (BGS): **30.4 ft**

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

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

SCREEN: TOP (BGS): **30.4 ft** BOTTOM (BGS): **40.2 ft**

END CAP: TOP (BGS): **40.2 ft** BOTTOM (BGS): **40.6 ft**

GROUT QUANTITY: **153 gal**

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

GROUT: TOP (BGS): **0.0 ft** BOTTOM (BGS): **25.9 ft**

GROUT DENSITY:
INITIAL (lbs/gal): **10.0** RETURN (lbs/gal): **10.0**

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

BENTONITE SEAL:
TOP (BGS): **25.9 ft** BOTTOM (BGS): **27.9 ft**

FILTER PACK - PRE-PACK AND ANNULAR SPACE:
TYPE: **20/40 Mesh (Unimin #00N)**

FILTER PACK: TOP (BGS): **27.9 ft** BOTTOM (BGS): **41.3 ft**

NOTES:
1) 4-1/4" HSA exploratory boring advanced to 40.5' (41.1' corrected). Boring subsequently overdrilled with 8-1/4" HSA to 40.7' (41.3' corrected). Exploratory boring backfilled from bottom of boring to 40.0' (40.6' corrected) with filter pack sand. Corrected values represent the boring depth from the surveyed ground surface elevation adjacent to the pad and consider grade modifications made during pad installation.

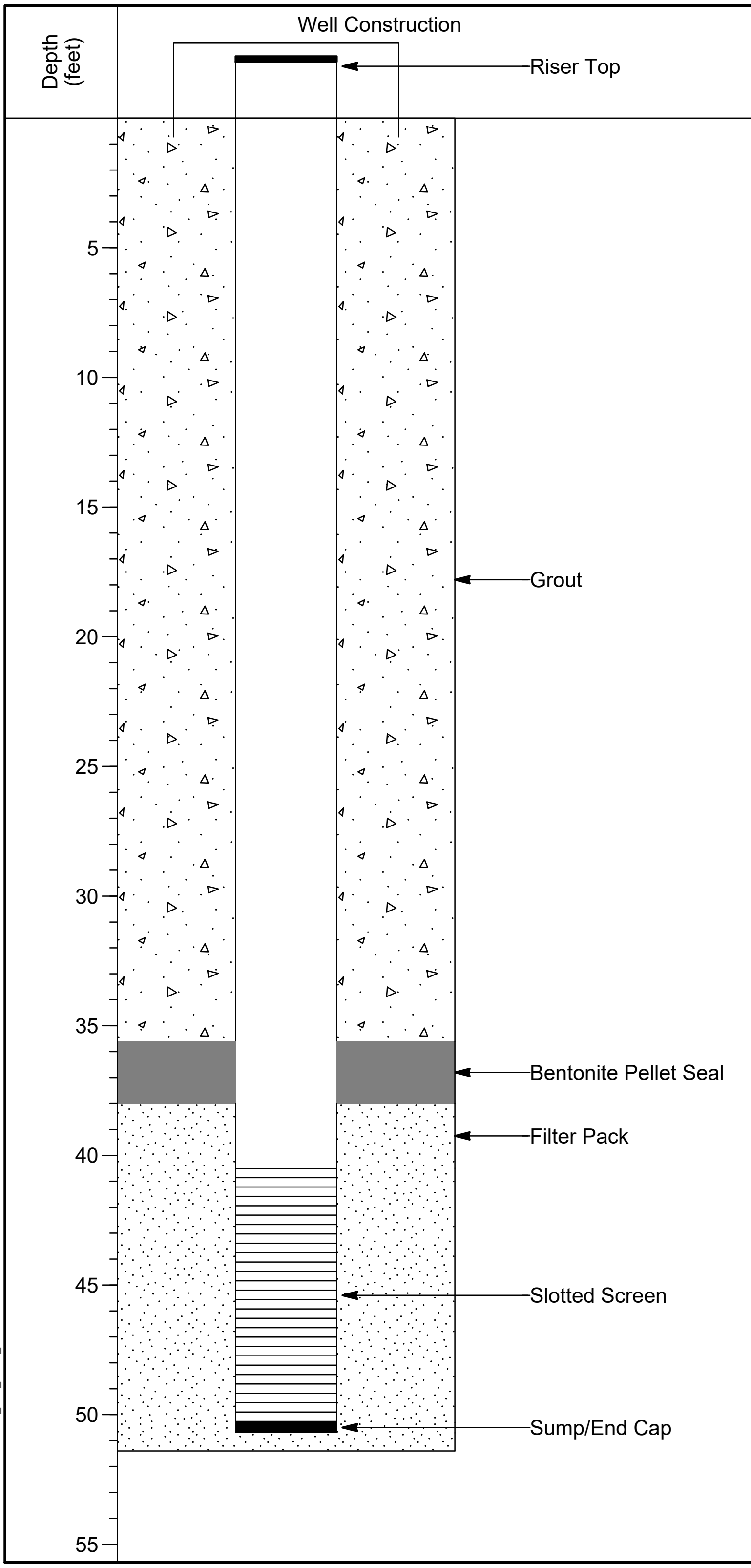
2) Final as-built depths are listed. These corrected depths use the surveyed ground surface (GS) elevation following pad placement as the reference datum and may differ from the unknown elevation of the GS reference point used during well installation. For JOF-117, the finished grade surveyed elevation was approximately 0.6' higher than the original grade reference used when the well was installed. The position of each well component, however, has not changed relative to original elevation of the bottom of the well.

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

WELL INSTALLATION DETAIL

WELL / PROBEHOLE / BOREHOLE NO: **JOF-118** (Boring JOF-118)

PROJECT: **JOF TDEC Order**	INSTALLATION: STARTED: **7/2/19** COMPLETED: **7/2/19**
PROJECT NUMBER: **175568286**	LOCATION: **603,219.11 N; 1,410,969.82 E** DATUM: **NAD27 Plant Local**
DRILLING COMPANY: **Stantec Consulting Services Inc.**	LOC. DESCRIP: **Active Ash Pond 2**
DRILLING EQUIPMENT: **CME 55T#1, #709**	LATITUDE: **36° 1' 57.71"** LONGITUDE: **-87° 59' 32.05"**
DRILLING METHOD: **8-1/4" HSA overdrill of boring**	GROUND ELEV (ft): **369.3** TOC ELEV (ft): **372.69**
SAMPLING METHOD: **4-1/4" HSA, 2" SS w/o liners, 3" Shelby Tubes**	ELEVATION DATUM: **NGVD29**
OBSERVED BY: **C. Burton**	WELL DEPTH (ft, bgs): **50.7**
REVIEWED BY: **J. Snider**	DTW AT COMPLETION (ft, bgs): **N/A**
APPROVED BY: **P. Dunne**	BOREHOLE DIA. (in): **13.0** WELL DIA. (in): **4.0**



Materials Inventory

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

RISER: TOP (AGS): **3.4 ft** BOTTOM (BGS): **40.5 ft**

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

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

SCREEN: TOP (BGS): **40.5 ft** BOTTOM (BGS): **50.3 ft**

END CAP: TOP (BGS): **50.3 ft** BOTTOM (BGS): **50.7 ft**

GROUT QUANTITY: **204 gal**

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

GROUT: TOP (BGS): **1.0 ft** BOTTOM (BGS): **35.6 ft**

GROUT DENSITY:
INITIAL (lbs/gal): **10.1** RETURN (lbs/gal): **10.4**

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

BENTONITE SEAL:
TOP (BGS): **35.6 ft** BOTTOM (BGS): **38.0 ft**

FILTER PACK - PRE-PACK AND ANNULAR SPACE:
TYPE: **20/40 Mesh (Unimin #00N)**

FILTER PACK: TOP (BGS): **38.0 ft** BOTTOM (BGS): **51.4 ft**

NOTES:
1) 4-1/4" HSA exploratory boring advanced to 51.0' (51.4' corrected). Boring subsequently overdrilled with 8-1/4" HSA to same depth. Corrected values represent the boring depth from the surveyed ground surface elevation adjacent to the pad and consider grade modifications made during pad installation.

2) Final as-built depths are listed. These corrected depths use the surveyed ground surface (GS) elevation following pad placement as the reference datum and may differ from the unknown elevation of the GS reference point used during well installation. For JOF-118, the finished grade surveyed elevation was approximately 0.4' higher than the original grade reference used when the well was installed. The position of each well component, however, has not changed relative to original elevation of the bottom of the well.

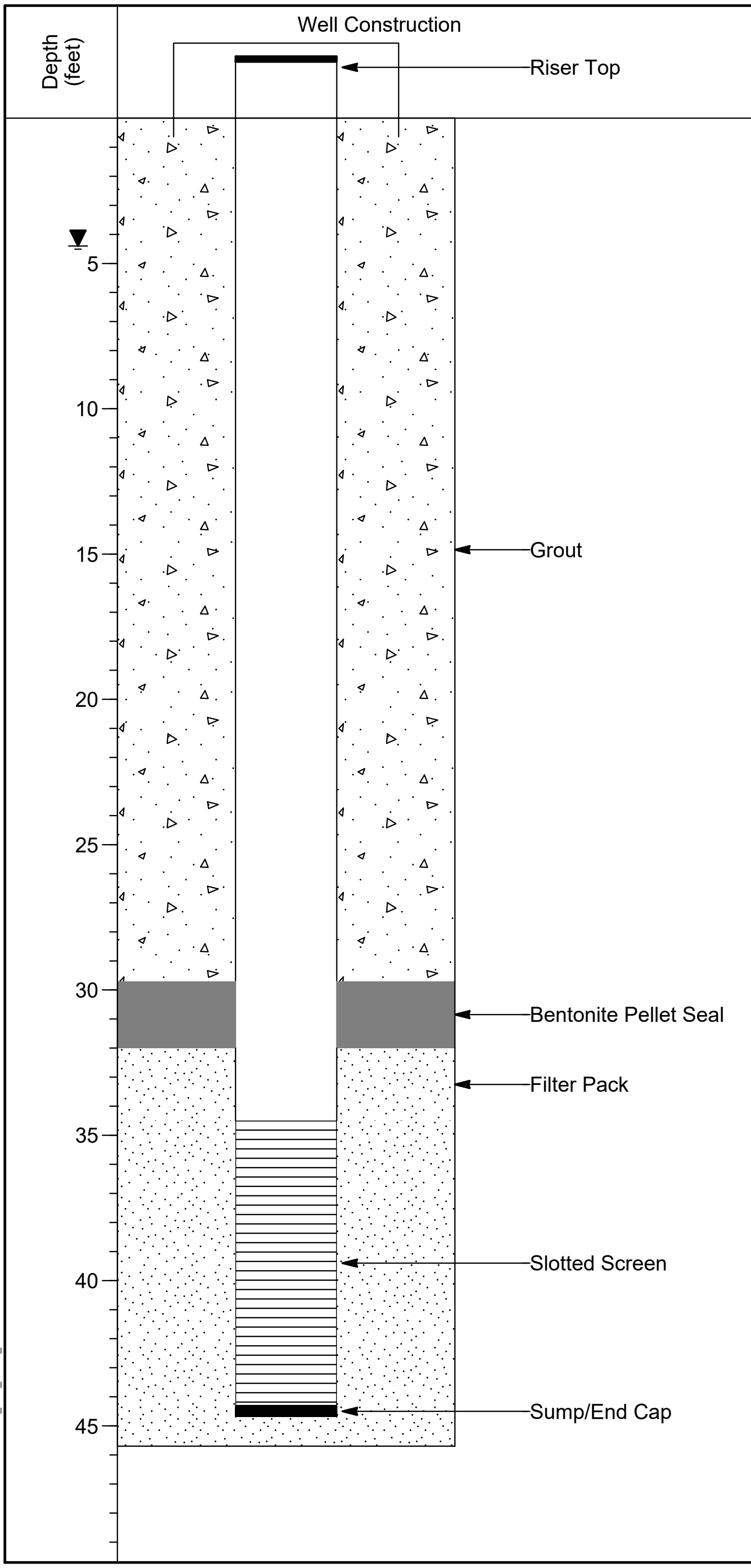
VERTICAL SCALE: AS SHOWN. HORIZONTAL SCALE: NOT TO SCALE (EXAGGERATED TO SHOW DETAIL)

WELL INSTALLATION DETAIL

WELL / PROBEHOLE / BOREHOLE NO: **JOF-119** (Boring JOF-119)	PAGE 1 OF 1

PROJECT: **JOF TDEC Order**	INSTALLATION: STARTED: **7/10/19**	COMPLETED: **7/11/19**
PROJECT NUMBER: **175568286**	LOCATION: **598,645.87 N; 1,410,031.49 E**	DATUM: **NAD27 Plant Local**
DRILLING COMPANY: **Stantec Consulting Services Inc.**	LOC. DESCRIP: **Active Ash Pond 2**	
DRILLING EQUIPMENT: **CME 55T#1, #709**	LATITUDE: **36° 1' 12.30"**	LONGITUDE: **-87° 59' 42.33"**
DRILLING METHOD: **8-1/4" HSA overdrill of boring**	GROUND ELEV (ft): **363.4**	TOC ELEV (ft): **366.89**
SAMPLING METHOD: **4-1/4" HSA, 2" SS w/o liners, 3" Shelby Tubes**	ELEVATION DATUM: **NGVD29**	
OBSERVED BY: **C. Burton**	WELL DEPTH (ft, bgs): **44.7**	
REVIEWED BY: **D. Norman**	DTW AT COMPLETION (ft, bgs): **4.4**	
APPROVED BY: **P. Dunne**	BOREHOLE DIA. (in): **13.0**	WELL DIA. (in): **4.0**

Well Construction



Materials Inventory

RISER TYPE: **4" Sch 40 PVC Riser**
RISER: TOP (AGS): **3.5 ft** BOTTOM (BGS): **34.5 ft**
SCREEN TYPE: **5"ID x 4"ID U-Pack**
SCREEN SLOT SIZE (in): **0.010**
SCREEN: TOP (BGS): **34.5 ft** BOTTOM (BGS): **44.3 ft**
END CAP: TOP (BGS): **44.3 ft** BOTTOM (BGS): **44.7 ft**
GROUT QUANTITY: **187 gal**
GROUT TYPE: **30% Solids Bentonite Grout**
GROUT: TOP (BGS): **0.0 ft** BOTTOM (BGS): **29.7 ft**
GROUT DENSITY: INITIAL (lbs/gal): **10.1** RETURN (lbs/gal): **10.1**
BENTONITE TYPE: **3/8" PDS TR30 pellets**
BENTONITE SEAL: TOP (BGS): **29.7 ft** BOTTOM (BGS): **32.0 ft**
FILTER PACK - PRE-PACK AND ANNULAR SPACE: TYPE: **20/40 Mesh (Unimin #00N)**
FILTER PACK: TOP (BGS): **32.0 ft** BOTTOM (BGS): **45.7 ft**

NOTES:

1) 4-1/4" HSA exploratory boring advanced to 45.0 ft bgs (45.7 ft bgs corrected). Boring subsequently overdrilled with 8-1/4" HSA to same depth. Corrected values represent the boring depth from the surveyed ground surface elevation adjacent to the pad and consider grade modifications made during pad installation.

2) Final as-built depths are listed. These corrected depths use the surveyed ground surface (GS) elevation following pad placement as the reference datum and may differ from the unknown elevation of the GS reference point used during well installation. For JOF-119 the finished grade surveyed elevation was approximately 0.7' higher than the original grade reference used when the well was installed. The position of each well component, however, has not changed relative to original elevation of the bottom of the well.

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

APPENDIX D – PHOTOGRAPHS OF SOIL BORINGS AND MONITORING WELLS/PIEZOMETER

ATTACHMENT D.1

Photographic Log of Soil Lithology

Stantec **Photographic Log**

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 1

Photo Location:
JOF-108

Photo Date:
8/6/2019

Comments:
First boring location interval (0.0-5.0 feet). The sample run should be shown on the white board as DP01.

Photograph ID: 2

Photo Location:
JOF-108

Photo Date:
8/6/2019

Comments:
First boring location interval (5.0-10.0 feet). Boring first encountered CCR at 0.7 feet.

Stantec

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 3

Photo Location:
JOF-108 Offset A

Photo Date:
8/6/2019

Comments:
Second boring location interval (0.0-5.0 feet). Offset 14 feet to the southwest of the first boring. The boring ID on the white board should be JOF-108 Offset A.

Photograph ID: 4

Photo Location:
JOF-108 Offset A

Photo Date:
8/6/2019

Comments:
Second boring location interval (5.0-10.0 feet). Boring encountered CCR at 5.2-10.0 feet. The boring ID on the white board should be JOF-108 Offset A.

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 5

Photo Location:
JOF-108 Offset B

Photo Date:
8/7/2019

Comments:
Third boring location interval (0.0-5.0 feet). Offset 43 feet to the northwest of the second boring.

Photograph ID: 6

Photo Location:
JOF-108 Offset B

Photo Date:
8/7/2019

Comments:
Third boring location interval (5.0-10.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 7

Photo Location:
JOF-108 Offset B

Photo Date:
8/7/2019

Comments:
Third boring location interval (10.0-15.0 feet).

Photograph ID: 8

Photo Location:
JOF-108 Offset B

Photo Date:
8/7/2019

Comments:
Third boring location interval (15.0-20.0 feet).

Stantec **Photographic Log**

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 9

Photo Location:
JOF-108 Offset B

Photo Date:
8/7/2019

Comments:
Third boring location interval (20.0-25.0 feet).

Photograph ID: 10

Photo Location:
JOF-108 Offset B

Photo Date:
8/7/2019

Comments:
Third boring location interval (25.0-29.9 feet). Boring first encountered CCR at 3.8 feet. Boring refusal at 29.9 feet.

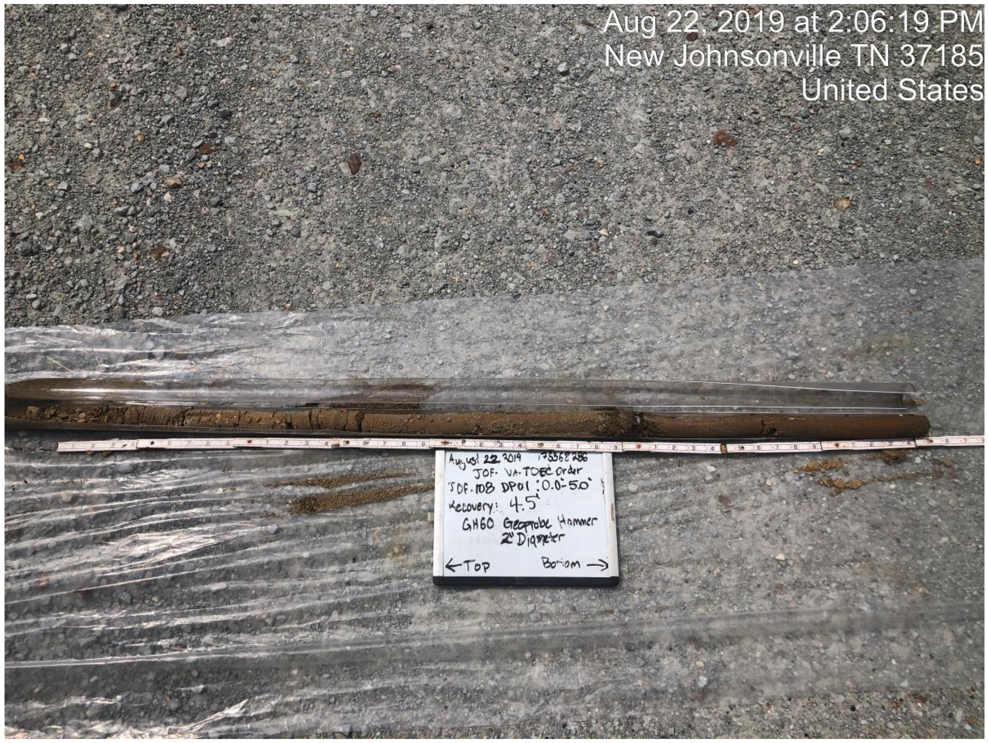
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 11

Photo Location:
JOF-108 Offset C

Photo Date:
8/22/2019

Comments:
Fourth boring location interval (0.0-5.0 feet). Offset 15 feet to the west of the third boring. The boring ID on the white board should be JOF-108 Offset C. The project and project number on the white board is TVA TDEC Order 175568286.



Photograph ID: 12

Photo Location:
JOF-108 Offset C

Photo Date:
8/22/2019

Comments:
Photo of fourth boring location interval (5.0-10.0 feet) unavailable.

No Photo Applicable

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 13

Photo Location:
JOF-108 Offset C

Photo Date:
8/22/2019

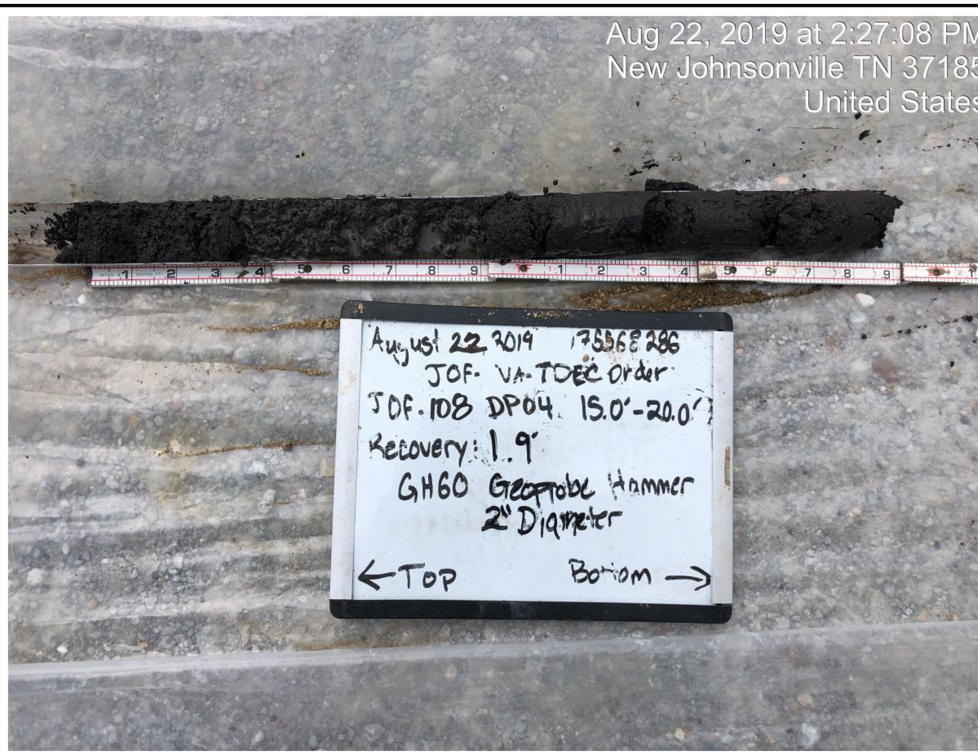
Comments:
Fourth boring location interval (10.0-15.0 feet). The boring ID on the white board should be JOF-108 Offset C.

Photograph ID: 14

Photo Location:
JOF-108 Offset C

Photo Date:
8/22/2019

Comments:
Fourth boring location interval (15.0-20.0 feet). The boring ID on the white board should be JOF-108 Offset C.



Stantec

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 15

Photo Location:
JOF-108 Offset C

Photo Date:
8/22/2019

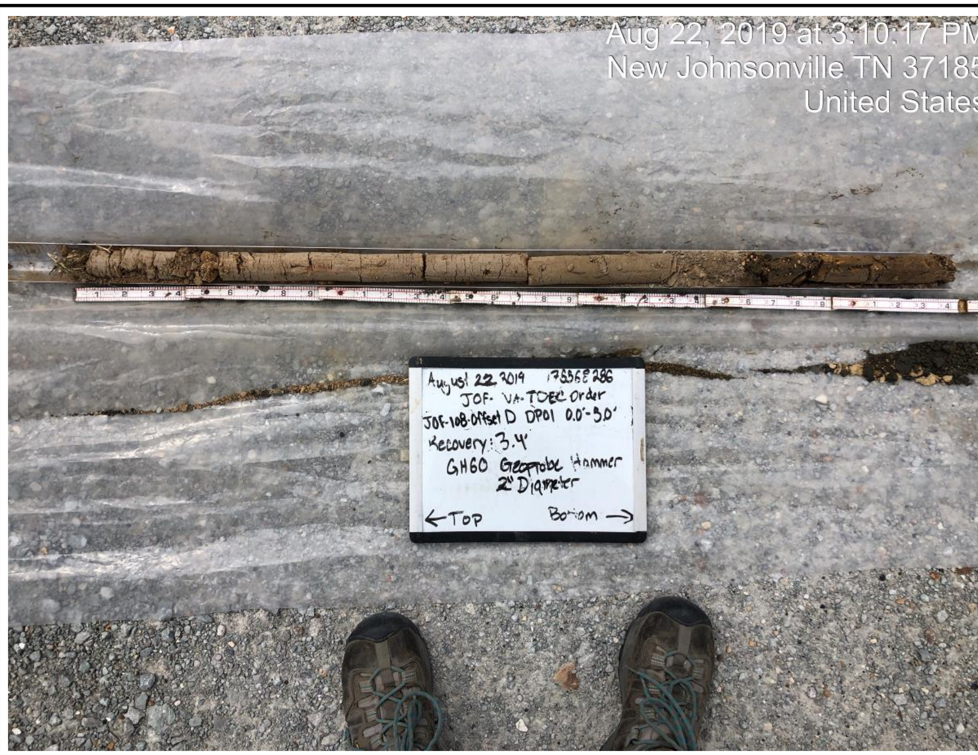
Comments:
Fourth boring location interval (20.0-24.5 feet). Boring first encountered CCR at 10.0 feet. Boring refusal at 24.5 feet. The boring ID on the white board should be JOF-108 Offset C.

Photograph ID: 16

Photo Location:
JOF-108 Offset D

Photo Date:
8/22/2019

Comments:
Fifth boring location interval (0.0-5.0 feet). Offset 40 feet to the west of the fourth boring.



Stantec

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 17

Photo Location:
JOF-108 Offset D

Photo Date:
8/22/2019

Comments:
Fifth boring location interval (5.0-10.0 feet).

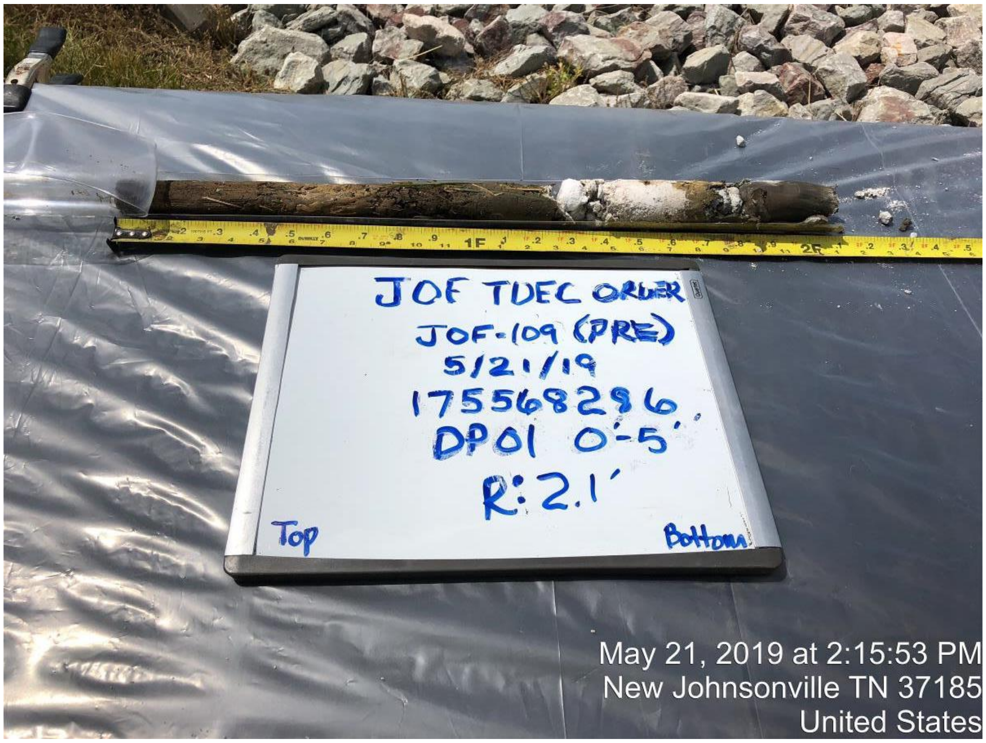
Photograph ID: 18

Photo Location:
JOF-108 Offset D

Photo Date:
8/22/2019

Comments:
Fifth boring location interval (10.0-13.5 feet). The sample run shown on the white board is DP03. The project and project number on the white board is TVA TDEC Order 175568286. Boring first encountered CCR at 7.3 feet. Boring refusal at 13.5 feet.

Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Johnsonville Fossil Plant (JOF)	Site Location:	New Johnsonville, Tennessee

Photograph ID: 19 **Photo Location:** JOF-109-Pre **Photo Date:** 5/21/2019 **Comments:** First boring location interval (0.0-5.0 feet).	
Photograph ID: 20 **Photo Location:** JOF-109-Pre **Photo Date:** 5/21/2019 **Comments:** Photo of first boring location interval (5.0-10.0 feet) unavailable.	No Photo Applicable

Stantec

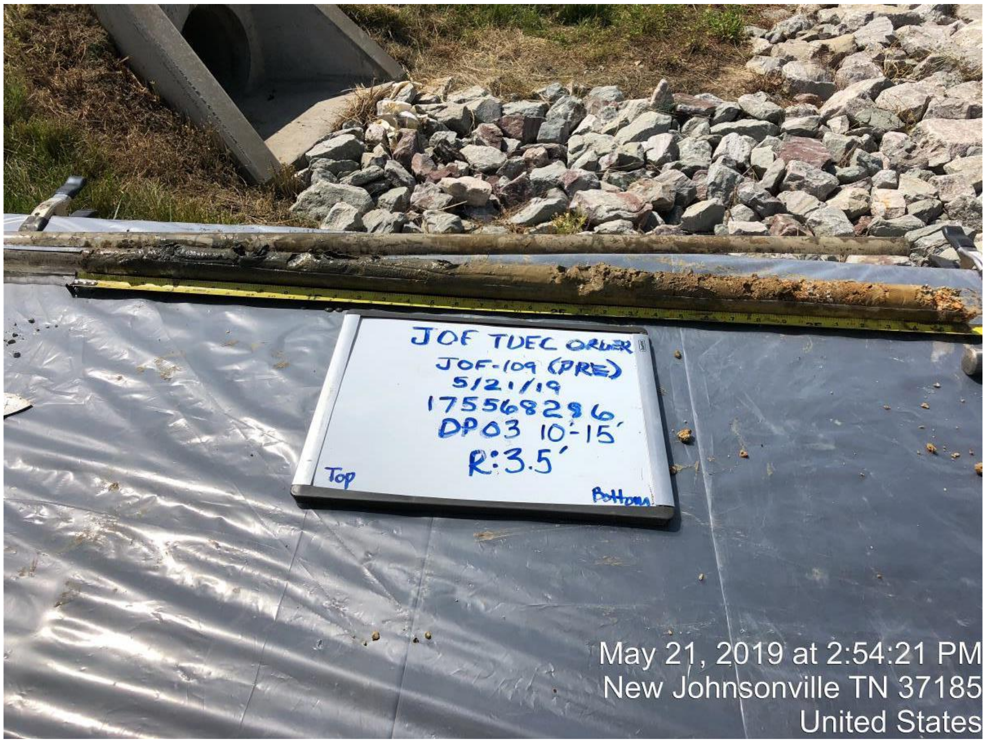
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 21

Photo Location:
JOF-109-Pre

Photo Date:
5/21/2019

Comments:
First boring location interval (10.0-15.0 feet).



Photograph ID: 22

Photo Location:
JOF-109-Pre

Photo Date:
5/21/2019

Comments:
Photo of first boring location interval (15.0-20.0 feet) unavailable. Boring refusal at 20.0 feet.

No Photo Applicable

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 23

Photo Location:
JOF-109

Photo Date:
6/19/2019

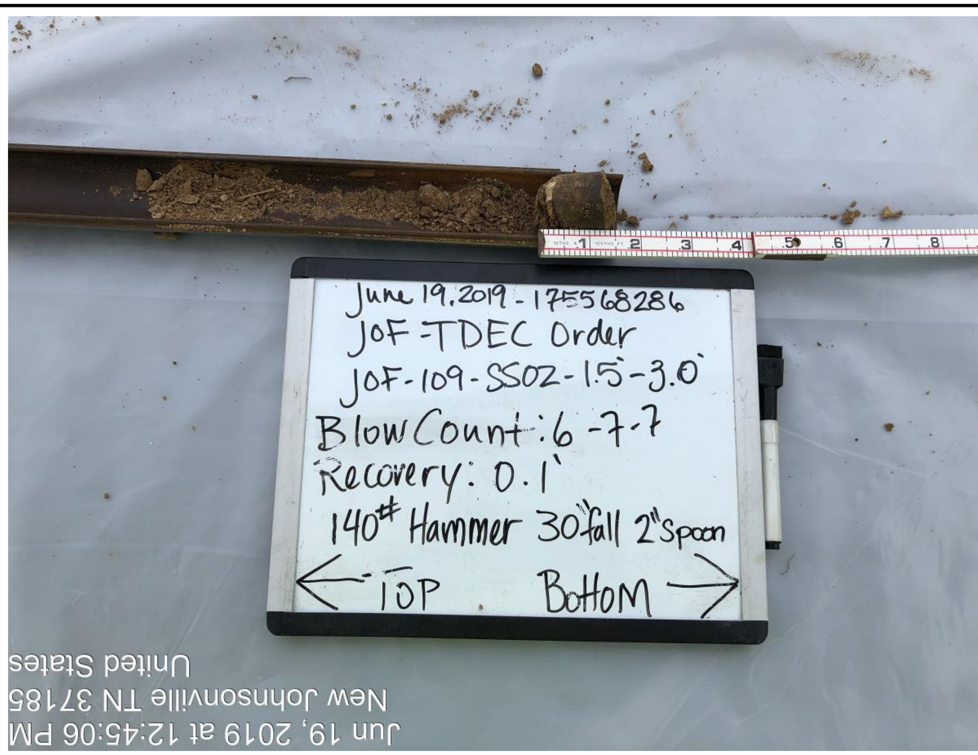
Comments:
Second boring location interval (0.0-1.5 feet). Offset 7 feet to the east of the first boring.

Photograph ID: 24

Photo Location:
JOF-109

Photo Date:
6/19/2019

Comments:
Second boring location interval (1.5-3.0 feet).



Stantec

Photographic Log

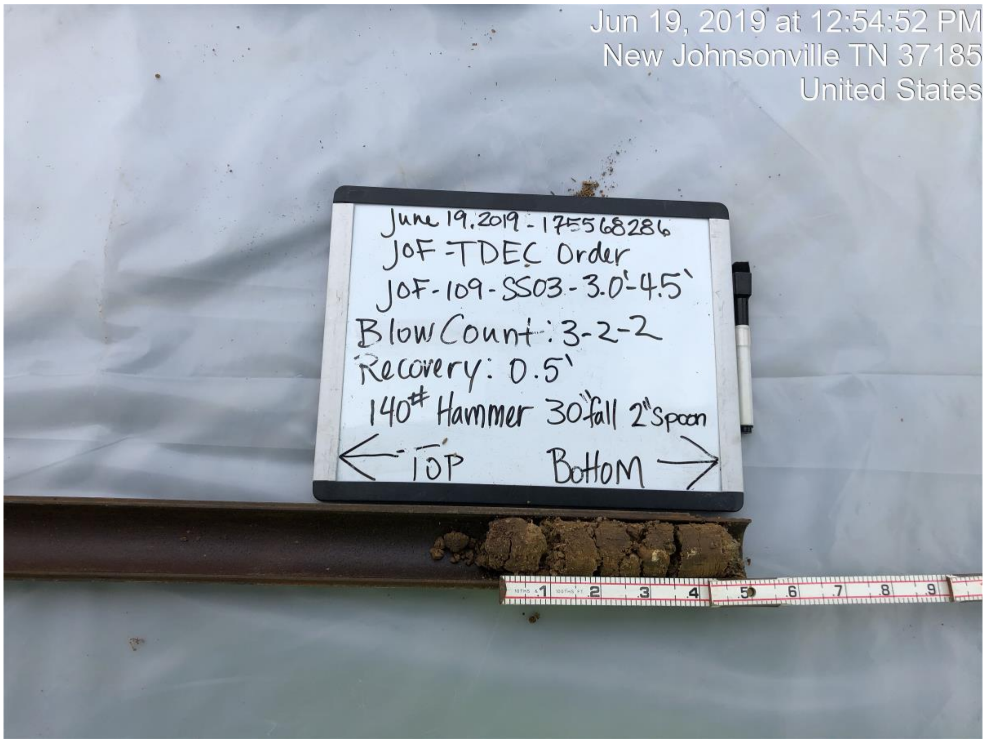
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 25

Photo Location:
JOF-109

Photo Date:
6/19/2019

Comments:
Second boring location interval (3.0-4.5 feet).

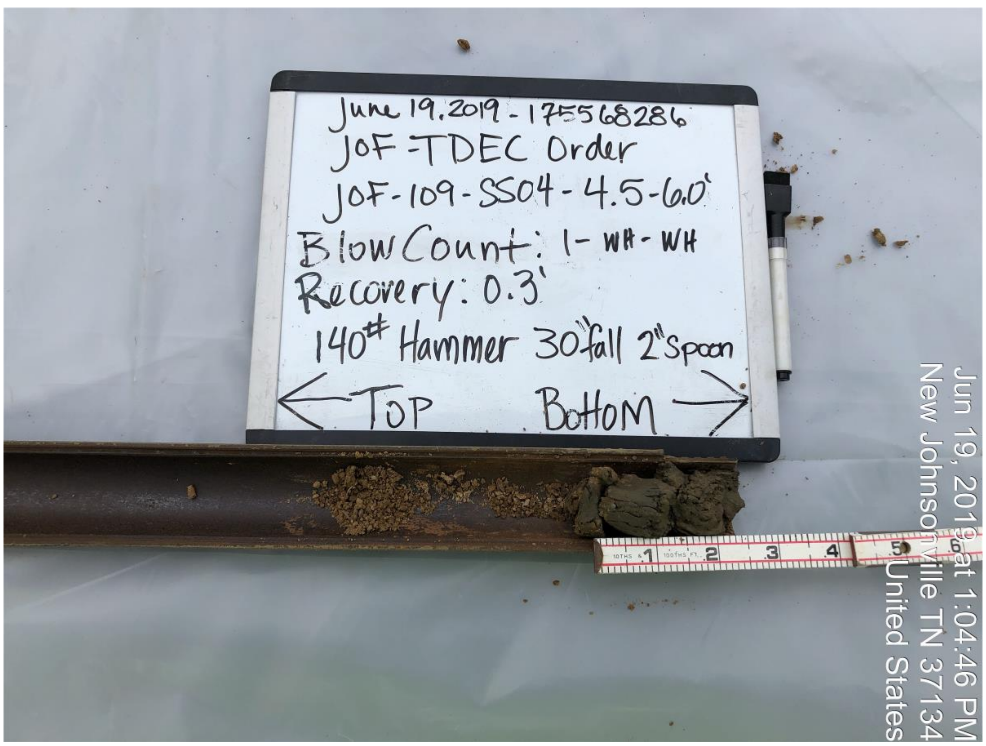


Photograph ID: 26

Photo Location:
JOF-109

Photo Date:
6/19/2019

Comments:
Second boring location interval (4.5-6.0 feet).



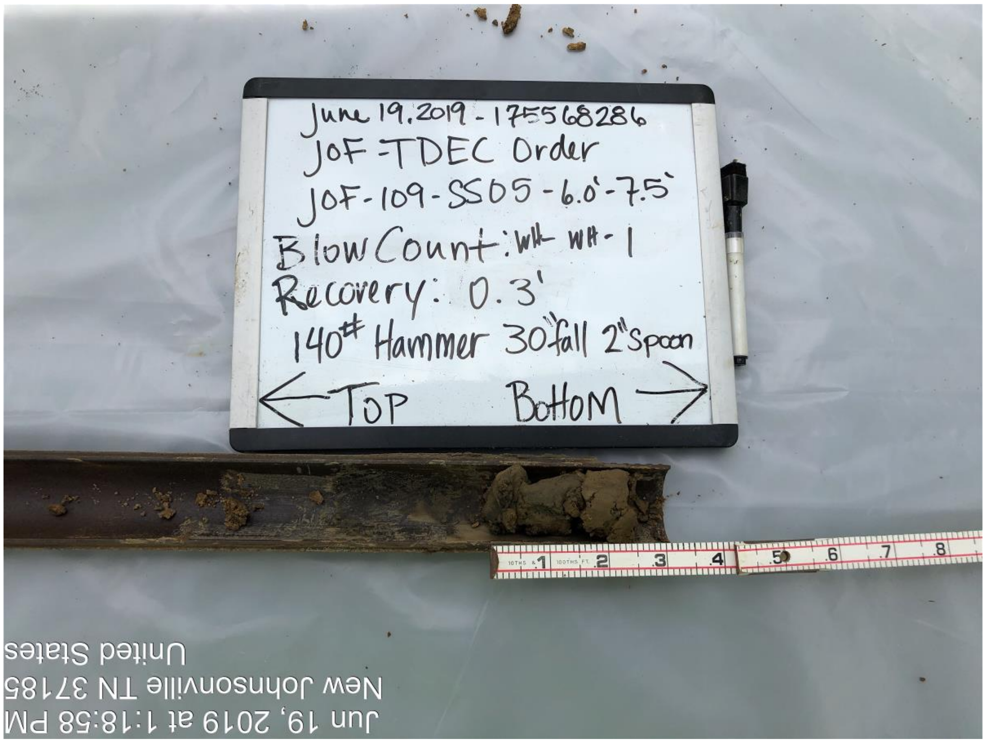
Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Johnsonville Fossil Plant (JOF)	Site Location:	New Johnsonville, Tennessee

Photograph ID: 27

Photo Location: JOF-109

Photo Date: 6/19/2019

Comments: Second boring location interval (6.0-7.5 feet).



Photograph ID: 28

Photo Location: JOF-109

Photo Date: 6/19/2019

Comments: Second boring location interval (7.5-9.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 29

Photo Location:
JOF-109

Photo Date:
6/19/2019

Comments:
Second boring location interval (9.0-10.2 feet). The depth range on the white board should be 9.0-10.2.

Photograph ID: 30

Photo Location:
JOF-109

Photo Date:
6/19/2019

Comments:
Second boring location interval (10.5-11.2 feet). The recovery on the white board should be 0.7 feet.

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 31

Photo Location:
JOF-109

Photo Date:
6/19/2019

Comments:
Second boring location interval (12.0-13.1 feet). The recovery on the white board should be 0.7 feet.

Photograph ID: 32

Photo Location:
JOF-109

Photo Date:
6/19/2019

Comments:
Second boring location interval (13.5-14.4 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 33

Photo Location:
JOF-109

Photo Date:
6/19/2019

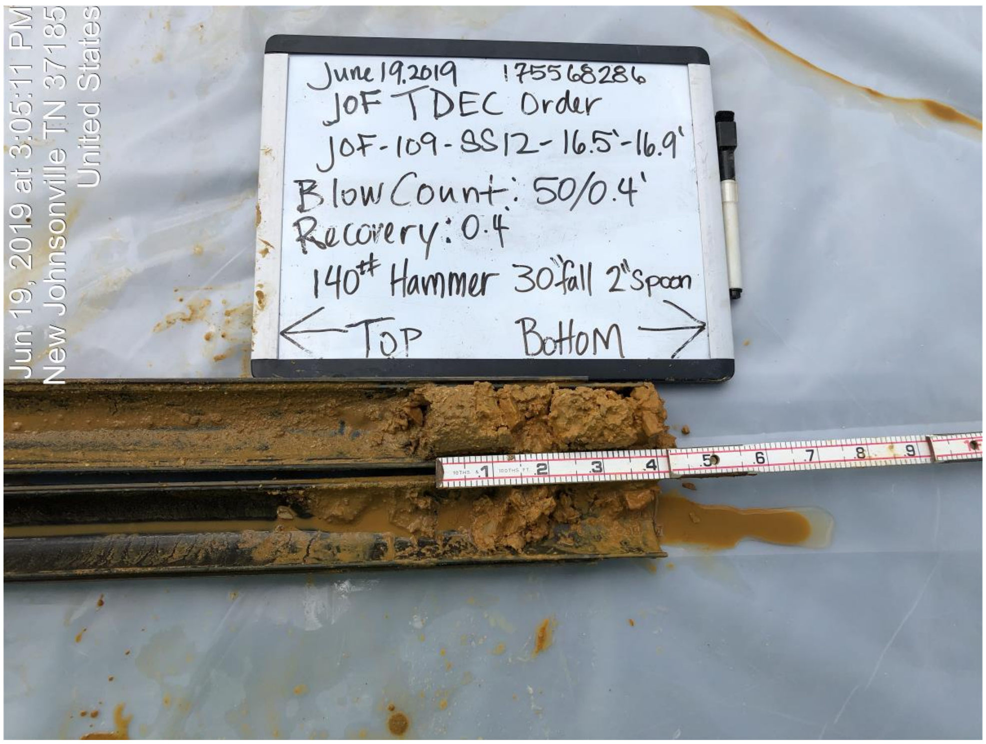
Comments:
Second boring location interval (15.0-15.4 feet).

Photograph ID: 34

Photo Location:
JOF-109

Photo Date:
6/19/2019

Comments:
Second boring location interval (16.5-16.9 feet).



Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 35

Photo Location: JOF-109

Photo Date: 6/19/2019

Comments: Second boring location interval (18.0-19.5 feet).

Photograph ID: 36

Photo Location: JOF-109

Photo Date: 6/19/2019

Comments: Second boring location interval (19.5-21.0 feet).

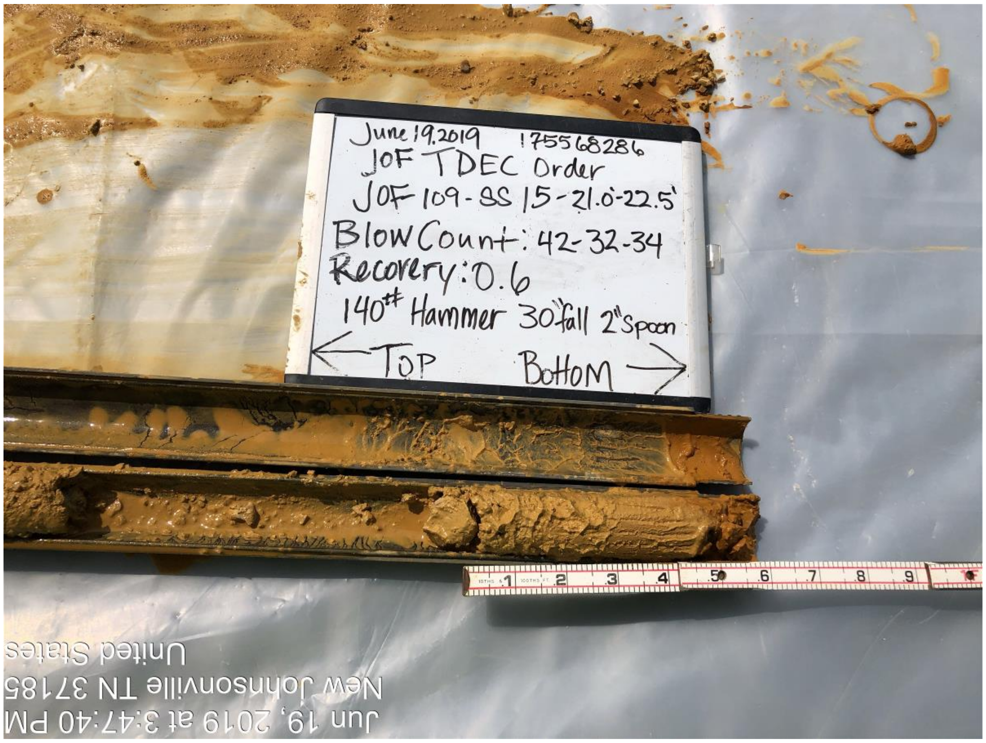
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 37

Photo Location:
JOF-109

Photo Date:
6/19/2019

Comments:
Second boring location interval (21.0-22.5 feet).



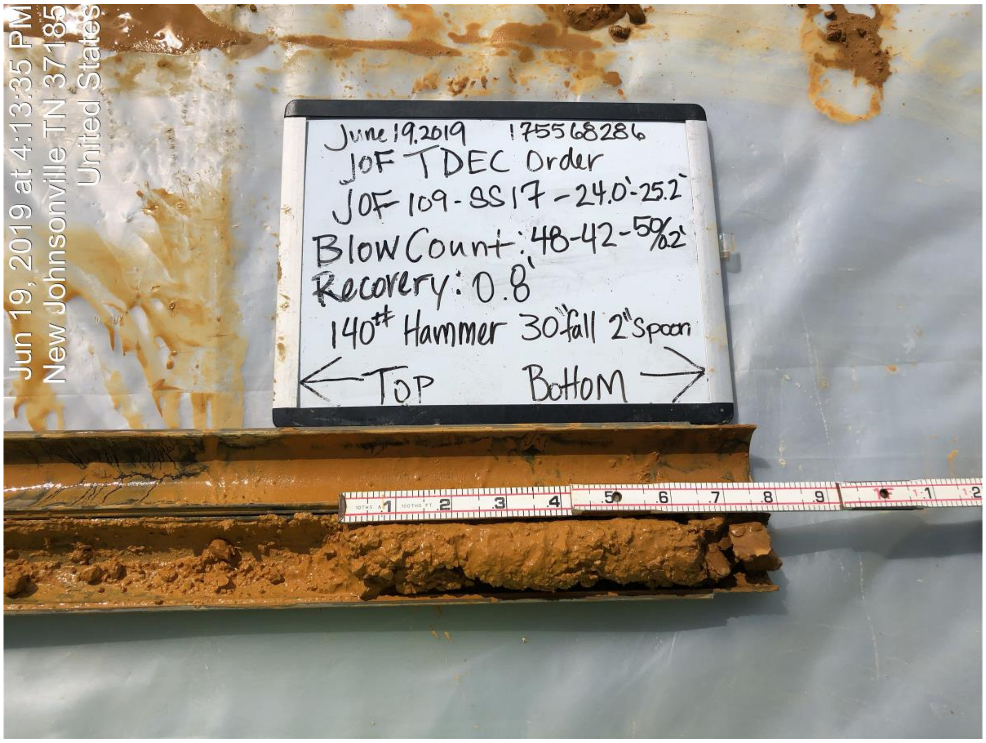
Photograph ID: 38

Photo Location:
JOF-109

Photo Date:
6/19/2019

Comments:
Second boring location interval (22.5-24.0 feet). The recovery on the white board should be 0.6 feet.

Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Johnsonville Fossil Plant (JOF)	Site Location:	New Johnsonville, Tennessee

Photograph ID: 39 **Photo Location:** JOF-109 **Photo Date:** 6/19/2019 **Comments:** Second boring location interval (24.0-25.2 feet).	
Photograph ID: 40 **Photo Location:** JOF-109 **Photo Date:** 6/19/2019 **Comments:** Second boring location interval (25.5-27.0 feet).	

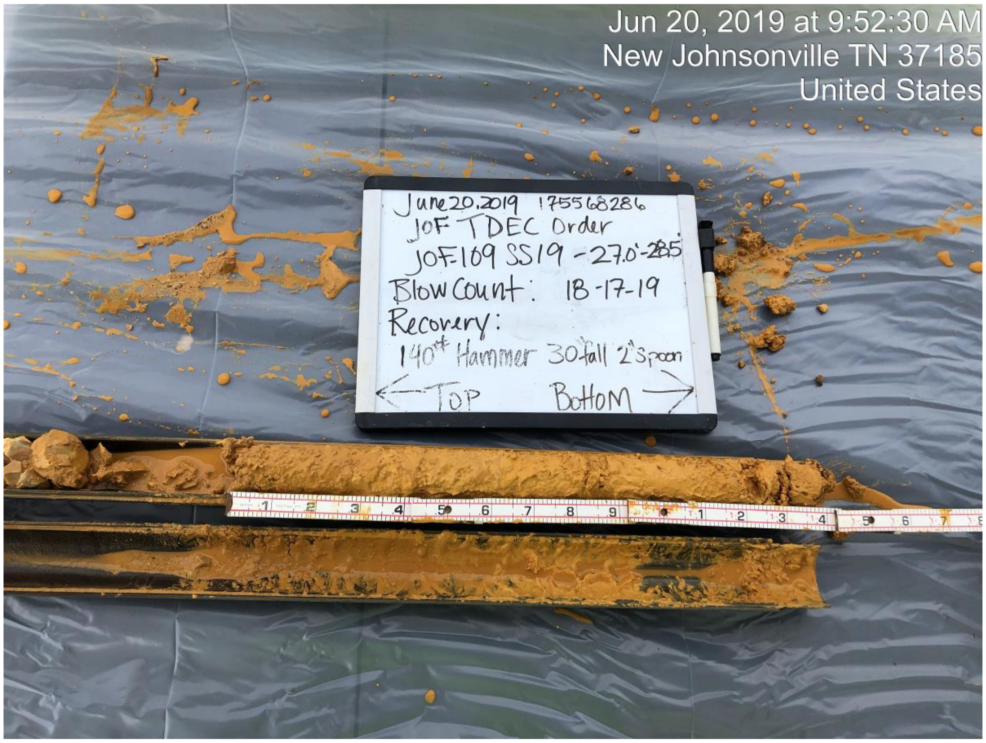
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 41

Photo Location:
JOF-109

Photo Date:
6/20/2019

Comments:
Second boring location interval (27.0-28.5 feet). The recovery on the white board should be 1.4 feet.



Photograph ID: 42

Photo Location:
JOF-109

Photo Date:
6/20/2019

Comments:
Second boring location interval (28.5-30.0 feet). The depth range on the white board should be 28.5-30.0 feet.

Stantec

Photographic Log

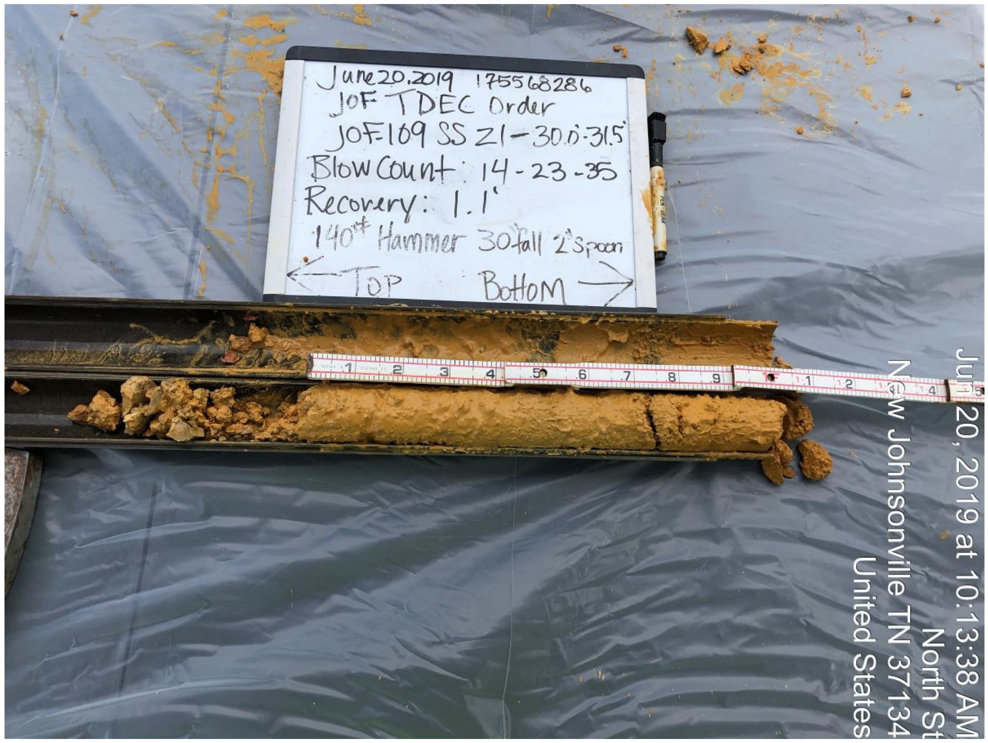
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 43

Photo Location:
JOF-109

Photo Date:
6/20/2019

Comments:
Second boring location interval (30.0-31.5 feet).



Photograph ID: 44

Photo Location:
JOF-109

Photo Date:
6/20/2019

Comments:
Second boring location interval (31.5-33.0 feet).

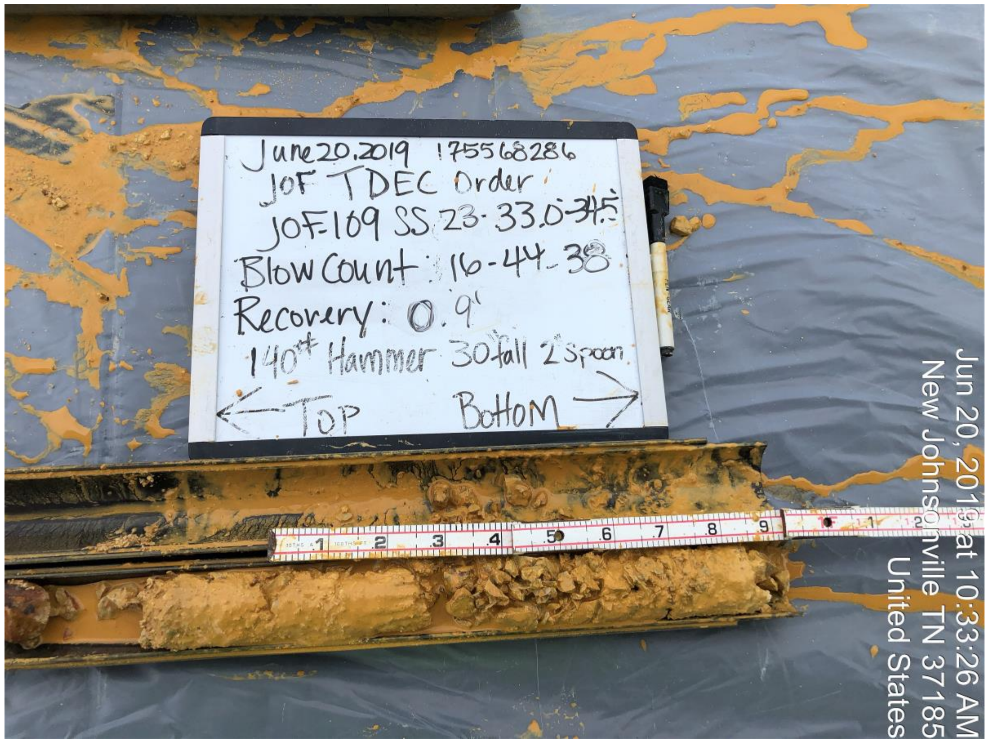
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 45

Photo Location:
JOF-109

Photo Date:
6/20/2019

Comments:
Second boring location interval (33.0-34.5 feet).



Photograph ID: 46

Photo Location:
JOF-109

Photo Date:
6/20/2019

Comments:
Second boring location interval (34.5-36.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 47

Photo Location:
JOF-109

Photo Date:
6/20/2019

Comments:
Second boring location interval (36.0-37.5 feet).

Photograph ID: 48

Photo Location:
JOF-109

Photo Date:
6/20/2019

Comments:
Second boring location interval (37.5-39.0 feet).

Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Johnsonville Fossil Plant (JOF)	Site Location:	New Johnsonville, Tennessee

Photograph ID: 49

Photo Location: JOF-109

Photo Date: 6/20/2019

Comments: Second boring location interval (39.0-40.5 feet).

Photograph ID: 50

Photo Location: JOF-109

Photo Date: 6/20/2019

Comments: Second boring location interval (40.5-42.0 feet).

Stantec

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 51

Photo Location:
JOF-109

Photo Date:
6/20/2019

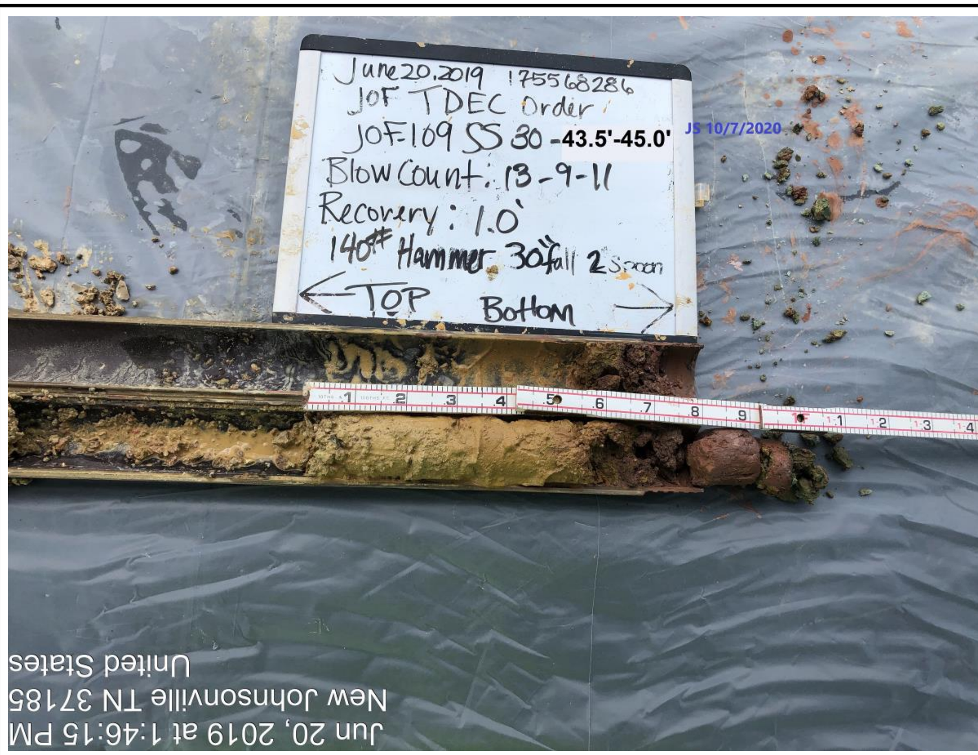
Comments:
Second boring location interval (42.0-43.5 feet). The recovery on the white board should be 0.9 feet.

Photograph ID: 52

Photo Location:
JOF-109

Photo Date:
6/20/2019

Comments:
Second boring location interval (43.5-45.0 feet).



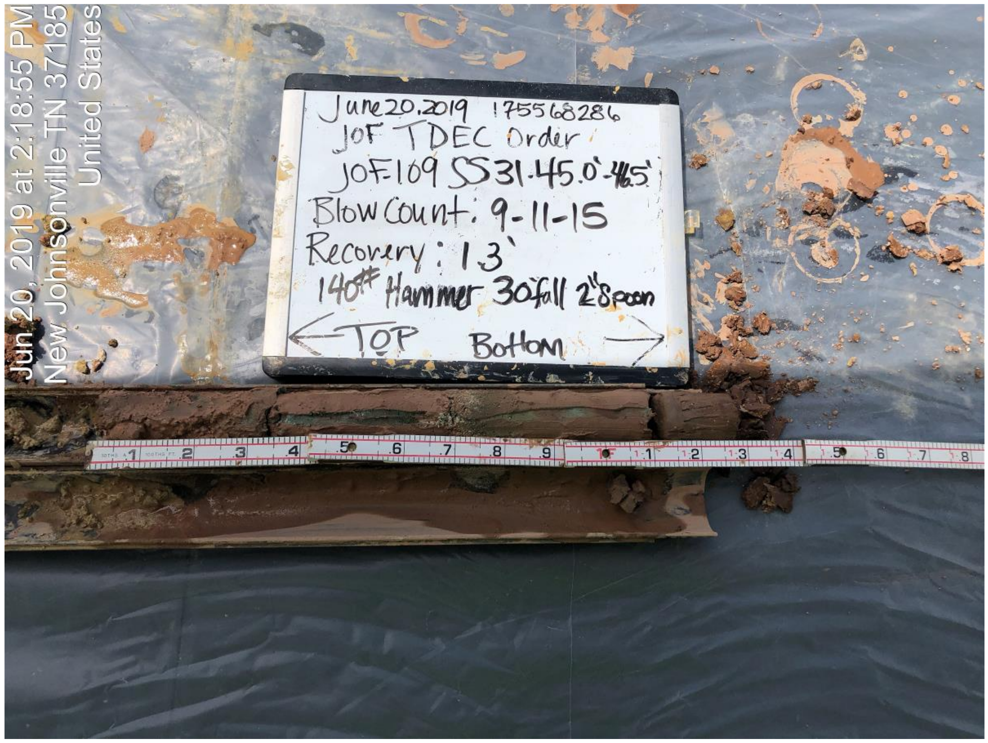
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 53

Photo Location:
JOF-109

Photo Date:
6/20/2019

Comments:
Second boring location interval (45.0-46.5 feet).



Photograph ID: 54

Photo Location:
JOF-110-Pre

Photo Date:
5/21/2019

Comments:
First boring location interval (0.0-5.0 feet).

Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Johnsonville Fossil Plant (JOF)	Site Location:	New Johnsonville, Tennessee

Photograph ID: 55

Photo Location:
JOF-110-Pre

Photo Date:
5/21/2019

Comments:
First boring location interval (5.0-10.0 feet). The direct push sample on the white board should be DP02.

Photograph ID: 56

Photo Location:
JOF-110-Pre

Photo Date:
5/21/2019

Comments:
First boring location interval (10.0-15.0 feet). The direct push sample on the white board should be DP03.

Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Johnsonville Fossil Plant (JOF)	Site Location:	New Johnsonville, Tennessee

Photograph ID: 57

Photo Location:
JOF-110-Pre

Photo Date:
5/21/2019

Comments:
First boring location interval (15.0-20.0 feet).

Photograph ID: 58

Photo Location:
JOF-110-Pre

Photo Date:
5/21/2019

Comments:
Photo of first boring location interval (20.0-25.0 feet) unavailable.

No Photo Applicable

Stantec

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 59

Photo Location:
JOF-110-Pre

Photo Date:
5/21/2019

Comments:
Photo of first boring location interval (25.0-30.0 feet) unavailable.

No Photo Applicable

Photograph ID: 60

Photo Location:
JOF-110-Pre

Photo Date:
5/21/2019

Comments:
First boring location interval (30.0-35.0 feet). Boring first encountered CCR at 0.0 feet.

Stantec

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 61

Photo Location: JOF-110Alt1

Photo Date: 8/22/2019

Comments: Second boring location interval (0.0-5.0 feet). Offset 119 feet to the northeast of the first boring. The boring ID on the white board should be JOF-110Alt1.

Photograph ID: 62

Photo Location: JOF-110Alt1

Photo Date: 8/22/2019

Comments: Second boring location interval (5.0-10.0 feet). The boring ID on the white board should be JOF-110Alt1.

Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Johnsonville Fossil Plant (JOF)	Site Location:	New Johnsonville, Tennessee

Photograph ID: 63 **Photo Location:** JOF-110Alt1 **Photo Date:** 8/22/2019 **Comments:** Second boring location interval (10.0-15.0 feet). The boring ID on the white board should be JOF-110Alt1.	
Photograph ID: 64 **Photo Location:** JOF-110Alt1 **Photo Date:** 8/22/2019 **Comments:** Second boring location interval (15.0-20.0 feet). The boring ID on the white board should be JOF-110Alt1.	

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 65

Photo Location:
JOF-110Alt1

Photo Date:
8/22/2019

Comments:
Second boring location interval (20.0-25.0 feet). The boring ID on the white board should be JOF-110Alt1.

Photograph ID: 66

Photo Location:
JOF-110Alt1

Photo Date:
8/22/2019

Comments:
Second boring location interval (25.0-30.0 feet). The boring ID on the white board should be JOF-110Alt1. The depth interval shown on the white board is 25.0-30.0.

Stantec **Photographic Log**

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 67

Photo Location:
JOF-110Alt1

Photo Date:
8/22/2019

Comments:
Second boring location interval (30.0-35.0 feet). The boring ID on the white board should be JOF-110Alt1.

Photograph ID: 68

Photo Location:
JOF-110Alt1

Photo Date:
8/22/2019

Comments:
Second boring location interval (35.0-40.0 feet). Boring first encountered CCR at 2.2 feet. The boring ID on the white board should be JOF-110Alt1.

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 69

Photo Location:
JOF-110

Photo Date:
9/10/2019

Comments:
Third boring location interval (0.0-10.0 feet). Offset 5 feet to the east of the first boring. The boring location shown on the white board is JOF-110.

Photograph ID: 70

Photo Location:
JOF-110

Photo Date:
9/10/2019

Comments:
Third boring location interval (10.0-20.0 feet). The boring location shown on the white board is JOF-110.

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 71

Photo Location:
JOF-110

Photo Date:
9/10/2019

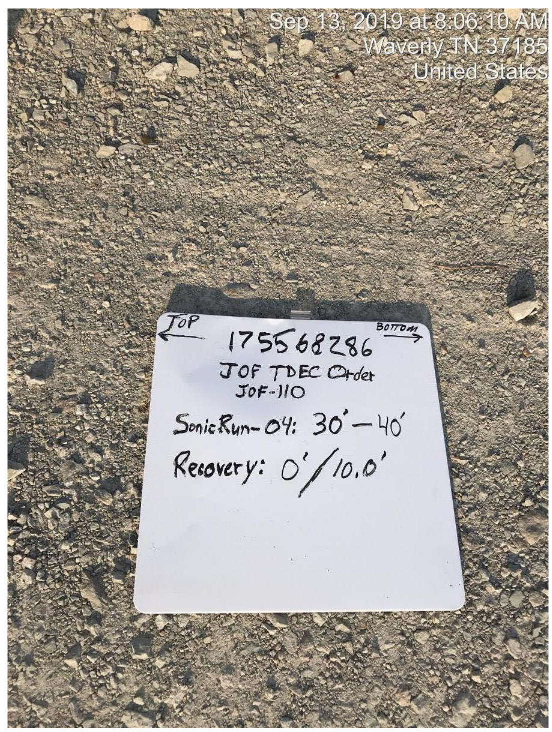
Comments:
Third boring location interval (20.0-30.0 feet). The boring location shown on the white board is JOF-110.

Photograph ID: 72

Photo Location:
JOF-110

Photo Date:
9/13/2019

Comments:
Third boring location interval (30.0-40.0 feet).



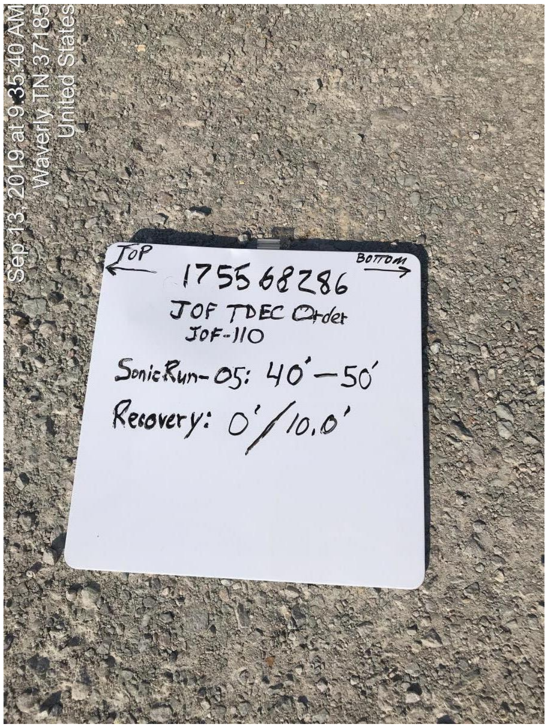
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 73

Photo Location:
JOF-110

Photo Date:
9/13/2019

Comments:
Third boring location interval (40.0-50.0 feet).



Photograph ID: 74

Photo Location:
JOF-110

Photo Date:
9/13/2019

Comments:
Third boring location interval (50.0-55.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 75

Photo Location:
JOF-110

Photo Date:
9/13/2019

Comments:
Third boring location interval (55.0-60.0 feet). Boring first encountered CCR at 4.4 feet.

Photograph ID: 76

Photo Location:
JOF-111-Pre

Photo Date:
8/7/2019

Comments:
First boring location interval (0.0-5.0 feet). The boring ID on the white board should be JOF-111-Pre.

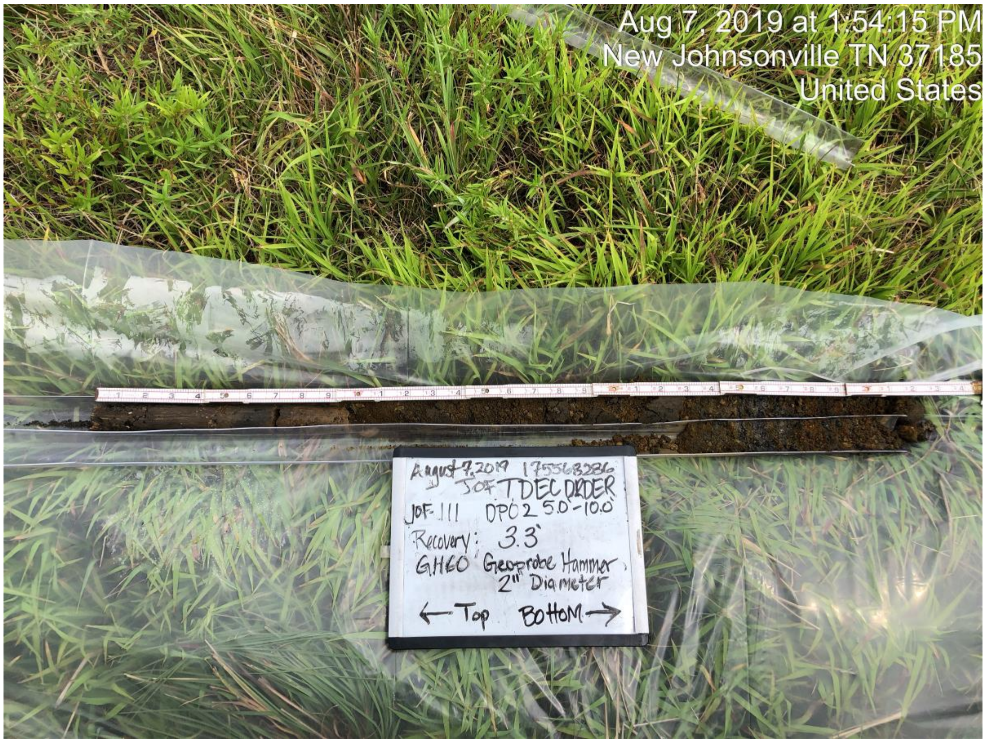
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 77

Photo Location:
JOF-111-Pre

Photo Date:
8/7/2019

Comments:
First boring location interval (5.0-10.0 feet). The boring ID on the white board should be JOF-111-Pre.



Photograph ID: 78

Photo Location:
JOF-111-Pre

Photo Date:
8/7/2019

Comments:
First boring location interval (10.0-15.0 feet). The boring ID on the white board should be JOF-111-Pre.

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 79

Photo Location:
JOF-111-Pre

Photo Date:
8/8/2019

Comments:
First boring location interval (15.0-20.0 feet). Boring first encountered CCR at 2.7 feet. The boring ID on the white board should be JOF-111-Pre.

Photograph ID: 80

Photo Location:
JOF-111 Offset A

Photo Date:
8/8/2019

Comments:
Second boring location interval (0.0-5.0 feet). Offset 18 feet to the west of the first boring.

Stantec

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 81

Photo Location:
JOF-111 Offset A

Photo Date:
8/8/2019

Comments:
Second boring location interval (5.0-10.0 feet). Boring first encountered CCR at 2.2 feet.

Photograph ID: 82

Photo Location:
JOF-111 Offset B

Photo Date:
8/8/2019

Comments:
Third boring location interval (0.0-5.0 feet). Offset 5 feet to the west of the second boring.

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 83

Photo Location:
JOF-111 Offset B

Photo Date:
8/8/2019

Comments:
Third boring location interval (5.0-10.0 feet).

Photograph ID: 84

Photo Location:
JOF-111 Offset B

Photo Date:
8/8/2019

Comments:
Photo of third boring location interval (10.0-15.0 feet) unavailable.

No Photo Applicable

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 85

Photo Location:
JOF-111 Offset B

Photo Date:
8/8/2019

Comments:
Third boring location interval (15.0-20.0 feet).

Photograph ID: 86

Photo Location:
JOF-111 Offset B

Photo Date:
8/8/2019

Comments:
Third boring location interval (20.0-25.0 feet).

Stantec

Photographic Log

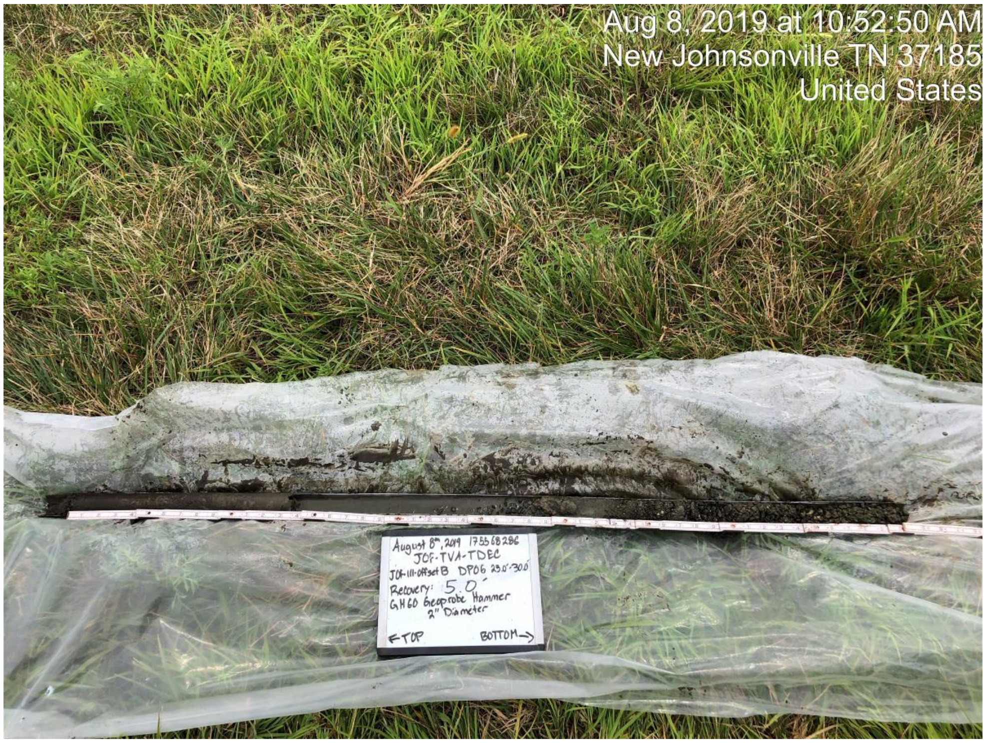
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 87

Photo Location:
JOF-111 Offset B

Photo Date:
8/8/2019

Comments:
Third boring location interval (25.0-30.0 feet).



Photograph ID: 88

Photo Location:
JOF-111 Offset B

Photo Date:
8/8/2019

Comments:
Third boring location interval (30.0-35.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 89

Photo Location:
JOF-111 Offset B

Photo Date:
8/8/2019

Comments:
Third boring location interval (35.0-40.0 feet). Boring first encountered CCR at 2.9 feet.

Photograph ID: 90

Photo Location:
JOF-111 Offset C

Photo Date:
8/22/2019

Comments:
Fourth boring location interval (0.0-5.0 feet). Offset 87 feet southwest of the third boring. The boring ID on the white board should be JOF-111 Offset C.

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 91

Photo Location:
JOF-111 Offset C

Photo Date:
8/22/2019

Comments:
Fourth boring location interval (5.0-10.0 feet). The boring ID on the white board should be JOF-111 Offset C.

Photograph ID: 92

Photo Location:
JOF-111 Offset C

Photo Date:
8/22/2019

Comments:
Fourth boring location interval (10.0-15.0 feet). The boring ID on the white board should be JOF-111 Offset C.

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 93

Photo Location:
JOF-111 Offset C

Photo Date:
8/22/2019

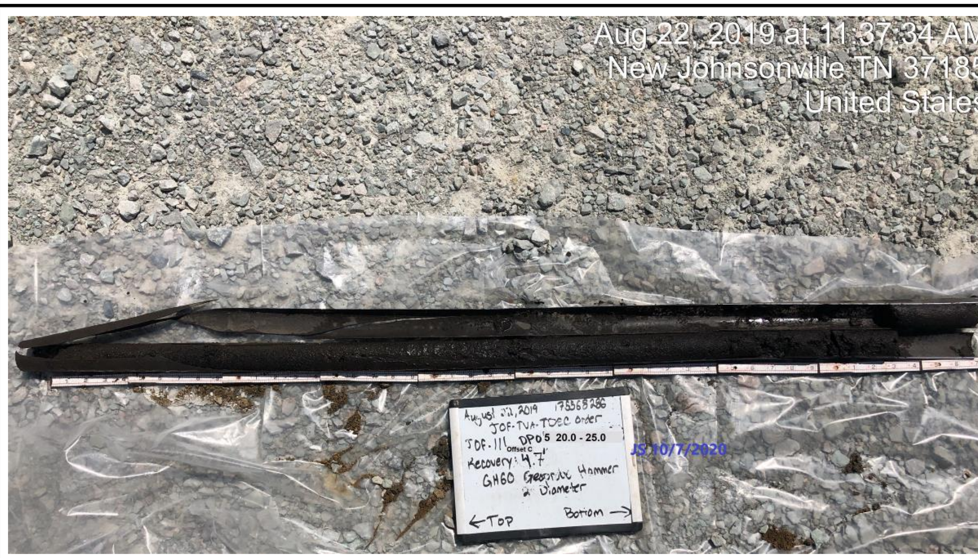
Comments:
Fourth boring location interval (15.0-20.0 feet). The boring ID on the white board should be JOF-111 Offset C.

Photograph ID: 94

Photo Location:
JOF-111 Offset C

Photo Date:
8/22/2019

Comments:
Fourth boring location interval (20.0-25.0 feet). The boring ID on the white board should be JOF-111 Offset C.



Stantec

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 95

Photo Location:
JOF-111 Offset C

Photo Date:
8/22/2019

Comments:
Fourth boring location interval (25.0-30.0 feet). The boring ID on the white board should be JOF-111 Offset C.

Photograph ID: 96

Photo Location:
JOF-111 Offset C

Photo Date:
8/22/2019

Comments:
Photo of fourth boring location interval (30.0-34.5 feet) unavailable. Boring first encountered CCR at 3.1 feet. Boring refusal at 34.5 feet.

No Photo Applicable

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 97

Photo Location:
JOF-111A

Photo Date:
9/11/2019

Comments:
Fifth boring location interval (0.0-10.0 feet). Adjacent to the fourth boring location. The boring ID on the white board should be JOF-111A.

Photograph ID: 98

Photo Location:
JOF-111A

Photo Date:
9/11/2019

Comments:
Fifth boring location interval (10.0-20.0 feet). The boring ID on the white board should be JOF-111A.

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 99

Photo Location:
JOF-111A

Photo Date:
9/11/2019

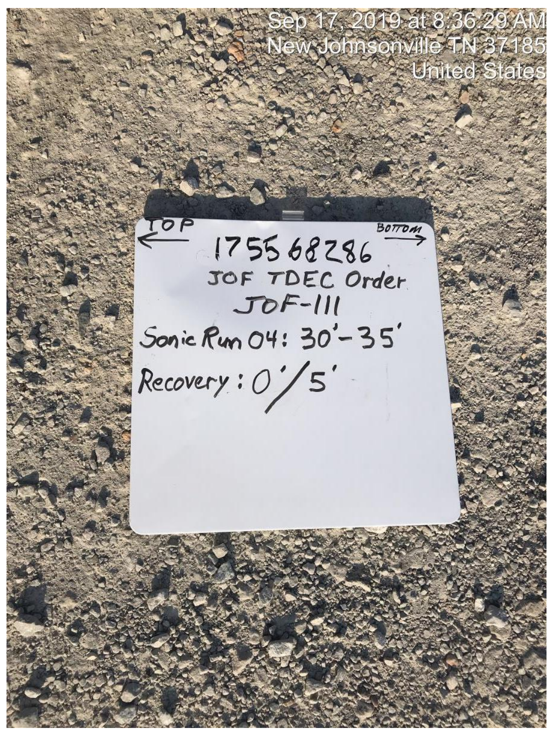
Comments:
Fifth boring location interval (20.0-29.0 feet). The boring ID on the white board should be JOF-111A.

Photograph ID: 100

Photo Location:
JOF-111A

Photo Date:
9/17/2019

Comments:
Fifth boring location interval (30.0-35.0 feet). The boring ID on the white board should be JOF-111A.



Stantec

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 101

Photo Location:
JOF-111A

Photo Date:
9/17/2019

Comments:
Fifth boring location interval (35.0-40.0 feet). The boring ID and recovery on the white board should be JOF-111A and 5.0 feet, respectively.

Photograph ID: 102

Photo Location:
JOF-111A

Photo Date:
9/17/2019

Comments:
Fifth boring location interval (40.0-50.0 feet). The boring ID on the white board should be JOF-111A.

Stantec **Photographic Log**

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 103

Photo Location:
JOF-111A

Photo Date:
9/17/2019

Comments:
Fifth boring location interval (50.0-60.0 feet). Boring first encountered CCR at 12.4 feet. The boring ID on the white board should be JOF-111A.

Photograph ID: 104

Photo Location:
JOF-111B

Photo Date:
9/18/2019

Comments:
Sixth boring location interval (0.0-10.0 feet). Offset 10 feet south of the fifth boring location.

Stantec

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 105

Photo Location:
JOF-111B

Photo Date:
9/18/2019

Comments:
Sixth boring location interval (10.0-20.0 feet).

Photograph ID: 106

Photo Location:
JOF-111B

Photo Date:
9/18/2019

Comments:
Sixth boring location interval (20.0-30.0 feet). The boring ID on the white board should be JOF-111B.

Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Johnsonville Fossil Plant (JOF)	Site Location:	New Johnsonville, Tennessee

Photograph ID: 107

Photo Location:
JOF-111B

Photo Date:
9/18/2019

Comments:
Sixth boring location interval (30.0-35.0 feet).

Photograph ID: 108

Photo Location:
JOF-111B

Photo Date:
9/18/2019

Comments:
Sixth boring location interval (35.0-40.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 109

Photo Location:
JOF-111B

Photo Date:
9/18/2019

Comments:
Sixth boring location interval (40.0-50.0 feet). Boring first encountered CCR at 10.0 feet.

Photograph ID: 110

Photo Location:
JOF-112-Pre

Photo Date:
8/6/2019

Comments:
First boring location interval (0.0-5.0 feet). The boring ID on the white board should be JOF-112-Pre.

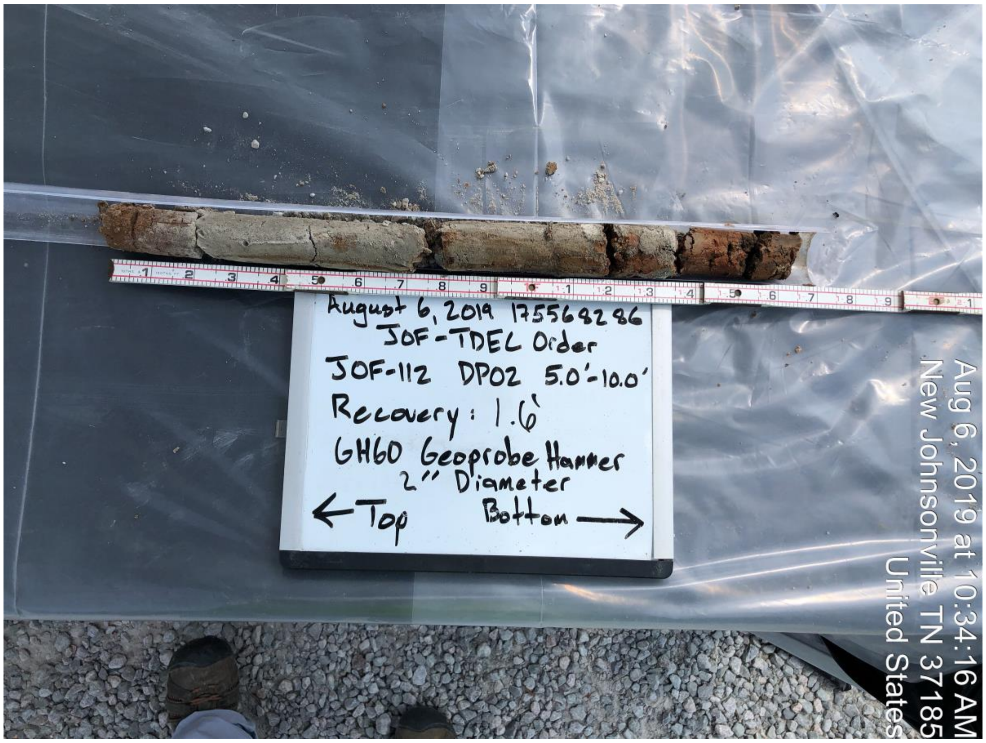
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 111

Photo Location: JOF-112-Pre

Photo Date: 8/6/2019

Comments: First boring location interval (5.0-10.0 feet). The boring ID on the white board should be JOF-112-Pre.



Photograph ID: 112

Photo Location: JOF-112-Pre

Photo Date: 8/6/2019

Comments: First boring location interval (10.0-14.0 feet). The boring ID on the white board should be JOF-112-Pre.

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 113

Photo Location:
JOF-112-Pre

Photo Date:
8/6/2019

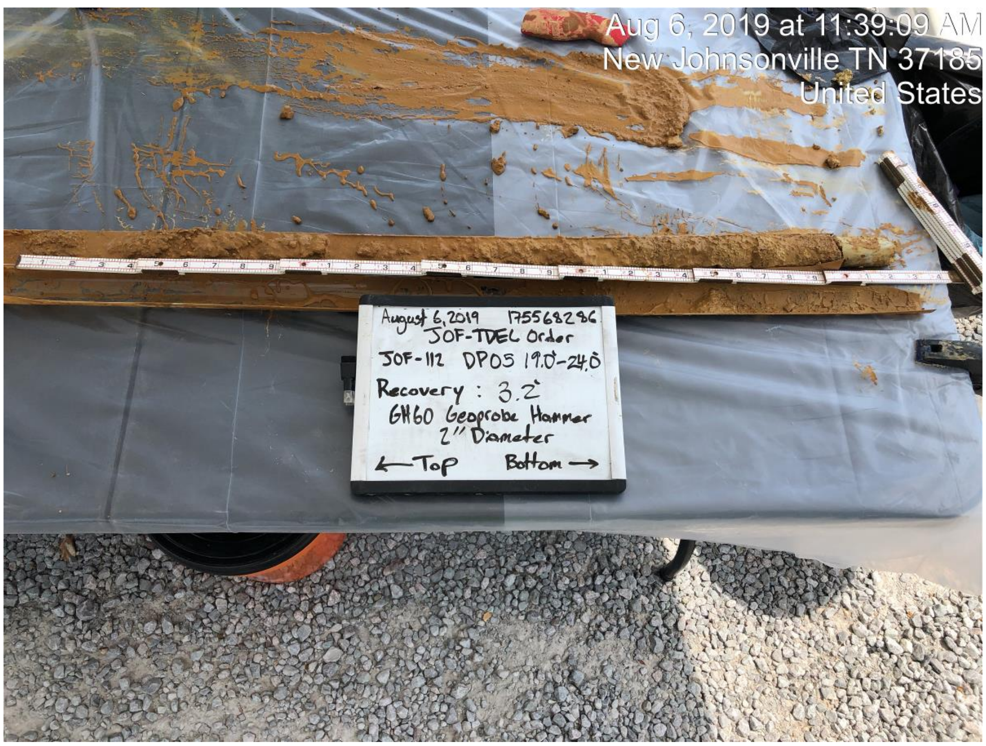
Comments:
First boring location interval (14.0-19.0 feet). The boring ID on the white board should be JOF-112-Pre.

Photograph ID: 114

Photo Location:
JOF-112-Pre

Photo Date:
8/6/2019

Comments:
First boring location interval (19.0-24.0 feet). The boring ID on the white board should be JOF-112-Pre.



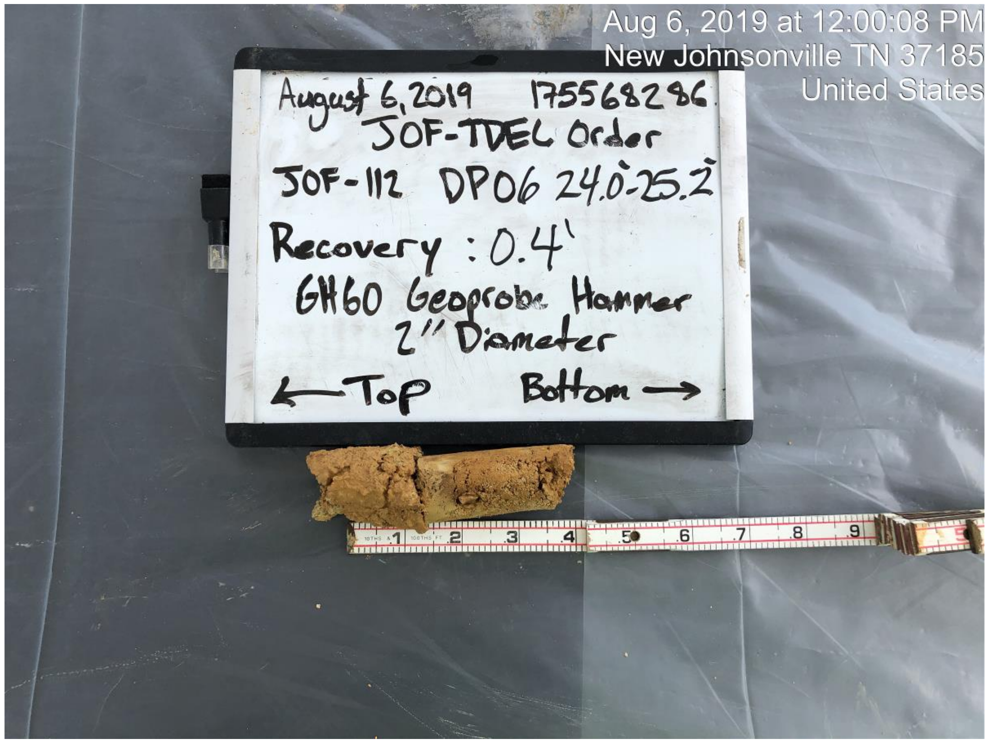
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 115

Photo Location:
JOF-112-Pre

Photo Date:
8/6/2019

Comments:
First boring location interval (24.0-25.2 feet). The boring ID on the white board should be JOF-112-Pre.

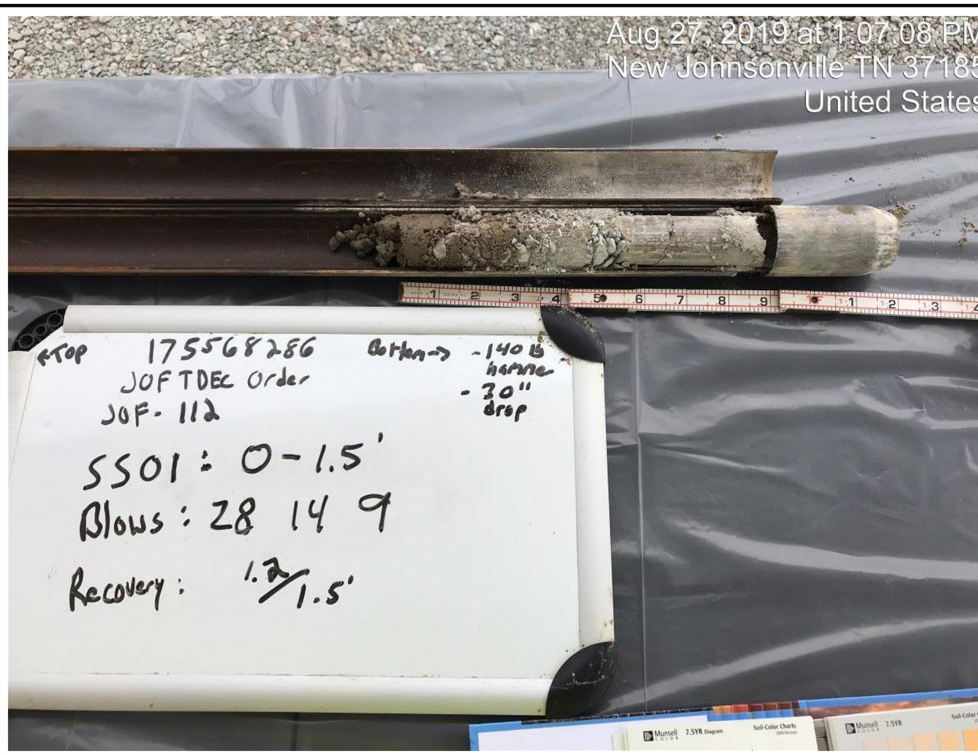


Photograph ID: 116

Photo Location:
JOF-112

Photo Date:
8/27/2019

Comments:
Second boring location interval (0.0-1.5 feet). Offset 3 feet to the north of the first boring.



Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 117

Photo Location:
JOF-112

Photo Date:
8/27/2019

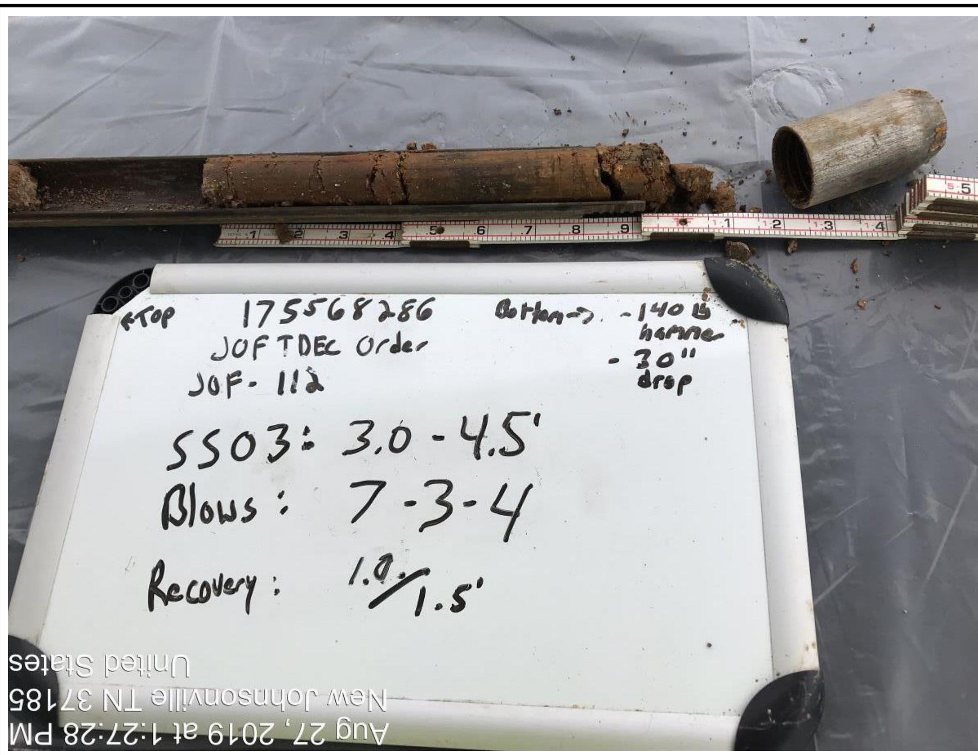
Comments:
Second boring location interval (1.5-3.0 feet). The recovery on the white board should be 0.4 feet.

Photograph ID: 118

Photo Location:
JOF-112

Photo Date:
8/27/2019

Comments:
Second boring location interval (3.0-4.5 feet).



Stantec **Photographic Log**

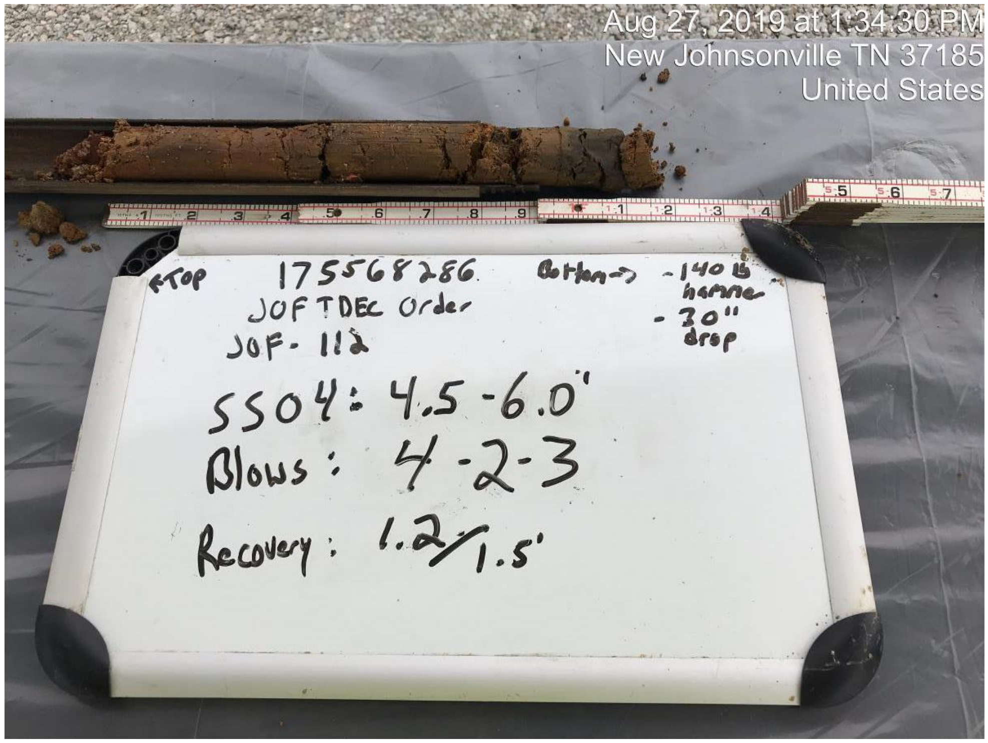
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 119

Photo Location:
JOF-112

Photo Date:
8/27/2019

Comments:
Second boring location interval (4.5-6.0 feet).

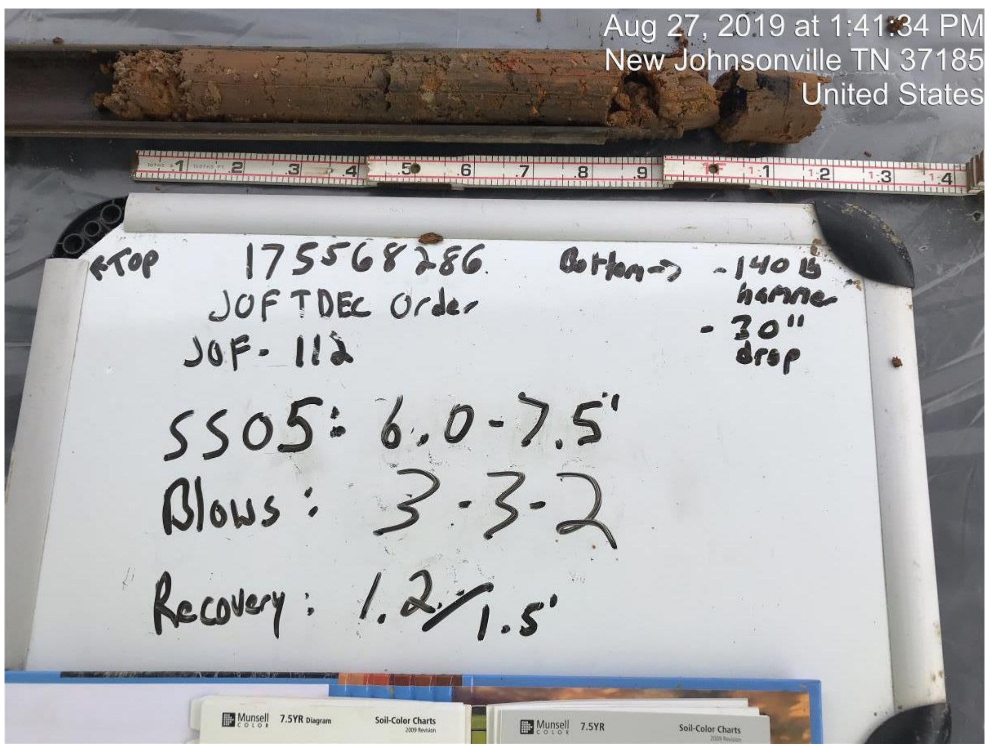


Photograph ID: 120

Photo Location:
JOF-112

Photo Date:
8/27/2019

Comments:
Second boring location interval (6.0-7.5 feet).



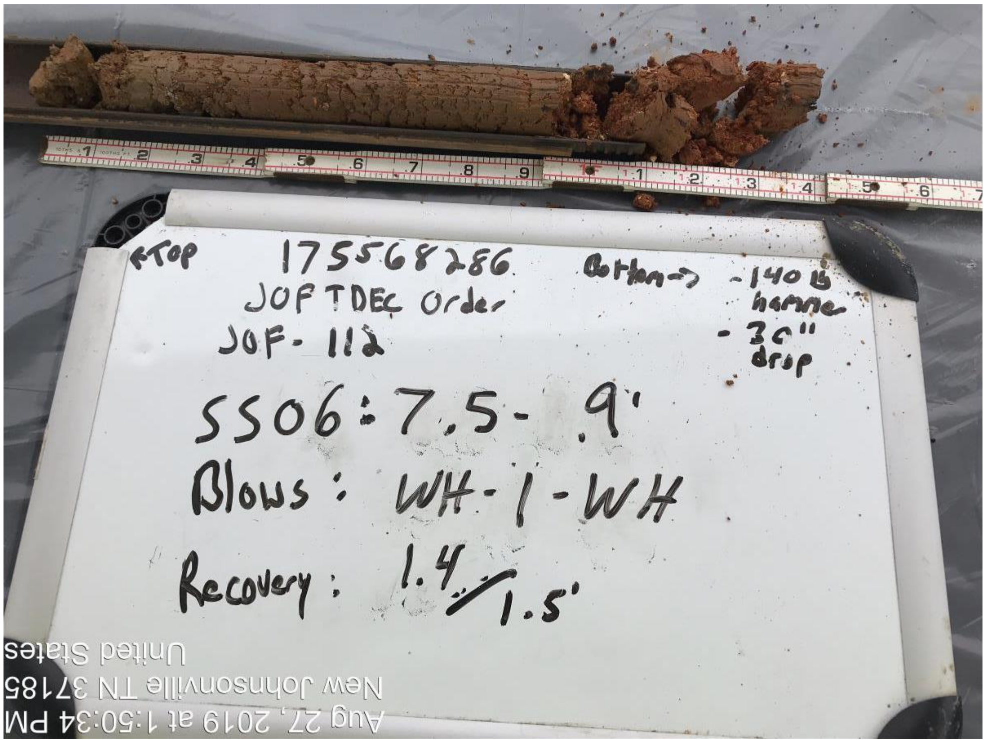
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 121

Photo Location: JOF-112

Photo Date: 8/27/2019

Comments: Second boring location interval (7.5-9.0 feet).

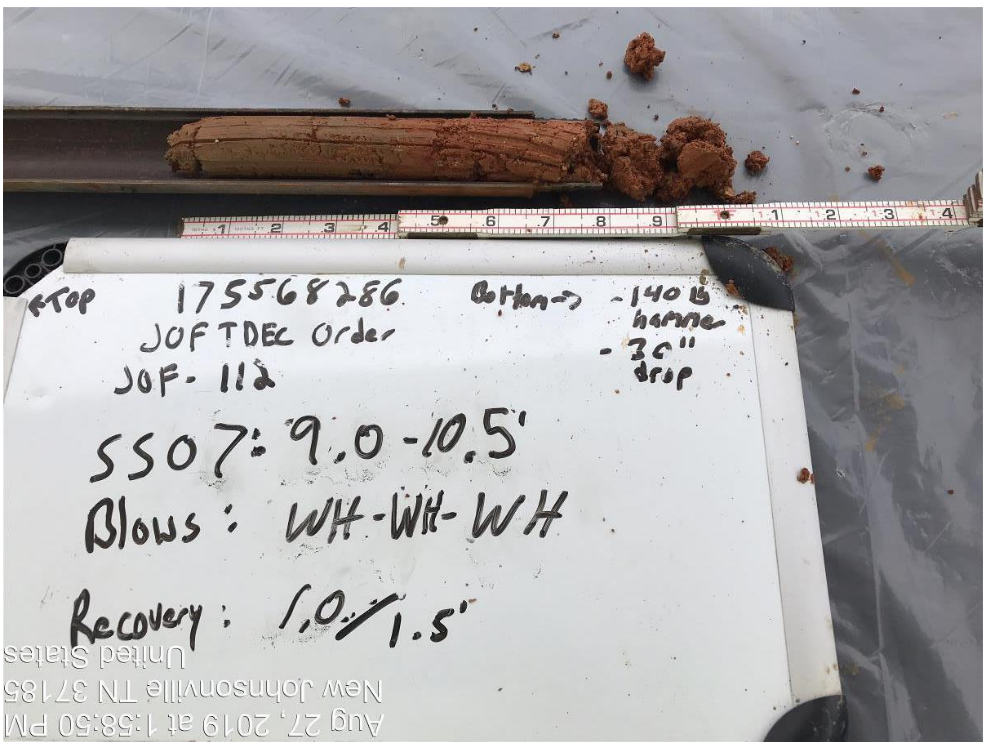


Photograph ID: 122

Photo Location: JOF-112

Photo Date: 8/27/2019

Comments: Second boring location interval (9.0-10.5 feet).



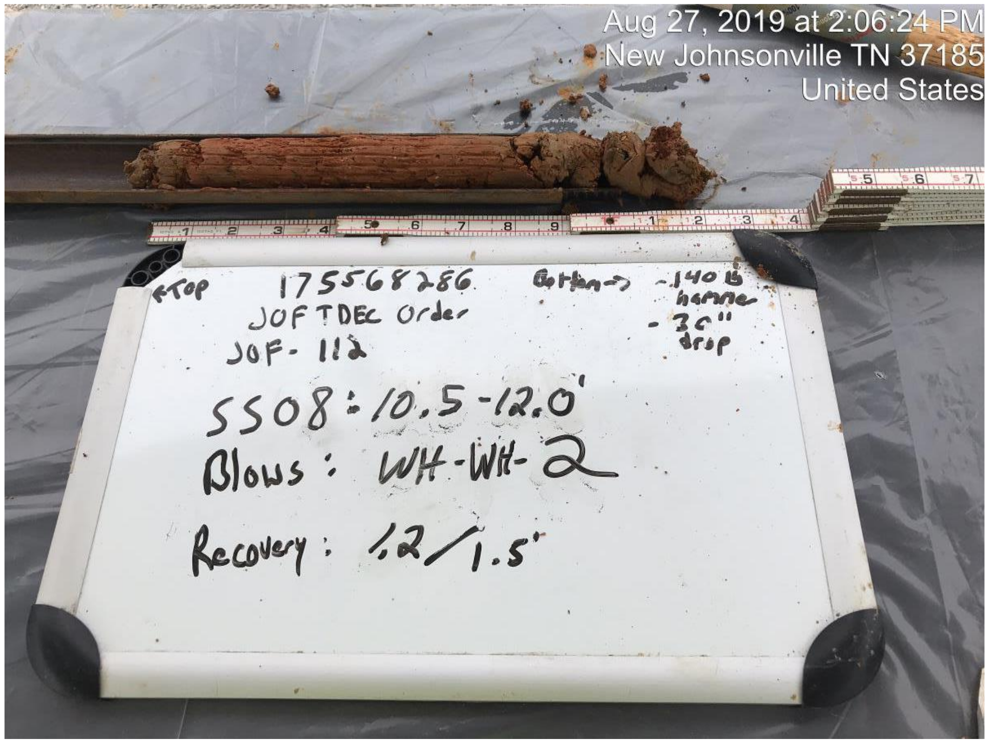
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 123

Photo Location: JOF-112

Photo Date: 8/27/2019

Comments: Second boring location interval (10.5-12.0 feet).

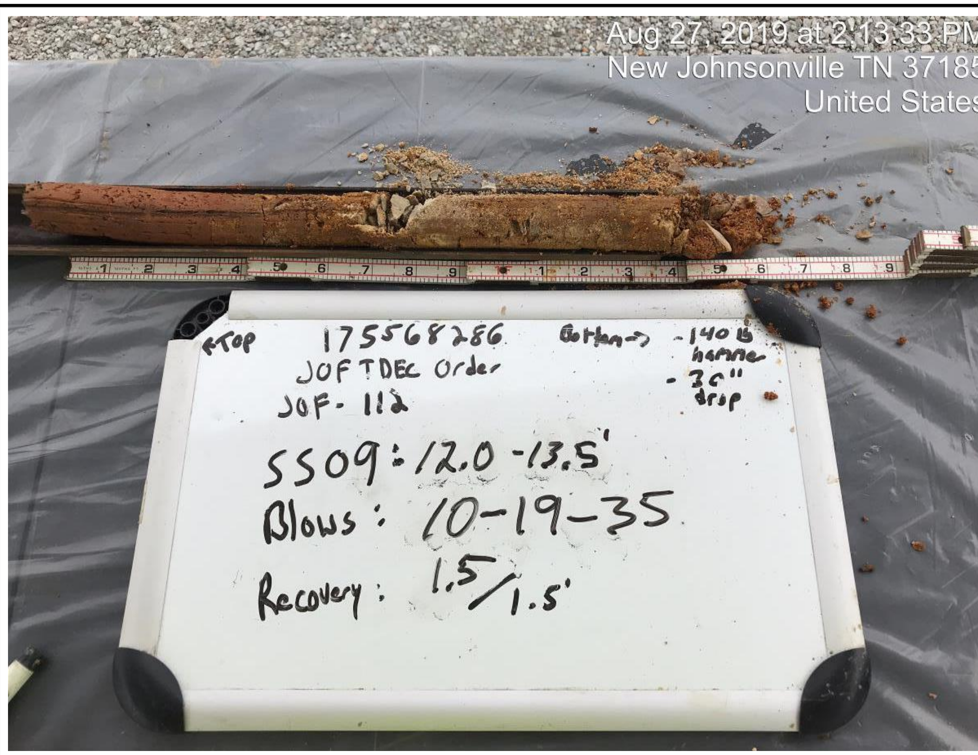


Photograph ID: 124

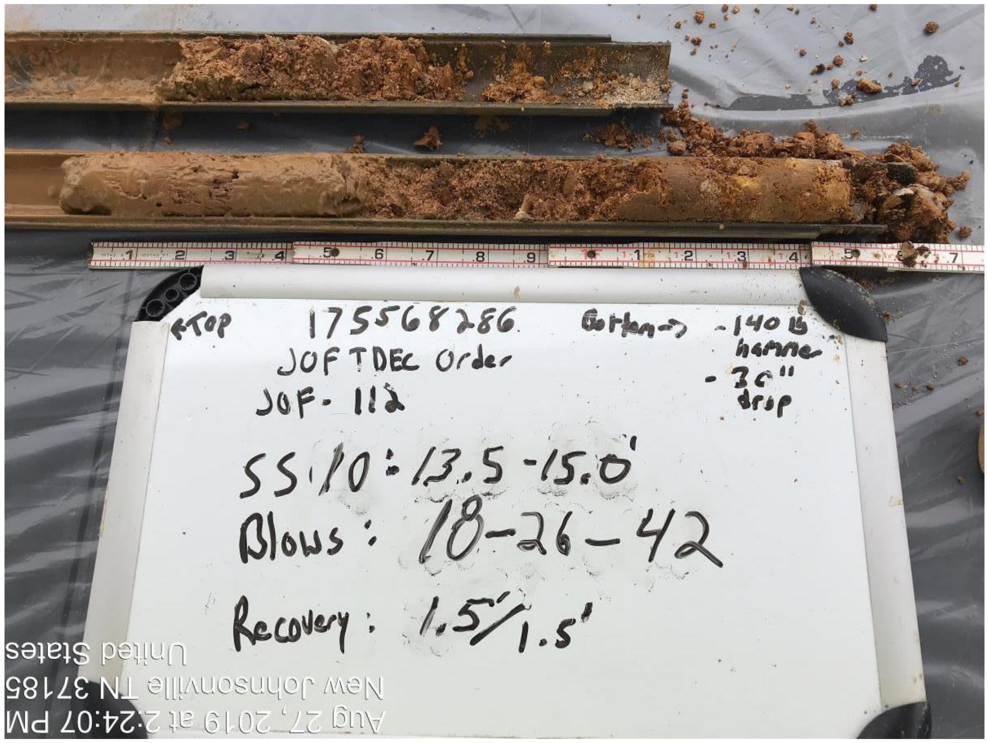
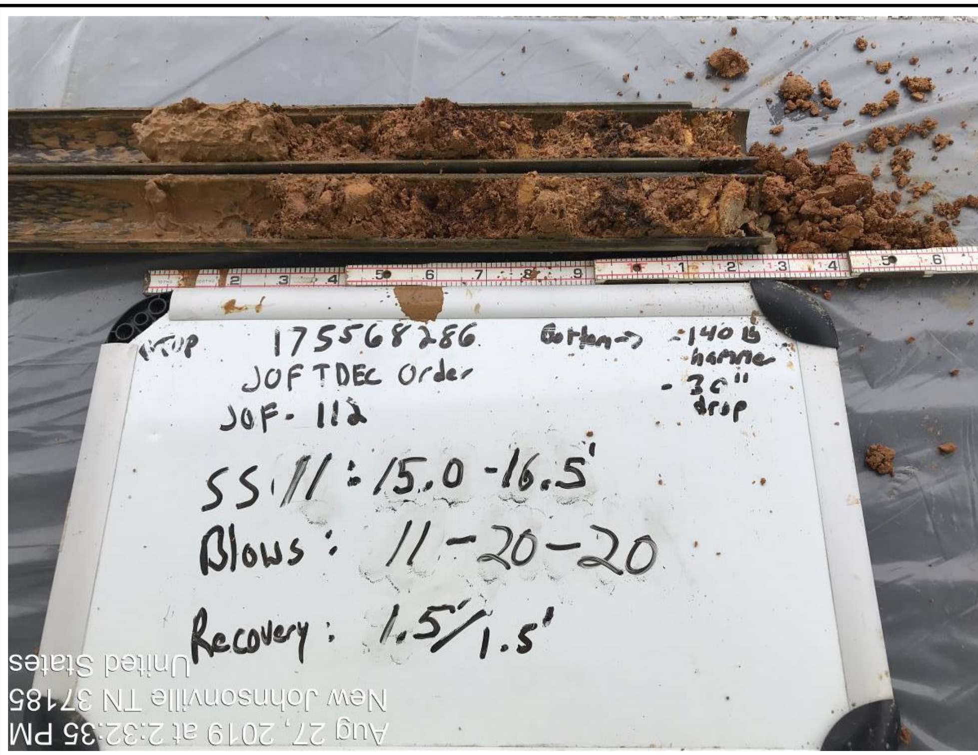
Photo Location: JOF-112

Photo Date: 8/27/2019

Comments: Second boring location interval (12.0-13.5 feet).



Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 125 **Photo Location:** JOF-112 **Photo Date:** 8/27/2019 **Comments:** Second boring location interval (13.5-15.0 feet).	
Photograph ID: 126 **Photo Location:** JOF-112 **Photo Date:** 8/27/2019 **Comments:** Second boring location interval (15.0-16.5 feet).	

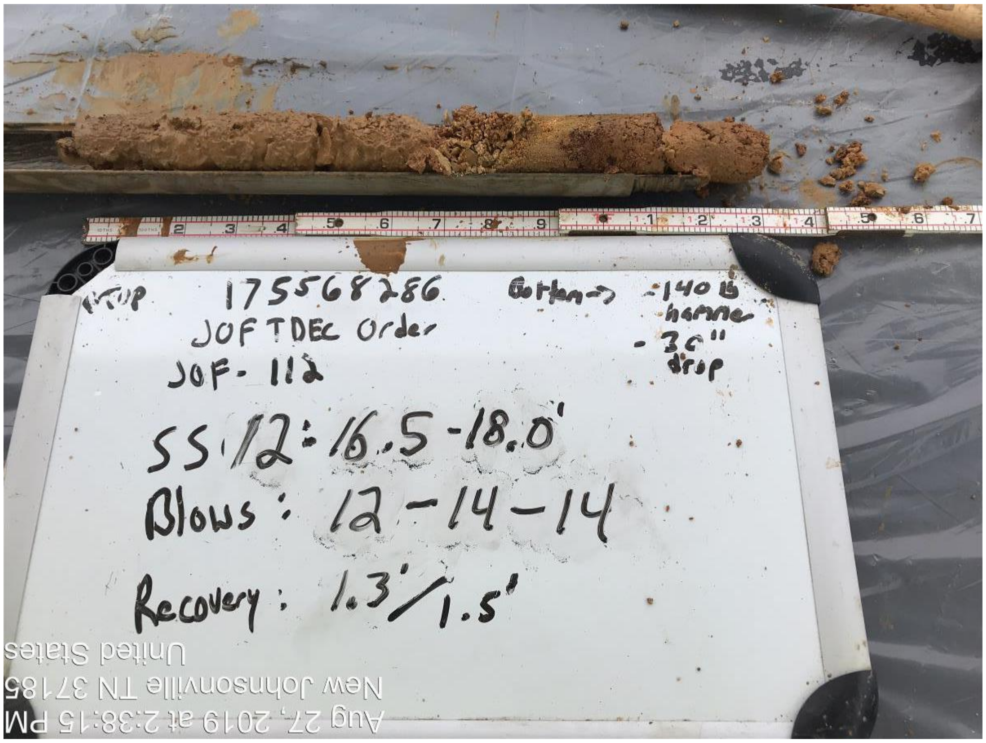
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 127

Photo Location:
JOF-112

Photo Date:
8/27/2019

Comments:
Second boring location interval (16.5-18.0 feet).

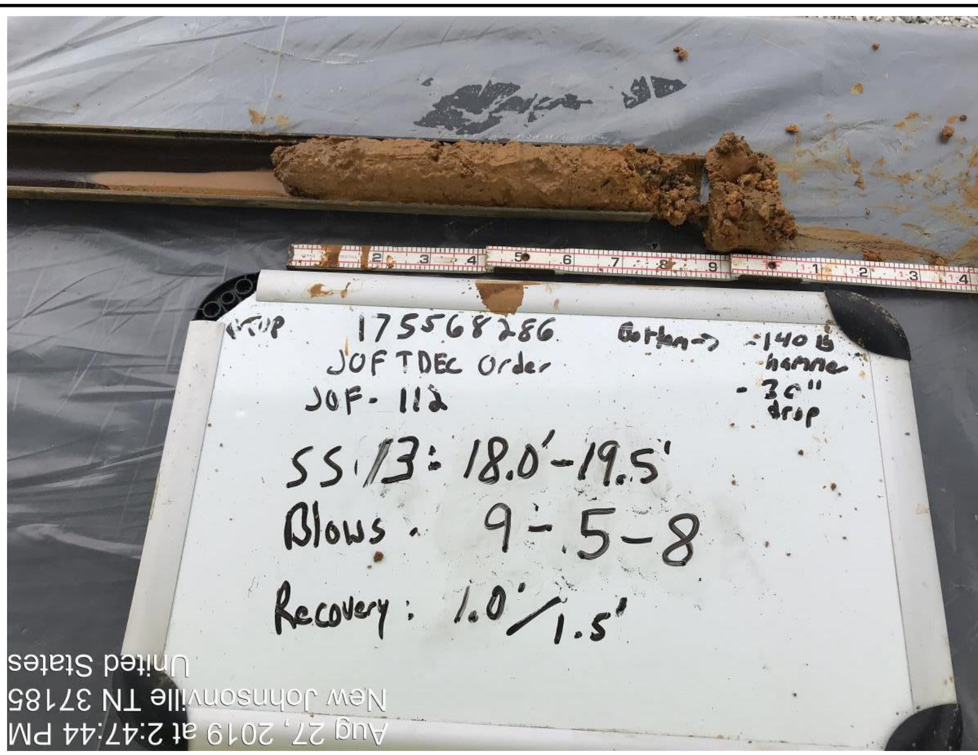


Photograph ID: 128

Photo Location:
JOF-112

Photo Date:
8/27/2019

Comments:
Second boring location interval (18.0-19.5 feet).



Stantec

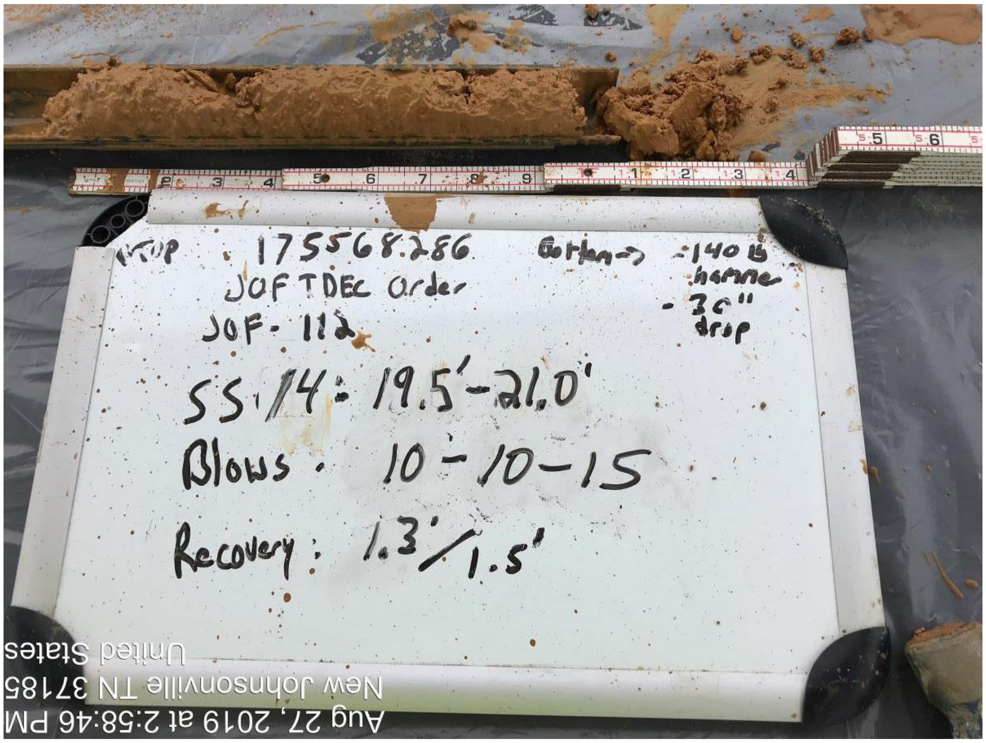
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 129

Photo Location: JOF-112

Photo Date: 8/27/2019

Comments: Second boring location interval (19.5-21.0 feet).

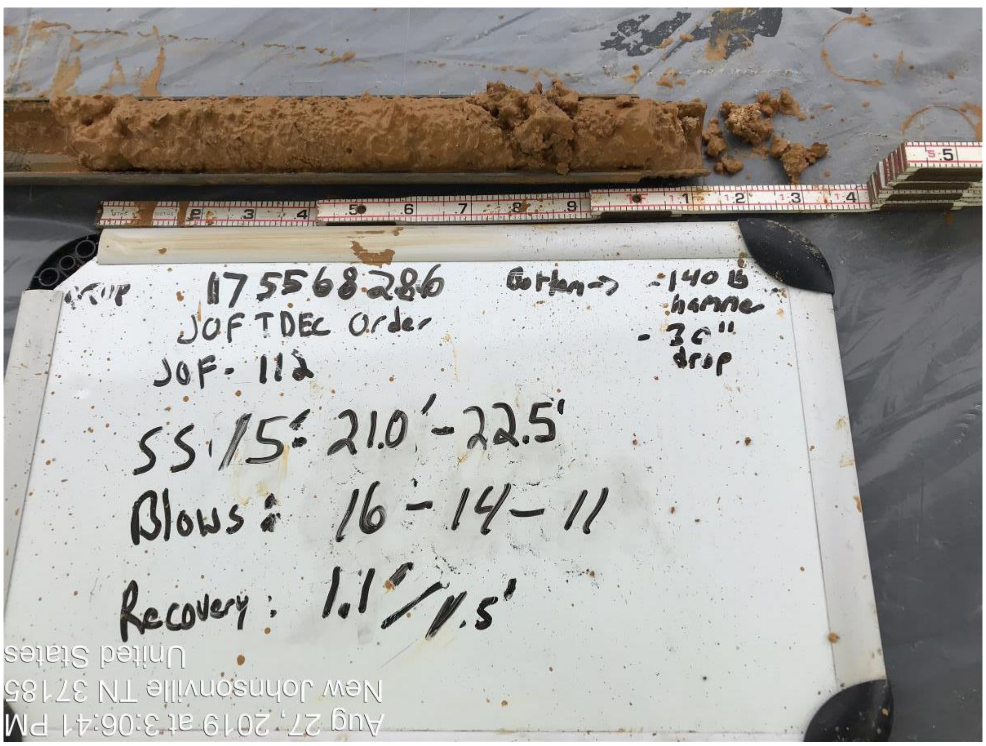


Photograph ID: 130

Photo Location: JOF-112

Photo Date: 8/27/2019

Comments: Second boring location interval (21.0-22.5 feet).



Stantec **Photographic Log**

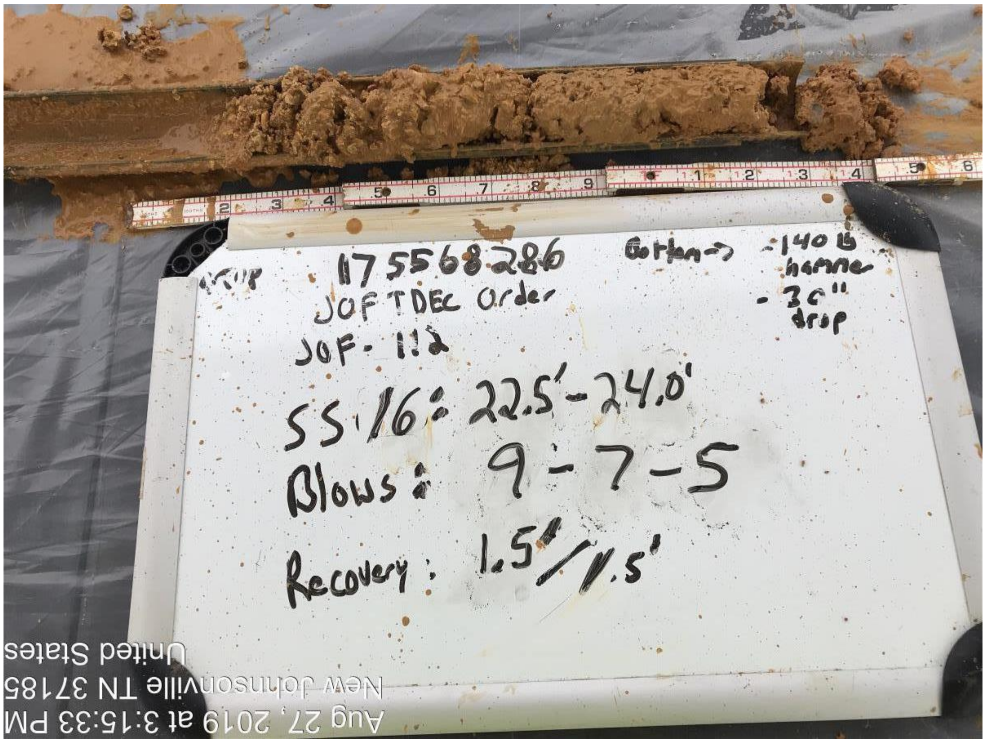
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 131

Photo Location:
JOF-112

Photo Date:
8/27/2019

Comments:
Second boring location interval (22.5-24.0 feet).

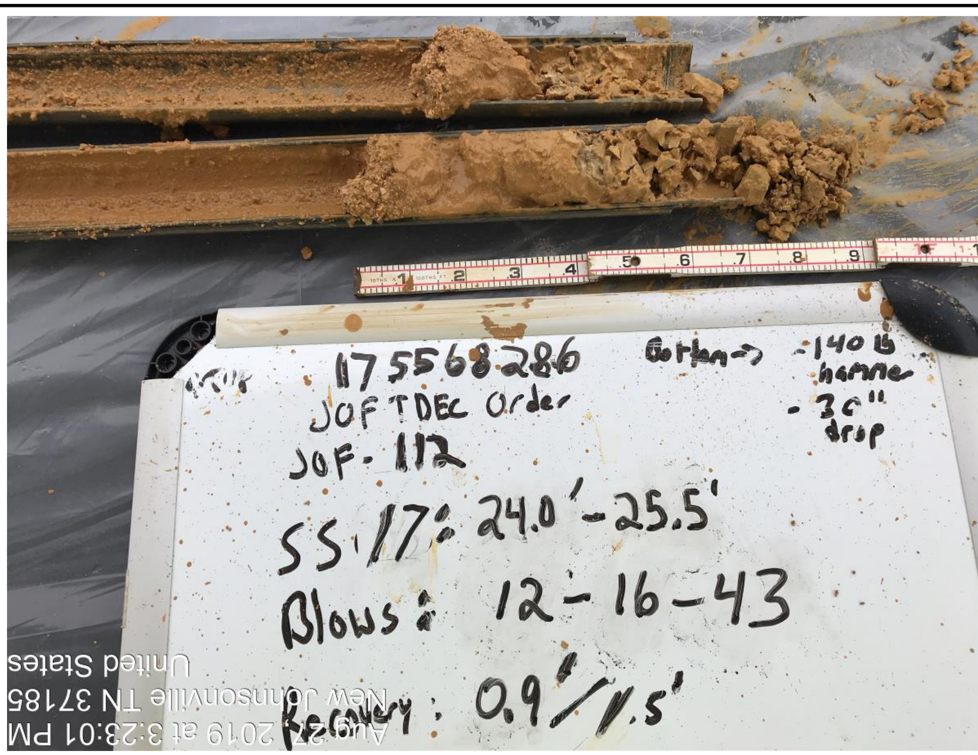


Photograph ID: 132

Photo Location:
JOF-112

Photo Date:
8/27/2019

Comments:
Second boring location interval (24.0-25.5 feet).



Stantec

Photographic Log

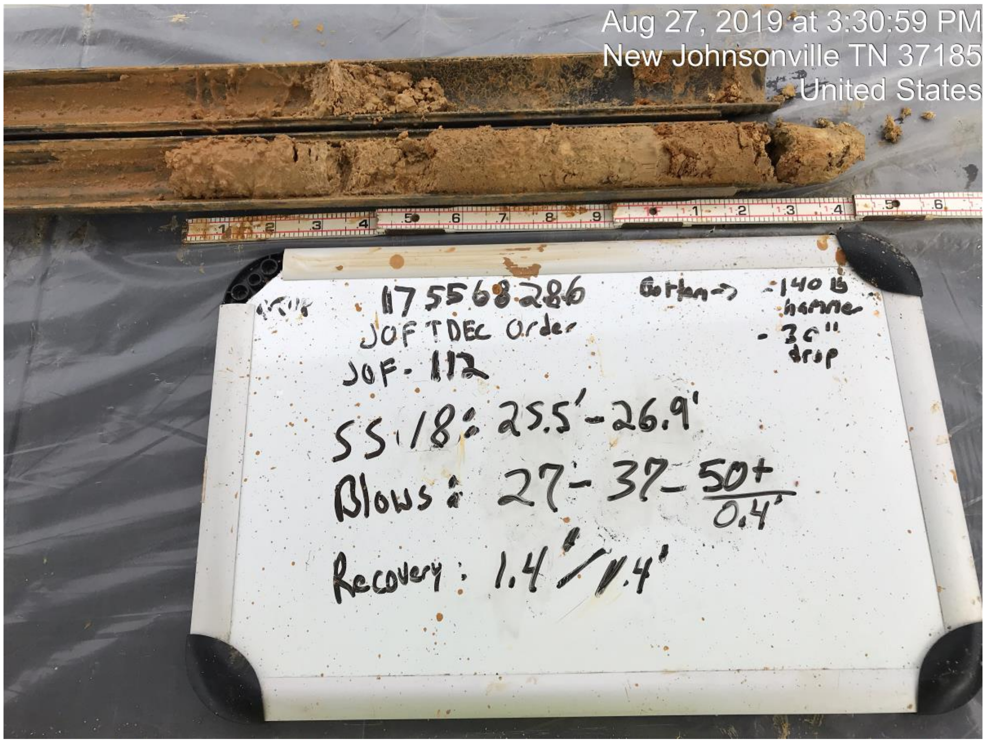
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 133

Photo Location:
JOF-112

Photo Date:
8/27/2019

Comments:
Second boring location interval (25.5-26.9 feet).

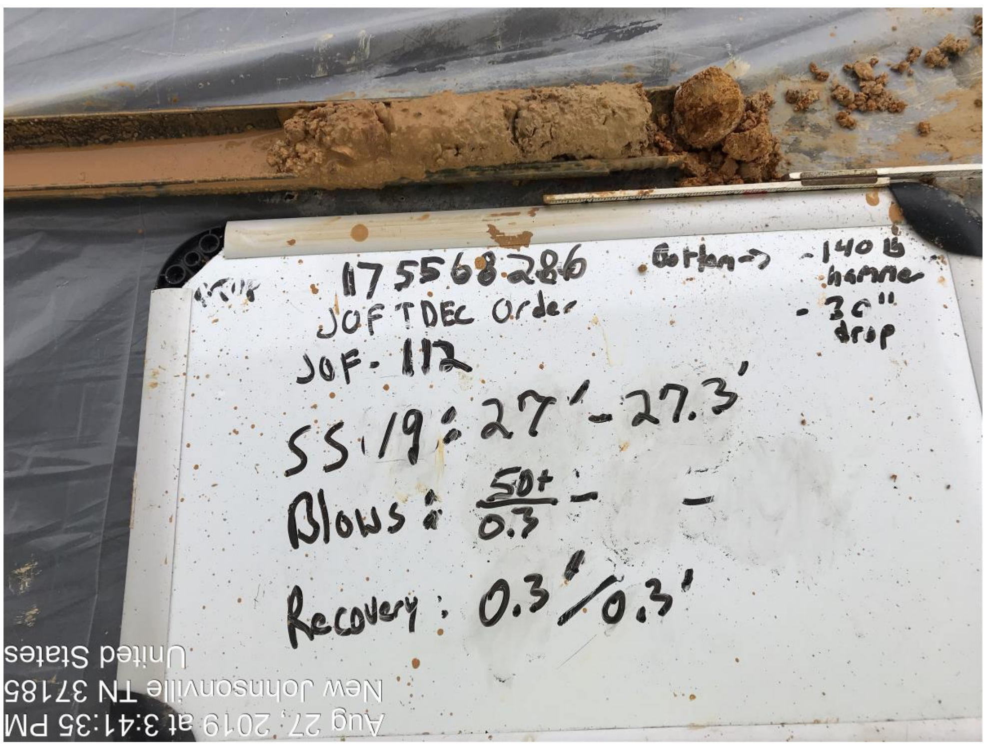


Photograph ID: 134

Photo Location:
JOF-112

Photo Date:
8/27/2019

Comments:
Second boring location interval (27.0-27.3 feet).



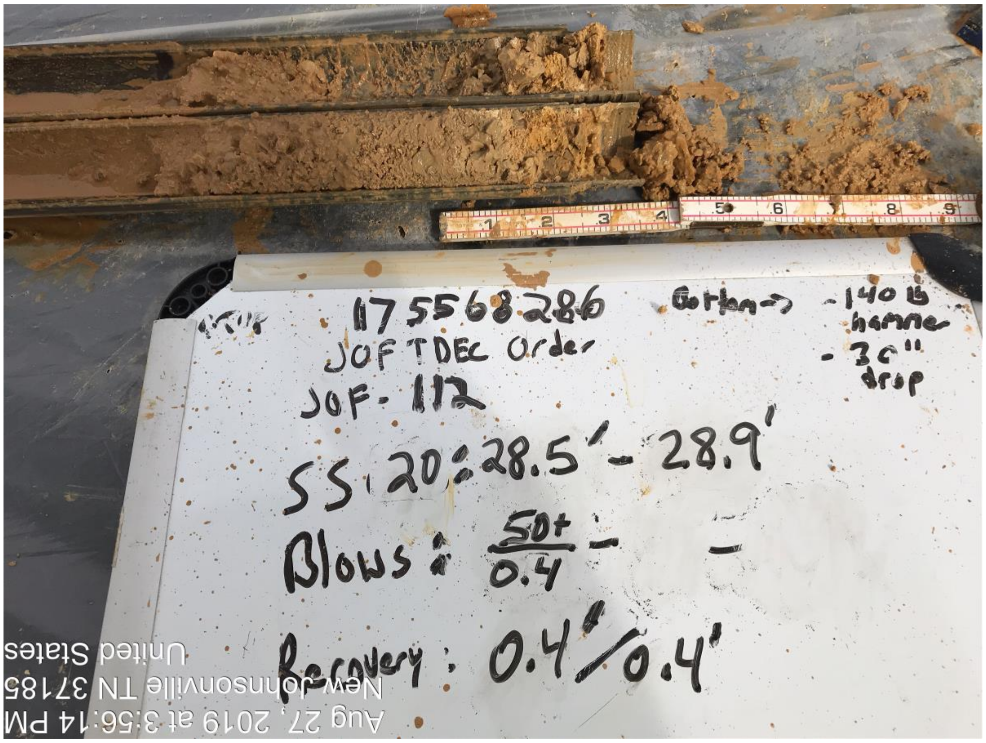
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 135

Photo Location:
JOF-112

Photo Date:
8/27/2019

Comments:
Second boring location interval (28.5-28.9 feet).

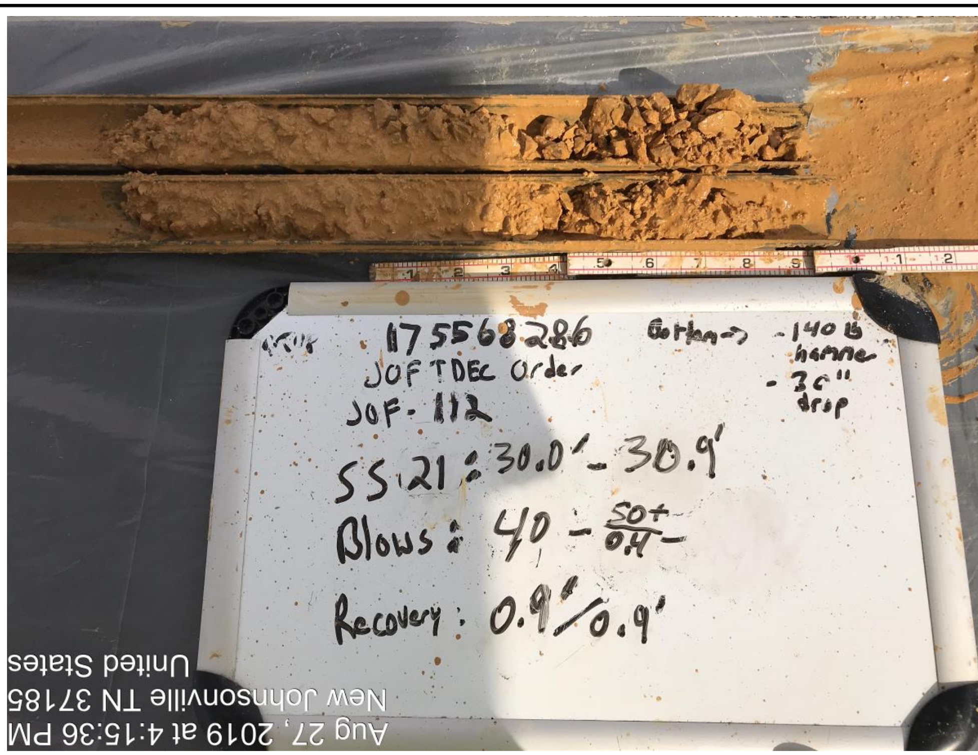


Photograph ID: 136

Photo Location:
JOF-112

Photo Date:
8/27/2019

Comments:
Second boring location interval (30.0-30.9 feet). Boring refusal at 30.9 feet.



Stantec

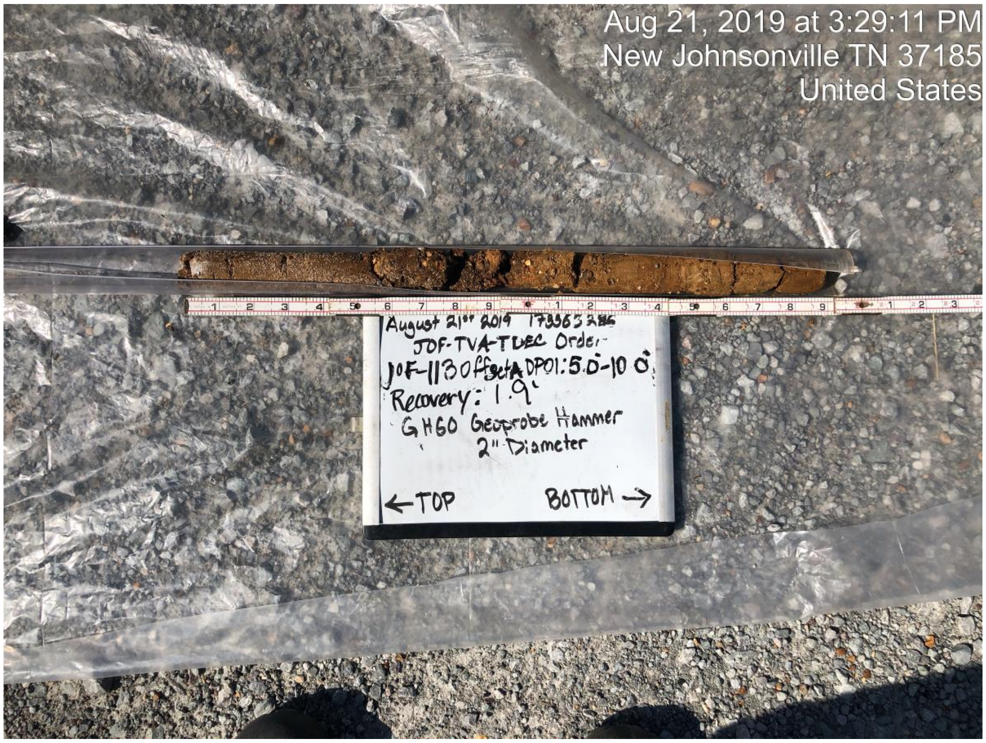
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 137

Photo Location:
JOF-113 Offset A

Photo Date:
8/21/2019

Comments:
First boring location interval (5.0-10.0 feet). The project number on the white board should be 175568286.

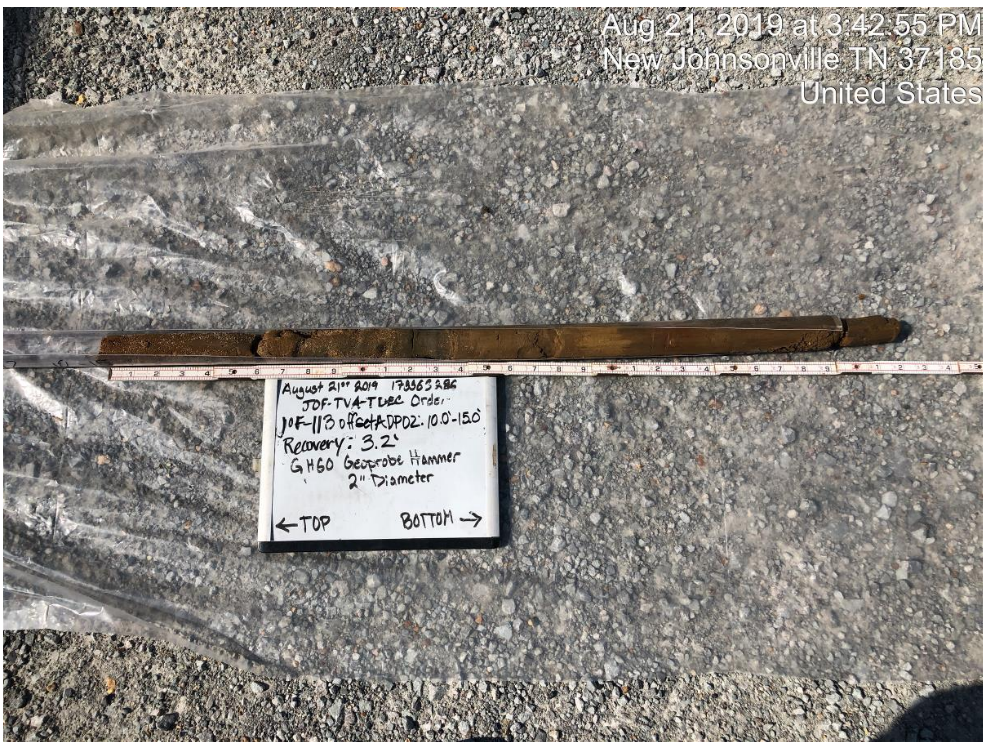


Photograph ID: 138

Photo Location:
JOF-113 Offset A

Photo Date:
8/21/2019

Comments:
First boring location interval (10.0-15.0 feet). The project number on the white board should be 175568286.



Stantec

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 139

Photo Location:
JOF-113 Offset A

Photo Date:
8/21/2019

Comments:
First boring location interval (15.0-20.0 feet). The project number on the white board should be 175568286.

Photograph ID: 140

Photo Location:
JOF-113 Offset A

Photo Date:
8/21/2019

Comments:
First boring location interval (20.0-25.0 feet). The project number on the white board should be 175568286.

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 141

Photo Location: JOF-113 Offset A

Photo Date: 8/21/2019

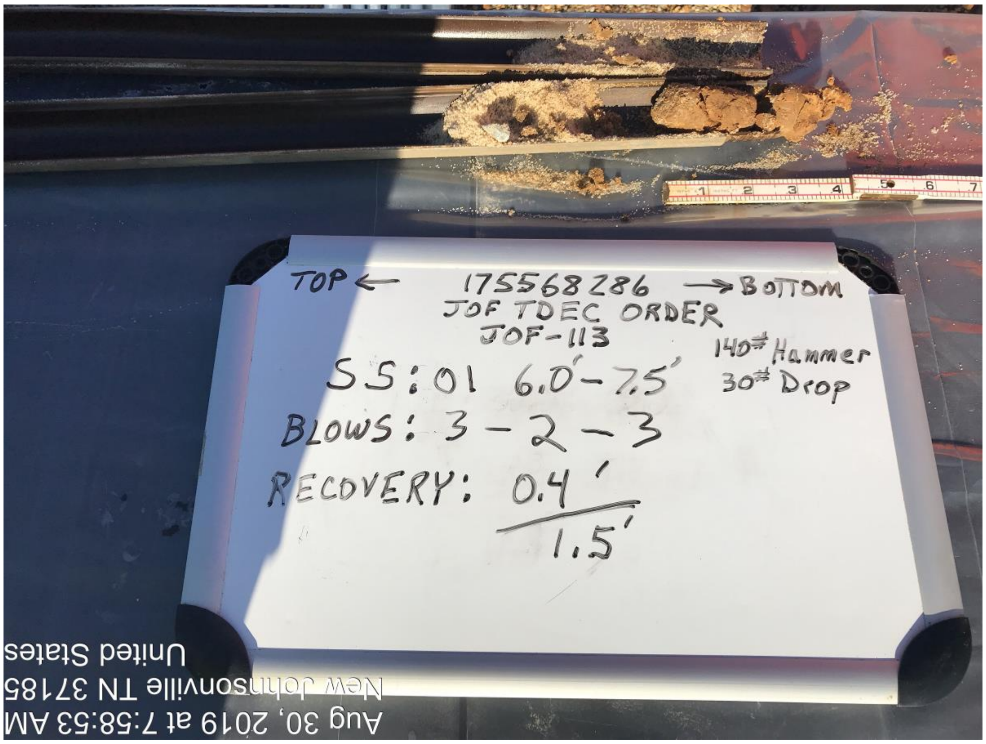
Comments: First boring location interval (25.0-28.4 feet). Boring refusal at 28.4 feet. The project number on the white board should be 175568286.

Photograph ID: 142

Photo Location: JOF-113

Photo Date: 8/30/2019

Comments: Second boring location interval (6.0-7.5 feet). Offset 3 feet to the north of the first boring.



Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Johnsonville Fossil Plant (JOF)	Site Location:	New Johnsonville, Tennessee

Photograph ID: 143

Photo Location:
JOF-113

Photo Date:
8/30/2019

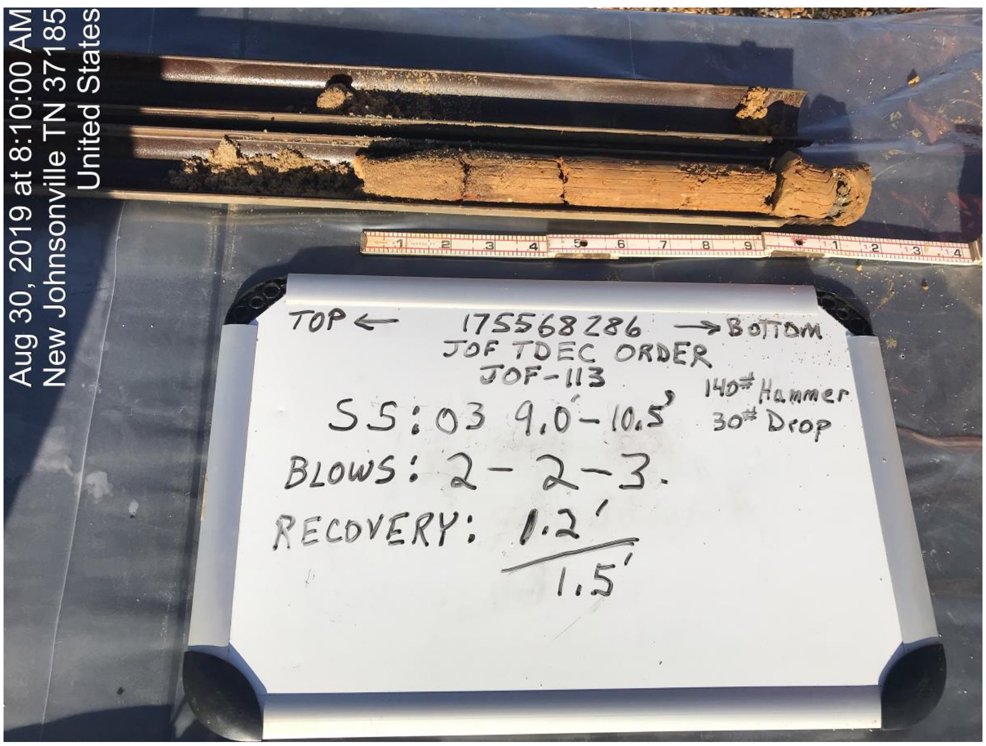
Comments:
Second boring location interval (7.5-9.0 feet).

Photograph ID: 144

Photo Location:
JOF-113

Photo Date:
8/30/2019

Comments:
Second boring location interval (9.0-10.5 feet).



Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 145

Photo Location:
JOF-113

Photo Date:
8/30/2019

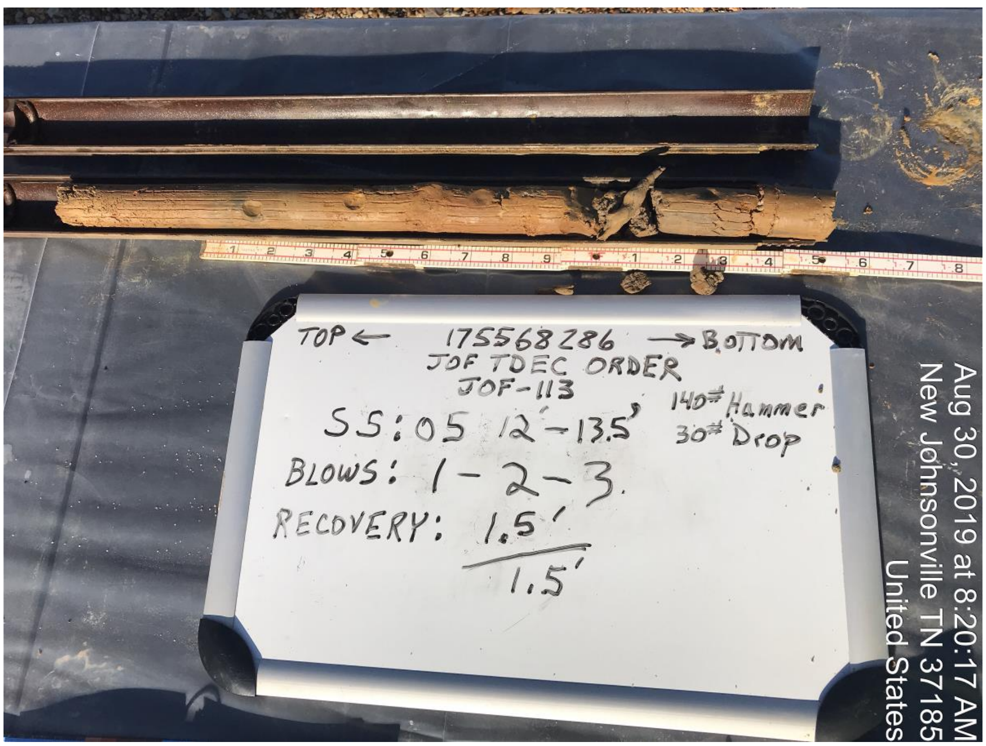
Comments:
Second boring location interval (10.5-12.0 feet).

Photograph ID: 146

Photo Location:
JOF-113

Photo Date:
8/30/2019

Comments:
Second boring location interval (12.0-13.5 feet).



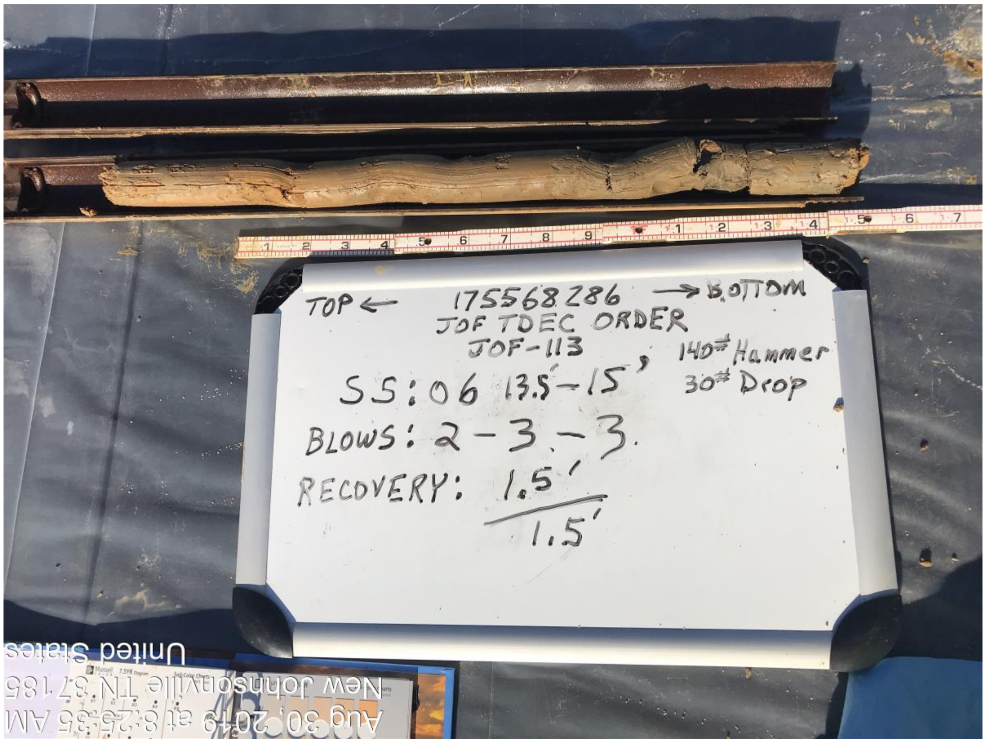
Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Johnsonville Fossil Plant (JOF)	Site Location:	New Johnsonville, Tennessee

Photograph ID: 147

Photo Location:
JOF-113

Photo Date:
8/30/2019

Comments:
Second boring location interval (13.5-15.0 feet).

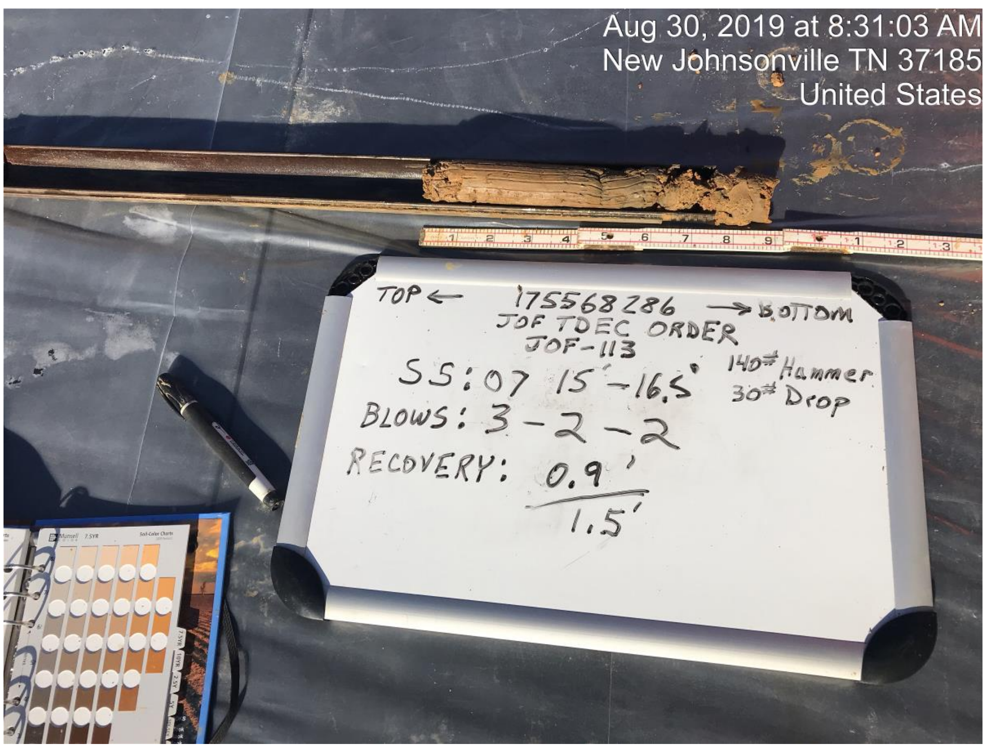


Photograph ID: 148

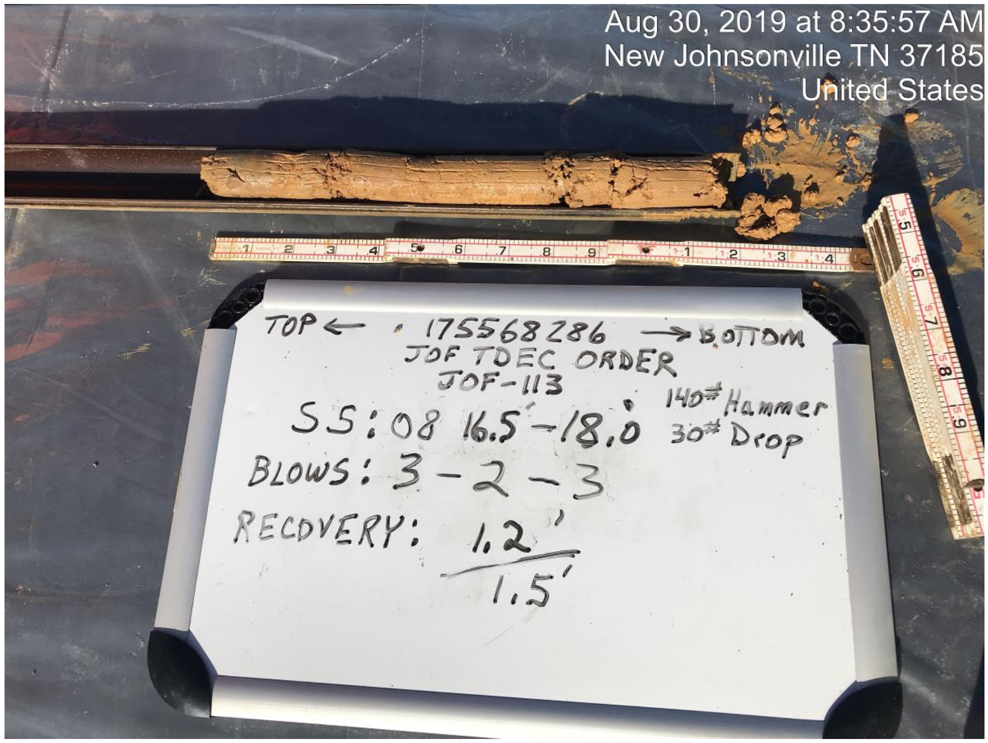
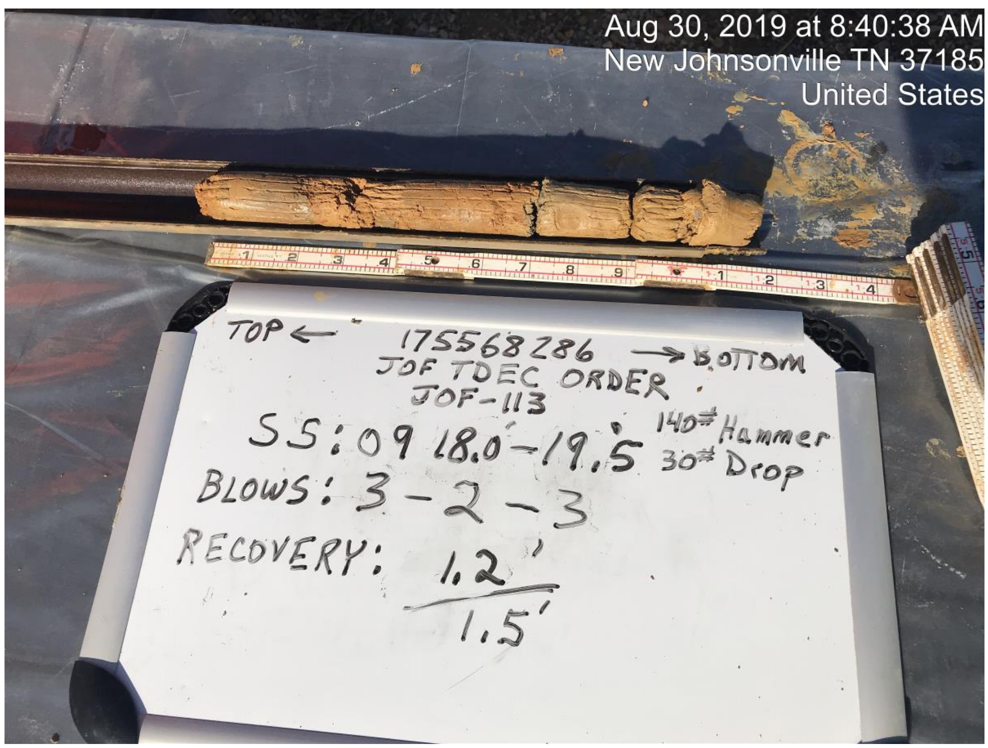
Photo Location:
JOF-113

Photo Date:
8/30/2019

Comments:
Second boring location interval (15.0-16.5 feet).



Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 149 **Photo Location:** JOF-113 **Photo Date:** 8/30/2019 **Comments:** Second boring location interval (16.5-18.0 feet).	
Photograph ID: 150 **Photo Location:** JOF-113 **Photo Date:** 8/30/2019 **Comments:** Second boring location interval (18.0-19.5 feet).	

Stantec **Photographic Log**

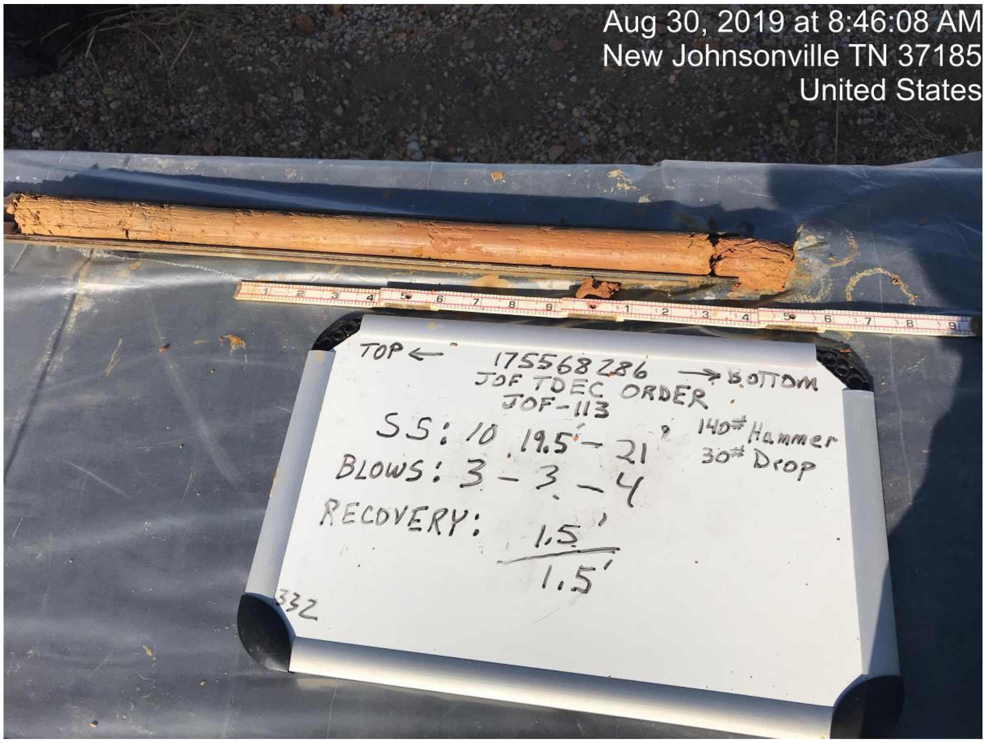
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 151

Photo Location:
JOF-113

Photo Date:
8/30/2019

Comments:
Second boring location interval (19.5-21.0 feet).

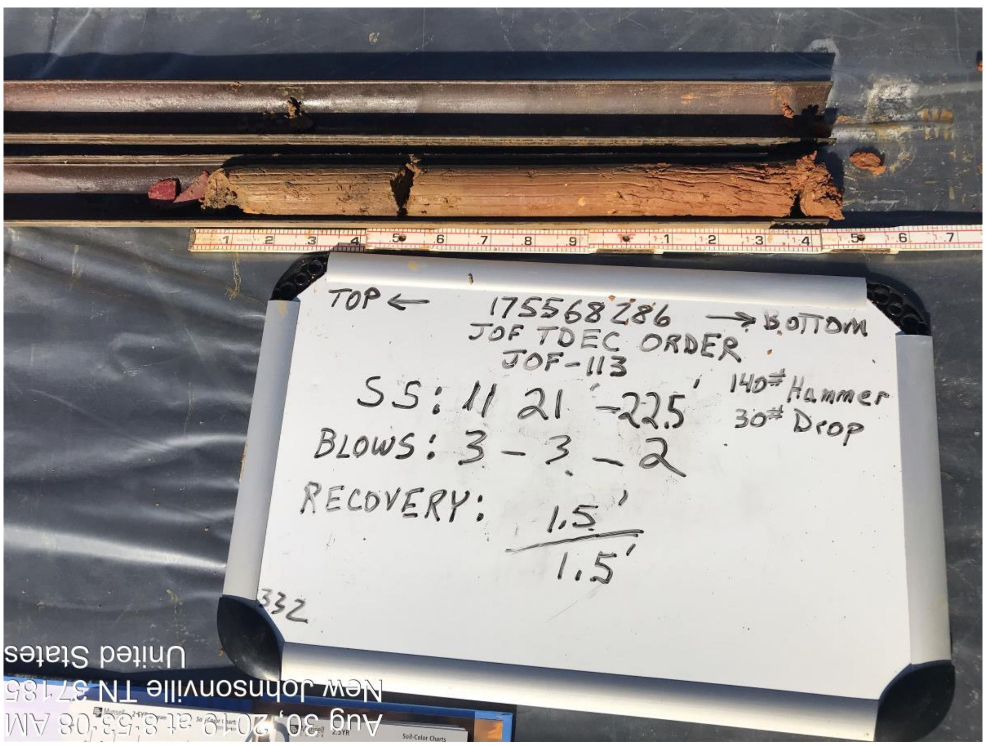


Photograph ID: 152

Photo Location:
JOF-113

Photo Date:
8/30/2019

Comments:
Second boring location interval (21.0-22.5 feet).



Stantec **Photographic Log**

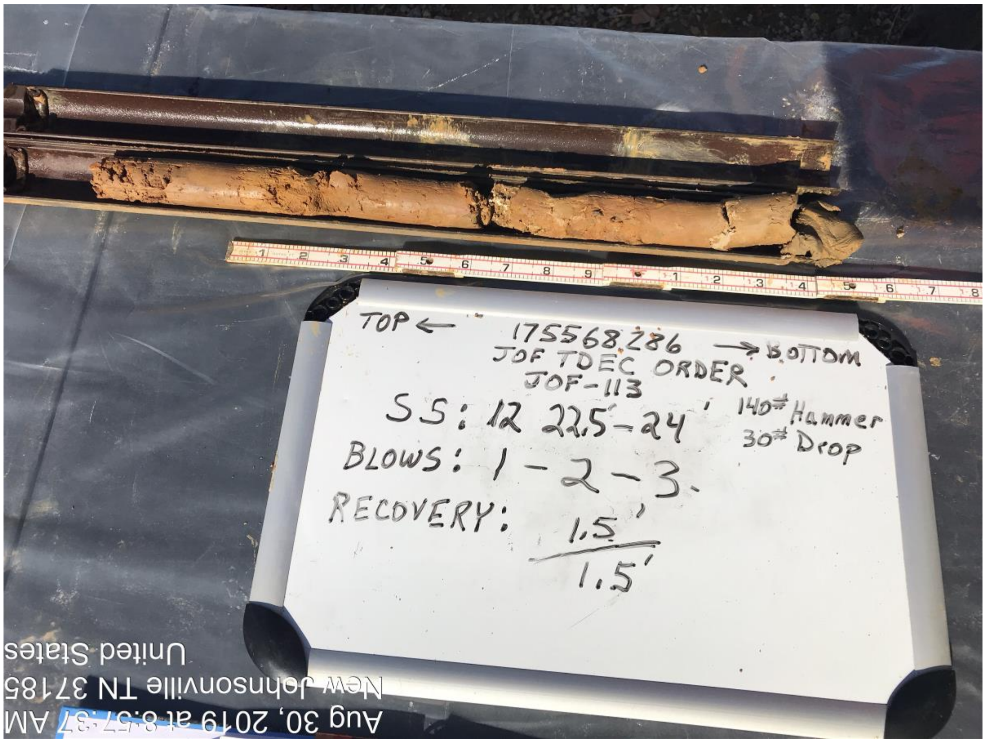
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 153

Photo Location:
JOF-113

Photo Date:
8/30/2019

Comments:
Second boring location interval (22.5-24.0 feet).

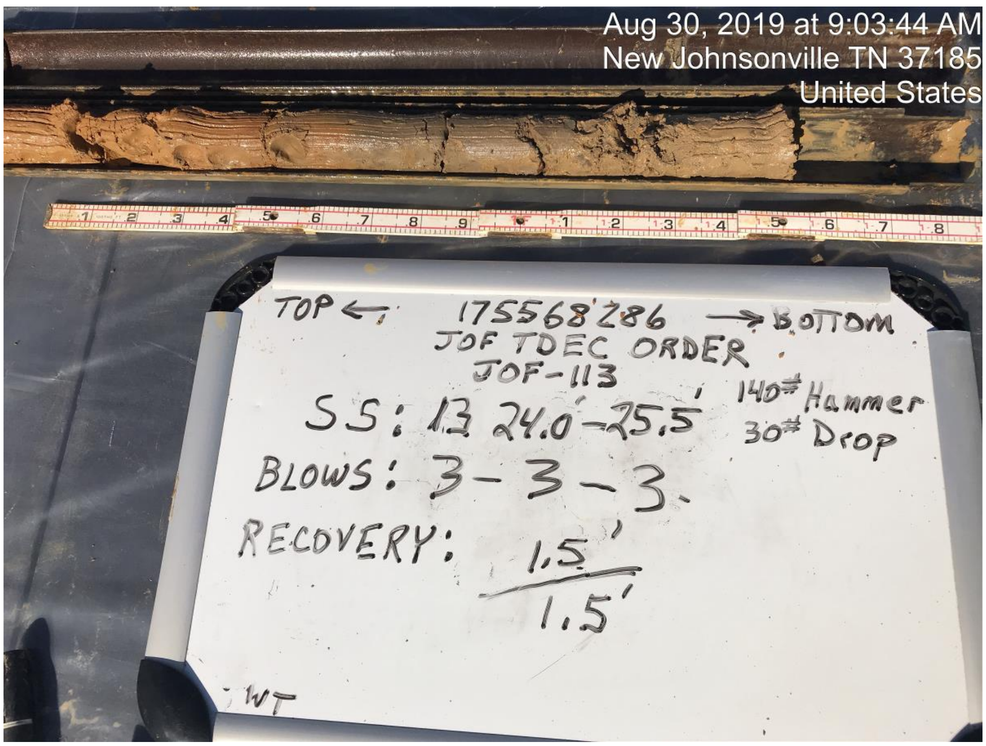


Photograph ID: 154

Photo Location:
JOF-113

Photo Date:
8/30/2019

Comments:
Second boring location interval (24.0-25.5 feet).



Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 155

Photo Location:
JOF-113

Photo Date:
8/30/2019

Comments:
Photo of second boring location interval (25.5-27.0 feet) unavailable.

No Photo Applicable

Photograph ID: 156

Photo Location:
JOF-113

Photo Date:
8/30/2019

Comments:
Second boring location interval (27.0-28.5 feet).

Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Johnsonville Fossil Plant (JOF)	Site Location:	New Johnsonville, Tennessee

Photograph ID: 157

Photo Location:
JOF-113

Photo Date:
8/30/2019

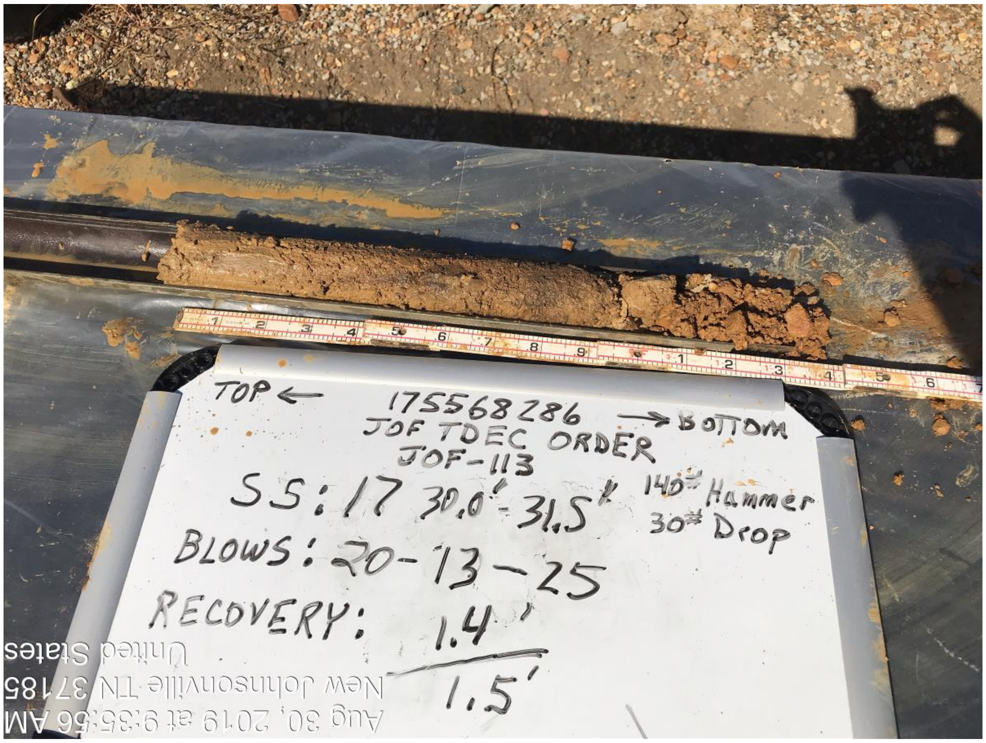
Comments:
Second boring location interval (28.5-30.0 feet).

Photograph ID: 158

Photo Location:
JOF-113

Photo Date:
8/30/2019

Comments:
Second boring location interval (30.0-31.5 feet).



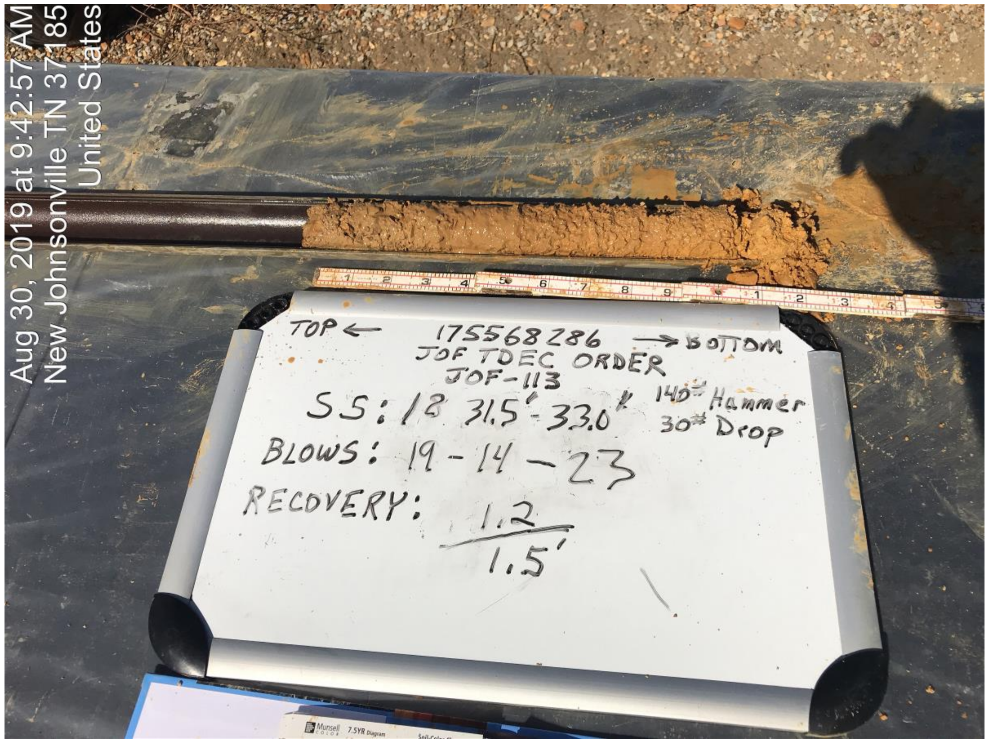
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 159

Photo Location: JOF-113

Photo Date: 8/30/2019

Comments: Second boring location interval (31.5-33.0 feet).



Photograph ID: 160

Photo Location: JOF-113

Photo Date: 8/30/2019

Comments: Second boring location interval (33.0-34.5 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 161

Photo Location: JOF-113

Photo Date: 8/30/2019

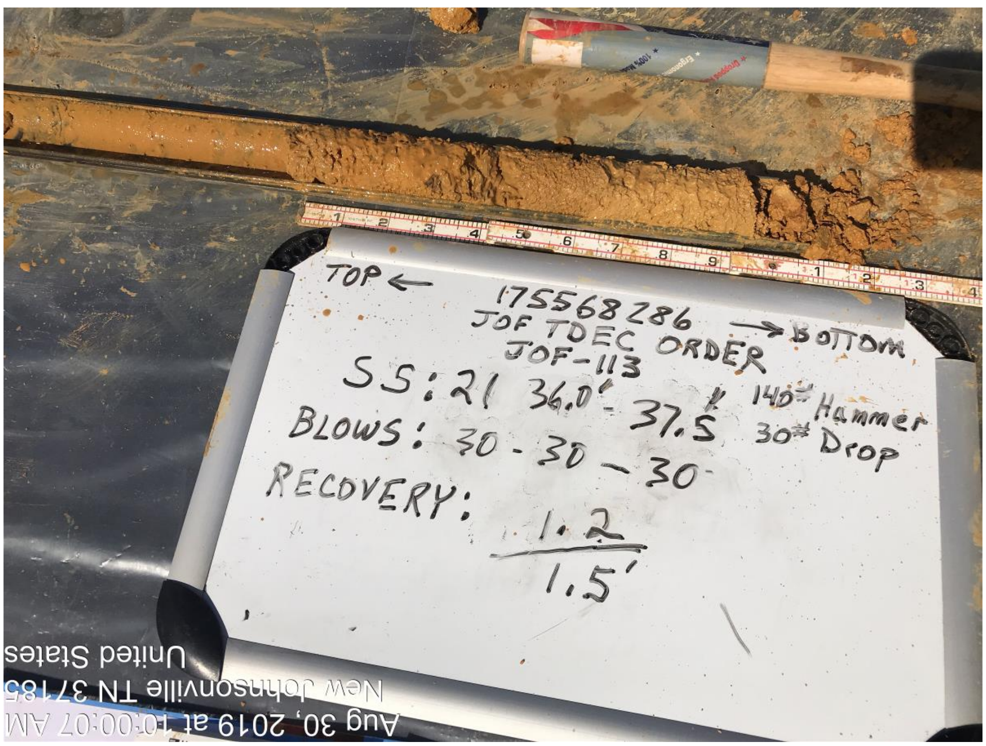
Comments: Second boring location interval (34.5-36.0 feet).

Photograph ID: 162

Photo Location: JOF-113

Photo Date: 8/30/2019

Comments: Second boring location interval (36.0-37.5 feet).



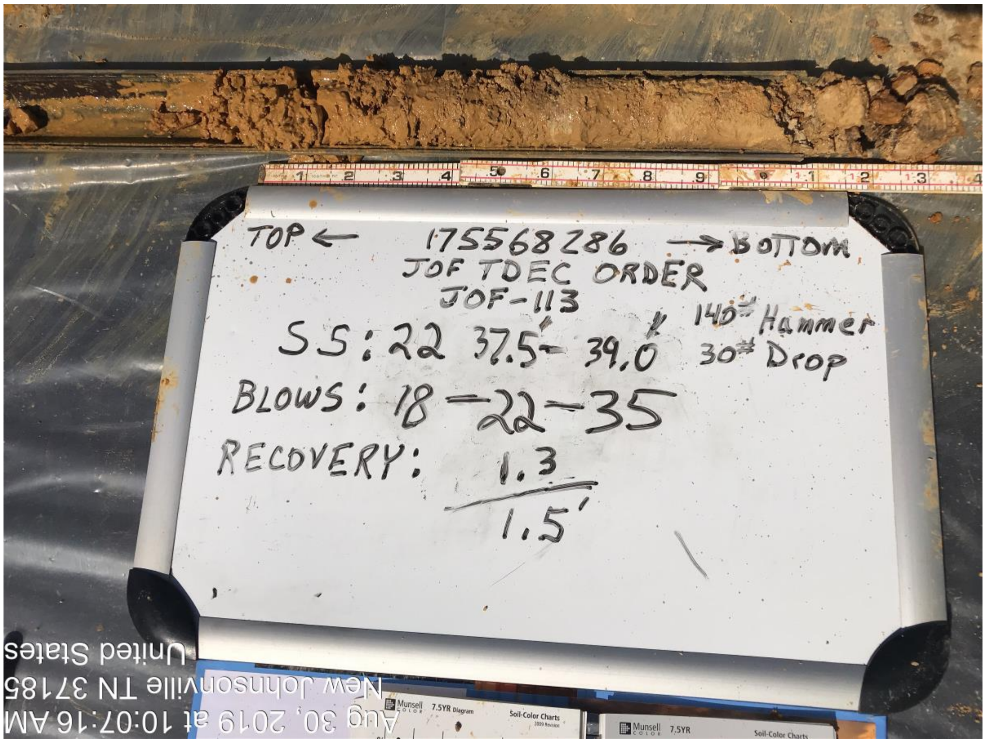
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 163

Photo Location:
JOF-113

Photo Date:
8/30/2019

Comments:
Second boring location interval (37.5-39.0 feet).

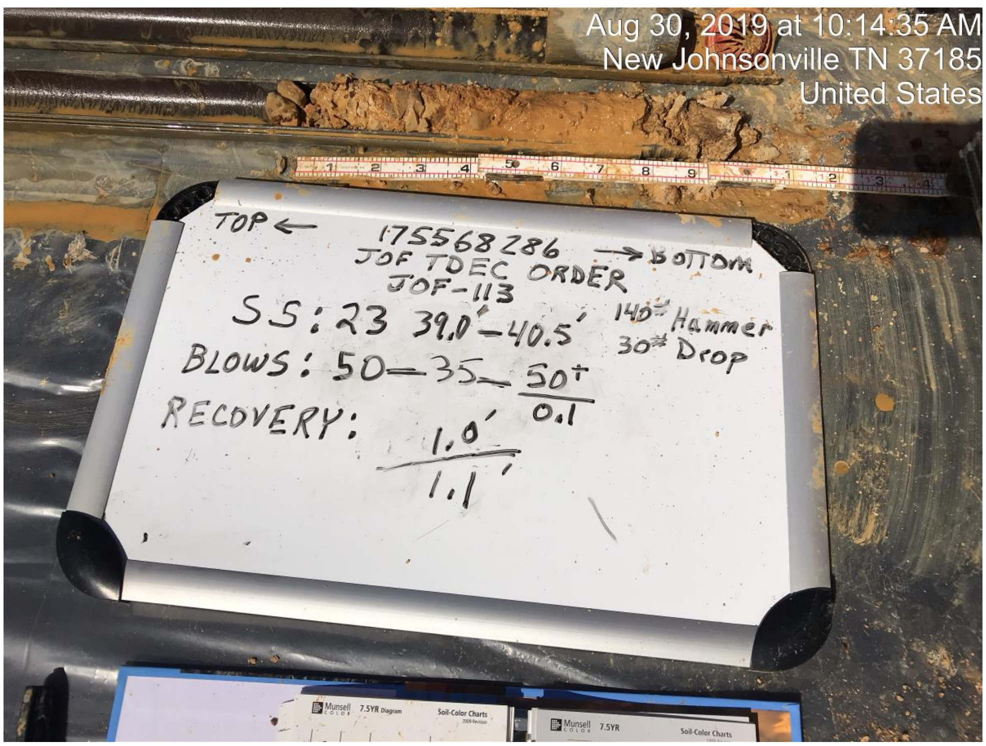


Photograph ID: 164

Photo Location:
JOF-113

Photo Date:
8/30/2019

Comments:
Second boring location interval (39.0-40.1 feet). The depth range on the white board should be 39.0-40.1 feet.



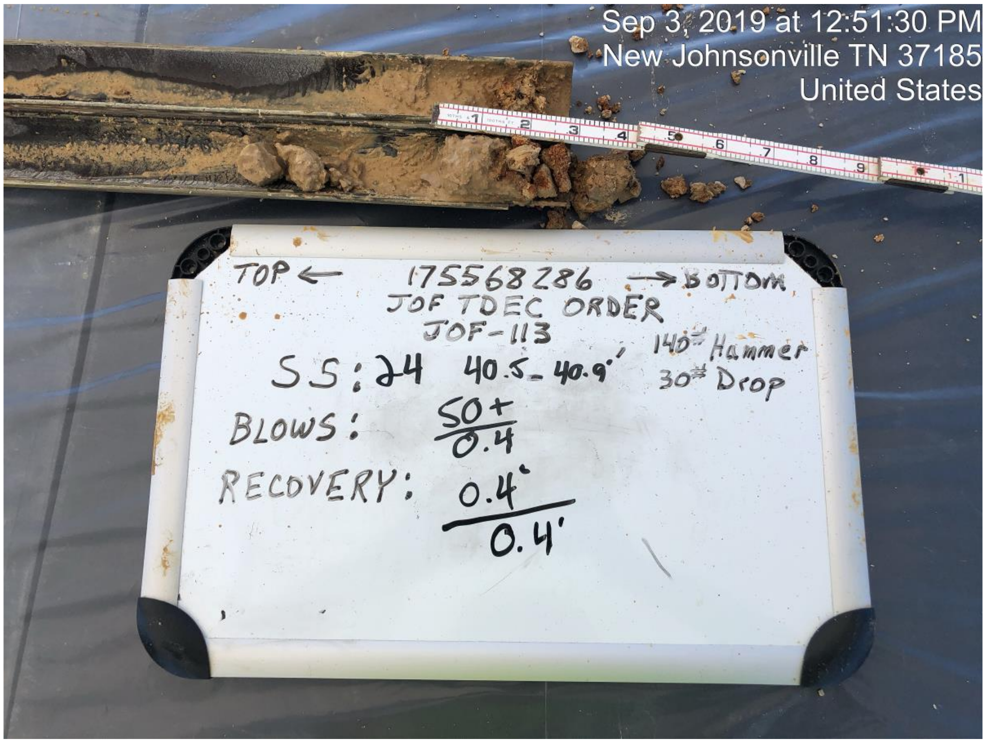
Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Johnsonville Fossil Plant (JOF)	Site Location:	New Johnsonville, Tennessee

Photograph ID: 165

Photo Location:
JOF-113

Photo Date:
9/3/2019

Comments:
Second boring location interval (40.5-40.9 feet).

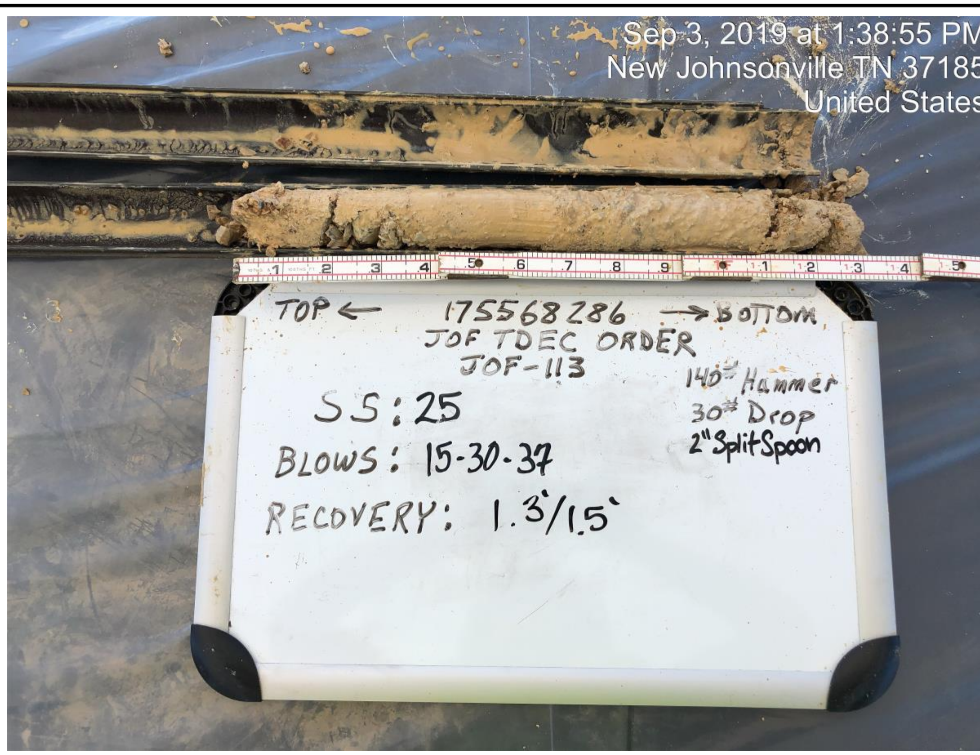


Photograph ID: 166

Photo Location:
JOF-113

Photo Date:
9/3/2019

Comments:
Second boring location interval (42.0-43.5 feet). The depth range on the white board should be 42.0-43.5.



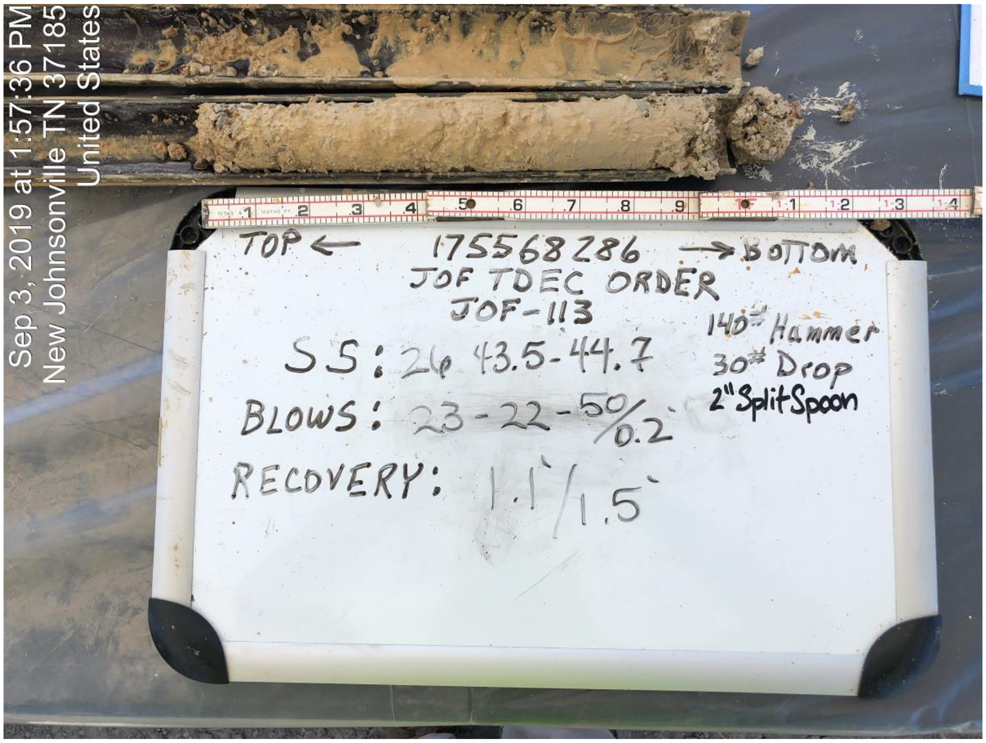
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 167

Photo Location:
JOF-113

Photo Date:
9/3/2019

Comments:
Second boring location interval (43.5-44.7 feet).



Photograph ID: 168

Photo Location:
JOF-114 Offset A

Photo Date:
8/21/2019

Comments:
First boring location interval (5.0-10.0 feet).

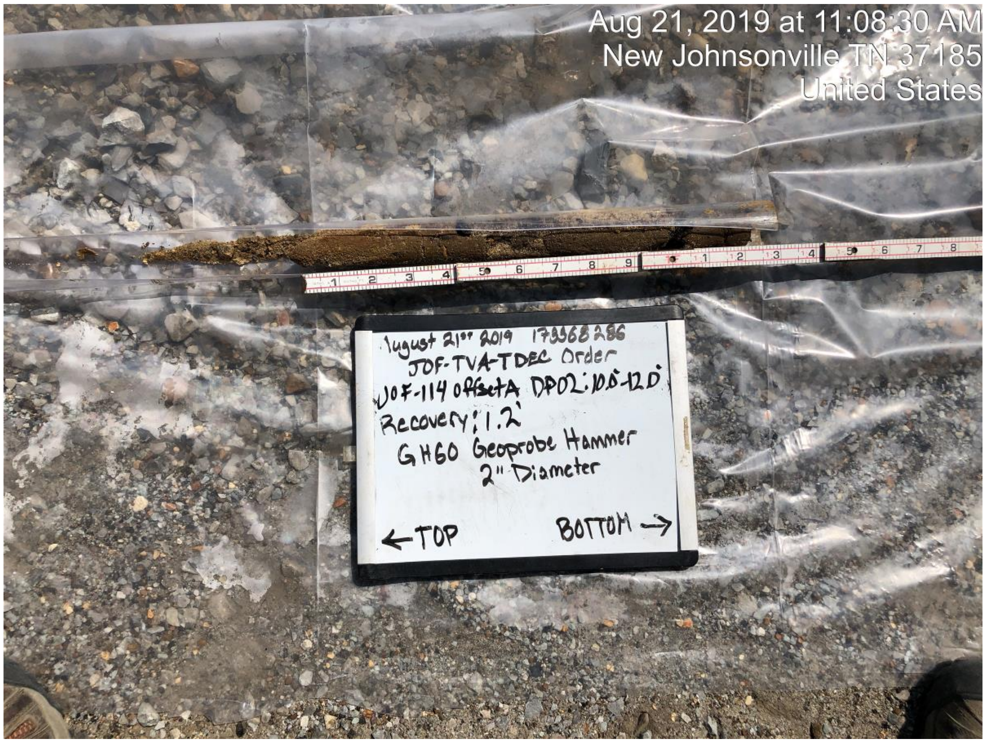
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 169

Photo Location:
JOF-114 Offset A

Photo Date:
8/21/2019

Comments:
First boring location interval (10.0-12.0 feet). Boring refusal at 12.0 feet.



Photograph ID: 170

Photo Location:
JOF-114-Pre

Photo Date:
8/21/2019

Comments:
Second boring location interval (5.0-10.0 feet). Offset 3 feet to the north of the first boring. The boring ID on the white board should be JOF-114-Pre.

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 171 **Photo Location:** JOF-114-Pre **Photo Date:** 8/21/2019 **Comments:** Second boring location interval (10.0-15.0 feet). The boring ID on the white board should be JOF-114-Pre.	
Photograph ID: 172 **Photo Location:** JOF-114-Pre **Photo Date:** 8/21/2019 **Comments:** Second boring location interval (15.0-20.0 feet). The boring ID on the white board should be JOF-114-Pre.	

Stantec

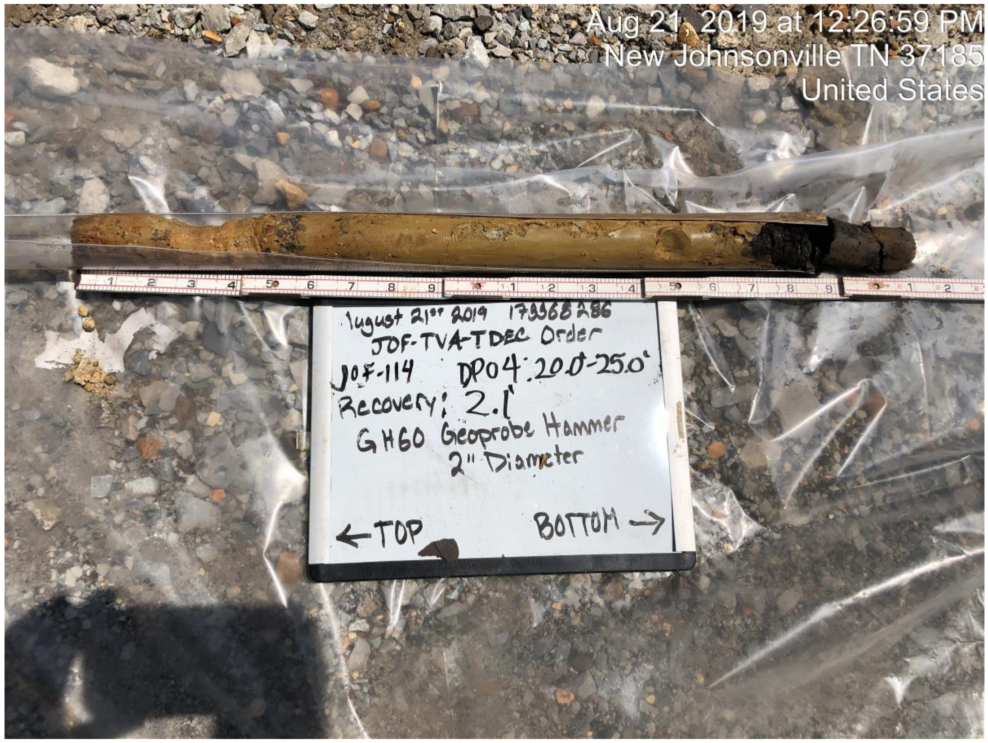
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 173

Photo Location:
JOF-114-Pre

Photo Date:
8/21/2019

Comments:
Second boring location interval (20.0-25.0 feet). The boring ID on the white board should be JOF-114-Pre.



Photograph ID: 174

Photo Location:
JOF-114-Pre

Photo Date:
8/21/2019

Comments:
Second boring location interval (25.0-27.5 feet). The boring ID on the white board should be JOF-114-Pre. Boring refusal at 27.5 feet.

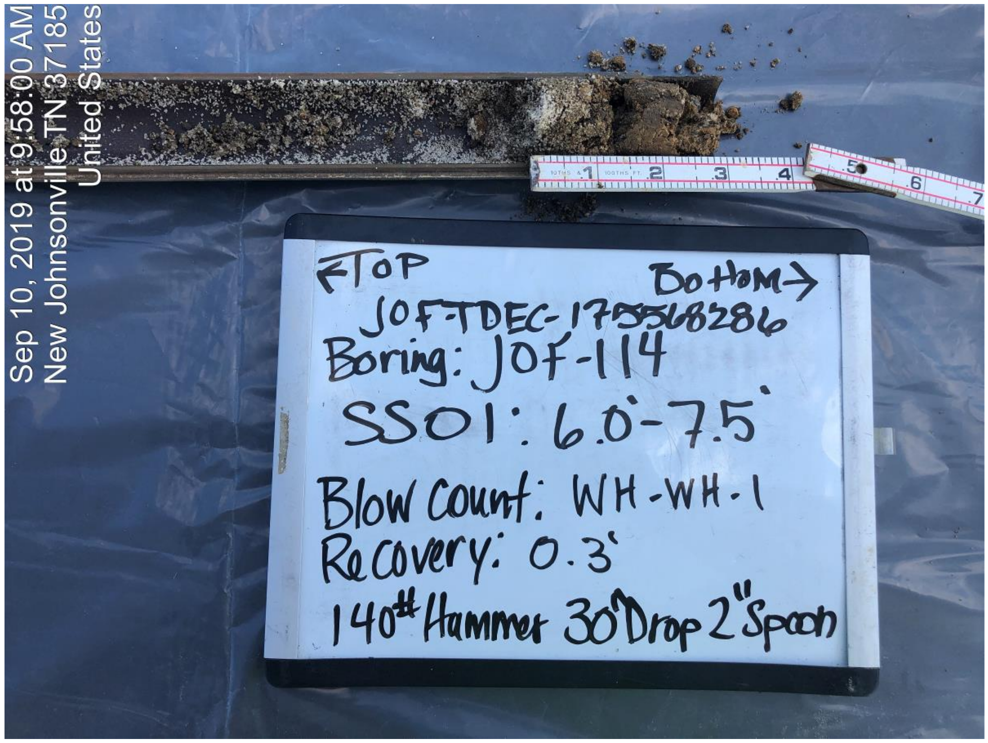
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 175

Photo Location:
JOF-114

Photo Date:
9/10/2019

Comments:
Third boring location interval (6.0-7.5 feet). Adjacent to the second boring.

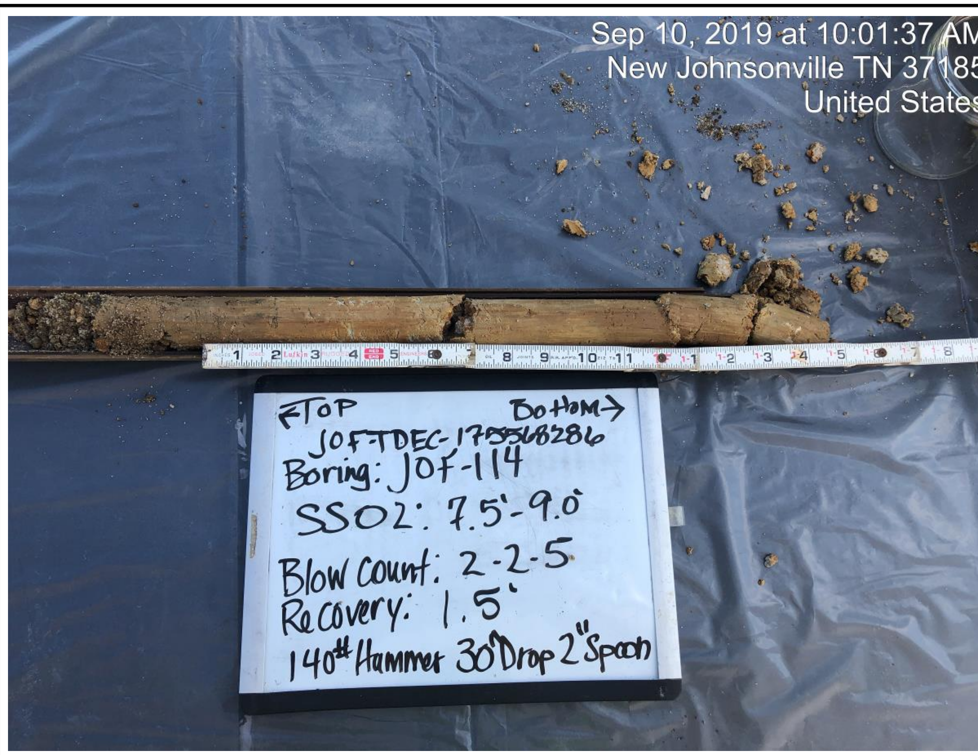


Photograph ID: 176

Photo Location:
JOF-114

Photo Date:
9/10/2019

Comments:
Third boring location interval (7.5-9.0 feet).



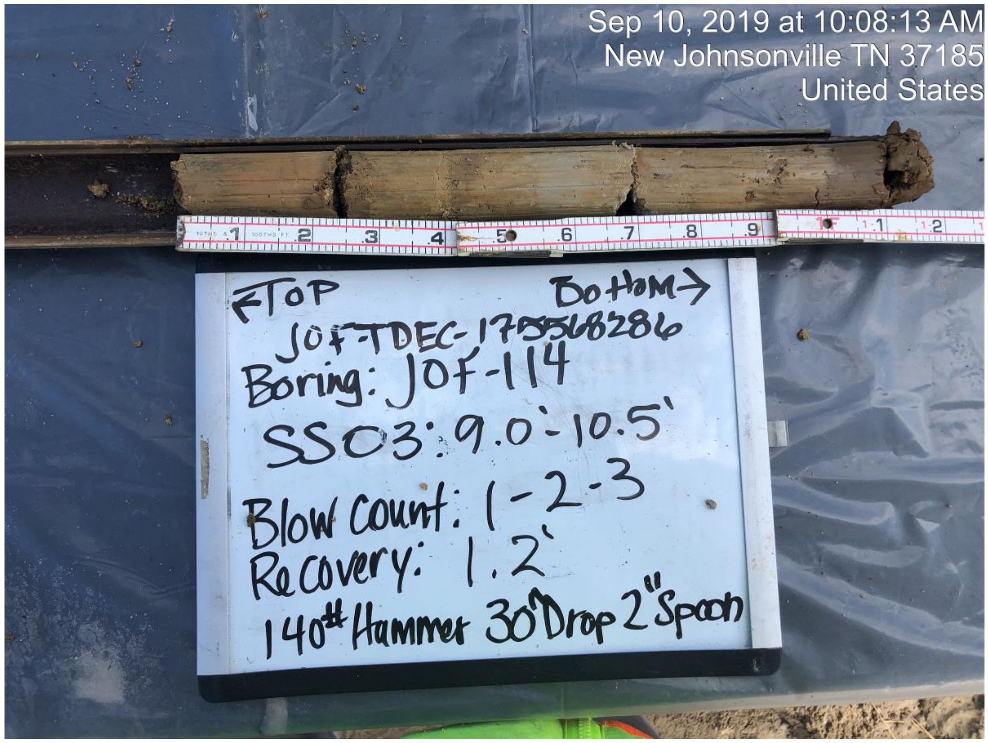
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 177

Photo Location:
JOF-114

Photo Date:
9/10/2019

Comments:
Third boring location interval (9.0-10.5 feet). The blow count on the white board should be 3-2-5.

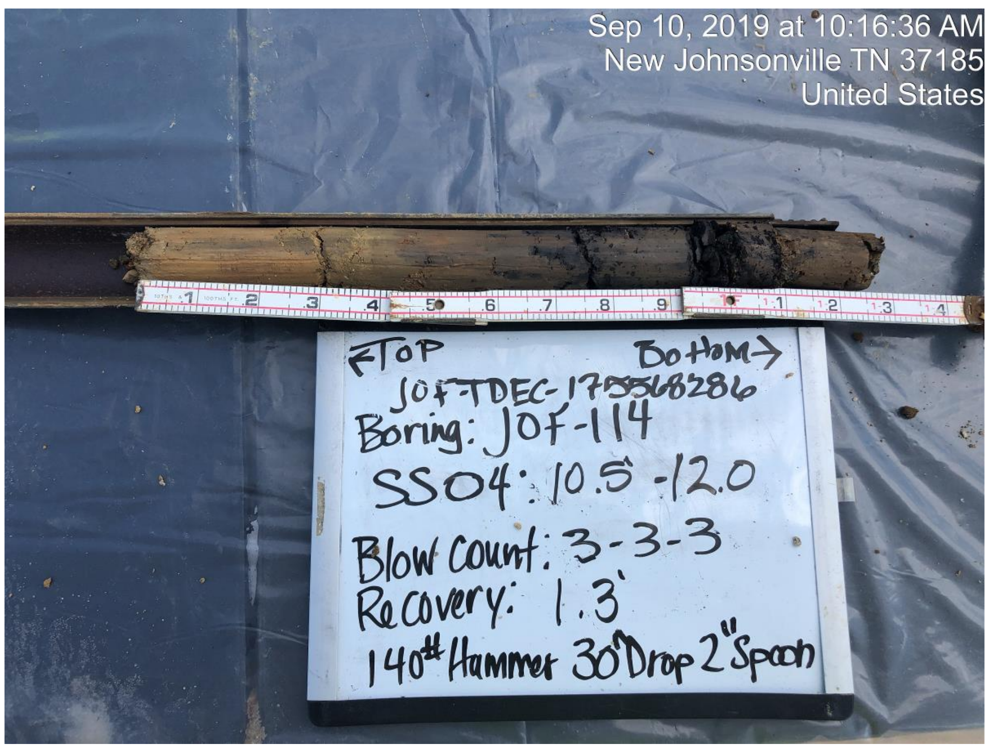


Photograph ID: 178

Photo Location:
JOF-114

Photo Date:
9/10/2019

Comments:
Third boring location interval (10.5-12.0 feet).



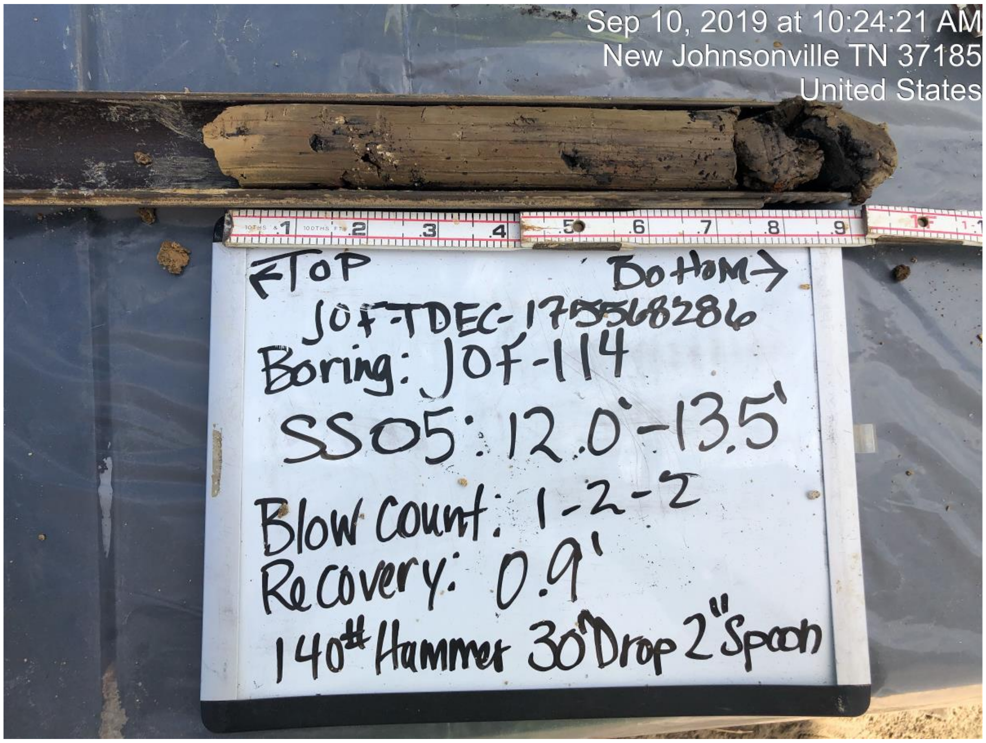
Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Johnsonville Fossil Plant (JOF)	Site Location:	New Johnsonville, Tennessee

Photograph ID: 179

Photo Location:
JOF-114

Photo Date:
9/10/2019

Comments:
Third boring location interval (12.0-13.5 feet).

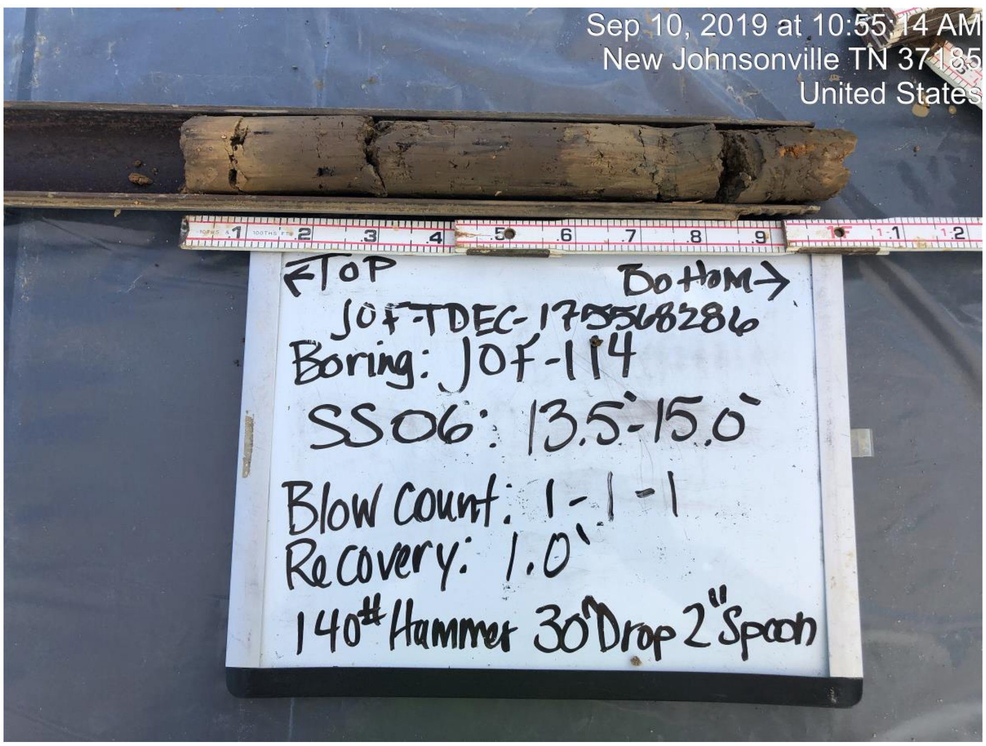


Photograph ID: 180

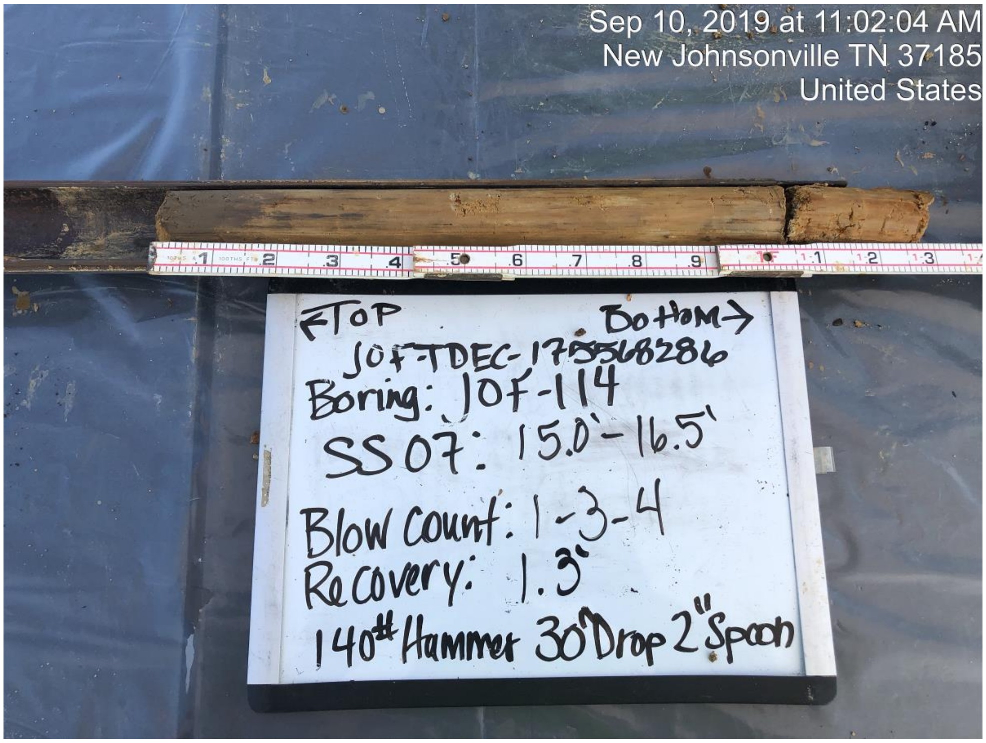
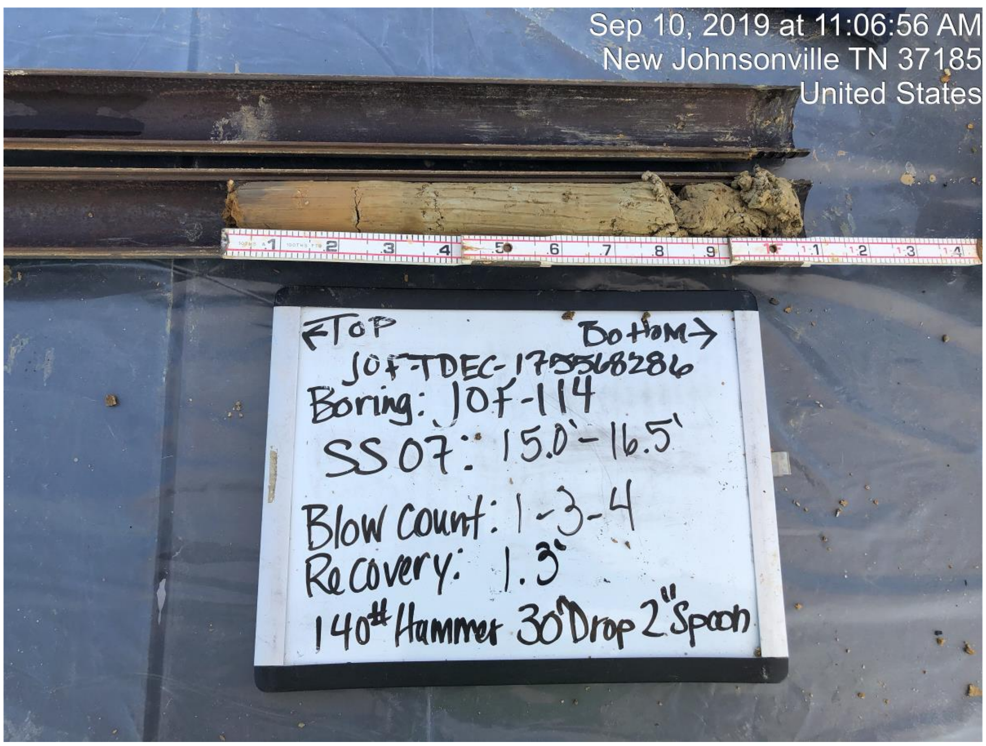
Photo Location:
JOF-114

Photo Date:
9/10/2019

Comments:
Third boring location interval (13.5-15.0 feet).



Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Johnsonville Fossil Plant (JOF)	Site Location:	New Johnsonville, Tennessee

Photograph ID: 181 **Photo Location:** JOF-114 **Photo Date:** 9/10/2019 **Comments:** Third boring location interval (15.0-16.5 feet).	
Photograph ID: 182 **Photo Location:** JOF-114 **Photo Date:** 9/10/2019 **Comments:** Third boring location interval (16.5-18.0 feet). The split spoon sample, depth range, blow count, and recovery, on the white board should be SS08, 16.5-18.0 feet, WH-1-1, and 1.1 feet, respectively.	

Stantec **Photographic Log**

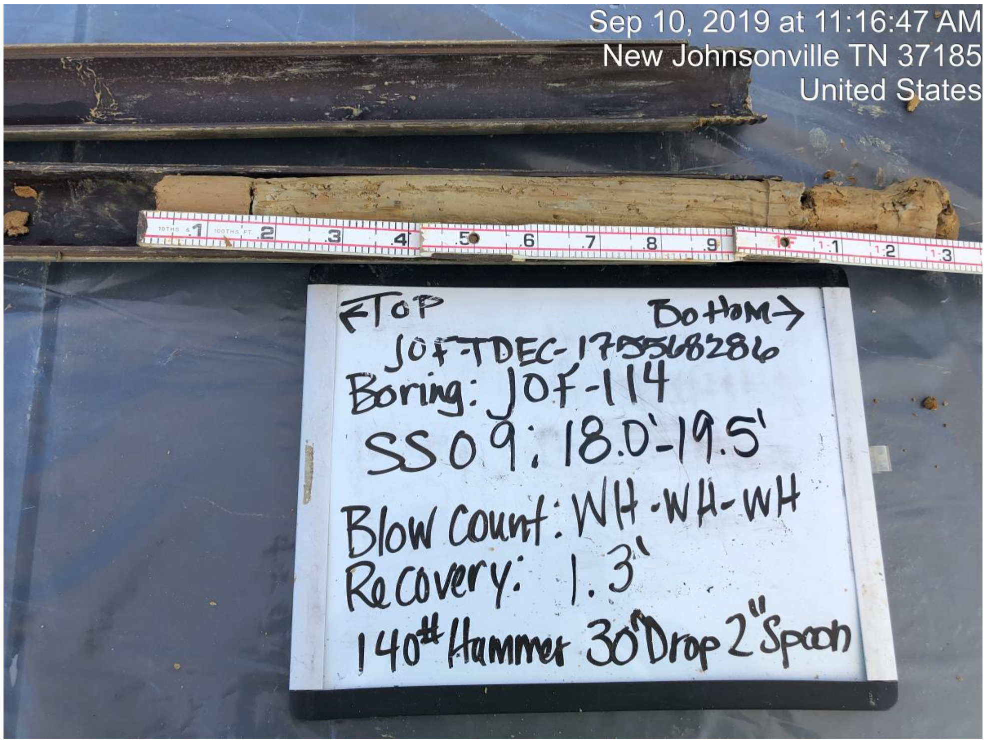
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 183

Photo Location: JOF-114

Photo Date: 9/10/2019

Comments: Third boring location interval (18.0-19.5 feet).

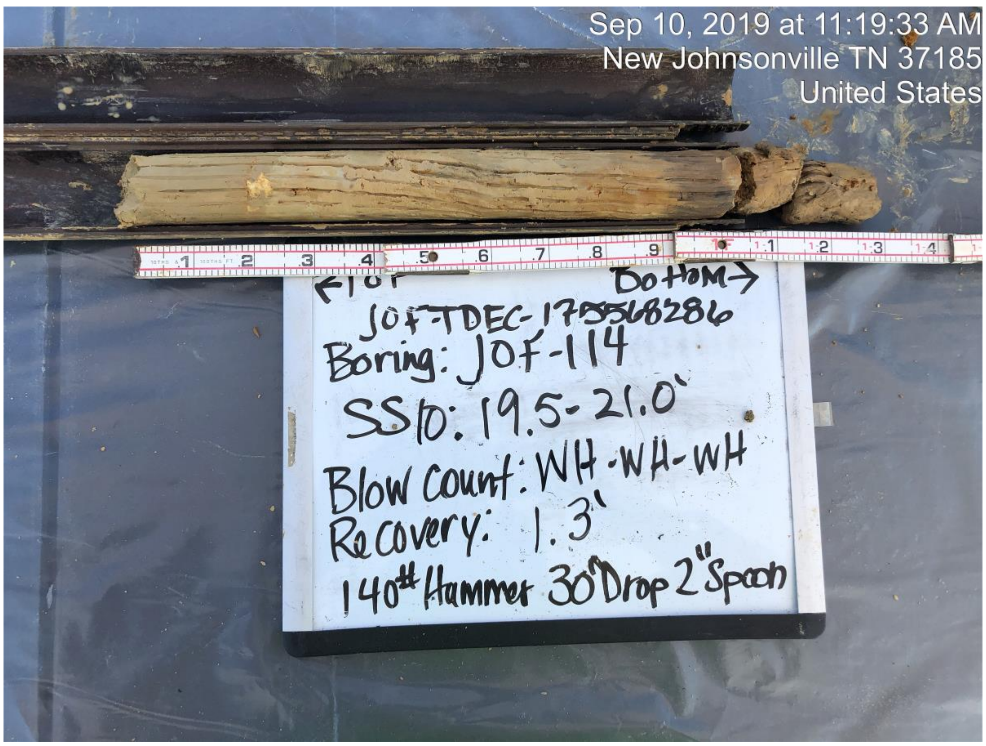


Photograph ID: 184

Photo Location: JOF-114

Photo Date: 9/10/2019

Comments: Third boring location interval (19.5-21.0 feet).



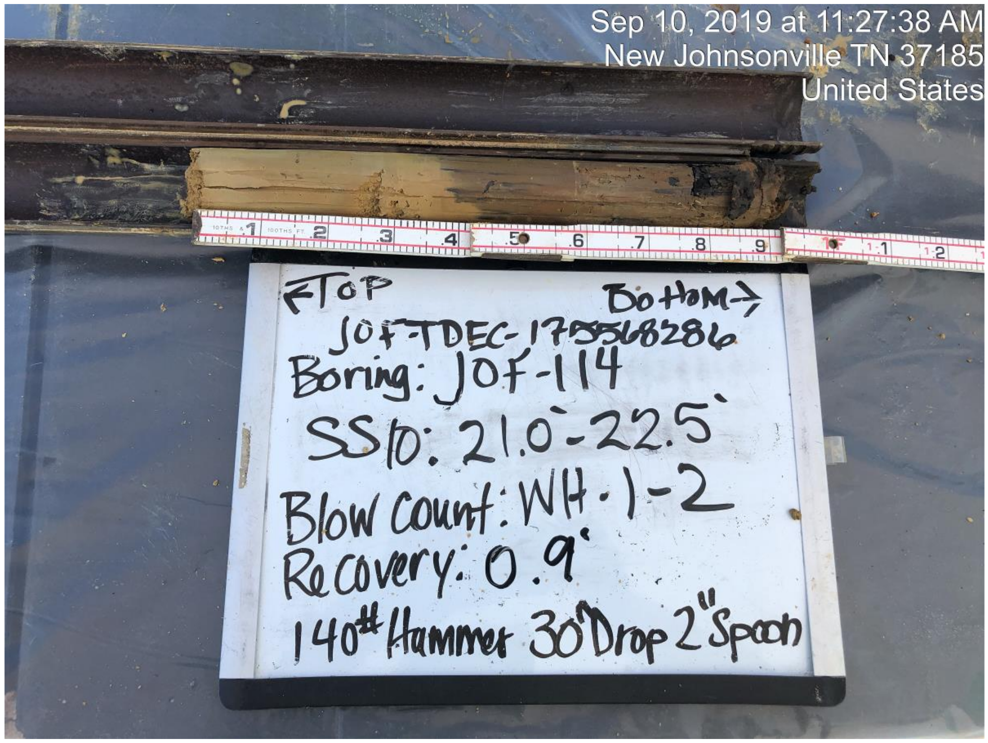
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 185

Photo Location: JOF-114

Photo Date: 9/10/2019

Comments: Third boring location interval (21.0-22.5 feet). The split spoon sample on the white board should be SS11.

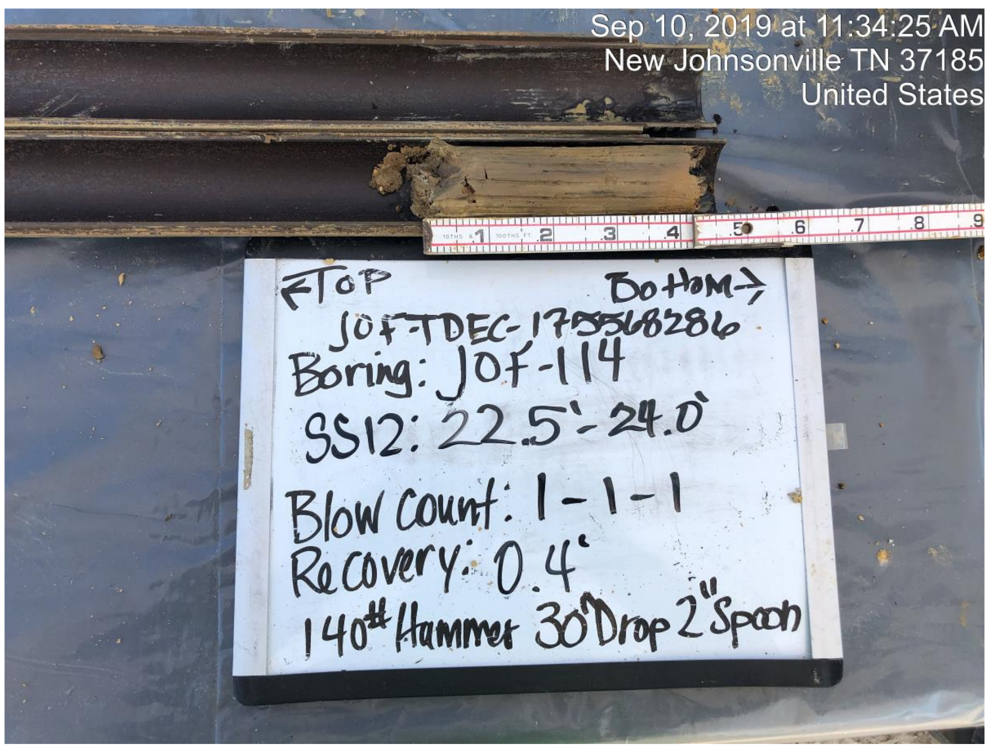


Photograph ID: 186

Photo Location: JOF-114

Photo Date: 9/10/2019

Comments: Third boring location interval (22.5-24.0 feet).



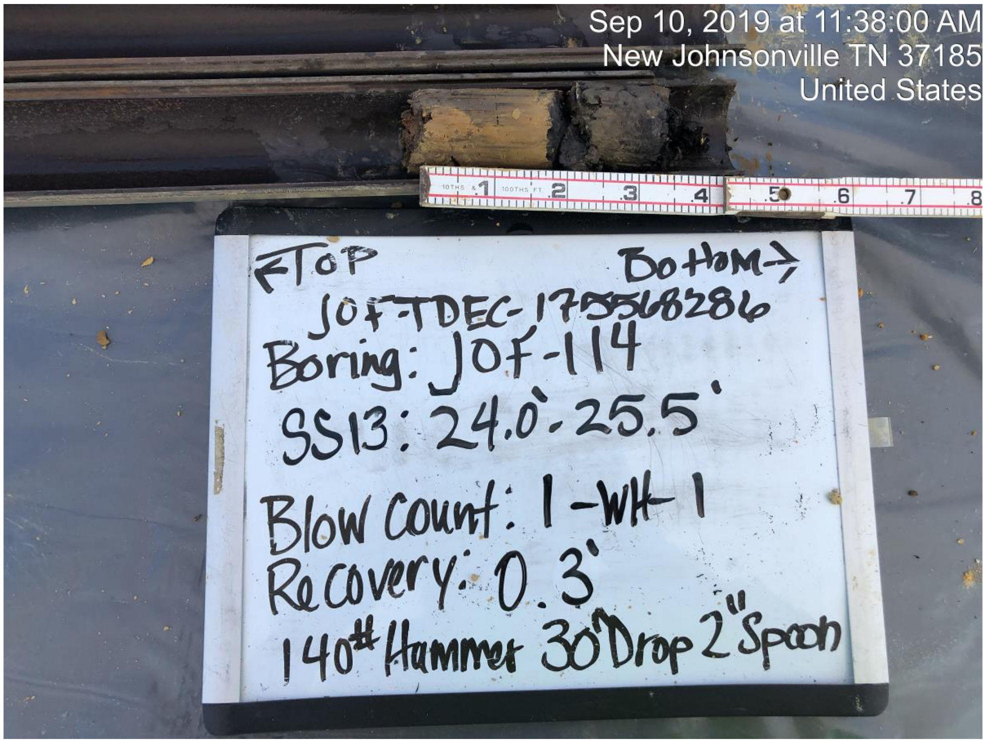
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 187

Photo Location:
JOF-114

Photo Date:
9/10/2019

Comments:
Third boring location interval (24.0-25.5 feet).

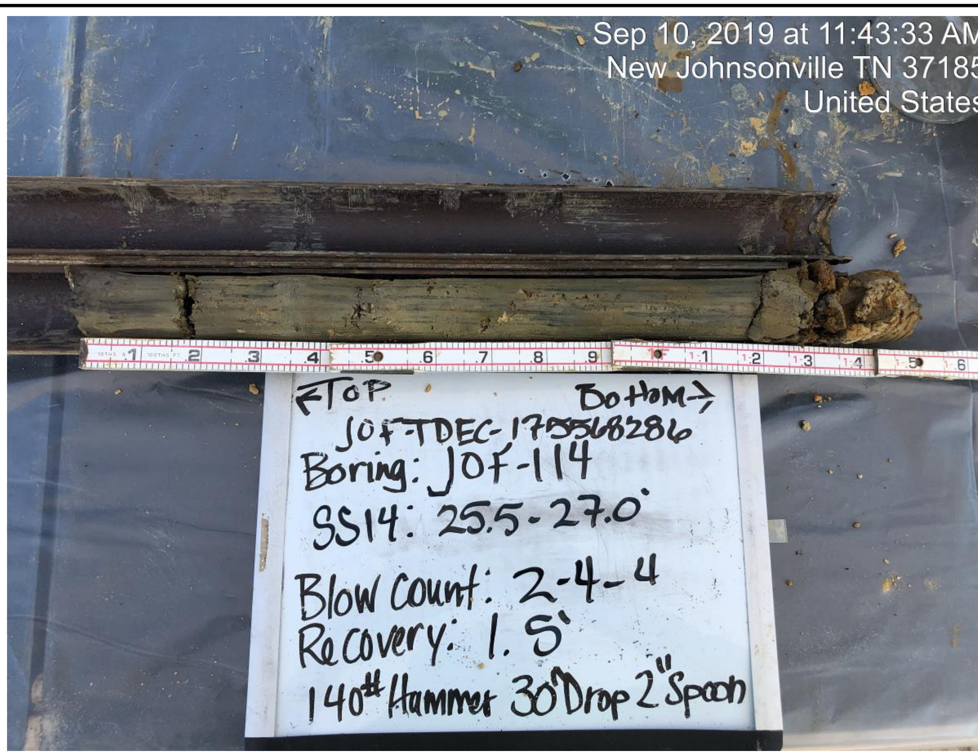


Photograph ID: 188

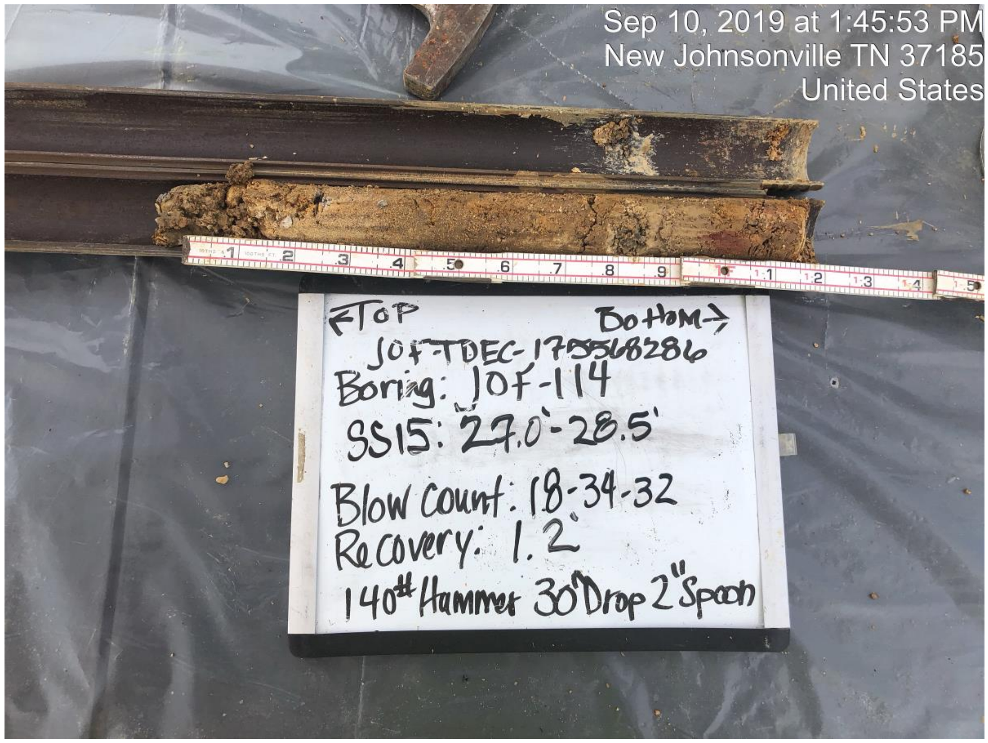
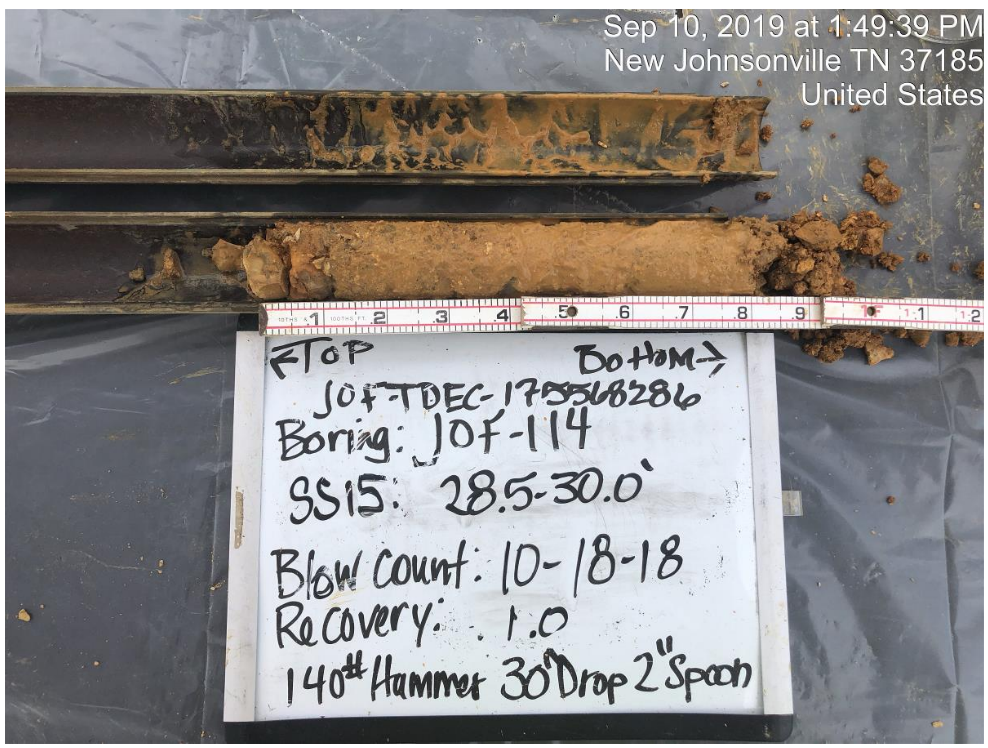
Photo Location:
JOF-114

Photo Date:
9/10/2019

Comments:
Third boring location interval (25.5-27.0 feet).



Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Johnsonville Fossil Plant (JOF)	Site Location:	New Johnsonville, Tennessee

Photograph ID: 189 **Photo Location:** JOF-114 **Photo Date:** 9/10/2019 **Comments:** Third boring location interval (27.0-28.5 feet).	
Photograph ID: 190 **Photo Location:** JOF-114 **Photo Date:** 9/10/2019 **Comments:** Third boring location interval (28.5-30.0 feet). The split spoon sample on the white board should be SS16.	

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 191

Photo Location:
JOF-114

Photo Date:
9/10/2019

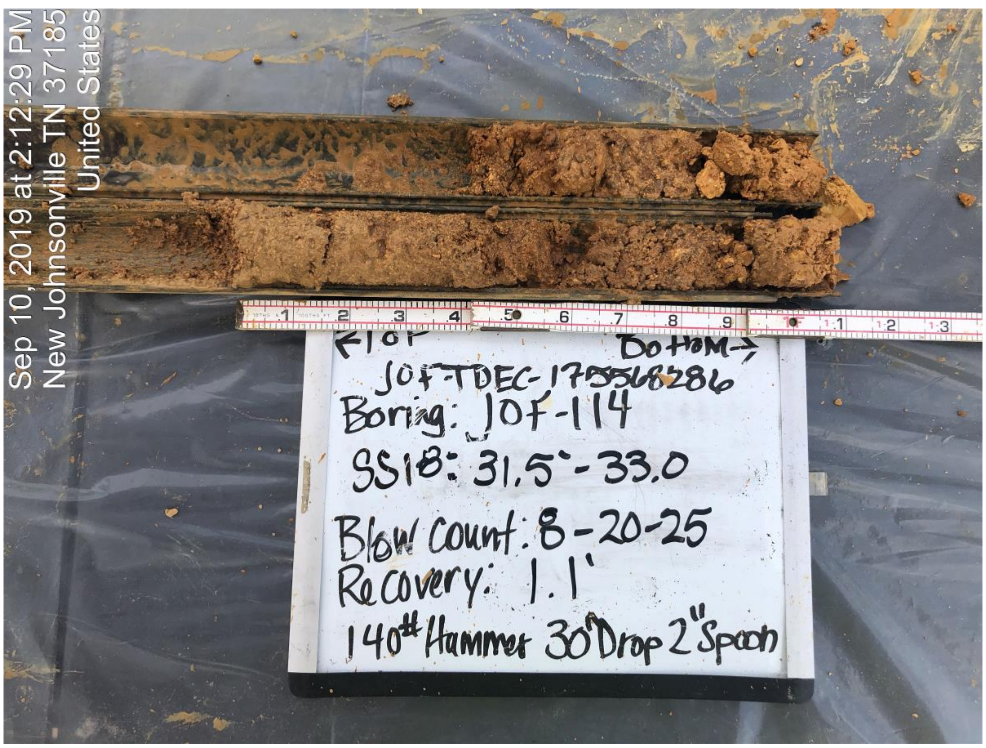
Comments:
Third boring location interval (30.0-31.5 feet).

Photograph ID: 192

Photo Location:
JOF-114

Photo Date:
9/10/2019

Comments:
Third boring location interval (31.5-33.0 feet). The blow count on the white board should be 2-20-25.



Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 193

Photo Location:
JOF-114

Photo Date:
9/10/2019

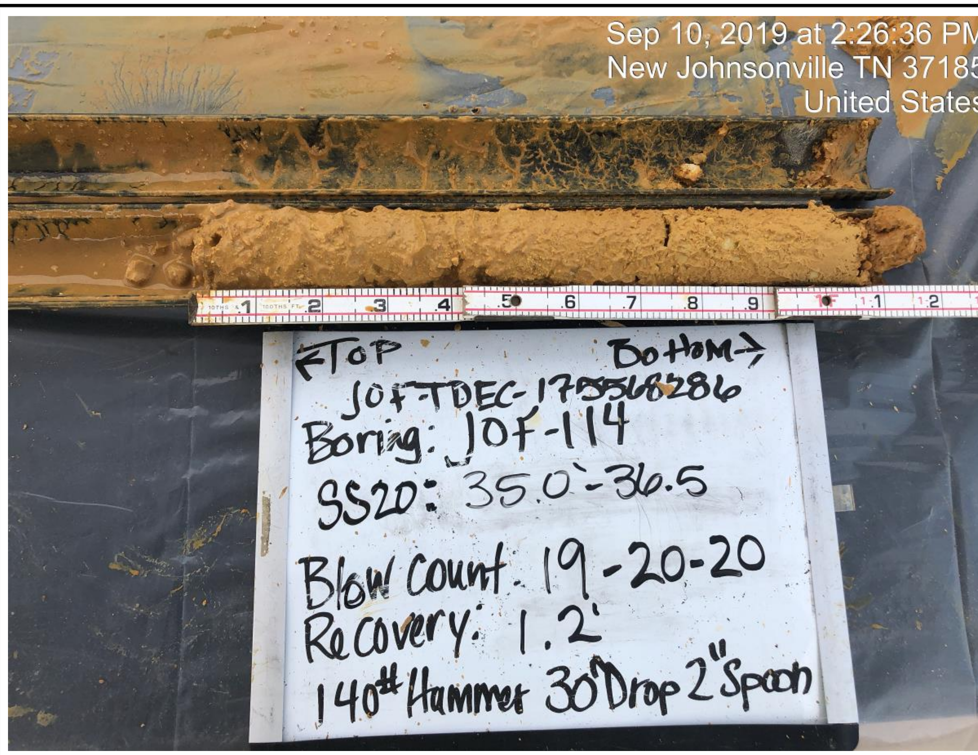
Comments:
Third boring location interval (33.0-34.5 feet). The depth range on the white board should be 33.0-34.5 feet. The blow count on the white board should be 18-28-25.

Photograph ID: 194

Photo Location:
JOF-114

Photo Date:
9/10/2019

Comments:
Third boring location interval (34.5-36.0 feet). The depth range on the white board should be 34.5-36.0 feet.



Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 195

Photo Location: JOF-114

Photo Date: 9/10/2019

Comments: Third boring location interval (36.0-37.5 feet). The depth range on the white board should be 36.0-37.5 feet.

Photograph ID: 196

Photo Location: JOF-114

Photo Date: 9/10/2019

Comments: Third boring location interval (37.5-39.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 197

Photo Location: JOF-114

Photo Date: 9/10/2019

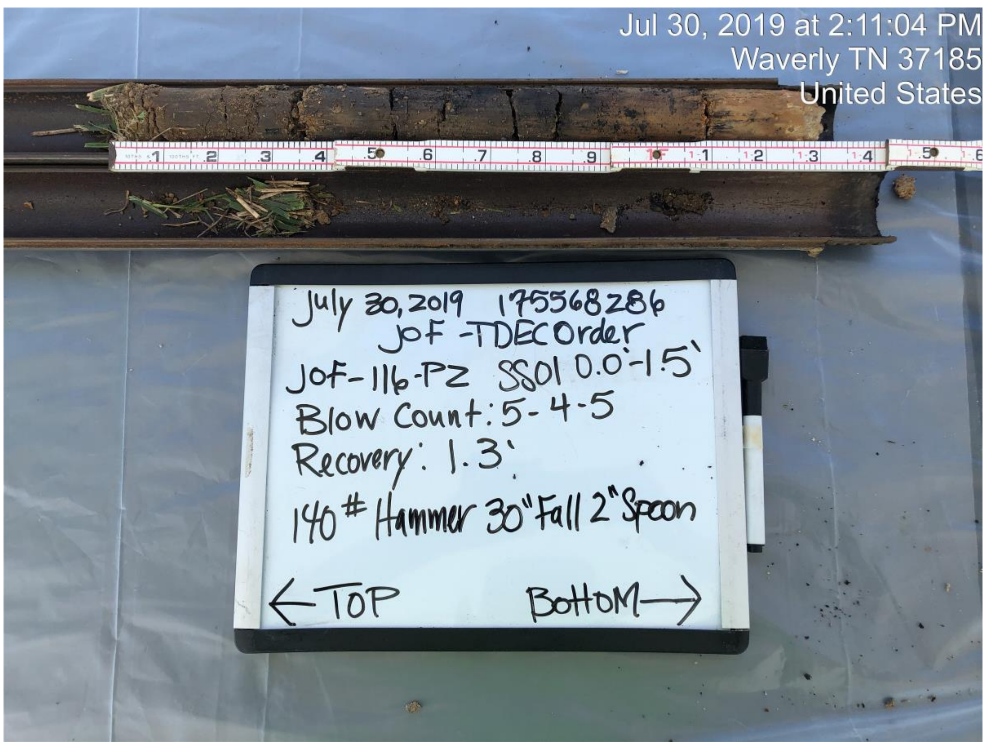
Comments: Third boring location interval (39.0-40.5 feet).

Photograph ID: 198

Photo Location: JOF-116-PZ

Photo Date: 7/30/2019

Comments: Interval (0.0-1.5 feet). The blow count on the white board should be 5-4-4.



Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Johnsonville Fossil Plant (JOF)	Site Location:	New Johnsonville, Tennessee

Photograph ID: 199 **Photo Location:** JOF-116-PZ **Photo Date:** 7/30/2019 **Comments:** Interval (1.5-3.0 feet).	
Photograph ID: 200 **Photo Location:** JOF-116-PZ **Photo Date:** 7/30/2019 **Comments:** Interval (3.0-4.5 feet).	

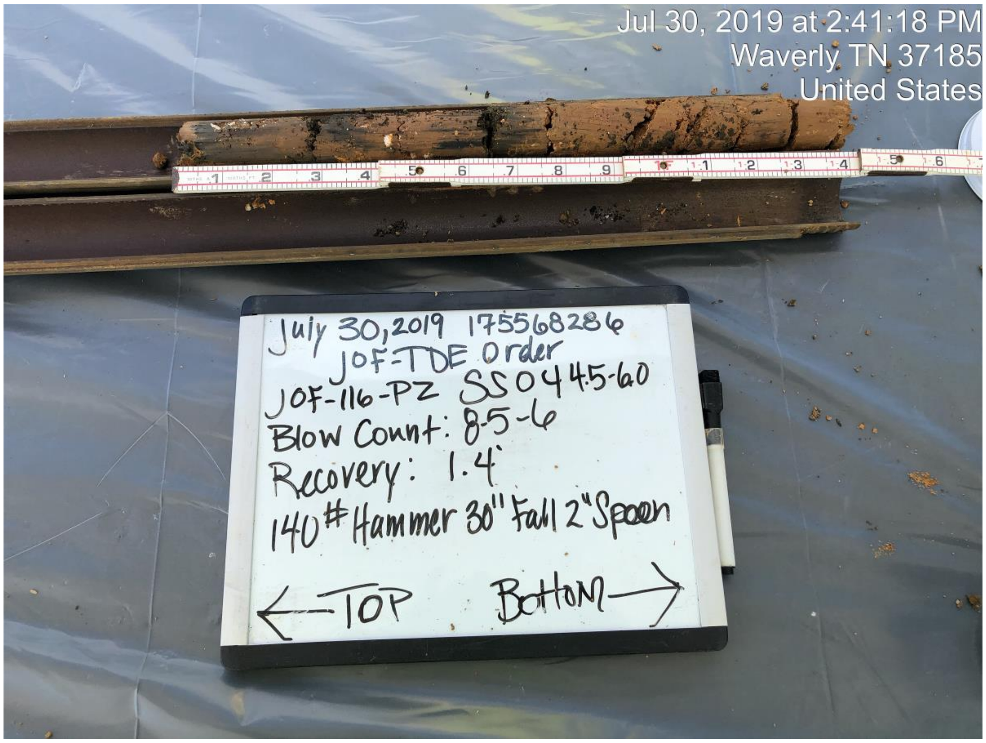
Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Johnsonville Fossil Plant (JOF)	Site Location:	New Johnsonville, Tennessee

Photograph ID: 201

Photo Location:
JOF-116-PZ

Photo Date:
7/30/2019

Comments:
Interval (4.5-6.0 feet).

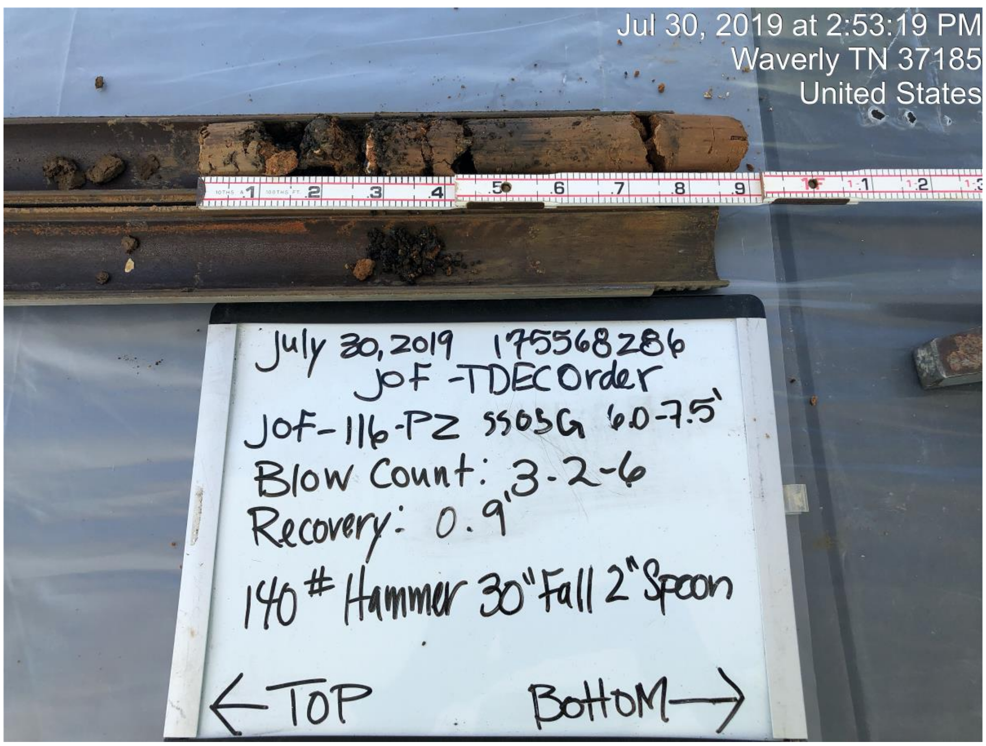


Photograph ID: 202

Photo Location:
JOF-116-PZ

Photo Date:
7/30/2019

Comments:
Interval (6.0-7.5 feet).



Stantec

Photographic Log

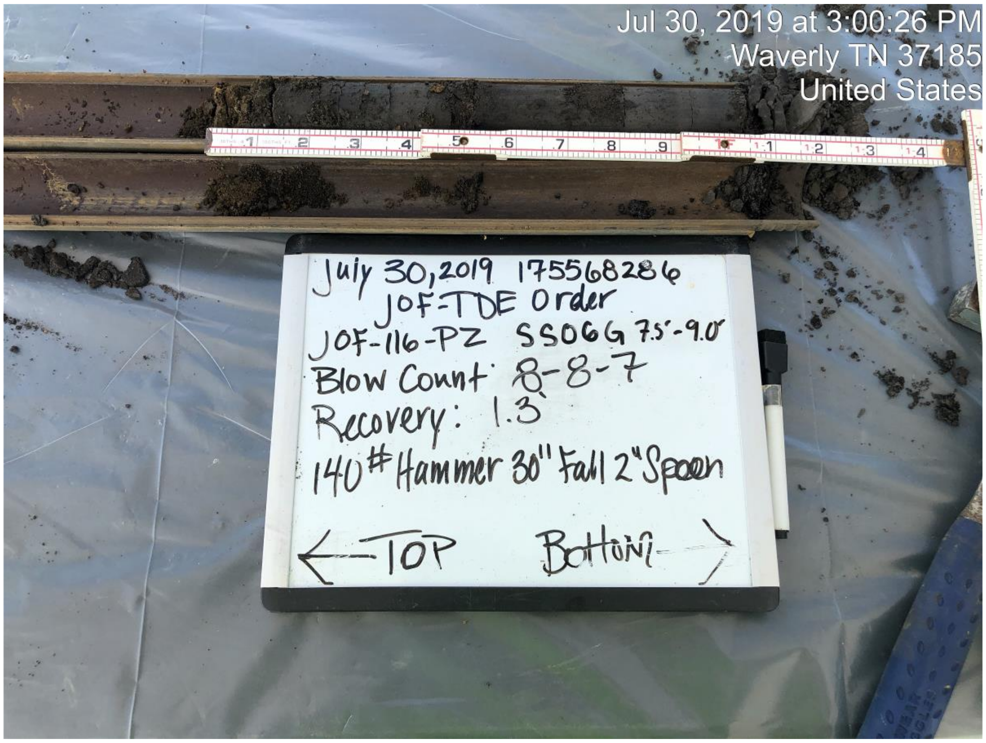
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 203

Photo Location:
JOF-116-PZ

Photo Date:
7/30/2019

Comments:
Interval (7.5-9.0 feet).



Photograph ID: 204

Photo Location:
JOF-116-PZ

Photo Date:
7/30/2019

Comments:
Interval (9.0-10.5 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 205

Photo Location:
JOF-116-PZ

Photo Date:
7/30/2019

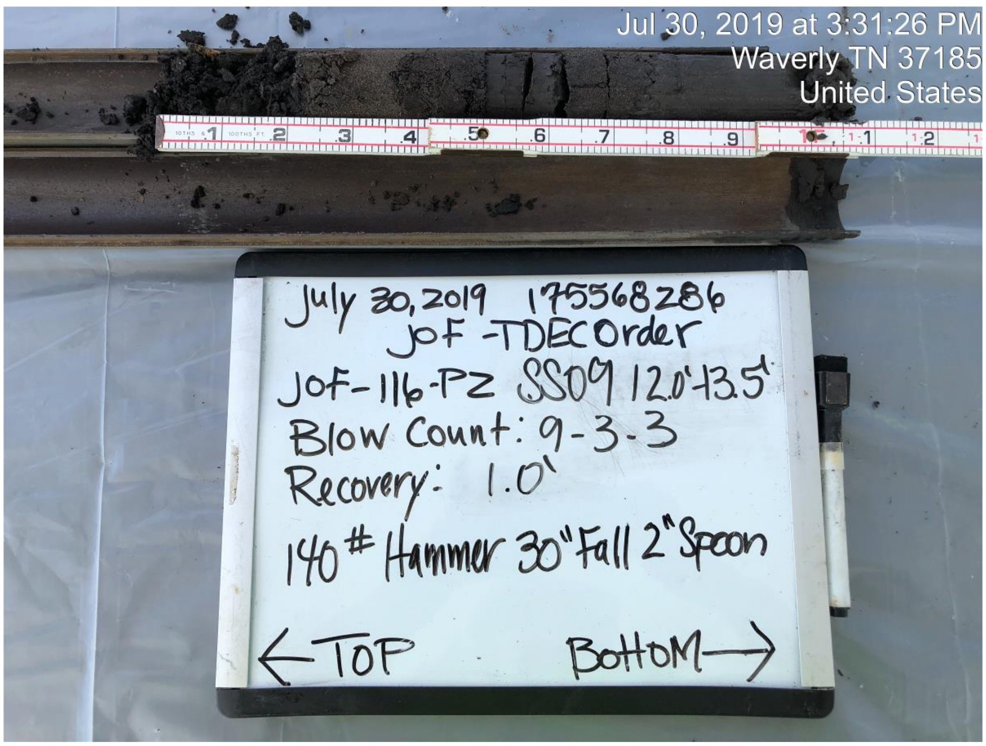
Comments:
Interval (10.5-12.0 feet).

Photograph ID: 206

Photo Location:
JOF-116-PZ

Photo Date:
7/30/2019

Comments:
Interval (12.0-13.5 feet).



Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 207

Photo Location:
JOF-116-PZ

Photo Date:
7/30/2019

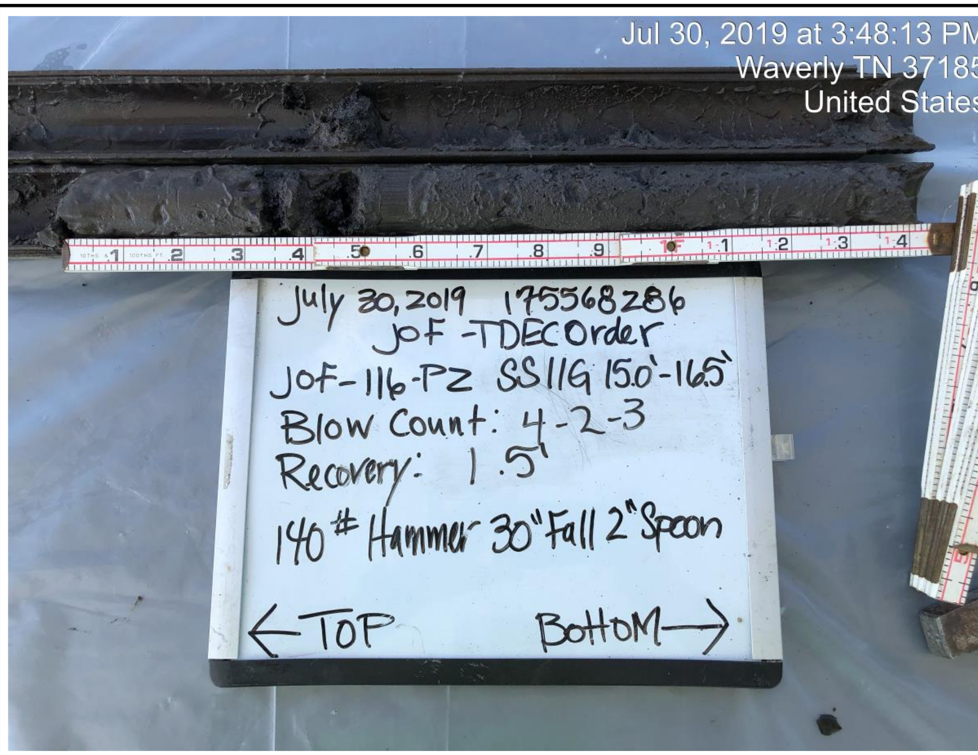
Comments:
Interval (13.5-15.0 feet).

Photograph ID: 208

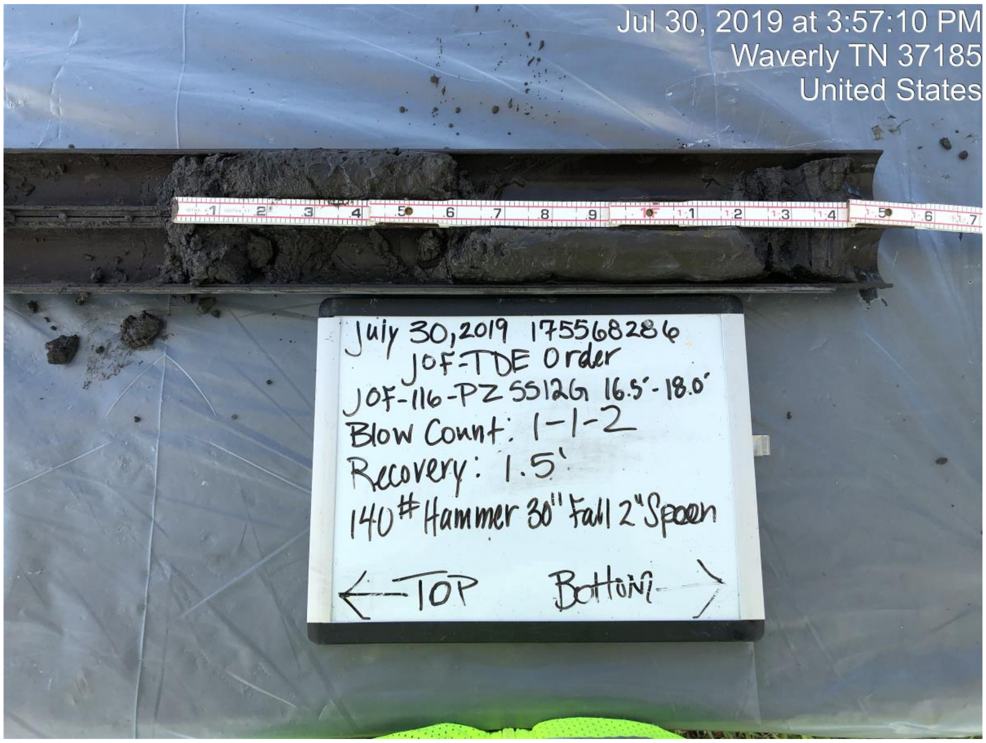
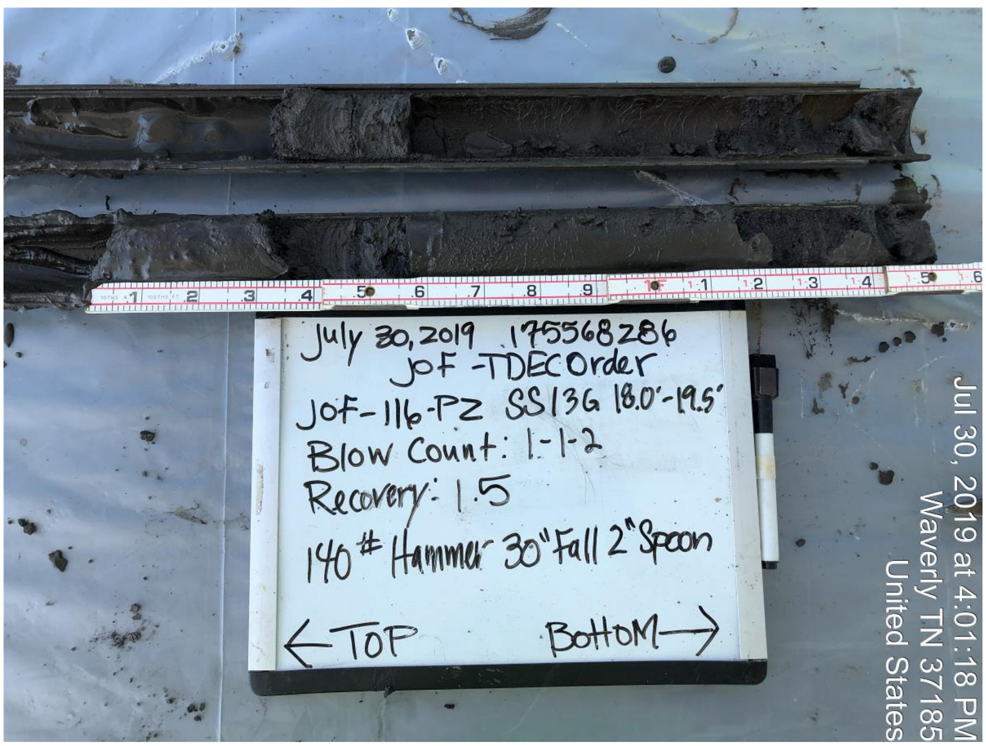
Photo Location:
JOF-116-PZ

Photo Date:
7/30/2019

Comments:
Interval (15.0-16.5 feet).



Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Johnsonville Fossil Plant (JOF)	Site Location:	New Johnsonville, Tennessee

Photograph ID: 209 **Photo Location:** JOF-116-PZ **Photo Date:** 7/30/2019 **Comments:** Interval (16.5-18.0 feet).	
Photograph ID: 210 **Photo Location:** JOF-116-PZ **Photo Date:** 7/30/2019 **Comments:** Interval (18.0-19.5 feet).	

Stantec

Photographic Log

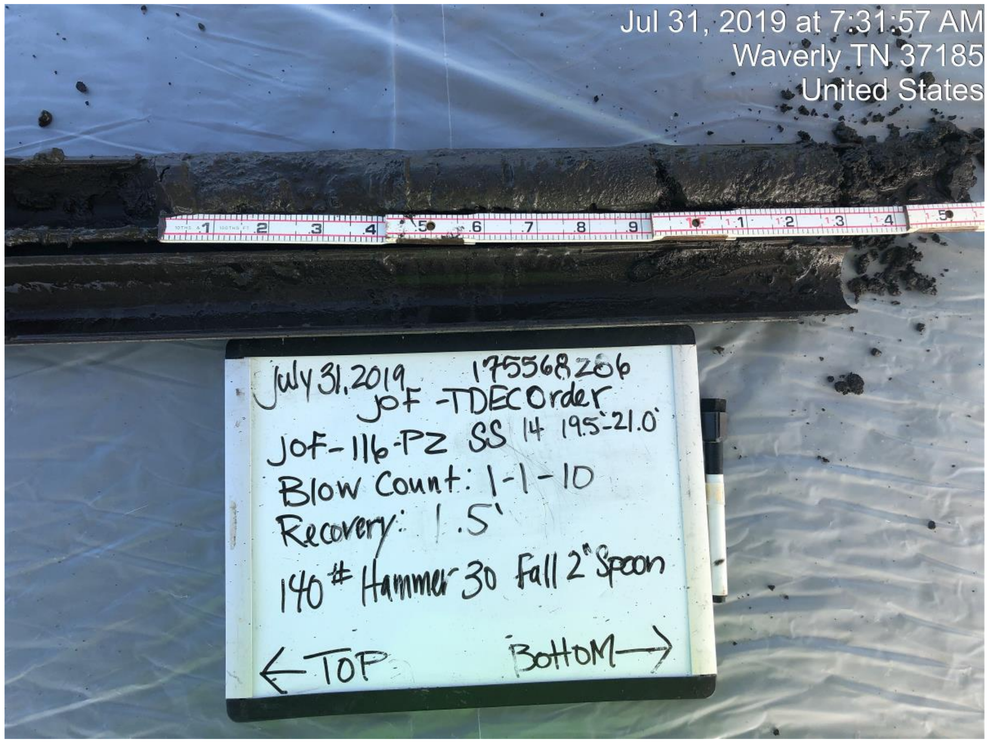
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 211

Photo Location:
JOF-116-PZ

Photo Date:
7/31/2019

Comments:
Interval (19.5-21.0 feet).

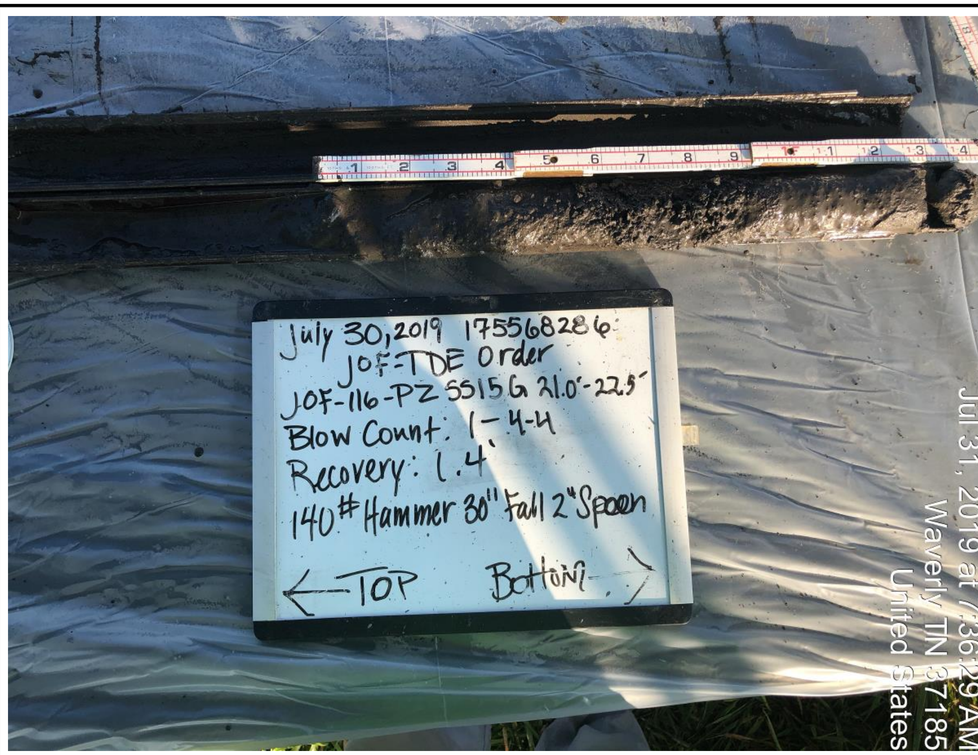


Photograph ID: 212

Photo Location:
JOF-116-PZ

Photo Date:
7/31/2019

Comments:
Interval (21.0-22.5 feet). The date on the white board should be July 31, 2019.



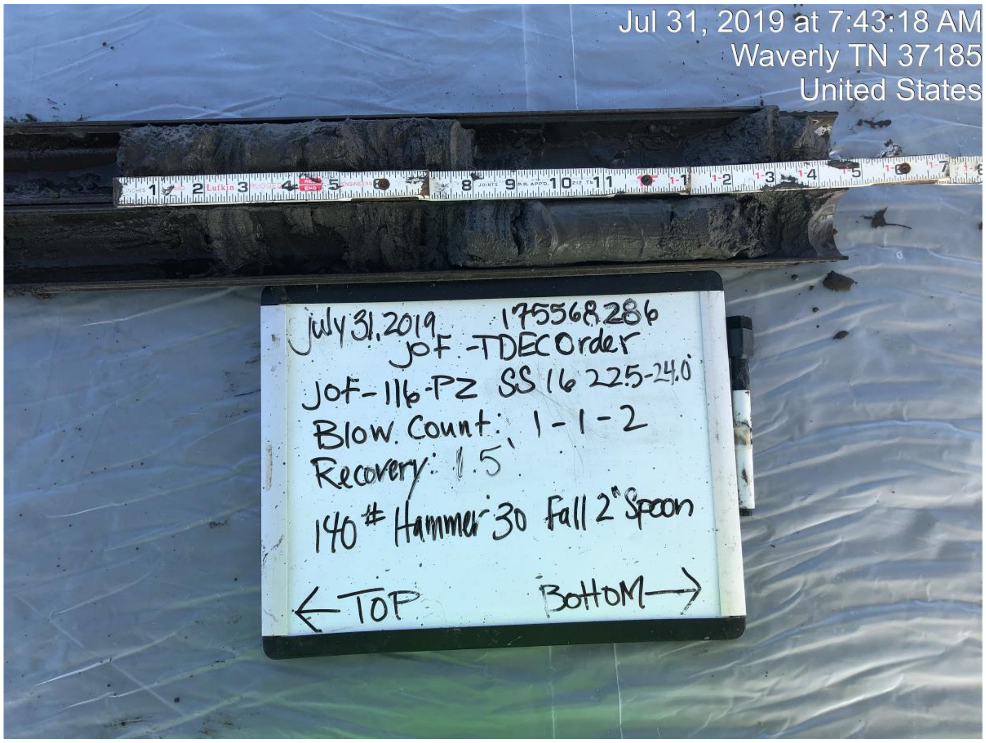
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 213

Photo Location: JOF-116-PZ

Photo Date: 7/31/2019

Comments: Interval (22.5-24.0 feet).

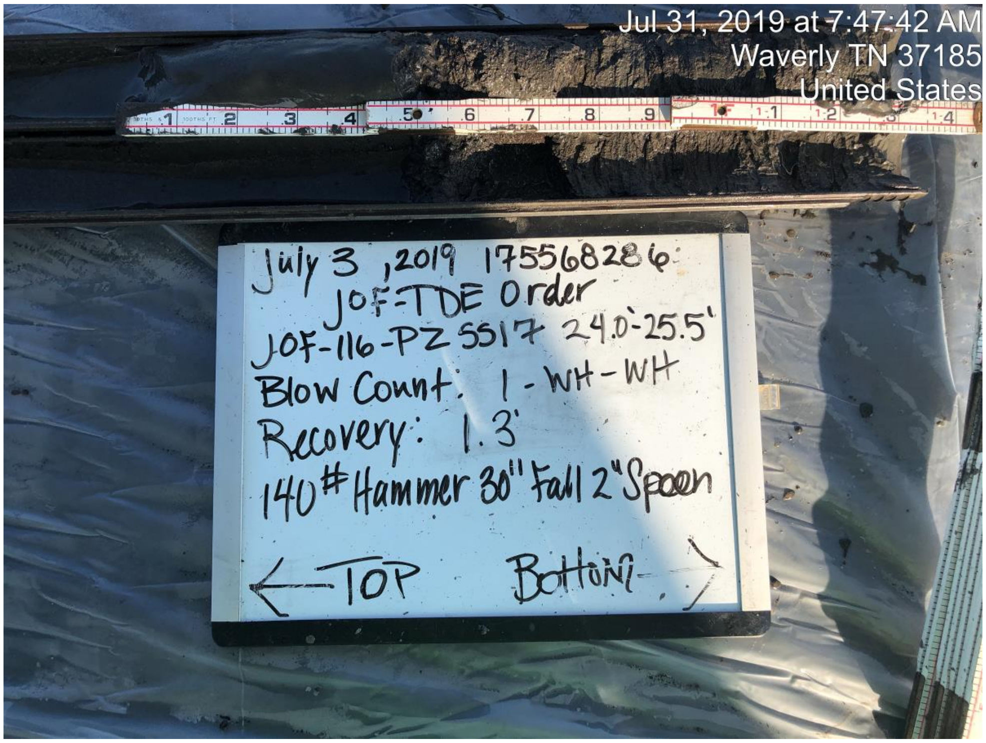


Photograph ID: 214

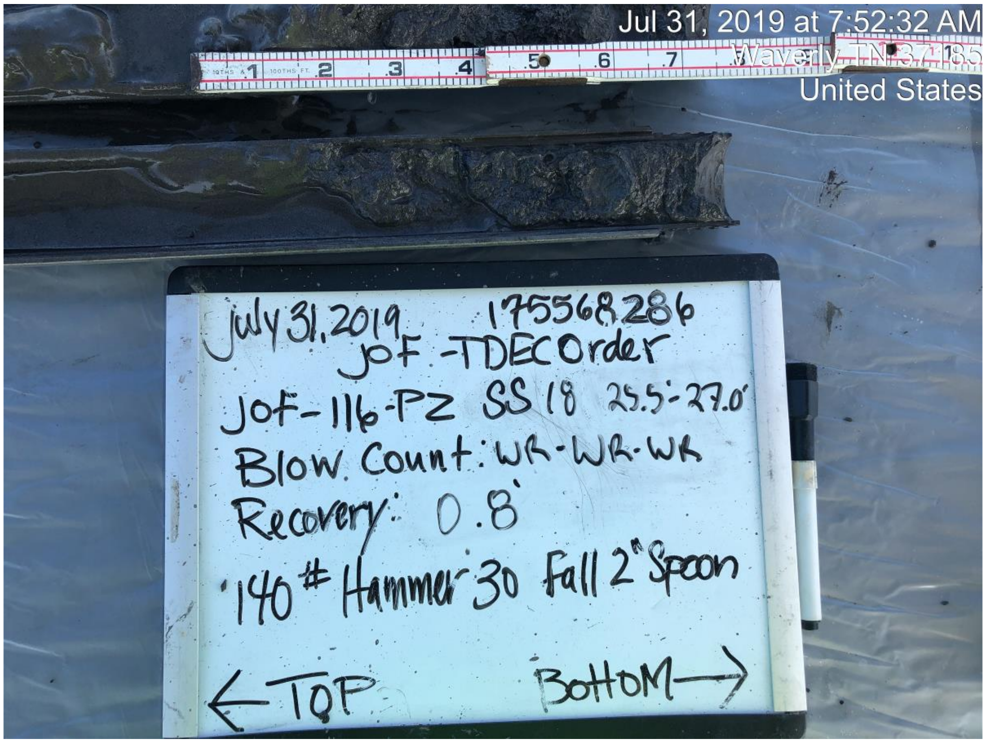
Photo Location: JOF-116-PZ

Photo Date: 7/31/2019

Comments: Interval (24.0-25.5 feet). The date on the white board should be July 31, 2019.



Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 215 **Photo Location:** JOF-116-PZ **Photo Date:** 7/31/2019 **Comments:** Interval (25.5-27.0 feet).	
Photograph ID: 216 **Photo Location:** JOF-116-PZ **Photo Date:** 7/31/2019 **Comments:** Interval (27.0-28.5 feet). The blow count on the white board should be WR-WR-WR.	

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 217

Photo Location: JOF-116-PZ

Photo Date: 7/31/2019

Comments: Interval (28.5-30.0 feet). The date on the white board should be July 31, 2019.

Photograph ID: 218

Photo Location: JOF-116-PZ

Photo Date: 7/31/2019

Comments: Interval (30.0-31.5 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 219

Photo Location:
JOF-116-PZ

Photo Date:
7/31/2019

Comments:
Interval (31.5-33.0 feet).

Photograph ID: 220

Photo Location:
JOF-116-PZ

Photo Date:
7/31/2019

Comments:
Interval (33.0-34.5 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 221

Photo Location: JOF-116-PZ

Photo Date: 7/31/2019

Comments: Interval (34.5-36.0 feet).

Photograph ID: 222

Photo Location: JOF-116-PZ

Photo Date: 7/31/2019

Comments: Interval (36.0-37.5 feet).

Stantec

Photographic Log

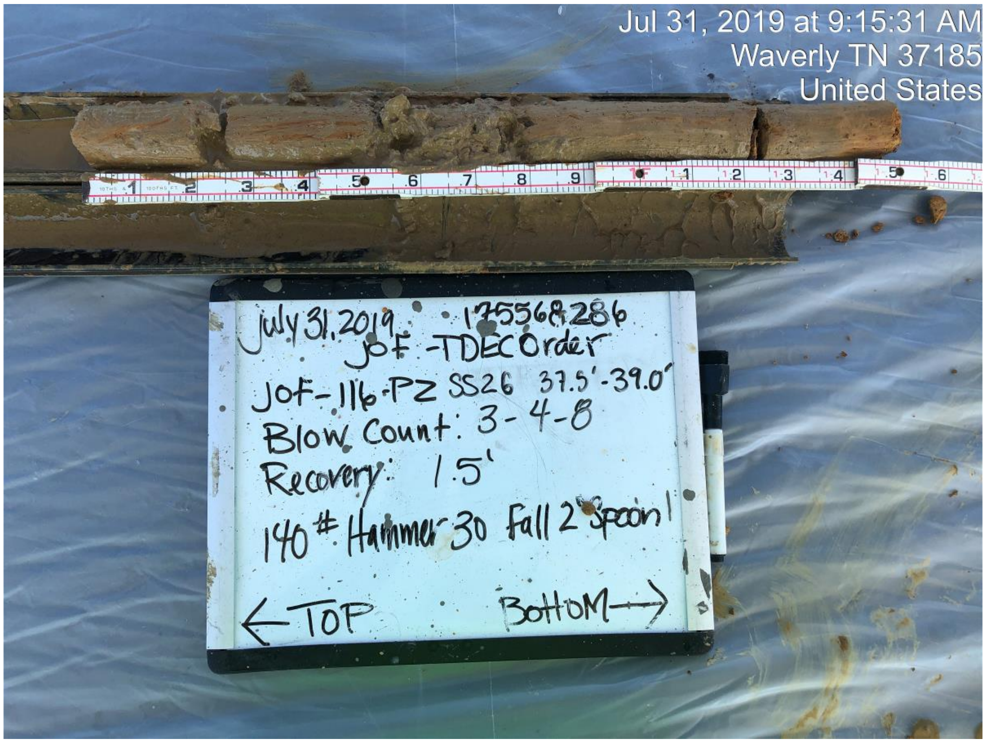
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 223

Photo Location:
JOF-116-PZ

Photo Date:
7/31/2019

Comments:
Interval (37.5-39.0 feet).



Photograph ID: 224

Photo Location:
JOF-116-PZ

Photo Date:
7/31/2019

Comments:
Interval (39.0-40.5 feet).

Stantec — Photographic Log

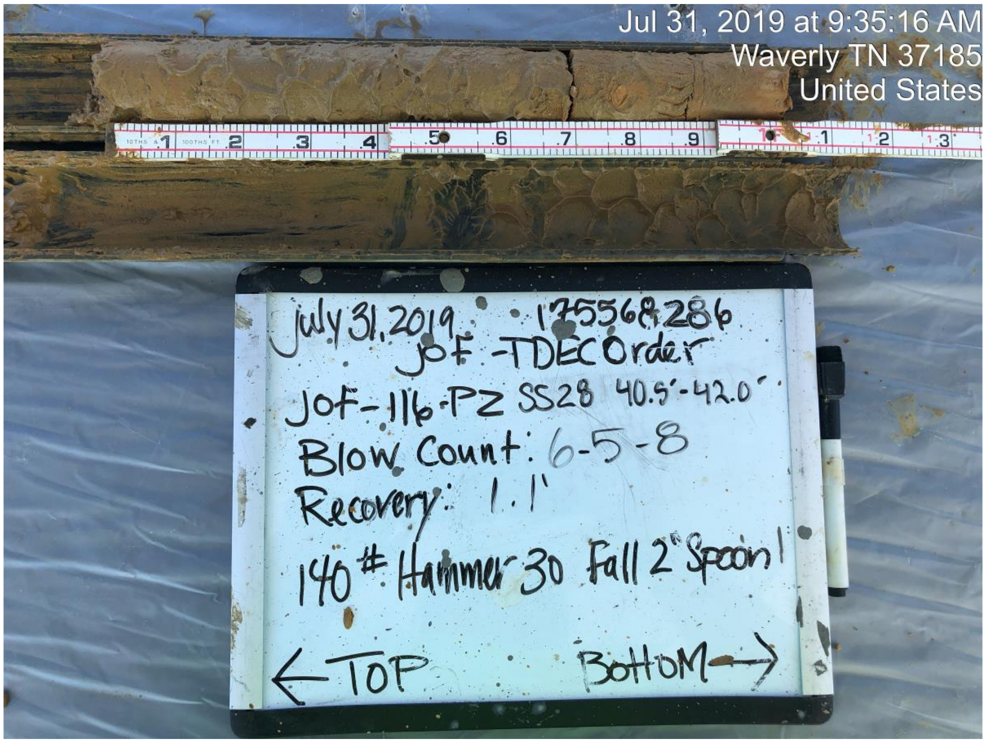
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 225

Photo Location:
JOF-116-PZ

Photo Date:
7/31/2019

Comments:
Interval (40.5-42.0 feet).

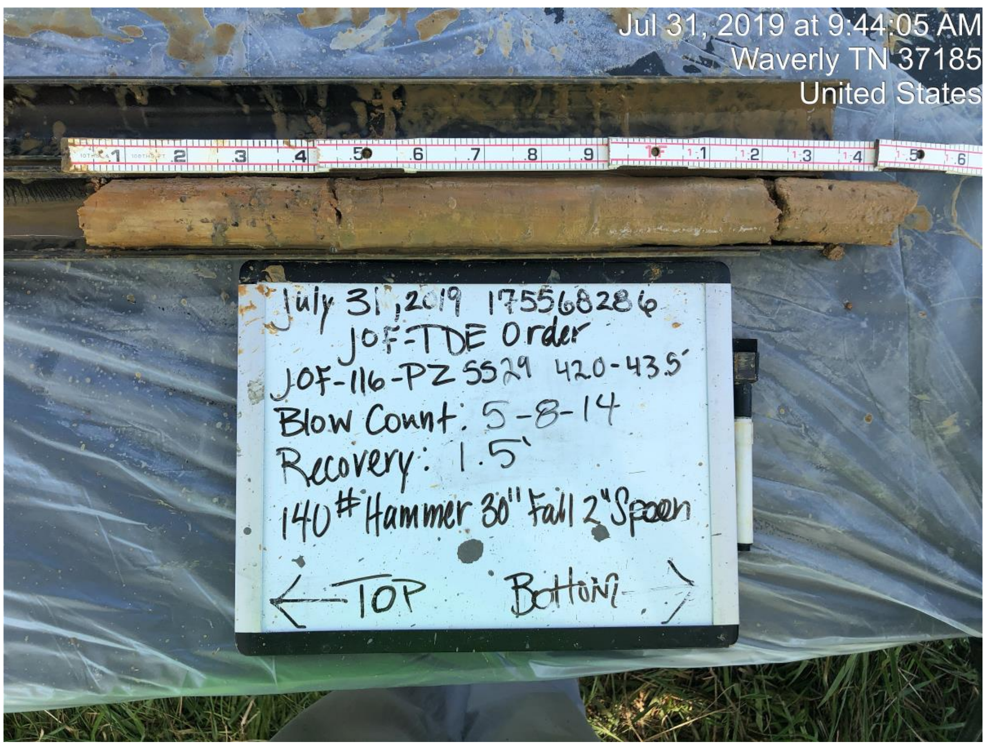


Photograph ID: 226

Photo Location:
JOF-116-PZ

Photo Date:
7/31/2019

Comments:
Interval (42.0-43.5 feet).



Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 227

Photo Location: JOF-116-PZ

Photo Date: 7/31/2019

Comments: Interval (43.5-45.0 feet).

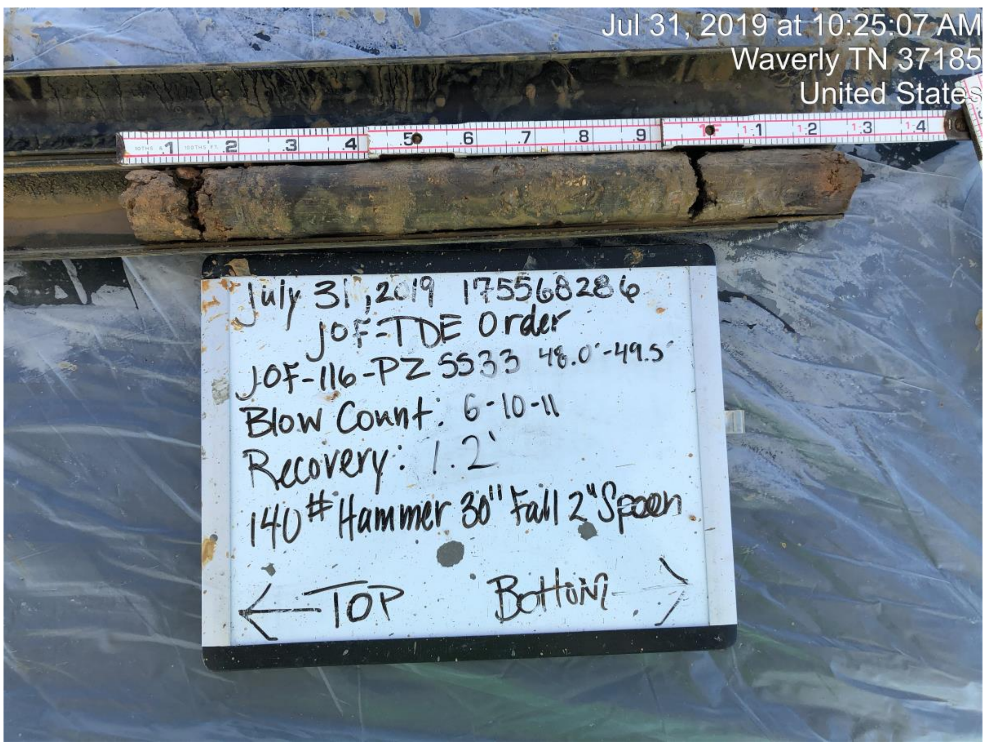
Photograph ID: 228

Photo Location: JOF-116-PZ

Photo Date: 7/31/2019

Comments: Interval (45.0-46.5 feet).

Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Johnsonville Fossil Plant (JOF)	Site Location:	New Johnsonville, Tennessee

Photograph ID: 229 **Photo Location:** JOF-116-PZ **Photo Date:** 7/31/2019 **Comments:** Interval (46.5-48.0 feet).	
Photograph ID: 230 **Photo Location:** JOF-116-PZ **Photo Date:** 7/31/2019 **Comments:** Interval (48.0-49.5 feet).	

Stantec **Photographic Log**

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 231

Photo Location: JOF-116-PZ

Photo Date: 7/31/2019

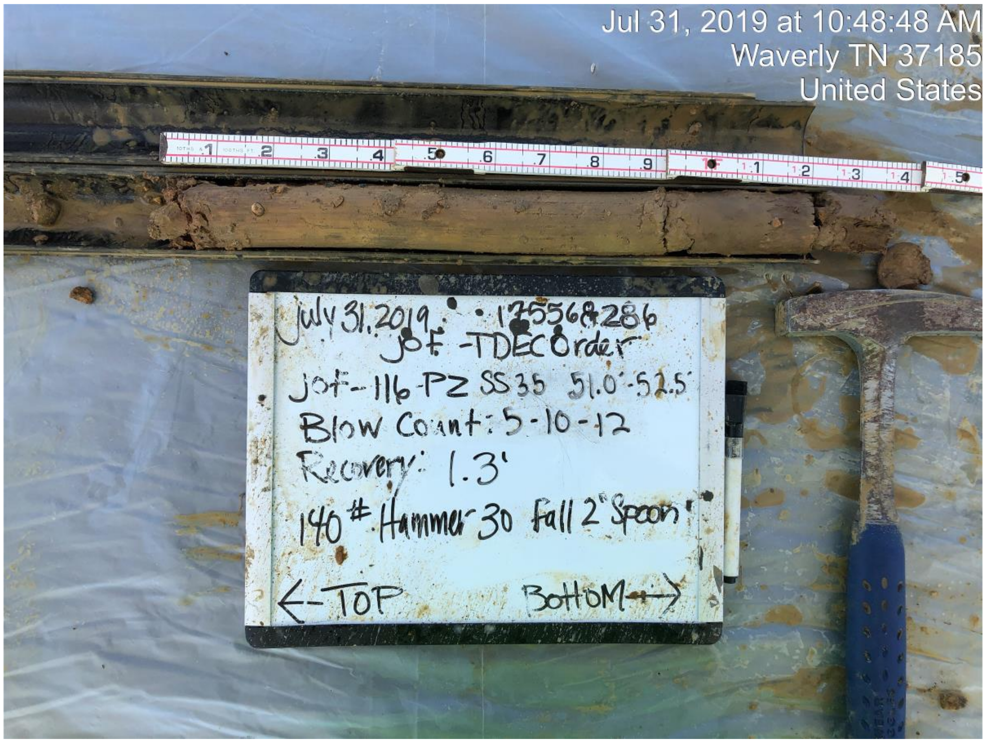
Comments: Interval (49.5-51.0 feet).

Photograph ID: 232

Photo Location: JOF-116-PZ

Photo Date: 7/31/2019

Comments: Interval (51.0-52.5 feet).



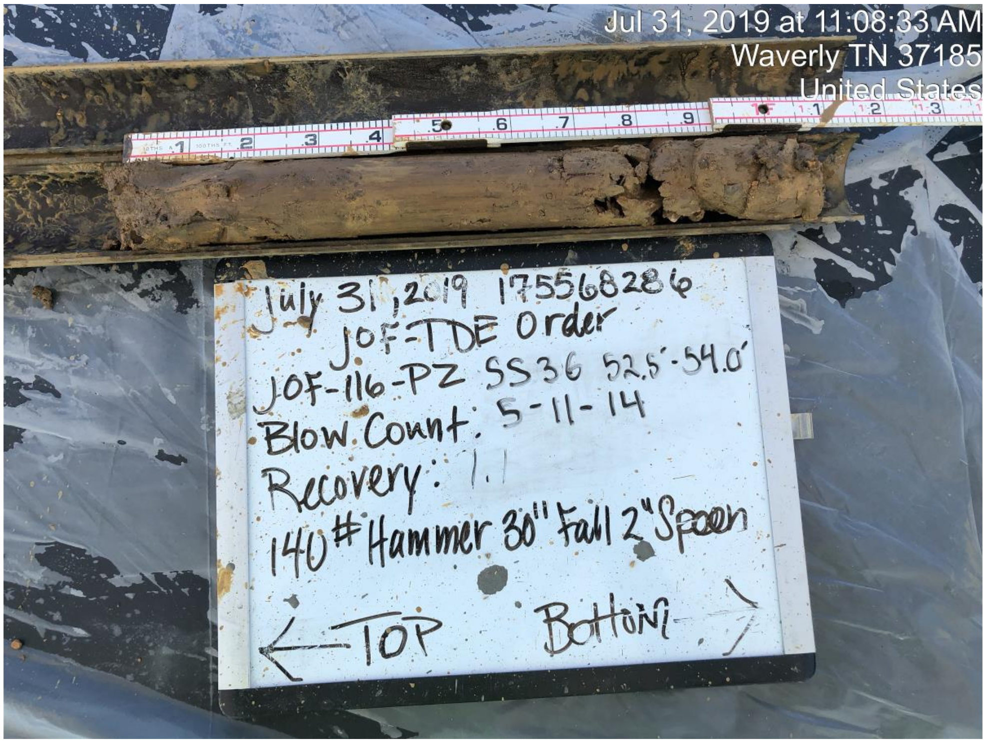
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 233

Photo Location:
JOF-116-PZ

Photo Date:
7/31/2019

Comments:
Interval (52.5-54.0 feet). The recovery on the white board should be 1.1 feet.



Photograph ID: 234

Photo Location:
JOF-116-PZ

Photo Date:
7/31/2019

Comments:
Interval (54.0-54.9 feet).

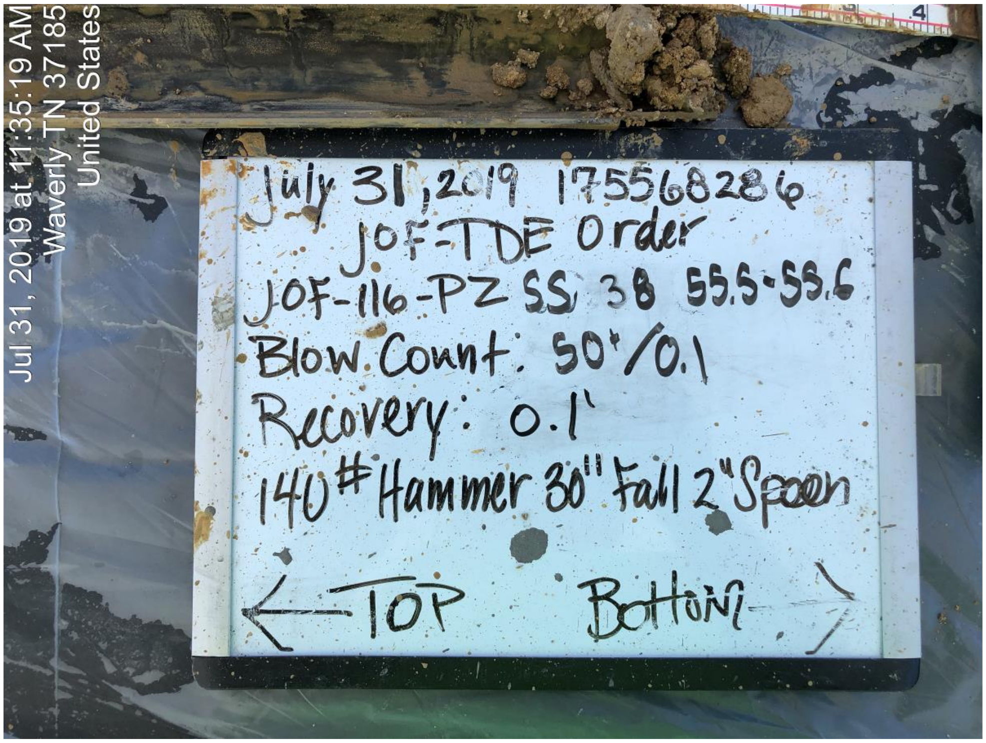
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 235

Photo Location:
JOF-116-PZ

Photo Date:
7/31/2019

Comments:
Interval (55.5-55.6 feet). Boring first encountered CCR at 3.3 feet. Boring refusal at 55.6 feet.

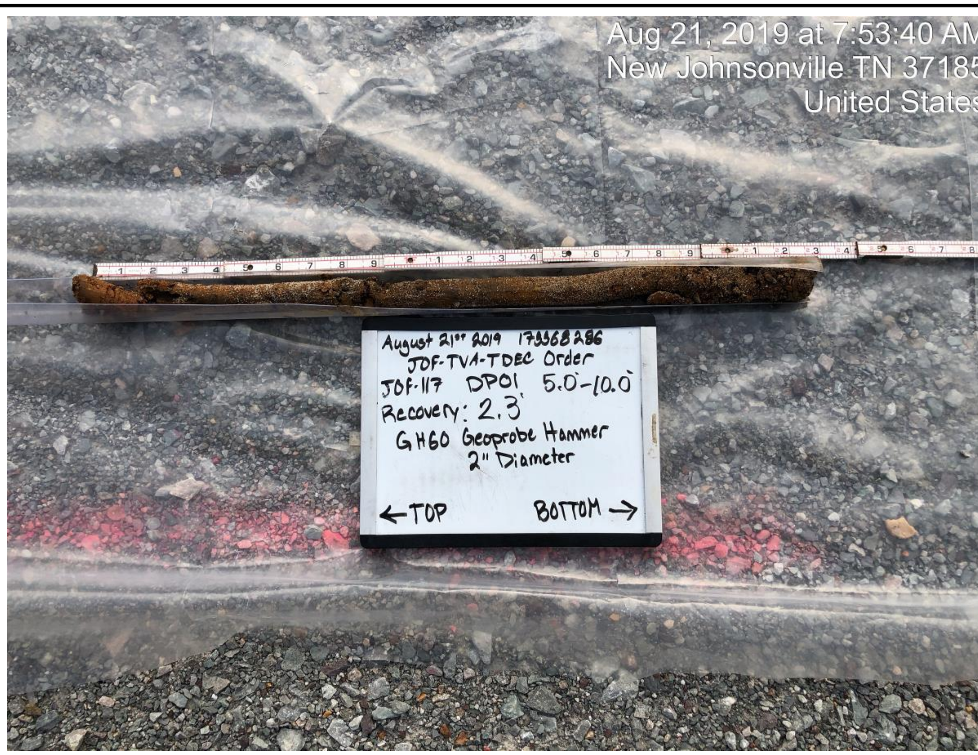


Photograph ID: 236

Photo Location:
JOF-117 Offset A

Photo Date:
8/21/2019

Comments:
First boring location interval (5.0-10.0 feet). The boring ID on the white board should be JOF-117 Offset A.



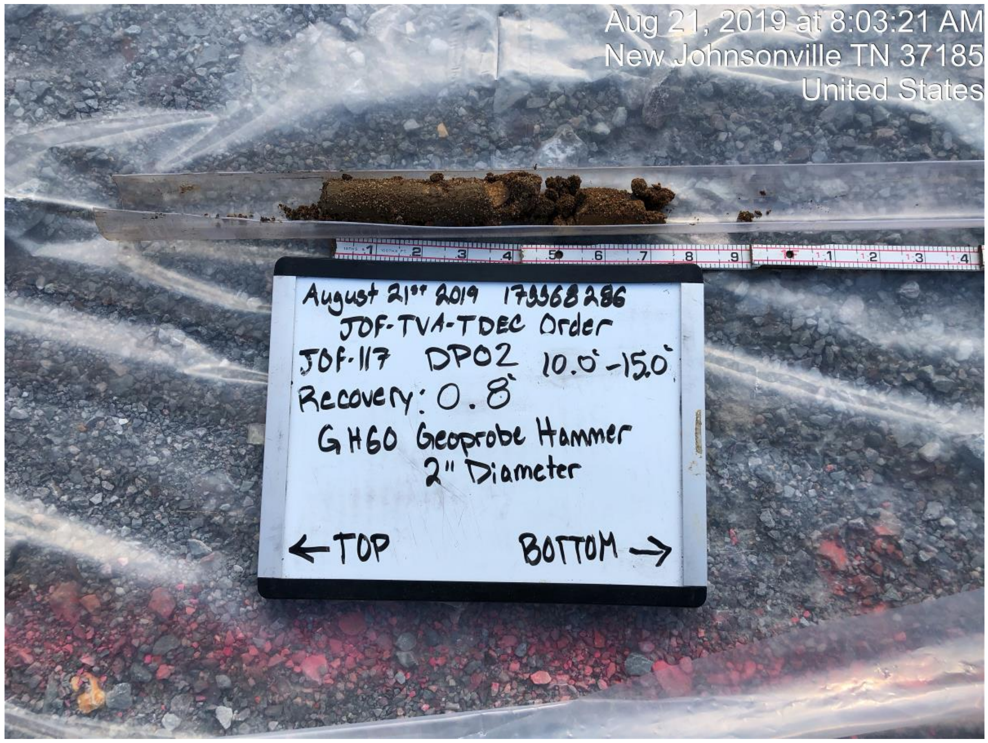
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 237

Photo Location:
JOF-117 Offset A

Photo Date:
8/21/2019

Comments:
First boring location interval (10.0-15.0 feet). The boring ID on the white board should be JOF-117 Offset A.



Photograph ID: 238

Photo Location:
JOF-117 Offset A

Photo Date:
8/21/2019

Comments:
First boring location interval (15.0-20.0 feet). The boring ID on the white board should be JOF-117 Offset A.

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 239

Photo Location:
JOF-117 Offset A

Photo Date:
8/21/2019

Comments:
First boring location interval (20.0-25.0 feet). The boring ID on the white board should be JOF-117 Offset A.

Photograph ID: 240

Photo Location:
JOF-117 Offset A

Photo Date:
8/21/2019

Comments:
First boring location interval (25.0-30.0 feet). The boring ID on the white board should be JOF-117 Offset A.

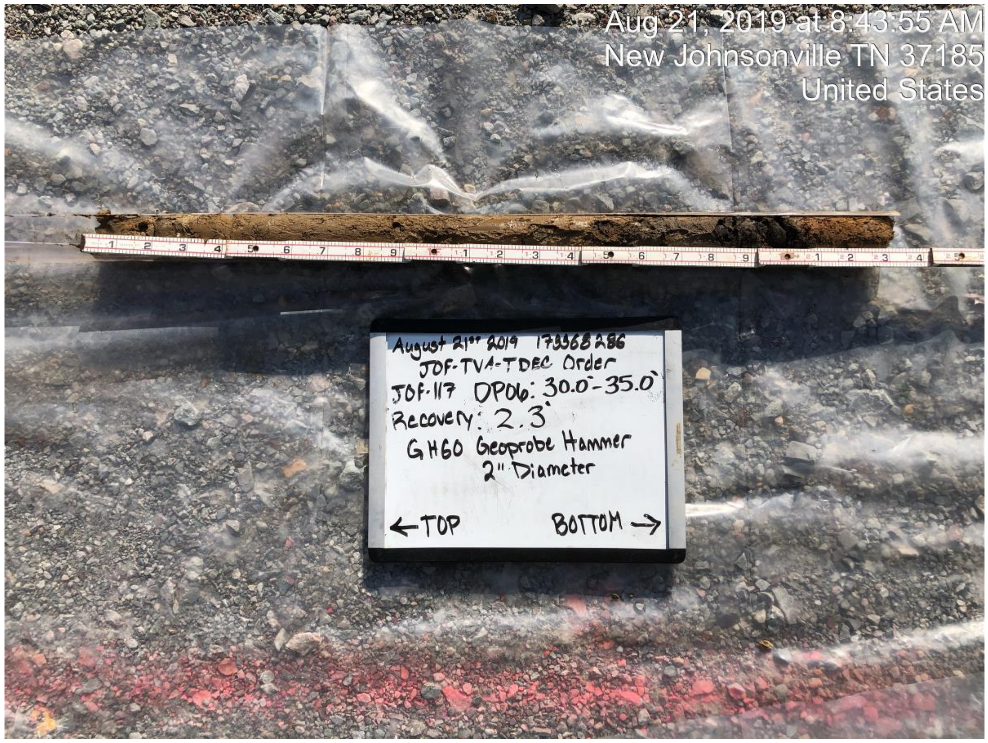
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 241

Photo Location:
JOF-117 Offset A

Photo Date:
8/21/2019

Comments:
First boring location interval (30.0-35.0 feet). The boring ID on the white board should be JOF-117 Offset A.

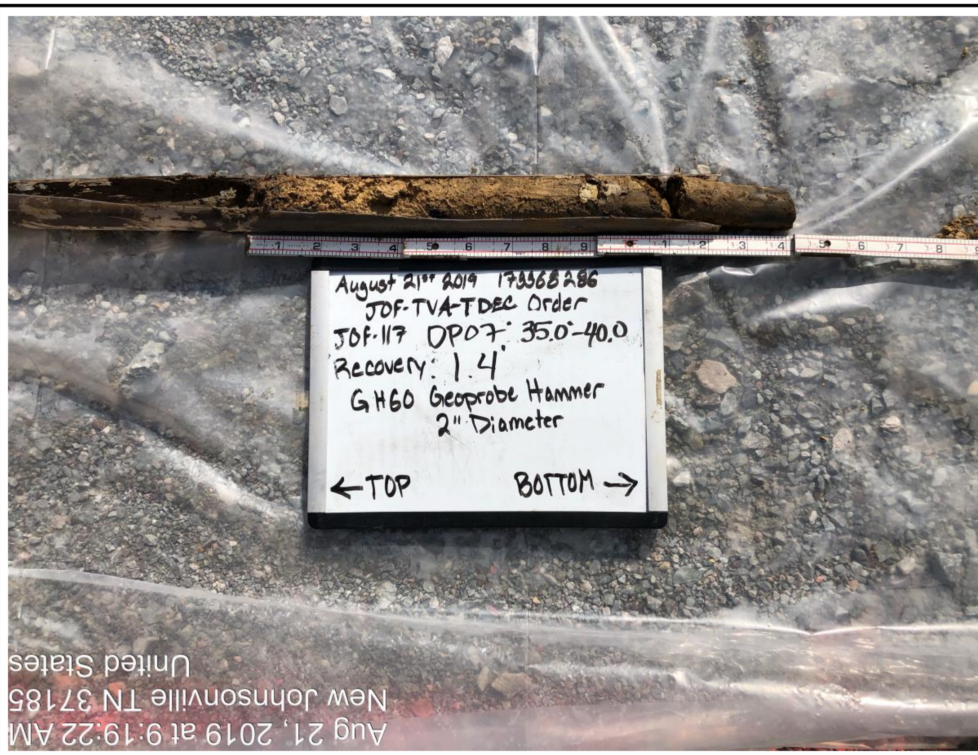


Photograph ID: 242

Photo Location:
JOF-117 Offset A

Photo Date:
8/21/2019

Comments:
First boring location interval (35.0-40.0 feet). The boring ID on the white board should be JOF-117 Offset A.



Stantec **Photographic Log**

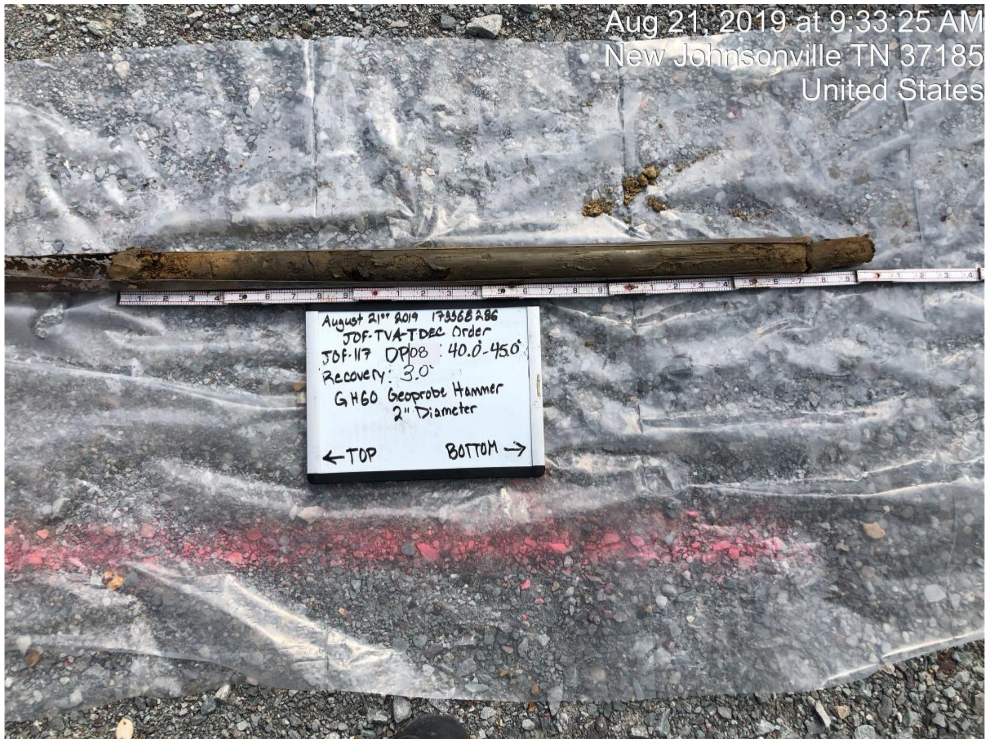
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 243

Photo Location:
JOF-117 Offset A

Photo Date:
8/21/2019

Comments:
First boring location interval (40.0-45.0 feet). The boring ID on the white board should be JOF-117 Offset A.



Photograph ID: 244

Photo Location:
JOF-117

Photo Date:
9/12/2019

Comments:
Photo of second boring location interval (6.0-7.5 feet) unavailable. Offset 3 feet to the north of the first boring.

No Photo Applicable

Stantec

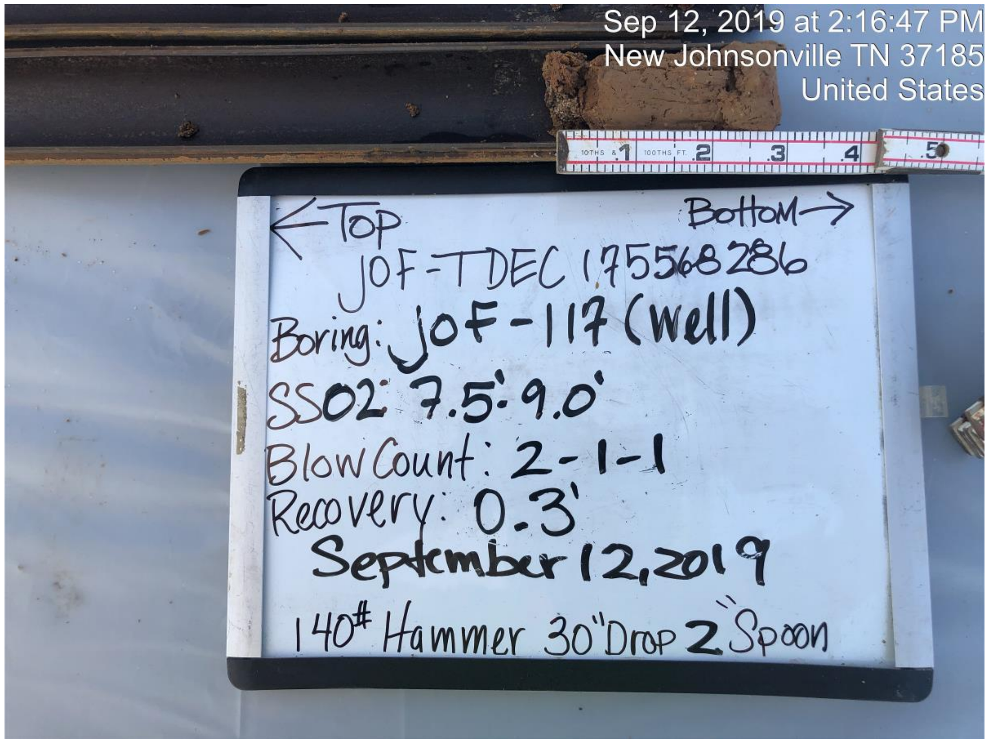
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 245

Photo Location: JOF-117

Photo Date: 9/12/2019

Comments: Second boring location interval (7.5-9.0 feet). The boring location shown on the white board is JOF-117.

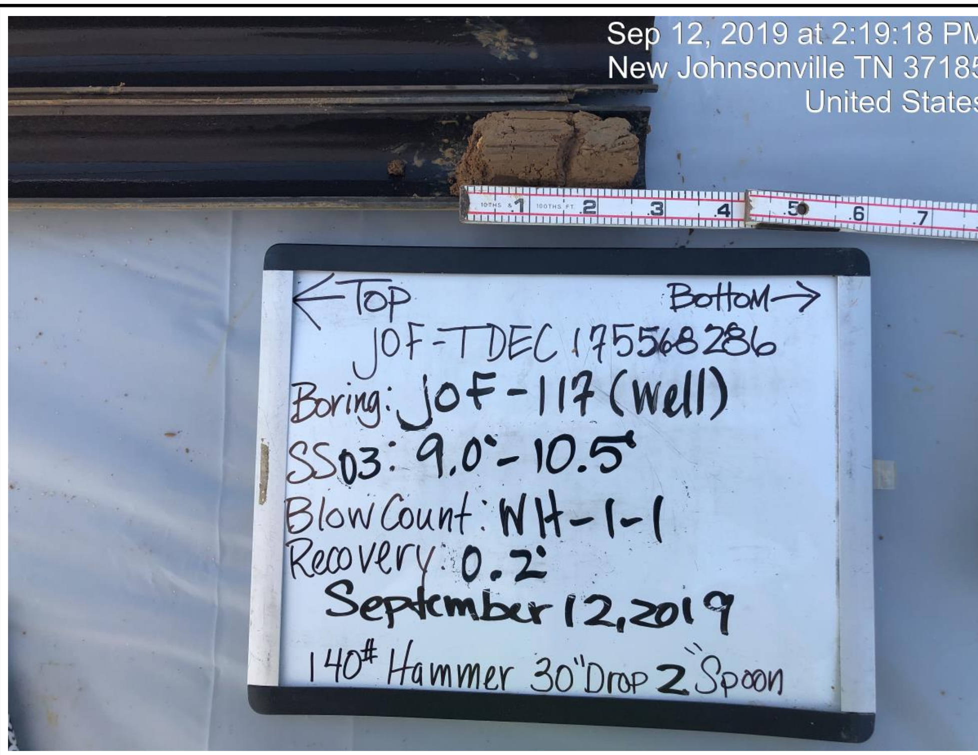


Photograph ID: 246

Photo Location: JOF-117

Photo Date: 9/12/2019

Comments: Second boring location interval (9.0-10.5 feet). The boring location shown on the white board is JOF-117.



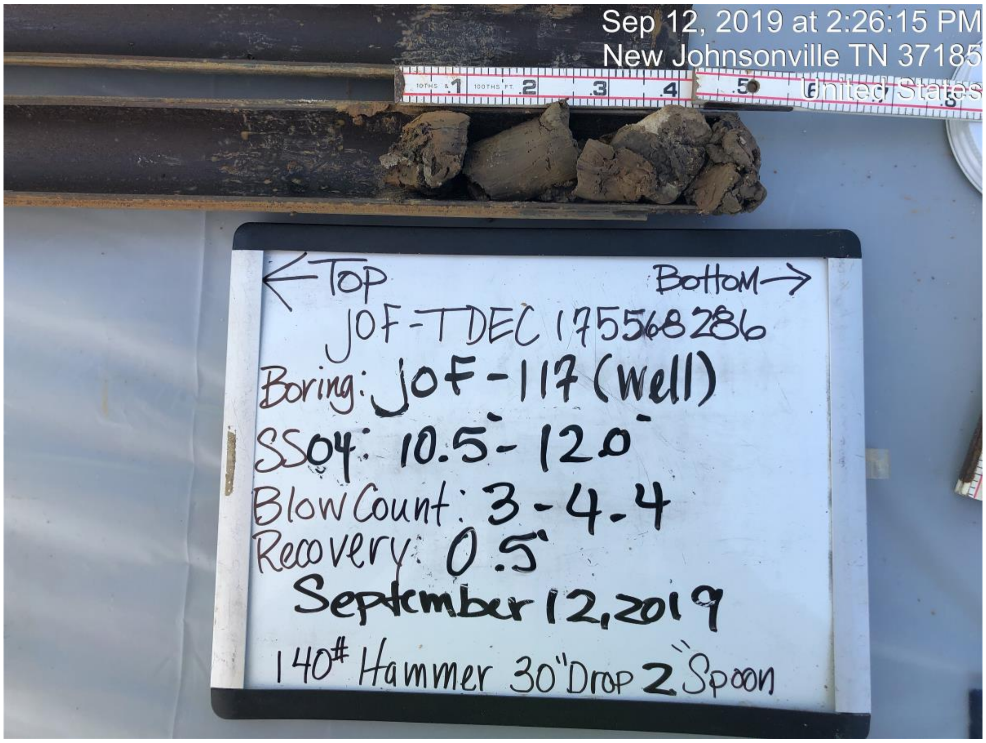
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 247

Photo Location: JOF-117

Photo Date: 9/12/2019

Comments: Second boring location interval (10.5-12.0 feet). The boring location shown on the white board is JOF-117.

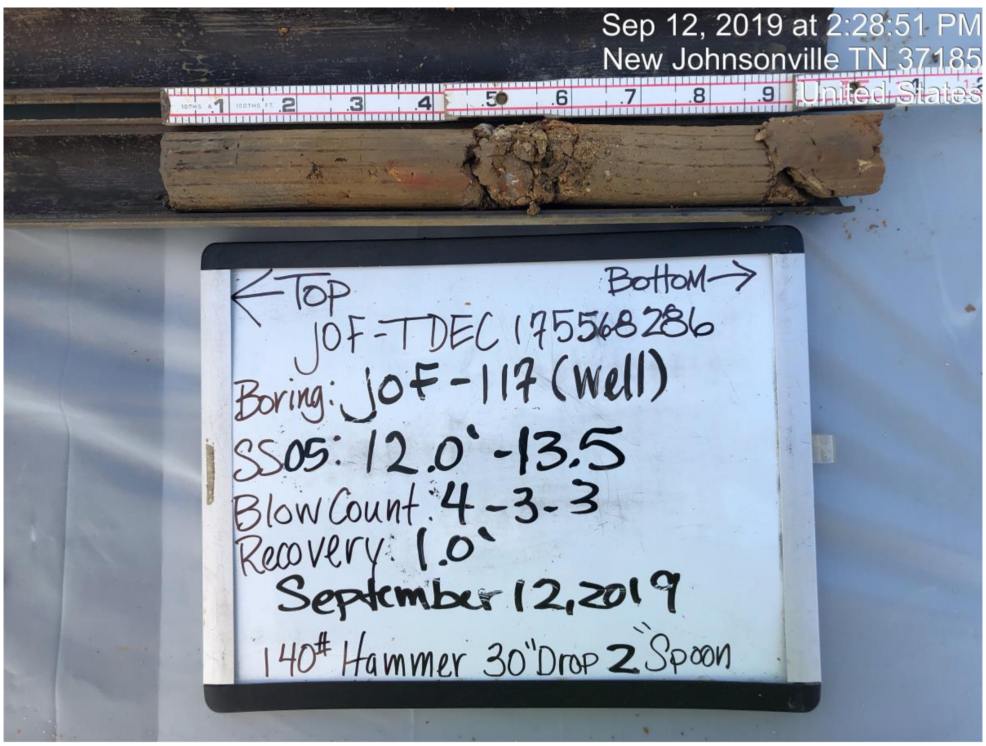


Photograph ID: 248

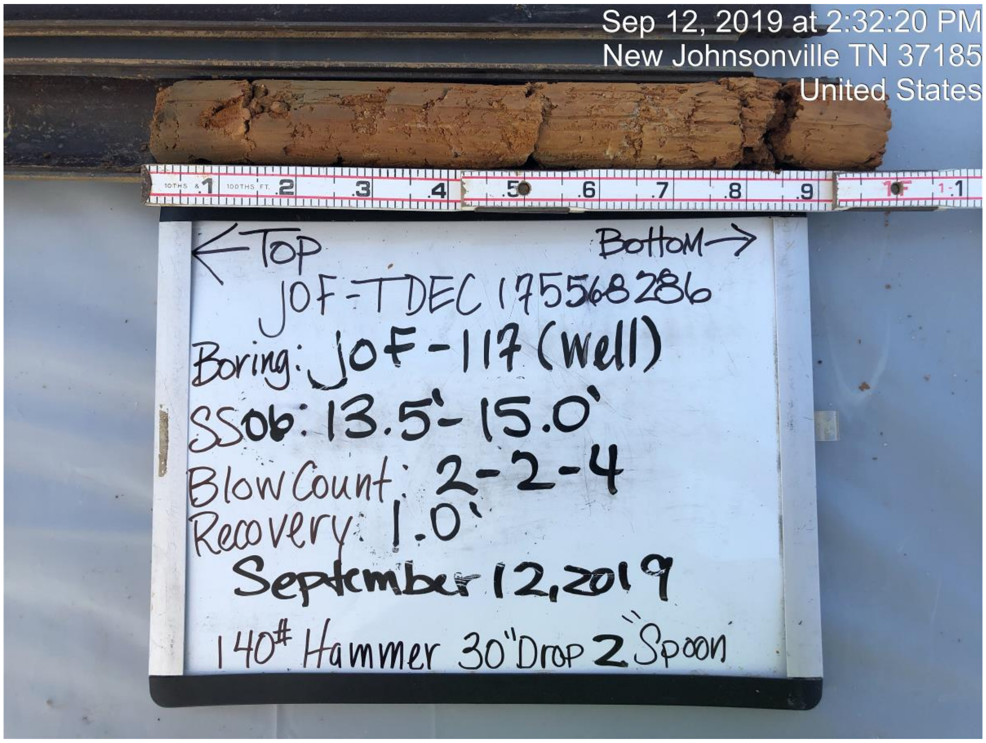
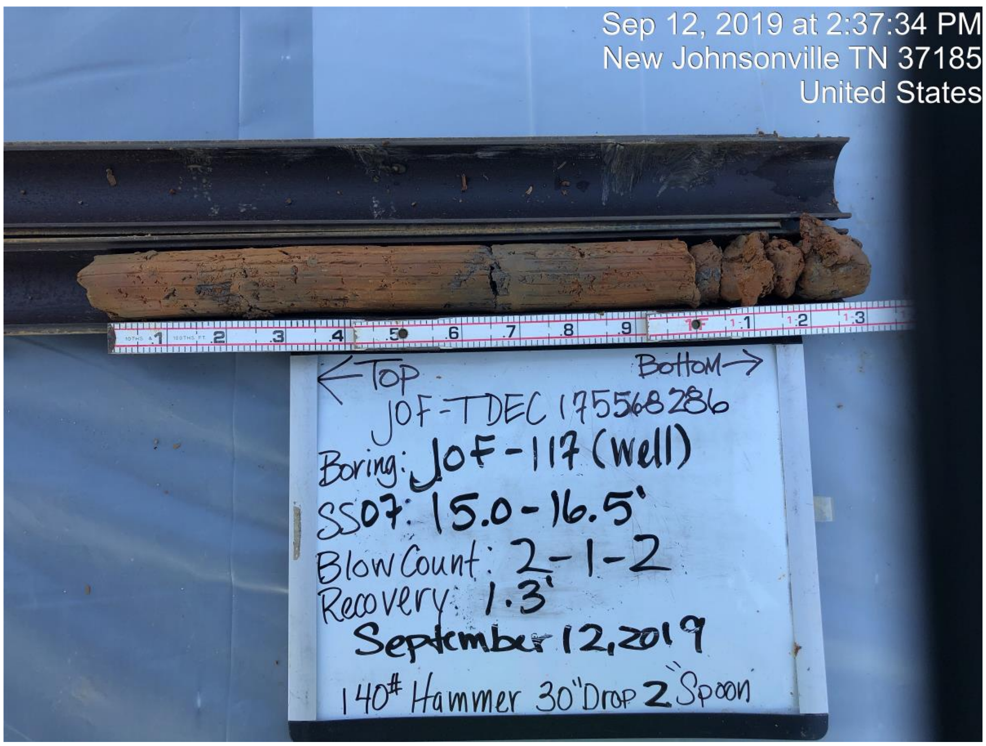
Photo Location: JOF-117

Photo Date: 9/12/2019

Comments: Second boring location interval (12.0-13.5 feet). The boring location shown on the white board is JOF-117.



Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Johnsonville Fossil Plant (JOF)	Site Location:	New Johnsonville, Tennessee

Photograph ID: 249 **Photo Location:** JOF-117 **Photo Date:** 9/12/2019 **Comments:** Second boring location interval (13.5-15.0 feet). The boring location shown on the white board is JOF-117.	
Photograph ID: 250 **Photo Location:** JOF-117 **Photo Date:** 9/12/2019 **Comments:** Second boring location interval (15.0-16.5 feet). The boring location shown on the white board is JOF-117.	

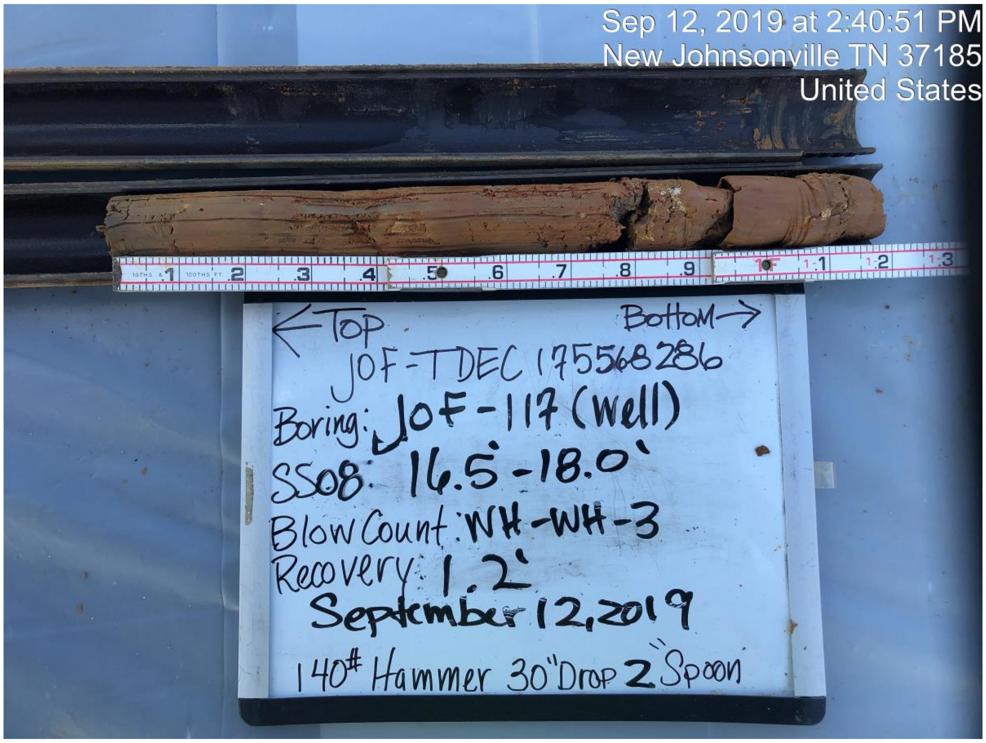
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 251

Photo Location: JOF-117

Photo Date: 9/12/2019

Comments: Second boring location interval (16.5-18.0 feet). The boring location shown on the white board is JOF-117.

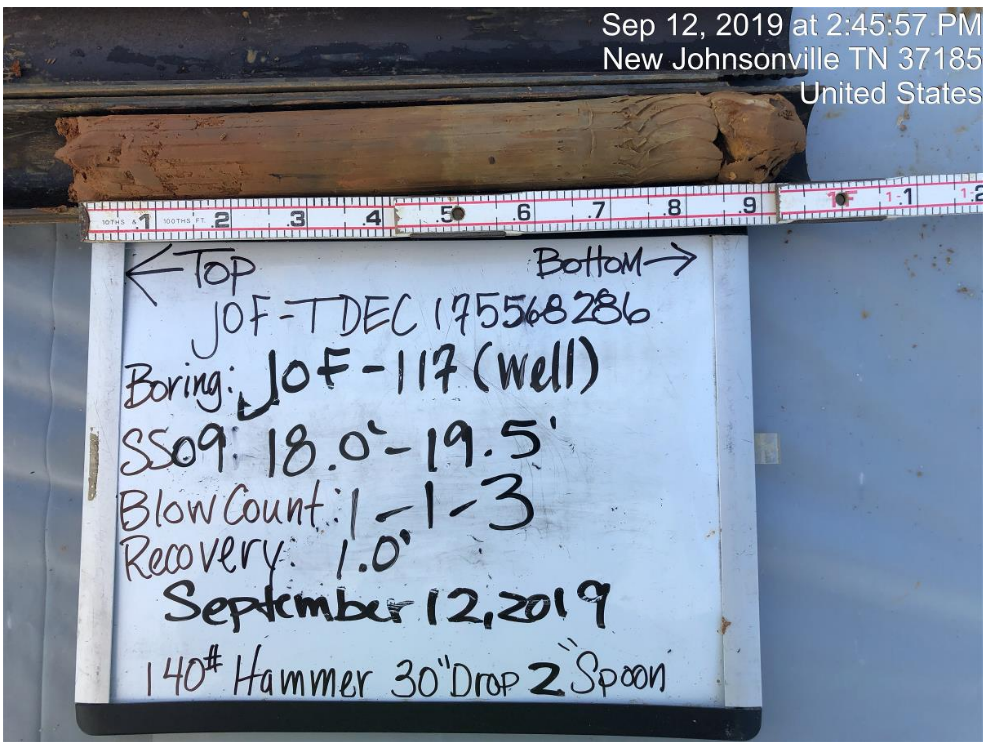


Photograph ID: 252

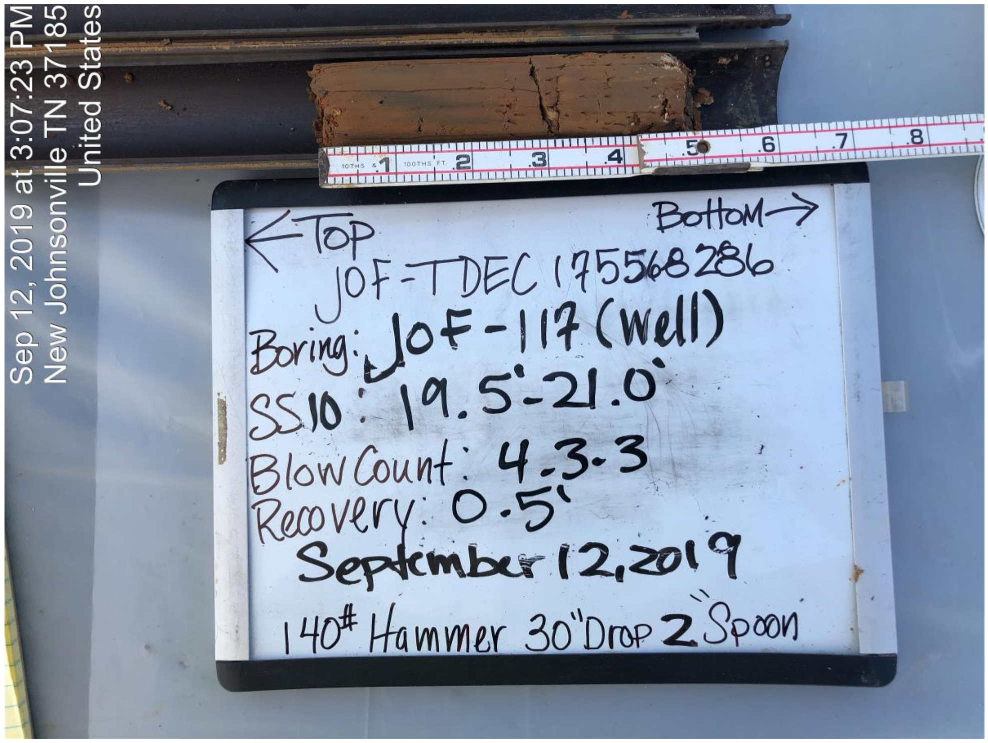
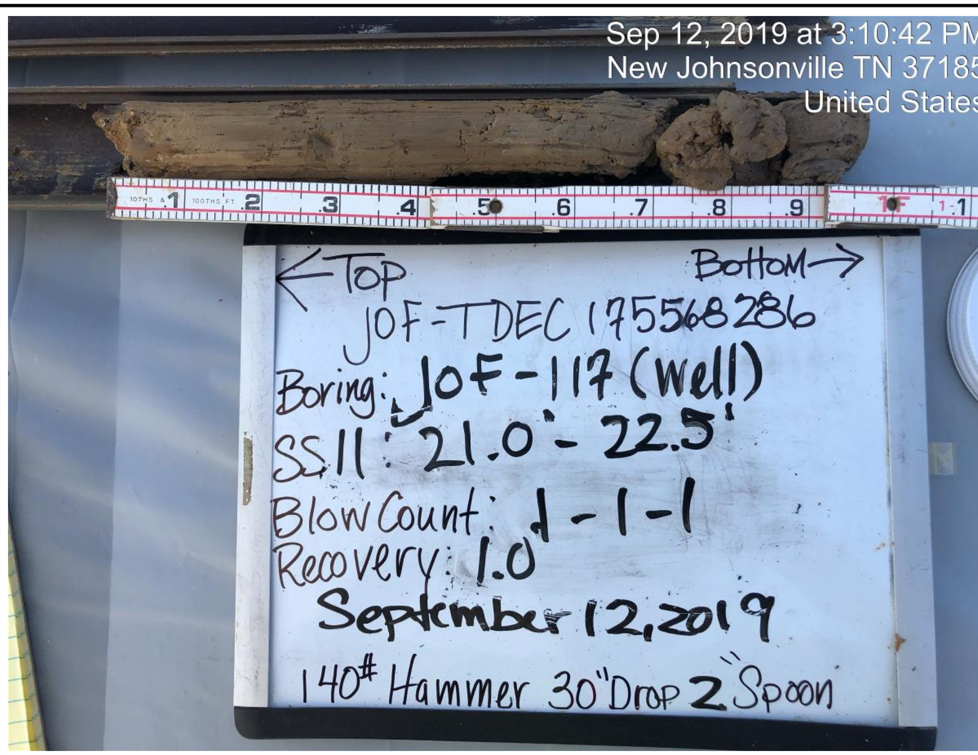
Photo Location: JOF-117

Photo Date: 9/12/2019

Comments: Second boring location interval (18.0-19.5 feet). The boring location shown on the white board is JOF-117.The blow count on the white board should be 1-4-3.



Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Johnsonville Fossil Plant (JOF)	Site Location:	New Johnsonville, Tennessee

Photograph ID: 253 **Photo Location:** JOF-117 **Photo Date:** 9/12/2019 **Comments:** Second boring location interval (19.5-21.0 feet). The boring location shown on the white board is JOF-117.	
Photograph ID: 254 **Photo Location:** JOF-117 **Photo Date:** 9/12/2019 **Comments:** Second boring location interval (21.0-22.5 feet). The boring location shown on the white board is JOF-117.	

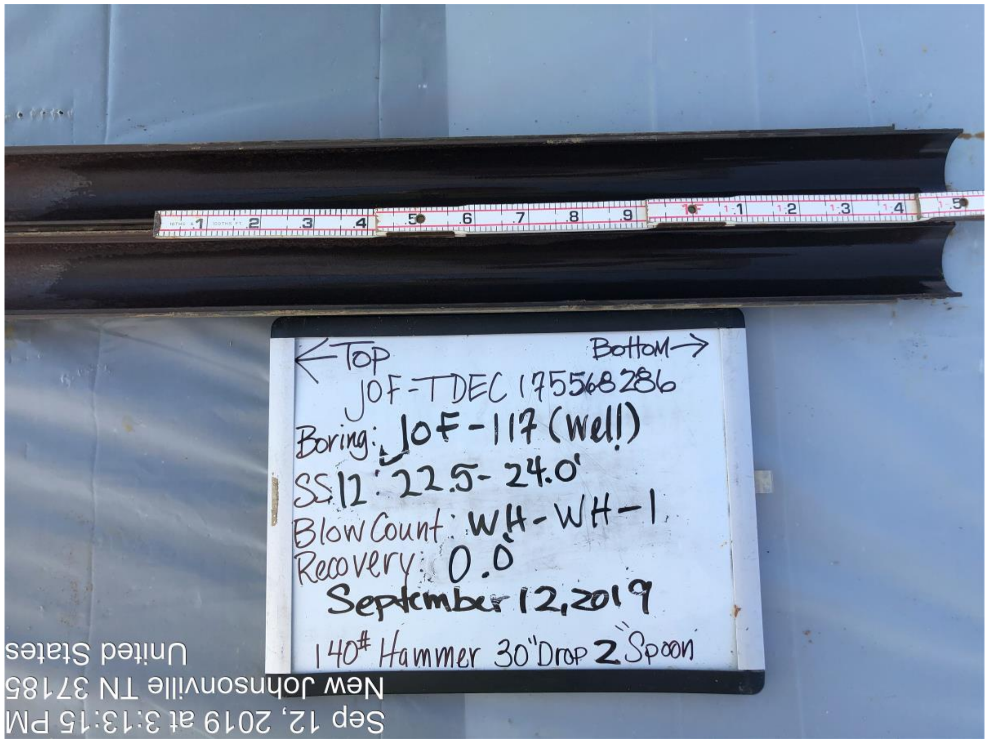
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 255

Photo Location:
JOF-117

Photo Date:
9/12/2019

Comments:
Second boring location interval (22.5-24.0 feet). The boring location shown on the white board is JOF-117.

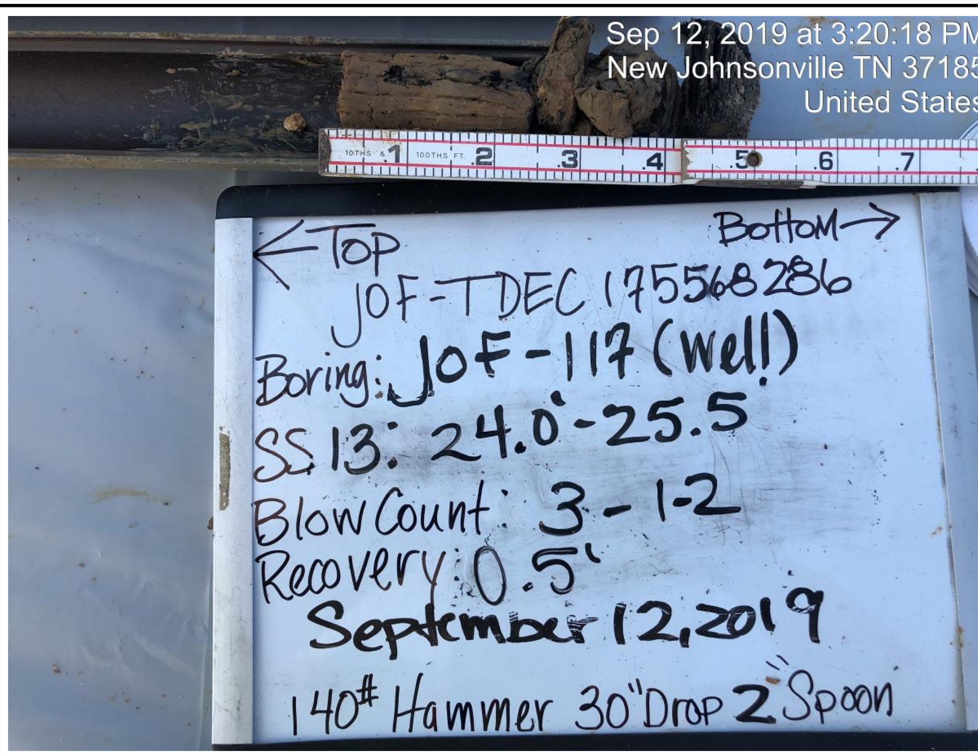


Photograph ID: 256

Photo Location:
JOF-117

Photo Date:
9/12/2019

Comments:
Second boring location interval (24.0-25.5 feet). The boring location shown on the white board is JOF-117.



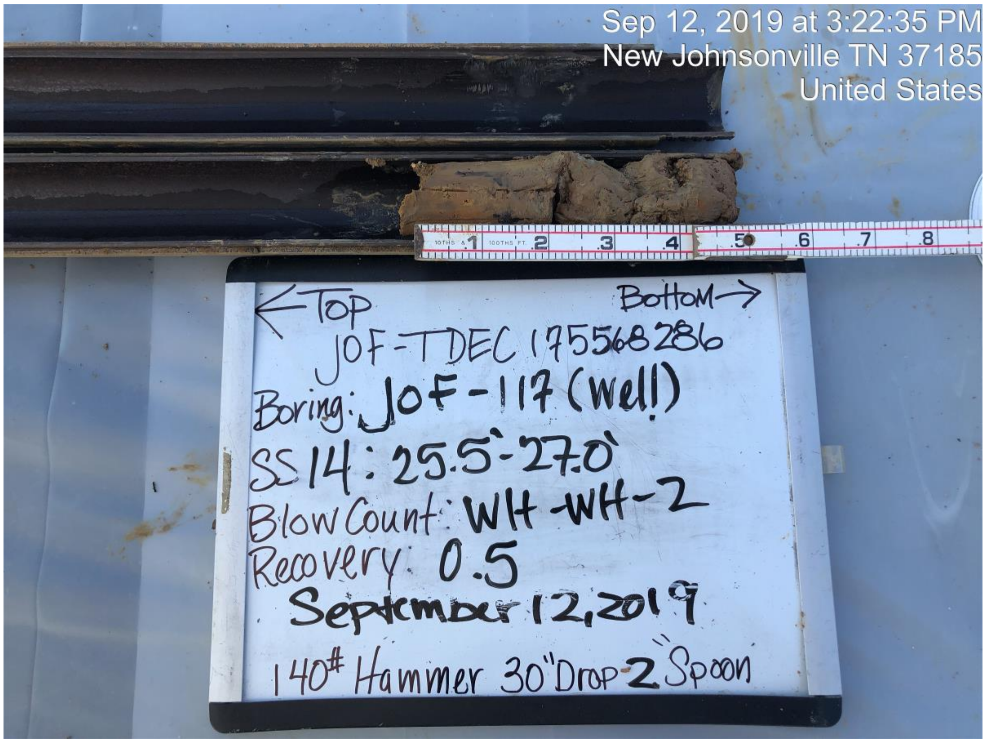
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 257

Photo Location:
JOF-117

Photo Date:
9/12/2019

Comments:
Second boring location interval (25.5-27.0 feet). The boring location shown on the white board is JOF-117.

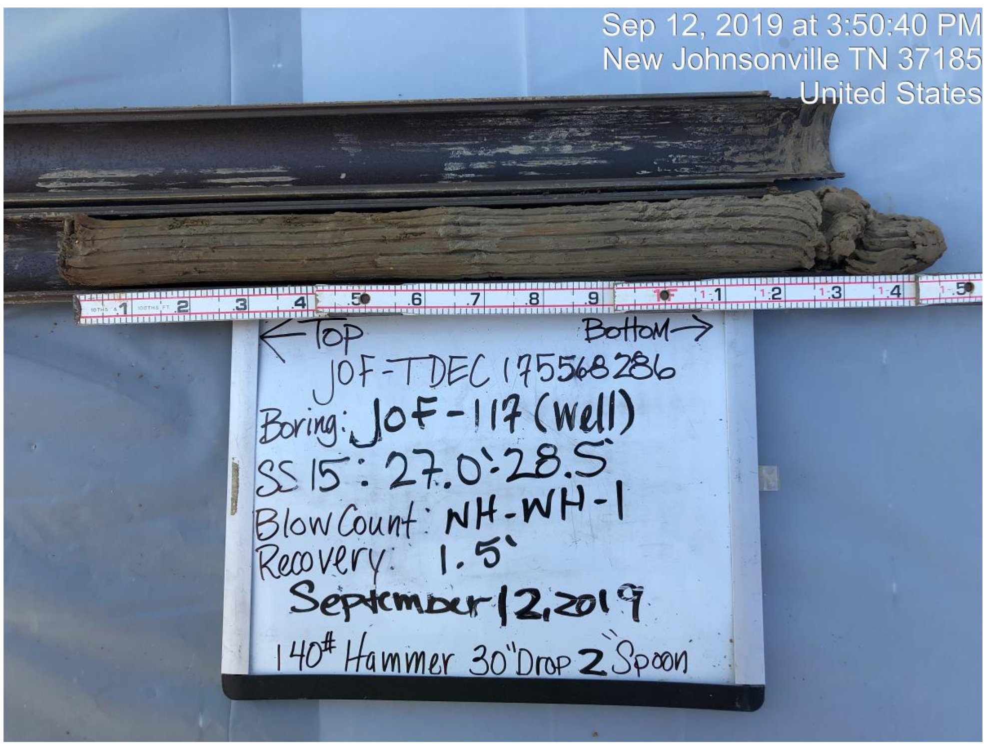


Photograph ID: 258

Photo Location:
JOF-117

Photo Date:
9/12/2019

Comments:
Second boring location interval (27.0-28.5 feet). The boring location shown on the white board is JOF-117.



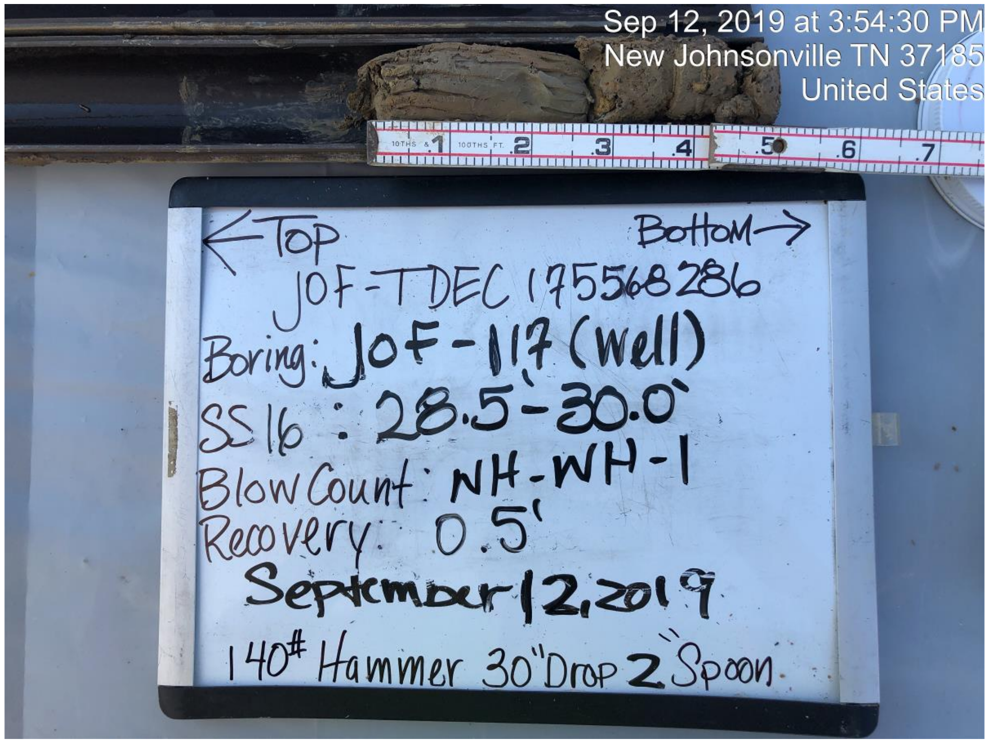
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 259

Photo Location:
JOF-117

Photo Date:
9/12/2019

Comments:
Second boring location interval (28.5-30.0 feet). The boring location shown on the white board is JOF-117.

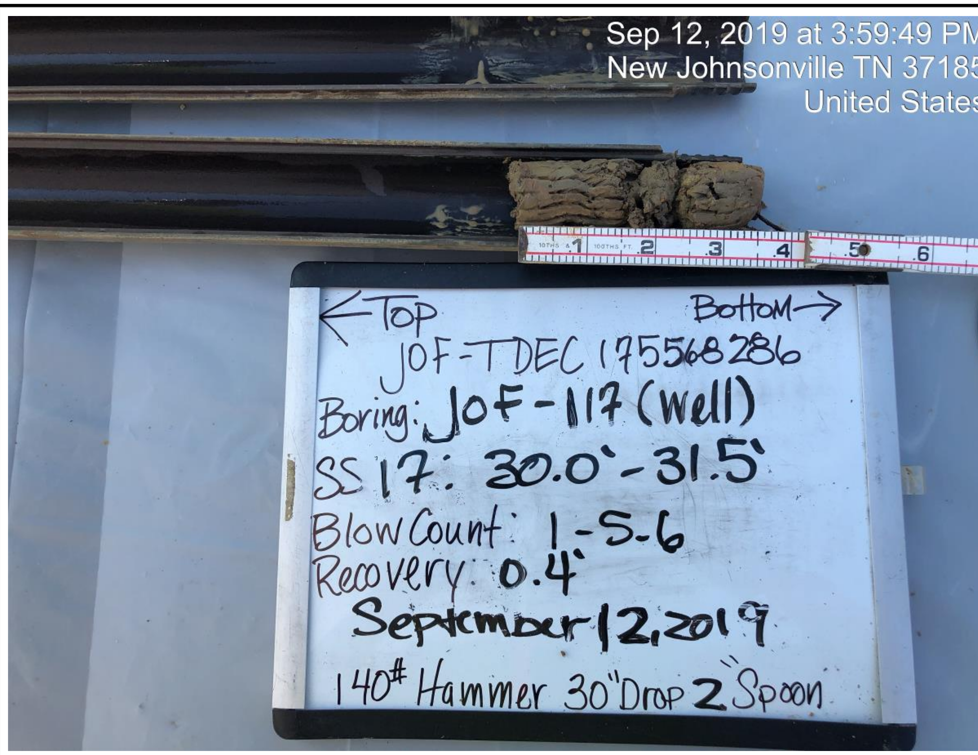


Photograph ID: 260

Photo Location:
JOF-117

Photo Date:
9/12/2019

Comments:
Second boring location interval (30.0-31.5 feet). The boring location shown on the white board is JOF-117.



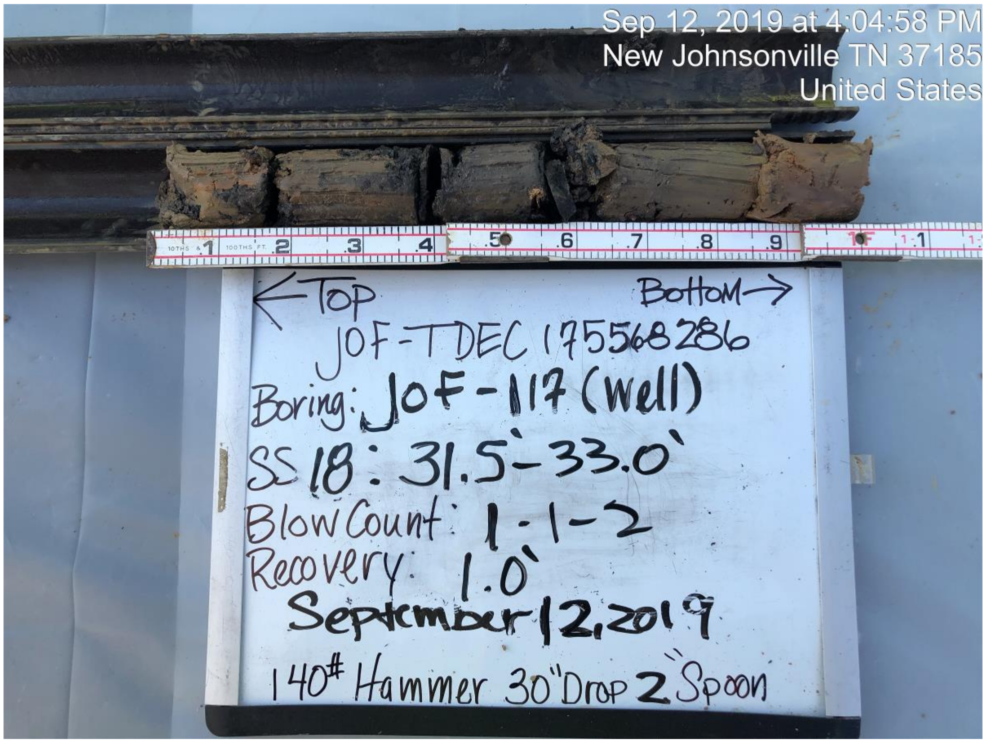
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 261

Photo Location:
JOF-117

Photo Date:
9/12/2019

Comments:
Second boring location interval (31.5-33.0 feet). The boring location shown on the white board is JOF-117.

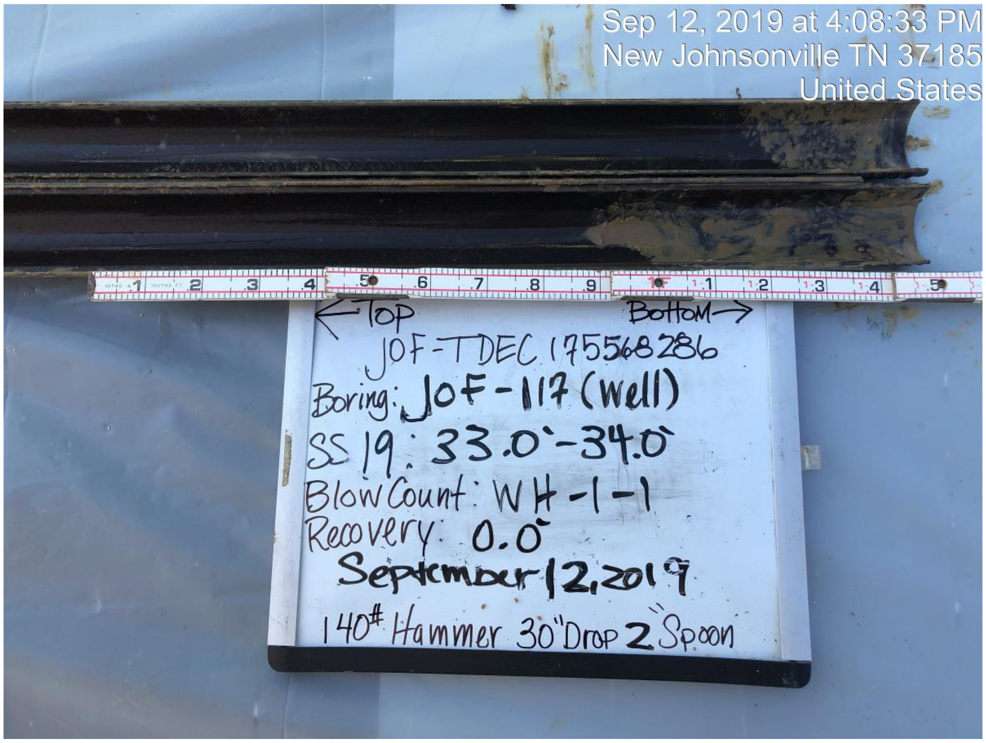


Photograph ID: 262

Photo Location:
JOF-117

Photo Date:
9/12/2019

Comments:
Second boring location interval (33.0-34.5 feet). The boring location shown on the white board is JOF-117. The depth range on the white board should be 33.0-34.5 feet.



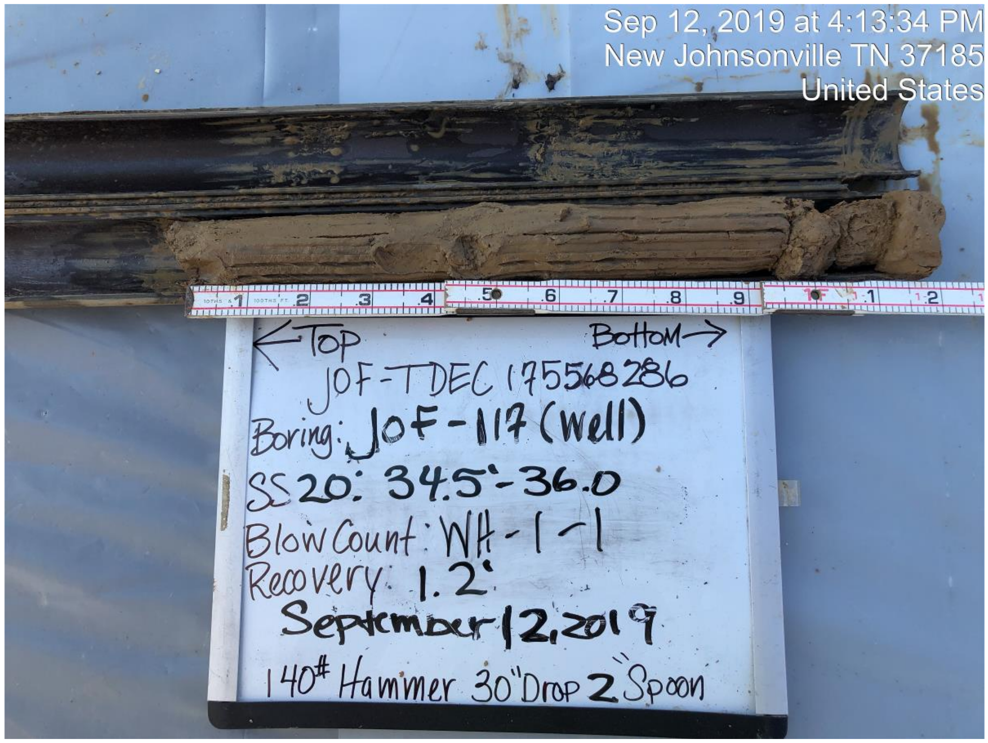
Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Johnsonville Fossil Plant (JOF)	Site Location:	New Johnsonville, Tennessee

Photograph ID: 263

Photo Location:
JOF-117

Photo Date:
9/12/2019

Comments:
Second boring location interval (34.5-36.0 feet). The boring location shown on the white board is JOF-117.

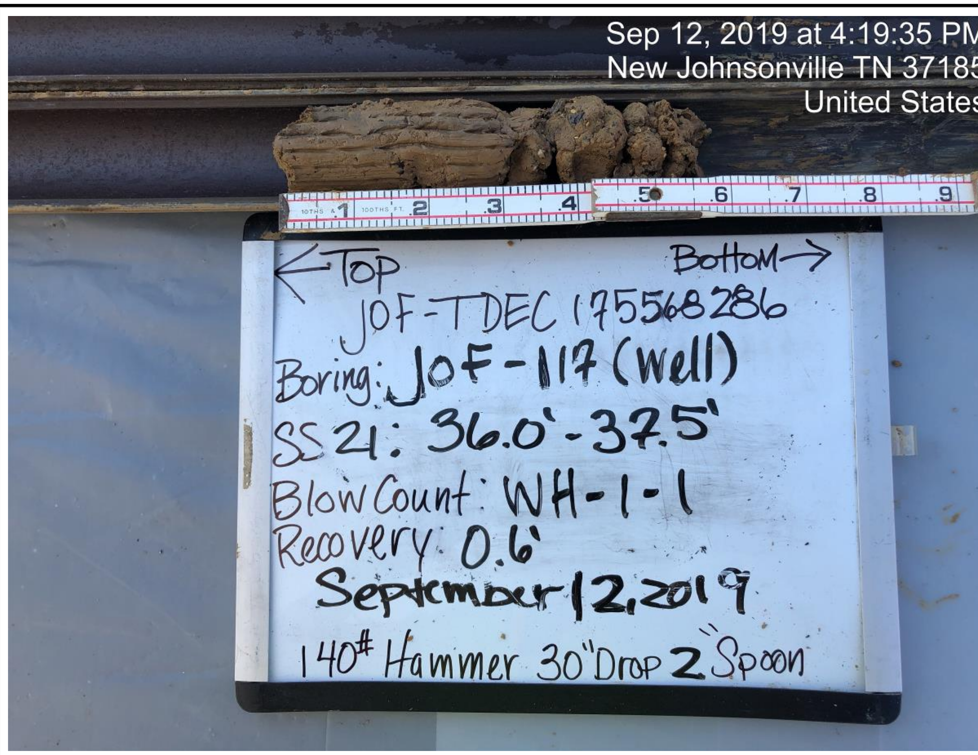


Photograph ID: 264

Photo Location:
JOF-117

Photo Date:
9/12/2019

Comments:
Second boring location interval (36.0-37.5 feet). The boring location shown on the white board is JOF-117.



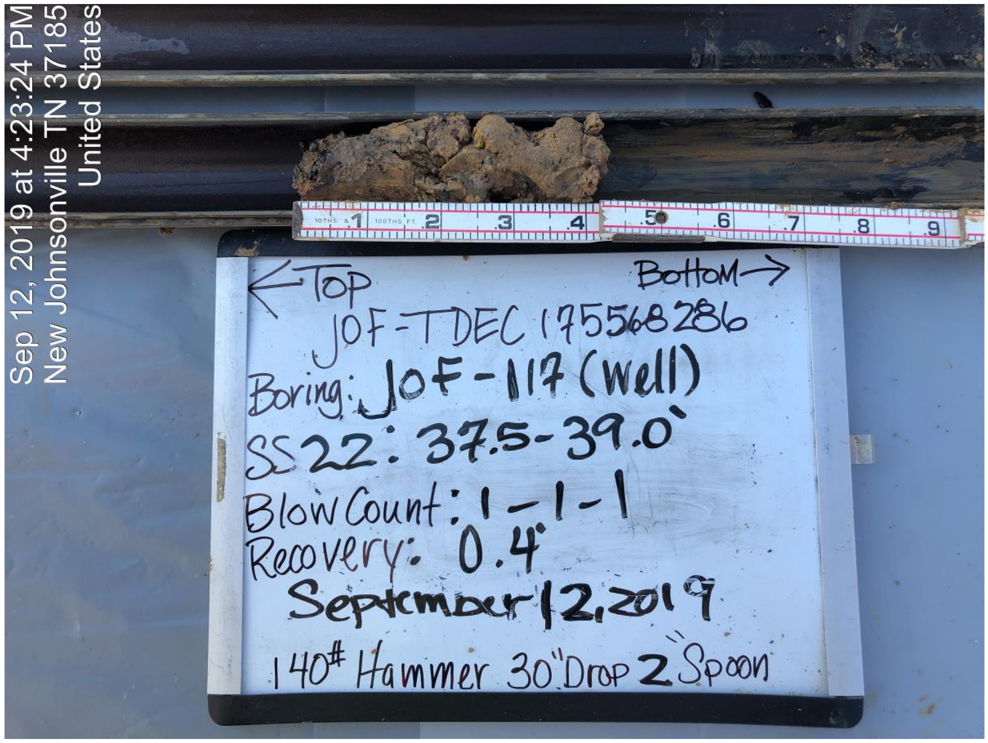
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 265

Photo Location: JOF-117

Photo Date: 9/12/2019

Comments: Second boring location interval (37.5-39.0 feet). The boring location shown on the white board is JOF-117. The blow count on the white board should be WH-1-1.

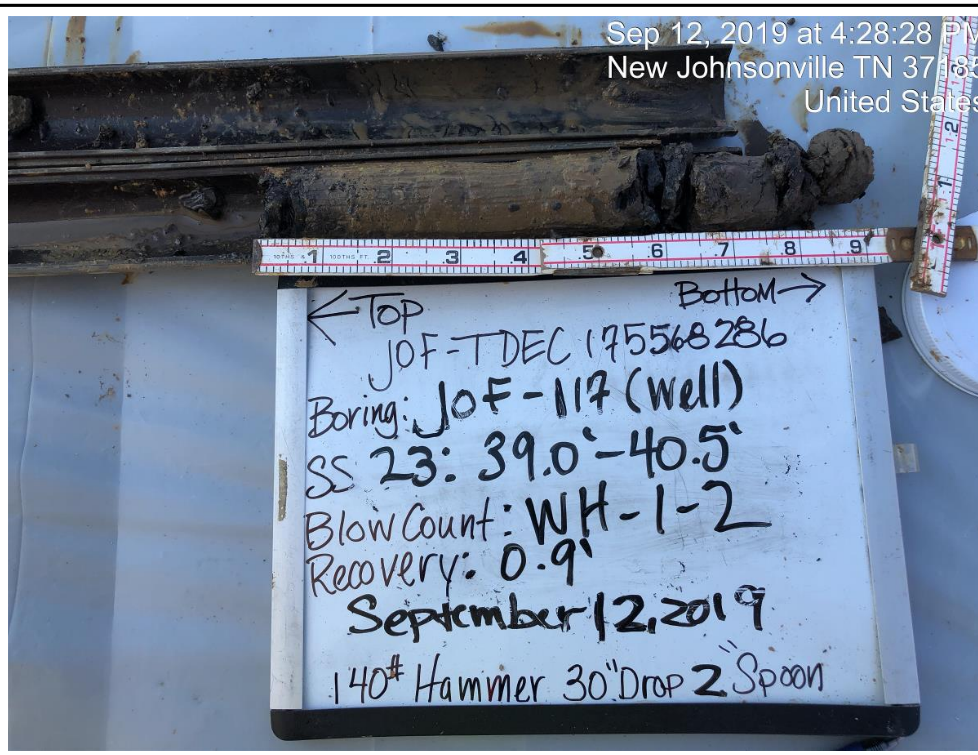


Photograph ID: 266

Photo Location: JOF-117

Photo Date: 9/12/2019

Comments: Second boring location interval (39.0-40.5 feet). The boring location shown on the white board is JOF-117.



Stantec

Photographic Log

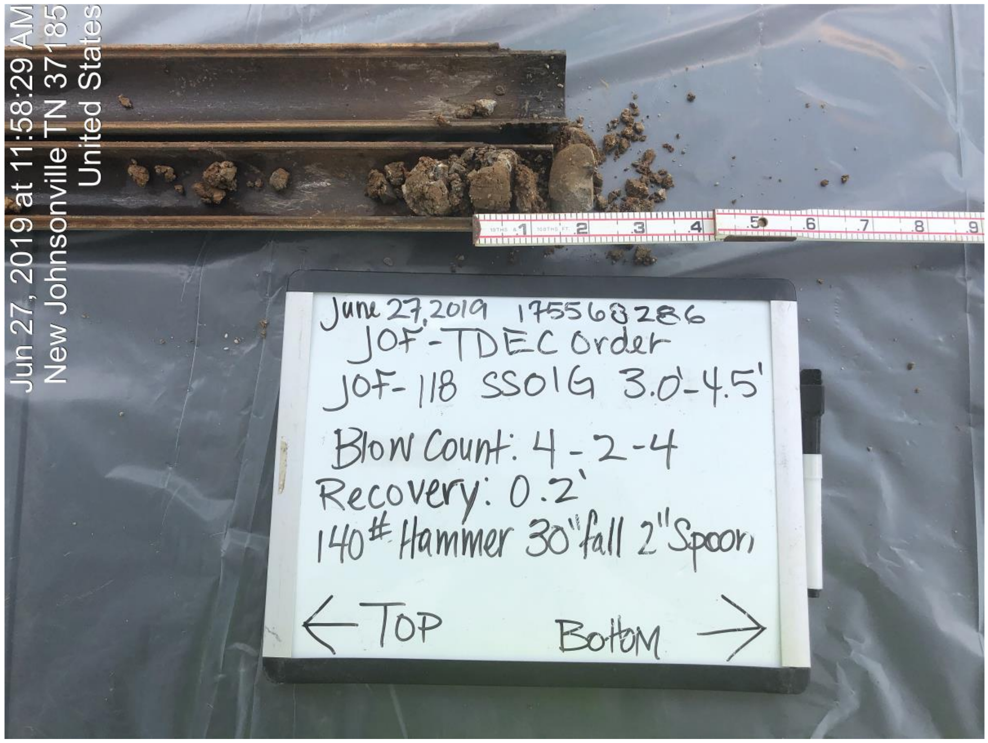
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 267

Photo Location: JOF-118

Photo Date: 6/27/2019

Comments: Interval (3.0-4.5 feet).

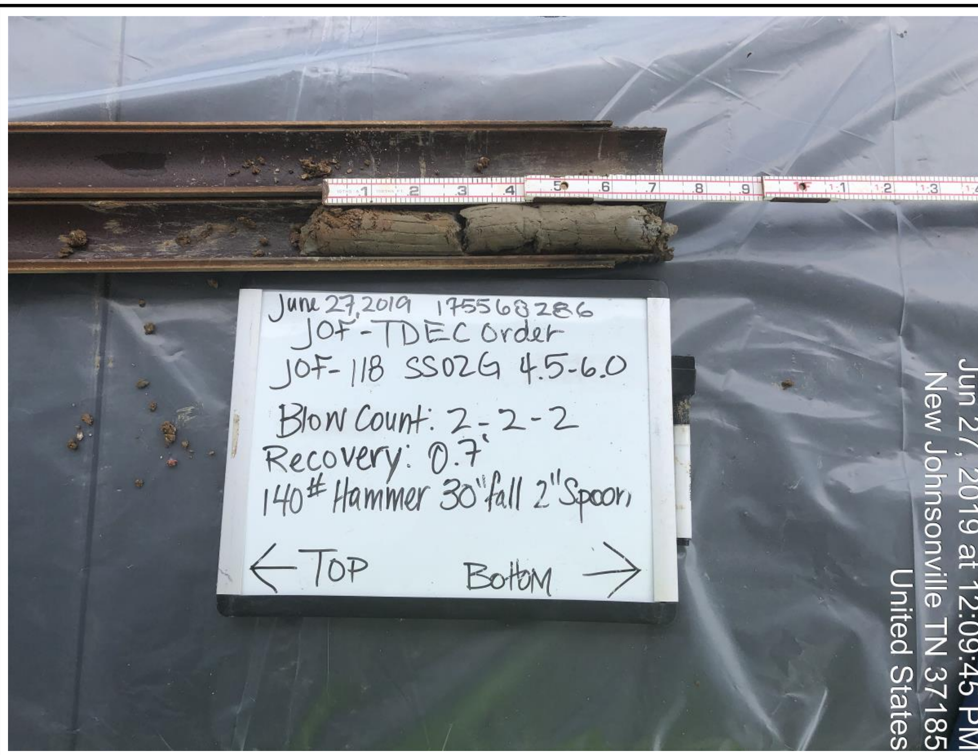


Photograph ID: 268

Photo Location: JOF-118

Photo Date: 6/27/2019

Comments: Interval (4.5-6.0 feet).



Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 269

Photo Location: JOF-118

Photo Date: 6/27/2019

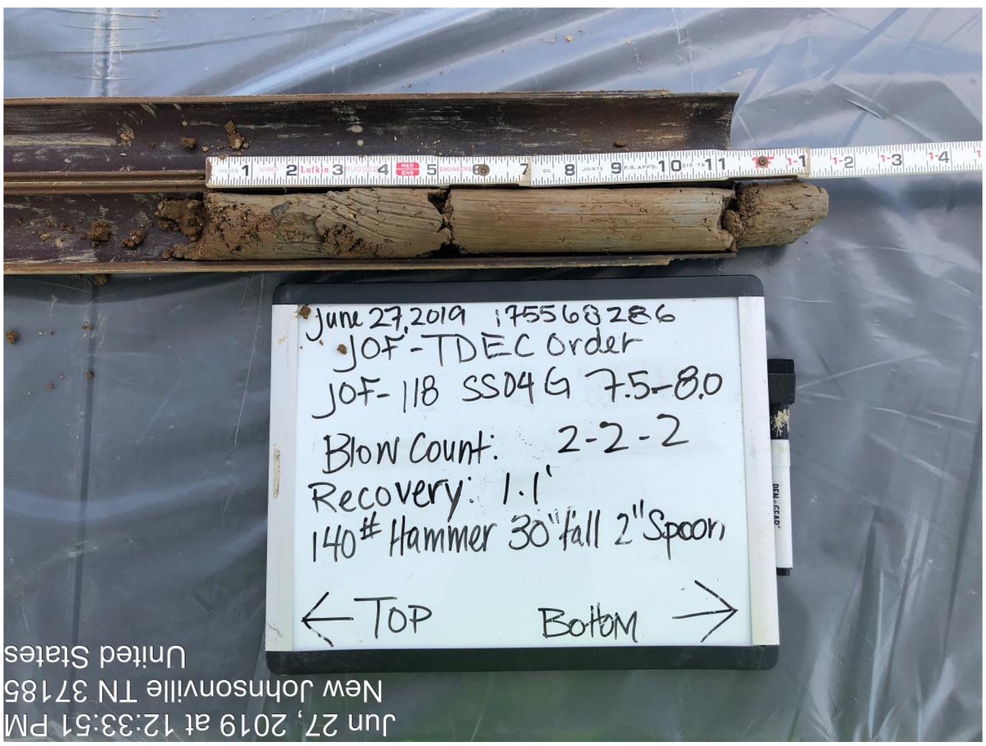
Comments: Interval (6.0-7.5 feet).

Photograph ID: 270

Photo Location: JOF-118

Photo Date: 6/27/2019

Comments: Interval (7.5-9.0 feet). The depth range on the white board should be 7.5-9.0 feet.



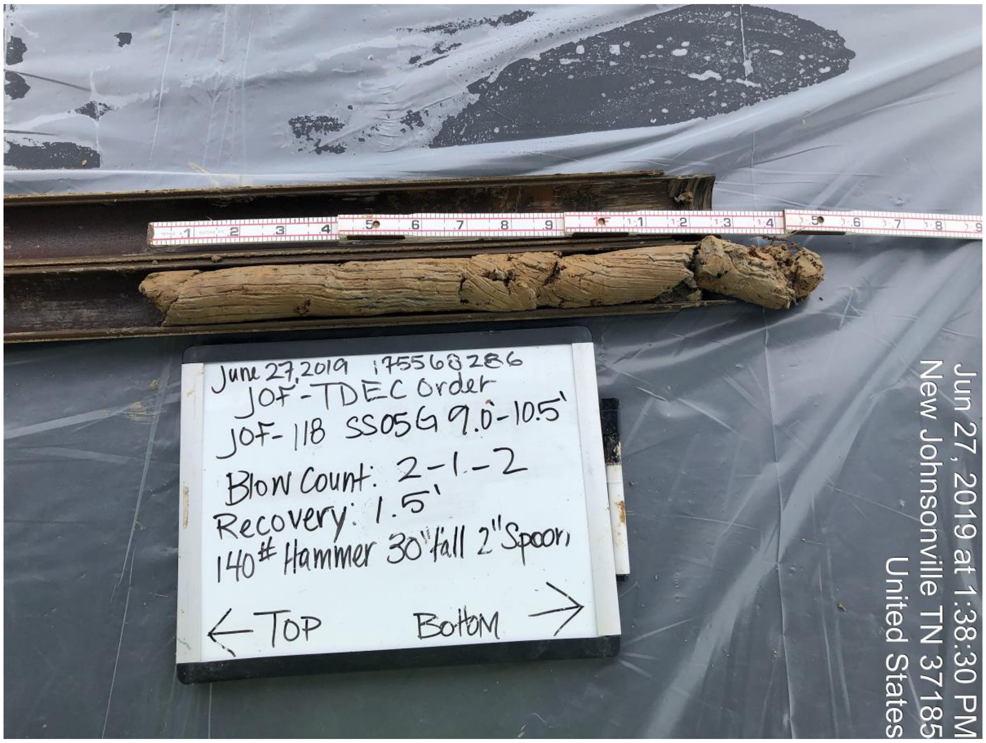
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 271

Photo Location:
JOF-118

Photo Date:
6/27/2019

Comments:
Interval (9.0-10.5 feet).

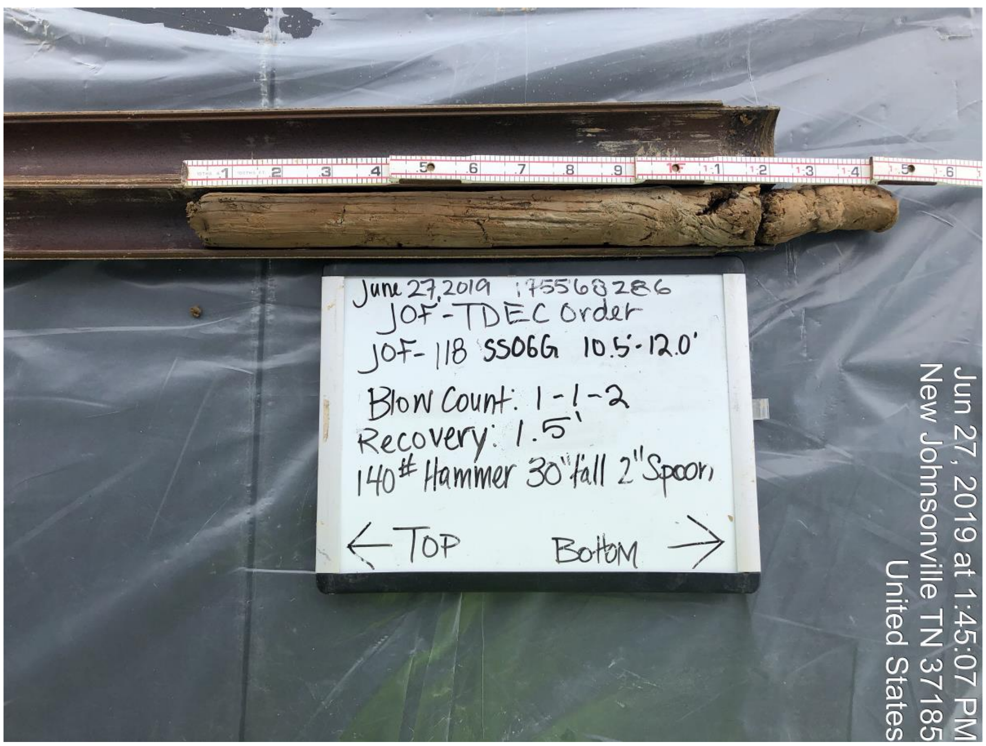


Photograph ID: 272

Photo Location:
JOF-118

Photo Date:
6/27/2019

Comments:
Interval (10.5-12.0 feet).



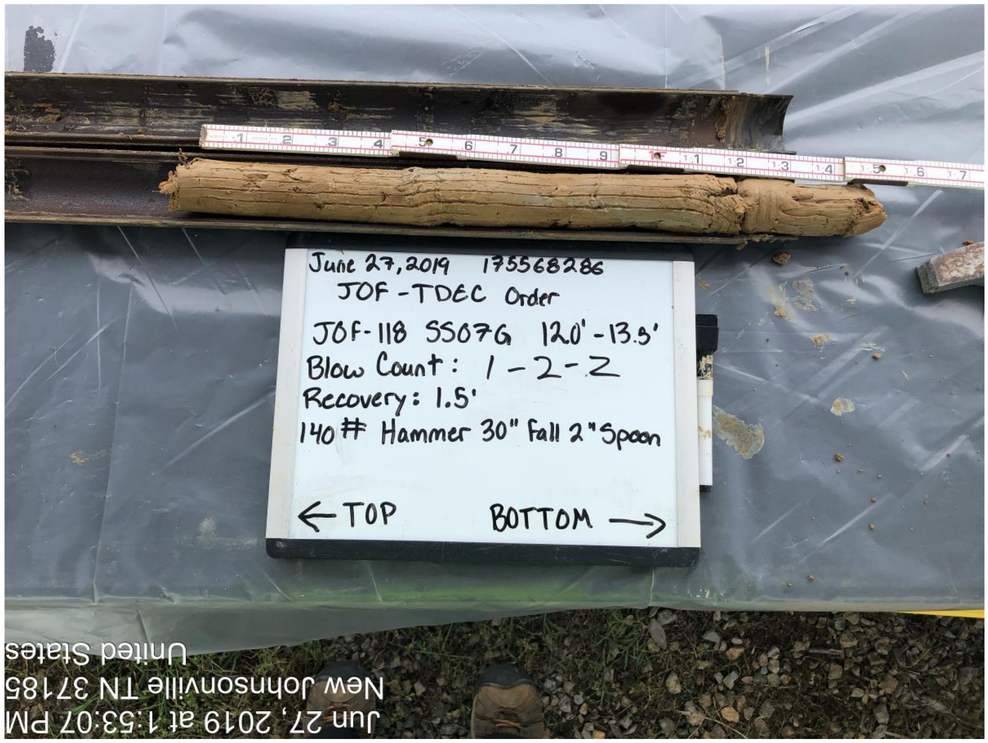
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 273

Photo Location:
JOF-118

Photo Date:
6/27/2019

Comments:
Interval (12.0-13.5 feet).

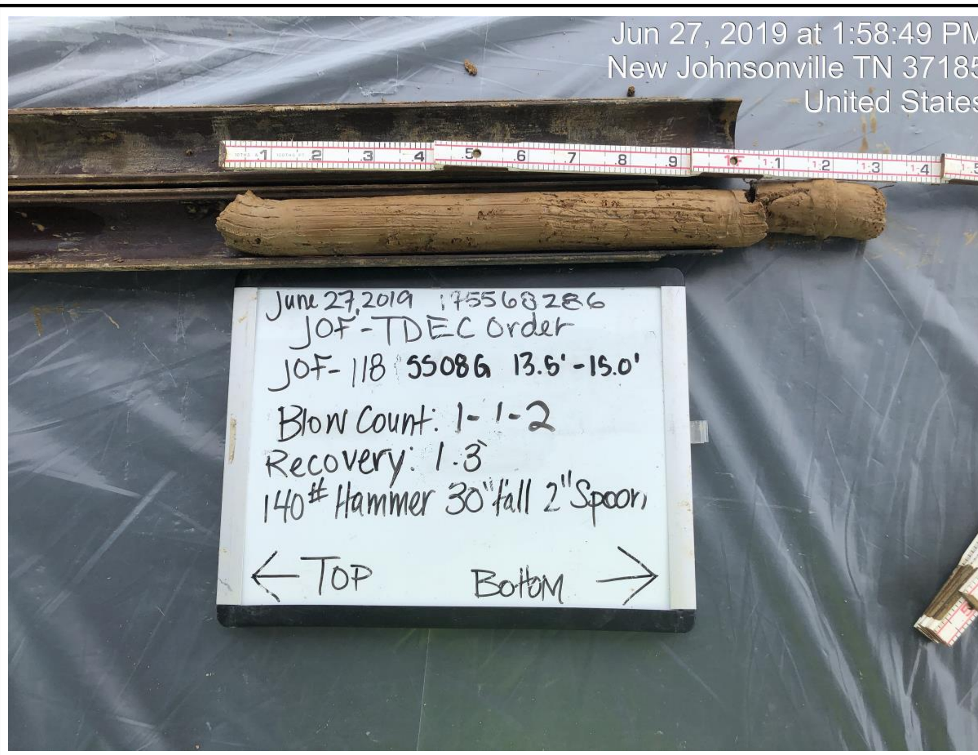


Photograph ID: 274

Photo Location:
JOF-118

Photo Date:
6/27/2019

Comments:
Interval (13.5-15.0 feet).



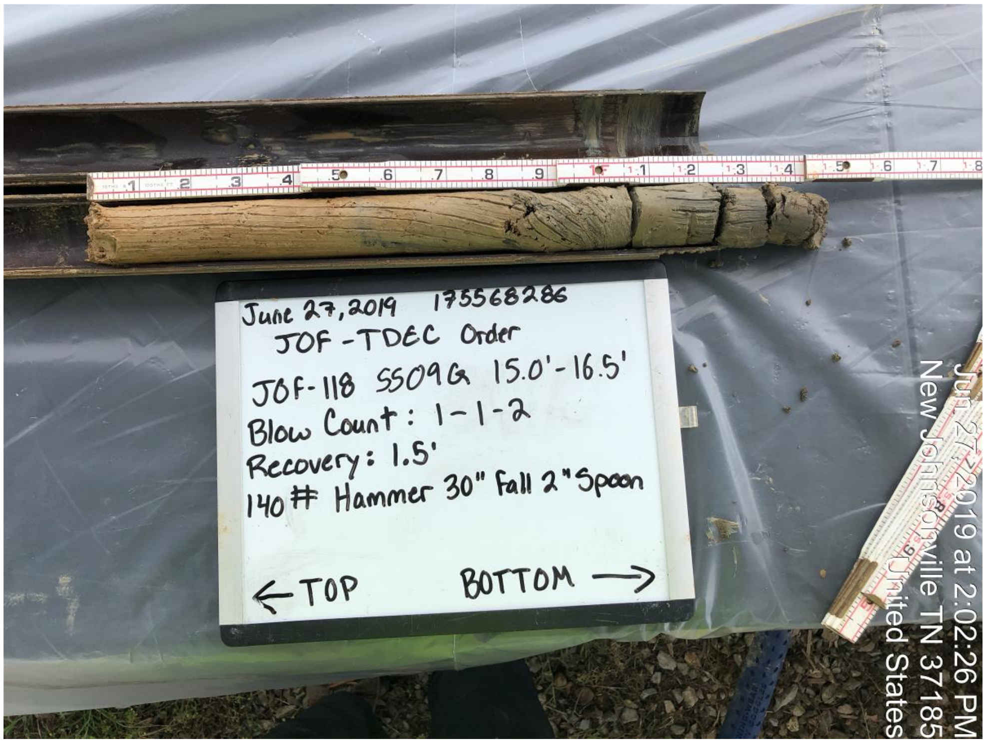
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 275

Photo Location:
JOF-118

Photo Date:
6/27/2019

Comments:
Interval (15.0-16.5 feet). The recovery on the white board should be 1.4 feet.

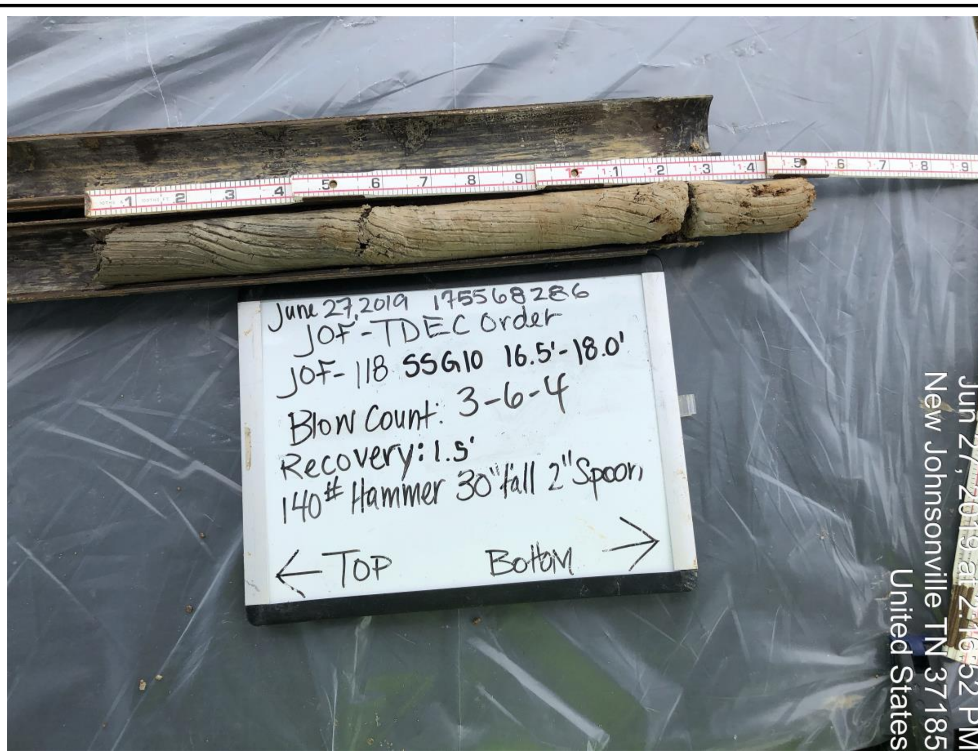


Photograph ID: 276

Photo Location:
JOF-118

Photo Date:
6/27/2019

Comments:
Interval (16.5-18.0 feet). The split spoon sample on the white board should be SS10G.



Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 277

Photo Location: JOF-118

Photo Date: 6/27/2019

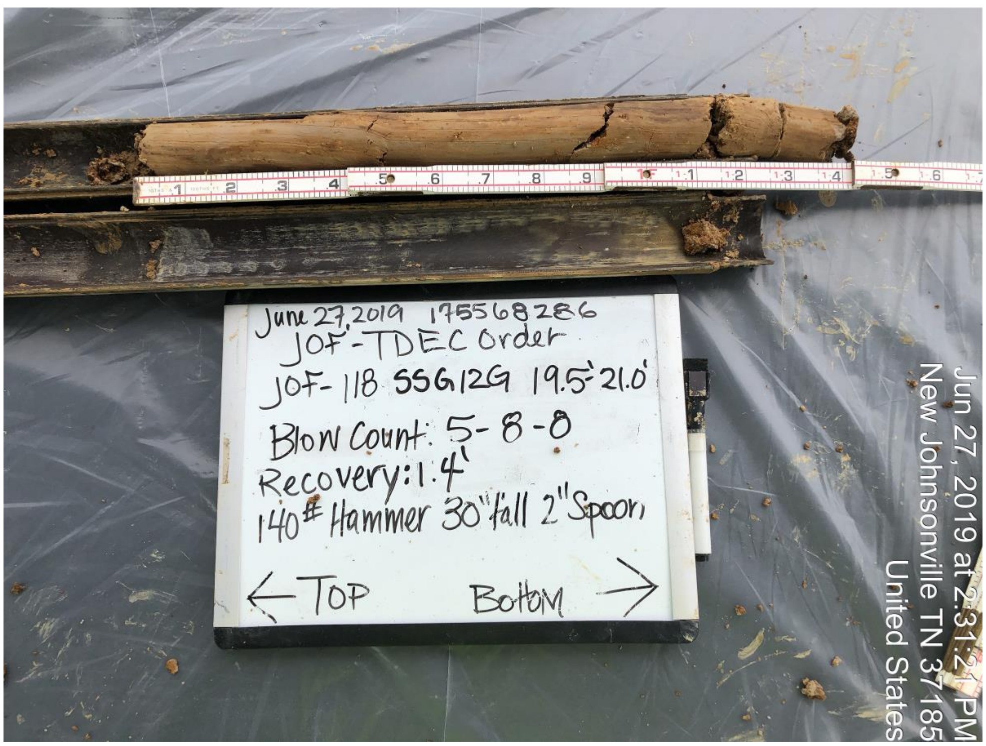
Comments: Interval (18.0-19.5 feet).

Photograph ID: 278

Photo Location: JOF-118

Photo Date: 6/27/2019

Comments: Interval (19.5-21.0 feet). The split spoon sample on the white board shold be SS12G.



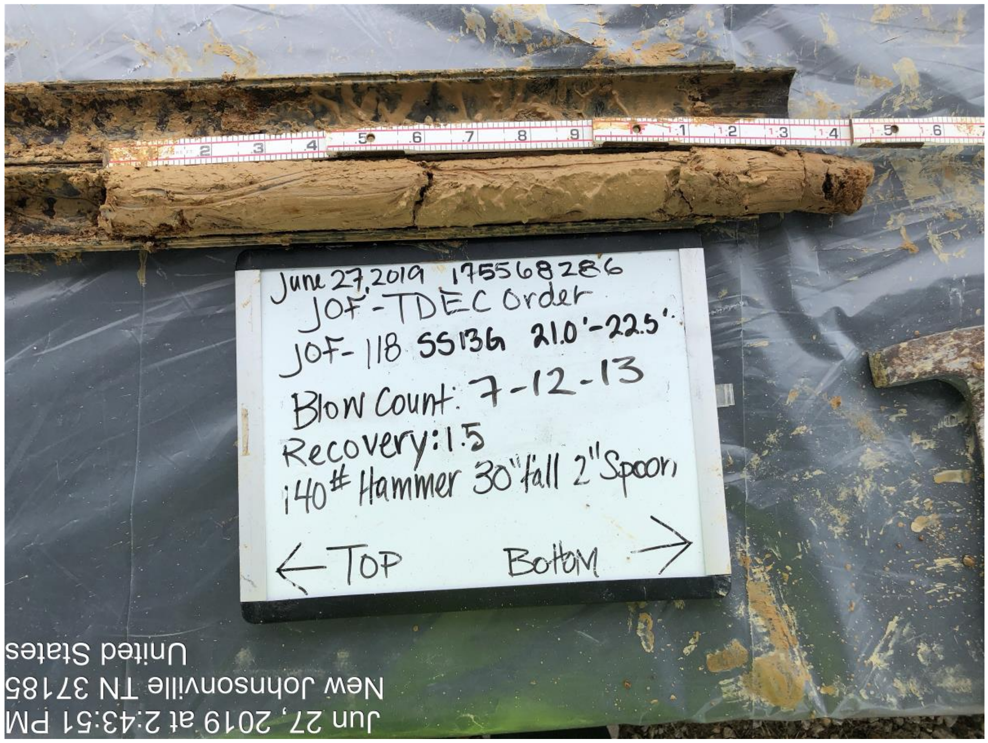
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 279

Photo Location:
JOF-118

Photo Date:
6/27/2019

Comments:
Interval (21.0-22.5 feet).



Photograph ID: 280

Photo Location:
JOF-118

Photo Date:
6/27/2019

Comments:
Interval (22.5-24.0 feet).

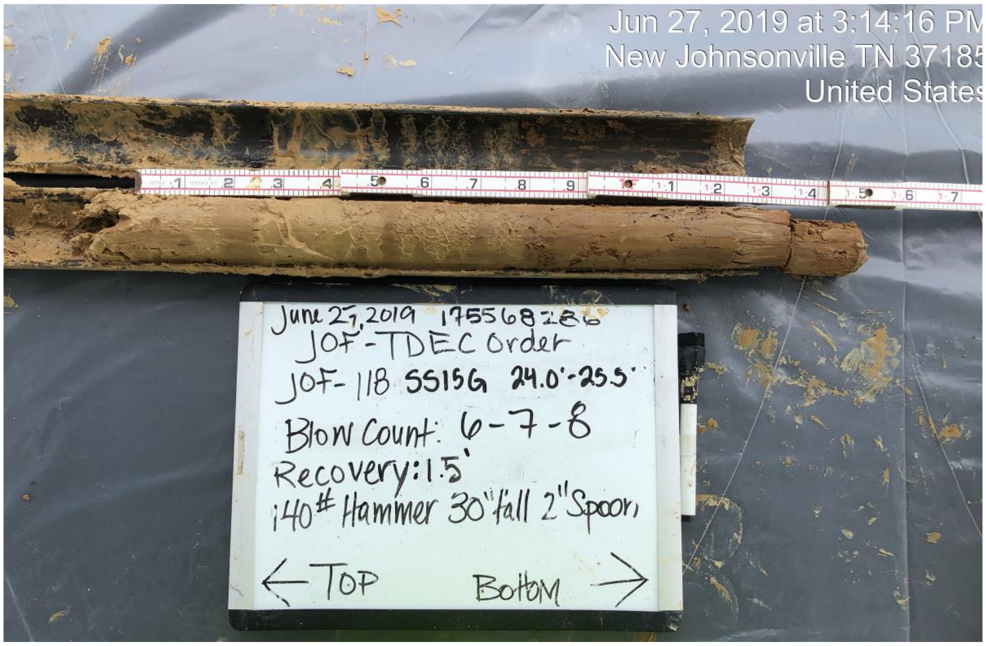
Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Johnsonville Fossil Plant (JOF)	Site Location:	New Johnsonville, Tennessee

Photograph ID: 281

Photo Location:
JOF-118

Photo Date:
6/27/2019

Comments:
Interval (24.0-25.5 feet).



Photograph ID: 282

Photo Location:
JOF-118

Photo Date:
6/27/2019

Comments:
Interval (25.5-27.0 feet). The recovery on the white board should be 0.9 feet.

Stantec

Photographic Log

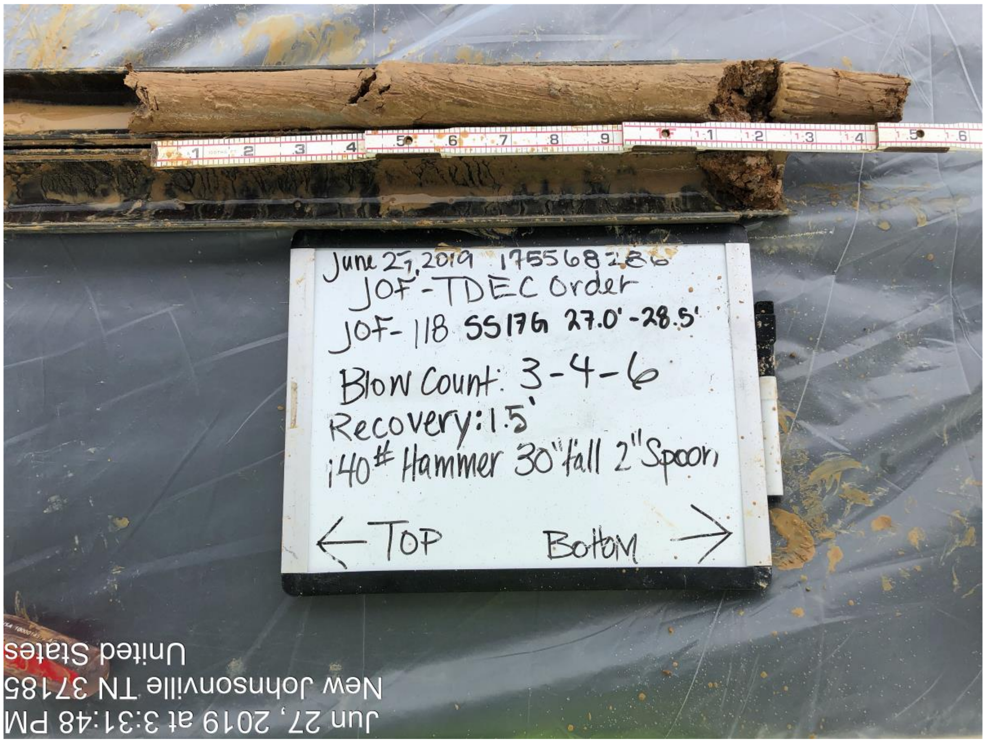
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 283

Photo Location: JOF-118

Photo Date: 6/27/2019

Comments: Interval (27.0-28.5 feet).



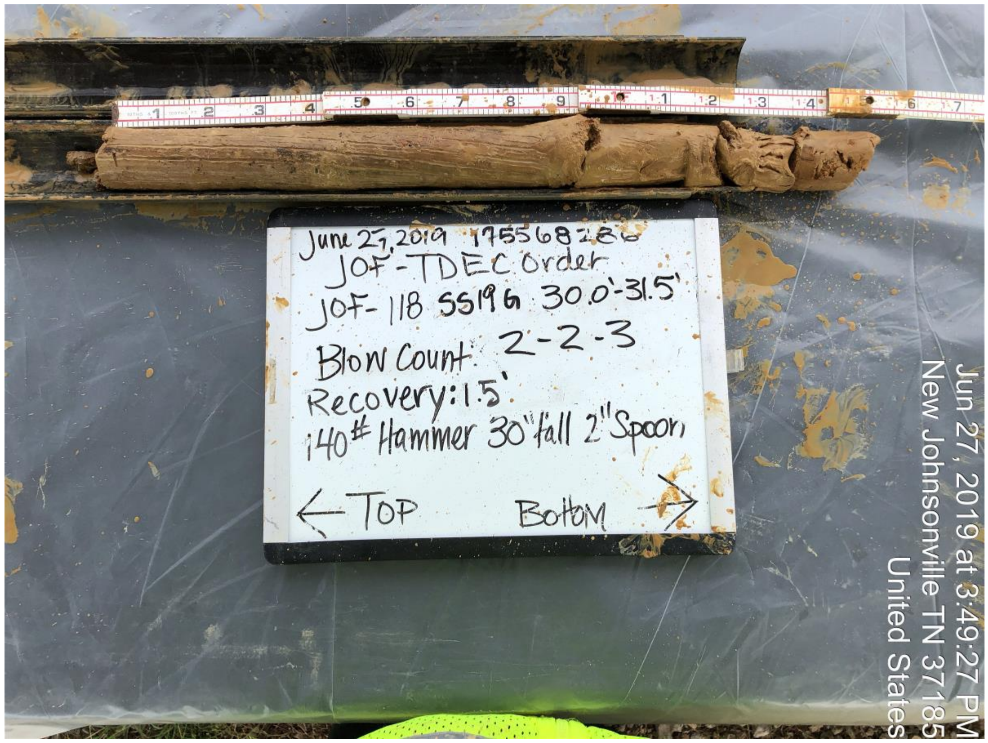
Photograph ID: 284

Photo Location: JOF-118

Photo Date: 6/27/2019

Comments: Interval (28.5-30.0 feet).

Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Johnsonville Fossil Plant (JOF)	Site Location:	New Johnsonville, Tennessee

Photograph ID: 285 **Photo Location:** JOF-118 **Photo Date:** 6/27/2019 **Comments:** Interval (30.0-31.5 feet).	
Photograph ID: 286 **Photo Location:** JOF-118 **Photo Date:** 6/27/2019 **Comments:** Interval (31.5-33.0 feet).	

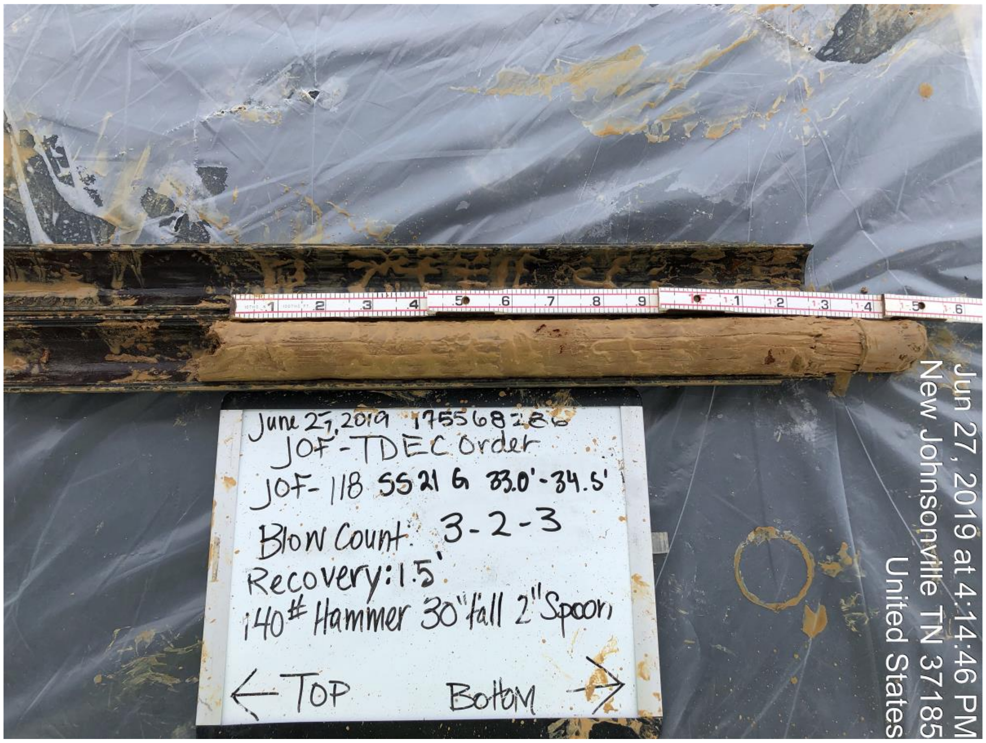
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 287

Photo Location:
JOF-118

Photo Date:
6/27/2019

Comments:
Interval (33.0-34.5 feet).



Photograph ID: 288

Photo Location:
JOF-118

Photo Date:
6/27/2019

Comments:
Interval (34.5-36.0 feet).

Stantec **Photographic Log**

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 289

Photo Location:
JOF-118

Photo Date:
6/28/2019

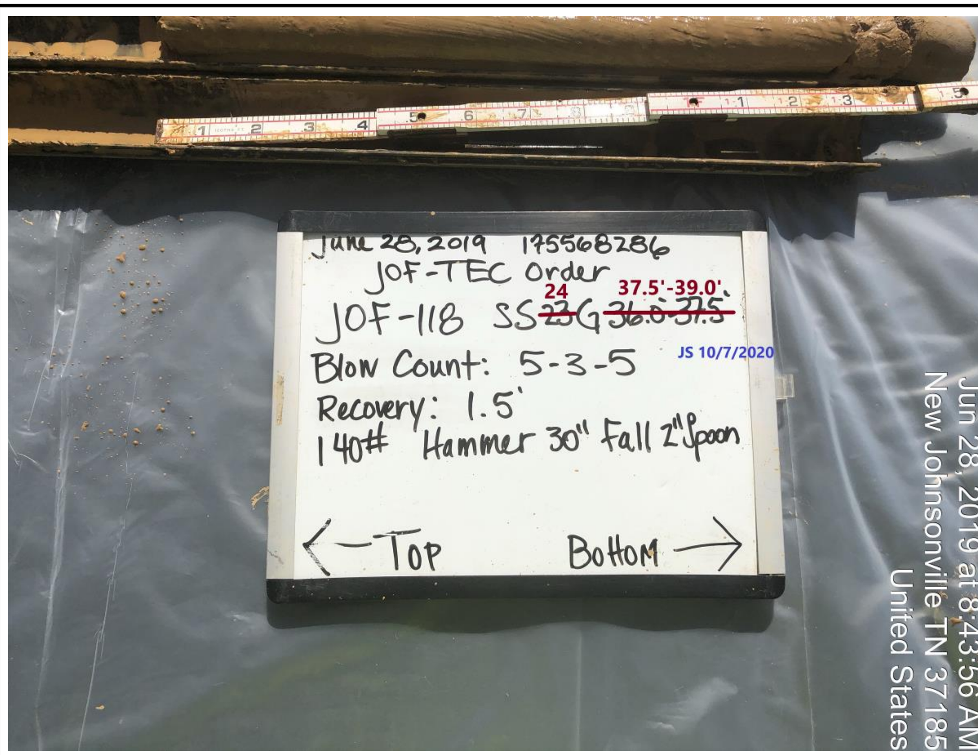
Comments:
Interval (36.0-37.5 feet).

Photograph ID: 290

Photo Location:
JOF-118

Photo Date:
6/28/2019

Comments:
Interval (37.5-39.0 feet).



Stantec

Photographic Log

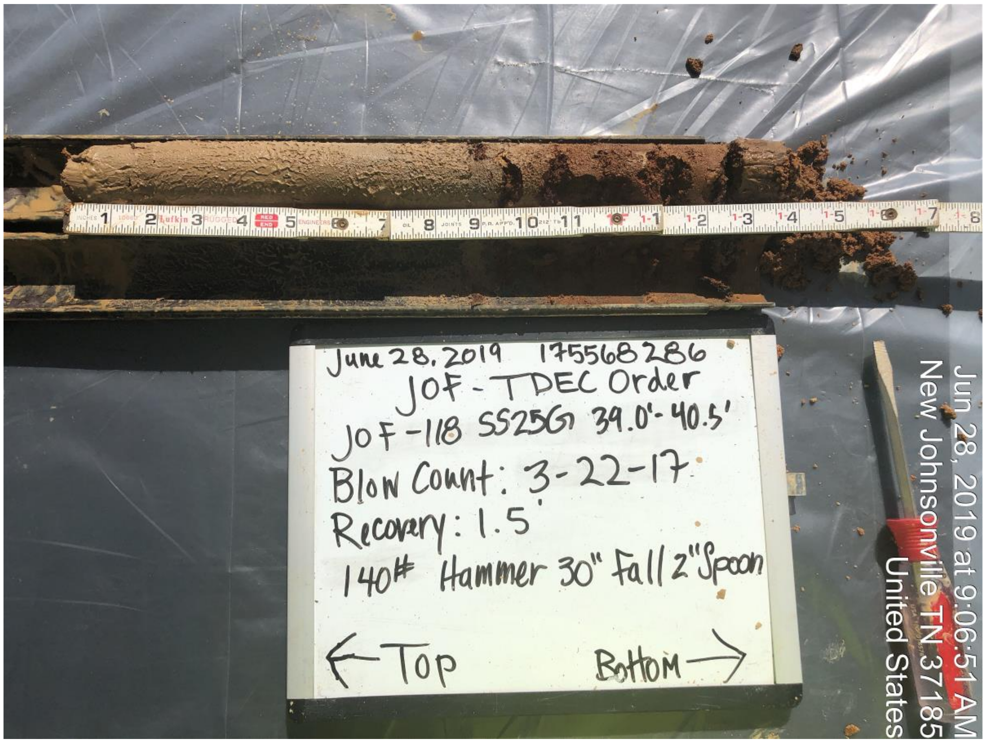
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 291

Photo Location:
JOF-118

Photo Date:
6/28/2019

Comments:
Interval (39.0-40.5 feet).

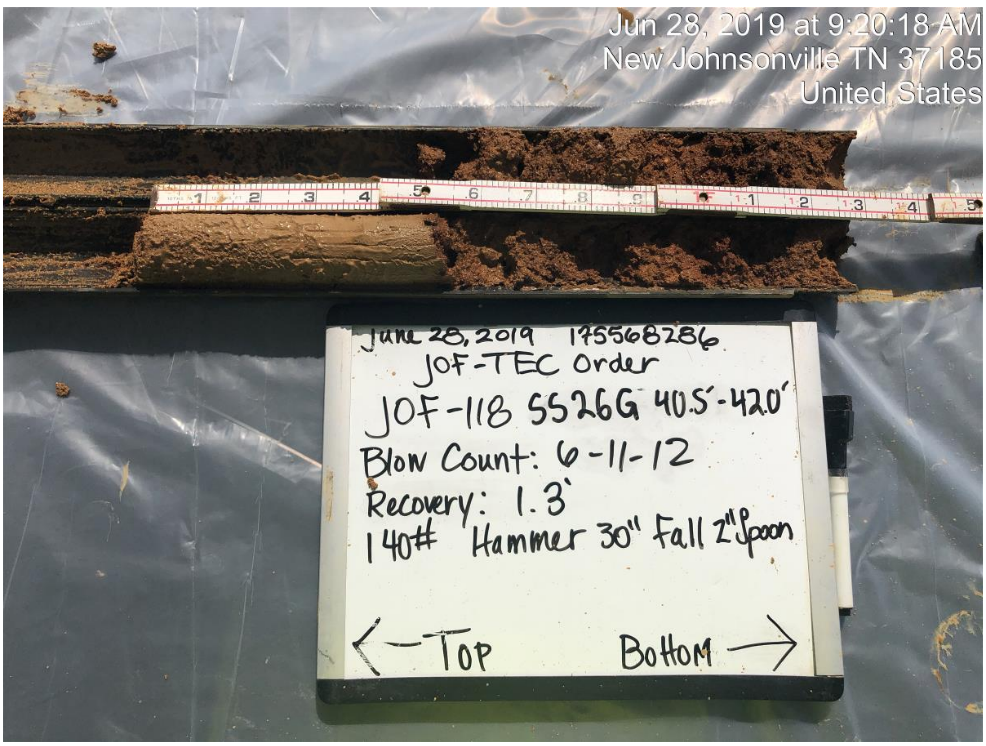


Photograph ID: 292

Photo Location:
JOF-118

Photo Date:
6/28/2019

Comments:
Interval (40.5-42.0 feet).



Stantec

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 293

Photo Location:
JOF-118

Photo Date:
6/28/2019

Comments:
Interval (42.0-43.5 feet).

Photograph ID: 294

Photo Location:
JOF-118

Photo Date:
6/28/2019

Comments:
Interval (43.5-45.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 295

Photo Location:
JOF-118

Photo Date:
6/28/2019

Comments:
Interval (45.0-46.5 feet).

Photograph ID: 296

Photo Location:
JOF-118

Photo Date:
6/28/2019

Comments:
Interval (46.5-48.0 feet).

Stantec

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 297

Photo Location: JOF-118

Photo Date: 6/28/2019

Comments: Interval (48.0-49.5 feet).

Photograph ID: 298

Photo Location: JOF-118

Photo Date: 6/28/2019

Comments: Interval (49.5-51.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 299

Photo Location: JOF-119

Photo Date: 7/9/2019

Comments: Interval (0.0-1.5 feet).

Photograph ID: 300

Photo Location: JOF-119

Photo Date: 7/9/2019

Comments: Interval (1.5-3.0 feet).

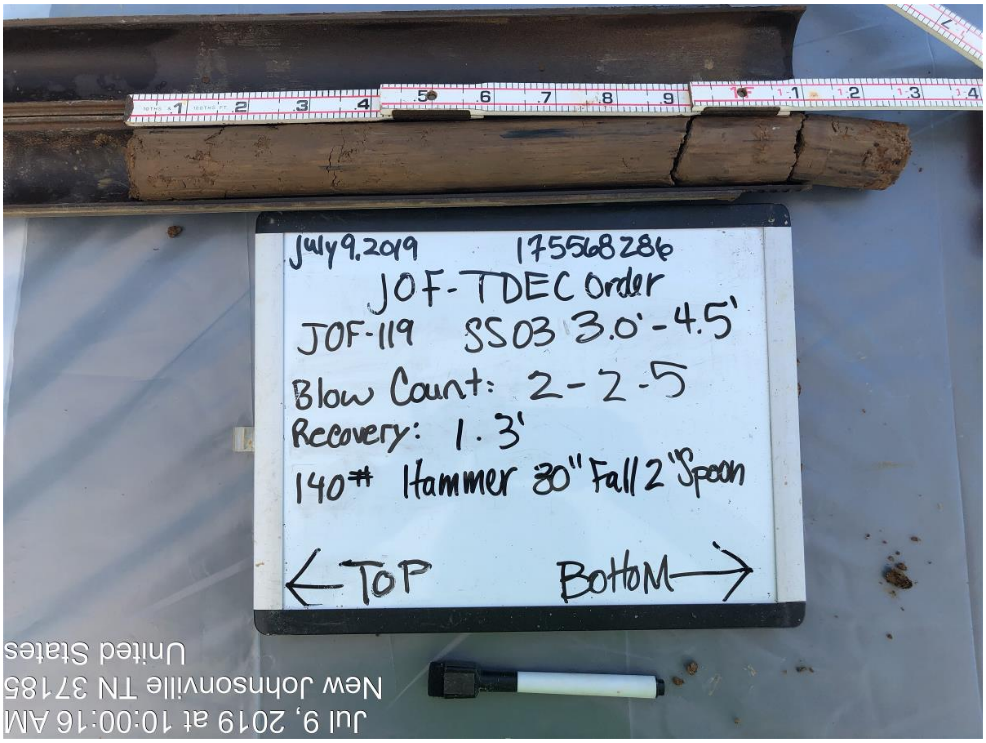
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 301

Photo Location:
JOF-119

Photo Date:
7/9/2019

Comments:
Interval (3.0-4.5 feet).



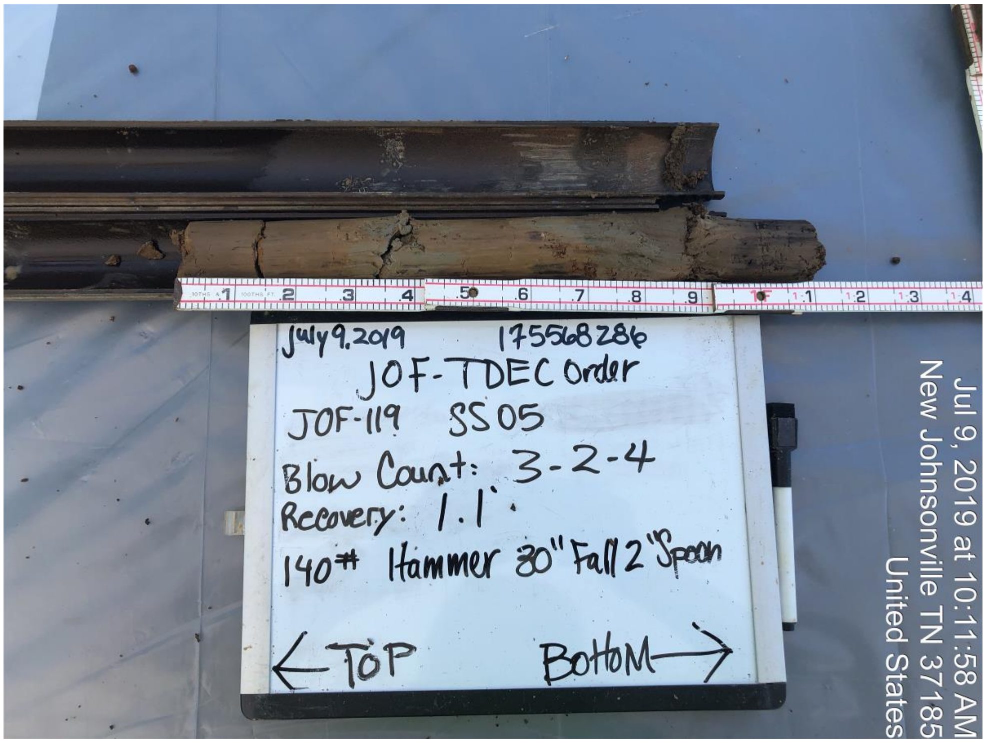
Photograph ID: 302

Photo Location:
JOF-119

Photo Date:
7/9/2019

Comments:
Interval (4.5-6.0 feet).

Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Johnsonville Fossil Plant (JOF)	Site Location:	New Johnsonville, Tennessee

Photograph ID: 303 **Photo Location:** JOF-119 **Photo Date:** 7/9/2019 **Comments:** Interval (6.0-7.5 feet). The depth range should be shown on the white board as 6.0-7.5.	
Photograph ID: 304 **Photo Location:** JOF-119 **Photo Date:** 7/9/2019 **Comments:** Interval (7.5-9.0 feet).	

Stantec **Photographic Log**

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 305

Photo Location: JOF-119

Photo Date: 7/9/2019

Comments: Interval (9.0-10.5 feet).

Photograph ID: 306

Photo Location: JOF-119

Photo Date: 7/9/2019

Comments: Interval (10.5-12.0 feet).

Stantec

Photographic Log

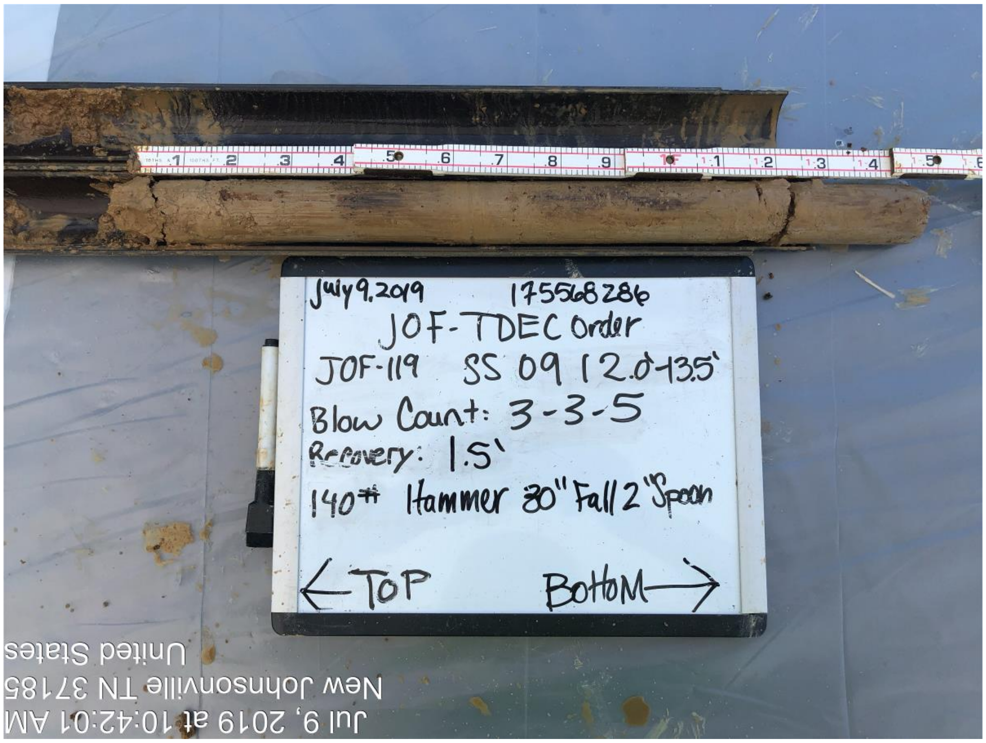
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 307

Photo Location:
JOF-119

Photo Date:
7/9/2019

Comments:
Interval (12.0-13.5 feet).

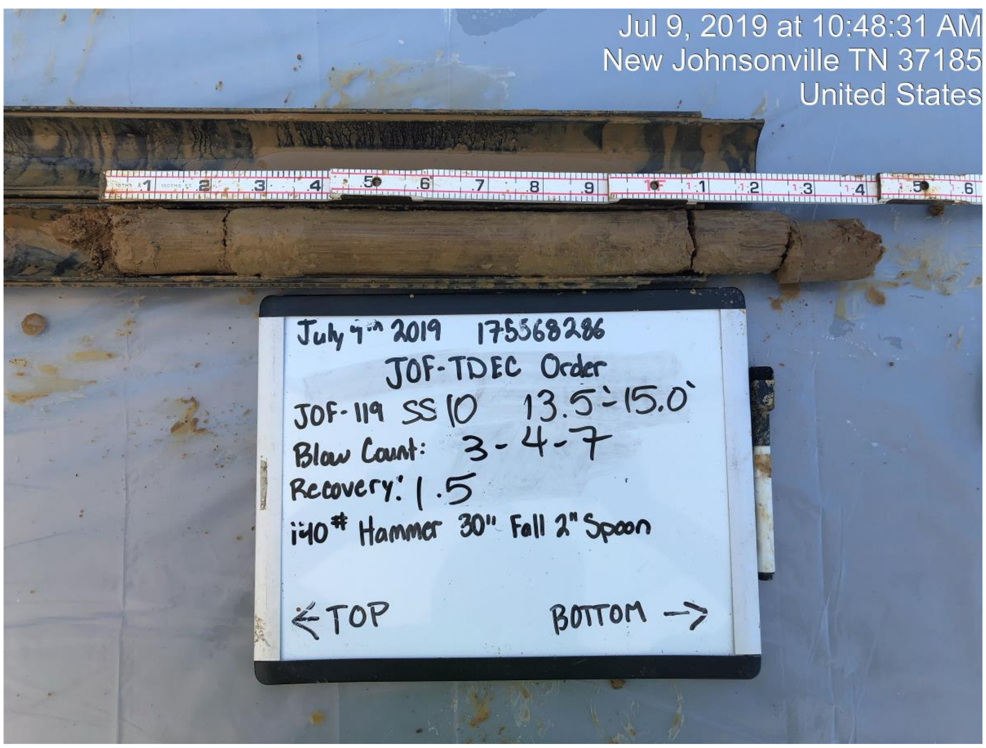


Photograph ID: 308

Photo Location:
JOF-119

Photo Date:
7/9/2019

Comments:
Interval (13.5-15.0 feet).



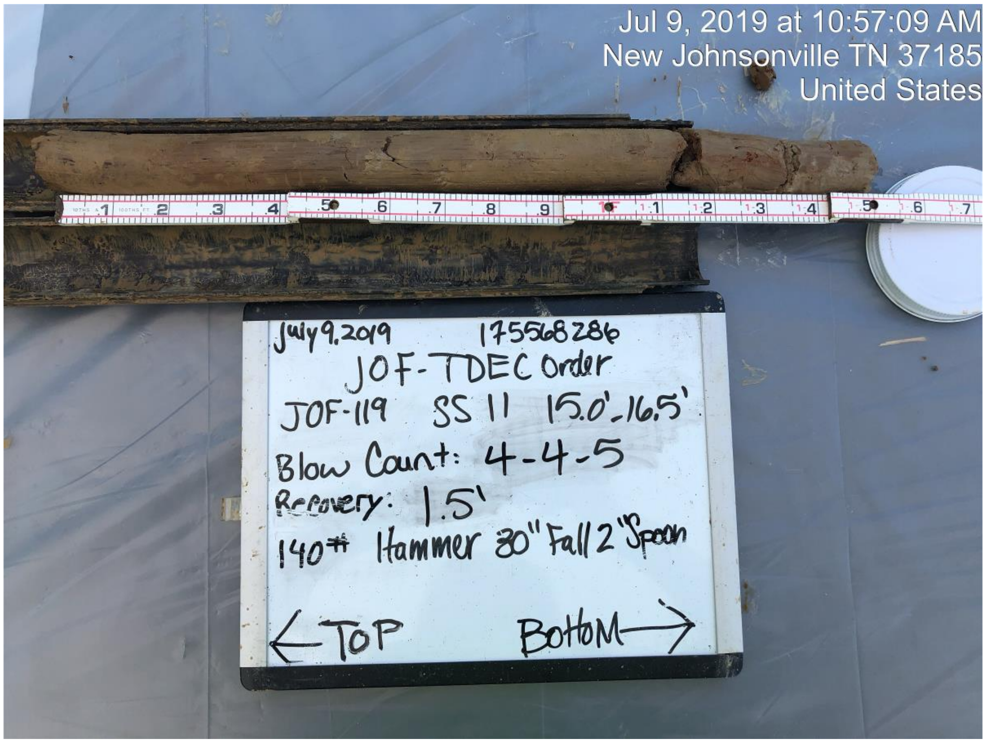
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 309

Photo Location: JOF-119

Photo Date: 7/9/2019

Comments: Interval (15.0-16.5 feet).



Photograph ID: 310

Photo Location: JOF-119

Photo Date: 7/9/2019

Comments: Interval (16.5-18.0 feet).

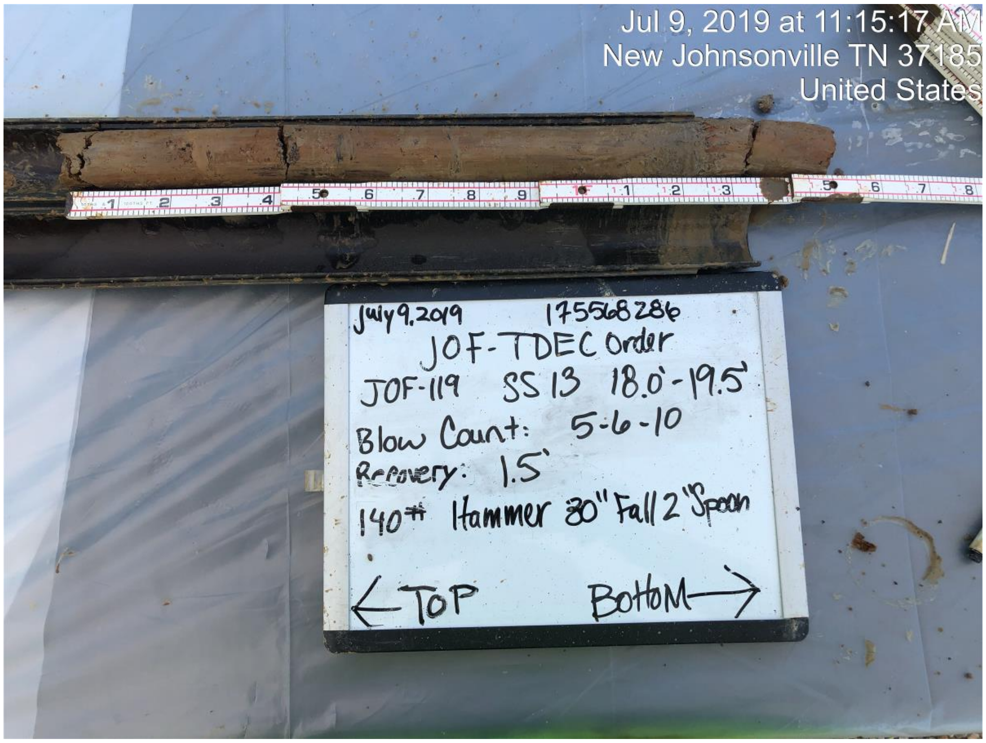
Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Johnsonville Fossil Plant (JOF)	Site Location:	New Johnsonville, Tennessee

Photograph ID: 311

Photo Location: JOF-119

Photo Date: 7/9/2019

Comments: Interval (18.0-19.5 feet).

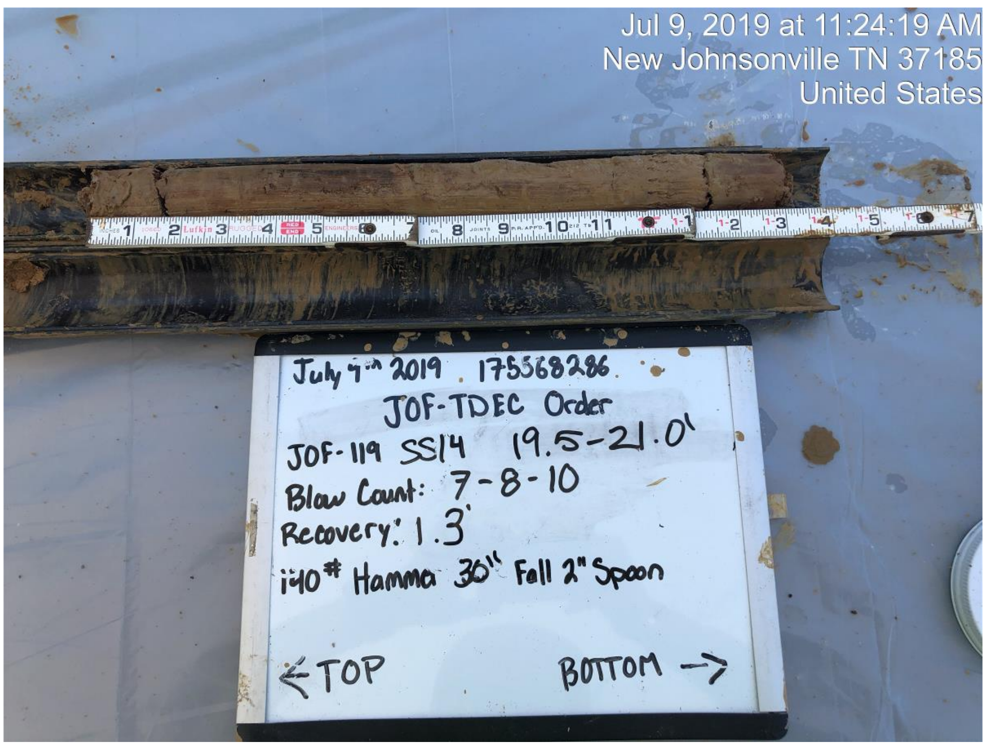


Photograph ID: 312

Photo Location: JOF-119

Photo Date: 7/9/2019

Comments: Interval (19.5-21.0 feet).



Stantec

Photographic Log

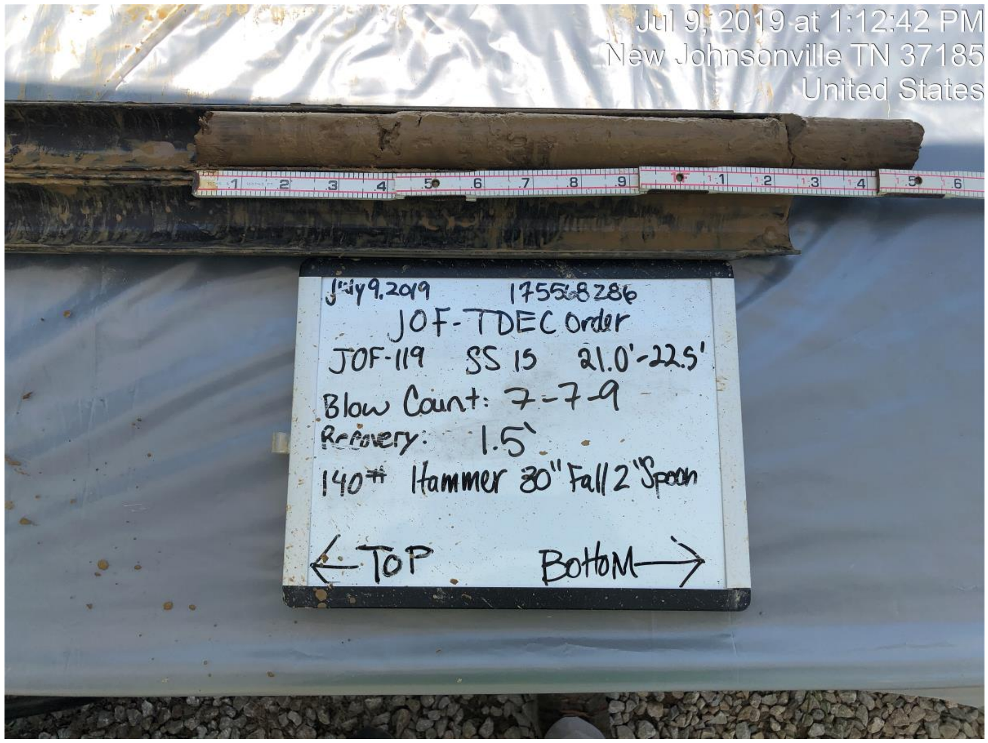
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 313

Photo Location:
JOF-119

Photo Date:
7/9/2019

Comments:
Interval (21.0-22.5 feet).



Photograph ID: 314

Photo Location:
JOF-119

Photo Date:
7/9/2019

Comments:
Interval (22.5-24.0 feet).

Stantec **Photographic Log**

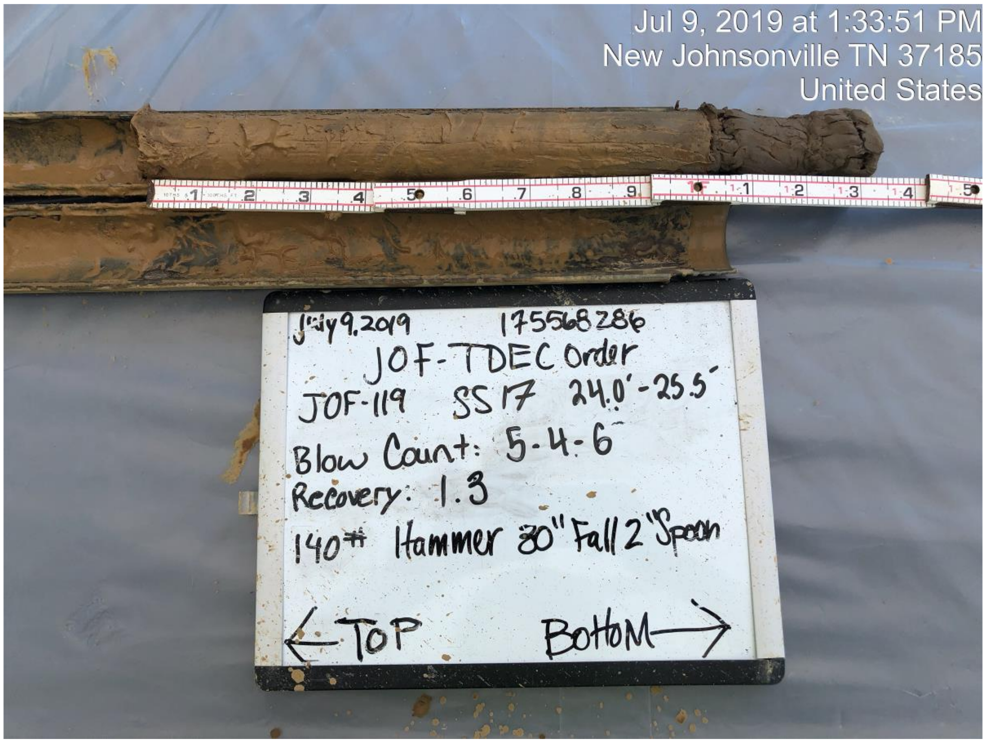
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 315

Photo Location:
JOF-119

Photo Date:
7/9/2019

Comments:
Interval (24.0-25.5 feet).



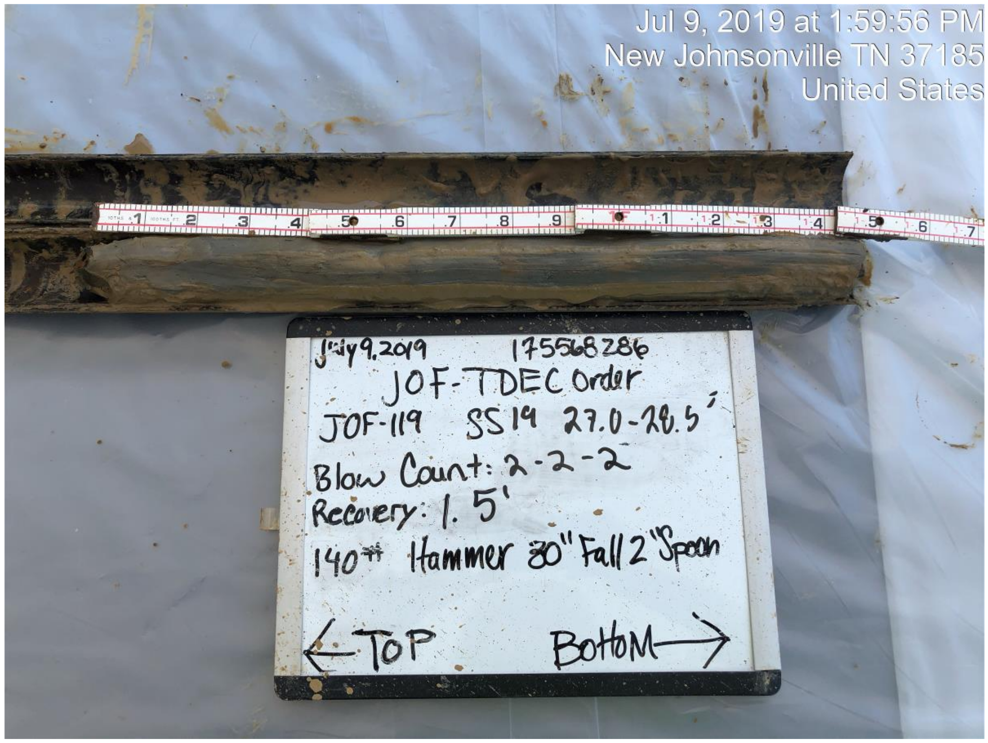
Photograph ID: 316

Photo Location:
JOF-119

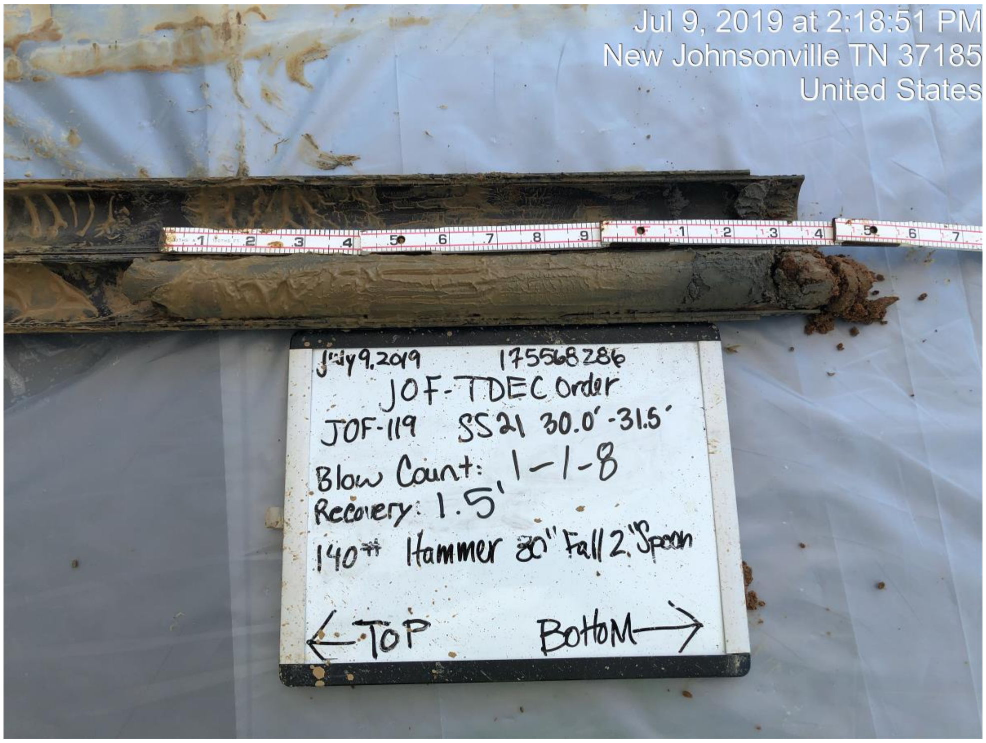
Photo Date:
7/9/2019

Comments:
Interval (25.5-27.0 feet).

Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Johnsonville Fossil Plant (JOF)	Site Location:	New Johnsonville, Tennessee

Photograph ID: 317 **Photo Location:** JOF-119 **Photo Date:** 7/9/2019 **Comments:** Interval (27.0-28.5 feet).	
Photograph ID: 318 **Photo Location:** JOF-119 **Photo Date:** 7/9/2019 **Comments:** Interval (28.5-30.0 feet).	

Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Johnsonville Fossil Plant (JOF)	Site Location:	New Johnsonville, Tennessee

Photograph ID: 319 **Photo Location:** JOF-119 **Photo Date:** 7/9/2019 **Comments:** Interval (30.0-31.5 feet).	
Photograph ID: 320 **Photo Location:** JOF-119 **Photo Date:** 7/9/2019 **Comments:** Interval (31.5-33.0 feet).	

Stantec

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 321

Photo Location:
JOF-119

Photo Date:
7/9/2019

Comments:
Interval (33.0-34.5 feet).

Photograph ID: 322

Photo Location:
JOF-119

Photo Date:
7/9/2019

Comments:
Interval (34.5-36.0 feet).

Stantec **Photographic Log**

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 323

Photo Location:
JOF-119

Photo Date:
7/9/2019

Comments:
Interval (36.0-37.5 feet).

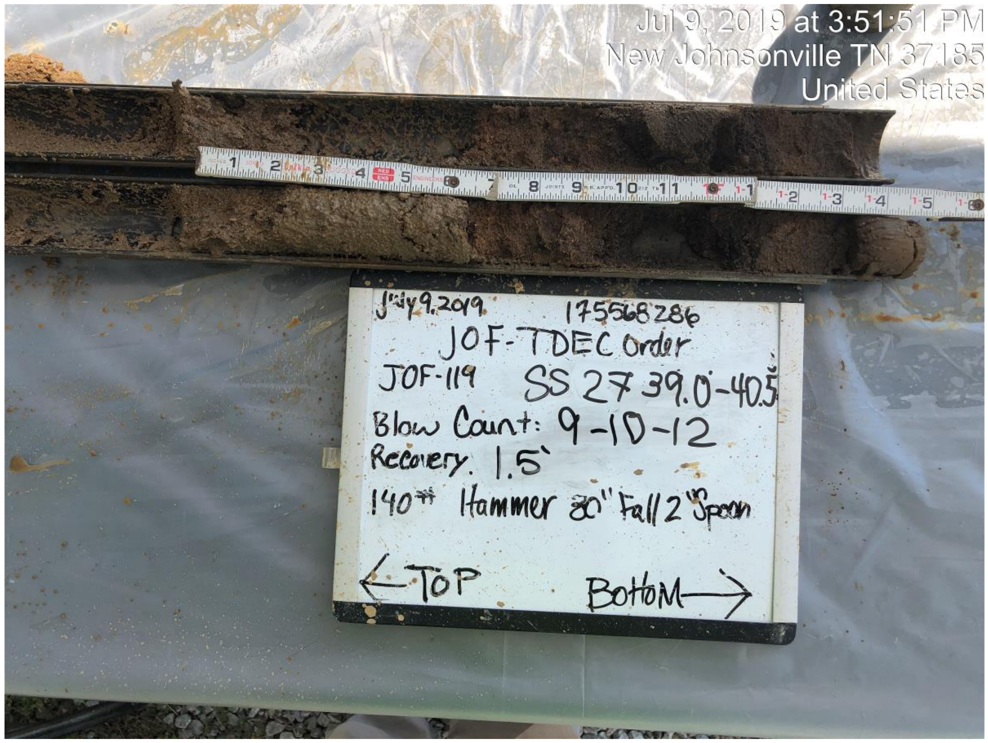
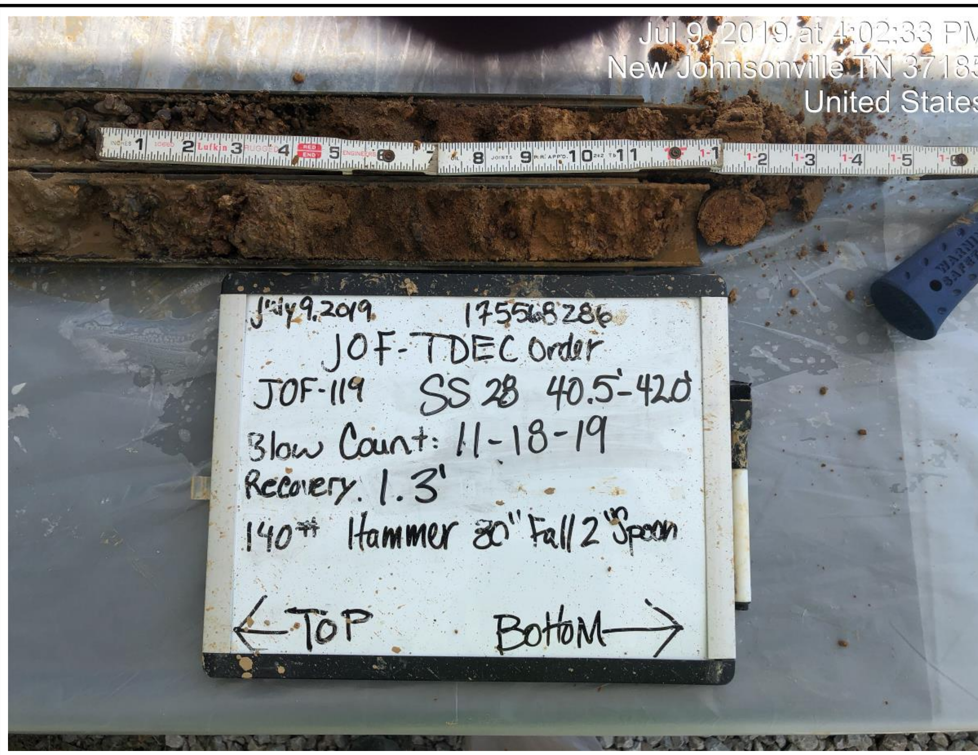
Photograph ID: 324

Photo Location:
JOF-119

Photo Date:
7/9/2019

Comments:
Interval (37.5-39.0 feet).

Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Johnsonville Fossil Plant (JOF)	Site Location:	New Johnsonville, Tennessee

Photograph ID: 325 **Photo Location:** JOF-119 **Photo Date:** 7/9/2019 **Comments:** Interval (39.0-40.5 feet).	
Photograph ID: 326 **Photo Location:** JOF-119 **Photo Date:** 7/9/2019 **Comments:** Interval (40.5-42.0 feet).	

Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Johnsonville Fossil Plant (JOF)	Site Location:	New Johnsonville, Tennessee

Photograph ID: 327 **Photo Location:** JOF-119 **Photo Date:** 7/9/2019 **Comments:** Interval (42.0-43.5 feet).	
Photograph ID: 328 **Photo Location:** JOF-119 **Photo Date:** 7/9/2019 **Comments:** Interval (43.5-45.0 feet).	

ATTACHMENT D.2

Photographic Log of Monitoring Wells/Piezometer

Client:	**Tennessee Valley Authority**	**Project:**	**JOF TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 1

Photo Location:
JOF-109

Photo Date:
4/21/2020

Comments:
Completion of monitoring well JOF-109. Well was installed in boring JOF-109.

Photograph ID: 2

Photo Location:
JOF-110

Photo Date:
4/21/2020

Comments:
Completion of monitoring well JOF-110. Well was installed in boring JOF-110.

Client:	**Tennessee Valley Authority**	**Project:**	**JOF TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 3

Photo Location:
JOF-111

Photo Date:
4/21/2020

Comments:
Completion of monitoring well JOF-111. Well was installed in boring JOF-111B.

Photograph ID: 4

Photo Location:
JOF-112

Photo Date:
4/21/2020

Comments:
Completion of monitoring well JOF-112. Well was installed in boring JOF-112.

Stantec

Client:	Tennessee Valley Authority	Project:	JOF TDEC Order
Site Name:	Johnsonville Fossil Plant (JOF)	Site Location:	New Johnsonville, Tennessee

Photograph ID: 5

Photo Location:
JOF-113

Photo Date:
4/21/2020

Comments:
Completion of monitoring well JOF-113. Well was installed in boring JOF-113.

Photograph ID: 6

Photo Location:
JOF-114

Photo Date:
4/21/2020

Comments:
Completion of monitoring well JOF-114. Well was installed in boring JOF-114.

Client:	**Tennessee Valley Authority**	**Project:**	**JOF TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 7

Photo Location:
JOF-116-PZ

Photo Date:
10/15/2020

Comments:
Completion of piezometer JOF-116-PZ. Piezometer was installed in boring JOF-116-PZ.

Photograph ID: 8

Photo Location:
JOF-117

Photo Date:
4/21/2020

Comments:
Completion of monitoring well JOF-117. Well was installed in boring JOF-117.

Client:	**Tennessee Valley Authority**	**Project:**	**JOF TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 9

Photo Location:
JOF-118

Photo Date:
4/21/2020

Comments:
Completion of monitoring well JOF-118. Well was installed in boring JOF-118.

Photograph ID: 10

Photo Location:
JOF-119

Photo Date:
4/21/2020

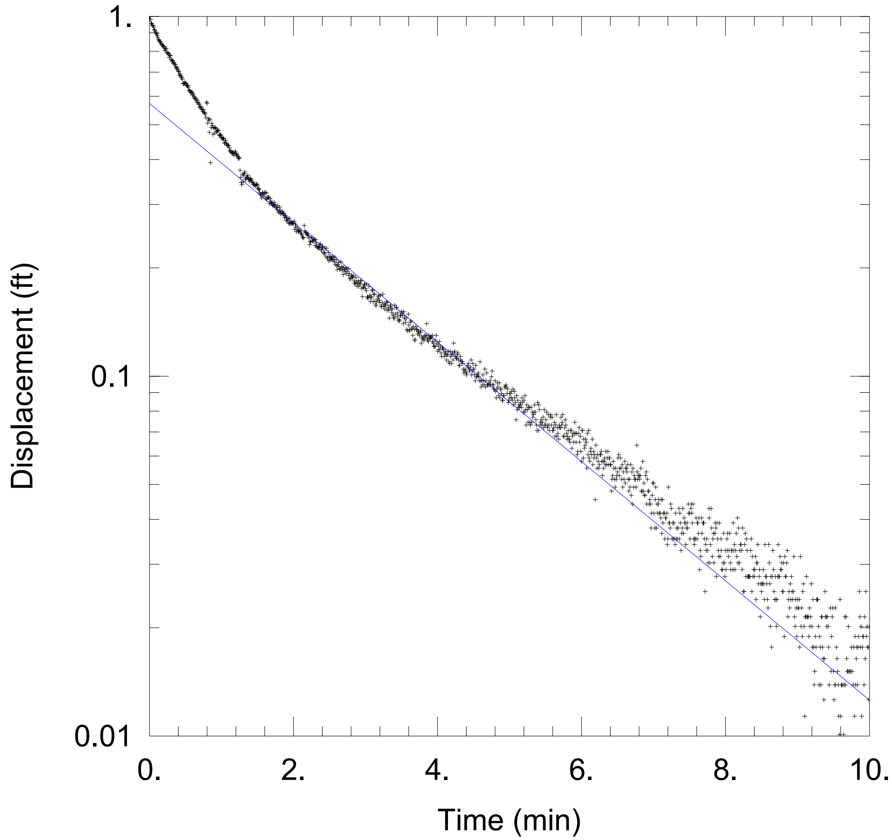
Comments:
Completion of monitoring well JOF-119. Well was installed in boring JOF-119.

APPENDIX E – SLUG TEST RESULTS

Table 1
May 2019 Slug Test Summary
TVA-JOF Facility
New Johnsonville, Tennessee
PN: 175668286

Well ID	Test	Test Date	Bouwer-Rice Hydraulic Conductivity (ft/day)	Bouwer-Rice Hydraulic Conductivity (cm/sec)	Average	
JOF-109	Falling Head 1	4/8/2020	2.72	9.6E-04		
	Falling Head 2	4/8/2020	2.769	9.8E-04	2.799	9.9E-04
	Falling Head 3	4/8/2020	2.918	1.0E-03		
	Rising Head 1	4/8/2020	2.783	9.8E-04		
	Rising Head 2	4/8/2020	2.717	9.6E-04		
	Rising Head 3	4/8/2020	2.884	1.0E-03		
JOF-110	Falling Head 1	4/20/2020	0.07968	2.8E-05		
	Falling Head 2	4/21/2020	0.07986	2.8E-05		
	Falling Head 3	4/22/2020	0.07915	2.8E-05	0.07960	2.8E-05
	Rising Head 1	4/21/2020	0.07962	2.8E-05		
	Rising Head 2	4/22/2020	0.07962	2.8E-05		
	Rising Head 3	4/23/2020	0.07969	2.8E-05		
JOF-111	Falling Head 1	4/20/2020	3.283	1.2E-03		
	Falling Head 2	4/20/2020	3.313	1.2E-03	3.309	1.2E-03
	Falling Head 3	4/20/2020	3.34	1.2E-03		
	Rising Head 1	4/20/2020	3.322	1.2E-03		
	Rising Head 2	4/20/2020	3.297	1.2E-03		
	Rising Head 3	4/20/2020	3.301	1.2E-03		
JOF-112	Falling Head 1	4/7/2020	23.67	8.4E-03		
	Falling Head 2	4/7/2020	24.51	8.6E-03	26.59	9.4E-03
	Falling Head 3	4/7/2020	25.59	9.0E-03		
	Rising Head 1	4/7/2020	28.03	9.9E-03		
	Rising Head 2	4/7/2020	28.69	1.0E-02		
	Rising Head 3	4/7/2020	29.04	1.0E-02		
JOF-113	Falling Head 1	4/22/2020	1.392	4.9E-04		
	Falling Head 2	4/22/2020	1.389	4.9E-04	1.530	5.4E-04
	Falling Head 3	4/22/2020	1.46	5.2E-04		
	Rising Head 1	4/22/2020	1.606	5.7E-04		
	Rising Head 2	4/22/2020	1.632	5.8E-04		
	Rising Head 3	4/22/2020	1.701	6.0E-04		
JOF-114	Falling Head 1	4/22/2020	10.46	3.7E-03		
	Falling Head 2	4/22/2020	10.45	3.7E-03	10.19	3.6E-03
	Falling Head 3	4/22/2020	10.35	3.7E-03		
	Rising Head 1	4/22/2020	9.587	3.4E-03		
	Rising Head 2	4/22/2020	9.956	3.5E-03		
	Rising Head 3	4/22/2020	10.34	3.6E-03		
JOF-117	Falling Head 1	4/22/2020	0.7062	2.5E-04		
	Falling Head 2	4/23/2020	0.7001	2.5E-04	0.7067	2.5E-04
	Falling Head 3	4/23/2020	0.7299	2.6E-04		
	Rising Head 1	4/23/2020	0.7104	2.5E-04		
	Rising Head 2	4/23/2020	0.6932	2.4E-04		
	Rising Head 3	4/23/2020	0.7003	2.5E-04		
JOF-118	Falling Head 1	4/21/2020	235.6	8.3E-02		
	Falling Head 2	4/21/2020	179.5	6.3E-02	217.7	7.7E-02
	Falling Head 3	4/21/2020	192.7	6.8E-02		
	Rising Head 1	4/21/2020	227.3	8.0E-02		
	Rising Head 2	4/21/2020	227.7	8.0E-02		
	Rising Head 3	4/21/2020	243.3	8.6E-02		
JOF-119	Falling Head 1	4/21/2020	142.6	5.0E-02		
	Falling Head 2	4/21/2020	141.8	5.0E-02	152.9	5.4E-02
	Falling Head 3	4/21/2020	148.6	5.2E-02		
	Rising Head 1	4/21/2020	163.0	5.8E-02		
	Rising Head 2	4/21/2020	165.2	5.8E-02		
	Rising Head 3	4/21/2020	156.1	5.5E-02		

Notes
ft/day - feet per day
cm/sec - centimeters per second
Data analysis was completed using AQTESOLV™, Version 4.50 Professional



JOF-109 FH 1

Data Set: C:\...\JOF-109_FH-1.aqt
Date: 05/22/20 Time: 14:33:36

PROJECT INFORMATION

Company: Stantec
Client: TVA-JOF
Project: 175568286
Location: New Johnsonville, TN
Test Well: JOF-109
Test Date: 4/8/2020

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

K = 2.72 ft/day
y0 = 0.5727 ft

AQUIFER DATA

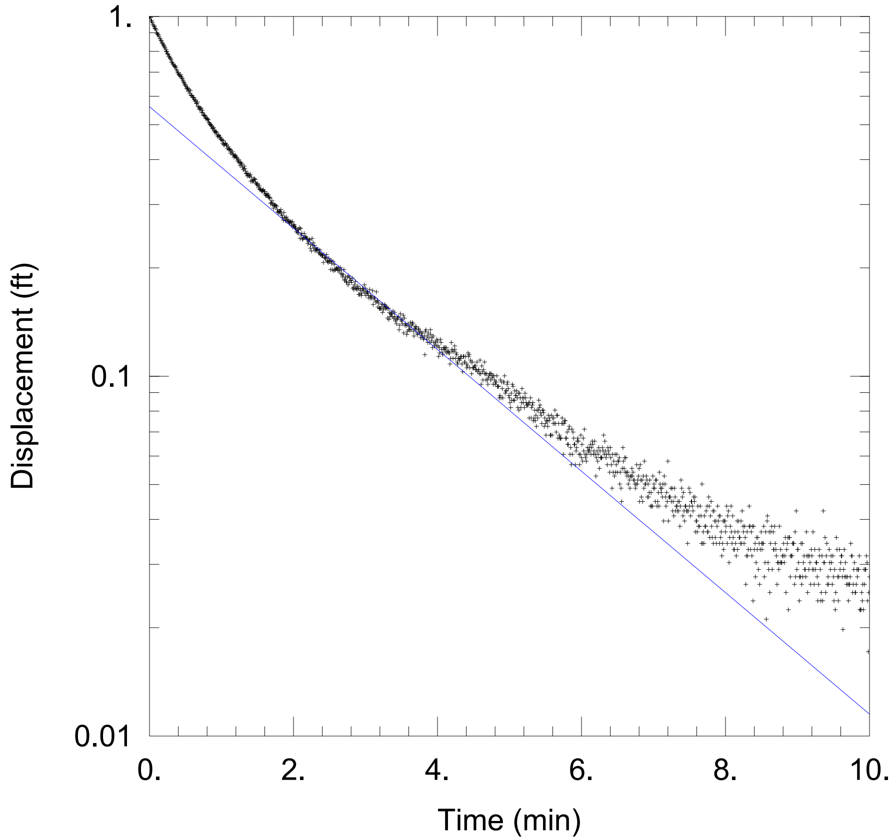
Saturated Thickness: 32.7 ft

Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (JOF-109)

Initial Displacement: 1. ft
Total Well Penetration Depth: 31.5 ft
Casing Radius: 0.1667 ft

Static Water Column Height: 40.29 ft
Screen Length: 9.8 ft
Well Radius: 0.542 ft



JOF-109 FH 2

Data Set: C:\...\JOF-109_FH-2.aqt
Date: 05/22/20 Time: 14:35:57

PROJECT INFORMATION

Company: Stantec
Client: TVA-JOF
Project: 175568286
Location: New Johnsonville, TN
Test Well: JOF-109
Test Date: 4/8/2020

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

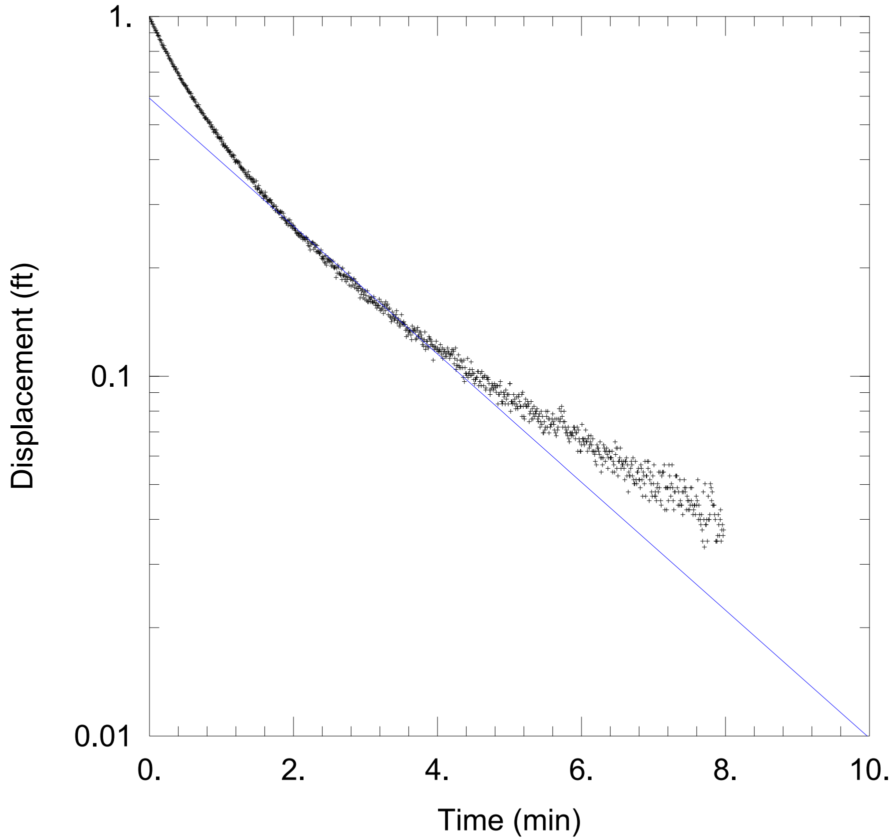
K = 2.769 ft/day
y0 = 0.5611 ft

AQUIFER DATA

Saturated Thickness: 32.7 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (JOF-109)

Initial Displacement: 1. ft
Total Well Penetration Depth: 31.5 ft
Casing Radius: 0.1667 ft
Static Water Column Height: 40.29 ft
Screen Length: 9.8 ft
Well Radius: 0.542 ft



JOF-109 FH 3

Data Set: C:\...\JOF-109_FH-3.aqt
Date: 05/22/20 Time: 14:38:26

PROJECT INFORMATION

Company: Stantec
Client: TVA-JOF
Project: 175568286
Location: New Johnsonville, TN
Test Well: JOF-109
Test Date: 4/8/2020

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

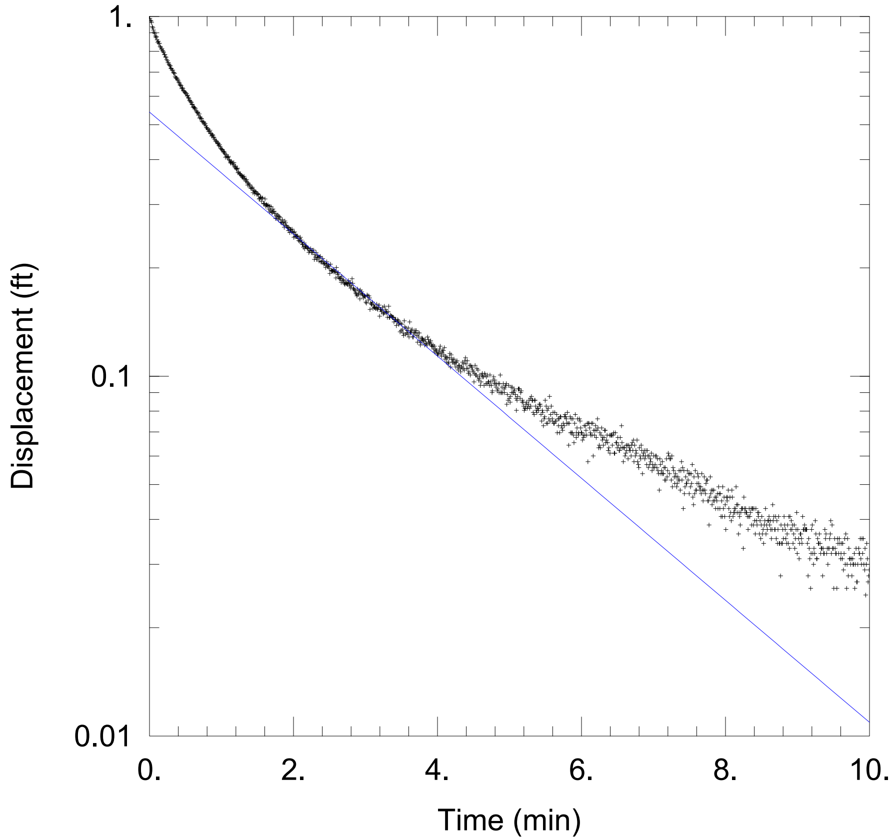
K = 2.918 ft/day
y0 = 0.5924 ft

AQUIFER DATA

Saturated Thickness: 32.7 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (JOF-109)

Initial Displacement: 1. ft
Total Well Penetration Depth: 31.5 ft
Casing Radius: 0.1667 ft
Static Water Column Height: 40.29 ft
Screen Length: 9.8 ft
Well Radius: 0.542 ft



JOF-109 RH 1

Data Set: C:\...\JOF-109_RH-1.aqt
Date: 05/22/20 Time: 14:40:38

PROJECT INFORMATION

Company: Stantec
Client: TVA-JOF
Project: 175568286
Location: New Johnsonville, TN
Test Well: JOF-109
Test Date: 4/8/2020

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

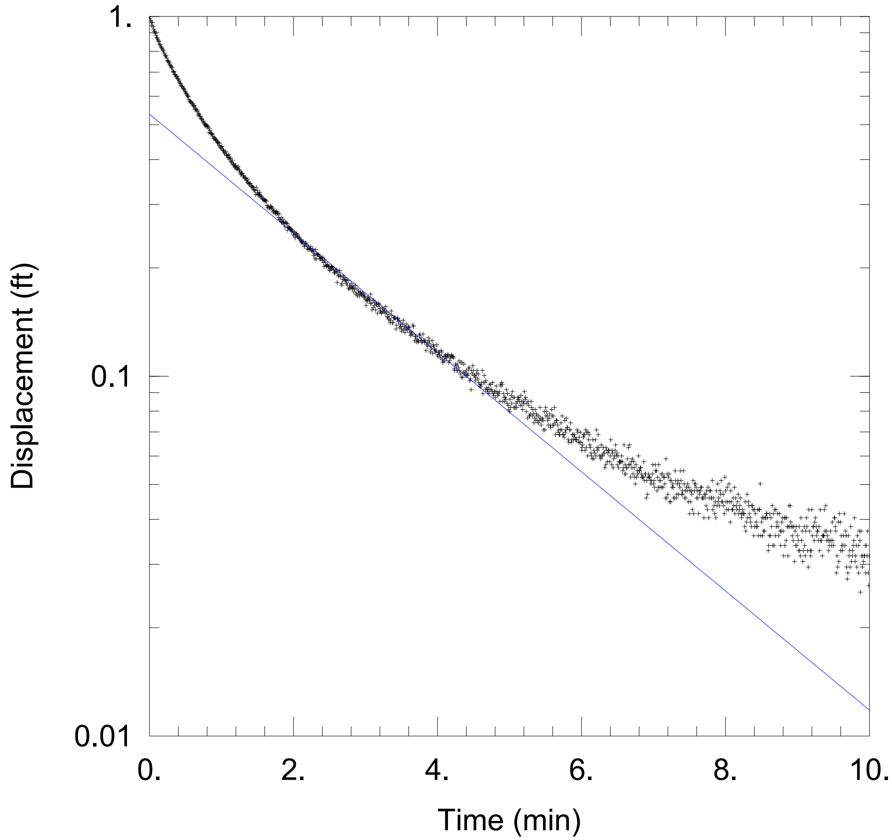
K = 2.783 ft/day
y0 = 0.5421 ft

AQUIFER DATA

Saturated Thickness: 32.7 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (JOF-109)

Initial Displacement: 1. ft
Total Well Penetration Depth: 31.5 ft
Casing Radius: 0.1667 ft
Static Water Column Height: 40.29 ft
Screen Length: 9.8 ft
Well Radius: 0.542 ft



JOF-109 RH 2

Data Set: C:\...\JOF-109_RH-2.aqt
Date: 05/22/20 Time: 14:47:57

PROJECT INFORMATION

Company: Stantec
Client: TVA-JOF
Project: 175568286
Location: New Johnsonville, TN
Test Well: JOF-109
Test Date: 4/8/2020

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

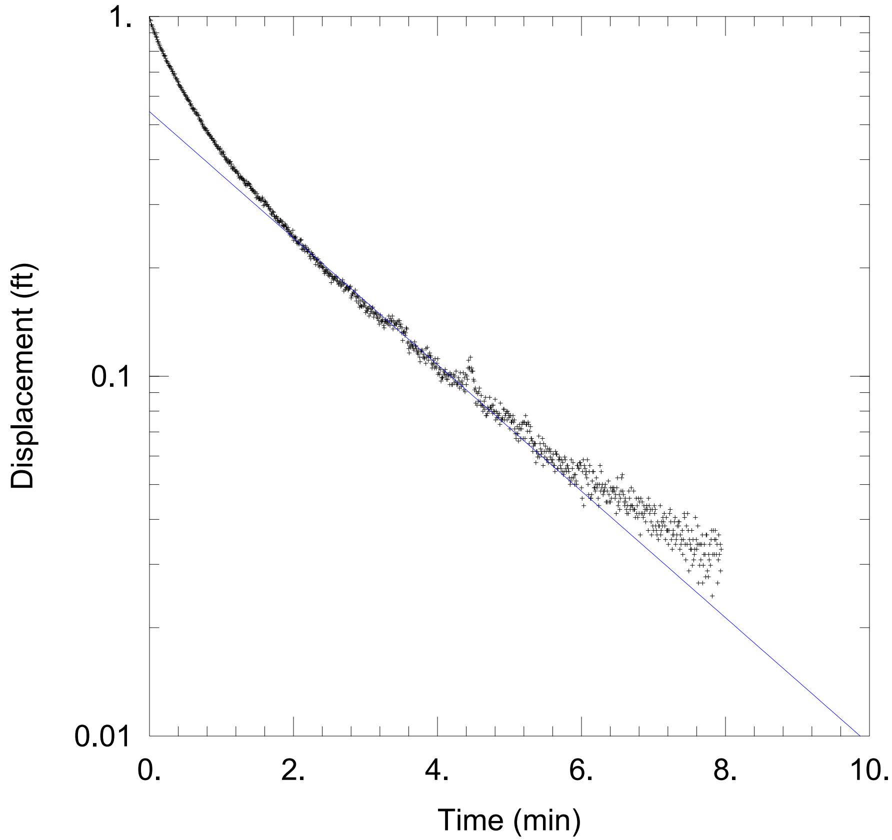
K = 2.717 ft/day
y0 = 0.535 ft

AQUIFER DATA

Saturated Thickness: 32.7 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (JOF-109)

Initial Displacement: 1. ft
Total Well Penetration Depth: 31.5 ft
Casing Radius: 0.1667 ft
Static Water Column Height: 40.29 ft
Screen Length: 9.8 ft
Well Radius: 0.542 ft



JOF-109 RH 3

Data Set: C:\...\JOF-109_RH-3.aqt
Date: 05/22/20 Time: 14:47:09

PROJECT INFORMATION

Company: Stantec
Client: TVA-JOF
Project: 175568286
Location: New Johnsonville, TN
Test Well: JOF-109
Test Date: 4/8/2020

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

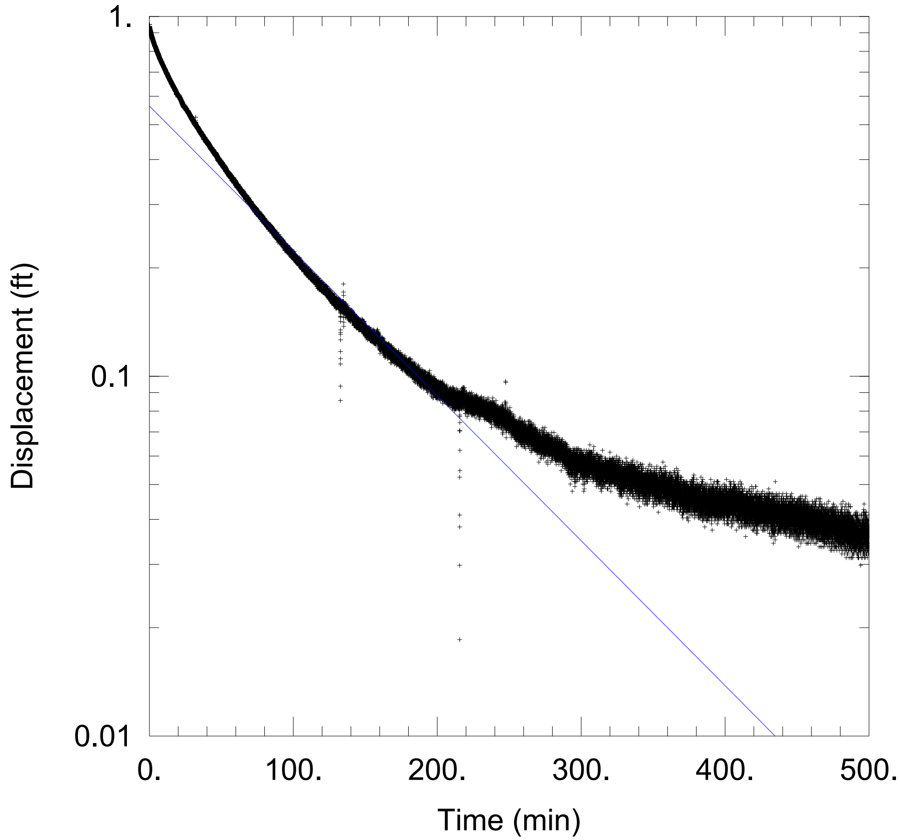
K = 2.884 ft/day
y0 = 0.5436 ft

AQUIFER DATA

Saturated Thickness: 32.7 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (JOF-109)

Initial Displacement: 1. ft
Total Well Penetration Depth: 31.5 ft
Casing Radius: 0.1667 ft
Static Water Column Height: 40.29 ft
Screen Length: 9.8 ft
Well Radius: 0.542 ft



JOF-110 FH 1

Data Set: C:\...\JOF-110_FH-1.aqt
Date: 06/18/20 Time: 12:07:40

PROJECT INFORMATION

Company: Stantec
Client: TVA-JOF
Project: 175568286
Location: New Johnsonville, TN
Test Well: JOF-110
Test Date: 4/20/2020

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.07968 ft/day
y0 = 0.5637 ft

AQUIFER DATA

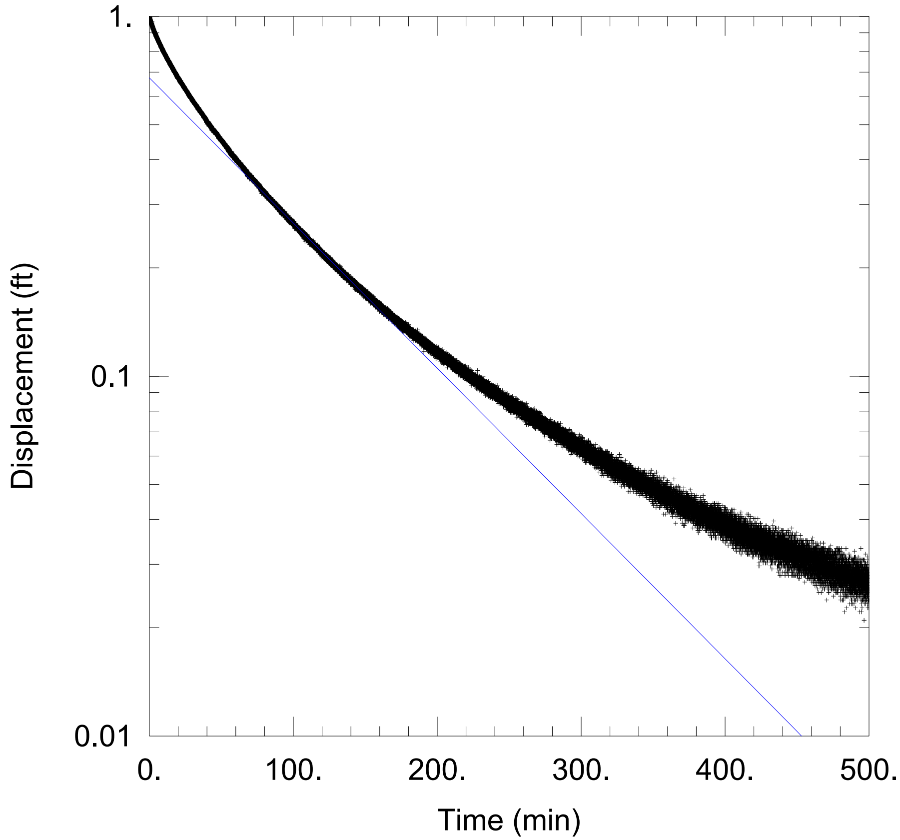
Saturated Thickness: 44.8 ft

Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (JOF-110)

Initial Displacement: 1. ft
Total Well Penetration Depth: 44.4 ft
Casing Radius: 0.1667 ft

Static Water Column Height: 44.8 ft
Screen Length: 9.8 ft
Well Radius: 0.333 ft



JOF-110 FH 2

Data Set: C:\...\JOF-110_FH-2.aqt
Date: 06/18/20 Time: 12:06:23

PROJECT INFORMATION

Company: Stantec
Client: TVA-JOF
Project: 175568286
Location: New Johnsonville, TN
Test Well: JOF-110
Test Date: 4/21/2020

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

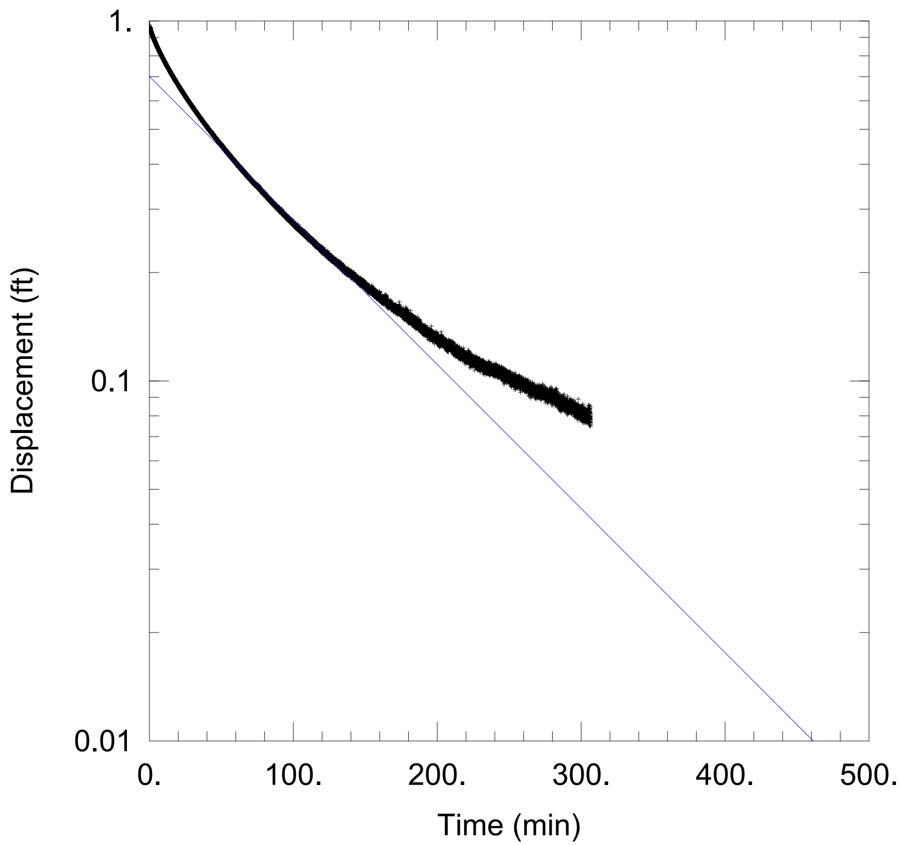
K = 0.07986 ft/day
y0 = 0.675 ft

AQUIFER DATA

Saturated Thickness: 44.8 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (JOF-110)

Initial Displacement: 1. ft
Total Well Penetration Depth: 44.4 ft
Casing Radius: 0.1667 ft
Static Water Column Height: 44.8 ft
Screen Length: 9.8 ft
Well Radius: 0.333 ft



JOF-110 FH 3

Data Set: C:\...\JOF-110_FH-3.aqt
Date: 06/18/20 Time: 11:53:21

PROJECT INFORMATION

Company: Stantec
Client: TVA-JOF
Project: 175568286
Location: New Johnsonville, TN
Test Well: JOF-110
Test Date: 4/22/2020

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.07915 ft/day
y0 = 0.7007 ft

AQUIFER DATA

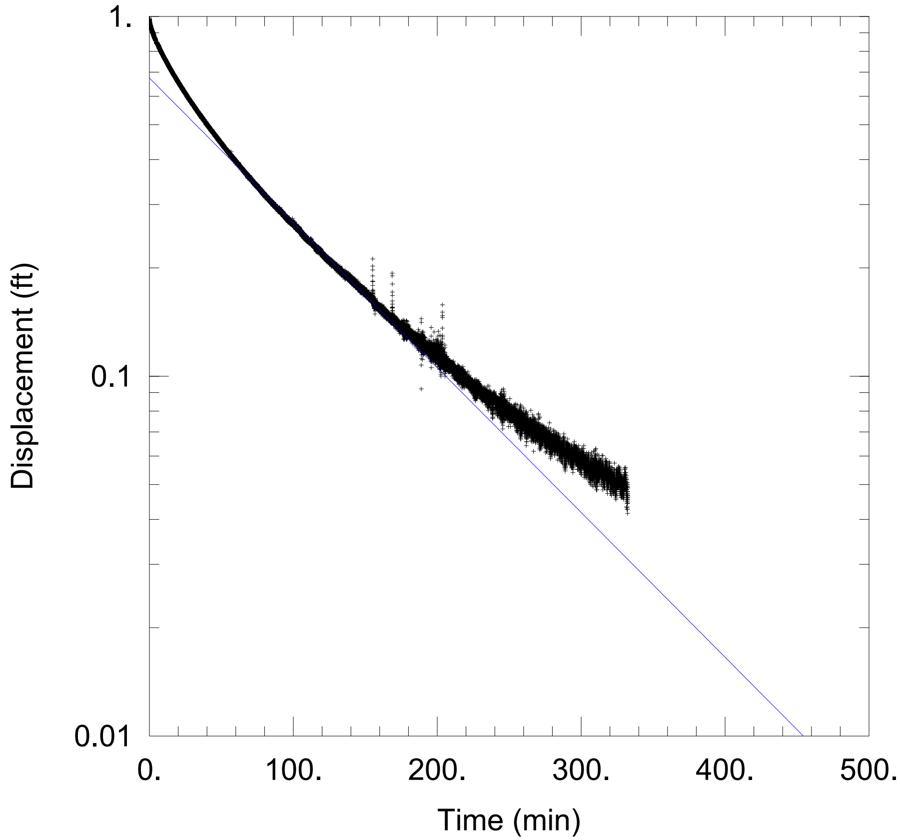
Saturated Thickness: 44.8 ft

Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (JOF-110)

Initial Displacement: 1. ft
Total Well Penetration Depth: 44.4 ft
Casing Radius: 0.1667 ft

Static Water Column Height: 44.8 ft
Screen Length: 9.8 ft
Well Radius: 0.333 ft



JOF-110 RH 1

Data Set: C:\...\JOF-110_RH-1.aqt
Date: 06/18/20 Time: 11:55:10

PROJECT INFORMATION

Company: Stantec
Client: TVA-JOF
Project: 175568286
Location: New Johnsonville, TN
Test Well: JOF-110
Test Date: 4/21/2020

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.07962 ft/day
y0 = 0.6739 ft

AQUIFER DATA

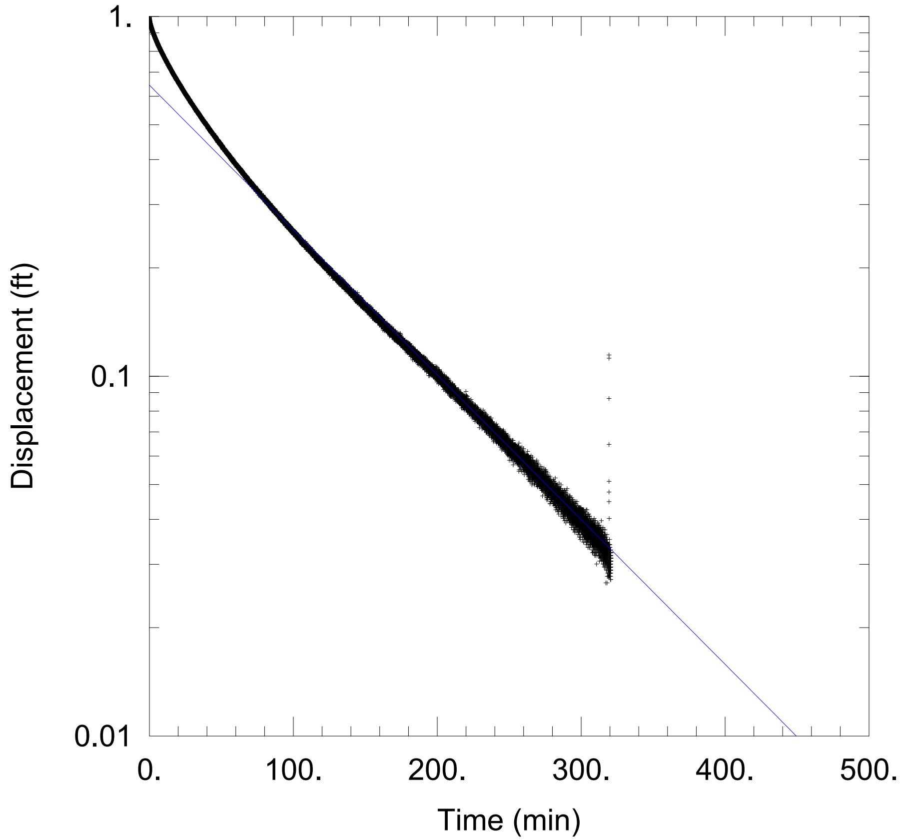
Saturated Thickness: 44.8 ft

Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (JOF-110)

Initial Displacement: 1. ft
Total Well Penetration Depth: 44.4 ft
Casing Radius: 0.1667 ft

Static Water Column Height: 44.8 ft
Screen Length: 9.8 ft
Well Radius: 0.333 ft



JOF-110 RH 2

Data Set: C:\...\JOF-110_RH-2.aqt
Date: 06/18/20 Time: 11:56:15

PROJECT INFORMATION

Company: Stantec
Client: TVA-JOF
Project: 175568286
Location: New Johnsonville, TN
Test Well: JOF-110
Test Date: 4/22/2020

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

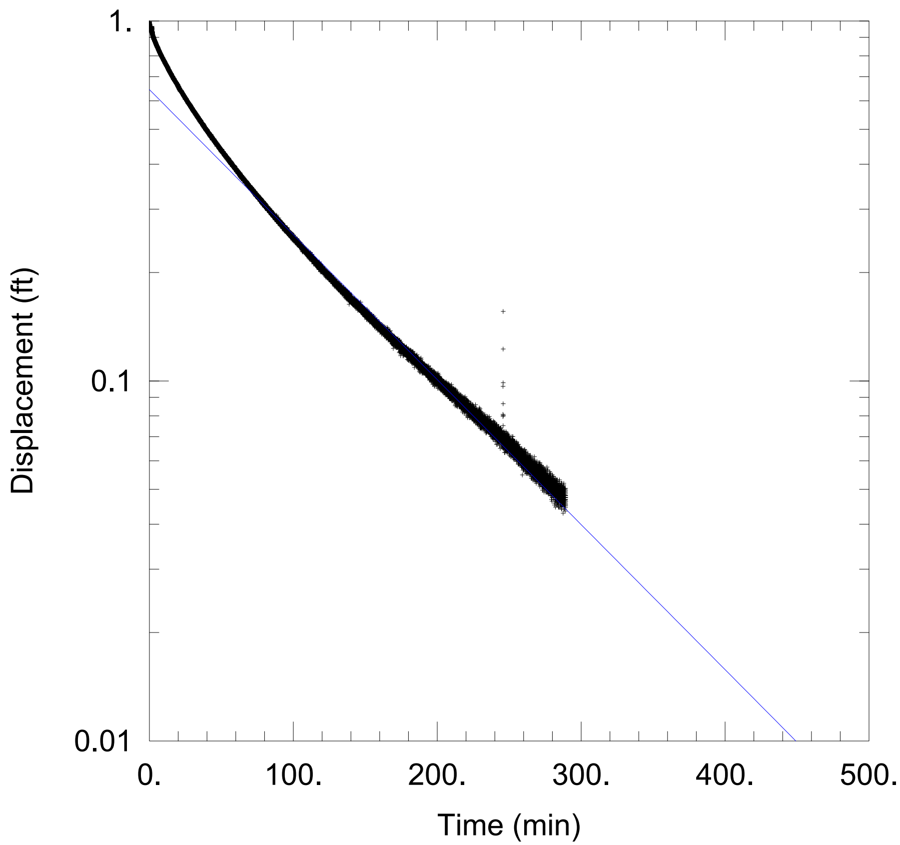
K = 0.07962 ft/day
y0 = 0.644 ft

AQUIFER DATA

Saturated Thickness: 44.8 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (JOF-110)

Initial Displacement: 1. ft
Total Well Penetration Depth: 44.4 ft
Casing Radius: 0.1667 ft
Static Water Column Height: 44.8 ft
Screen Length: 9.8 ft
Well Radius: 0.333 ft



JOF-110 RH 3

Data Set: C:\...\JOF-110_RH-3.aqt
Date: 06/18/20 Time: 11:58:10

PROJECT INFORMATION

Company: Stantec
Client: TVA-JOF
Project: 175568286
Location: New Johnsonville, TN
Test Well: JOF-110
Test Date: 4/23/2020

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

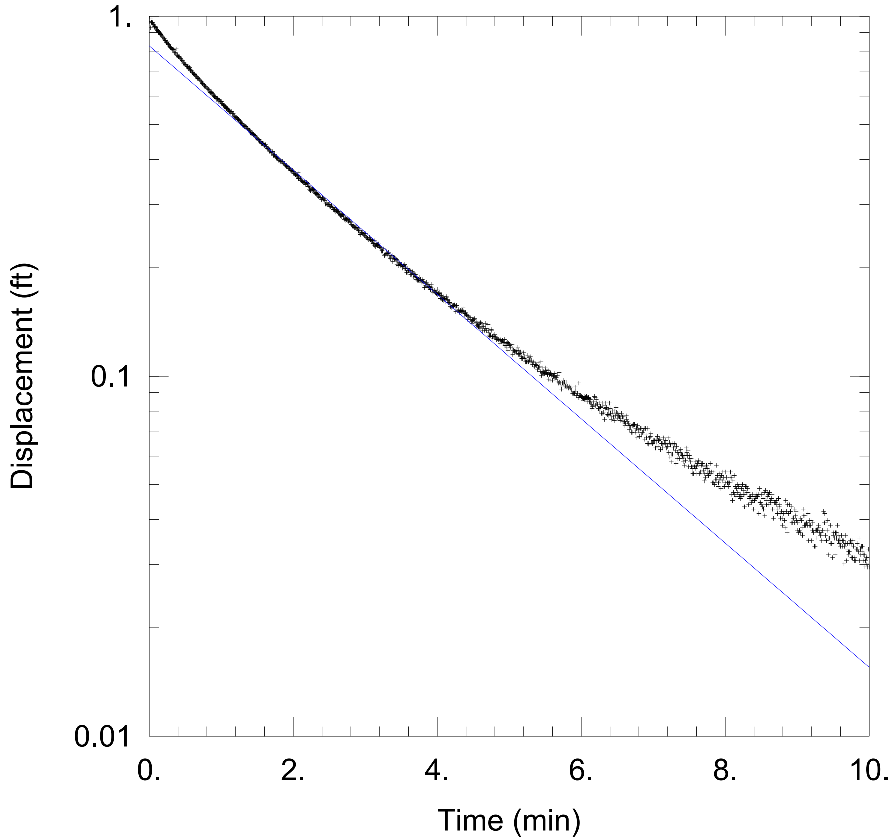
K = 0.07969 ft/day
y0 = 0.6445 ft

AQUIFER DATA

Saturated Thickness: 44.8 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (JOF-110)

Initial Displacement: 1. ft
Total Well Penetration Depth: 44.4 ft
Casing Radius: 0.1667 ft
Static Water Column Height: 44.8 ft
Screen Length: 9.8 ft
Well Radius: 0.333 ft



JOF-111 FH 1

Data Set: C:\...\JOF-111_FH-1.aqt
Date: 06/18/20 Time: 12:10:07

PROJECT INFORMATION

Company: Stantec
Client: TVA-JOF
Project: 175568286
Location: New Johnsonville, TN
Test Well: JOF-111
Test Date: 4/20/2020

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

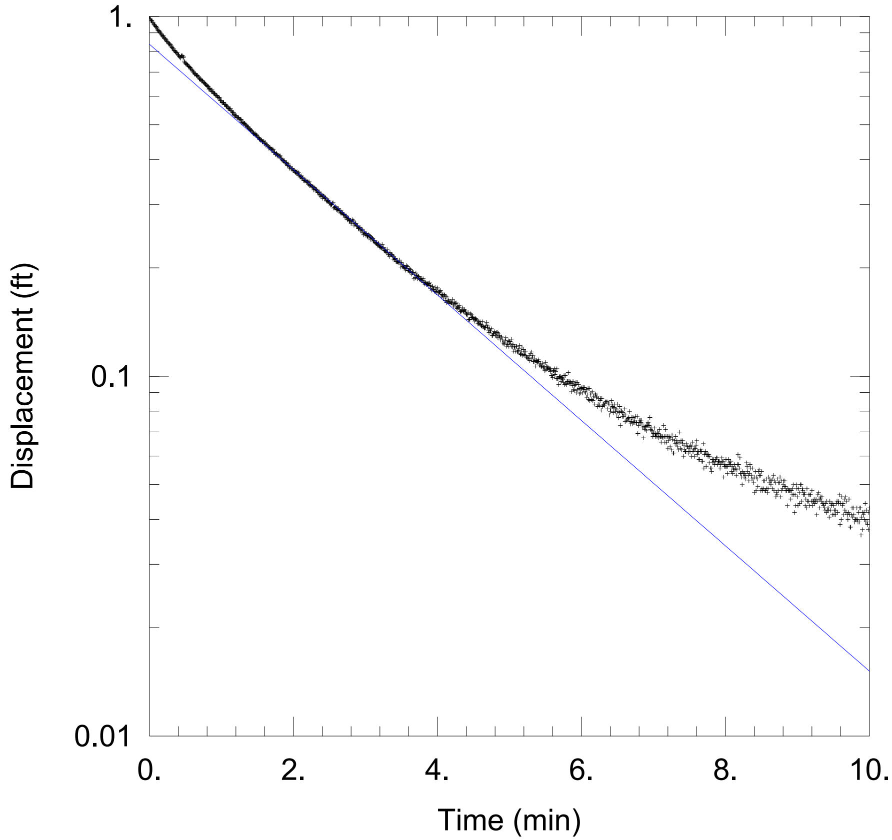
K = 3.283 ft/day
y0 = 0.8272 ft

AQUIFER DATA

Saturated Thickness: 32.8 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (JOF-111)

Initial Displacement: 1. ft
Total Well Penetration Depth: 32.4 ft
Casing Radius: 0.1667 ft
Static Water Column Height: 32.8 ft
Screen Length: 9.8 ft
Well Radius: 0.33 ft



JOF-111 FH 2

Data Set: C:\...\JOF-111_FH-2.aqt
Date: 06/18/20 Time: 12:00:06

PROJECT INFORMATION

Company: Stantec
Client: TVA-JOF
Project: 175568286
Location: New Johnsonville, TN
Test Well: JOF-111
Test Date: 4/20/2020

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

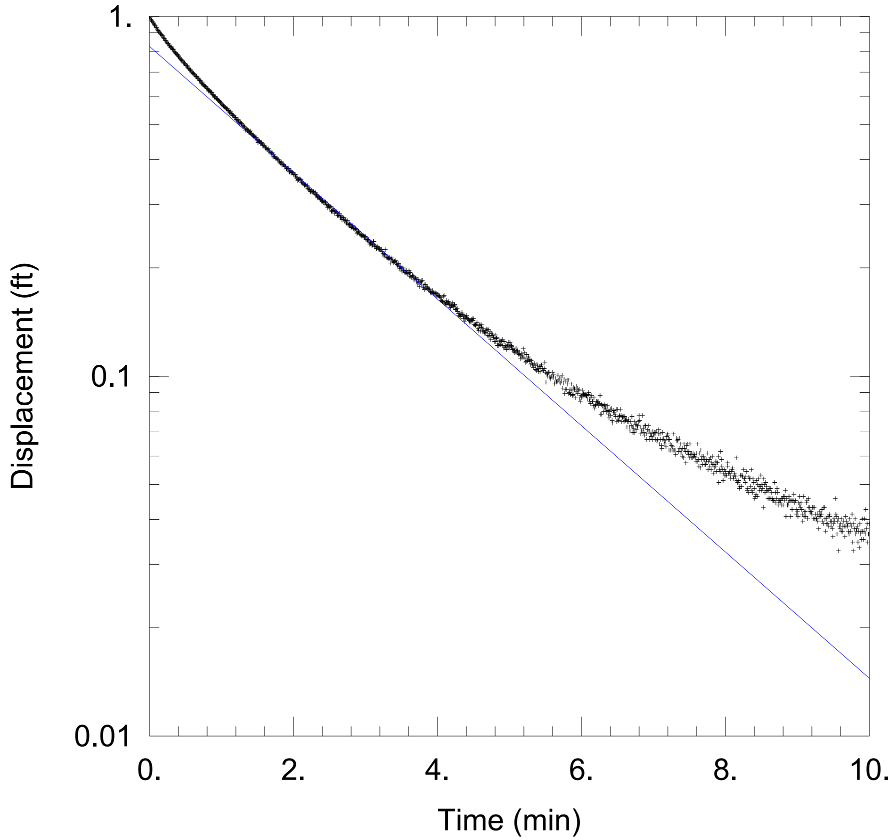
K = 3.313 ft/day
y0 = 0.8362 ft

AQUIFER DATA

Saturated Thickness: 32.8 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (JOF-111)

Initial Displacement: 1. ft
Total Well Penetration Depth: 32.4 ft
Casing Radius: 0.1667 ft
Static Water Column Height: 32.8 ft
Screen Length: 9.8 ft
Well Radius: 0.33 ft



JOF-111 FH 3

Data Set: C:\...\JOF-111_FH-3.aqt
Date: 06/18/20 Time: 12:00:47

PROJECT INFORMATION

Company: Stantec
Client: TVA-JOF
Project: 175568286
Location: New Johnsonville, TN
Test Well: JOF-111
Test Date: 4/20/2020

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

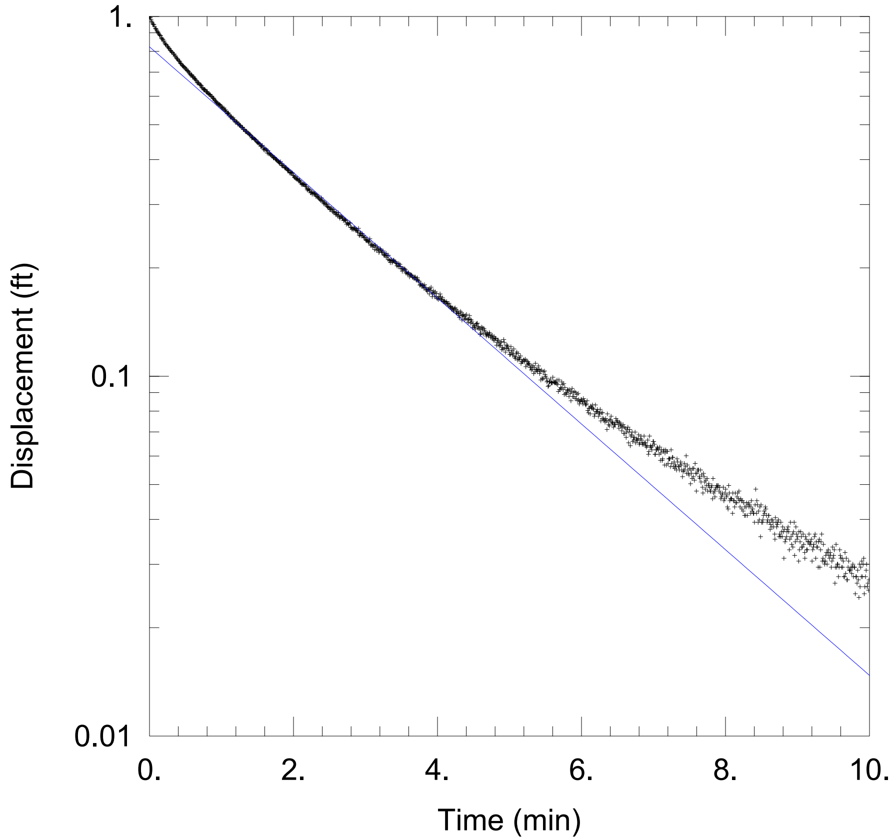
K = 3.34 ft/day
y0 = 0.8251 ft

AQUIFER DATA

Saturated Thickness: 32.8 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (JOF-111)

Initial Displacement: 1. ft
Total Well Penetration Depth: 32.4 ft
Casing Radius: 0.1667 ft
Static Water Column Height: 32.8 ft
Screen Length: 9.8 ft
Well Radius: 0.33 ft



JOF-111 RH 1

Data Set: C:\...\JOF-111_RH-1.aqt
Date: 06/18/20 Time: 12:01:35

PROJECT INFORMATION

Company: Stantec
Client: TVA-JOF
Project: 175568286
Location: New Johnsonville, TN
Test Well: JOF-111
Test Date: 4/20/2020

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

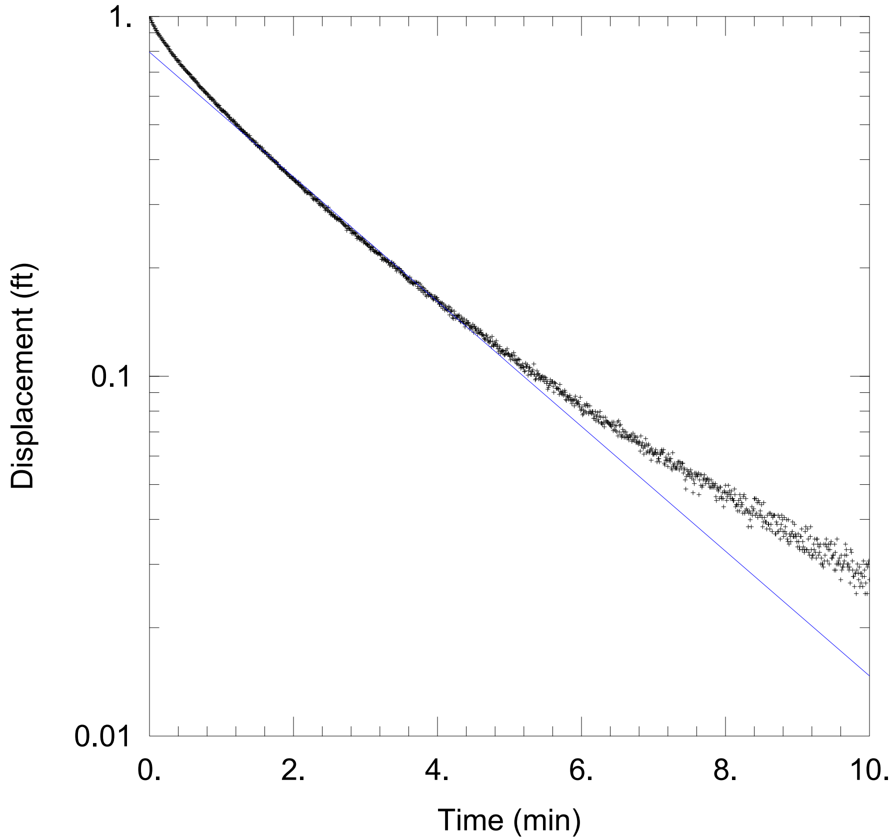
K = 3.322 ft/day
y0 = 0.8231 ft

AQUIFER DATA

Saturated Thickness: 32.8 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (JOF-111)

Initial Displacement: 1. ft
Total Well Penetration Depth: 32.4 ft
Casing Radius: 0.1667 ft
Static Water Column Height: 32.8 ft
Screen Length: 9.8 ft
Well Radius: 0.33 ft



JOF-111 RH 2

Data Set: C:\...\JOF-111_RH-2.aqt
Date: 06/18/20 Time: 12:02:25

PROJECT INFORMATION

Company: Stantec
Client: TVA-JOF
Project: 175568286
Location: New Johnsonville, TN
Test Well: JOF-111
Test Date: 4/20/2020

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

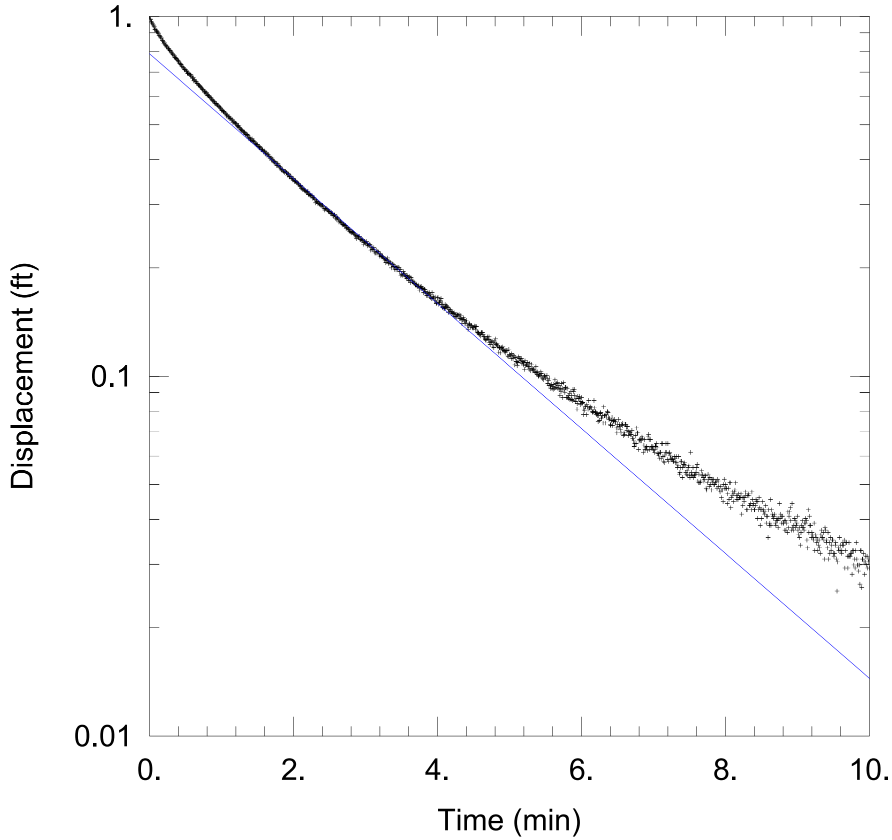
K = 3.297 ft/day
y0 = 0.7954 ft

AQUIFER DATA

Saturated Thickness: 32.8 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (JOF-111)

Initial Displacement: 1. ft
Total Well Penetration Depth: 32.4 ft
Casing Radius: 0.1667 ft
Static Water Column Height: 32.8 ft
Screen Length: 9.8 ft
Well Radius: 0.33 ft



JOF-111 RH 3

Data Set: C:\...\JOF-111_RH-3.aqt
Date: 06/18/20 Time: 12:03:10

PROJECT INFORMATION

Company: Stantec
Client: TVA-JOF
Project: 175568286
Location: New Johnsonville, TN
Test Well: JOF-111
Test Date: 4/20/2020

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 3.301 ft/day
y0 = 0.7872 ft

AQUIFER DATA

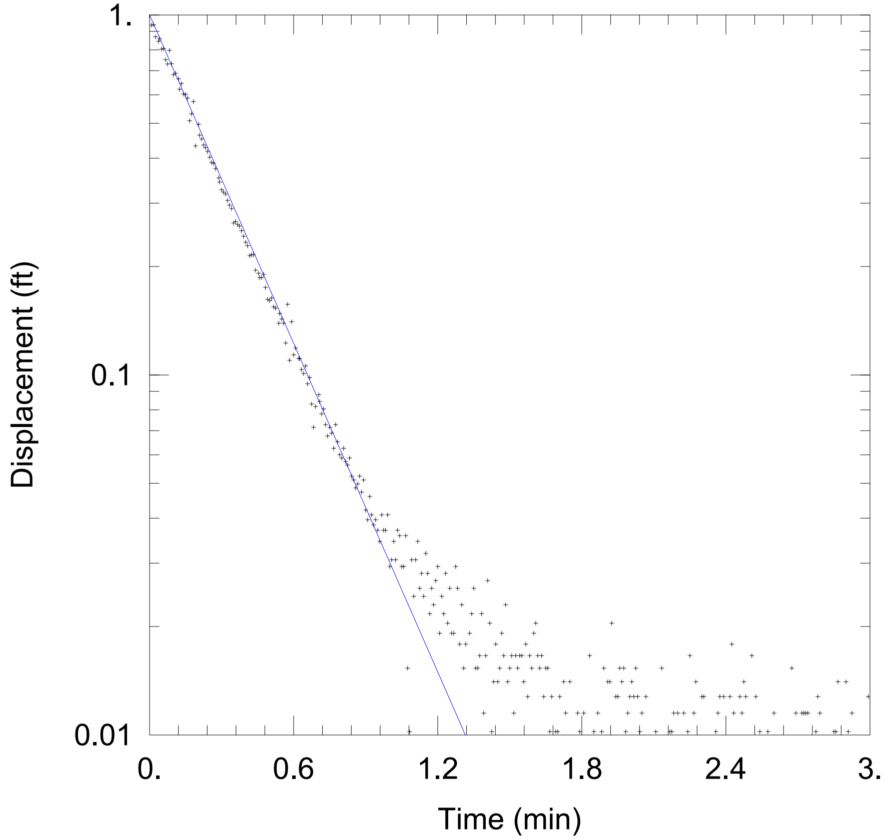
Saturated Thickness: 32.8 ft

Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (JOF-111)

Initial Displacement: 1. ft
Total Well Penetration Depth: 32.4 ft
Casing Radius: 0.1667 ft

Static Water Column Height: 32.8 ft
Screen Length: 9.8 ft
Well Radius: 0.33 ft



JOF-112 FH 1

Data Set: C:\...\JOF-112_FH-1.aqt
Date: 06/16/20 Time: 11:43:33

PROJECT INFORMATION

Company: Stantec
Client: TVA-JOF
Project: 175568286
Location: New Johnsonville, TN
Test Well: JOF-112
Test Date: 4/7/2020

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

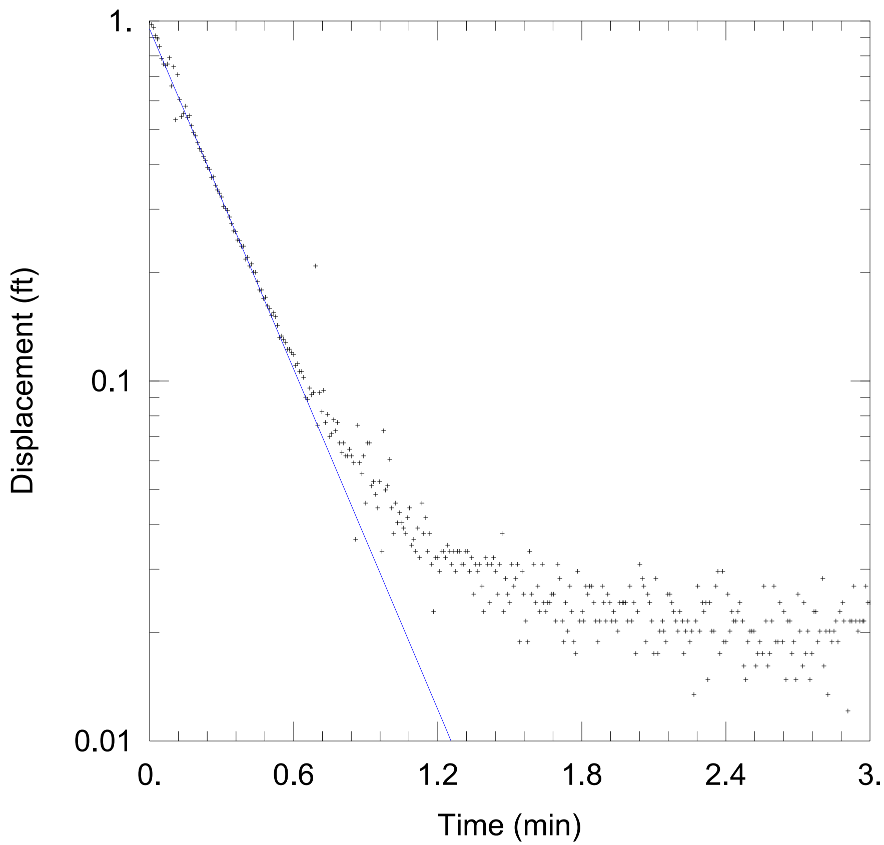
K = 23.67 ft/day
y0 = 0.9999 ft

AQUIFER DATA

Saturated Thickness: 18.3 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (JOF-112)

Initial Displacement: 1. ft
Total Well Penetration Depth: 17.9 ft
Casing Radius: 0.1667 ft
Static Water Column Height: 18.3 ft
Screen Length: 9.8 ft
Well Radius: 0.542 ft



JOF-112 FH 2

Data Set: C:\...\JOF-112_FH-2.aqt
Date: 06/16/20 Time: 11:44:50

PROJECT INFORMATION

Company: Stantec
Client: TVA-JOF
Project: 175568286
Location: New Johnsonville, TN
Test Well: JOF-112
Test Date: 4/7/2020

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

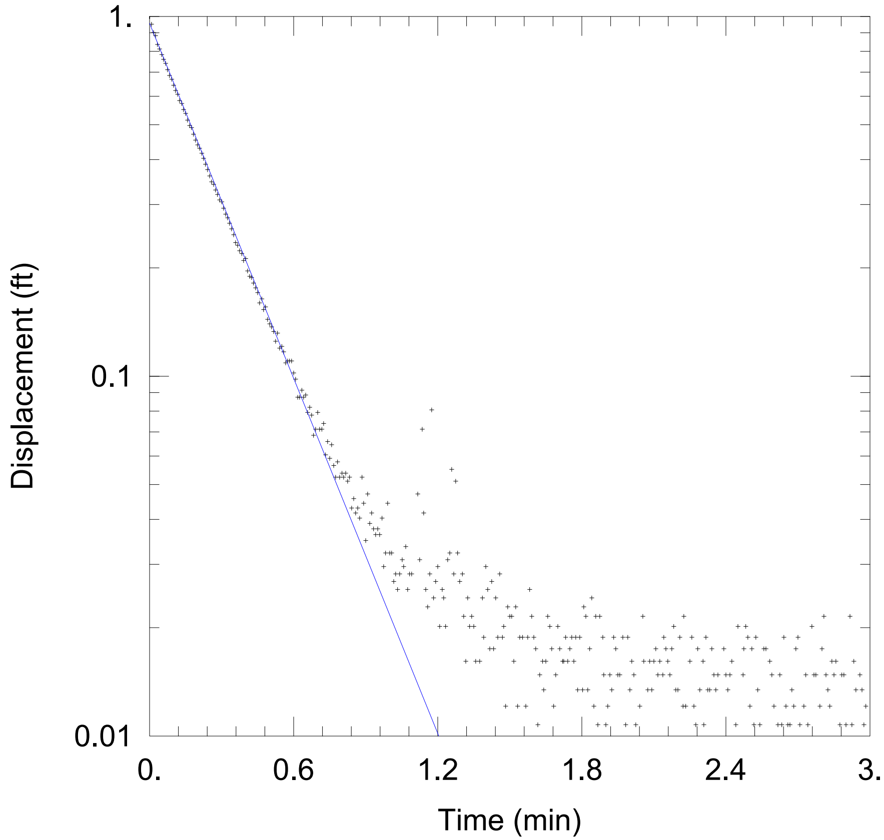
K = 24.51 ft/day
y0 = 0.9499 ft

AQUIFER DATA

Saturated Thickness: 18.3 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (JOF-112)

Initial Displacement: 1. ft
Total Well Penetration Depth: 17.9 ft
Casing Radius: 0.1667 ft
Static Water Column Height: 18.3 ft
Screen Length: 9.8 ft
Well Radius: 0.542 ft



JOF-112 FH 3

Data Set: C:\...\JOF-112_FH-3.aqt
Date: 06/16/20 Time: 11:45:42

PROJECT INFORMATION

Company: Stantec
Client: TVA-JOF
Project: 175568286
Location: New Johnsonville, TN
Test Well: JOF-112
Test Date: 4/7/2020

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

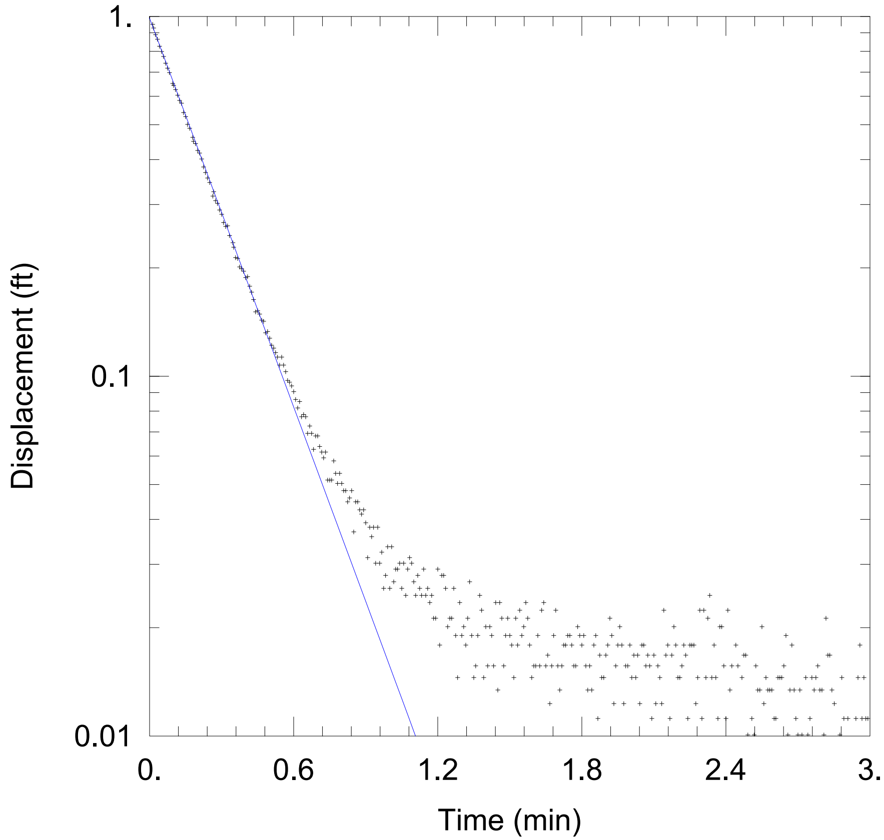
K = 25.59 ft/day
y0 = 0.9565 ft

AQUIFER DATA

Saturated Thickness: 18.3 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (JOF-112)

Initial Displacement: 1. ft
Total Well Penetration Depth: 17.9 ft
Casing Radius: 0.1667 ft
Static Water Column Height: 18.3 ft
Screen Length: 9.8 ft
Well Radius: 0.542 ft



JOF-112 RH 1

Data Set: C:\...\JOF-112_RH-1.aqt
Date: 06/16/20 Time: 11:48:38

PROJECT INFORMATION

Company: Stantec
Client: TVA-JOF
Project: 175568286
Location: New Johnsonville, TN
Test Well: JOF-112
Test Date: 4/7/2020

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 28.03 ft/day
y0 = 0.9886 ft

AQUIFER DATA

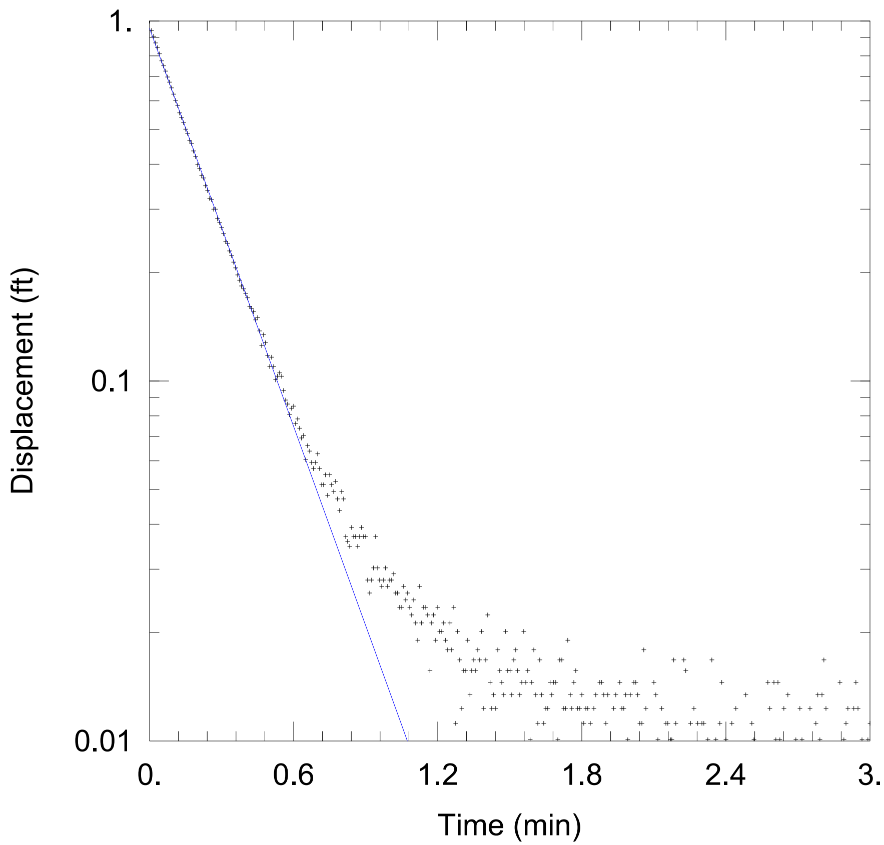
Saturated Thickness: 18.3 ft

Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (JOF-112)

Initial Displacement: 1. ft
Total Well Penetration Depth: 17.9 ft
Casing Radius: 0.1667 ft

Static Water Column Height: 18.3 ft
Screen Length: 9.8 ft
Well Radius: 0.542 ft



JOF-112 RH 2

Data Set: C:\...\JOF-112_RH-2.aqt
Date: 06/16/20 Time: 11:49:18

PROJECT INFORMATION

Company: Stantec
Client: TVA-JOF
Project: 175568286
Location: New Johnsonville, TN
Test Well: JOF-112
Test Date: 4/7/2020

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 28.69 ft/day
y0 = 0.9529 ft

AQUIFER DATA

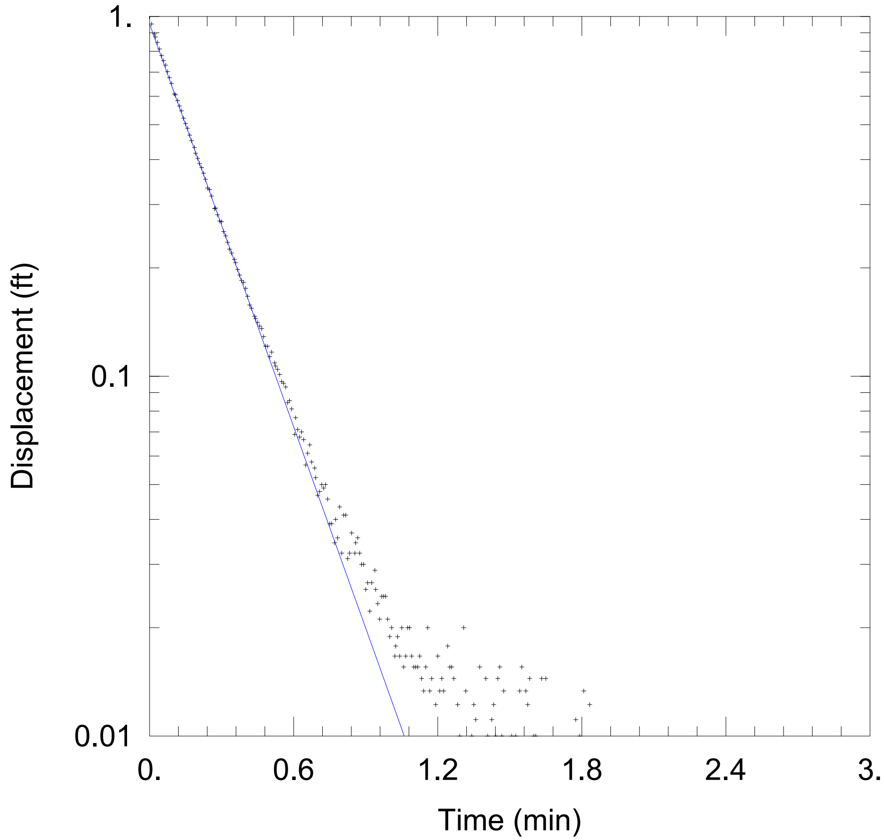
Saturated Thickness: 18.3 ft

Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (JOF-112)

Initial Displacement: 1. ft
Total Well Penetration Depth: 17.9 ft
Casing Radius: 0.1667 ft

Static Water Column Height: 18.3 ft
Screen Length: 9.8 ft
Well Radius: 0.542 ft



JOF-112 RH 3

Data Set: C:\...\JOF-112_RH-3.aqt
Date: 06/16/20 Time: 11:50:06

PROJECT INFORMATION

Company: Stantec
Client: TVA-JOF
Project: 175568286
Location: New Johnsonville, TN
Test Well: JOF-112
Test Date: 4/7/2020

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

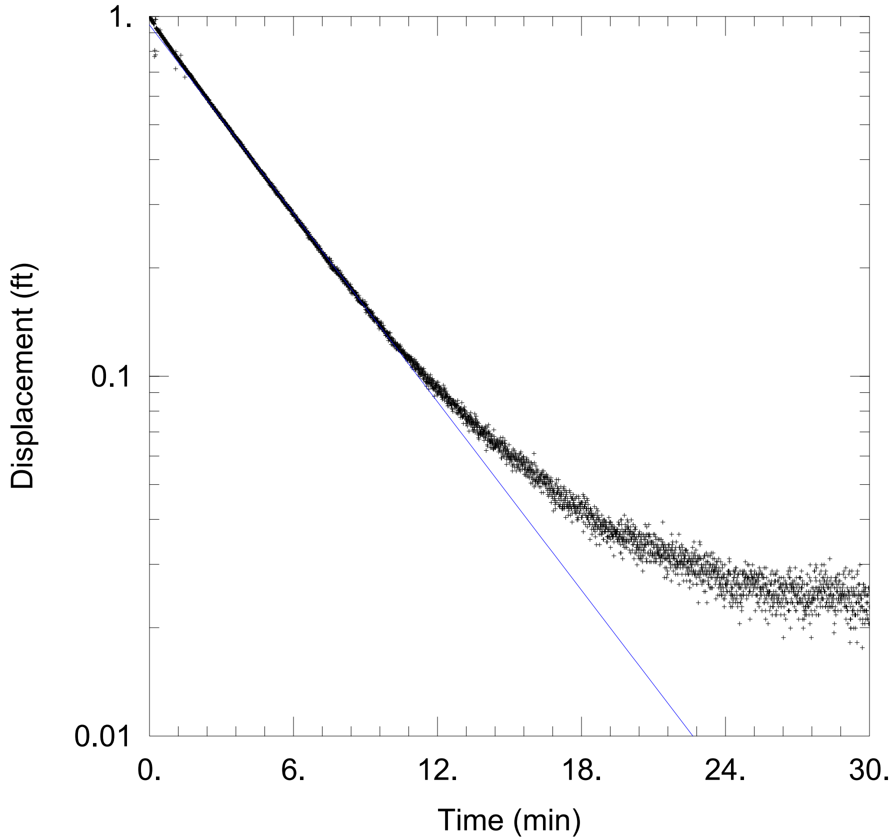
K = 29.04 ft/day
y0 = 0.9528 ft

AQUIFER DATA

Saturated Thickness: 18.3 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (JOF-112)

Initial Displacement: 1. ft
Total Well Penetration Depth: 17.9 ft
Casing Radius: 0.1667 ft
Static Water Column Height: 18.3 ft
Screen Length: 9.8 ft
Well Radius: 0.542 ft



JOF-113 FH 1

Data Set: C:\...\JOF-113_FH-1.aqt
Date: 06/16/20 Time: 11:51:32

PROJECT INFORMATION

Company: Stantec
Client: TVA-JOF
Project: 175568286
Location: New Johnsonville, TN
Test Well: JOF-113
Test Date: 4/22/2020

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

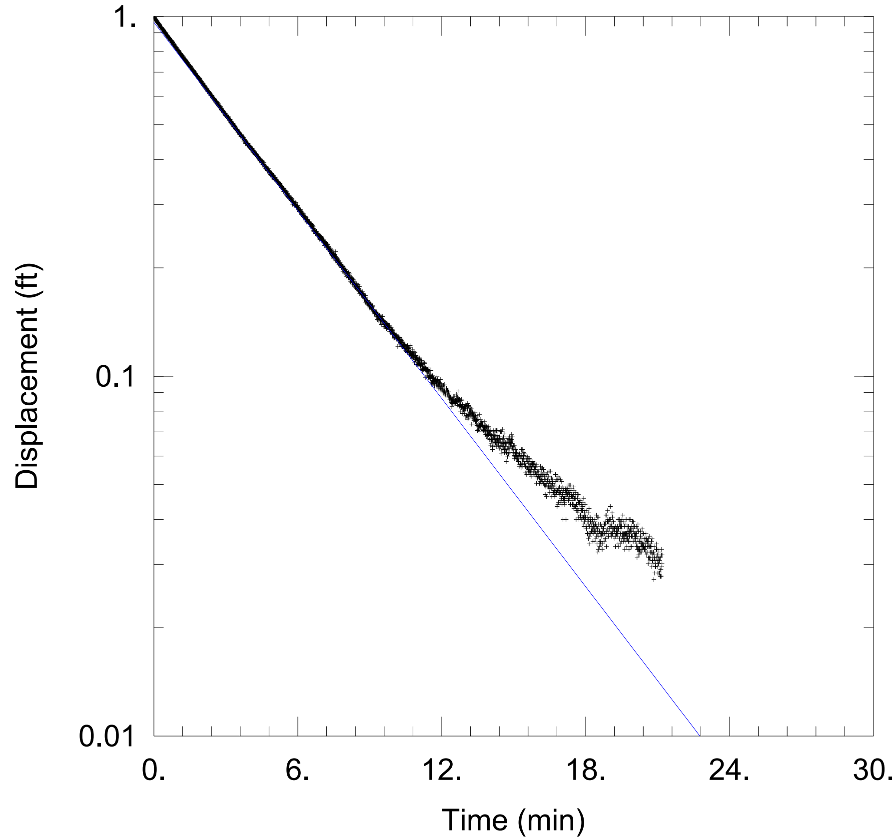
K = 1.392 ft/day
y0 = 0.9466 ft

AQUIFER DATA

Saturated Thickness: 21.1 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (JOF-113)

Initial Displacement: 1. ft
Total Well Penetration Depth: 20.7 ft
Casing Radius: 0.1667 ft
Static Water Column Height: 21.1 ft
Screen Length: 9.8 ft
Well Radius: 0.542 ft



JOF-113 FH 2

Data Set: C:\...\JOF-113_FH-2.aqt
Date: 06/16/20 Time: 11:52:17

PROJECT INFORMATION

Company: Stantec
Client: TVA-JOF
Project: 175568286
Location: New Johnsonville, TN
Test Well: JOF-113
Test Date: 4/22/2020

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

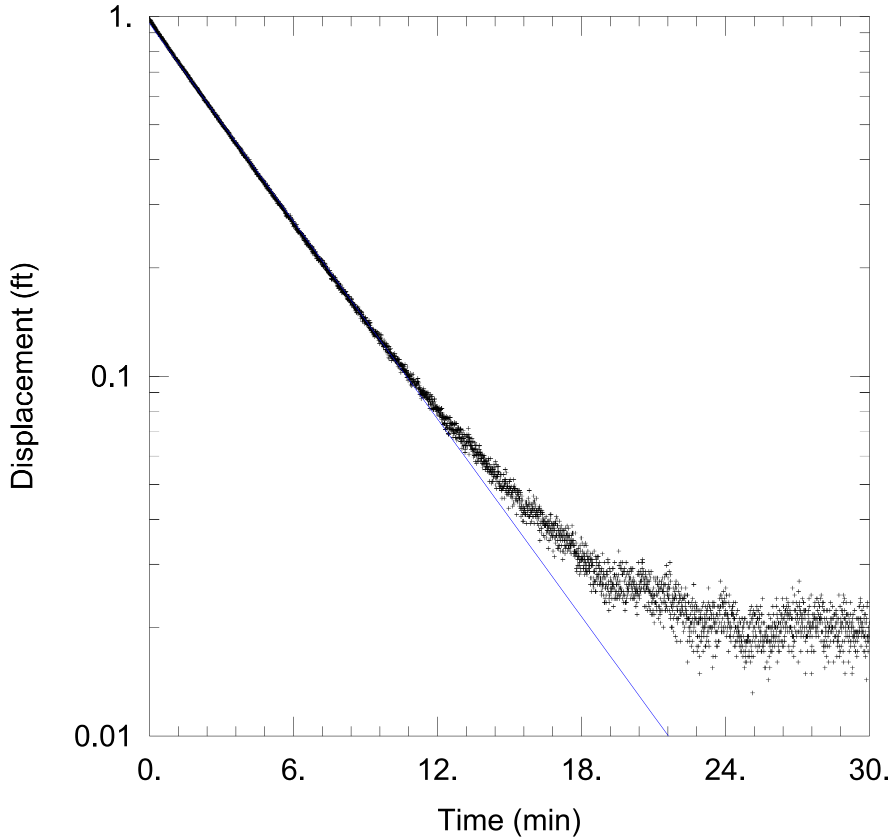
K = 1.389 ft/day
y0 = 0.9629 ft

AQUIFER DATA

Saturated Thickness: 21.1 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (JOF-113)

Initial Displacement: 1. ft
Total Well Penetration Depth: 20.7 ft
Casing Radius: 0.1667 ft
Static Water Column Height: 21.1 ft
Screen Length: 9.8 ft
Well Radius: 0.542 ft



JOF-113 FH 3

Data Set: C:\...\JOF-113_FH-3.aqt
Date: 06/16/20 Time: 11:53:03

PROJECT INFORMATION

Company: Stantec
Client: TVA-JOF
Project: 175568286
Location: New Johnsonville, TN
Test Well: JOF-113
Test Date: 4/22/2020

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

K = 1.46 ft/day
y0 = 0.9551 ft

AQUIFER DATA

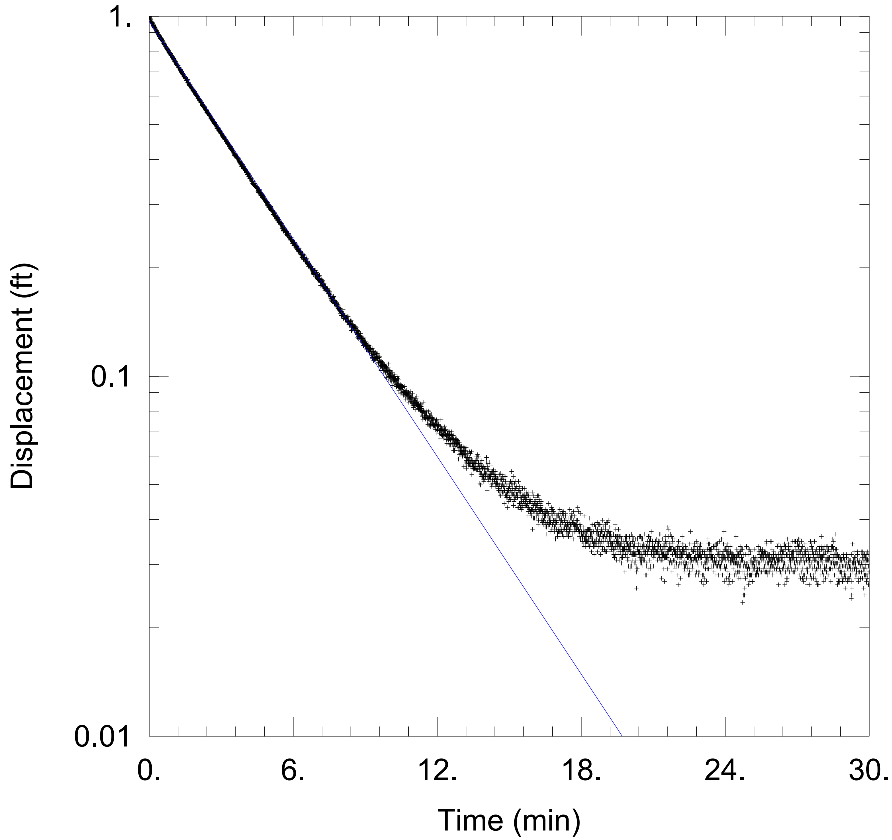
Saturated Thickness: 21.1 ft

Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (JOF-113)

Initial Displacement: 1. ft
Total Well Penetration Depth: 20.7 ft
Casing Radius: 0.1667 ft

Static Water Column Height: 21.1 ft
Screen Length: 9.8 ft
Well Radius: 0.542 ft



JOF-113 RH 1

Data Set: C:\...\JOF-113_RH-1.aqt
Date: 06/16/20 Time: 11:53:55

PROJECT INFORMATION

Company: Stantec
Client: TVA-JOF
Project: 175568286
Location: New Johnsonville, TN
Test Well: JOF-113
Test Date: 4/22/2020

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

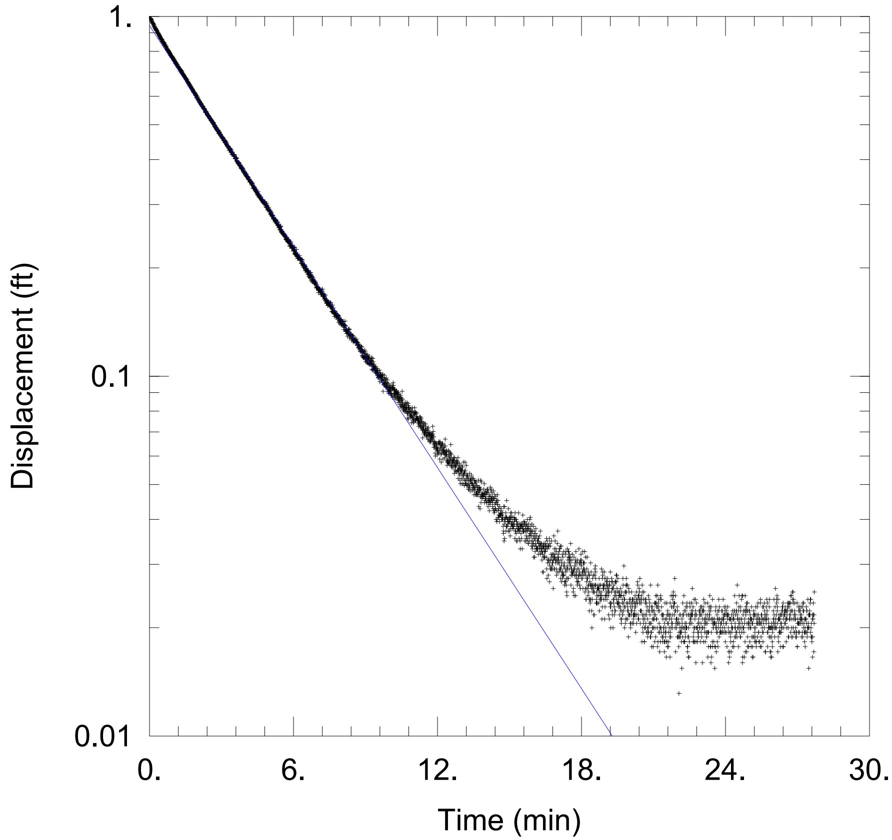
K = 1.606 ft/day
y0 = 0.9677 ft

AQUIFER DATA

Saturated Thickness: 21.1 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (JOF-113)

Initial Displacement: 1. ft
Total Well Penetration Depth: 20.7 ft
Casing Radius: 0.1667 ft
Static Water Column Height: 21.1 ft
Screen Length: 9.8 ft
Well Radius: 0.542 ft



JOF-113 RH 2

Data Set: C:\...\JOF-113_RH-2.aqt
Date: 06/16/20 Time: 11:54:53

PROJECT INFORMATION

Company: Stantec
Client: TVA-JOF
Project: 175568286
Location: New Johnsonville, TN
Test Well: JOF-113
Test Date: 4/22/2020

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

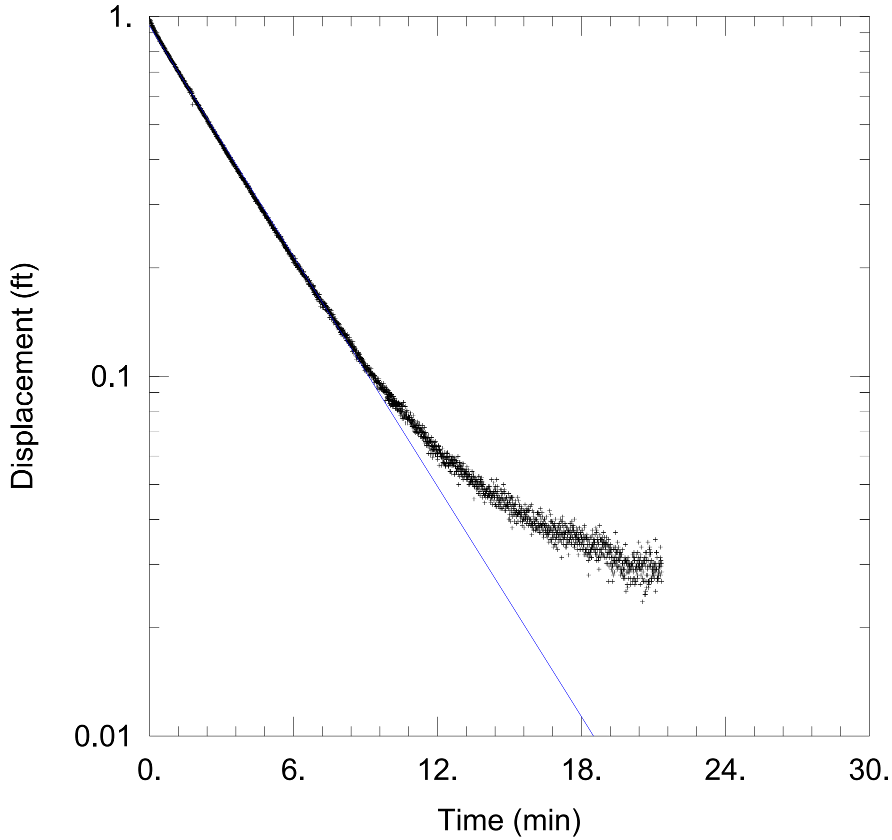
K = 1.632 ft/day
y0 = 0.9425 ft

AQUIFER DATA

Saturated Thickness: 21.1 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (JOF-113)

Initial Displacement: 1. ft
Total Well Penetration Depth: 20.7 ft
Casing Radius: 0.1667 ft
Static Water Column Height: 21.1 ft
Screen Length: 9.8 ft
Well Radius: 0.542 ft



JOF-113 RH 3

Data Set: C:\...\JOF-113_RH-3.aqt
Date: 06/16/20 Time: 11:55:45

PROJECT INFORMATION

Company: Stantec
Client: TVA-JOF
Project: 175568286
Location: New Johnsonville, TN
Test Well: JOF-113
Test Date: 4/22/2020

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

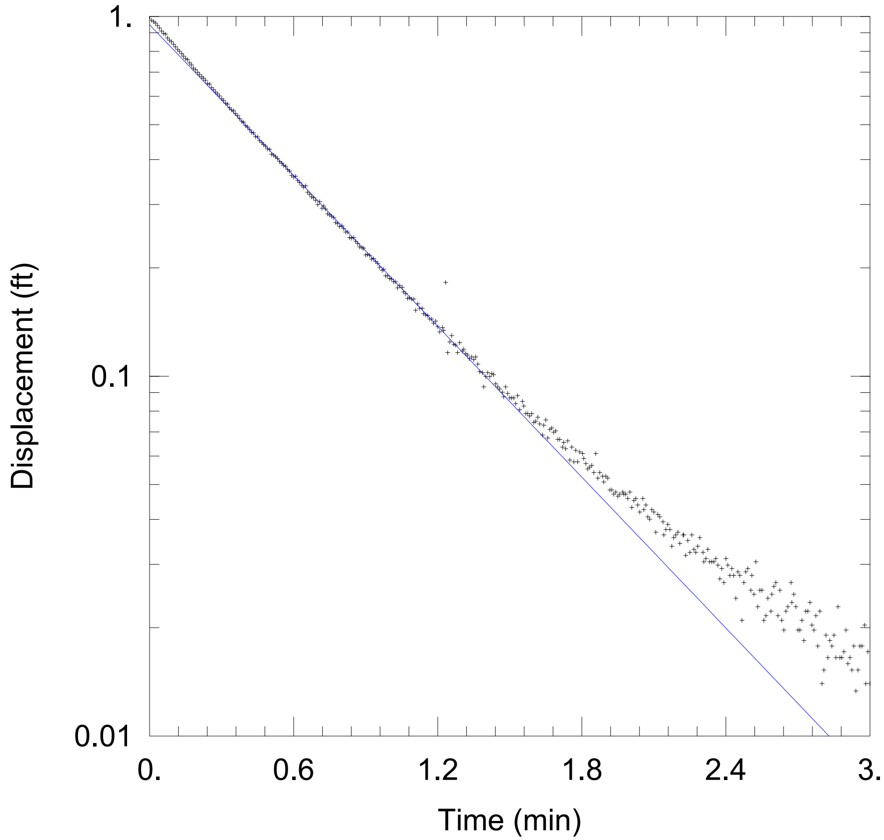
K = 1.701 ft/day
y0 = 0.9413 ft

AQUIFER DATA

Saturated Thickness: 21.1 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (JOF-113)

Initial Displacement: 1. ft
Total Well Penetration Depth: 20.7 ft
Casing Radius: 0.1667 ft
Static Water Column Height: 21.1 ft
Screen Length: 9.8 ft
Well Radius: 0.542 ft



JOF-114 FH 1

Data Set: C:\...\JOF-114_FH-1.aqt
Date: 05/22/20 Time: 15:17:26

PROJECT INFORMATION

Company: Stantec
Client: TVA-JOF
Project: 175568286
Location: New Johnsonville, TN
Test Well: JOF-114
Test Date: 4/22/2020

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

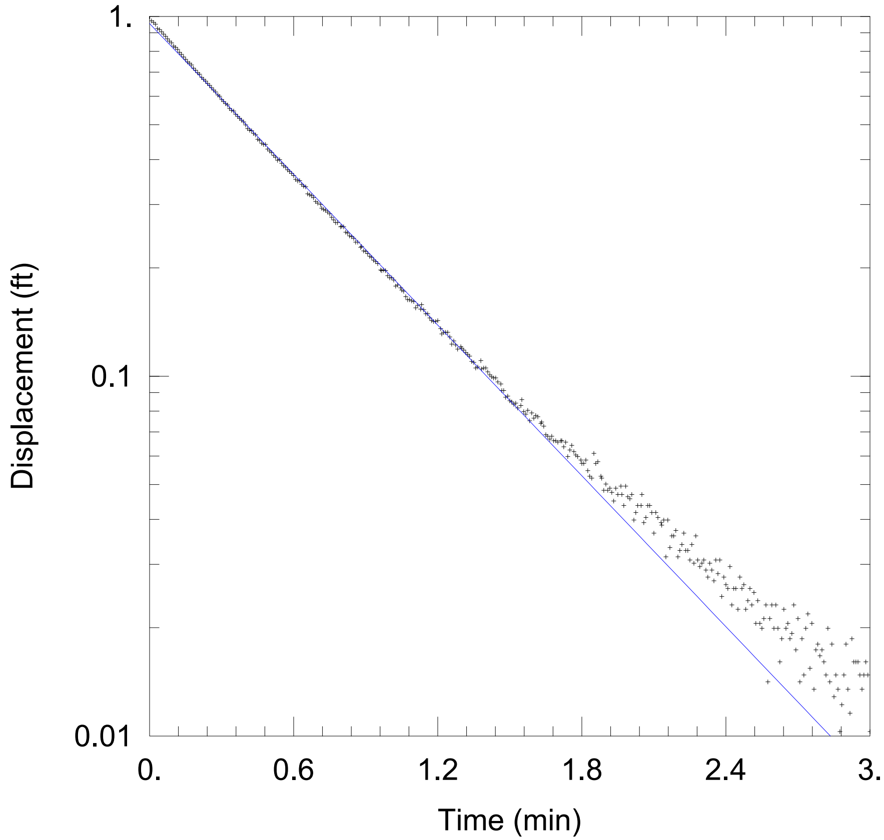
K = 10.46 ft/day
y0 = 0.9481 ft

AQUIFER DATA

Saturated Thickness: 14.7 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (JOF-114)

Initial Displacement: 1. ft
Total Well Penetration Depth: 14.3 ft
Casing Radius: 0.1667 ft
Static Water Column Height: 19.09 ft
Screen Length: 9.8 ft
Well Radius: 0.542 ft



JOF-114 FH 2

Data Set: C:\...\JOF-114_FH-2.aqt
Date: 05/22/20 Time: 16:09:04

PROJECT INFORMATION

Company: Stantec
Client: TVA-JOF
Project: 175568286
Location: New Johnsonville, TN
Test Well: JOF-114
Test Date: 4/22/2020

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

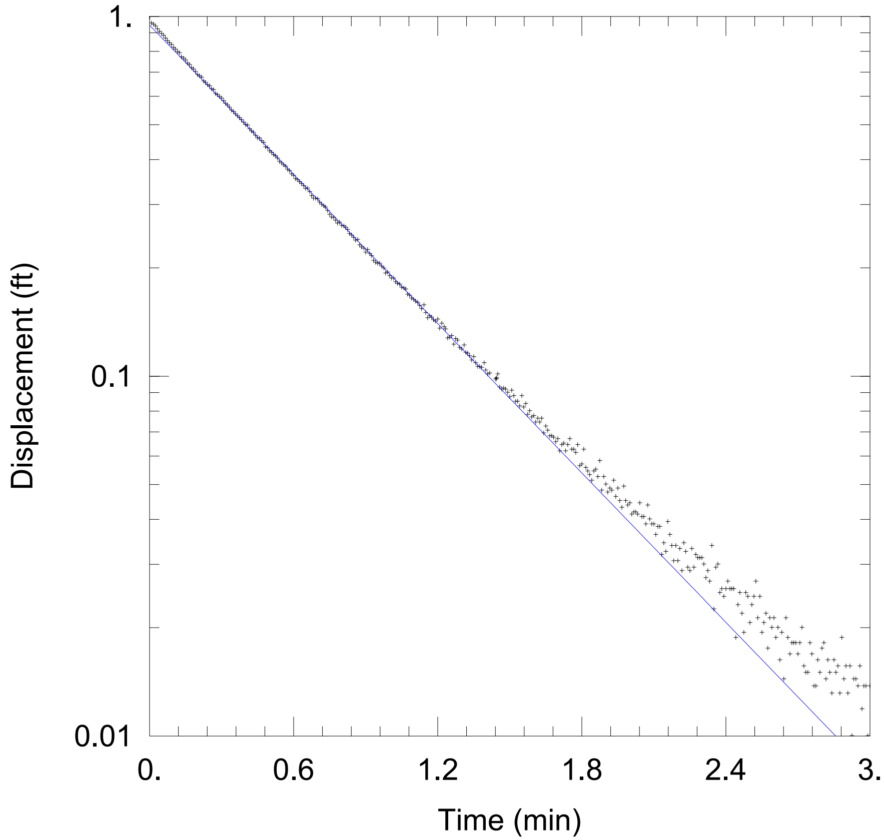
K = 10.45 ft/day
y0 = 0.9551 ft

AQUIFER DATA

Saturated Thickness: 14.7 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (JOF-114)

Initial Displacement: 1. ft
Total Well Penetration Depth: 14.3 ft
Casing Radius: 0.1667 ft
Static Water Column Height: 19.09 ft
Screen Length: 9.8 ft
Well Radius: 0.542 ft



JOF-114 FH 3

Data Set: C:\...\JOF-114_FH-3.aqt
Date: 05/22/20 Time: 16:09:42

PROJECT INFORMATION

Company: Stantec
Client: TVA-JOF
Project: 175568286
Location: New Johnsonville, TN
Test Well: JOF-114
Test Date: 4/22/2020

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

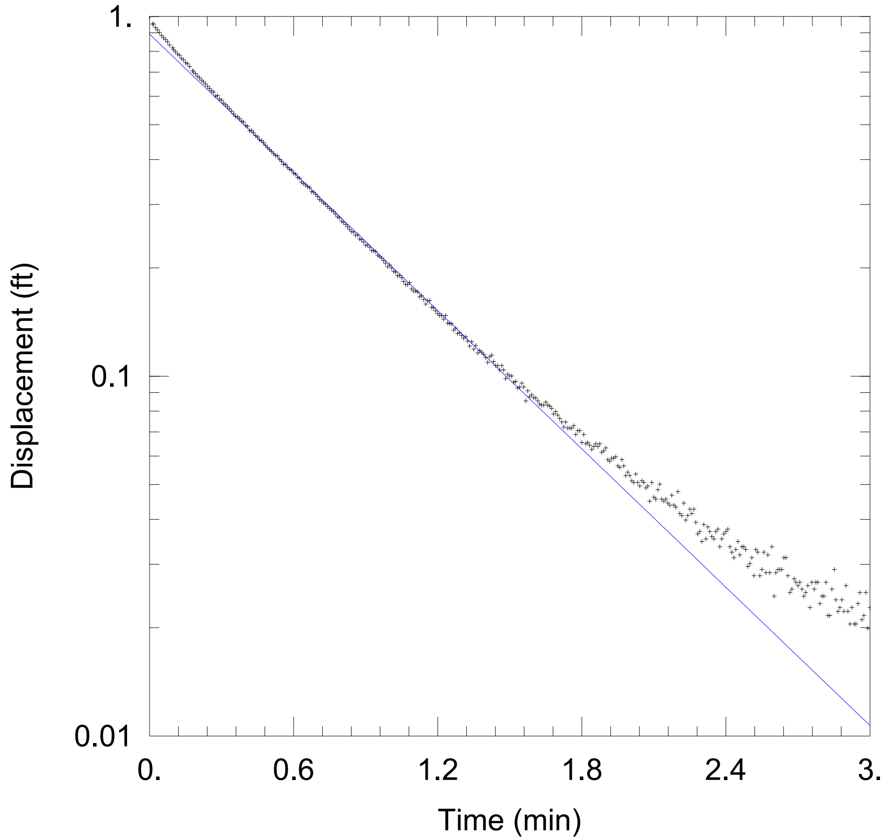
K = 10.35 ft/day
y0 = 0.9452 ft

AQUIFER DATA

Saturated Thickness: 14.7 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (JOF-114)

Initial Displacement: 1. ft
Total Well Penetration Depth: 14.3 ft
Casing Radius: 0.1667 ft
Static Water Column Height: 19.09 ft
Screen Length: 9.8 ft
Well Radius: 0.542 ft



JOF-114 RH 1

Data Set: C:\...\JOF-114_RH-1.aqt
Date: 05/22/20 Time: 16:10:29

PROJECT INFORMATION

Company: Stantec
Client: TVA-JOF
Project: 175568286
Location: New Johnsonville, TN
Test Well: JOF-114
Test Date: 4/22/2020

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

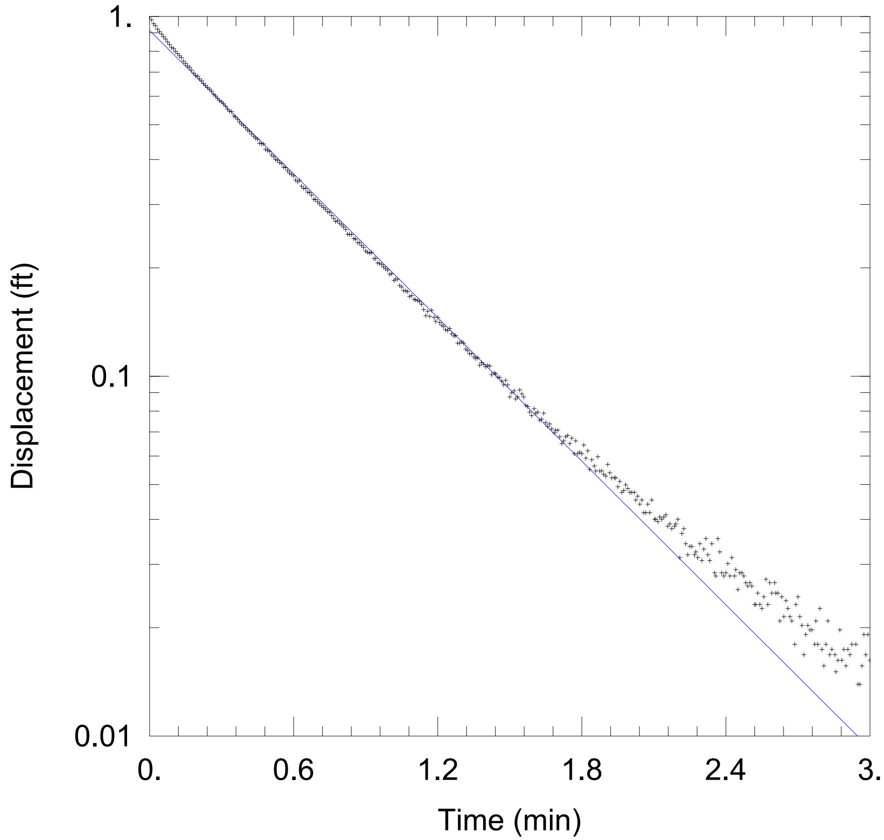
K = 9.587 ft/day
y0 = 0.8927 ft

AQUIFER DATA

Saturated Thickness: 14.7 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (JOF-114)

Initial Displacement: 1. ft
Total Well Penetration Depth: 14.3 ft
Casing Radius: 0.1667 ft
Static Water Column Height: 19.09 ft
Screen Length: 9.8 ft
Well Radius: 0.542 ft



JOF-114 RH 2

Data Set: C:\...\JOF-114_RH-2.aqt
Date: 05/22/20 Time: 16:11:13

PROJECT INFORMATION

Company: Stantec
Client: TVA-JOF
Project: 175568286
Location: New Johnsonville, TN
Test Well: JOF-114
Test Date: 4/22/2020

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

K = 9.956 ft/day
y0 = 0.9139 ft

AQUIFER DATA

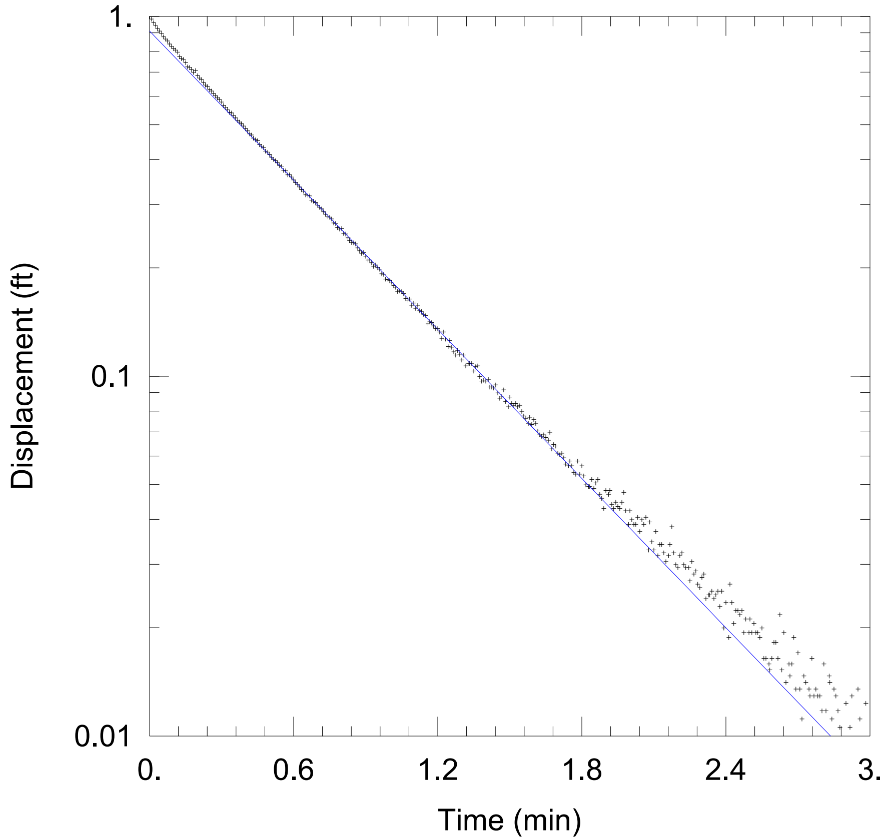
Saturated Thickness: 14.7 ft

Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (JOF-114)

Initial Displacement: 1. ft
Total Well Penetration Depth: 14.3 ft
Casing Radius: 0.1667 ft

Static Water Column Height: 19.09 ft
Screen Length: 9.8 ft
Well Radius: 0.542 ft



JOF-114 RH 3

Data Set: C:\...\JOF-114_RH-3.aqt
Date: 05/22/20 Time: 16:11:47

PROJECT INFORMATION

Company: Stantec
Client: TVA-JOF
Project: 175568286
Location: New Johnsonville, TN
Test Well: JOF-114
Test Date: 4/22/2020

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

K = 10.34 ft/day
y0 = 0.9105 ft

AQUIFER DATA

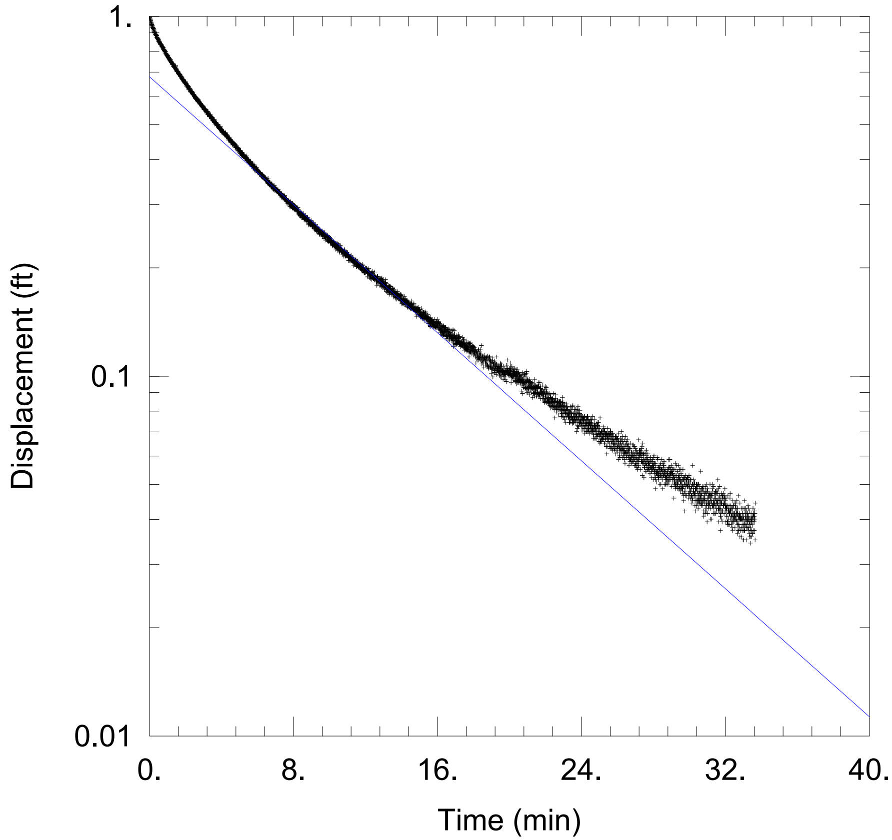
Saturated Thickness: 14.7 ft

Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (JOF-114)

Initial Displacement: 1. ft
Total Well Penetration Depth: 14.3 ft
Casing Radius: 0.1667 ft

Static Water Column Height: 19.09 ft
Screen Length: 9.8 ft
Well Radius: 0.542 ft



JOF-117 FH 1

Data Set: C:\...\JOF-117_FH-1.aqt
Date: 05/22/20 Time: 15:07:04

PROJECT INFORMATION

Company: Stantec
Client: TVA-JOF
Project: 175568286
Location: New Johnsonville, TN
Test Well: JOF-117
Test Date: 4/22/2020

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.7062 ft/day
y0 = 0.6798 ft

AQUIFER DATA

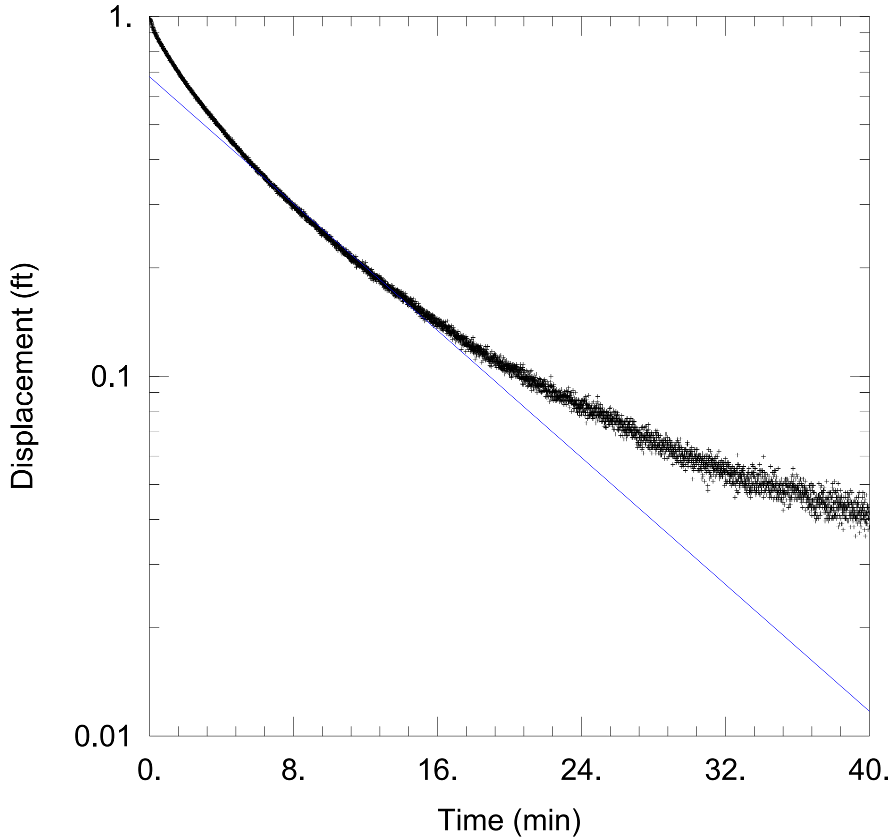
Saturated Thickness: 20.6 ft

Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (JOF-117)

Initial Displacement: 1. ft
Total Well Penetration Depth: 20.2 ft
Casing Radius: 0.1667 ft

Static Water Column Height: 20.6 ft
Screen Length: 9.8 ft
Well Radius: 0.542 ft



JOF-117 FH 2

Data Set: C:\...\JOF-117_FH-2.aqt
Date: 05/22/20 Time: 16:12:54

PROJECT INFORMATION

Company: Stantec
Client: TVA-JOF
Project: 175568286
Location: New Johnsonville, TN
Test Well: JOF-117
Test Date: 4/23/2020

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

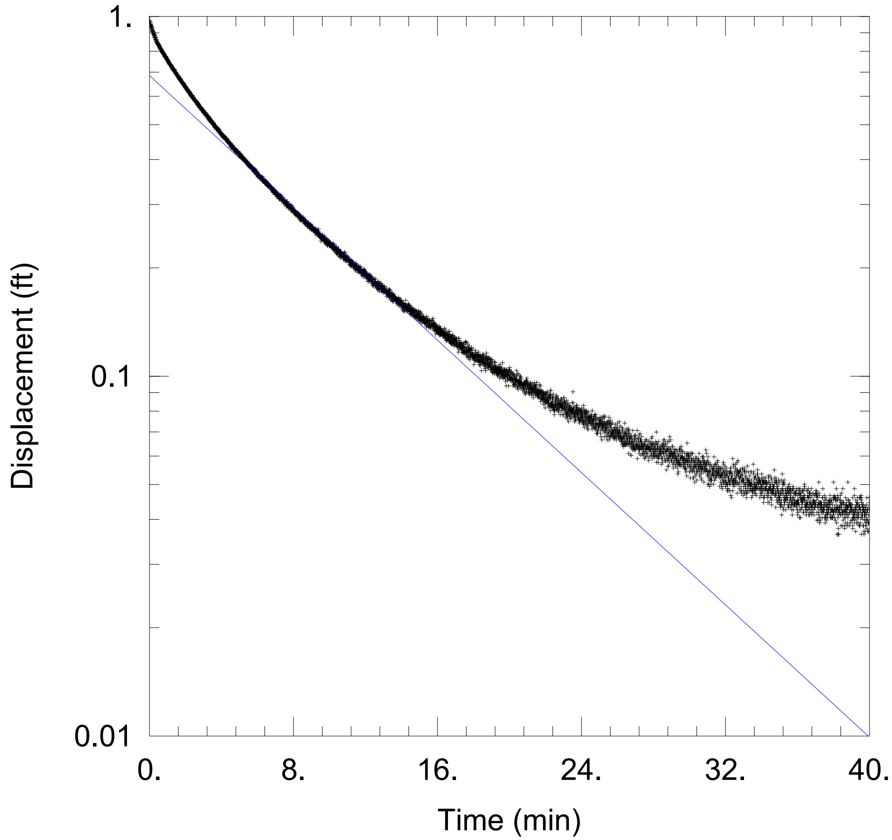
K = 0.7001 ft/day
y0 = 0.6798 ft

AQUIFER DATA

Saturated Thickness: 20.6 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (JOF-117)

Initial Displacement: 1. ft
Total Well Penetration Depth: 20.2 ft
Casing Radius: 0.1667 ft
Static Water Column Height: 20.6 ft
Screen Length: 9.8 ft
Well Radius: 0.542 ft



JOF-117 FH 3

Data Set: C:\...\JOF-117_FH-3.aqt
Date: 05/22/20 Time: 16:13:28

PROJECT INFORMATION

Company: Stantec
Client: TVA-JOF
Project: 175568286
Location: New Johnsonville, TN
Test Well: JOF-117
Test Date: 4/23/2020

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

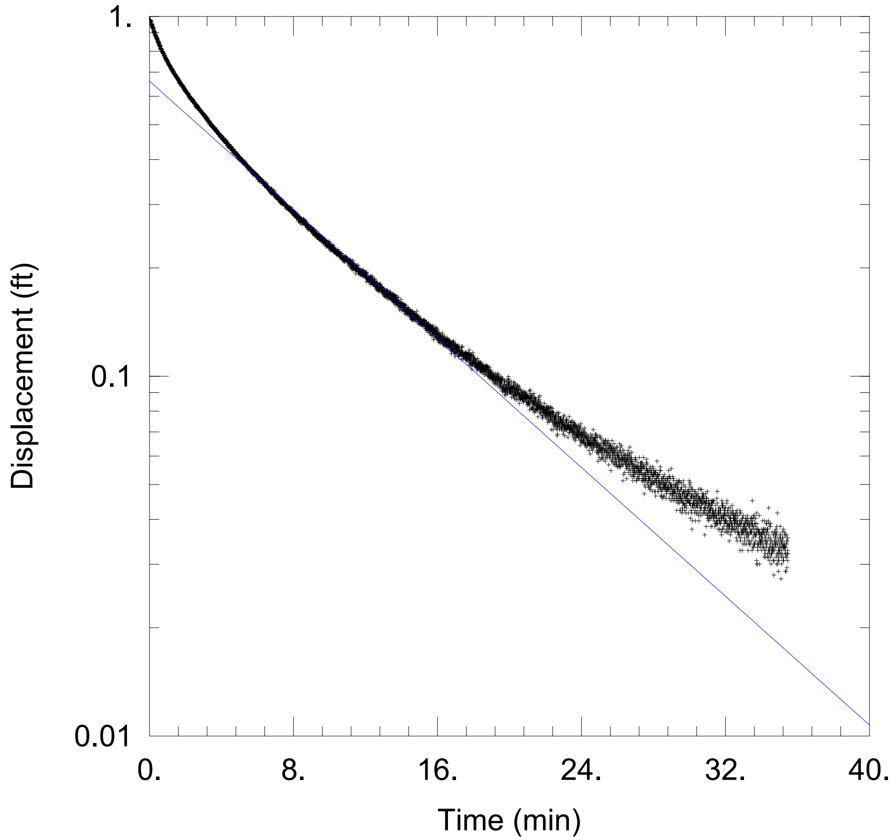
K = 0.7299 ft/day
y0 = 0.6849 ft

AQUIFER DATA

Saturated Thickness: 20.6 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (JOF-117)

Initial Displacement: 1. ft
Total Well Penetration Depth: 20.2 ft
Casing Radius: 0.1667 ft
Static Water Column Height: 20.6 ft
Screen Length: 9.8 ft
Well Radius: 0.542 ft



JOF-117 RH 1

Data Set: C:\...\JOF-117_RH-1.aqt
Date: 05/22/20 Time: 16:14:13

PROJECT INFORMATION

Company: Stantec
Client: TVA-JOF
Project: 175568286
Location: New Johnsonville, TN
Test Well: JOF-117
Test Date: 4/23/2020

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

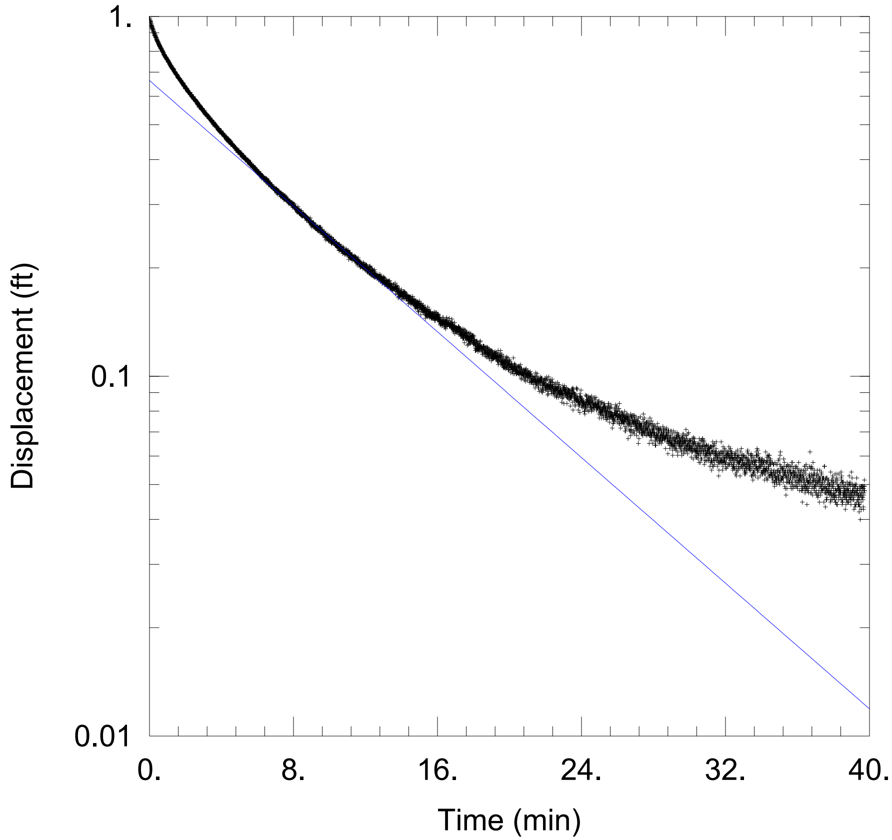
K = 0.7104 ft/day
y0 = 0.6609 ft

AQUIFER DATA

Saturated Thickness: 20.6 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (JOF-117)

Initial Displacement: 1. ft
Total Well Penetration Depth: 20.2 ft
Casing Radius: 0.1667 ft
Static Water Column Height: 20.6 ft
Screen Length: 9.8 ft
Well Radius: 0.542 ft



JOF-117 RH 2

Data Set: C:\...\JOF-117_RH-2.aqt
Date: 05/22/20 Time: 16:14:55

PROJECT INFORMATION

Company: Stantec
Client: TVA-JOF
Project: 175568286
Location: New Johnsonville, TN
Test Well: JOF-117
Test Date: 4/23/2020

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

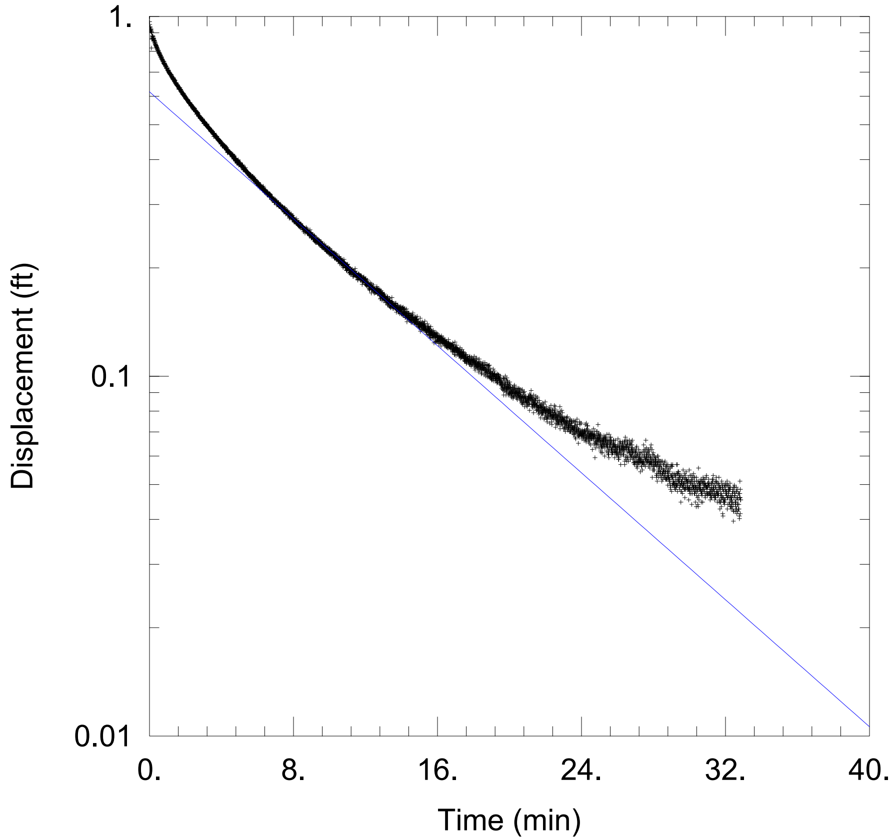
K = 0.6932 ft/day
y0 = 0.6634 ft

AQUIFER DATA

Saturated Thickness: 20.6 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (JOF-117)

Initial Displacement: 1. ft
Total Well Penetration Depth: 20.2 ft
Casing Radius: 0.1667 ft
Static Water Column Height: 20.6 ft
Screen Length: 9.8 ft
Well Radius: 0.542 ft



JOF-117 RH 3

Data Set: C:\...\JOF-117_RH-3.aqt
Date: 05/22/20 Time: 16:15:45

PROJECT INFORMATION

Company: Stantec
Client: TVA-JOF
Project: 175568286
Location: New Johnsonville, TN
Test Well: JOF-117
Test Date: 4/23/2020

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

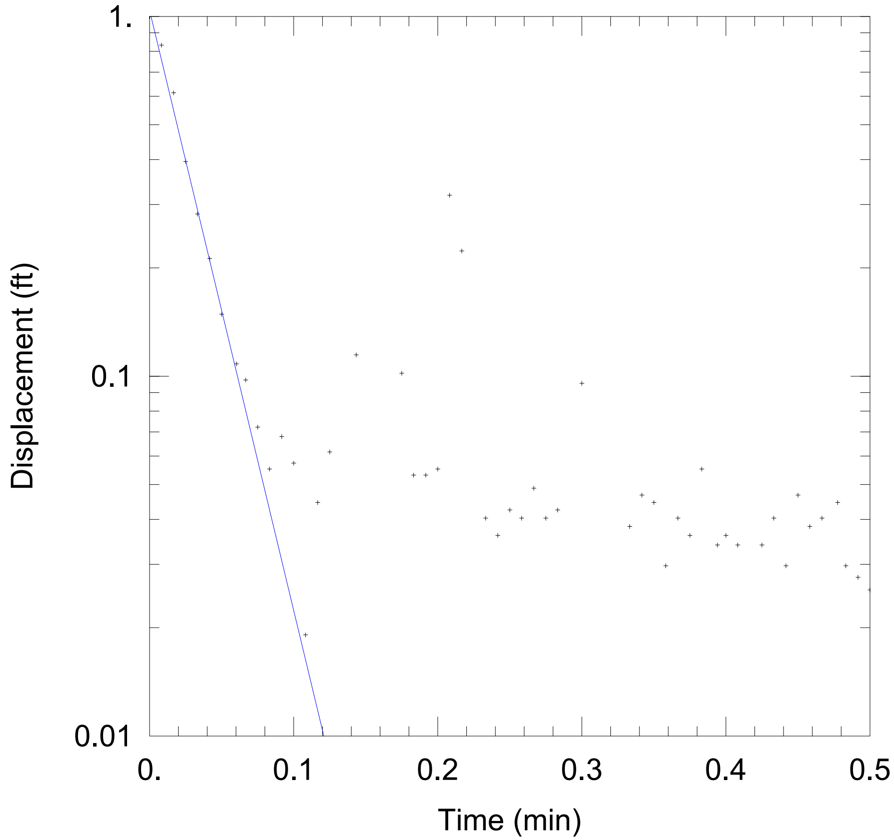
K = 0.7003 ft/day
y0 = 0.6169 ft

AQUIFER DATA

Saturated Thickness: 20.6 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (JOF-117)

Initial Displacement: 1. ft
Total Well Penetration Depth: 20.2 ft
Casing Radius: 0.1667 ft
Static Water Column Height: 20.6 ft
Screen Length: 9.8 ft
Well Radius: 0.542 ft



JOF-118 FH 1

Data Set: C:\...\JOF-118_FH-1.aqt
Date: 05/22/20 Time: 15:15:52

PROJECT INFORMATION

Company: Stantec
Client: TVA-JOF
Project: 175568286
Location: New Johnsonville, TN
Test Well: JOF-118
Test Date: 4/21/2020

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

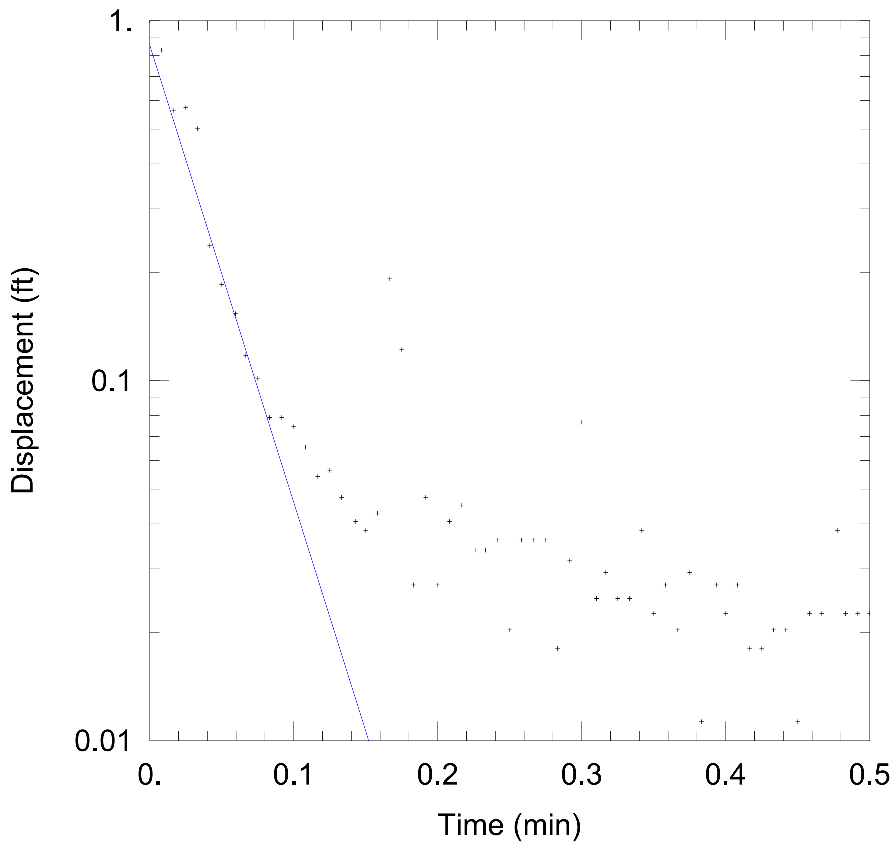
K = 235.6 ft/day
y0 = 1.04 ft

AQUIFER DATA

Saturated Thickness: 10.9 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (JOF-118)

Initial Displacement: 1. ft
Total Well Penetration Depth: 10.5 ft
Casing Radius: 0.1667 ft
Static Water Column Height: 42.02 ft
Screen Length: 9.8 ft
Well Radius: 0.542 ft



JOF-118 FH 2

Data Set: C:\...\JOF-118_FH-2.aqt
Date: 05/22/20 Time: 16:16:57

PROJECT INFORMATION

Company: Stantec
Client: TVA-JOF
Project: 175568286
Location: New Johnsonville, TN
Test Well: JOF-118
Test Date: 4/21/2020

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

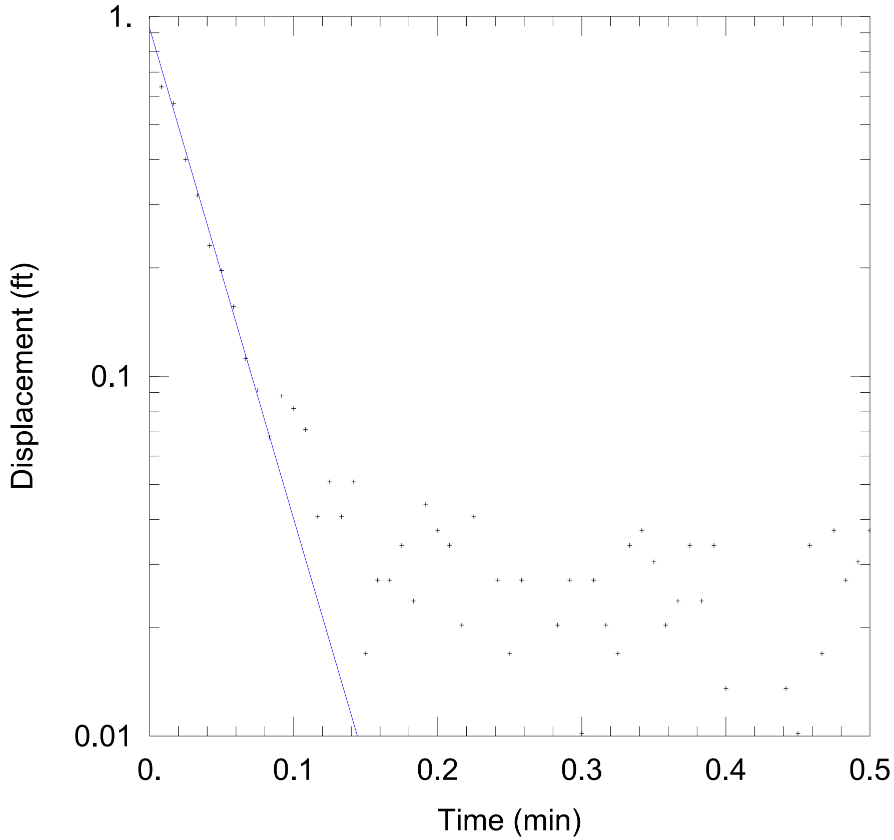
K = 179.5 ft/day
y0 = 0.8549 ft

AQUIFER DATA

Saturated Thickness: 10.9 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (JOF-118)

Initial Displacement: 1. ft
Total Well Penetration Depth: 10.5 ft
Casing Radius: 0.1667 ft
Static Water Column Height: 42.02 ft
Screen Length: 9.8 ft
Well Radius: 0.542 ft



JOF-118 FH 3

Data Set: C:\...\JOF-118_FH-3.aqt
Date: 05/22/20 Time: 16:31:36

PROJECT INFORMATION

Company: Stantec
Client: TVA-JOF
Project: 175568286
Location: New Johnsonville, TN
Test Well: JOF-118
Test Date: 4/21/2020

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

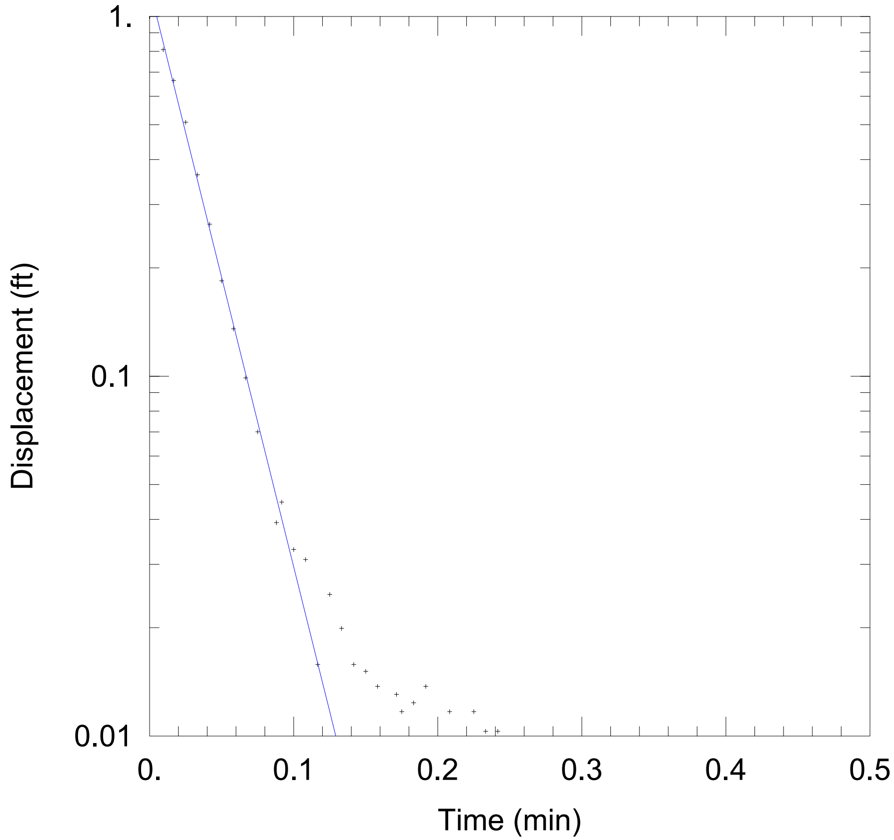
K = 192.7 ft/day
y0 = 0.9276 ft

AQUIFER DATA

Saturated Thickness: 10.9 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (JOF-118)

Initial Displacement: 1. ft
Total Well Penetration Depth: 10.5 ft
Casing Radius: 0.1667 ft
Static Water Column Height: 42.02 ft
Screen Length: 9.8 ft
Well Radius: 0.542 ft



JOF-118 RH 1

Data Set: C:\...\JOF-118_RH-1.aqt
Date: 05/22/20 Time: 16:32:22

PROJECT INFORMATION

Company: Stantec
Client: TVA-JOF
Project: 175568286
Location: New Johnsonville, TN
Test Well: JOF-118
Test Date: 4/21/2020

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

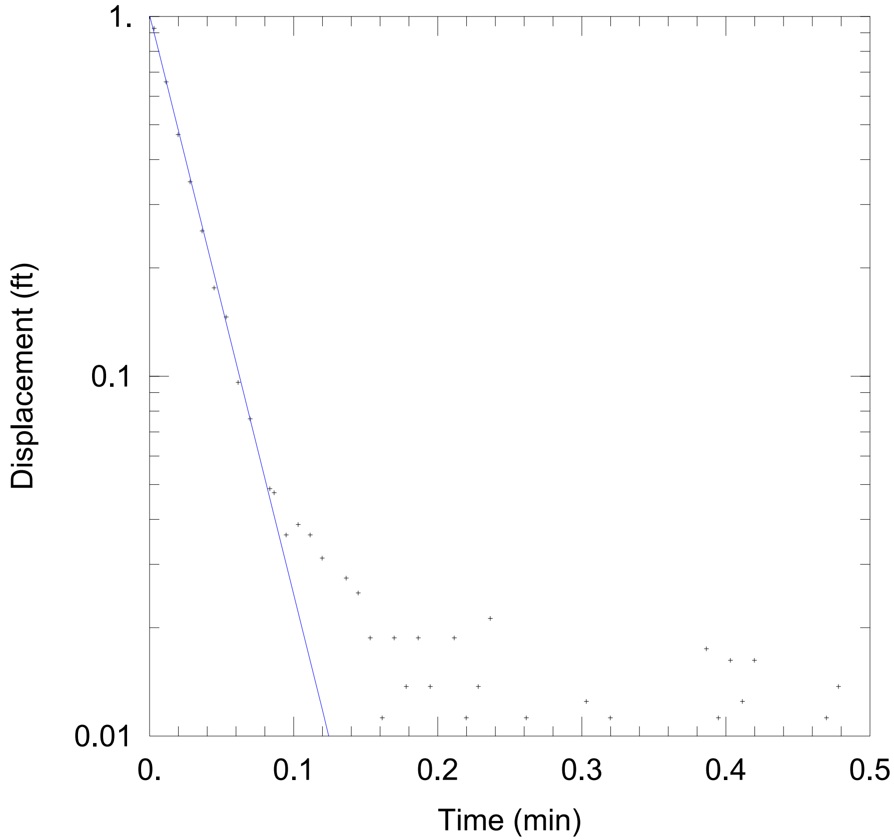
K = 227.3 ft/day
y0 = 1.2 ft

AQUIFER DATA

Saturated Thickness: 10.9 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (JOF-118)

Initial Displacement: 1. ft
Total Well Penetration Depth: 10.5 ft
Casing Radius: 0.1667 ft
Static Water Column Height: 42.02 ft
Screen Length: 9.8 ft
Well Radius: 0.542 ft



JOF-118 RH 2

Data Set: C:\...\JOF-118_RH-2.aqt
Date: 05/22/20 Time: 16:33:11

PROJECT INFORMATION

Company: Stantec
Client: TVA-JOF
Project: 175568286
Location: New Johnsonville, TN
Test Well: JOF-118
Test Date: 4/21/2020

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

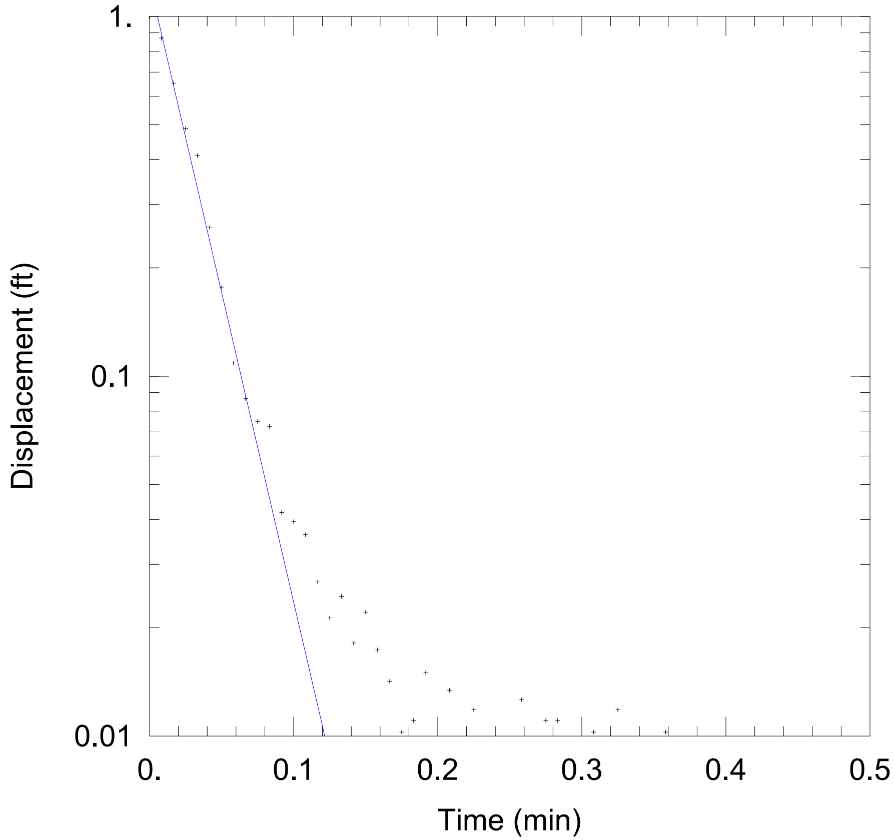
K = 227.7 ft/day
y0 = 1.012 ft

AQUIFER DATA

Saturated Thickness: 10.9 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (JOF-118)

Initial Displacement: 1. ft
Total Well Penetration Depth: 10.5 ft
Casing Radius: 0.1667 ft
Static Water Column Height: 42.02 ft
Screen Length: 9.8 ft
Well Radius: 0.542 ft



JOF-118 RH 3

Data Set: C:\...\JOF-118_RH-3.aqt
Date: 05/22/20 Time: 16:33:58

PROJECT INFORMATION

Company: Stantec
Client: TVA-JOF
Project: 175568286
Location: New Johnsonville, TN
Test Well: JOF-118
Test Date: 4/21/2020

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

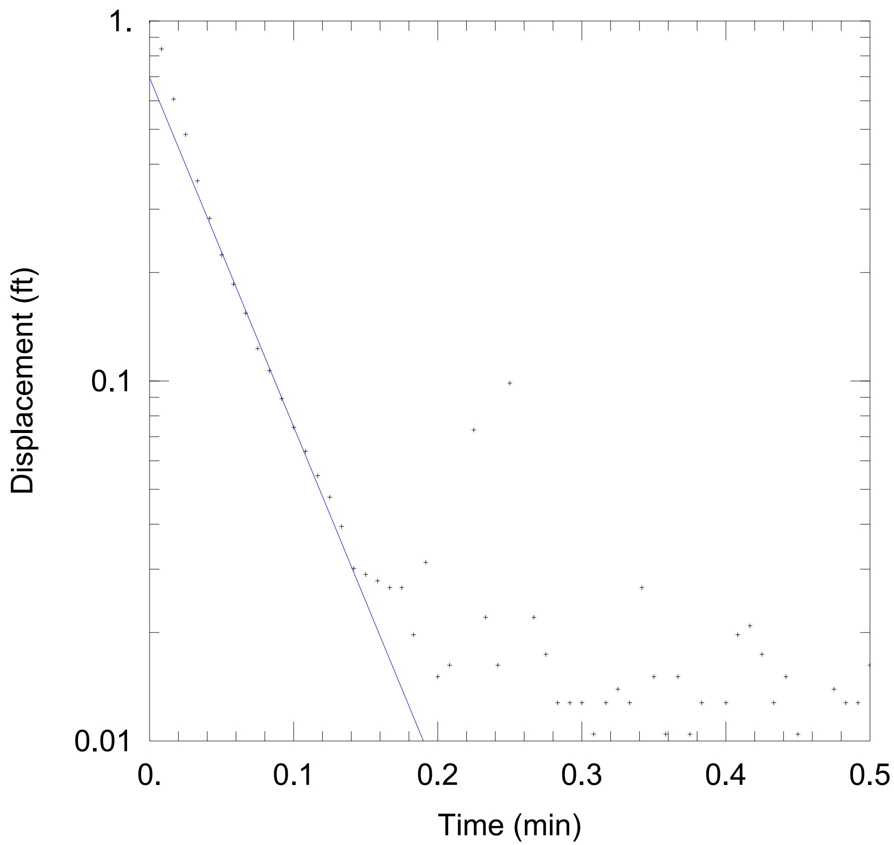
K = 243.3 ft/day
y0 = 1.241 ft

AQUIFER DATA

Saturated Thickness: 10.9 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (JOF-118)

Initial Displacement: 1. ft
Total Well Penetration Depth: 10.5 ft
Casing Radius: 0.1667 ft
Static Water Column Height: 42.02 ft
Screen Length: 9.8 ft
Well Radius: 0.542 ft



JOF-119 FH 1

Data Set: C:\...\JOF-119_FH-1.aqt
Date: 05/22/20 Time: 15:15:08

PROJECT INFORMATION

Company: Stantec
Client: TVA-JOF
Project: 175568286
Location: New Johnsonville, TN
Test Well: JOF-119
Test Date: 4/21/2020

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

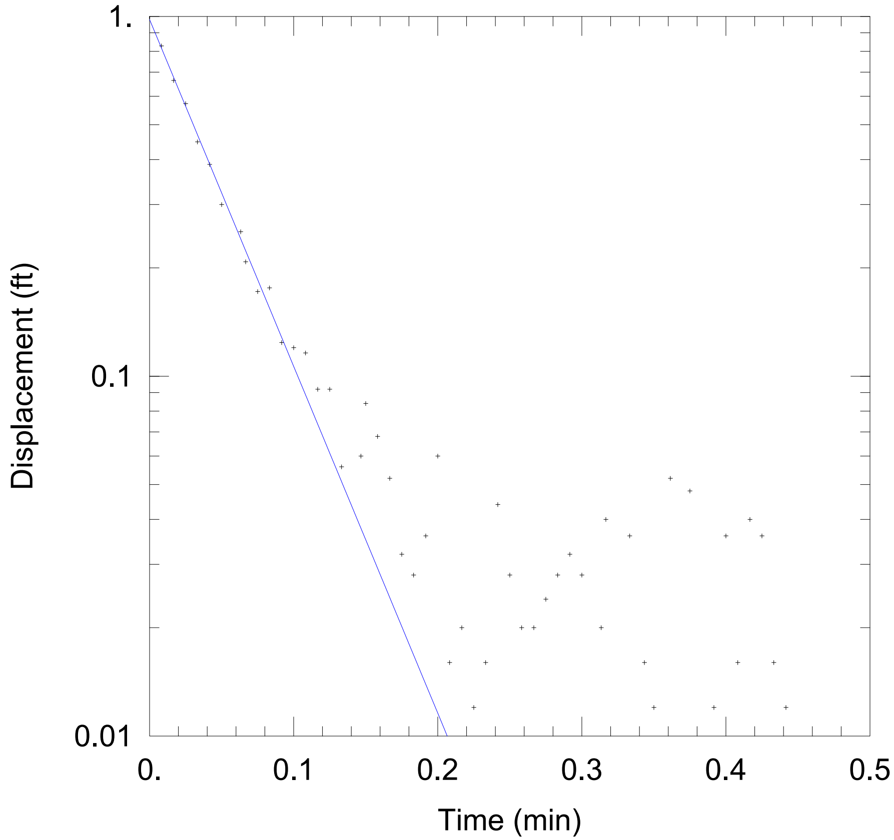
K = 142.6 ft/day
y0 = 0.6953 ft

AQUIFER DATA

Saturated Thickness: 13.4 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (JOF-119)

Initial Displacement: 1. ft
Total Well Penetration Depth: 13. ft
Casing Radius: 0.1667 ft
Static Water Column Height: 41.95 ft
Screen Length: 9.8 ft
Well Radius: 0.542 ft



JOF-119 FH 2

Data Set: C:\...\JOF-119_FH-2.aqt
Date: 05/22/20 Time: 15:20:03

PROJECT INFORMATION

Company: Stantec
Client: TVA-JOF
Project: 175568286
Location: New Johnsonville, TN
Test Well: JOF-119
Test Date: 4/21/2020

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

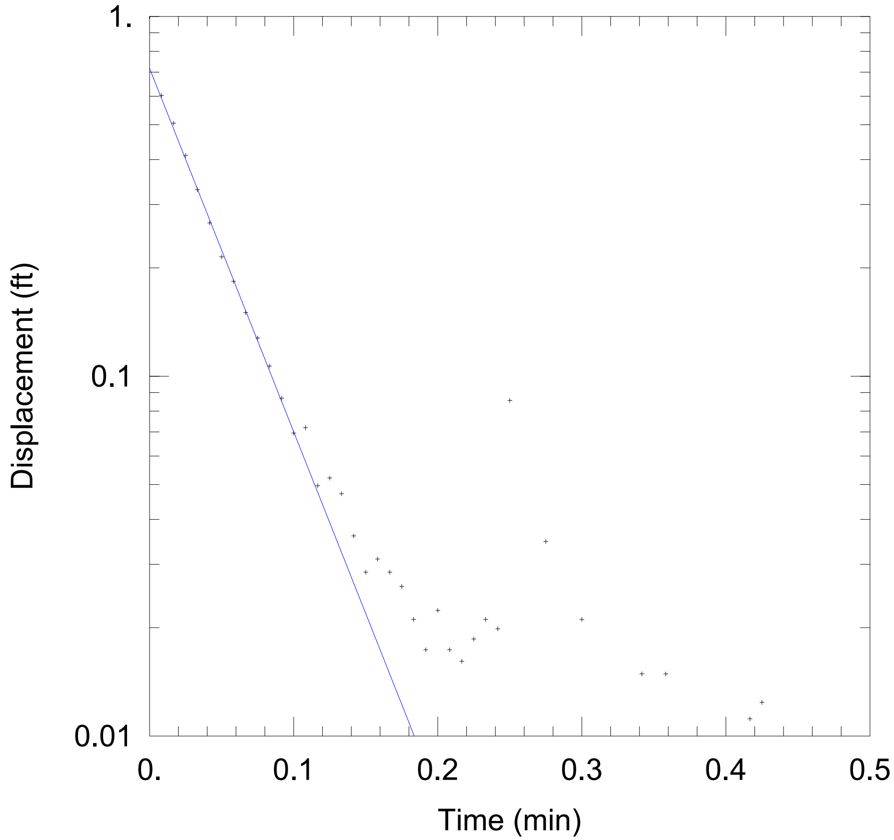
K = 141.8 ft/day
y0 = 0.9804 ft

AQUIFER DATA

Saturated Thickness: 13.4 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (JOF-119)

Initial Displacement: 1. ft
Total Well Penetration Depth: 13. ft
Casing Radius: 0.1667 ft
Static Water Column Height: 41.95 ft
Screen Length: 9.8 ft
Well Radius: 0.542 ft



JOF-119 FH 3

Data Set: C:\...\JOF-119_FH-3.aqt
Date: 05/22/20 Time: 15:20:55

PROJECT INFORMATION

Company: Stantec
Client: TVA-JOF
Project: 175568286
Location: New Johnsonville, TN
Test Well: JOF-119
Test Date: 4/21/2020

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

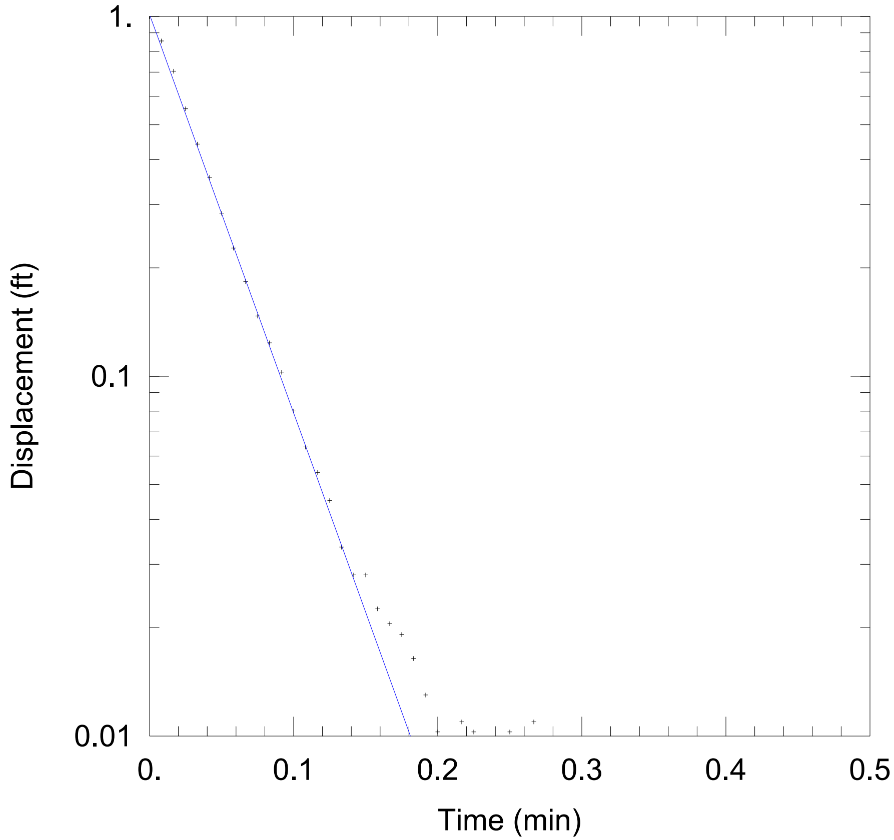
K = 148.6 ft/day
y0 = 0.7171 ft

AQUIFER DATA

Saturated Thickness: 13.4 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (JOF-119)

Initial Displacement: 1. ft
Total Well Penetration Depth: 13. ft
Casing Radius: 0.1667 ft
Static Water Column Height: 41.95 ft
Screen Length: 9.8 ft
Well Radius: 0.542 ft



JOF-119 RH 1

Data Set: C:\...\JOF-119_RH-1.aqt
Date: 05/22/20 Time: 16:34:56

PROJECT INFORMATION

Company: Stantec
Client: TVA-JOF
Project: 175568286
Location: New Johnsonville, TN
Test Well: JOF-119
Test Date: 4/21/2020

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

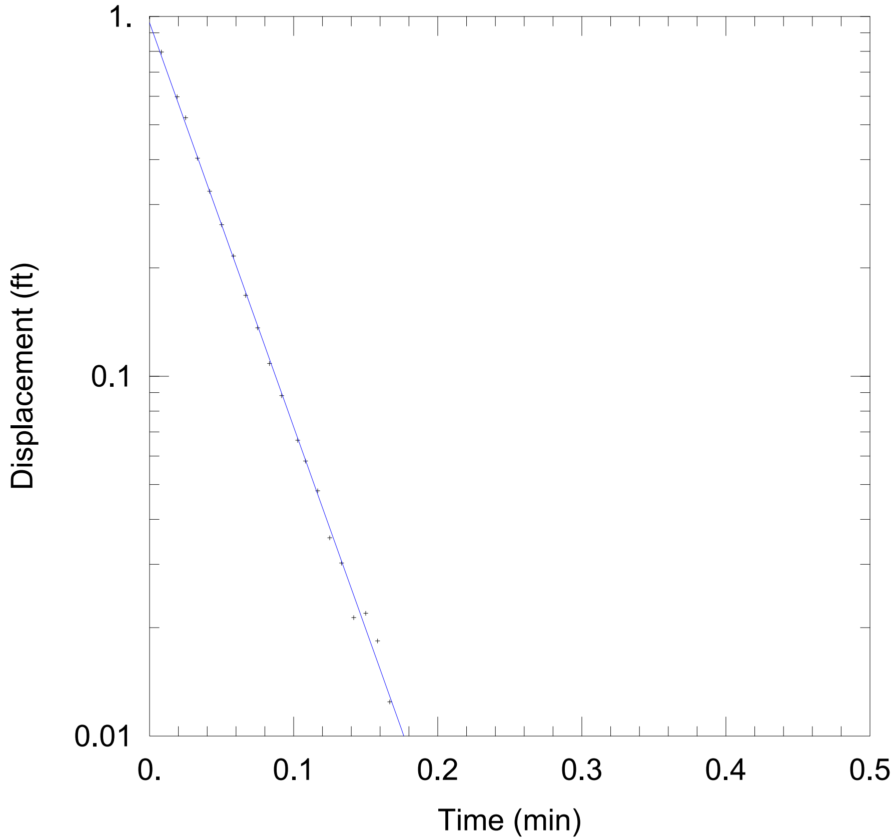
K = 163. ft/day
y0 = 1.013 ft

AQUIFER DATA

Saturated Thickness: 13.4 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (JOF-119)

Initial Displacement: 1. ft
Total Well Penetration Depth: 13. ft
Casing Radius: 0.1667 ft
Static Water Column Height: 41.95 ft
Screen Length: 9.8 ft
Well Radius: 0.542 ft



JOF-119 RH 2

Data Set: C:\...\JOF-119_RH-2.aqt
Date: 05/22/20 Time: 15:22:32

PROJECT INFORMATION

Company: Stantec
Client: TVA-JOF
Project: 175568286
Location: New Johnsonville, TN
Test Well: JOF-119
Test Date: 4/21/2020

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

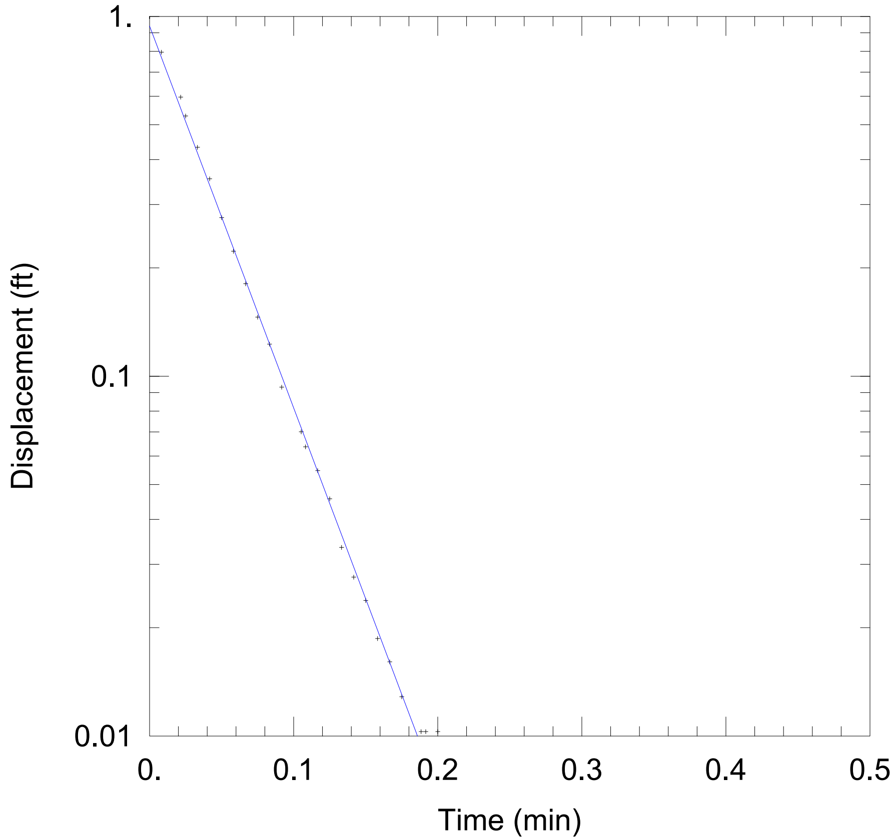
K = 165.2 ft/day
y0 = 0.9593 ft

AQUIFER DATA

Saturated Thickness: 13.4 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (JOF-119)

Initial Displacement: 1. ft
Total Well Penetration Depth: 13. ft
Casing Radius: 0.1667 ft
Static Water Column Height: 41.95 ft
Screen Length: 9.8 ft
Well Radius: 0.542 ft



JOF-119 RH 3

Data Set: C:\...\JOF-119_RH-3.aqt
Date: 05/22/20 Time: 15:21:57

PROJECT INFORMATION

Company: Stantec
Client: TVA-JOF
Project: 175568286
Location: New Johnsonville, TN
Test Well: JOF-119
Test Date: 4/21/2020

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

K = 156.1 ft/day
y0 = 0.9401 ft

AQUIFER DATA

Saturated Thickness: 13.4 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (JOF-119)

Initial Displacement: 1. ft
Total Well Penetration Depth: 13. ft
Casing Radius: 0.1667 ft
Static Water Column Height: 41.95 ft
Screen Length: 9.8 ft
Well Radius: 0.542 ft

APPENDIX H.3

GROUNDWATER INVESTIGATION EVENT #1 SAMPLING AND ANALYSIS REPORT

Johnsonville Fossil Plant Groundwater Investigation Event #1 Sampling and Analysis Report

TDEC Commissioner's Order:
Environmental Investigation Plan
Johnsonville Fossil Plant
New Johnsonville, Tennessee

October 29, 2021

Prepared for:

Tennessee Valley Authority
Chattanooga, Tennessee

Prepared by:

Stantec Consulting Services Inc.
Lexington, Kentucky

REVISION LOG

Revision	Description	Date
0	Submittal to TDEC	July 30, 2021
1	Addresses August 27, 2021 TDEC Review Comments and Issued for TDEC	September 17, 2021
2	Addresses October 18, 2021 TDEC Review Comments and Issued for TDEC	October 29, 2021

Sign-off Sheet

This document entitled Johnsonville Fossil Plant Groundwater Investigation Event #1 Sampling and Analysis Report was prepared by Stantec Consulting Services Inc. (“Stantec”) for the account of Tennessee Valley Authority (the “Client”). Any reliance on this document by any third party is strictly prohibited. The material in it reflects Stantec’s professional judgment in light of the scope, schedule and other limitations stated in the document and in the contract between Stantec and the Client. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. In preparing the document, Stantec did not verify information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions taken based on this document.

Prepared by Jamie Snider

Jamie Snider, Geologic Staff

Reviewed by Carole M. Farr

Carole M. Farr, Senior Principal Geologist

Approved by Brigid T. Brooks Zvirbulis

Brigid Zvirbulis, Project Manager

Table of Contents

Abbreviations

CCR	Coal Combustion Residuals
CCR Parameters	Constituents listed in Appendices III and IV of 40 CFR 257 and five inorganic constituents included in Appendix I of Tennessee Rule 0400-11-01-.04
CFR	Code of Federal Regulations
COC	Chain-of-Custody
DO	Dissolved Oxygen
EAR	Environmental Assessment Report
EIP	Environmental Investigation Plan
ENV	Environmental
EnvStds	Environmental Standards, Inc.
Event #1	Groundwater investigation field event performed December 2-5, 2019
FSP	Field Sampling Personnel
ft	Feet
GEL	GEL Laboratories LLC
ID	Identification
IDW	Investigation Derived Waste
JOF Plant	Johnsonville Fossil Plant
mg/L	Milligrams per Liter
NTU	Nephelometric Turbidity Units
ORP	Oxidation-Reduction Potential
PPE	Personal Protective Equipment
QAPP	Quality Assurance Project Plan
QC	Quality Control
SAP	Sampling and Analysis Plan
SAR	Sampling and Analysis Report
Stantec	Stantec Consulting Services Inc.
TDEC	Tennessee Department of Environment and Conservation
TDEC Order	Commissioner’s Order No. OGC15-0177
TestAmerica	Eurofins TestAmerica Inc.
TI	Technical Instruction
TVA	Tennessee Valley Authority
USEPA	United States Environmental Protection Agency

1.0 INTRODUCTION

Stantec Consulting Services Inc. (Stantec) has prepared this sampling and analysis report (SAR) on behalf of the Tennessee Valley Authority (TVA) to document the completion of activities related to a groundwater investigation sampling event performed December 2-5, 2019 (Event #1) at TVA's Johnsonville Fossil Plant (JOF Plant) located in New Johnsonville, Tennessee.

The purpose of the groundwater investigation, upon completion of six groundwater sampling events, is to characterize groundwater conditions at the JOF Plant in support of fulfilling the requirements for the Tennessee Department of Environment and Conservation (TDEC) issued Commissioner's Order No. OGC15-0177 (TDEC Order) to TVA (TDEC 2015). The TDEC Order sets forth a "process for the investigation, assessment, and remediation of unacceptable risks" at TVA's coal ash disposal sites in Tennessee.

The purpose of this SAR is to document the work completed during groundwater sampling Event #1 of 6 total events and to present the information and data collected during the execution of the Groundwater Investigation Sampling and Analysis Plan (SAP) (Stantec 2018a). This SAR is not intended to provide conclusions or evaluations of results. The scope of the groundwater investigation represented herein was conducted pursuant to the SAP and is part of a larger environmental investigation at the JOF Plant. The data provided in this SAR are not inclusive of other programmatic data that exist for the site. The evaluation of the results will include data from the six groundwater sampling events and consider other aspects of the environmental investigation, as well as data collected under other State and/or coal combustion residuals (CCR) programs. This evaluation will be presented in the Environmental Assessment Report (EAR).

Event #1 activities were performed in general accordance with the following documents developed by TVA to support fulfilling the requirements of the TDEC Order at the JOF Plant:

- *Groundwater Investigation SAP* (Stantec 2018a)
- *Environmental Investigation Plan (EIP)* (Stantec 2018b)
- *Quality Assurance Project Plan (QAPP)* (Environmental Standards, Inc. 2018).

The Groundwater Investigation SAP was updated based on TVA- and TDEC-approved Programmatic- and Project-specific changes. Minor variations in scope and procedures from those outlined in the SAP occurred during field activities due to field conditions and programmatic updates and are referenced in Section 3.6.

Event #1 is the first in a series of six planned sampling events for the groundwater investigation. Stantec performed the field work activities for this event. Laboratory analysis of constituents was performed by GEL Laboratories LLC (GEL) in Charleston, South Carolina (radium samples only) and Eurofins TestAmerica, Inc. (TestAmerica) in Pittsburgh, Pennsylvania (other analytes). Quality assurance oversight on data acquisition protocols, sampling practices, and data validation or verification was performed by Environmental Standards, Inc. (EnvStds) under direct contract to TVA.

This report summarizes the groundwater investigation activities for Event #1. The remaining sampling events will be completed before overall conclusions and findings about the groundwater investigation and groundwater conditions at the JOF Plant are made and documented in the EAR.

2.0 OBJECTIVE AND SCOPE

The primary objectives of the groundwater investigation conducted pursuant to the Groundwater Investigation SAP (which includes six sampling events) are to characterize existing groundwater quality and to evaluate groundwater flow conditions at the JOF Plant in response to the TDEC Order. The approach to characterizing the groundwater conditions is to:

- Collect groundwater samples for chemical analyses to evaluate the potential presence of constituents related to CCR in groundwater
- Measure groundwater and surface water elevations for subsequent evaluation of the direction and rate of groundwater flow.

The scope of work intended to achieve the objectives of the groundwater investigation consists of six sampling events at a frequency of one event every two months for one year to characterize seasonal groundwater quality and flow direction. This report describes the activities related to Event #1, performed in December 2019, the scope of which included:

- Collecting groundwater and surface water level measurements
- Collecting field measurements of groundwater quality parameters
- Collecting groundwater samples and associated quality control (QC) samples for laboratory analysis.

These activities were carried out after the installation of permanent monitoring wells as specified in the Groundwater Investigation SAP. Details of the monitoring well installation activities are provided in the JOF Plant Hydrogeologic Investigation SAR.

In addition, pore water measurements from piezometers installed in the CCR units at the JOF Plant are presented in this SAR for comparison with groundwater data. Groundwater piezometer installation activities are described in the JOF Plant Hydrogeologic Investigation SAR.

3.0 FIELD ACTIVITIES

Groundwater investigation field activities for Event #1 were conducted December 2-5, 2019. Stantec performed groundwater level measurements and sample collection activities based on guidance and specifications in TVA's Environmental (ENV) Technical Instructions (TIs), the SAP, the QAPP, and applicable United States Environmental Protection Agency (USEPA) documents except as noted in the Variations section of this report. As part of TVA's commitment to generate representative and reliable data, data validation, and/or verification of laboratory analytical results were performed by EnvStds under direct contract with TVA. EnvStds also conducted audits of field activities and provided quality reviews of field documentation.

During Event #1, Stantec conducted the following field activities:

- Measured groundwater levels at nine monitoring wells and one piezometer installed for the TDEC order, and 19 monitoring wells and nine piezometers installed for other environmental programs (28 total monitoring wells)
- Measured pore water levels at 13 piezometers installed in the CCR units
- Measured the surface water level at one location in the Tennessee River/Kentucky Lake
- Collected groundwater samples from nine monitoring wells installed for the TDEC Order
- Recorded field measurements of groundwater quality parameters during purging and stabilization at the sampled monitoring wells
- Collected QC samples including one field duplicate, one matrix spike/matrix spike duplicate, four field blanks, one filter blank, one tubing blank, and one equipment blank
- Shipped the collected samples to GEL in Charleston, South Carolina, and TestAmerica in Pittsburgh, Pennsylvania.

Details on each activity are presented in the sections below.

3.1 WORK LOCATIONS

The TDEC Order CCR units at the JOF Plant (Ash Disposal Area 1, Active Ash Pond 2, DuPont Road Dredge Cell, South Rail Loop Area 4, and Coal Yard) as well as the monitoring wells and piezometers sampled and/or gauged during Event #1 are shown on Exhibit A.1 in Appendix A. TVA is currently sampling groundwater at the JOF Plant for TDEC Solid Waste Management permit requirements and the USEPA CCR Rule codified in Title 40 of the Code of Federal Regulations (CFR) Part 257 (40 CFR 257). Monitoring wells that are being sampled as part of other programs are not sampled as part of the groundwater investigation for the TDEC Order.

Groundwater levels were measured in TDEC Order monitoring wells and one piezometer, as well as in select additional wells and piezometers from other environmental programs, as shown in Table B.1a in Appendix B, to provide information to prepare groundwater contour maps for this SAR and the JOF Plant EAR. Pore water levels measured in piezometers installed in the CCR units are presented in Table B.1b. Groundwater and pore water elevations are shown on Exhibits A.2 and A.3 in Appendix A. Groundwater elevation contours are depicted on Exhibit A.2 and pore water elevation contours are depicted on Exhibit A.3.

Groundwater analytical and field duplicate samples were collected from the TDEC Order monitoring wells as shown in Table B.2 in Appendix B. Groundwater analytical data collected for the TDEC Order and other environmental programs will be provided in the EAR.

3.2 DOCUMENTATION

Stantec maintained field documentation in accordance with ENV-TI-05.80.03, *Field Record Keeping*, and the QAPP. Field activities and data were recorded on program-specific field forms. Health and safety forms were completed in accordance with TVA and Stantec health and safety requirements. Additional information regarding field documentation is provided below.

3.2.1 Field Forms

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

- *Daily Field Activity Log*
- *Monitoring Well Inspection Checklist*
- *Equipment Calibration Form*
- *Vibrating Wire Piezometer Measurement Form*
- *Groundwater Level Measurement Form*
- *Groundwater Sampling Form*
- *Chain-of-Custody (COC).*

3.2.1.1 Daily Field Activity Log

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

3.2.1.2 Monitoring Well Inspection Checklist

Prior to measuring water levels, Stantec FSP inspected each monitoring well for damage or indications that the well integrity had been compromised in accordance with ENV-TI-05.80.21, *Monitoring Well Inspection and Maintenance.* Inspection results were documented on a *Monitoring Well Inspection Checklist*. No signs of damage or necessary repairs were noted during Event #1.

3.2.1.3 Equipment Calibration Form

Stantec FSP performed daily calibration of the water quality meter and turbidity meter and documented the results on an *Equipment Calibration Form*. The form documented the calibration results for temperature, turbidity, specific conductance, pH, dissolved oxygen (DO), and oxidation-reduction potential (ORP), and verified that the field instruments' sensors were operating within acceptance criteria. Refer to Section 3.2.2 for additional details on equipment calibration procedures.

3.2.1.4 Vibrating Wire Piezometer Measurement Form

Stantec FSP recorded field measurement data on a *Vibrating Wire Piezometer Measurement Form*. The form includes the vibrating wire piezometer identification (ID), serial number, time, digits, and temperature. The readings were used to calculate the pressure head (feet [ft] of water) above the vibrating wire sensor to obtain the groundwater or pore water elevation.

3.2.1.5 Groundwater Level Measurement Form

Stantec FSP recorded groundwater level field measurement data on a *Groundwater Level Measurement Form* in accordance with ENV-TI-05.80.44, *Groundwater Level and Well Depth Measurement*. The form includes the monitoring well ID, time, and depth to water measured from a standardized reference point on the top of each well casing, recorded in ft below top of casing.

3.2.1.6 Groundwater Sampling Form

Stantec FSP recorded the depth to water, purge flow rate, volume of groundwater purged, temperature, pH, specific conductance, DO, ORP, turbidity, color of water, and other observations during groundwater purging and sampling activities at each monitoring well in accordance with ENV-TI-05.80.42, *Groundwater Sampling*. Field measurements were recorded on a *Groundwater Sampling Form*. The form also documents the time intervals between measurement of field parameters, low-flow extraction rates, water level drawdown, and water quality parameter measurements until stabilization criteria were met.

3.2.1.7 Chain-of-Custody

Stantec FSP completed *COC* documentation for each groundwater sample collected. The sample ID, sample location, type of sample, sampling date and time, analyses requested, sample pH, and sample custody record were recorded on the *COC*. The Field Team Leader reviewed the *COC* for completeness, and the FSP conducted a QC check of samples in each cooler compared to sample IDs on the corresponding *COC*. *COCs* were completed in accordance with ENV-TI-05.80.02, *Sample Labeling and Custody*.

3.2.2 Equipment Calibration

Field instruments used to collect, generate, or measure water quality parameters were calibrated each day prior to use as specified in the SAP, QAPP, and ENV-TI-05.80.46, *Field Measurement Using a Multi-Parameter Sonde.* Afternoon calibration verifications were performed to evaluate if these instruments remained within acceptance criteria during sampling. Temperature and barometric pressure instrument readings were verified using a calibrated National Institute of Standards and Technology traceable thermometer and National Weather Service (via mesowest.utah.edu) barometric pressure readings for Lexington-Parsons Regional Airport in Darden, Tennessee, respectively. Additional details regarding equipment calibration were recorded on an *Equipment Calibration Form*, as described in Section 3.2.1.3.

3.3 SAMPLING METHODS

The following sections present monitoring well data collection and sampling procedures used during Event #1.

3.3.1 Static Water Level Measurements

FSP measured static groundwater levels at 28 monitoring wells in accordance with ENV-TI-05.80.44, *Groundwater Level and Well Depth Measurement.* On December 2, 2019, static groundwater level readings were measured and recorded to the nearest 0.01 ft from a reference point on the top of each well casing using an electronic water level indicator. Water level indicator probes were decontaminated prior to the first use and between measurements, and the decontamination was documented as specified in ENV-TI-05.80.05, *Field Sampling Equipment Cleaning and Decontamination.* Depth to groundwater measurements were recorded on a *Groundwater Level Measurement Form*. A groundwater level measurement was not obtained at monitoring well JOF-105 because the well was inaccessible due to construction activities during Event #1.

Stantec calculated the static groundwater level at vibrating wire piezometer JOF-116-PZ. FSP recorded the measured readings and temperature using a vibrating wire readout instrument on a *Vibrating Wire Piezometer Measurement Form.* The readings were used to calculate the pressure head (ft of water) above the vibrating wire sensor to obtain groundwater elevation.

Groundwater and pore water measurements were also obtained from transducers installed within nine and 13 piezometers, respectively. Additionally, a surface water level measurement for the Tennessee River/Kentucky Lake was provided by TVA using the reading closest to noon recorded by an automated staff gauge. The surface water staff gauge location is shown on Exhibit A.1 in Appendix A.

Groundwater level data and pore water level data are shown in Tables B.1a and B.1b, respectively, in Appendix B. A groundwater elevation contour map based on groundwater measurements made in wells and piezometers, along with pore water elevations, is included as Exhibit A.2 in Appendix A. Similarly, a pore water elevation contour map based on pore water measurements in piezometers, along with groundwater elevations, is included as Exhibit A.3 in Appendix A.

3.3.2 Groundwater Purging & Sampling

Analytical and field duplicate samples were collected from nine monitoring wells as shown in Table B.2 in Appendix B. Monitoring wells were purged using dedicated bladder pumps equipped with dedicated tubing using low-flow purging and sampling techniques as specified in ENV-TI-05.80.42, *Groundwater Sampling*.

During the purging process, water quality field parameters including pH, specific conductance, temperature, ORP, and DO were measured using water quality meters (YSI ProPlus with flow-through cell) and recorded on field forms. Depth to water and turbidity were measured and recorded using decontaminated electronic water-level indicators (Heron Dipper-T) and calibrated turbidimeters (Hach 2100Q). Field parameters were measured and recorded on *Groundwater Sampling Forms* during purging until readings were stabilized as specified in the SAP and/or applicable TI. As approved by TDEC, the specific conductance and turbidity stabilization limits were revised to the values below to meet overall programmatic objectives for groundwater investigations at the JOF Plant. Well purging was considered complete when three consecutive readings were within the following stabilization limits:

- pH – ± 0.1 Standard Units
- Specific Conductance – ± 3% microSiemens per centimeter
- Turbidity – Less than 5 Nephelometric Turbidity Units (NTUs) or ± 10% for values above 5 NTUs
- DO – Less than 0.5 milligrams per liter (mg/L) or ± 10% for values above 0.5 mg/L.

After water quality stabilization criteria were achieved, the final field parameter results were recorded, purging was discontinued, and a sample was collected as specified in the SAP. Due to final turbidity readings higher than 5 NTUs at wells JOF-109 and JOF-110, an additional sample was collected at each of these wells and submitted to the laboratory for dissolved metals analysis.

Laboratory-provided, pre-preserved sample containers were filled directly from the pump discharge line with the exception of the dissolved metals samples, which were collected via a new 0.45-micron disposable inline filter attached to the end of the discharge line to field filter the sample. FSP wore new, clean nitrile gloves when handling sample containers and did not touch the interior of containers or container caps. New gloves were used when handling each sample. When filling sample bottles, care was taken to minimize sample aeration (i.e., water was directed down the inner walls of the sample bottle) and to avoid overfilling and diluting preservatives. Each sample bottle was capped before filling the next bottle. Following completion of sampling, final field parameter measurements were made.

Sample containers were labeled and handled in accordance with ENV-TI-05.80.02, *Sample Labeling and Custody.* FSP secured caps on each bottle, attached a custody seal across the cap, and placed the bottles in a cooler on ice within 15 minutes of collection. QC samples were collected in accordance with ENV-TI-05.80.04, *Field Sampling Quality Control.*

Groundwater samples were analyzed for the CCR-related constituents listed in Appendices III and IV of 40 CFR 257. In addition, five inorganic constituents listed in Appendix I of Tennessee Rule 0400-11-01-.04 and not included in the 40 CFR 257 Appendices III and IV were analyzed to maintain continuity with TDEC environmental programs. These additional TDEC Appendix I constituents included copper, nickel, silver, vanadium, and zinc. The combined federal CCR Appendices III and IV constituents and TDEC Appendix I inorganic constituents will hereafter be referred to collectively as “CCR Parameters.” For geochemical evaluation, major cations/anions not included in the CCR Parameters were included in the analyses. The additional geochemical parameters included bicarbonate, carbonate, magnesium, potassium, and sodium.

3.4 INVESTIGATION DERIVED WASTE

Investigation derived waste (IDW) generated during groundwater investigation activities included:

- Used calibration solutions
- Purge water
- Decontamination fluids
- Disposable personal protective equipment (PPE)
- General trash.

IDW was handled in accordance with ENV-TI-05.80.05, *Field Sampling Equipment Cleaning and Decontamination*; ENV-TI-05.80.42, *Groundwater Sampling* (purge water); the JOF Plant-specific waste management plan; and local, state, and federal regulations. Transportation and disposal of IDW was coordinated with JOF Plant facility management. Used calibration solution was containerized and stored for disposal as directed by the JOF Plant facility management. Purge water and decontamination fluids were containerized for later disposal as specified in the JOF Plant-specific waste management plan. Used disposable PPE (e.g., nitrile gloves) and general trash generated throughout the day were placed in garbage bags and disposed of in a general trash dumpster onsite at the end of each day.

3.5 SAMPLE SHIPMENT

Samples were packed and secured under *COC* procedures specified in ENV-TI-05.80.06, *Handling and Shipping of Samples*. The samples were shipped by FedEx to GEL in Charleston, South Carolina (radium samples only), and to TestAmerica in Pittsburgh, Pennsylvania (other analytes). The laboratories submitted sample receipt confirmation forms to EnvStds for review and confirmation.

3.6 VARIATIONS

The proposed scope and procedures for the groundwater investigation were outlined in the SAP, QAPP, and applicable TVA TIs as detailed in the sections above. Variations in scope or procedures discussed with TDEC and/or TVA, changes based on field conditions, or additional field sampling performed to complete the scope of work in the SAP are described in the following sections. As dicussed below, these variations do not impact the overall usability and representativeness of the dataset provided in this SAR for groundwater investigation sampling Event #1 at the JOF Plant.

3.6.1 Variations in Scope

Variations in scope are provided below.

- Groundwater level gauging and sampling was not performed at well JOF-108 as specified in the SAP because it was not installed (the five borings drilled in that area encountered CCR and/or shallow refusal). This change in scope was approved by TDEC.
- Groundwater level gauging was not performed at monitoring well JOF-105 during this event as specified in the SAP because the well was inaccessible due to active construction and excavation. A groundwater elevation contour map was prepared based on available static groundwater level measurements from this event. Water level measurements were taken in well JOF-105 during Events #2-6 for evaluation in the EAR.

3.6.2 Variations in Procedures

Variations in procedures occurring in the field are provided below.

- The calibration verification of pH 4 was not within the afternoon acceptance criteria on December 5, 2019. This calibration variation was evaluated as part of the data validation/verification process performed by EnvStds.
- As approved by TDEC, the specific conductance and turbidity stabilization limits were revised to meet overall programmatic objectives for groundwater investigations.

4.0 SUMMARY

The data presented in this report are only for groundwater investigation sampling Event #1 at the JOF Plant. The scope of work for Event #1 was to:

- Collect groundwater samples for chemical analyses to assist with subsequent evaluation of the potential presence of CCR-related constituents in groundwater
- Measure groundwater and surface water elevations to assist with subsequent evaluation of groundwater flow direction and rate after multiple data sets have been collected.

In addition, pore water measurements from piezometers installed in the CCR units at the JOF Plant are presented in this SAR for comparison with groundwater data.

Event #1 included collecting groundwater level measurements at 28 monitoring wells and 10 piezometers; pore water measurements at 13 piezometers in the CCR units; and a surface water measurement at one gauge located in the Tennessee River/Kentucky Lake. Groundwater and surface water measurements and elevations are provided in Table B.1a, and pore water measurements and elevations are provided in Table B.1b, and depicted on Exhibits A.2 and A.3 .

Water quality measurements and groundwater analytical samples were collected at nine monitoring wells as summarized in Table B.2. Water quality parameters were recorded during purging. Stabilization criteria for pH, specific conductance, turbidity, and DO were achieved at the nine sampling locations. The final measurements prior to initiating sample collection are presented in Table B.3.

Groundwater analytical data for CCR Parameters and geochemical parameters are presented in Table B.4. Analytical data for radium analyses are presented in Table B.5. Analytical data were reported by GEL and TestAmerica, and then validated or verified by EnvStds.

Stantec has completed Event #1 of the groundwater investigation at the JOF Plant in New Johnsonville, Tennessee, in accordance with the Groundwater Investigation SAP as documented herein. The data collected during Event #1 are usable for reporting and evaluation in the EAR and meet the objectives of the TDEC Order EIP. The complete dataset from this event will be evaluated along with data collected during the remaining groundwater sampling events and under other TDEC Order SAPs, as well as data collected under other State and CCR programs. This evaluation will be provided in the EAR.

5.0 REFERENCES

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

Stantec Consulting Services Inc. (Stantec). 2018a. *Groundwater Investigation Sampling and Analysis Plan, Johnsonville Fossil Plant.* Revision 4. Prepared for Tennessee Valley Authority. December 10, 2018.

Stantec. 2018b. *Environmental Investigation Plan, Johnsonville Fossil Plant.* Revision 4. Prepared for Tennessee Valley Authority. December 10, 2018.

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

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

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

TVA, ENV-TI-05.80.04, *Field Sampling Quality Control*.

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

TVA, ENV-TI-05.80.06, *Handling and Shipping of Samples*.

TVA, ENV-TI-05.80.21, *Monitoring Well Inspection and Maintenance*.

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

TVA, ENV-TI-05.80.44, *Groundwater Level and Well Depth Measurement*.

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

APPENDIX A - EXHIBITS

Exhibit No.

A.1

Title

Monitoring Well and Piezometer Network

Client/Project

Tennessee Valley Authority
Johnsonville Fossil (JOF) Plant TDEC Order

Project Location

New Johnsonville, Tennessee

175568286

Prepared by DMB on 2021-05-24
Technical Review by MD on 2021-05-24

0 450 900 1,350 1,800 Feet

1:5,400 (At original document size of 22x34)

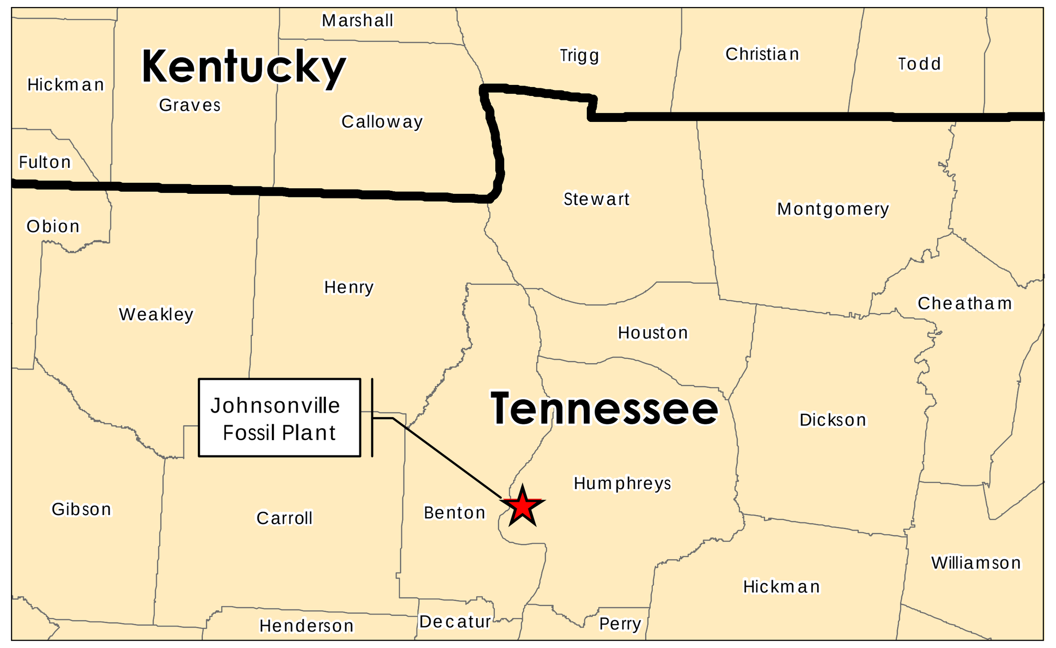
Legend

- Groundwater Investigation Monitoring Well
- Other Monitoring Well
- Piezometer
- Pore Water Piezometer in CCR Material
- Temporary Well within CCR Material
- Tennessee River/Kentucky Lake Gauging Station
- 2017 Imagery Boundary
- 2018 Imagery Boundary
- CCR Unit Area (Approximate)
- Coal Yard (Approximate)

CCR: Coal combustion residuals

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Imagery Provided by TVA (2017 & 2018) & ESRI World Imagery



Stantec TVA

U:\TVA-EP\175568286_JOF_Phase2\gis\mxd\GW_Tech_Memo\JOF_SAR_GW_ExhA1_GW_MonitoringWellNetwork_wPZ.mxd Revised: 2021-05-24 By: mbough

Exhibit No.

A.2

Title

Groundwater Elevation Contour Map, Event #1 (December 2, 2019)

Client/Project

Tennessee Valley Authority
Johnsonville Fossil (JOF) Plant TDEC Order

Project Location 175568286

New Johnsonville, Tennessee

Prepared by DMB on 2021-10-27
Technical Review by MD on 2021-10-27

0 450 900 1,350 1,800 Feet

1:5,400 (At original document size of 22x34)

Legend

- Groundwater Investigation Monitoring Well groundwater elevation in feet above mean sea level (ft amsl)
- Other Monitoring Well groundwater elevation in ft amsl
- Piezometer, groundwater label in blue text, pore water label in yellow highlighted black text; elevation in ft amsl (e.g., JOF-E-2A-PZ2) (e.g., JOF-E-2A-PZ5)
- Piezometer in CCR pore water elevation in ft amsl; value not used for contouring
- Temporary well in CCR pore water elevation in ft amsl; value not used for contouring
- Planned Temporary Well Location
- Tennessee River/Kentucky Lake Gauging Station surface water elevation in ft amsl
- Interpolated Groundwater Contour (5 ft interval; elevations are in ft amsl)
- Groundwater Contour (5 ft interval; elevations are in ft amsl)
- 2017 Imagery Boundary
- 2018 Imagery Boundary
- CCR Unit Area (Approximate)
- Coal Yard (Approximate)

CCR: Coal combustion residuals

NM: Not measured; data not available

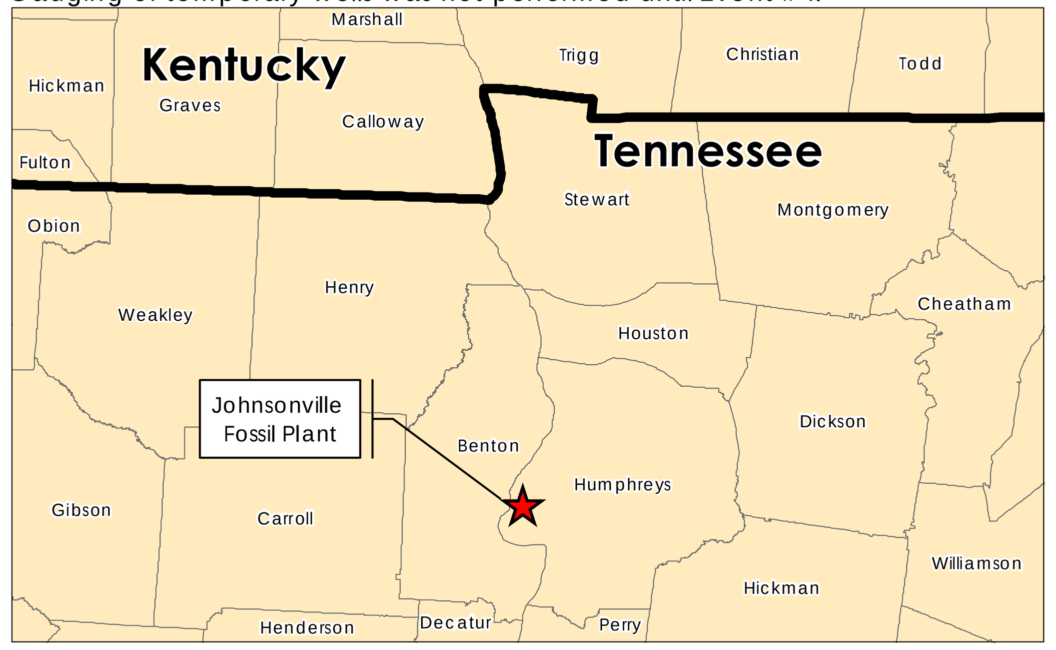
*Groundwater and pore water elevation displayed but not used as input for contouring due to factors such as well construction or being screened in a different hydrogeologic unit.

**Nested VWPZ sensors monitoring pore water and groundwater elevations in the same borehole, and the location is shown by a single symbol.

***The JOF_PZET and JOF_PZFT groundwater elevations are approximately 3-4 feet below the trend established in other piezometers within the Active Ash Pond 2. The groundwater elevation is displayed but not used for contouring.

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Imagery Provided by TVA (2017 & 2018) & ESRI World Imagery
3. Groundwater contours were created using Surfer Version 16.1.350 (December 13, 2018) and manual adjustment
4. Temporary well installation was not completed prior to this event. Gauging of temporary wells was not performed until Event #4.



Stantec TVA

U:\TVA-EP\175568286_JOF_Phase2\gis\mxd\GW_Tech_Memo\JOF_SAR_GW_ExhA2_GroundwaterContour_Event1.mxd Revised: 2021-10-27 By: lblackman

Exhibit No.

A.3

Title

Pore water Elevation Contour Map, Event #1 (December 2, 2019)

Client/Project

Tennessee Valley Authority
Johnsonville Fossil (JOF) Plant TDEC Order

Project Location | 175568286

New Johnsonville, Tennessee

Prepared by DMB on 2021-11-01
Technical Review by MD on 2021-11-01

0 | 450 | 900 | 1,350 | 1,800 Feet

1:5,400 (At original document size of 22x34)

Legend

- Groundwater Investigation Monitoring Well groundwater elevation in feet above mean sea level (ft amsl); value not used for contouring
- Other Monitoring Well groundwater elevation in ft amsl; value not used for contouring
- Piezometer, groundwater label in blue text, (e.g., JOF-E-2A-PZ2) pore water label in yellow highlighted black text; (e.g., JOF-E-2A-PZ5) elevation in ft amsl
- Piezometer in CCR pore water elevation in ft amsl
- Temporary well in CCR pore water elevation in ft amsl
- Planned Temporary Well Location
- Tennessee River/Kentucky Lake Gauging Station surface water elevation in ft amsl
- Interpolated Pore water Contour (5 ft interval; elevations are in ft amsl)
- Pore water Contour (5 ft interval; elevations are in ft amsl)
- 2017 Imagery Boundary
- 2018 Imagery Boundary
- CCR Unit Area (Approximate)
- Coal Yard (Approximate)

CCR: Coal combustion residuals

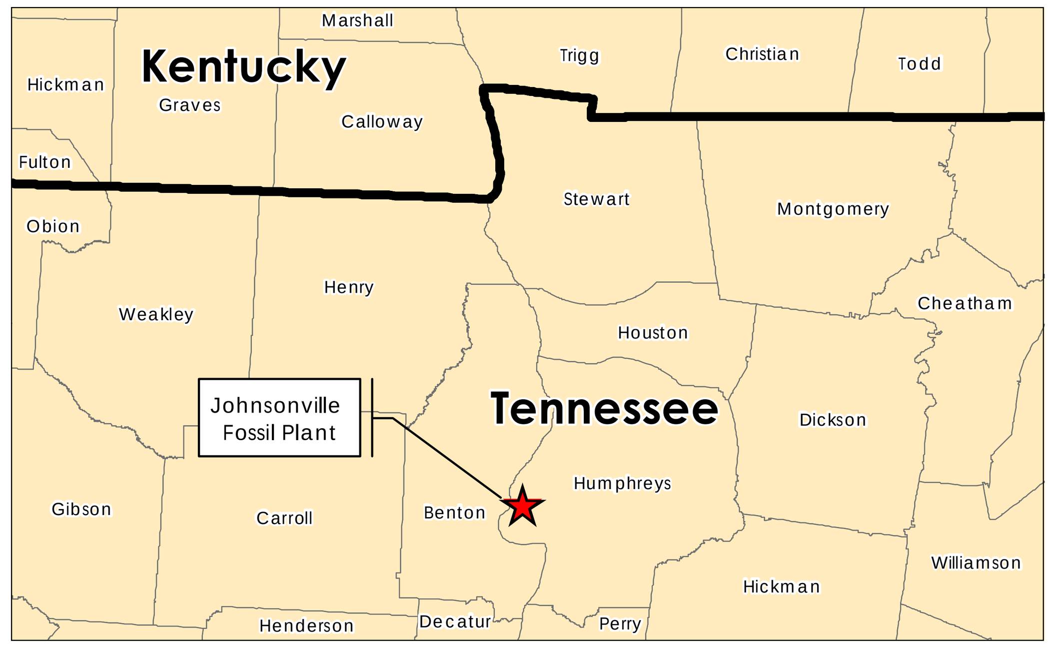
NM: Not measured; data not available

*Groundwater elevation displayed but not used as input for contouring due to factors such as well construction or being screened in a different hydrogeologic unit.

**Nested VWPZ sensors monitoring pore water and groundwater elevations in the same borehole, and the location is shown by a single symbol.

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Imagery Provided by TVA (2017 & 2018) & ESRI World Imagery
3. Pore water contours were created using manual adjustment and Surfer Version 16.1.350 (December 13, 2018)
4. Temporary well installation was not completed prior to this event. Gauging of temporary wells was not performed until Event #4.



Stantec TVA

APPENDIX B - TABLES

TABLE B.1a – Groundwater Level Measurements
Johnsonville Fossil Plant
December 2019

UNID	Well / Piezometer ID	Date Measured	Depth to Groundwater	Top of Casing Elevation	Groundwater Elevation	Piezometer Ground Surface Elevation	Piezometer Sensor Elevation	Piezometer Sensor Depth	Screened Interval	Screened / Piezometer Sensor Formation
			ft btoc	ft msl	ft msl	ft msl	ft msl	ft bgs	ft btoc	
Monitoring Wells										
JOF-00-GW-43-001	10-AP1	2-Dec-19	14.40	370.51	356.11	n/a	n/a	n/a	39.0 - 49.1	Alluvium: Sands and Gravels
JOF-00-GW-43-002	10-AP3	2-Dec-19	11.18	367.27	356.09	n/a	n/a	n/a	37.4 - 47.5	Alluvium: Sands and Gravels
JOF-00-GW-43-003	89-B10	2-Dec-19	24.61	401.19	376.58	n/a	n/a	n/a	32.0 - 40.3	Alluvium: Sands and Gravels
JOF-00-GW-43-004	94-B16	2-Dec-19	11.83	390.53	378.70	n/a	n/a	n/a	16.2 - 26.2	Alluvium: Sands and Gravels
JOF-00-GW-43-005	99-B19	2-Dec-19	15.46	394.50	379.04	n/a	n/a	n/a	12.6 - 27.7	Alluvium: Sands and Gravels/Shale Bedrock
JOF-00-GW-43-006	99-B20A	2-Dec-19	29.80	408.88	379.08	n/a	n/a	n/a	21.6 - 36.5	Alluvium: Sands and Gravels
JOF-00-GW-43-007	B-6R	2-Dec-19	17.46	395.57	378.11	n/a	n/a	n/a	18.2 - 21.2	Alluvium: Sands and Gravels
JOF-00-GW-43-008	B-8R	2-Dec-19	10.75	391.04	380.29	n/a	n/a	n/a	13.8 - 16.8	Alluvium: Sands and Gravels
JOF-00-GW-43-009	B-9	2-Dec-19	26.47	423.88	397.41	n/a	n/a	n/a	40.5 - 50.0	Alluvium: Silts and Clays
JOF-00-GW-43-010	B-11	2-Dec-19	20.48	400.67	380.19	n/a	n/a	n/a	26.7 - 36.7	Alluvium: Sands and Gravels
JOF-00-GW-43-011	B-12	2-Dec-19	12.71	393.03	380.32	n/a	n/a	n/a	26.8 - 36.9	Alluvium: Sands and Gravels
JOF-00-GW-43-012	B-13	2-Dec-19	29.61	409.87	380.26	n/a	n/a	n/a	33.8 - 43.9	Alluvium: Sands and Gravels
JOF-00-GW-43-013	JOF-101	2-Dec-19	25.82	424.59	398.77	n/a	n/a	n/a	43.6 - 53.2	Alluvium: Sands and Gravels
JOF-00-GW-43-014	JOF-102	2-Dec-19	19.82	407.64	387.82	n/a	n/a	n/a	23.6 - 33.9	Alluvium: Sands and Gravels
JOF-00-GW-43-015	JOF-103	2-Dec-19	17.82	374.24	356.42	n/a	n/a	n/a	41.9 - 52.1	Alluvium: Sands and Gravels
JOF-00-GW-43-016	JOF-104	2-Dec-19	23.16	379.44	356.28	n/a	n/a	n/a	48.4 - 58.6	Alluvium: Sands and Gravels
JOF-00-GW-43-017	JOF-105	n/a	NM	406.15	NM	n/a	n/a	n/a	23.4 - 33.7	Alluvium: Sands and Gravels
JOF-00-GW-43-018	A-3	2-Dec-19	23.51	403.73	380.22	n/a	n/a	n/a	66.1 - 86.1	Chattanooga Shale/Camden Formation
JOF-00-GW-43-019	JOF-106	2-Dec-19	22.71	403.16	380.45	n/a	n/a	n/a	23.3 - 32.8	Alluvium: Sands and Gravels
JOF-00-GW-43-020	JOF-107	2-Dec-19	28.81	409.95	381.14	n/a	n/a	n/a	31.9 - 41.4	Alluvium: Sands and Gravels
JOF-00-GW-43-021	JOF-109	2-Dec-19	5.45	386.11	380.66	n/a	n/a	n/a	34.1 - 43.9	Alluvium
JOF-00-GW-43-022	JOF-110	2-Dec-19	18.30	388.76	370.46	n/a	n/a	n/a	52.3 - 62.1	Alluvium
JOF-00-GW-43-023	JOF-111	2-Dec-19	19.49	390.08	370.59	n/a	n/a	n/a	41.3 - 51.1	Clay
JOF-00-GW-43-024	JOF-112	2-Dec-19	16.29	394.48	378.19	n/a	n/a	n/a	24.9 - 34.7	Alluvium
JOF-00-GW-43-025	JOF-113	2-Dec-19	29.08	388.13	359.05	n/a	n/a	n/a	39.6 - 49.4	Alluvium
JOF-00-GW-43-026	JOF-114	2-Dec-19	26.69	388.36	361.67	n/a	n/a	n/a	34.7 - 44.5	Alluvium
JOF-00-GW-43-027	JOF-117	2-Dec-19	28.73	388.63	359.90	n/a	n/a	n/a	35.0 - 44.8	Alluvium
JOF-00-GW-43-028	JOF-118	2-Dec-19	16.45	372.69	356.24	n/a	n/a	n/a	43.9 - 53.7	Alluvium
JOF-00-GW-43-029	JOF-119	2-Dec-19	10.62	366.89	356.27	n/a	n/a	n/a	38.0 - 47.8	Alluvium
Piezometers										
n/a	JOF-B-2A-PZ3	2-Dec-19	n/a	n/a	355.8	392.7	322.7	70.0	n/a	Alluvial Sand and Gravel
n/a	JOF-C-2A-PZ3	2-Dec-19	n/a	n/a	357.3	392.8	326.8	66.0	n/a	Alluvial Sand and Gravel
n/a	JOF-C-2B-PZ2	2-Dec-19	n/a	n/a	355.7	370.6	321.6	49.0	n/a	Alluvial Sand and Gravel
n/a	JOF-E-2A-PZ2	2-Dec-19	n/a	n/a	355.9	390.9	327.9	63.0	n/a	Alluvial Sand and Gravel
n/a	JOF-E-2B-PZ2	2-Dec-19	n/a	n/a	355.2	365.4	310.4	55.0	n/a	Alluvial Sand and Gravel
n/a	JOF-K-2A-PZ1	2-Dec-19	n/a	n/a	357.9	377.5	327.5	50.0	n/a	Alluvial Sand and Gravel
n/a	JOF_PZET	2-Dec-19	n/a	n/a	352.0	363.8	329.8	34.0	n/a	Alluvial Clay and Silt and Alluvial Sand and Gravel
n/a	JOF_PZFT	2-Dec-19	n/a	n/a	352.7	362.9	327.6	35.3	n/a	Alluvial Clay and Silt and Alluvial Sand and Gravel
n/a	JOF_PZHT	2-Dec-19	n/a	n/a	355.7	363.1	316.1	47.0	n/a	Alluvial Sand and Gravel
n/a	JOF-116-PZ	2-Dec-19	n/a	n/a	376.3	388.0	342.0	46.0	n/a	Alluvium

See notes on last page.

TABLE B.1a – Groundwater Level Measurements
Johnsonville Fossil Plant
December 2019

UNID	Well / Piezometer ID	Date Measured	Depth to Groundwater	Top of Casing Elevation	Groundwater Elevation	Piezometer Ground Surface Elevation	Piezometer Sensor Elevation	Piezometer Sensor Depth	Screened Interval	Screened / Piezometer Sensor Formation
			ft btoc	ft msl	ft msl	ft msl	ft msl	ft bgs	ft btoc	
Surface Water Gauge										
Tennessee River/Kentucky Lake gauge (GS-1)	n/a	2-Dec-19	n/a	n/a	356.36	n/a	n/a	n/a	n/a	n/a

Notes:

bgs below ground surface
btoc below top of casing
ft feet
ID identification
msl mean sea level
n/a not applicable
NM not measured
UNID Unique Numerical Identification

1. Top of casing elevations, screen intervals, and screened formations for monitoring wells were obtained from the TVA Well Inventory Log provided by TVA.
2. Tennessee River/Kentucky Lake data point is the reading closest to noon recorded by the automated staff gauge provided by TVA.
3. For piezometers, ground surface elevation, groundwater elevations and piezometer data were obtained from the geotechnical instrumentation database. Vibrating wire sensor formation information was obtained from boring logs. Data from automated piezometers are averaged for the measurement date.
4. Groundwater elevations in piezometers are calculated values. Accuracy of piezometer data is to 0.1 ft.
5. A groundwater level was not measured in well JOF-105 because the well was inaccessible.

TABLE B.1b – Pore Water Level Measurements
Johnsonville Fossil Plant
December 2019

Temporary Well / Piezometer ID	Date Measured	Depth to Pore Water	Top of Casing Elevation	Pore Water Elevation	Piezometer Ground Surface Elevation	Piezometer Sensor Elevation	Piezometer Sensor Depth	Screened Interval	Screened / Piezometer Sensor Formation
		ft btoc	ft msl	ft msl	ft msl	ft msl	ft bgs	ft bgs	
Temporary Wells									
JOF-TW01	n/a	NM	396.33	NM	n/a	n/a	n/a	24.8 - 34.6	CCR
JOF-TW02	n/a	NM	397.38	NM	n/a	n/a	n/a	25.5 - 35.3	CCR
JOF-TW03	n/a	NM	409.49	NM	n/a	n/a	n/a	40.4 - 50.2	CCR
JOF-TW04	n/a	NM	394.25	NM	n/a	n/a	n/a	25.9 - 35.7	CCR
JOF-TW05	n/a	NM	393.44	NM	n/a	n/a	n/a	36.2 - 46.0	CCR
JOF-TW06	n/a	NM	395.13	NM	n/a	n/a	n/a	26.5 - 36.3	CCR
JOF-TW07	n/a	NM	402.92	NM	n/a	n/a	n/a	32.2 - 42.0	CCR
JOF-TW08	n/a	NM	387.22	NM	n/a	n/a	n/a	6.0 - 15.8	CCR
JOF-TW09	n/a	NM	387.52	NM	n/a	n/a	n/a	15.8 - 25.6	CCR
JOF-TW10	n/a	NM	384.92	NM	n/a	n/a	n/a	6.0 - 15.8	CCR
JOF-TW11	n/a	NM	440.13	NM	n/a	n/a	n/a	31.6 - 41.4	CCR
JOF-TW12	n/a	NM	444.17	NM	n/a	n/a	n/a	36.1 - 45.9	CCR
JOF-TW13	n/a	NM	441.39	NM	n/a	n/a	n/a	33.3 - 43.1	CCR
JOF-TW15	n/a	NM	451.71	NM	n/a	n/a	n/a	55.0 - 64.8	CCR
JOF-TW16	n/a	NM	473.81	NM	n/a	n/a	n/a	72.9 - 82.7	CCR
Piezometers									
JOF-E-2A-PZ5	2-Dec-19	n/a	n/a	382.8	390.9	370.9	20.0	n/a	CCR
JOF_PZEC	2-Dec-19	n/a	n/a	382.1	390.4	365.4	25.0	n/a	CCR and Dike Fill
JOF_PZFC	2-Dec-19	n/a	n/a	382.3	389.8	364.8	25.0	n/a	CCR and Dike Fill
JOF_PZGC	2-Dec-19	n/a	n/a	376.9	389.8	364.8	25.0	n/a	CCR and Dike Fill
JOF_PZHC	2-Dec-19	n/a	n/a	380.6	390.0	365.8	24.2	n/a	CCR
JOF_PZIC	2-Dec-19	n/a	n/a	382.5	390.1	360.1	30.0	n/a	CCR and Dike Fill
JOF_PZJC	2-Dec-19	n/a	n/a	384.0	390.0	365.0	25.0	n/a	CCR
JOF_PZKC	2-Dec-19	n/a	n/a	382.5	390.5	365.5	25.0	n/a	CCR
JOF_PZLC	2-Dec-19	n/a	n/a	380.4	390.5	365.5	25.0	n/a	CCR
JOF_PZMC	2-Dec-19	n/a	n/a	377.6	391.1	366.1	25.0	n/a	CCR and Dike Fill
P-8	2-Dec-19	n/a	n/a	400.3	432.8	394.5	38.3	n/a	CCR
P-9	2-Dec-19	n/a	n/a	395.8	432.9	393.8	39.2	n/a	CCR and Clayey Fill
P-10	2-Dec-19	n/a	n/a	400.5	430.7	391.0	39.8	n/a	CCR

Notes:

bgs	below ground surface
btoc	below top of casing
CCR	coal combustion residuals
ft	feet
ID	identification
msl	mean sea level
n/a	not applicable
NM	not measured

1. Top of casing elevations, screen intervals, and screened formations were obtained from boring logs, well detail and well survey data.

2. For piezometers, ground surface elevation, pore water elevations, and piezometer data obtained from the geotechnical instrumentation database. Data from automated piezometers are averaged for the measurement date.

3. Pore water elevations in piezometers are calculated values. Accuracy of piezometer data is to 0.1 ft.

4. Temporary wells were not gauged during this event. Gauging and sampling of temporary wells did not commence until all temporary wells associated with the Exploratory Drilling scope were installed and developed.

TABLE B.2 – Summary of Groundwater Samples
Johnsonville Fossil Plant
December 2019

			Analysis Type										
Location ID	**Sample ID**	**Sample Type**	Field Parameters	Total Metals	Dissolved Metals	Total Mercury	Dissolved Mercury	Anions	Alkalinity	Total Dissolved Solids	Radium-226	Radium-228	Radium-226+228
JOF-109	JOF-GW-021-20191203	Normal Environmental Sample	X	X	X	X	X	X	X	X	X	X	X
JOF-110	JOF-GW-022-20191204	Normal Environmental Sample	X	X	X	X	X	X	X	X	X	X	X
JOF-111	JOF-GW-023-20191204	Normal Environmental Sample	X	X		X		X	X	X	X	X	X
JOF-112	JOF-GW-024-20191202	Normal Environmental Sample	X	X		X		X	X	X	X	X	X
JOF-113	JOF-GW-025-20191204	Normal Environmental Sample	X	X		X		X	X	X	X	X	X
JOF-114	JOF-GW-026-20191204	Normal Environmental Sample	X	X		X		X	X	X	X	X	X
JOF-117	JOF-GW-027-20191205	Normal Environmental Sample	X	X		X		X	X	X	X	X	X
JOF-118	JOF-GW-028-20191203	Normal Environmental Sample	X	X		X		X	X	X	X	X	X
JOF-119	JOF-GW-029-20191203	Normal Environmental Sample	X	X		X		X	X	X	X	X	X
	JOF-GW-DUP01-20191203	Field Duplicate Sample		X		X		X	X	X	X	X	X

Notes:

Total and Dissolved Metals	SW-846 6020A
Total and Dissolved Mercury	SW-846 7470A
Anions	EPA 300.0/SW 9056
Alkalinity	SM2320B
Total Dissolved Solids	SM2540C
Radium-226	EPA 903.0
Radium-228	EPA 904.0
Radium-226+228	CALC
ID	identification

1. Field and laboratory quality control sample results except for field duplicates are not included in report tables but were used for data validation.

TABLE B.3 – Summary of Groundwater Quality Parameters
Johnsonville Fossil Plant
December 2019

Sample Location		JOF-109	JOF-110	JOF-111	JOF-112	JOF-113	JOF-114	JOF-117	JOF-118	JOF-119
Sample Date		3-Dec-19	4-Dec-19	4-Dec-19	2-Dec-19	4-Dec-19	4-Dec-19	5-Dec-19	3-Dec-19	3-Dec-19
Sample ID		JOF-GW-021-20191203	JOF-GW-022-20191204	JOF-GW-023-20191204	JOF-GW-024-20191202	JOF-GW-025-20191204	JOF-GW-026-20191204	JOF-GW-027-20191205	JOF-GW-028-20191203	JOF-GW-029-20191203
Sample Depth		39 ft	57 ft	46 ft	29.5 ft	43.5 ft	39.5 ft	40.5 ft	48.5 ft	42.5 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Level of Review	Units	Final QC Review	Final QC Review	Final QC Review	Final QC Review	Final QC Review	Final QC Review	Final QC Review	Final QC Review	Final QC Review
Field Parameters										
Dissolved Oxygen	%	24.6	4.5	1.8	3.2	4.8	2.7	3.0	2.5	2.8
Dissolved Oxygen	mg/L	2.45	0.44	0.18	0.31	0.48	0.27	0.30	0.23	0.28
ORP	mV	162.4	24.7	-62.7	48.1	81.2	119.3	-104.8	79.6	87.0
pH (field)	SU	5.67	5.85	6.40	6.27	6.02	4.98	6.64	5.79	6.22
Specific Cond. (Field)	uS/cm	189.3	337.9	3,027	436.6	2,400	3,697	1,004	338.1	377.2
Temperature, Water (C)	DEG C	15.5	16.2	17.6	19.7	18.1	19.0	16.8	18.6	16.9
Turbidity, field	NTU	7.91	8.34	4.77	1.51	1.59	2.39	4.59	1.40	2.09

Notes:

%	percent
Cond.	conductance
DEG C	degrees Celsius
ft	feet below top of casing
ID	identification
mg/L	milligrams per Liter
mV	milliVolts
NTU	Nephelometric Turbidity Unit
ORP	Oxidation Reduction Potential, measured using a silver reference electrode which has a standard potential of 200 mV
SU	Standard Units
uS/cm	microSiemens per centimeter

TABLE B.4 - Groundwater Analytical Results for Metals, Anions, and General Chemistry
Johnsonville Fossil Plant
December 2019

Sample Location Sample Date Sample ID Sample Depth Sample Type Level of Review	Units	EPA MCLs	CCR Rule GWPS	JOF-109 3-Dec-19 JOF-GW-021-20191203 39 ft Normal Environmental Sample Validated	JOF-110 4-Dec-19 JOF-GW-022-20191204 57 ft Normal Environmental Sample Final-Verified	JOF-111 4-Dec-19 JOF-GW-023-20191204 46 ft Normal Environmental Sample Final-Verified	JOF-112 2-Dec-19 JOF-GW-024-20191202 29.5 ft Normal Environmental Sample Validated	JOF-113 4-Dec-19 JOF-GW-025-20191204 43.5 ft Normal Environmental Sample Final-Verified	JOF-114 4-Dec-19 JOF-GW-026-20191204 39.5 ft Normal Environmental Sample Final-Verified	JOF-117 5-Dec-19 JOF-GW-027-20191205 40.5 ft Normal Environmental Sample Final-Verified
Total Metals										
Antimony	ug/L	6[A]	n/v	<0.378	<0.378	<0.378	<0.378	<0.378	<0.378	<0.378
Arsenic	ug/L	10[A]	n/v	0.328 J	3.75	6.61	0.579 J	1.62	1.11	**28.5[A]**
Barium	ug/L	2,000[A]	n/v	17.1	76.0	49.0	58.8	29.4	24.0	95.4
Beryllium	ug/L	4[A]	n/v	0.331 J	<0.182	<0.182	0.223 U*	<0.182	0.619 J	<0.182
Boron	ug/L	n/v	n/v	84.5	1,290	4,450	56.6 J	15,500	10,700	<386
Cadmium	ug/L	5[A]	n/v	0.316 J	<0.125	0.179 J	0.357 J	0.535 J	0.335 J	<0.125
Calcium	ug/L	n/v	n/v	18,400	19,300	426,000	31,600	538,000	469,000	89,500
Chromium	ug/L	100[A]	n/v	1.63 J	2.98	2.84	2.15	2.15	2.84	3.10 U*
Cobalt	ug/L	n/v	6[B]	2.56	5.47	**98.8[B]**	**112[B]**	**7.83[B]**	**76.9[B]**	**25.7[B]**
Copper	ug/L	n/v	n/v	1.09 J	<0.627	0.787 J	0.637 J	0.655 J	1.79 J	0.697 J
Lead	ug/L	n/v	15[B]	0.172 J	0.284 J	<0.128	<0.128	<0.128	<0.128	<0.128
Lithium	ug/L	n/v	40[B]	<3.39	12.9 U*	**40.4[B]**	3.80 J	**156[B]**	**101[B]**	12.9 U*
Magnesium	ug/L	n/v	n/v	4,250	4,860	30,000	13,100	6,860	48,500	30,400
Mercury	ug/L	2[A]	n/v	<0.101	<0.101	<0.101	<0.101	<0.101	<0.101	<0.101
Molybdenum	ug/L	n/v	100[B]	<0.610	<0.610	48.5	0.746 J	**204[B]**	<0.610	26.8
Nickel	ug/L	100 (TN MCL)[A]	n/v	36.2	8.85	26.8	10.3	**123[A]**	24.0	10.1
Potassium	ug/L	n/v	n/v	1,110	350 J	46,000	861	59,200	95,900	2,760
Selenium	ug/L	50[A]	n/v	<1.51	<1.51	<1.51	<1.51	<1.51	<1.51	<1.51
Silver	ug/L	100 (TN MCL)[A]	n/v	<0.177	<0.177	<0.177	<0.177	<0.177	<0.177	<0.177
Sodium	ug/L	n/v	n/v	7,360	39,500	177,000	25,600	62,700	328,000	35,900
Thallium	ug/L	2[A]	n/v	0.170 J	<0.148	0.163 J	0.493 U*	0.758 J	0.636 J	<0.148
Vanadium	ug/L	n/v	n/v	1.30	2.42	1.36	1.31	1.22	1.46	1.18
Zinc	ug/L	n/v	n/v	51.5	13.2 U*	49.1	17.2 U*	173	70.6	4.62 U*
Dissolved Metals										
Antimony	ug/L	6[A]	n/v	<0.378	<0.378	-	-	-	-	-
Arsenic	ug/L	10[A]	n/v	<0.323	3.57	-	-	-	-	-
Barium	ug/L	2,000[A]	n/v	17.1	76.3	-	-	-	-	-
Beryllium	ug/L	4[A]	n/v	0.255 J	<0.182	-	-	-	-	-
Boron	ug/L	n/v	n/v	78.7 J	1,340	-	-	-	-	-
Cadmium	ug/L	5[A]	n/v	0.316 J	<0.125	-	-	-	-	-
Calcium	ug/L	n/v	n/v	18,800	19,500	-	-	-	-	-
Chromium	ug/L	100[A]	n/v	1.59 J	2.57	-	-	-	-	-
Cobalt	ug/L	n/v	6[B]	2.48	5.48	-	-	-	-	-
Copper	ug/L	n/v	n/v	1.37 J	<0.627	-	-	-	-	-
Lead	ug/L	n/v	15[B]	<0.128	0.145 J	-	-	-	-	-
Lithium	ug/L	n/v	40[B]	4.04 J	13.3 U*	-	-	-	-	-
Magnesium	ug/L	n/v	n/v	4,260	4,950	-	-	-	-	-
Mercury	ug/L	2[A]	n/v	<0.101	<0.101	-	-	-	-	-
Molybdenum	ug/L	n/v	100[B]	<0.610	<0.610	-	-	-	-	-
Nickel	ug/L	100 (TN MCL)[A]	n/v	37.2	8.83	-	-	-	-	-
Potassium	ug/L	n/v	n/v	1,140	298 J	-	-	-	-	-
Selenium	ug/L	50[A]	n/v	<1.51	<1.51	-	-	-	-	-
Silver	ug/L	100 (TN MCL)[A]	n/v	<0.177	<0.177	-	-	-	-	-
Sodium	ug/L	n/v	n/v	7,460	40,100	-	-	-	-	-
Thallium	ug/L	2[A]	n/v	0.160 J	<0.148	-	-	-	-	-
Vanadium	ug/L	n/v	n/v	1.48	1.99	-	-	-	-	-
Zinc	ug/L	n/v	n/v	54.3	11.0	-	-	-	-	-
Anions										
Chloride	mg/L	n/v	n/v	38.6	52.4	456	47.3	38.8	258	82.3
Fluoride	mg/L	4[A]	n/v	0.0408 J	0.376	0.150 J	0.379	0.164	<0.0658	0.793
Sulfate	mg/L	n/v	n/v	5.17	27.5	930	61.0	1,390	1,800	6.80
General Chemistry										
Alkalinity, Bicarbonate	mg/L	n/v	n/v	27.2	52.5	81.9	106	22.9	<5.00	322
Alkalinity, Carbonate	mg/L	n/v	n/v	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00
Alkalinity, Total as CaCO3	mg/L	n/v	n/v	27.2	52.5	81.9	106	22.9	<5.00	322
Total Dissolved Solids	mg/L	n/v	n/v	112	242	2,160	268	2,330	3,240	470

See notes on last page.

Stantec

TABLE B.4 - Groundwater Analytical Results for Metals, Anions, and General Chemistry
Johnsonville Fossil Plant
December 2019

Sample Location				JOF-118	JOF-119	
Sample Date				3-Dec-19	3-Dec-19	3-Dec-19
Sample ID				JOF-GW-028-20191203	JOF-GW-029-20191203	JOF-GW-DUP01-20191203
Sample Depth				48.5 ft	42.5 ft	42.5 ft
Sample Type				Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample
Level of Review				Validated	Validated	Validated
	Units	EPA MCLs	CCR Rule GWPS			
Total Metals						
Antimony	ug/L	6[A]	n/v	<0.378	<0.378	<0.378
Arsenic	ug/L	10[A]	n/v	1.30	1.36	1.29
Barium	ug/L	2,000[A]	n/v	22.3	38.9	38.9
Beryllium	ug/L	4[A]	n/v	<0.182	<0.182	<0.182
Boron	ug/L	n/v	n/v	57.3 J	<38.6	<38.6
Cadmium	ug/L	5[A]	n/v	<0.125	<0.125	<0.125
Calcium	ug/L	n/v	n/v	31,200	22,200	21,700
Chromium	ug/L	100[A]	n/v	1.58 J	<1.53	2.12
Cobalt	ug/L	n/v	6[B]	2.41	2.22	2.49
Copper	ug/L	n/v	n/v	<0.627	<0.627	<0.627
Lead	ug/L	n/v	15[B]	<0.128	<0.128	<0.128
Lithium	ug/L	n/v	40[B]	<3.39	<3.39	<3.39
Magnesium	ug/L	n/v	n/v	5,730	4,240	4,170
Mercury	ug/L	2[A]	n/v	<0.101	<0.101	<0.101
Molybdenum	ug/L	n/v	100[B]	<0.610	<0.610	<0.610
Nickel	ug/L	100 (TN MCL)[A]	n/v	8.56	2.47	2.60
Potassium	ug/L	n/v	n/v	932	1,480	1,480
Selenium	ug/L	50[A]	n/v	<1.51	<1.51	<1.51
Silver	ug/L	100 (TN MCL)[A]	n/v	<0.177	<0.177	<0.177
Sodium	ug/L	n/v	n/v	26,800	52,100	52,800
Thallium	ug/L	2[A]	n/v	<0.148	<0.148	<0.148
Vanadium	ug/L	n/v	n/v	1.33	0.999 J	1.65
Zinc	ug/L	n/v	n/v	5.51 U*	5.09 U*	3.79 U*
Dissolved Metals						
Antimony	ug/L	6[A]	n/v	-	-	-
Arsenic	ug/L	10[A]	n/v	-	-	-
Barium	ug/L	2,000[A]	n/v	-	-	-
Beryllium	ug/L	4[A]	n/v	-	-	-
Boron	ug/L	n/v	n/v	-	-	-
Cadmium	ug/L	5[A]	n/v	-	-	-
Calcium	ug/L	n/v	n/v	-	-	-
Chromium	ug/L	100[A]	n/v	-	-	-
Cobalt	ug/L	n/v	6[B]	-	-	-
Copper	ug/L	n/v	n/v	-	-	-
Lead	ug/L	n/v	15[B]	-	-	-
Lithium	ug/L	n/v	40[B]	-	-	-
Magnesium	ug/L	n/v	n/v	-	-	-
Mercury	ug/L	2[A]	n/v	-	-	-
Molybdenum	ug/L	n/v	100[B]	-	-	-
Nickel	ug/L	100 (TN MCL)[A]	n/v	-	-	-
Potassium	ug/L	n/v	n/v	-	-	-
Selenium	ug/L	50[A]	n/v	-	-	-
Silver	ug/L	100 (TN MCL)[A]	n/v	-	-	-
Sodium	ug/L	n/v	n/v	-	-	-
Thallium	ug/L	2[A]	n/v	-	-	-
Vanadium	ug/L	n/v	n/v	-	-	-
Zinc	ug/L	n/v	n/v	-	-	-
Anions						
Chloride	mg/L	n/v	n/v	11.6	24.8	24.9
Fluoride	mg/L	4[A]	n/v	0.0818 J	0.0719 J	0.203 J
Sulfate	mg/L	n/v	n/v	99.7	65.6	66.3
General Chemistry						
Alkalinity, Bicarbonate	mg/L	n/v	n/v	50.5	99.3	101
Alkalinity, Carbonate	mg/L	n/v	n/v	<5.00	<5.00	<5.00
Alkalinity, Total as CaCO3	mg/L	n/v	n/v	50.5	99.3	101
Total Dissolved Solids	mg/L	n/v	n/v	214	235	234

Notes:

A	EPA Maximum Contaminant Level
B	CCR Rule GWPS (Federal Register / Vol. 83, No. 146 / Monday, July 30, 2018 / Rules and Regulations)
n/v	No standard/guideline value
6.5[A]	Concentration is greater than or equal to the indicated standard.
<0.03	analyte was not detected at a concentration greater than the Method Detection Limit
-	parameter not analyzed / not available
ft	feet below top of casing
ID	identification
J	quantitation is approximate due to limitations identified during data validation
mg/L	milligrams per Liter
U*	result should be considered “not detected” because it was detected in an associated field or laboratory blank at a similar level
ug/L	micrograms per Liter

1. Level of review is defined in the Quality Assurance Project Plan.

TABLE B.5 – Groundwater Analytical Results for Radiological Parameters
Johnsonville Fossil Plant
December 2019

Sample Location Sample Date Sample ID Sample Depth Sample Type Level of Review	Units	EPA MCLs	CCR Rule GWPS	JOF-109 3-Dec-19 JOF-GW-021-20191203 39 ft Normal Environmental Sample Validated	JOF-110 4-Dec-19 JOF-GW-022-20191204 57 ft Normal Environmental Sample Validated	JOF-111 4-Dec-19 JOF-GW-023-20191204 46 ft Normal Environmental Sample Validated	JOF-112 2-Dec-19 JOF-GW-024-20191202 29.5 ft Normal Environmental Sample Validated	JOF-113 4-Dec-19 JOF-GW-025-20191204 43.5 ft Normal Environmental Sample Validated	JOF-114 4-Dec-19 JOF-GW-026-20191204 39.5 ft Normal Environmental Sample Validated
Radiological Parameters									
Radium-226	pCi/L	n/v	n/v	0.765 +/-(0.398)	0.332 +/-(0.556)U	0.481 +/-(0.292)	2.81 +/-(0.812)	3.49 +/-(0.906)	2.56 +/-(0.730)
Radium-228	pCi/L	n/v	n/v	-0.0935 +/-(0.274)U	-0.21 +/-(0.261)U	1.02 +/-(0.484)U*	-0.03 +/-(0.330)U	0.853 +/-(0.574)U*	2.26 +/-(0.828)
Radium-226+228	pCi/L	5[A]	n/v	0.765 +/-(0.484)J	0.332 +/-(0.614)U	1.50 +/-(0.565)J	2.81 +/-(0.876)J	4.34 +/-(1.07)J	4.82 +/-(1.10)

See notes on last page.

Stantec

TABLE B.5 – Groundwater Analytical Results for Radiological Parameters
Johnsonville Fossil Plant
December 2019

Sample Location				JOF-117	JOF-118	JOF-119	
Sample Date				5-Dec-19	3-Dec-19	3-Dec-19	3-Dec-19
Sample ID				JOF-GW-027-20191205	JOF-GW-028-20191203	JOF-GW-029-20191203	JOF-GW-DUP01-20191203
Sample Depth				40.5 ft	48.5 ft	42.5 ft	42.5 ft
Sample Type				Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample
Level of Review				Validated	Validated	Validated	Validated
	Units	EPA MCLs	CCR Rule GWPS				
Radiological Parameters							
Radium-226	pCi/L	n/v	n/v	1.80 +/-(0.579)	0.273 +/-(0.412)U	0.752 +/-(0.696)U	0.453 +/-(0.531)U
Radium-228	pCi/L	n/v	n/v	0.897 +/-(0.496)	-0.264 +/-(0.347)U	-0.211 +/-(0.267)U	-0.358 +/-(0.364)U
Radium-226+228	pCi/L	5[A]	n/v	2.69 +/-(0.763)	0.273 +/-(0.539)U	0.752 +/-(0.746)U	0.453 +/-(0.644)U

Notes:

A	EPA Maximum Contaminant Level
B	CCR Rule GWPS (Federal Register / Vol. 83, No. 146 / Monday, July 30, 2018 / Rules and Regulations)
n/v	No standard/guideline value
ft	feet below top of casing
ID	identification
J	quantitation is approximate due to limitations identified during data validation
pCi/L	picoCurie per Liter
U	not detected
U*	this result should be considered “not detected” because it was detected in an associated field or laboratory blank at a similar level.

1. Level of review is defined in the Quality Assurance Project Plan.

Stantec

APPENDIX H.4

GROUNDWATER INVESTIGATION EVENT #2 SAMPLING AND ANALYSIS REPORT

Stantec

Johnsonville Fossil Plant Groundwater Investigation Event #2 Sampling and Analysis Report

TDEC Commissioner's Order:
Environmental Investigation Plan
Johnsonville Fossil Plant
New Johnsonville, Tennessee

September 17, 2021

Prepared for:

Tennessee Valley Authority
Chattanooga, Tennessee

TVA

Prepared by:

Stantec Consulting Services Inc.
Lexington, Kentucky

REVISION LOG

Revision	Description	Date
0	Submittal to TDEC	July 30, 2021
1	Addresses August 31, 2021 TDEC Review Comments and Issued for TDEC	September 17, 2021

Sign-off Sheet

This document entitled Johnsonville Fossil Plant Groundwater Investigation Event #2 Sampling and Analysis Report was prepared by Stantec Consulting Services Inc. (“Stantec”) for the account of Tennessee Valley Authority (the “Client”). Any reliance on this document by any third party is strictly prohibited. The material in it reflects Stantec’s professional judgment in light of the scope, schedule and other limitations stated in the document and in the contract between Stantec and the Client. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. In preparing the document, Stantec did not verify information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions taken based on this document.

Prepared by Jamie Snider

Jamie Snider, Geologic Staff

Reviewed by Carole M. Farr

Carole M. Farr, Senior Principal Geologist

Approved by Brigid T Brooks Zvirbulis

Brigid Zvirbulis, Project Manager

Table of Contents

Abbreviations

CCR	Coal Combustion Residuals
CCR Parameters	Constituents listed in Appendices III and IV of 40 CFR 257 and five inorganic constituents included in Appendix I of Tennessee Rule 0400-11-01-.04
CEC	Civil and Environmental Consultants, Inc.
CFR	Code of Federal Regulations
COC	Chain-of-Custody
DO	Dissolved Oxygen
EAR	Environmental Assessment Report
EIP	Environmental Investigation Plan
ENV	Environmental
EnvStds	Environmental Standards, Inc.
Event #2	Groundwater investigation field event performed February 10-13, 2020
FSP	Field Sampling Personnel
ft	Feet
GEL	GEL Laboratories LLC
ID	Identification
IDW	Investigation Derived Waste
JOF Plant	Johnsonville Fossil Plant
mg/L	Milligrams per Liter
NTU	Nephelometric Turbidity Units
ORP	Oxidation-Reduction Potential
PPE	Personal Protective Equipment
QAPP	Quality Assurance Project Plan
QC	Quality Control
SAP	Sampling and Analysis Plan
SAR	Sampling and Analysis Report
Stantec	Stantec Consulting Services Inc.
TDEC	Tennessee Department of Environment and Conservation
TDEC Order	Commissioner's Order No. OGC15-0177
TI	Technical Instruction
TVA	Tennessee Valley Authority
USEPA	United States Environmental Protection Agency

1.0 INTRODUCTION

Stantec Consulting Services Inc. (Stantec) has prepared this sampling and analysis report (SAR) on behalf of the Tennessee Valley Authority (TVA) to document the completion of activities related to a groundwater investigation sampling event performed February 10-13, 2020 (Event #2) at TVA's Johnsonville Fossil Plant (JOF Plant) located in New Johnsonville, Tennessee.

The purpose of the groundwater investigation, upon completion of the six groundwater sampling events, is to characterize groundwater conditions at the JOF Plant in support of fulfilling the requirements for the Tennessee Department of Environment and Conservation (TDEC) issued Commissioner's Order No. OGC15-0177 (TDEC Order) to TVA (TDEC 2015). The TDEC Order sets forth a "process for the investigation, assessment, and remediation of unacceptable risks" at TVA's coal ash disposal sites in Tennessee.

The purpose of this SAR is to document the work completed during groundwater sampling Event #2 of 6 total events and to present the information and data collected during the execution of the Groundwater Investigation Sampling and Analysis Plan (SAP) (Stantec 2018a). This SAR is not intended to provide conclusions or evaluations of results. The scope of the groundwater investigation represented herein was conducted pursuant to the SAP and is part of a larger environmental investigation at the JOF Plant. The data provided in this SAR are not inclusive of other programmatic data that exist for the site. The evaluation of the results will include data from the six groundwater sampling events and consider other aspects of the environmental investigation, as well as data collected under other State and/or coal combustion residuals (CCR) programs. This evaluation will be presented in the Environmental Assessment Report (EAR).

Event #2 activities were performed in general accordance with the following documents developed by TVA to support fulfilling the requirements of the TDEC Order at the JOF Plant:

- *Groundwater Investigation SAP* (Stantec 2018a)
- *Environmental Investigation Plan (EIP)* (Stantec 2018b)
- *Quality Assurance Project Plan (QAPP)* (Environmental Standards, Inc. 2018).

The Groundwater Investigation SAP was updated based on TVA- and TDEC-approved Programmatic- and Project-specific changes. Minor variations in scope and procedures from those outlined in the SAP occurred during field activities due to field conditions and programmatic updates and are referenced in Section 3.6.

Event #2 is the second in a series of six planned sampling events for the groundwater investigation. Stantec performed the field work activities for this event. Laboratory analysis of constituents was performed by GEL Laboratories LLC (GEL) in Charleston, South Carolina. Quality assurance oversight on data acquisition protocols, sampling practices, and data validation or verification was performed by Environmental Standards, Inc. (EnvStds) under direct contract to TVA.

This report summarizes the groundwater investigation activities for Event #2. The remaining sampling events will be completed before overall conclusions and findings about the groundwater investigation and groundwater conditions at the JOF Plant are made and documented in the EAR.

2.0 OBJECTIVE AND SCOPE

The primary objectives of the groundwater investigation conducted pursuant to the Groundwater Investigation SAP (which includes six sampling events) are to characterize existing groundwater quality and to evaluate groundwater flow conditions at the JOF Plant in response to the TDEC Order. The approach to characterizing the groundwater conditions is to:

- Collect groundwater samples for chemical analyses to evaluate the potential presence of constituents related to CCR in groundwater
- Measure groundwater and surface water elevations for subsequent evaluation of the direction and rate of groundwater flow.

The scope of work intended to achieve the objectives of the groundwater investigation consists of six sampling events at a frequency of one event every two months for one year to characterize seasonal groundwater quality and flow direction. This report describes the activities related to Event #2, performed in February 2020, the scope of which included:

- Collecting groundwater and surface water level measurements
- Collecting field measurements of groundwater quality parameters
- Collecting groundwater samples and associated quality control (QC) samples for laboratory analysis.

These activities were carried out after the installation of permanent monitoring wells as specified in the Groundwater Investigation SAP. Details of the monitoring well installation activities are provided in the JOF Plant Hydrogeologic Investigation SAR.

In addition, pore water measurements from piezometers installed in the CCR units at the JOF Plant are presented in this SAR for comparison with groundwater data. Groundwater piezometer installation activities are described in the JOF Plant Hydrogeologic Investigation SAR.

3.0 FIELD ACTIVITIES

Groundwater investigation field activities for Event #2 were conducted February 10-13, 2020. Stantec performed groundwater level measurements and sample collection activities based on guidance and specifications in TVA's Environmental (ENV) Technical Instructions (TIs), the SAP, the QAPP, and applicable United States Environmental Protection Agency (USEPA) documents except as noted in the Variations section of this report. As part of TVA's commitment to generate representative and reliable data, data validation and/or verification of laboratory analytical results were performed by EnvStds under direct contract with TVA. EnvStds also conducted audits of field activities and provided quality reviews of field documentation. In addition, on behalf of TDEC, Civil and Environmental Consultants, Inc. (CEC) collected split groundwater samples during this sampling event. Additional details regarding CEC split sample collection is provided in Section 3.3.2.

During Event #2, Stantec conducted the following field activities:

- Measured groundwater levels at nine monitoring wells and one piezometer installed for the TDEC Order, and 20 monitoring wells and nine piezometers installed for other environmental programs (29 total monitoring wells)
- Measured pore water levels at 10 piezometers installed in the CCR units
- Measured the surface water level at one location in the Tennessee River/Kentucky Lake
- Collected groundwater samples from nine monitoring wells installed for the TDEC Order
- Recorded field measurements of groundwater quality parameters during purging and stabilization at the sampled monitoring wells
- Collected QC samples including one field duplicate, one matrix spike/matrix spike duplicate, two field blanks, one filter blank, one tubing blank, and one equipment blank
- Shipped the collected samples to GEL in Charleston, South Carolina.

Details on each activity are presented in the sections below.

3.1 WORK LOCATIONS

The TDEC Order CCR units at the JOF Plant (Ash Disposal Area 1, Active Ash Pond 2, DuPont Road Dredge Cell, South Rail Loop Area 4, and Coal Yard) as well as the monitoring wells and piezometers sampled and/or gauged during Event #2 are shown on Exhibit A.1 in Appendix A. TVA is currently sampling groundwater at the JOF Plant for TDEC Solid Waste Management permit requirements and the USEPA CCR Rule codified in Title 40 of the Code of Federal Regulations (CFR) Part 257 (40 CFR 257). Monitoring wells that are being sampled as part of other programs are not sampled as part of the groundwater investigation for the TDEC Order.

Groundwater levels were measured in TDEC Order monitoring wells and one piezometer, as well as in select additional wells and piezometers from other environmental programs, as shown in Table B.1a in Appendix B, to provide information to prepare groundwater contour maps for this SAR and the JOF Plant EAR. Pore water levels measured in piezometers installed in the CCR units are presented in Table B.1b. Groundwater and pore water elevations are shown on Exhibits A.2 and A.3 in Appendix A. Groundwater elevation contours are depicted on Exhibit A.2 and pore water elevation contours are depicted on Exhibit A.3.

Groundwater analytical and field duplicate samples were collected from the TDEC Order monitoring wells as shown in Table B.2 in Appendix B. Groundwater analytical data collected for the TDEC Order and other environmental programs will be provided in the EAR.

3.2 DOCUMENTATION

Stantec maintained field documentation in accordance with ENV-TI-05.80.03, *Field Record Keeping*, and the QAPP. Field activities and data were recorded on program-specific field forms. Health and safety forms were completed in accordance with TVA and Stantec health and safety requirements. Additional information regarding field documentation is provided below.

3.2.1 Field Forms

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

- *Daily Field Activity Log*
- *Monitoring Well Inspection Checklist*
- *Equipment Calibration Form*
- *Vibrating Wire Piezometer Measurement Form*
- *Groundwater Level Measurement Form*
- *Groundwater Sampling Form*
- *Chain-of-Custody (COC).*

3.2.1.1 Daily Field Activity Log

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

3.2.1.2 Monitoring Well Inspection Checklist

Prior to measuring water levels, Stantec FSP inspected each monitoring well for damage or indications that the well integrity had been compromised in accordance with ENV-TI-05.80.21, *Monitoring Well Inspection and Maintenance.* Inspection results were documented on a *Monitoring Well Inspection Checklist*. No signs of damage or necessary repairs were noted during Event #2.

3.2.1.3 Equipment Calibration Form

Stantec FSP performed daily calibration of the water quality meter and turbidity meter and documented the results on an *Equipment Calibration Form*. The form documented the calibration results for temperature, turbidity, specific conductance, pH, dissolved oxygen (DO), and oxidation-reduction potential (ORP), and verified that the field instruments' sensors were operating within acceptance criteria. Refer to Section 3.2.2 for additional details on equipment calibration procedures.

3.2.1.4 Vibrating Wire Piezometer Measurement Form

Stantec FSP recorded field measurement data on a *Vibrating Wire Piezometer Measurement Form*. The form includes the vibrating wire piezometer identification (ID), serial number, time, digits, and temperature. The readings were used to calculate the pressure head (feet [ft] of water) above the vibrating wire sensor to obtain the groundwater or pore water elevation.

3.2.1.5 Groundwater Level Measurement Form

Stantec FSP recorded groundwater level field measurement data on a *Groundwater Level Measurement Form* in accordance with ENV-TI-05.80.44, *Groundwater Level and Well Depth Measurement*. The form includes the monitoring well ID, time, and depth to water measured from a standardized reference point on the top of each well casing, recorded in ft below top of casing.

3.2.1.6 Groundwater Sampling Form

Stantec FSP recorded the depth to water, purge flow rate, volume of groundwater purged, temperature, pH, specific conductance, DO, ORP, turbidity, color of water, and other observations during groundwater purging and sampling activities at each monitoring well in accordance with ENV-TI-05.80.42, *Groundwater Sampling*. Field measurements were recorded on a *Groundwater Sampling Form*. The form also documents the time intervals between measurement of field parameters, low-flow extraction rates, water level drawdown, and water quality parameter measurements until stabilization criteria were met.

3.2.1.7 Chain-of-Custody

Stantec FSP completed *COC* documentation for each groundwater sample collected. The sample ID, sample location, type of sample, sampling date and time, analyses requested, sample pH, and sample custody record were recorded on the *COC*. The Field Team Leader reviewed the *COC* for completeness, and the FSP conducted a QC check of samples in each cooler compared to sample IDs on the corresponding *COC*. *COCs* were completed in accordance with ENV-TI-05.80.02, *Sample Labeling and Custody*.

3.2.2 Equipment Calibration

Field instruments used to collect, generate, or measure water quality parameters were calibrated each day prior to use as specified in the SAP, QAPP, and ENV-TI-05.80.46, *Field Measurement Using a Multi-Parameter Sonde.* Afternoon calibration verifications were performed to evaluate if these instruments remained within acceptance criteria during sampling. Temperature and barometric pressure instrument readings were verified using a calibrated National Institute of Standards and Technology traceable thermometer and National Weather Service (via mesowest.utah.edu) barometric pressure readings for Lexington-Parsons Regional Airport in Darden, Tennessee, respectively. Additional details regarding equipment calibration were recorded on an *Equipment Calibration Form*, as described in Section 3.2.1.3.

3.3 SAMPLING METHODS

The following sections present monitoring well data collection and sampling procedures used during Event #2.

3.3.1 Static Water Level Measurements

FSP measured static groundwater levels at 29 monitoring wells in accordance with ENV-TI-05.80.44, *Groundwater Level and Well Depth Measurement.* On February 10, 2020, static groundwater level readings were measured and recorded to the nearest 0.01 ft from a reference point on the top of each well casing using an electronic water level indicator. Water level indicator probes were decontaminated prior to the first use and between measurements, and the decontamination was documented as specified in ENV-TI-05.80.05, *Field Sampling Equipment Cleaning and Decontamination.* Depth to groundwater measurements were recorded on a *Groundwater Level Measurement Form*.

Stantec calculated the static groundwater level at vibrating wire piezometer JOF-116-PZ. FSP recorded the measured readings and temperature using a vibrating wire readout instrument on a *Vibrating Wire Piezometer Measurement Form.* The readings were used to calculate the pressure head (ft of water) above the vibrating wire sensor to obtain groundwater elevation.

On February 10-11, 2020, groundwater and pore water measurements were obtained from transducers installed within nine and 10 piezometers, respectively. Additionally, a surface water level measurement for the Tennessee River/Kentucky Lake was provided by TVA using the reading closest to noon recorded by an automated staff gauge. The surface water staff gauge location is shown on Exhibit A.1 in Appendix A.

Groundwater level data and pore water level data are shown in Tables B.1a and B.1b, respectively, in Appendix B. A groundwater elevation contour map based on groundwater measurements made in wells and piezometers, along with pore water elevations, is included as Exhibit A.2 in Appendix A. Similarly, a pore water elevation contour map based on pore water measurements in piezometers, along with groundwater elevations, is included as Exhibit A.3 in Appendix A.

3.3.2 Groundwater Purging & Sampling

Analytical and field duplicate samples were collected from nine monitoring wells as shown in Table B.2 in Appendix B. Split samples collected by CEC during Event #2 are also identified in Table B.2. Monitoring wells were purged using dedicated bladder pumps equipped with dedicated tubing using low-flow purging and sampling techniques as specified in ENV-TI-05.80.42, *Groundwater Sampling*.

During the purging process, water quality field parameters including pH, specific conductance, temperature, ORP, and DO were measured using water quality meters (YSI ProPlus with flow-through cell) and recorded on field forms. Depth to water and turbidity were measured and recorded using decontaminated electronic water-level indicators (Heron Dipper-T) and calibrated turbidimeters (Hach 2100Q). Field parameters were measured and recorded on *Groundwater Sampling Forms* during purging until readings were stabilized as specified in the SAP and/or applicable TI. As approved by TDEC, the specific conductance and turbidity stabilization limits were revised to meet overall programmatic objectives for groundwater investigations for the JOF Plant. Well purging was considered complete when three consecutive readings were within the following stabilization limits:

- pH – ± 0.1 Standard Units
- Specific Conductance – ± 3% microSiemens per centimeter
- Turbidity – Less than 5 Nephelometric Turbidity Units (NTUs) or ± 10% for values above 5 NTUs
- DO – Less than 0.5 milligrams per liter (mg/L) or ± 10% for values above 0.5 mg/L.

After water quality stabilization criteria were achieved, the final field parameter results were recorded, purging was discontinued, and a sample was collected as specified in the SAP. Due to final turbidity readings higher than 5 NTUs at wells JOF-109 and JOF-117, an additional sample was collected at each of these wells and submitted to the laboratory for dissolved metals analysis.

Laboratory-provided, pre-preserved sample containers were filled directly from the pump discharge line with the exception of the dissolved metals samples, which were collected via a new 0.45-micron disposable inline filter attached to the end of the discharge line to field filter the sample. FSP wore new, clean nitrile gloves when handling sample containers and did not touch the interior of containers or container caps. New gloves were used when handling each sample. When filling sample bottles, care was taken to minimize sample aeration (i.e., water was directed down the inner walls of the sample bottle) and to avoid overfilling and diluting preservatives. Each sample bottle was capped before filling the next bottle. Following completion of sampling, final field parameter measurements were made.

Sample containers were labeled and handled in accordance with ENV-TI-05.80.02, *Sample Labeling and Custody.* FSP secured caps on each bottle, attached a custody seal across the cap, and placed the bottles in a cooler on ice within 15 minutes of collection. QC samples were collected in accordance with ENV-TI-05.80.04, *Field Sampling Quality Control.*

Groundwater samples were analyzed for the CCR-related constituents listed in Appendices III and IV of 40 CFR 257. In addition, five inorganic constituents listed in Appendix I of Tennessee Rule 0400-11-01-.04 and not included in the 40 CFR 257 Appendices III and IV were analyzed to maintain continuity with TDEC environmental programs. These additional TDEC Appendix I constituents included copper, nickel, silver, vanadium, and zinc. The combined federal CCR Appendices III and IV constituents and TDEC Appendix I inorganic constituents will hereafter be referred to collectively as "CCR Parameters." For geochemical evaluation, major cations/anions not included in the CCR Parameters were included in the analyses. The additional geochemical parameters included bicarbonate, carbonate, magnesium, potassium, and sodium.

3.4 INVESTIGATION DERIVED WASTE

Investigation derived waste (IDW) generated during groundwater investigation activities included:

- Used calibration solutions
- Purge water
- Decontamination fluids
- Disposable personal protective equipment (PPE)
- General trash.

IDW was handled in accordance with ENV-TI-05.80.05, *Field Sampling Equipment Cleaning and Decontamination*; ENV-TI-05.80.42, *Groundwater Sampling* (purge water); the JOF Plant-specific waste management plan; and local, state, and federal regulations. Transportation and disposal of IDW was coordinated with JOF Plant facility management. Used calibration solution was containerized and stored for disposal as directed by the JOF Plant facility management. Purge water and decontamination fluids were containerized for later disposal as specified in the JOF Plant-specific waste management plan. Used disposable PPE (e.g., nitrile gloves) and general trash generated throughout the day were placed in garbage bags and disposed of in a general trash dumpster onsite at the end of each day.

3.5 SAMPLE SHIPMENT

Samples were packed and secured under *COC* procedures specified in ENV-TI-05.80.06, *Handling and Shipping of Samples*. The samples were shipped by FedEx to GEL in Charleston, South Carolina. The laboratory submitted sample receipt confirmation forms to EnvStds for review and confirmation.

3.6 VARIATIONS

The proposed scope and procedures for the groundwater investigation were outlined in the SAP, QAPP, and applicable TVA TIs as detailed in the sections above. Variations in scope or procedures discussed with TDEC and/or TVA, changes based on field conditions, or additional field sampling performed to complete the scope of work in the SAP are described in the following sections. As dicussed below, these variations do not impact the overall usability and representativeness of the dataset provided in this SAR for groundwater investigation sampling Event #2 at the JOF Plant.

3.6.1 Variations in Scope

Variations in scope are provided below.

- Groundwater level gauging and sampling was not performed at well JOF-108 as specified in the SAP because it was not installed (the five borings drilled in that area encountered CCR and/or shallow refusal). This change in scope was approved by TDEC.

3.6.2 Variations in Procedure

Variations in procedures occurring in the field are provided below.

- The calibration verification of pH 4 and pH 7 were not within the morning acceptance criteria on February 11, 2020. These calibration variations were evaluated as part of the data validation/verification process performed by EnvStds.
- As approved by TDEC, the specific conductance and turbidity stabilization limits were revised to meet overall programmatic objectives for groundwater investigations
- GEL was used as the laboratory for non-radium sample analysis in place of Eurofins TestAmerica. This change was approved by TVA and TDEC prior to field work.

4.0 SUMMARY

The data presented in this report are only for groundwater investigation sampling Event #2 at the JOF Plant. The scope of work for Event #2 was to:

- Collect groundwater samples for chemical analyses to assist with subsequent evaluation of the potential presence of CCR-related constituents in groundwater
- Measure groundwater and surface water elevations to assist with subsequent evaluation of groundwater flow direction and rate after multiple data sets have been collected.

In addition, pore water measurements from piezometers installed in the CCR units at the JOF Plant are presented in this SAR for comparison with groundwater data.

Event #2 included collecting groundwater level measurements at 29 monitoring wells and 10 piezometers; pore water measurements at 10 piezometers in the CCR units; and a surface water measurement at one gauge located in the Tennessee River/Kentucky Lake. Groundwater and surface water measurements and elevations are provided in Table B.1a, and pore water measurements and elevations are provided in Table B.1b, and depicted on Exhibits A.2 and A.3.

Water quality measurements and groundwater analytical samples were collected at nine monitoring wells as summarized in Table B.2. Water quality parameters were recorded during purging. Stabilization criteria for pH, specific conductance, turbidity, and DO were achieved at the nine sampling locations. The final measurements prior to initiating sample collection are presented in Table B.3.

Groundwater analytical data for CCR Parameters and geochemical parameters are presented in Table B.4. Analytical data for radium analyses are presented in Table B.5. Analytical data were reported by GEL and then validated or verified by EnvStds.

Stantec has completed Event #2 of the groundwater investigation at the JOF Plant in New Johnsonville, Tennessee, in accordance with the Groundwater Investigation SAP as documented herein. The data collected during Event #2 are usable for reporting and evaluation in the EAR and meet the objectives of the TDEC Order EIP. The complete dataset from this event will be evaluated along with data collected during the remaining groundwater sampling events and under other TDEC Order SAPs, as well as data collected under other State and CCR programs. This evaluation will be provided in the EAR.

5.0 REFERENCES

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

Stantec Consulting Services Inc. (Stantec). 2018a. *Groundwater Investigation Sampling and Analysis Plan, Johnsonville Fossil Plant.* Revision 4. Prepared for Tennessee Valley Authority. December 10, 2018.

Stantec. 2018b. *Environmental Investigation Plan, Johnsonville Fossil Plant.* Revision 4. Prepared for Tennessee Valley Authority. December 10, 2018.

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

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

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

TVA, ENV-TI-05.80.04, *Field Sampling Quality Control*.

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

TVA, ENV-TI-05.80.06, *Handling and Shipping of Samples*.

TVA, ENV-TI-05.80.21, *Monitoring Well Inspection and Maintenance*.

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

TVA, ENV-TI-05.80.44, *Groundwater Level and Well Depth Measurement*.

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

APPENDIX A - EXHIBITS

Exhibit No.
A.1

Title

Monitoring Well and Piezometer Network

Client/Project

Tennessee Valley Authority
Johnsonville Fossil (JOF) Plant TDEC Order

Project Location | 175568286
New Johnsonville, Tennessee
Prepared by DMB on 2021-05-24
Technical Review by MD on 2021-05-24

0 450 900 1,350 1,800 Feet

1:5,400 (At original document size of 22x34)

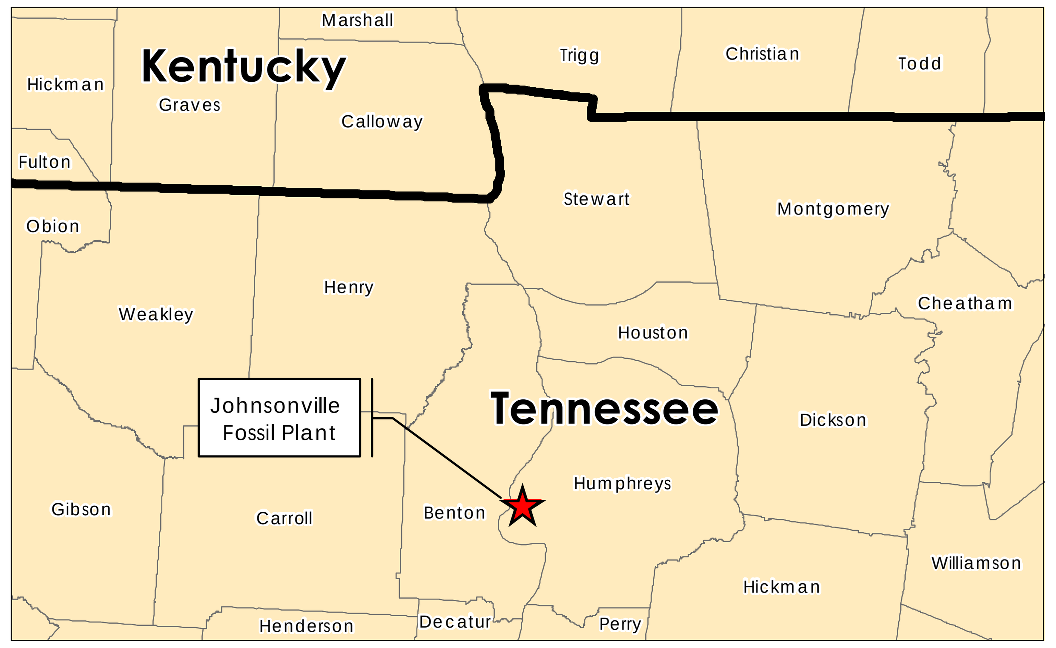
Legend

- Groundwater Investigation Monitoring Well
- Other Monitoring Well
- Piezometer
- Pore Water Piezometer in CCR Material
- Temporary Well within CCR Material
- Tennessee River/Kentucky Lake Gauging Station
- 2017 Imagery Boundary
- 2018 Imagery Boundary
- CCR Unit Area (Approximate)
- Coal Yard (Approximate)

CCR: Coal combustion residuals

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Imagery Provided by TVA (2017 & 2018) & ESRI World Imagery



Stantec TVA

Exhibit No.
A.2

Title

Groundwater Elevation Contour Map, Event #2 (February 10-11, 2020)

Client/Project

Tennessee Valley Authority
Johnsonville Fossil (JOF) Plant TDEC Order

Project Location | 175568286

New Johnsonville, Tennessee

Prepared by DMB on 2021-09-16
Technical Review by MD on 2021-09-16

0 450 900 1,350 1,800 Feet

1:5,400 (At original document size of 22x34)

Legend

- Groundwater Investigation Monitoring Well groundwater elevation in feet above mean sea level (ft amsl)
- Other Monitoring Well groundwater elevation in ft amsl
- Piezometer, groundwater label in blue text, pore water label in yellow highlighted black text; elevation in ft amsl (e.g., JOF-E-2A-PZ2) (e.g., JOF-E-2A-PZ5)
- Piezometer in CCR pore water elevation in ft amsl; value not used for contouring
- Temporary well in CCR pore water elevation in ft amsl; value not used for contouring
- Planned Temporary Well Location
- Tennessee River/Kentucky Lake Gauging Station surface water elevation in ft amsl
- Interpolated Groundwater Contour (5 ft interval; elevations are in ft amsl)
- Groundwater Contour (5 ft interval; elevations are in ft
- 2017 Imagery Boundary
- 2018 Imagery Boundary
- CCR Unit Area (Approximate)
- Coal Yard (Approximate)

CCR: Coal combustion residuals

NM: Not measured; data not available

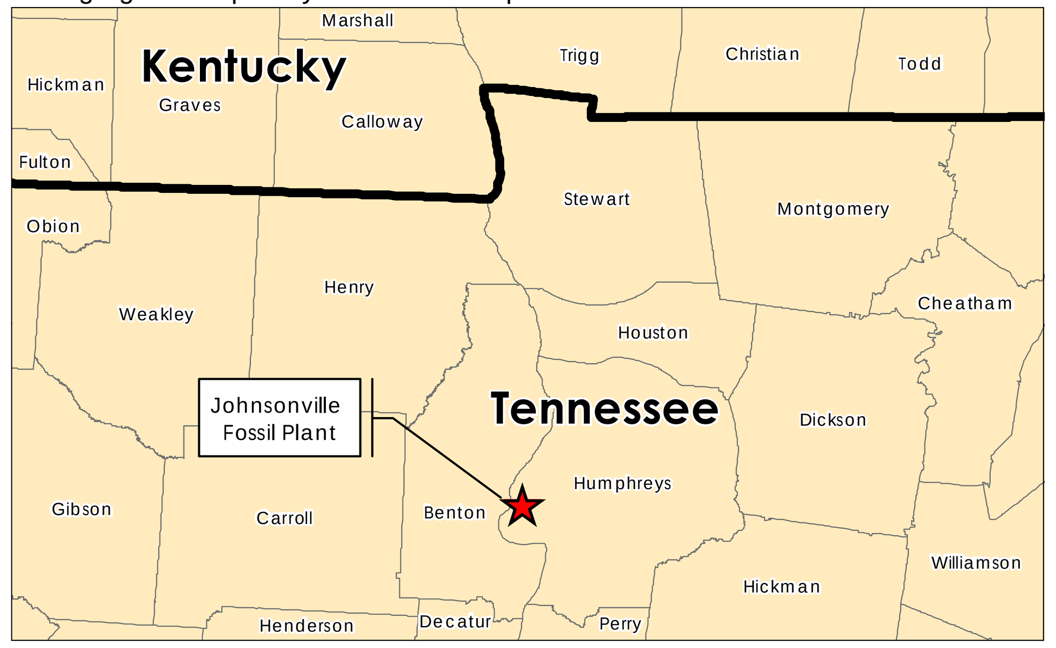
*Groundwater and pore water elevation displayed but not used as input for contouring due to factors such as well construction or being screened in a different hydrogeologic unit.

**Nested VWPZ sensors monitoring pore water and groundwater elevations in the same borehole, and the location is shown by a single symbol.

***The JOF_PZET and JOF_PZFT groundwater elevations are approximately 3-4 feet below the trend established in other piezometers within the Active Ash Pond 2. The groundwater elevation is displayed but not used for contouring.

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Imagery Provided by TVA (2017 & 2018) & ESRI World Imagery
3. Groundwater contours were created using Surfer Version 16.1.350 (December 13, 2018) and manual adjustment
4. Temporary well installation was not completed prior to this event. Gauging of temporary wells was not performed until Event #4.



Stantec TVA

Exhibit No.

A.3

Title

Pore water Elevation Contour Map, Event #2 (February 10, 2020)

Client/Project

Tennessee Valley Authority
Johnsonville Fossil (JOF) Plant TDEC Order

Project Location

New Johnsonville, Tennessee

175568286

Prepared by DMB on 2021-09-16
Technical Review by MD on 2021-09-16

0 450 900 1,350 1,800 Feet

1:5,400 (At original document size of 22x34)

Legend

- Groundwater Investigation Monitoring Well groundwater elevation in feet above mean sea level (ft amsl); value not used for contouring
- Other Monitoring Well groundwater elevation in ft amsl; value not used for contouring
- Piezometer, groundwater label in blue text, (e.g., JOF-E-2A-PZ2) pore water label in yellow highlighted black text; (e.g., JOF-E-2A-PZ5) elevation in ft amsl
- Piezometer in CCR pore water elevation in ft amsl; value not used for contouring
- Temporary well in CCR pore water elevation in ft amsl; value not used for contouring
- Planned Temporary Well Location
- Tennessee River/Kentucky Lake Gauging Station surface water elevation in ft amsl
- Interpolated Pore water Contour (5 ft interval; elevations are in ft amsl)
- Pore water Contour (5 ft interval; elevations are in ft amsl)
- 2017 Imagery Boundary
- 2018 Imagery Boundary
- CCR Unit Area (Approximate)
- Coal Yard (Approximate)

CCR: Coal combustion residuals

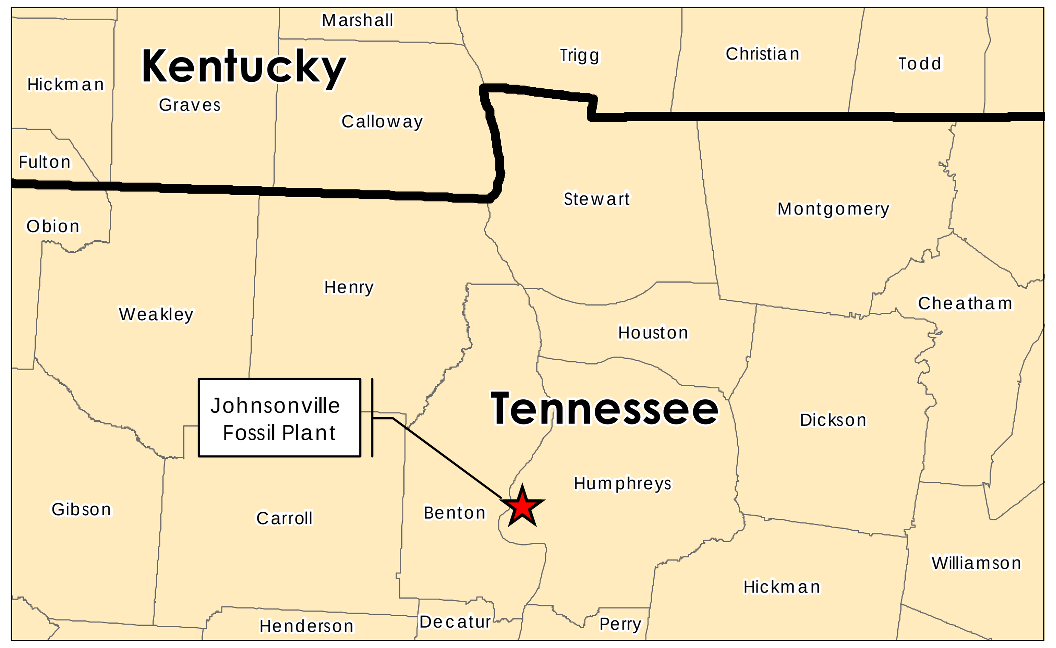
NM: Not measured; data not available

*Groundwater elevation displayed but not used as input for contouring due to factors such as well construction or being screened in a different hydrogeologic unit.

**Nested VWPZ sensors monitoring pore water and groundwater elevations in the same borehole, and the location is shown by a single symbol.

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Imagery Provided by TVA (2017 & 2018) & ESRI World Imagery
3. Pore water contours were created using manual adjustment and Surfer Version 16.1.350 (December 13, 2018)
4. Temporary well installation was not completed prior to this event. Gauging of temporary wells was not performed until Event #4.



Stantec TVA

APPENDIX B - TABLES

TABLE B.1a – Groundwater Level Measurements
Johnsonville Fossil Plant
February 2020

UNID	Well / Piezometer ID	Date Measured	Depth to Groundwater	Top of Casing Elevation	Groundwater Elevation	Piezometer Ground Surface Elevation	Piezometer Sensor Elevation	Piezometer Sensor Depth	Screened Interval	Screened / Piezometer Sensor Formation
			ft btoc	ft msl	ft msl	ft msl	ft msl	ft bgs	ft btoc	
Monitoring Wells										
JOF-00-GW-43-001	10-AP1	10-Feb-20	11.37	370.51	359.14	n/a	n/a	n/a	39.0 - 49.1	Alluvium: Sands and Gravels
JOF-00-GW-43-002	10-AP3	10-Feb-20	8.13	367.27	359.14	n/a	n/a	n/a	37.4 - 47.5	Alluvium: Sands and Gravels
JOF-00-GW-43-003	89-B10	10-Feb-20	23.89	401.19	377.30	n/a	n/a	n/a	32.0 - 40.3	Alluvium: Sands and Gravels
JOF-00-GW-43-004	94-B16	10-Feb-20	11.55	390.53	378.98	n/a	n/a	n/a	16.2 - 26.2	Alluvium: Sands and Gravels
JOF-00-GW-43-005	99-B19	10-Feb-20	14.86	394.50	379.64	n/a	n/a	n/a	12.6 - 27.7	Alluvium: Sands and Gravels/Shale Bedrock
JOF-00-GW-43-006	99-B20A	10-Feb-20	28.89	408.88	379.99	n/a	n/a	n/a	21.6 - 36.5	Alluvium: Sands and Gravels
JOF-00-GW-43-007	B-6R	10-Feb-20	17.51	395.57	378.06	n/a	n/a	n/a	18.2 - 21.2	Alluvium: Sands and Gravels
JOF-00-GW-43-008	B-8R	10-Feb-20	10.38	391.04	380.66	n/a	n/a	n/a	13.8 - 16.8	Alluvium: Sands and Gravels
JOF-00-GW-43-009	B-9	10-Feb-20	24.58	423.88	399.30	n/a	n/a	n/a	40.5 - 50.0	Alluvium: Silts and Clays
JOF-00-GW-43-010	B-11	10-Feb-20	19.40	400.67	381.27	n/a	n/a	n/a	26.7 - 36.7	Alluvium: Sands and Gravels
JOF-00-GW-43-011	B-12	10-Feb-20	11.00	393.03	382.03	n/a	n/a	n/a	26.8 - 36.9	Alluvium: Sands and Gravels
JOF-00-GW-43-012	B-13	10-Feb-20	28.20	409.87	381.67	n/a	n/a	n/a	33.8 - 43.9	Alluvium: Sands and Gravels
JOF-00-GW-43-013	JOF-101	10-Feb-20	23.81	424.59	400.78	n/a	n/a	n/a	43.6 - 53.2	Alluvium: Sands and Gravels
JOF-00-GW-43-014	JOF-102	10-Feb-20	18.45	407.64	389.19	n/a	n/a	n/a	23.6 - 33.9	Alluvium: Sands and Gravels
JOF-00-GW-43-015	JOF-103	10-Feb-20	14.82	374.24	359.42	n/a	n/a	n/a	41.9 - 52.1	Alluvium: Sands and Gravels
JOF-00-GW-43-016	JOF-104	10-Feb-20	20.08	379.44	359.36	n/a	n/a	n/a	48.4 - 58.6	Alluvium: Sands and Gravels
JOF-00-GW-43-017	JOF-105	10-Feb-20	26.22	406.15	379.93	n/a	n/a	n/a	23.4 - 33.7	Alluvium: Sands and Gravels
JOF-00-GW-43-018	A-3	10-Feb-20	22.52	403.73	381.21	n/a	n/a	n/a	66.1 - 86.1	Chattanooga Shale/Camden Formation
JOF-00-GW-43-019	JOF-106	10-Feb-20	21.59	403.16	381.57	n/a	n/a	n/a	23.3 - 32.8	Alluvium: Sands and Gravels
JOF-00-GW-43-020	JOF-107	10-Feb-20	27.58	409.95	382.37	n/a	n/a	n/a	31.9 - 41.4	Alluvium: Sands and Gravels
JOF-00-GW-43-021	JOF-109	10-Feb-20	5.26	386.11	380.85	n/a	n/a	n/a	34.1 - 43.9	Alluvium
JOF-00-GW-43-022	JOF-110	10-Feb-20	18.39	388.76	370.37	n/a	n/a	n/a	52.3 - 62.1	Alluvium
JOF-00-GW-43-023	JOF-111	10-Feb-20	21.35	390.08	368.73	n/a	n/a	n/a	41.3 - 51.1	Clay
JOF-00-GW-43-024	JOF-112	10-Feb-20	20.68	394.48	373.80	n/a	n/a	n/a	24.9 - 34.7	Alluvium
JOF-00-GW-43-025	JOF-113	10-Feb-20	27.01	388.13	361.12	n/a	n/a	n/a	39.6 - 49.4	Alluvium
JOF-00-GW-43-026	JOF-114	10-Feb-20	27.39	388.36	360.97	n/a	n/a	n/a	34.7 - 44.5	Alluvium
JOF-00-GW-43-027	JOF-117	10-Feb-20	27.02	388.63	361.61	n/a	n/a	n/a	35.0 - 44.8	Alluvium
JOF-00-GW-43-028	JOF-118	10-Feb-20	13.39	372.69	359.30	n/a	n/a	n/a	43.9 - 53.7	Alluvium
JOF-00-GW-43-029	JOF-119	10-Feb-20	8.46	366.89	358.43	n/a	n/a	n/a	38.0 - 47.8	Alluvium
Piezometers										
n/a	JOF-B-2A-PZ3	11-Feb-20	n/a	n/a	359.0	392.7	322.7	70.0	n/a	Alluvial Sand and Gravel
n/a	JOF-C-2A-PZ3	10-Feb-20	n/a	n/a	359.6	392.8	326.8	66.0	n/a	Alluvial Sand and Gravel
n/a	JOF-C-2B-PZ2	10-Feb-20	n/a	n/a	358.3	370.6	321.6	49.0	n/a	Alluvial Sand and Gravel
n/a	JOF-E-2A-PZ2	10-Feb-20	n/a	n/a	358.7	390.9	327.9	63.0	n/a	Alluvial Sand and Gravel
n/a	JOF-E-2B-PZ2	10-Feb-20	n/a	n/a	358.0	365.4	310.4	55.0	n/a	Alluvial Sand and Gravel
n/a	JOF-K-2A-PZ1	10-Feb-20	n/a	n/a	359.3	377.5	327.5	50.0	n/a	Alluvial Sand and Gravel
n/a	JOF_PZET	10-Feb-20	n/a	n/a	354.9	363.8	329.8	34.0	n/a	Alluvial Clay and Silt and Alluvial Sand and Gravel
n/a	JOF_PZFT	10-Feb-20	n/a	n/a	355.4	362.9	327.6	35.3	n/a	Alluvial Clay and Silt and Alluvial Sand and Gravel
n/a	JOF_PZHT	10-Feb-20	n/a	n/a	358.6	363.1	316.1	47.0	n/a	Alluvial Sand and Gravel
n/a	JOF-116-PZ	10-Feb-20	n/a	n/a	372.3	388.0	342.0	46.0	n/a	Alluvium

See notes on last page.

TABLE B.1a – Groundwater Level Measurements
Johnsonville Fossil Plant
February 2020

UNID	Well / Piezometer ID	Date Measured	Depth to Groundwater	Top of Casing Elevation	Groundwater Elevation	Piezometer Ground Surface Elevation	Piezometer Sensor Elevation	Piezometer Sensor Depth	Screened Interval	Screened / Piezometer Sensor Formation
			ft btoc	ft msl	ft msl	ft msl	ft msl	ft bgs	ft btoc	
Surface Water Gauge										
Tennessee River/Kentucky Lake gauge (GS-1)	n/a	10-Feb-20	n/a	n/a	359.07	n/a	n/a	n/a	n/a	n/a

Notes:

bgs	below ground surface
btoc	below top of casing
ft	feet
ID	identification
msl	mean sea level
n/a	not applicable
UNID	Unique Numerical Identification

1. Top of casing elevations, screen intervals, and screened formations for monitoring wells were obtained from the TVA Well Inventory Log provided by TVA.
2. Tennessee River/Kentucky Lake data point is the reading closest to noon recorded by the automated staff gauge provided by TVA.
3. For piezometers, ground surface elevation, groundwater elevations and piezometer data were obtained from the geotechnical instrumentation database. Vibrating wire sensor formation information was obtained from boring logs. Data from automated piezometers are averaged for the measurement date.
4. Groundwater elevations in piezometers are calculated values. Accuracy of piezometer data is to 0.1 ft.

TABLE B.1b – Pore Water Level Measurements
Johnsonville Fossil Plant
February 2020

Temporary Well / Piezometer ID	Date Measured	Depth to Pore Water	Top of Casing Elevation	Pore Water Elevation	Piezometer Ground Surface Elevation	Piezometer Sensor Elevation	Piezometer Sensor Depth	Screened Interval	Screened / Piezometer Sensor Formation
		ft btoc	ft msl	ft msl	ft msl	ft msl	ft bgs	ft bgs	
Temporary Wells									
JOF-TW01	n/a	NM	396.33	NM	n/a	n/a	n/a	24.8 - 34.6	CCR
JOF-TW02	n/a	NM	397.38	NM	n/a	n/a	n/a	25.5 - 35.3	CCR
JOF-TW03	n/a	NM	409.49	NM	n/a	n/a	n/a	40.4 - 50.2	CCR
JOF-TW04	n/a	NM	394.25	NM	n/a	n/a	n/a	25.9 - 35.7	CCR
JOF-TW05	n/a	NM	393.44	NM	n/a	n/a	n/a	36.2 - 46.0	CCR
JOF-TW06	n/a	NM	395.13	NM	n/a	n/a	n/a	26.5 - 36.3	CCR
JOF-TW07	n/a	NM	402.92	NM	n/a	n/a	n/a	32.2 - 42.0	CCR
JOF-TW08	n/a	NM	387.22	NM	n/a	n/a	n/a	6.0 - 15.8	CCR
JOF-TW09	n/a	NM	387.52	NM	n/a	n/a	n/a	15.8 - 25.6	CCR
JOF-TW10	n/a	NM	384.92	NM	n/a	n/a	n/a	6.0 - 15.8	CCR
JOF-TW11	n/a	NM	440.13	NM	n/a	n/a	n/a	31.6 - 41.4	CCR
JOF-TW12	n/a	NM	444.17	NM	n/a	n/a	n/a	36.1 - 45.9	CCR
JOF-TW13	n/a	NM	441.39	NM	n/a	n/a	n/a	33.3 - 43.1	CCR
JOF-TW15	n/a	NM	451.71	NM	n/a	n/a	n/a	55.0 - 64.8	CCR
JOF-TW16	n/a	NM	473.81	NM	n/a	n/a	n/a	72.9 - 82.7	CCR
Piezometers									
JOF-E-2A-PZ5	10-Feb-20	n/a	n/a	382.9	390.9	370.9	20.0	n/a	CCR
JOF_PZEC	10-Feb-20	n/a	n/a	382.2	390.4	365.4	25.0	n/a	CCR and Dike Fill
JOF_PZFC	10-Feb-20	n/a	n/a	382.4	389.8	364.8	25.0	n/a	CCR and Dike Fill
JOF_PZGC	10-Feb-20	n/a	n/a	376.6	389.8	364.8	25.0	n/a	CCR and Dike Fill
JOF_PZHC	10-Feb-20	n/a	n/a	380.9	390.0	365.8	24.2	n/a	CCR
JOF_PZIC	10-Feb-20	n/a	n/a	382.6	390.1	360.1	30.0	n/a	CCR and Dike Fill
JOF_PZJC	10-Feb-20	n/a	n/a	384.1	390.0	365.0	25.0	n/a	CCR
JOF_PZKC	10-Feb-20	n/a	n/a	382.9	390.5	365.5	25.0	n/a	CCR
JOF_PZLC	10-Feb-20	n/a	n/a	380.9	390.5	365.5	25.0	n/a	CCR
JOF_PZMC	10-Feb-20	n/a	n/a	378.2	391.1	366.1	25.0	n/a	CCR and Dike Fill
P-8	n/a	n/a	n/a	NM	432.8	394.5	38.3	n/a	CCR
P-9	n/a	n/a	n/a	NM	432.9	393.8	39.2	n/a	CCR and Clayey Fill
P-10	n/a	n/a	n/a	NM	430.7	391.0	39.8	n/a	CCR

Notes:

bgs	below ground surface
btoc	below top of casing
CCR	coal combustion residuals
ft	feet
ID	identification
msl	mean sea level
n/a	not applicable
NM	not measured

1. Top of casing elevations, screen intervals, and screened formations were obtained from boring logs, well detail and well survey data.
2. For piezometers, ground surface elevation, pore water elevations, and piezometer data obtained from the geotechnical instrumentation database. Data from automated piezometers are averaged for the measurement date.
3. Pore water elevations in piezometers are calculated values. Accuracy of piezometer data is to 0.1 ft.
4. Temporary wells were not gauged during this event. Gauging and sampling of temporary wells did not commence until all temporary wells associated with the Exploratory Drilling scope were installed and developed. In select piezometers, as noted by "NM" above, pore water elevation data were not available for this event.

TABLE B.2 – Summary of Groundwater Samples
Johnsonville Fossil Plant
February 2020

			Analysis Type										
Location ID	**Sample ID**	**Sample Type**	Field Parameters	Total Metals	Dissolved Metals	Total Mercury	Dissolved Mercury	Anions	Alkalinity	Total Dissolved Solids	Radium-226	Radium-228	Radium-226+228
JOF-109	JOF-GW-021-20200211	Normal Environmental Sample	X	X	X	X	X	X	X	X	X	X	X
JOF-110	JOF-GW-022-20200212	Normal Environmental Sample	X	X		X		X	X	X	X	X	X
JOF-111	JOF-GW-023-20200212	Normal Environmental Sample	X	X		X		X	X	X	X	X	X
JOF-112	JOF-GW-024-20200211	Normal Environmental Sample	X	X		X		X	X	X	X	X	X
JOF-113	JOF-GW-025-20200212	Normal Environmental Sample	X	X		X		X	X	X	X	X	X
JOF-114	JOF-GW-026-20200212	Normal Environmental Sample	X	X		X		X	X	X	X	X	X
JOF-117	JOF-GW-027-20200212	Normal Environmental Sample	X	X	X	X	X	X	X	X	X	X	X
JOF-118	JOF-GW-028-20200211	Normal Environmental Sample	X	X		X		X	X	X	X	X	X
JOF-119	JOF-GW-029-20200211	Normal Environmental Sample	X	X		X		X	X	X	X	X	X
	JOF-GW-DUP01-20200211	Field Duplicate Sample		X		X		X	X	X	X	X	X

Notes:

Total and Dissolved Metals	SW-846 6020A
Total and Dissolved Mercury	SW-846 7470A
Anions	EPA 300.0/SW 9056
Alkalinity	SM2320B
Total Dissolved Solids	SM2540C
Radium-226	EPA 903.0
Radium-228	EPA 904.0
Radium-226+228	CALC
ID	identification

1. Field and laboratory quality control sample results except for field duplicates are not included in report tables but were used for data validation.
2. CEC collected split samples from JOF-114, JOF-118, and JOF-119.

TABLE B.3 – Summary of Groundwater Quality Parameters
Johnsonville Fossil Plant
February 2020

Sample Location		JOF-109	JOF-110	JOF-111	JOF-112	JOF-113	JOF-114	JOF-117	JOF-118	JOF-119
Sample Date		11-Feb-20	12-Feb-20	12-Feb-20	11-Feb-20	12-Feb-20	12-Feb-20	12-Feb-20	11-Feb-20	11-Feb-20
Sample ID		JOF-GW-021-20200211	JOF-GW-022-20200212	JOF-GW-023-20200212	JOF-GW-024-20200211	JOF-GW-025-20200212	JOF-GW-026-20200212	JOF-GW-027-20200212	JOF-GW-028-20200211	JOF-GW-029-20200211
Sample Depth		39 ft	57 ft	46 ft	29.5 ft	43.5 ft	39.5 ft	40.5 ft	48.5 ft	42.5 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Level of Review	Units	Final QC Review	Final QC Review	Final QC Review	Final QC Review	Final QC Review	Final QC Review	Final QC Review	Final QC Review	Final QC Review
Field Parameters										
Dissolved Oxygen	%	40.7	5.9	5.1	44.7	12.7	5.3	10.9	3.6	3.5
Dissolved Oxygen	mg/L	4.12	0.59	0.50	4.39	1.24	0.46	1.07	0.34	0.36
ORP	mV	223.8	31.4	26.5	51.5	91.0	159.1	-111.8	-42.0	0.4
pH (field)	SU	5.63 J	5.75	5.85	6.29 J	5.91	4.64	6.60	5.87 J	6.51 J
Specific Cond. (Field)	uS/cm	169.5	326.9	3,054	374.2	2,515	3,921	1,075	283.0	374.4
Temperature, Water (C)	DEG C	14.7	16.1	15.9	-	16.6	18.7	15.9	17.4	15.9
Turbidity, field	NTU	13.3	4.96	3.63	2.10	4.51	2.55	15.3	2.45	4.14

Notes:

-	parameter not analyzed / not available
%	percent
Cond.	conductance
DEG C	degrees Celsius
ft	feet below top of casing
ID	identification
J	quantitation is approximate due to limitations identified during data validation
mg/L	milligrams per Liter
mV	milliVolts
NTU	Nephelometric Turbidity Unit
ORP	Oxidation Reduction Potential, measured using a silver reference electrode which has a standard potential of 200 mV
SU	Standard Units
uS/cm	microSiemens per centimeter

TABLE B.4 - Groundwater Analytical Results for Metals, Anions, and General Chemistry
Johnsonville Fossil Plant
February 2020

Sample Location Sample Date Sample ID Sample Depth Sample Type Level of Review	Units	EPA MCLs	CCR Rule GWPS	JOF-109 11-Feb-20 JOF-GW-021-20200211 39 ft Normal Environmental Sample Final-Verified	JOF-110 12-Feb-20 JOF-GW-022-20200212 57 ft Normal Environmental Sample Validated	JOF-111 12-Feb-20 JOF-GW-023-20200212 46 ft Normal Environmental Sample Validated	JOF-112 11-Feb-20 JOF-GW-024-20200211 29.5 ft Normal Environmental Sample Final-Verified	JOF-113 12-Feb-20 JOF-GW-025-20200212 43.5 ft Normal Environmental Sample Validated	JOF-114 12-Feb-20 JOF-GW-026-20200212 39.5 ft Normal Environmental Sample Validated	JOF-117 12-Feb-20 JOF-GW-027-20200212 40.5 ft Normal Environmental Sample Validated
Total Metals										
Antimony	ug/L	6[A]	n/v	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
Arsenic	ug/L	10[A]	n/v	<2.00	3.59 J	7.91	<2.00	4.16 J	4.03 J	**33.9[A]**
Barium	ug/L	2,000[A]	n/v	14.9	66.3	31.9	51.5	24.4	20.4	89.7
Beryllium	ug/L	4[A]	n/v	0.300 J	<0.200	<0.200	<0.200	<0.200	1.00	<0.200
Boron	ug/L	n/v	n/v	80.0	1,410	5,540	31.0	16,100	11,200	12.7 J
Cadmium	ug/L	5[A]	n/v	<0.300	<0.300	<0.300	1.23	3.31	0.346 J	<0.300
Calcium	ug/L	n/v	n/v	17,000	19,300	449,000	28,700	606,000	548,000	96,700
Chromium	ug/L	100[A]	n/v	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00
Cobalt	ug/L	n/v	6[B]	0.570 J	4.44 J	**195 J[B]**	**112[B]**	3.90 J	**77.3 J[B]**	**24.2 J[B]**
Copper	ug/L	n/v	n/v	0.939 U*	<0.300	<0.300	<0.300	<0.300	1.24 U*	<0.300
Lead	ug/L	n/v	15[B]	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500
Lithium	ug/L	n/v	40[B]	<3.00	3.05 J	9.95 J	<3.00	**133[B]**	**81.1[B]**	<3.00
Magnesium	ug/L	n/v	n/v	5,010	5,090	22,100	13,900	7,000	48,300	31,100
Mercury	ug/L	2[A]	n/v	<0.0670	<0.0670	<0.0670	<0.0670	<0.0670	<0.0670	<0.670
Molybdenum	ug/L	n/v	100[B]	0.235 U*	0.343 U*	16.1	0.595 U*	**235[B]**	<0.200	29.3
Nickel	ug/L	100(TN MCL)[A]	n/v	27.2	9.63	46.7	10.4	**123[A]**	22.1	6.96
Potassium	ug/L	n/v	n/v	1,260	340	53,500	844	66,100	113,000	2,890
Selenium	ug/L	50[A]	n/v	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
Silver	ug/L	100(TN MCL)[A]	n/v	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300
Sodium	ug/L	n/v	n/v	7,420	40,600	191,000	24,400	54,200	345,000	39,300
Thallium	ug/L	2[A]	n/v	<0.600	<0.600	<0.600	<0.600	0.811 J	0.637 J	<0.600
Vanadium	ug/L	n/v	n/v	<3.30	<3.30	<3.30	<3.30	<3.30	<3.30	<3.30
Zinc	ug/L	n/v	n/v	45.8	5.29 J	57.8	16.3 J	236	64.4	<3.30
Dissolved Metals										
Antimony	ug/L	6[A]	n/v	<1.00	-	-	-	-	-	<1.00
Arsenic	ug/L	10[A]	n/v	<2.00	-	-	-	-	-	**33.9[A]**
Barium	ug/L	2,000[A]	n/v	14.2	-	-	-	-	-	86.0
Beryllium	ug/L	4[A]	n/v	0.236 J	-	-	-	-	-	<0.200
Boron	ug/L	n/v	n/v	79.8	-	-	-	-	-	10.6 J
Cadmium	ug/L	5[A]	n/v	<0.300	-	-	-	-	-	<0.300
Calcium	ug/L	n/v	n/v	16,800	-	-	-	-	-	98,100
Chromium	ug/L	100[A]	n/v	<3.00	-	-	-	-	-	<3.00
Cobalt	ug/L	n/v	6[B]	0.491 J	-	-	-	-	-	**23.4 J[B]**
Copper	ug/L	n/v	n/v	1.17 J	-	-	-	-	-	<0.300
Lead	ug/L	n/v	15[B]	<0.500	-	-	-	-	-	<0.500
Lithium	ug/L	n/v	40[B]	<3.00	-	-	-	-	-	<3.00
Magnesium	ug/L	n/v	n/v	5,020	-	-	-	-	-	30,100
Mercury	ug/L	2[A]	n/v	<0.0670	-	-	-	-	-	<0.670
Molybdenum	ug/L	n/v	100[B]	<0.200	-	-	-	-	-	30.4
Nickel	ug/L	100(TN MCL)[A]	n/v	26.7	-	-	-	-	-	6.68
Potassium	ug/L	n/v	n/v	1,240	-	-	-	-	-	2,850
Selenium	ug/L	50[A]	n/v	<2.00	-	-	-	-	-	<2.00
Silver	ug/L	100(TN MCL)[A]	n/v	<0.300	-	-	-	-	-	<0.300
Sodium	ug/L	n/v	n/v	7,280	-	-	-	-	-	38,600
Thallium	ug/L	2[A]	n/v	<0.600	-	-	-	-	-	<0.600
Vanadium	ug/L	n/v	n/v	<3.30	-	-	-	-	-	<3.30
Zinc	ug/L	n/v	n/v	45.3	-	-	-	-	-	<3.30
Anions										
Chloride	mg/L	n/v	n/v	39.3	50.8	452	41.7	43.1	252	79.3
Fluoride	mg/L	4[A]	n/v	0.122	0.405 J	0.143 J	0.441	0.642 J	0.106 J	0.972 J
Sulfate	mg/L	n/v	n/v	4.63	26.0	938	49.4	1,530	2,090	8.68
General Chemistry										
Alkalinity, Bicarbonate	mg/L	n/v	n/v	14.8 J	43.0	40.6	79.4	16.6	6.00 J	348
Alkalinity, Carbonate	mg/L	n/v	n/v	<1.45	<1.45	<1.45	<1.45	<1.45	<1.45	<1.45
Alkalinity, Total as CaCO3	mg/L	n/v	n/v	14.8 J	43.0	40.6	79.4	16.6	6.00 J	348
Total Dissolved Solids	mg/L	n/v	n/v	92.9	189	2,090	201	2,330	3,220	464

See notes on last page.

TABLE B.4 - Groundwater Analytical Results for Metals, Anions, and General Chemistry
Johnsonville Fossil Plant
February 2020

Sample Location	Units	EPA MCLs	CCR Rule GWPS	JOF-118	JOF-119	
Sample Date				11-Feb-20	11-Feb-20	11-Feb-20
Sample ID				JOF-GW-028-20200211	JOF-GW-029-20200211	JOF-GW-DUP01-20200211
Sample Depth				48.5 ft	42.5 ft	42.5 ft
Sample Type				Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample
Level of Review				Final-Verified	Final-Verified	Final-Verified
Total Metals						
Antimony	ug/L	6[A]	n/v	<1.00	<1.00	<1.00
Arsenic	ug/L	10[A]	n/v	3.11 U*	3.77 U*	3.59 U*
Barium	ug/L	2,000[A]	n/v	22.2	41.0	41.7
Beryllium	ug/L	4[A]	n/v	<0.200	<0.200	<0.200
Boron	ug/L	n/v	n/v	59.4	37.0	36.2
Cadmium	ug/L	5[A]	n/v	<0.300	<0.300	<0.300
Calcium	ug/L	n/v	n/v	29,900	25,800	25,600
Chromium	ug/L	100[A]	n/v	<3.00	<3.00	<3.00
Cobalt	ug/L	n/v	6[B]	1.86	3.04	3.06
Copper	ug/L	n/v	n/v	<0.300	<0.300	<0.300
Lead	ug/L	n/v	15[B]	<0.500	<0.500	<0.500
Lithium	ug/L	n/v	40[B]	<3.00	<3.00	<3.00
Magnesium	ug/L	n/v	n/v	5,970	5,070	5,140
Mercury	ug/L	2[A]	n/v	<0.0670	<0.0670	<0.0670
Molybdenum	ug/L	n/v	100[B]	<0.200	0.789 U*	0.795 U*
Nickel	ug/L	100 (TN MCL)[A]	n/v	7.12	2.79	2.63
Potassium	ug/L	n/v	n/v	1,020	1,600	1,640
Selenium	ug/L	50[A]	n/v	<2.00	<2.00	<2.00
Silver	ug/L	100 (TN MCL)[A]	n/v	<0.300	<0.300	<0.300
Sodium	ug/L	n/v	n/v	24,400	62,300	60,800
Thallium	ug/L	2[A]	n/v	<0.600	<0.600	<0.600
Vanadium	ug/L	n/v	n/v	<3.30	<3.30	<3.30
Zinc	ug/L	n/v	n/v	4.56 J	<3.30	<3.30
Dissolved Metals						
Antimony	ug/L	6[A]	n/v	-	-	-
Arsenic	ug/L	10[A]	n/v	-	-	-
Barium	ug/L	2,000[A]	n/v	-	-	-
Beryllium	ug/L	4[A]	n/v	-	-	-
Boron	ug/L	n/v	n/v	-	-	-
Cadmium	ug/L	5[A]	n/v	-	-	-
Calcium	ug/L	n/v	n/v	-	-	-
Chromium	ug/L	100[A]	n/v	-	-	-
Cobalt	ug/L	n/v	6[B]	-	-	-
Copper	ug/L	n/v	n/v	-	-	-
Lead	ug/L	n/v	15[B]	-	-	-
Lithium	ug/L	n/v	40[B]	-	-	-
Magnesium	ug/L	n/v	n/v	-	-	-
Mercury	ug/L	2[A]	n/v	-	-	-
Molybdenum	ug/L	n/v	100[B]	-	-	-
Nickel	ug/L	100 (TN MCL)[A]	n/v	-	-	-
Potassium	ug/L	n/v	n/v	-	-	-
Selenium	ug/L	50[A]	n/v	-	-	-
Silver	ug/L	100 (TN MCL)[A]	n/v	-	-	-
Sodium	ug/L	n/v	n/v	-	-	-
Thallium	ug/L	2[A]	n/v	-	-	-
Vanadium	ug/L	n/v	n/v	-	-	-
Zinc	ug/L	n/v	n/v	-	-	-
Anions						
Chloride	mg/L	n/v	n/v	10.3	21.5	21.4
Fluoride	mg/L	4[A]	n/v	0.344	0.411	0.408
Sulfate	mg/L	n/v	n/v	81.0	53.8	53.7
General Chemistry						
Alkalinity, Bicarbonate	mg/L	n/v	n/v	41.0	113	111
Alkalinity, Carbonate	mg/L	n/v	n/v	<1.45	<1.45	<1.45
Alkalinity, Total as CaCO3	mg/L	n/v	n/v	41.0	113	111
Total Dissolved Solids	mg/L	n/v	n/v	190	246 J	249

Notes:

A	EPA Maximum Contaminant Level
B	CCR Rule GWPS (Federal Register / Vol. 83, No. 146 / Monday, July 30, 2018 / Rules and Regulations)
n/v	No standard/guideline value
6.5[A]	Concentration is greater than or equal to the indicated standard.
<0.03	analyte was not detected at a concentration greater than the Method Detection Limit
-	parameter not analyzed / not available
ft	feet below top of casing
ID	identification
J	quantitation is approximate due to limitations identified during data validation
mg/L	milligrams per Liter
U*	result should be considered “not detected” because it was detected in an associated field or laboratory blank at a similar level
ug/L	micrograms per Liter

1. Level of review is defined in the Quality Assurance Project Plan.

Stantec

TABLE B.5 – Groundwater Analytical Results for Radiological Parameters
Johnsonville Fossil Plant
February 2020

Sample Location Sample Date Sample ID Sample Depth Sample Type Level of Review	Units	EPA MCLs	CCR Rule GWPS	JOF-109 11-Feb-20 JOF-GW-021-20200211 39 ft Normal Environmental Sample Final-Verified	JOF-110 12-Feb-20 JOF-GW-022-20200212 57 ft Normal Environmental Sample Validated	JOF-111 12-Feb-20 JOF-GW-023-20200212 46 ft Normal Environmental Sample Validated	JOF-112 11-Feb-20 JOF-GW-024-20200211 29.5 ft Normal Environmental Sample Final-Verified	JOF-113 12-Feb-20 JOF-GW-025-20200212 43.5 ft Normal Environmental Sample Validated	JOF-114 12-Feb-20 JOF-GW-026-20200212 39.5 ft Normal Environmental Sample Validated
Radiological Parameters									
Radium-226	pCi/L	n/v	n/v	0.828 +/-(0.645)U	0.599 +/-(0.602)U	0.595 +/-(0.323)	2.86 +/-(0.781)	2.44 +/-(0.689)	2.71 +/-(0.763)
Radium-228	pCi/L	n/v	n/v	0.273 +/-(0.378)U	0.304 +/-(0.333)U	0.726 +/-(0.443)	0.484 +/-(0.418)U	0.275 +/-(0.335)U	2.18 +/-(0.828)
Radium-226+228	pCi/L	5[A]	n/v	1.10 +/-(0.748)U	0.902 +/-(0.688)U	1.32 +/-(0.549)	3.35 +/-(0.886)J	2.72 +/-(0.766)J	4.89 +/-(1.13)

See notes on last page.

TABLE B.5 – Groundwater Analytical Results for Radiological Parameters
Johnsonville Fossil Plant
February 2020

Sample Location				JOF-117	JOF-118	JOF-119	
Sample Date				12-Feb-20	11-Feb-20	11-Feb-20	11-Feb-20
Sample ID				JOF-GW-027-20200212	JOF-GW-028-20200211	JOF-GW-029-20200211	JOF-GW-DUP01-20200211
Sample Depth				40.5 ft	48.5 ft	42.5 ft	42.5 ft
Sample Type				Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample
Level of Review				Validated	Final-Verified	Final-Verified	Final-Verified
	Units	EPA MCLs	CCR Rule GWPS				
Radiological Parameters							
Radium-226	pCi/L	n/v	n/v	1.73 +/-(0.576)	-0.436 +/-(0.380)U	0.804 +/-(0.682)U	0.275 +/-(0.550)U
Radium-228	pCi/L	n/v	n/v	0.499 +/-(0.342)	0.303 +/-(0.484)U	-0.397 +/-(0.318)U	0.108 +/-(0.507)U
Radium-226+228	pCi/L	5[A]	n/v	2.23 +/-(0.670)	0.303 +/-(0.616)U	0.804 +/-(0.752)U	0.383 +/-(0.748)U

Notes:

A	EPA Maximum Contaminant Level
B	CCR Rule GWPS (Federal Register / Vol. 83, No. 146 / Monday, July 30, 2018 / Rules and Regulations)
n/v	No standard/guideline value
ft	feet below top of casing
ID	identification
J	quantitation is approximate due to limitations identified during data validation
pCi/L	picoCurie per Liter
U	not detected

1. Level of review is defined in the Quality Assurance Project Plan.

APPENDIX H.5

GROUNDWATER INVESTIGATION EVENT #3 SAMPLING AND ANALYSIS REPORT

Johnsonville Fossil Plant Groundwater Investigation Event #3 Sampling and Analysis Report

TDEC Commissioner's Order:
Environmental Investigation Plan
Johnsonville Fossil Plant
New Johnsonville, Tennessee

October 29, 2021

Prepared for:

Tennessee Valley Authority
Chattanooga, Tennessee

Prepared by:

Stantec Consulting Services Inc.
Lexington, Kentucky

REVISION LOG

Revision	Description	Date
0	Submittal to TDEC	July 30, 2021
1	Addresses September 01, 2021 TDEC Review Comments and Issued for TDEC	September 17, 2021
2	Addresses October 18, 2021 TDEC Review Comments and Issued for TDEC	October 29, 2021

Sign-off Sheet

This document entitled Johnsonville Fossil Plant Groundwater Investigation Event #3 Sampling and Analysis Report was prepared by Stantec Consulting Services Inc. ("Stantec") for the account of Tennessee Valley Authority (the "Client"). Any reliance on this document by any third party is strictly prohibited. The material in it reflects Stantec's professional judgment in light of the scope, schedule and other limitations stated in the document and in the contract between Stantec and the Client. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. In preparing the document, Stantec did not verify information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions taken based on this document.

Prepared by Jamie Snider

Jamie Snider, Geologic Staff

Reviewed by Carole M. Farr

Carole M. Farr, Senior Principal Geologist

Approved by Brigid T. Brooks Zvirbulis

Brigid Zvirbulis, Project Manager

Table of Contents

Abbreviations

CCR	Coal Combustion Residuals
CCR Parameters	Constituents listed in Appendices III and IV of 40 CFR 257 and five inorganic constituents included in Appendix I of Tennessee Rule 0400-11-01-.04
CFR	Code of Federal Regulations
COC	Chain-of-Custody
DO	Dissolved Oxygen
EAR	Environmental Assessment Report
EIP	Environmental Investigation Plan
ENV	Environmental
EnvStds	Environmental Standards, Inc.
Event #3	Groundwater investigation field event performed April 6-9, 2020
FSP	Field Sampling Personnel
ft	Feet
GEL	GEL Laboratories LLC
ID	Identification
IDW	Investigation Derived Waste
JOF Plant	Johnsonville Fossil Plant
mg/L	Milligrams per Liter
NTU	Nephelometric Turbidity Units
ORP	Oxidation-Reduction Potential
PPE	Personal Protective Equipment
QAPP	Quality Assurance Project Plan
QC	Quality Control
SAP	Sampling and Analysis Plan
SAR	Sampling and Analysis Report
Stantec	Stantec Consulting Services Inc.
TDEC	Tennessee Department of Environment and Conservation
TDEC Order	Commissioner’s Order No. OGC15-0177
TI	Technical Instruction
TVA	Tennessee Valley Authority
USEPA	United States Environmental Protection Agency

1.0 INTRODUCTION

Stantec Consulting Services Inc. (Stantec) has prepared this sampling and analysis report (SAR) on behalf of the Tennessee Valley Authority (TVA) to document the completion of activities related to a groundwater investigation sampling event performed April 6-9, 2020 (Event #3) at TVA's Johnsonville Fossil Plant (JOF Plant) located in New Johnsonville, Tennessee.

The purpose of the groundwater investigation, upon completion of the six groundwater sampling events, is to characterize groundwater conditions at the JOF Plant in support of fulfilling the requirements for the Tennessee Department of Environment and Conservation (TDEC) issued Commissioner's Order No. OGC15-0177 (TDEC Order) to TVA (TDEC 2015). The TDEC Order sets forth a "process for the investigation, assessment, and remediation of unacceptable risks" at TVA's coal ash disposal sites in Tennessee.

The purpose of this SAR is to document the work completed during groundwater sampling Event #3 of 6 total events and to present the information and data collected during the execution of the Groundwater Investigation Sampling and Analysis Plan (SAP) (Stantec 2018a). This SAR is not intended to provide conclusions or evaluations of results. The scope of the groundwater investigation represented herein was conducted pursuant to the SAP and is part of a larger environmental investigation at the JOF Plant. The data provided in this SAR are not inclusive of other programmatic data that exist for the site. The evaluation of the results will include data from the six groundwater sampling events and consider other aspects of the environmental investigation, as well as data collected under other State and/or coal combustion residuals (CCR) programs. This evaluation will be presented in the Environmental Assessment Report (EAR).

Event #3 activities were performed in general accordance with the following documents developed by TVA to support fulfilling the requirements of the TDEC Order at the JOF Plant:

- *Groundwater Investigation SAP* (Stantec 2018a)
- *Environmental Investigation Plan (EIP)* (Stantec 2018b)
- *Quality Assurance Project Plan (QAPP)* (Environmental Standards, Inc. 2018).

The Groundwater Investigation SAP was updated based on TVA- and TDEC-approved Programmatic- and Project-specific changes. Minor variations in scope and procedures from those outlined in the SAP occurred during field activities due to field conditions and programmatic updates and are referenced in Section 3.6.

Event #3 is the third in a series of six planned sampling events for the groundwater investigation. Stantec performed the field work activities for this event. Laboratory analysis of constituents was performed by GEL Laboratories LLC (GEL) in Charleston, South Carolina. Quality assurance oversight on data acquisition protocols, sampling practices, and data validation or verification was performed by Environmental Standards, Inc. (EnvStds) under direct contract to TVA.

This report summarizes the groundwater investigation activities for Event #3. The remaining sampling events will be completed before overall conclusions and findings about the groundwater investigation and groundwater conditions at the JOF Plant are made and documented in the EAR.

2.0 OBJECTIVE AND SCOPE

The primary objectives of the groundwater investigation conducted pursuant to the Groundwater Investigation SAP (which includes six sampling events) are to characterize existing groundwater quality and to evaluate groundwater flow conditions at the JOF Plant in response to the TDEC Order. The approach to characterizing the groundwater conditions is to:

- Collect groundwater samples for chemical analyses to evaluate the potential presence of constituents related to CCR in groundwater
- Measure groundwater and surface water elevations for subsequent evaluation of the direction and rate of groundwater flow.

The scope of work intended to achieve the objectives of the groundwater investigation consists of six sampling events at a frequency of one event every two months for one year to characterize seasonal groundwater quality and flow direction. This report describes the activities related to Event #3, performed in April 2020, the scope of which included:

- Collecting groundwater and surface water level measurements
- Collecting field measurements of groundwater quality parameters
- Collecting groundwater samples and associated quality control (QC) samples for laboratory analysis.

These activities were carried out after the installation of permanent monitoring wells as specified in the Groundwater Investigation SAP. Details of the monitoring well installation activities are provided in the JOF Plant Hydrogeologic Investigation SAR.

In addition, pore water measurements from piezometers installed in the CCR units at the JOF Plant are presented in this SAR for comparison with groundwater data. Groundwater piezometer installation activities are described in the JOF Plant Hydrogeologic Investigation SAR.

3.0 FIELD ACTIVITIES

Groundwater investigation field activities for Event #3 were conducted April 6-9, 2020. Stantec performed groundwater level measurements and sample collection activities based on guidance and specifications in TVA's Environmental (ENV) Technical Instructions (TIs), the SAP, the QAPP, and applicable United States Environmental Protection Agency (USEPA) documents except as noted in the Variations section of this report. As part of TVA's commitment to generate representative and reliable data, data validation and/or verification of laboratory analytical results were performed by EnvStds under direct contract with TVA. EnvStds also conducted audits of field activities and provided quality reviews of field documentation.

During Event #3, Stantec conducted the following field activities:

- Measured goundwater levels at nine monitoring wells and one piezometer installed for the TDEC Order, and 20 monitoring wells and nine piezometers installed for other environmental programs (29 total monitoring wells)
- Measured pore water levels at 11 piezometers in the CCR units
- Measured the surface water level at one location in the Tennessee River/Kentucky Lake
- Collected groundwater samples from nine monitoring wells installed for the TDEC Order
- Recorded field measurements of groundwater quality parameters during purging and stabilization at the sampled monitoring wells
- Collected QC samples including one field duplicate, one matrix spike/matrix spike duplicate, three field blanks, and one equipment blank
- Shipped the collected samples to GEL in Charleston, South Carolina.

Details on each activity are presented in the sections below.

3.1 WORK LOCATIONS

The TDEC Order CCR units at the JOF Plant (Ash Disposal Area 1, Active Ash Pond 2, DuPont Road Dredge Cell, South Rail Loop Area 4, and Coal Yard) as well as the monitoring wells and piezometers sampled and/or gauged during Event #3 are shown on Exhibit A.1 in Appendix A. TVA is currently sampling groundwater at the JOF Plant for TDEC Solid Waste Management permit requirements and the USEPA CCR Rule codified in Title 40 of the Code of Federal Regulations (CFR) Part 257 (40 CFR 257). Monitoring wells that are being sampled as part of other programs are not sampled as part of the groundwater investigation for the TDEC Order.

Groundwater levels were measured in TDEC Order monitoring wells and one piezometer, as well as in select additional wells and piezometers from other environmental programs, as shown in Table B.1a in

Appendix B, to provide information to prepare groundwater contour maps for this SAR and the JOF Plant EAR. Pore water levels measured in piezometers installed in the CCR units are presented in Table B.1b. Groundwater and pore water elevations are shown on Exhibits A.2 and A.3 in Appendix A. Groundwater elevation contours are depicted on Exhibit A.2 and pore water elevation contours are depicted on Exhibit A.3.

Groundwater analytical and field duplicate samples were collected from the TDEC Order monitoring wells as shown in Table B.2 in Appendix B. Groundwater analytical data collected for the TDEC Order and other environmental programs will be provided in the EAR.

3.2 DOCUMENTATION

Stantec maintained field documentation in accordance with ENV-TI-05.80.03, *Field Record Keeping*, and the QAPP. Field activities and data were recorded on program-specific field forms. Health and safety forms were completed in accordance with TVA and Stantec health and safety requirements. Additional information regarding field documentation is provided below.

3.2.1 Field Forms

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

- *Daily Field Activity Log*
- *Monitoring Well Inspection Checklist*
- *Equipment Calibration Form*
- *Vibrating Wire Piezometer Measurement Form*
- *Groundwater Level Measurement Form*
- *Groundwater Sampling Form*
- *Chain-of-Custody (COC).*

3.2.1.1 Daily Field Activity Log

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

3.2.1.2 Monitoring Well Inspection Checklist

Prior to measuring water levels, Stantec FSP inspected each monitoring well for damage or indications that the well integrity had been compromised in accordance with ENV-TI-05.80.21, *Monitoring Well*

Inspection and Maintenance. Inspection results were documented on a *Monitoring Well Inspection Checklist*. No signs of damage or necessary repairs were noted during Event #3.

3.2.1.3 Equipment Calibration Form

Stantec FSP performed daily calibration of the water quality meter and turbidity meter and documented the results on an *Equipment Calibration Form*. The form documented the calibration results for temperature, turbidity, specific conductance, pH, dissolved oxygen (DO), and oxidation-reduction potential (ORP), and verified that the field instruments' sensors were operating within acceptance criteria. Refer to Section 3.2.2 for additional details on equipment calibration procedures.

3.2.1.4 Vibrating Wire Piezometer Measurement Form

Stantec FSP recorded field measurement data on a *Vibrating Wire Piezometer Measurement Form*. The form includes the vibrating wire piezometer identification (ID), serial number, time, digits, and temperature. The readings were used to calculate the pressure head (feet [ft] of water) above the vibrating wire sensor to obtain the groundwater or pore water elevation.

3.2.1.5 Groundwater Level Measurement Form

Stantec FSP recorded groundwater level field measurement data on a *Groundwater Level Measurement Form* in accordance with ENV-TI-05.80.44, *Groundwater Level and Well Depth Measurement*. The form includes the monitoring well ID, time, and depth to water measured from a standardized reference point on the top of each well casing, recorded in ft below top of casing.

3.2.1.6 Groundwater Sampling Form

Stantec FSP recorded the depth to water, purge flow rate, volume of groundwater purged, temperature, pH, specific conductance, DO, ORP, turbidity, color of water, and other observations during groundwater purging and sampling activities at each monitoring well in accordance with ENV-TI-05.80.42, *Groundwater Sampling*. Field measurements were recorded on a *Groundwater Sampling Form*. The form also documents the time intervals between measurement of field parameters, low-flow extraction rates, water level drawdown, and water quality parameter measurements until stabilization criteria were met.

3.2.1.7 Chain-of-Custody

Stantec FSP completed *COC* documentation for each groundwater sample collected. The sample ID, sample location, type of sample, sampling date and time, analyses requested, sample pH, and sample custody record were recorded on the *COC*. The Field Team Leader reviewed the *COC* for completeness, and the FSP conducted a QC check of samples in each cooler compared to sample IDs on the corresponding *COC*. *COCs* were completed in accordance with ENV-TI-05.80.02, *Sample Labeling and Custody*.

3.2.2 Equipment Calibration

Field instruments used to collect, generate, or measure water quality parameters were calibrated each day prior to use as specified in the SAP, QAPP, and ENV-TI-05.80.46, *Field Measurement Using a Multi-Parameter Sonde.* Afternoon calibration verifications were performed to evaluate if these instruments remained within acceptance criteria during sampling. Temperature and barometric pressure instrument readings were verified using a calibrated National Institute of Standards and Technology traceable thermometer and National Weather Service (via mesowest.utah.edu) barometric pressure readings for Lexington-Parsons Regional Airport in Darden, Tennessee, respectively. Additional details regarding equipment calibration were recorded on an *Equipment Calibration Form*, as described in Section 3.2.1.3.

3.3 SAMPLING METHODS

The following sections present monitoring well data collection and sampling procedures used during Event #3.

3.3.1 Static Water Level Measurements

FSP measured static groundwater levels at 29 monitoring wells in accordance with ENV-TI-05.80.44, *Groundwater Level and Well Depth Measurement.* On April 6 and April 8, 2020, static groundwater level readings were measured and recorded to the nearest 0.01 ft from a reference point on the top of each well casing using an electronic water level indicator. Water level indicator probes were decontaminated prior to the first use and between measurements, and the decontamination was documented as specified in ENV-TI-05.80.05, *Field Sampling Equipment Cleaning and Decontamination.* Depth to groundwater measurements were recorded on a *Groundwater Level Measurement Form*.

Stantec calculated the static groundwater level at vibrating wire piezometer JOF-116-PZ. FSP recorded the measured readings and temperature using a vibrating wire readout instrument on a *Vibrating Wire Piezometer Measurement Form.* The readings were used to calculate the pressure head (ft of water) above the vibrating wire sensor to obtain groundwater elevation.

Groundwater and pore water measurements were also obtained from transducers installed within nine and 11 piezometers, respectively. Additionally, a surface water level measurement for the Tennessee River/Kentucky Lake was provided by TVA using the reading closest to noon recorded by an automated staff gauge. The surface water staff gauge location is shown on Exhibit A.1 in Appendix A.

Groundwater level data and pore water level data are shown in Tables B.1a and B.1b, respectively, in Appendix B. A groundwater elevation contour map based on groundwater measurements made in wells and piezometers, along with pore water elevations, is included as Exhibit A.2 in Appendix A. Similarly, a pore water elevation contour map based on pore water measurements in piezometers, along with groundwater elevations, is included as Exhibit A.3 in Appendix A.

3.3.2 Groundwater Purging & Sampling

Analytical and field duplicate samples were collected from nine monitoring wells as shown in Table B.2 in Appendix B. Monitoring wells were purged using dedicated bladder pumps equipped with dedicated tubing using low-flow purging and sampling techniques as specified in ENV-TI-05.80.42, *Groundwater Sampling*.

During the purging process, water quality field parameters including pH, specific conductance, temperature, ORP, and DO were measured using water quality meters (YSI ProPlus with flow-through cell) and recorded on field forms. Depth to water and turbidity were measured and recorded using decontaminated electronic water-level indicators (Heron Dipper-T) and calibrated turbidimeters (Hach 2100Q). Field parameters were measured and recorded on *Groundwater Sampling Forms* during purging until readings were stabilized as specified in the SAP and/or applicable TI. As approved by TDEC, the specific conductance and turbidity stabilization limits were revised to meet overall programmatic objectives for groundwater investigations for the JOF Plant. Well purging was considered complete when three consecutive readings were within the following stabilization limits:

- pH – ± 0.1 Standard Units
- Specific Conductance – ± 3% microSiemens per centimeter
- Turbidity – Less than 5 Nephelometric Turbidity Units (NTUs) or ± 10% for values above 5 NTUs
- DO – Less than 0.5 milligrams per liter (mg/L) or ± 10% for values above 0.5 mg/L.

After water quality stabilization criteria were achieved, the final field parameter results were recorded, purging was discontinued, and a sample was collected as specified in the SAP. Laboratory-provided, pre-preserved sample containers were filled directly from the pump discharge line. Turbidity readings at wells stabilized below 5 NTUs, therefore samples were not collected for dissolved metals analysis. FSP wore new, clean nitrile gloves when handling sample containers and did not touch the interior of containers or container caps. New gloves were used when handling each sample. When filling sample bottles, care was taken to minimize sample aeration (i.e., water was directed down the inner walls of the sample bottle) and to avoid overfilling and diluting preservatives. Each sample bottle was capped before filling the next bottle. Following completion of sampling, final field parameter measurements were made.

Sample containers were labeled and handled in accordance with ENV-TI-05.80.02, *Sample Labeling and Custody.* FSP secured caps on each bottle, attached a custody seal across the cap, and placed the bottles in a cooler on ice within 15 minutes of collection. QC samples were collected in accordance with ENV-TI-05.80.04, *Field Sampling Quality Control.*

Groundwater samples were analyzed for the CCR-related constituents listed in Appendices III and IV of 40 CFR 257. In addition, five inorganic constituents listed in Appendix I of Tennessee Rule 0400-11-01-.04 and not included in the 40 CFR 257 Appendices III and IV were analyzed to maintain continuity with TDEC environmental programs. These additional TDEC Appendix I constituents included copper, nickel, silver, vanadium, and zinc. The combined federal CCR Appendices III and IV constituents and TDEC

Appendix I inorganic constituents will hereafter be referred to collectively as "CCR Parameters." For geochemical evaluation, major cations/anions not included in the CCR Parameters were included in the analyses. The additional geochemical parameters included bicarbonate, carbonate, magnesium, potassium, and sodium.

3.4 INVESTIGATION DERIVED WASTE

Investigation derived waste (IDW) generated during groundwater investigation activities included:

- Used calibration solutions
- Purge water
- Decontamination fluids
- Disposable personal protective equipment (PPE)
- General trash.

IDW was handled in accordance with ENV-TI-05.80.05, *Field Sampling Equipment Cleaning and Decontamination*; ENV-TI-05.80.42, *Groundwater Sampling* (purge water); the JOF Plant-specific waste management plan; and local, state, and federal regulations. Transportation and disposal of IDW was coordinated with JOF Plant facility management. Used calibration solution was containerized and stored for disposal as directed by the JOF Plant facility management. Purge water and decontamination fluids were containerized for later disposal as specified in the JOF Plant-specific waste management plan. Used disposable PPE (e.g., nitrile gloves) and general trash generated throughout the day were placed in garbage bags and disposed of in a general trash dumpster onsite at the end of each day.

3.5 SAMPLE SHIPMENT

Samples were packed and secured under *COC* procedures specified in ENV-TI-05.80.06, *Handling and Shipping of Samples*. The samples were shipped by FedEx to GEL in Charleston, South Carolina. The laboratory submitted sample receipt confirmation forms to EnvStds for review and confirmation.

3.6 VARIATIONS

The proposed scope and procedures for the groundwater investigation were outlined in the SAP, QAPP, and applicable TVA TIs as detailed in the sections above. Variations in scope or procedures discussed with TDEC and/or TVA, changes based on field conditions, or additional field sampling performed to complete the scope of work in the SAP are described in the following sections. As dicussed below, these variations do not impact the overall usability and representativeness of the dataset provided in this SAR for groundwater investigation sampling Event #3 at the JOF Plant.

3.6.1 Variations in Scope

Variations in scope are provided below.

- Groundwater level gauging and sampling was not performed at well JOF-108 as specified in the SAP because it was not installed (the five borings drilled in that area encountered CCR and/or shallow refusal). This change in scope was approved by TDEC.
- Monitoring well JOF-114 was not gauged on April 6, 2020 because the well was inaccessible due to active demolition. The well was subsequently gauged and sampled on April 8, 2020. Because the reading was not within the same 24-hour period as the other water level measurements, the data were not used for the groundwater elevation contour map.

3.6.2 Variations in Procedure

Variations in procedures occurring in the field are provided below.

- As approved by TDEC, the specific conductance and turbidity stabilization limits were revised to meet overall programmatic objectives for groundwater investigations
- GEL was used as the laboratory for non-radium sample analysis in place of Eurofins TestAmerica. This change was approved by TVA and TDEC prior to field work.

4.0 SUMMARY

The data presented in this report are only for groundwater investigation sampling Event #3 at the JOF Plant. The scope of work for Event #3 was to:

- Collect groundwater samples for chemical analyses to assist with subsequent evaluation of the potential presence of CCR-related constituents in groundwater
- Measure groundwater and surface water elevations to assist with subsequent evaluation of groundwater flow direction and rate after multiple data sets have been collected.

In addition, pore water measurements from piezometers installed in the CCR units at the JOF Plant are presented in this SAR for comparison with groundwater data.

Event #3 included collecting groundwater level measurements at 29 monitoring wells and 10 piezometers; pore water measurements at 11 piezometers in the CCR units; and a surface water measurement at one gauge located in the Tennessee River/Kentucky Lake. Groundwater and surface water measurements and elevations are provided in Table B.1a, and pore water measurements and elevations are provided in Table B.1b, and depicted on Exhibits A.2 and A.3.

Water quality measurements and groundwater analytical samples were collected at nine monitoring wells as summarized in Table B.2. Water quality parameters were recorded during purging. Stabilization criteria for pH, specific conductance, turbidity, and DO were achieved at the nine sampling locations. The final measurements prior to initiating sample collection are presented in Table B.3.

Groundwater analytical data for CCR Parameters and geochemical parameters are presented in Table B.4. Analytical data for radium analyses are presented in Table B.5. Analytical data were reported by GEL and then validated or verified by EnvStds.

Stantec has completed Event #3 of the groundwater investigation at the JOF Plant in New Johnsonville, Tennessee, in accordance with the Groundwater Investigation SAP as documented herein. The data collected during Event #3 are usable for reporting and evaluation in the EAR and meet the objectives of the TDEC Order EIP. The complete dataset from this event will be evaluated along with data collected during the remaining groundwater sampling events and under other TDEC Order SAPs, as well as data collected under other State and CCR programs. This evaluation will be provided in the EAR.

5.0 REFERENCES

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

Stantec Consulting Services Inc. (Stantec). 2018a. *Groundwater Investigation Sampling and Analysis Plan, Johnsonville Fossil Plant.* Revision 4. Prepared for Tennessee Valley Authority. December 10, 2018.

Stantec. 2018b. *Environmental Investigation Plan, Johnsonville Fossil Plant.* Revision 4. Prepared for Tennessee Valley Authority. December 10, 2018.

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

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

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

TVA, ENV-TI-05.80.04, *Field Sampling Quality Control*.

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

TVA, ENV-TI-05.80.06, *Handling and Shipping of Samples*.

TVA, ENV-TI-05.80.21, *Monitoring Well Inspection and Maintenance*.

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

TVA, ENV-TI-05.80.44, *Groundwater Level and Well Depth Measurement*.

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

APPENDIX A - EXHIBITS

Exhibit No.

A.1

Title

Monitoring Well and Piezometer Network

Client/Project

Tennessee Valley Authority
Johnsonville Fossil (JOF) Plant TDEC Order

Project Location

New Johnsonville, Tennessee

175568286

Prepared by DMB on 2021-05-24
Technical Review by MD on 2021-05-24

0 450 900 1,350 1,800 Feet

1:5,400 (At original document size of 22x34)

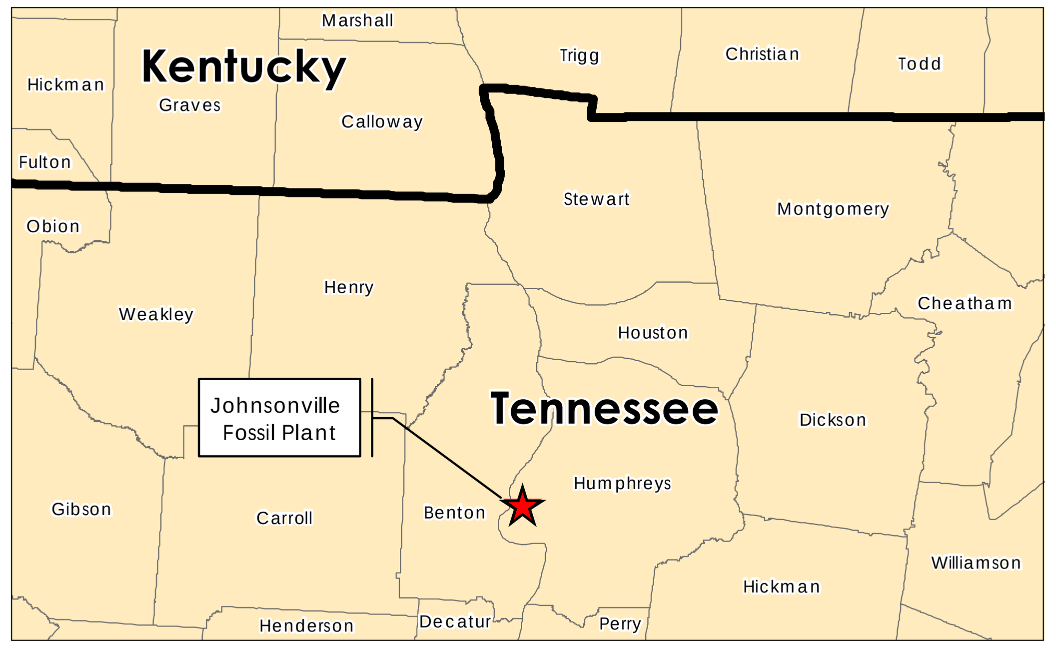
Legend

- Groundwater Investigation Monitoring Well
- Other Monitoring Well
- Piezometer
- Pore Water Piezometer in CCR Material
- Temporary Well within CCR Material
- Tennessee River/Kentucky Lake Gauging Station
- 2017 Imagery Boundary
- 2018 Imagery Boundary
- CCR Unit Area (Approximate)
- Coal Yard (Approximate)

CCR: Coal combustion residuals

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Imagery Provided by TVA (2017 & 2018) & ESRI World Imagery



Stantec TVA

U:\TVA-EP\175568286_JOF_Phase2\gis\mxd\GW_Tech_Memo\JOF_SAR_GW_ExhA1_GW_MonitoringWellNetwork_wPZ.mxd Revised: 2021-05-24 By: mbough

Exhibit No.

A.2

Title

Groundwater Elevation Contour Map, Event #3 (April 6 and April 8, 2020)

Client/Project

Tennessee Valley Authority
Johnsonville Fossil (JOF) Plant TDEC Order

Project Location 175568286

New Johnsonville, Tennessee

Prepared by DMB on 2021-09-16
Technical Review by MD on 2021-09-16

0 450 900 1,350 1,800 Feet

1:5,400 (At original document size of 22x34)

Legend

- Groundwater Investigation Monitoring Well groundwater elevation in feet above mean sea level (ft amsl)
- Other Monitoring Well groundwater elevation in ft amsl
- Piezometer, groundwater label in blue text, pore water label in yellow highlighted black text; elevation in ft amsl (e.g., JOF-E-2A-PZ2) (e.g., JOF-E-2A-PZ5)
- Piezometer in CCR pore water elevation in ft amsl; value not used for contouring
- Temporary well in CCR pore water elevation in ft amsl; value not used for contouring
- Tennessee River/Kentucky Lake Gauging Station surface water elevation in ft amsl
- Interpolated Groundwater Contour (5 ft interval; elevations are in ft amsl)
- Groundwater Contour (5 ft interval; elevations are in ft amsl)
- 2017 Imagery Boundary
- 2018 Imagery Boundary
- CCR Unit Area (Approximate)
- Coal Yard (Approximate)

CCR: Coal combustion residuals

NM: Not measured; data not available

*Groundwater and pore water elevation displayed but not used as input for contouring due to factors such as well construction or being screened in a different hydrogeologic unit.

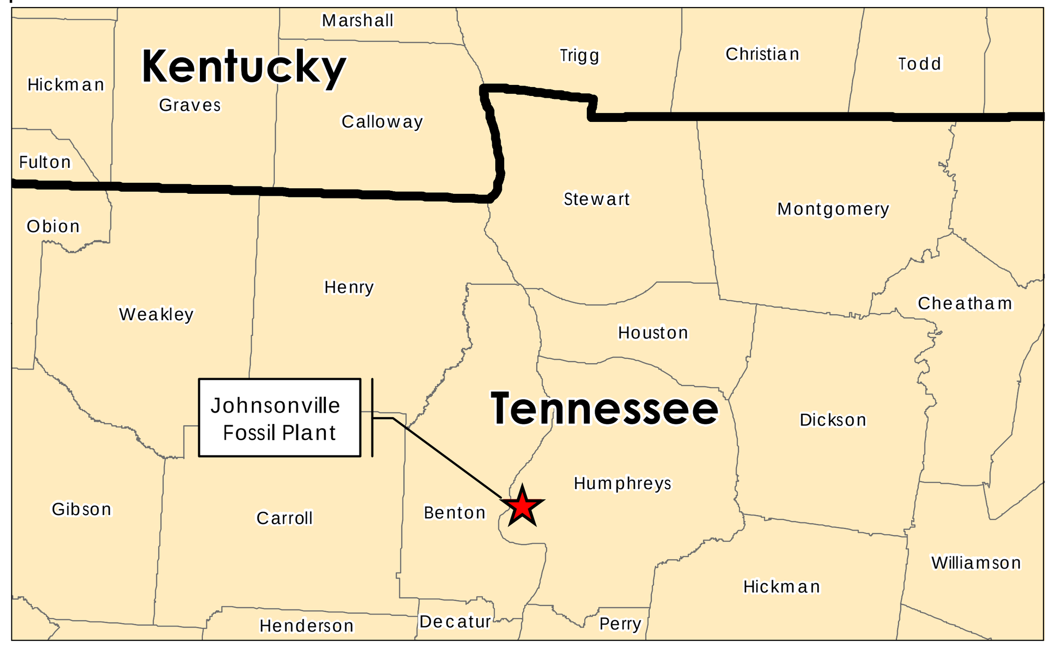
**Nested VWPZ sensors monitoring pore water and groundwater elevations in the same borehole, and the location is shown by a single symbol.

***The JOF_PZET and JOF_PZFT groundwater elevations are approximately 3-4 feet below the trend established in other piezometers within the Active Ash Pond 2. The groundwater elevation is displayed but not used for contouring.

****JOF-114 was gauged on April 8th and therefore not used for contouring.

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Imagery Provided by TVA (2017 & 2018) & ESRI World Imagery
3. Groundwater contours were created using Surfer Version 16.1.350 (December 13, 2018) and manual adjustment
4. Temporary well completion, including surveys and development, were not completed prior to this event. Gauging of temporary wells was not performed until Event #4.



Stantec TVA

U:\TVA-EP\175568286_JOF_Phase2\gis\mxd\GW_Tech_Memo\JOF_SAR_GW_ExhA2_GroundwaterContour_Event3.mxd Revised: 2021-09-16 By: lblackman

Exhibit No.
A.3

Title

Pore water Elevation Contour Map, Event #3 (April 6, 2020)

Client/Project

Tennessee Valley Authority
Johnsonville Fossil (JOF) Plant TDEC Order

Project Location 175568286

New Johnsonville, Tennessee

Prepared by DMB on 2021-11-01
Technical Review by MD on 2021-11-01

0 450 900 1,350 1,800 Feet

1:5,400 (At original document size of 22x34)

Legend

- Groundwater Investigation Monitoring Well groundwater elevation in feet above mean sea level (ft amsl); value not used for contouring
- Other Monitoring Well groundwater elevation in ft amsl; value not used for contouring
- Piezometer, groundwater label in blue text, pore water label in yellow highlighted black text; elevation in ft amsl (e.g., JOF-E-2A-PZ2) (**e.g., JOF-E-2A-PZ5**)
- Piezometer in CCR pore water elevation in ft amsl
- Temporary well in CCR pore water elevation in ft amsl
- Tennessee River/Kentucky Lake Gauging Station surface water elevation in ft amsl
- Interpolated Pore water Contour (5 ft interval; elevations are in ft amsl)
- Pore water Contour (5 ft interval; elevations are in ft amsl)
- 2017 Imagery Boundary
- 2018 Imagery Boundary
- CCR Unit Area (Approximate)
- Coal Yard (Approximate)

CCR: Coal combustion residuals

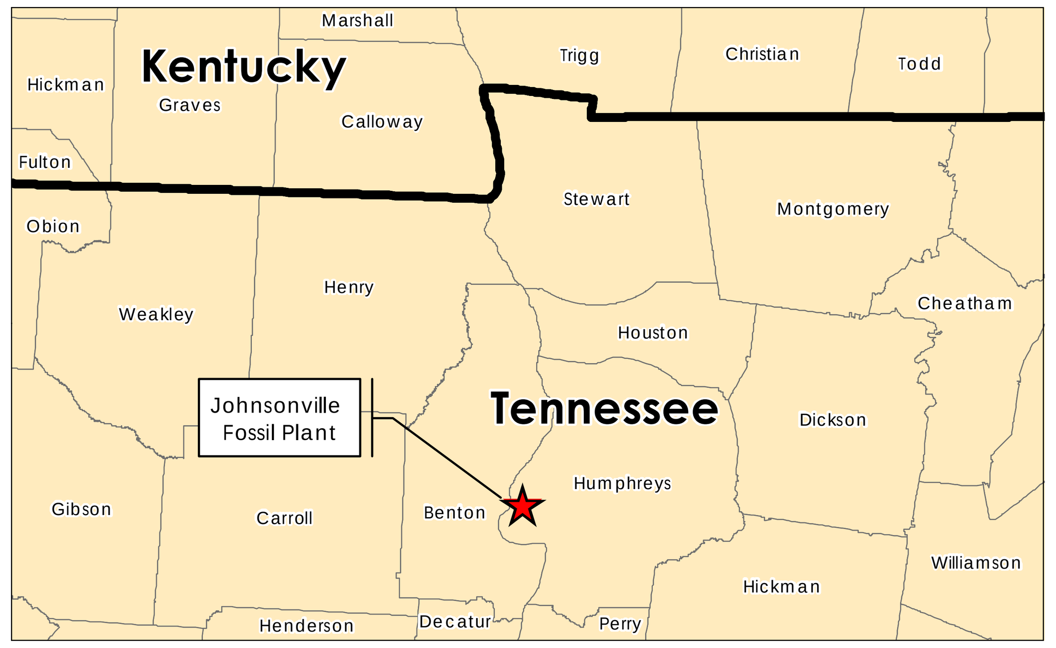
NM: Not measured; data not available

*Groundwater elevation displayed but not used as input for contouring due to factors such as well construction or being screened in a different hydrogeologic unit.

**Nested VWPZ sensors monitoring pore water and groundwater elevations in the same borehole, and the location is shown by a single symbol.

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Imagery Provided by TVA (2017 & 2018) & ESRI World Imagery
3. Pore water contours were created using manual adjustment and Surfer Version 16.1.350 (December 13, 2018)
4. Temporary well completion, including surveys and development, were not completed prior to this event. Gauging of temporary wells was not performed until Event #4.



Stantec TVA

U:\TVA-EP\175568286_JOF_Phase2\gis\mxd\GW_Tech_Memo\JOF_SAR_GW_ExhA3_PorewaterContour_Event3.mxd Revised: 2021-11-01 By: mbough

APPENDIX B - TABLES

TABLE B.1a – Groundwater Level Measurements
Johnsonville Fossil Plant
April 2020

UNID	Well / Piezometer ID	Date Measured	Depth to Groundwater	Top of Casing Elevation	Groundwater Elevation	Piezometer Ground Surface Elevation	Piezometer Sensor Elevation	Piezometer Sensor Depth	Screened Interval	Screened / Piezometer Sensor Formation
			ft btoc	ft msl	ft msl	ft msl	ft msl	ft bgs	ft btoc	
Monitoring Wells										
JOF-00-GW-43-001	10-AP1	6-Apr-20	10.87	370.51	359.64	n/a	n/a	n/a	39.0 - 49.1	Alluvium: Sands and Gravels
JOF-00-GW-43-002	10-AP3	6-Apr-20	7.43	367.27	359.84	n/a	n/a	n/a	37.4 - 47.5	Alluvium: Sands and Gravels
JOF-00-GW-43-003	89-B10	6-Apr-20	23.90	401.19	377.29	n/a	n/a	n/a	32.0 - 40.3	Alluvium: Sands and Gravels
JOF-00-GW-43-004	94-B16	6-Apr-20	11.85	390.53	378.68	n/a	n/a	n/a	16.2 - 26.2	Alluvium: Sands and Gravels
JOF-00-GW-43-005	99-B19	6-Apr-20	15.01	394.50	379.49	n/a	n/a	n/a	12.6 - 27.7	Alluvium: Sands and Gravels/Shale Bedrock
JOF-00-GW-43-006	99-B20A	6-Apr-20	28.45	408.88	380.43	n/a	n/a	n/a	21.6 - 36.5	Alluvium: Sands and Gravels
JOF-00-GW-43-007	B-6R	6-Apr-20	17.68	395.57	377.89	n/a	n/a	n/a	18.2 - 21.2	Alluvium: Sands and Gravels
JOF-00-GW-43-008	B-8R	6-Apr-20	11.06	391.04	379.98	n/a	n/a	n/a	13.8 - 16.8	Alluvium: Sands and Gravels
JOF-00-GW-43-009	B-9	6-Apr-20	23.61	423.88	400.27	n/a	n/a	n/a	40.5 - 50.0	Alluvium: Silts and Clays
JOF-00-GW-43-010	B-11	6-Apr-20	18.94	400.67	381.73	n/a	n/a	n/a	26.7 - 36.7	Alluvium: Sands and Gravels
JOF-00-GW-43-011	B-12	6-Apr-20	10.76	393.03	382.27	n/a	n/a	n/a	26.8 - 36.9	Alluvium: Sands and Gravels
JOF-00-GW-43-012	B-13	6-Apr-20	27.59	409.87	382.28	n/a	n/a	n/a	33.8 - 43.9	Alluvium: Sands and Gravels
JOF-00-GW-43-013	JOF-101	6-Apr-20	22.41	424.59	402.18	n/a	n/a	n/a	43.6 - 53.2	Alluvium: Sands and Gravels
JOF-00-GW-43-014	JOF-102	6-Apr-20	18.10	407.64	389.54	n/a	n/a	n/a	23.6 - 33.9	Alluvium: Sands and Gravels
JOF-00-GW-43-015	JOF-103	6-Apr-20	14.16	374.24	360.08	n/a	n/a	n/a	41.9 - 52.1	Alluvium: Sands and Gravels
JOF-00-GW-43-016	JOF-104	6-Apr-20	19.52	379.44	359.92	n/a	n/a	n/a	48.4 - 58.6	Alluvium: Sands and Gravels
JOF-00-GW-43-017	JOF-105	6-Apr-20	26.89	406.15	379.26	n/a	n/a	n/a	23.4 - 33.7	Alluvium: Sands and Gravels
JOF-00-GW-43-018	A-3	6-Apr-20	22.18	403.73	381.55	n/a	n/a	n/a	66.1 - 86.1	Chattanooga Shale/Camden Formation
JOF-00-GW-43-019	JOF-106	6-Apr-20	21.13	403.16	382.03	n/a	n/a	n/a	23.3 - 32.8	Alluvium: Sands and Gravels
JOF-00-GW-43-020	JOF-107	6-Apr-20	27.26	409.95	382.69	n/a	n/a	n/a	31.9 - 41.4	Alluvium: Sands and Gravels
JOF-00-GW-43-021	JOF-109	6-Apr-20	4.69	386.11	381.42	n/a	n/a	n/a	34.1 - 43.9	Alluvium
JOF-00-GW-43-022	JOF-110	6-Apr-20	17.09	388.76	371.67	n/a	n/a	n/a	52.3 - 62.1	Alluvium
JOF-00-GW-43-023	JOF-111	6-Apr-20	18.70	390.08	371.38	n/a	n/a	n/a	41.3 - 51.1	Clay
JOF-00-GW-43-024	JOF-112	6-Apr-20	16.70	394.48	377.78	n/a	n/a	n/a	24.9 - 34.7	Alluvium
JOF-00-GW-43-025	JOF-113	6-Apr-20	25.92	388.13	362.21	n/a	n/a	n/a	39.6 - 49.4	Alluvium
JOF-00-GW-43-026	JOF-114	8-Apr-20	27.45	388.36	360.91	n/a	n/a	n/a	34.7 - 44.5	Alluvium
JOF-00-GW-43-027	JOF-117	6-Apr-20	25.67	388.63	362.96	n/a	n/a	n/a	35.0 - 44.8	Alluvium
JOF-00-GW-43-028	JOF-118	6-Apr-20	12.76	372.69	359.93	n/a	n/a	n/a	43.9 - 53.7	Alluvium
JOF-00-GW-43-029	JOF-119	6-Apr-20	6.97	366.89	359.92	n/a	n/a	n/a	38.0 - 47.8	Alluvium
Piezometers										
n/a	JOF-B-2A-PZ3	6-Apr-20	n/a	n/a	359.5	392.7	322.7	70.0	n/a	Alluvial Sand and Gravel
n/a	JOF-C-2A-PZ3	6-Apr-20	n/a	n/a	360.7	392.8	326.8	66.0	n/a	Alluvial Sand and Gravel
n/a	JOF-C-2B-PZ2	6-Apr-20	n/a	n/a	359.1	370.6	321.6	49.0	n/a	Alluvial Sand and Gravel
n/a	JOF-E-2A-PZ2	6-Apr-20	n/a	n/a	359.3	390.9	327.9	63.0	n/a	Alluvial Sand and Gravel
n/a	JOF-E-2B-PZ2	6-Apr-20	n/a	n/a	358.6	365.4	310.4	55.0	n/a	Alluvial Sand and Gravel
n/a	JOF-K-2A-PZ1	6-Apr-20	n/a	n/a	361.3	377.5	327.5	50.0	n/a	Alluvial Sand and Gravel
n/a	JOF_PZET	6-Apr-20	n/a	n/a	355.5	363.8	329.8	34.0	n/a	Alluvial Clay and Silt and Alluvial Sand and Gravel
n/a	JOF_PZFT	6-Apr-20	n/a	n/a	356.0	362.9	327.6	35.3	n/a	Alluvial Clay and Silt and Alluvial Sand and Gravel
n/a	JOF_PZHT	6-Apr-20	n/a	n/a	359.1	363.1	316.1	47.0	n/a	Alluvial Sand and Gravel
n/a	JOF-116-PZ	6-Apr-20	n/a	n/a	373.1	388.0	342.0	46.0	n/a	Alluvium

See notes on last page.

Stantec

TABLE B.1a – Groundwater Level Measurements
Johnsonville Fossil Plant
April 2020

UNID	Well / Piezometer ID	Date Measured	Depth to Groundwater	Top of Casing Elevation	Groundwater Elevation	Piezometer Ground Surface Elevation	Piezometer Sensor Elevation	Piezometer Sensor Depth	Screened Interval	Screened / Piezometer Sensor Formation
			ft btoc	ft msl	ft msl	ft msl	ft msl	ft bgs	ft btoc	
Surface Water Gauge										
Tennessee River/Kentucky Lake gauge (GS-1)	n/a	6-Apr-20	n/a	n/a	359.60	n/a	n/a	n/a	n/a	n/a

Notes:

bgs	below ground surface
btoc	below top of casing
ft	feet
ID	identification
msl	mean sea level
n/a	not applicable
UNID	Unique Numerical Identification

1. Top of casing elevations, screen intervals, and screened formations for monitoring wells were obtained from the TVA Well Inventory Log provided by TVA.
2. Tennessee River/Kentucky Lake data point is the reading closest to noon recorded by the automated staff gauge provided by TVA.
3. For piezometers, ground surface elevation, groundwater elevations and piezometer data were obtained from the geotechnical instrumentation database. Vibrating wire sensor formation information was obtained from boring logs. Data from automated piezometers are averaged for the measurement date.
4. Groundwater elevations in piezometers are calculated values. Accuracy of piezometer data is to 0.1 ft.
5. Depth to groundwater at JOF-114 was taken on April 8, 2020 due to the well being inaccessible on April 6, 2020.

TABLE B.1b – Pore Water Level Measurements
Johnsonville Fossil Plant
April 2020

Temporary Well / Piezometer ID	Date Measured	Depth to Pore Water	Top of Casing Elevation	Pore Water Elevation	Piezometer Ground Surface Elevation	Piezometer Sensor Elevation	Piezometer Sensor Depth	Screened Interval	Screened / Piezometer Sensor Formation
		ft btoc	ft msl	ft msl	ft msl	ft msl	ft bgs	ft bgs	
Temporary Wells									
JOF-TW01	n/a	NM	396.33	NM	n/a	n/a	n/a	24.8 - 34.6	CCR
JOF-TW02	n/a	NM	397.38	NM	n/a	n/a	n/a	25.5 - 35.3	CCR
JOF-TW03	n/a	NM	409.49	NM	n/a	n/a	n/a	40.4 - 50.2	CCR
JOF-TW04	n/a	NM	394.25	NM	n/a	n/a	n/a	25.9 - 35.7	CCR
JOF-TW05	n/a	NM	393.44	NM	n/a	n/a	n/a	36.2 - 46.0	CCR
JOF-TW06	n/a	NM	395.13	NM	n/a	n/a	n/a	26.5 - 36.3	CCR
JOF-TW07	n/a	NM	402.92	NM	n/a	n/a	n/a	32.2 - 42.0	CCR
JOF-TW08	n/a	NM	387.22	NM	n/a	n/a	n/a	6.0 - 15.8	CCR
JOF-TW09	n/a	NM	387.52	NM	n/a	n/a	n/a	15.8 - 25.6	CCR
JOF-TW10	n/a	NM	384.92	NM	n/a	n/a	n/a	6.0 - 15.8	CCR
JOF-TW11	n/a	NM	440.13	NM	n/a	n/a	n/a	31.6 - 41.4	CCR
JOF-TW12	n/a	NM	444.17	NM	n/a	n/a	n/a	36.1 - 45.9	CCR
JOF-TW13	n/a	NM	441.39	NM	n/a	n/a	n/a	33.3 - 43.1	CCR
JOF-TW15	n/a	NM	451.71	NM	n/a	n/a	n/a	55.0 - 64.8	CCR
JOF-TW16	n/a	NM	473.81	NM	n/a	n/a	n/a	72.9 - 82.7	CCR
Piezometers									
JOF-E-2A-PZ5	n/a	n/a	n/a	NM	390.9	370.9	20.0	n/a	CCR
JOF_PZEC	6-Apr-20	n/a	n/a	382.6	390.4	365.4	25.0	n/a	CCR and Dike Fill
JOF_PZFC	6-Apr-20	n/a	n/a	383.8	389.8	364.8	25.0	n/a	CCR and Dike Fill
JOF_PZGC	6-Apr-20	n/a	n/a	377.5	389.8	364.8	25.0	n/a	CCR and Dike Fill
JOF_PZHC	6-Apr-20	n/a	n/a	381.5	390.0	365.8	24.2	n/a	CCR
JOF_PZIC	6-Apr-20	n/a	n/a	382.7	390.1	360.1	30.0	n/a	CCR and Dike Fill
JOF_PZJC	6-Apr-20	n/a	n/a	383.4	390.0	365.0	25.0	n/a	CCR
JOF_PZKC	6-Apr-20	n/a	n/a	382.8	390.5	365.5	25.0	n/a	CCR
JOF_PZLC	6-Apr-20	n/a	n/a	380.7	390.5	365.5	25.0	n/a	CCR
JOF_PZMC	6-Apr-20	n/a	n/a	378.0	391.1	366.1	25.0	n/a	CCR and Dike Fill
P-8	n/a	n/a	n/a	NM	432.8	394.5	38.3	n/a	CCR
P-9	6-Apr-20	n/a	n/a	395.9	432.9	393.8	39.2	n/a	CCR and Clayey Fill
P-10	6-Apr-20	n/a	n/a	401.3	430.7	391.0	39.8	n/a	CCR

Notes:

bgs	below ground surface
btoc	below top of casing
CCR	coal combustion residuals
ft	feet
ID	identification
msl	mean sea level
n/a	not applicable
NM	not measured

1. Top of casing elevations, screen intervals, and screened formations were obtained from boring logs, well detail and well survey data.

2. For piezometers, ground surface elevation, pore water elevations, and piezometer data obtained from the geotechnical instrumentation database. Data from automated piezometers are averaged for the measurement date.

3. Pore water elevations in piezometers are calculated values. Accuracy of piezometer data is to 0.1 ft.

4. Temporary wells were not gauged during this event. Gauging and sampling of temporary wells did not commence until all temporary wells associated with the Exploratory Drilling scope were installed and developed. In select piezometers, as noted by "NM" above, pore water elevation data were not available for this event.

TABLE B.2 – Summary of Groundwater Samples
Johnsonville Fossil Plant
April 2020

			Analysis Type								
Location ID	**Sample ID**	**Sample Type**	Field Parameters	Total Metals	Total Mercury	Anions	Alkalinity	Total Dissolved Solids	Radium-226	Radium-228	Radium-226+228
JOF-109	JOF-GW-021-20200407	Normal Environmental Sample	X	X	X	X	X	X	X	X	X
JOF-110	JOF-GW-022-20200407	Normal Environmental Sample	X	X	X	X	X	X	X	X	X
JOF-111	JOF-GW-023-20200407	Normal Environmental Sample	X	X	X	X	X	X	X	X	X
JOF-112	JOF-GW-024-20200407	Normal Environmental Sample	X	X	X	X	X	X	X	X	X
JOF-113	JOF-GW-025-20200408	Normal Environmental Sample	X	X	X	X	X	X	X	X	X
JOF-114	JOF-GW-026-20200408	Normal Environmental Sample	X	X	X	X	X	X	X	X	X
JOF-117	JOF-GW-027-20200408	Normal Environmental Sample	X	X	X	X	X	X	X	X	X
JOF-118	JOF-GW-028-20200409	Normal Environmental Sample	X	X	X	X	X	X	X	X	X
	JOF-GW-DUP01-20200409	Field Duplicate Sample		X	X	X	X	X	X	X	X
JOF-119	JOF-GW-029-20200409	Normal Environmental Sample	X	X	X	X	X	X	X	X	X

Notes:

Total Metals	SW-846 6020A
Total Mercury	SW-846 7470A
Anions	EPA 300.0/SW 9056
Alkalinity	SM2320B
Total Dissolved Solids	SM2540C
Radium-226	EPA 903.0
Radium-228	EPA 904.0
Radium-226+228	CALC
ID	identification

1. Field and laboratory quality control sample results except for field duplicates are not included in report tables but were used for data validation.

TABLE B.3 – Summary of Groundwater Quality Parameters
Johnsonville Fossil Plant
April 2020

Sample Location		JOF-109	JOF-110	JOF-111	JOF-112	JOF-113	JOF-114	JOF-117	JOF-118	JOF-119
Sample Date		7-Apr-20	7-Apr-20	7-Apr-20	7-Apr-20	8-Apr-20	8-Apr-20	8-Apr-20	9-Apr-20	9-Apr-20
Sample ID		JOF-GW-021-20200407	JOF-GW-022-20200407	JOF-GW-023-20200407	JOF-GW-024-20200407	JOF-GW-025-20200408	JOF-GW-026-20200408	JOF-GW-027-20200408	JOF-GW-028-20200409	JOF-GW-029-20200409
Sample Depth		39 ft	57 ft	46 ft	29.5 ft	43.5 ft	39.5 ft	40.5 ft	48.5 ft	42.5 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Level of Review	Units	Final QC Review	Final QC Review	Final QC Review	Final QC Review	Final QC Review	Final QC Review	Final QC Review	Final QC Review	Final QC Review
Field Parameters										
Dissolved Oxygen	%	33.1	4.2	6.1	3.5	4.1	2.9	1.1	11.6	22.1
Dissolved Oxygen	mg/L	3.18	0.39	0.59	0.33	0.39	0.27	0.09	1.08	2.27
ORP	mV	113.4	52.0	108.7	19.9	87.9	145.5	-121.3	69.5	48.0
pH (field)	SU	5.17	5.46	5.42	6.10	5.81	4.45	6.49	5.92	6.32
Specific Cond. (Field)	uS/cm	164.1	289.4	2,978	392.3	2,219	3,511	951	418.0	297.9
Temperature, Water (C)	DEG C	17.2	19.2	19.1	17.4	18.6	19.7	19.4	17.8	16.3
Turbidity, field	NTU	4.36	3.14	2.47	3.23	0.79	1.04	4.64	4.72	1.34

Notes:

%	percent
Cond.	conductance
DEG C	degrees Celsius
ft	feet below top of casing
ID	identification
mg/L	milligrams per Liter
mV	milliVolts
NTU	Nephelometric Turbidity Unit
ORP	Oxidation Reduction Potential, measured using a silver reference electrode which has a standard potential of 200 mV
SU	Standard Units
uS/cm	microSiemens per centimeter

TABLE B.4 - Groundwater Analytical Results for Metals, Anions, and General Chemistry
Johnsonville Fossil Plant
April 2020

Sample Location	Units	EPA MCLs	CCR Rule GWPS	JOF-109	JOF-110	JOF-111	JOF-112	JOF-113	JOF-114	JOF-117
Sample Date				7-Apr-20	7-Apr-20	7-Apr-20	7-Apr-20	8-Apr-20	8-Apr-20	8-Apr-20
Sample ID				JOF-GW-021-20200407	JOF-GW-022-20200407	JOF-GW-023-20200407	JOF-GW-024-20200407	JOF-GW-025-20200408	JOF-GW-026-20200408	JOF-GW-027-20200408
Sample Depth				39 ft	57 ft	46 ft	29.5 ft	43.5 ft	39.5 ft	40.5 ft
Sample Type				Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Level of Review				Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified
Total Metals										
Antimony	ug/L	6[A]	n/v	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
Arsenic	ug/L	10[A]	n/v	<2.00	2.07 J	3.02 J	<2.00	<2.00	2.15 J	**32.1[A]**
Barium	ug/L	2,000[A]	n/v	14.7	65.4	24.5	55.4	23.5	21.5	88.8
Beryllium	ug/L	4[A]	n/v	0.391 J	<0.200	0.310 J	<0.200	<0.200	0.767	<0.200
Boron	ug/L	n/v	n/v	71.7	1,460	4,550	36.2	16,100	12,500	15.6
Cadmium	ug/L	5[A]	n/v	<0.300	<0.300	0.418 J	0.523 J	1.64	<0.300	<0.300
Calcium	ug/L	n/v	n/v	16,500	18,600	419,000	34,600	590,000	543,000	96,700
Chromium	ug/L	100[A]	n/v	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00
Cobalt	ug/L	n/v	6[B]	0.467 J	3.69	**218[B]**	**105[B]**	3.34	**68.2[B]**	**21.5[B]**
Copper	ug/L	n/v	n/v	0.941 J	<0.300	<0.300	<0.300	0.325 J	1.32 J	<0.300
Lead	ug/L	n/v	15[B]	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500
Lithium	ug/L	n/v	40[B]	<3.00	<3.00	3.15 J	<3.00	**118[B]**	**83.4[B]**	<3.00
Magnesium	ug/L	n/v	n/v	5,140	4,990	19,300	14,000	6,520	58,300	30,300
Mercury	ug/L	2[A]	n/v	<0.0670	<0.0670	<0.0670	<0.0670	<0.0670	<0.0670	<0.0670
Molybdenum	ug/L	n/v	100[B]	<0.200	0.244 J	9.66	0.923 J	**229[B]**	<0.200	29.6
Nickel	ug/L	100(TN MCL)[A]	n/v	22.4	8.34	57.3	8.93	**113[A]**	17.9	5.94
Potassium	ug/L	n/v	n/v	1,290	331	47,000	1,030	64,700	113,000	3,000
Selenium	ug/L	50[A]	n/v	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
Silver	ug/L	100(TN MCL)[A]	n/v	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300
Sodium	ug/L	n/v	n/v	6,980	36,800	247,000	26,000	46,200	333,000	34,900
Thallium	ug/L	2[A]	n/v	<0.600	<0.600	<0.600	<0.600	0.823 J	<0.600	<0.600
Vanadium	ug/L	n/v	n/v	<3.30	<3.30	<3.30	<3.30	<3.30	<3.30	<3.30
Zinc	ug/L	n/v	n/v	47.3	6.21 U*	111	12.4 U*	234	51.9	3.61 U*
Anions										
Chloride	mg/L	n/v	n/v	39.2	49.3	643	34.8	64.8	257	77.8
Fluoride	mg/L	4[A]	n/v	0.105	0.402	0.271	0.390	<0.330	<0.330	0.864
Sulfate	mg/L	n/v	n/v	4.09	23.8	783	58.2	1,530	2,100	7.30
General Chemistry										
Alkalinity, Bicarbonate	mg/L	n/v	n/v	12.5	42.3	19.0	94.3	15.7	<1.45	332
Alkalinity, Carbonate	mg/L	n/v	n/v	<1.45	<1.45	<1.45	<1.45	<1.45	<1.45	<1.45
Alkalinity, Total as CaCO3	mg/L	n/v	n/v	12.5	42.3	19.0	94.3	15.7	<1.45	332
Total Dissolved Solids	mg/L	n/v	n/v	281 J	181 J	2,280	279 J	2,390	3,350	454

See notes on last page.

TABLE B.4 - Groundwater Analytical Results for Metals, Anions, and General Chemistry
Johnsonville Fossil Plant
April 2020

Sample Location				JOF-118		JOF-119
Sample Date				9-Apr-20	9-Apr-20	9-Apr-20
Sample ID				JOF-GW-028-20200409	JOF-GW-DUP01-20200409	JOF-GW-029-20200409
Sample Depth				48.5 ft	48.5 ft	42.5 ft
Sample Type				Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample
Level of Review	Units	EPA MCLs	CCR Rule GWPS	Final-Verified	Final-Verified	Final-Verified
Total Metals						
Antimony	ug/L	6^A	n/v	<1.00	<1.00	<1.00
Arsenic	ug/L	10^A	n/v	2.18 J	2.25 J	<2.00
Barium	ug/L	$2,000^A$	n/v	30.6	31.4	29.1
Beryllium	ug/L	4^A	n/v	<0.200	<0.200	<0.200
Boron	ug/L	n/v	n/v	65.5	63.9	28.5
Cadmium	ug/L	5^A	n/v	0.382 J	0.353 J	<0.300
Calcium	ug/L	n/v	n/v	40,600	42,100	21,200
Chromium	ug/L	100^A	n/v	<3.00	<3.00	<3.00
Cobalt	ug/L	n/v	6^B	3.02	3.08	0.723 J
Copper	ug/L	n/v	n/v	<0.300	<0.300	<0.300
Lead	ug/L	n/v	15^B	<0.500	<0.500	<0.500
Lithium	ug/L	n/v	40^B	<3.00	<3.00	<3.00
Magnesium	ug/L	n/v	n/v	7,140	7,330	4,210
Mercury	ug/L	2^A	n/v	<0.0670	<0.0670	<0.0670
Molybdenum	ug/L	n/v	100^B	0.344 J	0.341 J	0.354 J
Nickel	ug/L	$100_{(TN\ MCL)}{}^A$	n/v	9.16	9.68	1.58 J
Potassium	ug/L	n/v	n/v	1,300	1,290	1,930
Selenium	ug/L	50^A	n/v	<2.00	<2.00	<2.00
Silver	ug/L	$100_{(TN\ MCL)}{}^A$	n/v	<0.300	<0.300	<0.300
Sodium	ug/L	n/v	n/v	44,500	46,000	45,600
Thallium	ug/L	2^A	n/v	<0.600	<0.600	<0.600
Vanadium	ug/L	n/v	n/v	<3.30	<3.30	<3.30
Zinc	ug/L	n/v	n/v	10.1 U*	10.6 U*	6.82 U*
Anions						
Chloride	mg/L	n/v	n/v	14.2	13.8	22.3
Fluoride	mg/L	4^A	n/v	0.498	0.523	0.420
Sulfate	mg/L	n/v	n/v	127	125	53.1
General Chemistry						
Alkalinity, Bicarbonate	mg/L	n/v	n/v	64.8	64.0	118
Alkalinity, Carbonate	mg/L	n/v	n/v	<1.45	<1.45	<1.45
Alkalinity, Total as CaCO3	mg/L	n/v	n/v	64.8	64.0	118
Total Dissolved Solids	mg/L	n/v	n/v	259	254	199

Notes:

A	EPA Maximum Contaminant Level
B	CCR Rule GWPS (Federal Register / Vol. 83, No. 146 / Monday, July 30, 2018 / Rules and Regulations)
n/v	No standard/guideline value
6.5^A	Concentration is greater than or equal to the indicated standard.
<0.03	analyte was not detected at a concentration greater than the Method Detection Limit
ft	feet below top of casing
ID	identification
J	quantitation is approximate due to limitations identified during data validation
mg/L	milligrams per Liter
U*	result should be considered “not detected” because it was detected in an associated field or laboratory blank at a similar level
ug/L	micrograms per Liter

1. Level of review is defined in the Quality Assurance Project Plan.

TABLE B.5 – Groundwater Analytical Results for Radiological Parameters
Johnsonville Fossil Plant
April 2020

Sample Location Sample Date Sample ID Sample Depth Sample Type Level of Review	Units	EPA MCLs	CCR Rule GWPS	JOF-109 7-Apr-20 JOF-GW-021-20200407 39 ft Normal Environmental Sample Final-Verified	JOF-110 7-Apr-20 JOF-GW-022-20200407 57 ft Normal Environmental Sample Final-Verified	JOF-111 7-Apr-20 JOF-GW-023-20200407 46 ft Normal Environmental Sample Final-Verified	JOF-112 7-Apr-20 JOF-GW-024-20200407 29.5 ft Normal Environmental Sample Final-Verified	JOF-113 8-Apr-20 JOF-GW-025-20200408 43.5 ft Normal Environmental Sample Final-Verified	JOF-114 8-Apr-20 JOF-GW-026-20200408 39.5 ft Normal Environmental Sample Final-Verified
Radiological Parameters									
Radium-226	pCi/L	n/v	n/v	0.680 +/-(0.500)U	0.588 +/-(0.537)U	0.799 +/-(0.406)	2.50 +/-(0.714)	3.07 +/-(0.801)	1.92 +/-(0.603)
Radium-228	pCi/L	n/v	n/v	0.0308 +/-(0.254)U	0.599 +/-(0.382)U*	0.759 +/-(0.519)U*	0.635 +/-(0.497)U	1.13 +/-(0.733)	2.04 +/-(0.702)
Radium-226+228	pCi/L	5[A]	n/v	0.711 +/-(0.561)U	1.19 +/-(0.659)U*	1.56 +/-(0.659)J	3.13 +/-(0.870)J	4.21 +/-(1.09)	3.96 +/-(0.925)

See notes on last page.

TABLE B.5 – Groundwater Analytical Results for Radiological Parameters
Johnsonville Fossil Plant
April 2020

Sample Location				JOF-117	JOF-118		JOF-119
Sample Date				8-Apr-20	9-Apr-20	9-Apr-20	9-Apr-20
Sample ID				JOF-GW-027-20200408	JOF-GW-028-20200409	JOF-GW-DUP01-20200409	JOF-GW-029-20200409
Sample Depth				40.5 ft	48.5 ft	48.5 ft	42.5 ft
Sample Type				Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample
Level of Review	Units	EPA MCLs	CCR Rule GWPS	Final-Verified	Final-Verified	Final-Verified	Final-Verified
Radiological Parameters							
Radium-226	pCi/L	n/v	n/v	1.72 +/-(0.570)	0.751 +/-(0.648)U	1.21 +/-(0.707)	0.241 +/-(0.541)U
Radium-228	pCi/L	n/v	n/v	0.589 +/-(0.364)	0.757 +/-(0.647)U	-0.514 +/-(0.374)U	0.287 +/-(0.407)U
Radium-226+228	pCi/L	5[A]	n/v	2.31 +/-(0.677)	1.51 +/-(0.916)U	1.21 +/-(0.800)J	0.527 +/-(0.677)U

Notes:

A	EPA Maximum Contaminant Level
B	CCR Rule GWPS (Federal Register / Vol. 83, No. 146 / Monday, July 30, 2018 / Rules and Regulations)
n/v	No standard/guideline value
ft	feet below top of casing
ID	identification
J	quantitation is approximate due to limitations identified during data validation
pCi/L	picoCurie per Liter
U	not detected
U*	this result should be considered “not detected” because it was detected in an associated field or laboratory blank at a similar level.

1. Level of review is defined in the Quality Assurance Project Plan.

Stantec

APPENDIX H.6

GROUNDWATER INVESTIGATION EVENT #4 SAMPLING AND ANALYSIS REPORT

Stantec

Johnsonville Fossil Plant Groundwater Investigation Event #4 Sampling and Analysis Report

TDEC Commissioner's Order:
Environmental Investigation Plan
Johnsonville Fossil Plant
New Johnsonville, Tennessee

October 29, 2021

Prepared for:

Tennessee Valley Authority
Chattanooga, Tennessee

TVA

Prepared by:

Stantec Consulting Services Inc.
Lexington, Kentucky

REVISION LOG

Revision	Description	Date
0	Submittal to TDEC	July 30, 2021
1	Addresses October 18, 2021 TDEC Review Comments and Issued for TDEC	October 29, 2021

Sign-off Sheet

This document entitled Johnsonville Fossil Plant Groundwater Investigation Event #4 Sampling and Analysis Report was prepared by Stantec Consulting Services Inc. ("Stantec") for the account of Tennessee Valley Authority (the "Client"). Any reliance on this document by any third party is strictly prohibited. The material in it reflects Stantec's professional judgment in light of the scope, schedule and other limitations stated in the document and in the contract between Stantec and the Client. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. In preparing the document, Stantec did not verify information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions taken based on this document.

Prepared by Jamie Snider

Jamie Snider, Geologic Staff

Reviewed by Carole M. Farr

Carole M. Farr, Senior Principal Geologist

Approved by Brigid T. Brooks Zvirbulis

Brigid Zvirbulis, Project Manager

Table of Contents

Abbreviations

CCR	Coal Combustion Residuals
CCR Parameters	Constituents listed in Appendices III and IV of 40 CFR 257 and five inorganic constituents included in Appendix I of Tennessee Rule 0400-11-01-.04
CEC	Civil and Environmental Consultants, Inc.
CFR	Code of Federal Regulations
COC	Chain-of-Custody
DO	Dissolved Oxygen
EAR	Environmental Assessment Report
EIP	Environmental Investigation Plan
ENV	Environmental
EnvStds	Environmental Standards, Inc.
Event #4	Groundwater investigation field event performed June 8-11, 2020
FSP	Field Sampling Personnel
ft	Feet
GEL	GEL Laboratories LLC
ID	Identification
IDW	Investigation Derived Waste
JOF Plant	Johnsonville Fossil Plant
mg/L	Milligrams per Liter
NTU	Nephelometric Turbidity Units
ORP	Oxidation-Reduction Potential
PPE	Personal Protective Equipment
QAPP	Quality Assurance Project Plan
QC	Quality Control
SAP	Sampling and Analysis Plan
SAR	Sampling and Analysis Report
Stantec	Stantec Consulting Services Inc.
TDEC	Tennessee Department of Environment and Conservation
TDEC Order	Commissioner's Order No. OGC15-0177
TI	Technical Instruction
TVA	Tennessee Valley Authority
USEPA	United States Environmental Protection Agency

1.0 INTRODUCTION

Stantec Consulting Services Inc. (Stantec) has prepared this sampling and analysis report (SAR) on behalf of the Tennessee Valley Authority (TVA) to document the completion of activities related to a groundwater investigation sampling event performed June 8-11, 2020 (Event #4) at TVA's Johnsonville Fossil Plant (JOF Plant) located in New Johnsonville, Tennessee.

The purpose of the groundwater investigation, upon completion of the six groundwater sampling events, is to characterize groundwater conditions at the JOF Plant in support of fulfilling the requirements for the Tennessee Department of Environment and Conservation (TDEC) issued Commissioner's Order No. OGC15-0177 (TDEC Order) to TVA (TDEC 2015). The TDEC Order sets forth a "process for the investigation, assessment, and remediation of unacceptable risks" at TVA's coal ash disposal sites in Tennessee.

The purpose of this SAR is to document the work completed during groundwater sampling Event #4 of 6 total events and to present the information and data collected during the execution of the Groundwater Investigation Sampling and Analysis Plan (SAP) (Stantec 2018a). This SAR is not intended to provide conclusions or evaluations of results. The scope of the groundwater investigation represented herein was conducted pursuant to the SAP and is part of a larger environmental investigation at the JOF Plant. The data provided in this SAR are not inclusive of other programmatic data that exist for the site. The evaluation of the results will include data from the six groundwater sampling events and consider other aspects of the environmental investigation, as well as data collected under other State and/or coal combustion residuals (CCR) programs. This evaluation will be presented in the Environmental Assessment Report (EAR).

Event #4 activities were performed in general accordance with the following documents developed by TVA to support fulfilling the requirements of the TDEC Order at the JOF Plant:

- *Groundwater Investigation SAP* (Stantec 2018a)
- *Environmental Investigation Plan (EIP)* (Stantec 2018b)
- *Quality Assurance Project Plan (QAPP)* (Environmental Standards, Inc. 2018).

The Groundwater Investigation SAP was updated based on TVA- and TDEC-approved Programmatic- and Project-specific changes. Minor variations in scope and procedures from those outlined in the SAP occurred during field activities due to field conditions and programmatic updates and are referenced in Section 3.6.

Event #4 is the fourth in a series of six planned sampling events for the groundwater investigation. Stantec performed the field work activities for this event. Laboratory analysis of constituents was performed by GEL Laboratories LLC (GEL) in Charleston, South Carolina. Quality assurance oversight on data acquisition protocols, sampling practices, and data validation or verification was performed by Environmental Standards, Inc. (EnvStds) under direct contract to TVA.

This report summarizes the groundwater investigation activities for Event #4. The remaining sampling events will be completed before overall conclusions and findings about the groundwater investigation and groundwater conditions at the JOF Plant are made and documented in the EAR.

2.0 OBJECTIVE AND SCOPE

The primary objectives of the groundwater investigation conducted pursuant to the Groundwater Investigation SAP (which includes six sampling events) are to characterize existing groundwater quality and to evaluate groundwater flow conditions at the JOF Plant in response to the TDEC Order. The approach to characterizing the groundwater conditions is to:

- Collect groundwater samples for chemical analyses to evaluate the potential presence of constituents related to CCR in groundwater
- Measure groundwater and surface water elevations for subsequent evaluation of the direction and rate of groundwater flow.

The scope of work intended to achieve the objectives of the groundwater investigation consists of six sampling events at a frequency of one event every two months for one year to characterize seasonal groundwater quality and flow direction. This report describes the activities related to Event #4, performed in June 2020, the scope of which included:

- Collecting groundwater and surface water level measurements
- Collecting field measurements of groundwater quality parameters
- Collecting groundwater samples and associated quality control (QC) samples for laboratory analysis.

These activities were carried out after the installation of permanent monitoring wells as specified in the Groundwater Investigation SAP. Details of the monitoring well installation activities are provided in the JOF Plant Hydrogeologic Investigation SAR.

In addition, pore water measurements from piezometers and temporary wells installed in the CCR units at the JOF Plant are presented in this SAR for comparison with groundwater data. Groundwater piezometer installation activities are described in the JOF Plant Hydrogeologic Investigation SAR. Temporary well installation activities are described in the JOF Plant Exploratory Drilling SAR, and temporary well gauging and sampling information is provided in the JOF Plant CCR Material Characteristics SAR.

3.0 FIELD ACTIVITIES

Groundwater investigation field activities for Event #4 were conducted June 8-11, 2020. Stantec performed groundwater level measurements and sample collection activities based on guidance and specifications in TVA's Environmental (ENV) Technical Instructions (TIs), the SAP, the QAPP, and applicable United States Environmental Protection Agency (USEPA) documents except as noted in the Variations section of this report. As part of TVA's commitment to generate representative and reliable data, data validation and/or verification of laboratory analytical results were performed by EnvStds under direct contract with TVA. EnvStds also conducted audits of field activities and provided quality reviews of field documentation. In addition, on behalf of TDEC, Civil and Environmental Consultants, Inc. (CEC) collect split groundwater samples during this sampling event. Additional information regarding CEC split sample collection is provided in Section 3.3.2.

During Event #4, Stantec conducted the following field activities:

- Measured groundwater levels at nine monitoring wells and one piezometer installed for the TDEC Order, and 19 monitoring wells and nine piezometers installed for other environmental programs (28 total monitoring wells)
- Measured pore water levels at 15 temporary wells and 13 piezometers in the CCR units
- Measured the surface water level at one location in the Tennessee River/Kentucky Lake
- Collected groundwater samples from nine monitoring wells installed for the TDEC Order
- Recorded field measurements of groundwater quality parameters during purging and stabilization at the sampled monitoring wells
- Collected QC samples including one field duplicate, one matrix spike/matrix spike duplicate, three field blanks, and one equipment blank
- Shipped the collected samples to GEL in Charleston, South Carolina.

Details on each activity are presented in the sections below.

3.1 WORK LOCATIONS

The TDEC Order CCR units at the JOF Plant (Ash Disposal Area 1, Active Ash Pond 2, DuPont Road Dredge Cell, South Rail Loop Area 4, and Coal Yard) as well as the monitoring wells, temporary wells, and piezometers sampled and/or gauged during Event #4 are shown on Exhibit A.1 in Appendix A. TVA is currently sampling groundwater at the JOF Plant for TDEC Solid Waste Management permit requirements and the USEPA CCR Rule codified in Title 40 of the Code of Federal Regulations (CFR) Part 257 (40 CFR 257). Monitoring wells that are being sampled as part of other programs are not sampled as part of the groundwater investigation for the TDEC Order.

Groundwater levels were measured in TDEC Order monitoring wells and piezometer, as well as in select additional wells and piezometers from other environmental programs, as shown in Table B.1a in Appendix B, to provide information to prepare groundwater contour maps for this SAR and the JOF Plant EAR. Pore water levels measured in temporary wells and piezometers installed in the CCR units are presented in Table B.1b. Groundwater and pore water elevations are shown on Exhibits A.2 and A.3 in Appendix A. Groundwater elevation contours are depicted on Exhibit A.2 and pore water elevation contours are depicted on Exhibit A.3.

Groundwater analytical and field duplicate samples were collected from the TDEC Order monitoring wells as shown in Table B.2 in Appendix B. Groundwater analytical data collected for the TDEC Order and other environmental programs will be provided in the EAR.

3.2 DOCUMENTATION

Stantec maintained field documentation in accordance with ENV-TI-05.80.03, *Field Record Keeping*, and the QAPP. Field activities and data were recorded on program-specific field forms. Health and safety forms were completed in accordance with TVA and Stantec health and safety requirements. Additional information regarding field documentation is provided below.

3.2.1 Field Forms

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

- *Daily Field Activity Log*
- *Monitoring Well Inspection Checklist*
- *Equipment Calibration Form*
- *Vibrating Wire Piezometer Measurement Form*
- *Groundwater Level Measurement Form*
- *Groundwater Sampling Form*
- *Chain-of-Custody (COC).*

3.2.1.1 Daily Field Activity Log

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

3.2.1.2 Monitoring Well Inspection Checklist

Prior to measuring water levels, Stantec FSP inspected each monitoring and temporary well for damage or indications that the well integrity had been compromised in accordance with ENV-TI-05.80.21, *Monitoring Well Inspection and Maintenance.* Inspection results were documented on a *Monitoring Well Inspection Checklist*. Stantec documented observations and conditions on a well inspection form for this event.

3.2.1.3 Equipment Calibration Form

Stantec FSP performed daily calibration of the water quality meter and turbidity meter and documented the results on an *Equipment Calibration Form*. The form documented the calibration results for temperature, turbidity, specific conductance, pH, dissolved oxygen (DO), and oxidation-reduction potential (ORP), and verified that the field instruments' sensors were operating within acceptance criteria. Refer to Section 3.2.2 for additional details on equipment calibration procedures.

3.2.1.4 Vibrating Wire Piezometer Measurement Form

Stantec FSP recorded field measurement data on a *Vibrating Wire Piezometer Measurement Form*. The form includes the vibrating wire piezometer identification (ID), serial number, time, digits, and temperature. The readings were used to calculate the pressure head (feet [ft] of water) above the vibrating wire sensor to obtain the groundwater or pore water elevation.

3.2.1.5 Groundwater Level Measurement Form

Stantec FSP recorded groundwater level field measurement data on a *Groundwater Level Measurement Form* in accordance with ENV-TI-05.80.44, *Groundwater Level and Well Depth Measurement*. The form includes the monitoring well ID, time, and depth to water measured from a standardized reference point on the top of each well casing, recorded in ft below top of casing.

3.2.1.6 Groundwater Sampling Form

Stantec FSP recorded the depth to water, purge flow rate, volume of groundwater purged, temperature, pH, specific conductance, DO, ORP, turbidity, color of water, and other observations during groundwater purging and sampling activities at each monitoring well in accordance with ENV-TI-05.80.42, *Groundwater Sampling*. Field measurements were recorded on a *Groundwater Sampling Form*. The form also documents the time intervals between measurement of field parameters, low-flow extraction rates, water level drawdown, and water quality parameter measurements until stabilization criteria were met.

3.2.1.7 Chain-of-Custody

Stantec FSP completed *COC* documentation for each groundwater sample collected. The sample ID, sample location, type of sample, sampling date and time, analyses requested, sample pH, and sample custody record were recorded on the *COC*. The Field Team Leader reviewed the *COC* for completeness, and the FSP conducted a QC check of samples in each cooler compared to sample IDs on the corresponding *COC*. *COCs* were completed in accordance with ENV-TI-05.80.02, *Sample Labeling and Custody*.

3.2.2 Equipment Calibration

Field instruments used to collect, generate, or measure water quality parameters were calibrated each day prior to use as specified in the SAP, QAPP, and ENV-TI-05.80.46, *Field Measurement Using a Multi-Parameter Sonde.* Afternoon calibration verifications were performed to evaluate if these instruments remained within acceptance criteria during sampling. Temperature and barometric pressure instrument readings were verified using a calibrated National Institute of Standards and Technology traceable thermometer and National Weather Service (via mesowest.utah.edu) barometric pressure readings for Lexington-Parsons Regional Airport in Darden, Tennessee, respectively. Additional details regarding equipment calibration were recorded on an *Equipment Calibration Form*, as described in Section 3.2.1.3.

3.3 SAMPLING METHODS

The following sections present monitoring well data collection and sampling procedures used during Event #4.

3.3.1 Static Water Level Measurements

FSP measured static groundwater levels at 28 monitoring wells and pore water levels at 15 temporary wells in accordance with ENV-TI-05.80.44, *Groundwater Level and Well Depth Measurement.* On June 8, 2020, static groundwater and pore water level readings were measured and recorded to the nearest 0.01 ft from a reference point on the top of each well casing using an electronic water level indicator. Water level indicator probes were decontaminated prior to the first use and between measurements, and the decontamination was documented as specified in ENV-TI-05.80.05, *Field Sampling Equipment Cleaning and Decontamination.* Depth to groundwater and pore water measurements were recorded on a *Groundwater Level Measurement Form*. A groundwater level measurement was not obtained at monitoring well A-3 because the well cap was stuck and could not be removed.

On June 9, 2020, Stantec calculated the static groundwater level at vibrating wire piezometer JOF-116-PZ. FSP recorded the measured readings and temperature using a vibrating wire readout instrument on a *Vibrating Wire Piezometer Measurement Form.* The readings were used to calculate the pressure head (ft of water) above the vibrating wire sensor to obtain groundwater elevation.

Groundwater and pore water measurements were also obtained from transducers installed within nine and 13 piezometers, respectively. Additionally, a surface water level measurement for the Tennessee River/Kentucky Lake was provided by TVA using the reading closest to noon recorded by an automated staff gauge. The surface water staff gauge location is shown on Exhibit A.1 in Appendix A.

Groundwater level data and pore water level data are shown in Tables B.1a and B.1b, respectively, in Appendix B. A groundwater elevation contour map based on groundwater measurements made in wells and piezometers, along with pore water elevations, is included as Exhibit A.2 in Appendix A. Similarly, a pore water elevation contour map based on pore water measurements in wells and piezometers, along with groundwater elevations, is included as Exhibit A.3 in Appendix A.

3.3.2 Groundwater Purging & Sampling

Analytical and field duplicate samples were collected from nine monitoring wells as shown in Table B.2 in Appendix B. Split samples collected by CEC during Event #4 are also identified in Table B.2. Monitoring wells were purged using dedicated bladder pumps equipped with dedicated tubing using low-flow purging and sampling techniques as specified in ENV-TI-05.80.42, *Groundwater Sampling*.

During the purging process, water quality field parameters including pH, specific conductance, temperature, ORP, and DO were measured using water quality meters (YSI ProPlus with flow-through cell) and recorded on field forms. Depth to water and turbidity were measured and recorded using decontaminated electronic water-level indicators (Heron Dipper-T) and calibrated turbidimeters (Hach 2100Q). Field parameters were measured and recorded on *Groundwater Sampling Forms* during purging until readings were stabilized as specified in the SAP and/or applicable TI. As approved by TDEC, the specific conductance and turbidity stabilization limits were revised to meet overall programmatic objectives for groundwater investigations at the JOF Plant. Well purging was considered complete when three consecutive readings were within the following stabilization limits:

- pH – ± 0.1 Standard Units
- Specific Conductance – ± 3% microSiemens per centimeter
- Turbidity – Less than 5 Nephelometric Turbidity Units (NTUs) or ± 10% for values above 5 NTUs
- DO – Less than 0.5 milligrams per liter (mg/L) or ± 10% for values above 0.5 mg/L.

After water quality stabilization criteria were achieved, the final field parameter results were recorded, purging was discontinued, and a sample was collected as specified in the SAP. Laboratory-provided, pre-preserved sample containers were filled directly from the pump discharge line. Turbidity readings at wells stabilized below 5 NTUs, therefore samples were not collected for dissolved metals analysis. FSP wore new, clean nitrile gloves when handling sample containers and did not touch the interior of containers or container caps. New gloves were used when handling each sample. When filling sample bottles, care was taken to minimize sample aeration (i.e., water was directed down the inner walls of the sample bottle) and to avoid overfilling and diluting preservatives. Each sample bottle was capped before filling the next bottle. Following completion of sampling, final field parameter measurements were made.

Sample containers were labeled and handled in accordance with ENV-TI-05.80.02, *Sample Labeling and Custody.* FSP secured caps on each bottle, attached a custody seal across the cap, and placed the bottles in a cooler on ice within 15 minutes of collection. QC samples were collected in accordance with ENV-TI-05.80.04, *Field Sampling Quality Control.*

Groundwater samples were analyzed for the CCR-related constituents listed in Appendices III and IV of 40 CFR 257. In addition, five inorganic constituents listed in Appendix I of Tennessee Rule 0400-11-01-

.04 and not included in the 40 CFR 257 Appendices III and IV were analyzed to maintain continuity with TDEC environmental programs. These additional TDEC Appendix I constituents included copper, nickel, silver, vanadium, and zinc. The combined federal CCR Appendices III and IV constituents and TDEC Appendix I inorganic constituents will hereafter be referred to collectively as “CCR Parameters.” For geochemical evaluation, major cations/anions not included in the CCR Parameters were included in the analyses. The additional geochemical parameters included bicarbonate, carbonate, magnesium, potassium, and sodium.

3.4 INVESTIGATION DERIVED WASTE

Investigation derived waste (IDW) generated during groundwater investigation activities included:

- Used calibration solutions
- Purge water
- Decontamination fluids
- Disposable personal protective equipment (PPE)
- General trash.

IDW was handled in accordance with ENV-TI-05.80.05, *Field Sampling Equipment Cleaning and Decontamination*; ENV-TI-05.80.42, *Groundwater Sampling* (purge water); the JOF Plant-specific waste management plan; and local, state, and federal regulations. Transportation and disposal of IDW was coordinated with JOF Plant facility management. Used calibration solution was containerized and stored for disposal as directed by the JOF Plant facility management. Purge water and decontamination fluids were containerized for later disposal as specified in the JOF Plant-specific waste management plan. Used disposable PPE (e.g., nitrile gloves) and general trash generated throughout the day were placed in garbage bags and disposed of in a general trash dumpster onsite at the end of each day.

3.5 SAMPLE SHIPMENT

Samples were packed and secured under *COC* procedures specified in ENV-TI-05.80.06, *Handling and Shipping of Samples*. The samples were shipped by FedEx to GEL in Charleston, South Carolina. The laboratory submitted sample receipt confirmation forms to EnvStds for review and confirmation.

3.6 VARIATIONS

The proposed scope and procedures for the groundwater investigation were outlined in the SAP, QAPP, and applicable TVA TIs as detailed in the sections above. Variations in scope or procedures discussed with TDEC and/or TVA, changes based on field conditions, or additional field sampling performed to complete the scope of work in the SAP are described in the following sections. As dicussed below, these variations do not impact the overall usability and representativeness of the dataset provided in this SAR for groundwater investigation sampling Event #4 at the JOF Plant.

3.6.1 Variations in Scope

Variations in scope are provided below.

- Groundwater level gauging and sampling was not performed at well JOF-108 as specified in the SAP because it was not installed (the five borings drilled in that area encountered CCR and/or shallow refusal). This change in scope was approved by TDEC.
- Groundwater level gauging was not performed at monitoring well A-3 during this event as specified in the SAP because the well cap was stuck and could not be removed. A groundwater elevation contour map was prepared based on available static groundwater level measurements from this event. Groundwater level measurements were taken in well A-3 during other events for evaluation in the EAR.

3.6.2 Variations in Procedure

Variations in procedures occurring in the field are provided below.

- As approved by TDEC, the specific conductance and turbidity stabilization limits were revised to meet overall programmatic objectives for groundwater investigations
- GEL was used as the laboratory for non-radium sample analysis in place of Eurofins TestAmerica. This change was approved by TVA and TDEC prior to field work.

4.0 SUMMARY

The data presented in this report are only for groundwater investigation sampling Event #4 at the JOF Plant. The scope of work for Event #4 was to:

- Collect groundwater samples for chemical analyses to assist with subsequent evaluation of the potential presence of CCR-related constituents in groundwater
- Measure groundwater and surface water elevations to assist with subsequent evaluation of groundwater flow direction and rate after multiple data sets have been collected.

In addition, pore water measurements from piezometers and temporary wells installed in the CCR units at the JOF Plant are presented in this SAR for comparison with groundwater data.

Event #4 included collecting groundwater level measurements at 28 monitoring wells and 10 piezometers; pore water measurements at 15 temporary wells and 13 piezometers in the CCR units; and a surface water measurement at one gauge located in the Tennessee River/Kentucky Lake. Groundwater and surface water measurements and elevations are provided in Table B.1a, and pore water measurements and elevations are provided in Table B.1b, and depicted on Exhibits A.2 and A.3.

Water quality measurements and groundwater analytical samples were collected at nine monitoring wells as summarized in Table B.2. Water quality parameters were recorded during purging. Stabilization criteria for pH, specific conductance, turbidity, and DO were achieved at the nine sampling locations. The final measurements prior to initiating sample collection are presented in Table B.3.

Groundwater analytical data for CCR Parameters and geochemical parameters are presented in Table B.4. Analytical data for radium analyses are presented in Table B.5. Analytical data were reported by GEL and then validated or verified by EnvStds.

Stantec has completed Event #4 of the groundwater investigation at the JOF Plant in New Johnsonville, Tennessee, in accordance with the Groundwater Investigation SAP as documented herein. The data collected during Event #4 are usable for reporting and evaluation in the EAR and meet the objectives of the TDEC Order EIP. The complete dataset from this event will be evaluated along with data collected during the remaining groundwater sampling events and under other TDEC Order SAPs, as well as data collected under other State and CCR programs. This evaluation will be provided in the EAR.

5.0 REFERENCES

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

Stantec Consulting Services Inc. (Stantec). 2018a. *Groundwater Investigation Sampling and Analysis Plan, Johnsonville Fossil Plant.* Revision 4. Prepared for Tennessee Valley Authority. December 10, 2018.

Stantec. 2018b. *Environmental Investigation Plan, Johnsonville Fossil Plant.* Revision 4. Prepared for Tennessee Valley Authority. December 10, 2018.

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

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

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

TVA, ENV-TI-05.80.04, *Field Sampling Quality Control*.

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

TVA, ENV-TI-05.80.06, *Handling and Shipping of Samples*.

TVA, ENV-TI-05.80.21, *Monitoring Well Inspection and Maintenance*.

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

TVA, ENV-TI-05.80.44, *Groundwater Level and Well Depth Measurement*.

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

APPENDIX A - EXHIBITS

Exhibit No.

A.1

Title

Monitoring Well and Piezometer Network

Client/Project

Tennessee Valley Authority
Johnsonville Fossil (JOF) Plant TDEC Order

Project Location

New Johnsonville, Tennessee

175568286

Prepared by DMB on 2021-05-24
Technical Review by MD on 2021-05-24

0 450 900 1,350 1,800 Feet

1:5,400 (At original document size of 22x34)

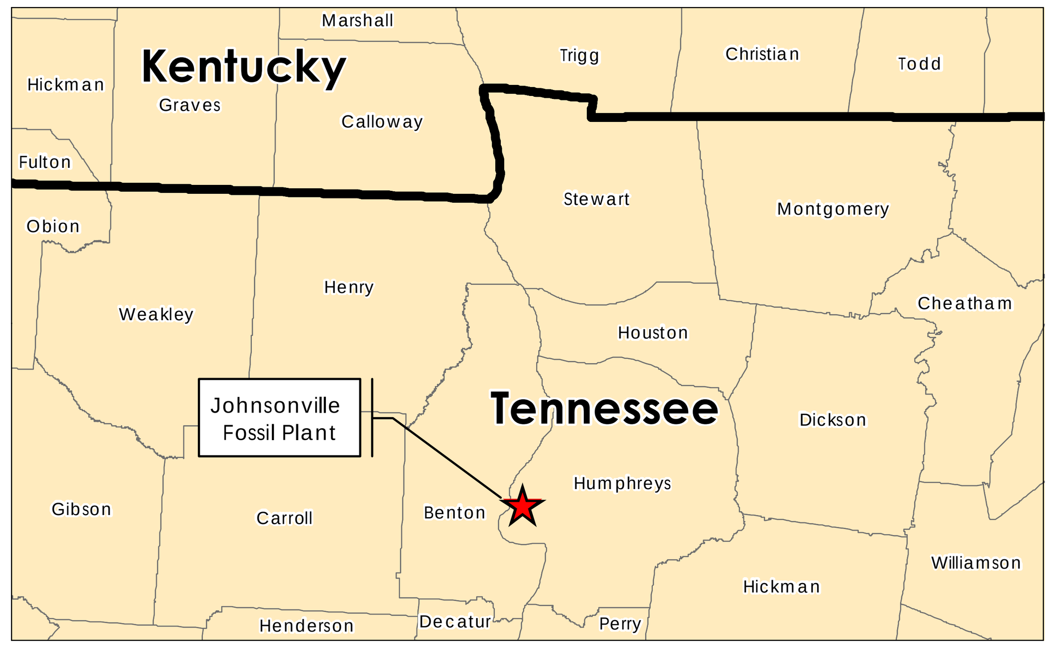
Legend

- Groundwater Investigation Monitoring Well
- Other Monitoring Well
- Piezometer
- Pore Water Piezometer in CCR Material
- Temporary Well within CCR Material
- Tennessee River/Kentucky Lake Gauging Station
- 2017 Imagery Boundary
- 2018 Imagery Boundary
- CCR Unit Area (Approximate)
- Coal Yard (Approximate)

CCR: Coal combustion residuals

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Imagery Provided by TVA (2017 & 2018) & ESRI World Imagery



Stantec TVA

U:\TVA-EP\175568286_JOF_Phase2\gis\mxd\GW_Tech_Memo\JOF_SAR_GW_ExhA1_GW_MonitoringWellNetwork_wPZ.mxd Revised: 2021-05-24 By: mbough

Exhibit No.
A.2

Title
Groundwater Elevation Contour Map, Event #4 (June 8-9, 2020)

Client/Project
Tennessee Valley Authority
Johnsonville Fossil (JOF) Plant TDEC Order

Project Location
New Johnsonville, Tennessee

175568286
Prepared by DMB on 2021-06-01
Technical Review by MD on 2021-06-01

Feet
1:5,400 (At original document size of 22x34)

Legend

- Groundwater Investigation Monitoring Well groundwater elevation in feet above mean sea level (ft amsl)
- Other Monitoring Well groundwater elevation in ft amsl
- Piezometer, groundwater label in blue text, pore water label in yellow highlighted black text; elevation in ft amsl (e.g., JOF-E-2A-PZ2) (e.g., JOF-E-2A-PZ5)
- Piezometer in CCR pore water elevation in ft amsl; value not used for contouring
- Temporary well in CCR pore water elevation in ft amsl; value not used for contouring
- Tennessee River/Kentucky Lake Gauging Station surface water elevation in ft amsl
- Interpolated Groundwater Contour (5 ft interval; elevations are in ft amsl)
- Groundwater Contour (5 ft interval; elevations are in ft amsl)
- 2017 Imagery Boundary
- 2018 Imagery Boundary
- CCR Unit Area (Approximate)
- Coal Yard (Approximate)

CCR: Coal combustion residuals

NM: Not measured; data not available

*Groundwater and pore water elevation displayed but not used as input for contouring due to factors such as well construction or being screened in a different hydrogeologic unit.

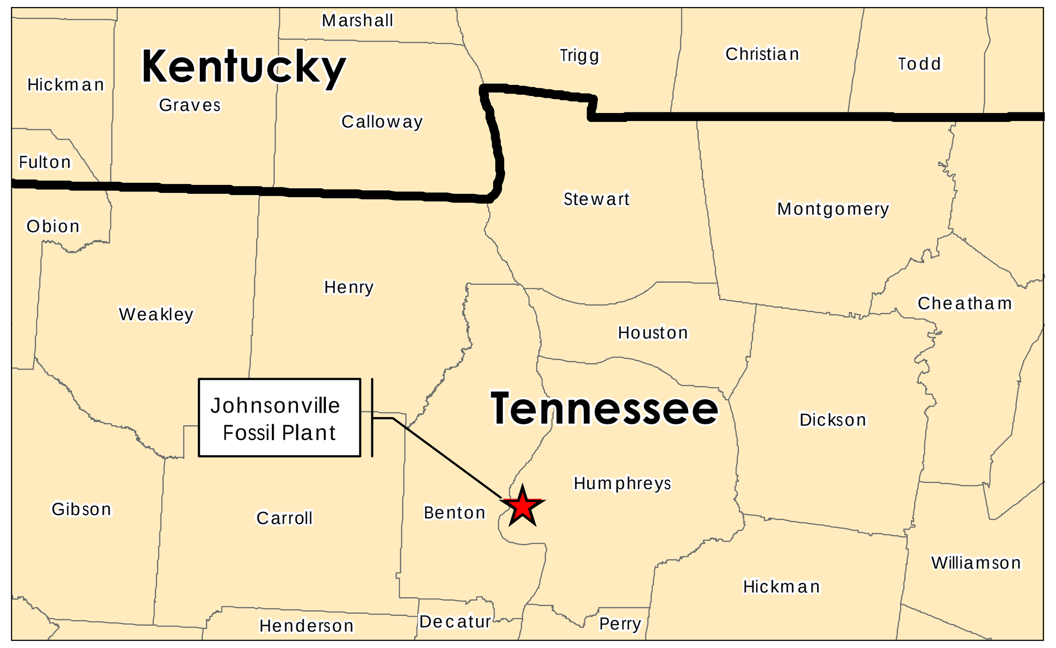
**Nested VWPZ sensors monitoring pore water and groundwater elevations in the same borehole, and the location is shown by a single symbol.

***The JOF_PZET and JOF_PZFT groundwater elevations are approximately 3-4 feet below the trend established in other piezometers within the Active Ash Pond 2. The groundwater elevation is displayed but not used for contouring.

****The B-12 groundwater elevation is approximately 9 feet below the trend for that well established during other SAR events. The groundwater elevation is displayed but not used in contouring for this event.

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Imagery Provided by TVA (2017 & 2018) & ESRI World Imagery
3. Groundwater contours were created using Surfer Version 16.1.350 (December 13, 2018) and manual adjustment



Stantec TVA

Exhibit No.
A.3

Title
Pore water Elevation Contour Map, Event #4 (June 8, 2020)

Client/Project

Tennessee Valley Authority
Johnsonville Fossil (JOF) Plant TDEC Order

Project Location

New Johnsonville, Tennessee

175568286
Prepared by DMB on 2021-10-25
Technical Review by MD on 2021-10-25

0 450 900 1,350 1,800 Feet

1:5,400 (At original document size of 22x34)

Legend

- Groundwater Investigation Monitoring Well groundwater elevation in feet above mean sea level (ft amsl); value not used for contouring
- Other Monitoring Well groundwater elevation in ft amsl; value not used for contouring
- Piezometer, groundwater label in blue text, pore water label in yellow highlighted black text; elevation in ft amsl (e.g., JOF-E-2A-PZ2) (e.g., JOF-E-2A-PZ5)
- Piezometer in CCR pore water elevation in ft amsl
- Temporary well in CCR pore water elevation in ft amsl
- Tennessee River/Kentucky Lake Gauging Station surface water elevation in ft amsl
- Interpolated Pore water Contour (5 ft interval; elevations are in ft amsl)
- Pore water Contour (5 ft interval; elevations are in ft amsl)
- 2017 Imagery Boundary
- 2018 Imagery Boundary
- CCR Unit Area (Approximate)
- Coal Yard (Approximate)

CCR: Coal combustion residuals

NM: Not measured; data not available

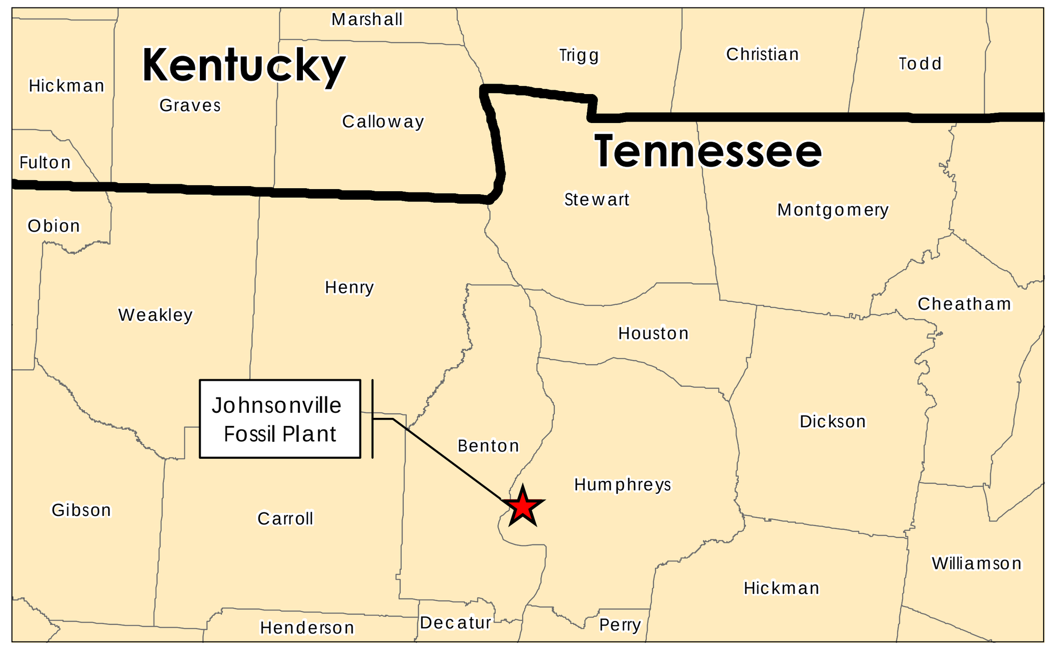
*Groundwater and pore water elevation displayed but not used as input for contouring due to factors such as well construction or being screened in a different hydrogeologic unit.

**Nested VWPZ sensors monitoring pore water and groundwater elevations in the same borehole, and the location is shown by a single symbol.

***The TW03 pore water elevation is approximately 16 feet above the trend for that well established during subsequent SAR events. The pore water elevation is displayed but not used in contouring for this event.

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Imagery Provided by TVA (2017 & 2018) & ESRI World Imagery
3. Pore water contours were created using manual adjustment and Surfer Version 16.1.350 (December 13, 2018)



Stantec TVA

APPENDIX B - TABLES

TABLE B.1a – Groundwater Level Measurements
Johnsonville Fossil Plant
June 2020

UNID	Well / Piezometer ID	Date Measured	Depth to Groundwater	Top of Casing Elevation	Groundwater Elevation	Piezometer Ground Surface Elevation	Piezometer Sensor Elevation	Piezometer Sensor Depth	Screened Interval	Screened / Piezometer Sensor Formation
			ft btoc	ft msl	ft msl	ft msl	ft msl	ft bgs	ft btoc	
Monitoring Wells										
JOF-00-GW-43-001	10-AP1	8-Jun-20	11.67	370.51	358.84	n/a	n/a	n/a	39.0 - 49.1	Alluvium: Sands and Gravels
JOF-00-GW-43-002	10-AP3	8-Jun-20	8.21	367.27	359.06	n/a	n/a	n/a	37.4 - 47.5	Alluvium: Sands and Gravels
JOF-00-GW-43-003	89-B10	8-Jun-20	25.34	401.19	375.85	n/a	n/a	n/a	32.0 - 40.3	Alluvium: Sands and Gravels
JOF-00-GW-43-004	94-B16	8-Jun-20	13.01	390.53	377.52	n/a	n/a	n/a	16.2 - 26.2	Alluvium: Sands and Gravels
JOF-00-GW-43-005	99-B19	8-Jun-20	16.18	394.50	378.32	n/a	n/a	n/a	12.6 - 27.7	Alluvium: Sands and Gravels/Shale Bedrock
JOF-00-GW-43-006	99-B20A	8-Jun-20	29.43	408.88	379.45	n/a	n/a	n/a	21.6 - 36.5	Alluvium: Sands and Gravels
JOF-00-GW-43-007	B-6R	8-Jun-20	17.81	395.57	377.76	n/a	n/a	n/a	18.2 - 21.2	Alluvium: Sands and Gravels
JOF-00-GW-43-008	B-8R	8-Jun-20	11.44	391.04	379.60	n/a	n/a	n/a	13.8 - 16.8	Alluvium: Sands and Gravels
JOF-00-GW-43-009	B-9	8-Jun-20	26.10	423.88	397.78	n/a	n/a	n/a	40.5 - 50.0	Alluvium: Silts and Clays
JOF-00-GW-43-010	B-11	8-Jun-20	20.15	400.67	380.52	n/a	n/a	n/a	26.7 - 36.7	Alluvium: Sands and Gravels
JOF-00-GW-43-011	B-12	8-Jun-20	20.97	393.03	372.06	n/a	n/a	n/a	26.8 - 36.9	Alluvium: Sands and Gravels
JOF-00-GW-43-012	B-13	8-Jun-20	28.49	409.87	381.38	n/a	n/a	n/a	33.8 - 43.9	Alluvium: Sands and Gravels
JOF-00-GW-43-013	JOF-101	8-Jun-20	24.36	424.59	400.23	n/a	n/a	n/a	43.6 - 53.2	Alluvium: Sands and Gravels
JOF-00-GW-43-014	JOF-102	8-Jun-20	18.62	407.64	389.02	n/a	n/a	n/a	23.6 - 33.9	Alluvium: Sands and Gravels
JOF-00-GW-43-015	JOF-103	8-Jun-20	14.88	374.24	359.36	n/a	n/a	n/a	41.9 - 52.1	Alluvium: Sands and Gravels
JOF-00-GW-43-016	JOF-104	8-Jun-20	20.25	379.44	359.19	n/a	n/a	n/a	48.4 - 58.6	Alluvium: Sands and Gravels
JOF-00-GW-43-017	JOF-105	8-Jun-20	27.00	406.15	379.15	n/a	n/a	n/a	23.4 - 33.7	Alluvium: Sands and Gravels
JOF-00-GW-43-018	A-3	n/a	NM	403.73	NM	n/a	n/a	n/a	66.1 - 86.1	Chattanooga Shale/Camden Formation
JOF-00-GW-43-019	JOF-106	8-Jun-20	22.29	403.16	380.87	n/a	n/a	n/a	23.3 - 32.8	Alluvium: Sands and Gravels
JOF-00-GW-43-020	JOF-107	8-Jun-20	28.60	409.95	381.35	n/a	n/a	n/a	31.9 - 41.4	Alluvium: Sands and Gravels
JOF-00-GW-43-021	JOF-109	8-Jun-20	5.68	386.11	380.43	n/a	n/a	n/a	34.1 - 43.9	Alluvium
JOF-00-GW-43-022	JOF-110	8-Jun-20	17.71	388.76	371.05	n/a	n/a	n/a	52.3 - 62.1	Alluvium
JOF-00-GW-43-023	JOF-111	8-Jun-20	19.32	390.08	370.76	n/a	n/a	n/a	41.3 - 51.1	Clay
JOF-00-GW-43-024	JOF-112	8-Jun-20	17.26	394.48	377.22	n/a	n/a	n/a	24.9 - 34.7	Alluvium
JOF-00-GW-43-025	JOF-113	8-Jun-20	28.57	388.13	359.56	n/a	n/a	n/a	39.6 - 49.4	Alluvium
JOF-00-GW-43-026	JOF-114	8-Jun-20	28.78	388.36	359.58	n/a	n/a	n/a	34.7 - 44.5	Alluvium
JOF-00-GW-43-027	JOF-117	8-Jun-20	24.96	388.63	363.67	n/a	n/a	n/a	35.0 - 44.8	Alluvium
JOF-00-GW-43-028	JOF-118	8-Jun-20	13.46	372.69	359.23	n/a	n/a	n/a	43.9 - 53.7	Alluvium
JOF-00-GW-43-029	JOF-119	8-Jun-20	7.74	366.89	359.15	n/a	n/a	n/a	38.0 - 47.8	Alluvium
Piezometers										
n/a	JOF-B-2A-PZ3	8-Jun-20	n/a	n/a	358.4	392.7	322.7	70.0	n/a	Alluvial Sand and Gravel
n/a	JOF-C-2A-PZ3	8-Jun-20	n/a	n/a	359.6	392.8	326.8	66.0	n/a	Alluvial Sand and Gravel
n/a	JOF-C-2B-PZ2	8-Jun-20	n/a	n/a	358.1	370.6	321.6	49.0	n/a	Alluvial Sand and Gravel
n/a	JOF-E-2A-PZ2	8-Jun-20	n/a	n/a	358.3	390.9	327.9	63.0	n/a	Alluvial Sand and Gravel
n/a	JOF-E-2B-PZ2	8-Jun-20	n/a	n/a	357.5	365.4	310.4	55.0	n/a	Alluvial Sand and Gravel
n/a	JOF-K-2A-PZ1	8-Jun-20	n/a	n/a	360.3	377.5	327.5	50.0	n/a	Alluvial Sand and Gravel
n/a	JOF_PZET	8-Jun-20	n/a	n/a	355.3	363.8	329.8	34.0	n/a	Alluvial Clay and Silt and Alluvial Sand and Gravel
n/a	JOF_PZFT	8-Jun-20	n/a	n/a	356.0	362.9	327.6	35.3	n/a	Alluvial Clay and Silt and Alluvial Sand and Gravel
n/a	JOF_PZHT	8-Jun-20	n/a	n/a	359.3	363.1	316.1	47.0	n/a	Alluvial Sand and Gravel
n/a	JOF-116-PZ	9-Jun-20	n/a	n/a	372.4	388.0	342.0	46.0	n/a	Alluvium

See notes on last page.

TABLE B.1a – Groundwater Level Measurements
Johnsonville Fossil Plant
June 2020

UNID	Well / Piezometer ID	Date Measured	Depth to Groundwater	Top of Casing Elevation	Groundwater Elevation	Piezometer Ground Surface Elevation	Piezometer Sensor Elevation	Piezometer Sensor Depth	Screened Interval	Screened / Piezometer Sensor Formation
			ft btoc	ft msl	ft msl	ft msl	ft msl	ft bgs	ft btoc	
Surface Water Gauge										
Tennessee River/Kentucky Lake gauge (GS-1)	n/a	8-Jun-20	n/a	n/a	359.12	n/a	n/a	n/a	n/a	n/a

Notes:

bgs	below ground surface
btoc	below top of casing
ft	feet
ID	identification
msl	mean sea level
n/a	not applicable
NM	not measured
UNID	Unique Numerical Identification

1. Top of casing elevations, screen intervals, and screened formations for monitoring wells were obtained from the TVA Well Inventory Log provided by TVA.
2. Tennessee River/Kentucky Lake data point is the reading closest to noon recorded by the automated staff gauge provided by TVA.
3. For piezometers, ground surface elevation, groundwater elevations and piezometer data were obtained from the geotechnical instrumentation database. Vibrating wire sensor formation information was obtained from boring logs. Data from automated piezometers are averaged for the measurement date.
4. Groundwater elevations in piezometers are calculated values. Accuracy of piezometer data is to 0.1 ft.
5. A groundwater level was not measured in well A-3 because the well was unable to be opened.

TABLE B.1b – Pore Water Level Measurements
Johnsonville Fossil Plant
June 2020

Temporary Well / Piezometer ID	Date Measured	Depth to Pore Water	Top of Casing Elevation	Pore Water Elevation	Piezometer Ground Surface Elevation	Piezometer Sensor Elevation	Piezometer Sensor Depth	Screened Interval	Screened / Piezometer Sensor Formation
		ft btoc	ft msl	ft msl	ft msl	ft msl	ft bgs	ft bgs	
Temporary Wells									
JOF-TW01	8-Jun-20	13.62	396.33	382.71	n/a	n/a	n/a	24.8 - 34.6	CCR
JOF-TW02	8-Jun-20	17.36	397.38	380.02	n/a	n/a	n/a	25.5 - 35.3	CCR
JOF-TW03	8-Jun-20	12.87	409.49	396.62	n/a	n/a	n/a	40.4 - 50.2	CCR
JOF-TW04	8-Jun-20	11.57	394.25	382.68	n/a	n/a	n/a	25.9 - 35.7	CCR
JOF-TW05	8-Jun-20	11.38	393.44	382.06	n/a	n/a	n/a	36.2 - 46.0	CCR
JOF-TW06	8-Jun-20	22.81	395.13	372.32	n/a	n/a	n/a	26.5 - 36.3	CCR
JOF-TW07	8-Jun-20	29.23	402.92	373.69	n/a	n/a	n/a	32.2 - 42.0	CCR
JOF-TW08	8-Jun-20	9.84	387.22	377.38	n/a	n/a	n/a	6.0 - 15.8	CCR
JOF-TW09	8-Jun-20	15.04	387.52	372.48	n/a	n/a	n/a	15.8 - 25.6	CCR
JOF-TW10	8-Jun-20	8.70	384.92	376.22	n/a	n/a	n/a	6.0 - 15.8	CCR
JOF-TW11	8-Jun-20	38.11	440.13	402.02	n/a	n/a	n/a	31.6 - 41.4	CCR
JOF-TW12	8-Jun-20	42.31	444.17	401.86	n/a	n/a	n/a	36.1 - 45.9	CCR
JOF-TW13	8-Jun-20	38.73	441.39	402.66	n/a	n/a	n/a	33.3 - 43.1	CCR
JOF-TW15	8-Jun-20	65.26	451.71	386.45	n/a	n/a	n/a	55.0 - 64.8	CCR
JOF-TW16	8-Jun-20	80.75	473.81	393.06	n/a	n/a	n/a	72.9 - 82.7	CCR
Piezometers									
JOF-E-2A-PZ5	8-Jun-20	n/a	n/a	383.1	390.9	370.9	20.0	n/a	CCR
JOF_PZEC	8-Jun-20	n/a	n/a	382.9	390.4	365.4	25.0	n/a	CCR and Dike Fill
JOF_PZFC	8-Jun-20	n/a	n/a	384.5	389.8	364.8	25.0	n/a	CCR and Dike Fill
JOF_PZGC	8-Jun-20	n/a	n/a	377.7	389.8	364.8	25.0	n/a	CCR and Dike Fill
JOF_PZHC	8-Jun-20	n/a	n/a	382.2	390.0	365.8	24.2	n/a	CCR
JOF_PZIC	8-Jun-20	n/a	n/a	381.8	390.1	360.1	30.0	n/a	CCR and Dike Fill
JOF_PZJC	8-Jun-20	n/a	n/a	381.6	390.0	365.0	25.0	n/a	CCR
JOF_PZKC	8-Jun-20	n/a	n/a	380.3	390.5	365.5	25.0	n/a	CCR
JOF_PZLC	8-Jun-20	n/a	n/a	380.0	390.5	365.5	25.0	n/a	CCR
JOF_PZMC	8-Jun-20	n/a	n/a	375.4	391.1	366.1	25.0	n/a	CCR and Dike Fill
P-8	8-Jun-20	n/a	n/a	400.0	432.8	394.5	38.3	n/a	CCR
P-9	8-Jun-20	n/a	n/a	395.6	432.9	393.8	39.2	n/a	CCR and Clayey Fill
P-10	8-Jun-20	n/a	n/a	401.6	430.7	391.0	39.8	n/a	CCR

Notes:

bgs	below ground surface
btoc	below top of casing
CCR	coal combustion residuals
ft	feet
ID	identification
msl	mean sea level
n/a	not applicable

1. Top of casing elevations, screen intervals, and screened formations were obtained from boring logs, well detail and well survey data.
2. For piezometers, ground surface elevation, pore water elevations, and piezometer data obtained from the geotechnical instrumentation database. Data from automated piezometers are averaged for the measurement date.
3. Pore water elevations in piezometers are calculated values. Accuracy of piezometer data is to 0.1 ft.

TABLE B.2 – Summary of Groundwater Samples
Johnsonville Fossil Plant
June 2020

			Analysis Type								
Location ID	**Sample ID**	**Sample Type**	Field Parameters	Total Metals	Total Mercury	Anions	Alkalinity	Total Dissolved Solids	Radium-226	Radium-228	Radium-226+228
JOF-109	JOF-GW-021-20200609	Normal Environmental Sample	X	X	X	X	X	X	X	X	X
JOF-110	JOF-GW-022-20200611	Normal Environmental Sample	X	X	X	X	X	X	X	X	X
JOF-111	JOF-GW-023-20200611	Normal Environmental Sample	X	X	X	X	X	X	X	X	X
JOF-112	JOF-GW-024-20200609	Normal Environmental Sample	X	X	X	X	X	X	X	X	X
	JOF-GW-DUP01-20200609	Field Duplicate Sample		X	X	X	X	X	X	X	X
JOF-113	JOF-GW-025-20200610	Normal Environmental Sample	X	X	X	X	X	X	X	X	X
JOF-114	JOF-GW-026-20200610	Normal Environmental Sample	X	X	X	X	X	X	X	X	X
JOF-117	JOF-GW-027-20200611	Normal Environmental Sample	X	X	X	X	X	X	X	X	X
JOF-118	JOF-GW-028-20200610	Normal Environmental Sample	X	X	X	X	X	X	X	X	X
JOF-119	JOF-GW-029-20200609	Normal Environmental Sample	X	X	X	X	X	X	X	X	X

Notes:

Total Metals	SW-846 6020A
Total Mercury	SW-846 7470A
Anions	EPA 300.0/SW 9056
Alkalinity	SM2320B
Total Dissolved Solids	SM2540C
Radium-226	EPA 903.0
Radium-228	EPA 904.0
Radium-226+228	CALC
ID	identification

1. Field and laboratory quality control sample results except for field duplicates are not included in report tables but were used for data validation.
2. CEC collected split samples from JOF-111, JOF-114, and JOF-118.

TABLE B.3 – Summary of Groundwater Quality Parameters
Johnsonville Fossil Plant
June 2020

Sample Location		JOF-109	JOF-110	JOF-111	JOF-112	JOF-113	JOF-114	JOF-117	JOF-118	JOF-119
Sample Date		9-Jun-20	11-Jun-20	11-Jun-20	9-Jun-20	10-Jun-20	10-Jun-20	11-Jun-20	10-Jun-20	9-Jun-20
Sample ID		JOF-GW-021-20200609	JOF-GW-022-20200611	JOF-GW-023-20200611	JOF-GW-024-20200609	JOF-GW-025-20200610	JOF-GW-026-20200610	JOF-GW-027-20200611	JOF-GW-028-20200610	JOF-GW-029-20200609
Sample Depth		39 ft	57 ft	46 ft	29.5 ft	43.5 ft	39.5 ft	40.5 ft	48.5 ft	42.5 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Level of Review	Units	Final QC Review	Final QC Review	Final QC Review	Final QC Review	Final QC Review	Final QC Review	Final QC Review	Final QC Review	Final QC Review
Field Parameters										
Dissolved Oxygen	%	10.3	14.1	4.2	3.0	11.5	3.8	3.2	2.2	3.7
Dissolved Oxygen	mg/L	0.93	1.21	0.38	0.29	1.01	0.35	0.29	0.21	0.35
ORP	mV	122.6	74.0	34.3	52.2	143.3	101.7	-97.9	95.1	60.8
pH (field)	SU	5.17	5.43	5.80	6.10	5.84	4.70	6.41	5.68	6.06
Specific Cond. (Field)	uS/cm	188.1	303.4	3,420	418.4	2,377	3,727	1,032	368.4	384.0
Temperature, Water (C)	DEG C	20.0	21.1	19.4	17.4	21.5	19.7	19.8	18.9	17.5
Turbidity, field	NTU	4.72	3.94	2.62	2.80	3.82	4.62	4.10	4.51	3.97

Notes:

%	percent
Cond.	conductance
DEG C	degrees Celsius
ft	feet below top of casing
ID	identification
mg/L	milligrams per Liter
mV	milliVolts
NTU	Nephelometric Turbidity Unit
ORP	Oxidation Reduction Potential, measured using a silver reference electrode which has a standard potential of 200 mV
SU	Standard Units
uS/cm	microSiemens per centimeter

TABLE B.4 - Groundwater Analytical Results for Metals, Anions, and General Chemistry
Johnsonville Fossil Plant
June 2020

Sample Location				JOF-109	JOF-110	JOF-111	JOF-112		JOF-113	JOF-114
Sample Date				9-Jun-20	11-Jun-20	11-Jun-20	9-Jun-20	9-Jun-20	10-Jun-20	10-Jun-20
Sample ID				JOF-GW-021-20200609	JOF-GW-022-20200611	JOF-GW-023-20200611	JOF-GW-024-20200609	JOF-GW-DUP01-20200609	JOF-GW-025-20200610	JOF-GW-026-20200610
Sample Depth				39 ft	57 ft	46 ft	29.5 ft	29.5 ft	43.5 ft	39.5 ft
Sample Type				Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample
Level of Review	Units	EPA MCLs	CCR Rule GWPS	Final-Verified	Validated	Validated	Final-Verified	Final-Verified	Final-Verified	Final-Verified
Total Metals										
Antimony	ug/L	6[A]	n/v	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
Arsenic	ug/L	10[A]	n/v	<2.00	<2.00	5.19	<2.00	<2.00	3.21 J	3.40 J
Barium	ug/L	2,000[A]	n/v	14.2	75.1	30.9	60.7	57.1	23.4	20.5
Beryllium	ug/L	4[A]	n/v	0.362 J	<0.200	<0.200	<0.200	<0.200	<0.200	0.784
Boron	ug/L	n/v	n/v	81.5	1,670	5,000	40.2	41.2	18,600	15,900
Cadmium	ug/L	5[A]	n/v	<0.300	<0.300	<0.300	0.523 J	0.531 J	2.01	<0.300
Calcium	ug/L	n/v	n/v	17,900	18,900	464,000	37,000	37,000	658,000	629,000
Chromium	ug/L	100[A]	n/v	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00
Cobalt	ug/L	n/v	6[B]	0.415 J	3.30	**203[B]**	**108[B]**	**105[B]**	3.09	**68.7[B]**
Copper	ug/L	n/v	n/v	0.910 J	0.419 U*	0.369 U*	<0.300	<0.300	0.343 U*	1.24 U*
Lead	ug/L	n/v	15[B]	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500
Lithium	ug/L	n/v	40[B]	<3.00	<3.00	3.10 J	<3.00	<3.00	**128[B]**	**87.6[B]**
Magnesium	ug/L	n/v	n/v	5,080	4,790	23,000	13,900	13,800	6,480	60,500
Mercury	ug/L	2[A]	n/v	<0.0670	<0.0670	<0.0670	<0.0670	<0.0670	<0.0670	<0.0670
Molybdenum	ug/L	n/v	100[B]	<0.200	0.200 U*	29.8	0.965 J	0.870 J	**251[B]**	0.277 J
Nickel	ug/L	100 (TN MCL)[A]	n/v	22.3	8.92	53.5	9.22	8.67	**115[A]**	17.7 U*
Potassium	ug/L	n/v	n/v	1,360	380	56,900	1,070	1,070	79,600	122,000
Selenium	ug/L	50[A]	n/v	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
Silver	ug/L	100 (TN MCL)[A]	n/v	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300
Sodium	ug/L	n/v	n/v	7,820	35,600	272,000	29,500	29,300	58,500	390,000
Thallium	ug/L	2[A]	n/v	<0.600	<0.600	<0.600	<0.600	<0.600	0.874 J	<0.600
Vanadium	ug/L	n/v	n/v	<3.30	<3.30	<3.30	<3.30	<3.30	<3.30	<3.30
Zinc	ug/L	n/v	n/v	47.7	8.23 U*	101	12.5 J	11.7 J	247	50.6
Anions										
Chloride	mg/L	n/v	n/v	41.6	48.8 J	736 J	35.2	34.0	53.3	252
Fluoride	mg/L	4[A]	n/v	0.0969 J	0.518	0.241 J	0.429	0.420	<0.0330	<0.0330
Sulfate	mg/L	n/v	n/v	4.25	27.3 J	930 J	62.7	61.7	1,510	2,050
General Chemistry										
Alkalinity, Bicarbonate	mg/L	n/v	n/v	12.1	38.0	34.6	96.9	94.5	15.5	2.35 J
Alkalinity, Carbonate	mg/L	n/v	n/v	<1.45	<1.45	<1.45	<1.45	<1.45	<1.45	<1.45
Alkalinity, Total as CaCO3	mg/L	n/v	n/v	12.1	38.0	34.6	96.9	94.5	15.5	2.35 J
Total Dissolved Solids	mg/L	n/v	n/v	87.1	180	2,500	240	220	2,290	3,310

See notes on last page.

TABLE B.4 - Groundwater Analytical Results for Metals, Anions, and General Chemistry
Johnsonville Fossil Plant
June 2020

Sample Location Sample Date Sample ID Sample Depth Sample Type Level of Review	Units	EPA MCLs	CCR Rule GWPS	JOF-117 11-Jun-20 JOF-GW-027-20200611 40.5 ft Normal Environmental Sample Validated	JOF-118 10-Jun-20 JOF-GW-028-20200610 48.5 ft Normal Environmental Sample Final-Verified	JOF-119 9-Jun-20 JOF-GW-029-20200609 42.5 ft Normal Environmental Sample Final-Verified
Total Metals						
Antimony	ug/L	6^A	n/v	<1.00	<1.00	<1.00
Arsenic	ug/L	10^A	n/v	**28.4^A**	2.81 J	3.11 J
Barium	ug/L	2,000^A	n/v	88.9	25.6	40.4
Beryllium	ug/L	4^A	n/v	<0.200	<0.200	<0.200
Boron	ug/L	n/v	n/v	17.8 U*	76.9	40.2
Cadmium	ug/L	5^A	n/v	<0.300	<0.300	<0.300
Calcium	ug/L	n/v	n/v	92,200	39,700	27,500
Chromium	ug/L	100^A	n/v	<3.00	<3.00	<3.00
Cobalt	ug/L	n/v	6^B	**20.1^B**	3.05	3.00
Copper	ug/L	n/v	n/v	<0.300	<0.300	<0.300
Lead	ug/L	n/v	15^B	<0.500	<0.500	<0.500
Lithium	ug/L	n/v	40^B	<3.00	<3.00	<3.00
Magnesium	ug/L	n/v	n/v	28,900	6,300	4,640
Mercury	ug/L	2^A	n/v	<0.0670	<0.0670	<0.0670
Molybdenum	ug/L	n/v	100^B	30.4	0.234 J	0.721 J
Nickel	ug/L	100(TN MCL)^A	n/v	5.26 U*	8.03 U*	2.41
Potassium	ug/L	n/v	n/v	2,790	1,270	1,720
Selenium	ug/L	50^A	n/v	<2.00	<2.00	<2.00
Silver	ug/L	100(TN MCL)^A	n/v	<0.300	<0.300	<0.300
Sodium	ug/L	n/v	n/v	34,200	41,800	59,200
Thallium	ug/L	2^A	n/v	<0.600	<0.600	<0.600
Vanadium	ug/L	n/v	n/v	<3.30	<3.30	<3.30
Zinc	ug/L	n/v	n/v	<3.30	5.50 U*	3.63 J
Anions						
Chloride	mg/L	n/v	n/v	81.6 J	11.6	22.9
Fluoride	mg/L	4^A	n/v	0.957	0.480	0.407
Sulfate	mg/L	n/v	n/v	7.27 J	100	44.9
General Chemistry						
Alkalinity, Bicarbonate	mg/L	n/v	n/v	303	51.5	111
Alkalinity, Carbonate	mg/L	n/v	n/v	<1.45	<1.45	<1.45
Alkalinity, Total as CaCO3	mg/L	n/v	n/v	303	51.5	111
Total Dissolved Solids	mg/L	n/v	n/v	403	250	240

Notes:

A	EPA Maximum Contaminant Level
B	CCR Rule GWPS (Federal Register / Vol. 83, No. 146 / Monday, July 30, 2018 / Rules and Regulations)
n/v	No standard/guideline value
6.5^A	Concentration is greater than or equal to the indicated standard.
<0.03	analyte was not detected at a concentration greater than the Method Detection Limit
ft	feet below top of casing
ID	identification
J	quantitation is approximate due to limitations identified during data validation
mg/L	milligrams per Liter
U*	result should be considered “not detected” because it was detected in an associated field or laboratory blank at a similar level
ug/L	micrograms per Liter

1. Level of review is defined in the Quality Assurance Project Plan.

TABLE B.5 – Groundwater Analytical Results for Radiological Parameters
Johnsonville Fossil Plant
June 2020

Sample Location				JOF-109	JOF-110	JOF-111	JOF-112		JOF-113
Sample Date				9-Jun-20	11-Jun-20	11-Jun-20	9-Jun-20	9-Jun-20	10-Jun-20
Sample ID				JOF-GW-021-20200609	JOF-GW-022-20200611	JOF-GW-023-20200611	JOF-GW-024-20200609	JOF-GW-DUP01-20200609	JOF-GW-025-20200610
Sample Depth				39 ft	57 ft	46 ft	29.5 ft	29.5 ft	43.5 ft
Sample Type				Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample
Level of Review				Final-Verified	Validated	Validated	Final-Verified	Final-Verified	Final-Verified
	Units	EPA MCLs	CCR Rule GWPS						
Radiological Parameters									
Radium-226	pCi/L	n/v	n/v	0.846 +/-(0.454)	0.328 +/-(0.424)U	1.87 +/-(0.930)	2.46 +/-(0.753)	3.31 +/-(0.897)	3.13 +/-(0.848)
Radium-228	pCi/L	n/v	n/v	-0.00890 +/-(0.355)U	0.0457 +/-(0.403)U	0.740 +/-(0.403)	0.0551 +/-(0.328)U	0.127 +/-(0.350)U	0.399 +/-(0.323)U
Radium-226+228	pCi/L	5[A]	n/v	0.846 +/-(0.577)J	0.374 +/-(0.585)U	2.61 +/-(1.01)	2.52 +/-(0.822)J	3.44 +/-(0.963)J	3.53 +/-(0.907)J

See notes on last page.

TABLE B.5 – Groundwater Analytical Results for Radiological Parameters
Johnsonville Fossil Plant
June 2020

Sample Location Sample Date Sample ID Sample Depth Sample Type Level of Review	Units	EPA MCLs	CCR Rule GWPS	JOF-114 10-Jun-20 JOF-GW-026-20200610 39.5 ft Normal Environmental Sample Final-Verified	JOF-117 11-Jun-20 JOF-GW-027-20200611 40.5 ft Normal Environmental Sample Validated	JOF-118 10-Jun-20 JOF-GW-028-20200610 48.5 ft Normal Environmental Sample Final-Verified	JOF-119 9-Jun-20 JOF-GW-029-20200609 42.5 ft Normal Environmental Sample Final-Verified
Radiological Parameters							
Radium-226	pCi/L	n/v	n/v	2.01 +/-(0.670)	2.61 +/-(0.748)	0.345 +/-(0.372)U	0.0436 +/-(0.211)U
Radium-228	pCi/L	n/v	n/v	2.12 +/-(0.738)	0.538 +/-(0.346)	-0.173 +/-(0.326)U	0.238 +/-(0.280)U
Radium-226+228	pCi/L	5[A]	n/v	4.13 +/-(0.997)	3.15 +/-(0.824)	0.345 +/-(0.494)U	0.282 +/-(0.351)U

Notes:

A	EPA Maximum Contaminant Level
B	CCR Rule GWPS (Federal Register / Vol. 83, No. 146 / Monday, July 30, 2018 / Rules and Regulations)
n/v	No standard/guideline value
ft	feet below top of casing
ID	identification
J	quantitation is approximate due to limitations identified during data validation
pCi/L	picoCurie per Liter
U	not detected

1. Level of review is defined in the Quality Assurance Project Plan.

APPENDIX H.7

GROUNDWATER INVESTIGATION EVENT #5 SAMPLING AND ANALYSIS REPORT

Johnsonville Fossil Plant Groundwater Investigation Event #5 Sampling and Analysis Report

TDEC Commissioner's Order:
Environmental Investigation Plan
Johnsonville Fossil Plant
New Johnsonville, Tennessee

October 29, 2021

Prepared for:

Tennessee Valley Authority
Chattanooga, Tennessee

Prepared by:

Stantec Consulting Services Inc.
Lexington, Kentucky

REVISION LOG

Revision	Description	Date
0	Submittal to TDEC	July 30, 2021
1	Addresses October 18, 2021 TDEC Review Comments and Issued for TDEC	October 29, 2021

Sign-off Sheet

This document entitled Johnsonville Fossil Plant Groundwater Investigation Event #5 Sampling and Analysis Report was prepared by Stantec Consulting Services Inc. ("Stantec") for the account of Tennessee Valley Authority (the "Client"). Any reliance on this document by any third party is strictly prohibited. The material in it reflects Stantec's professional judgment in light of the scope, schedule and other limitations stated in the document and in the contract between Stantec and the Client. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. In preparing the document, Stantec did not verify information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions taken based on this document.

Prepared by Jamie Snider

Jamie Snider, Geologic Staff

Reviewed by Carole M. Farr

Carole M. Farr, Senior Principal Geologist

Approved by Brigid T Brooks Zvirbulis

Brigid Zvirbulis, Project Manager

Table of Contents

Abbreviations

CCR	Coal Combustion Residuals
CCR Parameters	Constituents listed in Appendices III and IV of 40 CFR 257 and five inorganic constituents included in Appendix I of Tennessee Rule 0400-11-01-.04
CFR	Code of Federal Regulations
COC	Chain-of-Custody
DO	Dissolved Oxygen
EAR	Environmental Assessment Report
EIP	Environmental Investigation Plan
ENV	Environmental
EnvStds	Environmental Standards, Inc.
Event #5	Groundwater investigation field event performed August 10-13, 2020
FSP	Field Sampling Personnel
ft	Feet
GEL	GEL Laboratories LLC
ID	Identification
IDW	Investigation Derived Waste
JOF Plant	Johnsonville Fossil Plant
mg/L	Milligrams per Liter
NTU	Nephelometric Turbidity Units
ORP	Oxidation-Reduction Potential
PPE	Personal Protective Equipment
QAPP	Quality Assurance Project Plan
QC	Quality Control
SAP	Sampling and Analysis Plan
SAR	Sampling and Analysis Report
Stantec	Stantec Consulting Services Inc.
TDEC	Tennessee Department of Environment and Conservation
TDEC Order	Commissioner's Order No. OGC15-0177
TI	Technical Instruction
TVA	Tennessee Valley Authority
USEPA	United States Environmental Protection Agency

1.0 INTRODUCTION

Stantec Consulting Services Inc. (Stantec) has prepared this sampling and analysis report (SAR) on behalf of the Tennessee Valley Authority (TVA) to document the completion of activities related to a groundwater investigation sampling event performed August 10-13, 2020 (Event #5) at TVA's Johnsonville Fossil Plant (JOF Plant) located in New Johnsonville, Tennessee.

The purpose of the groundwater investigation, upon completion of the six groundwater sampling events, is to characterize groundwater conditions at the JOF Plant in support of fulfilling the requirements for the Tennessee Department of Environment and Conservation (TDEC) issued Commissioner's Order No. OGC15-0177 (TDEC Order) to TVA (TDEC 2015). The TDEC Order sets forth a "process for the investigation, assessment, and remediation of unacceptable risks" at TVA's coal ash disposal sites in Tennessee.

The purpose of this SAR is to document the work completed during groundwater sampling Event #5 of 6 total events and to present the information and data collected during the execution of the Groundwater Investigation Sampling and Analysis Plan (SAP) (Stantec 2018a). This SAR is not intended to provide conclusions or evaluations of results. The scope of the groundwater investigation represented herein was conducted pursuant to the SAP and is part of a larger environmental investigation at the JOF Plant. The data provided in this SAR are not inclusive of other programmatic data that exist for the site. The evaluation of the results will include data from the six groundwater sampling events and consider other aspects of the environmental investigation, as well as data collected under other State and/or coal combustion residuals (CCR) programs. This evaluation will be presented in the Environmental Assessment Report (EAR).

Event #5 activities were performed in general accordance with the following documents developed by TVA to support fulfilling the requirements of the TDEC Order at the JOF Plant:

- *Groundwater Investigation SAP* (Stantec 2018a)
- *Environmental Investigation Plan (EIP)* (Stantec 2018b)
- *Quality Assurance Project Plan (QAPP)* (Environmental Standards, Inc. 2018).

The Groundwater Investigation SAP was updated based on TVA- and TDEC-approved Programmatic- and Project-specific changes. Minor variations in scope and procedures from those outlined in the SAP occurred during field activities due to field conditions and programmatic updates and are referenced in Section 3.6.

Event #5 is the fifth in a series of six planned sampling events for the groundwater investigation. Stantec performed the field work activities for this event. Laboratory analysis of constituents was performed by GEL Laboratories LLC (GEL) in Charleston, South Carolina. Quality assurance oversight on data acquisition protocols, sampling practices, and data validation or verification was performed by Environmental Standards, Inc. (EnvStds) under direct contract to TVA.

This report summarizes the groundwater investigation activities for Event #5. The remaining sampling events will be completed before overall conclusions and findings about the groundwater investigation and groundwater conditions at the JOF Plant are made and documented in the EAR.

2.0 OBJECTIVE AND SCOPE

The primary objectives of the groundwater investigation conducted pursuant to the Groundwater Investigation SAP (which includes six sampling events) are to characterize existing groundwater quality and to evaluate groundwater flow conditions at the JOF Plant in response to the TDEC Order. The approach to characterizing the groundwater conditions is to:

- Collect groundwater samples for chemical analyses to evaluate the potential presence of constituents related to CCR in groundwater
- Measure groundwater and surface water elevations for subsequent evaluation of the direction and rate of groundwater flow.

The scope of work intended to achieve the objectives of the groundwater investigation consists of six sampling events at a frequency of one event every two months for one year to characterize seasonal groundwater quality and flow direction. This report describes the activities related to Event #5, performed in August 2020, the scope of which included:

- Collecting groundwater and surface water level measurements
- Collecting field measurements of groundwater quality parameters
- Collecting groundwater samples and associated quality control (QC) samples for laboratory analysis.

These activities were carried out after the installation of permanent monitoring wells as specified in the Groundwater Investigation SAP. Details of the monitoring well installation activities are provided in the JOF Plant Hydrogeologic Investigation SAR.

In addition, pore water measurements from piezometers and temporary wells installed in the CCR units at the JOF Plant are presented in this SAR for comparison with groundwater data. Groundwater piezometer installation activities are described in the JOF Plant Hydrogeologic Investigation SAR. Temporary well installation activities are described in the JOF Plant Exploratory Drilling SAR, and temporary well gauging and sampling information is provided in the JOF Plant CCR Material Characteristics SAR.

3.0 FIELD ACTIVITIES

Groundwater investigation field activities for Event #5 were conducted August 10-13, 2020. Stantec performed groundwater level measurements and sample collection activities based on guidance and specifications in TVA's Environmental (ENV) Technical Instructions (TIs), the SAP, the QAPP, and applicable United States Environmental Protection Agency (USEPA) documents except as noted in the Variations section of this report. As part of TVA's commitment to generate representative and reliable data, data validation and/or verification of laboratory analytical results were performed by EnvStds under direct contract with TVA. EnvStds also conducted audits of field activities and provided quality reviews of field documentation.

During Event #5, Stantec conducted the following field activities:

- Measured groundwater levels at nine monitoring wells and one piezometer installed for the TDEC Order, and 20 monitoring wells and nine piezometers installed for other environmental programs (29 total monitoring wells)
- Measured pore water levels at 15 temporary wells and 13 piezometers in the CCR units
- Measured the surface water level at one location in the Tennessee River/Kentucky Lake
- Collected groundwater samples from nine monitoring wells installed for the TDEC Order
- Recorded field measurements of groundwater quality parameters during purging and stabilization at the sampled monitoring wells
- Collected QC samples including one field duplicate, one matrix spike/matrix spike duplicate, two field blanks, and one equipment blank
- Shipped the collected samples to GEL in Charleston, South Carolina.

Details on each activity are presented in the sections below.

3.1 WORK LOCATIONS

The TDEC Order CCR units at the JOF Plant (Ash Disposal Area 1, Active Ash Pond 2, DuPont Road Dredge Cell, South Rail Loop Area 4, and Coal Yard) as well as the monitoring wells, temporary wells, and piezometers sampled and/or gauged during Event #5 are shown on Exhibit A.1 in Appendix A. TVA is currently sampling groundwater at the JOF Plant for TDEC Solid Waste Management permit requirements and the USEPA CCR Rule codified in Title 40 of the Code of Federal Regulations (CFR) Part 257 (40 CFR 257). Monitoring wells that are being sampled as part of other programs are not sampled as part of the groundwater investigation for the TDEC Order.

Groundwater levels were measured in TDEC Order monitoring wells and piezometer, as well as in select additional wells and piezometers from other environmental programs, as shown in Table B.1a in

Appendix B, to provide information to prepare groundwater contour maps for this SAR and the JOF Plant EAR. Pore water levels measured in temporary wells and piezometers installed in the CCR units are presented in Table B.1b. Groundwater and pore water elevations are shown on Exhibits A.2 and A.3 in Appendix A. Groundwater elevation contours are depicted on Exhibit A.2 and pore water elevation contours are depicted on Exhibit A.3.

Groundwater analytical and field duplicate samples were collected from the TDEC Order monitoring wells as shown in Table B.2 in Appendix B. Groundwater analytical data collected for the TDEC Order and other environmental programs will be provided in the EAR.

3.2 DOCUMENTATION

Stantec maintained field documentation in accordance with ENV-TI-05.80.03, *Field Record Keeping*, and the QAPP. Field activities and data were recorded on program-specific field forms. Health and safety forms were completed in accordance with TVA and Stantec health and safety requirements. Additional information regarding field documentation is provided below.

3.2.1 Field Forms

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

- *Daily Field Activity Log*
- *Monitoring Well Inspection Checklist*
- *Equipment Calibration Form*
- *Vibrating Wire Piezometer Measurement Form*
- *Groundwater Level Measurement Form*
- *Groundwater Sampling Form*
- *Chain-of-Custody (COC).*

3.2.1.1 Daily Field Activity Log

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

3.2.1.2 Monitoring Well Inspection Checklist

Prior to measuring water levels, Stantec FSP inspected each monitoring and temporary well for damage or indications that the well integrity had been compromised in accordance with ENV-TI-05.80.21, *Monitoring Well Inspection and Maintenance.* Inspection results were documented on a *Monitoring Well*

Inspection Checklist. Stantec documented observations and conditions on a well inspection form for this event.

3.2.1.3 Equipment Calibration Form

Stantec FSP performed daily calibration of the water quality meter and turbidity meter and documented the results on an *Equipment Calibration Form*. The form documented the calibration results for temperature, turbidity, specific conductance, pH, dissolved oxygen (DO), and oxidation-reduction potential (ORP), and verified that the field instruments' sensors were operating within acceptance criteria. Refer to Section 3.2.2 for additional details on equipment calibration procedures.

3.2.1.4 Vibrating Wire Piezometer Measurement Form

Stantec FSP recorded field measurement data on a *Vibrating Wire Piezometer Measurement Form*. The form includes the vibrating wire piezometer identification (ID), serial number, time, digits, and temperature. The readings were used to calculate the pressure head (feet [ft] of water) above the vibrating wire sensor to obtain the groundwater or pore water elevation.

3.2.1.5 Groundwater Level Measurement Form

Stantec FSP recorded groundwater level field measurement data on a *Groundwater Level Measurement Form* in accordance with ENV-TI-05.80.44, *Groundwater Level and Well Depth Measurement*. The form includes the monitoring well ID, time, and depth to water measured from a standardized reference point on the top of each well casing, recorded in ft below top of casing.

3.2.1.6 Groundwater Sampling Form

Stantec FSP recorded the depth to water, purge flow rate, volume of groundwater purged, temperature, pH, specific conductance, DO, ORP, turbidity, color of water, and other observations during groundwater purging and sampling activities at each monitoring well in accordance with ENV-TI-05.80.42, *Groundwater Sampling*. Field measurements were recorded on a *Groundwater Sampling Form*. The form also documents the time intervals between measurement of field parameters, low-flow extraction rates, water level drawdown, and water quality parameter measurements until stabilization criteria were met.

3.2.1.7 Chain-of-Custody

Stantec FSP completed *COC* documentation for each groundwater sample collected. The sample ID, sample location, type of sample, sampling date and time, analyses requested, sample pH, and sample custody record were recorded on the *COC*. The Field Team Leader reviewed the *COC* for completeness, and the FSP conducted a QC check of samples in each cooler compared to sample IDs on the corresponding *COC*. *COCs* were completed in accordance with ENV-TI-05.80.02, *Sample Labeling and Custody*.

3.2.2 Equipment Calibration

Field instruments used to collect, generate, or measure water quality parameters were calibrated each day prior to use as specified in the SAP, QAPP, and ENV-TI-05.80.46, *Field Measurement Using a Multi-Parameter Sonde.* Afternoon calibration verifications were performed to evaluate if these instruments remained within acceptance criteria during sampling. Temperature and barometric pressure instrument readings were verified using a calibrated National Institute of Standards and Technology traceable thermometer and National Weather Service (via mesowest.utah.edu) barometric pressure readings for Lexington-Parsons Regional Airport in Darden, Tennessee, respectively. Additional details regarding equipment calibration were recorded on an *Equipment Calibration Form*, as described in Section 3.2.1.3.

3.3 SAMPLING METHODS

The following sections present monitoring well data collection and sampling procedures used during Event #5.

3.3.1 Static Water Level Measurements

FSP measured static groundwater levels at 29 monitoring wells and pore water levels at 15 temporary wells in accordance with ENV-TI-05.80.44, *Groundwater Level and Well Depth Measurement.* On August 10-11, 2020, static groundwater and pore water level readings were measured and recorded to the nearest 0.01 ft from a reference point on the top of each well casing using an electronic water level indicator. Water level indicator probes were decontaminated prior to the first use and between measurements, and the decontamination was documented as specified in ENV-TI-05.80.05, *Field Sampling Equipment Cleaning and Decontamination.* Depth to groundwater and pore water measurements were recorded on a *Groundwater Level Measurement Form*.

Stantec calculated the static groundwater level at vibrating wire piezometer JOF-116-PZ. FSP recorded the measured readings and temperature using a vibrating wire readout instrument on a *Vibrating Wire Piezometer Measurement Form.* The readings were used to calculate the pressure head (ft of water) above the vibrating wire sensor to obtain groundwater elevation.

Groundwater and pore water measurements were also obtained from transducers installed within nine and 13 piezometers, respectively. Additionally, a surface water level measurement for the Tennessee River/Kentucky Lake was provided by TVA using the reading closest to noon recorded by an automated staff gauge. The surface water staff gauge location is shown on Exhibit A.1 in Appendix A.

Groundwater and pore water level data are shown in Tables B.1a and B.1b, respectively, in Appendix B. A groundwater elevation contour map based on groundwater measurements made in wells and piezometers, along with pore water elevations, is included as Exhibit A.2 in Appendix A. Similarly, a pore water elevation contour map based on pore water measurements in wells and piezometers, along with groundwater elevations, is included as Exhibit A.3 in Appendix A.

3.3.2 Groundwater Purging & Sampling

Analytical and field duplicate samples were collected from nine monitoring wells as shown in Table B.2 in Appendix B. Monitoring wells were purged using dedicated bladder pumps equipped with dedicated tubing using low-flow purging and sampling techniques as specified in ENV-TI-05.80.42, *Groundwater Sampling*.

During the purging process, water quality field parameters including pH, specific conductance, temperature, ORP, and DO were measured using water quality meters (YSI ProPlus with flow-through cell) and recorded on field forms. Depth to water and turbidity were measured and recorded using decontaminated electronic water-level indicators (Heron Dipper-T) and calibrated turbidimeters (Hach 2100Q). Field parameters were measured and recorded on *Groundwater Sampling Forms* during purging until readings were stabilized as specified in the SAP and/or applicable TI. As approved by TDEC, the specific conductance and turbidity stabilization limits were revised to meet overall programmatic objectives for groundwater investigations at the JOF Plant. Well purging was considered complete when three consecutive readings were within the following stabilization limits:

- pH – ± 0.1 Standard Units
- Specific Conductance – ± 3% microSiemens per centimeter
- Turbidity – Less than 5 Nephelometric Turbidity Units (NTUs) or ± 10% for values above 5 NTUs
- DO – Less than 0.5 milligrams per liter (mg/L) or ± 10% for values above 0.5 mg/L.

After water quality stabilization criteria were achieved, the final field parameter results were recorded, purging was discontinued, and a sample was collected as specified in the SAP. Laboratory-provided, pre-preserved sample containers were filled directly from the pump discharge line. Turbidity readings at wells stabilized below 5 NTUs, therefore samples were not collected for dissolved metals analysis. FSP wore new, clean nitrile gloves when handling sample containers and did not touch the interior of containers or container caps. New gloves were used when handling each sample. When filling sample bottles, care was taken to minimize sample aeration (i.e., water was directed down the inner walls of the sample bottle) and to avoid overfilling and diluting preservatives. Each sample bottle was capped before filling the next bottle. Following completion of sampling, final field parameter measurements were made.

Sample containers were labeled and handled in accordance with ENV-TI-05.80.02, *Sample Labeling and Custody.* FSP secured caps on each bottle, attached a custody seal across the cap, and placed the bottles in a cooler on ice within 15 minutes of collection. QC samples were collected in accordance with ENV-TI-05.80.04, *Field Sampling Quality Control.*

Groundwater samples were analyzed for the CCR-related constituents listed in Appendices III and IV of 40 CFR 257. In addition, five inorganic constituents listed in Appendix I of Tennessee Rule 0400-11-01-.04 and not included in the 40 CFR 257 Appendices III and IV were analyzed to maintain continuity with TDEC environmental programs. These additional TDEC Appendix I constituents included copper, nickel, silver, vanadium, and zinc. The combined federal CCR Appendices III and IV constituents and TDEC

Appendix I inorganic constituents will hereafter be referred to collectively as “CCR Parameters.” For geochemical evaluation, major cations/anions not included in the CCR Parameters were included in the analyses. The additional geochemical parameters included bicarbonate, carbonate, magnesium, potassium, and sodium.

3.4 INVESTIGATION DERIVED WASTE

Investigation derived waste (IDW) generated during groundwater investigation activities included:

- Used calibration solutions
- Purge water
- Decontamination fluids
- Disposable personal protective equipment (PPE)
- General trash.

IDW was handled in accordance with ENV-TI-05.80.05, *Field Sampling Equipment Cleaning and Decontamination*; ENV-TI-05.80.42, *Groundwater Sampling* (purge water); the JOF Plant-specific waste management plan; and local, state, and federal regulations. Transportation and disposal of IDW was coordinated with JOF Plant facility management. Used calibration solution was containerized and stored for disposal as directed by the JOF Plant facility management. Purge water and decontamination fluids were containerized for later disposal as specified in the JOF Plant-specific waste management plan. Used disposable PPE (e.g., nitrile gloves) and general trash generated throughout the day were placed in garbage bags and disposed of in a general trash dumpster onsite at the end of each day.

3.5 SAMPLE SHIPMENT

Samples were packed and secured under *COC* procedures specified in ENV-TI-05.80.06, *Handling and Shipping of Samples*. The samples were shipped by FedEx to GEL in Charleston, South Carolina. The laboratory submitted sample receipt confirmation forms to EnvStds for review and confirmation.

3.6 VARIATIONS

The proposed scope and procedures for the groundwater investigation were outlined in the SAP, QAPP, and applicable TVA TIs as detailed in the sections above. Variations in scope or procedures discussed with TDEC and/or TVA, changes based on field conditions, or additional field sampling performed to complete the scope of work in the SAP are described in the following sections. As discussed below, these variations do not impact the overall usability and representativeness of the dataset provided in this SAR for groundwater investigation sampling Event #5 at the JOF Plant.

3.6.1 Variations in Scope

Variations in scope are provided below.

- Groundwater level gauging and sampling was not performed at well JOF-108 as specified in the SAP because it was not installed (the five borings drilled in that area encountered CCR and/or shallow refusal). This change in scope was approved by TDEC.

3.6.2 Variations in Procedure

Variations in procedures occurring in the field are provided below.

- As approved by TDEC, the specific conductance and turbidity stabilization limits were revised to meet overall programmatic objectives for groundwater investigations
- GEL was used as the laboratory for non-radium sample analysis in place of Eurofins TestAmerica. This change was approved by TVA and TDEC prior to field work.

4.0 SUMMARY

The data presented in this report are only for groundwater investigation sampling Event #5 at the JOF Plant. The scope of work for Event #5 was to:

- Collect groundwater samples for chemical analyses to assist with subsequent evaluation of the potential presence of CCR-related constituents in groundwater
- Measure groundwater and surface water elevations to assist with subsequent evaluation of groundwater flow direction and rate after multiple data sets have been collected.

In addition, pore water measurements from piezometers and temporary wells installed in the CCR units at the JOF Plant are presented in this SAR for comparison with groundwater data.

Event #5 included collecting groundwater level measurements at 29 monitoring wells and 10 piezometers; pore water measurements at 15 temporary wells and 13 piezometers in the CCR units; and a surface water measurement at one gauge located in the Tennessee River/Kentucky Lake. Groundwater and surface water measurements and elevations are provided in Table B.1a, and pore water measurements and elevations are provided in Table B.1b, and depicted on Exhibits A.2 and A.3.

Water quality measurements and groundwater analytical samples were collected at nine monitoring wells as summarized in Table B.2. Water quality parameters were recorded during purging. Stabilization criteria for pH, specific conductance, turbidity, and DO were achieved at the nine sampling locations. The final measurements prior to initiating sample collection are presented in Table B.3.

Groundwater analytical data for CCR Parameters and geochemical parameters are presented in Table B.4. Analytical data for radium analyses are presented in Table B.5. Analytical data were reported by GEL and then validated or verified by EnvStds.

Stantec has completed Event #5 of the groundwater investigation at the JOF Plant in New Johnsonville, Tennessee, in accordance with the Groundwater Investigation SAP as documented herein. The data collected during Event #5 are usable for reporting and evaluation in the EAR and meet the objectives of the TDEC Order EIP. The complete dataset from this event will be evaluated along with data collected during the remaining groundwater sampling events and under other TDEC Order SAPs, as well as data collected under other State and CCR programs. This evaluation will be provided in the EAR.

5.0 REFERENCES

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

Stantec Consulting Services Inc. (Stantec). 2018a. *Groundwater Investigation Sampling and Analysis Plan, Johnsonville Fossil Plant.* Revision 4. Prepared for Tennessee Valley Authority. December 10, 2018.

Stantec. 2018b. *Environmental Investigation Plan, Johnsonville Fossil Plant.* Revision 4. Prepared for Tennessee Valley Authority. December 10, 2018.

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

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

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

TVA, ENV-TI-05.80.04, *Field Sampling Quality Control*.

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

TVA, ENV-TI-05.80.06, *Handling and Shipping of Samples*.

TVA, ENV-TI-05.80.21, *Monitoring Well Inspection and Maintenance*.

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

TVA, ENV-TI-05.80.44, *Groundwater Level and Well Depth Measurement*.

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

APPENDIX A - EXHIBITS

Exhibit No.

A.1

Title

Monitoring Well and Piezometer Network

Client/Project

Tennessee Valley Authority
Johnsonville Fossil (JOF) Plant TDEC Order

Project Location

New Johnsonville, Tennessee

175568286
Prepared by DMB on 2021-05-24
Technical Review by MD on 2021-05-24

0 450 900 1,350 1,800 Feet

1:5,400 (At original document size of 22x34)

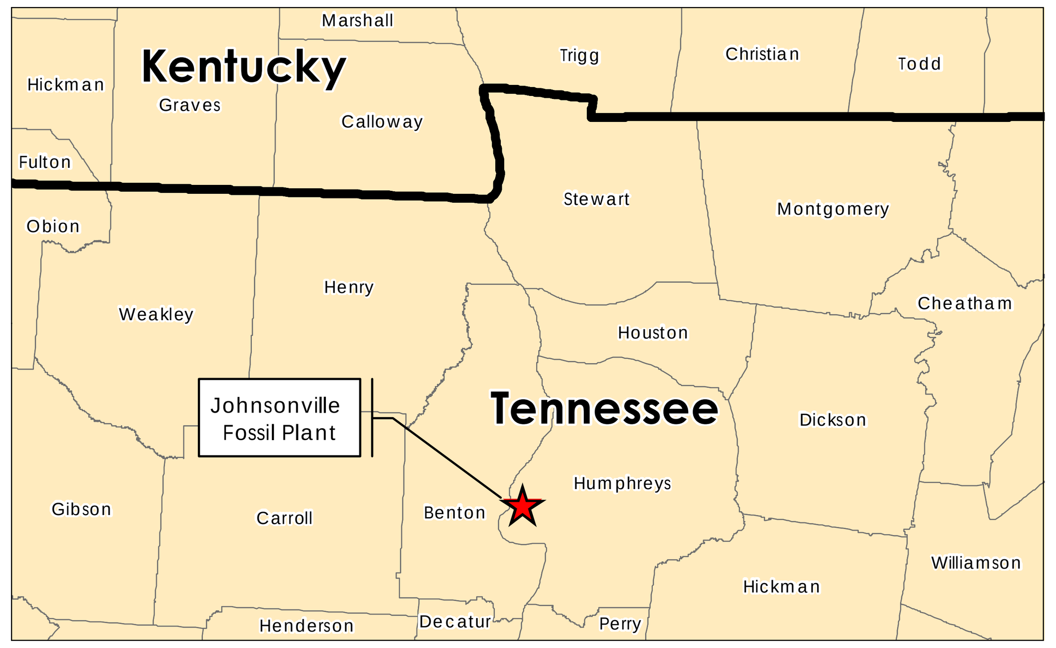
Legend

- Groundwater Investigation Monitoring Well
- Other Monitoring Well
- Piezometer
- Pore Water Piezometer in CCR Material
- Temporary Well within CCR Material
- Tennessee River/Kentucky Lake Gauging Station
- 2017 Imagery Boundary
- 2018 Imagery Boundary
- CCR Unit Area (Approximate)
- Coal Yard (Approximate)

CCR: Coal combustion residuals

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Imagery Provided by TVA (2017 & 2018) & ESRI World Imagery



Stantec TVA

U:\TVA-EP\175568286_JOF_Phase2\gis\mxd\GW_Tech_Memo\JOF_SAR_GW_ExhA1_GW_MonitoringWellNetwork_wP2.mxd Revised: 2021-05-24 By: mbough

Exhibit No.

A.2

Title

Groundwater Elevation Contour Map, Event #5 (August 10-11, 2020)

Client/Project

Tennessee Valley Authority
Johnsonville Fossil (JOF) Plant TDEC Order

Project Location

New Johnsonville, Tennessee

175568286
Prepared by DMB on 2021-06-01
Technical Review by MD on 2021-06-01

0 450 900 1,350 1,800 Feet

1:5,400 (At original document size of 22x34)

Legend

- Groundwater Investigation Monitoring Well groundwater elevation in feet above mean sea level (ft amsl)
- Other Monitoring Well groundwater elevation in ft amsl
- Piezometer, groundwater label in blue text, pore water label in yellow highlighted black text; elevation in ft amsl (e.g., JOF-E-2A-PZ2) (e.g., JOF-E-2A-PZ5)
- Piezometer in CCR pore water elevation in ft amsl; value not used for contouring
- Temporary well in CCR pore water elevation in ft amsl; value not used for contouring
- Tennessee River/Kentucky Lake Gauging Station surface water elevation in ft amsl
- Interpolated Groundwater Contour (5 ft interval; elevations are in ft amsl)
- Groundwater Contour (5 ft interval; elevations are in ft amsl)
- 2017 Imagery Boundary
- 2018 Imagery Boundary
- CCR Unit Area (Approximate)
- Coal Yard (Approximate)

CCR: Coal combustion residuals

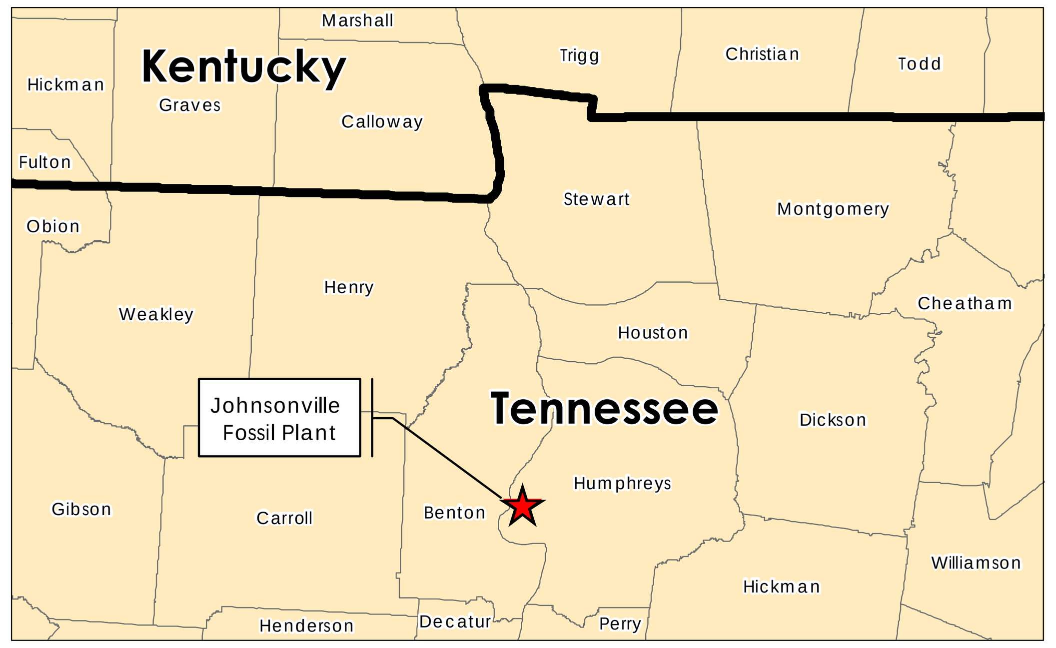
*Groundwater and pore water elevation displayed but not used as input for contouring due to factors such as well construction or being screened in a different hydrogeologic unit.

**Nested VWPZ sensors monitoring pore water and groundwater elevations in the same borehole, and the location is shown by a single symbol.

***The JOF_PZET and JOF_PZFT groundwater elevations are approximately 3-4 feet below the trend established in other piezometers within the Active Ash Pond 2. The groundwater elevation is displayed but not used for contouring.

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Imagery Provided by TVA (2017 & 2018) & ESRI World Imagery
3. Groundwater contours were created using Surfer Version 16.1.350 (December 13, 2018) and manual adjustment



Stantec TVA

U:\TVA-EP\175568286_JOF_Phase2\gis\mxd\GW_Tech_Memo\JOF_SAR_GW_ExhA2_GroundwaterContour_Event5.mxd Revised: 2021-06-01 By: mbough

Exhibit No.

A.3

Title

Pore water Elevation Contour Map, Event #5 (August 10, 2020)

Client/Project

Tennessee Valley Authority
Johnsonville Fossil (JOF) Plant TDEC Order

Project Location

175568286

New Johnsonville, Tennessee

Prepared by DMB on 2021-10-25
Technical Review by MD on 2021-10-25

0 450 900 1,350 1,800 Feet

1:5,400 (At original document size of 22x34)

Legend

- Groundwater Investigation Monitoring Well groundwater elevation in feet above mean sea level (ft amsl); value not used for contouring
- Other Monitoring Well groundwater elevation in ft amsl; value not used for contouring
- Piezometer, groundwater label in blue text, pore water label in yellow highlighted black text; elevation in ft amsl (e.g., JOF-E-2A-PZ2) (e.g., JOF-E-2A-PZ5)
- Piezometer in CCR pore water elevation in ft amsl
- Temporary well in CCR pore water elevation in ft amsl
- Tennessee River/Kentucky Lake Gauging Station surface water elevation in ft amsl
- Interpolated Pore water Contour (5 ft interval; elevations are in ft amsl)
- Pore water Contour (5 ft interval; elevations are in ft amsl)
- 2017 Imagery Boundary
- 2018 Imagery Boundary
- CCR Unit Area (Approximate)
- Coal Yard (Approximate)

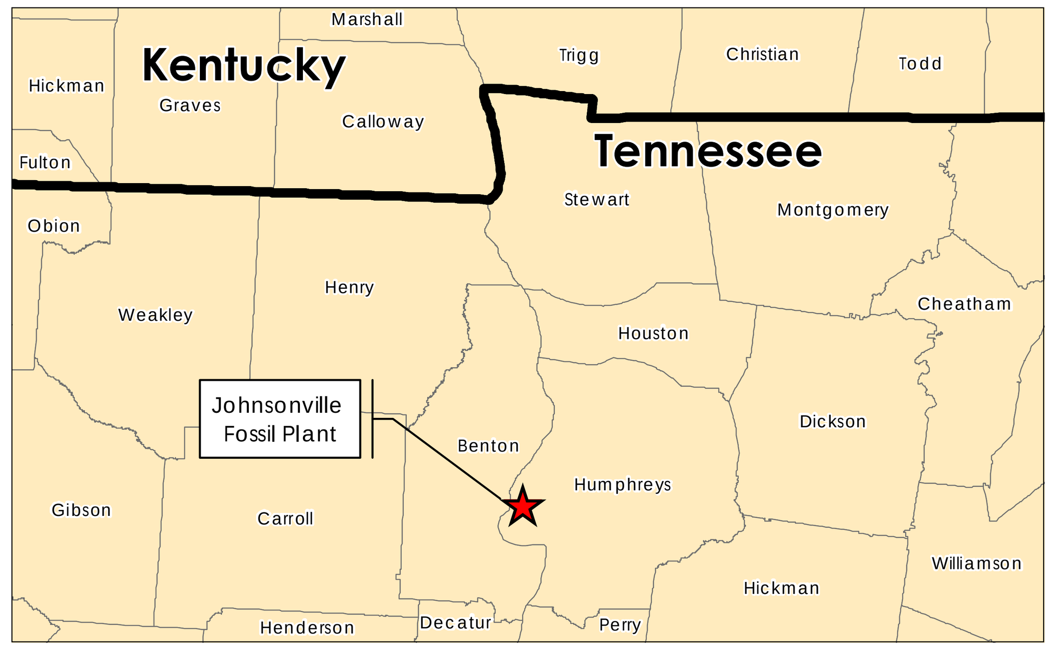
CCR: Coal combustion residuals

*Groundwater elevation displayed but not used as input for contouring due to factors such as well construction or being screened in a different hydrogeologic unit.

**Nested VWPZ sensors monitoring pore water and groundwater elevations in the same borehole, and the location is shown by a single symbol.

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Imagery Provided by TVA (2017 & 2018) & ESRI World Imagery
3. Pore water contours were created using manual adjustment and Surfer Version 16.1.350 (December 13, 2018)



Stantec TVA

APPENDIX B - TABLES

TABLE B.1a – Groundwater Level Measurements
Johnsonville Fossil Plant
August 2020

UNID	Well / Piezometer ID	Date Measured	Depth to Groundwater	Top of Casing Elevation	Groundwater Elevation	Piezometer Ground Surface Elevation	Piezometer Sensor Elevation	Piezometer Sensor Depth	Screened Interval	Screened / Piezometer Sensor Formation
			ft btoc	ft msl	ft msl	ft msl	ft msl	ft bgs	ft btoc	
Monitoring Wells										
JOF-00-GW-43-001	10-AP1	10-Aug-20	13.99	370.51	356.52	n/a	n/a	n/a	39.0 - 49.1	Alluvium: Sands and Gravels
JOF-00-GW-43-002	10-AP3	10-Aug-20	10.55	367.27	356.72	n/a	n/a	n/a	37.4 - 47.5	Alluvium: Sands and Gravels
JOF-00-GW-43-003	89-B10	10-Aug-20	25.65	401.19	375.54	n/a	n/a	n/a	32.0 - 40.3	Alluvium: Sands and Gravels
JOF-00-GW-43-004	94-B16	10-Aug-20	13.61	390.53	376.92	n/a	n/a	n/a	16.2 - 26.2	Alluvium: Sands and Gravels
JOF-00-GW-43-005	99-B19	10-Aug-20	16.34	394.50	378.16	n/a	n/a	n/a	12.6 - 27.7	Alluvium: Sands and Gravels/Shale Bedrock
JOF-00-GW-43-006	99-B20A	10-Aug-20	29.90	408.88	378.98	n/a	n/a	n/a	21.6 - 36.5	Alluvium: Sands and Gravels
JOF-00-GW-43-007	B-6R	10-Aug-20	17.92	395.57	377.65	n/a	n/a	n/a	18.2 - 21.2	Alluvium: Sands and Gravels
JOF-00-GW-43-008	B-8R	10-Aug-20	12.03	391.04	379.01	n/a	n/a	n/a	13.8 - 16.8	Alluvium: Sands and Gravels
JOF-00-GW-43-009	B-9	10-Aug-20	26.85	423.88	397.03	n/a	n/a	n/a	40.5 - 50.0	Alluvium: Silts and Clays
JOF-00-GW-43-010	B-11	10-Aug-20	20.55	400.67	380.12	n/a	n/a	n/a	26.7 - 36.7	Alluvium: Sands and Gravels
JOF-00-GW-43-011	B-12	10-Aug-20	12.28	393.03	380.75	n/a	n/a	n/a	26.8 - 36.9	Alluvium: Sands and Gravels
JOF-00-GW-43-012	B-13	11-Aug-20	29.25	409.87	380.62	n/a	n/a	n/a	33.8 - 43.9	Alluvium: Sands and Gravels
JOF-00-GW-43-013	JOF-101	10-Aug-20	25.75	424.59	398.84	n/a	n/a	n/a	43.6 - 53.2	Alluvium: Sands and Gravels
JOF-00-GW-43-014	JOF-102	10-Aug-20	19.58	407.64	388.06	n/a	n/a	n/a	23.6 - 33.9	Alluvium: Sands and Gravels
JOF-00-GW-43-015	JOF-103	10-Aug-20	17.20	374.24	357.04	n/a	n/a	n/a	41.9 - 52.1	Alluvium: Sands and Gravels
JOF-00-GW-43-016	JOF-104	10-Aug-20	22.60	379.44	356.84	n/a	n/a	n/a	48.4 - 58.6	Alluvium: Sands and Gravels
JOF-00-GW-43-017	JOF-105	10-Aug-20	27.33	406.15	378.82	n/a	n/a	n/a	23.4 - 33.7	Alluvium: Sands and Gravels
JOF-00-GW-43-018	A-3	10-Aug-20	23.70	403.73	380.03	n/a	n/a	n/a	66.1 - 86.1	Chattanooga Shale/Camden Formation
JOF-00-GW-43-019	JOF-106	10-Aug-20	22.70	403.16	380.46	n/a	n/a	n/a	23.3 - 32.8	Alluvium: Sands and Gravels
JOF-00-GW-43-020	JOF-107	10-Aug-20	28.90	409.95	381.05	n/a	n/a	n/a	31.9 - 41.4	Alluvium: Sands and Gravels
JOF-00-GW-43-021	JOF-109	10-Aug-20	5.70	386.11	380.41	n/a	n/a	n/a	34.1 - 43.9	Alluvium
JOF-00-GW-43-022	JOF-110	10-Aug-20	18.05	388.76	370.71	n/a	n/a	n/a	52.3 - 62.1	Alluvium
JOF-00-GW-43-023	JOF-111	10-Aug-20	19.65	390.08	370.43	n/a	n/a	n/a	41.3 - 51.1	Clay
JOF-00-GW-43-024	JOF-112	10-Aug-20	17.30	394.48	377.18	n/a	n/a	n/a	24.9 - 34.7	Alluvium
JOF-00-GW-43-025	JOF-113	10-Aug-20	28.55	388.13	359.58	n/a	n/a	n/a	39.6 - 49.4	Alluvium
JOF-00-GW-43-026	JOF-114	10-Aug-20	28.88	388.36	359.48	n/a	n/a	n/a	34.7 - 44.5	Alluvium
JOF-00-GW-43-027	JOF-117	10-Aug-20	26.60	388.63	362.03	n/a	n/a	n/a	35.0 - 44.8	Alluvium
JOF-00-GW-43-028	JOF-118	10-Aug-20	15.84	372.69	356.85	n/a	n/a	n/a	43.9 - 53.7	Alluvium
JOF-00-GW-43-029	JOF-119	10-Aug-20	10.09	366.89	356.80	n/a	n/a	n/a	38.0 - 47.8	Alluvium
Piezometers										
n/a	JOF-B-2A-PZ3	10-Aug-20	n/a	n/a	356.3	392.7	322.7	70.0	n/a	Alluvial Sand and Gravel
n/a	JOF-C-2A-PZ3	10-Aug-20	n/a	n/a	357.8	392.8	326.8	66.0	n/a	Alluvial Sand and Gravel
n/a	JOF-C-2B-PZ2	10-Aug-20	n/a	n/a	356.1	370.6	321.6	49.0	n/a	Alluvial Sand and Gravel
n/a	JOF-E-2A-PZ2	10-Aug-20	n/a	n/a	356.2	390.9	327.9	63.0	n/a	Alluvial Sand and Gravel
n/a	JOF-E-2B-PZ2	10-Aug-20	n/a	n/a	355.5	365.4	310.4	55.0	n/a	Alluvial Sand and Gravel
n/a	JOF-K-2A-PZ1	10-Aug-20	n/a	n/a	358.9	377.5	327.5	50.0	n/a	Alluvial Sand and Gravel
n/a	JOF_PZET	10-Aug-20	n/a	n/a	352.9	363.8	329.8	34.0	n/a	Alluvial Clay and Silt and Alluvial Sand and Gravel
n/a	JOF_PZFT	10-Aug-20	n/a	n/a	352.5	362.9	327.6	35.3	n/a	Alluvial Clay and Silt and Alluvial Sand and Gravel
n/a	JOF_PZHT	10-Aug-20	n/a	n/a	357.3	363.1	316.1	47.0	n/a	Alluvial Sand and Gravel
n/a	JOF-116-PZ	10-Aug-20	n/a	n/a	372.4	388.0	342.0	46.0	n/a	Alluvium

See notes on last page.

TABLE B.1a – Groundwater Level Measurements
Johnsonville Fossil Plant
August 2020

UNID	Well / Piezometer ID	Date Measured	Depth to Groundwater	Top of Casing Elevation	Groundwater Elevation	Piezometer Ground Surface Elevation	Piezometer Sensor Elevation	Piezometer Sensor Depth	Screened Interval	Screened / Piezometer Sensor Formation
			ft btoc	ft msl	ft msl	ft msl	ft msl	ft bgs	ft btoc	
Surface Water Gauge										
Tennessee River/Kentucky Lake gauge (GS-1)	n/a	10-Aug-20	n/a	n/a	356.83	n/a	n/a	n/a	n/a	n/a

Notes:

bgs below ground surface
btoc below top of casing
ft feet
ID identification
msl mean sea level
n/a not applicable
UNID Unique Numerical Identification

1. Top of casing elevations, screen intervals, and screened formations for monitoring wells were obtained from the TVA Well Inventory Log provided by TVA.
2. Tennessee River/Kentucky Lake data point is the reading closest to noon recorded by the automated staff gauge provided by TVA.
3. For piezometers, ground surface elevation, groundwater elevations and piezometer data were obtained from the geotechnical instrumentation database. Vibrating wire sensor formation information was obtained from boring logs. Data from automated piezometers are averaged for the measurement date.
4. Groundwater elevations in piezometers are calculated values. Accuracy of piezometer data is to 0.1 ft.

TABLE B.1b – Pore Water Level Measurements
Johnsonville Fossil Plant
August 2020

Temporary Well / Piezometer ID	Date Measured	Depth to Pore Water	Top of Casing Elevation	Pore Water Elevation	Piezometer Ground Surface Elevation	Piezometer Sensor Elevation	Piezometer Sensor Depth	Screened Interval	Screened / Piezometer Sensor Formation
		ft btoc	ft msl	ft msl	ft msl	ft msl	ft bgs	ft bgs	
Temporary Wells									
JOF-TW01	10-Aug-20	15.35	396.33	380.98	n/a	n/a	n/a	24.8 - 34.6	CCR
JOF-TW02	10-Aug-20	18.74	397.38	378.64	n/a	n/a	n/a	25.5 - 35.3	CCR
JOF-TW03	10-Aug-20	31.28	409.49	378.21	n/a	n/a	n/a	40.4 - 50.2	CCR
JOF-TW04	10-Aug-20	11.74	394.25	382.51	n/a	n/a	n/a	25.9 - 35.7	CCR
JOF-TW05	10-Aug-20	11.05	393.44	382.39	n/a	n/a	n/a	36.2 - 46.0	CCR
JOF-TW06	10-Aug-20	22.90	395.13	372.23	n/a	n/a	n/a	26.5 - 36.3	CCR
JOF-TW07	10-Aug-20	29.14	402.92	373.78	n/a	n/a	n/a	32.2 - 42.0	CCR
JOF-TW08	10-Aug-20	9.18	387.22	378.04	n/a	n/a	n/a	6.0 - 15.8	CCR
JOF-TW09	10-Aug-20	15.70	387.52	371.82	n/a	n/a	n/a	15.8 - 25.6	CCR
JOF-TW10	10-Aug-20	9.30	384.92	375.62	n/a	n/a	n/a	6.0 - 15.8	CCR
JOF-TW11	10-Aug-20	38.18	440.13	401.95	n/a	n/a	n/a	31.6 - 41.4	CCR
JOF-TW12	10-Aug-20	42.90	444.17	401.27	n/a	n/a	n/a	36.1 - 45.9	CCR
JOF-TW13	10-Aug-20	38.85	441.39	402.54	n/a	n/a	n/a	33.3 - 43.1	CCR
JOF-TW15	10-Aug-20	65.84	451.71	385.87	n/a	n/a	n/a	55.0 - 64.8	CCR
JOF-TW16	10-Aug-20	81.74	473.81	392.07	n/a	n/a	n/a	72.9 - 82.7	CCR
Piezometers									
JOF-E-2A-PZ5	10-Aug-20	n/a	n/a	383.3	390.9	370.9	20.0	n/a	CCR
JOF_PZEC	10-Aug-20	n/n	n/a	382.6	390.4	365.4	25.0	n/a	CCR and Dike Fill
JOF_PZFC	10-Aug-20	n/a	n/a	383.1	389.8	364.8	25.0	n/a	CCR and Dike Fill
JOF_PZGC	10-Aug-20	n/a	n/a	378.7	389.8	364.8	25.0	n/a	CCR and Dike Fill
JOF_PZHC	10-Aug-20	n/a	n/a	382.4	390.0	365.8	24.2	n/a	CCR
JOF_PZIC	10-Aug-20	n/a	n/a	381.7	390.1	360.1	30.0	n/a	CCR and Dike Fill
JOF_PZJC	10-Aug-20	n/a	n/a	381.5	390.0	365.0	25.0	n/a	CCR
JOF_PZKC	10-Aug-20	n/a	n/a	379.9	390.5	365.5	25.0	n/a	CCR
JOF_PZLC	10-Aug-20	n/a	n/a	379.0	390.5	365.5	25.0	n/a	CCR
JOF_PZMC	10-Aug-20	n/a	n/a	376.7	391.1	366.1	25.0	n/a	CCR and Dike Fill
P-8	10-Aug-20	n/a	n/a	400.1	432.8	394.5	38.3	n/a	CCR
P-9	10-Aug-20	n/a	n/a	395.7	432.9	393.8	39.2	n/a	CCR and Clayey Fill
P-10	10-Aug-20	n/a	n/a	401.6	430.7	391.0	39.8	n/a	CCR

Notes:

bgs	below ground surface
btoc	below top of casing
CCR	coal combustion residuals
ft	feet
ID	identification
msl	mean sea level
n/a	not applicable

1. Top of casing elevations, screen intervals, and screened formations were obtained from boring logs, well detail and well survey data.
2. For piezometers, ground surface elevation, pore water elevations, and piezometer data obtained from the geotechnical instrumentation database. Data from automated piezometers are averaged for the measurement date.
3. Pore water elevations in piezometers are calculated values. Accuracy of piezometer data is to 0.1 ft.

TABLE B.2 – Summary of Groundwater Samples
Johnsonville Fossil Plant
August 2020

			Analysis Type								
Location ID	**Sample ID**	**Sample Type**	Field Parameters	Total Metals	Total Mercury	Anions	Alkalinity	Total Dissolved Solids	Radium-226	Radium-228	Radium-226+228
JOF-109	JOF-GW-021-20200812	Normal Environmental Sample	X	X	X	X	X	X	X	X	X
JOF-110	JOF-GW-022-20200812	Normal Environmental Sample	X	X	X	X	X	X	X	X	X
JOF-111	JOF-GW-023-20200812	Normal Environmental Sample	X	X	X	X	X	X	X	X	X
JOF-112	JOF-GW-024-20200813	Normal Environmental Sample	X	X	X	X	X	X	X	X	X
JOF-113	JOF-GW-025-20200813	Normal Environmental Sample	X	X	X	X	X	X	X	X	X
	JOF-GW-DUP01-20200813	Field Duplicate Sample		X	X	X	X	X	X	X	X
JOF-114	JOF-GW-026-20200813	Normal Environmental Sample	X	X	X	X	X	X	X	X	X
JOF-117	JOF-GW-027-20200813	Normal Environmental Sample	X	X	X	X	X	X	X	X	X
JOF-118	JOF-GW-028-20200813	Normal Environmental Sample	X	X	X	X	X	X	X	X	X
JOF-119	JOF-GW-029-20200813	Normal Environmental Sample	X	X	X	X	X	X	X	X	X

Notes:

Total Metals	SW-846 6020A
Total Mercury	SW-846 7470A
Anions	EPA 300.0/SW 9056
Alkalinity	SM2320B
Total Dissolved Solids	SM2540C
Radium-226	EPA 903.0
Radium-228	EPA 904.0
Radium-226+228	CALC
ID	identification

1. Field and laboratory quality control sample results except for field duplicates are not included in report tables but were used for data validation.

TABLE B.3 – Summary of Groundwater Quality Parameters
Johnsonville Fossil Plant
August 2020

Sample Location		JOF-109	JOF-110	JOF-111	JOF-112	JOF-113	JOF-114	JOF-117	JOF-118	JOF-119
Sample Date		12-Aug-20	12-Aug-20	12-Aug-20	13-Aug-20	13-Aug-20	13-Aug-20	13-Aug-20	13-Aug-20	13-Aug-20
Sample ID		JOF-GW-021-20200812	JOF-GW-022-20200812	JOF-GW-023-20200812	JOF-GW-024-20200813	JOF-GW-025-20200813	JOF-GW-026-20200813	JOF-GW-027-20200813	JOF-GW-028-20200813	JOF-GW-029-20200813
Sample Depth		39 ft	57 ft	46 ft	29.5 ft	43.5 ft	39.5 ft	40.5 ft	48.5 ft	42.5 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Level of Review	Units	Final QC Review	Final QC Review	Final QC Review	Final QC Review	Final QC Review	Final QC Review	Final QC Review	Final QC Review	Final QC Review
Field Parameters										
Dissolved Oxygen	%	32.8	8.1	5.7	3.8	4.9	4.2	1.6	3.1	2.3
Dissolved Oxygen	mg/L	2.99	0.70	0.50	0.35	0.48	0.38	0.14	0.28	0.21
ORP	mV	136.4	-8.0	-27.7	74.0	115.5	170.5	119.5	83.3	41.2
pH (field)	SU	4.84	5.25	6.12	6.22	5.92	4.61	6.34	5.62	6.04
Specific Cond. (Field)	uS/cm	273.8	410.9	3,709	546.3	2,780	4,108	1,616	589	574
Temperature, Water (C)	DEG C	19.7	22.6	20.7	19.3	19.9	20.2	21.6	20.4	19.2
Turbidity, field	NTU	4.66	1.99	3.49	1.00	2.01	3.45	4.83	4.38	3.49

Notes:

%	percent
Cond.	conductance
DEG C	degrees Celsius
ft	feet below top of casing
ID	identification
mg/L	milligrams per Liter
mV	milliVolts
NTU	Nephelometric Turbidity Unit
ORP	Oxidation Reduction Potential, measured using a silver reference electrode which has a standard potential of 200 mV
SU	Standard Units
uS/cm	microSiemens per centimeter

Stantec

TABLE B.4 - Groundwater Analytical Results for Metals, Anions, and General Chemistry
Johnsonville Fossil Plant
August 2020

Sample Location	Units	EPA MCLs	CCR Rule GWPS	JOF-109	JOF-110	JOF-111	JOF-112	JOF-113		JOF-114
Sample Date				12-Aug-20	12-Aug-20	12-Aug-20	13-Aug-20	13-Aug-20	13-Aug-20	13-Aug-20
Sample ID				JOF-GW-021-20200812	JOF-GW-022-20200812	JOF-GW-023-20200812	JOF-GW-024-20200813	JOF-GW-025-20200813	JOF-GW-DUP01-20200813	JOF-GW-026-20200813
Sample Depth				39 ft	57 ft	46 ft	29.5 ft	43.5 ft	43.5 ft	39.5 ft
Sample Type				Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample
Level of Review				Final-Verified	Final-Verified	Final-Verified	Validated	Validated	Validated	Validated
Total Metals										
Antimony	ug/L	6[A]	n/v	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
Arsenic	ug/L	10[A]	n/v	<2.00	2.14 J	**11.5[A]**	<2.00	3.24 J	3.11 J	2.78 J
Barium	ug/L	2,000[A]	n/v	13.9	63.8	48.3	57.0	23.3	23.5	20.1
Beryllium	ug/L	4[A]	n/v	0.348 J	<0.200	<0.200	<0.200	0.203 J	<0.200	0.858
Boron	ug/L	n/v	n/v	67.2	1,500	5,260	36.3	15,700	15,700	11,500
Cadmium	ug/L	5[A]	n/v	<0.300	<0.300	<0.300	0.551 J	3.31	3.42	0.307 J
Calcium	ug/L	n/v	n/v	16,000	17,200	476,000	29,900	553,000	531,000	505,000
Chromium	ug/L	100[A]	n/v	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00
Cobalt	ug/L	n/v	6[B]	<0.300	2.75	**132[B]**	**102[B]**	2.65	2.74	**68.9[B]**
Copper	ug/L	n/v	n/v	1.05 J	<0.300	<0.300	0.532 J	1.36 J	1.49 J	1.80 J
Lead	ug/L	n/v	15[B]	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500
Lithium	ug/L	n/v	40[B]	<3.00	<3.00	17.5	<3.00	**121[B]**	**121[B]**	**79.5[B]**
Magnesium	ug/L	n/v	n/v	5,000	4,380	31,300	15,000	6,710	6,760	53,300
Mercury	ug/L	2[A]	n/v	<0.0670	<0.0670	<0.0670	<0.0670	<0.0670	<0.0670	<0.0670
Molybdenum	ug/L	n/v	100[B]	<0.200	0.261 J	48.8	0.760 J	**262[B]**	**258[B]**	<0.200
Nickel	ug/L	100 (TN MCL)[A]	n/v	19.7	7.90	35.4	8.81	**115[A]**	**115[A]**	18.8
Potassium	ug/L	n/v	n/v	1,150	254 J	50,600	809	59,500	59,000	106,000
Selenium	ug/L	50[A]	n/v	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
Silver	ug/L	100 (TN MCL)[A]	n/v	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300
Sodium	ug/L	n/v	n/v	6,990	34,800	226,000	27,100	42,500	41,800	313,000
Thallium	ug/L	2[A]	n/v	<0.600	<0.600	<0.600	<0.600	0.883 J	0.857 J	0.609 J
Vanadium	ug/L	n/v	n/v	<3.30	<3.30	<3.30	<3.30	<3.30	<3.30	<3.30
Zinc	ug/L	n/v	n/v	45.7	7.44 J	63.8	13.8 J	246	240	53.7
Anions										
Chloride	mg/L	n/v	n/v	41.5	49.6	603	31.6	70.0	69.9	233
Fluoride	mg/L	4[A]	n/v	0.158	0.565	0.187	0.452	0.178	0.175	0.0814 J
Sulfate	mg/L	n/v	n/v	3.91	25.1	1,010	56.6	1,480	1,500	1,980
General Chemistry										
Alkalinity, Bicarbonate	mg/L	n/v	n/v	11.0 J	37.4	65.2	92.6	13.9	13.9	1.96 J
Alkalinity, Carbonate	mg/L	n/v	n/v	<1.45	<1.45	<1.45	<1.45	<1.45	<1.45	<1.45
Alkalinity, Total as CaCO3	mg/L	n/v	n/v	11.0 J	37.4	65.2	92.6	13.9	13.9	1.96 J
Total Dissolved Solids	mg/L	n/v	n/v	117	193	2,590	213	2,320	2,370	3,270

See notes on last page.

TABLE B.4 - Groundwater Analytical Results for Metals, Anions, and General Chemistry
Johnsonville Fossil Plant
August 2020

Sample Location Sample Date Sample ID Sample Depth Sample Type Level of Review	Units	EPA MCLs	CCR Rule GWPS	JOF-117 13-Aug-20 JOF-GW-027-20200813 40.5 ft Normal Environmental Sample Validated	JOF-118 13-Aug-20 JOF-GW-028-20200813 48.5 ft Normal Environmental Sample Validated	JOF-119 13-Aug-20 JOF-GW-029-20200813 42.5 ft Normal Environmental Sample Validated
Total Metals						
Antimony	ug/L	6^A	n/v	<1.00	<1.00	<1.00
Arsenic	ug/L	10^A	n/v	**32.8^A**	2.66 J	2.50 J
Barium	ug/L	2,000^A	n/v	81.8	24.4	39.4
Beryllium	ug/L	4^A	n/v	<0.200	<0.200	<0.200
Boron	ug/L	n/v	n/v	14.6 J	61.2	29.6
Cadmium	ug/L	5^A	n/v	<0.300	<0.300	<0.300
Calcium	ug/L	n/v	n/v	84,600	35,400	24,700
Chromium	ug/L	100^A	n/v	<3.00	<3.00	<3.00
Cobalt	ug/L	n/v	6^B	**20.6^B**	3.07	2.21
Copper	ug/L	n/v	n/v	<0.300	0.490 J	<0.300
Lead	ug/L	n/v	15^B	<0.500	<0.500	<0.500
Lithium	ug/L	n/v	40^B	<3.00	<3.00	<3.00
Magnesium	ug/L	n/v	n/v	28,600	6,750	4,560
Mercury	ug/L	2^A	n/v	<0.0670	<0.0670	<0.0670
Molybdenum	ug/L	n/v	100^B	30.8	0.210 J	0.455 J
Nickel	ug/L	100(TN MCL)^A	n/v	5.52	11.2	2.05
Potassium	ug/L	n/v	n/v	2,510	936	1,350
Selenium	ug/L	50^A	n/v	<2.00	<2.00	<2.00
Silver	ug/L	100(TN MCL)^A	n/v	<0.300	<0.300	<0.300
Sodium	ug/L	n/v	n/v	32,800	32,800	41,900
Thallium	ug/L	2^A	n/v	<0.600	<0.600	<0.600
Vanadium	ug/L	n/v	n/v	<3.30	<3.30	<3.30
Zinc	ug/L	n/v	n/v	<3.30	9.71 J	4.52 J
Anions						
Chloride	mg/L	n/v	n/v	79.3	12.9	21.6
Fluoride	mg/L	4^A	n/v	0.984	0.449	0.413
Sulfate	mg/L	n/v	n/v	5.42	116	36.9
General Chemistry						
Alkalinity, Bicarbonate	mg/L	n/v	n/v	327	50.3	99.6
Alkalinity, Carbonate	mg/L	n/v	n/v	<1.45	<1.45	<1.45
Alkalinity, Total as CaCO3	mg/L	n/v	n/v	327	50.3	99.6
Total Dissolved Solids	mg/L	n/v	n/v	431	246	171

Notes:

A	EPA Maximum Contaminant Level
B	CCR Rule GWPS (Federal Register / Vol. 83, No. 146 / Monday, July 30, 2018 / Rules and Regulations)
n/v	No standard/guideline value
6.5^A	Concentration is greater than or equal to the indicated standard.
<0.03	analyte was not detected at a concentration greater than the Method Detection Limit
ft	feet below top of casing
ID	identification
J	quantitation is approximate due to limitations identified during data validation
mg/L	milligrams per Liter
ug/L	micrograms per Liter

1. Level of review is defined in the Quality Assurance Project Plan.

Stantec

TABLE B.5 – Groundwater Analytical Results for Radiological Parameters
Johnsonville Fossil Plant
August 2020

Sample Location				JOF-109	JOF-110	JOF-111	JOF-112	JOF-113	
Sample Date				12-Aug-20	12-Aug-20	12-Aug-20	13-Aug-20	13-Aug-20	13-Aug-20
Sample ID				JOF-GW-021-20200812	JOF-GW-022-20200812	JOF-GW-023-20200812	JOF-GW-024-20200813	JOF-GW-025-20200813	JOF-GW-DUP01-20200813
Sample Depth				39 ft	57 ft	46 ft	29.5 ft	43.5 ft	43.5 ft
Sample Type				Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample
Level of Review				Final-Verified	Final-Verified	Final-Verified	Validated	Validated	Validated
	Units	EPA MCLs	CCR Rule GWPS						
Radiological Parameters									
Radium-226	pCi/L	n/v	n/v	1.36 +/-(0.818)	-0.0168 +/-(0.463)U	0.711 +/-(0.363)	3.31 +/-(0.894)	3.25 +/-(0.906)	3.63 +/-(0.954)
Radium-228	pCi/L	n/v	n/v	0.522 +/-(0.344)	0.0258 +/-(0.336)U	0.801 +/-(0.386)	-0.325 +/-(0.351)U	0.207 +/-(0.340)U	0.524 +/-(0.442)U
Radium-226+228	pCi/L	5[A]	n/v	1.89 +/-(0.888)	0.0258 +/-(0.572)U	1.51 +/-(0.530)	3.31 +/-(0.960)J	3.46 +/-(0.968)J	4.16 +/-(1.05)J

See notes on last page.

TABLE B.5 – Groundwater Analytical Results for Radiological Parameters
Johnsonville Fossil Plant
August 2020

Sample Location Sample Date Sample ID Sample Depth Sample Type Level of Review	Units	EPA MCLs	CCR Rule GWPS	JOF-114 13-Aug-20 JOF-GW-026-20200813 39.5 ft Normal Environmental Sample Validated	JOF-117 13-Aug-20 JOF-GW-027-20200813 40.5 ft Normal Environmental Sample Validated	JOF-118 13-Aug-20 JOF-GW-028-20200813 48.5 ft Normal Environmental Sample Validated	JOF-119 13-Aug-20 JOF-GW-029-20200813 42.5 ft Normal Environmental Sample Validated
Radiological Parameters							
Radium-226	pCi/L	n/v	n/v	2.38 +/-(0.712)	2.57 +/-(0.762)	0.513 +/-(0.534)U	0.456 +/-(0.465)U
Radium-228	pCi/L	n/v	n/v	1.42 +/-(0.689)	0.580 +/-(0.494)U	0.293 +/-(0.447)U	0.130 +/-(0.341)U
Radium-226+228	pCi/L	5[A]	n/v	3.81 +/-(0.991)	3.15 +/-(0.908)J	0.806 +/-(0.696)U	0.586 +/-(0.577)U

Notes:

A	EPA Maximum Contaminant Level
B	CCR Rule GWPS (Federal Register / Vol. 83, No. 146 / Monday, July 30, 2018 / Rules and Regulations)
n/v	No standard/guideline value
ft	feet below top of casing
ID	identification
J	quantitation is approximate due to limitations identified during data validation
pCi/L	picoCurie per Liter
U	not detected

1. Level of review is defined in the Quality Assurance Project Plan.

Stantec

APPENDIX H.8

GROUNDWATER INVESTIGATION EVENT #6 SAMPLING AND ANALYSIS REPORT

Johnsonville Fossil Plant Groundwater Investigation Event #6 Sampling and Analysis Report

TDEC Commissioner's Order:
Environmental Investigation Plan
Johnsonville Fossil Plant
New Johnsonville, Tennessee

October 29, 2021

Prepared for:

Tennessee Valley Authority
Chattanooga, Tennessee

Prepared by:

Stantec Consulting Services Inc.
Lexington, Kentucky

REVISION LOG

Revision	Description	Date
0	Submittal to TDEC	July 30, 2021
1	Addresses October 18, 2021 TDEC Review Comments and Issued for TDEC	October 29, 2021

Sign-off Sheet

This document entitled Johnsonville Fossil Plant Groundwater Investigation Event #6 Sampling and Analysis Report was prepared by Stantec Consulting Services Inc. ("Stantec") for the account of Tennessee Valley Authority (the "Client"). Any reliance on this document by any third party is strictly prohibited. The material in it reflects Stantec's professional judgment in light of the scope, schedule and other limitations stated in the document and in the contract between Stantec and the Client. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. In preparing the document, Stantec did not verify information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions taken based on this document.

Prepared by Jamie Snider

Jamie Snider, Geologic Staff

Reviewed by Carole M. Farr

Carole M. Farr, Senior Principal Geologist

Approved by Brigid T Brooks Zvirbulis

Brigid Zvirbulis, Project Manager

Table of Contents

Abbreviations

CCR	Coal Combustion Residuals
CCR Parameters	Constituents listed in Appendices III and IV of 40 CFR 257 and five inorganic constituents included in Appendix I of Tennessee Rule 0400-11-01-.04
CFR	Code of Federal Regulations
COC	Chain-of-Custody
DO	Dissolved Oxygen
EAR	Environmental Assessment Report
EIP	Environmental Investigation Plan
ENV	Environmental
EnvStds	Environmental Standards, Inc.
Event #6	Groundwater investigation field event performed October 12-15, 2020
FSP	Field Sampling Personnel
ft	Feet
GEL	GEL Laboratories LLC
ID	Identification
IDW	Investigation Derived Waste
JOF Plant	Johnsonville Fossil Plant
mg/L	Milligrams per Liter
NTU	Nephelometric Turbidity Units
ORP	Oxidation-Reduction Potential
PPE	Personal Protective Equipment
QAPP	Quality Assurance Project Plan
QC	Quality Control
SAP	Sampling and Analysis Plan
SAR	Sampling and Analysis Report
Stantec	Stantec Consulting Services Inc.
TDEC	Tennessee Department of Environment and Conservation
TDEC Order	Commissioner’s Order No. OGC15-0177
TI	Technical Instruction
TVA	Tennessee Valley Authority
USEPA	United States Environmental Protection Agency

1.0 INTRODUCTION

Stantec Consulting Services Inc. (Stantec) has prepared this sampling and analysis report (SAR) on behalf of the Tennessee Valley Authority (TVA) to document the completion of activities related to a groundwater investigation sampling event performed October 12-15, 2020 (Event #6) at TVA's Johnsonville Fossil Plant (JOF Plant) located in New Johnsonville, Tennessee.

The purpose of the groundwater investigation, upon completion of the six groundwater sampling events, is to characterize groundwater conditions at the JOF Plant in support of fulfilling the requirements for the Tennessee Department of Environment and Conservation (TDEC) issued Commissioner's Order No. OGC15-0177 (TDEC Order) to TVA (TDEC 2015). The TDEC Order sets forth a "process for the investigation, assessment, and remediation of unacceptable risks" at TVA's coal ash disposal sites in Tennessee.

The purpose of this SAR is to document the work completed during groundwater sampling Event #6 of 6 total events and to present the information and data collected during the execution of the Groundwater Investigation Sampling and Analysis Plan (SAP) (Stantec 2018a). This SAR is not intended to provide conclusions or evaluations of results. The scope of the groundwater investigation represented herein was conducted pursuant to the SAP and is part of a larger environmental investigation at the JOF Plant. The data provided in this SAR are not inclusive of other programmatic data that exist for the site. The evaluation of the results will include data from the six groundwater sampling events and consider other aspects of the environmental investigation, as well as data collected under other State and/or coal combustion residuals (CCR) programs. This evaluation will be presented in the Environmental Assessment Report (EAR).

Event #6 activities were performed in general accordance with the following documents developed by TVA to support fulfilling the requirements of the TDEC Order at the JOF Plant:

- *Groundwater Investigation SAP* (Stantec 2018a)
- *Environmental Investigation Plan (EIP)* (Stantec 2018b)
- *Quality Assurance Project Plan (QAPP)* (Environmental Standards, Inc. 2018).

The Groundwater Investigation SAP was updated based on TVA- and TDEC-approved Programmatic- and Project-specific changes. Minor variations in scope and procedures from those outlined in the SAP occurred during field activities due to field conditions and programmatic updates and are referenced in Section 3.6.

Event #6 is the last in a series of six planned sampling events for the groundwater investigation. Stantec performed the field work activities for this event. Laboratory analysis of constituents was performed by GEL Laboratories LLC (GEL) in Charleston, South Carolina. Quality assurance oversight on data acquisition protocols, sampling practices, and data validation or verification was performed by Environmental Standards, Inc. (EnvStds) under direct contract to TVA.

This report summarizes the groundwater investigation activities for Event #6. Overall conclusions and findings about the groundwater investigation and groundwater conditions at the JOF Plant will be made and documented in the EAR.

2.0 OBJECTIVE AND SCOPE

The primary objectives of the groundwater investigation conducted pursuant to the Groundwater Investigation SAP (which includes six sampling events) are to characterize existing groundwater quality and to evaluate groundwater flow conditions at the JOF Plant in response to the TDEC Order. The approach to characterizing the groundwater conditions is to:

- Collect groundwater samples for chemical analyses to evaluate the potential presence of constituents related to CCR in groundwater
- Measure groundwater and surface water elevations for subsequent evaluation of the direction and rate of groundwater flow.

The scope of work intended to achieve the objectives of the groundwater investigation consists of six sampling events at a frequency of one event every two months for one year to characterize seasonal groundwater quality and flow direction. This report describes the activities related to Event #6, performed in October 2020, the scope of which included:

- Collecting groundwater and surface water level measurements
- Collecting field measurements of groundwater quality parameters
- Collecting groundwater samples and associated quality control (QC) samples for laboratory analysis.

These activities were carried out after the installation of permanent monitoring wells as specified in the Groundwater Investigation SAP. Details of the monitoring well installation activities are provided in the JOF Plant Hydrogeologic Investigation SAR.

In addition, pore water measurements from piezometers and temporary wells installed in the CCR units at the JOF Plant are presented in this SAR for comparison with groundwater data. Groundwater piezometer installation activities are described in the JOF Plant Hydrogeologic Investigation SAR. Temporary well installation activities are described in the JOF Plant Exploratory Drilling SAR, and temporary well gauging and sampling information is provided in the JOF Plant CCR Material Characteristics SAR.

3.0 FIELD ACTIVITIES

Groundwater investigation field activities for Event #6 were conducted October 12-15, 2020. Stantec performed groundwater level measurements and sample collection activities based on guidance and specifications in TVA's Environmental (ENV) Technical Instructions (TIs), the SAP, the QAPP, and applicable United States Environmental Protection Agency (USEPA) documents except as noted in the Variations section of this report. As part of TVA's commitment to generate representative and reliable data, data validation and/or verification of laboratory analytical results were performed by EnvStds under direct contract with TVA. EnvStds also provided quality reviews of field documentation.

During Event #6, Stantec conducted the following field activities:

- Measured groundwater levels at nine monitoring wells and one piezometer installed for the TDEC Order, and 20 monitoring wells and eight piezometers installed for other environmental programs (29 total monitoring wells)
- Measured pore water levels at 15 temporary wells and 12 piezometers in the CCR units
- Measured the surface water level at one location in the Tennessee River/Kentucky Lake
- Collected groundwater samples from nine monitoring wells installed for the TDEC Order
- Recorded field measurements of groundwater quality parameters during purging and stabilization at the sampled monitoring wells
- Collected QC samples including one field duplicate, one matrix spike/matrix spike duplicate, three field blanks, one equipment blank, one filter blank, and one tubing blank
- Shipped the collected samples to GEL in Charleston, South Carolina.

Details on each activity are presented in the sections below.

3.1 WORK LOCATIONS

The TDEC Order CCR units at the JOF Plant (Ash Disposal Area 1, Active Ash Pond 2, DuPont Road Dredge Cell, South Rail Loop Area 4, and Coal Yard) as well as the monitoring wells, temporary wells, and piezometers sampled and/or gauged during Event #6 are shown on Exhibit A.1 in Appendix A. TVA is currently sampling groundwater at the JOF Plant for TDEC Solid Waste Management permit requirements and the USEPA CCR Rule codified in Title 40 of the Code of Federal Regulations (CFR) Part 257 (40 CFR 257). Monitoring wells that are being sampled as part of other programs are not sampled as part of the groundwater investigation for the TDEC Order.

Groundwater levels were measured in TDEC Order monitoring wells and a piezometer, as well as in select additional wells and piezometers from other environmental programs, as shown in Table B.1a in Appendix B, to provide information to prepare groundwater contour maps for this SAR and the JOF Plant

EAR. Pore water levels measured in temporary wells and piezometers installed in the CCR units are presented in Table B.1b. Groundwater and pore water elevations are shown on Exhibits A.2 and A.3 in Appendix A. Groundwater elevation contours are depicted on Exhibit A.2 and pore water elevation contours are depicted on Exhibit A.3.

Groundwater analytical and field duplicate samples were collected from the TDEC Order monitoring wells as shown in Table B.2 in Appendix B. Groundwater analytical data collected for the TDEC Order and other environmental programs will be provided in the EAR.

3.2 DOCUMENTATION

Stantec maintained field documentation in accordance with ENV-TI-05.80.03, *Field Record Keeping*, and the QAPP. Field activities and data were recorded on program-specific field forms. Health and safety forms were completed in accordance with TVA and Stantec health and safety requirements. Additional information regarding field documentation is provided below.

3.2.1 Field Forms

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

- *Daily Field Activity Log*
- *Monitoring Well Inspection Checklist*
- *Equipment Calibration Form*
- *Vibrating Wire Piezometer Measurement Form*
- *Groundwater Level Measurement Form*
- *Groundwater Sampling Form*
- *Chain-of-Custody (COC).*

3.2.1.1 Daily Field Activity Log

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

3.2.1.2 Monitoring Well Inspection Checklist

Prior to measuring water levels, Stantec FSP inspected each monitoring and temporary well for damage or indications that the well integrity had been compromised in accordance with ENV-TI-05.80.21, *Monitoring Well Inspection and Maintenance.* Inspection results were documented on a *Monitoring Well*

Inspection Checklist. Stantec documented observations and conditions on a well inspection form for this event.

3.2.1.3 Equipment Calibration Form

Stantec FSP performed daily calibration of the water quality meter and turbidity meter and documented the results on an *Equipment Calibration Form*. The form documented the calibration results for temperature, turbidity, specific conductance, pH, dissolved oxygen (DO), and oxidation-reduction potential (ORP), and verified that the field instruments' sensors were operating within acceptance criteria. Refer to Section 3.2.2 for additional details on equipment calibration procedures.

3.2.1.4 Vibrating Wire Piezometer Measurement Form

Stantec FSP recorded field measurement data on a *Vibrating Wire Piezometer Measurement Form*. The form includes the vibrating wire piezometer identification (ID), serial number, time, digits, and temperature. The readings were used to calculate the pressure head (feet [ft] of water) above the vibrating wire sensor to obtain the groundwater or pore water elevation.

3.2.1.5 Groundwater Level Measurement Form

Stantec FSP recorded groundwater level field measurement data on a *Groundwater Level Measurement Form* in accordance with ENV-TI-05.80.44, *Groundwater Level and Well Depth Measurement*. The form includes the monitoring well ID, time, and depth to water measured from a standardized reference point on the top of each well casing, recorded in ft below top of casing.

3.2.1.6 Groundwater Sampling Form

Stantec FSP recorded the depth to water, purge flow rate, volume of groundwater purged, temperature, pH, specific conductance, DO, ORP, turbidity, color of water, and other observations during groundwater purging and sampling activities at each monitoring well in accordance with ENV-TI-05.80.42, *Groundwater Sampling*. Field measurements were recorded on a *Groundwater Sampling Form*. The form also documents the time intervals between measurement of field parameters, low-flow extraction rates, water level drawdown, and water quality parameter measurements until stabilization criteria were met.

3.2.1.7 Chain-of-Custody

Stantec FSP completed *COC* documentation for each groundwater sample collected. The sample ID, sample location, type of sample, sampling date and time, analyses requested, sample pH, and sample custody record were recorded on the *COC*. The Field Team Leader reviewed the *COC* for completeness, and the FSP conducted a QC check of samples in each cooler compared to sample IDs on the corresponding *COC*. *COCs* were completed in accordance with ENV-TI-05.80.02, *Sample Labeling and Custody*.

3.2.2 Equipment Calibration

Field instruments used to collect, generate, or measure water quality parameters were calibrated each day prior to use as specified in the SAP, QAPP, and ENV-TI-05.80.46, *Field Measurement Using a Multi-Parameter Sonde.* Afternoon calibration verifications were performed to evaluate if these instruments remained within acceptance criteria during sampling. Temperature and barometric pressure instrument readings were verified using a calibrated National Institute of Standards and Technology traceable thermometer and National Weather Service (via mesowest.utah.edu) barometric pressure readings for Lexington-Parsons Regional Airport in Darden, Tennessee, respectively. Additional details regarding equipment calibration were recorded on an *Equipment Calibration Form*, as described in Section 3.2.1.3.

3.3 SAMPLING METHODS

The following sections present monitoring well data collection and sampling procedures used during Event #6.

3.3.1 Static Water Level Measurements

FSP measured static groundwater levels at 29 monitoring wells and pore water levels at 15 temporary wells in accordance with ENV-TI-05.80.44, *Groundwater Level and Well Depth Measurement.* On October 12, 2020, static groundwater and pore water level readings were measured and recorded to the nearest 0.01 ft from a reference point on the top of each well casing using an electronic water level indicator. Water level indicator probes were decontaminated prior to the first use and between measurements, and the decontamination was documented as specified in ENV-TI-05.80.05, *Field Sampling Equipment Cleaning and Decontamination.* Depth to groundwater and pore water measurements were recorded on a *Groundwater Level Measurement Form*.

Stantec calculated the static groundwater level at vibrating wire piezometer JOF-116-PZ. FSP recorded the measured readings and temperature using a vibrating wire readout instrument on a *Vibrating Wire Piezometer Measurement Form.* The readings were used to calculate the pressure head (ft of water) above the vibrating wire sensor to obtain groundwater elevation.

Groundwater and pore water measurements were also obtained from transducers installed within eight and 12 piezometers, respectively. Additionally, a surface water level measurement for the Tennessee River/Kentucky Lake was provided by TVA using the reading closest to noon recorded by an automated staff gauge. The surface water staff gauge location is shown on Exhibit A.1 in Appendix A.

Groundwater and pore water level data are shown in Tables B.1a and B.1b, respectively, in Appendix B. A groundwater elevation contour map based on groundwater measurements made in wells and piezometers, along with pore water elevations, is included as Exhibit A.2 in Appendix A. Similarly, a pore water elevation contour map based on pore water measurements in wells and piezometers, along with groundwater elevations, is included as Exhibit A.3 in Appendix A.

3.3.2 Groundwater Purging & Sampling

Analytical and field duplicate samples were collected from nine monitoring wells as shown in Table B.2 in Appendix B. Monitoring wells were purged using dedicated bladder pumps equipped with dedicated tubing using low-flow purging and sampling techniques as specified in ENV-TI-05.80.42, *Groundwater Sampling*.

During the purging process, water quality field parameters including pH, specific conductance, temperature, ORP, and DO were measured using water quality meters (YSI ProPlus with flow-through cell) and recorded on field forms. Depth to water and turbidity were measured and recorded using decontaminated electronic water-level indicators (Heron Dipper-T) and calibrated turbidimeters (Hach 2100Q). Field parameters were measured and recorded on *Groundwater Sampling Forms* during purging until readings were stabilized as specified in the SAP and/or applicable TI. As approved by TDEC, the specific conductance and turbidity stabilization limits were revised to meet overall programmatic objectives for groundwater investigations at the JOF Plant. Well purging was considered complete when three consecutive readings were within the following stabilization limits:

- pH – ± 0.1 Standard Units
- Specific Conductance – ± 3% microSiemens per centimeter
- Turbidity – Less than 5 Nephelometric Turbidity Units (NTUs) or ± 10% for values above 5 NTUs
- DO – Less than 0.5 milligrams per liter (mg/L) or ± 10% for values above 0.5 mg/L.

After water quality stabilization criteria were achieved, the final field parameter results were recorded, purging was discontinued, and a sample was collected as specified in the SAP. Due to final turbidity readings higher than 5 NTUs at well JOF-117, an additional sample was collected at this well and submitted to the laboratory for dissolved metals analysis.

Laboratory-provided, pre-preserved sample containers were filled directly from the pump discharge line with the exception of the dissolved metals sample, which was collected via a new 0.45-micron disposable inline filter attached to the end of the discharge line to field filter the sample. FSP wore new, clean nitrile gloves when handling sample containers and did not touch the interior of containers or container caps. New gloves were used when handling each sample. When filling sample bottles, care was taken to minimize sample aeration (i.e., water was directed down the inner walls of the sample bottle) and to avoid overfilling and diluting preservatives. Each sample bottle was capped before filling the next bottle. Following completion of sampling, final field parameter measurements were made.

Sample containers were labeled and handled in accordance with ENV-TI-05.80.02, *Sample Labeling and Custody.* FSP secured caps on each bottle, attached a custody seal across the cap, and placed the bottles in a cooler on ice within 15 minutes of collection. QC samples were collected in accordance with ENV-TI-05.80.04, *Field Sampling Quality Control.*

Groundwater samples were analyzed for the CCR-related constituents listed in Appendices III and IV of 40 CFR 257. In addition, five inorganic constituents listed in Appendix I of Tennessee Rule 0400-11-01-.04 and not included in the 40 CFR 257 Appendices III and IV were analyzed to maintain continuity with TDEC environmental programs. These additional TDEC Appendix I constituents included copper, nickel, silver, vanadium, and zinc. The combined federal CCR Appendices III and IV constituents and TDEC Appendix I inorganic constituents will hereafter be referred to collectively as “CCR Parameters.” For geochemical evaluation, major cations/anions not included in the CCR Parameters were included in the analyses. The additional geochemical parameters included bicarbonate, carbonate, magnesium, potassium, and sodium.

3.4 INVESTIGATION DERIVED WASTE

Investigation derived waste (IDW) generated during groundwater investigation activities included:

- Used calibration solutions
- Purge water
- Decontamination fluids
- Disposable personal protective equipment (PPE)
- General trash.

IDW was handled in accordance with ENV-TI-05.80.05, *Field Sampling Equipment Cleaning and Decontamination*; ENV-TI-05.80.42, *Groundwater Sampling* (purge water); the JOF Plant-specific waste management plan; and local, state, and federal regulations. Transportation and disposal of IDW was coordinated with JOF Plant facility management. Used calibration solution was containerized and stored for disposal as directed by the JOF Plant facility management. Purge water and decontamination fluids were containerized for later disposal as specified in the JOF Plant-specific waste management plan. Used disposable PPE (e.g., nitrile gloves) and general trash generated throughout the day were placed in garbage bags and disposed of in a general trash dumpster onsite at the end of each day.

3.5 SAMPLE SHIPMENT

Samples were packed and secured under *COC* procedures specified in ENV-TI-05.80.06, *Handling and Shipping of Samples*. The samples were shipped by FedEx to GEL in Charleston, South Carolina. The laboratory submitted sample receipt confirmation forms to EnvStds for review and confirmation.

3.6 VARIATIONS

The proposed scope and procedures for the groundwater investigation were outlined in the SAP, QAPP, and applicable TVA TIs as detailed in the sections above. Variations in scope or procedures discussed with TDEC and/or TVA, changes based on field conditions, or additional field sampling performed to complete the scope of work in the SAP are described in the following sections. As discussed below, these variations do not impact the overall usability and representativeness of the dataset provided in this SAR for groundwater investigation sampling Event #6 at the JOF Plant.

3.6.1 Variations in Scope

Variations in scope are provided below.

- Groundwater level gauging and sampling was not performed at well JOF-108 as specified in the SAP because it was not installed (the five borings drilled in that area encountered CCR and/or shallow refusal). This change in scope was approved by TDEC.

3.6.2 Variations in Procedure

Variations in procedures occurring in the field are provided below.

- As approved by TDEC, the specific conductance and turbidity stabilization limits were revised to meet overall programmatic objectives for groundwater investigations
- GEL was used as the laboratory for non-radium sample analysis in place of Eurofins TestAmerica. This change was approved by TVA and TDEC prior to field work.

4.0 SUMMARY

The data presented in this report are only for groundwater investigation sampling Event #6 at the JOF Plant. The scope of work for Event #6 was to:

- Collect groundwater samples for chemical analyses to assist with subsequent evaluation of the potential presence of CCR-related constituents in groundwater
- Measure groundwater and surface water elevations to assist with subsequent evaluation of groundwater flow direction and rate after multiple data sets have been collected.

In addition, pore water measurements from piezometers and temporary wells installed in the CCR units at the JOF Plant are presented in this SAR for comparison with groundwater data.

Event #6 included collecting groundwater level measurements at 29 monitoring wells and nine piezometers; pore water measurements at 15 temporary wells and 12 piezometers in the CCR units; and a surface water measurement at one gauge located in the Tennessee River/Kentucky Lake. Groundwater and surface water measurements and elevations are provided in Table B.1a, and pore water measurements and elevations are provided in Table B.1b, and depicted on Exhibits A.2 and A.3.

Water quality measurements and groundwater analytical samples were collected at nine monitoring wells as summarized in Table B.2. Water quality parameters were recorded during purging. Stabilization criteria for pH, specific conductance, turbidity, and DO were achieved at the nine sampling locations. The final measurements prior to initiating sample collection are presented in Table B.3.

Groundwater analytical data for CCR Parameters and geochemical parameters are presented in Table B.4. Analytical data for radium analyses are presented in Table B.5. Analytical data were reported by GEL and then validated or verified by EnvStds.

Stantec has completed Event #6 of the groundwater investigation at the JOF Plant in New Johnsonville, Tennessee, in accordance with the Groundwater Investigation SAP as documented herein. The data collected during Event #6 are usable for reporting and evaluation in the EAR and meet the objectives of the TDEC Order EIP. The complete dataset from this event will be evaluated along with data collected during the other groundwater sampling events and under other TDEC Order SAPs, as well as data collected under other State and CCR programs. This evaluation will be provided in the EAR.

5.0 REFERENCES

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

Stantec Consulting Services Inc. (Stantec). 2018a. *Groundwater Investigation Sampling and Analysis Plan, Johnsonville Fossil Plant.* Revision 4. Prepared for Tennessee Valley Authority. December 10, 2018.

Stantec. 2018b. *Environmental Investigation Plan, Johnsonville Fossil Plant.* Revision 4. Prepared for Tennessee Valley Authority. December 10, 2018.

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

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

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

TVA, ENV-TI-05.80.04, *Field Sampling Quality Control*.

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

TVA, ENV-TI-05.80.06, *Handling and Shipping of Samples*.

TVA, ENV-TI-05.80.21, *Monitoring Well Inspection and Maintenance*.

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

TVA, ENV-TI-05.80.44, *Groundwater Level and Well Depth Measurement*.

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

APPENDIX A - EXHIBITS

Exhibit No.

A.1

Title

Monitoring Well and Piezometer Network

Client/Project

Tennessee Valley Authority
Johnsonville Fossil (JOF) Plant TDEC Order

Project Location

New Johnsonville, Tennessee

175568286

Prepared by DMB on 2021-05-24
Technical Review by MD on 2021-05-24

0 450 900 1,350 1,800 Feet

1:5,400 (At original document size of 22x34)

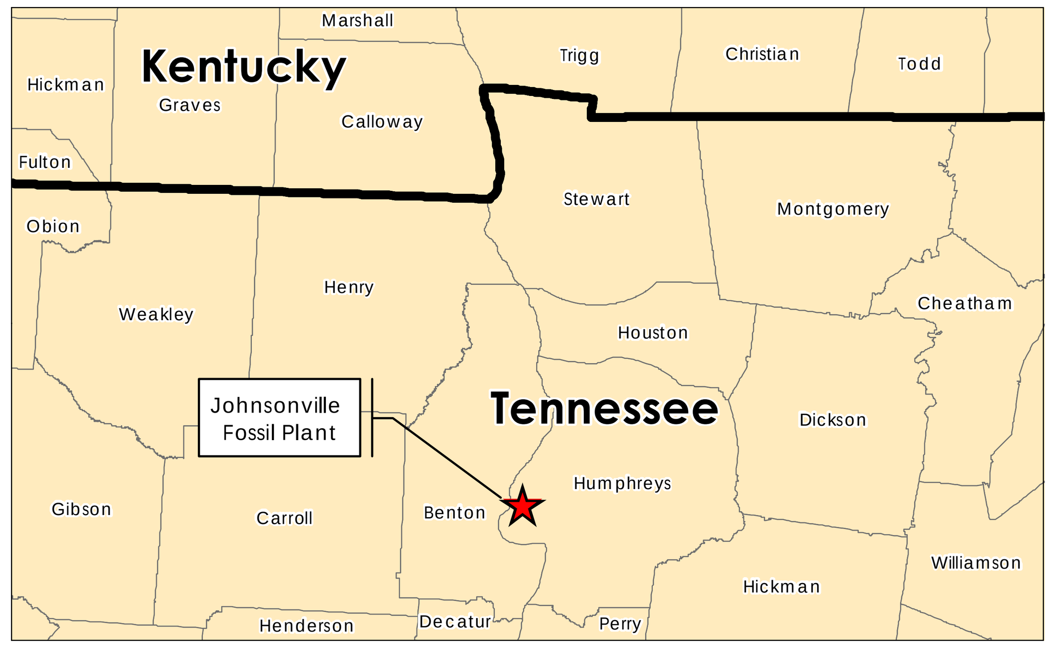
Legend

- Groundwater Investigation Monitoring Well
- Other Monitoring Well
- Piezometer
- Pore Water Piezometer in CCR Material
- Temporary Well within CCR Material
- Tennessee River/Kentucky Lake Gauging Station
- 2017 Imagery Boundary
- 2018 Imagery Boundary
- CCR Unit Area (Approximate)
- Coal Yard (Approximate)

CCR: Coal combustion residuals

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Imagery Provided by TVA (2017 & 2018) & ESRI World Imagery



Stantec TVA

Exhibit No.
A.2

Title

Groundwater Elevation Contour Map, Event #6 (October 12, 2020)

Client/Project

Tennessee Valley Authority
Johnsonville Fossil (JOF) Plant TDEC Order

Project Location
New Johnsonville, Tennessee

175568286
Prepared by DMB on 2021-06-07
Technical Review by MD on 2021-06-07

0 450 900 1,350 1,800 Feet

1:5,400 (At original document size of 22x34)

Legend

- Groundwater Investigation Monitoring Well
  groundwater elevation in feet above mean sea level (ft amsl)
- Other Monitoring Well
  groundwater elevation in ft amsl
- Piezometer, groundwater label in blue text, pore water label in yellow highlighted black text; (e.g., JOF-E-2A-PZ2) (e.g., JOF-E-2A-PZ5) elevation in ft amsl
- Piezometer in CCR
  pore water elevation in ft amsl; value not used for contouring
- Temporary well in CCR
  pore water elevation in ft amsl; value not used for contouring
- Tennessee River/Kentucky Lake Gauging Station
  surface water elevation in ft amsl
- Interpolated Groundwater Contour (5 ft interval; elevations are in ft amsl)
- Groundwater Contour (5 ft interval; elevations are in ft amsl)
- 2017 Imagery Boundary
- 2018 Imagery Boundary
- CCR Unit Area (Approximate)
- Coal Yard (Approximate)

CCR: Coal combustion residuals

NM: Not measured; data not available

*Groundwater and pore water elevation displayed but not used as input for contouring due to factors such as well construction or being screened in a different hydrogeologic unit.

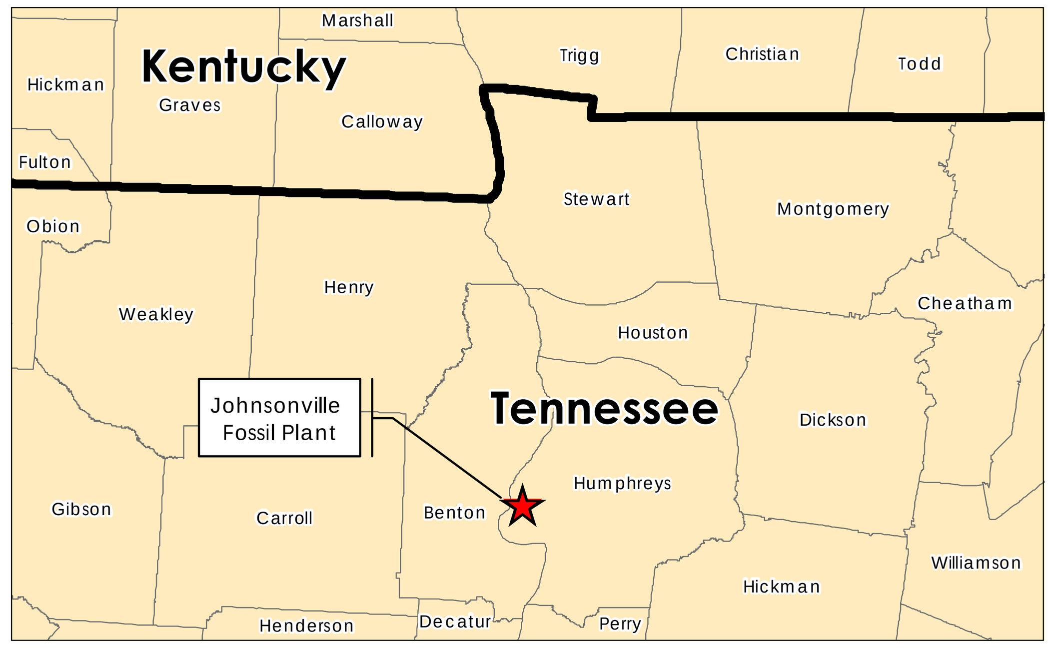
**Nested VWPZ sensors monitoring pore water and groundwater elevations in the same borehole, and the location is shown by a single symbol.

***The JOF_PZET and JOF_PZFT groundwater elevations are approximately 3-4 feet below the trend established in other piezometers within the Active Ash Pond 2. The groundwater elevation is displayed but not used for contouring.

****The JOF-117 groundwater elevation is approximately 10 feet below the trend for that well established during other SAR events. The groundwater elevation is displayed but not used in contouring for this event.

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Imagery Provided by TVA (2017 & 2018) & ESRI World Imagery
3. Groundwater contours were created using Surfer Version 16.1.350 (December 13, 2018) and manual adjustment



Stantec TVA

Exhibit No.
A.3

Title

Pore water Elevation Contour Map, Event #6 (October 12, 2020)

Client/Project

Tennessee Valley Authority
Johnsonville Fossil (JOF) Plant TDEC Order

Project Location

New Johnsonville, Tennessee

175568286

Prepared by DMB on 2021-10-25
Technical Review by MD on 2021-10-25

0 450 900 1,350 1,800 Feet

1:5,400 (At original document size of 22x34)

Legend

- Groundwater Investigation Monitoring Well groundwater elevation in feet above mean sea level (ft amsl); value not used for contouring
- Other Monitoring Well groundwater elevation in ft amsl; value not used for contouring
- Piezometer, groundwater label in blue text, pore water label in yellow highlighted black text: (e.g., JOF-E-2A-PZ2) (e.g., JOF-E-2A-PZ5) elevation in ft amsl
- Piezometer in CCR pore water elevation in ft amsl
- Temporary well in CCR pore water elevation in ft amsl
- Tennessee River/Kentucky Lake Gauging Station surface water elevation in ft amsl
- Interpolated Pore water Contour (5 ft interval; elevations are in ft amsl)
- Pore water Contour (5 ft interval; elevations are in ft amsl)
- 2017 Imagery Boundary
- 2018 Imagery Boundary
- CCR Unit Area (Approximate)
- Coal Yard (Approximate)

CCR: Coal combustion residuals

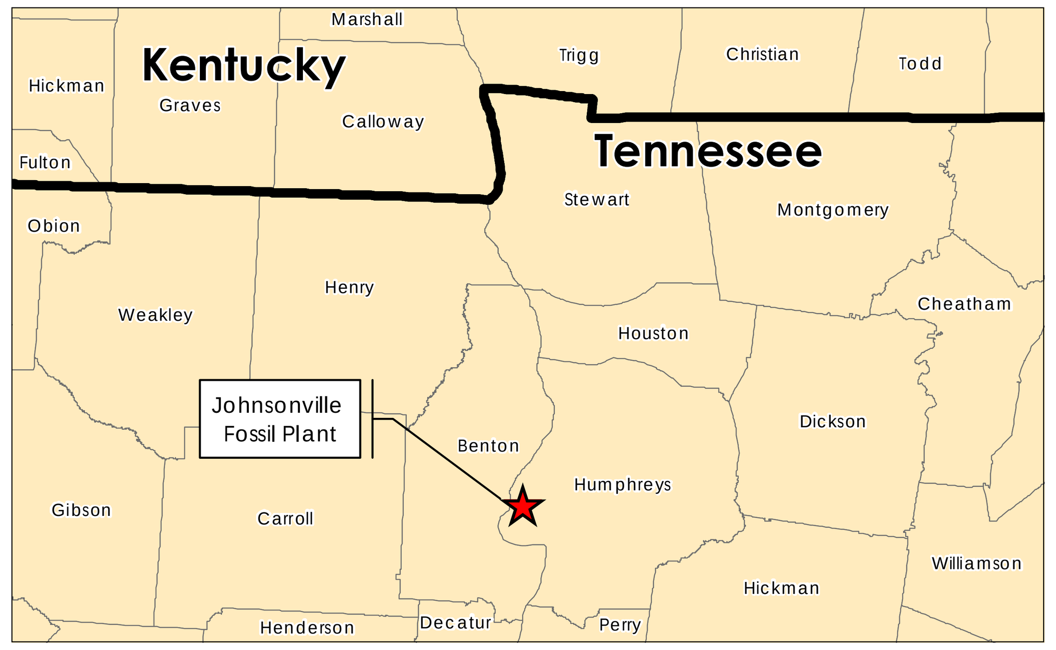
NM: Not measured; data not available

*Groundwater elevation displayed but not used as input for contouring due to factors such as well construction or being screened in a different hydrogeologic unit.

**Nested VWPZ sensors monitoring pore water and groundwater elevations in the same borehole, and the location is shown by a single symbol.

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Imagery Provided by TVA (2017 & 2018) & ESRI World Imagery
3. Pore water contours were created using manual adjustment and Surfer Version 16.1.350 (December 13, 2018)



Stantec TVA

APPENDIX B - TABLES

TABLE B.1a – Groundwater Level Measurements
Johnsonville Fossil Plant
October 2020

UNID	Well / Piezometer ID	Date Measured	Depth to Groundwater	Top of Casing Elevation	Groundwater Elevation	Piezometer Ground Surface Elevation	Piezometer Sensor Elevation	Piezometer Sensor Depth	Screened Interval	Screened / Piezometer Sensor Formation
			ft btoc	ft msl	ft msl	ft msl	ft msl	ft bgs	ft btoc	
Monitoring Wells										
JOF-00-GW-43-001	10-AP1	12-Oct-20	16.26	370.51	354.25	n/a	n/a	n/a	39.0 - 49.1	Alluvium: Sands and Gravels
JOF-00-GW-43-002	10-AP3	12-Oct-20	12.86	367.27	354.41	n/a	n/a	n/a	37.4 - 47.5	Alluvium: Sands and Gravels
JOF-00-GW-43-003	89-B10	12-Oct-20	26.07	401.19	375.12	n/a	n/a	n/a	32.0 - 40.3	Alluvium: Sands and Gravels
JOF-00-GW-43-004	94-B16	12-Oct-20	13.71	390.53	376.82	n/a	n/a	n/a	16.2 - 26.2	Alluvium: Sands and Gravels
JOF-00-GW-43-005	99-B19	12-Oct-20	16.82	394.50	377.68	n/a	n/a	n/a	12.6 - 27.7	Alluvium: Sands and Gravels/Shale Bedrock
JOF-00-GW-43-006	99-B20A	12-Oct-20	30.37	408.88	378.51	n/a	n/a	n/a	21.6 - 36.5	Alluvium: Sands and Gravels
JOF-00-GW-43-007	B-6R	12-Oct-20	17.99	395.57	377.58	n/a	n/a	n/a	18.2 - 21.2	Alluvium: Sands and Gravels
JOF-00-GW-43-008	B-8R	12-Oct-20	12.33	391.04	378.71	n/a	n/a	n/a	13.8 - 16.8	Alluvium: Sands and Gravels
JOF-00-GW-43-009	B-9	12-Oct-20	28.55	423.88	395.33	n/a	n/a	n/a	40.5 - 50.0	Alluvium: Silts and Clays
JOF-00-GW-43-010	B-11	12-Oct-20	21.25	400.67	379.42	n/a	n/a	n/a	26.7 - 36.7	Alluvium: Sands and Gravels
JOF-00-GW-43-011	B-12	12-Oct-20	13.12	393.03	379.91	n/a	n/a	n/a	26.8 - 36.9	Alluvium: Sands and Gravels
JOF-00-GW-43-012	B-13	12-Oct-20	29.63	409.87	380.24	n/a	n/a	n/a	33.8 - 43.9	Alluvium: Sands and Gravels
JOF-00-GW-43-013	JOF-101	12-Oct-20	27.26	424.59	397.33	n/a	n/a	n/a	43.6 - 53.2	Alluvium: Sands and Gravels
JOF-00-GW-43-014	JOF-102	12-Oct-20	20.24	407.64	387.40	n/a	n/a	n/a	23.6 - 33.9	Alluvium: Sands and Gravels
JOF-00-GW-43-015	JOF-103	12-Oct-20	19.53	374.24	354.71	n/a	n/a	n/a	41.9 - 52.1	Alluvium: Sands and Gravels
JOF-00-GW-43-016	JOF-104	12-Oct-20	24.91	379.44	354.53	n/a	n/a	n/a	48.4 - 58.6	Alluvium: Sands and Gravels
JOF-00-GW-43-017	JOF-105	12-Oct-20	27.84	406.15	378.31	n/a	n/a	n/a	23.4 - 33.7	Alluvium: Sands and Gravels
JOF-00-GW-43-018	A-3	12-Oct-20	24.18	403.73	379.55	n/a	n/a	n/a	66.1 - 86.1	Chattanooga Shale/Camden Formation
JOF-00-GW-43-019	JOF-106	12-Oct-20	23.40	403.16	379.76	n/a	n/a	n/a	23.3 - 32.8	Alluvium: Sands and Gravels
JOF-00-GW-43-020	JOF-107	12-Oct-20	29.74	409.95	380.21	n/a	n/a	n/a	31.9 - 41.4	Alluvium: Sands and Gravels
JOF-00-GW-43-021	JOF-109	12-Oct-20	6.61	386.11	379.50	n/a	n/a	n/a	34.1 - 43.9	Alluvium
JOF-00-GW-43-022	JOF-110	12-Oct-20	18.51	388.76	370.25	n/a	n/a	n/a	52.3 - 62.1	Alluvium
JOF-00-GW-43-023	JOF-111	12-Oct-20	20.24	390.08	369.84	n/a	n/a	n/a	41.3 - 51.1	Clay
JOF-00-GW-43-024	JOF-112	12-Oct-20	17.67	394.48	376.81	n/a	n/a	n/a	24.9 - 34.7	Alluvium
JOF-00-GW-43-025	JOF-113	12-Oct-20	30.72	388.13	357.41	n/a	n/a	n/a	39.6 - 49.4	Alluvium
JOF-00-GW-43-026	JOF-114	12-Oct-20	31.09	388.36	357.27	n/a	n/a	n/a	34.7 - 44.5	Alluvium
JOF-00-GW-43-027	JOF-117	12-Oct-20	41.40	388.63	347.23	n/a	n/a	n/a	35.0 - 44.8	Alluvium
JOF-00-GW-43-028	JOF-118	12-Oct-20	18.13	372.69	354.56	n/a	n/a	n/a	43.9 - 53.7	Alluvium
JOF-00-GW-43-029	JOF-119	12-Oct-20	12.38	366.89	354.51	n/a	n/a	n/a	38.0 - 47.8	Alluvium
Piezometers										
n/a	JOF-B-2A-PZ3	12-Oct-20	n/a	n/a	353.7	392.7	322.7	70.0	n/a	Alluvial Sand and Gravel
n/a	JOF-C-2A-PZ3	12-Oct-20	n/a	n/a	355.5	392.8	326.8	66.0	n/a	Alluvial Sand and Gravel
n/a	JOF-C-2B-PZ2	n/a	n/a	n/a	NM	370.6	321.6	49.0	n/a	Alluvial Sand and Gravel
n/a	JOF-E-2A-PZ2	12-Oct-20	n/a	n/a	353.7	390.9	327.9	63.0	n/a	Alluvial Sand and Gravel
n/a	JOF-E-2B-PZ2	12-Oct-20	n/a	n/a	353.0	365.4	310.4	55.0	n/a	Alluvial Sand and Gravel
n/a	JOF-K-2A-PZ1	12-Oct-20	n/a	n/a	356.9	377.5	327.5	50.0	n/a	Alluvial Sand and Gravel
n/a	JOF_PZET	12-Oct-20	n/a	n/a	350.5	363.8	329.8	34.0	n/a	Alluvial Clay and Silt and Alluvial Sand and Gravel
n/a	JOF_PZFT	12-Oct-20	n/a	n/a	350.4	362.9	327.6	35.3	n/a	Alluvial Clay and Silt and Alluvial Sand and Gravel
n/a	JOF_PZHT	12-Oct-20	n/a	n/a	355.0	363.1	316.1	47.0	n/a	Alluvial Sand and Gravel
n/a	JOF-116-PZ	12-Oct-20	n/a	n/a	372.0	388.0	342.0	46.0	n/a	Alluvium

See notes on last page.

TABLE B.1a – Groundwater Level Measurements
Johnsonville Fossil Plant
October 2020

UNID	Well / Piezometer ID	Date Measured	Depth to Groundwater	Top of Casing Elevation	Groundwater Elevation	Piezometer Ground Surface Elevation	Piezometer Sensor Elevation	Piezometer Sensor Depth	Screened Interval	Screened / Piezometer Sensor Formation
			ft btoc	ft msl	ft msl	ft msl	ft msl	ft bgs	ft btoc	
Surface Water Gauge										
Tennessee River/Kentucky Lake gauge (GS-1)	n/a	12-Oct-20	n/a	n/a	354.37	n/a	n/a	n/a	n/a	n/a

Notes:

bgs	below ground surface
btoc	below top of casing
ft	feet
ID	identification
msl	mean sea level
n/a	not applicable
NM	not measured
UNID	Unique Numerical Identification

1. Top of casing elevations, screen intervals, and screened formations for monitoring wells were obtained from the TVA Well Inventory Log provided by TVA.
2. Tennessee River/Kentucky Lake data point is the reading closest to noon recorded by the automated staff gauge provided by TVA.
3. For piezometers, ground surface elevation, groundwater elevations and piezometer data were obtained from the geotechnical instrumentation database. Vibrating wire sensor formation information for piezometer JOF-116-PZ was obtained from the boring log. Data from automated piezometers are averaged for the measurement date.
4. Groundwater elevations in piezometers are calculated values. Accuracy of piezometer data is to 0.1 ft.
5. In select piezometers, as noted by "NM" above, groundwater elevation data were not available for this event.

TABLE B.1b – Pore Water Level Measurements
Johnsonville Fossil Plant
October 2020

Temporary Well / Piezometer ID	Date Measured	Depth to Pore Water	Top of Casing Elevation	Pore Water Elevation	Piezometer Ground Surface Elevation	Piezometer Sensor Elevation	Piezometer Sensor Depth	Screened Interval	Screened / Piezometer Sensor Formation
		ft btoc	ft msl	ft msl	ft msl	ft msl	ft bgs	ft bgs	
Temporary Wells									
JOF-TW01	12-Oct-20	16.61	396.33	379.72	n/a	n/a	n/a	24.8 - 34.6	CCR
JOF-TW02	12-Oct-20	24.31	397.38	373.07	n/a	n/a	n/a	25.5 - 35.3	CCR
JOF-TW03	12-Oct-20	32.58	409.49	376.91	n/a	n/a	n/a	40.4 - 50.2	CCR
JOF-TW04	12-Oct-20	11.82	394.25	382.43	n/a	n/a	n/a	25.9 - 35.7	CCR
JOF-TW05	12-Oct-20	11.01	393.44	382.43	n/a	n/a	n/a	36.2 - 46.0	CCR
JOF-TW06	12-Oct-20	23.25	395.13	371.88	n/a	n/a	n/a	26.5 - 36.3	CCR
JOF-TW07	12-Oct-20	29.43	402.92	373.49	n/a	n/a	n/a	32.2 - 42.0	CCR
JOF-TW08	12-Oct-20	11.10	387.22	376.12	n/a	n/a	n/a	6.0 - 15.8	CCR
JOF-TW09	12-Oct-20	17.68	387.52	369.84	n/a	n/a	n/a	15.8 - 25.6	CCR
JOF-TW10	12-Oct-20	10.60	384.92	374.32	n/a	n/a	n/a	6.0 - 15.8	CCR
JOF-TW11	12-Oct-20	38.27	440.13	401.86	n/a	n/a	n/a	31.6 - 41.4	CCR
JOF-TW12	12-Oct-20	42.66	444.17	401.51	n/a	n/a	n/a	36.1 - 45.9	CCR
JOF-TW13	12-Oct-20	39.12	441.39	402.27	n/a	n/a	n/a	33.3 - 43.1	CCR
JOF-TW15	12-Oct-20	66.18	451.71	385.53	n/a	n/a	n/a	55.0 - 64.8	CCR
JOF-TW16	12-Oct-20	82.23	473.81	391.58	n/a	n/a	n/a	72.9 - 82.7	CCR
Piezometers									
JOF-E-2A-PZ5	12-Oct-20	n/a	n/a	383.0	390.9	370.9	20.0	n/a	CCR
JOF_PZEC	12-Oct-20	n/a	n/a	382.6	390.4	365.4	25.0	n/a	CCR and Dike Fill
JOF_PZFC	12-Oct-20	n/a	n/a	383.0	389.8	364.8	25.0	n/a	CCR and Dike Fill
JOF_PZGC	12-Oct-20	n/a	n/a	379.0	389.8	364.8	25.0	n/a	CCR and Dike Fill
JOF_PZHC	12-Oct-20	n/a	n/a	382.3	390.0	365.8	24.2	n/a	CCR
JOF_PZIC	12-Oct-20	n/a	n/a	381.7	390.1	360.1	30.0	n/a	CCR and Dike Fill
JOF_PZJC	12-Oct-20	n/a	n/a	379.4	390.0	365.0	25.0	n/a	CCR
JOF_PZKC	12-Oct-20	n/a	n/a	NM	390.5	365.5	25.0	n/a	CCR
JOF_PZLC	12-Oct-20	n/a	n/a	377.6	390.5	365.5	25.0	n/a	CCR
JOF_PZMC	12-Oct-20	n/a	n/a	375.0	391.1	366.1	25.0	n/a	CCR and Dike Fill
P-8	12-Oct-20	n/a	n/a	400.0	432.8	394.5	38.3	n/a	CCR
P-9	12-Oct-20	n/a	n/a	395.4	432.9	393.8	39.2	n/a	CCR and Clayey Fill
P-10	12-Oct-20	n/a	n/a	401.0	430.7	391.0	39.8	n/a	CCR

Notes:

bgs	below ground surface
btoc	below top of casing
CCR	coal combustion residuals
ft	feet
ID	identification
msl	mean sea level
n/a	not applicable
NM	not measured

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

TABLE B.2 – Summary of Groundwater Samples
Johnsonville Fossil Plant
October 2020

			Analysis Type										
Location ID	**Sample ID**	**Sample Type**	Field Parameters	Total Metals	Dissolved Metals	Total Mercury	Dissolved Mercury	Anions	Alkalinity	Total Dissolved Solids	Radium-226	Radium-228	Radium-226+228
JOF-109	JOF-GW-021-20201013	Normal Environmental Sample	X	X		X		X	X	X	X	X	X
JOF-110	JOF-GW-022-20201014	Normal Environmental Sample	X	X		X		X	X	X	X	X	X
JOF-111	JOF-GW-023-20201014	Normal Environmental Sample	X	X		X		X	X	X	X	X	X
JOF-112	JOF-GW-024-20201013	Normal Environmental Sample	X	X		X		X	X	X	X	X	X
JOF-113	JOF-GW-025-20201015	Normal Environmental Sample	X	X		X		X	X	X	X	X	X
JOF-114	JOF-GW-026-20201014	Normal Environmental Sample	X	X		X		X	X	X	X	X	X
JOF-117	JOF-GW-027-20201015	Normal Environmental Sample	X	X	X	X	X	X	X	X	X	X	X
JOF-118	JOF-GW-028-20201014	Normal Environmental Sample	X	X		X		X	X	X	X	X	X
JOF-119	JOF-GW-029-20201013	Normal Environmental Sample	X	X		X		X	X	X	X	X	X
	JOF-GW-DUP01-20201013	Field Duplicate Sample		X		X		X	X	X	X	X	X

Notes:

Total and Dissolved Metals	SW-846 6020A
Total and Dissolved Mercury	SW-846 7470A
Anions	EPA 300.0/SW 9056
Alkalinity	SM2320B
Total Dissolved Solids	SM2540C
Radium-226	EPA 903.0
Radium-228	EPA 904.0
Radium-226+228	CALC
ID	identification

1. Field and laboratory quality control sample results except for field duplicates are not included in report tables but were used for data validation.

TABLE B.3 – Summary of Groundwater Quality Parameters
Johnsonville Fossil Plant
October 2020

Sample Location Sample Date Sample ID Sample Depth Sample Type Level of Review	Units	JOF-109 13-Oct-20 JOF-GW-021-20201013 39 ft Normal Environmental Sample Final QC Review	JOF-110 14-Oct-20 JOF-GW-022-20201014 57 ft Normal Environmental Sample Final QC Review	JOF-111 14-Oct-20 JOF-GW-023-20201014 46 ft Normal Environmental Sample Final QC Review	JOF-112 13-Oct-20 JOF-GW-024-20201013 29.5 ft Normal Environmental Sample Final QC Review	JOF-113 15-Oct-20 JOF-GW-025-20201015 43.5 ft Normal Environmental Sample Final QC Review	JOF-114 14-Oct-20 JOF-GW-026-20201014 39.5 ft Normal Environmental Sample Final QC Review	JOF-117 15-Oct-20 JOF-GW-027-20201015 40.5 ft Normal Environmental Sample Final QC Review	JOF-118 14-Oct-20 JOF-GW-028-20201014 48.5 ft Normal Environmental Sample Final QC Review	JOF-119 13-Oct-20 JOF-GW-029-20201013 42.5 ft Normal Environmental Sample Final QC Review
Field Parameters										
Dissolved Oxygen	%	34.6	4.2	4.1	3.4	2.4	3.5	1.3	2.0	2.2
Dissolved Oxygen	mg/L	3.24	0.48	0.36	0.30	0.23	0.31	0.12	0.18	0.21
ORP	mV	153.3	109.6	-21.4	81.2	163.6	189.6	-106.8	96.6	87.2
pH (field)	SU	5.05	5.29	6.13	5.84	5.70	4.45	6.46	5.49	5.83
Specific Cond. (Field)	uS/cm	193.7	306.3	3,328	424.3	2,465	3,748	1,067	416.9	301.2
Temperature, Water (C)	DEG C	19.1	22.2	19.3	20.3	18.6	19.5	19.2	18.8	17.7
Turbidity, field	NTU	4.71	2.85	2.87	0.48	3.25	1.81	6.62	1.13	0.42

Notes:

%	percent
Cond.	conductance
DEG C	degrees Celsius
ft	feet below top of casing
ID	identification
mg/L	milligrams per Liter
mV	milliVolts
NTU	Nephelometric Turbidity Unit
ORP	Oxidation Reduction Potential, measured using a silver reference electrode which has a standard potential of 200 mV
SU	Standard Units
uS/cm	microSiemens per centimeter

TABLE B.4 - Groundwater Analytical Results for Metals, Anions, and General Chemistry
Johnsonville Fossil Plant
October 2020

Sample Location Sample Date Sample ID Sample Depth Sample Type Level of Review	Units	EPA MCLs	CCR Rule GWPS	JOF-109 13-Oct-20 JOF-GW-021-20201013 39 ft Normal Environmental Sample Final-Verified	JOF-110 14-Oct-20 JOF-GW-022-20201014 57 ft Normal Environmental Sample Final-Verified	JOF-111 14-Oct-20 JOF-GW-023-20201014 46 ft Normal Environmental Sample Final-Verified	JOF-112 13-Oct-20 JOF-GW-024-20201013 29.5 ft Normal Environmental Sample Final-Verified	JOF-113 15-Oct-20 JOF-GW-025-20201015 43.5 ft Normal Environmental Sample Validated	JOF-114 14-Oct-20 JOF-GW-026-20201014 39.5 ft Normal Environmental Sample Final-Verified	JOF-117 15-Oct-20 JOF-GW-027-20201015 40.5 ft Normal Environmental Sample Validated
Total Metals										
Antimony	ug/L	6[A]	n/v	<1.00	1.40 J	<1.00	<1.00	<1.00	<1.00	<1.00
Arsenic	ug/L	10[A]	n/v	<2.00	<2.00	**19.2[A]**	<2.00	2.82 J	<2.00	**31.9[A]**
Barium	ug/L	2,000[A]	n/v	14.7	70.3	43.8	64.8	24.4	20.3	92.0
Beryllium	ug/L	4[A]	n/v	0.374 J	<0.200	<0.200	<0.200	<0.200	1.10	<0.200
Boron	ug/L	n/v	n/v	64.1	1,430	5,190	36.1	15,600	11,600	13.9 J
Cadmium	ug/L	5[A]	n/v	<0.300	<0.300	<0.300	0.576 J	**7.10[A]**	<0.300	<0.300
Calcium	ug/L	n/v	n/v	16,100	17,000	482,000	29,900	580,000	518,000	91,800
Chromium	ug/L	100[A]	n/v	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00
Cobalt	ug/L	n/v	6[B]	<0.300	2.53	**109[B]**	**105[B]**	2.48	**71.1[B]**	**20.4[B]**
Copper	ug/L	n/v	n/v	0.873 U*	0.349 U*	<0.300	<0.300	1.17 U*	2.82 U*	<0.300
Lead	ug/L	n/v	15[B]	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500
Lithium	ug/L	n/v	40[B]	<3.00	<3.00	35.9	<3.00	**123[B]**	**77.5[B]**	<3.00
Magnesium	ug/L	n/v	n/v	5,040	4,380	29,200	13,400	6,540	47,900	28,500
Mercury	ug/L	2[A]	n/v	<0.0670	0.0740 U*	<0.0670	<0.0670	<0.0670	<0.0670	<0.0670
Molybdenum	ug/L	n/v	100[B]	<0.200	0.205 J	40.4	0.824 J	**236[B]**	<0.200	26.7
Nickel	ug/L	100(TN MCL)[A]	n/v	19.5	8.57	29.8	8.54	**117[A]**	20.4	6.00
Potassium	ug/L	n/v	n/v	1,250	338	46,700	915	61,700	104,000	2,780
Selenium	ug/L	50[A]	n/v	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
Silver	ug/L	100(TN MCL)[A]	n/v	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300
Sodium	ug/L	n/v	n/v	6,790	33,500	194,000	25,400	42,700	307,000	34,100
Thallium	ug/L	2[A]	n/v	<0.600	<0.600	<0.600	<0.600	0.919 J	0.741 J	<0.600
Vanadium	ug/L	n/v	n/v	5.49 U*	<3.30	<3.30	<3.30	<3.30	<3.30	<3.30
Zinc	ug/L	n/v	n/v	48.8	13.8 U*	57.6	14.8 U*	292 J	68.0	<3.30
Dissolved Metals										
Antimony	ug/L	6[A]	n/v	-	-	-	-	-	-	<1.00
Arsenic	ug/L	10[A]	n/v	-	-	-	-	-	-	**31.6[A]**
Barium	ug/L	2,000[A]	n/v	-	-	-	-	-	-	92.7
Beryllium	ug/L	4[A]	n/v	-	-	-	-	-	-	<0.200
Boron	ug/L	n/v	n/v	-	-	-	-	-	-	16.9
Cadmium	ug/L	5[A]	n/v	-	-	-	-	-	-	<0.300
Calcium	ug/L	n/v	n/v	-	-	-	-	-	-	94,000
Chromium	ug/L	100[A]	n/v	-	-	-	-	-	-	<3.00
Cobalt	ug/L	n/v	6[B]	-	-	-	-	-	-	**20.2[B]**
Copper	ug/L	n/v	n/v	-	-	-	-	-	-	<0.300
Lead	ug/L	n/v	15[B]	-	-	-	-	-	-	<0.500
Lithium	ug/L	n/v	40[B]	-	-	-	-	-	-	<3.00
Magnesium	ug/L	n/v	n/v	-	-	-	-	-	-	28,200
Mercury	ug/L	2[A]	n/v	-	-	-	-	-	-	<0.0670
Molybdenum	ug/L	n/v	100[B]	-	-	-	-	-	-	27.9
Nickel	ug/L	100(TN MCL)[A]	n/v	-	-	-	-	-	-	5.80
Potassium	ug/L	n/v	n/v	-	-	-	-	-	-	2,740
Selenium	ug/L	50[A]	n/v	-	-	-	-	-	-	<2.00
Silver	ug/L	100(TN MCL)[A]	n/v	-	-	-	-	-	-	<0.300
Sodium	ug/L	n/v	n/v	-	-	-	-	-	-	33,800
Thallium	ug/L	2[A]	n/v	-	-	-	-	-	-	<0.600
Vanadium	ug/L	n/v	n/v	-	-	-	-	-	-	<3.30
Zinc	ug/L	n/v	n/v	-	-	-	-	-	-	3.68 U*
Anions										
Chloride	mg/L	n/v	n/v	42.6	48.4	493	32.0	65.8	224	78.5
Fluoride	mg/L	4[A]	n/v	<0.0330	0.432	0.179	0.434	0.168	0.0623 J	0.851
Sulfate	mg/L	n/v	n/v	3.57	24.8	1,070	52.9	1,440	1,890	3.86
General Chemistry										
Alkalinity, Bicarbonate	mg/L	n/v	n/v	11.0	36.0	64.4	103	13.1	1.76 J	334
Alkalinity, Carbonate	mg/L	n/v	n/v	<1.45	<1.45	<1.45	<1.45	<1.45	<1.45	<1.45
Alkalinity, Total as CaCO3	mg/L	n/v	n/v	11.0	36.0	64.4	103	13.1	1.76 J	334
Total Dissolved Solids	mg/L	n/v	n/v	106	207	2,610	267	2,340	3,250	476

See notes on last page.

Stantec

TABLE B.4 - Groundwater Analytical Results for Metals, Anions, and General Chemistry
Johnsonville Fossil Plant
October 2020

Sample Location Sample Date Sample ID Sample Depth Sample Type Level of Review	Units	EPA MCLs	CCR Rule GWPS	JOF-118 14-Oct-20 JOF-GW-028-20201014 48.5 ft Normal Environmental Sample Final-Verified	JOF-119 13-Oct-20 JOF-GW-029-20201013 42.5 ft Normal Environmental Sample Final-Verified	JOF-119 13-Oct-20 JOF-GW-DUP01-20201013 42.5 ft Field Duplicate Sample Final-Verified
Total Metals						
Antimony	ug/L	6[A]	n/v	<1.00	<1.00	<1.00
Arsenic	ug/L	10[A]	n/v	<2.00	<2.00	<2.00
Barium	ug/L	2,000[A]	n/v	24.1	35.5	36.5
Beryllium	ug/L	4[A]	n/v	<0.200	<0.200	<0.200
Boron	ug/L	n/v	n/v	62.0	22.2	19.8
Cadmium	ug/L	5[A]	n/v	<0.300	<0.300	<0.300
Calcium	ug/L	n/v	n/v	34,600	20,700	20,600
Chromium	ug/L	100[A]	n/v	<3.00	<3.00	<3.00
Cobalt	ug/L	n/v	6[B]	2.93	1.91	1.94
Copper	ug/L	n/v	n/v	<0.300	<0.300	<0.300
Lead	ug/L	n/v	15[B]	<0.500	<0.500	<0.500
Lithium	ug/L	n/v	40[B]	<3.00	<3.00	<3.00
Magnesium	ug/L	n/v	n/v	6,980	3,960	3,920
Mercury	ug/L	2[A]	n/v	0.0670 U*	<0.0670	<0.0670
Molybdenum	ug/L	n/v	100[B]	<0.200	0.386 J	0.334 J
Nickel	ug/L	$100_{(TN\ MCL)}$[A]	n/v	13.0	1.66 J	1.69 J
Potassium	ug/L	n/v	n/v	976	1,310	1,300
Selenium	ug/L	50[A]	n/v	<2.00	<2.00	<2.00
Silver	ug/L	$100_{(TN\ MCL)}$[A]	n/v	<0.300	<0.300	<0.300
Sodium	ug/L	n/v	n/v	34,400	33,800	33,700
Thallium	ug/L	2[A]	n/v	<0.600	<0.600	<0.600
Vanadium	ug/L	n/v	n/v	<3.30	3.83 U*	3.89 U*
Zinc	ug/L	n/v	n/v	10.8 U*	3.71 U*	6.32 U*
Dissolved Metals						
Antimony	ug/L	6[A]	n/v	-	-	-
Arsenic	ug/L	10[A]	n/v	-	-	-
Barium	ug/L	2,000[A]	n/v	-	-	-
Beryllium	ug/L	4[A]	n/v	-	-	-
Boron	ug/L	n/v	n/v	-	-	-
Cadmium	ug/L	5[A]	n/v	-	-	-
Calcium	ug/L	n/v	n/v	-	-	-
Chromium	ug/L	100[A]	n/v	-	-	-
Cobalt	ug/L	n/v	6[B]	-	-	-
Copper	ug/L	n/v	n/v	-	-	-
Lead	ug/L	n/v	15[B]	-	-	-
Lithium	ug/L	n/v	40[B]	-	-	-
Magnesium	ug/L	n/v	n/v	-	-	-
Mercury	ug/L	2[A]	n/v	-	-	-
Molybdenum	ug/L	n/v	100[B]	-	-	-
Nickel	ug/L	$100_{(TN\ MCL)}$[A]	n/v	-	-	-
Potassium	ug/L	n/v	n/v	-	-	-
Selenium	ug/L	50[A]	n/v	-	-	-
Silver	ug/L	$100_{(TN\ MCL)}$[A]	n/v	-	-	-
Sodium	ug/L	n/v	n/v	-	-	-
Thallium	ug/L	2[A]	n/v	-	-	-
Vanadium	ug/L	n/v	n/v	-	-	-
Zinc	ug/L	n/v	n/v	-	-	-
Anions						
Chloride	mg/L	n/v	n/v	12.5	21.1	21.0
Fluoride	mg/L	4[A]	n/v	0.356	0.350	0.378
Sulfate	mg/L	n/v	n/v	120	27.9	28.0
General Chemistry						
Alkalinity, Bicarbonate	mg/L	n/v	n/v	42.9	83.4	84.5
Alkalinity, Carbonate	mg/L	n/v	n/v	<1.45	<1.45	<1.45
Alkalinity, Total as CaCO3	mg/L	n/v	n/v	42.9	83.4	84.5
Total Dissolved Solids	mg/L	n/v	n/v	286	176	171

Notes:

A	EPA Maximum Contaminant Level
B	CCR Rule GWPS (Federal Register / Vol. 83, No. 146 / Monday, July 30, 2018 / Rules and Regulations)
n/v	No standard/guideline value
6.5[A]	Concentration is greater than or equal to the indicated standard.
<0.03	analyte was not detected at a concentration greater than the Method Detection Limit
-	parameter not analyzed / not available
ft	feet below top of casing
ID	identification
J	quantitation is approximate due to limitations identified during data validation
mg/L	milligrams per Liter
U*	result should be considered “not detected” because it was detected in an associated field or laboratory blank at a similar level
ug/L	micrograms per Liter

1. Level of review is defined in the Quality Assurance Project Plan.

TABLE B.5 – Groundwater Analytical Results for Radiological Parameters
Johnsonville Fossil Plant
October 2020

Sample Location Sample Date Sample ID Sample Depth Sample Type Level of Review	Units	EPA MCLs	CCR Rule GWPS	JOF-109 13-Oct-20 JOF-GW-021-20201013 39 ft Normal Environmental Sample Final-Verified	JOF-110 14-Oct-20 JOF-GW-022-20201014 57 ft Normal Environmental Sample Final-Verified	JOF-111 14-Oct-20 JOF-GW-023-20201014 46 ft Normal Environmental Sample Final-Verified	JOF-112 13-Oct-20 JOF-GW-024-20201013 29.5 ft Normal Environmental Sample Final-Verified	JOF-113 15-Oct-20 JOF-GW-025-20201015 43.5 ft Normal Environmental Sample Validated	JOF-114 14-Oct-20 JOF-GW-026-20201014 39.5 ft Normal Environmental Sample Final-Verified
Radiological Parameters									
Radium-226	pCi/L	n/v	n/v	0.741 +/-(0.516)U*	0.808 +/-(0.631)U	1.56 +/-(0.747)U*	3.05 +/-(0.857)	3.77 +/-(1.00)	2.18 +/-(0.735)
Radium-228	pCi/L	n/v	n/v	-0.0120 +/-(0.232)U	0.166 +/-(0.375)U	0.754 +/-(0.452)	0.785 +/-(0.616)U	0.293 +/-(0.341)U	2.26 +/-(0.755)
Radium-226+228	pCi/L	5[A]	n/v	0.741 +/-(0.565)U*	0.974 +/-(0.734)U	2.31 +/-(0.873)J	3.83 +/-(1.06)J	4.07 +/-(1.06)J	4.44 +/-(1.05)

See notes on last page.

TABLE B.5 – Groundwater Analytical Results for Radiological Parameters
Johnsonville Fossil Plant
October 2020

Sample Location				JOF-117	JOF-118	JOF-119	
Sample Date				15-Oct-20	14-Oct-20	13-Oct-20	13-Oct-20
Sample ID				JOF-GW-027-20201015	JOF-GW-028-20201014	JOF-GW-029-20201013	JOF-GW-DUP01-20201013
Sample Depth				40.5 ft	48.5 ft	42.5 ft	42.5 ft
Sample Type				Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample
Level of Review	Units	EPA MCLs	CCR Rule GWPS	Validated	Final-Verified	Final-Verified	Final-Verified
Radiological Parameters							
Radium-226	pCi/L	n/v	n/v	3.72 +/-(0.981)	0.563 +/-(0.511)U	0.0515 +/-(0.274)U	0.284 +/-(0.326)U
Radium-228	pCi/L	n/v	n/v	0.534 +/-(0.394)U	0.136 +/-(0.240)U	-0.0856 +/-(0.329)U	0.0159 +/-(0.268)U
Radium-226+228	pCi/L	5[A]	n/v	4.25 +/-(1.06)J	0.699 +/-(0.565)U	0.0515 +/-(0.428)U	0.300 +/-(0.422)U

Notes:

A	EPA Maximum Contaminant Level
B	CCR Rule GWPS (Federal Register / Vol. 83, No. 146 / Monday, July 30, 2018 / Rules and Regulations)
n/v	No standard/guideline value
ft	feet below top of casing
ID	identification
J	quantitation is approximate due to limitations identified during data validation
pCi/L	picoCurie per Liter
U	not detected
U*	this result should be considered “not detected” because it was detected in an associated field or laboratory blank at a similar level.

1. Level of review is defined in the Quality Assurance Project Plan.

APPENDIX H.9
DYE TRACE SAMPLING AND ANALYSIS REPORT

Johnsonville Fossil Plant – Sampling and Analysis Report for Active Ash Pond 2 Dye Trace Study

TDEC Commissioner's Order:
Environmental Investigation Plan
Johnsonville Fossil Plant
New Johnsonville, Tennessee

April 14, 2021

Prepared for:

Tennessee Valley Authority
Chattanooga, Tennessee

Prepared by:

Stantec Consulting Services Inc.
Lexington, Kentucky

Revision Record

Revision	Description	Date
0	Submittal to TDEC	February 3, 2021
1	Addresses March 30, 2021 TDEC Review Comments and Issued for TDEC	April 14, 2021

Sign-off Sheet

This document entitled Johnsonville Fossil Plant – Active Ash Pond 2 Dye Trace Study Sampling and Analysis Report was prepared by Stantec Consulting Services Inc. ("Stantec") for the account of Tennessee Valley Authority (the "Client"). Any reliance on this document by any third party is strictly prohibited. The material in it reflects Stantec's professional judgment in light of the scope, schedule, and other limitations stated in the document and in the contract between Stantec and the Client. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. In preparing the document, Stantec did not verify information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions taken based on this document.

Prepared by Kevin P. Carey

Kevin P. Carey, PG, Senior Geologist

Reviewed by Carole M. Farr

Carole M. Farr, Senior Principal Geologist

Approved by J. M. Kerr, Jr.

James M. Kerr, Jr., Senior Principal Geologist

Table of Contents

TABLES

LIST OF APPENDICES

APPENDIX A – EXHIBITS

Abbreviations

AAP2	Active Ash Pond 2
CCR	Coal Combustion Residuals
COC	Chain of Custody
EAR	Environmental Assessment Report
EC&O	Environmental Compliance and Operations
EIP	Environmental Investigation Plan
ENV	Environmental
EnvStds	Environmental Standards, Inc.
EWC	Ewers Water Consultants, Inc.
Fluorescein	Sodium Fluorescein (Acid Yellow 73)
FSP	Field Sampling Personnel
ID	Identification
IDW	Investigation Derived Waste
IP	Injection Point
JOF Plant	Johnsonville Fossil Plant
Karst Works	Karst Works Inc.
mL	milliliter
PPE	Personal Protective Equipment
QA/QC	Quality Assurance/Quality Control
QAMP	Quality Assurance Management Plan
RWT	Rhodamine WT
SAP	Sampling and Analysis Plan
SAR	Sampling and Analysis Report
SRB	Sulphorhodamine B (Acid Red 52)
Stantec	Stantec Consulting Services Inc.
TDEC	Tennessee Department of Environment and Conservation
TDEC Order	Commissioner's Order No. OGC15-0177
TI	Technical Instruction
TVA	Tennessee Valley Authority

1.0 INTRODUCTION

Stantec Consulting Services Inc. (Stantec) has prepared this sampling and analysis report (SAR) on behalf of the Tennessee Valley Authority (TVA) to document the completion of the dye trace study activities associated with Active Ash Pond 2 (AAP2), which was conducted from April 2019 through March 2020 at TVA's Johnsonville Fossil Plant (JOF Plant) located in New Johnsonville, Tennessee.

The objective of the dye trace study is to evaluate if preferential hydrogeologic pathways are present between the AAP2 with the underlying alluvial aquifer and surrounding surface water (Kentucky Lake/Tennessee River) in support of fulfilling the requirements for the Tennessee Department of Environment and Conservation (TDEC) issued Commissioner's Order No. OGC15-0177 (TDEC Order) to TVA (TDEC 2015). The TDEC Order sets forth a "process for the investigation, assessment, and remediation of unacceptable risks" at TVA's coal ash disposal sites in Tennessee.

The purpose of this SAR is to document the phases of work completed during the dye trace study and to present the information and data collected during the execution of the Dye Trace Study Sampling and Analysis Plan (SAP) (Stantec 2019a). This SAR is not intended to provide conclusions or interpretations of results regarding preferential hydrogeologic pathways. The scope of the dye trace study represented herein was conducted pursuant to the SAP and is part of a larger environmental investigation at the JOF Plant. The data provided in this SAR are not inclusive of other programmatic data that exist for the site. The evaluation of the results from this dye trace study will consider other aspects of the environmental investigation, as well as data collected under other State and/or coal combustion residuals (CCR) programs, and be presented in the Environmental Assessment Report (EAR).

The dye trace study activities were performed in general accordance with the following documents developed by TVA to support fulfilling the requirements of the TDEC Order at the JOF Plant:

- *Dye Trace Study SAP* (Stantec 2019a)
- *Environmental Investigation Plan (EIP)* (Stantec 2019b)
- *Quality Assurance Management Plan (QAMP)* (Ewers Water Consultants 2020).

The Dye Trace Study SAP was implemented as documented herein in accordance with TVA- and TDEC-approved Programmatic- and Project-specific changes. Variations in scope and procedures from those outlined in the SAP occurred during field activities due to field conditions and programmatic updates and are referenced in Section 3.9.

Stantec conducted the dye trace study field activities, and Ewers Water Consultants, Inc. (EWC) in Richmond, Kentucky, supplied and analyzed the dye detectors. Quality assurance oversight for the dye detector preparation, sampling, and analysis was performed by both EWC and Stantec; data validation and verification were performed by Karst Works, Inc. (Karst Works); and Environmental Standards, Inc.(EnvStds) provided review of the overall dataset and report. This report summarizes the activities conducted to complete the dye trace study.

2.0 OBJECTIVES AND SCOPE

The primary objective of the dye trace study was to evaluate if preferential hydrogeologic pathways are present between AAP2, a CCR Unit at the JOF Plant, with the underlying alluvial aquifer and surrounding surface water (Kentucky Lake/Tennessee River) in response to the TDEC Order. The approach and scope of the dye trace study consisted of four phases and included the following site activities:

- A bench-scale and dye survivability study (herein referred to as the bench study) during which the CCR material and clay liner interface depths were determined, and CCR samples collected to evaluate which dyes should be used for the dye trace study
- A background study to evaluate if the potential dyes selected for the dye injection were present in surface water and monitoring wells around AAP2 prior to dye injections
- Dye injection into five borings advanced along the centerline of AAP2
- Post-injection sampling and analysis using dye detectors.

The following sections further describe the approach to the dye trace study.

2.1 APPROACH TO DYE TRACE STUDY

2.1.1 Bench Study

The objective of the bench study was to investigate the depth of the CCR material/clay bottom interface in five direct push borings that were advanced near the north-south trending centerline of AAP2, which was the proposed injection area. Two injection borings (IP-1 and IP-2) were advanced along the divider dike in the southern portion of AAP2, and three borings (IP-3, IP-4, and IP-5) were advanced near the centerline in the northern portion of AAP2. This investigation included logging the material encountered in each boring and collecting samples of the CCR material from the injection zone, which was immediately above the CCR material/clay bottom interface, to evaluate which commercially available organic dyes interact with, and adsorb the least to, the CCR material. Dyes were selected by EWC for the injection based on the results of bench-scale testing and background study.

2.1.2 Background Study

The objective of the background study was to evaluate if dyes were present within the underlying alluvial aquifer and adjacent surface water. In conjunction with the bench study, the background study was performed to assist in selecting dyes to use for the dye trace study. The background study consisted of two sampling events, the first of which occurred from May 6-7, 2019 followed by dye detector collection on May 13, 2019, and the second of which occurred on July 29-30 with dye detectors collected on August 5, 2019. A dye detector was placed in JOF-PZAT on August 5, 2019 and collected on August 12, 2019. Dye detectors were placed in surface water, monitoring wells, and piezometers around AAP2 and samples were collected for analysis of dyes by EWC. Dye detectors for the study were prepared and supplied by

EWC and were comprised of approximately 10 grams of granular carbon housed in a vinyl coated fiberglass screen cloth and provided in individual resealable plastic bags.

2.1.3 Dye Injection

The objectives of the dye injection activities were to advance five injection borings aligned down the north-south trending centerline of AAP2 to the depths identified during the bench study and inject dyes within the zone immediately above the CCR material/clay bottom interface. Two injection borings (IP-1 and IP-2) were advanced along the divider dike in the southern portion of AAP2, and three borings (IP-3, IP-4, and IP-5) were advanced near the centerline in the northern portion of AAP2. Each injection point was advanced immediately adjacent to its corresponding bench study boring. Dye was injected into each boring, followed by an additional volume of water obtained from the reverse-osmosis building at the JOF Plant to disperse the dyes within the bottom portion of the CCR unit along the clay bottom interface.

2.1.4 Post-Injection Sampling and Analysis

The objective of the post-injection sampling and analysis phase was to place and retrieve dye detectors for analysis by EWC. As part of that process, Stantec established Quality Assurance/Quality Control (QA/QC) guidelines for Stantec field sampling personnel (FSP) to implement when retrieving, replacing, handling, and transporting the dye detectors to EWC during the dye trace study. The QA/QC guidelines included collecting field blanks, field duplicates, and trip blanks during sampling activities. For nine sampling events from August 19 through October 14, 2019, the dye detector packets were retrieved and replaced weekly. For 11 sampling events from October 28, 2019 through March 4, 2020, the dye detectors were retrieved and replaced biweekly.

EWC implemented, maintained, and documented the QA/QC practices followed when preparing and analyzing the dye detectors.

3.0 FIELD ACTIVITIES

Dye trace study investigation field activities were conducted between April 8, 2019 and March 4, 2020. As described in Sections 3.3 through 3.6 below, field activities were conducted in four phases: the bench study, the background study, dye injection, and post-injection sampling and analysis. Stantec performed field activities based on guidance and specifications in TVA's Technical Instructions (TIs), the SAP, and the QAMP, except as noted in the Variations section of this report. As part of TVA's commitment to generate representative and reliable data, quality assurance oversight for the dye detector preparation, sampling, and analysis was performed by both EWC and Stantec, and data validation and verification were performed by Karst Works, Inc. (Karst Works). EnvStds, under direct contract with TVA, also provided quality reviews of field documentation. In addition, TVA's Environmental Compliance and Operations (EC&O) team observed dye trace field activities during post-injection sampling activities.

3.1 WORK LOCATIONS

The dye trace study investigation and sampling locations at the JOF Plant AAP2 are shown on Exhibits A.1 through A.3 in Appendix A. Dye trace study sampling results are presented in Tables B.1 through B.3 in Appendix B.

3.2 DOCUMENTATION

Stantec maintained field documentation in general accordance with TVA TI ENV-TI-05.80.03, *Field Record Keeping* and the QAMP. Field activities were recorded in field logbooks and other program-specific field forms. Health and safety forms were completed in accordance with TVA and Stantec health and safety requirements. Additional information regarding field documentation is provided below.

3.2.1 Field Forms

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

- *Field Logbook and Daily Field Activity Log*
- *Subsurface Log*
- *Chain-of-Custody (COC).*

3.2.1.1 Field Logbook and Daily Field Activity Log

Stantec FSP recorded field activities, observations, and data in a field logbook or a *Daily Field Activity Log* to chronologically document the field program. Deviations from the SAP, TIs, or QAMP were documented in the field logs.

3.2.1.2 Subsurface Log

A Professional Geologist (PG) licensed in the State of Tennessee prepared a *Subsurface Log* for the investigation borings. The log documented date, boring location, drilling personnel, tooling/equipment used, sample depth and time, sample recovery, subsurface lithology and other relevant observations. The *Subsurface Logs* are provided in Appendix C.

3.2.1.3 Chain-of-Custody

Stantec FSP completed *COC* documentation for bench study, background study, and post-injection samples collected during the dye trace study. *COCs* were provided by EWC. The unique sample identification (ID), sample location, type of sample, collection date and time, analyses requested, and sample custody were recorded on the *COC*. The Field Team Leader reviewed the *COCs* for completeness, and the FSP conducted a quality check of samples compared to sample IDs on the corresponding *COC*. *COCs* were completed in general accordance with ENV-TI-05.80.02, *Sample Labeling and Custody*.

3.2.2 Photographs

Photographs of the dye trace study investigation, bench study, and dye injection activities are presented in Appendix D, Attachments D.1 and D.2 respectively.

3.3 BENCH STUDY

On April 8 and 9, 2019, Stantec retained the track-mounted Geoprobe® services of Geo Logic, Inc. to collect the CCR material samples from each of the five injection point (IP) borings (IP-1, IP-2, IP-3, IP-4, and IP-5), which were advanced along the north-south trending centerline of AAP2. A CCR material sample was collected from the proposed injection zone in each boring, which was immediately above the CCR material/clay bottom interface of the CCR unit. The depths of the CCR material/clay interface in each boring and intervals from which the CCR material samples were collected were as follows:

Table 1 – Bench Study Boring Details

Boring Location	Depth of CCR Material/Clay Interface	CCR Sample Interval	Depth of Dye Injection
IP-1	47.0 ft bgs	45.5-47.0 ft	46.0 ft
IP-2	43.5 ft bgs	42.0-43.5 ft	43.0 ft
IP-3	51.8 ft bgs	50.3-51.8 ft	51.0 ft
IP-4	42.0 ft bgs	40.5-42.0 ft	41.5 ft
IP-5	35.0 ft bgs	33.5-35.0 ft	34.5 ft

Notes: bgs – below ground surface
CCR – coal combustion residuals
ft - feet
IP-injection point

The locations of the bench study borings are shown on Exhibit A.1 in Appendix A, and photographs of bench study activities are included in Appendix D.1 in Appendix D.

Once the base of the CCR material was reached, CCR material was collected from the injection interval and placed into laboratory provided soil jars, placed into an iced cooler, and transported to the EWC laboratory for analysis. The analysis consisted of mixing a portion of CCR material from each boring with four different dyes to evaluate how each dye reacted with the CCR material. The four dyes used during the Bench Study analyses were:

- Eosine (Acid Red 87)
- Rhodamine-WT (Acid Red 388)
- Sodium Fluorescein (Acid Yellow 73)
- Sulphorhodamine B (Acid Red 52).

During EWC's analysis, six sets of two closable 50 milliliter (mL) Pyrex® reactor vessels were used in the Bench Study tests. A "set" consisted of two vessels: one for Sodium Fluorescein (Fluorescein) and Rhodamine-WT (RWT) and a second for Eosine and Sulphorhodamine-B (SRB). The six sets consisted of one for each of the five CCR samples and one control sample set for the two dye solutions. The two dye solutions were prepared in bicarbonate water, one using Fluorescein and RWT (Solution A), the other containing Eosine and SRB (Solution B).

Ten grams of CCR material from a boring location were placed into a set of two reactor vessels. Thirty (30) mL of dye Solution A were added to one of the vessels and a similar quantity of Solution B was added to the second vessel. The process was repeated for each of the five samples and the control sample. The control sample consisted of unused carbon and did not contain CCR material. The vessels were filled with the same dye solutions, capped, and placed in a Gyrotary® shaker and agitated to prevent the CCR material from settling on the bottom of the vessels.

Two mL of the liquid from the samples were withdrawn from each set of vessels at intervals of one, three, nine, and 21 hours. These samples were analyzed spectrofluorometrically with a Shimadzu RF-5301-PC Spectrofluorophotometer.

Based on analysis of the samples from each boring, EWC determined that both Fluorescein and SRB dyes were the appropriate dyes to be used for the injection activities. A table summarizing the results of the bench-scale dye survivability study is included in Table B.1 in Appendix B.

3.4 BACKGROUND STUDY

The background study was conducted in accordance with the SAP. Dye detector sampling was performed at the following locations:

- Fifteen surface water sampling locations around the periphery of AAP2 (SW01 through SW14) - The 15 surface water sampling locations included five background/upgradient locations: two along the south end of AAP2 (SW11 and SW12); one on the southwest end of Highway 70 bridge (SW14); one on the southeast end of Highway 70 bridge (SW13); and the Spillway in the southeast portion of AAP2. The remaining 10 surface water locations were SW01 through SW10, located along the east and west sides of AAP2.

- Groundwater monitoring wells 10-AP1, 10-AP3, JOF-103, and JOF-104 - Groundwater monitoring wells JOF-118 and JOF-119 were later added to the sampling network, as these two monitoring wells were not installed at the time the background study began.

- Piezometer JOF-PZAT was added to the second background study event.

The monitoring points for the background study are shown on Exhibit A.2 in Appendix A. Results of the dye detector background analysis are provided in Table B.2 in Appendix B.

On May 6-7, 2019, Stantec FSP set up surface water and aquifer background sampling locations by placing dye detectors at each location. Two dye detectors were placed within the screened intervals of each groundwater monitoring well, one at the top portion and one in the bottom portion to provide two sampling locations within the screened interval. The dye detectors in the groundwater monitoring wells were designated as “top” and “bottom.” Dye detectors remained in their respective locations for approximately one week.

On May 13, 2019, the dye detectors were retrieved from each sampling location, placed into new resealable plastic bags, placed into a cooler to prevent exposure to sunlight, and transported to EWC laboratory for analysis.

The laboratory procedure performed to produce the eluent for analysis was prepared and implemented by EWC and consisted of the following sequence:

- Vigorously rinse each dye detector with dechlorinated activated carbon filtered potable water

- Remove excess water by centrifugal extraction

- Dry the dye detectors in a temperature-controlled, filtered forced air, dye-free drying cabinet

- Withdraw approximately three grams of the granular activated carbon into a disposable plastic container

- Elute the dye (if present) with six mL of Smart Solution for one hour (Smart Solution consists of a 5:3:2 ratio of 1-propanol: 30% ammonium hydroxide and deionized water at 140°F, respectively)

- Decant the eluent into a clean, disposable cuvette
- Place the cuvette into a spectrofluorophotometer for analysis.

On July 29 and 30, 2019, a second, limited background sampling event was conducted, which included five surface water locations (SW01-SW05), to evaluate the surface water in-between the initial background sampling event and the dye injection activities, and JOF-118 and JOF-119, which had been installed since the initial background sampling event. On August 5th, the dye detectors were collected from the second background sampling event. During that time, piezometer JOF-PZAT was located and deemed a viable sampling location. A dye detector was then placed into piezometer JOF-PZAT to add this piezometer as part of the background study. The dye detector placed in piezometer JOF-PZAT during the second background study was collected on August 12, 2019.

3.5 DYE INJECTION

On August 12 and 13, 2019, prior to performing the dye injection activities, new dye detectors were placed in groundwater monitoring wells JOF-103, JOF-104, JOF118, JOF-119, 10-AP1, 10-AP3, the Spillway, and the surface water sampling locations. On August 13-15, 2019, Stantec retained the Geoprobe® and material injection services of Geo Logic, Inc. to inject dye into five boring locations adjacent to the bench study borings. Two different dyes were used for the study: SRB was injected into borings IP-1 and IP-2, which were advanced along the divider dike in the southern portion of the AAP2; and Fluorescein was injected into borings IP-3, IP-4, and IP-5, which were advanced within the northern portion of the unit.

Locations of the injection points are depicted on Exhibit A.3 in Appendix A, and photographs of dye injection activities are included in Appendix D.2 in Appendix D.

For the injections, EWC supplied 25 pounds of SRB powder and 25 pounds of 40% Fluorescein solution. The SRB powder was dissolved in water and evenly divided among injection points IP-1 and IP-2. Approximately 12.5 pounds of SRB was dissolved in five to ten gallons of water and injected into IP-1 and IP-2. The Fluorescein was evenly divided between injection points IP-3, IP-4, and IP-5. To do so, approximately one gallon of Fluorescein dye was mixed with 15 to 20 gallons of water per boring and injected into IP-3, IP-4, and IP-5.

The injections were performed by advancing a 1.25-inch diameter Geoprobe® drill-rod with an expendable point in each injection boring location to the depth just above the CCR material/clay bottom interface, as determined during the Bench Study. Once the target depth was reached in each boring location, five to ten gallons of water were pumped through the drill-rod (at a boring-specific pounds per square inch, as determined by Stantec's geotechnical engineers) while slowly retracting the drill-rod in order to detach the expendable point and allow water to flow into the injection interval (Table 1). Water was injected first to determine how well the CCR material would accept water. After injecting the water, the dye was prepared for each injection point in a new five-gallon bucket and injected through the drill-rod into the bottom five-feet of CCR material. Once the dye was fully injected, an additional 25 to 35 gallons of water was injected into each boring location to aid in dispersing the dye along the CCR material/clay bottom interface.

3.6 SAMPLING AND ANALYSIS

The dye detectors that were placed at each sampling location prior to the dye injection were retrieved and replaced with new dye detectors on August 19 and 20, 2019, approximately one week after the dye injection activities were conducted. The retrieved dye detectors were transported to EWC for analysis.

The dye detectors were then retrieved and replaced once per week for the next eight weeks (August 19 through October 14, 2019). After the October 14, 2019, event (Round 9), the dye detectors were retrieved and replaced twice per month until the final dye detector packet retrieval event was conducted on March 3-4, 2020. During the post-injection sampling, a total of 584 dye packets (including duplicate samples) were retrieved for dye detection analysis.

Dye detectors used between August 19 and October 28, 2019, contained unwashed (coconut) carbon. From November 12 through the end of the study, acid-washed carbon was used in the dye detectors. The change in carbon was implemented by EWC when early rounds of dye detectors placed in the monitoring wells consistently showed a “low-flow signature” near the wavelength of Fluorescein. Low-flow signature is indicative of background levels of fluorescence that naturally occur in unwashed (coconut) carbon due to low water flow in the wells and through the dye detectors. A positive low-flow signature does not indicate a positive dye recovery. The acid-washed carbon was reported by EWC to have lower capture efficiency than the unwashed carbon, but this was offset by reducing the low flow signature interference.

As described below in the Variations section of this report, although new dye detectors and duplicates were placed after each sampling event, several dye detectors and duplicates were missing when the Stantec FSP returned to collect them. Dye detectors and duplicates were missing at the following locations and dates during the post-injection sampling activities:

- August 19-20, 2019 (Round 1): SW07 and SW08
- August 26-27, 2019 (Round 2): SW03, SW04, and SW07
- September 3-4, 2019 (Round 3): SW14
- September 9, 2019 (Round 4): SW04
- October 28, 2019 (Round 10): duplicates missing from SW06 and SW10
- November 12, 2019 (Round 11): SW01, SW02, and SW13
- November 25, 2019 (Round 12): SW02 and SW12
- December 9, 2019 (Round 13): SW04 and SW09
- December 19, 2019 (Round 14): duplicates missing from SW09 and SW11

- January 6, 2020 (Round 15): SW04, SW08, and SW13
- January 21-22, 2020 (Round 16): SW03 and SW05
- February 18-19, 2020 (Round 18): SW06 and SW13, missing duplicates from SW06 and JOF-119TOP
- March 3-4, 2020 (Round 19): SW13

The missing dye detectors may be attributed to various causes including strong currents/water movement detaching the packet, aquatic life interfering with the packet, or non-dye trace study related anthropogenic activities. As described in Section 4.2, there were adequate dye detectors analyzed from the locations included in this study.

3.6.1 Analysis of Dye Detector Packets

Dye detectors were transported to EWC for analysis. The procedure utilized by EWC to produce the eluent for analysis was the same as described in Section 3.4 above for the background study.

3.6.2 Quality Control Methodology

Quality Control samples were collected in accordance with TVA's Technical Instruction ENV-TI.05.080.04 – *Field Sampling Quality Control*. During the sampling activities, Stantec FSP followed QA/QC procedures designed specifically for the dye trace study including:

- Changing nitrile gloves between each sample location or when handling a different dye detector
- Double-bagging dye detectors once collected using resealable plastic bags with no color(s) in the zipper seal
- After double-bagging was completed, a custody seal was placed across the zipper seal of the outer resealable plastic bag
- Labeling all sample bags using only a black marker
- Stantec FSP were directed not to wear high-visibility (fluorescent) clothing while handling the dye detectors
- QA/QC samples were maintained in accordance with the QAMP (EWC 2020) except as documented in the Section 3.9 - Variations. The QAMP called for one field blank per five dye detector samples; one field duplicate per 10 dye detector samples, and one trip blank per event.

3.7 SAMPLE SHIPMENT

Samples were delivered by Stantec FSP to EWC's laboratory under *COC* protocols in accordance with TVA's Technical Instruction ENV-TI.05.80.06 *Handling and Shipping of Samples*.

In accordance with EWC practices, "under normal circumstances, dye detectors are stored and transported in coolers at ambient temperature. If more than 48 hours (will) lapse before the samples are sent to the laboratory, they are refrigerated to retard bacterial action". As such, ice was only placed in the cooler in the event the dye detectors were shipped overnight to EWC, possibly exceeding the 48-hour hold-time. However, if the dye detectors were driven/transported directly to EWC immediately following the sampling activities, ice was not placed in the cooler.

Once received by EWC, the dye detectors were either processed immediately or within 24-hours of receipt. If the dye detectors were not processed immediately, they were stored under locked refrigeration accessible only to laboratory personnel. The laboratory refrigerator at EWC operates between 0.7° Celsius and 2.0° Celsius.

3.8 INVESTIGATIVE DERIVED WASTE

Investigation derived waste (IDW) generated during the dye trace study activities included:

- Disposable personal protective equipment (PPE)
- General trash.

IDW was handled in accordance with ENV-TI-05.80.05, *Field Sampling Equipment Cleaning and Decontamination*; the Plant-specific waste management plan; and local, state, and federal regulations. Transportation and disposal of IDW was coordinated with TVA Plant facility management. Used disposable PPE (e.g., nitrile gloves) and general trash generated throughout the dye trace study were placed in garbage bags and disposed of in a general trash dumpster onsite at the end of each day.

3.9 VARIATIONS

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

3.9.1 Variations in Scope

Variations in scope are provided below.

- Although new dye detectors and duplicates were placed during each sampling event by Stantec FSP, several dye detectors and duplicates were missing upon returning to collect them. As described in Section 3.6, the missing dye detectors may be attributed to various reasons not related to the dye trace study (e.g., strong currents/water movement, aquatic life, or other anthropogenic activities). Based on the QA/QC assessment performed by Karst Works, there were adequate dye detectors analyzed from the locations included in this study (see Section 4.2).

3.9.2 Variations in Procedures

Variations in procedures occurring in the field are provided below.

- Borings IP-1 through IP-5 were not professionally surveyed as part of this investigation per the SAP; however, boring locations were determined using field measurements and GPS, providing sufficient information to meet the objective of the study.

- The frequency of field QC sample collection did not meet the specific QAMP and SAP requirements. The results of the collected field QC samples were evaluated as part of the data validation/verification process performed by Karst Works.

- TVA's Environmental Compliance and Operations (EC&O) team observed dye trace activities during the September 4, 2019 dye detector collection event. The EC&O auditor noted that the carbon used for the study should have a certification verifying its purity. After discussions with several carbon vendors, it was determined that EWC would self-certify the carbon. EWC's self-certification was included with the data packages.

4.0 SAMPLING RESULTS AND DATA REVIEW

The following sections summarize EWC's evaluation of the dye packet sampling analysis results, and Karst Works data review of the dye trace study field methods, laboratory procedures, and sampling results.

4.1 SAMPLING RESULTS EVALUATION

Once an eluent was analyzed, a graph was produced depicting the wavelength generated for each eluent and was reviewed by EWC to determine if peak(s) within the graph indicated a positive signature for the injected dyes (Fluorescein or SRB). According to EWC, the combined criteria for determining a positive dye detection result for post-injection samples are as follows:

- A spectrofluorometric emission scan must show a peak at the appropriate wavelength for the dye and the sample matrix
- A spectrofluorometric emission scan must reveal a peak with the appropriate shape, one similar to that observed in the scans of the standards
- The dye must be present only in the samples taken after dye injection or the peak amplitude or post injection dye fluorescence must exceed the dye background peak amplitude fluorescence by an appropriate factor (a factor of four is acceptable)
- The dye should appear in a series of samples, not in a single sample.

The following summarizes the dye trace study sampling results based on these combined criteria, with post-injection sampling results for positive, trace or questionable results for dye detection shown on Exhibit A.4 in Appendix A, and summarized in Table B.3 in Appendix B.

<u>Positive Dye Detections: JOF-104</u>

Based on the above criteria, a positive signature for Fluorescein was observed in monitoring well JOF-104 in both the "top" and "bottom" dye detectors from the following sampling events:

- The initial trace detection of Fluorescein was reported after the November 25, 2019 (Round 12) sampling event
- Four consecutive positive signatures for Fluorescein were detected in JOF-104 after the initial trace detection in samples from the December 9, 2019; December 19, 2019; January 6, 2020; and January 21-22, 2020 (Rounds 13 through 16) sampling events
- A trace amount of Fluorescein was detected on the "bottom" dye detector in JOF-104 after the February 3, 2020 (Round 17) sampling event (Note: The "top" dye detector was deemed "dry" at that time)

- Trace amounts of Fluorescein were detected on both the “top” and “bottom” dye detectors in JOF-104 after the February 18-19, 2020 (Round 18) sampling event
- A possible trace amount of Fluorescein was detected on the “bottom” dye detector in JOF-104 after the March 3-4, 2020 (Round 19) sampling event (Note: The “top” dye detector was deemed “dry” at that time).

Positive dye detections in JOF-104 met the four criteria for a positive Fluorescein detection. The positive Fluorescein detections were found after the change to acid-washed carbon.

<u>False Positive Dye Detections: JOF-PZAT</u>

A positive signature for Fluorescein was detected on the “bottom” dye detector in piezometer JOF-PZAT after the August 12, 2019 background sampling event (Table B.2). The positive signature for this sample was detected before the dye injection, and therefore does not meet the criteria for a positive result for the dye trace study.

False-positive signatures for Fluorescein were observed in piezometer JOF-PZAT after the following sampling events:

- A false-positive Fluorescein signature was detected on the “bottom” dye detector in piezometer JOF-PZAT after the August 19-20, 2019 (Round 1) sampling event
- A false-positive Fluorescein signature was detected on the “bottom” dye detector in piezometer JOF-PZAT after the August 26-27, 2019 (Round 2) sampling event.

The false positives in JOF-PZAT post-injection samples were not considered positive dye detections because no dye was detected in JOF-PZAT after the first and second rounds of post-injection sampling.

<u>Possible Trace and Questionable Results: JOF 118, JOF-119, 10-AP1</u>

- A possible trace result for Fluorescein was reported in the top and bottom samples from well JOF-118 during the last round of dye detector sampling on March 3-4, 2020. These results are not considered positive dye detections because possible trace results were not reported in a series of samples. The dye trace study concluded after the March 3-4, 2020 event.
- Questionable (denoted by ‘?’ in Table B.3) and possible trace results for Fluorescein were reported for the top and bottom samples in well JOF-119 for one or both of the February 11, 2020 and March 3-4, 2020 sampling events. A questionable result indicates that one or more of the criteria for a positive dye detection was not met. Additionally, well JOF-119 is located on the upgradient end of AAP2 where SRB dye was injected.
- Questionable and possible trace results for Fluorescein were also reported for the top samples from monitoring well 10-AP1 from the February 3, 2020 and March 3-4, 2020 sampling events, respectively. These were not considered to be positive results because one or more criteria for a

positive dye detection were not met for the samples, and because 10-AP1 is located on the west side of the area where SRB dye was injected.

The locations of groundwater monitoring wells JOF-104, JOF-118, 10-AP1, and JOF-119, as well as piezometer JOF-PZAT, are shown on Exhibit A.3 in Appendix A.

4.2 DATA REVIEW

For QA/QC purposes, Stantec retained the services of Karst Works to provide a third-party review and evaluation of the dye trace study field methods, laboratory procedures, and sampling results. Karst Works reviewed the following:

- Guidelines on retrieving and replacing dye detectors
- Bench study implementation and sample results
- QAMP
- Dye injection amounts and volumes
- Field forms including *COCs*, sample receipt checklists, sample preparation checklists, and instrument checklists
- Laboratory methods
- Analytical results and luminance plots
- Laboratory quality control sample results
- Field duplicate, field blank, and trip blank results.

The Data Validation Report prepared by Karst Works is provided in Appendix E. Based on this review, Karst Works determined that quality control variations were minimal, did not compromise the findings of the tracer tests (dye trace study), and did not impact the quality or use of the data. Additionally, Karst Works determined that although some dye packets were missing upon retrieval, sufficient data have been collected during the dye trace study from the following locations:

- 14 surface water locations, including four background/upgradient locations; two along the southern end of AAP2 (SW11 and SW12); and two on the southern side of the bridge (SW13 and SW 14)
- One within the Spillway located in the southwestern portion of AAP2
- Groundwater monitoring wells 10-AP1, 10-AP3, JOF-103, JOF-104, JOF-118, and JOF-119
- Piezometer JOF-PZAT.

Finally, Karst Works' review of the spectrofluorometric emissions scans validated that the reported dye detections in well JOF-104 were consistent with the presence of Fluorescein dye.

5.0 SUMMARY

The data presented in this report are from the dye trace study conducted at the JOF Plant. The dye trace study investigation field activities consisted of four phases: the bench study, the background study, dye injection, and post-injection sampling and analysis. Dye injection activities included injecting two dyes (Fluorescein and SRB) during August 13-15, 2019 into five injection borings located along the north-south trending centerline of AAP2. The post-injection sampling was performed for the following six months at weekly or biweekly intervals.

A summary of bench study boring locations is presented in Section 3.3 and bench study boring, background study monitoring, and injection boring locations are shown on Exhibits A.1 through A.3. Bench study, background study, and post-injection sampling results are presented in Tables B.1 through B.3. Dye trace study data were reported by EWC and validated by Karst Works.

After the November 25, 2019, sampling event, Fluorescein was detected in the bottom dye detector from monitoring well JOF-104, followed by four consecutive “positive” Fluorescein signatures in the top and bottom dye detectors from the December 2019 and the January 2020 sampling events. The Fluorescein then decreased to a “trace” and “possible trace” in the February 2020 sampling events and March 2020 sampling event, respectively. SRB was not detected in any of the sampling locations during the dye trace study. A summary of the positive detections in well JOF-104 is described in Section 4.1 and presented in Table B.3 in Appendix B.

Stantec has completed the dye trace study at the JOF Plant in New Johnsonville, Tennessee, in accordance with the Dye Trace Study SAP as documented herein. The data collected during the dye trace study are usable for reporting and evaluation in the EAR and meet the objectives of the TDEC Order EIP. The complete dataset from this study will be evaluated along with data collected during the other TDEC Order SAPs, as well as data collected under other State and CCR Programs. This evaluation will be provided in the EAR.

6.0 REFERENCES

Ewers Water Consultants, 2020, Quality Assurance Management Plan, March 2020.

Stantec Consulting Services Inc. (Stantec). 2019a. *Dye Trace Study Sampling and Analysis Plan, Johnsonville Fossil Plant.* Revision 3. Prepared for Tennessee Valley Authority. August 8, 2019.

Stantec. 2019b. *Environmental Investigation Plan, Johnsonville Fossil Plant*. Revision 3. Prepared for Tennessee Valley Authority. March 4, 2019.

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

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

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

TVA, ENV-TI-05.80.04, *Field Sampling Quality Control*.

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

TVA, ENV-TI-05.80.06, *Handling and Shipping of Samples*.

APPENDIX A –EXHIBITS

Exhibit No.
A.1

Title
Dye Trace Study
Bench Study Boring Locations
Active Ash Pond 2

Client/Project
Tennessee Valley Authority
Johnsonville Fossil (JOF) Plant TDEC Order

Project Location
New Johnsonville, Tennessee

175568286
Prepared by DMB on 2020-06-29
Technical Review by KC on 2020-06-29

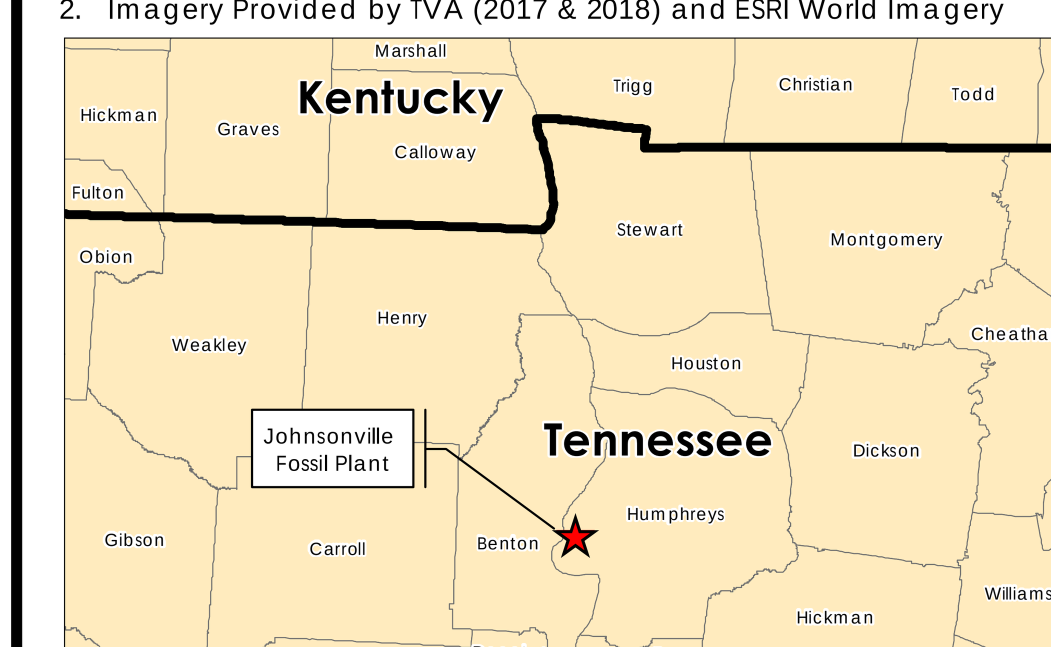
0 400 800 1,200 1,600 Feet
1:4,800 (At original document size of 22x34)

Legend

- CCR Well Monitoring Location
- Boring Location to Collect Samples for Bench Study
- 2017 Imagery Boundary
- 2018 Imagery Boundary
- CCR Unit Boundary (Approximate)
- Coal Yard
- TVA Property Boundary

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Imagery Provided by TVA (2017 & 2018) and ESRI World Imagery



Stantec TVA

U:\TVA-EP\175568286_JOF_Phase2\gis\mxd\DyeTraceStudy_SAR\JOF_Dye_Trace_Study_SAR_A1_BenchSampleBoring.mxd Revised: 2020-06-29 By: mbough

Exhibit No.
A.2

Title
Background Study Monitoring Locations Active Ash Pond 2

Client/Project
Tennessee Valley Authority
Johnsonville Fossil (JOF) Plant TDEC Order

Project Location
New Johnsonville, Tennessee

175568286
Prepared by DMB on 2021-01-25
Technical Review by KC on 2021-01-25

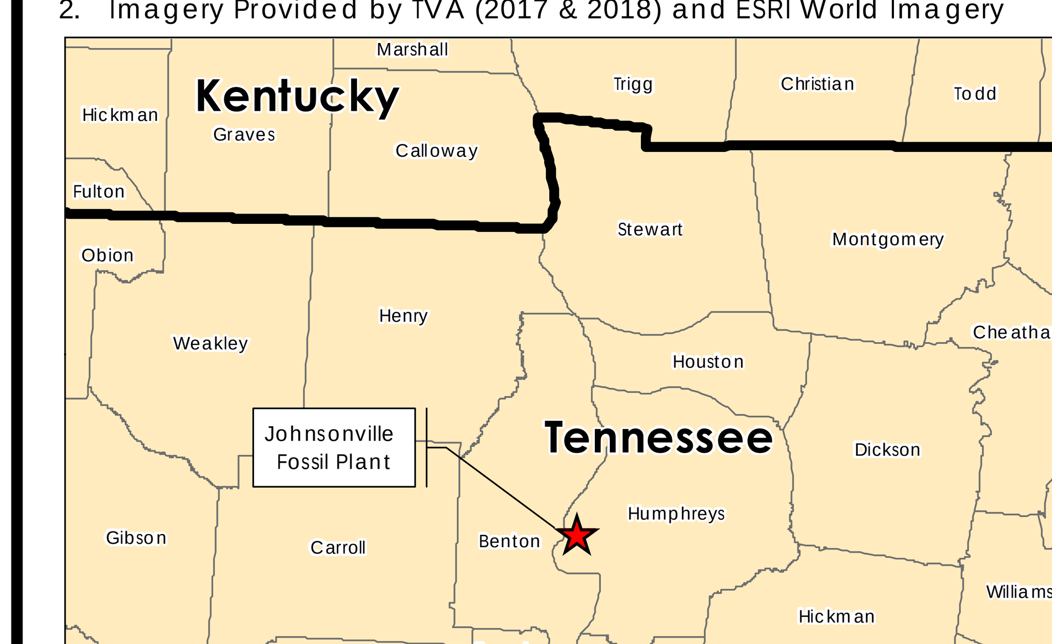
0 400 800 1,200 1,600 Feet
1:4,800 (At original document size of 22x34)

Legend

- CCR Well Monitoring Location
- Surface Water Monitoring Location
- Monitoring Well
- Existing Piezometer Open Standpipe
- 2017 Imagery Boundary
- 2018 Imagery Boundary
- CCR Unit Boundary (Approximate)
- Coal Yard
- TVA Property Boundary

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Imagery Provided by TVA (2017 & 2018) and ESRI World Imagery



Stantec
TVA

U:\TVA-EIP\175568286_JOF_Phase2\gis\mxd\DyeTraceStudy_SAR\JOF_Dye_Trace_Study_SAR_A2_BackgroundStudyMonitoring.mxd Revised: 2021-01-25 By: mbough

Exhibit No.
A.3

Title
Dye Trace Study
Injection Boring Locations
Active Ash Pond 2

Client/Project
Tennessee Valley Authority
Johnsonville Fossil (JOF) Plant TDEC Order

Project Location
New Johnsonville, Tennessee

175568286
Prepared by DMB on 2021-01-25
Technical Review by KC on 2021-01-25

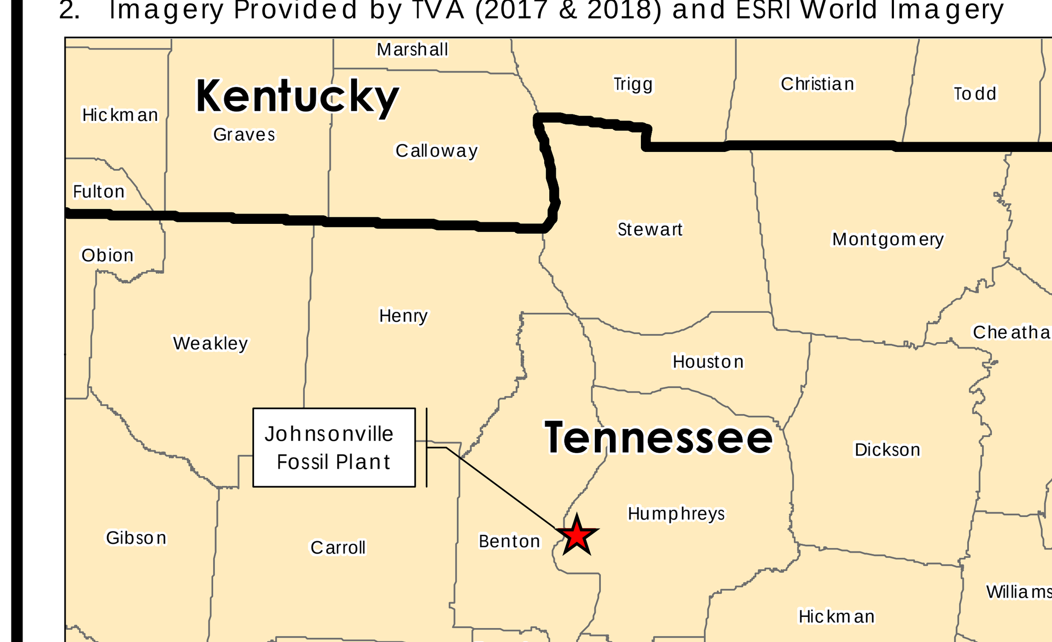
0 400 800 1,200 1,600 Feet
1:4,800 (At original document size of 22x34)

Legend

- CCR Well Monitoring Location
- Boring Location to Collect Samples for Bench
- Surface Water Upgradient Monitoring
- Dye Injection Boring Location
- Surface Water Monitoring
- Monitoring Well
- Existing Piezometer Open
- 2017 Imagery Boundary
- 2018 Imagery Boundary
- CCR Unit Boundary
- Coal Yard
- TVA Property Boundary

Injected Dyes:
IP-1 and IP-2 Sulpho Rhodamine-B
IP-3, IP-4, and IP-5 fluorescein

Notes
1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Imagery Provided by TVA (2017 & 2018) and ESRI World Imagery



Stantec TVA

U:\TVA-EIP\175568286_JOF_Phase2\gis\mxd\DyeTraceStudy_SAR\JOF_Dye_Trace_Study_SAR_A3_InjectionBoringLocations.mxd Revised: 2021-01-25 By: mbough

Exhibit No.
A.4

Title

Post-Injection Dye Detection Results

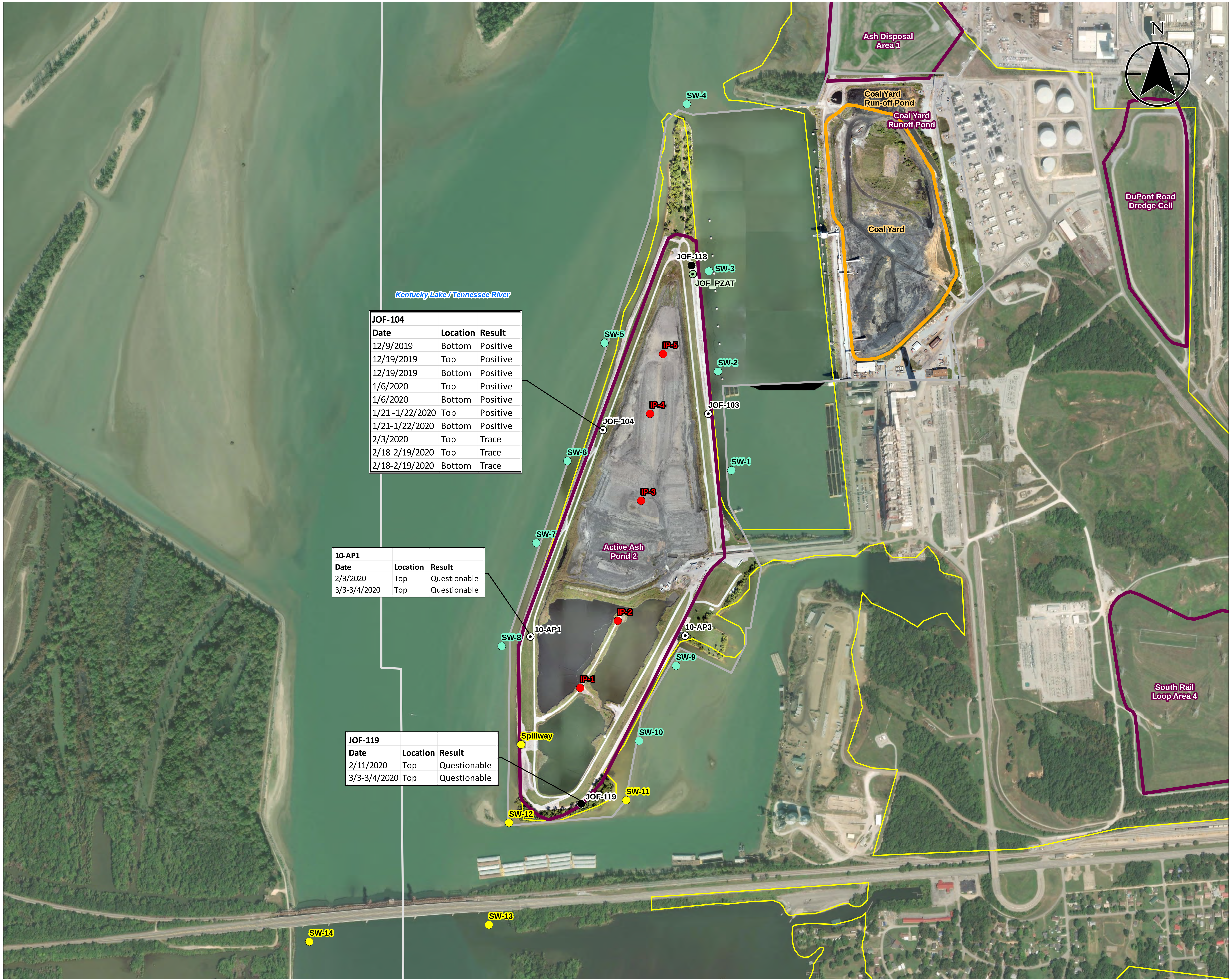
Client/Project

Tennessee Valley Authority
Johnsonville Fossil (JOF) Plant TDEC Order

Project Location
New Johnsonville, Tennessee

175568286
Prepared by DMB on 2021-04-16
Technical Review by KC on 2021-04-16

0 400 800 1,200 1,600 Feet
1:4,800 (At original document size of 22x34)



JOF-104		
Date	Location	Result
12/9/2019	Bottom	Positive
12/19/2019	Top	Positive
12/19/2019	Bottom	Positive
1/6/2020	Top	Positive
1/6/2020	Bottom	Positive
1/21 -1/22/2020	Top	Positive
1/21-1/22/2020	Bottom	Positive
2/3/2020	Top	Trace
2/18-2/19/2020	Top	Trace
2/18-2/19/2020	Bottom	Trace

10-AP1		
Date	Location	Result
2/3/2020	Top	Questionable
3/3-3/4/2020	Top	Questionable

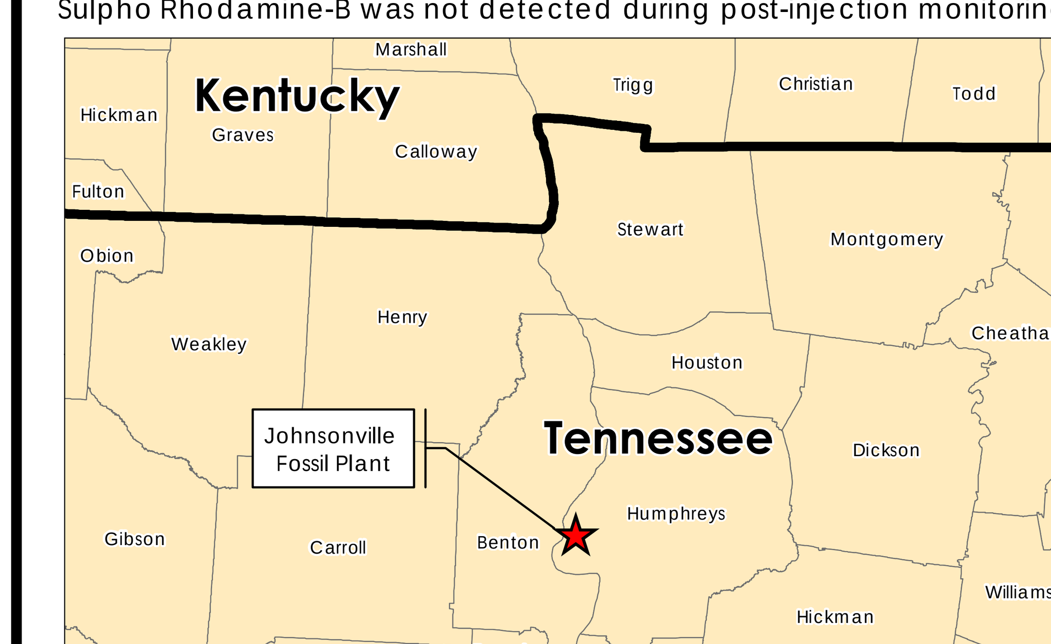
JOF-119		
Date	Location	Result
2/11/2020	Top	Questionable
3/3-3/4/2020	Top	Questionable

Legend

- CCR Well Monitoring Location
- Surface Water Upgradient Monitoring Location
- Dye Injection Boring Location
- Surface Water Monitoring Location
- Monitoring Well
- Existing Piezometer Open Standpipe
- 2017 Imagery Boundary
- 2018 Imagery Boundary
- CCR Unit Boundary (Approximate)
- Coal Yard
- TVA Property Boundary

Injected Dyes:
IP-1 and IP-2 Sulpho Rhodamine-B
IP-3, IP-4, and IP-5 fluorescein
Refer to Table B.3 for complete Post-injection analytical results

Notes
1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Imagery Provided by TVA (2017 & 2018) and ESRI World Imagery
3. All results reported on this Exhibit are for Fluoescein.
Sulpho Rhodamine-B was not detected during post-injection monitoring.



Stantec TVA

U:\TVA-EIP\175568286_JOF_Phase2\gis\mxd\DyeTraceStudy_SAR\JOF_Dye_Trace_Study_SAR_A4_LocationGWMonWellJOF-104.mxd Revised: 2021-04-16 By: lblackman

APPENDIX B - TABLES

Table B.1 - Bench Study Results (1)

EWC *Ewers Water Consultants Inc.*

160 Redwood Drive, Richmond, Kentucky 40475
Phone & Fax (859) 623-8464 E-mail: ewc@mis.net

StanTec, TVA Dye Survivability Study

		Sampling Time After Inoculation With Dyes			
Vessel	Sample/Dye	1 Hour	3 Hours	9 Hours	21 Hours
Vessel 1	Control Fluor	3091	3064	2930	2774
	Control RWT	2668	2723	2746	2613
Vessel 2	Control Eos	4912	4784	4692	4250
	Control SRB	3698	3753	3786	3634
Vessel- 3	IP-1 Fluor	25.6	23.6	22.6	21.2
	IP-1 RWT	Trace	Trace	Trace	Trace
Vessel -4	IP-1 Eos	*24.9,10	*22.7	*22.3	*21.2
	IP-1 SRB	9.2	1.7	Trace	1.5
Vessel -5	IP-2 Fluor	131.4	64.5	36.9	35.3
	IP-2 RWT	11.1	4.9	3.2	3.7
Vessel- 6	IP-2 Eos	*30, 84	*23.8, 15.8	*22.6, 4.1	*21.3, 5
	IP-2 SRB	32.7	9.6	4.1	4.2
Vessel- 7	IP-3 Fluor	1748	1306	863	824
	IP-3 RWT	276	87.4	32.6	35.8
Vessel -8	IP-3 Eos	1624	519.8	*40, 124.9	*25, 114.5
	IP-3 SRB	860	266.1	90.6	89.7
Vessel -9	IP-4 Fluor	24.5	23.1	22.8	21.6
	IP-4 RWT	Trace	1.9	Trace	Trace
Vessel- 10	IP-4 Eos	*24.5	*22.8	*22.7	21.3
	IP-4 SRB	2.2	1.6	Trace	Trace
Vessel- 11	IP-5 Fluor	24.3	22.9	22.5	21.7
	IP-5 RWT	Trace	1.5	Trace	2
Vessel -12	IP-5 Eos	*24.3	*22.7	*22.5	21.1
	IP-5 SRB	2.3	Trace	1.8	2

* indicates Eosine has shifted from a peak of 535nm to +/-510nm.
An additional number indicates that a peak at 535nm is also present.

"Control" is obtained from analysis of the dye inoculation solution in a separate reaction vessel.

Fluor = Fluorescein, RWT = Rhodamine-WT, Eos = Eosine , SRB = Sulphorhodamine-B

(1) - Results are for the Dye Trace Study performed at the Johnsonville Fossil Plant

Trace - dye detected in trace amount based on analysis of scans and peak amplitude.

Results are reported in Fluorescence units.

Table B.2 Background Study Results

ID	Location of Dye Detectors	5/13/2019			8/5/2019			8/12/2019		
		Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature
Surface Water										
TSW01	SW01	-	-	-	-	-	-			
TSW02	SW02	-	-	-	-	-	-			
TSW03	SW03	-	-	-	-	-	-			
TSW04	SW04	-	-	-	-	-	-			
TSW05	SW05	-	-	-	-	-	-			
TSW06	SW06	-	-	-						
TSW07	SW07	-	-	-						
TSW08	SW08	-	-	-						
TSW09	SW09	-	-	-						
TSW10	SW10	-	-	-						
TSW11	SW11	-	-	-						
TSW12	SW12	-	-	-						
TSW13	SW13	-	-	-						
TSW14	SW14	-	-	-						
TSPILL	Spillway	-	-	-						
Well Samples										
T103T	JOF103	-	-	+						
T103B	JOF103	-	-	+						
T104T	JOF104	-	-	+						
T104B	JOF104	-	-	+						
T118T	JOF118	NS	NS	NS	-	-	-			
T118B	JOF118	NS	NS	NS	-	-	-			
T119T	JOF119	NS	NS	NS	-	-	-			
T119B	JOF119	NS	NS	NS	-	-	-			
TAP1T	10AP1	-	-	+						
TAP1B	10AP1	-	-	+						
TAP3T	10AP3	-	-	+						
TAP3B	10AP3	-	-	+						
TPAZT	JOFPZAT	NS	NS	NS				-	-	+
TPAZB	JOFPZAT	NS	NS	NS				+	-	-

Notes:

SRB	Sulphorhodamine-B Dye
T	"T" at end of sample ID indicates upper dye detector set at location shown.
B	"B" at end of sample ID indicates lower dye detector set at bottom location shown.
NS	No sample collected
-	Dye not detected
Low Flow Signature	A '+' result in the low flow signature column indicated background flourescence was detected in the dye detector carbon due to low water flow. This condition was found in dye detectors placed in wells and piezometers where unwashed carbon was used and does not indicate a positive dye detection.
+	Positive dye detection

Table B.3 Post Injection Dye Detector Results
Johnsonville Fossil Plant
Johnsonville, Tennessee

Location of Dye Detectors		SW01			DUP 01			DUP03			SW02			DUP01		
ID/Duplicate Parent		TSW01			TSW01			TSW01			TSW02			TSW02		
Surface Water		Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature
Round 1	8/19-20/2019	-	-	-	-	-	-				-	-	-			
Round 2	8/26-27/2019	-	-	-							-	-	-			
Round 3	9/03-04/2019	-	-	-							-	-	-			
Round 4	9/9/219	-	-	-							-	-	-			
Round 5	9/16/2019	-	-	-							-	-	-			
Round 6	9/23/2019	-	-	-							-	-	-			
Round 7	9/30/2019	-	-	-							-	-	-			
Round 8	10/7/2019	-	-	-							-	-	-			
Round 9	10/14/2019	-	-	-							-	-	-			
Round 10	10/28/2019	-	-	-							-	-	-			
Round 11	11/12/2019[a]	NS	NS	NS							NS	NS	NS			
Round 12	11/25/2019	-	-	-							NS	NS	NS			
Round 13	12/9/2019	-	-	-							-	-	-			
Round 14	12/19-20/2019	-	-	-							-	-	-	-	-	-
Round 15	1/6/2020	-	-	-				-	-	-	-	-	-			
Round 16	1/21-22/2020	-	-	-							-	-	-			
Round 17	2/3/2020	-	-	-							-	-	-			
Round 18	2/18-19/2020	-	-	-							-	-	-			
Round 19	3/03-04/2020	-	-	-							-	-	-			

Table B.3 Post Injection Dye Detector Results
Johnsonville Fossil Plant
Johnsonville, Tennessee

Location of Dye Detectors		DUP02			DUP03			SW03			DUP02			DUP03		
ID/Duplicate Parent		TSW02			TSW02			TSW03			TSW03			TSW03		
Surface Water		Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature
Round 1	8/19-20/2019							-	-	-						
Round 2	8/26-27/2019							NS	NS	NS						
Round 3	9/03-04/2019							-	-	-						
Round 4	9/9/219							-	-	-						
Round 5	9/16/2019							-	-	-						
Round 6	9/23/2019							-	-	-	-	-	-			
Round 7	9/30/2019	-	-	-				-	-	-						
Round 8	10/7/2019							-	-	-						
Round 9	10/14/2019							-	-	-						
Round 10	10/28/2019							-	-	-	-	-	-			
Round 11	11/12/2019[a]							-	-	-				-	-	-
Round 12	11/25/2019							-	-	-						
Round 13	12/9/2019	-	-	-				-	-	-						
Round 14	12/19-20/2019							-	-	-						
Round 15	1/6/2020	-	-	-				-	-	-						
Round 16	1/21-22/2020							NS	NS	NS						
Round 17	2/3/2020				-	-	-	-	-	-						
Round 18	2/18-19/2020							-	-	-						
Round 19	3/03-04/2020							-	-	-						

Table B.3 Post Injection Dye Detector Results
Johnsonville Fossil Plant
Johnsonville, Tennessee

	Location of Dye Detectors	SW04			SW05			DUP01			SW06			DUP03		
	ID/Duplicate Parent	TSW04			TSW05			TSW05			TSW06			TSW06		
Surface Water		Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature
Round 1	8/19-20/2019	-	-	-	-	-	-				-	-	-			
Round 2	8/26-27/2019	NS	NS	NS	-	-	-				-	-	-			
Round 3	9/03-04/2019	-	-	-	-	-	-	-	-	-	-	-	-			
Round 4	9/9/219	NS	NS	NS	-	-	-				-	-	-			
Round 5	9/16/2019	-	-	-	-	-	-				-	-	-			
Round 6	9/23/2019	-	-	-	-	-	-				-	-	-			
Round 7	9/30/2019	-	-	-	-	-	-				-	-	-			
Round 8	10/7/2019	-	-	-	-	-	-				-	-	-	-	-	-
Round 9	10/14/2019	-	-	-	-	-	-				-	-	-	-	-	-
Round 10	10/28/2019	-	-	-	-	-	-				-	-	-			
Round 11	11/12/2019[a]	-	-	-	-	-	-				-	-	-			
Round 12	11/25/2019	-	-	-	-	-	-				-	-	-			
Round 13	12/9/2019	NS	NS	NS	-	-	-				-	-	-			
Round 14	12/19-20/2019	-	-	-	-	-	-				-	-	-			
Round 15	1/6/2020	NS	NS	NS	-	-	-	-	-	-	-	-	-			
Round 16	1/21-22/2020	-	-	-	NS	NS	NS				-	-	-			
Round 17	2/3/2020	-	-	-	-	-	-				-	-	-			
Round 18	2/18-19/2020	-	-	-	-	-	-				NS	NS	NS			
Round 19	3/03-04/2020	-	-	-	-	-	-				-	-	-			

Table B.3 Post Injection Dye Detector Results
Johnsonville Fossil Plant
Johnsonville, Tennessee

Location of Dye Detectors		SW07			SW08			DUP01			SW09			DUP01		
ID/Duplicate Parent		TSW07			TSW08			TSW08			TSW09			TSW09		
Surface Water		Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature
Round 1	8/19-20/2019	NS	NS	NS	NS	NS	NS				-	-	-			
Round 2	8/26-27/2019	NS	NS	NS	-	-	-				-	-	-			
Round 3	9/03-04/2019	-	-	-	-	-	-				-	-	-			
Round 4	9/9/219	-	-	-	-	-	-				-	-	-			
Round 5	9/16/2019	-	-	-	-	-	-				-	-	-			
Round 6	9/23/2019	-	-	-	-	-	-				-	-	-			
Round 7	9/30/2019	-	-	-	-	-	-				-	-	-	-	-	-
Round 8	10/7/2019	-	-	-	-	-	-				-	-	-			
Round 9	10/14/2019	-	-	-	-	-	-				-	-	-			
Round 10	10/28/2019	-	-	-	-	-	-				-	-	-			
Round 11	11/12/2019[a]	-	-	-	-	-	-				-	-	-			
Round 12	11/25/2019	-	-	-	-	-	-				-	-	-			
Round 13	12/9/2019	-	-	-	-	-	-				NS	NS	NS			
Round 14	12/19-20/2019	-	-	-	-	-	-				-	-	-			
Round 15	1/6/2020	-	-	-	NS	NS	NS				-	-	-			
Round 16	1/21-22/2020	-	-	-	-	-	-	-	-	-	-	-	-			
Round 17	2/3/2020	-	-	-	-	-	-				-	-	-			
Round 18	2/18-19/2020	-	-	-	-	-	-				-	-	-			
Round 19	3/03-04/2020	-	-	-	-	-	-				-	-	-			

Table B.3 Post Injection Dye Detector Results
Johnsonville Fossil Plant
Johnsonville, Tennessee

	Location of Dye Detectors	DUP02			SW10			DUP01			DUP02			SW11		
	ID/Duplicate Parent	TSW09			TSW10			TSW10			TSW10			TSW11		
Surface Water		Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature
Round 1	8/19-20/2019				-	-	-							-	-	-
Round 2	8/26-27/2019				-	-	-							-	-	-
Round 3	9/03-04/2019				-	-	-							-	-	-
Round 4	9/9/219				-	-	-							-	-	-
Round 5	9/16/2019				-	-	-	-	-	+				-	-	-
Round 6	9/23/2019				-	-	-	-	-	-				-	-	-
Round 7	9/30/2019				-	-	-							-	-	-
Round 8	10/7/2019				-	-	-				-	-	-	-	-	-
Round 9	10/14/2019				-	-	-				-	-	-	-	-	-
Round 10	10/28/2019				-	-	-							-	-	-
Round 11	11/12/2019[a]	-	-	-	-	-	-							-	-	-
Round 12	11/25/2019				-	-	-							-	-	-
Round 13	12/9/2019				-	-	-	-	-	-				-	-	-
Round 14	12/19-20/2019				-	-	-							-	-	-
Round 15	1/6/2020				-	-	-							-	-	-
Round 16	1/21-22/2020				-	-	-							-	-	-
Round 17	2/3/2020				-	-	-							-	-	-
Round 18	2/18-19/2020				-	-	-							-	-	-
Round 19	3/03-04/2020	-	-	-	-	-	-							-	-	-

Table B.3 Post Injection Dye Detector Results
Johnsonville Fossil Plant
Johnsonville, Tennessee

Location of Dye Detectors		DUP01			SW12			DUP01			SW13			SW14		
ID/Duplicate Parent		TSW11			TSW12			TSW12			TSW13			TSW14		
Surface Water		Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature
Round 1	8/19-20/2019				-	-	-				-	-	-	-	-	-
Round 2	8/26-27/2019				-	-	-				-	-	-	-	-	-
Round 3	9/03-04/2019				-	-	-				-	-	-	NS	NS	NS
Round 4	9/9/219				-	-	-				-	-	-	-	-	-
Round 5	9/16/2019				-	-	-				-	-	-	-	-	-
Round 6	9/23/2019				-	-	-				-	-	-	-	-	-
Round 7	9/30/2019				-	-	-				-	-	-	-	-	-
Round 8	10/7/2019				-	-	-				-	-	-	-	-	-
Round 9	10/14/2019				-	-	-				-	-	-	-	-	-
Round 10	10/28/2019				-	-	-	-	-	+	-	-	-	-	-	-
Round 11	11/12/2019[a]	-	-	-	-	-	-				NS	NS	NS	-	-	-
Round 12	11/25/2019				NS	NS	NS				-	-	-	-	-	-
Round 13	12/9/2019				-	-	-				-	-	-	-	-	-
Round 14	12/19-20/2019				-	-	-				-	-	-	-	-	-
Round 15	1/6/2020				-	-	-				NS	NS	NS	-	-	-
Round 16	1/21-22/2020				-	-	-				-	-	-	-	-	-
Round 17	2/3/2020				-	-	-				-	-	-	-	-	-
Round 18	2/18-19/2020				-	-	-				NS	NS	NS	-	-	-
Round 19	3/03-04/2020				-	-	-				NS	NS	NS	-	-	-

Table B.3 Post Injection Dye Detector Results
Johnsonville Fossil Plant
Johnsonville, Tennessee

Location of Dye Detectors		Spillway			DUP02			DUP04			DUP05		
ID/Duplicate Parent		TSPILL			TSPILL			TSPILL			TSPILL		
Surface Water		Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature
Round 1	8/19-20/2019	-	-	-									
Round 2	8/26-27/2019	-	-	-									
Round 3	9/03-04/2019	-	-	-									
Round 4	9/9/219	-	-	-									
Round 5	9/16/2019	-	-	-									
Round 6	9/23/2019	-	-	-									
Round 7	9/30/2019	-	-	-									
Round 8	10/7/2019	-	-	-									
Round 9	10/14/2019	-	-	-									
Round 10	10/28/2019	-	-	-				-	-	-			
Round 11	11/12/2019[a]	-	-	-									
Round 12	11/25/2019	-	-	-									
Round 13	12/9/2019	-	-	-									
Round 14	12/19-20/2019	-	-	-									
Round 15	1/6/2020	-	-	-							-	-	-
Round 16	1/21-22/2020	-	-	-									
Round 17	2/3/2020	-	-	-	-	-	-						
Round 18	2/18-19/2020	-	-	-									
Round 19	3/03-04/2020	-	-	-									

Table B.3 Post Injection Dye Detector Results
Johnsonville Fossil Plant
Johnsonville, Tennessee

	Location of Dye Detectors	JOF103			DUP03			DUP01			JOF103			DUP04		
	ID	T103T			T103T			T103T			T103B			T103B		
Well Samples		Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature
Round 1	8/19-20/2019	-	-	+							-	-	+			
Round 2	8/26-27/2019	-	-	+							-	-	+			
Round 3	9/03-04/2019	-	-	+							-	-	+			
Round 4	9/9/2019	-	-	+							-	-	+			
Round 5	9/16/2019	-	-	+							-	-	+	-	-	+
Round 6	9/23/2019	-	-	+							-	-	+			
Round 7	9/30/2019	-	-	+							-	-	+			
Round 8	10/7/2019	-	-	+							-	-	+			
Round 9	10/14/2019	-	-	+							-	-	+			
Round 10	10/28/2019	-	-	+	-	-	-				-	-	+			
Round 11	11/12/2019[a]	-	-	-							-	-	-			
Round 12	11/25/2019	-	-	-							-	-	-			
Round 13	12/9/2019	-	-	-							-	-	-			
Round 14	12/19-20/2019	-	-	-							-	-	-			
Round 15	1/6/2020	-	-	-							-	-	-			
Round 16	1/21-22/2020	-	-	-							-	-	-			
Round 17	2/3/2020	-	-	-							-	-	-			
Round 18	2/18-19/2020	-	-	-				Possible trace	-	-	-	-	-			
Round 19	2/11/2020[b] 3/03-04/2020	-	-	-							-	-	-			

Table B.3 Post Injection Dye Detector Results
Johnsonville Fossil Plant
Johnsonville, Tennessee

Location of Dye Detectors		DUP01			JOF104			DUP02			DUP04			JOF104		
	ID	T103B			T104T			T104T			T104T			T104B		
Well Samples		Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	Sulphorhodamine-B	Low-Flow Signature
Round 1	8/19-20/2019				-	-	+							-	-	+
Round 2	8/26-27/2019				-	-	+							-	-	+
Round 3	9/03-04/2019				-	-	+							-	-	+
Round 4	9/9/2019				-	-	+							-	-	+
Round 5	9/16/2019				-	-	+							-	-	+
Round 6	9/23/2019				-	-	+							-	-	+
Round 7	9/30/2019				-	-	+							-	-	+
Round 8	10/7/2019				-	-	+							-	-	+
Round 9	10/14/2019				-	-	+							-	-	+
Round 10	10/28/2019				-	-	+							-	-	+
Round 11	11/12/2019[a]				-	-	-							-	-	-
Round 12	11/25/2019	-	-	-	-	-	-							+	-	-
Round 13	12/9/2019				+	-	-							+	-	-
Round 14	12/19-20/2019				+	-	-	-	-	-				+	-	-
Round 15	1/6/2020				+	-	-				+	-	-	+	-	-
Round 16	1/21-22/2020				+	-	-							+	-	-
Round 17	2/3/2020				DRY	DRY	DRY							Trace	-	-
Round 18	2/18-19/2020				Trace	-	-	+	-	-				Trace	-	-
Round 19	2/11/2020[b] 3/03-04/2020				DRY	DRY	DRY							Possible Trace	-	-

Table B.3 Post Injection Dye Detector Results
Johnsonville Fossil Plant
Johnsonville, Tennessee

Location of Dye Detectors		DUP02			DUP03			DUP01			JOF118			DUP02		
	ID	T104B			T104B			T104B			T118T			T118T		
Well Samples		Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature
Round 1	8/19-20/2019										-	-	+			
Round 2	8/26-27/2019										-	-	+			
Round 3	9/03-04/2019	-	-	+							-	-	+			
Round 4	9/9/2019										-	-	+			
Round 5	9/16/2019										-	-	+			
Round 6	9/23/2019										-	-	+			
Round 7	9/30/2019										-	-	+			
Round 8	10/7/2019										-	-	+			
Round 9	10/14/2019										-	-	+			
Round 10	10/28/2019										-	-	+			
Round 11	11/12/2019[a]										-	-	-			
Round 12	11/25/2019				-	-	-				-	-	-	-	-	-
Round 13	12/9/2019										-	-	-			
Round 14	12/19-20/2019										-	-	-			
Round 15	1/6/2020										-	-	-			
Round 16	1/21-22/2020	-	-	-							-	-	-			
Round 17	2/3/2020										-	-	-			
Round 18	2/18-19/2020										UC	UC	UC			
Round 19	2/11/2020[b]										-	-	-			
	3/03-04/2020							Possible Trace	-	-	Possible trace	-	-			

Table B.3 Post Injection Dye Detector Results
Johnsonville Fossil Plant
Johnsonville, Tennessee

Location of Dye Detectors		DUP03			JOF118			DUP01			JOF119			DUP01		
	ID	T118T			T118B			T118B			T119T			T119T		
Well Samples		Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature
Round 1	8/19-20/2019				-	-	+				-	-	+			
Round 2	8/26-27/2019				-	-	+				-	-	+			
Round 3	9/03-04/2019				-	-	+				-	-	+			
Round 4	9/9/2019				-	-	+				-	-	+			
Round 5	9/16/2019	-	-	+	-	-	+				-	-	+			
Round 6	9/23/2019				-	-	+				-	-	+			
Round 7	9/30/2019				-	-	+				-	-	+			
Round 8	10/7/2019				-	-	+				-	-	+	-	-	+
Round 9	10/14/2019				-	-	+				-	-	+			
Round 10	10/28/2019				-	-	+				-	-	+			
Round 11	11/12/2019[a]				-	-	-				-	-	-			
Round 12	11/25/2019				-	-	-				-	-	-			
Round 13	12/9/2019				-	-	-				-	-	-			
Round 14	12/19-20/2019				-	-	-	-	-	-	-	-	-			
Round 15	1/6/2020				-	-	-				-	-	-			
Round 16	1/21-22/2020				-	-	-				-	-	-	-	-	-
Round 17	2/3/2020				DRY	DRY	+	DRY	DRY	+	-	-	-			
Round 18	2/18-19/2020				UC	UC	UC				UC	UC	UC			
Round 19	2/11/2020[b]				-	-	-				?	-	-			
	3/03-04/2020				Possible trace	-	-				Possible trace	-	-			

Table B.3 Post Injection Dye Detector Results
Johnsonville Fossil Plant
Johnsonville, Tennessee

Location of Dye Detectors		JOF119			DUP02			DUP03			10AP1			10AP1		
	ID	T119B			T119B			T119B			TAP1T			TAP1B		
Well Samples		Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature
Round 1	8/19-20/2019	-	-	+	-	-	-				-	-	+	-	-	+
Round 2	8/26-27/2019	-	-	+							-	-	+	-	-	+
Round 3	9/03-04/2019	-	-	+							-	-	+	-	-	+
Round 4	9/9/2019	-	-	+							-	-	+	-	-	+
Round 5	9/16/2019	-	-	+							-	-	+	-	-	+
Round 6	9/23/2019	-	-	+							-	-	+	-	-	+
Round 7	9/30/2019	-	-	+				-	-	+	-	-	+	-	-	+
Round 8	10/7/2019	-	-	+							-	-	+	-	-	+
Round 9	10/14/2019	-	-	+							-	-	+	-	-	+
Round 10	10/28/2019	-	-	+							-	-	+	-	-	+
Round 11	11/12/2019[a]	-	-	-							-	-	-	-	-	-
Round 12	11/25/2019	-	-	-							-	-	-	-	-	-
Round 13	12/9/2019	-	-	-				-	-	-	-	-	-	-	-	-
Round 14	12/19-20/2019	-	-	-							-	-	-	-	-	-
Round 15	1/6/2020	-	-	-							-	-	-	-	-	-
Round 16	1/21-22/2020	-	-	-							-	-	-	-	-	-
Round 17	2/3/2020	-	-	-							DRY	DRY	+	-	-	-
Round 18	2/18-19/2020	UC	UC	UC							?	-	+	-	-	-
Round 19	2/11/2020[b]	Possible trace	-	-												
	3/03-04/2020	-	-	-							Possible Trace	-	-	-	-	-

Table B.3 Post Injection Dye Detector Results
Johnsonville Fossil Plant
Johnsonville, Tennessee

Location of Dye Detectors		DUP01			10AP3			10AP3			DUP03			JOFPZAT		
	ID	TAP1B			TAP3T			TAP3B			TAP3B			TPAZT		
Well Samples		Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature
Round 1	8/19-20/2019				-	-	+	-	-	+				NS	NS	NS
Round 2	8/26-27/2019				-	-	+	-	-	+				NS	NS	NS
Round 3	9/03-04/2019				-	-	+	-	-	+				NS	NS	NS
Round 4	9/9/2019				-	-	+	-	-	+				NS	NS	NS
Round 5	9/16/2019				-	-	+	-	-	+				NS	NS	NS
Round 6	9/23/2019				-	-	+	-	-	+	-	-	+	-	-	+
Round 7	9/30/2019				-	-	+	-	-	+				-	-	+
Round 8	10/7/2019				-	-	+	-	-	+				-	-	+
Round 9	10/14/2019	-	-	+	-	-	+	-	-	+						
Round 10	10/28/2019				-	-	+	-	-	+						
Round 11	11/12/2019[a]				-	-	-	-	-	-				DRY	DRY	DRY
Round 12	11/25/2019				-	-	-	-	-	-				DRY	DRY	DRY
Round 13	12/9/2019				-	-	-	-	-	-				DRY	DRY	DRY
Round 14	12/19-20/2019				-	-	-	-	-	-				DRY	DRY	DRY
Round 15	1/6/2020				-	-	-	-	-	-				DRY	DRY	DRY
Round 16	1/21-22/2020				-	-	-	-	-	-				DRY	DRY	DRY
Round 17	2/3/2020				-	-	-	-	-	-				DRY	DRY	DRY
Round 18	2/18-19/2020				-	-	-	-	-	-				DRY	DRY	DRY
Round 19	2/11/2020[b] 3/03-04/2020				-	-	-	-	-	-				DRY	DRY	+

Table B.3 Post Injection Dye Detector Results
Johnsonville Fossil Plant
Johnsonville, Tennessee

Location of Dye Detectors		JOFPZAT			DUP01			DUP02			DUP03		
	ID	TPAZB			UNKNOWN			UNKNOWN			UNKNOWN		
Well Samples		Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature	Flourescein	SRB	Low-Flow Signature
Round 1	8/19-20/2019	+*	-	+									
Round 2	8/26-27/2019	+*	-	+	-	-	-						
Round 3	9/03-04/2019	-	-	+									
Round 4	9/9/2019	-	-	+	-	-	-	-	-	-	-	-	+
Round 5	9/16/2019	-	-	+				-	-	+			
Round 6	9/23/2019	-	-	+									
Round 7	9/30/2019	-	-	+									
Round 8	10/7/2019	-	-	+									
Round 9	10/14/2019												
Round 10	10/28/2019												
Round 11	11/12/2019[a]	DRY	DRY	DRY									
Round 12	11/25/2019	DRY	DRY	DRY									
Round 13	12/9/2019	DRY	DRY	DRY									
Round 14	12/19-20/2019	DRY	DRY	DRY									
Round 15	1/6/2020	-	-	-									
Round 16	1/21-22/2020	-	-										
Round 17	2/3/2020	-	-	-									
Round 18	2/18-19/2020	-	-	-									
Round 19	2/11/2020[b] 3/03-04/2020	-	-	-									

Notes:

SRB	Sulphorhodamine-B Dye
NS	No sample collected
-	Dye not detected
Low Flow Signature	A '+' result in the low flow signature column indicated background flourescence is present in the dye detector carbon due to low water flow. This condition was found in dye detectors placed in wells and piezometers where unwashed carbon was used and does not indicate a positive dye detection.
Possible trace	Possible detection of dye in trace amount, but not repeated in a series.
Trace	Dye detected in trace amount based on analysis of scans and peak amplitude.
+	Positive dye detection
+*	Results for JOFPZAT for Fluorescein in Rounds 1 and 2 were determined not to be positive detections since Fluorescein was also reported during the Background Study.
UC	Dye detector contained unwashed carbon, sample not analyzed
?	Questionable dye detection, criteria not met for positive result
DRY	The dye detector packet was not submerged in water after placement.
NA	Sample not analyzed
T	"T" at end of sample ID indicates upper dye detector set at top of location shown.
B	"B" at end of sample ID indicates lower dye detector set at bottom location shown.
[a]	Prior to November 12, 2019, unwashed carbon was used in the dye detectors. Beginning with this event, acid washed carbon was used in the dye detectors.
[b]	Dye detectors collected on February 11, 2020 were removed from wells that were included in groundwater sampling. The dye detectors were analyzed with the same batch as the dye detectors collected on March 3-4, 2020.

APPENDIX C – BORING LOGS

SUBSURFACE LOG

Client Borehole ID	Injection Point 1 (IP-1)	Stantec Boring No.	**IP-1**
Client	Tennessee Valley Authority	Boring Location	NR
Project Number	175568286	Surface Elevation	NR
		Elevation Datum	N/A
Project Name	JOF TDEC Order Dye Trace Study	Date Started	4/8/19
		Completed	4/8/19
Project Location	New Johnsonville, Humphreys Co., TN	Depth to Water	N/A
		Date/Time	N/A
Inspector	K. Carey	Depth to Water	N/A
Logger	K. Carey	Date/Time	N/A
Drilling Contractor	Geo Logic	Drill Rig Type and ID	Geoprobe 7822DT
Overburden Drilling and Sampling Tools (Type and Size)	2" diameter x 60" sampler w/ PVC liner		
Rock Drilling and Sampling Tools (Type and Size)	N/A		
Overdrill Tooling (Type and Size)	N/A	Overdrill Depth	N/A
Sampler Hammer Type	N/A	Weight	N/A
Drop	N/A	Efficiency	N/A
Borehole Azimuth	N/A	Borehole Inclination (from Vertical)	N/A
Reviewed By	C. Millhollin	Approved By	P. Dunne

Lithology Depth Ft[3]	Elevation	Graphic	Description	Overburden: Sample[1,2] / Rock Core: RQD %	Depth Ft[3] / Run Ft	Rec. Ft / Rec. Ft	Blows/PSI / Rec. %
0.0			Top of Hole				
			LEAN CLAY, CL, light brown, stiff, dry to moist, contains pebbles and cobbles, [FILL]	DP01	0.0 - 5.0	4.5	N/A
				DP02	5.0 - 10.0	5.0	N/A
10.0			CCR, light brown mottled with gray and orange, soft, wet, [CCR]	DP03	10.0 - 15.0	2.5	N/A
			With angular pebbles/cobbles from 14.0' to 15.0'				
15.0			CCR, reddish orange to gray, soft, wet, changes from silty clay with pebbles/cobbles throughout, [CCR]	DP04	15.0 - 20.0	5.0	N/A

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

TVA EIP BORING LOG 175568286_JOF_TDEC_ORDER_DYETRACE.GPJ TDEC SUBSURF DT 20190530.GDT 11/10/20

SUBSURFACE LOG

Client Borehole ID: Injection Point 1 (IP-1)
Stantec Boring No.: **IP-1**
Client: Tennessee Valley Authority
Boring Location: NR
Project Number: 175568286
Surface Elevation: NR
Elevation Datum: N/A

Lithology: Depth Ft[3]	Elevation	Graphic	Description	Overburden: Sample[1,2] / Rock Core: RQD %	Depth Ft[3] / Run Ft	Rec. Ft / Rec. Ft	Blows/PSI / Rec. %
18–20			CCR, reddish orange to gray, soft, wet, changes from silty clay with pebbles/cobbles throughout, [CCR] *(Continued)*				
20–25				DP05	20.0 - 25.0	0.0	N/A
25–30				DP06	25.0 - 30.0	0.0	N/A
30–35				DP07	30.0 - 35.0	0.0	N/A
35–40				DP08	35.0 - 40.0	0.0	N/A
40–42							

TVA EIP BORING LOG 175568286_JOF_TDEC_ORDER_DYETRACE.GPJ TDEC SUBSURF DT 20190530.GDT 11/10/20

Client Borehole ID	Injection Point 1 (IP-1)	Stantec Boring No.	**IP-1**
Client	Tennessee Valley Authority	Boring Location	NR
Project Number	175568286	Surface Elevation	NR
		Elevation Datum	N/A

Lithology Depth Ft[3]	Lithology Elevation	Lithology Graphic	Description	Overburden: Sample[1,2] / Rock Core: RQD %	Depth Ft[3] / Run Ft	Rec. Ft / Rec. Ft	Blows/PSI / Rec. %
47.0			CCR, reddish orange to gray, soft, wet, changes from silty clay with pebbles/cobbles throughout, [CCR] *(Continued)*	DP09	40.0 - 45.0	0.0	N/A
49.0			LEAN CLAY, CL, reddish orange mottled with light gray, low plasticity, stiff, moist	DP10	45.0 - 49.0	4.0	N/A

Depth scale: 43, 44, 45, 46, 47, 48, 49

Sample interval labels: 40.0 - 45.0; 45.0 - 49.0; 45.5/47.0-20190408

No Refusal /
Bottom of Hole at 49.0 Ft.

CCR material/clay interface @ 47.0' bgs. Began hammering with probe @ 47.0' bgs.

Dye trace study survivability sample collected at 45.5' to 47.0' at 1640 04/08/19.

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

SUBSURFACE LOG

Client Borehole ID	Injection Point 2 (IP-2)	Stantec Boring No.	**IP-2**
Client	Tennessee Valley Authority	Boring Location	NR
Project Number	175568286	Surface Elevation	NR; Elevation Datum N/A
Project Name	JOF TDEC Order Dye Trace Study	Date Started	4/8/19; Completed 4/8/19
Project Location	New Johnsonville, Humphreys Co., TN	Depth to Water	N/A; Date/Time N/A
Inspector	K. Carey; Logger K. Carey	Depth to Water	N/A; Date/Time N/A
Drilling Contractor	Geo Logic	Drill Rig Type and ID	Geoprobe 7822DT
Overburden Drilling and Sampling Tools (Type and Size)	2" diameter x 60" sampler w/ PVC liner		
Rock Drilling and Sampling Tools (Type and Size)	N/A		
Overdrill Tooling (Type and Size)	N/A	Overdrill Depth	N/A
Sampler Hammer Type	N/A; Weight N/A	Drop	N/A; Efficiency N/A
Borehole Azimuth	N/A	Borehole Inclination (from Vertical)	N/A
Reviewed By	C. Millhollin	Approved By	P. Dunne

Lithology Depth Ft[3]	Elevation	Graphic	Description	Overburden: Sample[1,2] / Rock Core: RQD %	Depth Ft[3] / Run Ft	Rec. Ft / Rec. Ft	Blows/PSI / Rec. %
0.0			Top of Hole				
0.0 – 12.5			LEAN CLAY, CL, dark gray and orange, dry to moist, pebbles and cobbles present throughout, [FILL] Moist from 8.0' to 8.5'	DP01	0.0 - 5.0	4.7	N/A
				DP02	5.0 - 10.0	4.7	N/A
12.5			CCR, orange to dark gray, moist to wet, silty clay mixed with gravelly CCR material, [CCR]	DP03	10.0 - 15.0	5.0	N/A
				DP04	15.0 - 20.0	4.3	N/A

SUBSURFACE LOG

Client Borehole ID	Injection Point 2 (IP-2)	Stantec Boring No.	**IP-2**
Client	Tennessee Valley Authority	Boring Location	NR
Project Number	175568286	Surface Elevation	NR
		Elevation Datum	N/A

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]	Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft	Rec. Ft	Rec. %
18–20			CCR, orange to dark gray, moist to wet, silty clay mixed with gravelly CCR material, [CCR] *(Continued)* Decrease in hammer resistance (much softer material) at 18.5'					
20–25					DP05	20.0 - 25.0	4.1	N/A
25–30					DP06	25.0 - 30.0	2.8	N/A
30–35					DP07	30.0 - 35.0	1.0	N/A
35–40					DP08	35.0 - 40.0	0.0	N/A
40–42								

TVA EIP BORING LOG 175568286_JOF_TDEC_ORDER_DYETRACE.GPJ TDEC SUBSURF DT 20190530.GDT 11/10/20

Client Borehole ID	Injection Point 2 (IP-2)	Stantec Boring No.	**IP-2**
Client	Tennessee Valley Authority	Boring Location	NR
Project Number	175568286	Surface Elevation	NR
		Elevation Datum	N/A

Lithology				Overburden:	Sample[1,2]	Depth Ft[3]	Rec. Ft	Blows/PSI
Depth Ft[3]	Elevation	Graphic	Description	Rock Core:	RQD %	Run Ft	Rec. Ft	Rec. %
43.5			CCR, orange to dark gray, moist to wet, silty clay mixed with gravelly CCR material, [CCR] *(Continued)*	42.0/43.5-20190408	DP09	40.0 - 45.0	5.0	N/A
48.0			LEAN CLAY, CL, light gray		DP10	45.0 - 48.0	0.0	N/A

No Refusal /
Bottom of Hole at 48.0 Ft.

CCR material/clay interface @ 43.5' bgs.

Dye trace study survivability sample collected at 42.0' to 43.5' at 1525 04/08/19.

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

TVA EIP BORING LOG 175568286_JOF_TDEC_ORDER_DYETRACE.GPJ TDEC SUBSURF DT 20190530.GDT 11/10/20

SUBSURFACE LOG

Stantec TVA

Client Borehole ID: Injection Point 3 (IP-3)	Stantec Boring No.: **IP-3**
Client: Tennessee Valley Authority	Boring Location: NR
Project Number: 175568286	Surface Elevation: NR — Elevation Datum: N/A
Project Name: JOF TDEC Order Dye Trace Study	Date Started: 4/9/19 — Completed: 4/9/19
Project Location: New Johnsonville, Humphreys Co., TN	Depth to Water: N/A — Date/Time: N/A
Inspector: K. Carey — Logger: K. Carey	Depth to Water: N/A — Date/Time: N/A
Drilling Contractor: Geo Logic	Drill Rig Type and ID: Geoprobe 7822DT

Overburden Drilling and Sampling Tools (Type and Size): 2" diameter x 60" sampler w/ PVC liner

Rock Drilling and Sampling Tools (Type and Size): N/A

Overdrill Tooling (Type and Size): N/A — Overdrill Depth: N/A

Sampler Hammer Type: N/A — Weight: N/A — Drop: N/A — Efficiency: N/A

Borehole Azimuth: N/A — Borehole Inclination (from Vertical): N/A

Reviewed By: C. Millhollin — Approved By: P. Dunne

Lithology Depth Ft[3]	Elevation	Graphic	Description	Overburden: Sample[1,2] / Rock Core: RQD %	Depth Ft[3] / Run Ft	Rec. Ft / Rec. Ft	Blows/PSI / Rec. %
0.0			Top of Hole				
0.0 – 10.0			CCR, medium gray, stiff, dry to moist, [CCR]	DP01	0.0 - 5.0	4.3	N/A
				DP02	5.0 - 10.0	4.3	N/A
10.0			CCR, gray, non-plastic, soft to firm, dry to moist, [CCR]	DP03	10.0 - 15.0	4.7	N/A
				DP04	15.0 - 20.0	5.0	N/A

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

TVA EIP BORING LOG 175568286_JOF_TDEC_ORDER_DYETRACE.GPJ TDEC SUBSURF DT 20190530.GDT 11/10/20

Client Borehole ID	Injection Point 3 (IP-3)	Stantec Boring No.	**IP-3**
Client	Tennessee Valley Authority	Boring Location	NR
Project Number	175568286	Surface Elevation	NR
		Elevation Datum	N/A

Depth Ft[3]	Lithology Depth	Elevation	Graphic	Description	Overburden: Sample[1,2] / Rock Core: RQD %	Depth Ft[3] / Run Ft	Rec. Ft / Rec. Ft	Blows/PSI / Rec. %
18–29	29.5			CCR, gray, non-plastic, soft to firm, dry to moist, [CCR] *(Continued)*	DP05	20.0 - 25.0	5.0	N/A
					DP06	25.0 - 30.0	5.0	N/A
30–36	36.0			SILTY LEAN CLAY, CL, reddish orange, contains chert pebbles/cobbles throughout, [FILL]	DP07	30.0 - 35.0	5.0	N/A
36–42				CCR, dark gray, medium to coarse, moist to wet, silty clay, [CCR]	DP08	35.0 - 40.0	5.0	N/A

Sample interval labels: 20.0 - 25.0; 25.0 - 30.0; 30.0 - 35.0; 35.0 - 40.0

SUBSURFACE LOG

Client Borehole ID	Injection Point 3 (IP-3)	Stantec Boring No.	**IP-3**
Client	Tennessee Valley Authority	Boring Location	NR
Project Number	175568286	Surface Elevation	NR
		Elevation Datum	N/A

Depth Ft[3]	Elevation	Graphic	Description	Overburden: Sample[1,2] / Rock Core: RQD %	Depth Ft[3] / Run Ft	Rec. Ft	Blows/PSI / Rec. %
43–51.8			CCR, dark gray, medium to coarse, moist to wet, silty clay, [CCR] *(Continued)*	DP09	40.0 - 45.0	5.0	N/A
				DP10	45.0 - 50.0	5.0	N/A
51.8				DP11	50.0 - 53.0	3.0	N/A
53.0			LEAN CLAY, CL, tan mottled with gray, low to medium plasticity				

50.3/51.8-20190409

No Refusal /
Bottom of Hole at 53.0 Ft.

CCR material/clay interface @ 51.8' bgs.

Dye trace study survivability sample collected at 50.3' to 51.8' at 0955 04/09/19.

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

Stantec TVA

SUBSURFACE LOG

Client Borehole ID	Injection Point 4 (IP-4)	Stantec Boring No.	**IP-4**
Client	Tennessee Valley Authority	Boring Location	NR
Project Number	175568286	Surface Elevation	NR
		Elevation Datum	N/A
Project Name	JOF TDEC Order Dye Trace Study	Date Started	4/9/19
		Completed	4/9/19
Project Location	New Johnsonville, Humphreys Co., TN	Depth to Water	N/A
		Date/Time	N/A
Inspector	K. Carey	Depth to Water	N/A
Logger	K. Carey	Date/Time	N/A
Drilling Contractor	Geo Logic	Drill Rig Type and ID	Geoprobe 7822DT
Overburden Drilling and Sampling Tools (Type and Size)	2" diameter x 60" sampler w/ PVC liner		
Rock Drilling and Sampling Tools (Type and Size)	N/A		
Overdrill Tooling (Type and Size)	N/A	Overdrill Depth	N/A
Sampler Hammer Type	N/A	Weight	N/A
Drop	N/A	Efficiency	N/A
Borehole Azimuth	N/A	Borehole Inclination (from Vertical)	N/A
Reviewed By	C. Millhollin	Approved By	P. Dunne

Lithology Depth Ft[3]	Elevation	Graphic	Description	Overburden: Sample[1,2] / Rock Core: RQD %	Depth Ft[3] / Run Ft		Rec. Ft / Rec. Ft	Blows/PSI / Rec. %
0.0			Top of Hole					
			CCR, dark gray, fine, soft to very soft, moist to wet, [CCR]					
				DP01	0.0 - 5.0	0.0 - 5.0	3.8	N/A
				DP02	5.0 - 10.0	5.0 - 10.0	1.9	N/A
			No resistance from 10.0' to 40.0'					
				DP03	10.0 - 15.0	10.0 - 15.0	1.9	N/A

Depth scale: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17

TVA EIP BORING LOG 175568286_JOF_TDEC_ORDER_DYETRACE.GPJ TDEC SUBSURF DT 20190530.GDT 11/10/20

SUBSURFACE LOG

Client Borehole ID	Injection Point 4 (IP-4)	Stantec Boring No.	**IP-4**
Client	Tennessee Valley Authority	Boring Location	NR
Project Number	175568286	Surface Elevation	NR
		Elevation Datum	N/A

Lithology: Depth Ft[3]	Elevation	Graphic	Description	Overburden: Sample[1,2] / Rock Core: RQD %	Depth Ft[3] / Run Ft	Rec. Ft / Rec. Ft	Blows/PSI / Rec. %
17–20			CCR, dark gray, fine, soft to very soft, moist to wet, [CCR] *(Continued)*	DP04	15.0 - 20.0	1.9	N/A
20–25				DP05	20.0 - 25.0	1.9	N/A
25–30				DP06	25.0 - 30.0	1.9	N/A
30–35				DP07	30.0 - 35.0	1.9	N/A
35–39				DP08	35.0 - 40.0	1.9	N/A

SUBSURFACE LOG

Client Borehole ID	Injection Point 4 (IP-4)	Stantec Boring No.	**IP-4**
Client	Tennessee Valley Authority	Boring Location	NR
Project Number	175568286	Surface Elevation	NR
		Elevation Datum	N/A

Lithology			Description	Overburden: / Rock Core:	Sample[1,2] / RQD %	Depth Ft[3] / Run Ft	Rec. Ft / Rec. Ft	Blows/PSI / Rec. %
Depth Ft[3]	Elevation	Graphic						
42.0			CCR, dark gray, fine, soft to very soft, moist to wet, [CCR] *(Continued)*	40.5/42.0-20190409	DP09	40.0 - 43.0	3.0	N/A
43.0			SILTY LEAN CLAY, CL, reddish orange mottled with gray/tan, low plasticity, stiff, dry			40.0 - 43.0		

No Refusal /
Bottom of Hole at 43.0 Ft.

CCR material/clay interface @ 42.0' bgs. Began hammering with probe @ 42.0' bgs.

Dye trace study survivability sample collected at 40.5' to 42.0' at 0832 04/09/19.

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

Stantec TVA

SUBSURFACE LOG

Client Borehole ID	Injection Point 5 (IP-5)	Stantec Boring No.	**IP-5**
Client	Tennessee Valley Authority	Boring Location	NR
Project Number	175568286	Surface Elevation	NR
		Elevation Datum	N/A
Project Name	JOF TDEC Order Dye Trace Study	Date Started	4/9/19
		Completed	4/9/19
Project Location	New Johnsonville, Humphreys Co., TN	Depth to Water	N/A
		Date/Time	N/A
Inspector	K. Carey	Depth to Water	N/A
Logger	K. Carey	Date/Time	N/A
Drilling Contractor	Geo Logic	Drill Rig Type and ID	Geoprobe 7822DT

Overburden Drilling and Sampling Tools (Type and Size) 2" diameter x 60" sampler w/ PVC liner

Rock Drilling and Sampling Tools (Type and Size) N/A

Overdrill Tooling (Type and Size) N/A Overdrill Depth N/A

Sampler Hammer Type N/A Weight N/A Drop N/A Efficiency N/A

Borehole Azimuth N/A Borehole Inclination (from Vertical) N/A

Reviewed By C. Millhollin Approved By P. Dunne

Lithology Depth Ft[3]	Elevation	Graphic	Description	Overburden: Sample[1,2] / Rock Core: RQD %	Depth Ft[3] / Run Ft	Rec. Ft / Rec. Ft	Blows/PSI / Rec. %
0.0			Top of Hole				
0.0 – 5.0			CCR, medium gray, fine, soft, dry to moist, [CCR]	DP01	0.0 - 5.0	3.6	N/A
5.0 –			CCR, medium gray, fine, soft, moist to wet, [CCR]	DP02	5.0 - 10.0	2.5	N/A
				DP03	10.0 - 15.0	2.5	N/A
				DP04	15.0 - 20.0	2.5	N/A

Depth scale: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

TVA EIP BORING LOG 175568286_JOF_TDEC_ORDER_DYETRACE.GPJ TDEC SUBSURF DT 20190530.GDT 11/10/20

SUBSURFACE LOG

Client Borehole ID	Injection Point 5 (IP-5)	Stantec Boring No.	IP-5
Client	Tennessee Valley Authority	Boring Location	NR
Project Number	175568286	Surface Elevation	NR
		Elevation Datum	N/A

Depth Ft[3]	Elevation	Graphic	Description	Sample[1,2] / RQD %	Depth Ft[3] / Run Ft	Rec. Ft	Blows/PSI / Rec. %
20–35.0			CCR, medium gray, fine, soft, moist to wet, [CCR] *(Continued)*	DP05	20.0 - 25.0	2.5	N/A
				DP06	25.0 - 30.0	2.5	N/A
				DP07	30.0 - 35.0	2.5	N/A
35.0–37.0			LEAN CLAY, CL, gray to tan, non-plastic, dry, with red-orange mottling	DP08	35.0 - 37.0	2.0	N/A

33.5/35.0-20190409

No Refusal /
Bottom of Hole at 37.0 Ft.

CCR material/clay interface @ 35.0' bgs.

Dye trace study survivability sample collected at 33.5' to 35.0' at 0905 04/09/19.

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

APPENDIX D – PHOTOGRAPHS

ATTACHMENT D.1

Bench Study Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil (JOF) Plant**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 1

Photo Location:
JOF Bench Study Boring

Photo Date:
4/8/2019

Comments:
Location of Bench Study Boring IP-1

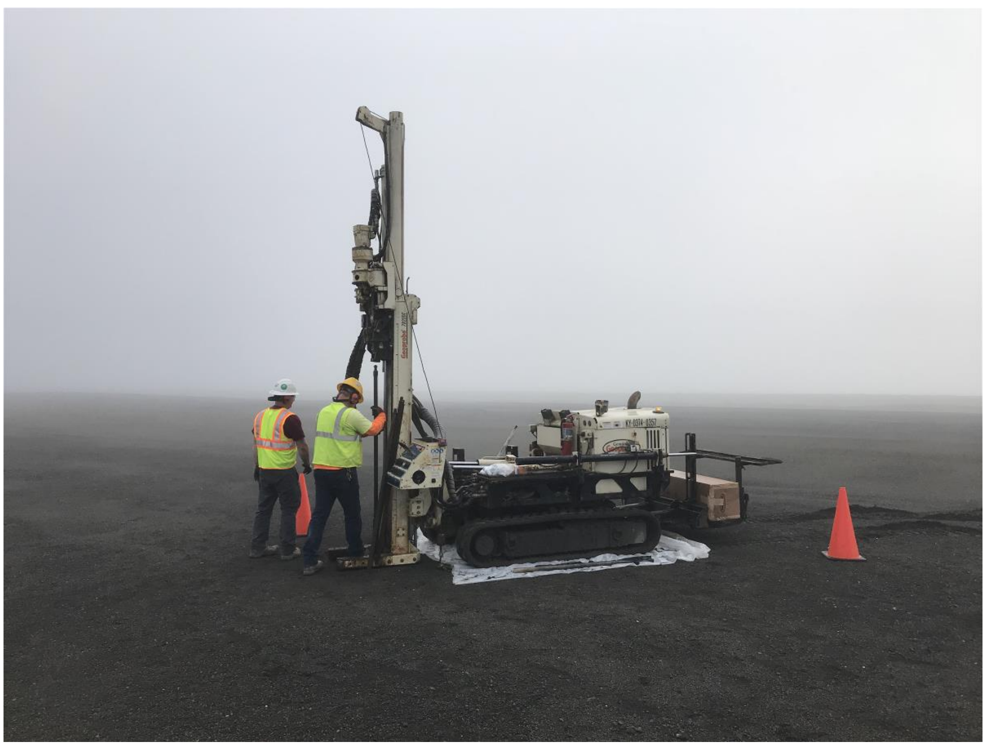
Photograph ID: 2

Photo Location:
JOF Bench Study Boring

Photo Date:
4/8/2019

Comments:
Location of Bench Study Boring IP-2

Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Johnsonville Fossil (JOF) Plant	Site Location:	New Johnsonville, Tennessee

Photograph ID: 3 **Photo Location:** JOF Bench Study Boring **Photo Date:** 4/9/2019 **Comments:** Location of Bench Study Boring IP-3	
Photograph ID: 4 **Photo Location:** JOF Bench Study Boring **Photo Date:** 4/9/2019 **Comments:** Location of Bench Study Boring IP-4	

Stantec **Photographic Log**

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil (JOF) Plant**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 5	No Photo Applicable
Photo Location: JOF Bench Study Boring	
Photo Date: 4/9/2019	
Comments: Photo of Location of Bench Study Boring IP-5 unavailable.	

ATTACHMENT D.2

Dye Injection Photographic Log

Stantec

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 1

Photo Location:
Injection Boring IP-1

Photo Date:
8/13/2019

Comments:
Location of Injection Boring IP-1

Photograph ID: 2

Photo Location:
Injection Boring IP-1

Photo Date:
8/13/2019

Comments:
Injecting SRB Dye into Injection Boring IP-1

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 3

Photo Location:
Injection Boring IP-2

Photo Date:
8/14/2019

Comments:
Location of Injection Boring IP-2

Photograph ID: 4

Photo Location:
Injection Boring IP-2

Photo Date:
8/14/2019

Comments:
Injecting SRB Dye into Injection Boring IP-2

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Johnsonville Fossil Plant (JOF)**	**Site Location:**	**New Johnsonville, Tennessee**

Photograph ID: 5

Photo Location:
Injection Boring IP-3

Photo Date:
8/14/2019

Comments:
Location of Injection Boring IP-3

Photograph ID: 6

Photo Location:
Injection Boring IP-3

Photo Date:
8/14/2019

Comments:
Injecting Fluorescein Dye into Injection Boring IP-3

APPENDIX E – DATA VALIDATION REPORT (KARST WORKS)

Data Validation Report
Stantec EIP Tracer Test
Johnsonville Fossil Plant, Tennessee

Prepared by

Geary M. Schindel, P.G.
Karst Works, Inc.
11310 Whisper Dawn
San Antonio, Texas 78230

February 1, 2021

I. INTRODUCTION

This Data Validation Report (DVR) describes and summarizes the field forms and data review for the Stantec Consulting Services Inc. (Stantec) Dye Trace Study, New Johnsonville, Tennessee. Stantec employees were tasked with designing a dye trace study (tracer test) within Active Ash Pond 2 which resulted in the injection of dyes and collection of field samples. Analysis of samples was performed by Ewers Water Consultants Inc (EWC) of Richmond, Kentucky as a subcontractor to Stantec. In August 2019, sulforhodamine B (SRB) was injected into two borings and sodium fluorescein (fluorescein) was injected into three borings within Active Ash Pond 2 at the Tennessee Valley Authority (TVA) Johnsonville Fossil Plant at New Johnsonville, Tennessee. The intent of the tracer test was to evaluate if preferential flow paths exist between the CCR unit and the uppermost aquifer or the surrounding surface water body. SRB was not recovered during the sampling period. Fluorescein was detected in samples collected during five events at well JOF-104.

EWC specializes in groundwater tracer testing using fluorescent dyes. EWC provided consultation on tracer test study design considerations, provided granular activated carbon (charcoal) packets for dye monitoring and performed analysis of the charcoal samples used to capture fluorescent dyes.

The Department of Defense (DoD) Environmental Laboratory Program (ELAP), National Environmental Laboratory Accreditation Program (NELAP) and State Agencies do not conduct certification of laboratories for the analysis of fluorescent dyes. Consequently, EWC, a laboratory that specializes in the analysis of fluorescent dyes does not hold laboratory certifications but does follow relevant laboratory quality control processes and standards.

Karst Works, Inc. was incorporated in 1988 and provides specialized consulting services for the evaluation and management of cave and karst resources. Karst Works, Inc. staff have designed and executed more than 500 tracer tests throughout the US and internationally and include full laboratory services for analysis of fluorescent dyes. Karst Works, Inc was contracted by Stantec Consulting Services to evaluate tracer testing results performed at the TVA New Johnsonville, Tennessee site.

II. REVIEW PROCESS

The following documents specifying details regarding the tracer test field methods and analytical procedures were evaluated for this review:

1. Stantec Guidelines on Retrieving and Replacing Dye Detector Packets;
2. Stantec TVA Dye Survivability (Bench) Study;
3. EWC Quality Assurance Management Plan (QAMP);
4. Dye Injection Information;
5. Review of the Chain-of-Custody Forms, Sample Receipt Check Lists, Sample-Prep Check Lists, and Instrument Check Lists;
6. Laboratory analytical method;
7. Analytical Results/Luminance Plots;
8. Laboratory Control Sample (LCS) results;
9. Field Duplicate, Field Blanks, and Trip Blanks; and,
10. Daily Field Activity Logs

III. ASSESSMENT FINDINGS

The following section summarizes the findings of the review of procedures and analytical results.

1. **Stantec Guidelines on Retrieving and Replacing Dye Detector Packets** – Stantec personnel prepared a nine-page document detailing training requirements; field supplies necessary to perform the study; QA/QC sample description including field duplicates, field blanks and trip blanks; retrieval and replacement techniques for charcoal packets in both surface water and groundwater monitoring wells; and custody transfer of samples to EWC laboratory for analysis.

   The methods defined within the Stantec Guidelines are consistent with commonly followed practices for testing background concentrations of dye (prior to the dye injection) and the collection and custody transfer of samples to the EWC laboratory.

2. **Stantec TVA Dye Survivability Study** (Bench Study) – This document defines the methods used to test the compatibility of four different fluorescent dyes with the CCR material. The methods included collection of representative materials, exposure of the CCR material to the four fluorescent dyes for 1, 3, and 9 hours, and analytical results.

   The methods defined in the Bench Study are reasonable to test dye compatibility with the matrix. The methods and results were sufficient to allow selection of dyes for the tests.

3. **EWC Quality Assurance Management Plan (QAMP)** – The EWC QAMP is a 33-page document that outlines the methods used for sample processing and analysis. The EWC QAMP documents the credentials and experience of the laboratory analysts; procurement of laboratory materials; handling of documents and records created for the study; analytical instrumentation and operation; sample processing; quality systems, and quality assurance and improvement.

   EWC utilized activated carbon for dye detection but in November 2019, EWC changed to an acid-washed carbon to remove potential false fluorescein and false rhodamine peaks. EWC also indicated that the acid-washed carbon was not as sensitive as unwashed carbon but was acceptable for this study.

The QAMP was found to be consistent with commonly followed practices for the collection, custody transfer, analysis, recording, and reporting of results related to tracer testing.

The QAMP was finalized during the twelfth sampling event in November 2019 and used for successive sampling events. The methods that were employed to collect and analyze samples before formal adoption of the QAMP were consistent with the QAMP. Therefore, the data associated with early samples are representative of conditions at the site and are valid for use in this study.

4. **Dye Injection Information** – Stantec provided the following information on injection of dyes at the Johnsonville Plant.

Dye	**Mass**	**Injection Location**	**Date**
Fluorescein (sodium)	25 lbs (40% dye)	IP-3, IP-4, IP-5	August 14-15, 2019
Sulforhodamine B (SRB)	25 lbs	IP-1 and IP-2	August 13-14, 2019

Dyes were equally divided between the respective injection locations. Initially, 5-10 gallons of water were injected into each direct push boring followed by injection of dyes. After the dye injection, and additional 25-30 gallons of water were injected in each boring location.

The mass of dye and the techniques used in both dye injections was a reasonable amount to inject for the distance to be monitored and unconsolidated material receiving the dye.

5. **Review of Chain-of-Custody Forms, Sample Receipt Check Lists, and Spectrofluorophotometer & Sample Analysis Check Lists,**

Chain of Custody Forms. EWC provided copies of Chain-of-Custody (CoC) forms for the 19 sampling events and two background sampling events.

Sample Receipt Check List – The Sample Receipt Check List form is an internal document prepared by EWC and is used to determine the condition of samples received from the field.

Spectrofluorophotometer & Sample Analysis Check List – Spectrofluorophotometer Instrument check list form is an internal document prepared by EWC and is used to document that the analytical instrument used for analysis of eluent is functioning properly. The Sample Prep Check List form is an internal document prepared by EWC and is used to document processing of samples including washing and drying of samples and quality control samples for water used in washing samples.

Chain-of-Custody forms for each sampling event were found to be complete with proper signatures and documentation. Sample Receipt Check List, Sample Prep Check List, and Instrument Check List were provided for the October 15, 2019 sampling event and subsequent events. They were found to be properly completed. Sampling events prior to October 15, 2019 did not have Sample Receipt Check Lists, Sample Prep Check Lists, and Spectrofluorophotometer & Sample Analysis Check Lists. These forms were incorporated at the request of Stantec to document sample and instrument calibration and use.

The absence of these forms does not impact the quality of the data. The forms provide a summary of the information on the documents to assist in the ease of review. The information can be reviewed on the actual documents for accuracy and completeness.

6. **Laboratory Analytical Methods – An on-site audit of** the EWC laboratory was not conducted as part of the Data Validation process due to travel restrictions related to the COVID-19 Pandemic. However, EWC provided a PowerPoint presentation detailing the laboratory equipment and processes as well as spectrographs and other supporting materials for analyses.

   The EWC PowerPoint and QAMP indicated the methods for recording and processing charcoal samples collected in the field by Stantec personnel. Samples were logged into the EWC data management system and then placed in a dryer to remove moisture for preparation for extraction. The charcoal samples were then placed in an eluent to extract dye and tested for the presence of dye. EWC used the "Smart" solution (5 parts 1-Propanol, 3 parts deionized water, and 2 parts Ammonium Hydroxide). The Smart solution is used by many dye laboratories for the extraction of dyes from charcoal.

   EWC provided a spectrofluorometric emission scan for each sample analyzed. The scans are plots of wavelength (X-axis) verses intensity (Y-axis). Nineteen rounds of samples and two background rounds were collected for this study, including field duplicate samples, field blanks, laboratory quality control and trip blanks.

   Each spectrofluorometric emission scan included the scan range in nanometers (nm), monochromator slit widths (nm), scan speed, sensitivity, sample information, sample type, project name, and sampling date and round. Each round of samples included Chain-of-Custody forms, quality assurance standards, and field blanks. A Shimadzu RF-530PC spectrofluorometer was used for dye analysis.

   The processing and analysis of samples was consistent with the QAMP as well as standard practices for laboratories specializing in testing for fluorescent dyes. More than 650 samples were analyzed for this study. The results for each emission scan were provided and reviewed for this data validation report.

7. **Analytical Results/Luminance Plots –** EWC provided spectrofluorometric emission plots for each sample analyzed. The graphs plotted fluorescence intensity (y-axis) verses wavelength (x-axis). The scanned wavelength ranged from 460.0 nm to 610.0 nm. Analytical data and spectra were compared to CoC forms to evaluate whether samples were processed. The emission scans were reviewed in preparation of this report. The EWC QAMP defined criteria to determine a positive dye recovery as a peak at the appropriate wavelength for the dye and sample matrix. A deviation of 2 nm from the ideal wavelength was considered acceptable. In addition, a dye detection was considered positive if the scan presented a peak with the appropriate shape, dye was present in samples collected after injection of the dye with an increase in the amplitude of

fluorescence by a value of four, and the dye appeared in a series of samples.

EWC indicated that only samples from monitoring well JOF-104 met the criteria defined above and were considered positive for fluorescein dye. Samples collected at both the top and bottom of well JOF-104 were determined to be positive during round 13 (December 9, 2019) through round 17 (February 3, 2020, respectively). A review of the spectrofluorometric emissions indicated that detections from well JOF-104 were consistent with the presence of fluorescein dye. The emission peaks were in the correct location on the emission spectrum; the height of the peaks were sufficient to be quantified; the shape of the peaks were consistent with the presence of dye; the peaks occurred after the dye injection; and were found in five subsequent sampling events over almost two months.

The detection of fluorescein dye in well JOF-104 was validated based on the location, height, and shape of the peak of the emission spectrum and the detection of dye in five sampling events.

SRB dye was not detected in the charcoal samples during the study.

8. **Quality Control Sample Results –** EWC preformed laboratory quality control, including laboratory water samples, eluent blanks, and dye standards in eluent. Approximately 10 percent of samples were quality control samples. Laboratory quality control was performed before, during, and after each sampling event. Quality control sample results indicated that the laboratory instrumentation was working properly, and results were acceptable.

9. **Field Duplicate, Field Blanks, and Trip Blanks –** Field duplicate, field blanks, and trip blanks were collected during each sampling event. Samples were processed and analyzed by EWC. The results for duplicate samples were in agreement with the respective paired samples. Field blanks and trip blank analytical results did not indicate the occurrence of contamination of samples during the collection or transportation of samples.

10. **Daily Field Activity Logs –** The Daily Field Activity Logs were utilized to document all field activities including personnel present on site, time and date of activities, and documentation of all actions related to the collection of field data and samples. The recording of Daily Field Activity Logs was directed by and followed the Dye Trace Study Sampling and Analysis Plan for the Johnsonville Fossil Plant (December 10, 2018). Document dates provided for this review ranged from the initial placement of equipment and materials for sample collection (dye receptors) on July 29th and 30th, 2019 through completion of field sample collection activities on March 4, 2020. The field forms were reviewed for content and completeness. In addition, copies of field book notes were also reviewed including Background Study (May 6 and 13, 2019), Soil Boring Benchtop Study (April 8, 2019) and Dye Injection (August 12, 2019).

    Data collected on the Daily Field Activity Logs included the time and date of the action, the TI No/SOP reference, and a description of daily activities and events. The entries were noted as being complete with revisions highlighted, initialed, and dated. The methods used were documented on the forms and followed the sampling and analysis plan. The Chain of Custody forms associated with each activity log were reviewed to make sure that all samples were recorded and transferred to the laboratory for analysis or they were noted as missing or damaged in the activity log.

An overview of the activity logs found them to be complete with documentation of the methods used to collect and replace the charcoal samples. There were some limited issues with missing samples or QC samples.

As with any study of this size and complexity, there were some issues with missing, damaged, or mislabeled samples as well as the recovery of duplicate samples. The activity logs do a adequate job in documenting problems with sampling. The limited problems with the recovery of duplicate samples from the field appear to be related to communication between sampling personnel between events. However, the loss of a few duplicate samples over the course of the study did not appear to impact the quality of the findings.

Some of the sampling locations, such as those in the river, could not be secured and were exposed to unauthorized access by the public. This sometimes results in the loss of sample packets by curious fisherman or other boaters. Generally, the loss of a few of these packets over the course of the study does not impact the results. Dye movement, especially in the porous media occurring at the New Johnsonville site, would result in dye discharging over numerous sample collection periods. While the loss of a dye packet is unfortunate, it does not impinge upon the overall quality or findings of the study.

IV. QUALITY ISSUES

Quality control issues related to this study were minimal and did not compromise the findings of the tracer tests. There were no significant issues during the sample collection, transport, or analysis of samples for the study. A limited number of charcoal samples were not recovered in the field – most likely they were removed by fisherman (not an uncommon problem in high traffic areas). However, the loss did not affect the outcome of the test.

Laboratory quality control issues were minimal and did not impact the quality or use of the data. The final laboratory spike sample analytical results were missing for the two background sampling periods. A review of the intensity plots for prior analysis for each of these rounds indicated the instrument was working correctly.

SRB dye was not detected during the sampling period.

Fluorescein dye was detected in charcoal samples collected from both the top and bottom of Well JOF-104 during round 13 (December 9, 2019) through round 17 (February 3, 2020, respectively). A review of the spectrofluorometric emissions indicated that detections from well JOF-104 were consistent with the presence of fluorescein dye. The emission peaks were in the correct location on the emission spectrum; the height of the peaks were sufficient to be quantified; the shape of the peaks were consistent with the presence of dye; the peaks occurred after the dye injection and were found in five subsequent sampling events over almost two months. The study design, quality control, and execution were adequate to result in a positive tracer test. Therefore, the results of the fluorescein dye are considered valid.

Karst Works, Inc.
ENVIRONMENTAL CONSULTANTS

Geary M. Schindel, PG
Karst Works, Inc.
11310 Whisper Dawn
San Antonio, Texas 78230
Phone 210.326.1576
gschindel@karstworks.com

June 2, 2020

Zach Wilder, PE
Project Manager
Stantec Consulting Services Inc.
3052 Beaumont Centre Circle
Lexington, KY 40513-1703

Re: Transmittal of Data Validation Report, New Johnsonville, Tennessee.

Dear Mr. Wilder;

Please find attached, the Data Validation Report for the TVA New Johnsonville, Tennessee facility.

Thank you for the opportunity to work on this project.

Sincerely,

Geary M. Schindel

Geary M. Schindel, P.G.

APPENDIX H.10
TECHNICAL EVALUATION OF WATER USE SURVEY

Appendix H.10 - Technical Evaluation of Water Use Survey

TDEC Commissioner's Order:
Environmental Assessment Report
Johnsonville Fossil Plant
New Johnsonville, Tennessee

February 12, 2024

Prepared for:

Tennessee Valley Authority
Chattanooga, Tennessee

Prepared by:

Stantec Consulting Services Inc.
Lexington, Kentucky

REVISION LOG

Revision	Description	Date
0	Submittal to TDEC	September 6, 2023
1	Addresses November 14, 2023 TDEC Review Comments and Issued for TDEC	February 12, 2024

Sign-off Sheet

This document entitled Appendix H.10 - Technical Evaluation of Water Use Survey was prepared by Stantec Consulting Services Inc. ("Stantec") for the account of Tennessee Valley Authority (the "Client"). Any reliance on this document by any third party is strictly prohibited. The material in it reflects Stantec's professional judgment in light of the scope, schedule and other limitations stated in the document and in the contract between Stantec and the Client. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. In preparing the document, Stantec did not verify information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions taken based on this document.

Prepared by ______________________________

Stu Gross, Senior Project Manager

Reviewed by ______________________________

John Griggs, Senior Principal

Approved by ______________________________

Rebekah Brooks, LG, LHg, Principal Hydrogeologist

Table of Contents

LIST OF TABLES

LIST OF EXHIBITS

Abbreviations

JOF Plant	Johnsonville Fossil Plant
CCR	Coal Combustion Residuals
EAR	Environmental Assessment Report.
EIP	Environmental Investigation Plan
GIS	Geographic Information System
NJWD	New Johnsonville Water Department
SAP	Sampling and Analysis Plan
Stantec	Stantec Consulting Services Inc.
Survey Area	½-mile boundary of JOF CCR management units
the Survey	Desktop Survey
TDEC	Tennessee Department of Environment and Conservation
TDEC Order	Commissioner’s Order OGC15-0177
TVA	Tennessee Valley Authority
USGS	United States Geological Survey

1.0 INTRODUCTION

Stantec Environmental Consulting Services, Inc (Stantec), on behalf of the Tennessee Valley Authority (TVA), has prepared this technical evaluation appendix to summarize applicable historical and recent water use survey information in the area surrounding TVA's Johnsonville Fossil Plant (JOF Plant) in New Johnsonville, Tennessee. This technical appendix provides a detailed evaluation of this information for the Environmental Assessment Report (EAR) in support of fulfilling the requirements for the Tennessee Department of Environment and Conservation (TDEC) issued Commissioner's Order OGC15-0177 (TDEC Order) Program (TDEC 2015).

2.0 WATER USE SURVEY

As part of the Environmental Investigation Plan (EIP) (TVA 2018), TVA developed a Water Use Survey Sampling and Analysis Plan (SAP). The objectives of the Water Use Survey SAP were to identify and sample usable private water supply wells and surface water sources being used for domestic purposes within ½-mile of the of the boundary of the JOF Plant Coal Combustion Residuals (CCR) Management Units. This area is referred to herein as the Survey Area and is illustrated on Exhibit H.10-1.

TVA defines a usable water well to be one that will house a pump (even if a pump is not currently present) and does not contain an obstruction or defective construction that would prevent the insertion or operation of a pump.

The initial tasks of the Water Use Survey are presented in this appendix. These tasks included a desktop survey to identify potentially usable water wells and springs within the Survey Area. A description of the desktop survey, its results, and parcels of land that will be included in future survey efforts are provided in the following sections. The remaining Water Use Survey tasks are ongoing and will be presented in a future revision of the EAR.

2.1 DESKTOP SURVEY

The first step of the Water Use Survey was a desktop survey (the Survey) to identify potentially usable private wells and springs. The Survey included: reviewing well logs obtained from TDEC, historical hydrogeologic reports provided by TVA and aerial photographs; and contacting public water supply providers in the vicinity of the JOF Plant. The goal of the Survey was to identify potential and known wells or springs within the Survey Area. Details of the Survey are provided in the following sections.

2.1.1 Data Sources and Evaluation

The following information and historical reports were obtained and reviewed:

- TVA Engineering Laboratory - Johnsonville Groundwater Assessment Report (TVA 1995) (herein referred to as the "1995 TVA Report")

- TVA Engineering Laboratory - Hydrogeology of Rail Loop Dredged Ash Stacking Area Report (TVA 1997) (herein referred to as the “1997 TVA Report”)
- United State Geological Survey (USGS) Public Water-Supply Systems and Associated Water Use in Tennessee, 2005 (Robinson and Brooks 2010)
- April 2015 Aerial Photographs (Google Earth© 2021)
- USGS National Water Information System online mapping database (USGS 2019)
- Parcel data received as geographic information system (GIS)-ready electronic data from Humphreys County (Humphreys County 2019)
- Well construction information received from Luke Ewing, TDEC Division of Water Resources, Drinking Water Unit (Ewing 2019)
- Local Public Water Supply Information
    - Interview – Brandy Vann - City of New Johnsonville (Vann 2019)
    - Interview – John Beasley – Camden Water Department (Beasley 2019).

2.1.1.1 Desktop Survey Results

The findings from the main data sources reviewed as part of this Survey are presented below.

Public Water Service Providers

The nearest source of public potable water is the New Johnsonville Water Department (NJWD) located in the city of New Johnsonville (Robinson & Brooks 2010 and USGS 2019). NJWD obtains their water supply from the Tennessee River at river mile marker 101.8R located approximately one mile south (upstream) of the Survey Area and provides potable water to New Johnsonville and the entire area within ½-mile of JOF (Vann 2019). The City of Camden’s, potable water supply system does not service the Survey Area or areas east of the Tennessee River however the water system also obtains water from the Tennessee River with the water intake located within the Survey Area near where Interstate Highway 70 crosses the River. Table H.10-1 summarizes the identified public water suppliers.

Humphreys County Parcel Information

Stantec obtained the complete parcel information set from Humphreys County in electronic format and assimilated the information into Stantec’s GIS database for the JOF Plant. Stantec used these data to populate Table H.10-2 including only those parcels partially or fully within the Survey Area, which totaled 359 parcels. The parcel information included the following water supply classifications:

- Individual (1 parcel)
- Private (1 parcel)

- None (6 parcels)
- Public (351 parcels).

The eight parcels identified as having an “individual”, “private”, “none” water supply are parcels that have no known connection to a municipal water supply. The remaining 351 parcels identified as having a “public” water supply are served by a municipal water supply.

TDEC Water Well Logs

TDEC provided an electronic list of the recorded water well logs within and near the Survey Area (Ewing 2019). Some well logs included the well depth and other well construction details. Stantec geo-referenced the listed latitude/longitude of each well log using GIS to plot the well locations on a map. The provided coordinates were imported into GIS “as is” without modification. Table H.10-3 summarizes the only TDEC-documented well log located on a parcel within the Survey Area, and the well location is shown on Exhibit H.10-2.

Historical Reports

1995 and 1997 TVA Report Findings

Although the 1995 TVA Report summarized hydrogeological conditions surrounding JOF, a formal survey of wells or springs was not conducted as part of this effort. However, 1995 TVA report identified “offsite well locations”. The 1997 TVA Report identified the approximate locations of “water supply wells” near the JOF Plant. The 1997 TVA Report also summarizes a survey of non-public water supply wells and springs near the JOF Plant that was conducted by TVA. The wells identified are consistent in both reports. Five non-public water supply wells (labeled PH, 5W1, 5W2, 6W, and JERA) were identified in the reports. No springs were identified. The water supply wells and springs identified in the historical reports within the Survey Area are shown on Exhibit H.10-2.

Recent Aerial Photograph Review

Stantec reviewed the December 2015 Google Earth© aerial photograph (most recent photograph available) to identify buildings or structures (i.e., residences, businesses) in the Survey Area that are likely to require a potable water source. If a parcel was identified by Humphreys County as having an “individual” water source and a building was present, then it was assumed that a private well used for domestic or business purposes was present at the parcel. Alternatively, if a parcel was identified with an “individual” listing but no evidence of recent or current buildings or structures was observed, then it was considered unlikely for a private well to be present or currently in use at the parcel. Two parcels with likely residential structures and an “individual” or “private” water source were identified in the Survey Area as part of the aerial photograph review with their locations shown on Exhibit H.10-2.

2.1.1.2 Summary of Desktop Survey Findings

Based on the records reviewed, the private well information obtained from these data sources as it relates to the Survey Area are summarized in Table H.10-4.

Table H.10-2 provides a complete list of parcels in the Survey Area and includes data presented in Table H.10-3. Exhibit H.10-2 illustrates potential water supply wells and springs identified during the Survey and highlights those parcels in the Survey Area where one or more potential well(s) or spring(s) were identified based on the data reviewed.

Based on the results of the Survey, four parcels (highlighted on Exhibit H.10-2) were identified in the Survey Area that may contain up to five wells potentially used for domestic or business purposes. No springs were identified in the Survey Area.

2.1.2 Hydrogeological Considerations

In addition to conducting the Survey, the current JOF Plant Water Use Survey SAP outlines a process to identify locations where groundwater or surface water has the potential to be affected by JOF Plant coal combustion residuals (CCR) management units using results of investigative activities required as part of the EIP. This process includes consideration of geologic and hydrogeologic conditions (i.e. hydraulic barriers [rivers/streams], topography, groundwater flow direction, and watershed boundaries). Relevant hydrogeologic information presented in the EAR Section 5 is discussed below as it relates to identifying usable water wells and surface water sources being used for domestic purposes with the potential to be affected by JOF Plant CCR management units.

- The stratigraphy of the JOF Plant area is comprised of the following units listed in order of increasing depth (except for the CCR material): fill, native unconsolidated materials (alluvial deposits), and residuum. Unconsolidated materials at the CCR management units consist of fill, residuum, or alluvium deposited within the Tennessee Western Valley Watershed. Residuum is formed from the weathering of the underlying bedrock. Alluvium refers to native materials (i.e., clay, silt, sand, or gravel) that are deposited by moving water. The unconsolidated materials range in thickness from a few feet to over 70 feet

- Alluvial deposits in the Tennessee River flood plain were observed to be poorly sorted and unconsolidated and consist of clay, silt, sand, and gravel. The finer grained material is usually near the surface and the coarser grained material is more common at depth.

- The JOF Plant adjoins the eastern shore of the Tennessee River. A key characteristic of the setting is that the JOF Plant is situated in a low-lying area along the Tennessee River with a higher elevation ridge to the east of the plant. Mimicking topography, groundwater flows west/southwest across the JOF Plant area towards the Tennessee River as shown in Exhibit H.10-3. In general, groundwater elevation contours follow surface topography, and groundwater flows from areas of higher elevation towards Tennessee River. The key hydraulic barrier (Tennessee River) is illustrated on Exhibit H.10-3.

Based on geologic and hydrogeologic conditions present at and in the vicinity of the JOF Plant, parcels containing a well or spring located west of the JOF Plant would have the greatest likelihood of being downgradient of the JOF Plant CCR management units. Potable water wells screened in overburden or bedrock located east, north, and south of the JOF Plant CCR management units would have a low likelihood of being impacted from groundwater associated with JOF Plant CCR management units based on the current groundwater flow pattern.

2.1.3 Usable Water Well Identification

Considering geologic and hydrogeologic conditions within the Survey Area resulted in an Area of Interest where next steps of the Water Use Survey process would be implemented. Therefore, the next steps of the Water Use Survey, being initiated through delivery of letters and postcards to landowners, will be limited to parcels in this Area of Interest, as outlined on Exhibit H.10-3, and listed in Table H.10-5.

Planned efforts to contact parcel owners listed in Table H.10-5 will determine if additional wells or springs are present. These efforts will be initiated immediately upon TDEC's concurrence with the approach and parcels identified.

3.0 REFERENCES

Beasley, John (Camden Water Department). (2019). Email to Christopher Hatfield (Stantec), March 20, 2019.

Ewing, Luke (Tennessee Department of Environmental and Conservation [TDEC] Division of Water Resources, Drinking Water Unit). (2019). Email to Christopher Hatfield (Stantec). June 20, 2019.

Google Earth. (2021). December 2015 Aerial Photographs of New Johnsonville, Tennessee, Retrieved February 23, 2021.

Humphreys County, 2019. GIS-ready Electronic Parcel Data of Humphreys County, June 2019.

Robinson, J.A., and Brooks, J.M. (2010). Public Water-Supply Systems and Associated Water Use in Tennessee, 2005: U.S. Geological Survey Open-File Report 2010–1226.

TVA Engineering Laboratory. (1995). *Johnsonville Groundwater Assessment*, Report No. WR28-1-30-111-104, March 1995.

TVA Engineering Laboratory. (1997). *Hydrogeology of Rail Loop Dredged Ash Stacking Area – TVA New Johnsonville Fossil Plant*, Report No. WR97-2-30-113, September 1997.

Vann, Brandy (City of New Johnsonville). (2019). Emails to Christopher Hatfield (Stantec), June 28 and July 29, 2019.

United States Geological Survey. (2019). National Water Information System online mapping database, Retrieved June, 2019, from https://maps.waterdata.usgs.gov/mapper/index.html.

TABLES

Table H.10-1 – JOF Plant Area Public Water Service Providers

Public Water Supply Provider	Service Area in Relation to JOF Plant	Does Service Area Extend into Survey Area (Yes/No)	Water Source/Intake Location	Distance of Source/Intake from JOF Plant Survey Area
New Johnsonville Water Department	Entire survey area	Yes	Tennessee River / mile marker 101.8R	1 mile south (downstream)
City of Camden Water Department	Provides potable water west of the Survey Area	No	Tennessee River / intersection of Interstate Highway 70 with Tennessee River	Within Survey Area (southwest portion)

Table H.10-2 – JOF Plant Parcel Data Inside Survey Area

ASSIGNED WELL ID	OWNER	PARCEL ADDRESS	PARCEL ID	HUMPHREYS COUNTY GIS WATER SERVICE DESIGNATION	RECENT AERIAL PHOTOGRAPH REVIEW NOTES	TDEC WELL LOG NUMBER	TDEC WELL LOG WELL DEPTH (feet below ground surface)	TVA/LAW ENGINEERING REPORT WELL ID
	THE CHEMOURS COMPANY LLC	DUPONT RD 1950	088 001.00	PUBLIC	many buildings/structures associated with DuPont			1997 TVA report - SW, SW1, & SW2 (industrial use wells) 1997 TVA report - PH, JERA (potable water well)
	KRECZMER & SHELTON PROP	CARMAN AVE 466	091G A 037.00	PRIVATE	residential structure			
	NICHOLS MICHELLE ETVIR	ASHE AVE 460	091G B 003.02	INDIVIDUAL	likely residential structure			
	CONTINENTAL GRAIN CO	TVA 104	091 031.04	PUBLIC	multiple grain silos and three small buildings	TDEC Well Log Record (no ID #)	no information	
	L & N RAILROAD	COUNTY	064 403.00	NONE				
	NEW JOHNSONVILLE CITY OF	BROADWAY AVE	088 042.00	PUBLIC	New Johnsonville water tower			
	PEEK SHERRY C TRUSTEE	BROADWAY AVE 700	091 001.00	PUBLIC				
	MERIWETHER LEWIS ELECTRIC	DUPONT ACCESS RD	091 001.01	NONE				
	LUCAS LYNDA TRUSTEE	HWY 70 W	091 001.02	PUBLIC				
	KANJARIA DENISH L & AMIT KUMAR PATEL	BROADWAY AVE	091 001.03	PUBLIC				
	LUCAS LYNDA TRUSTEE	BROADWAY AVE 608	091 001.04	PUBLIC				
	VEGA JUAN S REVELES ETUX	BROADWAY AVE 616	091 001.05	PUBLIC				
	CROWELL KAYE R	BROADWAY AVE	091 001.07	PUBLIC				
	NEW JOHNSONVILLE CITY OF	LONG ST	091 001.08	PUBLIC				
	RODGERS CATHY T	BROADWAY AVE	091 001.09	PUBLIC				
	WERFEL LARRY G	CHARLES WEBB DR 812	091 003.00	PUBLIC				
	STEWART DUSTIN B ETUX	CHARLES WEBB DR 806	091 004.00	PUBLIC				
	DUCK RIVER MILLS INC	CHARLES WEBB DR 802	091 005.00	PUBLIC				
	LUCAS LYNDA TRUSTEE	CHARLES WEBB DR	091 006.00	PUBLIC				
	LUCAS LYNDA TRUSTEE	LONG ST	091 007.00	PUBLIC				
	VOLUNTEER READY MIX LLC	LONG ST	091 007.01	PUBLIC				
	T V A	LONG ST	091 031.02	PUBLIC				
	LUCAS LYNDA TRUSTEE	LONG ST	091 031.03	PUBLIC				
	SANDGRAVL CO INC	HERBERT RD	091 403.03	PUBLIC				
	MEDLING WAYNE ETUX JULIA	BROADWAY AVE 404	091B A 001.00	PUBLIC				
	WHEELER BLAKE ALAN	CARMAN AVE 403	091B A 002.00	PUBLIC				
	OXIER CHARLES EDWARD ETUX CHRYSPIN DEAN	CARMAN AVE 411	091B A 003.00	PUBLIC				
	MALONE ALBERT JOE ETUX	CARMAN AVE 419	091B A 004.00	PUBLIC				
	DODD ROBERT WAYNE SR ETUX	CARMAN AVE 427	091B A 005.00	PUBLIC				
	LOVELESS LANCE ETUX	CARMAN AVE 435	091B A 006.00	PUBLIC				
	LOVELESS LANCE ETUX CYNTHIA	CARMAN AVE 447	091B A 007.00	PUBLIC				
	INDEPENDENT PROPERTY	CARMAN AVE 451	091B A 008.00	PUBLIC				
	FELTS CLYDE B III	CARMAN AVE 453	091B A 009.00	PUBLIC				
	BURLISON JOANN RICE	CARMAN AVE 455	091B A 010.00	PUBLIC				
	PICKENS JAMES H ETUX	CARMAN AVE 459	091B A 011.00	PUBLIC				
	GRIFFITH JESSICA W	CARMAN AVE 463	091B A 012.00	PUBLIC				
	LANE MARION ETUX RUTH	CARMAN AVE 469	091B A 013.00	PUBLIC				
	ANDERSON GLEN E ETUX COLLEEN	CARMAN AVE 471	091B A 014.00	PUBLIC				
	BOWMAN VICTORIA	CARMAN AVE 475	091B A 015.00	PUBLIC				
	WYATT HOWARD D ETUX JANICE	CARMAN AVE 479	091B A 016.00	PUBLIC				
	CURTIS PHILLIP CRAIG	CARMAN AVE 481	091B A 017.00	PUBLIC				
	LUCAS LYNDA TRUSTEE	CARMAN AVE	091B A 018.00	PUBLIC				
	LUCAS LYNDA TRUSTEE	CARMAN AVE	091B A 019.00	PUBLIC				
	CURTIS ROYCE W ETUX	CARMAN AVE 478	091B A 020.00	PUBLIC				
	LUCAS LYNDA TRUSTEE	CARMAN AVE	091B A 021.00	PUBLIC				
	MOSLEY OACIE L ETUX L/E	CARMAN AVE 495	091B A 022.00	PUBLIC				
	WHITSETT TURNER F II L/E	WYLY DR 116	091B A 023.00	PUBLIC				
	AMONETTE MELISSA ETVIR ANTHONY &	WYLY DR 112	091B A 024.00	PUBLIC				

Table H.10-2 – JOF Plant Parcel Data Inside Survey Area

ASSIGNED WELL ID	OWNER	PARCEL ADDRESS	PARCEL ID	HUMPHREYS COUNTY GIS WATER SERVICE DESIGNATION	RECENT AERIAL PHOTOGRAPH REVIEW NOTES	TDEC WELL LOG NUMBER	TDEC WELL LOG WELL DEPTH (feet below ground surface)	TVA/LAW ENGINEERING REPORT WELL ID
	LUCAS LYNDA TRUSTEE	WYLY DR 106	091B A 025.00	PUBLIC				
	LUCAS LYNDA TRUSTEE	BROADWAY AVE 494	091B A 026.00	PUBLIC				
	LUCAS LYNDA TRUSTEE	BROADWAY AVE	091B A 027.00	PUBLIC				
	NEW JOHNSONVILLE CITY OF	BROADWAY AVE 478	091B A 028.00	NONE				
	BARBER NANCY L ETAL	BROADWAY AVE	091B A 029.00	NONE				
	SMITH REBECCA ANN	BROADWAY AVE 470	091B A 030.00	NONE				
	CHUNN KIMBERLY	BROADWAY AVE 478	091B A 032.00	PUBLIC				
	BAKER EDDIE R ETUX	BROADWAY AVE 458	091B A 033.00	PUBLIC				
	PITCHFORD AGNES B L/E	BROADWAY AVE 454	091B A 034.00	PUBLIC				
	MOORE JESSICA	BROADWAY AVE 450	091B A 035.00	PUBLIC				
	BRYANT DONNA A	BROADWAY AVE 446	091B A 036.00	PUBLIC				
	CALIXTRO NATIVIDAD A	BROADWAY AVE 442	091B A 037.00	PUBLIC				
	DAVIS MICHAEL D ETUX	BROADWAY AVE 438	091B A 038.00	PUBLIC				
	DRAKE LOIS A L/E	BROADWAY AVE 434	091B A 039.00	PUBLIC				
	WILSON DALE A &	BROADWAY AVE 430	091B A 040.00	PUBLIC				
	INDEPENDENT PROPERTY	BROADWAY AVE 426	091B A 041.00	PUBLIC				
	JOHNSON CONLEY O ETUX MAI	BROADWAY AVE 422	091B A 042.00	PUBLIC				
	EDEN RICHARD L AND	BROADWAY AVE 418	091B A 043.00	PUBLIC				
	FERRELL CARROLL CLAYTON	BROADWAY AVE 414	091B A 044.00	PUBLIC				
	MEDLING MARK C	BROADWAY AVE 406	091B A 045.00	PUBLIC				
	BAKER EDDIE ETUX SANDRA	BROADWAY AVE 410	091B A 046.00	PUBLIC				
	LUCAS LYNDA TRUSTEE	WYLY DR 105	091B B 001.00	PUBLIC				
	CASSININO GLENDA & LORETTA BROWN &	WYLY DR 113	091B B 002.00	PUBLIC				
	ABRAMSON EVELYN H L/E	WYLY DR 117	091B B 003.00	PUBLIC				
	HARRIS PATRICIA ANN	CARMAN AVE 511	091B B 004.00	PUBLIC				
	HARRINGTON PATRICIA A	CARMAN AVE 515	091B B 005.00	PUBLIC				
	BOSWELL HARRY K ETUX	CARMAN AVE 519	091B B 006.00	PUBLIC				
	MITCHELL JACK C	CARMAN AVE 523	091B B 007.00	PUBLIC				
	LUCAS LYNDA TRUSTEE	BROADWAY AVE 556	091B B 008.00	PUBLIC				
	LUCAS LYNDA TRUSTEE	BROADWAY AVE	091B B 009.00	PUBLIC				
	FIRST FEDERAL BANK	BROADWAY AVE 509	091B B 009.01	PUBLIC				
	TERRY BRENDA L	BROADWAY AVE 550	091B B 010.00	PUBLIC				
	NEW JOHNSONVILLE CITY OF	BROADWAY AVE 528	091B B 010.01	PUBLIC				
	TUCKER MILDRED PIRTLE	CARMAN AVE 527	091B B 010.02	PUBLIC				
	LUCAS RACHEL P	CARMAN AVE	091B B 010.03	PUBLIC				
	CASEY'S MARKETING COMPANY	BROADWAY AVE 540	091B B 010.04	PUBLIC				
	LUCAS LYNDA TRUSTEE	BROADWAY AVE 522	091B B 011.00	PUBLIC				
	LUCAS LYNDA TRUSTEE	BROADWAY AVE 516	091B B 012.00	PUBLIC				
	NEW JOHNSONVILLE CITY OF	BROADWAY AVE 604	091B C 001.00	PUBLIC				
	HAMPTON WILLIS	LONG ST 113	091B C 002.00	PUBLIC				
	HUMPHREYS CO TELEPHONE	LONG ST	091B C 003.00	PUBLIC				
	LUCAS LYNDA TRUSTEE	LONG ST	091B C 003.01	PUBLIC				
	JOHNSONVILLE TVA EMPLOYEES	LONG ST 213	091B C 004.00	PUBLIC				
	LUCAS LYNDA TRUSTEE	LONG ST 223	091B C 005.00	PUBLIC				
	HUMPHREYS CO UTILITY	LONG ST	091B C 006.00	PUBLIC				
	PATTON THOMAS EARL	CARMAN AVE 506	091B D 001.00	PUBLIC				
	PRINCE TODD ETUX JODI	WYLY DR 207	091B D 002.00	PUBLIC				
	BROWN KAREN L	WYLY DR 213	091B D 003.00	PUBLIC				
	JONES RYAN M	WYLY DR 217	091B D 004.00	PUBLIC				
	KING GLENDA O'DANIEL	ASHE AVE 511	091B D 005.00	PUBLIC				
	FLOWERS SHARON L	ASHE AVE 515	091B D 006.00	PUBLIC				
	WYATT HOWARD D ETUX JANICE	ASHE AVE 519	091B D 007.00	PUBLIC				
	WYATT HOWARD D ETUX	ASHE AVE 523	091B D 008.00	PUBLIC				
	BONE NIKI DALE	ASHE AVE 527	091B D 009.00	PUBLIC				

Table H.10-2 – JOF Plant Parcel Data Inside Survey Area

ASSIGNED WELL ID	OWNER	PARCEL ADDRESS	PARCEL ID	HUMPHREYS COUNTY GIS WATER SERVICE DESIGNATION	RECENT AERIAL PHOTOGRAPH REVIEW NOTES	TDEC WELL LOG NUMBER	TDEC WELL LOG WELL DEPTH (feet below ground surface)	TVA/LAW ENGINEERING REPORT WELL ID
	KESLINGER CODY K	ASHE AVE 531	091B D 010.00	PUBLIC				
	SPEARS SHANE STEPHEN ETUX MARY ANN	ASHE AVE 535	091B D 011.00	PUBLIC				
	JOHNSON JOSHUA HEATH ETUX	ASHE AVE 539	091B D 012.00	PUBLIC				
	SMITH SHERRY L	ASHE AVE 543	091B D 013.00	PUBLIC				
	SCURLOCK SHEILA W	ASHE AVE 547	091B D 014.00	PUBLIC				
	PICKENS JAMES H ETUX DESSIE M	ASHE AVE 551	091B D 015.00	PUBLIC				
	PURCELL SANDI N FLOWERS & MICHAEL WAYNI	ASHE AVE 555	091B D 016.00	PUBLIC				
	TAYLOR VELMA L/E	ASHE AVE 559	091B D 017.00	PUBLIC				
	MILLER CARL A ETUX	ASHE AVE 563	091B D 018.00	PUBLIC				
	PAPOW SANDRA AND	ASHE AVE 567	091B D 019.00	PUBLIC				
	TYLER RICHARD W	ASHE AVE 571	091B D 020.00	PUBLIC				
	HUMPHREYS COUNTY COMMUNITY	LONG ST 224	091B D 021.00	PUBLIC				
	LUCAS LYNDA TRUSTEE	LONG ST 214	091B D 022.00	PUBLIC				
	CHURCH OF CHRIST	CARMAN AVE 565	091B D 023.00	PUBLIC				
	KING JOANNIE LYNN	CARMAN AVE 558	091B D 024.00	PUBLIC				
	HATLER DONALD M ETUX	CARMAN AVE 554	091B D 025.00	PUBLIC				
	MULLINAX TIMOTHY & KAYLA MULLINAX	CARMAN AVE 550	091B D 026.00	PUBLIC				
	GERALDI AURELIO L	CARMAN AVE 546	091B D 027.00	PUBLIC				
	WORK ERNEST T	CARMAN AVE 542	091B D 028.00	PUBLIC				
	RHODES ROBBIE L/E	CARMAN AVE 538	091B D 029.00	PUBLIC				
	BROWN RONALD E ETUX KELLY M	CARMAN AVE 534	091B D 030.00	PUBLIC				
	ASKINS PHILLIP A	CARMAN AVE 530	091B D 031.00	PUBLIC				
	MALLARD G W ETUX	CARMAN AVE 526	091B D 032.00	PUBLIC				
	HATLEY RICHARD &	CARMAN AVE 522	091B D 033.00	PUBLIC				
	BETTY AUSTIN N ETUX KATIE	CARMAN AVE 518	091B D 034.00	PUBLIC				
	BONER LLOYD E ETUX	CARMAN AVE 514	091B D 035.00	PUBLIC				
	PECK GINA	CARMAN AVE 510	091B D 036.00	PUBLIC				
	NEW JOHNSONVILLE CITY OF	LONG ST	091F A 001.00	PUBLIC				
	LUCAS LYNDA TRUSTEE	LONG ST	091F A 001.01	PUBLIC				
	MOSLEY RUTH E L/E	CARMAN AVE 402	091G A 001.00	PUBLIC				
	CLAIBORNE DORIS & NIKI DALE BONE	FISH HOOK DR 207	091G A 002.00	PUBLIC				
	TYLER CALVIN ZANE SR	FISH HOOK DR 213	091G A 003.00	PUBLIC				
	CLAIBORNE DORIS & NIKI DALE BONE	ASHE AVE 403	091G A 004.00	PUBLIC				
	CLAIBORNE DORIS & NIKI DALE BONE	ASHE AVE 415	091G A 006.00	PUBLIC				
	BREEDEN MADALYNN	ASHE AVE 423	091G A 008.00	PUBLIC				
	BROWN CLYDE A &	ASHE AVE 427	091G A 009.00	PUBLIC				
	OWEN PAULA MAE SHELTON	ASHE AVE 431	091G A 010.00	PUBLIC				
	MARTIN LINDA J	ASHE AVE 435	091G A 011.00	PUBLIC				
	BRUMMITT STEPHEN M & J BRADLEY BRUMMIT	ASHE AVE 439	091G A 012.00	PUBLIC				
	WILSON JACQUELINE ETVIR	ASHE AVE 443	091G A 013.00	PUBLIC				
	BATES ASHLEY D	ASHE AVE 447	091G A 014.00	PUBLIC				
	WARSTLER MARGARET A	ASHE AVE 451	091G A 015.00	PUBLIC				
	ABRAMS DAVID L	ASHE AVE 455	091G A 016.00	PUBLIC				
	JOHNSON TERRI SCHNEIDER	ASHE AVE 459	091G A 017.00	PUBLIC				
	HIMES JAMES R ETUX	ASHE AVE 463	091G A 018.00	PUBLIC				
	JAMES PAUL W ETUX	ASHE AVE 467	091G A 019.00	PUBLIC				
	LUCAS LYNDA TRUSTEE	ASHE AVE	091G A 023.00	PUBLIC				
	MCCRACKEN NEIL LEON AND	ASHE AVE 491	091G A 024.00	PUBLIC				
	REEVES JUDY A	ASHE AVE 495	091G A 025.00	PUBLIC				
	PHILPOTT CHAD	ASHE AVE 499	091G A 026.00	PUBLIC				
	WHITE GARLAND J ETUX	WYLY DR 214	091G A 027.00	PUBLIC				
	SCURLOCK BECKY E AND	WYLY DR 208	091G A 028.00	PUBLIC				
	LYTTLE BUNARD C ETUX	CARMAN AVE 498	091G A 029.00	PUBLIC				
	PIRTLE JAMES RAY &	CARMAN AVE 494	091G A 030.00	PUBLIC				

Table H.10-2 – JOF Plant Parcel Data Inside Survey Area

ASSIGNED WELL ID	OWNER	PARCEL ADDRESS	PARCEL ID	HUMPHREYS COUNTY GIS WATER SERVICE DESIGNATION	RECENT AERIAL PHOTOGRAPH REVIEW NOTES	TDEC WELL LOG NUMBER	TDEC WELL LOG WELL DEPTH (feet below ground surface)	TVA/LAW ENGINEERING REPORT WELL ID
	LUCAS LYNDA TRUSTEE	CARMAN AVE	091G A 031.00	PUBLIC				
	TOMLIN JAMES MICHAEL	CARMAN AVE 478	091G A 035.00	PUBLIC				
	TOMLIN JAMES M	CARMAN AVE 474	091G A 036.00	PUBLIC				
	LOFTON KEVIN J ETUX GINGER	CARMAN AVE 470	091G A 036.01	PUBLIC				
	INDEPENDENT PROPERTY	CARMAN AVE 462	091G A 038.00	PUBLIC				
	KING TONY W	CARMAN AVE 458	091G A 039.00	PUBLIC				
	DOUGLAS DUSTIN	CARMAN AVE	091G A 039.01	PUBLIC				
	DOUGLAS DUSTIN	CARMAN AVE 454	091G A 040.00	PUBLIC				
	DOUGLAS DUSTIN	CARMAN AVE 450	091G A 041.00	PUBLIC				
	DOUGLAS DUSTIN	CARMAN AVE 442	091G A 042.00	PUBLIC				
	CRAWFORD SCOT	CARMAN AVE 434	091G A 043.00	PUBLIC				
	BLAZIER KATHY	CARMAN AVE 426	091G A 044.00	PUBLIC				
	PEELER DAVID G	CARMAN AVE 418	091G A 045.00	PUBLIC				
	JOHNSON TERRI SCHEIDER	CARMAN AVE 410	091G A 046.00	PUBLIC				
	JACKSON BRIDGET KELLY ETVIR JOSHUA L	ASHE AVE 414	091G B 002.00	PUBLIC				
	DODD HOUSTON	ASHE AVE 440	091G B 003.00	PUBLIC				
	CULP JONATHAN D	ASHE AVE 450	091G B 003.03	PUBLIC				
	LUCAS LYNDA TRUSTEE	ASHE AVE	091G B 004.00	PUBLIC				
	BRUCE DAVID W	LEADER DR 304	091G B 005.00	PUBLIC				
	ROSS TAMMY L	LEADER DR 308	091G B 006.00	PUBLIC				
	JOYNER DANNIE R ETUX	LEADER DR 312	091G B 007.00	PUBLIC				
	ATKINSON MICHELLE ETAL	LEADER DR 316	091G B 008.00	PUBLIC				
	AULIDGE CAROLYN SUE	LEADER DR 320	091G B 009.00	PUBLIC				
	FINCH GREGORY A ETUX	LEADER DR 324	091G B 010.00	PUBLIC				
	OELKA LEE JOHN ETUX	LEADER DR 332	091G B 012.00	PUBLIC				
	CHITTENDEN LEON H ET UX	LEADER DR 336	091G B 013.00	PUBLIC				
	JACKSON RONALD A	LEADER DR 340	091G B 014.00	PUBLIC				
	WOODS NATHAN WAYNE	LEADER DR 344	091G B 015.00	PUBLIC				
	SLOAN WILLIAM C ETUX ETTA R	LEADER DR 348	091G B 016.00	PUBLIC				
	BAKER EDDIE R ETUX	LEADER DR 352	091G B 017.00	PUBLIC				
	THOMPSON PHILLIP LAIN	LEADER DR 356	091G B 018.00	PUBLIC				
	THOMPSON HUEY F	LEADER DR 360	091G B 019.00	PUBLIC				
	PHY JASON H ETUX DEANNA	LEADER DR 364	091G B 020.00	PUBLIC				
	WILLIAMS ROY D	LEADER DR 368	091G B 021.00	PUBLIC				
	WILEMAN BENJAMIN THEODORE	LEADER DR 372	091G B 022.00	PUBLIC				
	PHILPOTT CHAD	LEADER DR 376	091G B 023.00	PUBLIC				
	ONEAL PAUL VERNON	LEADER DR 380	091G B 024.00	PUBLIC				
	MASHAW PHYLLIS KAY	LEADER DR 384	091G B 025.00	PUBLIC				
	WAGONER SUSAN D	LEADER DR 388	091G B 026.00	PUBLIC				
	HIMES BILLY R ETUX MARTHA	LEADER DR 392	091G B 027.00	PUBLIC				
	DANIEL TIMOTHY SCOTT	LEADER DR 396	091G B 028.00	PUBLIC				
	LUCAS LYNDA TRUSTEE	ASHE AVE	091G B 029.00	PUBLIC				
	CAGLE TIMOTHY C	ASHE AVE 490	091G C 001.00	PUBLIC				
	LOGAN DONNA	LEADER DR 305	091G C 002.00	PUBLIC				
	LOGAN VALORIE	LEADER DR 309	091G C 003.00	PUBLIC				
	LUCAS LYNDA L	LEADER DR 313	091G C 004.00	PUBLIC				
	RHODES TIM FRANKLIN	LEADER DR 317	091G C 005.00	PUBLIC				
	BRANDON BRENDA A	LEADER DR 321	091G C 006.00	PUBLIC				
	INGRAM JAMES D	LEADER DR 325	091G C 007.00	PUBLIC				
	COOK THOMAS EDWARD JR	LEADER DR 333	091G C 009.00	PUBLIC				
	MULLINAX EDWIN G ETUX	LEADER DR 337	091G C 010.00	PUBLIC				
	LANE MARION W &	LEADER DR 341	091G C 011.00	PUBLIC				
	DANIEL TIMOTHY WADE ETUX	LEADER DR 347	091G C 012.00	PUBLIC				
	FLOWERS RICHARD COLT	LEADER DR 355	091G C 013.00	PUBLIC				

Table H.10-2 – JOF Plant Parcel Data Inside Survey Area

ASSIGNED WELL ID	OWNER	PARCEL ADDRESS	PARCEL ID	HUMPHREYS COUNTY GIS WATER SERVICE DESIGNATION	RECENT AERIAL PHOTOGRAPH REVIEW NOTES	TDEC WELL LOG NUMBER	TDEC WELL LOG WELL DEPTH (feet below ground surface)	TVA/LAW ENGINEERING REPORT WELL ID
	PICKARD RICHARD C	LEADER DR 363	091G C 014.00	PUBLIC				
	BERGERON LAURA K	LEADER DR 371	091G C 015.00	PUBLIC				
	LEE DANIEL W &	LEADER DR 381	091G C 016.00	PUBLIC				
	LUCAS LYNDA LYNNE	LEADER DR	091G C 017.01	NONE				
	NEWTON FRED ETUX SANDRA	ASHE AVE	091G C 018.00	PUBLIC				
	NEWTON FRED ETUX SANDRA	ASHE AVE	091G C 019.00	PUBLIC				
	CHAPMAN TRACY A	ASHE AVE 530	091G C 020.00	PUBLIC				
	DAVIS DONALD E ETUX	ASHE AVE 524	091G C 021.00	PUBLIC				
	PHILLIPS MICHAEL LAMONT	ASHE AVE 518	091G C 022.00	PUBLIC				
	PIRTLE WM EARL	ASHE AVE 512	091G C 023.00	PUBLIC				
	BEARD JASON L ETUX	ASHE AVE 506	091G C 024.00	PUBLIC				
	DICKINSON SANDRA M	ASHE AVE 502	091G C 025.00	PUBLIC				
	LADD BARRETT ETUX	ASHE AVE 498	091G C 026.00	PUBLIC				
	PARK JOHN CARTER	ASHE AVE 494	091G C 027.00	PUBLIC				
	MODI MAHENDRA ETUX	BROADWAY AVE 116	091H A 001.00	PUBLIC				
	SULLIVAN LAURA B ETVIR RALPH B	HARBOR CIR 132	091H A 002.01	PUBLIC				
	REASONS TAMMY C	HARBOR CIR 130	091H A 002.02	PUBLIC				
	SULLIVAN JAMES R	HARBOR CIR 140	091H A 003.00	PUBLIC				
	MOORE WANDA MRS L/E	HARBOR CIR 142	091H A 004.00	PUBLIC				
	TUBBS E GRANVILLE TRUST	HARBOR CIR 150	091H A 005.00	PUBLIC				
	TUBBS E GRANVILLE TRUST	HARBOR CIR 146	091H A 005.01	PUBLIC				
	PLANT HILTON LEE	HARBOR CIR 154	091H A 006.00	PUBLIC				
	TIDWELL JOHN C ETUX	HARBOR CIR 158	091H A 007.00	PUBLIC				
	KESLINGER CODY K	HARBOR CIR 162	091H A 008.00	PUBLIC				
	WYATT HOWARD D ETUX JANICE	HARBOR CIR 164	091H A 008.01	PUBLIC				
	RAMSEY DONNA JEAN	HARBOR CIR 170	091H A 009.00	PUBLIC				
	RAMSEY DONNA JEAN	HARBOR CIR 169	091H A 009.01	PUBLIC				
	KESLINGER CODY	HARBOR CIR 174	091H A 010.00	PUBLIC				
	ARNOLD KEITH ETUX	HARBOR CIR 178	091H A 011.00	PUBLIC				
	BAGGETT MICHAEL S	HARBOR CIR 182	091H A 012.00	PUBLIC				
	BLACKBURN DELANA C	HARBOR CIR 117	091H B 001.00	PUBLIC				
	MANGRUM DOUGLAS W	HARBOR CIR 129	091H B 002.00	PUBLIC				
	POLK THERESA	HARBOR CIR 133	091H B 003.00	PUBLIC				
	TIDWELL NICOLE T	HARBOR CIR 141	091H B 004.00	PUBLIC				
	SULLIVAN RALPH ETUX	HARBOR CIR 145	091H B 005.00	PUBLIC				
	SULLIVAN RALPH ETUX	HARBOR CIR 149	091H B 006.00	PUBLIC				
	BLEDSOE JEFFREY K ETUX ANDREA N &	PERCH ALLEY 110	091H B 007.00	PUBLIC				
	BURKETT THOMAS	PERCH ALLEY 106	091H B 007.01	PUBLIC				
	FIDO PROPERTIES	HARBOR CIR 105	091H C 001.00	PUBLIC				
	SPENCE KYLE L	HARBOR CIR 109	091H C 002.00	PUBLIC				
	SPENCER BRENDA F	HARBOR CIR 113	091H C 003.00	PUBLIC				
	WYATT HOWARD D ETUX JAN	PERCH ALLEY 109	091H C 004.00	PUBLIC				
	WARREN CHARLES ETUX NANCY	PERCH ALLEY 101	091H C 004.01	PUBLIC				
	TUBBS ERNEST G JR	PERCH ALLEY 105	091H C 004.02	PUBLIC				
	BAKER EDDIE R ETUX SANDRA G	PERCH ALLEY 113	091H C 005.00	PUBLIC				
	TIDWELL JOHN C ETUX	PERCH ALLEY 117	091H C 006.00	PUBLIC				
	HATLEY TONY LEE &	HARBOR CIR 173	091H C 008.00	PUBLIC				
	KESLINGER CODY K	HARBOR CIR 177	091H C 009.00	PUBLIC				
	BROGDON STEPHEN A ETUX	HARBOR CIR 181	091H C 010.00	PUBLIC				
	BLAZIER SHARNA LOUISE	HARBOR CIR 185	091H C 011.00	PUBLIC				
	BISHOP BRIAN	LANKFORD DR 128	091H C 011.01	PUBLIC				
	LUCAS LYNDA TRUSTEE	BROADWAY AVE 208	091H D 001.00	PUBLIC				
	HAACK JOHN	BROADWAY AVE 212	091H D 001.01	PUBLIC				
	KESLINGER PROPERTIES LLC	HARBOR CIR 121	091H D 002.00	PUBLIC				

Table H.10-2 – JOF Plant Parcel Data Inside Survey Area

ASSIGNED WELL ID	OWNER	PARCEL ADDRESS	PARCEL ID	HUMPHREYS COUNTY GIS WATER SERVICE DESIGNATION	RECENT AERIAL PHOTOGRAPH REVIEW NOTES	TDEC WELL LOG NUMBER	TDEC WELL LOG WELL DEPTH (feet below ground surface)	TVA/LAW ENGINEERING REPORT WELL ID
	MILLER JOHN ETUX	HARBOR CIR 125	091H D 003.00	PUBLIC				
	LOCKHART WALDO C ETUX	LANKFORD DR 129	091H D 004.00	PUBLIC				
	KING DALLAS F W JR	LANKFORD DR 133	091H D 005.00	PUBLIC				
	LASHLEE MARVIN P JR	LANKFORD DR 137	091H D 006.00	PUBLIC				
	SCHNEIDER LEONARD RAYMOND	LANKFORD DR 141	091H D 007.00	PUBLIC				
	GRAY GLEN WAYNE ETUX	LANKFORD DR 145	091H D 008.00	PUBLIC				
	MCCLUNG ANDREA M	LANKFORD DR 149	091H D 009.00	PUBLIC				
	CARTER JULIA A & VICKIE WEAVER	LANKFORD DR 153	091H D 010.00	PUBLIC				
	WHITE ROBERT J	LANKFORD DR 157	091H D 011.00	PUBLIC				
	ROOS ERNEST D &	LANKFORD DR 161	091H D 012.00	PUBLIC				
	PLANT RACHEL	INDIAN CK DR 210	091H D 013.00	PUBLIC				
	PIRTLE JERRY W L/E	INDIAN CK DR 206	091H D 014.00	PUBLIC				
	FRANCIS NICHOLAS R	INDIAN CK DR 202	091H D 015.00	PUBLIC				
	DEWITT ROGER L ETUX	PARK CIRCLE DR 156	091H D 016.00	PUBLIC				
	UMSTEAD PATRICIA A ETVIR	PARK CIRCLE DR 144	091H D 018.00	PUBLIC				
	KUFALK BECKY JO ETVIR	PARK CIRCLE DR 140	091H D 019.00	PUBLIC				
	NETTERVILLE JEFFERY P ETUX	PARK CIRCLE DR 136	091H D 020.00	PUBLIC				
	TENNESSEE VALLEY AUTHORITY	BROADWAY AVE	091H D 022.00	PUBLIC				
	KIMBRO BROTHERS EQUITIES	BROADWAY AVE 302	091H E 001.00	PUBLIC				
	MEALER MARTHA LYNN	INDIAN CK DR 113	091H E 002.00	PUBLIC				
	WYATT HOWARD D ETUX JANICE	CARMAN AVE 303	091H E 003.00	PUBLIC				
	CRICHTON RANDY & SASHA CRICHTON	CARMAN AVE 307	091H E 004.00	PUBLIC				
	PIRTLE JERRY W L/E	CARMAN AVE 311	091H E 005.00	PUBLIC				
	TIDWELL SAMMY ETUX	CARMAN AVE 315	091H E 005.01	PUBLIC				
	MADILL DONALD ETUX	CARMAN AVE 319	091H E 006.00	PUBLIC				
	BARNETT KEVIN FRANKLIN & TERRY BARNETT	CARMAN AVE 323	091H E 007.00	PUBLIC				
	BROWN MICHAEL LYNN ETUX	CARMAN AVE 331	091H E 008.00	PUBLIC				
	NEBLETT JESSICA	FISH HOOK DR 112	091H E 008.01	PUBLIC				
	GARNER GREGORY L ETUX	CARMAN AVE 327	091H E 008.02	PUBLIC				
	EDEN BRENDA	CARMAN AVE 337	091H E 009.00	PUBLIC				
	LUCAS LYNDA TRUSTEE	BROADWAY AVE 3	091H E 010.00	PUBLIC				
	LUCAS LYNDA TRUSTEE	BROADWAY AVE 356	091H E 011.00	PUBLIC				
	LUCAS LYNDA TRUSTEE	BROADWAY AVE 348	091H E 012.00	PUBLIC				
	LUCAS LYNDA TRUSTEE	BROADWAY AVE 340	091H E 013.00	PUBLIC				
	LUCAS LYNDA TRUSTEE	BROADWAY AVE 332	091H E 014.00	PUBLIC				
	LUCAS LYNDA TRUSTEE	BROADWAY AVE 328	091H E 015.00	PUBLIC				
	LUCAS LYNDA TRUSTEE	BROADWAY AVE 310	091H E 016.00	PUBLIC				
	HUNT ROBIN & JEREMY SHANE BATES	INDIAN CK DR 220	091H F 001.00	PUBLIC				
	TURNER PATSY SUE &	INDIAN CK DR 224	091H F 002.00	PUBLIC				
	MCKINNEY MATTHEW P ETUX BRITTA	INDIAN CK DR 228	091H F 003.00	PUBLIC				
	PLANT JODIE P ETUX	INDIAN CK DR 232	091H F 004.00	PUBLIC				
	GOSS DIANA BREEDEN	INDIAN CK DR 236	091H F 005.00	PUBLIC				
	DEANGELIS ROGER J ETUX	INDIAN CK DR 240	091H F 006.00	PUBLIC				
	TURNER ROBIN S	INDIAN CK DR 244	091H F 007.00	PUBLIC				
	GIDDEN-MORAN CYNTHIA L	INDIAN CK DR 248	091H F 008.00	PUBLIC				
	ALLEN TAMELA L	INDIAN CK DR 252	091H F 009.00	PUBLIC				
	PHILLIPS ROBERT H	INDIAN CK DR 253	091H F 010.00	PUBLIC				
	BARBER BOBBY O L/E	INDIAN CK DR 249	091H F 011.00	PUBLIC				
	BARD SHIRLEY ANN &	INDIAN CK DR 245	091H F 012.00	PUBLIC				
	TERRY RAYMOND M JR ETUX	INDIAN CK DR 241	091H F 013.00	PUBLIC				
	AMMONS ODESSIA	INDIAN CK DR 237	091H F 014.00	PUBLIC				
	ADKINS JONATHAN	INDIAN CK DR 233	091H F 015.00	PUBLIC				
	LONG CAROLYN L/E	INDIAN CK DR 225	091H F 016.00	PUBLIC				
	LONG CAROLYN L/E	INDIAN CK DR 229	091H F 016.01	PUBLIC				

Table H.10-2 – JOF Plant Parcel Data Inside Survey Area

ASSIGNED WELL ID	OWNER	PARCEL ADDRESS	PARCEL ID	HUMPHREYS COUNTY GIS WATER SERVICE DESIGNATION	RECENT AERIAL PHOTOGRAPH REVIEW NOTES	TDEC WELL LOG NUMBER	TDEC WELL LOG WELL DEPTH (feet below ground surface)	TVA/LAW ENGINEERING REPORT WELL ID
	LONG CAROLYN L/E	INDIAN CK DR 221	091H F 017.00	PUBLIC				
	VINE LARRY K	INDIAN CK DR 217	091H F 018.00	PUBLIC				
	COWELL VICKIE ETAL	INDIAN CK DR 213	091H F 019.00	PUBLIC				
	FRAZIER ODELL ETUX NORMA	INDIAN CK DR 209	091H F 020.00	PUBLIC				
	FRAZIER ODELL ETUX NORMA	INDIAN CK DR 205	091H F 021.00	PUBLIC				
	FRAZIER ODELL ETUX	INDIAN CK DR 201	091H F 022.00	PUBLIC				
	PIRTLE JERRY W L/E	CARMAN AVE 308	091H F 023.00	PUBLIC				
	NEW JOHNSONVILLE COMMUNITY	CARMAN AVE	091H F 024.00	PUBLIC				
	BRODSKY GLADYS J	CARMAN AVE 338	091H F 026.00	PUBLIC				
	HOOPER TAMELA F	FISH HOOK DR 210	091H F 028.00	PUBLIC				
	HASKIN MALCOLM &	FISH HOOK DR 214	091H F 029.01	PUBLIC				
	BLUE RICHIE A	FISH HOOK DR 218	091H F 030.00	PUBLIC				
	HENDERSON ALICE L ETVIR HERBERT R	SUNSET DR 204	091H G 001.00	PUBLIC				
	BRYANT DONNA ANN HARRIS	SUNSET DR 208	091H G 002.00	PUBLIC				
	BRYANT RICHARD ETUX DONNA	SUNSET DR 212	091H G 003.00	PUBLIC				
	HARRISON LINDA B	SUNSET DR	091H G 003.01	PUBLIC				
	MAY ROBERT E ETUX	SUNSET DR 216	091H G 004.00	PUBLIC				
	KIMMONS KASSIE L	SUNSET DR 220	091H G 005.00	PUBLIC				
	CLAY CHARLES W ETUX DORIS	SUNSET DR 228	091H G 006.00	PUBLIC				
	WISER BARBARA GAYLE ROBBINS	SUNSET DR 232	091H G 007.00	PUBLIC				
	WYATT HOWARD ETUX JAN	SUNSET DR 235	091H G 008.00	PUBLIC				
	WYATT HOWARD D	SUNSET DR 231	091H G 009.00	PUBLIC				
	HILLMAN ROGER ETUX CAROL	SUNSET DR 229	091H G 009.01	PUBLIC				
	BEARD ROLLIE H JR &	SUNSET DR 223	091H G 010.00	PUBLIC				
	SHANNON NOEL W	SUNSET DR 219	091H G 011.00	PUBLIC				
	BEARD ROLLIE H ETUX DEBBY C	LAKEVIEW DR 306	091H G 012.00	PUBLIC				
	WYATT HOWARD DWAYNE ETUX JAN	LAKEVIEW DR 310	091H G 012.01	PUBLIC				
	SCHNEIDER LEONARD RAYMOND	LAKEVIEW DR 314	091H G 013.00	PUBLIC				
	BARD SHIRLEY ANN &	LAKEVIEW DR 322	091H G 014.00	PUBLIC				
	BIRCKHEAD FRANCES	LAKEVIEW DR 325	091H G 015.00	PUBLIC				
	CRAIG LARRY D ETUX	LAKEVIEW DR 321	091H G 016.00	PUBLIC				
	BARD SHIRLEY ANN &	LAKEVIEW DR 317	091H G 017.00	PUBLIC				
	LAUGHLIN GEORGE W ETUX	LAKEVIEW DR 313	091H G 018.00	PUBLIC				
	BEAL ANGELIA M & DOUGLAS MANCUSO	LAKEVIEW DR 309	091H G 019.00	PUBLIC				
	SIMOES ROUL S ETUX	LAKEVIEW DR 305	091H G 020.00	PUBLIC				
	POTTER BAXTER G	SUNSET DR 215	091H G 021.00	PUBLIC				
	THOMLINSON WILLIAM T AND	SUNSET DR 211	091H G 022.00	PUBLIC				
	PLANT LARRY W	SUNSET DR 207	091H G 023.00	PUBLIC				
	QUALLS HAROLD D ETUX	SUNSET DR 203	091H G 024.00	PUBLIC				
	HUTCHISON CHARLENE	LANKFORD DR 148	091H G 025.00	PUBLIC				
	TENNESSEE VALLEY AUTHORITY	TENN RIVER	112 001.00	PUBLIC				

Table H.10-3 – TDEC Well Logs Located Inside Survey Area
Johnsonville Fossil Plant

Parcel Identification Number	TDEC Well Log Number(s)	Comments
091 031.04	TDEC Well Log Record (no ID #)	no additional information provided in TDEC Well Log Record

Stantec

Table H.10-4 – Parcels Inside JOF Plant Survey Area with Likely Private Water Source
Johnsonville Fossil Plant

Assigned Well ID	Parcel ID	Potential Private Wells/Springs on Parcel and Inside Study Area	TDEC Well Log Number	TVA or Law Engineering Report Well ID	Water Source Listing	Recent Aerial Photograph Review Notes
JOFPV-001 JOFPV-002	088 001.00	2		<u>1997 TVA report</u> SW, SW1, & SW2 (industrial use wells) PH, JERA (potable water well)	PUBLIC	many buildings/structures associated with DuPont
JOFPV-003	091 031.04	1	TDEC Well Log Record (no ID #)		PUBLIC	multiple grain silos and three small buildings
JOFPV-004	091G A 037.00	1			PRIVATE	residential structure
JOFPV-005	091G B 003.02	1			INDIVIDUAL	residential structure

Table H.10-5 – Parcels Identified for Water Use Survey
Johnsonville Fossil Plant

Exhibit H.10-3 Map Label	Parcel ID	Owner	Parcel Address	Potential Private Wells/Springs Identified
1	112 001.00	Tennessee Valley Authority	Tenn River	0
2	091 403.03	Sandgravl Co Inc.	Herbert Road	0
3	091 031.04	Continental Grain Co.	TVA 104	1
4	091 001.01	Meriwether Lewis Electric	DuPont Access Road	0
5	064 403.00	L&N Railroad	County	0
6	088 001.00	The Chemours Company	DuPont Road 1950	2

EXHIBITS

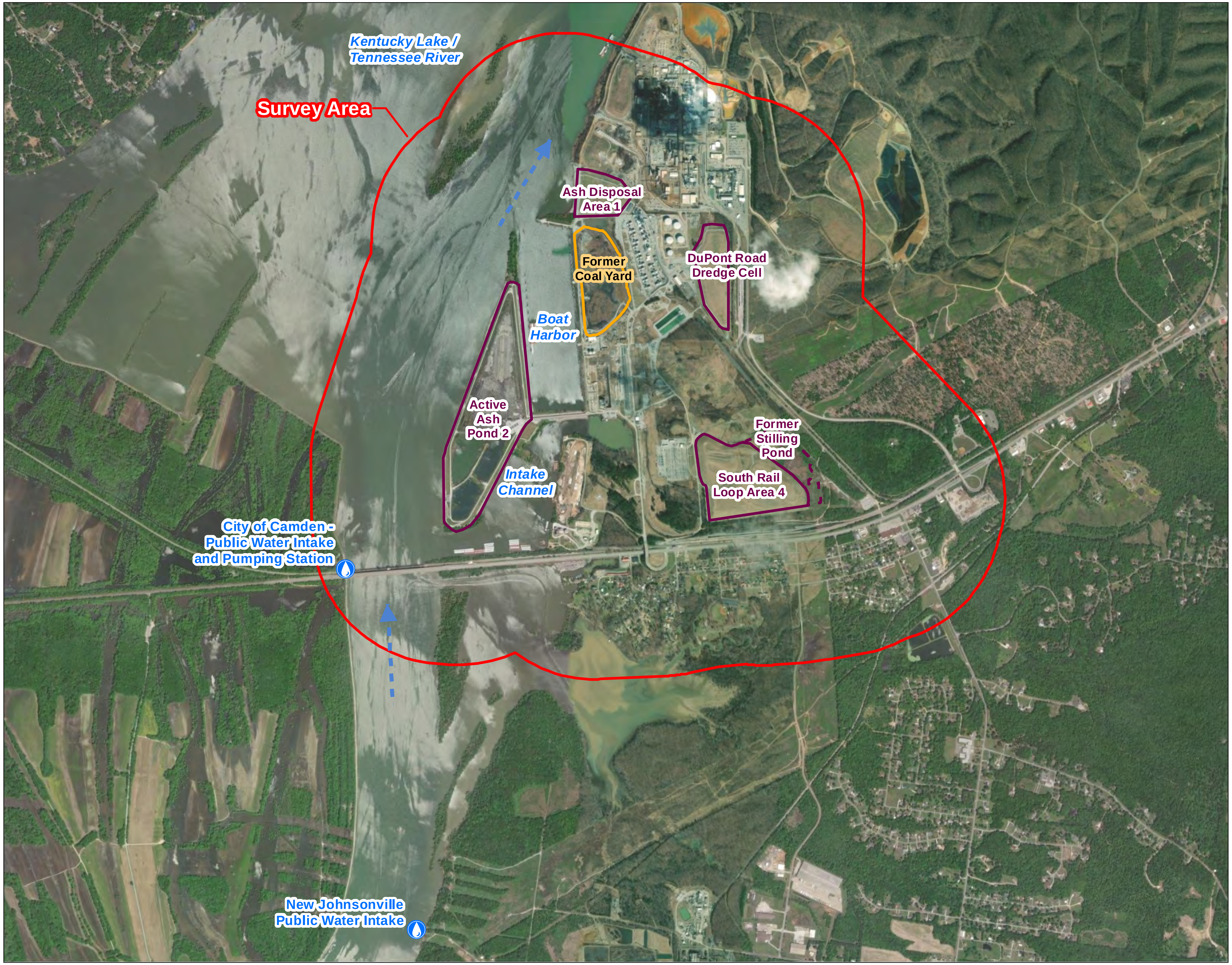


Exhibit No.

H.10-1

Title

Water Use Survey Area

Client/Project 175568286

Tennessee Valley Authority
Johnsonville Fossil Plant

Project Location
New Johnsonville, Tennessee

Prepared by DMB on 2024-01-17
TR by CH on 2024-01-17
IR Review by SG on 2024-01-17

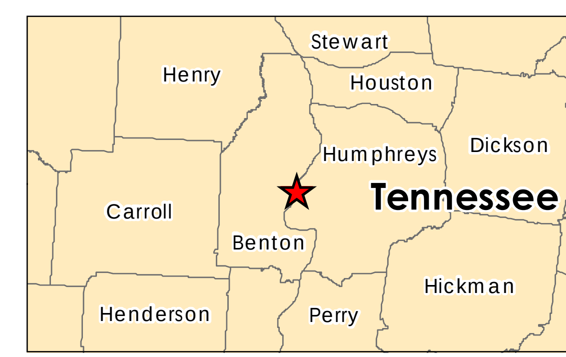
N

0 2,000 4,000
Feet
(At original document size of 11x17)
1:24,000

Legend

- Public Water Intake
- Surface Water Flow Direction
- Survey Area
- JOF Plant CCR Management Units (Approximate)
- Former Coal Yard (Approximate)
- Former Stilling Pond (Approximate)

CCR = Coal Combustion Residuals



Notes
1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Background: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Stantec

TVA

U:\TVA-EIP\175568286_JOF_Phase2\gis\mxd\EAR\H.10-1_JOF_Wateruse_Survey.mxd Revised: 2024-01-17 By: mbough

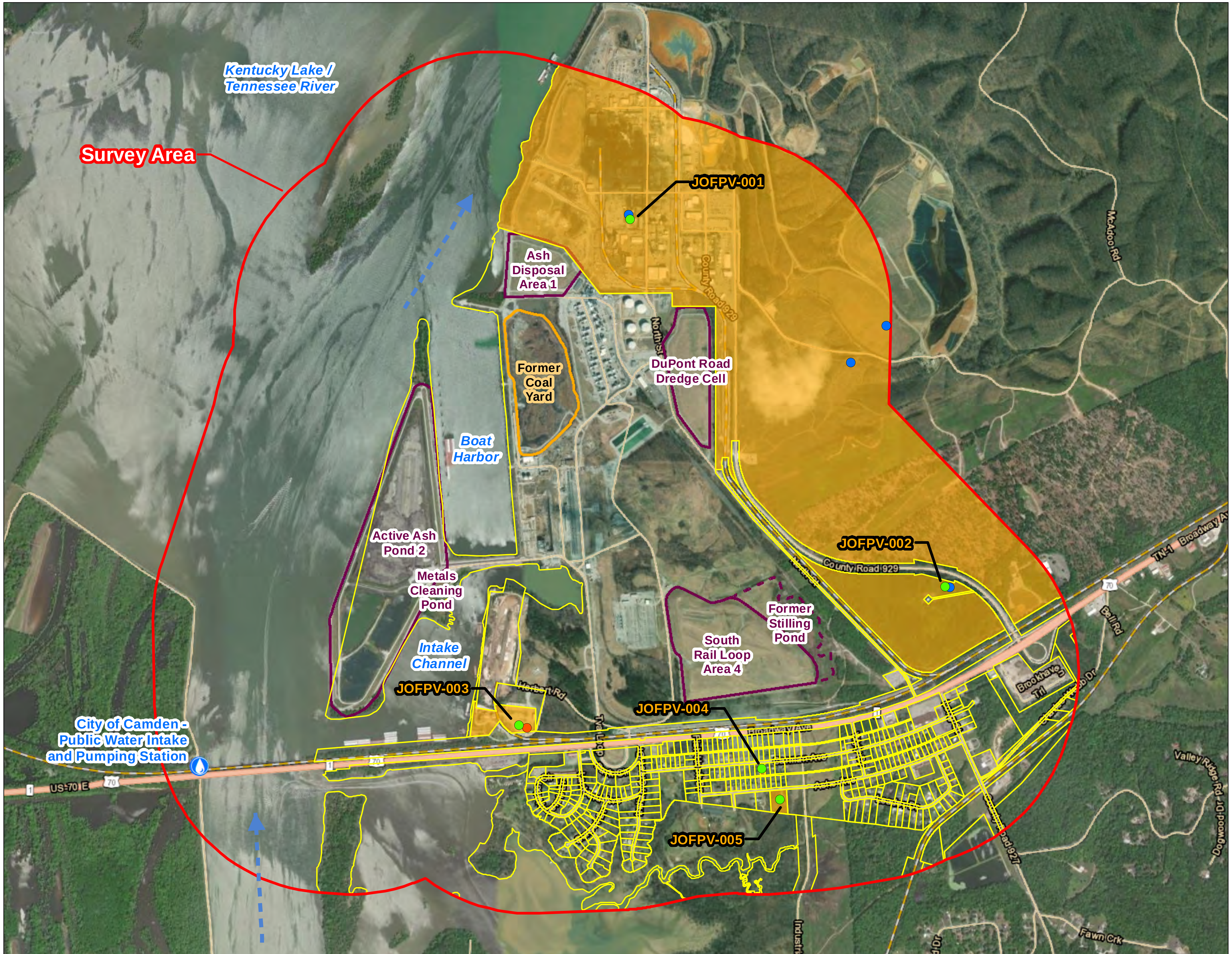


Exhibit No.

H.10-2

Title

Parcels in Survey Area with Potential Wells or Springs

Client/Project 175568286

Tennessee Valley Authority
Johnsonville Fossil Plant

Project Location

New Johnsonville, Tennessee

Prepared by DMB on 2024-01-29
TR by CH on 2024-01-29
IR Review by SG on 2024-01-29

N

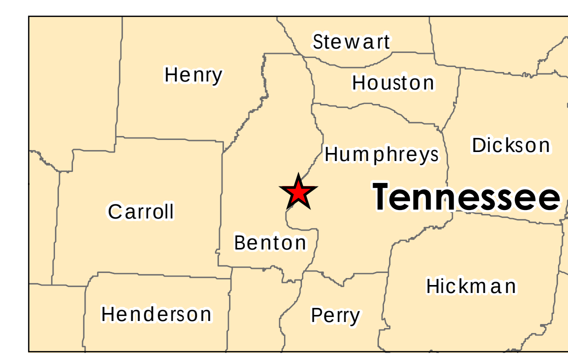
0 1,500 3,000 Feet

(At original document size of 11x17)
1:18,000

Legend

- Public Water Intake
- TDEC Well Logs
- Historical Report Potable Well Locations
- Possible Well Location (recent or current building present and private/individual water source in County parcel records)
- Surface Water Flow Direction
- Survey Area
- JOF Plant CCR Management Units (Approximate)
- Former Coal Yard (Approximate)
- Former Stilling Pond (Approximate)
- Parcel Boundaries
- Parcels with Potential Wells and or Springs

CCR = Coal Combustion Residuals
JOFPV-XXX = Assigned Well Identification



Notes
1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Background: Esri, HERE, Garmin, (c) OpenStreetMap contributors
Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community:
3. Parcel boundaries obtained from Humphreys County, Tennessee GIS June 2019.
4. Only parcel boundaries within the Survey Area are shown. Parcel boundaries may extend beyond the limits of the Survey Area.

Stantec TVA

U:\TVA-EIP\175568286_JOF_Phase2\gis\mxd\EAR\H.10-2_JOF_Wateruse_Survey.mxd Revised: 2024-01-29 By: mbough

Exhibit No.

H.10-3

Title

Parcels in Area of Interest and Hydrogeologically Downgradient of JOF Plant CCR Management Units

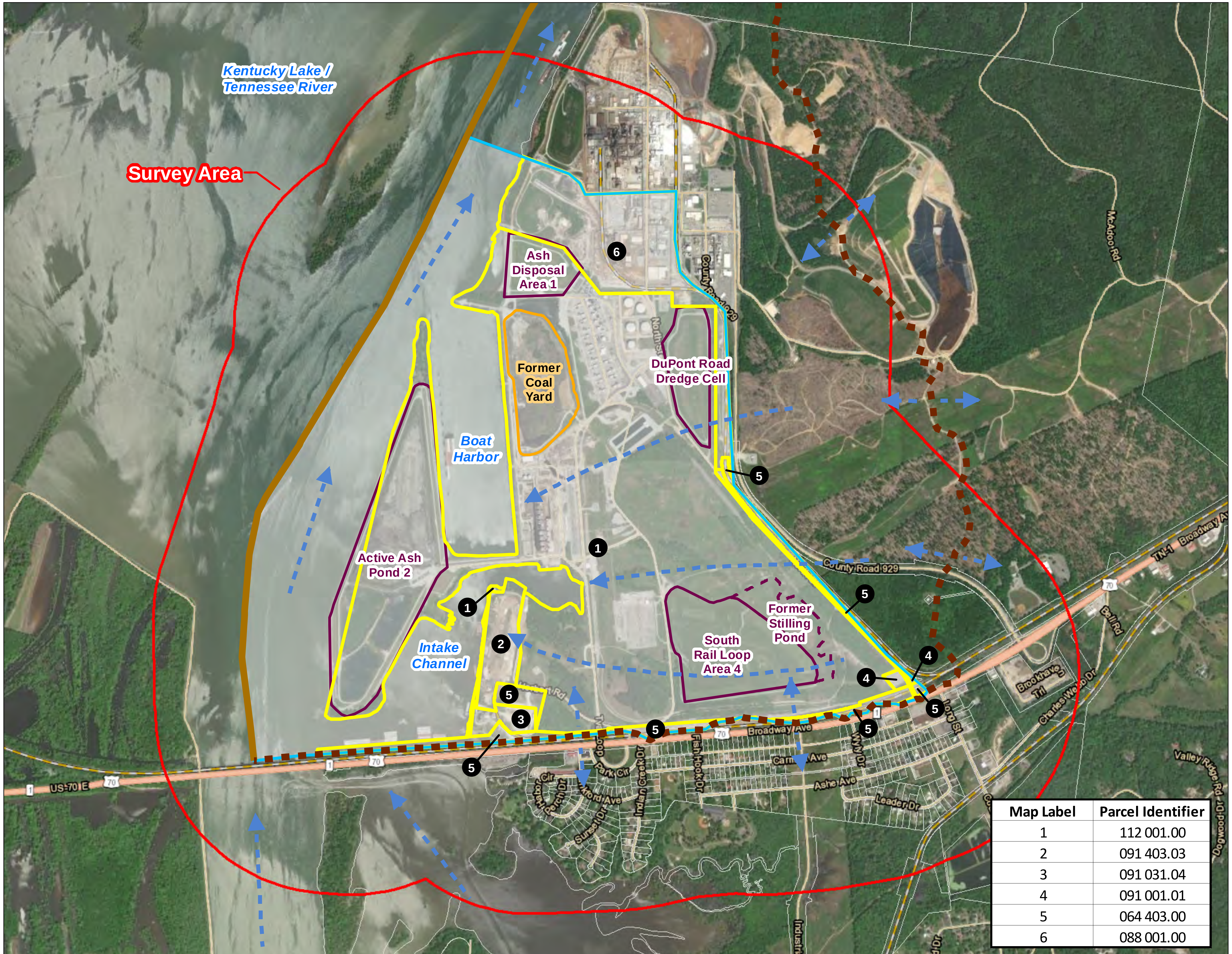
Client/Project 175568286

Tennessee Valley Authority
Johnsonville Fossil Plant

Project Location

New Johnsonville, Tennessee

Prepared by DMB on 2023-08-16
TR by CH on 2023-08-16
IR Review by SG on 2023-08-16



Map Label	Parcel Identifier
1	112 001.00
2	091 403.03
3	091 031.04
4	091 001.01
5	064 403.00
6	088 001.00

N

0 1,500 3,000 Feet

(At original document size of 11x17)
1:18,000

Legend

- Hydrogeological Divide
- Surface Stream that Bounds Groundwater Flow
- General Groundwater/Surface Water Flow Direction
- Survey Area (1/2 Mile)
- Water Use Survey Area of Interest
- JOF Plant CCR Management Units (Approximate)
- Former Coal Yard (Approximate)
- Former Stilling Pond (Approximate)
- Parcel Identified for Water Use Survey
- Parcel
- # Parcel Identifier

CCR = Coal Combustion Residuals

Notes
1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Background: Esri, HERE, Garmin, (c) OpenStreetMap contributors
Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community:
3. Parcel boundaries obtained from Humphreys County, Tennessee GIS June 2019.
4. Only parcel boundaries within the Area of Interest are shown in yellow. Parcel boundaries may extend beyond the limits of the Area of Interest.

Stantec

TVA

U:\TVA-EIP\175568286_JOF_Phase2\gis\mxd\EAR\H.10-3_JOF_Wateruse_SurveyParcels.mxd Revised: 2023-08-16 By: mbough