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

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 2, 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 John Sevier Coal Fired Fossil Fuel Plant
Environmental Investigation Plan Approval

Dear Ms. Smelley:

Tennessee Valley Authority (TVA) submitted the Environmental Investigation Plan (EIP) Revision 3 TVA John Sevier Coal Fired Fossil Power Plant (TVA JSF) on October 19, 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 JSF EIP Revision 3. 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 JSF.

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

Robert Wilkinson, P.G., CHMM CCR Technical Manager
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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

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.

REFERENCES

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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).

EIP-EAR Cross-Reference Table
John Sevier 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	Cadmium (Cd) results from the analysis of groundwater monitoring samples exceeded the Cd MCL from October 2007 till April 2011. As a part of the Environmental Investigation Plan, TVA shall analyze all samples for the constituents as described in Attachment A. Upon completion of sampling, TVA shall submit the results of sample analyses in the Environmental Assessment Report. The EAR for the TVA JSF site shall include all groundwater monitoring sampling locations and the results from all groundwater samples collected. The EAR shall identify sampling locations where analysis of groundwater monitoring samples indicated the level of constituents' results exceeded either the Maximum Contaminant Level (MCL) as defined in the TN Public Drinking Water regulations or background levels in local groundwater. TVA shall include in the EAR the history of Cd sampling at the JSF site, the groundwater sampling data for Cd and report if monitoring well sampling was discontinued after 2011 and if so why.	Included in the EIP and Chapter 5.2 - Groundwater and Hydrogeological Investigations
3.1.TDEC Site-Specific Environmental Investigation Requests, 3.1.2	2	Groundwater monitoring parameters are being reported in two different tables in the information provided by TVA for the JSF site: a. Table 2 = Primary Constituents b. Table 3 = Other Permit Required Constituents In the EAR for the JSF Site, please include all groundwater monitoring results in one Excel workbook by sampling location and sampling date. The workbook should include the sampling dates and whether constituents exceed Drinking Water MCLs or background levels for constituents without MCLs. - Reference Groundwater Monitoring Report – November 2015.	Included in the EIP and Chapter 5.2 - Groundwater and Hydrogeological Investigations
3.1.TDEC Site-Specific Environmental Investigation Requests, 3.1.3	3	TVA shall install a minimum of one up gradient and three down gradient monitoring wells at each of the four disposal units at the JSF site. The wells should be located and constructed to provide representative groundwater samples from the upper most aquifer. A description of the drilling method, well logging, well construction and well development shall be provided in the EIP. TVA shall provide a schedule for the placement construction and development of additional borings/groundwater monitoring wells.	Included in the EIP and Chapter 5.2 - Groundwater and Hydrogeological Investigations
3.1.TDEC Site-Specific Environmental Investigation Requests, 3.1.4	4	Page 113 of the multisite order presentation references active facilities and that TVA is in the process of determining the uppermost aquifer at the JSF Site. Ongoing work as well as additional work to determine the uppermost aquifer at the JSF site shall be included in the JSF Site EIP. TVA shall provide a groundwater potentiometric surface map for the Highway 70 borrow area and Ash Disposal Area J as a part of the JSF site EAR.	Chapter 5.2 - Groundwater and Hydrogeological Investigations
3.1.TDEC Site-Specific Environmental Investigation Requests, 3.1.5	5	The JSF Site EIP shall describe how TVA will determine if the piezometric surface and the potentiometric surface are hydraulically connected. TVA shall include in the JSF Site EAR the results of this investigation including if there are differences between the groundwater piezometric surface and potentiometric surface and explain if the piezometric surface and potentiometric surface are distinctly different from the uppermost aquifer at this site.	Chapters 5 - Hydrogeological Investigations
3.1.TDEC Site-Specific Environmental Investigation Requests, 3.1.6	6	TVA shall identify the processes it plans to use to estimate the amount of CCR material that is below the highest recorded groundwater potentiometric surface at the JSF Site.	Chapter 5.1 - CCR Material Characteristics Evaluation and Chapter 4.3 - CCR Material Quantity Assessment
3.1.TDEC Site-Specific Environmental Investigation Requests, 3.1.7	7	TVA shall provide a copy of the seismic hazard study performed by AMEC Geomatrix, Inc. referenced on page 94 of the multisite order presentation with the JSF Site EIP. TVA shall explain in the JSF Site EAR how the horizontal seismic coefficient of 0.115g was determined. The data and formulae used to make this determination shall also be included.	NA - Included in the EIP
3.1.TDEC Site-Specific Environmental Investigation Requests, 3.1.8	8	Stantec recommended further work at the TVA JSF site in the "February 8, 2010 Report of Geotechnical Exploration". TVA shall explain whether it took the actions recommended, the data generated from that work and the results from implementing the recommendations when it submits the JSF Site EAR.	Included in the EIP and Chapter 4.1 - Geotechnical Investigation
3.1.TDEC Site-Specific Environmental Investigation Requests, 3.1.9	9	The TVA shall provide, in the JSF site EIP, a description of the process it plans to use to determine if dike construction at the TVA JSF site is susceptible to failure. While TVA may have historic data for dike construction, TVA shall perform proposed additional on-site activities to definitively determine dike construction materials and the location and relative amount of the different materials in the dikes. The JSF Site EAR shall contain this information as well as data that confirm CCR materials used to raise the dikes and a determination if the use of CCR materials contributed to the North Dike Failure in 1973. TVA shall describe the repairs made to the North Dike Failure after the 1973 repair and if any additional repair work is anticipated.	NA - Included in the EIP
3.1.TDEC Site-Specific Environmental Investigation Requests, 3.1.10	10	TVA shall propose the method(s) it will implement to better define the physical characteristics of the clay layer identified below the compacted ash. This includes (1) compaction if any, (2) the occurrence of rock or debris in the clay that would reduce permeability and (3) the depth and location of the clay layers referenced on page 111 of the TVA JSF Fossil Plant multisite order presentation.	NA - Included in the EIP
3.1.TDEC Site-Specific Environmental Investigation Requests, 3.1.11	11	TVA shall provide the date of the drawing set with the 10W204-combined file name.	NA - Included in the EIP
3.1.TDEC Site-Specific Environmental Investigation Requests, 3.1.12	12	TVA shall provide data for the location and depth of borings 33B, 34B, 33A and 33B presented on drawing 10W507-09. The borings shall be mapped with their location relative to the liner system present in the "Bathtub Area" (Drawing 10W507-02). TVA shall provide geotechnical data and stability calculations that transect and include the liner system of the ammoniated ash fill area and also provide cross section E-E' indicated on drawing 10W502-1.	NA - Included in the EIP
3.1.TDEC Site-Specific Environmental Investigation Requests, 3.1.13	13	As a part of the JSF Site EAR, TVA shall provide geotechnical data and stability calculations for the critical sections of the final geometry should the Bottom Ash Stacking plan be implemented as planned.	NA - Included in the EIP

EIP Section	Request No.	TDEC Information Request	Associated EAR Section
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	TVA shall provide 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 III Detection Monitoring and Appendix IV Assessment Monitoring found on page 21500 of the Friday, April 17, 2015 Federal Register (Appendices III and IV 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.	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);	Chapter 2 - Site History and 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.	Chapter 2 - Site History and Physical Characteristics
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 off CCR material at each site.	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 - Included in the EIP
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 groundwater (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 groundwater is used as a source of domestic water supply within a ½ mile radius of the TVA site, the EIP shall include an offsite groundwater and surface water sampling plan as a part of the EIP.	Chapter 5.4 - Water Use Survey
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 groundwater 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 groundwater monitoring wells and springs. TVA shall include all groundwater monitoring construction information, location and historical groundwater monitoring data in each TVA site's EAR.	Included in the EIP and Chapter 5.2 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 groundwater monitoring wells including the reasons for proposed their proposed location.	NA - Included in the EIP
4.3 C. Groundwater Monitoring and Mapping, 4.3.3	3	A discussion of additional groundwater monitoring wells that will be installed to complete a groundwater monitoring network at the TVA site around all surface impoundments, landfills and/or non registered disposal sites; including the location of existing or proposed groundwater monitoring wells down gradient of all CCR disposal areas on the TVA site. TVA shall propose a groundwater monitoring network that will provide data to develop a TVA site wide groundwater potentiometric surface map. TVA shall ensure that the groundwater monitoring locations (current and proposed) in the EIP will accurately determine groundwater flow and direction.	NA - Included in the EIP
4.3 C. Groundwater Monitoring and Mapping, 4.3.4	4	A discussion of the construction methods TVA will use to install additional groundwater 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 groundwater monitoring plan for sampling all wells and springs included in the monitoring network. This should include the methods TVA shall use to collect groundwater samples, the analytical methods to be used for groundwater 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 groundwater surface elevation under the landfill(s), surface impoundment(s) and/or non registered site(s). If additional data is needed to provide groundwater 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 groundwater surface in the ash disposal areas such that (1) the CCR material between the original ground surface and the top of the current groundwater table is defined and (2) CCR material between the current groundwater 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 groundwater surface and from CCR material that is below the projected groundwater 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 5.1 - CCR Material Characteristics Evaluation and Chapter 4.3 - CCR Material Quantity Assessment
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 shall 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 TVA site. This should include the science it will use to extend its groundwater monitoring network.	NA - Included in the EIP

EIP Section	Request No.	TDEC Information Request	Associated EAR Section
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 groundwater 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 groundwater monitoring well construction data. TVA shall describe the methods (surface geophysics; installation of borings/groundwater 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 and Chapter 4.1 Geotechnical Investigation
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 and Chapter 2.2 CCR Management Unit History and Land Use
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 4.1 - Geotechnical Investigation
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 groundwater 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 the stability calculations for final permitted design elevations for Landfills that are defined by the Federal Regulations as overfills. If the stability calculations have not been completed, then TVA shall provide stability calculations 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.	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.	Included in the EIP and Chapter 4.1 - Geotechnical Investigation
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 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.	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 and Chapter 5.2 - Groundwater and Hydrogeological Investigations

EIP Section	Request No.	TDEC Information Request	Associated EAR Section
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 groundwater 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).	Chapter 7 - Surface Streams, Sediment and Ecological Investigations
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 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 groundwater 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.	NA - Included in the EIP

Robert Wilkinson, P.G., CHMM CCR Technical Manager
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David W. Salyers, P.E.
Commissioner

Bill Lee
Governor

April 4, 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 John Sevier Coal Fired Fossil Fuel Plant
Environmental Assessment Report Revision 0

Dear Mr. Rudder:

On January 10, 2023, Tennessee Valley Authority (TVA) submitted the Environmental Assessment Report (EAR) Revision 0 for the TVA John Sevier Coal Fired Fossil Power Plant (TVA JSF) 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).

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 JSF 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 address the attached comments and provide the results of the updated Water Use Survey 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 July 3, 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	Beth Rowan	Caleb Nelson
Brandon Boyd	Anna Fisher	Kelly Love
Roy Quinn	Julie Arp	

Attachment 1 – Summary of TDEC Comments

TVA JSF EAR Rev 0
Summary of TDEC Comments

Section Number	Section Title	Page	Paragraph	Line	Comment
General	NA	NA	NA	NA	Since Dodson Creek is used as a hydrologic boundary for significant sections in this report, it should be labeled on all Exhibits and Figures just as Polly Branch and the Holston River are.
4.2.3.2	Pore Water Phreatic Surface	43 of 131	1	2	"*Phreatic surfaces in the Bottom Ash Pond have generally shown a declining trend since geosynthetic caps were constructed.* " is a common theme through the document. However, the data presented in this document do not show this. If in fact, the phreatic surface has dropped since the geosynthetic caps were installed then data in the tables should show data prior to capping and then after capping that indicate this declining trend. Currently, TW06 and TW08 do not show a declining trend, it is noted that TW07 does exhibit a modest decline. At a minimum the section should point to the appropriate Appendix where this decline can be seen in the pore water data.
5.1.3.2	Geology and Lithology	51 of 131	NA	NA	The JSF Plant Unconsolidated Materials figure appears to show some areas of bedrock that is not identified in the legend or discussed in the section. Please correct.
5.1.3.3	Hydrostratigraphic Units and the Uppermost Aquifer	52 of 131	4	1	TVA states "*Based on the geology and hydraulic conductivities measured in the vicinity of the CCR management units, the coarse grained unconsolidated materials and upper bedrock shown on Exhibit D-2 in Appendix D of the EAR are hydraulically connected and defined as the uppermost aquifer.* " TDEC has reviewed all exhibits and narrative and can not determine the horizontal extent or location of the "*coarse grained unconsolidated materials* ". Please provide a figure and narrative description that identifies the location, vertical, and horizontal extent of the unit.
5.4	Hydrogeological Investigation Summary	63 of 131	2nd bullet	NA	The statement that *"drainage improvements of potential corrective actions are expected to reduce concentrations of CCR constituents…"* is speculative and premature; such conclusions should be developed for presentation in the CARA with and provided with appropriate supporting information.
Chapter 8	NA	77 of 131	Figure	NA	The figure on this page needs a title block and figure number for reference.

TVA JSF EAR Rev 0
Summary of TDEC Comments

Section Number	Section Title	Page	Paragraph	Line	Comment
Table 1-1 and Table H.1-11	Human Health Screening Levels for Groundwater	91 of 131 and 145 of 833	NA	NA	The value for silver is a TN secondary MCL.
Exhibit 8-2	NA	127 of 131	NA	NA	It appears some wells/borings shown in this exhibit do not have corresponding logs in the Appendices. Also, groundwater levels should be indicated in each well. Section 8.3, PDF P 80 of 131 paragraph 3 states the groundwater elevation is a *"few"* feet below the pore water phreatic surface. This should be indicated in this figure.
Appendix D	General	NA	NA	NA	Since the Dry Fly Ash Stack is not a homogeneous unit across the area and includes a lined ammoniated waste area, a second cross section that depicts the cross section geometry in that area may be appropriate.
Appendix D	General	NA	NA	NA	Ash Disposal Area J may benefit from an approximately west to east cross section from Dodson Creek through approximately PAH-1, it appears there are significant number of boring, temporary wells, etc.
Appendix D	Exhibit D.1	2 of 4	NA	NA	It appears that the ID for JSF_PZ-BA19 is missing.
Appendix G.1	General	NA	NA	NA	Pore water concentration data versus time is shown for the Dry Fly Ash stack and the Bottom Ash pond but not for Ash Pond J, is there a reason Ash Pond J was not included in the time series? It may be potentially beneficial to see the difference in pore water response between a geosynthetic capped unit and a soil capped unit.
Appendix G.1	2.1.3 Results	15 of 2958	Bullet 3	19-29	The entire bulleted section is highlighted.
Appendix G.1	Figure G.1-14	59 of 2958	NA	NA	The locations for PZ-JS73B and PZ-JS75B do not seem to be located on either Figure G.1-13 or Exhibit 4-7.
Appendix G.1	Figure G.1-14	59 of 2958	NA	NA	Of the approximately seven piezometers in CCR (JS30, JS37, JS49, JS58, JS53, JS42, JS34C) depicted on G.1-13 why are only four included in this figure?

Attachment 2 – Summary of CEC Comments

TVA JSF EAR Rev 0
Summary of CEC Comments

Section Number	Commentator	Section Title	Page	Paragraph	Line	Comment
Executive Summary						
Executive Summary	EIL	Executive Summary	11 of 131	1	8	insert "CCR Management" Unit.
Executive Summary	CEC	Executive Summary	12 of 131	bullet 2	2	What is the source of mercury upstream of the JSF plant? Can the related documented source be referenced? Bullet also indicates that an evaluation of potential risks associated with the sediment at one location in the Holston River and two locations in Polly Branch ARE warranted in the CARA Plan to determine if corrective actions are needed. This conflicts with note on exhibit ES.1.
Executive Summary	CEC	Executive Summary	14 of 131	Exhibit ES-1		Note concerning mercury seems to conflict with executive summary noted on page ix-bullet 2 which says that an evaluation of potential risks are warranted.
Section 1						
1.3.1.2	CEC	Hydrogeological Terms	24 of 131	Pore Water Figure/notes		Extra period after last sentence in note under pore water diagram.
Section 2						
2.2.5	CEC	Other Plant Operations	31 of 131	1	1	*"In addition to the four CCR management units, historical JSF Plant operations included non-CCR several process water, ….."* Something may be missing from this sentence after "several", sentence needs to be revised for clarity.
2.3	CEC	Ownership and Surrounding Land Use	32 of 131	3	1	*"Public water is provided by the Rogersville/Persia Utility public water utility"* . The following sentences after this sentence imply these are two separate utilities. Consider revising the first sentence to specify this is more than one public water utility**.**
2.4.2.2	CEC	Surface Water Hydrology	34 of 131	1	2	General Comment: Do not see the 1927 topo in the same location as the 1940 topo (exhibit 2-5). Text stated there were a total of 6 historical stream channels observed in 1927 in the area of investigation. Is the 1927 topo attached or referenced in another location for viewing? This may be helpful in Appendix H.1 as well.

TVA JSF EAR Rev 0
Summary of CEC Comments

Section Number	Commentator	Section Title	Page	Paragraph	Line	Comment
Section 7						
7.1.2	CEC	Previous Studies and Assessments	67 of 131	1	3-10	Bullet point two contradicts bullet point one. Bullet point one - highly stressed benthic community not directly correlated with JSF discharge. Bullet point two - substantial reductions in gastropod productivity may have been due to chlorinated JSF plant discharge.
7.3	TEA	Results and Discussion	70 of 131	3	1	Please indicate the specific location; distance; etc. or reference on an exhibit as to the location of the potable water source located downstream of the JSF Plant CCR management units.
7.3.1	TEA	Holston River	71 of 131	1	2	*"Most CCR Parameter concentrations in sediment samples collected from the Holston River were below acute and chronic ESVs."* Were copper, zinc and mercury the only constituents that were above ESV's? If so, please indicate.
Appendix G.1						
2.1.3	EIL	Results	14	7	5	Please define the term"elastic silt"
Appendix H.1						
2.2	CEC	Current and Ongoing Groundwater Monitoring	13 of 833	2	2 to 3	*"… Pond and determined that constituents detected at downgradient monitoring wells had statistically significant increases over background levels…"*- May be beneficial to specify that constituents detected in **onsite** downgradient monitoring wells? Also, are the background levels referenced here site specific/up-gradient background levels? This may be discussed at length in App. E but may be useful to add briefly in this sentence.
2.3.7.1	CEC	Well Construction and Presence of CCR Material	17 of 833	1	4	Sentence indicates CCR material near the boring in which well W-28 was installed. Would it be appropriate to say that the CCR material was also above the screened interval of W-28?
2.3.7.3	CEC	Hydrostratigraphic Units and the Uppermost Aquifer	19 of 833	2	4	Mentions protecting the uppermost aquifer because it could be used by property owners as a source of water. It would probably be beneficial to have some reference in the text of Appendix H.1 concerning the desktop water use survey. Do we know if identified wells nearby are screened in the uppermost aquifer or deeper aquifers?

TVA JSF EAR Rev 0
Summary of CEC Comments

Section Number	Commentator	Section Title	Page	Paragraph	Line	Comment
2.3.7.4	CEC	Groundwater and Surface Water Level Elevations	19 of 833	1	1	Was any consideration given to measuring surface water elevations in Polly Branch and Dodson Creek? These physiographic features are said to influence groundwater (Section 2.3.7.5); however, evaluation appears to be missing.
2.3.7.4	CEC	Groundwater and Surface Water Elevations	19 of 833	1	1	Mentions 31 wells were used for groundwater elevation contours and 17 piezometers. Suggest adding another sentence identifying the number of wells and piezometers from either the uppermost aquifer or bedrock aquifer.
2.3.7.5	CEC	Groundwater Flow	20 of 833	4	9	*"Most bedrock wells were not gauged during sampling events 1 and 2".* - Was there a reason why?
2.3.7.5	CEC	Groundwater Flow	21 of 833	1	2	Was this the mean hydraulic conductivity from slug testing the geometric mean?
2.3.7.5	CEC	Groundwater Flow	21 of 833	1	8	Good that the reference the report where the dry fly ash stack hydraulic conductivities were located. It would be helpful to include the Dry Fly Ash stack geometric mean values in Table H.1-4, similar to the other CCR management unit areas. It was difficult to find where that value came from on the next page, the others were summarized in table h.1-4.
2.4	CEC	Groundwater Quality	24 of 833	1	8	*"analytical results were above the GSL at 99% confidence level"* . Instead, should it state that the lower confidence limit (LCL) at 99% confidence level was above the GSL?
2.4	CEC	Groundwater Quality	24 of 833	2	7	Is the capping of the CCR management unit considered somewhat of a corrective action? Statistical evaluations including compliance confidence intervals are useful for evaluating the effectiveness of corrective actions that have been completed. May be worth stating if true?

TVA JSF EAR Rev 0
Summary of CEC Comments

Section Number	Commentator	Section Title	Page	Paragraph	Line	Comment
2.4	CEC	Groundwater Quality	26 of 833	1	7	CCR constituents were similar, but slightly higher in JSF-210. Was the turbidity similar or were these based on dissolved metals concentrations? Were the dissolved fractions for cations and anion concentrations used for the Piper diagrams?
2.4.2	CEC	Geochemistry of Soils-Groundwater Interaction	27 of 833	1st and 3rd bullet		Note that adsorption and mineral precipitation are controlled by pH and redox changes. Note that pH values in 10-36 and W-29 had a statistical increasing trend.
3	CEC	Summary	30 of 833	2nd bullet	3	Mentions potable water wells. May need to include a summary in Appendix H.1 similar to section 5.3 of the EAR summarizing water use survey and reference to H.9.
Appendix J.1 - Technical Evaluation of Surface Streams Data						
2.1	TEA	Historical Studies	10 of 301	1	9	*"The studies found that downstream aquatic communities near the JSF and JCC Plants were ecologically similar to their upstream* ***control*** *sites."* *"Control sites"* is used numerous times throughout Appendix J. They don't represent "controlled" conditions. A more appropriate term is background or reference locations. In fact, the appropriate term is used in Section 3.1 of Appendix J.4: *"These areas represent* ***background****, adjacent, and downstream conditions".* Please consider using the term "reference or background" as opposed to "controlled".
2.4.2	TEA	Analytical Results	12 of 301	2	2	*"The human health screening levels were only applied to surface stream sampling results for the Holston River, as it is the only surface stream used as a potable water source near the JSF Plant."* How close is the intake from the site? Could the intake be influenced by the site discharges?
2.4.2	TEA	Analytical Results	13 of 301	4	3	If a data point was a statistically significant outlier and no other factor could be identified to explain the outlying value, the data point was excluded from further data screening, statistical analysis, or evaluation of the EI results in the EAR. Suggest adding a parenthetical identifying what some of those "other factors" might be.
Appendix J.3 – Technical Evaluation of Sediment and Benthic Macroinvertebrate Data						

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Section Number	Commentator	Section Title	Page	Paragraph	Line	Comment
2.1.2	TEA	Historical Benthic Macroinvertebrate Studies	84 of 301	1	10	*"Additionally, the studies found that while* ***control site*** *and experimental station . . ."* As previously mentioned, the term Background locations is more appropriate. These locations are meant to reflect background environmental conditions, i.e., not influenced by the site (EPA 2002). Likewise, and "experiment stations" should be described consistent with other sections in the Appendix. Note in Section 3.1 of Appendix J.4: "These areas represent **background**, adjacent, and downstream conditions"
2.1.1	TEA	Historical Benthic Macroinvertebrate Studies	84 of 301	1	10	*"Additionally, the studies found that while control site and experimental station benthic macroinvertebrate communities* ***were different****, and downstream communities were highly stressed, the study results did not show a direct correlation of these factors with JSF Plant thermal discharges, and it was not possible to separate possible thermal discharge effects from other variables."* How were they different; what factors indicated they were "highly stressed"? Please consider listing these.
3.1.1	TEA	Exploratory data Analysis	87 of 301	2nd bullet	4 in 2nd bullet	*"There is a documented source of mercury contamination to the Holston River upstream of the JSF Plant (USEPA 2017)."* Were the upstream samples elevated indicative of this upstream source? As noted in the first statement, some of the adjacent and downstream locations had concentrations above ESVs but not the upstream locations. Doesn't that indicate the plant is a source? Please explain as this is an important point.
4.1	TEA	Sediment Quality	96 of 301	3	4	*"Mercury concentrations were identified at concentrations slightly above the chronic ESV in sediment samples collected from five separate locations along the Holston River."* It would be helpful to identify those locations.
4.1	TEA	Sediment Quality	96 of 301	3	4	*"These results are attributed to a documented source of mercury upstream of the JSF Plant CCR management units, the Saltville Waste Disposal Ponds Superfund (Saltville) site. . ."* If this was the case, why are there exceedances in the adjacent and downstream locations but not the upstream locations? Should there be a consistent spatial distribution instead of an apparent gradient?

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Section Number	Commentator	Section Title	Page	Paragraph	Line	Comment
4.1	TEA	Sediment Quality	96 of 301	4	1	*"however, arsenic, beryllium, and nickel were present at concentrations above their respective chronic ESVs in one or more sediment samples from the PB06 and/or PB07 locations"* Suggest adding (Exhibit J.3-4) to the end of the sentence as reference.
4.2	TEA	Benthic Macroinvertebrate Community Analysis	97 of 301	3	1	*"Community sensitivity, examined through the HBI, reflects possible spatial relationships that may have resulted from localized differences in habitat conditions or other environmental factors;"* We have discussed this on other sites; but has there ever been consideration given to using a quantitative habitat assessment tool to shed some light on this?
Appendix J.5 - Technical Evaluation of Fish Community and Fish Tissue Data						
2.1.1	TEA	Fish Population Monitoring	254 of 301	1	4	Again, please evaluate the use of the word "control" versus "reference".
2.1.4	TEA	Fish Entrainment Monitoring	255 of 301	2	3	Please provide a short statement as to the results of the fish entrainment studies conducted between 2004 and 2006.
3.1	TEA	Analytical Results	258 of 301	1	1	Should mercury and selenium be added to the list of CCR parameters evaluated and mentioned in this section?
Table J.5-2	TEA	Critical Body Residue Value Analysis - Holston River	267 of 301	NA	NA	Because of the importance of this data related to fish tissues, can more specific statements be made other than the general conclusions that the concentrations downstream were "higher" or "analogous" when comparing CBR values (for instance in Chapter 4 Summary of this appendix)? Although the general statement is supported, there are some examples in which "adjacent" sample concentrations exceed "upstream" values, such as muscle mercury values in Bluegill and redear sunfish.
Appendix E- Statistical analysis						
Appendix E.1	CEC	Statistical Analysis of Background Soil Data	Pages 1-6	Sections 1.0 though 4.0	N/A	Excellent narrative summary of the statistical approach to deriving soil background threshold values (UTLs). Statistical methods, as described in this section, are valid and defensible, in compliance with statistical standard practices for the evaluation of environmental data.

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Section Number	Commentator	Section Title	Page	Paragraph	Line	Comment
Appendix E.1 Section 2.1.3	CEC	Outlier Screening	4	N/A	N/A	Rosner's method was used in evaluating outlier data for all data given in Appendix E, except for the background soil data. I assume that Rosner's procedure was not used in the identification of specific data values that are statistically significant outliers for the background soil evaluation because of the stated decision to not remove any outliers as given in the final sentence of Section 2.1.3 as follows: *"However, given the heterogeneity of naturally occurring inorganic compounds in soils, statistical outliers were not removed from the datasets prior to statistical analysis, but may be reevaluated if BTVs are used to inform future corrective actions. "* Is this correct?
Appendix E.2, Section 2.2	CEC	Regression Analysis	4	1st	Line 7	Has there been any thought given to evaluating the SPLP/CCR correlations 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, Section 2.2	CEC	Regression Analysis	4	1st	Line 5	*Sentence states: "As part of the analysis, the SPLP results for the CCR Parameters were compared to the range of pore water concentrations from the Ash Disposal Area J, Bottom Ash Pond, and Dry Fly Ash Stack."* Are you stating that you calculated correlation coefficients for the pore water vs SPLP results? Or is this simply stating that you have shown the pore water ranges on each of the regression plots ?
Appendix E.2, Section 2.2	CEC	Regression Analysis	4 and 5	1st	Entire paragraph	Correlation between CCR material data and SPLP extraction results will typically not produce a correlation coefficient high enough (0.8 to 1.0) to justify the development of a regression model. Therefore, the development of a reliable linear regression-based mathematical model to predict CCR pore water constituent concentrations resulting from the leaching of these constituents from CCR ash will be difficult to achieve. Estimations of this kind should be performed with a more complex geochemical model, such as PHREEQC or Geochemist Workbench.

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Section Number	Commentator	Section Title	Page	Paragraph	Line	Comment
Appendix E.2, Section 3.2	CEC	Regression Analysis	5	2nd	6	The quoted statement is not surprising: *"The results indicate that the total concentrations of metals in CCR material is not a reliable predictor of the magnitude of the potentially leached concentrations measured using SPLP."* Based on past attempts to model the mathematical relationships between particulate-bound constituents and dissolved constituents from SPLP eluate, the development of a reliable regression-based mathematical model to predict CCR pore water and SPLP constituent concentrations resulting from leaching of constituents from CCR ash is difficult to accurately achieve.
Appendix E.3 Statistical Analysis of Groundwater Analytical Results	CEC	Section 2.2: Comparison to Groundwater Quality Data To Groundwater Screening Levels	4	First 3 paragraphs	N/A	Excellent summary of the approach used to compare groundwater constituent concentrations with MCLs and screening levels (i.e., confidence intervals for data with limited statistical evidence of trends and confidence bands for data with statistically significant trends).
Appendix E.3 Statistical Analysis of Groundwater Analytical Results	CEC	Section 2.2.1	5	Paragraph 1	1	*"For well-constituent pairs with five or more samples and at least four detected values, groundwater quality data were compared to GSLs using a linear regression trend analysis and confidence interval/ confidence band evaluation."* Page 21-24 of the EPA Unified Guidance (March 2009) states "At least 8 to 10 measurements should be available when computing a confidence band around a linear regression. There must be enough data to not only estimate the trend function but also to compute the variance around the trend line." The use of a sample size of five may not provide adequate Power to detect a statistically significant slope coefficient for the regression line. However, when examining the linear regression trend plots in Attachment E.3-D, there does not appear to be any plots with less than 6 data points. JFS-107 has 7 data points for Boron, pH, Molybdenum and JSF-110 has 6 data points for pH. Of these four plots, there was one, JFS-107 Boron, listed as having a statistically significant trend. Additional data acquired in the future will continue to build the size of these data sets and improve the validity and accuracy of the statistical test results.

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Section Number	Commentator	Section Title	Page	Paragraph	Line	Comment
Appendix E.3 Statistical Analysis of Groundwater Analytical Results	CEC	Section 2.2.1 Figure E.3-1	7	N/A	N/A	Nice flow chart figure added as Figure E.3-1. The only comment is that the wording within the pH boxes of the flow chart appear to be cut off.
Appendix E.4 Statistical Analysis of Surface Stream Data	CEC	Attachment E.4-A Summary Statistics by Water Body	Pages 174 to 178 of the entire PDF	See Table	See Table	There are references to total constituents, dissolved constituents, and Normal constituents. "Normal" concentrations are for those constituents that are not typically reported as "total" or "dissolved" fractions, such as chlorides, TSS, TDS, etc. However, there are inconsistencies as to when the term "Normal" is applied throughout the tables. Please revise. In addition, why was this aqueous-based chemical nomenclature with the differentiation of fractions not also used in the groundwater data tables in Appendix E.3?
Appendix E.4 Statistical Analysis of Surface Stream Data	CEC	Section 3.1 Summary Statistics, Exploratory Data Plots, and Outlier Screening	6	2nd	1	The results of the outlier screenings state the following: *"There were no statistically significant outliers in the JSF surface stream dataset."* However, when reviewing the box plots for Holston River in Attachment E.4-B, a note at the bottom of the box plot for copper states that the sample JSF-STR-WC07-LB-SUR-20190813 at 12.5 µg/L was identified as a potential outlier and was removed from the data. What was the reasoning for removing this value? Also, this removed outlier needs to be stated in the narrative of Section 3.1.

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Section Number	Commentator	Section Title	Page	Paragraph	Line	Comment
Appendix E.4 Statistical Analysis of Surface Stream Data	CEC	Section 2.2	5	1st	4	A statement is made that since there were no exceedances of ESVs and generic SSL_{HH} in the surface water sample analytical results, the only comparisons performed to assess changes between upstream, adjacent, and downstream sample locations were graphical in nature (via transects and box plots). The text specifically states: *"Comparisons were done graphically."* However, there were no summary discussions regarding the results of the referenced graphical comparisons of data within the Holston River relative to differences in analytical results between adjacent and downstream locations and differences in analytical results between upstream and adjacent sample results for Polly Branch.
Appendix E.5 Statistical Analysis of Sediment Data	CEC	Attachment E.5-B Box Plots	Pages 245 to 250 of the entire PDF	N/A	N/A	Relative to the box plots of comparisons of adjacent and upstream sediment concentrations for Polly Branch for the CCR Rule Appendix III Parameters, the colored boxes in the bottom legend intended to distinguish the upstream box plots from the adjacent box plots have the same color. A different color for the adjacent boxes needs to be shown in the legend.
Appendix E.5 Statistical Analysis of Sediment Data	CEC	Section 3.1 Summary Statistics, Exploratory Data Plots, and Outlier Screening	6	2nd	1	The results of the outlier screenings state the following: *"There were no statistically significant outliers in the JSF surface stream dataset."* However, when reviewing the box plots for Holston River in Attachment E.4-B, a note at the bottom of the box plot for copper states that the sample JSF-STR-WC07-LB-SUR-20190813 at 12.5 µg/L was identified as a potential outlier and was removed from the data. What was the reasoning for removing this value? Also, this removed outlier needs to be stated in the narrative of Section 3.1.

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Section Number	Commentator	Section Title	Page	Paragraph	Line	Comment
Appendix E.5 Statistical Analysis of Sediment Data	CEC	Section 3.3.1 Formal Hypothesis Testing	7 and 8	Entire Section	N/A	A parametric, two-sided hypothesis test (Type I error =0.05) was used to evaluate whether there are statistically significant differences in the means for given constituent concentrations adjacent to the facility and downstream for the Holston River sediment and upstream and adjacent comparisons of constituents for sediments taken from Polly Branch. Based on Attachment E.5-A, for the Holston River sediment samples, the hypothesis test results given in Section 3.3.1 are based on sample sizes of 12 for adjacent samples and 6 for downstream samples. Polly Branch results were based on sample sizes of 5 for upstream and 8 for adjacent locations. The hypothesis test results given in Section 3.3.1 should be considered preliminary, due to the low Power associated with these tests using the small sample sizes. For example, when examining the sediment box plots in Attachment E.5-B for the Holston River, there are visually evident differences in the distributions for adjacent vs. downstream sediment concentrations for arsenic, cadmium, and thallium. When examining the Power associated with the two-sided t-tests for these constituents, given the samples sizes, mean differences, and differences in standard deviations, the Power is very low. Therefore, if there are real differences in the means between the upstream and adjacent sample locations for these 3 referenced constituents, there is a low probability that the derived hypothesis tests would be able to detect these differences. Additional data acquired in the future will continue to build the size of these data sets and improve the validity and accuracy of the statistical test results.
Appendix E.7	CEC	Data Evaluation of Fish Tissue Data	2	Table E.7-3	Subheadings of Table	Regarding the fish categories "BG", "CC", "LB", "SB", "RS", and "SH" subheadings of the table listed under "Sample Concentration mg/kg ww*" and under the headings "Muscle', "Liver", "Ovary", and "Whole Body" : These fish types need to be clearly stated in the Legend at the bottom of Table E.7-3 so that the table can be pulled out as a stand-alone table for presentation and publications, if needed. It is understood that these designations are given in Table E.7-1; however, clear delineations of these call-outs are needed within Table E.7-3.

Appendix A
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Comment Number	Commentor	Section Number	Section Title	Page	Paragraph	Line	TDEC Comment (April 4, 2023)	TVA Response (July 3, 2023)
1	TDEC	General	NA	NA	NA	NA	Since Dodson Creek is used as a hydrologic boundary for significant sections in this report, it should be labeled on all Exhibits and Figures just as Polly Branch and the Holston River are.	Agree. This edit has been made throughout the document.
2	TDEC	4.2.3.2	Pore Water Phreatic Surface	43 of 131	1	2	*"Phreatic surfaces in the Bottom Ash Pond have generally shown a declining trend since geosynthetic caps were constructed. "* is a common theme through the document. However, the data presented in this document do not show this. If in fact, the phreatic surface has dropped since the geosynthetic caps were installed then data in the tables should show data prior to capping and then after capping that indicate this declining trend. Currently, TW06 and TW08 do not show a declining trend, it is noted that TW07 does exhibit a modest decline. At a minimum the section should point to the appropriate Appendix where this decline can be seen in the pore water data.	Additional information has been added to the EAR regarding the trend in the elevation of the phreatic surface in the Bottom Ash Pond, including discussion of the pore water levels in the temporary wells. The additional information can be found in Section 2.3.7.6 of Appendix H.1. Pore water levels prior to capping are unavailable; however, trends can begin after capping and be identified without prior data. Temporary well JSF-TW06 has been dry since it was installed. Temporary wells JSF-TW07 and JSF-TW08 show declining trends since installation as illustrated in Exhibit H.1-12b.
3	TDEC	5.1.3.2	Geology and Lithology	51 of 131	NA	NA	The JSF Plant Unconsolidated Materials figure appears to show some areas of bedrock that is not identified in the legend or discussed in the section. Please correct.	The unconsolidated materials figure has been revised based on additional review of available boring log information.
4	TDEC	5.1.3.3	Hydrostratigraphic Units and the Uppermost Aquifer	52 of 131	4	1	TVA states *"Based on the geology and hydraulic conductivities measured in the vicinity of the CCR management units, the coarse grained unconsolidated materials and upper bedrock shown on Exhibit D-2 in Appendix D of the EAR are hydraulically connected and defined as the uppermost aquifer. "* TDEC has reviewed all exhibits and narrative and can not determine the horizontal extent or location of the *"coarse grained unconsolidated materials "*. Please provide a figure and narrative description that identifies the location, vertical, and horizontal extent of the unit.	A Leapfrog exhibit has been added showing the inferred extent of coarse grained (primarily sand and gravel) alluvial deposits.
5	TDEC	5.4	Hydrogeological Investigation Summary	63 of 131	2nd bullet	NA	The statement that *"drainage improvements of potential corrective actions are expected to reduce concentrations of CCR constituents…"* is speculative and premature; such conclusions should be developed for presentation in the CARA with and provided with appropriate supporting information.	This sentence has been removed from the text. The effects of drainage improvements will be evaluated and presented in the CARA Plan.
6	TDEC	Chapter 8	NA	77 of 131	Figure	NA	The figure on this page needs a title block and figure number for reference.	The title and reference to an attached exhibit number are now included directly above this graphic in the text. This figure is included separately as Exhibit 8-6.
7	TDEC	Table 1-1 and Table H.1-11	Human Health Screening Levels for Groundwater	91 of 131 and 145 of 833	NA	NA	The value for silver is a TN secondary MCL.	An edit has been made to Table 1-1 to indicate the value for silver is a Secondary MCL.
8	TDEC	Exhibit 8-2	NA	127 of 131	NA	NA	It appears some wells/borings shown in this exhibit do not have corresponding logs in the Appendices. Also, groundwater levels should be indicated in each well. Section 8.3, PDF P 80 of 131 paragraph 3 states the groundwater elevation is a *"few"* feet below the pore water phreatic surface. This should be indicated in this figure.	Some historical boring logs are not available. More recent companion borings have been drilled near wells that do not have boring logs. The companion boring logs are included in the EAR. Groundwater levels are included on the cross sections included in Appendix D. The exhibits in Section 8 of the EAR are intended to be a more simplified representation of the conceptual site model and less technical than the cross sections in Appendix D.
9	TDEC	Appendix D	General	NA	NA	NA	Since the Dry Fly Ash Stack is not a homogeneous unit across the area and includes a lined ammoniated waste area, a second cross section that depicts the cross section geometry in that area may be appropriate.	An east -west cross-section (F-F') across the Dry Fly Ash Stack has been added to Appendix D.
10	TDEC	Appendix D	General	NA	NA	NA	Ash Disposal Area J may benefit from an approximately west to east cross section from Dodson Creek through approximately PAH-1, it appears there are significant number of boring, temporary wells, etc.	An east -west cross-section (E-E') across Ash Disposal Area J has been added to Appendix D.

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Comment Number	Commentor	Section Number	Section Title	Page	Paragraph	Line	TDEC Comment (April 4, 2023)	TVA Response (July 3, 2023)
11	TDEC	Appendix D	Exhibit D.1	2 of 4	NA	NA	It appears that the ID for JSF_PZ-BA19 is missing.	A label for JSF_PZ-BA19 has been added to Exhibit D-1.
12	TDEC	Appendix G.1	General	NA	NA	NA	Pore water concentration data versus time is shown for the Dry Fly Ash stack and the Bottom Ash pond but not for Ash Pond J, is there a reason Ash Pond J was not included in the time series? It may be potentially beneficial to see the difference in pore water response between a geosynthetic capped unit and a soil capped unit.	Pore water concentration data versus time were included for Ash Disposal Area J (TW09, TW10 and TW11) on the same graphs as for the other CCR management units. The graphs for individual constituents do not include temporary wells where reported concentrations were below groundwater screening levels. Also, Section 2.3.7.6 and Attachment C of Appendix H.1 provide information and time series graphs of phreatic surface elevations within each CCR management unit, including responses for geosynthetic and soil capped units.
13	TDEC	Appendix G.1	2.1.3 Results	15 of 2958	Bullet 3	19-29	The entire bulleted section is highlighted.	There should not be any highlighting in this section. The reason for highlighting on the reviewer's copy of the PDF is unclear. In any event, for the EAR Rev 1 we will make sure there is no highlighting.
14	TDEC	Appendix G.1	Figure G.1-14	59 of 2958	NA	NA	The locations for PZ-JS73B and PZ-JS75B do not seem to be located on either Figure G.1-13 or Exhibit 4-7.	The locations of PZ-JS73B and PZ-JS75B were not initially included on the exhibit because these sensors did not detect water. These locations are now shown on Exhibit G.1-13 for reference purposes.
15	TDEC	Appendix G.1	Figure G.1-14	59 of 2958	NA	NA	Of the approximately seven piezometers in CCR (JS30, JS37, JS49, JS58, JS53, JS42, JS34C) depicted on G.1-13 why are only four included in this figure?	The purpose of the exhibit is to show the trends of pore water elevations measured in piezometers that are within the area covered by the geosynthetic cap and that illustrate the effect that the cap has had on pore water levels. Piezometer JSF-JS34C is included in the exhibit. Piezometers JSF-JS30, JSF-JS37, JSF-JS49, and JSF-JS58 were installed along the edge of the geosynthetic cap in a ditch between the edge of the cap and a perimeter road. Because of this, they show an influence from precipitation events and do not represent a capped condition. Several piezometers located in the ditch have been identified as having surface infiltration of the piezometer casing itself. Piezometer JSF-JS42 shows a generally flat elevation with seasonal fluctuations that are interpreted to represent seasonal groundwater fluctuations, not the effect of capping. Piezometer JSF-JS42 is an open standpipe type with a screen that penetrates an underlying clay layer and extends into the top of a gravel deposit. Piezometer JSF-JS53 is outside of the capped area and represents groundwater elevations.
16	CEC	Executive Summary	Executive Summary	11 of 131	1	8	insert "CCR Management" Unit.	This edit has been made in the text.
17	CEC	Executive Summary	Executive Summary	12 of 131	bullet 2	2	What is the source of mercury upstream of the JSF plant? Can the related documented source be referenced? Bullet also indicates that an evaluation of potential risks associated with the sediment at one location in the Holston River and two locations in Polly Branch ARE warranted in the CARA Plan to determine if corrective actions are needed. This conflicts with note on exhibit ES.1.	Section 7.3.1 of Main Text references further discussion of the source as detailed in Appendix J.3. Since the Executive Summary is a general summary of the overall document, it does not typically include references. However, ES-1 has been modified. The note has been revised to remove "sediment". The note about the mercury source has the full reference added to indicate the EPA Superfund Site.
18	CEC	Executive Summary	Executive Summary	14 of 131	Exhibit ES-1		Note concerning mercury seems to conflict with executive summary noted on page ix-bullet 2 which says that an evaluation of potential risks are warranted.	The note in Exhibit ES-1 has been revised.
19	CEC	1.3.1.2	Hydrogeological Terms	24 of 131	Pore Water Figure/notes		Extra period after last sentence in note under pore water diagram.	This edit has been made.
20	CEC	2.2.5	Other Plant Operations	31 of 131	1	1	*"In addition to the four CCR management units, historical JSF Plant operations included non-CCR several process water, ….."* Something may be missing from this sentence after "several", sentence needs to be revised for clarity.	Edits have been made to the sentence to clarify.
21	CEC	2.3	Ownership and Surrounding Land Use	32 of 131	3	1	*"Public water is provided by the Rogersville/Persia Utility public water utility"* . The following sentences after this sentence imply these are two separate utilities. Consider revising the first sentence to specify this is more than one public water utility.	The text has been revised for clarity.

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Comment Number	Commentor	Section Number	Section Title	Page	Paragraph	Line	TDEC Comment (April 4, 2023)	TVA Response (July 3, 2023)
22	CEC	2.4.2.2	Surface Water Hydrology	34 of 131	1	2	General Comment: Do not see the 1927 topo in the same location as the 1940 topo (exhibit 2-5). Text stated there were a total of 6 historical stream channels observed in 1927 in the area of investigation. Is the 1927 topo attached or referenced in another location for viewing? This may be helpful in Appendix H.1 as well.	After additional review of the historical 1927 topographic map, it appears that the reference date should be 1935 for this map. This change has been made to the text and the historical 1935 topographic map has been included as Exhibit 2-4a. Additionally, surface stream locations from the 1935 and 1940 topographic maps have also been included on Exhibit 2-5.
23	CEC	7.1.2	Previous Studies and Assessments	67 of 131	1	3-10	Bullet point two contradicts bullet point one. Bullet point one - highly stressed benthic community not directly correlated with JSF discharge. Bullet point two - substantial reductions in gastropod productivity may have been due to chlorinated JSF plant discharge.	Clarification has been added to specify that the first bullet is referring to the "thermal" discharge, where as the second bullet is referencing the "chlorinated discharge". The word “thermal” has been added and the language in bullet 1 has been revised to say: "While control site and experimental station benthic macroinvertebrate communities were different, and downstream communities appear to be more highly stressed, results did not directly correlate with JSF Plant **thermal** discharges, and it was not possible to separate JSF Plant **thermal** discharge effects from other ecological ambient variables." Please also see response to Comment #44.
24	CEC	7.3	Results and Discussion	70 of 131	3	1	Please indicate the specific location; distance; etc. or reference on an exhibit as to the location of the potable water source located downstream of the JSF Plant CCR management units.	Added reference for where this information is located.
25	CEC	7.3.1	Holston River	71 of 131	1	2	*"Most CCR Parameter concentrations in sediment samples collected from the Holston River were below acute and chronic ESVs."* Were copper, zinc and mercury the only constituents that were above ESV's? If so, please indicate.	Sentence with reference to exhibit added.
26	CEC	Appendix G.1, Section 2.1.3	Results	14	7	5	Please define the term "elastic silt"	Elastic silt is simply the USCS naming convention for a soil that classifies as MH. The text has been clarified.
27	CEC	Appendix H.1, Section 2.2	Current and Ongoing Groundwater Monitoring	13 of 833	2	2 to 3	*"… Pond and determined that constituents detected at downgradient monitoring wells had statistically significant increases over background levels…"*- May be beneficial to specify that constituents detected in **onsite** downgradient monitoring wells? Also, are the background levels referenced here site specific/up-gradient background levels? This may be discussed at length in App. E but may be useful to add briefly in this sentence.	The subject sentence has been revised to include the suggested words "onsite" and "site-specific".
28	CEC	Appendix H.1, Section 2.3.7.1	Well Construction and Presence of CCR Material	17 of 833	1	4	Sentence indicates CCR material near the boring in which well W-28 was installed. Would it be appropriate to say that the CCR material was also above the screened interval of W-28?	The subject sentence has been revised by adding "above the well screen interval." at the end of the sentence.
29	CEC	Appendix H.1, Section 2.3.7.3	Hydrostratigraphic Units and the Uppermost Aquifer	19 of 833	2	4	Mentions protecting the uppermost aquifer because it could be used by property owners as a source of water. It would probably be beneficial to have some reference in the text of Appendix H.1 concerning the desktop water use survey. Do we know if identified wells nearby are screened in the uppermost aquifer or deeper aquifers?	Appendix H.9 provides the results of the desk top survey. Identification of the uppermost aquifer is independent of whether a hydrostratigraphic unit is being used as a source of water. The water use survey did not identify wells in the study area.
30	CEC	Appendix H.1, Section 2.3.7.4	Groundwater and Surface Water Level Elevations	19 of 833	1	1	Was any consideration given to measuring surface water elevations in Polly Branch and Dodson Creek? These physiographic features are said to influence groundwater (Section 2.3.7.5); however, evaluation appears to be missing.	The groundwater investigation sampling and analysis plan only included measuring surface stream elevations in the Holston River. Because of the smaller sizes of these surface streams and the localized influence, ground surface elevations were used as a proxy for surface stream stage elevations.
31	CEC	Appendix H.1, Section 2.3.7.4	Groundwater and Surface Water Elevations	19 of 833	1	1	Mentions 31 wells were used for groundwater elevation contours and 17 piezometers. Suggest adding another sentence identifying the number of wells and piezometers from either the uppermost aquifer or bedrock aquifer.	The number of monitoring wells installed in unconsolidated materials and bedrock and the number of piezometers installed in foundation soils and bedrock have been added to the text in Section 2.3.7.4.
32	CEC	Appendix H.1, Section 2.3.7.5	Groundwater Flow	20 of 833	4	9	*"Most bedrock wells were not gauged during sampling events 1 and 2".* - Was there a reason why?	The gauging of bedrock wells was not included in the groundwater investigation sampling and analysis plan because the environmental investigation plan initially only included the installation of wells in the unconsolidated materials. Because of encountered field conditions, bedrock wells were installed at the Highway 70 Borrow Area. After the first two rounds of sampling, it was decided to include other previously existing bedrock wells in the remaining gauging events.
33	CEC	Appendix H.1, Section 2.3.7.5	Groundwater Flow	21 of 833	1	2	Was this the mean hydraulic conductivity from slug testing the geometric mean?	Yes, it was the geometric mean.
34	CEC	Appendix H.1, Section 2.3.7.5	Groundwater Flow	21 of 833	1	8	Good that the reference the report where the dry fly ash stack hydraulic conductivities were located. It would be helpful to include the Dry Fly Ash stack geometric mean values in Table H.1-4, similar to the other CCR management unit areas. It was difficult to find where that value came from on the next page, the others were summarized in table h.1-4.	The hydraulic conductivity value used for the Dry Fly Ash Stack has been added to Table H.1-4. Slug testing has not been conducted in the wells around this CCR management unit to calculate a geometric mean. Slug testing of these monitoring wells is being planned and is expect to be available for use for the CARA Plan.

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35	CEC	Appendix H.1, Section 2.4	Groundwater Quality	24 of 833	1	8	*"analytical results were above the GSL at 99% confidence level"* . Instead, should it state that the lower confidence limit (LCL) at 99% confidence level was above the GSL?	This text has been updated in H.1 to align with the description provided in Appendix E.3, i.e., " green indicates no statistically significant concentration greater than or equal to the GSL for constituents other than pH and no statistically significant difference outside the GSL range for pH, and red indicates a statistically significant concentration greater than or equal to the GSL for constituents other than pH or a statistically significant difference outside the GSL range for pH."
36	CEC	Appendix H.1, Section 2.4	Groundwater Quality	24 of 833	2	7	Is the capping of the CCR management unit considered somewhat of a corrective action? Statistical evaluations including compliance confidence intervals are useful for evaluating the effectiveness of corrective actions that have been completed. May be worth stating if true?	Capping is not considered a corrective action for groundwater but is expected to influence groundwater quality. Groundwater monitoring for compliance, including statistical evaluation of the data, will be conducted to evaluate the effect of closure activities and corrective actions.
37	CEC	Appendix H.1, Section 2.4	Groundwater Quality	26 of 833	1	7	CCR constituents were similar, but slightly higher in JSF-210. Was the turbidity similar or were these based on dissolved metals concentrations? Were the dissolved fractions for cations and anion concentrations used for the Piper diagrams?	Turbidity was similar or lower in well JSF-210 compared to well JSF-206. Totals metals analyses were used for the Piper diagrams.
38	CEC	Appendix H.1, Section 2.4.2	Geochemistry of Soils-Groundwater Interaction	27 of 833	1st and 3rd bullet		Note that adsorption and mineral precipitation are controlled by pH and redox changes. Note that pH values in 10-36 and W-29 had a statistical increasing trend.	The referenced bullets state that the adsorption and mineral precipitation are controlled by pH and redox. With respect to trends of pH in individual wells, the geochemical discussion in the EAR is intended to be generic. A site-specific evaluation of geochemical conditions for monitoring wells that have statistically significant concentrations of CCR Rule Appendix IV constituents above a groundwater screening level will be included in the CARA Plan.
39	CEC	Appendix H.1, Section 3	Summary	30 of 833	2nd bullet	3	Mentions potable water wells. May need to include a summary in Appendix H.1 similar to section 5.3 of the EAR summarizing water use survey and reference to H.9.	The mention of potable water wells is intended to be a general statement that is independent of the water use survey. The structure of the EAR is intended to keep Appendices H.1 and H.9 separate; therefore, a summary of Appendix H.9 has not been included in the summary for Appendix H.1.
40	CEC	Appendix J.1, Section 2.1	Historical Studies	10 of 301	1	9	*"The studies found that downstream aquatic communities near the JSF and JCC Plants were ecologically similar to their upstream* ***control*** *sites." "Control sites"* is used numerous times throughout Appendix J. They don't represent "controlled" conditions. A more appropriate term is background or reference locations. In fact, the appropriate term is used in Section 3.1 of Appendix J.4: *"These areas represent* ***background*** *, adjacent, and downstream conditions".* Please consider using the term "reference or background" as opposed to "controlled".	"Control" is the term used in historical TVA monitoring reports and is directly pulled from those documents. It is used in those documents in a manner consistent with the intent of "background" as described by the reviewer.
41	CEC	Appendix J.1, Section 2.4.2	Analytical Results	12 of 301	2	2	*"The human health screening levels were only applied to surface stream sampling results for the Holston River, as it is the only surface stream used as a potable water source near the JSF Plant."* How close is the intake from the site? Could the intake be influenced by the site discharges?	See response to Comment 24.
42	CEC	Appendix J.1, Section 2.4.2	Analytical Results	13 of 301	4	3	If a data point was a statistically significant outlier and no other factor could be identified to explain the outlying value, the data point was excluded from further data screening, statistical analysis, or evaluation of the EI results in the EAR. Suggest adding a parenthetical identifying what some of those "other factors" might be.	This explanation of outlier disposition does not accurately describe how outliers were handled in this analysis. The outlier disposition text in statistics Appendix E.4 is more accurate. As such, the description of outlier disposition in the text in Appendix J.1 has been deleted and the reader is directed to Appendix E.4 for the full and complete discussion of statistical methods, including outlier analysis.
43	CEC	Appendix J.3, Section 2.1.2	Historical Benthic Macroinvertebrate Studies	84 of 301	1	10	*"Additionally, the studies found that while* ***control site*** *and experimental station . . ."* As previously mentioned, the term Background locations is more appropriate. These locations are meant to reflect background environmental conditions, i.e., not influenced by the site (EPA 2002). Likewise, and "experiment stations" should be described consistent with other sections in the Appendix. Note in Section 3.1 of Appendix J.4: "These areas represent **background**, adjacent, and downstream conditions"	See response to comment 40. The term "control" is used in historical TVA monitoring reports and is directly pulled from those documents. It is used in those documents in a manner consistent with the intent of "background" as described by the reviewer.

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44	CEC	Appendix J.3, Section 2.1.1	Historical Benthic Macroinvertebrate Studies	84 of 301	1	10	*"Additionally, the studies found that while control site and experimental station benthic macroinvertebrate communities **were different** , and downstream communities were highly stressed, the study results did not show a direct correlation of these factors with JSF Plant thermal discharges, and it was not possible to separate possible thermal discharge effects from other variables."* How were they different; what factors indicated they were "highly stressed"? Please consider listing these.	The text has been revised to better explain the location of the "highly stressed" communities. The location being referenced is approximately 24 miles downstream and not within the direct influence of the Plant discharge. The specific stress mechanism(s) were not determined; however, thermal discharge, passage over the John Sevier Detention Dam or through the JSF Plant condenser cooling water system (CCWS), and/or chlorination treatments in the CCWS may have affected the plankton and periphyton communities.
45	CEC	Appendix J.3, Section 3.1.1	Exploratory data Analysis	87 of 301	2nd bullet	4 in 2nd bullet	*"There is a documented source of mercury contamination to the Holston River upstream of the JSF Plant (USEPA 2017)."* Were the upstream samples elevated indicative of this upstream source? As noted in the first statement, some of the adjacent and downstream locations had concentrations above ESVs but not the upstream locations. Doesn't that indicate the plant is a source? Please explain as this is an important point.	Reference to the Superfund Site has been moved up to Chpt 2.2 in the document to explain that the SAP did not include sample collection above the JSF detention dam given the knowledge of the mercury source and concentrations of mercury in sediments.
46	CEC	Appendix J.3, Section 4.1	Sediment Quality	96 of 301	3	4	*"Mercury concentrations were identified at concentrations slightly above the chronic ESV in sediment samples collected from five separate locations along the Holston River."* It would be helpful to identify those locations.	A reference has been added for Exhibit J.3-4 which shows these locations.
47	CEC	Appendix J.3, Section 4.1	Sediment Quality	96 of 301	3	4	*"These results are attributed to a documented source of mercury upstream of the JSF Plant CCR management units, the Saltville Waste Disposal Ponds Superfund (Saltville) site. . ."* If this was the case, why are there exceedances in the adjacent and downstream locations but not the upstream locations? Should there be a consistent spatial distribution instead of an apparent gradient?	Please see response to comment #45. Due to the knowledge of the upstream source, there were no upstream sediment or surface stream samples collected. All samples collected for the EI were adjacent or downstream.
48	CEC	Appendix J.3, Section 4.1	Sediment Quality	96 of 301	4	1	*"however, arsenic, beryllium, and nickel were present at concentrations above their respective chronic ESVs in one or more sediment samples from the PB06 and/or PB07 locations"* Suggest adding (Exhibit J.3-4) to the end of the sentence as reference.	This edit has been made.
49	CEC	Appendix J.3, Section 4.2	Benthic Macroinvertebrate Community Analysis	97 of 301	3	1	*"Community sensitivity, examined through the HBI, reflects possible spatial relationships that may have resulted from localized differences in habitat conditions or other environmental factors;"* We have discussed this on other sites; but has there ever been consideration given to using a quantitative habitat assessment tool to shed some light on this?	Habitat assessment was not part of the EI scope. The purpose of the investigation was to determine if unacceptable risks from the CCR management units were present. If an unacceptable risk were identified, a habitat assessment could be warranted to rule out causality from physical habitat conditions or to better understand the influence of physical habitat on the HBI and other metric results. This would lend additional context to a comparative benthic community metric analysis.
50	CEC	Appendix J.5, Section 2.1.1	Fish Population Monitoring	254 of 301	1	4	Again, please evaluate the use of the word "control" versus "reference".	Please see response to comment #40. This section is referencing language from previously published TVA reports and this language is consist with those reports.
51	CEC	Appendix J.5, Section 2.1.4	Fish Entrainment Monitoring	255 of 301	2	3	Please provide a short statement as to the results of the fish entrainment studies conducted between 2004 and 2006.	The text has been revised to add the following: "Results of the 2005-2007 fish entrainment and impingement studies indicated no adverse impacts on the Holston River Fish community"
52	CEC	Appendix J.5, Section 3.1	Analytical Results	258 of 301	1	1	Should mercury and selenium be added to the list of CCR parameters evaluated and mentioned in this section?	Mercury and selenium are included as part of the 40 CFR Part 257 Appendix IV Constituents and are included in the CCR Parameter list.
53	CEC	Appendix J.5, Table J.5-2	Critical Body Residue Value Analysis - Holston River	267 of 301	NA	NA	Because of the importance of this data related to fish tissues, can more specific statements be made other than the general conclusions that the concentrations downstream were "higher" or "analogous" when comparing CBR values (for instance in Chapter 4 Summary of this appendix)? Although the general statement is supported, there are some examples in which "adjacent" sample concentrations exceed "upstream" values, such as muscle mercury values in Bluegill and redear sunfish.	Close examination of Table J.5-2 shows instances where the adjacent and/or downstream results appear to be higher than the upstream values. Most of those are within the limits of precision of chemical analyses for this relatively small dataset and even the higher values are below the LOAEL-based CBRs. In two instances, mercury in the livers of largemouth bass and channel catfish, were the downstream results significantly higher than the upstream values and greater than the LOAEL-based CBR. For reasons discussed elsewhere in the report, it is unlikely the mercury in those tissues is related to JSF operations.

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54	CEC	Appendix E.1	Statistical Analysis of Background Soil Data	Pages 1-6	Sections 1.0 though 4.0	NA	Excellent narrative summary of the statistical approach to deriving soil background threshold values (UTLs). Statistical methods, as described in this section, are valid and defensible, in compliance with statistical standard practices for the evaluation of environmental data.	Comment acknowledged. No response required.
55	CEC	Appendix E.1 Section 2.1.3	Outlier Screening	4	NA	NA	Rosner's method was used in evaluating outlier data for all data given in Appendix E, except for the background soil data. I assume that Rosner's procedure was not used in the identification of specific data values that are statistically significant outliers for the background soil evaluation because of the stated decision to not remove any outliers as given in the final sentence of Section 2.1.3 as follows: *"However, given the heterogeneity of naturally occurring inorganic compounds in soils, statistical outliers were not removed from the datasets prior to statistical analysis, but may be reevaluated if BTVs are used to inform future corrective actions. "* Is this correct?	This is correct.
56	CEC	Appendix E.2, Section 2.2	Regression Analysis	4	1st	Line 7	Has there been any thought given to evaluating the SPLP/CCR correlations 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 a an alternate non-parametric method such as Spearman Rank correlation has not been pursued.
57	CEC	Appendix E.2, Section 2.2	Regression Analysis	4	1st	Line 5	Sentence states: *"As part of the analysis, the SPLP results for the CCR Parameters were compared to the range of pore water concentrations from the Ash Disposal Area J, Bottom Ash Pond, and Dry Fly Ash Stack."* Are you stating that you calculated correlation coefficients for the pore water vs SPLP results? Or is this simply stating that you have shown the pore water ranges on each of the regression plots ?	The range of pore water concentrations were on each regression plot. This was a qualitative comparison to highlight the relative magnitude of CCR parameter concentrations measured in pore as compared to SPLP results. There were insufficient data to calculate correlation coefficients.
58	CEC	Appendix E.2, Section 2.2	Regression Analysis	4 and 5	1st	Entire paragraph	Correlation between CCR material data and SPLP extraction results will typically not produce a correlation coefficient high enough (0.8 to 1.0) to justify the development of a regression model. Therefore, the development of a reliable linear regression-based mathematical model to predict CCR pore water constituent concentrations resulting from the leaching of these constituents from CCR ash will be difficult to achieve. Estimations of this kind should be performed with a more complex geochemical model, such as PHREEQC or Geochemist Workbench.	As noted in the response to Comment 56, above, this statistical analysis 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. This response is consistent with the conclusion that was reached after the analysis. SPLP is not a reliable predictor of CCR parameter concentrations in pore water.
59	CEC	Appendix E.2, Section 3.2	Regression Analysis	5	2nd	6	The quoted statement is not surprising: *"The results indicate that the total concentrations of metals in CCR material is not a reliable predictor of the magnitude of the potentially leached concentrations measured using SPLP."* Based on past attempts to model the mathematical relationships between particulate-bound constituents and dissolved constituents from SPLP eluate, the development of a reliable regression-based mathematical model to predict CCR pore water and SPLP constituent concentrations resulting from leaching of constituents from CCR ash is difficult to accurately achieve.	Agreed, the relationship between CCR parameter concentrations in solid CCR material and SPLP is not consistently strong and not consistent across CCR parameters and CCR Management Units, making a statistical model unreliable. See further discussion in response to comment 58, above
60	CEC	Appendix E.3 Statistical Analysis of Groundwater Analytical Results	Section 2.2: Comparison to Groundwater Quality Data To Groundwater Screening Levels	4	First 3 paragraphs	NA	Excellent summary of the approach used to compare groundwater constituent concentrations with MCLs and screening levels (i.e., confidence intervals for data with limited statistical evidence of trends and confidence bands for data with statistically significant trends).	Comment acknowledged. No response required.

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61	CEC	Appendix E.3 Statistical Analysis of Groundwater Analytical Results	Section 2.2.1	5	Paragraph 1	1	*"For well-constituent pairs with five or more samples and at least four detected values, groundwater quality data were compared to GSLs using a linear regression trend analysis and confidence interval/ confidence band evaluation."* Page 21-24 of the EPA Unified Guidance (March 2009) states "At least 8 to 10 measurements should be available when computing a confidence band around a linear regression. There must be enough data to not only estimate the trend function but also to compute the variance around the trend line." The use of a sample size of five may not provide adequate Power to detect a statistically significant slope coefficient for the regression line. However, when examining the linear regression trend plots in Attachment E.3-D, there does not appear to be any plots with less than 6 data points. JFS-107 has 7 data points for Boron, pH, Molybdenum and JSF-110 has 6 data points for pH. Of these four plots, there was one, JFS-107 Boron, listed as having a statistically significant trend. Additional data acquired in the future will continue to build the size of these data sets and improve the validity and accuracy of the statistical test results.	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 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. We agree that we can expect validity and accuracy of the statistical test results to improve as additional data are collected.
62	CEC	Appendix E.3 Statistical Analysis of Groundwater Analytical Results	Section 2.2.1 Figure E.3-1	7	NA	NA	Nice flow chart figure added as Figure E.3-1. The only comment is that the wording within the pH boxes of the flow chart appear to be cut off.	The flow chart has been revised to include the cut off wording.
63	CEC	Appendix E.4 Statistical Analysis of Surface Stream Data	Attachment E.4-A Summary Statistics by Water Body	Pages 174 to 178 of the entire PDF	See Table	See Table	There are references to total constituents, dissolved constituents, and Normal constituents. "Normal" concentrations are for those constituents that are not typically reported as "total" or "dissolved" fractions, such as chlorides, TSS, TDS, etc. However, there are inconsistencies as to when the term "Normal" is applied throughout the tables. Please revise. In addition, why was this aqueous-based chemical nomenclature with the differentiation of fractions not also used in the groundwater data tables in Appendix E.3?	Corrections have been made to Attachment E.4-A. For Appendix E.3, all results presented are 'total' or 'normal'. Analysis for 'dissolved' results was typically not completed for groundwater. Regulations that govern groundwater monitoring are based on total metals, or normal, concentrations. Therefore the focus of the statistical analysis and reporting is on total and normal results only. For groundwater, dissolved analyses were only conducted for evaluation of the effect of turbidity on the analytical results in situations where the turbidity purging criterion was not met. Many wells have no dissolved analyses and for wells that have dissolved analyses, the data sets are small. For these reasons, dissolved metals results for groundwater are not reported or discussed in Appendix E.3 for the EAR.
64	CEC	Appendix E.4 Statistical Analysis of Surface Stream Data	Section 3.1 Summary Statistics, Exploratory Data Plots, and Outlier Screening	6	2nd	1	The results of the outlier screenings state the following: *"There were no statistically significant outliers in the JSF surface stream dataset."* However, when reviewing the box plots for Holston River in Attachment E.4-B, a note at the bottom of the box plot for copper states that the sample JSF-STR-WC07-LB- SUR-20190813 at 12.5 µg/L was identified as a potential outlier and was removed from the data. What was the reasoning for removing this value? Also, this removed outlier needs to be stated in the narrative of Section 3.1.	The outlier screening text is correct. The text in the boxplot was an error and has been removed.
65	CEC	Appendix E.4 Statistical Analysis of Surface Stream Data	Section 2.2	5	1st	4	A statement is made that since there were no exceedances of ESVs and generic SSLHH in the surface water sample analytical results, the only comparisons performed to assess changes between upstream, adjacent, and downstream sample locations were graphical in nature (via transects and box plots). The text specifically states: *"Comparisons were done graphically."* However, there were no summary discussions regarding the results of the referenced graphical comparisons of data within the Holston River relative to differences in analytical results between adjacent and downstream locations and differences in analytical results between upstream and adjacent sample results for Polly Branch.	Revised language in section 2.2 to the following: "No CCR parameter concentrations in either the Holston River or Polly Branch were above their respective ESV or SSLHH, therefore no additional statistical analyses were conducted (PCA and hypothesis testing). Results were summarized graphically using transect plots and in tabular format in Tables in Appendix J.1."
66	CEC	Appendix E.5 Statistical Analysis of Sediment Data	Attachment E.5-B Box Plots	Pages 245 to 250 of the entire PDF	NA	NA	Relative to the box plots of comparisons of adjacent and upstream sediment concentrations for Polly Branch for the CCR Rule Appendix III Parameters, the colored boxes in the bottom legend intended to distinguish the upstream box plots from the adjacent box plots have the same color. A different color for the adjacent boxes needs to be shown in the legend.	The upstream boxes are a lighter shade of green and there is a footnote that states that lighter shaded boxes are representative of upstream sampling locations.

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67	CEC	Appendix E.5 Statistical Analysis of Sediment Data	Section 3.1 Summary Statistics, Exploratory Data Plots, and Outlier Screening	6	2nd	1	The results of the outlier screenings state the following: *"There were no statistically significant outliers in the JSF surface stream dataset."* However, when reviewing the box plots for Holston River in Attachment E.4-B, a note at the bottom of the box plot for copper states that the sample JSF-STR-WC07-LB- SUR-20190813 at 12.5 µg/L was identified as a potential outlier and was removed from the data. What was the reasoning for removing this value? Also, this removed outlier needs to be stated in the narrative of Section 3.1.	The outlier screening text is correct. The text in the boxplot was an error and has been removed.
68	CEC	Appendix E.5 Statistical Analysis of Sediment Data	Section 3.3.1 Formal Hypothesis Testing	7 and 8	Entire Section	NA	A parametric, two-sided hypothesis test (Type I error =0.05) was used to evaluate whether there are statistically significant differences in the means for given constituent concentrations adjacent to the facility and downstream for the Holston River sediment and upstream and adjacent comparisons of constituents for sediments taken from Polly Branch. Based on Attachment E.5- A, for the Holston River sediment samples, the hypothesis test results given in Section 3.3.1 are based on sample sizes of 12 for adjacent samples and 6 for downstream samples. Polly Branch results were based on sample sizes of 5 for upstream and 8 for adjacent locations. The hypothesis test results given in Section 3.3.1 should be considered preliminary, due to the low Power associated with these tests using the small sample sizes. For example, when examining the sediment box plots in Attachment E.5-B for the Holston River, there are visually evident differences in the distributions for adjacent vs. downstream sediment concentrations for arsenic, cadmium, and thallium. When examining the Power associated with the two-sided t-tests for these constituents, given the samples sizes, mean differences, and differences in standard deviations, the Power is very low. Therefore, if there are real differences in the means between the upstream and adjacent sample locations for these 3 referenced constituents, there is a low probability that the derived hypothesis tests would be able to detect these differences. Additional data acquired in the future will continue to build the size of these data sets and improve the validity and accuracy of the statistical test results.	The comment is correct, collection of additional data would increase the power and sensitivity of a statistical evaluation of sediment sample concentrations. However, 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. In addition, these sediment data will be further evaluated in the CARA Plan.
69	CEC	Appendix E.7	Data Evaluation of Fish Tissue Data	2	Table E.7-3	Subheadings of Table	Regarding the fish categories "BG", "CC", "LB", "SB", "RS", and "SH" subheadings of the table listed under "Sample Concentration mg/kg ww*" and under the headings "Muscle', "Liver", "Ovary", and "Whole Body" : These fish types need to be clearly stated in the Legend at the bottom of Table E.7-3 so that the table can be pulled out as a stand-alone table for presentation and publications, if needed. It is understood that these designations are given in Table E.7-1; however, clear delineations of these call-outs are needed within Table E.7-3.	Footnotes have been added to the Table E.7-3 legend.