APPENDIX A –
REGULATORY INFORMATION AND CORRESPONDENCE

APPENDIX A.1

TDEC ORDER

STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION

IN THE MATTER OF:	)	
	)	
TENNESSEE VALLEY AUTHORITY	)	**ORDER NUMBER: OGC15-0177**
	)	
RESPONDENT	)	

COMMISSIONER'S ORDER

PREAMBLE

This Order (Order) has two purposes. First, it is intended to establish a transparent, comprehensive process for the investigation, assessment, and remediation of unacceptable risks, resulting from the management and disposal of coal combustion residuals (CCR) at the Tennessee Valley Authority's (TVA) coal-fired power plants in Tennessee.[1] Second, it is intended to establish the process whereby the Tennessee Department of Environment and Conservation (Department) will oversee TVA's implementation of the federal CCR rule to insure coordination and compliance with Tennessee laws and regulations that govern the management and disposal of CCR.

On December 19, 2014, the Administrator of the Environmental Protection Agency (EPA) signed a final rule that establishes a comprehensive set of requirements for the disposal of CCR from electric utilities. This rule was published in the *Federal Register* on April 17, 2015, 80 Fed. Reg. 21302-21501, and becomes effective on October 19, 2015.

[1] This order does not apply to TVA's Gallatin Fossil Plant. CCR management and disposal activities at that facility are subject to an enforcement lawsuit filed on behalf of the Department on January 7, 2015.

EPA's regulations specifically do not preempt state law requirements, and EPA recognized in its rulemaking the significant role that states play in implementing requirements for managing CCR. EPA strongly encouraged states to adopt and implement the CCR criteria as state law. Following the December 2008 Kingston ash spill, Tennessee amended its laws and regulations to reduce the risk of another such event. Among the changes made are requirements that all new or expanded coal ash disposal facilities must include a Resource Conservation and Recovery Act of 1976 (RCRA) Subtitle D equivalent liner and final cap. Further, pursuant to T.C.A. §68-211-107(c) all solid waste disposal facilities must have groundwater monitoring and if sampling results indicate that ground water protection standards are exceeded, an assessment monitoring program is required. Further, required corrective measures are specified in Chapter 0400-11-01-.04 of the Rules and Regulations of the State of Tennessee.

Therefore, this Order is issued pursuant to the provisions of Tennessee's Waste Management and Remediation laws and in furtherance of the public policies specified therein.

PARTIES

I.

Robert J. Martineau, Jr. is the duly appointed Commissioner of the Tennessee Department of Environment and Conservation.

II.

Tennessee Valley Authority is a federal agency and instrumentality of the United States Government pursuant to the Tennessee Valley Authority Act of 1933, as amended, 16 U.S.C.

Sections 831-831ee. Service of process may be made on William D. Johnson CEO at 400 Summit Hill Drive, Knoxville, TN, 37902-1499

JURISDICTION

III.

Pursuant to T.C.A. §68-211-103(8), "[s]olid waste" is defined as "spent material, byproducts, . . . ash, sludge, and all discarded material including solid, liquid, [or] semisolid . . . material resulting from industrial, commercial, and agricultural operations." CCR are solid waste.

IV.

Pursuant to T.C.A. §68-211-107(a), "[t]he Department is authorized to exercise general supervision over the operation and maintenance of solid waste processing facilities and disposal facilities or sites. Such general supervision shall apply to all the features of operation or maintenance *which* do or *may* affect the public health and safety or the quality of the environment *and which* do or *may affect* the proper processing and disposal of solid wastes." (Emphasis added).

V.

Pursuant to T.C.A. §68-211-107(c) "[t]he Department shall require all solid waste disposal facilities to have a groundwater monitoring program and report sampling results to the department at least once each year. *If sampling results indicate that ground water protection standards are exceeded, the owner or operator of the facility shall commence an assessment monitoring program, in accordance with regulations adopted by the board and carry out all corrective measures specified by the commissioner.*" (Emphasis added). Further, required

corrective measures are specified in Chapter 0400-11-01-.04 of the Rules and Regulations of the State of Tennessee.

SCOPE OF THE ORDER

VI.

This Order shall apply to all "CCR disposal areas" at the coal-power plant sites listed below that TVA operates or has operated in Tennessee (hereinafter sites or plants). "CCR disposal areas" include all areas where CCR disposal has occurred, including without limitation, all permitted landfills, all "non-registered" landfills (landfills that existed before they were subject to regulation), and all current and former surface water impoundments that contain CCR.

- Allen Fossil Plant
- Cumberland Fossil Plant
- Johnsonville Fossil Plant
- Kingston Fossil Plant
- Bull Run Fossil Plant
- John Sevier Fossil Plant
- Watts Bar Plant

ORDER

VII.

WHEREFORE, I, Robert J. Martineau, Jr., hereby ORDER TVA to perform the following actions and comply with the conditions set-out below.

A. Site-Wide CCR Investigation, Assessment and Remediation

TVA shall conduct an investigation of CCR disposal areas at the TVA plant sites listed in Section VI by taking the following actions:

a. Within 60 days of the issuance of this Order, an investigation conference shall be scheduled at which TVA shall brief the Department on its CCR management plans at each of the listed plant sites and provide information concerning CCR disposal, releases, existing risk analysis, sampling information, etc. At this briefing, TVA shall discuss and provide information about:

i. Groundwater monitoring and other environmental data at each plant site, including any exceedances of groundwater protection standards and the detection of CCR constituents listed in Appendix III and Appendix IV of the CCR rule in ground water, surface water, or soil;

ii. Biological monitoring reports and whole effluent toxicity testing that TVA may have conducted near each plant site;

iii. The hydrology, geology, and hydrogeology of each plant site with an emphasis on the geology at the locations where TVA has disposed of CCR;

iv. The results of soil borings and analysis of rock cores at each site, including soil, rock, and CCR materials encountered in the borings as well as the analytical work performed on soil boring samples;

v. Any surface seeps and other observable surface releases from CCR impoundments to surface water;

vi. Plans and schedule for closing wet impoundments and converting CCR processes to dry; and

vii. The history of CCR activities at each site.

b. During the investigation conference, the Department and TVA shall discuss what additional documents and/or information TVA shall be required to provide the Department to complete the investigation. Any additional documents requested by the Department shall be provided as expeditiously as practicable, but no later than 45 days, after the conference. Documents may be provided in paper or electronic format or may be posted at a secure internet link.

c. The Department recognizes that TVA and EPA exchanged detailed information about the condition of its CCR impoundments and that this information is at http://www.epa.gov/osw/nonhaz/industrial/special/fossil/surveys2/index.htm. TVA need not provide copies of reports or analyses found at this internet site.

d. Following the initial investigation conference and the review of available information about CCR at each plant site, the Department shall identify what, if any, additional information is needed to complete the investigation of each site. The Department shall discuss with TVA the basis for this determination and a schedule for providing the additional information on a per-site basis. TVA shall develop Environmental Investigation Plans (EIPs) for each site and submit them to the Department. Each EIP shall include a schedule of the work to be performed to fully identify the extent of soil, surface water, and ground water contamination by CCR. TVA shall implement the EIP in accordance with a schedule approved by the Department. Within 60 days

of completion of the EIP, TVA shall submit an Environmental Assessment Report (EAR) to the Department. The EAR shall provide an analysis of the extent of soil, surface water, and ground water contamination by CCR at the site. The Department shall evaluate the EAR to determine if the extent of CCR contamination has been fully defined.

e. The process set-out in VII A. item d. above, shall be repeated until the Department determines there is sufficient information to adequately characterize the extent of CCR contamination in soil, surface water, and ground water at each site.

f. Upon approval of each EAR by the Department, TVA shall submit, within 60 days, a Corrective Action/Risk Assessment (CARA) Plan. The CARA Plan shall specify all actions TVA plans to take at the site and the basis of those actions. Corrective measures may include (1) soil, surface water, and ground water remediation, (2) risk assessment and institutional controls, or (3) no further corrective action. As appropriate for the site, the final approved CARA Plan shall include:

i. The method(s) TVA will employ to remove and/or close in place CCR material at the site;

ii. The method(s) TVA will employ to remediate CCR contaminated soil, surface water, and ground water at the site;

iii. The method(s) TVA proposes to restore any natural resources damaged as a result of the CCR waste water treatment and on-site CCR disposal:

iv. A plan for monitoring the air and water in the area during the cleanup process;

v. A plan to ensure that public and private water supplies are protected from CCR contamination and that alternative water supplies are provided to local citizens if CCR

contamination above ground water protection standards is detected in ground water drinking wells; and,

vi. A plan addressing both the short term and long term management of CCR at the site, including remediation and stabilization of the CCR surface impoundment(s) and/or landfill and/or non-registered disposal site(s), to include design drawings and appropriate supporting engineering calculations.

g. The CARA Plan shall include a schedule of activities to be completed by TVA. The Department and TVA shall discuss the draft CARA Plan and any changes that the Department may determine are necessary for tentative approval of a plan. Following completion of the Public Involvement process set-out in Section B. of this Order, the Department shall decide to either accept or reject the CARA Plan. Should the Department disapprove the CARA Plan, the Department shall provide comments to TVA identifying the deficiencies. TVA shall correct the deficiencies and resubmit the CARA Plan to TDEC for approval.

B. Public Involvement

The Department shall identify opportunities for TVA and the Department to involve the public during the site investigation, assessment, and remediation processes of this Order. This shall include TVA providing the Public notice of all EIP and CARA Plans. Each Public Notice shall contain a summary of the proposed plan and it shall be published in a manner specified by the Department. The Public shall have a minimum of 30 days to comment on each plan; and, if any comments are received, TVA shall have 30 days to provide the Department responses to the comments. After consideration of all Public comments and TVA's responses, the Department will approve, modify, or reject each EIP and CARA Plan.

C. Additional Time

TVA may request a time extension for any deadline in this Order, or in plans approved pursuant to this Order, prior to the deadline. The Commissioner may grant the time extension for good cause shown by TVA; provided, however, that the Department and TVA recognize that deadlines set by the CCR rule cannot be extended except as allowed therein.

D. CCR Rule Implementation

1. CCR Rule Compliance: The requirements of Sections A. and B. of this Order are supplemental to the CCR rule and are not intended to impede or delay actions that TVA takes in compliance with CCR rule requirements. The Department recognizes that TVA may, in compliance with CCR rule requirements, elect to close CCR surface impoundments and/or landfills before the full extent of contamination at a site has been determined. However, if TVA elects to do so, it may later be required by Section A. of this Order to take other and further remedial actions.

2. Notice of CCR Documents: As required by the CCR rule, TVA shall notify the Department when it posts CCR-related documents on its CCR rule public website. The Department in its discretion may request that TVA provide it electronic or paper copies of specific documents.

3. Department Review Process: The Department shall have 60 days to review CCR rule related plans, demonstrations, and assessments, after they are placed on TVA's public CCR rule website. If the Department does not inform TVA that it has comments on a plan, demonstration, or assessment within this 60-day period, TVA may proceed with such plan, demonstration, or assessment. If the Department informs TVA that it has comments, the Department and TVA shall meet to discuss those comments within 30 days. Thereafter, TVA shall appropriately

modify its plans, demonstrations, or assessments to respond to the Department's final comments and resubmit the plan, demonstration, or assessment to the Department. Thirty (30) days thereafter, unless informed otherwise by the Department, TVA may proceed with such plan, demonstration, or assessment. The Department's review and comment on a CCR-rule plan, demonstration, or assessment shall not be deemed its approval of actions required under Section A of this Order. However, TVA may assume the risk of implementing a CCR-rule plan, demonstration, or assessment.

4. Preliminary Activities: Notwithstanding any other provision of this Order, TVA may proceed immediately with preliminary activities (e.g., pond surface water drawdown, contouring, etc.) that are necessary to prepare CCR-surface impoundments and/or landfills for closure; provided, however, that discharges from permitted outfalls must remain within limits set forth in applicable National Pollutant Discharge Elimination System permits.

E. Reimbursement of Costs

TVA shall pay all costs associated with the Department's oversight of the implementation of this Order. These costs shall include, but are not limited to, mileage, lab expense, salary, benefit, and administrative costs for the Department's employees and other state employees actively employed in oversight of work under this Order (including preparation for and attendance at meetings), at the current State overhead rate. Oversight costs also include expenditures for separate office space and related expenses, services contracted for by the Department that facilitate or support the Department's oversight of work under this Order, including, but not limited to, the review of documents submitted by TVA to the Department as required by the CCR rule. The Department shall provide TVA with periodic statements

reflecting oversight costs incurred. Within 60 days of the receipt of each such statement, TVA shall pay to the Department the amount invoiced.

F. Point of Contact and Written Communications

The Department and TVA shall designate two individuals to serve as the primary technical and compliance points of contact for implementation of this Order, in writing, sent to the other party. Either party may change a designated point of contact at any time by informing the other party to the change in writing.

G. Assessment Conferences

At any time deemed necessary by the Department, the Department may schedule an assessment conference that TVA shall attend.

H. Termination of Order

Upon completion of all tasks set forth in this Order, the Department shall issue to TVA a letter stating the requirements of this Order have been fulfilled and no further action of TVA is required under this Order; provided, however, that the Department may terminate the Order earlier if changes in conditions warrant this, including changes in applicable regulations

ASSESSMENT OF CIVIL PENALTIES

VIII.

If TVA does not meet the requirements of this Order, TVA shall pay the following administrative penalties upon request by the Department:

a. Failure to comply with any specific requirement, including deadlines set-out in this Order or which are specified in schedules that are approved by the Department pursuant

to this Order: FIVE THOUSAND DOLLARS ($5,000) per noncompliance and ONE THOUSAND DOLLARS ($1,000) for each day until the noncompliance is remedied.

b. Failure to comply with CCR rule requirements: FIVE THOUSAND DOLLARS ($5,000) for each noncompliance and ONE THOUSAND DOLLARS ($1,000) for each day until the noncompliance is remedied.

The Department, in its discretion, may waive a potential penalty in whole or in part for good cause including, but not limited to, a showing by TVA that events beyond its control (i.e., a force majeure event such as act of God, acts of war or terrorism, and construction, labor or equipment delays) impeded or prevented it from complying.

SITE ACCESS

IX.

During the effective period of this Order, and until the Department determines that all activities under this Order have been completed, the Department and its representatives or designees, upon presentation of credentials, shall have access during normal business hours and, upon reasonable notice, at non-business hours to the sites listed in Section VI. of this Order. Such access may be for the purpose of monitoring activities; verifying data; conducting investigation; inspecting and copying records, logs, or other documents that are not subject to a legally applicable privilege; and/or conducting other activities associated with the implementation of this Order. Nothing herein shall limit or otherwise affect the Department's right of entry, pursuant to any applicable statute, regulation or permit. The Department and its representative shall comply with all reasonable health and safety plans published by TVA or its contractor and used by site personnel for the purpose of protecting life and property.

RESERVATION OF RIGHTS

X.

This Order shall not be construed as waiving any right or authority available to the Commissioner to further assess TVA for liability for civil penalties or damages incurred by the State. The right to order further investigation, remedial action, and/or monitoring and maintenance is also specifically reserved. Further, this Order shall not be construed as waiving, settling, or in any manner compromising any natural resource damage claims which the Department or the State of Tennessee may have under Section 107 of CERCLA or any other statute, rule, regulation, or common law.

Issued this 6th **day of** August **, 2015, by the Commissioner of the Tennessee Department of Environment and Conservation.**

8/6/15
Date

Robert J. Martineau, Jr.
Commissioner
Department of Environment and Conservation

NOTICE OF RIGHTS

Tennessee Code Annotated ("T.C.A.") §68-211-113 and §68-212-215(d) allows the Respondent to appeal this Order. To do so, a written petition setting forth the grounds (reasons) for requesting a hearing must be RECEIVED by the Commissioner within THIRTY (30) DAYS of the date the Respondent received this Order and Assessment or this Order and Assessment become final (not subject to review).

If an appeal is filed, an initial hearing will be conducted by an Administrative Law Judge (ALJ) as a contested case hearing pursuant to the provisions of T.C.A. §68-211-113, T.C.A. §68-212-215(d), T.C.A. §4-5-301 *et seq.* (the Uniform Administrative Procedures Act), and Rule 1360-04-01 *et seq.* (the Department of State's Uniform Rules of Procedures for Hearing Contested Cases Before State Administrative Agencies). Such hearings are legal proceedings in the nature of a trial. Individual Respondents may represent themselves or be represented by an attorney licensed to practice law in Tennessee. Artificial Respondents (corporations, limited partnerships, limited liability companies, etc.) cannot engage in the practice of law and therefore may only pursue an appeal through an attorney licensed to practice law in Tennessee. Low income individuals may be eligible for representation at reduced or no cost through a local bar association or legal aid organization.

At the conclusion of any initial hearing the ALJ has the authority to affirm, modify, or deny the Order. This includes the authority to modify (decrease or increase) the penalty within the statutory confines of T.C.A. §68-211-117 and T.C.A. §68-212-213 (from $100 to $10,000 per day per violation). Furthermore, the ALJ, on behalf of the Board, has the authority to assess additional damages incurred by the Department including, but not limited to, all docketing expenses associated with the setting of the matter for a hearing and the hourly fees incurred due to the presence of the ALJ and a court reporter.

Any petition for review (appeal) must be directed to the Commissioner of the Tennessee Department of Environment and Conservation, c/o E. Joseph Sanders, General Counsel, Department of Environment and Conservation, 2nd Floor William R. Snodgrass Bldg., 312 Rosa Parks Avenue, Nashville, Tennessee 37243-1548. Payments of any civil penalty and/or damages shall be made payable to the "Treasurer, State of Tennessee" and sent to the Division of Fiscal

Services - Consolidated Fees Section, Tennessee Department of Environment and Conservation, 10th Floor, William R. Snodgrass Bldg., 312 Rosa Parks Avenue, Nashville, Tennessee 37243. The case number, OGC15-0177, should be written on all correspondence regarding this matter.

E. Joseph Sanders BPR# 6691
General Counsel
Department of Environment & Conservation
312 Rosa L. Parks Avenue, 2nd Floor
Nashville, Tennessee 37243-1548
PH 615-532-0131

APPENDIX A.2
REGULATORY CORRESPONDENCE

Chuck Head, Senior Advisor
Bureau of Environment
TN Department of Environment & Conservation
William R. Snodgrass - TN Tower
312 Rosa L. Parks Ave., 2nd Floor
Nashville, TN 37243
615 532-0998
chuck.head@tn.gov

Robert J. Martineau, Jr.
Commissioner

Bill Haslam
Governor

June 14, 2016

Mr. Paul Pearman, Project Manager
Tennessee Valley Authority
1101 Market Street
Chattanooga, TN 37402

RE: TVA Kingston Fossil Plant
Environmental Investigation Plan

Dear Mr. Pearman:

This letter serves as a follow-up to our meeting with the Tennessee Valley Authority (TVA) on April 28th 2016 regarding the TVA Kingston Fossil Plant (TVA Kingston). This meeting fulfilled Section VII.A.a. of Commissioner's Order OGC15-0177 (the Order). The TN Department of Environment and Conservation (TDEC) appreciates the time and effort of your staff and consultants in presenting a summary of the geologic, hydrologic, analytical, engineering and historic data for TVA Kingston. Our staff found the information presented to be more easily understood than by reviewing all the written records for the site and greatly appreciated the opportunity to ask questions and to discuss technical issues. TVA Kingston is an active CCR disposal site adjacent to Emory Reservoir.

The TVA Kingston site is unique when compared to the other 7 TVA Fossil Plant sites in Tennessee.

a. Work was completed by TVA to address the December 2008 TVA Kingston CCR release from the permitted industrial landfill. Due to the magnitude of the release, the U.S Environmental Protection Agency (EPA) and TDEC jointly oversaw the investigation and remediation of the Kingston CCR release. That work has been

completed, with both EPA and TDEC approving the clean-up of the historic landfill area; and

b. TDEC has permitted a new industrial landfill at the TVA Kingston site located on the peninsula adjacent to the TVA Kingston Fossil Plant. This landfill was designed to meet Tennessee's Class I Solid Waste Municipal Landfill design criteria and is constructed with a geologic buffer, synthetic liner and leachate collection system. Further, the landfill is required by TDEC to have an active ground water monitoring program and quarterly inspections.

Given these considerations, the application of the TDEC/TVA Consent Order is to address the other CCR disposal areas at the TVA Kingston Fossil Plant. Specifically, the TVA Kingston Stilling Pond, the historic CCR sluice trench and the "ball field" CCR disposal area.

Our staff members met following the April 28, 2016 TVA Kingston meeting to discuss what we learned about the site and identified additional information needed from TVA to fully understand the site's current status and the amount and location of all CCR material disposed at the site. Section VII.A.b. of the Order requires TDEC, after the initial TDEC/TVA on-site meeting to provide TVA with a written response identifying additional work and/or information needed at each TVA CCR site. TVA is required to submit this information in a proposed Environmental Investigation Plan (EIP).

TDEC has specific questions the Stilling Pond, the Ball field area and the old sluice channel area at the TVA Kingston site. Our questions are listed below. You will also find attached to this letter a guidance document (Attachment A) which contains a general description of the items that should be addressed in the Environmental Investigation Plan for each TVA Fossil Plant site (active and closed); excluding the TVA Gallatin Fossil Plant which is governed by a separate legal document.

TVA Kingston Environmental Investigation Plan Questions

TDEC requests that TVA provide responses to the points presented below in the EIP for the TVA Kingston site.

1. Existing or additional site characterization shall include a discussion of fluctuations in ground water elevations that may be connected to Watts Bar Lake levels, seasonal variations or other factors.

2. Existing or additional site characterization shall estimate the amount of CCR material that is below the upper most aquifer for the Stilling Pond, historic Sluice Channel and the "ball field" temporary storage area. The upper most aquifer must be identified to determine to meet this request and properly characterize the site.

3. Ground Water samples analyzed from Monitoring Well KIF-22 exceeded the Drinking Water MCL for Arsenic. TVA suggested the AS levels were higher than

expected due to the influenced of Total Suspended Solids in the ground water samples taken. TVA shall provide a science based explanation of this statement. TVA should explain its position that the Stilling Pond is contributing to the AS levels in Monitoring Well KIF-22.

4. TVA shall provide a schedule for the placement of any additional borings/monitoring wells proposed at the Kingston site as well as a map identifying the location all borings and monitoring wells that TVA plans to use as a part of its Environmental Investigation (existing and proposed). TVA shall present the reasons for selecting the location of additional boings/monitoring wells at the site. Further, TVA shall install/identify two ground water monitoring wells to serve as background ground water monitoring wells for the site. TVA shall have a TN Licensed Professional Geologist on site to log the installation borings and/or ground water monitoring to install borings and ground water monitoring wells as well as the method of construction for ground water monitoring wells. TVA shall propose a sampling plan to analyze soil, overburden and CCR material generated during on-site drilling for Appendix 3 and 4 CCR constituents. TVA shall only install the ground water monitoring wells and soil/rock borings after approval by TDEC.

5. Due to the 2008 CCR release, there is extens4e data for this site including ground water monitoring data. TVA should include a catalog of existing ground water monitoring wells and soil borings that will be used in determining ground water flow rates, current ground water elevation, direction of ground water flow, subsurface geological conditions and stability and characteristics of local hydrogeology. TVA shall provide a ground water monitoring schedule that identifies the ground water monitoring wells that will be sampled, sampling methodology, sample collection and transportation, analytical methods used for analyses and the qualifications of the laboratory performing the analyses. All samples shall be analyzed for Appendix 3 and IV CCR constituents. Disposal units regulated by a landfill permit will need to incorporate the additional constituents through the end of post closure care period.

6. TVA shall characterize the site's hydrogeology to better understand the cause of the Red-Water seeps at the East Dike/Engineered Red-Water Wetlands. The seeps need to be investigated to identify if the source of water generating the seeps is either infiltration through the Interim Ash Staging Area (ball field) or groundwater flow from offsite or perhaps another source.

   TDEC recommends closure of the Interim Ash Staging Area (ball field) and Sluice Channel to help eliminate Red-Water seep flow, treatment and mitigation. TVA shall collect representative soil and water samples from the Red-water seeps at the East Dike/Engineered Red-Water Wetlands and provide the analytical results for Appendix 3 & 4 CCR constituents found in those samples. The source of contaminants is a critical part of the environmental investigation.

7. Given the site stabilization work completed as a part of the CERCLA closure of the industrial landfill, additional analyses of the seismic stability of the Stilling Pond is

needed for the Stilling Pond once it is dewatered and site conditions if the Stilling Pond is closed in place. TVA shall provide a description of the methods it will employ to conduct seismic stability analyses, specifically, embankment liquefaction potential analysis for the Stilling Pond. TVA shall provide a schedule for conducting this analysis.

8. TDEC has reviewed EPA's comments about the seismic stability of the Stilling Pond. TDEC concurs with EPA's statement "the underlying potential for liquefaction-induced failure of these units remain a concern". The Stilling Pond at KIF is one of the units referenced.

9. TVA shall also propose the methodology it will use to determine the structural stability of the Stilling Pond area to determine if the Stilling Pond area has the load bearing capacity to remain stable after the Stilling Pond is dewatered. TVA shall conduct the same stability analysis to evaluate the possibility of closing the Stilling Pond in place. This analysis is needed to help determine if closure in place is an option for corrective action at the Kingston site. TVA shall provide a schedule performing this analysis. TVA shall address the foundation settlement and the potential for unconsolidated materials in the Stilling Pond area

TVA shall submit the proposed EIP for the TVA Kingston site on or before close of business on September 16, 2016.

It is our goal to work with TVA to ensure the environmental investigation of the TVA Kingston site is complete, accurate and timely. Please review the Kingston specific questions presented in this letter and Attachment A as you prepare the draft Kingston EIP. If you or staff members have any questions, please contact us.

Sincerely,

Chuck Head

Chuck Head

CC: Shari Meghreblian, Ph. D. Tisha C. Benton Wilbourne C. Markham, Jr., P.E.
E. Joseph Sanders Britton Dotson Samuel Hixson
Patrick J. Flood, P.E. Glen Pugh Neil Carricker

Appendix A

General Guidelines for Environmental Investigation Plans

TVA Fossil Plants

TDEC anticipates that the 1st iteration of each TVA Environmental Investigation Plan (EIP) will generate comments and/or questions from TDEC as the review is conducted. TDEC recognizes that each TVA site will have differences due to local geology and plant operation. TDEC believes providing TVA with the guidance for the scope of work for the EIP will significantly limit review time and increase the pace of environmental investigation work at each TVA site. This guidance document is divided into 5 sections based upon different aspects of the TVA Fossil Plants that must be fully environmentally assessed to accurately characterize the site as required in the TN Department of Environment and Conservation (TDEC) and Tennessee Valley Authority Multi-site Order (Order). TDEC believes that successful implementation of the EIP and completion of the corresponding Environmental Assessment Report (EAR) shall provide sufficient information to determine the most appropriate corrective action options to address any environmental and/or public health concerns.

Environmental Investigation Plan Guidance

A. Site Information

TVA shall provide information about CCR storage and disposal sites at the TVA Fossil Plant. TDEC expects TVA to include how it will provide the following information about each TVA Fossil Plant site as a part of its EIP:

1. All information about the natural chemistry of the soils in the area of the TVA Fossil Plant. This includes the naturally occurring levels of metals and other CCR constituents present in the soil. TVA shall propose, in the EIP, the collection of soil samples within a one-mile radius of the specific fossil plant to supplement the information gained from local soil studies, reports or soil profiles. Of particular interest are all constituents listed in the federal CCR regulations Appendix 3 Detection Monitoring and Appendix 4 Assessment Monitoring found on page 21500 of the Friday, April 17, 2015 Federal Register (Appendices 3 and 4 CCR constituents)

   TVA shall report the levels of naturally occurring CCR constituents as reported in existing documents and the results of soil samples collected per a TDEC Approved EIS in the (EAR) for that site. TVA shall submit maps that identify the location of soil samples in proximity to the TVA Fossil Plant when the EAR is submitted.

2. TVA shall propose a sampling plan to determine the leachability of CCR constituents from CCR material in surface Impoundments, landfills and non-registered sites at each TVA site. The plan should include sampling points at each disposal area and at different depths in each disposal area. TVA shall describe sample collection methods, sample transport, analytical methodology and the qualifications of the laboratory selected to perform the analyses.

3. Information about the area surrounding the TVA Fossil Plant location before the TVA Fossil Plant was constructed. TVA shall provide in its EIP, geologic maps before the impoundment was created; if an impoundment is adjacent to the TVA Fossil Plant site. TVA discuss topographic maps from the pre-embayment time period and how these maps will be used to identify surface water features such as springs, the original flow of surface streams, etc. in the Environmental Assessment Report (EAR);

4. Discuss if construction design information for original CCR surface impoundments; specifically any construction drawings or engineering plans are available. It is important to identify the surface elevation and location of surface impoundments, landfills or non-registered disposal areas when originally constructed. TVA should explain if/how the information to identify the materials used to construct these disposal areas.

5. Discuss the information available and additional information that will be gathered to provide a three-dimensional profile of the CCR materials from the current elevation of all surface impoundments, landfills and/or non-registered disposal sites to the natural occurring surface below each structure. Also discuss how TVA plans to provide an estimated amount of CCR material disposed within each structure and the total amount of CCR material disposed at each site. Discuss the methods that TVA will use to provide drawings (to scale) that illustrate the height, length and breadth of the CCR disposal areas in relation to the naturally occurring features of each site. Comprehensively define the amount and location off CCR material at each site.

   Also discuss how TVA plans to provide an estimated amount of CCR material disposed within each structure and the total amount of CCR material disposed at each site. Discuss the methods that TVA will use to provide drawings (to scale) that illustrate the height, length and breadth of the CCR disposal areas in relation to the naturally occurring features of each site.

6. Describe the method TVA shall use to provide a water balance analysis for active surface impoundments at each TVA site. This should include all wastewater and surface water runoff entering the impoundment from the TVA site and the amount of water discharged from the surface impoundment(s) into receiving streams at the NPDES permitted discharge point. TVA shall also describe briefly how it will determine the transpiration rate of water from the surface impoundment(s) into the atmosphere;

B. Water Use Survey

As a part of the Environmental Assessment, TVA is required to conduct a water use survey. The purpose of the water use survey is to determine if any surface water or ground water (water wells or springs) are being used by local residents or by TVA as domestic water supplies. TVA shall describe how it will conduct a water use survey within ½ mile of the boundary of the TVA site.

TVA shall describe how it will determine the construction, depth and location of private water wells identified in the survey. If TVA determines local surface water and/or ground water is used as a source of domestic water supply within a ½ mile radius of the TVA site, the EIP shall include an offsite ground water and surface water sampling plan as a part of the EIP.

C. Groundwater Monitoring and Mapping

The EPA CCR rules specify constituents that should be included for analysis for ground water sampling. The constituents for Ground Water Detection Monitoring are listed in Appendix 3 of the EPA CCR regulations and the constituents for Ground Water Assessment Monitoring are listed in Appendix 4 of the EPA CCR regulations. TDEC is requiring TVA to include a description of the ground water monitoring plan it will implement at each TVA site. All ground water samples collected as a part of the Ground Water Monitoring Plan shall be analyzed for the CCR constituents listed in **Appendices** 3 and 4 of the federal CCR regulations. Items to include in the EIP are:

1. A discussion of all ground water monitoring wells TVA has installed/abandoned/closed at the TVA site as well and any springs that have been monitored at the TVA site or adjacent to the TVA site. TVA shall discuss the data it TVA has generated from historical sampling of ground water monitoring wells and springs. TVA shall include all ground water monitoring construction information, location and historical ground water monitoring data in each TVA site's EAR.

2. A discussion of the location of at least two background ground water monitoring wells including the reasons for proposed their proposed location.

3. A discussion of additional ground water monitoring wells that will be installed to complete a ground water monitoring network at the TVA site around all surface impoundments, landfills and/or non-registered disposal sites; including the location of existing or proposed ground water monitoring wells down gradient of all CRCR disposal areas on the TVA site . TVA shall propose a ground water monitoring network that will provide data to develop a TVA site wide ground water potentiometric surface map. TVA shall ensure that the ground water monitoring locations (current and proposed) in the EIP will accurately determine groundwater flow and direction.

4. A discussion of the construction methods TVA will use to install additional ground water monitoring wells. This includes drilling method, methods and personnel for logging cuttings and cores, well construction and well development. A scaled diagram of a properly completed monitoring well shall be provided in the EIP

5. A ground water monitoring plan for sampling all wells and springs included in the monitoring network. This should include the methods TVA shall use to collect ground water samples, the analytical methods to be used for ground water sample analyses, methods for sample transport from point of collection to the laboratory and identification and qualification of the laboratory (ies) that will perform sample analyses.

6. Describe any existing information available and additional data needed to develop a map which identifies the current ground water surface elevation under the landfill(s), surface impoundment(s) and/or non-registered site(s). If additional data is needed to provide ground water elevations across the TVA site, below the footprint of the landfill(s), surface impoundment(s) and/or non-registered site(s), describe the methods TVA plans to use to collect the data. TVA shall collect sufficient data to create a map that clearly delineates the ground water surface in the ash disposal areas such that (1) the CCR material between the original ground surface and the top of the current ground water table is defined and (2) CCR material between the current ground water surface and the surface elevation of the CCR disposal area is clearly defined. TVA shall also collect pore water samples from CCR material that is below the current ground water surface and from CCR material that is below the projected ground water surface with closure in place. TDEC has not determined that closure in place is a corrective action option at any TVA site; however; this information is needed should TVA propose closure in place. 7.

7. Describe how TVA will define ground water contaminant plumes identified using currently available ground water monitoring data and new ground water monitoring data gathered from the installation and sampling of new ground water monitoring wells. TVA shall also discuss its strategy to determine the extent of any CCR constituent plume should the initial ground water monitoring network not define the full extent of the CCR constituent ground water plume at the TVA site. This should include the science it will use to extend its ground water monitoring network.

D. TVA Site Conditions

1. Discuss all current information available about the geologic lithology (formations, bedding planes, etc.) and their relevance to natural seeps, springs and karst features on the TVA site; including the CCR disposal areas. Some limestone formations are very susceptible to solution channeling, especially when they have been disturbed through natural events or construction activities such as blasting. TVA shall describe the methods it will use to determine whether solution channeling has occurred at and near the soil/rock interface;

2. Discuss all current information about the geologic structure below the TVA site and how it may be used to help determine if faults and/or fractures have been identified in the subsurface. TVA shall describe the methods it will use to collect additional data (faults, fractures, bedding planes, karst features, etc.) to determine whether faulting and fracturing has impacted and/or controls groundwater movement. Describe how TVA will determine if identified faults, fractures, bedding planes, karst features, etc. are filled to the point that they limit or eliminate ground water flow.

3. Discuss existing data available to TVA to map top of bedrock; i.e. existing boring and ground water monitoring well construction data. TVA shall describe the methods (surface geophysics; installation of borings/ground water monitoring wells) it will use to collect additional data to

map top of bedrock. The EIP shall include a description of the data collection methods TVA will use to determine the thickness and types of natural material overlying bedrock as well as the top of bedrock contours. For all new soil borings, TVA shall provide the location of the borings, the information used to determine boring location, the drilling method to be used, how the borings will be logged. Logging shall be performed by a Professional Geologist licensed to practice in Tennessee. Logs shall provide the following information when presented in the EAR; soil type, depth and changes, identify geologic formations, depth of formation, karst features, fractures, bedding planes, and any other pertinent information. TVA shall provide an example of a boring log in the EIP.

4. When/if TVA divided original Coal Combustion Residual (fly ash, bottom ash and gypsum) surface impoundments into individual units (surface impoundments, non-registered disposal areas and or landfills), TVA shall discuss where this has happened on each TVA site. As a part of the EAR, TVA shall discuss the source of information reviewed to provide the specifications of those structural changes. Discuss if there are as built drawings or engineering plans for the modifications TVA has made at each site made. If there is not existing information that describes the structural changes in the original surface impoundment(s) or non-registered site(s), TVA shall discuss in the EIP how it will collect the information needed to document structural changes over time. This information is needed in determining the structural and seismic stability of each TVA site

5. Stipulate whether there are any as-built designs for the interface between the originally disposed CCR material and any disposal structures constructed above the original disposal area.

6. TVA shall discuss any existing stability calculations for final permitted design elevation for all landfills. Unless TDEC specifies otherwise, TVA shall conduct new stability calculations for all landfills, surface impoundments and/or non-registered disposal sites. The EIP shall describe the method TVA will use to determine structural stability. TVA shall provide stability calculations for each disposal area based upon (1) the permitted final elevation or planned final elevation for each landfill, (2) the current elevation for all surface impoundments and/or (3) the current elevation for all non-registered disposal location.

7. TVA shall specify how it will determine the construction methods and properties of the drainage layers between each “stacked layer” for permitted CCR landfills; including where the drainage layer discharges.

8. TVA shall review Section VI.D.5 (page 21373) of the section of the Federal CCR Preamble that describes areas of concern regarding overfill at landfills. TVA shall explain how it will determine if there are potential overfill situations for each surface impoundment/landfill at the TVA site.

9. Discuss current information/data that is available to estimate the shear strength of the CCR materials in the landfill(s), surface impoundment(s) and/or nonregistered sites. If there is not sufficient data available to determine shear strength, describe the methods TVA shall use to collect this data. If there is existing data collected during installation of soil/rock borings or

construction of ground water monitoring wells, provide a brief description of this data and how it will be presented for use in the EIP.

10. TVA shall provide **static, seismic and liquefaction analysis in accordance with 257.63 and 257.73 of the Federal CCR regulations** for final permitted design elevations for Landfills that are defined by the Federal Regulations as overfills. If the **analyses** have not been completed, then TVA shall provide **analyse**s for each landfill based upon either the permitted final elevation for each or for the planned final elevation for each; should TVA decide it does not need to use the entire permitted capacity of any permitted CCR landfill. **TVA shall identify and analyze the critical cross section(s) and document that the modeling represents the actual field conditions at the cross section location(s). TVA shall also address foundation settlement of these Landfills.**

11. TVA shall discuss any current dam safety analysis performed at the TVA site for all landfills, surface impoundments and/or non-registered disposal areas. If dam safety analysis has not been performed for each disposal area or if TDEC determines the dam safety analysis is inadequate, then TVA shall describe the method(s) it will use to determine the "dam safety factor" for all disposal areas at the TVA site.

12. TVA shall discuss any current information or assessments regarding seismic stability for the TVA site, including existing seismic analysis for each surface impoundment(s), landfill(s) and/or non-registered site(s) s at the TVA site. TVA shall describe in the EIP the method it will use to determine the size of the seismic event that would cause structural failure for entire area of the surface impoundments, landfills and/or non-registered disposal sites at the TVA site. The seismic analysis method proposed by TVA shall provide seismic data comparable to the requirements for seismic analysis in the federal CCR regulations at CFR 257.63. The seismic analysis plan shall determine the seismic stability of the entire TVA site and any improvements need to ensure seismic stability for the site, as it exists today and for closure in place. Soils below the surface impoundments and landfill shall be evaluated for liquefaction potential. If these soils are found to be susceptible to liquefaction, stability calculations shall be performed which account for liquefaction.

13. TVA shall discuss how the structural integrity of the entire area of CCR disposal (surface impoundment(s), landfill(s) and non-registered sites) shall be determined. TVA shall include in the EIP the methods and models it will use to evaluate structural integrity as discussed in CFR 257.73(d) and (e).

14. Discuss any current information available that may be used to determine the ability of the local geology to provide sufficient structural stability for the existing surface impoundments, landfills and/or non-registered disposal areas at the TVA site as well as any disposal area considered for closure in place. TDEC anticipates there will not be sufficient existing structural stability information for this analysis. Describe the methods TVA shall employ to collect data that may be used to determine the capability of the geologic formation at the TVA site to provide structurally

sound/load bearing strength for existing CCR disposal areas as well as for those disposal areas should TVA consider closure in place of those areas.

E. Surface Water Impacts

Because of the long operating history of the TVA Fossil Plants, there have been potential opportunities for CCR materials to move into surface water and for dissolved CCR constituents to migrate via ground water flow into surface water. As a part of the EIP, TVA shall describe how it will determine if CCR material and/or dissolved CCR constituents have entered surface water at or adjacent to TVA sites. TVA shall also describe in the EIP how it will assess any impact CCR material and/or dissolved CCR constituents may have on water quality and/or the impact on fish and aquatic life.

1. TVA shall discuss any current information it has for the TVA site that identifies CCR deposition on the streambed for surface water on the TVA site or surface water adjacent to the TVA site.

2. TVA shall describe in the EIP the methods it will use to determine if CCR material has moved from the TVA site into surface water on the TVA site or adjacent to the TVA site. TVA shall propose a procedure for sampling the streambed for CCR material. TVA shall describe sample collection methods, sample preservation and sample analysis methods for CCR materials. All samples shall be analyzed for the CCR constituents listed in Appendices 3 and 4 of the federal CCR regulations. Further, TVA shall propose how it will test sediment and CCR samples taken from riverbeds to determine if CCR constituents dissolve into surface water.

3. TVA shall describe how streambed sample results will be used to develop a map identifying the location of CCR material on the streambed and the depth of the CCR material on the streambed.

4. TVA shall discuss any current information it has for the TVA site that identifies the movement of ground water with dissolved CCR constituents into surface streams on or adjacent to the TVA site. This includes any surface water analyses TVA has performed for samples taken from the seeps and surface stream(s).

5. TVA shall propose a plan to collect and analyze water samples from seeps and surface stream(s) on the TVA site and/or adjacent to the TVA site. This plan shall include sampling locations, sample collection methods, sample preservation and transport and methods for sample analysis. All samples shall be analyzed for the CCR constituents listed in Appendices 3 and 4 of the federal CCR regulations.

6. TVA shall describe how seep and stream sample results will be used to develop a map identifying the location of seep and stream sampling points and the results of the analyses. This map shall also include the location of any public water intakes within 1 mile of the downstream side of the TVA site.

7. TVA shall provide a brief discussion of any studies conducted by TVA or any other agency to determine if CCR materials or dissolved CCR constituents have impacted fish and/or aquatic life.

8. Upon a determination by TDEC of the need to assess the impact of CCR material in surface streams or migration of ground water containing dissolved CCR constituents, TVA shall provide a plan to study the impact of CCR materials and/or constituents on fish and/or aquatic life in surface streams on the TVA site or adjacent to the TVA site.

Robert Wilkinson, P.G., CHMM CCR Technical Manager
2nd Floor TN Tower, W.R. Snodgrass Building
312 Rosa L. Parks Avenue
Nashville, TN 37243
Office: (615) 253-0689
e-mail: Robert.S.Wilkinson@tn.gov

Shari Meghreblian, Ph.D.
Commissioner

Bill Haslam
Governor

November 16, 2018

M. Susan Smelley
Director
Environmental Compliance and Operations
Tennessee Valley Authority
1101 Market Street, BR 4A-C
Chattanooga, TN 37402

RE: TDEC Commissioner's Order OGC 15-1077
TVA Kingston Coal Fired Fossil Fuel Plant
Environmental Investigation Plan Approval

Dear Ms. Smelley:

Tennessee Valley Authority (TVA) submitted the Environmental Investigation Plan (EIP) Revision 4 TVA Kingston Coal Fired Fossil Power Plant (TVA KIF) on November 9, 2018. Included in this revision was the Summary of Public Comments & TVA Responses. Tennessee Department of Environment and Conservation (TDEC) has completed its review of the submittal and found it to be acceptable.

TVA is approved to begin field data collection activities as outlined in the TVA KIF EIP Revision 4. Within 30 days of this letter, TVA will schedule a meeting to present and submit a revised schedule for field data collection activities at TVA KIF.

Should you have any questions, please do not hesitate to contact me via email at Robert.S.Wilkinson@tn.gov or phone at (615) 253-0689.

Sincerely,

Robert Wilkinson, P.G., CHMM

CC:
Chuck Head
Rob Burnette
Jennifer Dodd
Jenny Howard
Roy Quinn
Britton Dotson
Angela Adams
Pat Flood
Tisha Calabrese-Benton
Shawn Rudder
James Clark
Caleb Nelson
Joseph E. Sanders
Bryan Wells

Stantec

Memo

To:	Missy Hedgecoth, Roy Quinn, Brandon Boyd, Paul Thomas	From:	Stantec
File:	Proposed Screening Levels for Sample Results in Environmental Assessment Report (EAR)	Date:	March 26, 2021

Reference: Proposed Screening Levels for Sample Results in the EAR

PURPOSE OF THE TECHNICAL MEMORANDUM

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) for coal combustion residuals (CCR) compliance pursuant to the provisions of Tennessee's solid waste management and remediation laws. As part of the TDEC Order, Stantec is implementing Environmental Investigation Plans (EIPs) at seven TVA Fossil Plants in Tennessee. The EIP for each fossil plant provides Sampling and Analysis Plans (SAPs) for the types of investigations to be conducted at each fossil plant. As specified in the TDEC Order, within 60 days of the completion of the environmental investigations TVA is required to submit an Environmental Assessment Report (EAR), which shall provide *"…an analysis of the extent of soil, surface water, and ground water contamination by CCR at the site. The Department shall evaluate the EAR to determine if the extent of CCR contamination has been fully defined".* Collection of environmental samples is complete or nearing completion at all TVA Fossil Plants subject to the TDEC Order, and development of the EARs has commenced.

As required by the TDEC Order, samples of environmental media were analyzed for the following parameters listed in Appendix III and Appendix IV of the Federal CCR Rule, Title 40 of the Code of Federal Regulations Part 257 (40 CFR 257):

- antimony, arsenic, barium, beryllium, boron, cadmium, calcium, chloride, chromium (total), cobalt, fluoride, lead, lithium, mercury (inorganic), molybdenum, pH (SU), radium 226 & 228, selenium, sulfate, thallium, and total dissolved solids.

Samples were also analyzed for five inorganic constituents listed in Appendix 1 of TN Rule 0400-11-01-.04 that are not listed in 40 CFR 257:

- copper, nickel, silver, vanadium, and zinc.

This Technical Memorandum describes proposed screening levels for the CCR Parameters analyzed in environmental investigation samples. The purpose of the screening levels in the EAR is to identify CCR Parameters in the environmental media that require further assessment in the Corrective Action Risk

Assessment Plan (CARA) to be submitted within 60 days of TDEC approval of the EAR. The screening levels used to evaluate environmental sample results are generic (not specific to an individual person or ecological receptor) and protective – frequently referred to as conservative. Environmental samples were analyzed for up to 26 individual CCR Parameters (listed above), as applicable to the media. CCR Parameters above screening levels will be further evaluated in the human health and ecological risk assessment in the CARA. Screening levels for protection of human health are proposed for groundwater and surface water. Screening levels for protection of ecological receptors are proposed for surface water, mayfly and fish tissue, and sediment. If there is more than one applicable screening level for an environmental medium (e.g. surface water), the lowest value will be selected to evaluate those analytical results in the EAR.

PROPOSED SCREENING LEVELS BY MEDIA

Groundwater

The proposed screening levels for groundwater are protective of the drinking water pathway for residential receptors. Analytical results for parameters detected in groundwater will be compared to screening levels obtained from the following hierarchy of sources:

- US EPA Maximum Contaminant Levels (MCLs)
- Tennessee MCLs in State of Tennessee Solid Waste Processing and Disposal (TN Rule 0400-11-01)
- US EPA groundwater protection standards listed in Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments (40 CFR Part 257.95(h))
- US EPA Secondary Maximum Contaminant Levels (SMCLs)
- US EPA residential tap water Regional Screening Levels (RSL).

The Proposed Human Health Screening Levels for Groundwater for the EAR are presented in Table 1.

Surface Water

Applicable screening levels for surface water are presented for human exposure through use of surface water for drinking water supply and for protection of fish and freshwater aquatic life. When more than one screening level is identified for the same parameter, the lowest of the available values is proposed as the screening level to evaluate surface water analytical results in the EAR.

Analytical results for parameters detected in surface water will be compared to screening levels for domestic water supply obtained from the following hierarchy of sources:

- State of Tennessee Drinking Water Standards (TN DWS) promulgated in the following Rules:
    - General Water Quality Criteria, Surface Water used for Domestic Water Supply (TN Rule 0400-40-03-.03)
    - Solid Waste Processing and Disposal (TN Rule 0400-11-01)

    - Public Water Systems (TN Rule 0400-45-01-.06 MCLS and 0400-45-01-.12 Secondary drinking water regulations)

- US EPA MCLs
- US EPA SMCLs
- US EPA residential tap water RSL
- US EPA Drinking Water Lifetime Health Advisory Level or HAL; (March 2018).

The proposed human health screening levels for surface water are identical to the screening levels for groundwater described previously, except for lead and zinc. The Tennessee criteria for lead for surface water used for Domestic Water Supply (TN Rule 0400-40-03-.03) is 5 micrograms per liter (µg/L) compared to the Tennessee Solid Waste Rule (TN Rule 0400-11-01) criteria of 15 µg/L which is also the alternative GWPS under the CCR Rule. The human health screening level for zinc in surface water is the US EPA Lifetime Health Advisory Level (HAL) of 2,000 µg/L derived from the oral RfD of 0.3 mg/kg bw-day to protect against immune and hematological effects. For groundwater, the screening level for zinc is the SMCL of 5,000 µg/L based on objectionable metallic taste. Selection of the SMCL for groundwater is consistent with the proposed hierarchy of sources.

The Proposed Human Health Screening Levels for Surface Water in the EAR are presented in Table 2.

Surface water screening levels for protection of freshwater aquatic life were identified from the sources described below. Published values for both acute and chronic effects are not available for all parameters analyzed in surface water. Where both acute and chronic values were available, the chronic values were selected since they are lower and more protective than acute values. For some parameters chronic screening levels are published for both total and dissolved concentrations. Hardness-dependent parameters (cadmium, chromium, lead, copper, nickel, silver, and zinc) are expressed as dissolved concentrations and adjusted where appropriate based on stream-specific water chemistry. All other parameters are expressed as total recoverable concentrations (TN Rule 0400-40-03-.03).

The majority of the surface water screening values to be used in the EARs and Ecological Risk Assessments (ERAs) for the TVA fossil plants under the TDEC Order are the Surface Water Screening Values for Hazardous Waste Sites referenced from *USEPA Region 4 Ecological Risk Assessment Supplemental Guidance (March 2018 Update)* or the TDEC General Water Quality Criteria (Chapter 0400-40-03, General Water Quality Criteria). Surface water screening levels that are hardness-dependent have been calculated using the formulae presented in the TDEC General Water Quality Criteria guidelines using site-specific hardness values for the major water bodies at each of the fossil plants. The mean hardness values for each of the major water bodies were determined using the data collected during the Environmental Investigations (EI) at each fossil plant and conservatively rounded down for use in the calculations.

The only surface water screening values that were not referenced from the TDEC or USEPA Region 4 sources cited above were for Radium-226 & -228. The surface water screening values for Radium-226 & -228 were the Biota Concentration Guides (BCG) for water referenced from the U. S. Department of Energy (DOE) report titled *A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota*, DOE Standard (DOE-STD-1153-2019). The BCG is the limiting concentration of a radionuclide in soil, sediment,

or water that would not cause dose rate criteria for protection of populations of aquatic and terrestrial biota to be exceeded.

Human Health and Ecological Screening Levels for Surface Water are presented in Table 2. The proposed screening level for evaluation of surface water in the EAR is the lowest (most conservative) of the available values for each parameter. National Oceanic and Atmospheric Administration's (NOAA) Screening Quick Reference Tables (SQuiRTs) (Buchman 2008) were also reviewed to determine whether additional surface water screening values could be derived for constituents without screening levels in Table 2. Although the SQuiRTs provide screening levels for the dissolved fraction for several constituents where USEPA Region 4 and TDEC screening levels are unavailable, these screening values were not selected because some primary sources presented in SQuiRTs have been superseded and the SQuiRTs were developed in 2008 and are no longer being maintained by NOAA.

Mayfly Critical Body Residues

The mayfly tissue critical body residue values proposed as screening levels were referenced from the *Kingston Ash Recovery Project Non-Time Critical Removal Action River System Baseline Ecological Risk Assessment* (BERA) (Arcadis 2012), which used values from the USEPA/USACE Environmental Residue-Effects Database (ERED). A number of other potential sources of critical body residue data were searched in order to identify additional data and to fill data gaps but no additional data were located. Per Arcadis (2012) "CBR data were selected from literature-derived values from the ERED. The selection process included only whole-body data for the closest relevant species (i.e., mayfly) and life stages (e.g., adult selected over egg) for growth, mortality, or reproductive endpoints. Combined or absorbed doses were preferred over water only exposures. If the data were unpaired (i.e., only a NOAEL or LOAEL was available), either the highest NOAEL or the lowest LOAEL was selected. The corresponding value was extrapolated from the available value by a factor of 10. If only effects concentrations were available (e.g., LC_{50}, ED_{25}, etc.), the lowest effects concentration was selected as the LOAEL, and the estimated NOAEL was set at 1/10th the LOAEL value." The screening levels based on CBR values presented in Arcadis (2012) have been reviewed and accepted by TDEC and USEPA as part of their review and acceptance of the River System BERA (Arcadis 2012). As such, these values have been vetted and deemed acceptable for use as screening levels in the EAR for the fossil plants under the Commissioner's Order. Data presented in the ERED will be further evaluated and CBR values revised, if necessary, as part of the ecological risk assessments presented in the Corrective Action/Risk Assessment (CARA) reports for each of the fossil plants under the Commissioner's Order.

The Proposed Screening Levels for Mayfly Tissue Critical Body Residues for the EAR are presented in Table 3.

Fish Tissue Critical Body Residues

Human consumption of CCR parameters detected in fish fillet samples will be evaluated in the Human Health Risk Assessment in the CARA Plan.

The fish tissue critical body residue values proposed as screening levels for most of the constituents were referenced from the *Kingston Ash Recovery Project Non-Time Critical Removal Action River System Baseline Ecological Risk Assessment* (BERA) (Arcadis 2012), which used values from the USEPA/USACE ERED. As discussed above, the methodology for selecting the fish tissue critical body residue values and the screening levels based on CBR values presented in Arcadis (2012) have been

reviewed and accepted by TDEC and USEPA as part of their review and acceptance of the River System BERA (Arcadis 2012). As such, these values have been vetted and deemed acceptable for use as screening levels in the EAR for the fossil plants under the Commissioner's Order. Data presented in the ERED will be further evaluated and CBR values revised, if necessary, as part of the ecological risk assessments presented in the CARA reports for each of the fossil plants under the Commissioner's Order.

The fish tissue screening levels for selenium were referenced from the Chronic Ambient Water Quality Criterion for Selenium (USEPA 2016). A number of other potential sources of critical body residue data were searched in order to identify additional data and to fill data gaps but no additional data were located.

The Proposed Screening Levels for Fish Tissue Critical Body Residues for the EAR are presented in Table 4.

Sediment

Most of the proposed sediment screening values to be used to evaluate investigation analytical results in the EAR were derived by MacDonald, et al. (2003) in their paper *Development and Evaluation of Numerical Sediment Quality Assessment Guidelines for Florida Inland Waters* and adopted by USEPA Region 4 as their recommended Freshwater Sediment Screening Values presented in *Region 4 Ecological Risk Assessment Supplemental Guidance, March 2018 Update, Screening Values*. The Threshold Effect Concentration (TEC) and Probable Effect Concentration (PEC) values derived by MacDonald, et al. (2003) are consensus-based values derived from multiple toxicity test results for a number of benthic species and are the basis for the majority of the USEPA Region 4 freshwater sediment screening values and correspond to USEPA Region 4 Ecological Screening Value (chronic) and Refinement Screening Value (acute) sediment screening values, respectively.

The USEPA Region 4 Freshwater Sediment Screening Values are recommended to be used for sediment screening values for the following constituents in sediment: antimony, arsenic, cadmium, chromium, cobalt, lead, mercury, selenium (acute), copper, nickel, silver, and zinc.

Several other sources, including NOAA's Screening Quick Reference Tables (SQuiRTs) (Buchman 2008), were referenced to identify sediment screening values in instances where USEPA Region 4 did not have recommended screening values or where other screening values were deemed more toxicologically defensible.

USEPA Region 4 does not have sediment screening values for percent ash; therefore, site-specific values were referenced from the approved EIP and the *Kingston Ash Recovery Project Non-Time Critical Removal Action River System BERA* (Arcadis 2012). Sediment samples from the Emory and Clinch Rivers submitted for laboratory toxicity testing using standard aquatic organisms contained approximately 20 to 90 percent ash. Exposure to sediment with 40 percent ash was associated with 25 percent decreased survival and growth reduction in the test organisms compared to reference sediments. This was considered a biologically significant effect. 20 percent ash was proposed as the threshold triggering quantitative analysis of a sediment sample in the EIPs approved by TDEC. The EIPs for each fossil plant used a value of 20 percent ash in sediment samples as a Phase 1 screening level to determine if additional chemical analyses would be required. If a sediment sample from the zero to six-inch depth increment had less than 20 percent ash composition, then the sample was deemed to have insufficient ash content to pose deleterious effects from ash itself and sediment samples from deeper depth

increments would not be analyzed further. Based on this rationale, the 20 percent ash content is proposed as the chronic sediment screening value for percent ash.

The acute sediment screening value for percent ash is referenced from the *Kingston Ash Recovery Project Non-Time Critical Removal Action River System BERA* (Arcadis 2012). The Kingston BERA (Arcadis 2012) presented multiple toxicity test results that indicated sediment samples with 40 percent ash or greater were associated with statistically and biologically significant adverse effects. Based on these toxicity test results; 40 percent ash content is proposed as the acute sediment screening value for percent ash.

USEPA Region 4 provides sediment screening values for barium based on a study conducted by USEPA Region 5 in 1977 titled *Guidelines for the Pollution Classification of Great Lakes Harbor Sediments*. The sediment ESVs for barium derived by USEPA Region 5 (1977) and cited by USEPA Region 4 (2018) are not effects-based and are not based on measured toxicity to benthic or other organisms, which brings into question their defensibility for use in determining potential ecological risk to sediment-dwelling organisms. An alternative to the USEPA Region 4 sediment screening values for barium (and several other inorganics) is provided by The Netherlands National Institute for Public Health and the Environment (RIVM) in their report titled *Environmental Risk Limits for Nine Trace Elements* (van Vlaardingen, et al., 2005). The RIVM methodology utilizes toxicity data from the scientific literature to derive Environmental Risk Limits (ERL) including: 1) Maximum Permissible Concentration (MPC); and 2) Serious Risk Addition (SRA_{eco}).

The MPC as defined in the Netherlands report (RIVM 2005) is the concentration of a substance in air, water, soil, or sediment that should protect all species in ecosystems from adverse effects of that substance. Depending on the amount of toxicological data available, the lowest toxicity result is divided by a fixed value (assessment factor). When enough data are available, a cut-off value is used. This is the fifth percentile if a species sensitivity distribution of No-Observed-Effect-Concentration (NOEC) is used. This is the hazardous concentration for five percent of the species. This definition correlates well with the definition of the TEC as defined by MacDonald, et al. (2003) and adopted by USEPA Region 4 for chronic sediment screening levels.

The Serious Risk Addition (SRA_{eco}) concentration is the concentration of a substance in soil, sediment, or groundwater at which functions in these compartments will be seriously affected or are threatened to be negatively affected. This is assumed to occur when 50 percent of the species and/or 50 percent of the microbial and enzymatic processes are possibly affected. This definition correlates well with the definition of Probable Effect Concentration (PEC) as defined by MacDonald, et al. (2003) and adopted by USEPA Region 4 for acute sediment screening levels.

Literature-based toxicity data for effects on growth, reproduction or survival are used in the derivation of MPC and SRA_{eco} values. All categories are further subdivided into chronic and acute toxicity values. Chronic values (NOEC or EC_{10}) and acute values (EC_{50} or LC_{50}) are referenced or derived from the relevant studies. The lowest value (the most sensitive toxicity endpoint) of the available data per species is selected. The SRA_{eco} for the water compartment is derived by applying an assessment factor of 10 to the geometric mean of the selected acute toxicity data, which results in an SRA_{eco}, acute. This SRA_{eco}, acute is then compared to the geometric mean of all selected chronic data (SRA_{eco}, chronic). The lower of the SRA_{eco}, acute and the SRA*eco*, chronic value is defined as the SRA_{eco} for the water compartment. No toxicity data were identified for sediment; therefore, all of the MPC and the SRA_{eco} values for sediment

were calculated using surface water toxicity data and equilibrium partitioning by applying sediment-to-water partition coefficients.

The MPC of 240 mg/kg is proposed as the chronic sediment screening value for barium and the SRA_{eco} value of 22,925 mg/kg is proposed as the acute sediment screening value for barium.

USEPA Region 4, or any of the other sources researched for potential sediment screening values, does not provide sediment screening values for beryllium, molybdenum, thallium, or vanadium. As such, the MPC and the SRA_{eco} values for these constituents as derived using the RIVM (van Vlaardingen, et al., 2005) methodology are proposed as sediment screening values.

USEPA Region 4 references the Los Alamos National Laboratory (LANL) ECORISK database (2017) as the source for the sediment screening values for selenium. The chronic sediment screening value is identified as the "No Effect Ecological Screening Value" and the acute sediment screening value is identified as the "Low Effect Ecological Screening Value" in the ECORISK database; however, the source and toxicological basis (if any) of these values is not presented in the ECORISK database. Alternatively, Lemly (2002) has proposed a sediment screening value of 2.0 mg/kg in his book *Selenium Assessment in Aquatic Ecosystems* (2002). The screening level proposed by Lemly (2002) is based on selenium concentrations in sediment that result in body residues in benthic invertebrates that result in deleterious effects to fish and aquatic birds that consume benthic invertebrates. According to Lemly (2002), benthic invertebrates can tolerate significantly higher concentrations of selenium in sediment. Thus, the most important aspect of selenium concentrations in sediment is not direct toxicity to benthic invertebrates themselves, but the dietary source of selenium that benthic invertebrates provide to fish and wildlife species that feed on benthic invertebrates. Based on the information presented by Lemly (2002), 2.0 mg/kg is proposed as the chronic screening value for selenium in sediment and the acute sediment screening value is proposed as 2.9 mg/kg, which is the Refinement Screening Value as presented in USEPA Region 4 (2018). These sediment screening values are conservative compared to the remediation goals for selenium in sediment (3.0 – 3.2 mg/kg) presented in *the Kingston Ash Recovery Project Non-Time Critical Removal Action for the River System Long-Term Monitoring Sampling and Analysis Plan* (TVA, 2013).

USEPA Region 4 does not provide sediment screening values for Radium-226 or Radium-228. However, the DOE provides Biota Concentration Guides (BCG) for sediment in their guidance *A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota* (DOE 2019). The BCG is defined as the limiting concentration of a radionuclide in soil, sediment, or water that would not cause dose rate criteria for protection of populations of aquatic and terrestrial biota to be exceeded. DOE (2019) presents BCG of 100 pCi/g for Radium-226 and 90 pCi/g for Radium-228. These values are recommended for sediment screening values for Radium-226 and Radium-228 individually and the lower of these two values (90 pCi/g) is recommended as the sediment screening value for combined Radium-226 & -228.

The Proposed Ecological Screening Levels for Freshwater Sediment for the EAR are presented in Table 5.

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ATTACHMENTS

Table 1. Proposed Human Health Screening Levels for Groundwater. Environmental Assessment Report

Table 2. Proposed Human Health and Ecological Screening Levels for Surface Water. Environmental Assessment Report

Table 3. Proposed Screening Levels for May Fly Tissue Critical Body Residues. Environmental Assessment Report

Table 4. Proposed Screening Levels for Fish Tissue Critical Body Residues. Environmental Assessment Report

Table 5. Proposed Ecological Screening Levels for Freshwater Sediment. Environmental Assessment Report

Table 1. Proposed Human Health Screening Levels for Groundwater
Environmental Assessment Report

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 MCL
Vanadium	86	RSL
Zinc	5,000	SMCL

Notes:

CCR: coal combustion residuals
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
TN MCL: maximum contaminant level promulgated by State of Tennessee
µg/L: micrograms per liter

Table 2. Proposed Human Health and Ecological Site Specific Screening Levels for Surface Water
Environmental Assessment Report

CCR Parameters	Bull Run Fossil Plant																
	Human Health Surface Water Screening Levels		Ecological Surface Water Screening Levels														
			Bull Run Creek (Hardness = 140 mg/L)					Clinch River (Hardness = 120 mg/L)					Worthington Branch (Hardness = 175 mg/L)				
			Total Chronic	Total Acute	Dissolved Chronic	Dissolved Acute		Total Chronic	Total Acute	Dissolved Chronic	Dissolved Acute		Total Chronic	Total Acute	Dissolved Chronic	Dissolved Acute	
	(µg/L)	Source	(µg/L)	(µg/L)	(µg/L)	(µg/L)		(µg/L)	(µg/L)	(µg/L)	(µg/L)		(µg/L)	(µg/L)	(µg/L)	(µg/L)	
CCR Rule Appendix III Constituents :																	
Boron	4,000	RSL	7,200	34,000	NA	NA	a	7,200	34,000	NA	NA	a	7,200	34,000	NA	NA	a
Calcium	--	--	116,000	NA	NA	NA	a	116,000	NA	NA	NA	a	116,000	NA	NA	NA	a
Chloride	250,000	SMCL	230,000	860,000	NA	NA	a	230,000	860,000	NA	NA	a	230,000	860,000	NA	NA	a
Fluoride	4,000	MCL	2,700	9,800	NA	NA	a	2,700	9,800	NA	NA	a	2,700	9,800	NA	NA	a
pH	6 - 9 S.U.	TN DWS	6.5 - 9	NA	NA	NA	b	6.5 - 9	NA	NA	NA	b	6 - 9	NA	NA	NA	b
Sulfate	250,000	SMCL	NA	NA	NA	NA		NA	NA	NA	NA		NA	NA	NA	NA	
Total Dissolved Solids	500,000	TN DWS/SMCL	NA	NA	NA	NA		NA	NA	NA	NA		NA	NA	NA	NA	
CCR Rule Appendix IV Constituents :																	
Antimony	6	TN DWS/MCL	190	900	NA	NA	a	190	900	NA	NA	a	190	900	NA	NA	a
Arsenic	10	TN DWS/MCL	150	340	150	340	a	150	340	150	340	a	150	340	150	340	a
Barium	2,000	TN DWS/MCL	220	2,000	NA	NA	a	220	2,000	NA	NA	a	220	2,000	NA	NA	a
Beryllium	4	TN DWS/MCL	11	93	NA	NA	a	11	93	NA	NA	a	11	93	NA	NA	a
Cadmium*	5	TN DWS/MCL	1.03	2.65	0.925	2.47	b	0.914	2.28	0.824	2.14	b	1.23	3.30	1.09	3.04	b
Chromium*	100	TN DWS/MCL	114	2375	97.6	751	b	100	2093	86.1	662	b	136	2851	117	901	b
Cobalt	6	RSL	19	120	NA	NA	a	19	120	NA	NA	a	19	120	NA	NA	a
Fluoride	4,000	MCL	2,700	9,800	NA	NA	a	2,700	9,800	NA	NA	a	2,700	9,800	NA	NA	a
Lead*	5	TN DWS	4.88	125	3.62	93.0	b	4.01	103	3.07	78.7	b	6.49	166	4.60	118	b
Lithium	40	RSL	440	910	NA	NA	a	440	910	NA	NA	a	440	910	NA	NA	a
Mercury	2	TN DWS/MCL	0.77	1.4	0.77	1.4	a	0.77	1.4	0.77	1.4	a	0.77	1.4	0.77	1.4	a
Molybdenum	100	RSL	800	7,200	NA	NA	a	800	7,200	NA	NA	a	800	7,200	NA	NA	a
Radium-226 & 228	5 pCi/L	MCL	3 pCi/L	3 pCi/L	NA	NA	c	3 pCi/L	3 pCi/L	NA	NA	c	3 pCi/L	3 pCi/L	NA	NA	c
Selenium	50	TN DWS/MCL	3.1	20	NA	NA	b	3.1	20	NA	NA	b	3.1	20	NA	NA	b
Thallium	2	TN DWS/MCL	6	54	NA	NA	a	6	54	NA	NA	a	6	54	NA	NA	a
TDEC Appendix I Constituents :																	
Copper*	1,300	MCL	12.4	19.2	11.9	18.5	b	10.9	16.6	10.5	16.0	b	15.0	23.7	14.4	22.8	b
Nickel*	100	TN DWS	69.3	624	69.1	622	b	60.9	547	60.7	546	b	83.7	753	83.5	752	b
Silver*	100	TN DWS/SMCL	NA	6.75	NA	5.74	b	NA	5.18	NA	4.40	b	NA	9.91	NA	8.42	b
Vanadium	86	RSL	27	79	NA	NA	a	27	79	NA	NA	a	27	79	NA	NA	a
Zinc*	2,000	HAL	159	159	157	156	b	140	140	138	137	b	193	193	190	188	b

Table 2. Proposed Human Health and Ecological Site Specific Screening Levels for Surface Water
Environmental Assessment Report

CCR Parameters	Cumberland Fossil Plant																
	Human Health Surface Water Screening Levels		Ecological Surface Water Screening Levels														
			Cumberland River (Hardness = 100 mg/L)					Wells Creek (Hardness = 140 mg/L)					Unnamed Tributary (Hardness = 750 mg/L)[d]				
	(µg/L)	Source	Total Chronic (µg/L)	Total Acute (µg/L)	Dissolved Chronic (µg/L)	Dissolved Acute (µg/L)		Total Chronic (µg/L)	Total Acute (µg/L)	Dissolved Chronic (µg/L)	Dissolved Acute (µg/L)		Total Chronic (µg/L)	Total Acute (µg/L)	Dissolved Chronic (µg/L)	Dissolved Acute (µg/L)	
CCR Rule Appendix III Constituents :																	
Boron	4,000	RSL	7,200	34,000	NA	NA	a	7,200	34,000	NA	NA	a	7,200	34,000	NA	NA	a
Calcium	--	--	116,000	NA	NA	NA	a	116,000	NA	NA	NA	a	116,000	NA	NA	NA	a
Chloride	250,000	SMCL	230,000	860,000	NA	NA	a	230,000	860,000	NA	NA	a	230,000	860,000	NA	NA	a
Fluoride	4,000	MCL	2,700	9,800	NA	NA	a	2,700	9,800	NA	NA	a	2,700	9,800	NA	NA	a
pH	6 - 9 S.U.	TN DWS	6.5 - 9	NA	NA	NA	b	6.5 - 9	NA	NA	NA	b	6.5 - 9	NA	NA	NA	b
Sulfate	250,000	SMCL	NA	NA	NA	NA		NA	NA	NA	NA		NA	NA	NA	NA	
Total Dissolved Solids	500,000	TN DWS/SMCL	NA	NA	NA	NA		NA	NA	NA	NA		NA	NA	NA	NA	
CCR Rule Appendix IV Constituents :																	
Antimony	6	TN DWS/MCL	190	900			a	190	900			a	190	900			a
Arsenic	10	TN DWS/MCL	150	340	150	340	a	150	340	150	340	a	150	340	150	340	a
Barium	2,000	TN DWS/MCL	220	2,000	NA	NA	a	220	2,000	NA	NA	a	220	2,000	NA	NA	a
Beryllium	4	TN DWS/MCL	11	93	NA	NA	a	11	93	NA	NA	a	11	93	NA	NA	a
Cadmium*	5	TN DWS/MCL	0.790	1.91	0.718	1.80	b	1.03	2.65	0.925	2.47	b	2.39	7.42	2.03	6.58	b
Chromium*	100	TN DWS/MCL	86.2	1803	74.1	570	b	114	2375	97.6	751	b	268	5612	231	1773	b
Cobalt	6	RSL	19	120	NA	NA	a	19	120	NA	NA	a	19	120	NA	NA	a
Fluoride	4,000	MCL	2,700	9,800	NA	NA	a	2,700	9,800	NA	NA	a	2,700	9,800	NA	NA	a
Lead*	5	TN DWS	3.18	81.6	2.52	64.6	b	4.88	125	3.62	93.0	b	18.6	477	10.9	281	b
Lithium	40	RSL	440	910	NA	NA	a	440	910	NA	NA	a	440	910	NA	NA	a
Mercury	2	TN DWS/MCL	0.77	1.4	0.77	1.4	a	0.77	1.4	0.77	1.4	a	0.77	1.4	0.77	1.4	a
Molybdenum	100	RSL	800	7,200	NA	NA	a	800	7,200	NA	NA	a	800	7,200	NA	NA	a
Radium-226 & 228	5 pCi/L	MCL	3 pCi/L	3 pCi/L	NA	NA	c	3 pCi/L	3 pCi/L	NA	NA	c	3 pCi/L	3 pCi/L	NA	NA	c
Selenium	50	TN DWS/MCL	3.1	20	NA	NA	b	3.1	20	NA	NA	b	3.1	20	NA	NA	b
Thallium	2	TN DWS/MCL	6	54	NA	NA	a	6	54	NA	NA	a	6	54	NA	NA	a
TDEC Appendix I Constituents :																	
Copper*	1,300	MCL	9.33	14.0	8.96	13.4	b	12.4	19.2	11.9	18.5	b	30.5	51.7	29.3	49.6	b
Nickel*	100	TN DWS	52.2	469	52.0	468	b	69.3	624	69.1	622	b	169	1516	168	1513	b
Silver*	100	TN DWS/SMCL	NA	3.78	NA	3.22	b	NA	6.75	NA	5.74	b	NA	41.1	NA	34.9	b
Vanadium	86	RSL	27	79	NA	NA	a	27	79	NA	NA	a	27	79	NA	NA	a
Zinc*	2,000	HAL	120	120	118	117	b	159	159	157	156	b	388	388	382	379	b

Table 2. Proposed Human Health and Ecological Site Specific Screening Levels for Surface Water
Environmental Assessment Report

CCR Parameters	Johnsonville Fossil Plant							John Sevier Fossil Plant								
	Human Health Surface Water Screening Levels		Ecological Surface Water Screening Levels					Ecological Surface Water Screening Levels								
			Tennessee River (Hardness = 60 mg/L)					Holston River (Hardness = 100 mg/L)					Polly Branch (Hardness = 100 mg/L)				
	(µg/L)	Source	Total Chronic (µg/L)	Total Acute (µg/L)	Dissolved Chronic (µg/L)	Dissolved Acute (µg/L)		Total Chronic (µg/L)	Total Acute (µg/L)	Dissolved Chronic (µg/L)	Dissolved Acute (µg/L)		Total Chronic (µg/L)	Total Acute (µg/L)	Dissolved Chronic (µg/L)	Dissolved Acute (µg/L)	
CCR Rule Appendix III Constituents :																	
Boron	4,000	RSL	7,200	34,000	NA	NA	a	7,200	34,000	NA	NA	a	7,200	34,000	NA	NA	a
Calcium	--	--	116,000	NA	NA	NA	a	116,000	NA	NA	NA	a	116,000	NA	NA	NA	a
Chloride	250,000	SMCL	230,000	860,000	NA	NA	a	230,000	860,000	NA	NA	a	230,000	860,000	NA	NA	a
Fluoride	4,000	MCL	2,700	9,800	NA	NA	a	2,700	9,800	NA	NA	a	2,700	9,800	NA	NA	a
pH	6 - 9 S.U.	TN DWS	6.5 - 9	NA	NA	NA	b	6.5 - 9	NA	NA	NA	b	6 - 9	NA	NA	NA	b
Sulfate	250,000	SMCL	NA	NA	NA	NA		NA	NA	NA	NA		NA	NA	NA	NA	
Total Dissolved Solids	500,000	TN DWS/SMCL	NA	NA	NA	NA		NA	NA	NA	NA		NA	NA	NA	NA	
CCR Rule Appendix IV Constituents :																	
Antimony	6	TN DWS/MCL	190	900	NA	NA	a	190	900	NA	NA	a	190	900	NA	NA	a
Arsenic	10	TN DWS/MCL	150	340	150	340	a	150	340	150	340	a	150	340	150	340	a
Barium	2,000	TN DWS/MCL	220	2,000	NA	NA	a	220	2,000	NA	NA	a	220	2,000	NA	NA	a
Beryllium	4	TN DWS/MCL	11	93	NA	NA	a	11	93	NA	NA	a	11	93	NA	NA	a
Cadmium*	5	TN DWS/MCL	0.526	1.16	0.489	1.12	b	0.790	1.91	0.718	1.80	b	0.790	1.91	0.718	1.80	b
Chromium*	100	TN DWS/MCL	56.7	1187	48.8	375	b	86.2	1803	74.1	570	b	86.2	1803	74.1	570	b
Cobalt	6	RSL	19	120	NA	NA	a	19	120	NA	NA	a	19	120	NA	NA	a
Fluoride	4,000	MCL	2,700	9,800	NA	NA	a	2,700	9,800	NA	NA	a	2,700	9,800	NA	NA	a
Lead*	5	TN DWS	1.66	42.6	1.44	36.9	b	3.18	81.6	2.52	64.6	b	3.18	81.6	2.52	64.6	b
Lithium	40	RSL	440	910	NA	NA	a	440	910	NA	NA	a	440	910	NA	NA	a
Mercury	2	TN DWS/MCL	0.77	1.4	0.77	1.4	a	0.77	1.4	0.77	1.4	a	0.77	1.4	0.77	1.4	a
Molybdenum	100	RSL	800	7,200	NA	NA	a	800	7,200	NA	NA	a	800	7,200	NA	NA	a
Radium-226 & 228	5 pCi/L	MCL	3 pCi/L	3 pCi/L	NA	NA	c	3 pCi/L	3 pCi/L	NA	NA	c	3 pCi/L	3 pCi/L	NA	NA	c
Selenium	50	TN DWS/MCL	3.1	20	NA	NA	b	3.1	20	NA	NA	b	3.1	20	NA	NA	b
Thallium	2	TN DWS/MCL	6	54	NA	NA	a	6	54	NA	NA	a	6	54	NA	NA	a
TDEC Appendix I Constituents :																	
Copper*	1,300	MCL	6.03	8.65	5.79	8.31	b	9.33	14.0	8.96	13.4	b	9.33	14.0	8.96	13.4	b
Nickel*	100	TN DWS	33.9	305	33.8	304	b	52.2	469	52.0	468.24	b	52.2	469	52.0	468	b
Silver*	100	TN DWS/SMCL	NA	1.57	NA	1.34	b	NA	3.78	NA	3.22	b	NA	3.78	NA	3.22	b
Vanadium	86	RSL	27	79	NA	NA	a	27	79	NA	NA	a	27	79	NA	NA	a
Zinc*	2,000	HAL	77.7	77.7	76.6	76.0	b	120	120	118	117	b	120	120	118	117	b

Table 2. Proposed Human Health and Ecological Site Specific Screening Levels for Surface Water
Environmental Assessment Report

CCR Parameters	Watts Bar Fossil Plant						
	Human Health Surface Water Screening Levels		Ecological Surface Water Screening Levels				
			Tennessee River (Hardness = 75 mg/L)				
	(µg/L)	Source	Total Chronic (µg/L)	Total Acute (µg/L)	Dissolved Chronic (µg/L)	Dissolved Acute (µg/L)	
CCR Rule Appendix III Constituents :							
Boron	4,000	RSL	7,200	34,000	NA	NA	a
Calcium	--	--	116,000	NA	NA	NA	a
Chloride	250,000	SMCL	230,000	860,000	NA	NA	a
Fluoride	4,000	MCL	2,700	9,800	NA	NA	a
pH	6 - 9 S.U.	TN DWS	6.5 - 9	NA	NA	NA	b
Sulfate	250,000	SMCL	NA	NA	NA	NA	
Total Dissolved Solids	500,000	TN DWS/SMCL	NA	NA	NA	NA	
CCR Rule Appendix IV Constituents :							
Antimony	6	TN DWS/MCL	190	900	NA	NA	a
Arsenic	10	TN DWS/MCL	150	340	150	340	a
Barium	2,000	TN DWS/MCL	220	2,000	NA	NA	a
Beryllium	4	TN DWS/MCL	11	93	NA	NA	a
Cadmium*	5	TN DWS/MCL	0.628	1.44	0.579	1.38	b
Chromium*	100	TN DWS/MCL	68.1	1425	58.6	450	b
Cobalt	6	RSL	19	120	NA	NA	a
Fluoride	4,000	MCL	2,700	9,800	NA	NA	a
Lead*	5	TN DWS	2.21	56.6	1.84	47.2	b
Lithium	40	RSL	440	910	NA	NA	a
Mercury	2	TN DWS/MCL	0.77	1.4	0.77	1.4	a
Molybdenum	100	RSL	800	7,200	NA	NA	a
Radium-226 & 228	5 pCi/L	MCL	3 pCi/L	3 pCi/L	NA	NA	c
Selenium	50	TN DWS/MCL	3.1	20	NA	NA	b
Thallium	2	TN DWS/MCL	6	54	NA	NA	a
TDEC Appendix I Constituents :							
Copper*	1,300	MCL	7.30	10.7	7.00	10.2	b
Nickel*	100	TN DWS	40.9	368	40.8	367	b
Silver*	100	TN DWS/SMCL	NA	2.31	NA	1.96	b
Vanadium	86	RSL	27	79	NA	NA	a
Zinc*	2,000	HAL	93.9	93.9	92.6	91.8	b

Table 2. Proposed Human Health and Ecological Site Specific Screening Levels for Surface Water
Environmental Assessment Report

Notes:

* The freshwater screening values are hardness dependent. These screening values were adjusted using the following equations and parameters provided in TDEC 2019:

Acute Screening Levels (dissolved) = exp{mA[ln(hardness)]+bA } (CF)

Chronic Screening Levels (dissolved) = exp{mC [ln(hardness)]+bC} (CF)

Parameters	mA	bA	mC	bC	Conversation Factor (CF)	
					CMC	CCC
Cadmium	0.9798	-3.866	0.7977	-3.909	1.136672-[(ln hardness)(0.041838)]	1.101672-[(ln hardness)(0.041838)]
Chromium III	0.819	3.7256	0.8190	0.6848	0.316	0.860
Copper	0.9422	-1.700	0.8545	-1.702	0.960	0.960
Lead	1.273	-1.460	1.273	-4.705	1.46203-[(ln hardness)(0.145712)]	1.46203-[(ln hardness)(0.145712)]
Nickel	0.8460	2.555	0.8460	0.0584	0.998	0.997
Silver	1.72	-6.59			0.85	
Zinc	0.8473	0.884	0.8473	0.884	0.978	0.986

ug/L: micrograms per liter
NA = not applicable
SMCL: USEPA secondary maximum contaminant level
HAL: Health advisory level
MCL: USEPA maximum contaminant level
MCLG: Maximum contaminant level goal
TN DWS: drinking water standard promulgated by State of Tennessee
RSL: USEPA regional screening level for residential tapwater (November 2020)

a USEPA Region 4 Surface Water Screening Values for Hazardous Waste Sites (March 2018 Revision).
b Tennessee Department of Environment and Consevation (TDEC), 2019. Chapter 0400-40-03, General Water Quality Criteria.
c U.S. Department of Energy (DOE), 2019. DOE Standard (DOE-STD-1153-2019), A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota. Biota Concentration Guides for water of 4 pCi/L for Radium-226 and 3 pCi/L for Radium-228.
d The mean hardness of surface water in the Unnamed Tributary is approximately 750 mg/L; however, per TDEC water quality guidelines TDEC, 2019), a hardness value of 400 mg/L was used to calculate hardness-dependent water quality criteria.

Red highlight denotes bioaccumulative constituent (USEPA Region 4 Ecological Risk Assessment Supplemental Guidance (March 2018 Update).

Table 3. Proposed Screening Levels for Mayfly Tissue Critical Body Residues
Environmental Assessment Report

CCR Parameters	Mayfly Tissue Critical Body Residue NOAEL (mg/kg-ww)	Mayfly Tissue Critical Body Residue LOAEL (mg/kg-ww)	
CCR Rule Appendix III Constituents :			
Boron	NA	NA	
Calcium	NA	NA	
Chloride	NA	NA	
Fluoride	NA	NA	
pH	NA	NA	
Sulfate	NA	NA	
Total Dissolved Solids	NA	NA	
CCR Rule Appendix IV Constituents :			
Antimony	NA	NA	
Arsenic	0.0249	0.249	a
Barium	NA	NA	
Beryllium	NA	NA	
Cadmium	15.6	156	a
Chromium (total)	0.144	1.44	a
Cobalt	0.1061	1.061	
Fluoride	NA	NA	
Lead	269	2690	a
Lithium	NA	NA	
Mercury	2.7	27	a
Molybdenum	NA	NA	
Radium-226 & 228	NA	NA	
Selenium	0.051	0.51	a
Thallium	1.206	12.06	a
TDEC Appendix I Constituents :			
Copper	26	260	a
Nickel	0.115	1.15	a
Silver	0.23	2.3	a
Vanadium	0.604	6.04	a
Zinc	382	3820	a

Notes:

a Arcadis, 2012. Kingston Ash Recovery Project Non-Time Critical Removal Action River System Baseline Ecological Risk Assessment (BERA).

Toxicity values were selected from the U.S. Army Corps of Engineers/ USEPA Environmental Residue-Effects Database (ERED).

mg/kg-ww - milligrams per kilogram, wet weight

Red highlight denotes bioaccumulative constituent (USEPA Region 4 Ecological Risk Assessment Supplemental Guidance (March 2018 Update).

Table 4. Proposed Screening Levels for Fish Tissue Critical Body Residues
Environmental Assessment Report

CCR Parameters	Whole Body Fish Tissue Critical Body Residue		Liver Tissue Critical Body Residue		Muscle Tissue Critical Body Residue		Ovary Tissue Critical Body Residue	
	NOAEL (mg/kg-ww)	LOAEL (mg/kg-ww)	NOAEL (mg/kg-ww)	LOAEL (mg/kg-ww)	NOAEL (mg/kg-ww)	LOAEL (mg/kg-ww)	NOAEL (mg/kg-ww)	LOAEL (mg/kg-ww)
CCR Rule Appendix III Constituents :								
Boron	NA	NA	NA	NA	NA	NA	NA	NA
Calcium	NA	NA	NA	NA	NA	NA	NA	NA
Chloride	NA	NA	NA	NA	NA	NA	NA	NA
Fluoride	NA	NA	NA	NA	NA	NA	NA	NA
pH	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate	NA	NA	NA	NA	NA	NA	NA	NA
Total Dissolved Solids	NA	NA	NA	NA	NA	NA	NA	NA
CCR Rule Appendix IV Constituents :								
Antimony	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	0.04	0.4 a	0.569	5.69 a	0.076	0.76 a	8.4	84 a
Barium	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium	5.13	51.3 a	NA	NA	NA	NA	NA	NA
Cadmium	0.0019	0.019 a	0.0000137	0.000137 a	0.03	0.12 a	NA	NA
Chromium (total)	0.128	1.28 a	0.042	0.42 a	NA	NA	NA	NA
Cobalt	NA	NA	NA	NA	NA	NA	NA	NA
Fluoride	NA	NA	NA	NA	NA	NA	NA	NA
Lead	0.0278	0.278 a	0.0393	0.393 a	2.3	23 a	NA	NA
Lithium	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	0.006	0.06 a	0.0009	0.009 a	0.08	0.8 a	NA	NA
Molybdenum	NA	NA	NA	NA	NA	NA	NA	NA
Radium-226 & 228	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	8.5	8.5 b	0.524	5.24 a	11.3	11.3 b	15.1	15.1 b
Thallium	0.027	0.27 a	NA	NA	NA	NA	NA	NA
TDEC Appendix I Constituents :								
Copper	0.196	1.96 a	6.52	65.2 a	3.4	34 a	NA	NA
Nickel	11.81	118.1 a	8.22	82.2 a	11.81	118.1 a	NA	NA
Silver	0.0114	0.114 a	19	190 a	NA	NA	NA	NA
Vanadium	0.68	2.7 a	0.03	0.3 a	NA	NA	NA	NA
Zinc	0.45	4.5 a	3.4	34 a	NA	NA	NA	NA

Notes:

a Arcadis, 2012. Kingston Ash Recovery Project Non-Time Critical Removal Action River System Baseline Ecological Risk Assessment (BERA).
Toxicity values were selected from the U.S. Army Corps of Engineers/USEPA Environmental Residue-Effects Database (ERED).

b USEPA, 2016. Chronic Ambient Water Quality Criterion for Selenium. Fish tissue concentrations expressed as mg/kg-dry weight.

mg/kg-ww - milligrams per kilogram, wet weight

Red highlight denotes bioaccumulative constituent (USEPA Region 4 Ecological Risk Assessment Supplemental Guidance (March 2018 Update).

Table 5. Proposed Ecological Screening Levels for Freshwater Sediment
Environmental Assessment Report

CCR Parameters	Freshwater Sediment Screening Values		Sediment Quality Assessment Guidelines[a]	
	Chronic (mg/kg-dw)	Acute (mg/kg-dw)	TEC (mg/kg-dw)	PEC (mg/kg-dw)
CCR Rule Appendix III Constituents :				
Percent Ash	20% b	40% c	NA	NA
Boron	NA	NA	NA	NA
Calcium	NA	NA	NA	NA
Chloride	NA	NA	NA	NA
Fluoride	NA	NA	NA	NA
pH	NA	NA	NA	NA
Sulfate	NA	NA	NA	NA
Total Dissolved Solids	NA	NA	NA	NA
CCR Rule Appendix IV Constituents :				
Antimony	2	25 e	NA	NA
Arsenic	9.8	33 e	9.8	33
Barium	240	22925 f	NA	NA
Beryllium	1.2	42 f	NA	NA
Cadmium	1	5 e	1	5
Chromium	43.4	111 e	43	110
Cobalt	50	NA e	50	NA
Fluoride	NA	NA	NA	NA
Lead	35.8	128 e	36	130
Lithium	NA	NA	NA	NA
Mercury	0.18	1.1 e	0.18	1.1
Molybdenum	38	69760 f	NA	NA
Radium-226 & 228	90 pCi/g	90 pCi/g d	NA	NA
Selenium	2 g	2.9 e	NA	NA
Thallium	1.2	10 f	NA	NA
TDEC Appendix I Constituents :				
Copper	31.6	149 e	32	150
Nickel	22.7	48.6 e	23	49
Silver	1	2.2 e	NA	NA
Vanadium	66	564 f	NA	NA
Zinc	121	459 e	120	460

Notes:
mg/kg-dw - Milligrams per kilogram dry weight
NA - Not Available

a MacDonald, et al., 2003. Development and Evaluation of Numerical Sediment Quality Assessment Guidelines for Florida Inland Waters. TEC - Threshold Effect Concentration, PEC - Probable Effect Concentration.
b Environmental Investigation Plans (EIP) for TVA fossil plants under the TDEC Consent Order.
c Arcadis, 2012. Kingston Ash Recovery Project Non-Time Critical Removal Action River System Baseline Ecological Risk Assessment (BERA).
d U.S. Department of Energy (DOE), 2019. DOE Standard (DOE-STD-1153-2019), A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota. Biota Concentration Guides for sediment of 100 pCi/g for Radium-226 and 90 pCi/g for Radium-228.
e USEPA Region 4 Sediment Screening Values for Hazardous Waste Sites (March 2018 Revision).
f National Institute for Public Health and the Environment (RIVM), 2005. Environmental Risk Limits for Nine Trace Elements. The Maximum Permissible Concentration (MPC) is used for the chronic value and the Serious Risk Addition (SRAeco) is used for the acute value.
g Lemly, A.D., 2002. Selenium Assessment in Aquatic Ecosystems
Red highlight denotes bioaccumulative constituent (USEPA Region 4 Ecological Risk Assessment Supplemental Guidance (March 2018 Update).

Robert Wilkinson, P.G., CHMM CCR Technical Manager
2nd Floor TN Tower, W.R. Snodgrass Building
312 Rosa L. Parks Avenue
Nashville, TN 37243
Phone: (615) 598-3272
e-mail: Robert.S.Wilkinson@tn.gov

February 23, 2021

Shawn Rudder
Sr. Manager
Waste Permits, Compliance, and Monitoring
Tennessee Valley Authority
1101 Market Street, BR 4A
Chattanooga, TN 37402

RE: TDEC Commissioner's Order OGC15-0177
Environmental Assessment Report Screening Levels
Response to TDEC Comments

Dear Mr. Rudder:

Tennessee Valley Authority (TVA) submitted the Commissioner's Order OGC15-0177 (Order) Proposed Screening Levels for Sample Results in the Environmental Assessment Report (EAR) Technical Memorandum Response to Comments on February 8, 2021. The Tennessee Department of Environment and Conservation (TDEC) has completed its review submittal and found it acceptable with the following comments:

- TVA is proposing to define *"unacceptable risks"* by referring to *"reasonably interpreted to be negligible."* TDEC does not agree with this proposed definition and it is not appropriate to be included in this document. Coal Combustion Residual (CCR) constituent concentrations and the potential risks to human health and the environment will be evaluated in the Corrective Action/Risk Assessment (CARA) phase of the Order process.

Should you have any questions, please do not hesitate to contact me via email at Robert.S.Wilkinson@tn.gov or phone at (615) 598-3272.

Sincerely,

Robert Wilkinson, P.G., CHMM

CC:

Pat Flood	Britton Dotson	James Clark
Rob Burnette	Angela Adams	Caleb Nelson
Beth Rowan	Jim Ozment	Anna Fisher
Brandon Boyd	Kelly Love	Roy Quinn

Robert Wilkinson, P.G., CHMM CCR Technical Manager
2nd Floor TN Tower, W.R. Snodgrass Building
312 Rosa L. Parks Avenue
Nashville, TN 37243
Phone: (615) 598-3272
e-mail: Robert.S.Wilkinson@tn.gov

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EIP-EAR Cross-Reference Table
Kingston Fossil Plant

EIP Section	Request No.	TDEC Information Request	Associated EAR Section
3.1 TDEC Site-Specific Environmental Investigation Requests			
3.1.TDEC Site-Specific Environmental Investigation Requests, 3.1.1	1	Existing or additional site characterization shall include a discussion of fluctuations in ground water elevations that may be connected to Watts Bar Lake levels, seasonal variations or other factors.	Chapter 5.1 - Groundwater and Hydrogeological Investigations
3.1.TDEC Site-Specific Environmental Investigation Requests, 3.1.2	2	Existing or additional site characterization shall estimate the amount of CCR material that is below the upper most aquifer for the Stilling Pond, historic Sluice Trench and the "ball field" temporary storage area. The upper most aquifer must be identified to accurately make this determination.	Chapter 4.3 - CCR Material Quantity Assessment and Chapter 5.1 - Groundwater and Hydrogeological Investigations
3.1.TDEC Site-Specific Environmental Investigation Requests, 3.1.3	3	TVA shall provide a schedule for the placement of any additional borings/monitoring wells proposed at the Kingston site as well as a map identifying the location all borings and monitoring wells that TVA plans to use as a part of its Environmental Investigation (existing and proposed). TVA shall present the reasons for selecting the location of additional boings/monitoring wells at the site. Further, TVA shall install/identify two ground water monitoring wells to serve as background ground water monitoring wells for the site. TVA shall have a TN Licensed Professional Geologist on site to log the installation borings and/or ground water monitoring to install borings and ground water monitoring wells as well as the method of construction for ground water monitoring wells. TVA shall propose a sampling plan to analyze soil, overburden and CCR material generated during on-site drilling for Appendix III and IV CCR constituents.	NA - Included in the EIP
3.1.TDEC Site-Specific Environmental Investigation Requests, 3.1.4	4	TVA shall characterize the site's hydrogeology to better understand the cause of the Red-Water seeps at the East Dike/Engineered Red-Water Wetlands. The investigation should determine if the source might be either infiltration through the Interim Ash Staging Area (ballfield) or groundwater flow from offsite.	Included in the EIP and Chapter 6 - Seep Investigation
3.1.TDEC Site-Specific Environmental Investigation Requests, 3.1.5	5	TVA shall gather sufficient information to provide a three dimensional picture of the CCR material disposed in the Stilling Pond, Sluice Trench and "Ballfield" area. TVA shall gather enough information to determine the volume of CCR material disposed in each area.	Chapter 4.3 - CCR Material Quantity Assessment
3.2 TDEC Hydrogeologic Report Information Request			
3.2 TDEC Hydrogeologic Report Information Requests, 3.2.1	1	TVA shall collect sufficient data from existing and proposed ground water monitoring wells and from existing and proposed soil borings to allow TVA to determine the following results that will be included in the Environmental Assessment Report: i.A ground water map for the site presenting the ground water elevation ii.Ground water flow rate and direction; and iii.Location of ground water monitoring wells where the level of CCR constituents exceed the EPA CCR levels provided in Appendices III and IV of the rule;	Chapter 5.1 - Groundwater and Hydrogeological Investigations
3.3 TDEC Water Use Survey Information Request			
3.3. TDEC Water Use Survey Information Requests, 3.3.1	1	TVA shall conduct a water use survey as required by TDEC for the environmental investigation at other TVA Coal fired power plants. The survey shall include water wells and springs used by for either domestic or business purposes.	Chapter 5.3 - Water Use Survey
3.4 TDEC Ground Water Monitoring Information Request			
3.4. TDEC Ground Water Monitoring Information Requests, 3.4.1	1	Due to the 2008 CCR release, there is extensive data for this site including ground water monitoring data. TVA should include a catalog of existing ground water monitoring wells that will be used in determining ground water flow rates, current ground water elevation and direction of ground water flow. TVA shall propose additional ground water monitoring wells, as needed, to accurately identify ground water quality, flow direction, velocity, quality and influence due to release of CCR constituents. TVA shall provide a ground water monitoring schedule that identifies the ground water monitoring wells that will be sampled, sampling methodology, sample collection and transportation, analytical methods used for analyses and the qualifications of the laboratory performing the analyses. All samples shall be analyzed for Appendix III and IV CCR constituents. Disposal units regulated by a landfill permit will need to incorporate the additional constituents through the end of post closure care period.	NA - Included in the EIP
3.5 TDEC Ground Water – Chemical and Physical Properties Information Request			
3.5. TDEC Ground Water – Chemical and Physical Properties Information Request, 3.5.1	1	Ground Water samples analyzed from Monitoring Well KIF-22 exceeded the Drinking Water MCL for Arsenic. TVA suggested the AS levels were higher than TVA Kingston Fossil Plant Environmental Investigation Plan expected due to the influenced of Total Suspended Solids in the ground water samples taken. TVA shall provide a science based explanation of this statement. TVA should explain its position that the Stilling Pond is contributing to the AS levels in Monitoring Well KIF-22.	Included in the EIP and Chapter 1.2.3 State Programs
3.5. TDEC Ground Water – Chemical and Physical Properties Information Request, 3.5.2	2	TVA shall determine if the level of the ground water at the TVA KIF site is controlled by the level of the Emory River. If the Emory River affects the ground water level, then TVA shall collect data to determine the extent of the impact of the Emory River on the ground water table below the TVA KIF site.	Chapter 5.1 - Groundwater and Hydrogeological Investigations
3.6. TDEC Structural and Seismic Stability Information Request			
3.6. TDEC Structural and Seismic Stability Information Requests, 3.6.1	1	Given the site stabilization work completed as a part of the CERCLA closure of the industrial landfill, additional analyses of the structural and seismic stability of the Stilling Pond is needed for the Stilling Pond once it is dewatered to determine if the Stilling Pond may be closed in place. TDEC has reviewed EPA's comments about the seismic stability of the Stilling Pond. TDEC concurs with EPA's statement "the underlying potential for liquefaction-induced failure of these units remains a concern". The Stilling Pond at KIF is one of the units referenced.	Included in the EIP and Chapter 4.1 - Geotechnical Investigation

EIP Section	Request No.	TDEC Information Request	Associated EAR Section
3.6. TDEC Structural and Seismic Stability Information Requests, 3.6.2	2	TVA shall provide a description of the methods it will employ to conduct seismic stability analyses, specifically, embankment liquefaction potential analysis for the Stilling Pond. TVA shall provide a schedule for conducting this analysis.	NA - Included in the EIP
3.6. TDEC Structural and Seismic Stability Information Requests, 3.6.3	3	It is our understanding that TVA has conducted seismic analyses for the Stilling Pond area and that if the Stilling Pond were closed in place there would be movement of Stilling Pond during a seismic event. TDEC cannot approve closure of the Stilling Pond in place, if the seismic and structural stability of the Stilling Pond does not meet the criteria established in the U.S. Environmental Protection Agency Coal Combustion Residual Rule, even if the Stilling Pond may not be "specifically" subject to those rules.	Included in the EIP and Chapter 4.1 - Geotechnical Investigation
3.7 TDEC Site Geology Information Request			
3.7. TDEC Site Geology Information Requests, 3.7.1	1	Due to the 2008 CCR release, there is extensive data for this site including subsurface geology. TVA should include a catalog of existing ground water monitoring wells and soil borings subsurface geological conditions and stability and characteristics of local hydrogeology. TVA shall propose the location and construction of additional ground water monitoring wells and soil borings that will provide data to fully characterize the geology of this site.	NA - Included in the EIP
3.7. TDEC Site Geology Information Requests, 3.7.2	2	TVA shall collect sufficient data to prepare a three dimensional picture of the subsurface environment from ground surface to bedrock. This shall include the depth of CCR material and native soil, sand and rock, the physical characteristics of these materials and any geologic anomalies discovered during investigation.	Chapter 4.3 - CCR Material Quantity Assessment
4.1 A. Site Information		**TVA shall provide information about CCR storage and disposal sites at the TVA Fossil Plant. TDEC expects TVA to include how it will provide the following information about each TVA Fossil Plant site as a part of its EIP:**	
4.1 A. Site Information, 4.1.1	1	All information about the natural chemistry of the soils in the area of the TVA Fossil Plant. This includes the naturally occurring levels of metals and other CCR constituents present in the soil. TVA shall propose, in the EIP, the collection of soil samples within a one-mile radius of the specific fossil plant to supplement the information gained from local soil studies, reports or soil profiles. Of particular interest are all constituents listed in the federal CCR regulations Appendix 3 Detection Monitoring and Appendix 4 Assessment Monitoring found on page 21500 of the Friday, April 17, 2015 Federal Register (Appendices 3 and 4 CCR constituents).	Included in the EIP and Chapter 3 - Background Soil Investigation
4.1 A. Site Information, 4.1.2	2	TVA shall propose a sampling plan to determine the leachability of CCR constituents from CCR material in surface Impoundments, landfills and non-registered sites at each TVA site. The plan should include sampling points at each disposal area and at different depths in each disposal area. TVA shall describe sample collection methods, sample transport, analytical methodology and the qualifications of the laboratory selected to perform the analyses.	NA - Included in the EIP
4.1 A. Site Information, 4.1.3	3	Information about the area surrounding the TVA Fossil Plant location before the TVA Fossil Plant was constructed. TVA shall provide in its EIP, geologic maps before the impoundment was created; if an impoundment is adjacent to the TVA Fossil Plant site. TVA discuss topographic maps from the pre-embayment time period and how these maps will be used to identify surface water features such as springs, the original flow of surface streams, etc. in the Environmental Assessment Report (EAR);	Included in the EIP and Chapter 2.4 - Physical Characteristics
4.1 A. Site Information, 4.1.4	4	Discuss if construction design information for original CCR surface impoundments, specifically any construction drawings or engineering plans, are available. It is important to identify the surface elevation and location of surface impoundments, landfills or non-registered disposal areas when originally constructed. TVA should explain if/how the information to identify the materials used to construct these disposal areas.	Included in the EIP, Chapter 2 - Site History and Physical Characteristics, and Chapter 4.3 - CCR Material Quantity Assessment
4.1 A. Site Information, 4.1.5	5	Discuss the information available and additional information that will be gathered to provide a three-dimensional profile of the CCR materials from the current elevation of all surface impoundments, landfills and/or non-registered disposal sites to the natural occurring surface below each structure. Also discuss how TVA plans to provide an estimated amount of CCR material disposed within each structure and the total amount of CCR material disposed at each site. Discuss the methods that TVA will use to provide drawings (to scale) that illustrate the height, length and breadth of the CCR disposal areas in relation to the naturally occurring features of each site. Comprehensively define the amount and location of CCR material at each site.	Included in the EIP, Chapter 2.4 - Physical Characteristics, and Chapter 4.3 - CCR Material Quantity Assessment
4.1 A. Site Information, 4.1.6	6	Describe the method TVA shall use to provide a water balance analysis for active surface impoundments at each TVA site. This should include all wastewater and surface water runoff entering the impoundment from the TVA site and the amount of water discharged from the surface impoundment(s) into receiving streams at the NPDES permitted discharge point. TVA shall also describe briefly how it will determine the transpiration rate of water from the surface impoundment(s) into the atmosphere.	NA - the Water Balance Analysis was removed from the scope of the EIP and approved by TDEC
4.2 B. Water Use Survey			
4.2.1 B. Water Use Survey, 4.2.1	1	As a part of the Environmental Assessment, TVA is required to conduct a water use survey. The purpose of the water use survey is to determine if any surface water or ground water (water wells or springs) are being used by local residents or by TVA as domestic water supplies. TVA shall describe how it will conduct a water use survey within ½ mile of the boundary of the TVA site. TVA shall describe how it will determine the construction, depth and location of private water wells identified in the survey. If TVA determines local surface water and/or ground water is used as a source of domestic water supply within a ½ mile radius of the TVA site, the EIP shall include an offsite ground water and surface water sampling plan as a part of the EIP.	Chapter 5.3 - Water Use Survey

EIP Section	Request No.	TDEC Information Request	Associated EAR Section
4.3 C. Groundwater Monitoring and Mapping		**The EPA CCR rules specify constituents that should be included for analysis for groundwater sampling. The constituents for Groundwater Detection Monitoring are listed in Table Appendix 3 of the EPA CCR regulations and the constituents for Groundwater Assessment Monitoring are listed in Table Appendix 4 of the EPA CCR regulations. TDEC is requiring TVA to include a description of the groundwater monitoring plan it will implement at each TVA site. All groundwater samples collected as a part of the Groundwater Monitoring Plan shall be analyzed for the CCR constituents listed in Tables 3 and 4 of the federal CCR regulations. Items to include in the EIP are:**	
4.3 C. Groundwater Monitoring and Mapping, 4.3.1	1	A discussion of all ground water monitoring wells TVA has installed/abandoned/closed at the TVA site as well and any springs that have been monitored at the TVA site or adjacent to the TVA site. TVA shall discuss the data it TVA has generated from historical sampling of ground water monitoring wells and springs. TVA shall include all ground water monitoring construction information, location and historical ground water monitoring data in each TVA site's EAR.	Included in the EIP and Chapter 5.1 Groundwater and Hydrogeological Investigations
4.3 C. Groundwater Monitoring and Mapping, 4.3.2	2	A discussion of the location of at least two background ground water monitoring wells including the reasons for proposed their proposed location.	Included in the EIP and Chapter 5.1 Groundwater and Hydrogeological Investigations
4.3 C. Groundwater Monitoring and Mapping, 4.3.3	3	A discussion of additional ground water monitoring wells that will be installed to complete a ground water monitoring network at the TVA site around all surface impoundments, landfills and/or non-registered disposal sites; including the location of existing or proposed ground water monitoring wells down gradient of all CCR disposal areas on the TVA site. TVA shall propose a ground water monitoring network that will provide data to develop a TVA site wide ground water potentiometric surface map. TVA shall ensure that the ground water monitoring locations (current and proposed) in the EIP will accurately determine groundwater flow and direction.	Included in the EIP and Chapter 5.1 Groundwater and Hydrogeological Investigations
4.3 C. Groundwater Monitoring and Mapping, 4.3.4	4	A discussion of the construction methods TVA will use to install additional ground water monitoring wells. This includes drilling method, methods and personnel for logging cuttings and cores, well construction and well development. A scaled diagram of a properly completed monitoring well shall be provided in the EIP.	NA - Included in the EIP
4.3 C. Groundwater Monitoring and Mapping, 4.3.5	5	A ground-water monitoring plan for sampling all wells and springs included in the monitoring network. This should include the methods TVA shall use to collect ground water samples, the analytical methods to be used for ground water sample analyses, methods for sample transport from point of collection to the laboratory and identification and qualification of the laboratory(ies) that will perform sample analyses.	NA - Included in the EIP
4.3 C. Groundwater Monitoring and Mapping, 4.3.6	6	Describe any existing information available and additional data needed to develop a map which identifies the current ground water surface elevation under the landfill(s), surface impoundment(s) and/or non-registered site(s). If additional data is needed to provide ground water elevations across the TVA site, below the footprint of the landfill(s), surface impoundment(s) and/or non-registered site(s), describe the methods TVA plans to use to collect the data. TVA shall collect sufficient data to create a map that clearly delineates the ground water surface in the ash disposal areas such that (1) the CCR material between the original ground surface and the top of the current ground water table is defined and (2) CCR material between the current ground water surface and the surface elevation of the CCR disposal area is clearly defined. TVA shall also collect pore water samples from CCR material that is below the current ground water surface and from CCR material that is below the projected ground water surface with closure in place. TDEC has not determined that closure in place is a corrective action option at any TVA site; however; this information is needed should TVA propose closure in place.	Chapter 4.3 - CCR Material Quantity Assessment, and Chapter 5.1 - Groundwater and Hydrogeological Investigations
4.3 C. Groundwater Monitoring and Mapping, 4.3.7	7	Describe how TVA will define groundwater contaminant plumes identified using currently available groundwater monitoring data and new groundwater monitoring data gathered from the installation and sampling of new groundwater monitoring wells. TVA will also discuss its strategy to determine the extent of any CCR constituent plume should the initial groundwater monitoring network not define the full extent of the CCR constituent groundwater plume at the site. This should include the science it will use to extend its groundwater monitoring network.	Chapter 5.1 Groundwater and Hydrogeological Investigations
4.4 D. TVA Site Conditions			
4.4 D. TVA Site Conditions, 4.4.1	1	Discuss all current information available about the geologic lithology (formations, bedding planes, etc.) and their relevance to natural seeps, springs and karst features on the TVA site; including the CCR disposal areas. Some limestone formations are very susceptible to solution channeling, especially when they have been disturbed through natural events or construction activities such as blasting. TVA shall describe the methods it will use to determine whether solution channeling has occurred at and near the soil/rock interface;	Included in the EIP and Chapter 2.4 - Physical Characteristics
4.4 D. TVA Site Conditions, 4.4.2	2	Discuss all current information about the geologic structure below the TVA site and how it may be used to help determine if faults and/or fractures have been identified in the subsurface. TVA shall describe the methods it will use to collect additional data (faults, fractures, bedding planes, karst features, etc.) to determine whether faulting and fracturing has impacted and/or controls groundwater movement. Describe how TVA will determine if identified faults, fractures, bedding planes, karst features, etc. are filled to the point that they limit or eliminate ground water flow.	Included in the EIP and Chapter 2.4 - Physical Characteristics
4.4 D. TVA Site Conditions, 4.4.3	3	Discuss existing data available to TVA to map top of bedrock; i.e. existing boring and ground water monitoring well construction data. TVA shall describe the methods (surface geophysics; installation of borings/ground water monitoring wells) it will use to collect additional data to map top of bedrock. The EIP shall include a description of the data collection methods TVA will use to determine the thickness and types of natural material overlying bedrock as well as the top of bedrock contours. For all new soil borings, TVA shall provide the location of the borings, the information used to determine boring location, the drilling method to be used, how the borings will be logged. Logging shall be performed by a Professional Geologist licensed to practice in Tennessee. Logs shall provide the following information when presented in the EAR; soil type, depth and changes, identify geologic formations, depth of formation, karst features, fractures, bedding planes, and any other pertinent information. TVA shall provide an example of a boring log in the EIP.	Included in the EIP, Chapter 4.1 Geotechnical Investigation and Chapter 4.3 Material Quantity Assessment
4.4 D. TVA Site Conditions, 4.4.4	4	When/if TVA divided original Coal Combustion Residual (fly ash, bottom ash and gypsum) surface impoundments into individual units (surface impoundments, non-registered disposal areas and or landfills), TVA shall discuss where this has happened on each TVA site. As a part of the EAR, TVA shall discuss the source of information reviewed to provide the specifications of those structural changes. Discuss if there are as built drawings or engineering plans for the modifications TVA has made at each site made. If there is not existing information that describes the structural changes in the original surface impoundment(s) or non-registered site(s), TVA shall discuss in the EIP how it will collect the information needed to document structural changes over time. This information is needed in determining the structural and seismic stability of each TVA site.	Included in the EIP, Chapter 2.2 CCR Management Unit History and Land Use, and Chapter 4.3 Material Quantity Assessment
4.4 D. TVA Site Conditions, 4.4.5	5	Stipulate whether there are any as-built designs for the interface between the originally disposed CCR material and any disposal structures constructed above the original disposal area.	Included in the EIP-and Chapter 4.3 - CCR Material Quantity Assessment
4.4 D. TVA Site Conditions, 4.4.6	6	TVA shall discuss any existing stability calculations for final permitted design elevation for all landfills. Unless TDEC specifies otherwise, TVA shall conduct new stability calculations for all landfills, surface impoundments and/or non-registered disposal sites. The EIP shall describe the method TVA will use to determine structural stability. TVA shall provide stability calculations for each disposal area based upon (1) the permitted final elevation or planned final elevation for each landfill, (2) the current elevation for all surface impoundments and/or (3) the current elevation for all non-registered disposal location.	Included in the EIP and Chapter 4.1 - Geotechnical Investigation
4.4 D. TVA Site Conditions, 4.4.7	7	TVA shall specify how it will determine the construction methods and properties of the drainage layers between each “stacked layer” for permitted CCR landfills; including where the drainage layer discharges.	Included in the EIP and Chapter 2.2 CCR Management Unit History and Land Use

EIP Section	Request No.	TDEC Information Request	Associated EAR Section
4.4 D. TVA Site Conditions, 4.4.8	8	TVA shall review Section VI.D.5 (page 21373) of the section of the Federal CCR Preamble that describes areas of concern regarding overfill at landfills. TVA shall explain how it will determine if there are potential overfill situations for each surface impoundment/landfill at the TVA site.	NA - Included in the EIP
4.4 D. TVA Site Conditions, 4.4.9	9	Discuss current information/data that is available to estimate the shear strength of the CCR materials in the landfill(s), surface impoundment(s) and/or nonregistered sites. If there is not sufficient data available to determine shear strength, describe the methods TVA shall use to collect this data. If there is existing data collected during installation of soil/rock borings or construction of ground water monitoring wells, provide a brief description of this data and how it will be presented for use in the EIP.	Included in the EIP and Chapter 4.1 - Geotechnical Investigation
4.4 D. TVA Site Conditions, 4.4.10	10	TVA shall provide static, seismic and liquefaction analysis in accordance with 257.63 and 257.73 of the Federal CCR regulations for final permitted design elevations for Landfills that are defined by the Federal Regulations as overfills. If the analyses have not been completed, then TVA shall provide analyses for each landfill based upon either the permitted final elevation for each or for the planned final elevation for each; should TVA decide it does not need to use the entire permitted capacity of any permitted CCR landfill. TVA shall identify and analyze the critical cross section(s) and document that the modeling represents the actual field conditions at the cross section location(s). TVA shall also address foundation settlement of these Landfills.	NA - Included in the EIP
4.4 D. TVA Site Conditions, 4.4.11	11	TVA shall discuss any current dam safety analysis performed at the TVA site for all landfills, surface impoundments and/or non-registered disposal areas. If dam safety analysis has not been performed for each disposal area or if TDEC determines the dam safety analysis is inadequate, then TVA shall describe the method(s) it will use to determine the "dam safety factor" for all disposal areas at the TVA site.	NA - Included in the EIP
4.4 D. TVA Site Conditions, 4.4.12	12	TVA shall discuss any current information or assessments regarding seismic stability for the TVA site, including existing seismic analysis for each surface impoundment(s), landfill(s) and/or nonregistered site(s) s at the TVA site. TVA shall describe in the EIP the method it will use to determine the size of the seismic event that would cause structural failure for entire area of the surface impoundments, landfills and/or non-registered disposal sites at the TVA site. The seismic analysis method proposed by TVA shall provide seismic data comparable to the requirements for seismic analysis in the federal CCR regulations at CFR 257.63. The seismic analysis plan shall determine the seismic stability of the entire TVA site and any improvements need to ensure seismic stability for the site, as it exists today and for closure in place. Soils below the surface impoundments and landfill shall be evaluated for liquefaction potential. If these soils are found to be susceptible to liquefaction, stability calculations shall be performed which account for liquefaction.	Chapter 4.1 - Geotechnical Investigation
4.4 D. TVA Site Conditions, 4.4.13	13	TVA shall discuss how the structural integrity of the entire area of CCR disposal (surface impoundment(s), landfill(s) and non-registered sites) shall be determined. TVA shall include in the EIP the methods and models it will use to evaluate structural integrity as discussed in CFR 257.73(d) and (e).	Chapter 4.1 - Geotechnical Investigation
4.4 D. TVA Site Conditions, 4.4.14	14	Discuss any current information available that may be used to determine the ability of the local geology to provide sufficient structural stability for the existing surface impoundments, landfills and/or non-registered disposal areas at the TVA site as well as any disposal area considered for closure in place. TDEC anticipates there will not be sufficient existing structural stability information for this analysis. Describe the methods TVA shall employ to collect data that may be used to determine the capability of the geologic formation at the TVA site to provide structurally sound/load bearing strength for existing CCR disposal areas as well as for those disposal areas should TVA consider closure in place of those areas.	Chapter 4.1 - Geotechnical Investigation
4.5 E. Surface Water Impacts		**Because of the long operating history of the TVA Fossil Plants, there have been potential opportunities for CCR materials to move into surface water and for dissolved CCR constituents to migrate via groundwater flow into surface water. As a part of the EIP, TVA shall describe how it will determine if CCR material and/or dissolved CCR constituents have entered surface water at or adjacent to TVA sites. TVA shall also describe in the EIP how it will assess any impact CCR material and/or dissolved CCR constituents may have on water quality and/or the impact on fish and aquatic life.**	
4.5 E. Surface Water Impacts, 4.5.1	1	TVA shall discuss any current information it has for the TVA site that identifies CCR deposition on the streambed for surface water on the TVA site or surface water adjacent to the TVA site.	Chapter 7 - Surface Streams, Sediment and Ecological Investigations
4.5 E. Surface Water Impacts, 4.5.2	2	TVA shall describe in the EIP the methods it will use to determine if CCR material has moved from the TVA site into surface water on the TVA site or adjacent to the TVA site. TVA shall propose a procedure for sampling the streambed for CCR material. TVA shall describe sample collection methods, sample preservation and sample analysis methods for CCR materials. All samples shall be analyzed for the CCR constituents listed in Appendices 3 and 4 of the federal CCR regulations. Further, TVA shall propose how it will test sediment and CCR samples taken from riverbeds to determine if CCR constituents dissolve into surface water.	NA - Included in the EIP
4.5 E. Surface Water Impacts, 4.5.3	3	TVA shall describe how streambed sample results will be used to develop a map identifying the location of CCR material on the streambed and the depth of the CCR material on the streambed.	Chapter 7 - Surface Streams, Sediment and Ecological Investigations
4.5 E. Surface Water Impacts, 4.5.4	4	TVA shall discuss any current information it has for the TVA site that identifies the movement of ground water with dissolved CCR constituents into surface streams on or adjacent to the TVA site. This includes any surface water analyses TVA has performed for samples taken from the seeps and surface stream(s).	Chapters 7 - Surface Streams, Sediment and Ecological Investigations and Chapter 6 - Seep Investigation
4.5 E. Surface Water Impacts, 4.5.5	5	TVA shall propose a plan to collect and analyze water samples from seeps and surface stream(s) on the TVA site and/or adjacent to the TVA site. This plan shall include sampling locations, sample collection methods, sample preservation and transport and methods for sample analysis. All samples shall be analyzed for the CCR constituents listed in Appendices 3 and 4 of the federal CCR regulations.	NA - Included in the EIP
4.5 E. Surface Water Impacts, 4.5.6	6	TVA shall describe how seep and stream sample results will be used to develop a map identifying the location of seep and stream sampling points and the results of the analyses. This map shall also include the location of any public water intakes within 1 mile of the downstream side of the TVA site.	Included in the EIP, Chapter 6 - Seep Investigation, and Chapter 7 - Surface Streams, Sediment and Ecological Investigations
4.5 E. Surface Water Impacts, 4.5.7	7	TVA shall provide a brief discussion of any studies conducted by TVA or any other agency to determine if CCR materials or dissolved CCR constituents have impacted fish and/or aquatic life.	Included in the EIP and Chapter 7 - Surface Streams, Sediment and Ecological Investigations
4.5 E. Surface Water Impacts, 4.5.8	8	Upon a determination by TDEC of the need to assess the impact of CCR material in surface streams or migration of ground water containing dissolved CCR constituents, TVA shall provide a plan to study the impact of CCR materials and/or constituents on fish and/or aquatic life in surface streams on the TVA site or adjacent to the TVA site.	Included in the EIP and Chapter 7 - Surface Streams, Sediment and Ecological Investigations

Robert Wilkinson, P.G., CHMM CCR Technical Manager
2nd Floor TN Tower, W.R. Snodgrass Building
312 Rosa L. Parks Avenue
Nashville, TN 37243
Phone: (615) 598-3272
e-mail: Robert.S.Wilkinson@tn.gov

David W. Salyers, P.E.
Commissioner

Bill Lee
Governor

August 16, 2023

Shawn Rudder
Sr. Manager
Waste Permits, Compliance, and Monitoring
Tennessee Valley Authority
1101 Market Street, BR 4A
Chattanooga, TN 37402

RE: TDEC Commissioner's Order OGC15-0177
TVA Kingston Coal Fired Fossil Fuel Plant
Environmental Assessment Report Revision 0

Dear Mr. Rudder:

On May 30, 2023, Tennessee Valley Authority (TVA) submitted the Environmental Assessment Report (EAR) Revision 0 for the TVA Kingston Coal Fired Fossil Power Plant (TVA KIF) documenting the results from the implementation of the Environmental Investigation Plan (EIP). The Tennessee Department of Environment and Conservation (TDEC) has completed its review of the submittal and is providing comments in the attached table (Attachment 1).

TDEC requested that our subcontractor, Civil & Environmental Consultants, Inc. (CEC), provide subject matter experts to assist in the review of the EAR Revision 0. CEC and their technical consultants, TEA Inc., and Environmental Information Logistics, LLC (EIL) have completed their review and provided comments in the attached table (Attachment 2).

Please address the attached comments in an updated document (EAR Revision 1) with a cover letter summarizing TVA's response to each comment and subsequent modifications to TDEC no later than November 14, 2023.

Should you have any questions, please do not hesitate to contact me via email at Robert.S.Wilkinson@tn.gov or phone at (615) 598-3272.

Sincerely,

Robert Wilkinson, P.G., CHMM

CC:	Pat Flood	Angela Adams	James Clark
	Rob Burnette	Chris Vail	Caleb Nelson
	Judy Low	Anna Fisher	Kelly Love
	Roy Quinn	Suama Bolden	Brandon Boyd

Attachment 1 – Summary of TDEC Comments

TVA KIF EAR Rev 0
Summary of TDEC Comments

Section Number	Section Title	Page	Paragraph	Line	Comment
KIF Data Quality Summary Report					
Table 1	N/A	14 of 32	N/A	N/A	The first row under number of field audits should not be highlighted in blue like the headings.
KIF EAR Revision 0					
N/A	List of Appendices	8 of 118	N/A	N/A	Typo: Appendix B.5 is incorrectly labeled as Appendix B.3
N/A	Acronyms and Abbreviations	14 of 118	N/A	N/A	The table is missing the definition of CERCLA.
N/A	Acronyms and Abbreviations	14 of 118	N/A	N/A	The table is missing the definition of USDA.
N/A	Acronyms and Abbreviations	14 of 118	N/A	N/A	The table is missing the definition of Terramodel.
1.2.4	Kingston Recovery Project	20 of 118	1	1	The sentence is incomplete.
2.4.2.1	Geology	34 of 118	1	5	This would be a good location to describe that based on the angle of dip of the bedrock and the depth of penetration by rock core, which Formation(s) were encountered within the EI area.
2.4.2.1	Geology	34 of 118	1	7	Please include more recent data than the 1951 study that speaks bedding inclinations specific to the KIF, including the Failure analysis report for the KRP which indicated bedding in recovered core of 10 to 30 degrees beneath the KRP which is adjacent to the EI areas.

TVA KIF EAR Rev 0
Summary of TDEC Comments

Section Number	Section Title	Page	Paragraph	Line	Comment
3.4	Rock Outcrop Survey	38 of 118	1	1	Since the Background Soil Investigation SAR does not provide the evaluations of results, at a minimum in this section there should be a presentation of: 1) the types of rocks observed in outcrop, 2) the formation to which the outcrop is representative of, and 3) the measured strike and dips observed and 4) any possible fracture set measurements. Across the six locations there should be an attempt to at least provide a basic description of the stratigraphic units, any map scale structures observed, bedding orientations and if there is any interpretation that can be drawn between the six locations outcrop locations and the fractures, rock types, etc. observed in the rock cores.
5.1.3.3	Uppermost Aquifer and Groundwater Flow	55 of 118	All	All	What effect does the cutoff wall between the stilling pond and KRP landfill on groundwater flow beneath the stilling pond?
5.1.3.3	Uppermost Aquifer and Groundwater Flow	56 of 118	N/A	N/A	The illustration note references "Exhibit 5-2 Groundwater Elevation Contour Map Event #4 (February 3, 2020); however, the preceding text in this section references Exhibit 5-1. In addition, there isn't an Exhibit 5-2 listed in the List of Exhibits. Should this be referencing "Exhibit 5-1 Groundwater Elevation Contour Map, Event #3 (August 19, 2019)"?
5.3.1.1	Desktop Survey Results	63 of 118	All	All	It is not clear on the figure referenced where the 18 parcels identified during the desktop survey and any potential wells are located within the 0.5 mile WUS survey area.
5.3.1.2	Usable Water Well and/or Spring Identification	64 of 118	N/A	N/A	The illustration note references "Exhibit 5-2 Groundwater Elevation Contour Map Event #4 (February 3, 2020); however, there isn't an Exhibit 5-2 listed in the List of Exhibits. Should this be referencing "Exhibit 5-1 Groundwater Elevation Contour Map, Event #3 (August 19, 2019)"?

TVA KIF EAR Rev 0
Summary of TDEC Comments

Section Number	Section Title	Page	Paragraph	Line	Comment
5.3.1.2	Usable Water Well and/or Spring Identification	65 of 118	1	1 & 2	In this paragraph, it states that "one parcel has the potential of being impacted by CCR management operations. The parcel within the area of interest is shown in the figure above." The figure referenced (pg. 64 of 118) does not really outline the parcel or it's exact location.
Table 4-2	Estimated CCR Material Areas, Depths, and Volumes	96 of 118	N/A	N/A	In Note #4, it references "MQA SAR (Appendix G.5)". This should actually be Appendix G.7.
Appendix F.1, Section 3.4	Rock Outcrop Survey	16 of 154	1	1	Since the Background Soil Investigation SAR does not provide the evaluations of results, at a minimum in this section there should be a presentation of: 1) the types of rocks observed in outcrop, 2) the Formation to which the outcrop is representative of, and 3) the measured strike and dips observed and 4) any possible fracture set measurements. Across the six locations there should be an attempt to at least provide a basic description of the stratigraphic units, any map scale structures observed, colors, bedding orientations, mineral inclusions and if there is any interpretation that can be drawn between the six locations outcrop locations and the fractures, rock types, etc. observed in the rock cores.

TVA KIF EAR Rev 0
Summary of TDEC Comments

Section Number	Section Title	Page	Paragraph	Line	Comment
Appendix F.1, Attachment D.2	Photographic Logs of Rock Outcrops	131 of 154	N/A	N/A	Photograph 17 appears to indicate that the outcrop observed at Area 02, Sample 01 on 8/29/2019 is of the Knox Group. While Photograph 18 (mislabeled in the legend as photographed 9/6/2019) seemingly from the same area is attributed to the Conasauga Shale. According to the "Geologic Map of the Harriman Quadrangle, Roane and Morgan Counties, Tennessee" (Moore, et al., 1993), the study area is underlain by Cambrian-age sedimentary rock comprising two primary units: The Conasauga Shale and the Rome Formation shale. Please explain and properly attribute the outcrop to its proper Formation as it appears that based on previously understood site geology that the Knox Group is not observed within the investigation area. Of course if the geologist has reason to believe that the outcrop is truly representative of the Knox Group then it should be left as such and the site specific geologic map and subsequent conceptual site model should be revised with the understanding that regional studies are not conducted at a scale generally able to always properly reflect site specific conditions.
Appendix H.1	2.3.7.2 Geology and Lithology	18 of 617	4	3	Please be more specific as to where boring logs 6AR-D and AD-2-D can be found in Appendix B of the EAR (i.e. Appendix B.5), since there are five sections in Appendix B.
Appendix H.9	Exhibit H.9-1	615 of 617	N/A	N/A	Is the Kingston Water intake labeled along Rt 58 southwest of the KIF the same as the Rockwood Water Utility indicated in the EAR as the source for the Roane Central Water District?
Appendix H.9	Exhibit H.9-1	615 of 617	N/A	N/A	Is the Kingston Water intake labeled northwest of the KIF the same as the Harriman Utility Board indicated in the EAR?
Appendix H.9	Exhibit H.9-1	615 of 617	N/A	N/A	It is not clear where the Kingston Water Department intake is since nothing is labeled near the confluence of the Emory and Clinch Rivers.
Appendix H.9	Exhibit H.9-1	615 of 617	N/A	N/A	Is the Cumberland Water Utility intake outside the scope of this figure?
Appendix H.9	Exhibit H.9-2	615 of 617	N/A	N/A	Parcels that are not within the 0.5 mile survey area should not be highlighted with the yellow box that indicates a parcel within the Study Area.

TVA KIF EAR Rev 0
Summary of TDEC Comments

Section Number	Section Title	Page	Paragraph	Line	Comment
Appendix H.9	Exhibit H.9-2	615 of 617	N/A	N/A	It appears that the pattern for the railroad did not get placed into the legend for the figure.
Appendix H.9	Exhibit H.9-2	615 of 617	N/A	N/A	It is not clear why the roads are highlighted with the yellow outline that indicates a parcel within the Study Area.
Appendix H.9	Exhibit H.9-3	615 of 617	N/A	N/A	It is not clear why the roads, skimmer wall and shorelines are highlighted with the yellow outline that indicates a parcel identified for the Water Use Survey.

Attachment 2 – Summary of Subcontractor Comments

TVA KIF EAR Rev 0
Summary of Subcontractor Comments

Section Number	Section Title	Page	Paragraph	Line	Comment
5.1.3.5	Groundwater Quality Evaluation	62 of 118	N/A	N/A	See comment regarding the phreatic surface in Appendix D. - Comment-"The phreatic surface shown on Section BB' is based on one data point only. In Appendix G.1 , P 35/2668 Section 3.1.4 it is stated that "Pore water levels were available from piezometers installed in the Stilling Pond; however, the dataset was not of sufficient density for pore water elevation contours to be drawn for this CCR management unit." How was the phreatic surface shown on the cross section derived? This question becomes more pressing considering that the cement-bentonite shear wall should inhibit horizontal leachate flow."
5.3.1.2	Usable Water Well and/or Spring Identification/ Associated Figure	64 of 118	1	2	"The parcel within the area of Interest is shown in the figure above". It is difficult to see where this parcel is located on the figure. Could it be labeled on the figure?
8	TDEC order Investigation Summary and Conceptual Site Model	75 of 118	2	5 to 8	The text states: "TDEC Order CCR management units were evaluated for potential slope stability impacts, which were defined as those areas having analysis results (i.e., factors of safety) that do not meet TDEC-approved criteria for one or more load cases. This section provides a summary of potential impacts identified during the EI that will be further evaluated in the CARA Plan." On Page 41 it states: "It is anticipated that the mitigation design process will commence in parallel with the CARA phase of the TDEC Order program." Please be consistent with the approach taken in the mitigation design process.
8.3	Sluice Trench and Area East of Sluice Trench	78 of 118	3	1 and 2	Please provide separate CCR volume estimates for the Interim Ash Staging Area and the Sluice Trench and Area East of Sluice Trench instead of joining them because they are separate CCR management units.
Exhibits	8-2	116 of 118	N/A	N/A	See comment regarding the phreatic surface in Appendix D.
Appendix D	D-2 Cross Section	N/A	N/A	N/A	The phreatic surface shown on Section BB' is based on one data point only. In Appendix G.1 , P 35/2668 Section 3.1.4 it is stated that "Pore water levels were available from piezometers installed in the Stilling Pond; however, the dataset was not of sufficient density for pore water elevation contours to be drawn for this CCR management unit." How was the phreatic surface shown on the cross section derived? This question becomes more pressing considering that the cement-bentonite shear wall should inhibit horizontal leachate flow.

TVA KIF EAR Rev 0
Summary of Subcontractor Comments

Section Number	Section Title	Page	Paragraph	Line	Comment
Appendix E.1-Statistical Analysis of Background Soil Data	2.1.2 Exploratory Data Plots	11 of 213	2nd Paragraph of Section 2.1.2	Lines 7-9 of the 2nd Paragraph of Section 2.1.2	The statement is presented as follows: "The method detection limit was used as the reported value in order to construct the box plot when analytical results were reported as non-detects." The reference to "method detection limit" (MDL) should be replaced with either "practical quantitation limit (PQL)" or "reporting limit (RL)" . "Method detection limit" references the lab limit where the constituent is detected just above background noise with 99% certainty that the constituent is there but the concentration is unknown (inaccurate). The RL or PQL is 2 to 5 times the MDL and is the concentration at which the lab can accurately report the concentration within given limits of precision. There are references to "MDL" in the notes section of the tables on page 18, 44, 47, 50, and 53 of the KIF Appendix E report. (Note: This reference to MDL has also been used in reports for Bull Run and Cumberland.)
Appendix E.1-Statistical Analysis of Background Soil Data	2.2 Estimates of Background Conditions	Page 12 of 213 of the Appendix E PDF	1st	Line 6	Statement is made as follows: "For example, for a “95% UTL with 95% coverage”, there is 95% confidence that, on average, 95% of the data are below the UTL.". This statement should be corrected as follows: "For example, for a “95% UTL with 95% coverage”, there is 95% confidence that, on average, 95% of the data are equal to or below the UTL."
Appendix E.1-Statistical Analysis of Background Soil Data	Attachment E.A-1 : Summary Statistics Tables	Page 18 of 213 of the Appendix E PDF	1st, 2nd, and 3rd page of Summary Stats Table for Background Soils	10th and 11th row of Page 18	Concerns as to the way the stats have been handled for data sets with zero detections. For example, the referenced data for silver for background soils in soil samples from 0.5' to 10' and >10' have 20 and 19 entries, respectively, that are all below the reporting limit (or PQL). However, it appears that the lab-estimated values for silver which are between the reporting limit (RL or PQL) and the Method Detection Limit are used to designate 25th, 50th, 75th and 95th percentile values. Since these values are based on estimates of constituents that are confirmed to be present but their quantitative values and uncertainties are unknown, the estimates shown for the background TLV and all percentiles are suspect due to the range of additional errors that are involved with estimating the constituent values between the MDL and RL (or PQL). My recommendation is to forgo the calculation of TLVs/UTLs and percentiles for similar data sets for future cases as this. I understand this approach may have been pre-agreed between TVA and TDEC in the planning stages for the EAR, but I recommend that the way these data are handled for future EAR work and corrective action be re-assessed.

TVA KIF EAR Rev 0
Summary of Subcontractor Comments

Section Number	Section Title	Page	Paragraph	Line	Comment
Appendix E.2 - Statistical Analysis of CCR Material Characteristics Data	2.2 Regression Analysis	Page 39 of 213 of the Appendix E PDF (Page 5 of Appendix E.2)	1st paragraph of the Section	Line 4	For the corrective action stage and/or the development of future guidance documents on handling the CCR TVA data, please consider using the Spearman Rank correlation method, which will assess both monotonic non-linear and linear relationships that may exist between two data sets. The Pearson's correlation evaluates only linear relationships.
Appendix E.2 - Statistical Analysis of CCR Material Characteristics Data	2.1.2 Exploratory Data Plots	Page 38 of 213 of the Appendix E PDF	2nd Paragraph of Section 2.1.2	Lines 7-9 of the 2nd Paragraph of Section 2.1.2	Refer to previous comment regarding Exploratory Data Plots in Appendix E.1.
Appendix E.2 - Statistical Analysis of CCR Material Characteristics Data	Attachment E.2-A Summary Statistics	Page 45 and 46 of the SPLP Summary Stats, and 48 through 50 of the Total Metals Summary Stats and 51-52 of the Dissolved Metals Summary Stats (Page Numbers Referenced Based on the PDF Document for Appendix E)	Tables	N/A	Similar to previous concerning the way the stats have been handled for data sets with zero detections. The 50th percentile and 95th percentile values are based on estimated values below the RL/PQL. These values are based on estimates of constituents that are confirmed to be present but their quantitative values and uncertainties are unknown. Therefore, I would recommend removing the values shown for the 50th percentile and 95th percentile for these specific entries in the tables.

TVA KIF EAR Rev 0
Summary of Subcontractor Comments

Section Number	Section Title	Page	Paragraph	Line	Comment
Appendix E.3 Statistical Analysis of Groundwater Analytical Results	2.2.1 Linear Regression Trend Analysis and Confidence Interval/Confidence Band Evaluation	Page 982 of 213 of the Appendix E PDF	1st paragraph of the Section	1st line	This comment has been made in previous reviews for other TVA sites and I realize we are currently limited in sample size for certain constituents. However, I resubmit the following comment for the record: Chapter 21, page 24 of the EPA Unified Guidance requires "at least 8 to 10" samples to construct a confidence band around a linear regression line. However, the authors of Appendix E.3, per Section 2.2.1, reference using a standard of a minimum of 5 samples to develop linear regression models with confidence bands. This minimum sample size does not follow the EPA Unified Guidance.
Appendix E.3 Statistical Analysis of Groundwater Analytical Results	3.2 Comparisons of Groundwater Quality Data To Approved Screening Levels	Page 90 of 213 of the Appendix E PDF	Table E.3-3: Summary of Statistically Significant Concentrations /Values	N/A	Data with statistically significant trends and their confidence bands are readily reviewable from the plots given in this section (Appendix E.3). However, for the constituent data with no trends, it would be helpful to be able to review the output for the "static" confidence intervals produced directly from the EPA ProUCL software and include these results in Appendix E.3.
Appendix E.3 Statistical Analysis of Groundwater Analytical Results	3.2 Comparisons of Groundwater Quality Data To Approved Screening Levels	Page 90 of 213 of the Appendix E PDF	Table E.3-3: Summary of Statistically Significant Concentrations /Values	N/A	If there were any instances of the limited datasets (where there are <5 data entries or <4 data entries that are detections) with values that are greater then the GSL or outside the GSL range for pH, how is this denoted in the table? I understand that we do not have any occurrences for this situation at this time but some type of designation for this possibility of occurrence in the future should be listed in the notes section at the bottom of the table (for example " Red* " designation?)
Appendix E.3 Statistical Analysis of Groundwater Analytical Results	3.1 Exploratory Data Analysis	Page 88 of 213 of the Appendix E PDF	4th Paragraph in Section 3.1	Entire Paragraph	The removal of the outlier TDS data for in AD-1 for June 2016 and the removal of outlier TDS for TDS in GW-2 for December 2019 appear justifiable based on the reasons given in the text, especially when there is a lack of any correlating data between elevated TDS and lack of elevated conductivity readings. However, the removal of the zinc outlier data at AD-2 and AD-3 for September 2018 is not so straightforward and convincing, in my opinion. It would be good to see correlating time series plots for electrical conductivity with zinc for AD-2 and AD-3 for the same time period in question. Especially considering the specific magnitude of the zinc concentrations in question, 12.5 mg/L for AD-2 and 6.57 mg/L for zinc at AD-3.

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Section Number	Section Title	Page	Paragraph	Line	Comment
Appendix E.3 Statistical Analysis of Groundwater Analytical Results	3.1 Exploratory Data Analysis	Page 88 of 213 of the Appendix E PDF	5th Paragraph in Section 3.1	Entire Paragraph	There is not enough good evidence that has been presented in this section of the report to validate the removal of the low outlier for sulfate at Well 6AR for September 2009. Please provide more relevant supporting data to justify the removal of this concentration for the statistical analyses.
Appendix E.3 Statistical Analysis of Groundwater Analytical Results	Attachment E.3-A Summary Statistics	Pages 94 to 99 of 213 of the Appendix E PDF	Tables	N/A	Similar comment as previous concerning the way the stats have been handled for data sets with zero detections. The 50th percentile and 95th percentile values are based on estimated values below the RL/PQL. These values are based on estimates of constituents that are confirmed to be present but their quantitative values and uncertainties are unknown. Recommend removing the values shown for the 50th percentile and 95th percentile for these specific entries in the tables.
Appendix E.4 - Statistical Analysis of Seep Investigation	All sections in E.4	Pages 138 to 213 of the PDF Appendix E document	N/A	N/A	The title page on PDF page 138 of 213 is mislabeled as "Appendix D" with the title "Statistical Analysis of Water Quality Parameters" but should be "Appendix E.4" with the title "Statistical Analysis of Seep Investigation". Same for the headers in this entire section and the table references, and attachment references.
Appendix E.4 - Statistical Analysis of Seep Investigation	Section 3.0 Datasets	Page 2 of Appendix E.4 (Page 144 of the PDF Appendix E document)	Paragraph 3 of Section 3.0	5 and 6	The description of the 20 samples taken from each "upstream control area" location indicates that the distance between each control sample was only five (5) feet. These are aqueous samples taken from Emory River. The description of sample locations in this paragraph does not indicate whether the spacing of 5 feet is based on lateral (x,y) spacing or also involves depth spacing within the water column. Regardless, a 5 ft. spacing of mixed, aqueous samples may pose a problem with defending the argument the we have achieved statistical independence of each sample, considering the very close spacing of the mixed, aqueous samples. Have we derived 20 independent samples or is it really a smaller set of independent samples? This would affect the calculation results for the tolerance limits that are used in the comparisons with the intermediate sample locations.
Appendix E.4 - Statistical Analysis of Seep Investigation	Section 4.1 Exploratory Data Analysis/Outlier Screening	Page 145 of the PDF Appendix E document and Page 3 of Appendix E.4	4th paragraph of the Section	Line 2	Why is Dixon's method for identifying single outliers identified as a outlier test in Appendix E.4 for the Seep Investigation, along with Rosner's Method, but not consistently used in other outlier tests in the other sections in Appendix E?

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Section Number	Section Title	Page	Paragraph	Line	Comment
Appendix E.4 - Statistical Analysis of Seep Investigation	Section 5.1and 5.2	Page 149 and 150 through 213 of the PDF Appendix E document	N/A	N/A	Why were formal group hypothesis tests specified for the historical seeps/AOC locations versus areas upstream of these locations but were not specified for the comparisons of group data for intermediate sample areas vs. "upstream control " groups UC24 and UC25?
Appendix E.4 - Statistical Analysis of Seep Investigation	Table D.3 (Should be relabeled as Table E.4-C) - Summary of Statistical Hypothesis Testing	Page 154 of the PDF Appendix E document	Table	N/A	Comment is for future reference and consideration as sampling programs are designed, including for the CARA: Based on the small sample sizes for the adjacent versus upstream data group comparisons/hypothesis tests, limited to sample sizes of 11 or less, the calculated Power associated with these hypothesis tests are low. Power is the ability of the test to detect a statistically significant difference between groups when a true difference actually does exist. The reality of these specific hypothesis tests is that, because of the limited sample sizes, the ability of these tests to detect a real statistical difference between the adjacent and upstream populations is severely limited.
Appendix G.1	2.2 Slope Stability	13 of 2668	2	1 to 3	The text states: "As described in the EIP, including the Evaluation of Existing Geotechnical Data (Appendix L of the EIP; Stantec 2018a), the existing data are sufficient to establish appropriate shear strengths and stability results for certain static and seismic load cases." The second response to TDEC comment # 6 of the Static Slope Stability SAR states in part "The strength parameters used in historical analyses are presented for information only, and only for purposes of relative comparison. This report does not attempt to judge the level of conservatism or the appropriateness of the historical parameters." How are these two statements by Stantec compatible?
Appendix G.1	2.2.3 Results	19 of 2668	1	2 to 4	The text states "The displacements due to the design earthquake were less than the tolerable displacement of three feet, and thus correlate to a FS Sliding greater than one." That is not correct. If a mass is expected to slide less than tolerable under earthquake loading its limited equilibrium FOS is less than 1. If the FOS would be greater than 1 the mass would not slide. Please correct/rephrase the statement perhaps by defining what the FS Sliding represents.

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Section Number	Section Title	Page	Paragraph	Line	Comment
Appendix G.1	2.3.1 Previous Representative Studies and Assessments	20 of 2668	1	N/A	CFR 257.73)d) is not a complete citation of the applicable rule. Please complete the citation here and on page 22/2668

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Comment Number	Section Number	Section Title	Page	Paragraph	Line	TDEC Comment (August 16, 2023)	TVA Response (November 14, 2023)
1	Table 1	N/A	14 of 32	N/A	N/A	The first row under number of field audits should not be highlighted in blue like the headings.	The blue highlight was removed from the number of field audits row of Table 1. In addition, yellow highlighting was removed throughout the document
2	N/A	List of Appendices	8 of 118	N/A	N/A	Typo: Appendix B.5 is incorrectly labeled as Appendix B.3	The text has been revised to address the comment.
3	N/A	Acronyms and Abbreviations	14 of 118	N/A	N/A	The table is missing the definition of CERCLA.	The table has been revised to address the comment.
4	N/A	Acronyms and Abbreviations	14 of 118	N/A	N/A	The table is missing the definition of USDA.	The table has been revised to address the comment.
5	N/A	Acronyms and Abbreviations	14 of 118	N/A	N/A	The table is missing the definition of Terramodel.	The table has been revised to address the comment.
6	1.2.4	Kingston Recovery Project	20 of 118	1	1	The sentence is incomplete.	This sentence is a continuation from the previous page.
7	2.4.2.1	Geology	34 of 118	1	5	This would be a good location to describe that based on the angle of dip of the bedrock and the depth of penetration by rock core, which Formation(s) were encountered within the EI area.	The text has been revised to include more recent information from the KRP root cause analysis report and geophysical logging of AD-2D.
8	2.4.2.1	Geology	34 of 118	1	7	Please include more recent data than the 1951 study that speaks bedding inclinations specific to the KIF, including the Failure analysis report for the KRP which indicated bedding in recovered core of 10 to 30 degrees beneath the KRP which is adjacent to the EI areas.	The text has been revised to include more recent information from the KRP root cause analysis report and geophysical logging of AD-2D.
9	3.4	Rock Outcrop Survey	38 of 118	1	1	Since the Background Soil Investigation SAR does not provide the evaluations of results, at a minimum in this section there should be a presentation of: 1) the types of rocks observed in outcrop, 2) the formation to which the outcrop is representative of, and 3) the measured strike and dips observed and 4) any possible fracture set measurements. Across the six locations there should be an attempt to at least provide a basic description of the stratigraphic units, any map scale structures observed, bedding orientations and if there is any interpretation that can be drawn between the six locations outcrop locations and the fractures, rock types, etc. observed in the rock cores.	A short discussion of the rock outcrop survey evaluation has been added to Section 3.4.
10	5.1.3.3	Uppermost Aquifer and Groundwater Flow	55 of 118	All	All	What effect does the cutoff wall between the stilling pond and KRP landfill on groundwater flow beneath the stilling pond?	The perimeter containment walls around the KRP Ash Landfill are not designed with the purpose of cutting off or impeding groundwater flow. These walls are designed to add structural support to native foundation soils. The segment between the KRP Ash Landfill and the Stilling Pond consists of a series of shear walls that are oriented parallel to groundwater flow, with space between individual elements. As designed, the system does not impede groundwater flow between the shear wall elements. In addition, groundwater gradients beneath the Stilling Pond are very small. Because of the design/orientation of the shear walls and the low groundwater hydraulic gradient, the shear wall elements in this segment have a negligible effect on groundwater flow beneath the KRP Ash Landfill and the Stilling Pond.
11	5.1.3.3	Uppermost Aquifer and Groundwater Flow	56 of 118	N/A	N/A	The illustration note references "Exhibit 5-2 Groundwater Elevation Contour Map Event #4 (February 3, 2020); however, the preceding text in this section references Exhibit 5-1. In addition, there isn't an Exhibit 5-2 listed in the List of Exhibits. Should this be referencing "Exhibit 5-1 Groundwater Elevation Contour Map, Event #3 (August 19, 2019)"?	The note has been revised to address the comment.
12	5.3.1.1	Desktop Survey Results	63 of 118	All	All	It is not clear on the figure referenced where the 18 parcels identified during the desktop survey and any potential wells are located within the 0.5 mile WUS survey area.	The text has been revised to remove the reference to the 18 parcels being shown on the figure.
13	5.3.1.2	Usable Water Well and/or Spring Identification	64 of 118	N/A	N/A	The illustration note references "Exhibit 5-2 Groundwater Elevation Contour Map Event #4 (February 3, 2020); however, there isn't an Exhibit 5-2 listed in the List of Exhibits. Should this be referencing "Exhibit 5-1 Groundwater Elevation Contour Map, Event #3 (August 19, 2019)"?	The note has been revised to address the comment.
14	5.3.1.2	Usable Water Well and/or Spring Identification	65 of 118	1	1 & 2	In this paragraph, it states that "one parcel has the potential of being impacted by CCR management operations. The parcel within the area of interest is shown in the figure above." The figure referenced (pg. 64 of 118) does not really outline the parcel or it's exact location.	The figure has been revised to clearly illustrate the parcel identified for water use survey.
15	Table 4-2	Estimated CCR Material Areas, Depths, and Volumes	96 of 118	N/A	N/A	In Note #4, it references "MQA SAR (Appendix G.5)". This should actually be Appendix G.7.	The note has been revised to address the comment.

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Comment Number	Section Number	Section Title	Page	Paragraph	Line	TDEC Comment (August 16, 2023)	TVA Response (November 14, 2023)
16	Appendix F.1, Section 3.4	Rock Outcrop Survey	16 of 154	1	1	Since the Background Soil Investigation SAR does not provide the evaluations of results, at a minimum in this section there should be a presentation of: 1) the types of rocks observed in outcrop, 2) the Formation to which the outcrop is representative of, and 3) the measured strike and dips observed and 4) any possible fracture set measurements. Across the six locations there should be an attempt to at least provide a basic description of the stratigraphic units, any map scale structures observed, colors, bedding orientations, mineral inclusions and if there is any interpretation that can be drawn between the six locations outcrop locations and the fractures, rock types, etc. observed in the rock cores.	A short discussion of the rock outcrop survey evaluation has been added to Section 3.4 of the Environmental Assessment Report.
17	Appendix F.1, Attachment D.2	Photographic Logs of Rock Outcrops	131 of 154	N/A	N/A	Photograph 17 appears to indicate that the outcrop observed at Area 02, Sample 01 on 8/29/2019 is of the Knox Group. While Photograph 18 (mislabeled in the legend as photographed 9/6/2019) seemingly from the same area is attributed to the Conasauga Shale. According to the "Geologic Map of the Harriman Quadrangle Roane and Morgan Counties, Tennessee" (Moore, et al., 1993), the study area is underlain by Cambrian-age sedimentary rock comprising two primary units: The Conasauga Shale and the Rome Formation shale. Please explain and properly attribute the outcrop to its proper Formation as it appears that based on previously understood site geology that the Knox Group is not observed within the investigation area. Of course if the geologist has reason to believe that the outcrop is truly representative of the Knox Group then it should be left as such and the site specific geologic map and subsequent conceptual site model should be revised with the understanding that regional studies are not conducted at a scale generally able to always properly reflect site specific conditions.	Revised photographic logs of rock outcrops are provided as Appendix F.2. to address the comment. Photograph 18 was taken on 9/6/2019 and shows a sample that was collected on 8/29/2019.
18	Appendix H.1	2.3.7.2 Geology and Lithology	18 of 617	4	3	Please be more specific as to where boring logs 6AR-D and AD-2-D can be found in Appendix B of the EAR (i.e. Appendix B.5), since there are five sections in Appendix B.	Boring logs 6AR-D and AD-2-D can be found in Appendix B.5 of the EAR. This information has also been added to the text.
19	Appendix H.9	Exhibit H.9-1	615 of 617	N/A	N/A	Is the Kingston Water intake labeled along Rt 58 southwest of the KIF the same as the Rockwood Water Utility indicated in the EAR as the source for the Roane Central Water District?	Based on information obtained as part of the desktop study, the Kingston Public Water intake labeled along Rt 58 southwest of the KIF is not the same Rockwood Water Utility indicated in the EAR. The Roane Central Water District purchases water from the Rockwood Utility District which sources water from an intake located approximately 5 miles downstream of the KIF Plant (not illustrated on Exhibit). See Table H.9-1 for further information.
20	Appendix H.9	Exhibit H.9-1	615 of 617	N/A	N/A	Is the Kingston Water intake labeled northwest of the KIF the same as the Harriman Utility Board indicated in the EAR?	Yes. The Water Intake was incorrectly labeled on the Exhibit. The Exhibit has been edited with the correct information.
21	Appendix H.9	Exhibit H.9-1	615 of 617	N/A	N/A	It is not clear where the Kingston Water Department intake is since nothing is labeled near the confluence of the Emory and Clinch Rivers.	The location of the public water intake for the Kingston Water Department has been revised and is located on Exhibit H.9-1.
22	Appendix H.9	Exhibit H.9-1	615 of 617	N/A	N/A	Is the Cumberland Water Utility intake outside the scope of this figure?	Yes. The Cumberland Water Utility intake is located approximately 4 miles northeast of the KIF Plant and is not illustrated on Exhibit H.9-1.
23	Appendix H.9	Exhibit H.9-2	615 of 617	N/A	N/A	Parcels that are not within the 0.5 mile survey area should not be highlighted with the yellow box that indicates a parcel within the Study Area.	Exhibit H.9-2 has been revised to exclude parcel boundaries outside the Survey Area.
24	Appendix H.9	Exhibit H.9-2	615 of 617	N/A	N/A	It appears that the pattern for the railroad did not get placed into the legend for the figure.	The pattern indicating a rail line has been included in the legend of applicable exhibits in Appendix H.9.
25	Appendix H.9	Exhibit H.9-2	615 of 617	N/A	N/A	It is not clear why the roads are highlighted with the yellow outline that indicates a parcel within the Study Area.	Roads and rail lines within TVA owned parcel #073 037 04600 000 are considered part of the parcel. For clarity, parcel boundaries associated with historical roadways within TVA-owned property have been removed.
26	Appendix H.9	Exhibit H.9-3	615 of 617	N/A	N/A	It is not clear why the roads, skimmer wall and shorelines are highlighted with the yellow outline that indicates a parcel identified for the Water Use Survey.	Exhibit H.9-3 has been revised to exclude highlighting associated with the roads, skimmer wall, and shorelines.
27	5.1.3.5	Groundwater Quality Evaluation	62 of 118	N/A	N/A	See comment regarding the phreatic surface in Appendix D. - Comment-"The phreatic surface shown on Section BB' is based on one data point only. In Appendix G.1 , P 35/2668 Section 3.1.4 it is stated that "Pore water levels were available from piezometers installed in the Stilling Pond; however, the dataset was not of sufficient density for pore water elevation contours to be drawn for this CCR management unit." How was the phreatic surface shown on the cross section derived? This question becomes more pressing considering that the cement-bentonite shear wall should inhibit horizontal leachate flow."	The cross section has been revised to show more than one data point for pore water elevations. See also the response to Comment 10 regarding the design of the shear walls.

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Comment Number	Section Number	Section Title	Page	Paragraph	Line	TDEC Comment (August 16, 2023)	TVA Response (November 14, 2023)
28	5.3.1.2	Usable Water Well and/or Spring Identification/ Associated Figure	64 of 118	1	2	"The parcel within the area of Interest is shown in the figure above". It is difficult to see where this parcel is located on the figure. Could it be labeled on the figure?	The figure has been revised to clearly illustrate the parcel identified for water use survey.
29	8	TDEC order Investigation Summary and Conceptual Site Model	75 of 118	2	5 to 8	The text states: "TDEC Order CCR management units were evaluated for potential slope stability impacts, which were defined as those areas having analysis results (i.e., factors of safety) that do not meet TDEC-approved criteria for one or more load cases. This section provides a summary of potential impacts identified during the EI that will be further evaluated in the CARA Plan." On Page 41 it states: "It is anticipated that the mitigation design process will commence in parallel with the CARA phase of the TDEC Order program." Please be consistent with the approach taken in the mitigation design process.	The text has been revised to describe the mitigation design process.
30	8.3	Sluice Trench and Area East of Sluice Trench	78 of 118	3	1 and 2	Please provide separate CCR volume estimates for the Interim Ash Staging Area and the Sluice Trench and Area East of Sluice Trench instead of joining them because they are separate CCR management units.	The text has been revised to address the comment.
31	Exhibits	8-2	116 of 118	N/A	N/A	See comment regarding the phreatic surface in Appendix D.	The cross section has been revised to show more than one data point for pore water elevations. See also the response to Comment 10 regarding the design of the shear walls.
32	Appendix D	D-2 Cross Section	N/A	N/A	N/A	The phreatic surface shown on Section BB' is based on one data point only. In Appendix G.1 , P 35/2668 Section 3.1.4 it is stated that "Pore water levels were available from piezometers installed in the Stilling Pond; however, the dataset was not of sufficient density for pore water elevation contours to be drawn for this CCR management unit." How was the phreatic surface shown on the cross section derived? This question becomes more pressing considering that the cement-bentonite shear wall should inhibit horizontal leachate flow.	The cross section has been revised to show more than one data point for pore water elevations. See also the response to Comment 10 regarding the design of the shear walls.
33	Appendix E.1- Statistical Analysis of Background Soil Data	2.1.2 Exploratory Data Plots	11 of 213	2nd Paragraph of Section 2.1.2	Lines 7-9 of the 2nd Paragraph of Section 2.1.2	The statement is presented as follows: "The method detection limit was used as the reported value in order to construct the box plot when analytical results were reported as non-detects." The reference to "method detection limit" (MDL) should be replaced with either "practical quantitation limit (PQL)" or "reporting limit (RL)" . "Method detection limit" references the lab limit where the constituent is detected just above background noise with 99% certainty that the constituent is there but the concentration is unknown (inaccurate). The RL or PQL is 2 to 5 times the MDL and is the concentration at which the lab can accurately report the concentration within given limits of precision. There are references to "MDL" in the notes section of the tables on page 18, 44, 47, 50, and 53 of the KIF Appendix E report. (Note: This reference to MDL has also been used in reports for Bull Run and Cumberland.)	As far as handling non-detect data in the datasets and subsequent analyses, non-detects reported as "<" values in the project database are "analyte was not detected at a concentration greater than the Method Detection Limit". Any value with a "J" qualifier is an estimated value, usually representing a result between the method detection limit and reporting limit, although a "J" qualifier can be a result of "quantitation is approximate due to limitations identified during data validation". For the purpose of the analysis "J" qualified data are considered as a detected concentration.
34	Appendix E.1- Statistical Analysis of Background Soil Data	2.2 Estimates of Background Conditions	Page 12 of 213 of the Appendix E PDF	1st	Line 6	Statement is made as follows: "For example, for a "95% UTL with 95% coverage", there is 95% confidence that, on average, 95% of the data are below the UTL.". This statement should be corrected as follows: "For example, for a "95% UTL with 95% coverage", there is 95% confidence that, on average, 95% of the data are equal to or below the UTL."	This language is referenced to a Ofungyu, 2014. In the textbook it gives the following example: "For instance, a 99% coverage UTL with 95% confidence level is that data value for which there is a 95% probability that 99% of the background data population is lower that (i.e. only 1% of the underlying population is lower than" The statement in the textbook was modified to be representative of 95% UTL with 95% coverage.
35	Appendix E.1- Statistical Analysis of Background Soil Data	Attachment E.A- 1 : Summary Statistics Tables	Page 18 of 213 of the Appendix E PDF	1st, 2nd, and 3rd page of Summary Stats Table for Background Soils	10th and 11th row of Page 18	add	With respect to handling non-detects, see response to Comment 33. For datasets with zero detections: 50th and 95th percentiles represent the percentiles of non-detect (<) data only. The BTV is represented by an order statistic, usually the highest MDL. Non-parametric UTLs were used for data sets with greater than 50% non-detects. The non-parametric UTL is represented by the highest detected concentration or highest MDL. The level of confidence cannot be pre-specified when using Non-parametric UTLs, so the estimated level of confidence based on sample size is also reported along with the UTL value. In the Silver example the highest MDLs were used for both examples, 0.0362 and 0.0445 mg/kg, respectively.
36	Appendix E.2 - Statistical Analysis of CCR Material Characteristics Data	2.2 Regression Analysis	Page 39 of 213 of the Appendix E PDF (Page 5 of Appendix E.2)	1st paragraph of the Section	Line 4	For the corrective action stage and/or the development of future guidance documents on handling the CCR TVA data, please consider using the Spearman Rank correlation method, which will assess both monotonic non-linear and linear relationships that may exist between two data sets. The Pearson's correlation evaluates only linear relationships.	The statistical analysis included in the EAR used simple linear regression to evaluate associations between CCR parameter concentrations in solid CCR Material and parameter concentrations in SPLP. The analysis was exploratory in nature and not intended to produce rigorous statistical estimates. At this time, further evaluation using an alternate non-parametric method such as Spearman Rank correlation has not been pursued.
37	Appendix E.2 - Statistical Analysis of CCR Material Characteristics Data	2.1.2 Exploratory Data Plots	Page 38 of 213 of the Appendix E PDF	2nd Paragraph of Section 2.1.2	Lines 7-9 of the 2nd Paragraph of Section 2.1.2	Refer to previous comment regarding Exploratory Data Plots in Appendix E.1.	See response to Comment 33, above.

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38	Appendix E.2 - Statistical Analysis of CCR Material Characteristics Data	Attachment E.2- A Summary Statistics	Page 45 and 46 of the SPLP Summary Stats, and 48 through 50 of the Total Metals Summary Stats and 51-52 of the Dissolved Metals Summary Stats (Page Numbers Referenced Based on the PDF Document for Appendix E)	Tables	N/A	Similar to previous concerning the way the stats have been handled for data sets with zero detections. The 50th percentile and 95th percentile values are based on estimated values below the RL/PQL. These values are based on estimates of constituents that are confirmed to be present but their quantitative values and uncertainties are unknown. Therefore, I would recommend removing the values shown for the 50th percentile and 95th percentile for these specific entries in the tables.	See response to Comment 35, above
39	Appendix E.3 Statistical Analysis of Groundwater Analytical Results	2.2.1 Linear Regression Trend Analysis and Confidence Interval/Confidence Band Evaluation	Page 982 of 213 of the Appendix E PDF	1st paragraph of the Section	1st line	This comment has been made in previous reviews for other TVA sites and I realize we are currently limited in sample size for certain constituents. However, I resubmit the following comment for the record: Chapter 21, page 24 of the EPA Unified Guidance requires "at least 8 to 10" samples to construct a confidence band around a linear regression line. However, the authors of Appendix E.3, per Section 2.2.1, reference using a standard of a minimum of 5 samples to develop linear regression models with confidence bands. This minimum sample size does not follow the EPA Unified Guidance.	We acknowledge that statistical power may be limited when sample size is small. However, we have established the described method to support early screening of well-constituent pairs, even if data are limited. In addition, the date range in consideration has been expanded to include both historical and more recent data, where available. Therefore, the occurrence of datasets with less than 8 to 10 samples has become less frequent for the EARs being prepared for multiple fossil plants (including KIF). However, we prefer to retain the method description that allows for statistical analysis to be completed with smaller sample sizes to support earlier preliminary identification of well-constituent pairs that are statistically above the applicable GSL. In general, the use of a linear regression and confidence band approach will be infrequent when sample size is small as the method only proceeds with linear regression and confidence band when the linear regression is statistically significant (and, as noted, the likelihood of detecting a significant trend when sample size is small is low). Therefore, in most cases if sample size is limited, a confidence interval approach is used rather than confidence band. This analysis does not prevent additional analysis being applied to revisit these categories when additional data become available. We agree that we can expect validity and accuracy of the statistical test results to improve as additional data are collected.
40	Appendix E.3 Statistical Analysis of Groundwater Analytical Results	3.2 Comparisons of Groundwater Quality Data To Approved Screening Levels	Page 90 of 213 of the Appendix E PDF	Table E.3-3: Summary of Statistically Significant Concentrations /Values	N/A	Data with statistically significant trends and their confidence bands are readily reviewable from the plots given in this section (Appendix E.3). However, for the constituent data with no trends, it would be helpful to be able to review the output for the "static" confidence intervals produced directly from the EPA ProUCL software and include these results in Appendix E.3.	The confidence intervals are presented in the same fashion as the confidence bands and can be interpreted the same way (i.e. does the lower confidence interval exceed the Groundwater screening level at the last sampling event).
41	Appendix E.3 Statistical Analysis of Groundwater Analytical Results	3.2 Comparisons of Groundwater Quality Data To Approved Screening Levels	Page 90 of 213 of the Appendix E PDF	Table E.3-3: Summary of Statistically Significant Concentrations /Values	N/A	If there were any instances of the limited datasets (where there are <5 data entries or <4 data entries that are detections) with values that are greater then the GSL or outside the GSL range for pH, how is this denoted in the table? I understand that we do not have any occurrences for this situation at this time but some type of designation for this possibility of occurrence in the future should be listed in the notes section at the bottom of the table (for example " Red* " designation?)	This possibility is discussed under Section 2.2.2, where it states "However, if there was a limited dataset (i.e., less than five samples in the dataset or less than four detected results), and at least one value was greater than or equal to the GSL for constituents other than pH or there were detected values outside the GSL range for pH, this triggered further data review and an alternate evaluation of that well-constituent pair. For these well-constituent pairs, the available data were reviewed and alternate statistical approaches were considered (e.g., completing a statistical evaluation resulting in a 'Red' or 'Green' classification as described in Section 2.2.1 using the limited dataset). If such an alternate evaluation was required, then this was clearly identified and additional rationale provided in the applicable sub-sections of Section 3.0." Essentially, in the rare cases where this has occurred at other plants, we have gone back and re-evaluated the available data and determined an appropriate approach on a case-by-case basis (e.g., adding more recent sampling data to strengthen the dataset, if available, or applying a regression approach with the full detection limit replacing the non-detect values. Wherever such an alternate approach is required, this has been noted in Section 3.0.
42	Appendix E.3 Statistical Analysis of Groundwater Analytical Results	3.1 Exploratory Data Analysis	Page 88 of 213 of the Appendix E PDF	4th Paragraph in Section 3.1	Entire Paragraph	The removal of the outlier TDS data for in AD-1 for June 2016 and the removal of outlier TDS for TDS in GW-2 for December 2019 appear justifiable based on the reasons given in the text, especially when there is a lack of any correlating data between elevated TDS and lack of elevated conductivity readings. However, the removal of the zinc outlier data at AD-2 and AD-3 for September 2018 is not so straightforward and convincing, in my opinion. It would be good to see correlating time series plots for electrical conductivity with zinc for AD-2 and AD-3 for the same time period in question. Especially considering the specific magnitude of the zinc concentrations in question, 12.5 mg/L for AD-2 and 6.57 mg/L for zinc at AD-3.	The excluded outlier concentrations occurred in September 2018 and all other samples collected between 2009 and November 2022 are at least 190 times lower than the excluded outliers. It would make sense to evaluate these further if they were the most recent results and no further sampling had happened since then, but we have 4 more years of sampling subsequent to those events for which sample results are at least 190X lower. These results will be retained in the database but it is reasonable to exclude them from statistical analysis.

Appendix A
TVA Kingston EAR Rev_0
Summary of Comments and TVA Responses
November 14, 2023

Comment Number	Section Number	Section Title	Page	Paragraph	Line	TDEC Comment (August 16, 2023)	TVA Response (November 14, 2023)
43	Appendix E.3 Statistical Analysis of Groundwater Analytical Results	3.1 Exploratory Data Analysis	Page 88 of 213 of the Appendix E PDF	5th Paragraph in Section 3.1	Entire Paragraph	There is not enough good evidence that has been presented in this section of the report to validate the removal of the low outlier for sulfate at Well 6AR for September 2009. Please provide more relevant supporting data to justify the removal of this concentration for the statistical analyses.	The excluded outlier concentration (18,900 ug/L) occurred in September 2009 and all other samples collected over the following 12 years (2010 to November 2022) are at least an order of magnitude higher than the excluded outlier. Using the methods outlined in appendix E.3, this values was determined to be a statistically significant low outlier. These results will be retained in the database so outliers can be continually evaluated with ongoing groundwater monitoring, but it is reasonable to exclude them from statistical analysis at this time.
44	Appendix E.3 Statistical Analysis of Groundwater Analytical Results	Attachment E.3- A Summary Statistics	Pages 94 to 99 of 213 of the Appendix E PDF	Tables	N/A	Similar comment as previous concerning the way the stats have been handled for data sets with zero detections. The 50th percentile and 95th percentile values are based on estimated values below the RL/PQL. These values are based on estimates of constituents that are confirmed to be present but their quantitative values and uncertainties are unknown. Recommend removing the values shown for the 50th percentile and 95th percentile for these specific entries in the tables.	See response to Comment 35, above
45	Appendix E.4 - Statistical Analysis of Seep Investigation	All sections in E.4	Pages 138 to 213 of the PDF Appendix E document	N/A	N/A	The title page on PDF page 138 of 213 is mislabeled as "Appendix D" with the title "Statistical Analysis of Water Quality Parameters" but should be "Appendix E.4" with the title "Statistical Analysis of Seep Investigation". Same for the headers in this entire section and the table references, and attachment references.	This Appendix was pulled directly from the Seep Investigation SAR that is included as Appendix I. No changes were made to the document. The cover sheet has been modified to explain this.
46	Appendix E.4 - Statistical Analysis of Seep Investigation	Section 3.0 Datasets	Page 2 of Appendix E.4 (Page 144 of the PDF Appendix E document)	Paragraph 3 of Section 3.0	5 and 6	The description of the 20 samples taken from each "upstream control area" location indicates that the distance between each control sample was only five (5) feet. These are aqueous samples taken from Emory River. The description of sample locations in this paragraph does not indicate whether the spacing of 5 feet is based on lateral (x,y) spacing or also involves depth spacing within the water column. Regardless, a 5 ft. spacing of mixed, aqueous samples may pose a problem with defending the argument the we have achieved statistical independence of each sample, considering the very close spacing of the mixed, aqueous samples. Have we derived 20 independent samples or is it really a smaller set of independent samples? This would affect the calculation results for the tolerance limits that are used in the comparisons with the intermediate sample locations.	The comment is correct and addresses achieved sample size and the independence of samples collected in the upstream control areas. Samples were collected from the same depth in the water column, at a spacing of 5 feet in the lateral direction. TVA acknowledges the importance of independent samples, however the number of samples is constrained by the available length of the river or creek banks. The goal was to collect a sufficient number of samples for comparison to samples collected in intermediate areas, to identify the presence of previously unknown seeps.
47	Appendix E.4 - Statistical Analysis of Seep Investigation	Section 4.1 Exploratory Data Analysis/Outlier Screening	Page 145 of the PDF Appendix E document and Page 3 of Appendix E 4	4th paragraph of the Section	Line 2	Why is Dixon's method for identifying single outliers identified as a outlier test in Appendix E.4 for the Seep Investigation, along with Rosner's Method, but not consistently used in other outlier tests in the other sections in Appendix E?	The choice of outlier test (Dixon's or Rosner's) is based on sample size. Dixon's test is used for sample sizes <25, Rosner's test is used on sample sizes>=25. The other statistical appendices will be updated to include both Dixon's and Rosner's methods in the outlier analysis sections.
48	Appendix E.4 - Statistical Analysis of Seep Investigation	Section 5.1and 5.2	Page 149 and 150 through 213 of the PDF Appendix E document	N/A	N/A	Why were formal group hypothesis tests specified for the historical seeps/AOC locations versus areas upstream of these locations but were not specified for the comparisons of group data for intermediate sample areas vs. "upstream control " groups UC24 and UC25?	Formal group hypothesis tests were selected for comparing historical seep/AOC locations to areas upstream of these locations. These tests compare the mean/median monitoring results between the two groups. Since samples collected adjacent to historical seep/AOC location and locations upstream were relatively close in areal space, the river banks were assumed to have similar characteristics. Since the physical characteristics of the river banks were similar, a direct comparison of means/medians was appropriate since differences in mean/median monitoring results are unlikely to be due to differences in physical characteristics of the river banks. However, the physical characteristics of the river banks between intermediate areas and control locations were more variable, which could lead to confounding effects related to different physical characteristics of the banks. For example, differences in vegetative shading of the river between the two locations could explain differences in mean/median temperature when comparing the two groups. Similarly, differences in river flow could explain differences in mean/median dissolved oxygen between the two groups. Given, the possibility of this type of confounding, monitoring results collected in intermediate areas (confidence intervals) were compared to tolerance intervals calculated from monitoring results collected from the upstream control locations. Using a statistic that is based on the upper and lower ends of a distribution (e.g. tolerance intervals) helps control for confounding.

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Comment Number	Section Number	Section Title	Page	Paragraph	Line	TDEC Comment (August 16, 2023)	TVA Response (November 14, 2023)
49	Appendix E.4 - Statistical Analysis of Seep Investigation	Table D.3 (Should be relabeled as Table E.4-C) - Summary of Statistical Hypothesis Testing	Page 154 of the PDF Appendix E document	Table	N/A	Comment is for future reference and consideration as sampling programs are designed, including for the CARA: Based on the small sample sizes for the adjacent versus upstream data group comparisons/hypothesis tests, limited to sample sizes of 11 or less, the calculated Power associated with these hypothesis tests are low. Power is the ability of the test to detect a statistically significant difference between groups when a true difference actually does exist. The reality of these specific hypothesis tests is that, because of the limited sample sizes, the ability of these tests to detect a real statistical difference between the adjacent and upstream populations is severely limited.	The comment is correct and addresses achieved sample size. Statistical tests on relatively small sample sizes can lack the power to identify statistical differences between two groups. The number of monitoring results were constrained by the length of the historic seep/AOC locations and the length of the river bank available for sampling. Efforts were made to collect as much data as possible given these constraints. The current sample sizes are typical of an environmental investigation of this nature and are adequate for the purposes of the EAR given that numerous other lines of evidence are being investigated at the site to provide an overall evaluation of current environmental conditions. The statistical results supplement the results of the exploratory data analysis.
50	Appendix G.1	2.2 Slope Stability	13 of 2668	2	1 to 3	The text states: "As described in the EIP, including the Evaluation of Existing Geotechnical Data (Appendix L of the EIP; Stantec 2018a), the existing data are sufficient to establish appropriate shear strengths and stability results for certain static and seismic load cases." The second response to TDEC comment # 6 of the Static Slope Stability SAR states in part "The strength parameters used in historical analyses are presented for information only, and only for purposes of relative comparison. This report does not attempt to judge the level of conservatism or the appropriateness of the historical parameters." How are these two statements by Stantec compatible?	The first statement, regarding Section 2.2 of the EAR, is specifically addressing the *potential* use of certain field and laboratory data from historical explorations that were summarized in Appendix L of the EIP. The second statement, regarding the Static Stability SAR, is specifically addressing shear strength parameters derived for the new analyses presented in the SAR. The two statements are not addressing the same topic and are compatible. The referenced language in both the EAR and the Static Stability SAR is standard and has been accepted by TDEC in previous EAR and Static Stability SAR submittals.
51	Appendix G.1	2.2.3 Results	19 of 2668	1	2 to 4	The text states "The displacements due to the design earthquake were less than the tolerable displacement of three feet, and thus correlate to a FS Sliding greater than one." That is not correct. If a mass is expected to slide less than tolerable under earthquake loading its limited equilibrium FOS is less than 1. If the FOS would be greater than 1 the mass would not slide. Please correct/rephrase the statement perhaps by defining what the FS Sliding represents.	Throughout the TDEC Order seismic stability work (for each Plant), a pseudostatic sliding FS of one has consistently been correlated to a tolerable displacement of 3 feet. This is documented in the Seismic Stability SAR (see Table 13) and the Stability SAP (see Table 2). The statement in the EAR is consistent with how the pseudostatic sliding FS has been defined throughout the TDEC Order work. The statement in Section 2.2.3 of the EAR Appendix G.1 will be clarified as follows: "The displacements due to the design earthquake were less than the tolerable displacement of three feet, and thus correlate to a FS Sliding greater than one*(as defined in the Seismic Stability SAR [EAR Appendix G.4] and the Stability SAP).*"
52	Appendix G.1	2.3.1 Previous Representative Studies and Assessments	20 of 2668	1	N/A	CFR 257.73(d) is not a complete citation of the applicable rule. Please complete the citation here and on page 22/2668	Throughout Section 2.3, the citation will be revised as follows: 40 CFR Part 257.73(d). This format is consistent with other references to parts of the CCR Rule elsewhere in the document.

Robert Wilkinson, P.G., CHMM CCR Technical Manager
2nd Floor TN Tower, W.R. Snodgrass Building
312 Rosa L. Parks Avenue
Nashville, TN 37243
Phone: (615) 598-3272
e-mail: Robert.S.Wilkinson@tn.gov

David W. Salyers, P.E.
Commissioner

Bill Lee
Governor

January 12, 2024

Shawn Rudder
Sr. Manager
Waste Permits, Compliance, and Monitoring
Tennessee Valley Authority
1101 Market Street, BR 4A
Chattanooga, TN 37402

RE: TDEC Commissioner's Order OGC15-0177
TVA Kingston Coal Fired Fossil Fuel Plant
Environmental Assessment Report Revision 1

Dear Mr. Rudder:

On November 14, 2023, Tennessee Valley Authority (TVA) submitted the Environmental Assessment Report (EAR) Revision 1 for the TVA Kingston Coal Fired Fossil Power Plant (TVA KIF) documenting the results from the implementation of the Environmental Investigation Plan (EIP). The Tennessee Department of Environment and Conservation (TDEC) has completed its review of the submittal and has no further comments.

TDEC concurs with the results of the initial desktop survey phase of the water use survey, intended to identify usable water wells and springs potentially being used for domestic purposes within 0.5-mile of the boundary of the TVA KIF as outlined in Section 5.3 – Water Use Survey and Appendix H.9. TVA is authorized to proceed with the next phases of Water Use Survey activities as outlined in the TDEC accepted plans.

Please provide the results of the Water Use Survey in an updated document (EAR Revision 2) to TDEC no later than March 12, 2024.

Should you have any questions, please do not hesitate to contact me via email at Robert.S.Wilkinson@tn.gov or phone at (615) 598-3272.

Sincerely,

Robert Wilkinson, P.G., CHMM

CC:	Pat Flood	Angela Adams	James Clark
	Rob Burnette	Chris Vail	Caleb Nelson
	Judy Low	Anna Fisher	Kelly Love
	Roy Quinn	Suama Bolden	Brandon Boyd