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DATA QUALITY SUMMARY REPORT

FOR THE TENNESSEE VALLEY AUTHORITY

CUMBERLAND FOSSIL PLANT

ENVIRONMENTAL INVESTIGATION

Revision 1

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Acronym List

CAR	Corrective Action Request
CCR	Coal Combustion Residuals
COC	Chain-of-Custody
CUF	Cumberland Fossil Plant
CUF EIP QAPP	*Quality Assurance Project Plan for the Tennessee Valley Authority CUF Environmental Investigation*
DQO	Data Quality Objectives
EB	Equipment Blank
EDD	Electronic Data Deliverable
EI	Environmental Investigation
EIP	Environmental Investigation Plan
EQDMS	Environmental Quality Data Management System
FB	Field Blank
FD	Field Duplicate
FLB	Filter Blank
FSP	Field Sampling Personnel
KMP	Knowledge Management Portal
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
LD	Laboratory Duplicate
MASW	Multi-Channel Analysis of Surface Waves
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ORP	Oxidation-Reduction Potential
RB	Rinse Blank
%RSD	Relative Standard Deviation
SDG	Sample Delivery Group
QA	Quality Assurance
QAPP	Quality Assurance Project Plans
QC	Quality Control
SAP	Sampling and Analysis Plan
TB	Tubing Blank
TDEC	Tennessee Department of Environment and Conservation
TDEC Order	Tennessee Department of Environment and Conservation (TDEC) issued Commissioner's Order No. OGC15-0177
TI	Technical Instructions
TVA EIP DMP	*Tennessee Valley Authority Multi-Site Order Environmental Investigations Data Management Plan*

1. Introduction

On August 6, 2015, the Tennessee Department of Environment and Conservation (TDEC) issued Commissioner's Order No. OGC15-0177 (TDEC Order) to the Tennessee Valley Authority (TVA), setting forth a process for the investigation, assessment, and remediation of unacceptable risks at TVA's coal ash disposal sites in Tennessee. The TDEC Order is limited to the purposes and processes set forth in the Order. In accordance with the TDEC Order, TVA developed the Cumberland Fossil Plant (CUF) Environmental Investigation Plan (EIP) CUF EIP; Revision 3, June 2018), to provide requested information to TDEC and to outline the environmental investigation (EI) that would be performed to meet the requirements of the TDEC Order.

The purpose of the CUF EIP was to comply with Section VII.A.d. of the TDEC Order, which required TVA, upon receiving requests for information from TDEC, to develop an EIP for each plant that, when implemented, would provide the information necessary to "fully identify the extent of soil, surface water, and ground water contamination by coal combustion residuals (CCR).This report has been prepared to summarize the data quality process and activities that were followed during the EI activities.

2. Quality Program Description

A comprehensive, full-cycle Quality Assurance (QA) Program was designed for the TDEC Order EIs and documented in Plant-specific Quality Assurance Project Plans (QAPPs). The QA program was designed in accordance to the *Data Quality Objectives Process for Superfund, Interim Final Guidance* (US EPA, EPA540-R-93-071, September 1993) and the *Environmental Investigations Standard Operating Procedures and Quality Assurance Manual* (US EPA Region 4, November 2001). The QA Program was implemented to ensure the environmental data generated for use in decision making is of high quality and is legally defensible in support of the EIs. The EI data were generated for purposes such as, but not limited to, operational decisions, delineation of the extent of potential CCR impacts and transport of CCR, demonstration of achievement of EIP objectives, and satisfying the requirements of the TDEC Order.

The primary objective of the QA Program was to identify, mitigate, and substantively minimize issues that might impact data quality through proactive data quality monitoring and data review activities. If an issue were identified that might impact data quality, the QA Program provided a feedback mechanism to assess the issue, identify the cause, determine appropriate corrective actions, communicate impacts, assess the effectiveness of remedies, and minimize the potential for recurrence. The QA program feedback mechanism enabled continuous program improvement and swift resolution of quality assurance issues arising during EI implementation.

Data generated under other programs may have been used to support EI objectives. Data from other programs used as part of the EI was held to the same QA standard as data generated under the TDEC Order QA Program.

2.1. Project Control Documents

The QA Program for the CUF EIP was described in the *Quality Assurance Project Plan for the Tennessee Valley Authority CUF Environmental Investigation* (CUF EIP QAPP; Revision 2, January 2018). The CUF EIP QAPP was prepared on TVA's behalf by Environmental Standards, Inc. (Environmental Standards), an independent QA firm. Environmental Standards was responsible for the administration and the associated QA oversight activities throughout the execution of the CUF EIP.

Each EI was guided by a specific Sampling and Analysis Plan (SAP). The SAP described the sampling locations, methodology, and field activities. As EI needs evolved, SAP(s) were updated, with TDEC concurrence, and maintained as redline documents to clearly identify changes from the approved EIP.

Field procedures were conducted in accordance with TVA's Environmental Technical Instructions (TIs). Some of the TVA TIs were periodically updated on an as-needed basis. The TVA TI updates published during EI implementation were incorporated to promote consistency in sample collection across TVA programs. This standardization allows the TDEC Order EIs to utilize data generated under other TVA programs with a known level of data quality. Current versions of TVA TIs were accessible to project personnel via the project Knowledge Management Portal (KMP).

Field and laboratory analytical data collected during the EI were managed in accordance with the *Tennessee Valley Authority Multi-Site Order Environmental Investigations Data Management Plan* (TVA EIP DMP; Revision 1, March 2018).

The version history of the CUF EIP project control documents is presented in Attachment A, Table A-1. A matrix describing the TVA TI versions and effective dates is provided in Attachment A, Table A-2.

2.2. Sampling Planning

The data quality objectives (DQO) process is a series of planning steps based on a scientific method to ensure that the type, quantity, and quality of environmental data used in decision-making are appropriate for the intended application. In general, DQOs provide a qualitative and quantitative framework around which data collection programs can be designed. The qualitative aspect of DQOs seeks to encourage good planning for field investigations. The quantitative aspect of DQOs involves designing an efficient field investigation that reduces the possibility of incorrect decision-making.

The DQO process is employed during the project planning stage to ensure the data generated from an investigation are appropriate and of sufficient quality and quantity to address the investigation objectives. TVA, its QA Oversight Consultant, and Investigation Consultant considered key components of the DQO process in developing investigation-specific SAPs to guide the data collection efforts for the EI.

Sampling schedules and analytical requests were communicated to the associated analytical laboratory(ies) through a dedicated Laboratory Coordinator. The Laboratory Coordinator served

as a liaison between Field Sampling Personnel (FSP) and the contracted analytical laboratory and was responsible for ordering appropriate sampling containers and preservatives for each investigation. FSP reviewed the sampling container prior to sampling to verify a sufficient number and type of bottleware/preservative was available to complete the sampling scope-of-work. The formal analytical request process allowed efficient execution of field activities and ensured laboratory analyses were performed in accordance with the QAPP requirements.

2.3. Field Activities Quality Assurance

Throughout the implementation of the EIP, Environmental Standards provided ongoing QA support to TVA, which included QA oversight of FSP and activities. Field QA included verifying the following activities were performed and documented in accordance with the investigation-specific SAP, Plant-specific QAPP, and TVA TIs:

- Field documentation
- Sample collection, handling, and preservation
- Chain-of-Custody (COC) procedures
- Field instrumentation and equipment calibration
- Analytical methods
- QC sample types and frequency

Field data verification was accomplished through the combination of document review and field audits. In addition, Field QA activities also included the following:

- TI training
- Requesting Corrective Action
- Field data review and qualification (if applicable)

Specific field quality monitoring activities are described in the following sections.

2.3.1. Field Audits

Field auditing is a recognized technique for evaluating the performance of FSP and assessing how team performance may affect data quality. Field audits were conducted by Environmental Standards to ensure that sampling, handling, and transportation of samples to the contracted analytical laboratories were performed in a manner consistent with the project QA requirements. In addition, field audits confirmed that the field documentation was sufficient to produce data of satisfactory quality and to provide documentation if field procedures were called into question.

Field audits were conducted once for onetime field collection activities, semi-annually for reoccurring field activities, as directed by TVA to verify that corrective actions had been implemented if deficiencies were identified in prior field audits, or at other frequencies as requested by TVA. A summary of the field observations conducted for the CUF EIP are presented in **Table 1** (Section 3.1). A chronology of the field audits performed, and a summary of findings associated with CUF EIP field audits are provided in **Tables 2 and 3** (Section 3.1).

Field audit observations were documented and communicated to the field sampling personnel at the time of the audit and summarized during routine project meetings. In response to field QA

observations, field sampling personnel proposed corrective actions which were reviewed by Environmental Standards prior to implementation. Effectiveness of field corrective actions was assessed during on-going quality monitoring activities, including follow-up audits and field documentation review.

2.3.2. Sampler Training

To verify understanding of the project sampling requirements, Environmental Standards conducted training sessions for FSP. Training sessions focused on the applicable SAP, TI and QAPP requirements associated with a particular sampling program. Training topics included, but were not limited to, field sampling activities, equipment calibration, field documentation, sample handling procedures, sample shipping procedures, and sample custody. Prior completion of FSP training was documented and verified during field audit activities. A complete record of FSP training is presented in Table 4 (Section 3.1).

2.3.3. Field Documentation Review

Field documentation generated during the implementation of the EIs was reviewed for completeness, correctness, and adherence to Plant-specific SAPs, QAPP, and TVA TIs.

Field documentation were reviewed to assess the following:

- Compliance with TIs
- Compliance with SAPs
- Field equipment calibration method and frequency
- Field calibration standard lot numbers and expiration dates
- Date and time sampled
- Preservation
- Sampler collection procedures
- COC Records
- Date samples shipped

Field measurement data were subjected to data usability review, verifying that the procedures used by FSP complied with the requirements of the Plant-specific SAPs, QAPP, and TVA TIs. Environmental Standards applied data usability qualifiers to field measurement data if any non-compliance with applicable requirements were observed.

Field measurements evaluated for qualification due to calibration noncompliance included pH, dissolved oxygen, specific conductivity, turbidity, and oxidation-reduction potential (ORP) measurements. Environmental Standards applied data usability qualifiers to field measurement data when the associated instrument calibration did not meet the calibration criteria specified in TVA TI ENV-TI-05.80.46 (*Field Measurement Using a Multi Parameter Sonde*) and/or the investigation-specific SAP.

The data usability qualifiers and reason codes are included in the final field data stored in the project EarthSoft EQuIS® database. A summary of field data qualification for the CUF EIP is presented in **Table 5** (Section 3.1).

2.3.3.1. Real-Time Review of Field Documentation

A QA review of the field documentation and field data (if generated) was performed during field audits conducted by Environmental Standards. This review focused on correctness of field documentation and adherence to Plant-specific SAPs, QAPP, and TVA TIs. Documentation related to the following activities was typically included in this review:

- Pre-task planning and preparation for field activities
- Field equipment calibration and decontamination
- Field conditions, field measurements, and field activities (non-sampling) documentation and adherence for field activity completeness
- Sample collection equipment decontamination
- Collection of investigative samples (normal and quality control samples)
- COC procedures, sample labeling, sample containers, sample packing, and sample container (*i.e.*, cooler) shipping
- Completion of field documentation (equipment calibration, well stabilization and collection forms, sample collection forms, field parameter forms, daily field activity logs, and COC Records, *etc.*)

2.3.3.2. Post-Sampling Review of Field Documentation

A QA review of the field documentation and field data was performed as the documents were available on the KMP. Field documentation QA review included the complete set of field documents needed to substantiate the field activities. Field documentation was reviewed for correctness and compliance to the Plant-specific SAPs, Plant-specific QAPP, and TVA TIs. Feedback, questions, and resolutions of issues observed during field documentation review were documented using the KMP. Upon completion of data review, field documents were approved as final within the KMP and maintained as part of the Project Record. A summary of field documentation review and approval is provided in **Table 6** (Section 3.1)

2.4. Chemistry Quality Assurance

2.4.1. Laboratory Technical Requirements

TVA established multiple contracts with accredited commercial analytical laboratories to support the TDEC Order EIPs. TVA's laboratory contracts included detailed technical requirements to enhance and standardize practices among the various analytical laboratories performing analyses for the TDEC Order Program.

These technical requirements include detailed specifications including (but not limited to):

- Personnel training
- Quality systems
- Sample collection media and materials
- Sample preservatives
- Analytical procedures
- Records control

- Sample and waste disposal
- Reporting limits
- Sample receipt and handling
- Quality control samples
- Deliverables specifications
- Turn-around times.
- Method-specific quality control requirements

As part of the QA Program corrective action process, analytical laboratory corrective actions were requested for significant or recurring data quality issues or noncompliance with the program technical requirements. A summary of laboratory corrective actions is presented in **Table 7** (Section 3.2).

2.4.2. Laboratory Coordination

The Environmental Standards Laboratory Coordinator served as a liaison between the FSP and the analytical laboratories. The Laboratory Coordinator performed the following tasks:

- Reviewed analytical requests for consistency with Plant-specific SAPs and the associated QAPP
- Submitted analytical requests to the Laboratory Project Manager
- Scheduled sample submission and transportation (as needed)
- Reviewed and approved laboratory sample container/preservative orders
- Reviewed COC Records submitted to the laboratories and sample receipt documentation provided by the laboratories
- Served as the point of contact for questions and issues arising during laboratory analysis

Centralized laboratory coordination leveraged TVA's ability to efficiently understand sampling schedules across multiple EIs and Plants and to strategically manage sample allocation among contracted laboratories. In addition, single-point communication for analytical services provided consistency across EIs and Plants.

2.4.3. Sample Receipt Confirmation Review

After samples were received and logged in at the analytical laboratory, a sample receipt confirmation and copy of the signed COC Record were provided to Environmental Standards for review. The Laboratory Coordinator confirmed that the samples were correctly logged in at the laboratory (*i.e.,* sample identifications and collection date and times match the COC Record), were received in good condition, and were maintained within the temperature requirements per the analytical methods during shipment.

QA review of sample receipt information allowed any laboratory login errors or field COC errors to be identified and corrected prior to data reporting, reducing the need for data resubmittals. Additionally, these reviews enabled fast responses to sample preservation or holding time issues to help ensure data produced was of high quality.

2.4.4. Laboratory Data Review Activities

Laboratory analytical data were subjected to verification (Stage 2A data review; see Section 2.4.4.2). A subset of the laboratory analytical data was subjected to validation in accordance with the TVA CUF EIP QAPP (Stage 4 data review; see Section 2.4.4.3). A summary of the data review level of effort is provided in **Table 9** (Section 3.2). A summary of qualification applied to CUF EIP data resulting from third-party data review is presented in **Tables 10 through 20** (Section 3.2).

Analytical data validation of a portion of the data was performed to ensure data completeness, correctness, and method compliance/conformance, and to identify data quality, including unusable data that would be insufficient to support environmental decisions. The data presented in the laboratory Level IV data packages was validated by Environmental Standards for the following:

- Compliance with specified testing requirements
- Completeness
- Reporting accuracy (including hardcopy to Electronic Data Deliverable (EDD))
- Confirmation of receipt of requested items
- Traceability, sensibility, and usability of the data

2.4.4.1. Automated Data Review

The first step in the data verification process was automated data review. Environmental Standards' Data Verification Module, a proprietary software application, was used to assess reported data against quantitative quality control (QC) limits for field and laboratory blank contamination, holding times, accuracy, precision, and surrogate recoveries as defined in the TVA CUF EIP QAPP. This supported project goals by automating a significant amount of manual effort in the quantitative assessment of analytical data.

2.4.4.2. Verification

Following automated data review, Data Validators performed 100% verification of the data. This included manual review of laboratory deliverables for completeness, correctness, and compliance with applicable methods. A primary focus of verification is evaluating batch QC and holding times.

Data verification included review of the following QA elements:

- Sample holding times
- Sample condition upon laboratory review
- Field QC sample results
- Laboratory batch QC sample results
- Total vs. dissolved results (where applicable)
- Confirmation of results reported electronically vs. the laboratory report.

Analytical data that did not meet batch QC or method holding times were appropriately qualified. Field QC sample results were used to assess potential limitations of sample analytical data

based on sample collection activities; a summary of field QC associations applied during data verification is presented in **Table 21.**

2.4.4.3. Validation

Following verification, a subset of the analytical data was subjected to data validation in accordance with the TVA CUF EIP QAPP as presented on **Table 9**. Overall, 35% of the CUF EIP data were validated. The validation of data presented in a Level IV data package included the review of the following elements:

- Instrumental calibrations
- Instrumental QC samples
- Recalculation of reported results from instrumental raw data
- Analytical sequence logs and/or measurement logbooks
- Confirmation of qualitative parameter identification

Analytical data that did not meet instrumental calibration or instrumental QC method requirements were appropriately qualified. Data Qualification flags and reason codes descriptions and explanations are included in Attachment B.

2.4.5. Laboratory Audit Program

Audits of TVA's contracted laboratories were performed as directed by TVA and the QA Oversight Manager. The systems audited included review of personnel qualifications, equipment, documentation, analytical methods, and adherence to QA procedures. The on-site audits focused on the analytical services provided by the laboratory for the project. The audit included both the laboratory's analytical capabilities and associated peripheral non-analytical areas such as sample receiving and project management.

Laboratory audit findings were communicated to the analytical laboratories during the audit and subsequently in a formal audit report. Laboratories proposed corrective actions in response to audit findings, which were reviewed for adequacy prior to implementation. Effectiveness of laboratory corrective actions was evaluated during ongoing quality monitoring activities.

A summary of laboratory audit(s) for laboratories conducting work under the CUF EIP is presented in **Table 22** (Section 3.2).

2.4.6. TDEC QA Program

In addition to the independent, third-party QA program administered by Environmental Standards, TDEC executed a stand-alone QA program. TDEC's QA Program was documented in a QAPP and included quality monitoring activities such as field observations and collecting split samples for analysis by their laboratories, results of which were compared against TVA's analytical results. TVA and TDEC reviewed split sample data precision and reconciled discrepancies, where apparent. TDEC's findings from its QA activities associated with the EIP are documented in a report prepared by TDEC.

2.5. Data Management

Field and laboratory analytical data were managed in accordance with the TVA EIP DMP. Field and analytical data were managed using an Environmental Quality Data Management System (EQDMS; project EQuIS database). Field- and laboratory-generated data were captured and transferred electronically to the extent possible to avoid transcription errors. Field and analytical data and supporting documentation were available to data users and TDEC via the project KMP.

2.5.1. EDD Receipt and Loading

Field and analytical laboratory data were received into an electronic mailbox established specifically for the project. EDDs were provided in a format compliant for loading to the project EQuIS database. The EDDs initially were reviewed for correctness against the project specifications and structural rules. Correctness testing determined if data were delivered using the correct file layout, data types, and adherence to project specific values. Analytical data requests were managed using Method Analyte Group codes. After correctness testing, data were evaluated for completeness. The completeness review included comparing sample identifications, analytical methods and analytes delivered by the laboratory against the anticipated data based on field records. After correctness and completeness review, the results were initially loaded into the database as unclassified data subject to verification and validation, and were not assigned a verification/validation status (null status).

2.5.2. Status Tracking

Sample tracking was initiated when each COC Record was created. Events tracked in the EQDMS included the following:

COC Record initiation
Laboratory sample receipt
Data package receipt
EDD receipt
Any rejection or resubmission dates
Data status updates.

Data were assigned status values in the EQDMS based on its progression through the data loading and review processes. Three status levels were used to denote the status of a given dataset. The status levels used were “VERIFIED”, “FINAL-VERIFIED”, and “VALIDATED”.

2.5.3. Reporting

Reports were available to users through EQuIS Professional or EQuIS Enterprise platforms. In addition, field and analytical data were available to data users and TDEC through replication from the EQuIS database to the KMP.

2.5.4. Archive

Automated full backups of the EQDMS are performed daily, and automated incremental backups of transactions are performed every 15 minutes to limit any potential data loss. An incremental daily backup is archived every night and retained for 30 days. A full weekly backup is archived and retained for two months. Monthly full backups are archived and retained for 40 years. Backups are written to digital tapes and are stored the next business day in an off-site environmentally - controlled storage facility.

The KMP database is stored on Azure. Automated full backups are performed once a week, with differential backups taken every five minutes to limit any potential data loss. A full weekly backup is archived and retained for two months. Monthly backups are archived and retained for ten years. All backups are kept on secured cloud services.

2.5.5. Historical Data Gathering and Review

Historical and legacy data were gathered and evaluated for acceptability prior to use in the EIP and possible inclusion in the EAR. Historical and legacy data procured from sources such as TVA and TDEC records or TVA-led investigations performed outside the scope of the EIP were subjected to a formal critical review process.

Historical data were minimally subjected to a reasonability review to identify potentially suspect data (*e.g.*, the validity of the data type/source), apparent anomalies, or data that did not appear to be representative of current Plant conditions. Additional evaluation and/or validation was conducted following the reasonability review; the level of review and validation conducted was dependent on the source of the data, the data type, availability of supporting documentation, and criticality of the dataset for supporting project objectives.

A summary of the historical data gathering and review effort is presented in **Table 23** (Section 3).

2.6. Final QA Approval and Data Release

Field and laboratory- generated data were thoroughly reviewed prior to release to end users, TDEC, and the public. Data were made available to TDEC following finalization (*e.g.*, “Final-Verified” or “Validated” status for analytical laboratory data). Prior to release to the public, the complete field and laboratory documentation package was reviewed to verify correctness and completeness of the reported data. The final QA approval process ensured that data provided externally were accurate, fully documented, and appropriately qualified to communicate data usability.

3. Summary of QA Activities

Section 3 presents a summary of the QA Program implementation described in Section 2.

3.1. Field Activities Quality Assurance Summary

Table 1: CUF TDEC Order Investigations Summary of Field Audits

	CUF Investigation								
	Background Soil	**Sediment**	**Surface Water**	**CCR Material**	**Exploratory Drilling**	**Hydrogeological**	**Pore Water**	**Groundwater**	**Water Use Survey**
Number of Field Observations	3	1	1	1	1	2	3	5	0

Table 2: CUF TDEC Order Investigations Chronology of Field Audits

CUF Investigation	
Field Activity Observed	**Date**
Background Soil Sampling	8/21/2018
Background Soil Sampling	8/22/2018
Sediment Sampling	10/10/2018
Surface Water Sampling	11/28/2018
Background Soil Sampling	12/4/2018
CCR Material Sampling/Temp Well Install	12/13/2018
Borehole logging	5/1/2019
Well Development, dedicated pump install, dedicated pump calibration	5/2/2019
Groundwater Sampling	5/7/2019

CUF Investigation	
Field Activity Observed	**Date**
Groundwater Sampling	5/8/2019
Groundwater Sampling	5/9/2019
Pore Water Sampling	6/4/2019
Pore Water Sampling	6/5/2019
Pore Water Sampling	6/6/2019
Slug Testing	6/26/2019
Groundwater Sampling	7/9/2019
Groundwater Sampling	1/8/2020

Table 3: CUF TDEC Order Investigations Field Audit Summary

		Audit Area																			
		Pre-Task Planning		Field Documentation		Field Measurements		Sample Collection		Sample Containers		Field Quality Control Sampling		Decontamination		Sample Packing and Shipping		Chain-of-Custody		Waste Management	
		Project Record Document Compliance Variation	Procedural Compliance Variation	Project Record Document Compliance Variation	Procedural Compliance Variation	Project Record Document Compliance Variation	Procedural Compliance Variation	Project Record Document Compliance Variation	Procedural Compliance Variation	Project Record Document Compliance Variation	Procedural Compliance Variation	Project Record Document Compliance Variation	Procedural Compliance Variation	Project Record Document Compliance Variation	Procedural Compliance Variation	Project Record Document Compliance Variation	Procedural Compliance Variation	Project Record Document Compliance Variation	Procedural Compliance Variation	Project Record Document Compliance Variation	Procedural Compliance Variation
Number of Findings		NA	NA	NA	5	NA	1	2	3	NA	3	NA	NA	NA	1	NA	NA	NA	2	NA	NA
Resolution	Addressed in the Field	NA	NA	NA	5	NA	1	2	3	NA	3	NA	NA	NA	1	NA	NA	NA	2	NA	NA
	FSP Reminder/Training	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Record Document Update	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

NA: Not Applicable

Table 4: CUF TDEC Order Investigations Sampler Training Matrix

		CUF Investigation								
Technical Instruction	**Title**	**Groundwater**	**Background Soil**	**Exploratory Drilling**	**Hydrogeological**	**Seep**	**Benthic**	**Fish**	**Water Use Survey**	**Surface Water**
ENV-TI-05.80.02	Sample Labeling and Custody	x	x	NA	x	x	x	x	x	x
ENV-TI-05.80.03	Field Record Keeping	x	x	x	x	x	x	x	x	x
ENV-TI-05.80.04	Field Sampling Quality Control	x	x	x	NA	x	x	x	x	x
ENV-TI-05.80.05	Field Sampling Equipment Cleaning and Decontamination	x	x	x	x	x	x	x	x	x
ENV-TI-05.80.06	Handling and Shipping of Samples	x	x	x	x	x	x	x	x	x
ENV-TI-05.80.25	Monitoring Well and Piezometer Installation and Development	NA	NA	x	x	NA	NA	NA	NA	NA
ENV-TI-05.40.22	Fish Sampling Using Boat-Mounted Electroshocker	NA	NA	NA	NA	NA	NA	x	NA	NA
ENV-TI-05.80.40	Surface Water Sampling	NA	NA	NA	NA	x	NA	NA	NA	x
ENV-TI-05.80.42	Groundwater Sampling	x	NA	NA	NA	NA	NA	NA	x	NA
ENV-TI-05.40.43	Mayfly Sampling	NA	NA	NA	NA	NA	x	NA	NA	NA
ENV-TI-05.80.44	Groundwater Level and Well-Depth Measurement	x	NA	NA	NA	NA	NA	NA	NA	NA
ENV-TI-05.80.46	Field Measurement Using a Multi-Parameter Sonde	x	NA	NA	NA	x	NA	NA	x	x
ENV-TI-05.80.47	Potable Water Sampling	NA	NA	NA	NA	NA	NA	NA	x	NA
ENV-TI-05.80.50	Soil and Sediment Sampling	NA	x	NA	NA	x	x	NA	NA	NA

Table 5: CUF TDEC Order Investigations Summary of Field Data Qualification

	CUF Investigation							
	Background Soil	**Groundwater**	**CCR Material**	**Benthic**	**Fish**	**Surface Stream**	**Seep**	**Water Use Survey**
% Results not Qualified	100%	99.7%	100%	NA	NA	NA	100%	100%
% Results Qualified as Estimated	NA	0.3%	NA	NA	NA	NA	NA	NA

NA: Not Applicable

Table 6: CUF TDEC Order Investigations Field Documents Reviewed/Approved

CUF Investigation		
Field Form	**Number of Records Reviewed**	**Number of Records Approved**
Lab COC	150	150
Subsurface Boring log	54	54
Daily Field Activity Log	392	392
Soil pH Calibration and Inspection Log	40	40
Soil pH Data Form	34	34
Equipment Calibration and Inspection Form	45	45
Groundwater Level Measurement	15	15
Groundwater Sampling Form (low flow sampling)	33	33
Monitoring Well Installation Field Log	14	14
Well Development Form	11	11
Well Installation Detail Form	11	11
Slug Test Data Form	10	10

CUF Investigation		
Field Form	**Number of Records Reviewed**	**Number of Records Approved**
Water Pressure Test Form	56	56
Well Pump Install Check list	5	5
Seep Investigation Inspection Log	1	1
Seep Investigation Sample Collection Form	1	1
Surface Water Parameter Form (Seep)	2	2
Surface Water Parameter Form	53	53
Weekly Observation Log (Seep)	19	19
Cone Penetration Test Form	33	33
Piezometer Detail Form	4	4
Vibrating Wire Piezometer Install Form	4	4
Borehole Geophysical Log	15	15
Surface Geophysics Checklist Multi-Surface Analysis of Surface Waves (MASW)	5	5
Water Use Survey Sampling Form	1	1

3.2 Chemistry Quality Assurance Summary

Table 7: CUF TDEC Order Investigations Analytical Laboratory Corrective Actions

	CUF Investigation		
	Eurofins TestAmerica	**Pace Analytical**	**GEL**
Number of Corrective Action Requests (CARs)	2	0	0
Number of CARs Closed/Resolved	2	0	0
Number of Impacted Sample Delivery Groups (SDGs)	20	0	0

Table 8: CUF TDEC Order Investigations Sample and QC Collection

	CUF Investigation												
	Background Soil	Groundwater						CCR Material[2]	Benthic[3]	Fish	Surface Stream	Seeps	Water Use Survey
		Event 1	Event 2	Event 3	Event 4	Event 5	Event 6						
Sample Count	73	5	4	4	4	5	5	116	177	130	266	2	1
	QC Sample Count[1]												
Field Duplicates (FDs)	5	1	1	1	1	1	1	9	10	19	15	2	1
Matrix Spike/Matrix Spike Duplicate/Laboratory Duplicate (MS/MSD/LD)	5	1	1	1	1	1	1	11	5	NA	14	NA	1
Field Blanks (FBs)	13	3	2	2	2	2	2	24	2	NA	14	2	1
Equipment Blanks (EBs)	6	1	1	1	1	1	1	11	28	16	12	1	NA
Filter Blank (FLBs)	NA	NA	NA	NA	NA	1	1	3	NA	NA	12	1	NA
Tubing Blank (TBs)	NA	NA	NA	NA	NA	1	1	2	NA	NA	NA	1	1

[1] Refer to TVA CUF QAPP for QC sample collection frequency requirements. A summary of field QC sample collection, and variations in procedure (if appliable) are presented in the associated SAR and data qualification based on field duplicate results is addressed in the associated data validation report.
[2] Investigation includes CCR Material and Pore Water Samples.
[3] Investigation includes sediment and mayfly samples.

Table 9: CUF TDEC Order Investigations Data Review Summary

	CUF Investigation							
	Background Soil	**Groundwater**	**CCR Material[1]**	**Benthic[2]**	**Fish**	**Surface Stream**	**Seep**	**Water Use Survey**
Sample Count (N^3 + FD)	78	33	125	187	149	281	4	2
% Data Verified (Stage 2A)	100%	100%	100%	100%	100%	100%	100%	100%
% Data Validated (Stage 4)	67%	30%	30%	28%	57%	23%	0%	0%
Number of Samples Validated (Stage 4 Review)	52	10	38	50	85	66	0	0

[1] Investigation includes CCR Material and Pore Water Samples.
[2] Investigation includes sediment and mayfly samples.
[3] Field Investigative Samples

Table 10: CUF TDEC Order Investigations Data Usability Summary

	CUF Investigation							
	Background Soil	**Groundwater**	**CCR Material[2]**	**Benthic[2]**	**Fish**	**Surface Stream**	**Seep**	**Water Use Survey**
% Results not Qualified	65%	82%	75%	52%	78%	76%	45%	100%
% Results Qualified as Estimated ("J"/"UJ")	30%	9%	22%	44%	17%	15%	45%	0%
% Results Qualified as Blank Contaminated ("U*")	4%	9%	3%	3%	5%	8%	10%	0%
% Results Qualified as Unusable ("R"/"UR")	1%	0%	0%	1%	0%	0%	0%	0%
% Usable Results	99%	100%	100%	99%	100%	100%	100%	100%

[1] Results are considered usable unless qualified due to serious analytical deficiencies or qualified as blank contaminated above associated project investigation sensitivity goals.
[2] Investigation includes CCR Material and Pore Water Samples.
[3] Investigation includes sediment and mayfly samples.

Table 11: CUF TDEC Order Investigations – Background Soil Data Qualified by QC type

	CUF Investigation - Background Soil Parameters					
	Metals	**Mercury**	**Anions**	**pH**	**Radium**	**PLM**
% Results Qualified: MS/MSD recoveries	20%	0%	32%	NA	NA	NA
% Results Qualified: MS/MSD imprecision	1%	0%	2%	NA	NA	NA
% Results Qualified: FD imprecision	1%	0%	0%	0%	2%	0%
% Results Qualified: LD imprecision	0%	0%	0%	0%	11%	0%
% Results Qualified: Trace-level laboratory blank contamination	2%	0%	12%	NA	0%	NA
% Results Qualified: Trace-level field blank contamination	1%	0%	20%	NA	0%	NA
% Results Qualified: Internal Standards	5%	0%	NA	NA	NA	NA

NA: Not Applicable

Table 12: CUF TDEC Order Investigations – Groundwater Data Qualified by QC Type

	CUF Investigation - Groundwater Parameters					
	Metals	**Mercury**	**Anions**	**Alkalinity**	**TDS**	**Radium**
% Results Qualified: MS/MSD recoveries	0.1%	29%	0%	NA	NA	NA
% Results Qualified: Laboratory Control Sample/Laboratory Control Sample Duplicate (LCS/LCSD) recoveries	0%	0%	0%	0%	0%	2%
% Results Qualified: FD imprecision	0%	0%	0%	0%	0%	3%
% Results Qualified: Trace-level laboratory blank contamination	1%	0%	0%	0%	0%	3%
% Results Qualified: Trace-level field blank contamination	12%	0%	0%	0%	0%	3%
% Results Qualified: Chemical Yield recoveries	NA	NA	NA	NA	NA	2%

NA: Not Applicable

Table 13: CUF TDEC Order Investigations – CCR Material Data Qualified by QC Type

	CUF Investigation - CCR Material Characteristics Parameters					
	Metals	**Mercury**	**Anions**	**pH**	**TOC**	**Radium**
% Results Qualified: MS/MSD recoveries	8%	0%	10%	NA	10%	NA
% Results Qualified: MS/MSD imprecision	1%	0%	0%	NA	0%	NA
% Results Qualified: LCS/LCSD recoveries	0%	0%	0%	NA	13%	30%
% Results Qualified: Initial or Continuing Calibration	0%	0%	0%	NA	7%	0%
% Results Qualified: FD imprecision	2%	0%	1%	0%	6%	8%
% Results Qualified: LD imprecision	0%	0%	0%	0%	20%	4%
% Results Qualified: Trace-level laboratory blank contamination	2%	0%	0%	NA	0%	0%
% Results Qualified: Trace-level field blank contamination	0%	0%	3%	NA	0%	0%
% Results Qualified: Internal Standards	4%	0%	NA	NA	0%	NA
% Results Qualified: Post-Digestion Spike Recoveries	2%	NA	NA	NA	NA	NA
% Results Qualified: Serial Dilution imprecision	1%	NA	NA	NA	NA	NA
% Results Qualified: Holding Time Exceedance	0%	0%	0%	0%	2%	0%

NA: Not Applicable

Table 14: CUF TDEC Order Investigations – Pore Water Data Qualified by QC Type

	CUF Investigation – Pore Water Parameters					
	Metals	**Mercury**	**Anions**	**TDS**	**TOC**	**Radium**
% Results Qualified: LCS/LCSD recoveries	0%	0%	0%	0%	0%	48%
% Results Qualified: Trace-level laboratory blank contamination	1%	0%	0%	0%	0%	0%
% Results Qualified: Trace-level field blank contamination	19%	0%	0%	0%	0%	0%
% Results Qualified: Internal Standards	18%	NA	NA	NA	NA	NA
% Results Qualified: Total versus Dissolved Comparison	3%	0%	NA	NA	0%	NA

NA: Not Applicable

Table 15: CUF TDEC Order Investigations – Fish Data Qualified by QC Type

	CUF Investigation - Fish Parameters		
	Metals	**Mercury**	**%Moisture**
% Results Qualified: MS/MSD recoveries	2%	42%	NA
% Results Qualified: MS/MSD imprecision	0.6%	0%	NA
% Results Qualified: FD imprecision	0.4%	7%	0%
% Results Qualified: Trace-level laboratory blank contamination	1%	12%	NA
% Results Qualified: Trace-level field blank contamination	4%	0%	NA
% Results Qualified: LCS/LCSD recoveries	2%	0%	NA
% Results Qualified: Reporting Limit standard recoveries	0%	10%	NA
% Results Qualified: Initial or Continuing Calibration	0%	3%	NA

NA: Not Applicable

Table 16: CUF TDEC Order Investigations – Sediment Data Qualified by QC Type

	CUF Investigation - Sediment Parameters					
	Metals	**Mercury**	**Anions**	**pH**	**Radium**	**PLM**
% Results Qualified: MS/MSD recoveries	12%	10%	41%	NA	NA	NA
% Results Qualified: MS/MSD imprecision	0%	0%	6%	NA	NA	NA
% Results Qualified: FD imprecision	0%	0%	1%	0%	1%	0%
% Results Qualified: LD imprecision	0%	0%	0%	0%	29%	0%
% Results Qualified: Trace-level laboratory blank contamination	2%	0%	2%	NA	0%	NA
% Results Qualified: Trace-level field blank contamination	0%	0%	20%	NA	0%	NA
% Results Qualified: Internal Standards	0%	NA	NA	NA	NA	NA
% Results Qualified: Percent Moisture Content	38%	38%	38%	NA	NA	NA
% Results Qualified: Replicate Exposure Relative Standard Deviation (%RSD)	0.1%	0%	NA	NA	NA	NA
% Results Qualified: Holding Time Exceedance	0%	4%	2%	0%	0%	NA
% Results Qualified: Headspace	NA	NA	NA	NA	32%	NA

NA: Not Applicable

Table 17: CUF TDEC Order Investigations – Mayfly Data Qualified by QC Type

	CUF Investigation - Mayfly Parameters		
	Metals	**Mercury**	**% Moisture**
% Results Qualified: MS/MSD recoveries	10%	0%	NA
% Results Qualified: LCS/LCSD recoveries	2%	0%	NA
% Results Qualified: FD imprecision	1%	0%	NA
% Results Qualified: Trace-level laboratory blank contamination	3%	85%	NA

NA: Not Applicable

Table 18: CUF TDEC Order Investigations – Seep Soil Data Qualified by QC Type

	CUF Investigation - Seep Soil Parameters				
	Metals	**Mercury**	**Anions**	**pH**	**Radium**
% Results Qualified: MS/MSD recoveries	20%	0%	67%	NA	NA
% Results Qualified: FD imprecision	5%	0%	0%	0%	67%
% Results Qualified: Percent Moisture Content	100%	100%	100%	NA	NA

NA: Not Applicable

Table 19: CUF TDEC Order Investigations – Seep Water Data Qualified by QC Type

	CUF Investigation - Seep Water Parameters				
	Metals	**Mercury**	**Anions**	**TDS**	**TSS**
% Results Qualified: FD imprecision	3%	0%	0%	0%	100%
% Results Qualified: Trace-level laboratory blank contamination	1%	0%	0%	0%	0%
% Results Qualified: Trace-level field blank contamination	20%	0%	0%	0%	0%
% Results Qualified: Total vs Dissolved Results Comparison	5%	0%	NA	NA	NA

NA: Not Applicable

Table 20: CUF TDEC Order Investigations – Surface Stream Data Qualified by QC Type

	CUF Investigation - Surface Stream Parameters						
	Metals	**Mercury**	**Anions**	**Hardness**	**TDS**	**TSS**	**Radium**
% Results Qualified: MS/MSD recoveries	0.6%	0%	1%	0%	NA	NA	NA
% Results Qualified: MS/MSD imprecision	0.2%	0%	1%	0%	NA	NA	NA
% Results Qualified: Post-Digestion Spike Recoveries	0.2%	0%	NA	0%	NA	NA	NA
% Results Qualified: LCS/LCSD recoveries	0%	0%	0%	0%	NA	NA	1%
% Results Qualified: LD imprecision	0%	0%	0%	0%	0%	0%	9%
% Results Qualified: FD imprecision	0.2%	0.2%	0.2%	0%	0%	1%	1%
% Results Qualified: Trace-level laboratory blank contamination	2%	0%	0%	0%	0%	0%	6%
% Results Qualified: Trace-level field blank contamination	8%	3%	0%	0%	0%	4%	7%
% Results Qualified: Total vs Dissolved Results Comparison	0.2%	0%	NA	0%	NA	NA	NA
% Results Qualified: Chemical Yield recoveries	NA	NA	NA	NA	NA	NA	0.2%
% of Results Qualified: Temperature Exceedance	NA	NA	3%	3%	3%	3%	NA
% of Results Qualified: Holding Time Exceedance	0%	0%	0%	0%	1%	1%	0%
% of Results Qualified: Detector Background Control Check	NA	NA	NA	NA	NA	NA	0.2%

NA: Not Applicable

Table 21: CUF TDEC Order Investigations Data Validation Field QC Associations

	CUF Investigation							
Field QC Sample	**Groundwater**	**Background Soils**	**CCR Material**	**Benthic**	**Fish**	**Surface Stream**	**Seeps**	**Water Use Survey**
EB	All groundwater samples collected during the event	All background soil samples collected during the event	All CCR Material and pore water samples collected during the respective events	All sediment and mayfly samples collected during the respective events	All fish samples collected during the event	All surface stream samples collected during the event	All seep soils and seep waters collected during the respective events	NA
RB	NA	NA	NA	NA	All fish samples collected during the event	NA	NA	NA
FB	All groundwater samples collected on the same day as the FB	NA	All CCR Material and pore water samples collected on the same day as the FB during the respective events	All sediment samples collected on the same day as the FB	NA	All surface stream samples collected on the same day as the FB	All seep soils and seep waters collected on the same day as the FB during the respective events	All water use samples collected on the same day as the FB
FLB	Dissolved metals and dissolved mercury samples collected during the event	NA	Dissolved metals and dissolved mercury samples collected during the pore water event.	NA	NA	Dissolved metals and dissolved mercury samples collected during the event	Dissolved metals and dissolved mercury samples collected during the event	NA
TB	Total metals and total mercury samples collected during the event	NA	Total metals and total mercury samples collected during the pore water event	NA	NA	NA	Total metals and total mercury samples collected during the seep water event	Total metals and total mercury samples collected during water use survey event
FD	FD and Parent Sample Only	FD and Parent Sample Only	FD and Parent Sample Only	FD and Parent Sample Only	FD and Parent Sample Only	FD and Parent Sample Only	FD and Parent Sample Only	FD and Parent Sample Only

NA: Not applicable

Table 22: CUF TDEC Order Investigations Laboratory Audit Summary

Eurofins TestAmerica Pittsburgh		Document Archival	Sample Storage Temperatures	Labeling/ Traceability	Sample Preparation	Analytical Technique/ QC protocols	Personnel Training and Records	Documentation	Laboratory - Routine Cleaning	Laboratory Data Management	Laboratory Equipment	Sample Disposal	Sample Receiving
Number of Findings		2	3	8	3	6	3	5	NA	NA	1	1	NA
Resolution	Documented Training	2	3	8	3	6	3	5	NA	NA	1	1	NA
	SOP Update	0	0	0	0	3	0	0	NA	NA	0	0	NA

Eurofins TestAmerica St. Louis		Document Archival	Sample Storage Temperatures	Labeling/ Traceability	Sample Preparation	Analytical Technique/ QC protocols	Personnel Training and Records	Documentation	Laboratory - Routine Cleaning	Laboratory Data Management	Laboratory Equipment	Sample Disposal	Sample Receiving
Number of Findings		NA	NA	1	NA	2	1	2	NA	NA	1	NA	1
Resolution	Documented Training	NA	NA	1	NA	2	1	2	NA	NA	1	NA	1
	SOP Update	NA	NA	1	NA	0	0	1	NA	NA	0	NA	0

Pace Green Bay		Document Archival	Sample Storage Temperatures	Labeling/ Traceability	Sample Preparation	Analytical Technique/ QC protocols	Personnel Training and Records	Documentation	Labortory - Routine Cleaning	Laboratory Data Management	Laboratory Equipment	Sample Disposal	Sample Receiving
Number of Findings		NA	NA	NA	NA	3	1	NA	NA	NA	2	NA	1
Resolution	Documented Training	NA	NA	NA	NA	3	1	NA	NA	NA	2	NA	1
	SOP Update	NA	NA	NA	NA	1	0	NA	NA	NA	0	NA	0

GEL Laboratories		Document Archival	Sample Storage Temperatures	Labeling/ Traceability	Sample Preparation	Analytical Technique/ QC protocols	Personnel Training and Records	Documentation	Labortory - Routine Cleaning	Laboratory Data Management	Laboratory Equipment	Sample Disposal	Sample Receiving
Number of Findings		2	NA	11	NA	13	1	3	NA	NA	1	2	4
Resolution	Documented Training	2	NA	11	NA	13	1	3	NA	NA	1	2	4
	SOP Update	0	NA	3	NA	6	0	1	NA	NA	0	0	1

* Labeling/Traceability includes: reagents, consumables, support equipment, and instrumentation
NA - Not Applicable

3.3. Data Management Quality Assurance Summary

Table 23: CUF TDEC Order Investigations Historical Data Summary

	CUF Investigation							
	Groundwater	**Background Soil**	**CCR Material**	**Benthic**	**Fish**	**Surface Stream**	**Seeps**	**Water Use Survey**
% Data Validated (Value 5.0)	6%	NA	NA	NA	NA	NA	NA	NA
% Final-Verified (Value 4.0)	8%	NA	NA	NA	NA	NA	NA	NA
% Final QC Review (Value 3.0)	25%	NA	NA	NA	NA	NA	NA	NA
% Final QC Review Laboratory QC not available (Value 2.0)	6%	NA	NA	NA	NA	NA	NA	NA
% Final-No QC Laboratory Report not available (Value 1.0)	55%	NA	NA	NA	NA	NA	NA	NA

"Final QC Review" indicates sample results were confirmed against laboratory reports; no additional QC results were reviewed.
"Final-No QC" indicates sample results were not confirmed because laboratory reports were unavailable.

4. Conclusions

Based on the QA program implemented for the CUF EI, a complete, comprehensive, high-quality dataset was generated. The CUF EI sampling and data generation activities substantially complied with the requirements of the project control documents, resulting in a robust, high-quality, defensible dataset appropriate for use in decision-making. As presented in Table 10, the dataset exceeded the 90% completeness goal specified in Section 19.4 of the TVA CUF QAPP. The QA program developed for the CUF EIP was sufficient to ensure that the resulting dataset met or exceeded the project data quality objectives.

ATTACHMENT A

Table A-1. Project Control Document Revision History

Document Title	Revision Number	Revision Date
CUF EIP	0	July 2016
	1	May 2017
	2	November 2017
	3	June 2018
CUF EIP QAPP	2 (Redline)*	November 2021
Background Soil Investigation Sampling and Analysis Plan, CUF Fossil Plant	3 (Redline)*	January 2020
Material Quantity Sampling and Analysis Plan, CUF Fossil Plant	3 (Redline)*	May 2019
Exploratory Drilling Sampling and Analysis Plan, CUF Fossil Plant	3 (Redline)*	May 2020
CCR Material Characteristics Sampling and Analysis Plan, CUF Fossil Plant	3 (Redline)*	May 2020
Hydrogeological Investigation Sampling and Analysis Plan, CUF Fossil Plant	3 (Redline)*	December 2019
Water balance Sampling and Analysis Plan, CUF Fossil Plant	3	June 2018
Water Use Survey Sampling and Analysis Plan, CUF Fossil Plant	3 (Redline)*	December 2021
Groundwater Investigation Sampling and Analysis Plan, CUF Fossil Plant	3 (Redline)*	December 2019
Benthic Sampling and Analysis Plan, CUF Fossil Plant	3 (Redline)*	May 2020
Seep Investigation Sampling and Analysis Plan, CUF Fossil Plant	3 (Redline)*	December 2019
Surface Stream Sampling and Analysis Plan, CUF Fossil Plant	3 (Redline)*	May 2020
Fish Sampling and Analysis Plan, CUF Fossil Plant	3 (Redline)*	March 2020

Note:
* Redline update documents TDEC-approved changes to EIP following EIP approval.

Table A-2. TVA TI Revision Matrix

Technical Instruction	Title	Original Version	Original Date	Revision	Revision Date	Revision	Revision Date	Revision	Revision Date
TVA-KIF-SOP-31	Fish Sampling with Gill Nets		8/1/2010	replaced by ENV-TI-05.40.20					
ENV-TI-05.40.20	Fish Sampling with Gill Nets			0000	1/31/2019				
TVA-KIF-SOP-33	Fish Sampling Using Boat-Mounted Electroshocker		6/1/2010	replaced by ENV-TI-05.40.22					
ENV-TI-05.40.22	Fish Sampling Using Boat-Mounted Electroshocker			0000	5/20/2019				
TVA-KIF-SOP-29	TVA Kingston Standard Operating Procedure for Mayfly Sampling	0001	8/1/2013	replaced by ENV-TI-05.40.43					
ENV-TI-05.40.43	Mayfly Sampling			0000	9/16/2019				
ENV-TI-05.80.01	Planning Sample Events	0000	3/31/2017						
ENV-TI-05.80.02	Sample Labeling and Custody	0001	3/31/2017						
ENV-TI-05.80.03	Field Record Keeping	0000	3/31/2017						
ENV-TI-05.80.04	Field Sampling Quality Control	0000	3/31/2017	0001	9/16/2019				
ENV-TI-05.80.05	Field Sampling Equipment Cleaning and Decontamination	0000	3/31/2017						
ENV-TI-05.80.06	Handling and Shipping of Samples	0000	3/31/2017						
ENV-TI-05.80.21	Monitoring Well Inspection and Maintenance	0000	3/31/2017						
ENV-TI-05.80.25	Monitoring Well and Piezometer Installation and Development	0000	3/31/2017	0001	7/31/2018	0002	4/1/2019	0003	9/16/2019
ENV-TI-05.80.40	Surface Water Sampling	0000	5/4/2017						
ENV-TI-05.80.42	Groundwater Sampling	0001	3/31/2017	0002	7/18/2017	0003	9/16/2019		
ENV-TI-05.80.44	Groundwater Level and Well-Depth Measurement	0000	3/31/2017						
ENV-TI-05.80.46	Field Measurement Using a Multi-Parameter Sonde	0000	3/31/2017	0001	9/16/2019				
ENV-GAF-PW.01	Potable Water Sampling		8/29/2016	replaced by ENV-TI-05.80.47					
ENV-TI-05.80.47	Potable Water Sampling			0000	3/26/2019				
TVA-GAF-SOP-02	TVA Gallatin Standard Operating Procedure for Sediment Sampling		7/1/2016	replaced by ENV-TI-05.80.50					
ENV-TI-05.80.50	Soil and Sediment Sampling			0000	9/29/2017	0001	7/25/2019		
TVA-KIF-SOP-35	TVA Kingston Standard Operating Procedure for Reservoir Benthic Macroinvertebrate Sampling	0001	8/1/2013	0002	3/1/2015				

ATTACHMENT B

Table B-1: Inorganic Data Qualifiers and Explanations

Data Qualifier	Explanation
U*	This result should be considered “not-detected” because it was detected in a rinsate blank or laboratory blank at a similar level.
UR	Unreliable reporting limit; analyte may or may not be present in sample.
R	Unreliable positive result; analyte may or may not be present in sample.
J	Quantitation is approximate due to limitations identified during data validation.
UJ	This analyte was not detected, but the reporting limit may or may not be higher due to a bias identified during data validation.

Table B-2: Data Validation Reason Codes and Explanations

Reason Code	Explanation
BE	Equipment blank contamination. The result should be considered “not-detected.”
BF	Field blank contamination. The result should be considered “not-detected.”
BL	Laboratory blank contamination. The result should be considered “not-detected.”
BN	Negative laboratory blank contamination.
C	Initial and/or Continuing Calibration issue, indeterminate bias.
C+	Initial and/or Continuing Calibration issue. The result may be biased high.
C-	Initial and/or Continuing Calibration issue. The result may be biased low.
FD	Field duplicate imprecision.
FG	Total versus Dissolved Imprecision.
H	Holding time exceeded.
I	Internal standard recovery outside of acceptance limits.
L	LCS and LCSD recoveries outside of acceptance limits, indeterminate bias.
L+	LCS and/or LCSD recoveries outside of acceptance limits. The result may be biased high.
L-	LCS and/or LCSD recoveries outside of acceptance limits. The result may be biased low.
LD	Laboratory duplicate imprecision.
LP	LCS/LCSD imprecision.
M	MS and MSD recoveries outside of acceptance limits, indeterminate bias.
M+	MS and/or MSD recoveries outside of acceptance limits. The result may be biased high.
M-	MS and/or MSD recoveries outside of acceptance limits. The result may be biased low.
MP	MS/MSD imprecision.
P	Post-digestion spike recoveries outside of acceptance limits, indeterminate bias.
P+	Post-digestion spike recovery outside of acceptance limits. The result may be biased high.
P-	Post-digestion spike recovery outside of acceptance limits. The result may be biased low.
Q	Chemical Preservation issue.
R	RL standards outside of acceptance limits, indeterminate bias.
R+	RL standard(s) outside of acceptance limits. The result may be biased high.
R-	RL standard(s) outside of acceptance limits. The result may be biased low.
RL	Reported result between the MDL and the QL.
S	Radium-226+228 flagged due to reporting protocol for combine results.
T	Temperature preservation issue.
SD	Serial Dilution imprecision.
X	Percent solids < 50%.
Y+	Chemical Yield outside of acceptance limits. The result may be biased high.
Y-	Chemical yield outside of acceptance limits. The result may be biased low.
Z	ICP or ICP/MS Interference.
ZZ	Other.