

FINDING OF NO SIGNIFICANT IMPACT
TENNESSEE VALLEY AUTHORITY
FINAL PROGRAMMATIC ENVIRONMENTAL ASSESSMENT
GROUNDWATER CORRECTIVE ACTION
Alabama, Kentucky, and Tennessee

The Tennessee Valley Authority (TVA) evaluated groundwater corrective actions at one or more TVA properties within the TVA Power Service Area (PSA) with the preparation of a Programmatic Environmental Assessment (PEA), pursuant to the National Environmental Policy Act (NEPA).

This PEA programmatically assesses the effects of corrective actions designed to address potential exceedances of federal groundwater protection standards (40 Code of Federal Regulations [CFR] Part 257, Appendix IV) at various sites. As part of this programmatic assessment, TVA has developed new guidance, including an Environmental Screening Checklist and a bounding analysis, that complies with NEPA's procedural requirements, up to and including potential site-specific considerations of groundwater corrective actions at one or more of these TVA properties. The programmatic approach would allow TVA to adequately cover most of the site-specific activities that could occur, including the alternatives. TVA would consider this guidance, including recommended environmental practices and mitigation measures, in its decision-making processes.

TVA has twelve (12) properties which may require groundwater corrective actions in Alabama, Kentucky, and Tennessee. The 12 TVA properties, considered in this PEA, include: Allen Fossil Plant (ALF), Bull Run Fossil Plant (BRF), Colbert Fossil Plant (COF), Cumberland Fossil Plant (CUF), Gallatin Fossil Plant (GAF), John Sevier Fossil Plant (JSF), Johnsonville Fossil Plant (JOF), Kingston Fossil Plant (KIF), Paradise Fossil Plant (PAF), Shawnee Fossil Plant (SHF), Watts Bar Fossil Plant (WBF), and Widows Creek Fossil Plant (WCF). All 12 TVA properties evaluated in the scope of this proposed action are either active or closed fossil plants that have exceedances of groundwater protection standards (GWPS) that monitoring data indicates could arise from storage of coal combustion residuals (CCR). CCR are by-products produced from burning coal and include fly ash, bottom ash, boiler slag, and flue gas desulfurization materials. These by-products have historically been stored or disposed of in surface impoundments (like ash ponds), landfills, and other CCR units. "CCR units" is used generally to describe areas where CCR are or were stored and are the current focus of potential groundwater corrective action.

Beyond compliance requirements with the Federal CCR regulations (40 CFR Part 257), TVA is currently conducting environmental studies under the oversight of the Tennessee Department of Environment and Conservation (TDEC), as directed by a TDEC Commissioner's Order (Office of General Council 15-0177) from August 6, 2015 (TDEC Order). The TDEC Order created a process by which sites that have CCR in Tennessee would be investigated and assessed for unacceptable risks. The TDEC Order also provides a process by which TDEC could oversee TVA's implementation of the 2015 Environmental Protection Agency Final Rule on Disposal of Coal Combustion Residuals from Electric Utilities (the CCR Rule) to ensure coordination and

compliance with applicable Tennessee law. TVA is also pursuing several studies and planning actions pursuant to applicable Alabama and Kentucky state law and regulation, respectively.

Ultimately, TVA is pursuing all CCR unit and facility closures in compliance with the Federal CCR Regulations (40 CFR Part 257) (Federal CCR Rule), which is a self-implementing federal regulation that provides minimum performance standards and groundwater actions for all CCR units. TVA would adhere to all applicable federal and state regulations throughout the course of implementation of the proposed groundwater corrective actions.

Following implementation requirements and guidelines in the Federal CCR Rule and applicable state agency regulations, TVA identified 12 TVA facilities containing one or more CCR units with GWPS exceedances, herein referred to as Sites, that required additional testing of groundwater and an assessment of corrective measures. This identification process requires TVA to consider and evaluate potential actions that could be taken to address constituents of interest (COIs) measured at statistically significant levels above established GWPS. For the purposes of this document, a COI is defined as a CCR constituent in groundwater that requires corrective action. The process includes detection and assessment monitoring to confirm that some COIs are statistically above GWPS in onsite monitoring wells

The purpose of the Proposed Action is to address the need for corrective action across CCR units at TVA facilities within the TVA PSA (Sites) due to exceedances of federal GWPS. The purpose of this PEA is to programmatically analyze potential impacts of proposed groundwater corrective actions (Proposed Actions) at one or more TVA facilities across the TVA PSA. TVA conducted this Programmatic NEPA review of the Proposed Actions in accordance with TVA's NEPA regulations (18 CFR 1318 et seq.). Programmatic NEPA reviews address the general environmental issues relating to broad decisions, such as those establishing policies, plans, programs, or a suite of projects, and can effectively frame the scope of subsequent site- and project-specific federal actions. This PEA is intended to reduce the cost of duplicative, site-specific analyses of environmental impacts of Proposed Actions. Because these impacts are likely to be similar within typical environmental contexts, they can be effectively evaluated at a broad scale for TVA properties analyzed in this PEA.

This document identifies potential effects of the proposed action and establishes mitigation measures to reduce adverse impacts from a programmatic perspective. If needed, future site-specific reviews would integrate the processes, findings, and conclusions from this PEA.

Alternatives

TVA has determined that four potential action alternatives are technically and economically feasible for consideration and/or subsequent implementation to address groundwater exhibiting statistically significant concentrations above the GWPS. These alternatives include:

- Alternative B – Enhanced In Situ Treatment (EIST)
- Alternative C – Hydraulic Control and Groundwater Treatment
- Alternative D – Monitored Natural Attenuation (MNA)
- Alternative E – Combination of Corrective Actions

These technologies along with Alternative A, i.e. the No Action Alternative, are described below.

Alternative A - No Action Alternative

Under the No Action Alternative, no additional corrective actions would be performed. The No Action Alternative does not meet the purpose and need because it does not actively mitigate environmental risks (if any) and may fail to meet regulatory compliance if COI levels exceed GWPS with statistical significance. Therefore, this alternative was determined to not be feasible for consideration. However, the No Action Alternative provides a baseline for comparison against the action alternatives. All groundwater monitoring required would continue in conjunction with the CCR Rule, state permits and regulations, or as required under TVA's agreement(s) with state regulators.

Alternative B – Enhanced In Situ Treatment (EIST)

EIST of groundwater is an established technology for a variety of site conditions and contaminants. Under this alternative, TVA would address statistically significant exceedances above the GWPS by utilizing appropriate measures implemented *in situ* (i.e., treatment within the uppermost aquifer) to immobilize, reduce or degrade COIs. *In situ* technologies can be deployed in a variety of configurations depending on the extent of COIs and their proximity to potential receptors, though they typically involve introducing reactive media, chemical reagents, or biological agents (herein referred to generally as reagents) into the groundwater.

Evaluation of EIST approaches for COIs is typically dependent upon a detailed hydrogeologic conceptual site model, a groundwater flow model, and a geochemical model.

These approaches offer targeted treatment strategies that adapt to site-specific hydrogeologic conditions. Bench-scale testing is designed to develop an understanding of geochemistry and assess the effectiveness of prospective reagents to be used *in situ*, and can also be used to inform the scope and necessity of field-scale pilot testing. The geochemical model is then used to evaluate potential COI attenuation rates and long-term stability for the EIST approach. A groundwater monitoring program is also typically an integral part of any EIST system to track changes in COI concentrations and provide feedback on the effectiveness of the EIST system.

Several critical site-specific conditions need to be considered when evaluating the applicability of an EIST system, including site access, dike stability, depth of installation, and geochemistry. Four specific EIST approaches were selected for further evaluation because of their potential applicability at TVA properties, including:

- Permeable reactive barriers (PRBs) using continuous (one-pass) trenching equipment;
- Vertical injection wells, including infiltration galleries and direct injection;
- Horizontal injection wells; and
- Funnel-and-gate approach.

Alternative C – Hydraulic Control and Groundwater Treatment

Hydraulic control is a reliable, proven technology that has been employed for decades to control impacted groundwater. Hydraulic control, also referred to as hydraulic containment or “ex situ”, typically involves the active extraction of impacted groundwater from collection galleries, wells or trenches, through the use of submersible pumps, for treatment at the surface before being discharged. These methods provide direct control over COI migration and mass removal and allow for a range of treatment options, including physical (filtration, sedimentation), chemical (oxidation, precipitation), and biological (bioreactors) processes.

The applicability and orientation of a hydraulic control system is largely based on site-specific conditions such as aquifer dimensions and hydraulic conductivity, presence of confining layers, depth, gradient, characteristics of the COIs, and presence of receiving water bodies or wells.

Groundwater extraction deployment approaches for hydraulic control include vertical and horizontal wells. Vertical wells can be used in unconsolidated soils and bedrock. The number of wells, spacing between wells, and well depths are a function of aquifer characteristics and the targeted control zone. Horizontal wells potentially allow for the installation of more well screen along a zone of COI impacts in comparison with vertical wells, thus improving the overall efficiency of the extraction system, though they may not be as practical as vertical wells depending on site-specific conditions.

For both vertical and horizontal extraction, extracted groundwater would be pumped through a conveyance pipeline and treated through an above-ground treatment facility prior to discharge under applicable permit(s). If there is not already a water treatment facility at the site, one would need to be constructed. Water treatment operations would occur within a 10,000-square-foot area containing a cargo container (Conex) and storage tank. Water treatment involves separating solids from liquids and removing impurities and suspended solids with a filter press, producing clean water and waste solids. Discharges from the water treatment facility would be to nearby surface water at a permitted outfall. Appropriate permits would be obtained for groundwater withdrawal (e.g., water allocation permits) whose requirements vary by state.

Hydraulic control methods of extraction provide direct control over COI mass removal and allow for a range of treatment options, including physical (filtration, sedimentation), chemical (oxidation, precipitation), and biological (bioreactors) processes. Treatment of the extracted groundwater would be completed onsite using treatment methodologies such as pH adjustment, chemical precipitation, adsorption, and ion exchange (see Appendix C for more information on treatment methodologies).

A groundwater monitoring program is typically an integral part of any hydraulic control system. The monitoring program tracks changes in groundwater levels and COI concentrations to provide feedback on the effectiveness of the hydraulic control system.

The time frame to achieve GWPS with a hydraulic control system is strongly dependent on the site's hydrogeologic conditions, the degree and extent of COI impact, and the geochemical behavior of COIs in the subsurface. These inherent site conditions often function as rate limiting characteristics and should be considered when developing the schedule for achieving GWPS.

Alternative D – Monitored Natural Attenuation (MNA)

Monitored Natural Attenuation (MNA) is a corrective action strategy that involves establishing a program to monitor the physical, chemical, or biological processes that occur naturally at a site. These processes can often work to reduce the toxicity, concentration, or mobility of site COIs in a time frame that is acceptable and can be comparable to other technologies. MNA is increasingly employed at sites where COI concentrations are near GWPS threshold levels, do not have an immediate pathway to sensitive receptors, and are not resultant from an ongoing source. These conditions increase the likelihood that natural processes can attenuate COI concentrations in an acceptable time frame.

The basis of a MNA remedy for COI is typically centered on developing a detailed hydrogeologic conceptual site model, a groundwater flow model, and a geochemical model. MNA

implementation would consist of designing a monitoring and assessment program to demonstrate that the COI concentrations present in the groundwater are being reduced by natural processes. Existing and potentially new monitoring wells at the facility would be used to characterize reduction in COI concentrations over time.

Reliance on natural processes rather than active treatment may require institutional controls to restrict access to affected zones. MNA relies upon naturally occurring processes to reduce COI levels and, by itself, does not provide a means to affect change in the subsurface environment. This strategy can be effective, especially when used in combination with unit closure and source control.

Alternative E – Combination of Corrective Actions

Under Alternative E, TVA would address groundwater statistically significant exceedances above the GWPS by utilizing a combination of Alternatives B, C, and D to meet the purpose and need of the project. The most likely combination of corrective action alternatives would be the use of Alternative B and Alternative D or the use of Alternative C and Alternative D. It is unlikely that there would be any occurrence where a combination of Alternatives B, C, and D would be applicable.

A hybrid remediation approach integrates multiple corrective actions and alternatives to optimize effectiveness and adaptability for site-specific conditions. The combination of corrective actions leverages a mix of EIST, hydraulic control, and MNA techniques to address contamination through a phased or targeted strategy. This alternative allows for flexible applications where highly impacted groundwater zones may require hydraulic control treatment, while less impacted groundwater zones may benefit from stabilization through EIST and/or MNA. By incorporating multiple technologies, this approach maximizes contaminant removal, enhances regulatory compliance, and balances efficiency with environmental sustainability.

Preferred Alternative

Based on the review of the potentially applicable corrective action alternatives and the associated bounding values, Alternative E (Combination of Corrective Actions) is TVA's preferred alternative across all Sites. TVA anticipates using a combination of corrective actions at various Sites consisting of Alternatives B or C used in combination with Alternative D to meet the purpose and need of the project. Alternatives B and C would not be used together.

Alternative E is consistent with the established Purpose and Need to address groundwater protection exceedances across the Tennessee Valley at TVA fossil plant properties. Other alternatives used would not be sufficient to meet GWPS independently. By pursuing a programmatic Environmental Screening Checklist, TVA can efficiently pursue programmatic review of site-specific environmental effects and continue to pursue adherence with federal and state groundwater requirements. A specific preferred groundwater corrective action alternative for each Site would be determined by the site-specific analysis.

Ultimately, TVA is pursuing all CCR unit and facility closures in compliance with applicable law, including applicable Federal and state requirements. TVA would select and implement corrective actions consistent with those applicable requirements throughout the course of implementation of the proposed groundwater corrective actions.

Impacts Assessment

TVA's analysis found that environmental resources would be minimally affected by the proposed action. Most activities associated with the proposed program would occur on previously disturbed areas; therefore, impacts to most resources, including geology and groundwater, land use and prime farmland, soil erosion and surface water, floodplains, wetlands, threatened and endangered species (including plants and terrestrial and aquatic animals), visual resources, noise, air quality, greenhouse gas and climate change, transportation and navigation, hazardous materials and solid waste, public health and safety, and socioeconomics are anticipated to be minor to moderate and temporary during construction and minor to moderate during operations. Effects would be mitigated through implementation of standard and routine best management practices (BMPs) and non-routine mitigation measures as identified in the PEA. Because sites have not yet been identified, specific reasonably foreseeable future actions with a close causal relationship cannot be identified; however, overall effects from such actions are addressed in the PEA and expected to be minor.

Public Involvement and Intergovernmental Review

TVA released the Draft PEA for a 30-day public comment period on August 18, 2025, at www.tva.com/nepa. To solicit public input, the availability of this Draft PEA was announced in regional and local newspapers including: Colbert County Reporter, Paducah Sun, Florence Times Daily, The Commercial Appeal, The News-Democrat, The Gallatin News, Knoxville News Sentinel, The Hendersonville Standard, and The Courier-News. A media advisory was also issued. Hard copies were made available by request. TVA's agency involvement included sending notices to local, state, and federal agencies and federally recognized tribes to inform them of the availability of the Draft PEA. Comments of the Draft PEA were accepted via mail, email, and the online comment system through September 17, 2025.

TVA received a total of three submissions during the public comment period. Submissions were received from the United States Environmental Protection Agency Region 4, TDEC, and the Energy and Environment Cabinet Department of the Kentucky Department for Environmental Protection (KYDEP), which consolidated comments from multiple KYDEP resource divisions. Comments were generally supportive or neutral and primarily contained recommendations related to site-specific analyses. TVA carefully reviewed all substantive comments that were received for consideration in the Final PEA and revised text in the Final PEA, as appropriate.

Best Management Practices and Routine Measures

TVA has identified the following BMPs that could be used to minimize impacts and restore areas disturbed during proposed project activities; these are bounding BMPs, and would be employed on an as-needed basis at any given site:

- Fugitive dust emissions from site preparation and construction would be controlled by wet suppression and other BMPs (CAA Title V operating permit incorporates fugitive dust management conditions).
- Erosion and sedimentation control BMPs (e.g., silt fences, truck washes) would be used to ensure surface waters and wetlands are protected from construction impacts.
- Equipment refueling and maintenance operations would be conducted at designated locations using applicable BMPs.

- Construction would include customary industrial safety standards, applicable BMPs, and jobsite safety plans to maintain worker and public safety.
- The vendor and/or host would develop a project specific SWPPP, as required, prior to the start of construction.
- Consistent with Executive Order (EO) 13112 (Invasive Species), disturbed areas would be revegetated with native or non-native, non-invasive plant species to avoid the introduction or spread of invasive species.
- BMPs in accordance with TVA's A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Construction and Maintenance Activities (TVA 2022) would be used during construction activities to minimize and restore areas disturbed during construction.
- BMPs that may be implemented to help minimize impacts to bat species would include standards for noise during construction, human presence guidance, tree removal BMPs, standards for sedimentation, spills, pollutants and contaminants, lighting, and bat species monitoring.
- TVA would manage all solid waste generated in accordance with applicable state regulations and following procedures outlined in TVA's current Environmental Procedures and applicable BMPs.
- TVA would review Federal Emergency Management Agency (FEMA) flood insurance rate maps and/or site contour maps showing known 100-year flood elevations to ensure above-ground structures and laydown areas, as well as any other areas that to be used for non-repetitive actions (i.e. one-time construction activity), would be located outside 100-year floodplains.
- Perennial, intermittent, and ephemeral streams that could be affected by the proposed construction would be protected by implementing standard BMPs as identified in the project specific SWPPP.
- BMP procedures for controlling soil erosion and sediment control, such as the use of buffer zones, to the extent practicable, surrounding perennial and intermittent streams, would be implemented.
- BMP procedures to prevent potential groundwater contamination and ensure water quality standards would be maintained.

Mitigation

As part of TVA's site-specific environmental review and screening process, which utilizes the Environmental Screening Checklist defined in the Final Programmatic Environmental Assessment for Groundwater Corrective Action and the 2025 Biological and Cultural Compliance (BCC) Guidelines, TVA will evaluate each proposed action for resource-specific impacts and apply the following mitigation measures and best management practices (BMPs) as needed. These measures represent the programmatically bounded mitigations identified in PEA § 2.6 and will be refined or supplemented during site-level analyses to ensure compliance with the National Environmental Policy Act (NEPA), Endangered Species Act (ESA), National

Historic Preservation Act (NHPA), Executive Orders 11988 (Floodplain Management) and 11990 (Protection of Wetlands), and other applicable regulations.

- TVA would determine if a Site proposed for corrective action would have wetlands present and if there would be potential adverse impacts to wetlands. Wetlands would be preferentially avoided during construction. Any potential unavoidable wetland impacts would be mitigated under regulations implementing Sections 401 and 404 of the CWA, applicable state regulations, and EO 11990 (Protection of Wetlands). Compensatory mitigation would be purchased if necessary.
- If forest is present at a proposed site, surveys would be conducted to determine suitability of summer roosting habitat for federally listed bat species. Sites with presence of suitable summer roosting habitat for federally listed bats, and for which the removal of such habitat would not be avoidable, may be subject to seasonal surveys to determine bat presence prior to construction actions.
- Potential impacts to bats and other sensitive species would be avoided by observing seasonal restrictions on tree clearing and avoiding impacts to potentially suitable habitat identified during surveys. In accordance with TVA's ESA Section 7 Programmatic Bat Consultation, if site-specific proposed actions warrant, a TVA Bat Strategy Project Review Form would be completed prior to carrying out proposed actions and any conservation measures identified during the review would be implemented.
- TVA's commitment to abiding by the Endangered Species Act (ESA) and state-level regulations would minimize impacts to terrestrial animal species that are federally or state-listed. Under the bounding condition, project activities would comply with the Migratory Bird Treaty Act (MBTA) and Bald and Golden Eagle Protection Act (BGEPA), as construction activities would be at least 660 feet away from any known protected species nests or would comply with MBTA and BGEPA permitting requirements. TVA would check state and federal species that have the potential to occur within a specific project area for site-specific analyses.
- TVA would initiate consultation with the State Historic Preservation Office (SHPO) and federally recognized tribes to determine the area of potential effect (APE), identify historic properties in the APE, and assess the potential effects of the proposed action on any National Register of Historic Places (NRHP)-listed or -eligible properties in the APE. TVA would seek an existing disturbed location, or an area that past archaeological surveys have shown do not contain NRHP-listed or -eligible archaeological sites, to ensure that no such sites would be affected by the action to the extent practicable. TVA would complete any needed surveys for historic architectural resources, assess potential adverse effects on any identified NRHP-listed or -eligible historic architectural properties, and seek ways to avoid such adverse effects, in consultation with the appropriate SHPO and tribes as project plans are developed. Should avoidance of adverse effects on historic properties prove to be infeasible, TVA would work with the appropriate consulting parties to develop a Memorandum of Agreement (MOA) for the resolution of the adverse effects, pursuant to § 800.6(b)(1).

Conclusion and Findings

This FONSI relies on the bounding analyses and mitigation framework documented in the Final PEA. Based on these findings, we conclude that the proposed Groundwater Corrective Action program would not be a major federal action significantly affecting the environment. Accordingly, an environmental impact statement is not required. This finding of no significant impact is contingent upon adherence to the permit conditions and mitigation measures described above.



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Date Signed